

Final Report
on
Reef Resilience and Climate Change:
A Workshop for Coral Reef Managers

Tumon Bay, Guam
August 17-20, 2009

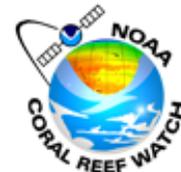
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Section 1. Overview

The Guam Reef Resilience and Climate Change: A workshop for Coral Reef Managers, held August 17-20, 2009 at the Guam Hilton Resort and Spa in Tumon Bay, was the seventh in a series of capacity-building presentations based on *A Reef Manager's Guide to Coral Bleaching (The Manager's Guide)* and the *Reef Resilience Toolkit: Resources for Reef Managers (R² Toolkit)*, providing a response framework for mass bleaching and climate change and MPA design which incorporates the concept of resilience. This particular workshop was the second that occurred after a curriculum update that was undertaken in partnership with The Nature Conservancy Global Marine Initiative. The updated curriculum merges the NOAA Coral Reef Conservation Program *Responding to Climate Change* curriculum with The Nature Conservancy *Reef Resilience Toolkit* curriculum. The workshop curriculum brings together world-class tools and expertise:

- **NOAA's Coral Reef Watch Program (CRW)**, which uses satellite imagery to predict the onset and severity of mass bleaching events globally;
- **NOAA's Coral Reef Conservation Program (CRCP)**, whose mission is to protect, conserve and restore coral reef resources by maintaining healthy ecosystem function
- **The Nature Conservancy (TNC) Reef Resilience initiative**, which seeks to estimate reef resilience to climate change and integrate resilience into marine protected area design;
- **The Coral Reef Targeted Research Program (CRTR)**, researching climate change impacts on coral reef ecosystems and methods for restoring ecosystem resilience;
- **The Great Barrier Reef Marine Park Authority (GBRMPA)** innovation on practical, science-based management strategies for climate change;
- **The Global Socioeconomic Monitoring Initiative for Coastal Management (SocMon)**, an initiative supported by the CRCP and the Global Coral Reef Monitoring Network (GCRMN) which facilitates community-based socioeconomic monitoring of coral reef areas.
- **The World Wildlife Fund (WWF)** initiatives on climate change adaptation and its "Climate Camps" that help conservation practitioners start working toward adaptation.
- **Papahānaumokuākea Marine National Monument's (PMNM)** initiative to bridge multiple knowledge systems, strengthen partnerships and increase community involvement for better marine management;

Funding and logistical support for the Guam Workshop was provided by the following:

- **NOAA Coral Reef Watch (CRW):** The mission of CRW is to utilize remote sensing and *in situ* tools for near-real-time and long term monitoring, modeling and reporting of physical environmental conditions of coral reef ecosystems. CRW aims to assist in the management, study and assessment of impacts of environmental change on coral reef ecosystems. CRW has provided coordination, staff and funding in support of this workshop.
- **The Nature Conservancy (TNC):** The mission of TNC is to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. TNC provided funding, coordination and staff support for this workshop.
- **NOAA National Marine Fisheries Service Pacific Islands Regional Office:** The Pacific Islands Regional Office of the National Marine Fisheries Service (NMFS) is part of the National Oceanic and Atmospheric Administration (NOAA). The Pacific Islands Regional Office manages programs that support both domestic and international conservation and management of living marine resources within the Pacific. The Pacific Islands Region is comprised of American Samoa, Guam, Hawaii, the Northern Mariana Islands, and other U.S. Pacific islands.

- **Guam Department of Agriculture:** The Guam Department of Agriculture was established under P.L. 3-103, effective 8/01/56 to protect and promote the agricultural resources and economy of the Territory of Guam by research, quarantine, control and conservation.
- **University of Guam Marine Laboratory:** The laboratory, established as a research unit of the university in 1970, serves the greater Micronesian region. Our mission is trifold: to perform basic and applied research on the biology of tropical marine organisms, emphasizing conservation and management of coastal marine resources; to provide community service through environmental assessments, technical reports, educational materials, public lectures and expertise on marine issues; and to assist with teaching biology and environmental science at the university.
- **East West Center:** The East-West Center contributes to a peaceful, prosperous, and just Asia Pacific community by serving as a vigorous hub for cooperative research, education, and dialogue on critical issues of common concern to the Asia Pacific region and the United States
- **NOAA Coral Reef Conservation Program:** The mission of the CRCP is to protect, conserve, and restore coral reef resources by maintaining healthy ecosystem function. The primary objective of the CRCP is to address strategic coral reef management needs in a targeted, cost-effective, and efficient manner.
- **Guam Coastal Zone Management Program:** Coastal hazards, public access, urban growth, conservation of coral reefs, and wetlands are some of the key issues for Guam's coastal management program.
- **Guam Environmental Protection Agency:** Guam EPA is made up of five Divisions dedicated to enforcing environmental regulations, issuing environmental permits, responding to public concerns and complaints, and protecting the environment of Guam in general.

1.1 Goals

This effort presents a capacity-building program built around the Reef *Manager's Guide to Coral Bleaching* and *The Reef Resilience Toolkit: Resources for Reef Managers*. The workshop was a refinement of the other NOAA presentations of these materials in Australia, American Samoa, the Florida Keys, Hawai'i and Bonaire over the last 3 years. New to the workshop in Guam was a section on climate change and coral disease. This will be included in future workshops.

