



Larval fishes, Connectivity, and Management: A Mesoamerican Reef Case Study



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Introduction: ELH Unit

The Early Life History Unit (ELH) is a multi-disciplinary team of scientists dedicated to excellence in early life history research to support applied fisheries management and habitat conservation and connectivity across the broader Caribbean ecosystem.

Research

Since 2004, in partnership with ECOSUR, Mexico, we have conducted ichthyoplankton surveys to determine transport and recruitment patterns along the Mesoamerican reef system from Belize to the northern tip of the Yucatan peninsula. With support from NOAA-CRCP, we focus on the potential value of combining long-term results revealing large-scale patterns with the cooperative implementation of an international network of prioritized MPAs that emphasize ecological function to support effective ecosystem-scale management.

Capacity Building

MAR Fund, an international NGO, defined priority MPAs along the Mesoamerican reef. (Fig 1). In May 2010, ELH convened a workshop for representatives from these thirteen Mesoamerican MPAs to determine priority management needs and coordinate connectivity science and management goals to form an integrated, ecosystem-scale network of MPAs across the region (Fig 2).

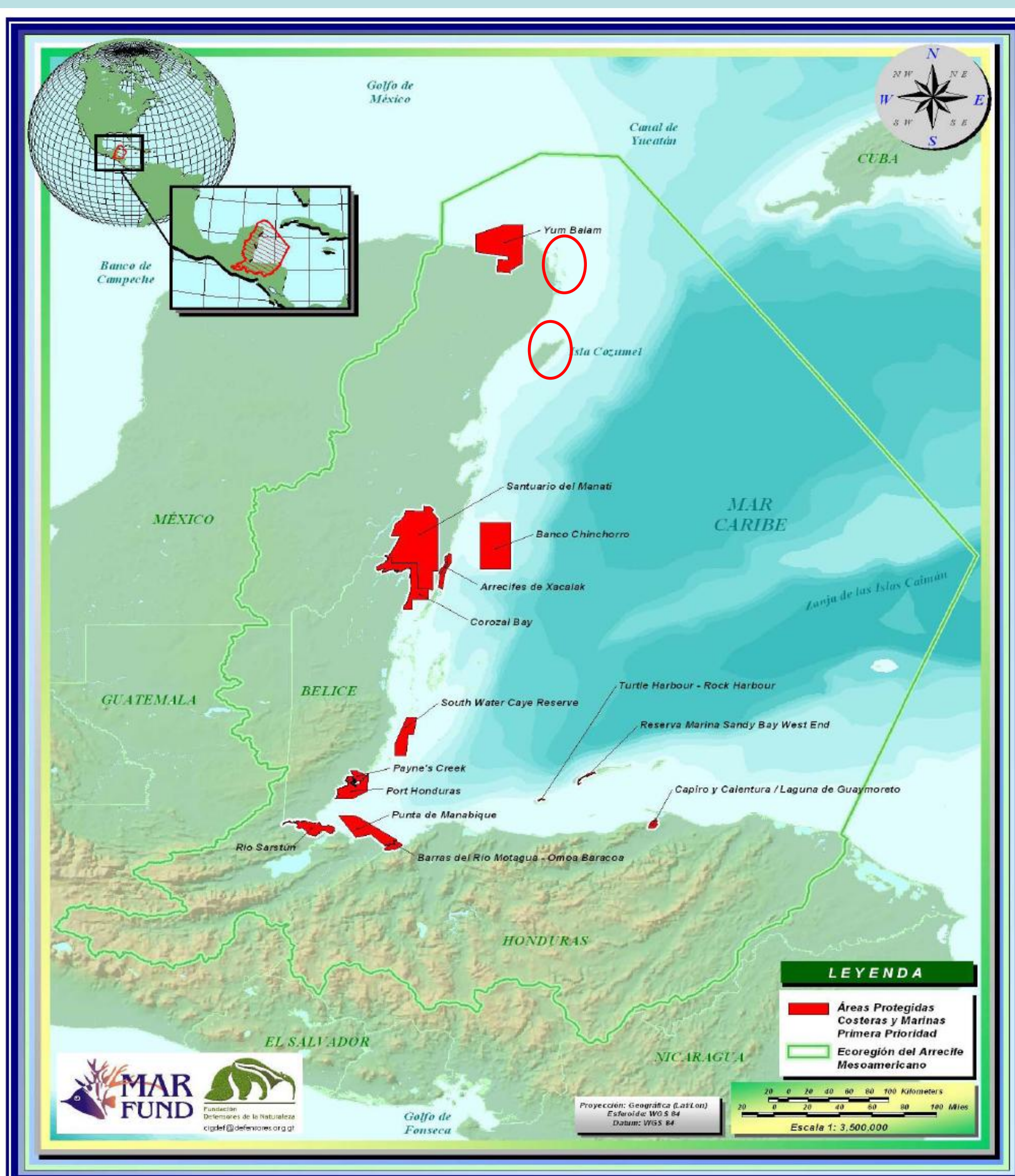


Figure 1. Mesoamerican Reef Funds' regional priority MPAs covering México, Belize, Guatemala, and Honduras.

Four Regional MPA Connectivity Goals, Mesoamerican Reef

- Grazers:** Investigate source/sink dynamics of protected parrotfish populations
- Invasives:** Investigate source/sink dynamics of lionfish
- