

Degradation of the Mesoamerican Barrier Reef

Overview

The Mesoamerican Barrier Reef System (MBRS),ⁱ which stretches 700 miles from the tip of the Yucatan Peninsula to the Bay Islands of Honduras, is the second largest barrier reef in the world (Figure 1). This reef and its associated ecosystems host some of the richest biodiversity in the Caribbean as well as one of the fastest growing tourism industries in the world.ⁱ Over the past 20 years, increasing pressure from a number of region-wide threats has degraded the appearance and structure of the reef.ⁱⁱ



Figure 1: The Mesoamerican Reef (from the WWF Website)

Major threats to the MBRS include overfishing, land-based water pollution, rapidly expanding tourism, and climate change.^{iiiiv} Connected as it is by currents and mobile reef species, even localized damage to segments of the reef can have regional impacts.^v The reef is also subject to natural threats such as hurricanes and coral disease, vulnerability to which can be heightened by anthropogenic stressors.^{vi}

The four countries bordering the reef – Mexico, Belize, Guatemala, and Honduras- have significantly differing capacities for monitoring and management of the reef in the face of these threats.^{vii} Since 1997, however, they have collaborated to develop a regional approach to the conservation of the MBRS.^{viii} The reef system is also considered a global conservation priority by numerous NGOs.^{ix} Despite these efforts, the system remains at significant risk.^x

History of Regional and International MRBS Protection Efforts

The MBRS is of immense importance to the countries along whose coastlines it stretches, serving as it does as a buffer from hurricanes, a shelter for economically and culturally important fish species, and a source of significant tourism revenue. Approximately a million people in the region benefit directly from the fisheries, tourism, and coastal development associated with the MBRS.^{xi} In Belize, economic activity around the reef makes up approximately 30 percent of the gross national product.^{xii} It is thus not

ⁱ Also known simply as the Mesoamerican Barrier Reef (MAR)

surprising, that, while monitoring and enforcement capacity remain an issue, the MBRS nations have actively sought to mitigate threats to the reef.

Prior to establishment of regional coordination in the late 1990s, Mexico and Belize had the most fully developed management systems, with Honduras and Guatemala having few laws regulating the use of reefs.^{xiii} In Honduras, community based management efforts emerged to fill this gap in national capacity.^{xiv} Then, as now, monitoring and enforcement varied and reliance on international funding and NGO management was significant.^{xv}

In 1997, two years after the first recorded instance of mass coral bleaching (a sign of intense reef stress), the four bordering nations signed the Tulum Declaration outlining their intent to collaborate towards the sustainable use of the MBRS and to seek international support for regionally-focused efforts.^{xvixvii} This declaration set the stage for numerous regionally focused efforts to come, most directly the launch of the MBRS Project in 2001. This fifteen year project is funded by the Global Environment Facility (GEF) and implemented by the Central American Commission on Environment and Development (CCAD), which is made up of the environment ministers of the seven Central American countries. The MBRS project is focused on the establishment and institutional strengthening of Marine Protected Areas, the promotion of sustainable fisheries and tourism, and the establishment of a region-wide environmental monitoring system.^{xviii}

In addition to the GEF, funding for transnational MBRS projects comes from a variety of regional and international sources. The U.S. Based Summit foundation The Four in-country foundations formed the Mesoamerican Reef Fund (MAR Fund), in 2002, to provide “long term financial sustainability” for MBRS conservation efforts which might otherwise depend on potentially inconsistent support from international groups.^{xix} In 2003, the United Nations Foundation and U.S. Agency for International Development pledged three million dollars to contribute to “local, national, and regional-level resource conservation and sustainable development projects” in the MBRS region.^{xx} This pledge funded the three-year International Coral Reef Action Network– Mesoamerican Reef Alliance (ICRAN-MAR) project, which concluded in the summer of 2007.

