Report Card for the Mesoamerican Reef 2012

Healthy Reefs
for healthy people

An Evaluation of Ecosystem Health

Recommendations

The following recommendations describe prioritized management actions that governments, NGOs, the private sector and scientists can take to improve reef health. They were developed by HRI partners and staff at the Regional Partners Meeting in Playa del Carmen, Mexico in August 2012 and were ranked by their impact on ecological and social well-being.

1. Create and implement integrated coastal zone management plans that include impacts from watersheds.

2. Create an outreach network to educate, inform, and translate research information to managers, policy makers, government leaders, researchers, stakeholders and communities through effective use of the media.

3. Reduce upstream watershed pollution sources (agriculture, livestock, urban, industrial, rural, deforestation) through better management plans and practices; and regulations in each sector.

4. Promote more effective fisheries regulations of species with key ecosystem functions.

5. Achieve 20% of territorial sea under "full protection" by 2020, through an inclusive and participatory approach.

6. Formalize the creation and implementation of alternative livelihood programs, especially for fishers displaced by "fully protected" areas.

7. Improve the effectiveness of MPA management through enforcement, funding and improvement of technical capacity.

8. Apply the regionally accepted standards for sewage effluents (Land Based Sources of Marine Pollution Protocol of the Cartagena Convention for Class I waters).

9. Design and establish a regional system of MPAs with ecological connectivity, habitat, species representation, and including areas of particular importance for biodiversity, ecosystem services and resiliency.

10. Standardize fisheries regulations (size limits, closed seasons, fishing gear) and strengthen their application.

11. Adopt and expand a reward system for carbon sequestration and encourage a reduction in hydrocarbon extraction and dependency while promoting the use of alternative renewable energy sources.

12. Engage in research that responds to questions posed by resource and protected area managers and reef stakeholders, including the identification of specific stressors impacting reefs.

13. Continue implementing a standardized regional monitoring program and create a collaborative database that includes all necessary indicators of reef health.

14. Promote and adopt existing responsible and sustainable consumption guidelines for marine species.

15. Private sector should contribute significantly to the fulfillment of conservation objectives (as defined in their management plan) of the region's MPAs through financial assistance, technical support and/or human resources.

16. Governments should provide economic incentives for conservation and sustainable businesses and eliminate subsidies that compromise conservation goals.

17. Adopt voluntary "Codes of Conduct", "Ecolabels," and other mechanisms that reduce environmental impacts in accordance with international standards for hotels and marine recreation providers.

18. Transform all open access fisheries to rights-based sustainable fisheries management systems.

Cover photo: © Dano Pendygrasse/danopendygrasse.com
Trained divers remove lionfish with numbered spears in Cordelia Banks, Honduras.

The Mesoamerican Reef Region

A DELICATE BALANCE

Local economies and the livelihoods of nearly two million people rest on the health of the Mesoamerican Reef. The eco-region, an interconnected system of critical, fragile habitats, faces growing threats from overfishing, inland land clearing, and offshore oil exploration.

System Under Stress

- Coastal development along with increased tourism can lead to harmful dredging and sewage pollution.
- Offshore oil exploration and drilling pose risks to the entire reef system, including the Belize Barrier Reef World Heritage site.
- Corals off the coasts of Honduras and Belize are slowly recovering from bleaching and disease worsened by 1998's Hurricane Mitch.
- Multiuse protected areas like Gladden Spit balance conservation with the needs of the local economy, allowing limited fishing and tourism.
- Deforestation, agriculture, and urban development, especially in Honduras, result in runoff that damages habitats.

Critical Habitat

- Mangrove
- Sea grass
- Coral reef
- Marine protected area
- Protected fish spawning site

0 mi 25
0 km 25

MAGGIE SMITH, NGM STAFF; DARCY BELLIDO DE LUNA

SOURCES: MELANIE MCFIELD, HEALTHY REEFS INITIATIVE; NATURE CONSERVANCY; SEAGRASSNET; WASHINGTON DEPARTMENT OF NATURAL RESOURCES; CATHALAC; USGS; INSTITUTE FOR MARINE REMOTE SENSING; INEGI; SCRIPPS INSTITUTION OF OCEANOGRAPHY; NOAA

NATIONAL GEOGRAPHIC

What's Inside

The 2012 Report Card highlights three focal sections - existing and emerging **threats** to reef health; an assessment on the current **state** of the reef and social context; highlights of reef conservation **actions** across the region, including the prioritized recommendations to foster healthy reefs and healthy people.

THREATS

First, the Report Card reviews the main threats facing the reef, including: the rapid and widespread invasion of the exotic lionfish; climate change, with a fresh look at ocean acidification already in progress; marine-based threats, including plastic debris and oil exploration; land based threats, including sedimentation and nutrient enrichment; and finally urbanization, as measured through the proxy of 'nightime lights".

STATUS

Next, this Report Card gives a quick overview of the human dimension by analyzing coastal versus national poverty indices; then it describes the process of site selection, and reef health indicator criteria that constitute the Healthy Reef Index. Data collected in 2011/12 at 80 representative sites are compared to data collected for previous report cards (2008) to show how these reefs have changed since 2006. At 50 reef sites there are evaluations covering all three reporting periods, which are compared for the different reef health classifications.

ACTIONS

Finally, HRI partners collectively selected four success stories of good reef management from across the MAR region (Mexico, Belize, Guatemala and Honduras). HRI commends these important steps and calls for broader management actions in the prioritized list of recommendations presented on the inside cover.

HEALTHY REEFS FOR HEALTHY PEOPLE (HRI)

Healthy Reefs for Healthy People (HRI) is a collaborative international initiative that generates user-friendly tools to measure, track, and report on the health of the Mesoamerican Reef Ecosystem (MAR).

It includes a formal partnership of 48 organizations and other informal collaborations with government agencies, individual scientists, and other partners. HRI aims to improve reef management and decision-making to effectively sustain an economically and ecologically thriving MAR eco-region by delivering scientifically credible and respected biennial Report Cards on ecosystem health, which are followed up with biennial Eco-Audits that evaluate the implementation of recommended management actions.

For more information please visit: www.healthyreefs.org

The Lionfish Invasion

The invasion by Indo-Pacific lionfish (*Pterois volitans*) of the Caribbean is emerging as a major threat to coral reef communities across the region. First recorded in the MAR in 2008, lionfish are now common. By 2012 lionfish were recorded in almost a quarter of the sites surveyed by HRI teams for this report (30 out of 133 sites). Honduras had the highest densities and greatest frequency of occurrence (17 of 59 sites), while in Mexico and Belize sightings were more rare, likely due to the intensive fishing effort of local authorities (e.g. CONANP) and other organizations.

Lionfish are larger and more abundant on invaded reefs

Comparing native and introduced populations reveals shifts in the population dynamics of this invasive species.

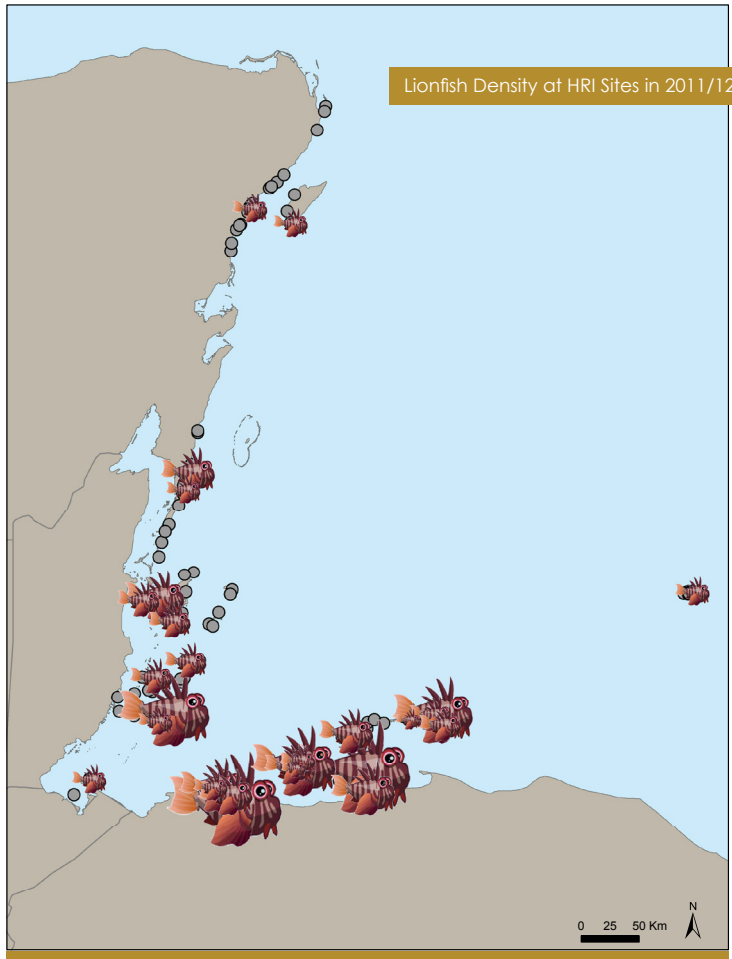
	Native habitat	*Invaded habitat*
Max Body size (cm)	27	49
Max Body mass (g)	255	1720
Max Abundance (ind/100m^2)	110	340

From Darling et al 2011; Barbour et al 2011; Kulbicki et al 2012

Lionfish: Always in season

Management actions can decrease the extent of the lionfish invasion. Some actions taken in the MAR:

Country	Management Action
Belize	*The Belize Fisheries Department has partnered with local NGOs, tourism businesses, tour guides and fishers to organize lionfish tournaments to reduce numbers.*
Guatemala	*The Fisheries Department, in collaboration with other entities, is developing an action plan for controlling them.*
Honduras	*The Fisheries Department, alongside NGOs managing MPA, created and implemented a licensing and training process for divers to purchase individually marked lionfish spears.*
Mexico	*CONANP, in partnership with several NGO's, convened a workshop to develop a regional strategy and continues to hold lionfish tournaments.*



Lionfish density in the 133 sites surveyed by HRI and its partners that used the AGRRA methodology. Data are for only lionfish counted inside the ten fish transects. Any recorded lionfish is represented with a lionfish symbol, with the size representing the relative density (ranging from 0.1 to 2.2 individuals/ 100m^2). Grey circles indicate a density of zero within that sample area.

