Published on *OpenChannels* (https://www.openchannels.org)

MPA Perspective: Monitoring for Resilience to Climate Change in Coral MPAs

Editor's note: David Obura is East Africa coordinator of Coral Reef Degradation in the Indian Ocean (CORDIO), an international research program. Gabriel Grimsditch is program associate with CORDIO. Ameer Abdulla is senior specialist in marine biodiversity and conservation science with IUCN.

By David Obura, Gabriel Grimsditch, and Ameer Abdulla

With the world's attention now squarely on climate change as a global threat, many MPA managers are correctly asking, "What can we do about such a large-scale issue?" At the MPA scale, the primary approach to limiting climate impacts is to reduce other stressors. By minimizing the work an ecosystem must do to resist one threat, the ecosystem is better able to deal with other threats.

Resilience is the ability of a system to absorb or recover from disturbance while maintaining its functions and services. The key for MPA practitioners is to manage for this. It becomes critical then for scientists and managers to determine the range of threats affecting a given ecosystem, and thereby understand and manage its ability to cope with climate change. This is monitoring for resilience.

Such monitoring provides a comprehensive overview of threats, as well as the state of the system. With this information in hand, a manager can make sound decisions. For example, fishing may be closed for different herbivorous fish groups during or after a bleaching event to minimize algal competition with recovering corals. Or, during bleaching events, the manager may press for more stringent control of pollution or runoff to minimize stress to corals.

With support from the MacArthur Foundation, the IUCN Climate Change and Coral Reefs (CCCR) working group is developing a resilience assessment protocol to address this management need. The project is focusing on the major threat of high sea-surface temperatures, which cause thermal stress to corals. The resilience-monitoring protocol involves the following themes:

1. Benthic cover - Obtainable from ongoing monitoring programs. This provides a standard status assessment that is common to coral reef studies.
2. Coral genera - Relative abundance on a 5-point scale. This provides a picture of the coral community, its susceptibility to threats, and impacts of past threats.Coral size class distributions - From smallest to largest, with sampling stratified for different sizes. The most time-consuming section, this gives a picture of population dynamics within the coral community, which is evidence of past conditions and regeneration.
3. Coral condition - Including bleaching, disease, other conditions and mortality. This gives an indication of current stress in the coral community, and of recent mortality.
4. Fish community structure - Emphasizing a) abundance of herbivore functional groups (large and small excavators, scrapers, grazers, browsers and grazers/detritivores) as these affect recovery via coral-algal competition, and b) top predators as their removal is a primary indication of fishing pressure.
5. Resilience indicators - Factors affecting protection of a site from thermal stress, such as temperature, visibility, depth, topographic complexity, sediment impact, and anthropogenic influence on water quality.

The full protocol can be obtained from the CCCR website (see the box at the end of this article), along with information on current sites and partners. Future improvements to the protocol will allow for customization to various local needs, including the capacity of monitoring teams, and incorporate new modules for additional components of resilience. It is worth noting that the principles applied here for coral reefs and climate change should be transferable to other ecosystems and threats.

Some tips on resilience monitoring are below:

- The survey area should ideally be an integral reef system, up to about 100 km in length.
- Good knowledge of the survey area and its representativeness in the greater region is required; this enables scaling and customization of semi-quantitative indicators.
- A large number of sites within the survey area should be included, covering different levels of reef health, threats, and protection categories. Because of the large number of variables, 20 or more sites should be included. The protocol can be completed in one dive per site.
- Background information improves the interpretation of resilience indicators, so past or ongoing monitoring and research greatly improve the utility of the resilience assessment. Other information - such as maps, charts, fish catch levels, and demographic information - are also useful.
- Prior to surveys, a clear examination of MPA objectives and key threats will help guide site-selection, application of the method, and feasible management responses that could be prioritized based on data analysis.
- Conducting resilience surveys before a marine protected area is zoned can help identify critical sites and refugia from different threats.

For more information:

David Obura, IUCN Climate Change and Coral Reefs Working Group (CCCR), P.O. Box 10135 Mombasa, Kenya. Email: dobura@cordioea.org

---

BOX: Additional resources on resilience

IUCN Climate Change and Coral Reefs Working Group
www.iucn.org/themes/marine/coral_reefs/cccr/cccr_home.html

Resilience Practitioners Network
www.reefresilience.org

Reef Manager's Guide to Coral Bleaching
www.iucn.org/dbtw-wpd/edocs/2006-043.pdf