The goals of the workshop were:

- To provide coral reef managers with a learning opportunity to better understand coral reef resilience and the tools available to them
- To facilitate the incorporation of resilience into coral reef management and planning
- To provide managers with innovative approaches and tools that lead to practical solutions for coral reef management in the face of global change
- To initiate a draft version of a protected area or network design for each participating country
- To initiate a draft Bleaching Response Plan for each participating country.
- To facilitate an exchange between Pacific Island coral reef managers
- To integrate Pacific Island managers into a global practitioners network for managers working to incorporate resilience at their sites

1.2 Participants

The workshop was mainly attended by coral reef managers, conservation practitioners and scientists from the Pacific Islands. Twenty-five participants were from Guam, the Commonwealth of the Northern Mariana Islands, Palau, the Republic of the Marshall Islands, and the Federated States of Micronesia (Kosrae, Chuuk,

Pohnpei, and Yap). The Guam workshop was also attended by a journalist and writer who is working on a book project about the concept of resilience entitled, *Resilience: The Science of Why Things Bounce Back*.

The Guam workshop brought together a few of the same instructors from previous workshops, as well as past participants returning in an instructor role, plus multiple new instructors who provided local and regional expertise on the subject matter. The following instructors took part in the workshop:

- Valerie Brown, NOAA NMFS Pacific Islands Regional Office
- Mark Eakin, NOAA Coral Reef Watch
- Britt Parker, NOAA Coral Reef Watch
- Trina Leberer, The Nature Conservancy
- Laurie Raymundo, The University of Guam Marine Lab
- Supin Wongbusarakum, East West Center
- Chip Guard, NOAA National Weather Service
- David Burdick, Guam Coastal Management Program
- Mike Gawel, Guam Environmental Protection Agency

1.3 Structure

Workshop instruction as delivered in lectures, hands-on activities, focused group discussions and field exercises. The participants added lively discussion from their personal experience; this enhanced the value of the workshop, and also allowed participants to get to know one another better and to network with one another.

Module 1 was a synthesis of the latest science about observed and expected climate change impacts on coral reef ecosystems as well as the physiology of coral bleaching. Participants were also introduced to the bleaching response plan framework so that they could begin thinking about how to incorporate the information being presented into their own response plans. This module included a presentation on local impacts of climate change to Micronesia as well as information on climate change and coral disease.

Module 2 provided participants with NOAA tools available to predict where conditions are conducive to coral bleaching and the utility of community based monitoring programs which can provide more eyes on the ground to inform managers of reef condition. There was also discussion of how to incorporate these early warning systems in bleaching response plans.

Module 3 defined both biological and social resilience, presented the four principles of resilience and how to identify resilience and resilient communities.

Module 4 followed on with the incorporation of resilience factors into MPA and MPA network design and management. The participants then took part in a group exercise in which they considered their reef area classification and MPA design and zoning based on guiding principles for incorporating resilience into MPAs. Since some represented jurisdictions had already completed this exercise, there were also groups who discussed incorporating episodic monitoring into ongoing monitoring programs, designing an MPA network across the Federated States of Micronesia, and issues of jurisdiction in Guam.

Module 5 introduced importance of understanding and assessing the ecological impacts of mass bleaching. The module continued with a brief review of reef characteristics that promote resilience, protocols for rapidly assessing resilience, and the importance of incorporating resilience monitoring into long term monitoring programs. A field exercise where participants were asked to rate the resilience of two coral reef sites was one of the highlights of the workshop.

Module 6 was about the incorporation of resilience into management strategies. In past workshops, this has been a module that was presented through presentations and discussions. Given the expertise in the room the presentation was used to facilitate a discussion amongst participants and staff.

Module 7 was on communicating about climate change, mass bleaching, and management activities to constituents, decision makers, local community organizations, community members and the general public.

Module 8 included a brief presentation reviewing the components of a bleaching response plan and also provided examples of bleaching response plans from Bonaire, Hawai'i and Australia's Great Barrier Reef. Participants then worked in their group to develop a draft bleaching response plans for their regions. This exercise synthesized the lessons learned in the other modules.

Section 2. Outcomes

2.1 Curriculum

In addition to providing training, this workshop also produced an improved library of presentations for future use. The agenda and presentations have been improved based on feedback from Australia, American Samoa, Florida Keys, Hawai'i, and Bonaire participants. The information and presentations will continue to be updated and feedback from Guam has already been incorporated into the curriculum and agenda for a workshop that will be presented later this year in the United States Virgin Islands. The workshop materials will be publicly available on the CRW website: <http://coralreefwatch.noaa.gov/satellite/education/workshop/>.

2.2. Participant Feedback

Participants were asked to complete evaluations at the close of the workshop. Feedback was overwhelmingly positive. 98% of participants either agreed or strongly agreed that the modules presented were useful, interesting, clearly delivered, and helpful to their jobs. Examples of comments included:

“The workshop contained a lot of interesting content, especially from the socioeconomic standpoint. I gained a lot of ideas about how we can integrate bleaching response into our monitoring effort.”

“Overall the workshop was super informative and very timely. Thanks you for extending the invitation to the FAS.”

“The Bleaching Response Plan Exercise made us realize the importance of having a response plan in place whether or not there's bleaching.”

A number of participants made suggestions to improve the workshop and these changes will be incorporated into future trainings. Most of these comments focused on workshop organization, the amount of information being presented, keeping information and examples relevant to the local region. Examples of comments included:

“More focus on the bleaching response plan, as in what to do when bleaching happens. There should be more emphasis on what needs to be done in terms of management and other resources for reefs before bleaching even happens.”

“Some different ways of presenting might break up the way of listening (e.g. showing a video).”

“Across the board – the conference would benefit from more practical examples and less “texty” powerpoints.”

“Let’s get conservation/EPA people working with Disaster and Weather people.”

Discussions and recommendations will be currently being developed and will be provided for the planning of future workshops.