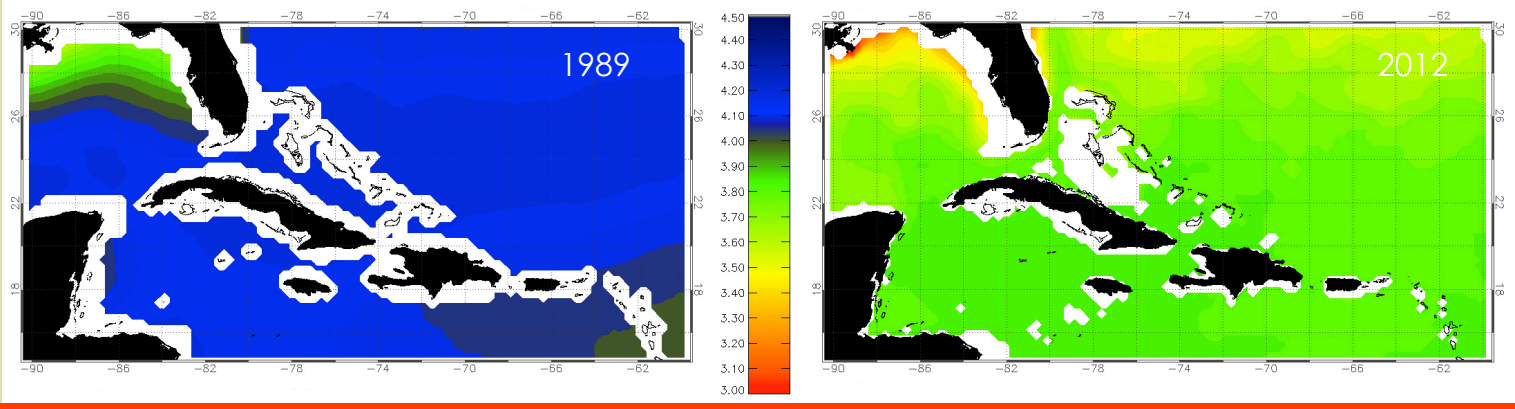
Lionfish females can lay up to 30,000 eggs every month.

Climate Change Threats

OCEAN ACIDIFICATION

Oceanic uptake of anthropogenic carbon dioxide (CO_2) is altering the chemistry of the world's oceans. The increase in CO_2, produced primarily by the burning of fossil fuels, deforestation and agriculture, enters the ocean and causes acidification. This process significantly reduces the ability of reef-building corals and other calcifiers to produce their skeletons, reducing growth rates and the ability of the larger reef ecosystem to maintain a positive balance between reef building and reef erosion.

Images show aragonite saturation for 1989 and 2012



As CO_2 is absorbed by the ocean, it's acidity increases, as shown by the change from blue (optimal reef building conditions) to green (marginal reef building conditions).

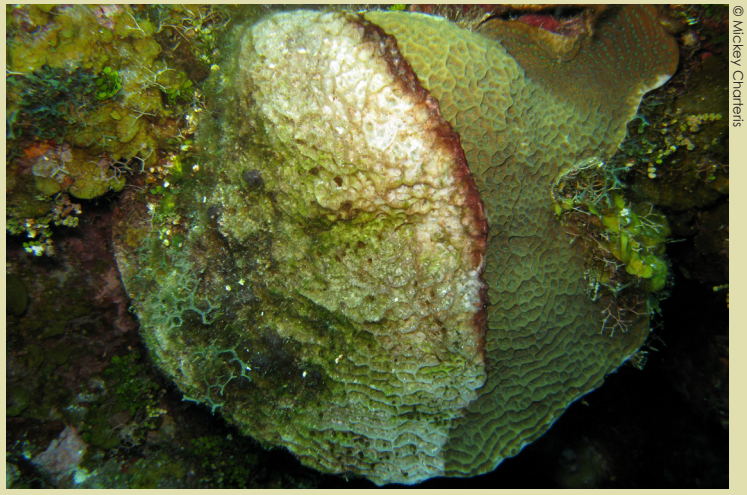
INCREASED TEMPERATURE

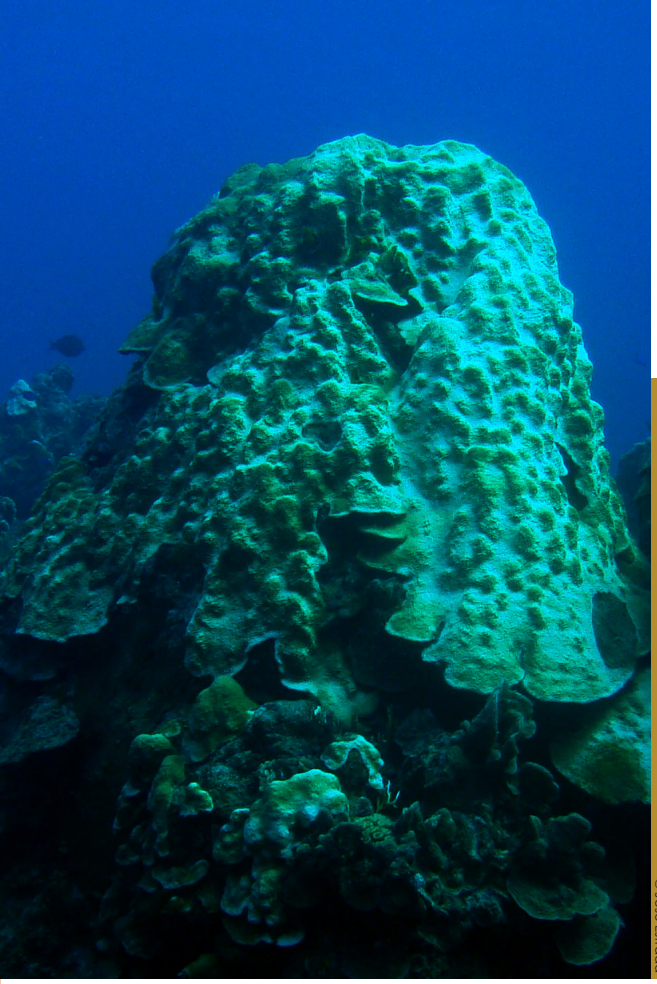
The rapidly increasing global temperature is already having negative effects on coral populations via at least four mechanisms: ***Coral bleaching events*** that result when the coral's helpful symbiotic algae are released from the host due to stress; ***coral disease outbreaks*** often follow bleaching because stressed corals are more susceptible to infections which can kill large numbers of colonies; ***hurricane*** intensity and frequency influence the magnitude of coral cover loss; recent scientific evidence suggests that hurricane intensity has already increased and will continue to increase along with temperature; and ***sea level rise*** will cause lower light conditions that jeopardizes coral growth on deeper reefs.

Bleached coral

Global temperatures and atmospheric carbon dioxide concentration have increased to the highest level experienced on Earth for at least the past 650,000 years.

Coral with red band disease





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EFFECTS ON REEF HEALTH & SOCIAL CONSEQUENCES

Coral reefs are valuable economic resources, supporting over two million people in the MAR by providing food, tourism and fisheries income, as well as stabilizing shorelines. Some social consequences of the loss of coral reefs can be:

Marine organisms that reefs support will also disappear.

Lost biodiversity – including potential pharmaceutical value .

Decrease in fish and lobster populations and fisheries values.

Coastal erosion and increased damage during storms and hurricanes.

Loss of leisure activities and tourism revenue.

Displacement of people who depend on them, especially fishers and dive operators.

What can we do ?

Climate change will create hardships for people dependent upon these reefs, due to changes to reef structure, function, distribution and diversity. There are easy things you can do to prevent this change:

Reduce-Reuse-Recycle.

Ride a bike, walk or use public transportation instead of driving.

Plant trees and other vegetation.

Save energy, disconnect your appliances.

Use alternative energy (solar panels or wind generators).

Change your normal light bulbs for fluorescent and LED bulbs.

Marine Based Threats

FISHING PRACTICES AND OVERFISHING

Removal of target species and larger sized individuals affects the ecological balance of coral reef communities, altering the food chain and causing indirect but significant ecological effects far beyond the targeted population. Healthy reefs require intact food webs, including predatory fish and sharks to maintain ecological functioning.