In addition to those organizations listed above, the World Wildlife Fund for Nature (WWF), the Nature Conservancy, Wildlife Conservation Society, Conservation International, the Coral Reef Alliance, World Conservation Union, and numerous local NGOs also all run projects specifically targeted at the MBRS. Given this array of institutions and programs at work in the region it is little wonder that the coordination of these efforts, and the avoidance of duplicate work, has been called a “major challenge.”^{xxi}

Approaches to Mitigating Threats

Improving monitoring capacity

The expansion and coordination of environmental monitoring, and resulting improvements in understanding of the MBRS, that has taken place over the last decade is considered one of the bright spots in the current prognosis for the reef, though monitoring capacity remains weak in some areas.^{xxii} The MBRS Project’s Synoptic Monitoring Program coordinates environmental monitoring of the reef and associated ecosystems (such as mangroves and other wetlands) for the region, providing guidance and training to promote standardized monitoring.^{xxiii} To complement this effort, an array of non-governmental organizations collaborated with the MBRS project to create the Health People Healthy Reefs initiative, a multi-institutional effort to develop and track ecological and socio-economic indicators for the MBRS. Partners in this effort include the MBRS program, the World Bank, WWF, the Nature Conservancy, Environmental Defense, and the Smithsonian Institute.

Protecting Fish and Improving Regulations

The influx of tourists and their appetite for conch, lobster, and reef fish has significantly increased fishing pressure in the MBRS region, and particularly in the rapidly developing coastal sections of Honduras.^{xxiv} This overfishing problem has been approached through the use of fishing regulations and MPAs, both of which are established management tools in all MBRS countries.^{xxv} Monitoring and enforcement of both fishing regulations and no-take zones in MPAs are, however, inconsistent due to limited monitoring and enforcement capacities.^{xxvi}

All of the international environmental organizations working in the MBRS are addressing overfishing in some way, whether by seeking to enhance the strength of MPA management, training

fishermen for alternative occupations, or providing education on fisheries issues to affected communities.^{xxvii} WWF, working in conjunction with the ICRAN-USAID program, has been holding meetings with fishing communities in all four MAR countries to encourage acceptance of regulations and no-take zones. There are signs that outreach and education efforts are working. A 2002 survey pole in Belize showed that 45 percent of fishermen approved of marine protected areas as a management tool; by 2004 that number had increased to 75 percent.^{xxviii} In 2004, the MBRS nations also took the important step of harmonizing their regulations, which should make the standardization of both training and enforcement a possibility.^{xxix}

Understanding and Reducing Land-based Pollution

Currently over 300,000 hectares of land has been converted to agricultural use in the MAR watershed. Sediments, nutrients, and chemicals that drain from these areas pose a significant risk to near-shore sections of the reef.^{xxx} A 2005 report commissioned by several large environmental NGOS, described the lack of coordinated strategies to address watershed development was described as one of the major gaps in MBRS conservation.^{xxxi} In 2006, the World Resources Institute undertook a watershed analysis of the MBRS region in order to facilitate strategic efforts to reduce land-based pollution. The report found that 80 percent of the sediments, and over half of the nutrients, reaching the MBRS originate in Honduras, with Guatemala also a significant contributor of nutrients.^{xxxii}

ICRAN has funded WWF to lead collaborative work with agro-business and local farmers to reduce the use of pesticides and to control erosion in the MAR watershed.^{xxxiii} As a result of this work several major agricultural producers, including Dole and Chiquita, are implementing a plan to reduce environmental exposure to the most toxic pesticides.^{xxxiv} WWF also recently signed an agreement with African oil palm producers in Honduras to jointly work towards the implementation of best management practices.^{xxxv} The threat of nutrient pollution from shrimp farming to the MBRS is also receiving increasing attention and has become a priority issue for the Summit Foundation and WWF.^{xxxvi} Work is underway to both better understand the affects of shrimp farming on the reef and to incentivize better practices through certification programs.^{xxxvii}

