

❖ Conservation Measures and Adaptive Management

Case Study: Adaptive Management - Mesoamerican Reef Monitoring

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Purpose and region of analysis:

This study looks at and analyzes the value of monitoring large projects using one or two indicators applied region-wide. These indicators may measure one or more of the project's goals directly or may be proxies for the goal(s). It further advances the idea that by looking at large parts of the area being conserved, exceptions to any trends found can be singled out and looked at in more detail to discover the cause of their success or failure. Lessons thus learned can be applied to the project, per the Conservation by Design (CbD) framework.

Specifically, this study looks at monitoring work that was done by TNC in the Mesoamerican Reef (MAR) ecoregion. This region encompasses the reefs and their marine environment as well as the coast, coastal lagoons, mangroves, and other ecotypes and land uses found near the coast which influence the health of the ecoregion. The ecoregion stretches from northern Yucatan, Mexico, south and east and includes coastal and reef areas of Belize, Guatemala, and Honduras. The ecoregion ends at Cape Camaron on the central Honduran coast.

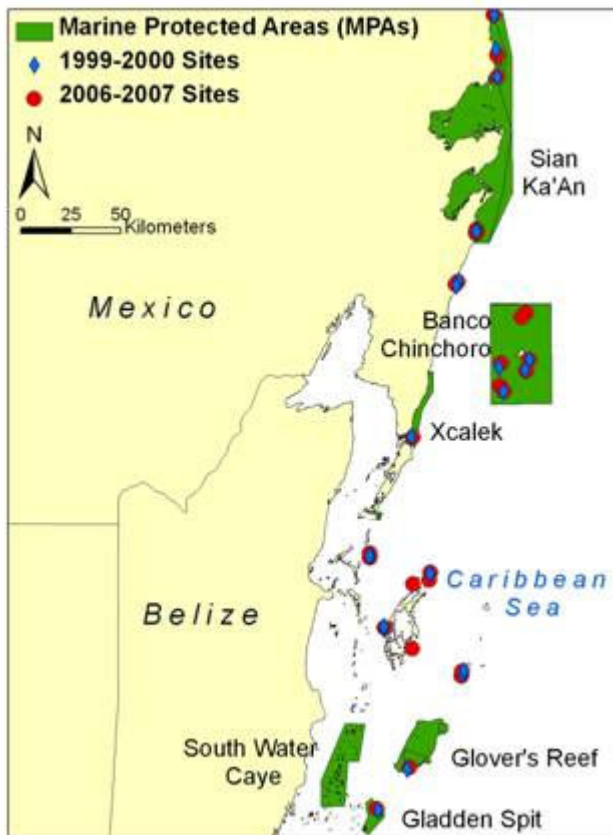
Two parameters were examined: total fish biomass - a proxy for biodiversity and overall ecosystem health - and percent coral cover, one of the goal parameters. Both parameters were analyzed over time in places that were both in and outside of MAR priority conservation sites.

The total fish biomass data indicated that the areas which are being managed as MAR priority sites are comparatively better off than those unmanaged areas. This finding is important in itself, but also because of the specificity of the sampling sites, areas which are higher and lower than the mean can be identified, and their management studied to gain insight into better management practices. The coral data showed sites which were below the regional average may be explained by natural processes. Both studies can be used in the CbD process to apply successful strategies more widely, where appropriate, and to change ineffective strategies.

Criteria/Methods:

Total Fish Biomass:

In 1999 and 2000 the Atlantic and Gulf Rapid Reef Assessment (AGRRA) program surveyed sites throughout the MAR, which was repeated by the MAR program in 2006 and 2007. This analysis focused on paired sites from both in and outside of 6 MAR marine protected areas (MPAs) that were decreed around this time period – Sian Ka’An (created in 2000), Banco Chinchorro (1996), Xcalek (2000), Glover’s Reef (2001), South Water Caye (1996), and Gladden Spit (2000) – on the Caribbean coast of Mexico and Belize (see map). The fish were surveyed by observation using 30-meter by 2-meter straight transects bounded above by the water’s surface noting the numbers and size of a select list of species (see details at www.agrra.org). A study using the same sites and protocols was commissioned by the MAR project in 2006-2007. The biomass inside and outside the MPA’s for the two sampling periods was compared to see if there were changes during the intervening years.



Coral Cover:

The AGRRA data and protocols were used to compare % coral cover in the same 6 MPA’s studied for total fish biomass over the same time period. The protocols specified transects 10 meters long by 1 meter wide which are placed over areas of

coral, avoiding non-consolidated (see details at www.agrra.org). Comparisons were made to determine any changes in % coral cover.

Products/Outcomes:

The Nature Conservancy MAR used survey date and treatment (inside and outside MPAs) as factors in an analysis of variance of the total fish biomass and coral cover in 6 MPAs that are part of MAR. Data from the AGRRA study of 1999-2000 were compared with data taken by TNC in 2006-2007. There were 34 paired sites, 19 in the MPA's and 15 outside them. The analysis of the total fish biomass showed that while the biomass had stayed constant for the areas within MAR, it had declined in the sites outside the project's control. Even though not definitive, these data point to a positive effect of having MAR in place and argue for the use of indirect measures for project evaluation. The analysis of coral cover showed no significant difference in cover between areas inside and outside protected areas. This is not surprising because we expect coral to respond to management in the order of decades while fish biomass should respond much more quickly.

Tools and Data:

The protocols used in 1999 and 2000 by the Atlantic and Gulf Rapid Reef Assessment (AGRRA) program were employed again by TNC in 2006-2007. Thirty four sites inside and outside of the 6 MPA's were sampled in 1999-2000 and were sampled again in 2006-2007. The protocols are summarized above in the section on Methodology and can be seen in greater detail at www.agrra.org. Data for the time series analysis was taken from the AGRRA study and compared to the same data from the later TNC study.

Strengths and weaknesses:

The study of total fish biomass pointed to the interesting and valuable conclusion that the MAR project was having an effect on the managed areas over a large region which included various habitat types and project goals. This implies that large, expensive, multi-indicator studies may not be needed to determine if a project is moving toward its goals or not. In this case it also shows that a proxy parameter may be used to measure progress.

Another strength of wide-ranging studies is that they may highlight sites that are anomalies. For example, coral cover at 2 of the sites decreased much more rapidly than the others. Further investigation suggested that this difference was likely due to natural forces (Hurricane Emily in 2005) rather than management practices. This demonstrates the ability to pick out and analyze special cases from large studies. Once identified – whether indicating very good or very bad management results – the exceptional sites can be studied and lessons learned applied to other, similar sites,

thus improving the efficiency of the management process. A weakness of this approach is that the specific reasons for a site being exceptional are not necessarily indicated by the measure used, so additional work is required to decide what exactly should be studied to determine the management lesson offered by the site.