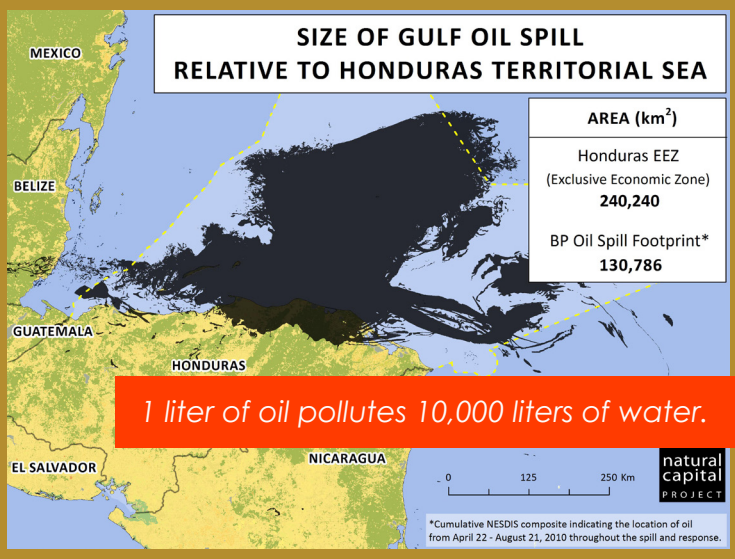
One-third of all fish stocks globally have collapsed-having less than 10% of their maximum observed population. At current rate all fish stocks will collapse by 2050.

MARINE DEBRIS

Marine debris is typically defined as any man-made object discarded or blown from vessels, stationary platforms, or even from land that enters the coastal or marine environment. Ocean currents carry floating debris into the five subtropical gyres where they accumulate over time. The North Pacific Gyre is the largest accumulation of marine debris globally and is at least twice the size of Texas. Marine debris is a growing concern in the MAR, particularly in the Gulf of Honduras.

OIL POLLUTION and DRILLING

Leaked or deliberate discharges of oil into the ocean originate from tankers, offshore oil platforms and associated activities. A major oil rig blowout, such as happened in the Gulf of Mexico in 2010, could cover the entire MAR in oil.



EFFECTS ON REEF HEALTH & SOCIAL CONSEQUENCES

- Oil spills can destroy marine ecosystems if they come in contact with corals, mangroves or seagrass beds.
- Indirect effects of even low level contamination include the disruption of coral reproduction, growth, recruitment and development.
- Contamination and closure of seafood production occurs when fishing areas are exposed to toxins.
- The long-term toxicity of oil and related compounds to human health is extensive and is associated with increased cancer risk.
- Plastic debris, including bottles, bags and loose fishing gear, suffocate and debilitate marine life (i.e. turtles, seabirds).
- Targeting the largest individuals in a fishery reduces successful replenishing of the population.
- Ecological functioning is severely affected by the loss of predatory fish and sharks.

What can we do ?

Choose reusable items and use fewer disposable ones.

Properly stow all pieces of fishing line, net and other litter for proper disposal in trash containers on land.

Get involved in cleanups in your area and encourage others to help on clean-ups.

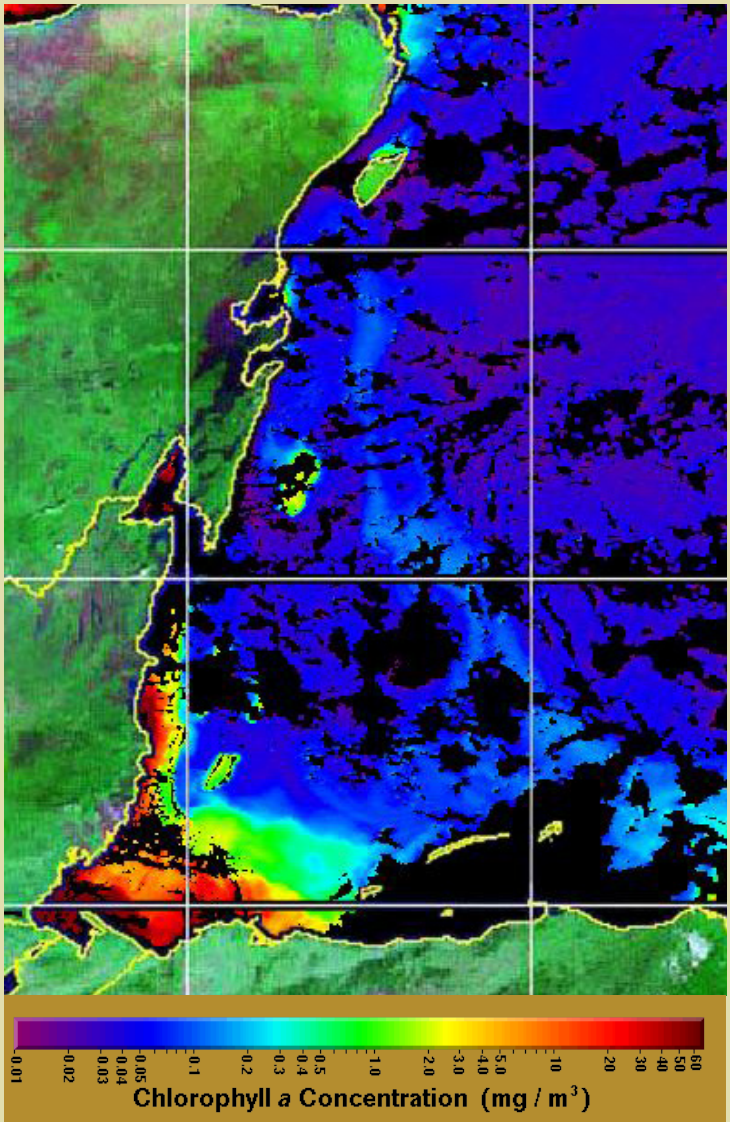
Demand proper labeling on fish products: including species and source area.

Never buy products made from shark fins.

LEARN AND ABIDE by all local fishing regulations, including closed seasons, size limits and gear restrictions. What you buy and eat are important personal actions.

Land Based Threats

Coastal waters around the world are reporting declining water quality due primarily to land-based activities including vegetation removal, soil erosion and fertilizer additions from expanding agriculture, coastal urbanization and associated discharges of insufficiently treated sewage and industrial pollution.



July 18, 2011 MODIS satellite image of ocean color illustrating the extent of the unprecedented phytoplankton bloom. Red areas indicate very high chlorophyll (indicator for phytoplankton), which are normally confined to river mouths and areas of natural upwelling.

Coral reefs are typically found in areas of very low chlorophyll, blue and purple areas, which are characteristic of clean, clear waters in which reefs normally thrive.

MODIS images available at:
www.servir.net/images/imageviewer/red_tides

NUTRIENT OVERLOADING

Nutrients come from sewage, storm water runoff, deforestation, fertilizers and other nutrient-loaded discharges from homes, factories and farmlands far inland. An excess of nutrients can cause algal blooms, which have negative impacts on other organisms via production of natural toxins, competition, shading, and eventually oxygen depletion, as the plankton eventually die and fall to the seabed where they decompose and use up available oxygen. This deadly cycle played out in summer 2011 in Belize, when an unprecedented phytoplankton bloom persisted for several months, drastically reducing water clarity and eventually leading to isolated areas of anoxia.

SEDIMENTS

Sediment is loose sand, clay, silt and other soil particles that eventually settles to the bottom of a body of water. Coastal dredging is one of the biggest contributors to coral reef damage from sedimentation. It can also come from soil erosion far inland. Wind and water help carry these particles to rivers, lakes, streams and finally into the ocean where they settle, often along with associated contaminants like metals and pesticides. Sediment pollution causes US$16 billion in environmental damage annually globally.

"80% of the sediment and over half the nutrients entering the MAR come from Honduran rivers"

INDUSTRIAL WASTE

Industry is a major source of water pollution in some areas. Industrial waste can be extremely harmful to people and the environment. Many industrial facilities use freshwater to carry waste away from the plant into rivers, lakes and oceans.

EFFECTS ON REEF HEALTH & SOCIAL CONSEQUENCES

Increased human cancer and other disease risks from nitrates, pesticides, and metals in contaminated drinking water and seafood.

Nutrients cause phytoplankton to bloom, and together with sediments, they reduce the amount of light reaching corals, which decreases their growth and stimulates benthic algal overgrowth on the reef.

Sewage and run-off have been linked to increases in coral diseases.

Increase in human infectious diseases related to bathing and swimming in coastal waters contaminated with sewage discharge.

Sediment can clog fish gills, reducing resistance to disease, lowering growth rates, and affecting fish egg and larvae development.

"It has been estimated that about 40% of marine pollution is land-based, and 90% of this collects in shallow, coastal waters, where coral reefs thrive"

What can we do ?

Avoid dumping households cleaners down drains and sewers.

Save water and reduce your consumption when taking showers, washing/cleaning dishes, etc. About 70% of the waste water is grey water (soaps, shampoo, detergents, cleaning liquids).

Use biodegradable and ecofriendly cleaners.

Adopt best management practices in industry and agriculture, including reduction of chemical use.

Urge municipalities to invest in adequate sewage treatment facilities or fully treat your own waste.