Reducing the Impact of Tourism

The tourism industry which has sprung up along the MAR is one of the fastest growing in the world.^{xxxviii} This is both one of the great hopes for the reef – offering real economic incentives for conservation and non-consumptive employment opportunities- and a significant threat to the ecosystem. Release of wastes by cruises ships and hotels, destruction of reef by careless snorkelers and divers, and fragmentation of habitat due to coastal development are all considered key issues.^{xxxix} In 2006, Conservation International and the Coral Reef Alliance formed the Mesoamerican Reef Tourism Initiative (MARTI) to address the threat of mass tourism to the reef.^{xl} MARTI has worked with the International Council of Cruise Lines to secure an agreement that ships will discharge waste water no fewer than four miles from the reef.^{xli} They are also working with hotels in Mexico and Belize to reduce solid wastes and improve the management of chemicals.^{xlii}

Enhancing Resilience to Climate Change

In 1995, 1998 and 2005, unusually warm temperatures caused significant coral bleaching events throughout the world. The 2005 event, which was the most severe bleaching recorded in the Caribbean, caused the bleaching of up to 95% of corals in the most significantly impacted areas. The cooling of water by storm events during 2005 spared the Mesoamerican reef from the large-scale coral mortality experienced in other parts of the Caribbean, but it might be considered a harbinger of things to come for the MBRS.^{xliii}

To address this threat, WWF and TNC have conducted an assessment of the MAR and identified, and is promoting the protection of, bleaching resilient and bleaching resistant reefs. The MBRS Synoptic Monitoring Protocol made monitoring for climate-influenced bleaching events a priority.^{xliv}

List of particularly helpful resources (full citations are in endnotes)

- Alejandro Arrivillaga and Miguel Angel Garcia (2004), "Status of Coral Reefs of the Mesoamerican Barrier Reef System Project Region, and Reefs of El Salvador, Nicaragua, and the Pacific Coasts of Mesoamerica"
- Patricia Almadá-Villela et al (2002), Status of Coral Reefs of Mesoamerica- Mexico, Belize, Guatemala, Honduras, Nicaragua, and El Salvador
- Maya Gorrez, Building Synergies in the Mesoamerican Reef (report was commissioned by WWF, MRBS project, the Nature Conservancy, and the Summit Foundation)
- ICRAN MAR Alliance Terminal Report
- MBRS project website (explains details of Tulum Declaration and hosts policy documents and agreements)

ⁱ Arrivillaga, Alejandro and Miguel Angel Garcia, "Status of Coral Reefs of the Mesoamerican Barrier Reef System Project Region, and Reefs of El Salvador, Nicaragua, and the Pacific Coasts of Mesoamerica," in Status of the Worlds Coral Reefs: 2004. C. Wilkinson ed. Page 475

ⁱⁱ Arrivillaga, Alejandro and Miguel Angel Garcia, "Status of Coral Reefs of the Mesoamerican Barrier Reef System Project Region, and Reefs of El Salvador, Nicaragua, and the Pacific Coasts of Mesoamerica," in Status of the Worlds Coral Reefs: 2004. C. Wilkinson ed. Page 473

ⁱⁱⁱ Arrivillaga, Alejandro and Miguel Angel Garcia, (2004) "Status of Coral Reefs of the Mesoamerican Barrier Reef System Project Region, and Reefs of El Salvador, Nicaragua, and the Pacific Coasts of Mesoamerica," in Status of the Worlds Coral Reefs. C. Wilkinson ed. Page 473

^{iv} Wilkinson, C., Souter, D. (2008). Status of Caribbean coral reefs after bleaching and hurricanes in 2005. Global Coral Reef Monitoring Network, and Reef and Rainforest Research Centre, Townsville, 16

^v Harborne, Alastair, Daniel Afzal, Mark Andrews (2001). Honduras: Caribbean Coast, Marine Pollution Bulletin. Vol 42, No 12, page 1221

^{vi} Arrivillaga, Alejandro and Miguel Angel Garcia, (2004) "Status of Coral Reefs of the Mesoamerican Barrier Reef System Project Region, and Reefs of El Salvador, Nicaragua, and the Pacific Coasts of Mesoamerica," in Status of the Worlds Coral Reefs. C. Wilkinson ed. Page 486

^{vii} Arrivillaga, Alejandro and Miguel Angel Garcia, (2004) "Status of Coral Reefs of the Mesoamerican Barrier Reef System Project Region, and Reefs of El Salvador, Nicaragua, and the Pacific Coasts of Mesoamerica," in Status of the Worlds Coral Reefs. C. Wilkinson ed. Page 475

^{viii} Mesoamerican Reef System Project, Project Background, June 15, 2005.

