CARE: Comprehensive Assessment of Risk to Ecosystems

A Rapid, User-Friendly Tool to Assess Marine Ecosystem Risks

Thousands of commercial and recreational fisheries exist worldwide, representing an important component of many countries' economies and supporting billions of people around the world who rely on healthy oceans for food and income. And yet the health of, and risks to, the marine ecosystems that support these fisheries remain largely unknown, making it challenging for fishing communities to manage fishing smart and sustainably.

Specifically, the failure to assess the potential impacts of a variety of natural and human activities on marine ecosystems can pose risks to marine biodiversity and impact the ability of these systems to continue to produce the goods and services we depend on. Furthermore, without an accurate assessment of the comprehensive risks facing marine ecosystems, managers may spend valuable time and resources attempting to limit or control the wrong drivers of system change. Costly efforts to reform fisheries management, for example, may be undermined by the impacts of other system stressors (e.g., coastal development, climate change) that are outside the fishery managers' control.

While several ecological risk assessment (ERA) models exist, the majority focus mainly on evaluating the impacts of fishing without quantitatively considering other threats. None of these tools assess the synergistic or antagonistic effects that different threats can have on each other. All of these tools require significant time as well as expert knowledge and access to resources to complete.

To address these issues, EDF developed the Comprehensive Assessment of Risk to Ecosystems (CARE) model. CARE helps fishing communities to identify and rapidly rank threats to marine ecosystems or a species health and productivity, even when few data are available: CARE fills deficits in scientific data with local knowledge.

WHAT DOES CARE DO?

CARE guides users through a step-by-step process to evaluate the potential impact of all natural and human threats to a given set of marine ecosystems (defined by dominant habitat type) and species. The tool can be used to aid in the selection of fishery reform sites and guide initiatives to reduce threats in data-limited fisheries. It can also be used to evaluate risks facing a single site; to compare multiple sites for the suitability or necessity of different management options; or to evaluate the effects of a proposed management action aimed at reducing one or more risks. This analysis can help users identify which threats are the most important at a given site and for a given target, and therefore where limited management resources should be targeted. Drawing from existing ERA methods and several notable ecosystem research studies, CARE:

- ➢ Assesses all threats to a given marine ecosystem including fishing, climate change, pollutants, coastal development, other system uses (such as aquaculture or tourism), or any other potential stressor that may be present in a given system
- ➢ Allows users to assess the synergistic or antagonistic interactions of multiple threats
- ➢ Considers risk to the entire ecosystem through inclusion of a comprehensive suite of attributes that characterize system health and functioning by describing:
  - o Intrinsic system recovery potential and
  - o Resistance to impact
- ➢ Includes a module designed to quantify risks to the production of ecosystem services in both data-rich and data-limited settings
- ➢ Can be implemented in the field, relying largely on local and expert knowledge and can take as little as 1-2 hours
- ➢ Generates risk values for each threat as it impacts each target (valued components (ecosystems and/ or species) of the system selected for analysis), ecosystem service production and the ecosystem as a whole

CARE IN ACTION: PILOTING THE TOOL IN THE PHILIPPINES

Overfishing is a pervasive problem throughout the Philippines and most near-shore fishing areas are overexploited. Cantilan, a small municipality in the northeastern part of the island of Mindanao, is no different. Some activities both within and around the Cantilan area present potential threats to marine environmental health and productivity. EDF applied CARE to determine whether non-fishing threats are likely to compromise the ability of fishery management to restore fish populations in this area.

The results of the CARE analysis revealed that the most pressing threats facing Cantilan are legal and illegal fishing followed by climate change which implies that this site has a high potential for recovery through implementation of improved fishery management. By decreasing pressure from legal and illegal fishing, stakeholders could greatly reduce risk to most of the evaluated targets in the site and leave only climate change as a significant concern. Importantly, research shows that control of other chronic threats could allow the marine ecosystem to recover and become more resilient to the acute stressors associated with climate change.

The analysis also found that among all of the ecosystems evaluated in the Cantilan site, coral reefs are the most threatened, followed by seagrasses, and then beaches. The CARE results also suggest that the reefs produce somewhat more ecosystem services than the seagrasses and beaches. Together, these results suggest that coral reefs in Cantilan should potentially warrant more attention than the seagrass and beach ecosystems because they are at much higher risk, and produce more ecosystem services.

Overall, the CARE analysis suggests that Cantilan is an excellent candidate for the implementation of fishery management improvement projects.

MOVING FORWARD WITH CARE

Recent research has highlighted the need for comprehensive ERA tools to help strengthen marine resource conservation and fishery management plans. While many ERAs exist, they focus mainly on evaluating risks to single species, generally from the impact of fishing alone. CARE builds on existing ERA methods by allowing users to examine multiple threats to multiple ecosystem types, capture interactions between threats, and describe potential impacts of threats on ecosystem services. This holistic model also incorporates recent research on ecosystem attributes associated with resilience to better characterize ecosystem response to threats. And importantly, the streamlined CARE process is highly accessible to scientists and managers who are operating with limited time, data, resources and capacity.

EDF has applied the CARE model to sites in a variety of countries around the world to inform fishery management strategy decisions. By piloting the tool in the Philippines and Indonesia, we've been able to incorporate feedback from partners and fishing communities to better enhance the tool and streamline it for ease of use in the field. As we continue to use CARE in other fishing communities and share it with partners and stakeholders, we will adapt the tool based on emerging science, local knowledge and expert experiences on the water.

A paper describing CARE in detail, an instruction manual and automated spreadsheets for performing a CARE analysis are available at **www.fishe.edf.org**