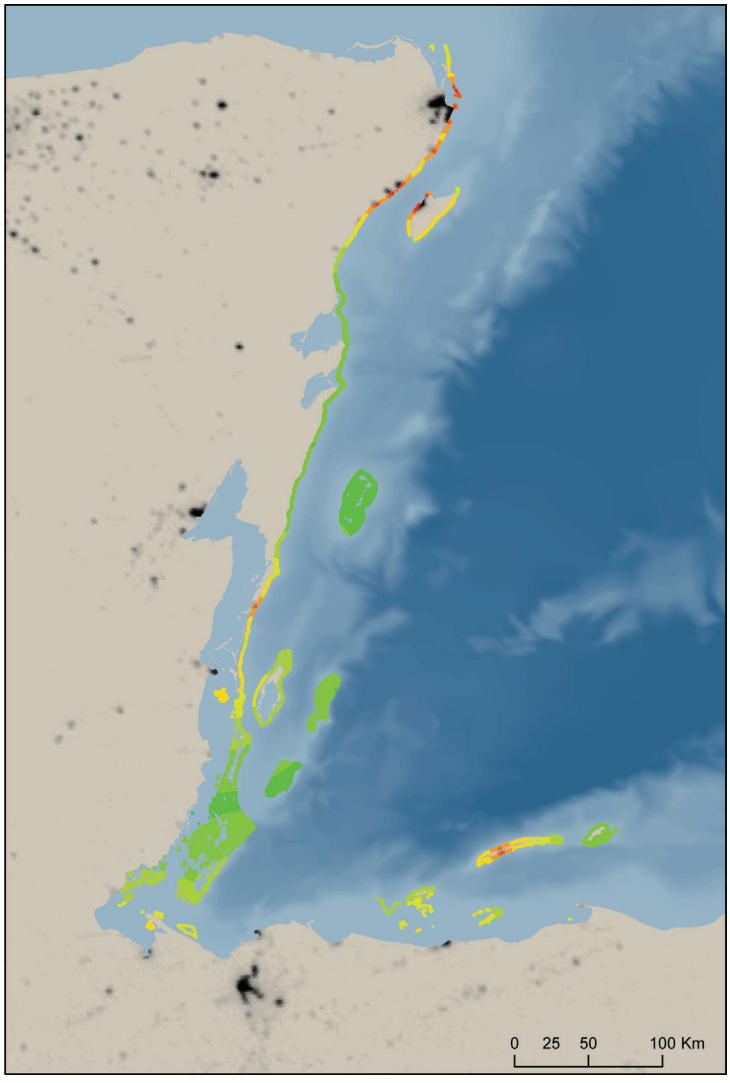
Only eat seafood harvested from clean harvesting areas.

Implement water free technologies, for example using water free urinals saves 151,000 L per unit a year.

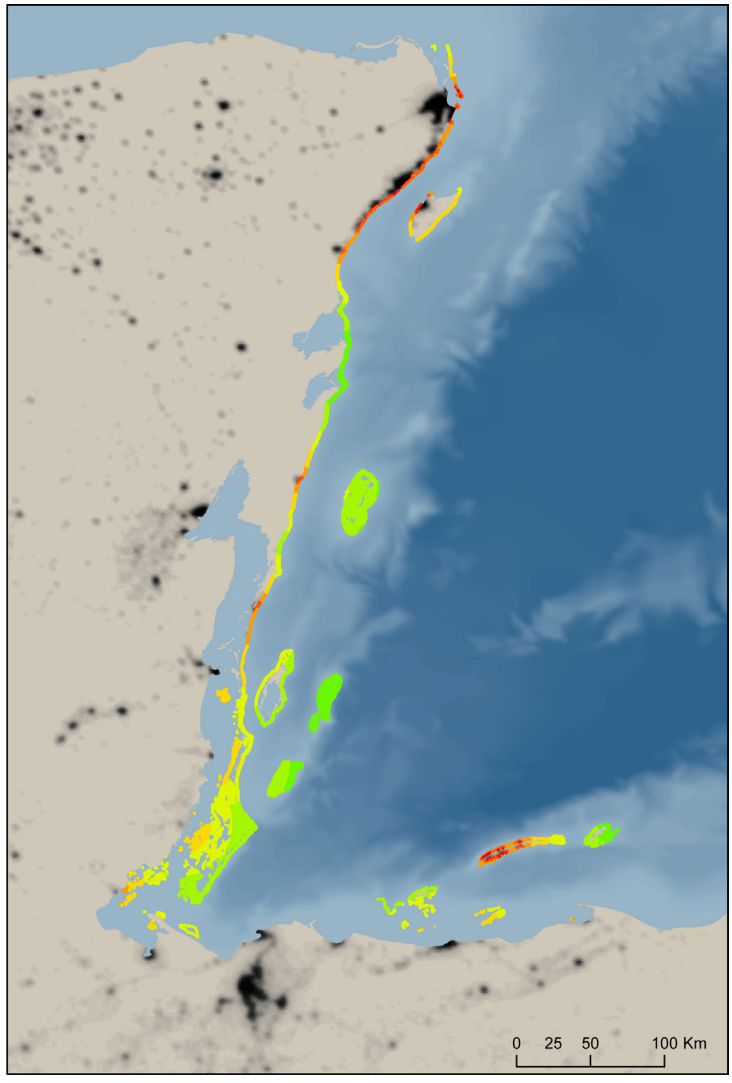
Urbanization

Human activities have considerably altered the landscape in coastal areas. The extent of urbanization and human activity can provide a proxy for localized impacts such as pollutants, run off, fishing, and recreational use of reefs. The footprint of human occupation is uniquely visible from space in the form of artificial night lighting, allowing the use of satellite observations of human settlements (urbanization) to provide a proxy for related stressors on the reef.

1992



2010



Data on night lightning obtained from the NOAA's National Geophysical Data Center: http://www.ngdc.noaa.gov/ngdc.html

The figures show urbanization (black areas) in the Mesoamerican reef eco-region for 1992 and 2010, and displays the reefs in closest proximity to the development centers in red, while reefs farther away from these urbanized areas are shown in green.

There has been a notable increase in coastal population and infrastructure, mostly related to tourism industry growth. Areas of high development include the main tourism centers like Cancun, the Riviera Maya and Cozumel in Mexico and the Bay Islands in Honduras.

"Satellite technologies have become essential tools for monitoring coral reef health and the increasing threats Coral Reefs face around the globe."

Marine Resources – a Safety Net for Coastal People

Coastal and marine resources are crucial to the livelihoods of over 2 million people in the MAR. They provide food security, fisheries revenue, and employment opportunities in popular tourist areas. Monitoring of social indicators related to changing ecosystem health is important for identifying trends and linkages between reef health and social well-being. Communities can use this information to adapt to changing ecological conditions. Policy makers can also adjust their management strategies to ensure they produce the desired social benefits.

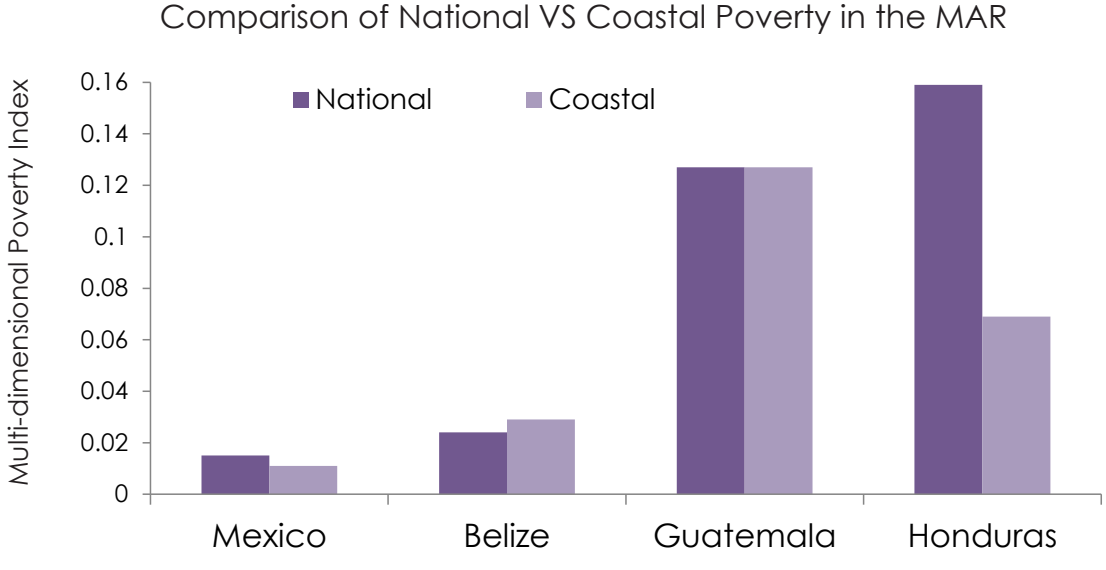
The graph below illustrates the national level Multidimensional Poverty Index (MPI)[1] for the four MAR countries compared to the MPI of their coastal divisions within the MAR eco-region. The MPI has three main dimensions: Health, Education, and Standard of Living (see supplement for details).

At a national scale, Mexico has the lowest and Honduras the highest MPI. The coastal state of Quintana Roo, Mexico and the coastal departments of Honduras indicate that poverty is less severe than at the national levels, suggesting that MAR resources provide additional benefits to people living near the coast. For example, Quintana Roo has 88% of its population living in urban areas with better access to education, health services and a higher standard of living, due partly to employment surrounding coastal resources. The pattern in Belize is skewed, contrary to trend, primarily by the exceedingly high poverty in one 'coastal' district (Toledo) in which 80% of the population lives in rural (inland) areas with very high poverty. Unfortunately, MPI scores are not available at the scale of coastal towns and communities within these larger divisions or departments.

