



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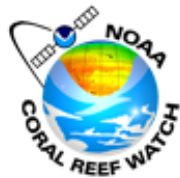
**Reef Resilience and Climate Change:
A Workshop for Coral Reef Managers**

**Kralendijk, Bonaire, Netherland Antilles
June 9-12, 2009**

By

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Section 1. Overview

The Bonaire Reef Resilience and Climate Change: A workshop for Coral Reef Managers, held June 9-12, 2009 in Kralendijk, Bonaire, Netherlands Antilles, was the sixth in a series of capacity-building presentations based on *A Reef Manager's Guide to Coral Bleaching (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 first 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 Bonaire 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.
- **Dutch Caribbean Nature Alliance (DCNA):** A non-profit organization created to protect the national environment and to promote sustainable management of natural resources on Aruba, Bonaire, Cuaçao, Saba, St. Eustatius, and St. Maarten. DCNA works to strengthen individual conservation campaigns by creating a united voice and sharing resources, skills and experience.
- **Stuchting Nationale Parken Bonaire (STINAPA):** A non-governmental, not for profit foundation commissioned by the island government to manage the two protected areas of Bonaire: The Bonaire National Marine Park (BNMP) and the Washington Slagbaai National Park (WSNP).

STINAPA Bonaire is dedicated to the conservation of Bonaire's natural and historical heritage through the sustainable use of its resources.

- **International Union for the Conservation of Nature (IUCN):** The IUCN helps the world find pragmatic solutions to our most pressing environment and development challenges. It supports scientific research, manages field projects all over the world and brings governments, non-government organizations, United Nations agencies, companies and local communities together to develop and implement policy, laws, and best practice.
- **EarthEcho International:** EarthEcho International is a nonprofit 501c3 organization founded in 2003 by siblings Philippe and Alexandre Cousteau in honor of their father Philippe Cousteau, Sr., famous son of the legendary explorer Jacques Yves Cousteau. EarthEcho International's mission is to foster extraordinary leaders to take action to restore and protect our Oceans.
- **Dr. George Buckley and Harvard University's Environmental Management Extension Program:** Harvard University's primary resource for continuing education for nearly a century, the Harvard Extension School offers an open and comprehensive academic curriculum and programs to meet the interests and needs of a diverse public including graduate degrees and certificates in Environmental Management.

The workshop in Bonaire was hosted by the Bonaire National Marine Park at Capt. Don's Habitat Dive Resort Bonaire and was held in conjunction with the 30th Anniversary celebration of the Bonaire National Marine Park. The dedicated staff members of the BNMP, Capt. Don's Habitat, and Linda Cruise and Travel were integral to the success of this workshop.

1.1 Goals

This effort aimed to present 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, and Hawai'i over the last 3 years, but was unique in the sense that it focused primarily on the international coral reef managers from the Lesser Antilles Region of the Caribbean.

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 Caribbean coral reef managers
- To integrate Caribbean managers into a global practitioners network for managers working to incorporate resilience at their sites

1.2 Participants

The workshop was mainly attended by international coral reef management practitioners, scientists, and dive operators from the Lesser Antilles and Mexico. Twenty-six participants were from the Netherlands Antilles (Bonaire, Curaçao, St. Maartin, and Eustacia), St. Vincent and the Grenadines, Grenada, Antigua and Barbuda, St. Kitts and Nevis, and Mexico.

The Bonaire workshop brought together a few of the same instructors from previous workshops, plus multiple new instructors who provided local and regional expertise on the subject matter. The following instructors took part in the workshop:

- Britt Parker, NOAA Coral Reef Watch
- Stephanie Wear, The Nature Conservancy
- Scott Heron, NOAA Coral Reef Watch
- Gabriel Grimsditch, IUCN Global Marine Programme
- Ramon de Leon, Bonaire National Marine Park
- Jeanne Brown, The Nature Conservancy

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.

Module 2 defined both biological and social resilience, presented the four principles of resilience and how to identify resilience and resilient communities.

Module 3 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.

Module 4 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 5 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 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. In Bonaire, there was a unique opportunity to have a panel discussion with stakeholders of the BNMP and to hear from park management about the 30 year progression of management in the Park. Guests included Zarzino Josephia local fisherman and kayak tour operator, Bart Snelder the owner of Wannadive, and Augusto Montbrun the dive operations manager of Buddy Dive.

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.

As part of this module, participants developed their own key messages on the threats facing coral reefs and presented them in skits, songs, and puppet shows.

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, and Hawai'i participants. The information and presentations will continue to updated and feedback from Bonaire has already been incorporated into the curriculum and agenda for a workshop that will be presented last this year in Guam. 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. 90% 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:

"I think that this workshop was well organized the sessions were well put together, very interesting, and educational. The coaches were very clear in the presentations and during the activities we received a lot of help from them. I hope that in the future more workshops will be planned and also some of the information can be used to help with our newly formed protected area."

"Our area poses a large number of challenges – but the workshop has given us information and enthusiasm."

"The BNMP presentation and discussion was very interesting. It was very practical and dealt with the real threats and possible solutions and put solutions in perspective."

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 Caribbean region, and the need for workshops that tackle the local threats of unsustainable fishing, water quality, land based sources of pollution, coastal development, etc. Examples of comments included:

"I had anticipated much more interaction (e.g. possibilities for the different islands to share threats and solutions. The presentation and stakeholders of the BNMP was a good start."

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

"Useful workshop; maybe less stress on activities and more on discussions."

“Very good, interactive. Would be good to conduct a workshop on “Coral Reef Threats and Solutions” for marine park managers.”

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