<http://www.mbrs.org.bz/english/projdesc.htm> (accessed February 18, 2008)

^{ix} Wilkinson, C., Souter, D. (2008). Status of Caribbean coral reefs after bleaching and hurricanes in 2005. Global Coral Reef Monitoring Network, and Reef and Rainforest Research Centre, Townsville, 46

^x Wilkinson, C., Souter, D. (2008). Status of Caribbean coral reefs after bleaching and hurricanes in 2005. Global Coral Reef Monitoring Network, and Reef and Rainforest Research Centre, Townsville, 22

^{xi} Almadá-Villela, P.C, P.F. Sale, G. Gold-Bouchot, and B. Kjefve (2003). Manual of Methods for the MBRS Synoptic Monitoring Program. Mesoamerican Barrier Reef Systems Project, Belize City, Belize, v

^{xii} Cho, Leandra (2005). "Marine Protected Areas: a tool for integrated coastal management in Belize." Ocean and Coastal Management, vol. 48, Issue 11. page 1.

^{xiii} P. Almadá-Villela et al., "Status of Coral Reefs of Mesoamerica," in *Status of Coral Reefs of the World: 2002*. C. Wilkinson, ed. (Townsville: Australian Institute of Marine Science, 2002), 317

^{xiv} Luttinger, Nina (1997). "Community-based Coral Reef Conservation in the Bay Islands of Honduras." *Ocean and Coastal Management*. Vol. 36, Nos 1-3. Page 13

- ^{xv} P. Almada-Villela et al., "Status of Coral Reefs of Mesoamerica," in *Status of Coral Reefs of the World: 2002*. C. Wilkinson, ed. (Townsville: Australian Institute of Marine Science, 2002), 317
- ^{xvi} Wilkinson, C., Souter, D. (2008). Status of Caribbean coral reefs after bleaching and hurricanes in 2005. Global Coral Reef Monitoring Network, and Reef and Rainforest Research Centre, Townsville, 46
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- ^{xx} ICRAN Mesoamerican Reef Alliance (2007), *Terminal Report Executive Summary*. page 2.
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- ^{xxii} Arrivillaga, Alejandro and Miguel Angel Garcia, (2004), Page 474
- ^{xxiii} Arrivillaga, Alejandro and Miguel Angel Garcia, (2004), Page 474
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- ^{xxv} Central American Commission on Environment and Development (2004), the Agreement on Common Enforcements in the Mesoamerican Barrier Reef System Geographical Area
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- ^{xxvii} Gorrez, Maya (October, 2005), Building Synergies in the Mesoamerican Reef, page 6
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- ^{xxxi} Gorrez, Maya (October, 2005), Building Synergies in the Mesoamerican Reef
- ^{xxxii} Burke, Lauretta and Zachary Sugg (December 1, 2005) *Hydrologic Modeling of Watershed Discharge Adjacent to the Mesoamerican Reef*. World Resources Institute. Page 3
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- ^{xxxiv} ICRAN Mesoamerican Reef Alliance (2007). *Terminal Report Executive Summary*. Page 4.
- ^{xxxv} International Coral Reef Action Network (June 27, 2007). "Coral Reefs Protected by Sustainable Agriculture." <http://www.icriforum.org/List/Thread.cfm?MessageID=2269> (Accessed February 19, 2008).
- ^{xxxvi} The Summit Foundation, Program Areas- Conservation of the Mesoamerican Reef <http://www.summitfdn.org/foundation/programs/reef-conservation.html> (accessed February 19,2008)
- ^{xxxvii} WWF, Aquaculture – Featured Projects: Shrimp Aquaculture in Belize http://www.worldwildlife.org/cc/aquaculture_projects2.cfm (Accessed February 19,2008).
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