Fishing and tourism could help explain the lower poverty rates in coastal areas. Fishing remains a solid source of employment in the region. In Belize four percent of the Economically Active Population (EAP) is fishermen, and it is one of few opportunities for people with less formal education. In Honduras and Guatemala, 95% of fishers have not completed secondary education, while in Belize the number is just over 90%[2].

Tourism is the major employer in the MAR region. In Mexico, tourism employs 34% of the 668,482 working age population in Quintana Roo[3]; in Belize, tourism is the single largest contributor to the nation's economy, with tourism expenditure representing 24% of the US$1.5 billion GDP. Tourism has also been a contributor in improving gender equity for women by providing employment, allowing them more opportunities to join the workforce[4] (contrasting with fishing that tends to be dominated by men).

Despite the economic benefits, tourism can also cause large cultural and demographic shifts due to the immigration of tourism workers into coastal areas that contribute to unplanned or inappropriate coastal development in some municipalities[5]. Economic inequity in tourism is also a concern for local inhabitants, who often lack access to capital for tourism investments. Tourism interests can also out-compete local households for access to fresh seafood[6].



Poverty in coastal areas of the MAR Countries as compared to national levels using the Multi-dimensional Poverty Index. The greater the index the greater the poverty and the lower the level of positive human development metrics.

Only through an enhanced understanding of the full social, financial, cultural and ecological interactions within the coastal zone, will we succeed at maintaining the long-term integrity of the holistic ecological-human community.

Evaluating Reef Health

Sourcing Data for this Report

Evaluating reef health on a large scale requires a collaborative and coordinated effort among all partners in the MAR region. The data in this Report Card came from several partner organizations, as well as data collected by the Healthy Reefs Initiative (HRI) team. HRI sites were independently selected to be representative of the entire region (see box); while sites monitored by our partners are chosen with local expert knowledge – often in response to a variety of research and management questions. Thus, while not randomly selected, partner's sites are generally considered representative of the better-developed reef areas in their respective geographical areas.

A total of 193 sites were monitored throughout the MAR for this 2012 Report Card; 123 of these sites were surveyed by the HRI team and 70 sites were contributed by our partners (see online supplement for details). While additional sites would be useful to be fully representative of all reef types in the MAR, the data presented includes a nearly 50 % increase in the number of sites included in the 2010 Report Card.

In this report, we first provide a snapshot map of the status of the Mesoamerican Reef based on the Reef Health Index for all 193 sites monitored in 2011/2012. We then present a more detailed analysis of how the health of the MAR has changed over the past 6 years, using only a subset of sites that have been repeatedly monitored by HRI (pages 17 and 18).

Selection of HRI representative sites

In 2005, a team of researchers from the University of Miami and The Nature Conservancy used the Millennium Coral Reef Mapping Project products to randomly select sites representing various geomorhological reef types (shallow, fore, patch, pinnacles, back/reef flat). The 326 resulting sites were surveyed through a collaborative effort in 2005-2006 and reported in the 2008 Report Card. This survey remains the largest synoptic reef survey ever conducted in the Atlantic Ocean.

Since then, HRI has monitored a subset of these 'representative sites' in order to track changes in the health of the MAR region. HRI and partners continue efforts to raise additional funding to increase the number of sites monitored within the region.

Regional Database

Although HRI's Report Card data are available upon request, all partner data and HRI data are not yet fully integrated into a widely available online database.

Since 1999, the AGRRA program (www. agrra.org) has maintained an active database of sites throughout the Caribbean, including HRI reef sites.

However, data from other monitoring protocols, such as the MBRS method, cannot be added to this database. HRI is now creating an online regional database that will accept data from different methodologies and integrate them into this reef health evaluation and reporting framework.

Indicators of Reef Health

The Healthy Reefs Initiative is one of the first efforts globally to develop measurable ranking criteria for indicators of coral reef health. Indicators are parameters or metrics of an ecosystem that relay relevant information on the condition of the ecosystem. They help translate the complex concept of ecosystem health into tangible, rigorously defined quantities by which changes in condition can be assessed over time. The development of a single index, the "Simplified Integrated Reef Health Index" (SIRHI) facilitates the mapping and reporting on reef health for a "big picture" snapshot throughout the MAR (see map on following pages).

SIMPLIFIED INTEGRATED REEF HEALTH INDEX (SIRHI):

The SIRHI index is a combination of the following four indicators, which are then combined and equally weighted:

Coral cover is the proportion of reef surface covered by live stony corals, contributing to the reef's three-dimensional framework.

Fleshy macroalgae cover is the proportion of reef surface covered by fleshy algae or "seaweed".

Herbivorous fish is a measure of the biomass of important grazers on plants that could overgrow the reef.

Commercial fish is a measure of the biomass of fish species commercially important to people.

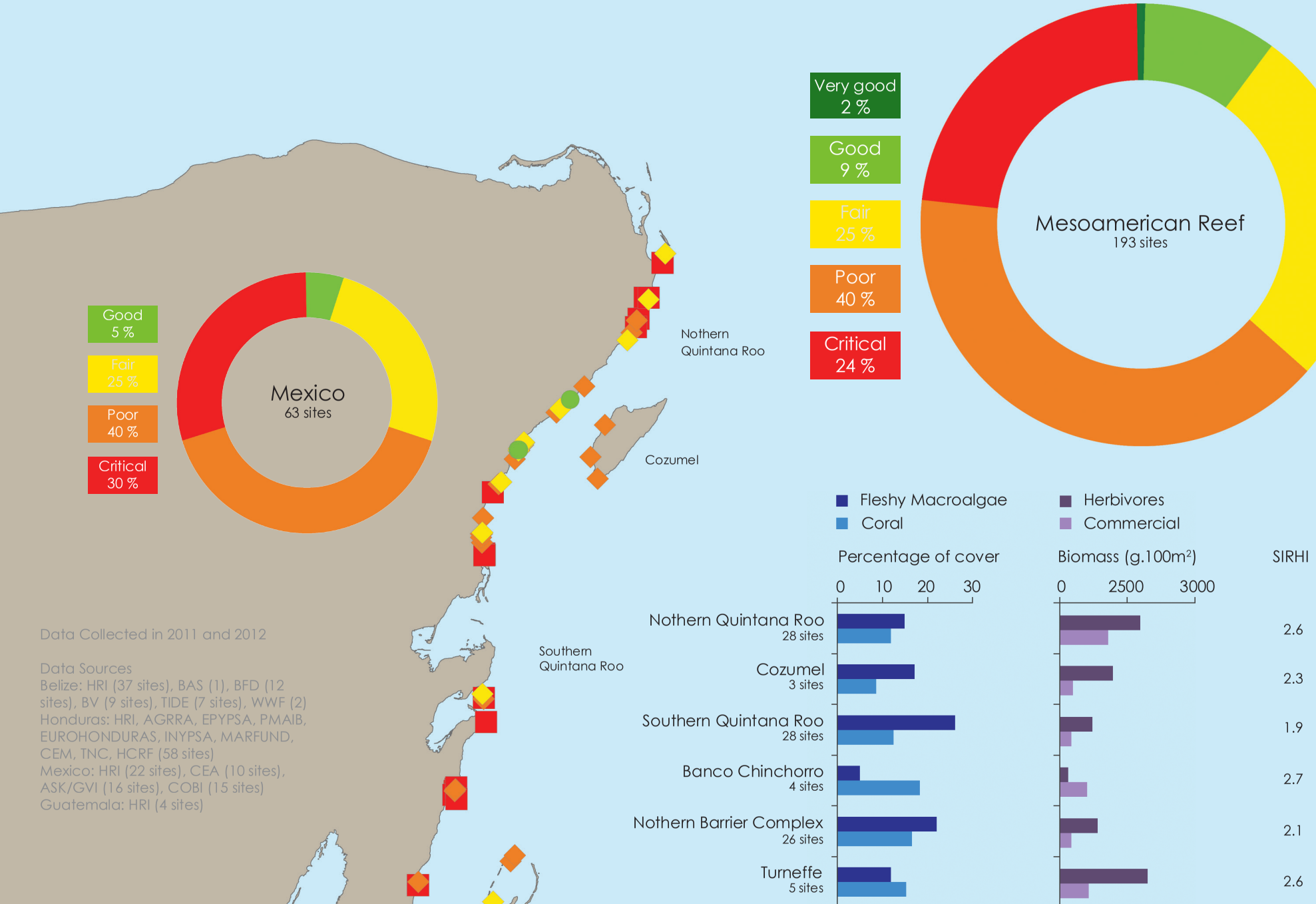
HOW THE GRADES ARE CALCULATED

The mean value of each indicator is compared to the following criteria and given a grade from one ('critical') to five ('very good'). The four grades are averaged to obtain the SIRHI score for each site. It is important to highlight that a site with a given SIRHI score (e.g. 'fair') might have some indicator(s) ranking in different conditions (e.g. 'good' or 'poor').

SIRHI INDICATORS	VERY GOOD (5)	GOOD (4)	FAIR (3)	POOR (2)	CRITICAL (1)
Coral cover (%)	≥40	20.0-39.9	10.0-19.9	5.0-9.9	<5
Fleshy macroalgae cover (%)	0-0.9	1.0-5.0	5.1-12.0	12.1-25	>25.0
Key herbivorous fish (g•100 m^2) note: only parrotfish and surgeonfish	≥3480	2880-3479	1920-2879	960-1919	<960
Key commercial fish (g•100 m^2) note: only snapper and grouper	≥1680	1260-1679	840-1259	420-839	<420

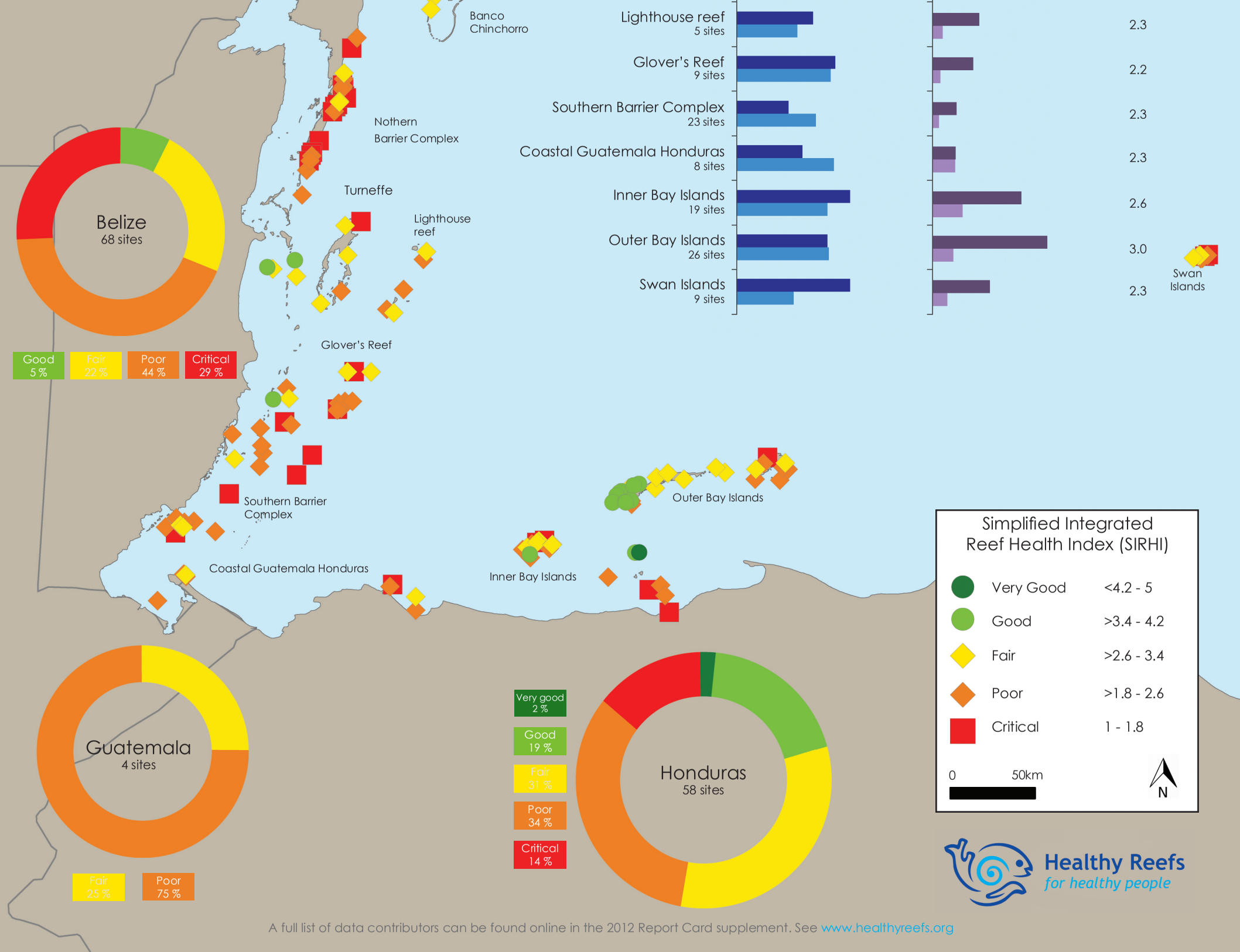
The development of the following data ranges for the grading criteria relied heavily on the experience, perspectives and data from a scientific review committee convened in 2008. Members of this committee included: Judith Lang (Atlantic and Gulf Rapid Reef Assessment), Ernesto Arias (CINVESTAV), Les Kauffman (Boston University), Pete Mumby (University of Queensland) Eric Sala (formerly of Scripps Institution of Oceanography), Valerie Paul (Smithsonian Institution) and Leandra Cho Ricketts (University of Belize). They represent a compromise position between grading for the ideal "pristine" reef conditions and what we can realistically hope to achieve in modern times and conditions based on actual data from the AGRRA.org database for the Wider Caribbean.

Reef Health in the Mesoamerican Reef



Data Collected in 2011 and 2012

Data Sources
Belize: HRI (37 sites), BAS (1), BFD (12 sites), BV (9 sites), TIDE (7 sites), WWF (2)
Honduras: HRI, AGRRA, EPYPSA, PMAIB, EUROHONDURAS, INYPSA, MARFUND, CEM, TNC, HCRF (58 sites)
Mexico: HRI (22 sites), CEA (10 sites), ASK/GVI (16 sites), COBI (15 sites)
Guatemala: HRI (4 sites)

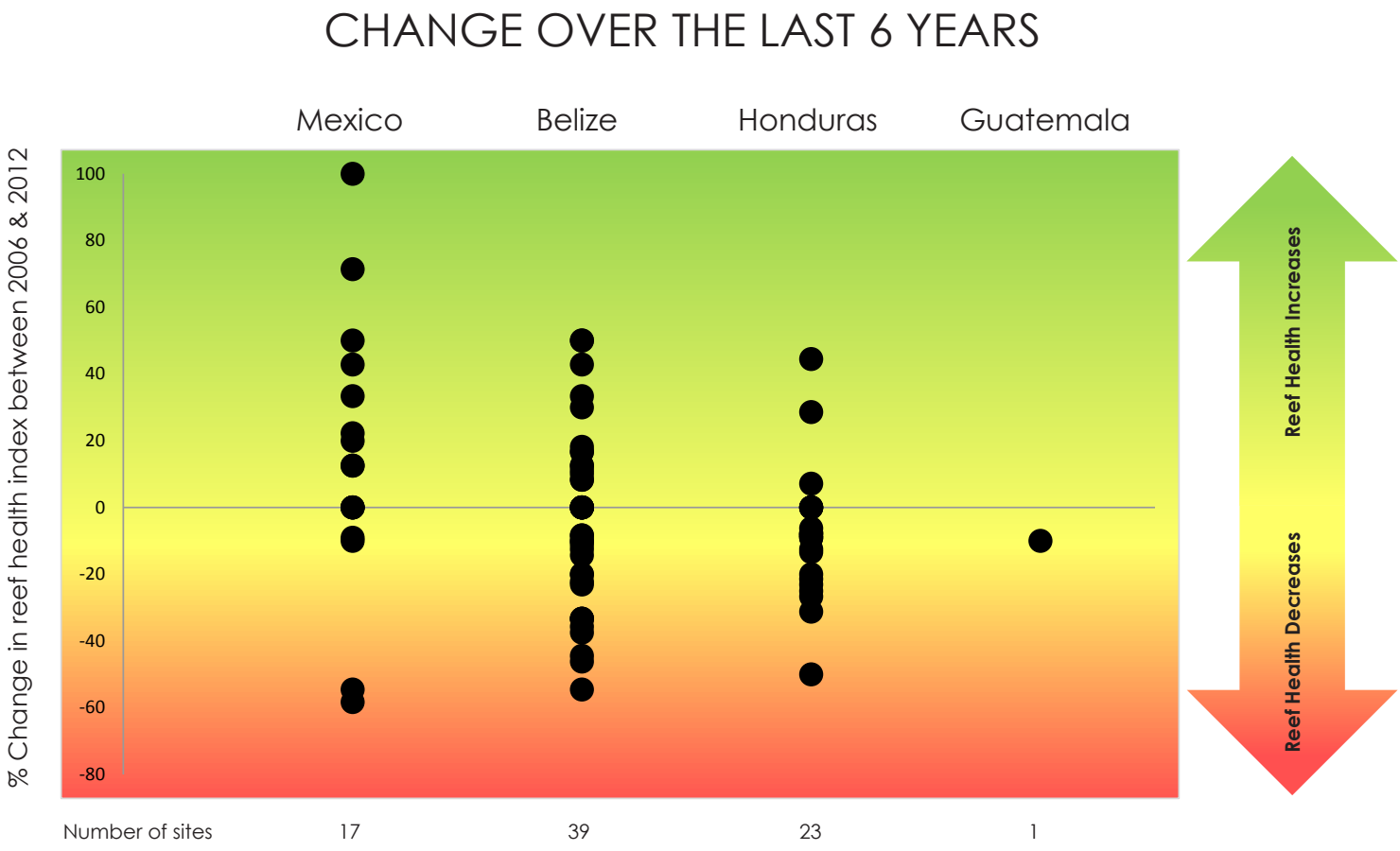


A full list of data contributors can be found online in the 2012 Report Card supplement. See www.healthyreefs.org

Changes in Reef Health in

The previous map offers the most comprehensive reef health assessment in the MAR (193 sites) since the 2008 Report Card. This snapshot view of the present condition of reefs across the MAR is based on the Simplified Intregrated Reef Health Index and ranking criteria detailed on page 14. However, reef health can also be examined in terms of the change at specific sites throughout time.

To answer the question, "Is reef health improving or declining over time?", the HRI team has repeatedly evaluated a subset of the original 'representative' sites, distributed across the region. More sites were re-evaluated for this Report Card than in the 2010 Report Card.



The figure above depicts changes in reef health (SIRHI score) at 80 sites that were monitored in 2005-2006 and again in 2011-2012. Each dot on the graph represents a site. If the site's score did not change over this time period, the dot remains on the central line. If the SIRHI score increased, the dot moved into the green zone for improved health. If the score declined, it falls into the red zone of declining health.

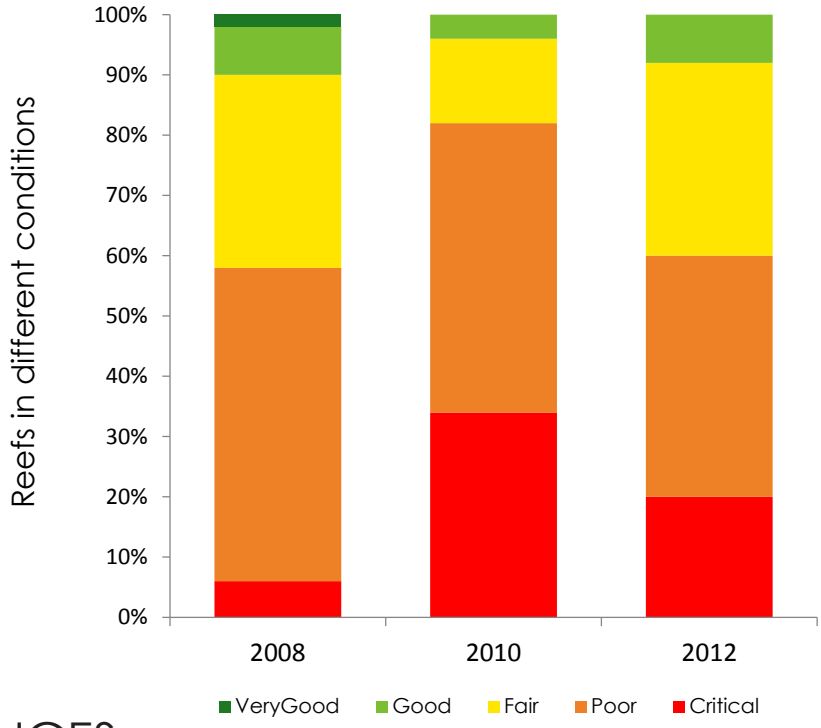
The magnitude of change (positive or negative) is illustrated by the distance the dot moves from the central line, but it does not reflect the reef condition of the site. For example, a site that increased its condition from 'critical' to 'poor' would appear in the green portion of the figure because it's health status improved.

Between 2006 and 2012, reef health in 26 sites increased, while 14 remained stable and 40 sites decreased. In Belize, a relatively equal number of sites increased and decreased in health (14 and 19 respectively); while in Honduras 70% of sites (n=16) decreased in health. In Mexico, most sites improved reef health (n=9), likely associated with recovery observed after hurricanes Emily and Wilma impacted these reefs in 2005. The information for Guatemala is scarce, highlighting the necessity of increasing long-term monitoring efforts at representative sites. Details of how change was calculated can be found online in the supplement.

CHANGES IN THE PROPORTION OF REEFS IN DIFFERENT CONDITIONS

Fifty reef sites (36 in Belize, 4 in Honduras and 10 in Mexico) were evaluated in all three Report Cards (2008, 2010 and 2012), and the proportion of these sites in different conditions can be tracked over time.

Although the 2010 Report Card showed an alarming increase in the proportion of 'critical' sites from 6% to 34%, this 2012 Report Card shows an encouraging decrease in the number of 'critical' sites to 20% of the total sites. Similarly, reefs in 'good' condition increased from 5% to almost 10% of the total number of sites from the 2010 to 2012 reporting periods.



A CLOSER LOOK AT THE CHANGES

While the Simplified Integrated Reef Health Index (SIRHI) is a useful tool for summarizing the complexity of reef indicators into one easy to understand metric, it is also important to take a closer look at individual indicators in order to understand the specific sources of declines or improvements, and to target our management actions accordingly.

Mean values of the Reef Health Indicators by Country

	Coral cover (%)			Fleshy macroalgae (%)			Herbivorous fishes (g.100 m^2)			Commercial fishes (g.100 m^2)		
	2008	2010	2012	2008	2010	2012	2008	2010	2012	2008	2010	2012
Belize	12	19	19	9	17	16	1788	1407	1870	757	573	495
Honduras	20	27	19	16	16	24	5440	2156	4305	1261	215	1014
Mexico	10	16	12	11	18	14	2515	820	1790	1343	896	1451
MAR	12	19	18	10	17	16	2226	1350	2049	915	609	728

Data in this table differ slightly from the 2010 table because some reefs were added or removed for this summary.
No Guatemalan sites were surveyed during 2010.

Overall, coral cover in the region had the highest grades, despite some declines in the Honduran sites. During this evaluation period no major hurricanes affected the region, and interestingly, it seems that coral cover was not adversely affected by the 2010 coral bleaching event that affected parts of the region. High levels of fleshy macroalgae remain a concern – particularly in Honduras. Commercial fish biomass changed greatly among the evaluation periods, with generally increasing trends (more fish) in Mexico and Honduras and a negative trend (less fish) in Belize. Herbivorous fish biomass was particularly high in Honduras, where spearfishing is banned in the Bay Islands (thus reducing human fishing threat). In Belize, herbivorous fish biomass decreased from 2006 to 2009 but then increased in 2011 after the implementation of the parrotfish protection regulation that helped lower the take of these key herbivores (see page 20). Hopefully the increased herbivorous fish biomass in these locations will lead to future reductions in macroalgae, although increasing nutrient levels will encourage more macroalgal growth and could off-set any such trend.

Alianza Kanan Kay

Recovering our seas through collaboration

Alianza Kanan Kay, meaning "guardian of the fish" in Mayan, is an intersectorial collaborative initiative with the common objective of contributing to the replenishment of traditional fisheries through the creation of an effective fish refuge network. It aims to cover 20% of the territorial sea of the state of Quintana Roo, Mexico, by 2015.

Alianza Kanan Kay currently has 41 institutional members, representing fishing, environmental, and government agencies, fishermen's cooperatives and federations, civil society, research centers and philanthropic foundations.

The members of the Alliance have gathered since October 2010 with the objective of consolidating this collaboration platform.

Currently, they have funded projects to select, monitor and establish fish refuges; as well as providing training and strengthening fishermen cooperatives.

© Eric Mercier

Fish refuges are zones without fishing that foster the reproduction and replenishment of marine life, thereby protecting marine biodiversity and improving the welfare of coastal communities.

At the beginning of 2012, fisheries and environmental authorities, the state government and the National Federation of Fishermen Cooperatives, participated in the Alliance's official launch.

© Alianza Kanan Kay

Alianza Kanan Kay seeks to establish the first fish refuges in Quintana Roo. The fishermen cooperative of Cozumel has selected the sites that will be protected under their fishing concession and will soon submit the formal application to the authorities.

Similarly, the cooperatives Andrés Quintana Roo, José María Azcorra, Langosteros del Caribe, fishermen from Banco Chinchorro and fishermen from Vigía Chico, will soon finish the technical studies that justify requesting the establishment of fish refuges inside their concessions and reinforce the zoning schemes of the protected areas where they fish.

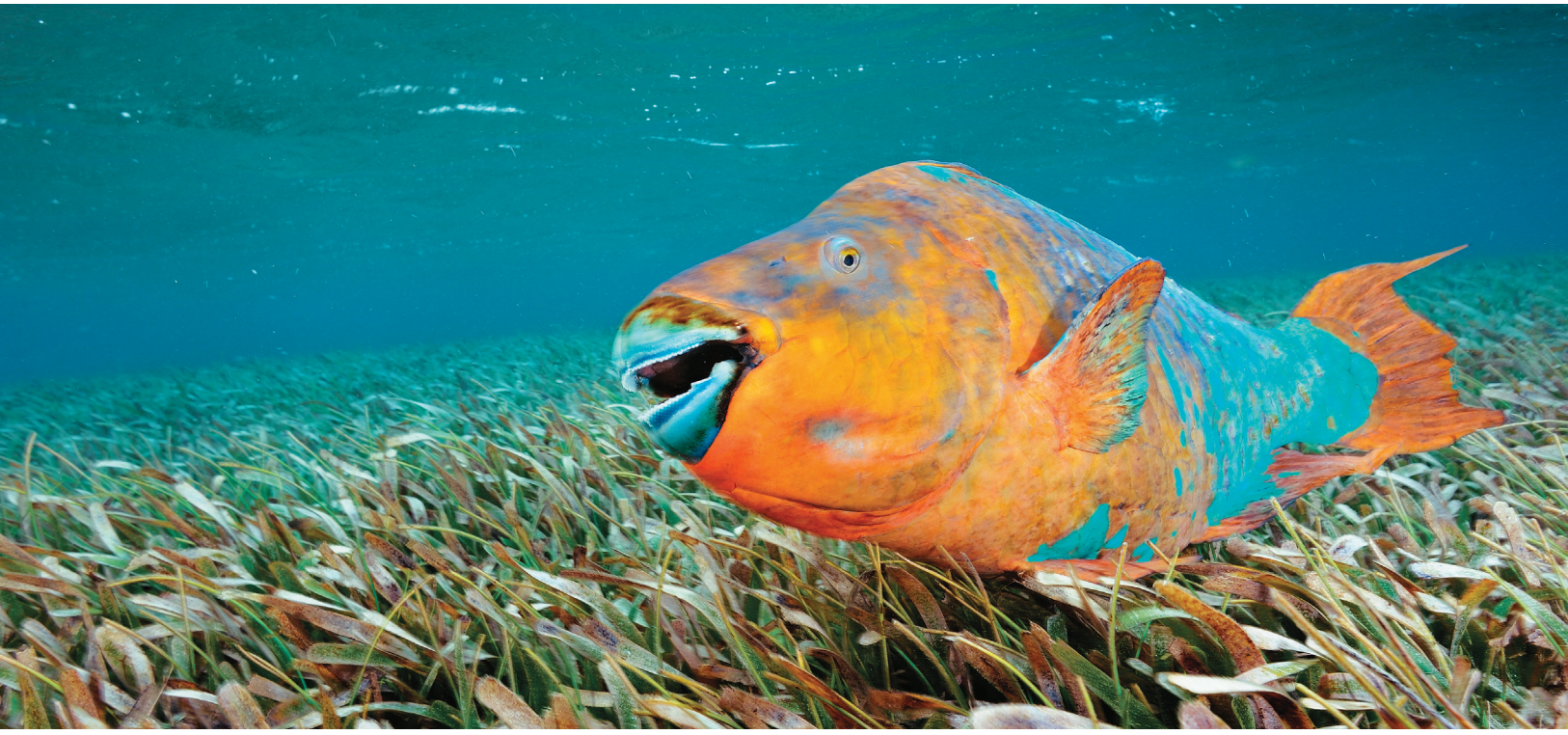
Members of the Alliance participated in drafting the official Mexican regulation that will determine the procedure to establish fish refuges. With this step, the creation of a fish refuge network has begun, with the aim of expanding this network to the rest of the state, the country, and ideally, the Mesoamerican Reef System. This might transform our region in a worldwide example of local leadership in the management of the fishing resources.

Reef Grazers Get Protection in Belize

As many coral reefs have shifted to become macroalgae dominated reefs over the last 40 years, the ecological role of grazers, like the magnificent rainbow parrotfish pictured below, has become even more critical. Macroalgae can smother corals directly or reduce coral growth and recruitment success.

Fisheries catch data collected at Glover's Reef by the Wildlife Conservation Society (WCS) revealed that parrotfishes were the second most common type of finfish caught. This came as a big surprise to regulators, as fish are mostly sold as fillet, and no fillets are labeled as parrotfish. This new knowledge, alongside the region-wide reef declines noted in the 2008 Report Card, spurred a campaign to protect these "cleaners of the reef".

In April 2009, Belize responded by passing landmark regulations giving full protection to all species of parrotfish and surgeonfish. Genetic testing of fillet samples throughout the country demonstrates good compliance (over 90%). Data presented in this report card (pg. 18) suggests that the protection is already helping the recovery of herbivore biomass in Belize, with the 2011 biomass just surpassing levels recorded in 2006 and increasing 33% above the low levels measured in 2009.



Bottom Trawling Banned In Belize

Shrimp trawling is one of the most indiscriminate and destructive kinds of fishing because the small mesh used to catch the shrimp allow few other animals to escape. The process of dragging these nets across the seafloor destroys or disturbs the bottom community and has been compared to hunting in a forest with a bulldozer. Everything in the path of these nets is disturbed or destroyed, including seagrass, coral reefs or benthic organisms that provide habitat for fish and other species.

In Belize, many juvenile groupers and snappers, among other species, were being caught and disposed of as by-catch, threatening the sustainability of local fisheries. Oceana worked with the Government of Belize and the fishing cooperative that owned the two remaining trawlers to purchase the debt-ridden trawlers in return for their support for the ban.

In February 2011, Belize became the first country in the world to ban all forms of bottom trawling, especially the ongoing practice of bottom trawling for shrimp, from its territorial sea and Exclusive Economic Zone. Bottom trawling is still a concern in other parts of the Mesoamerican Reef.

Fishing Communities Propose Fishery Recovery Areas in Guatemala

Guatemala's first initiative to create fully-protected ("no-take") zones was proposed by three fishing communities of Punta de Manabique (Graciosa, Santa Isabel and Punta Gruesa) and the Trammel and Fishing Committee of Puerto Barrios.

The official agreement, signed on July 10, 2012, recognizes the first fully-protected marine zones in Guatemala, which include three areas, two located in the Graciosa Bay and one in Laguna Santa Isabel. These areas are located within Punta de Manabique Wildlife Refuge in Puerto Barrios, Izabal. The total area under full protection is 345 hectares.

The National Protected Areas Council (CONAP), Ministry of Agriculture, Livestock and Food (MAGA) through the Office of Regulations of Fisheries and Aquaculture (DIPESCA), the Ministry of Environment and Natural Resources (MARN), alongside the fishing groups, have all agreed on these boundaries, as well as the necessary legal foundation, so these communities' initiative can be established within the Wildlife Refuge.

This achievement is the result of a year-long process, during which many organizations provided technical and legal advice.

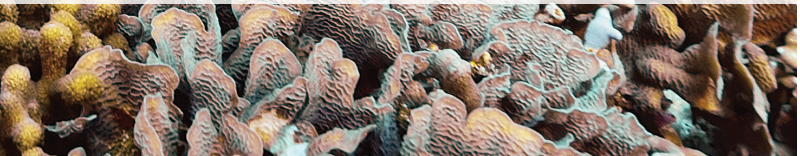
Authorities and fishing communities signing the Agreement to establish the first Fishery Recovery Areas (no-take zones) in Guatemala.

Cordelia Banks, Jewel of the Caribbean

There exists on Roatan an impressive biological treasure known as Cordelia Banks, with a coral reef of approximately 17 km^2 (1,700 ha).

This coral reef has attracted special attention from scientists and protected area managers since 2005, as the dominant species, staghorn coral (*Acropora cervicornis*) is critically endangered. This coral's branching growth pattern creates intricate refuges for a variety of fish, particularly during their juvenile stage.

Fishery sustainability greatly depends on this type of habitat.



Cordelia Banks has more than 70% live coral cover – which is impressive when contrasted with the 18% average for the whole Mesoamerican Reef (MAR).

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In the early 80's, *Acropora cervicornis* suffered a disease that killed approximately 98% of its population in the Caribbean Sea. Therefore, the healthy population in Cordelia Banks is very welcome news, since it may prove to be a source of larvae for other reefs in the MAR. Due to the prevailing marine currents, the spawn has the possibility of repopulating this coral in the entire region.

Part of Cordelia's value is being a world famous dive site; one of the top five in the Bay Islands. Tourists enjoy not only this amazing coral garden, but also the thrill of diving with grey reef sharks (*Carcharinus perezi*). The surrounding waters of this bank are also important for artisanal fishing. Curiously, Cordelia Banks is located only a short distance away from Coxen Hole, the largest urban development of the Bay Islands. Fortunately, prevailing currents from the East create a very effective "flushing" process, mitigating, to a certain degree, the impacts stemming from this large population center.

In May 2012, after a long declaration process, the Honduran government designated Cordelia Banks as a Site of Wildlife Importance. This designation creates a great opportunity to begin appropriate management strategies, which will include adequate zoning for effective protection and will involve the active participation by all the surrounding communities, particularly those that depend on artisanal fishery.

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Contributors

More than 40 partners from the four Mesoamerican countries (Belize, Mexico, Honduras and Guatemala) attended our first Regional Partners Meeting to review and develop a comprehensive set of prioritized recommendations to improve reef health in the Mesoamerican Reef.

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Success Stories

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Healthy Reefs Initiative Regional Partners Meeting.
Playa del Carmen, Quintana Roo, Mexico, August, 2012.

Regional experts in marine conservation developed the prioritized reef management recommendations presented in this report (inside cover). The 2013 Eco-Audit will evaluate each country's progress implementing them.

Results of the first 2011 Eco-Audit can be found on www.healthyreefs.org

Colaboradores

Más de 40 socios de los cuatro países Mesoamericanos (Belice, México, Honduras y Guatemala) asistieron a nuestra primera Reunión Regional para revisar y en conjunto llegar a las nuevas recomendaciones para preservar nuestro importante arrecife Mesoamericano.

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Taller Regional de la Iniciativa Arrecifes Saludables.
Playa del Carmen, Quintana Roo, México, Agosto, 2012.

Expertos regionales en conservación marina desarrollaron y priorizaron las recomendaciones para el manejo del arrecife (interior de la portada).
El Informe de Avances 2013 evaluará el progreso de cada país en implementarlas.

Los resultados del Informe de Avances 2011 se encuentran en www.healthyreefs.org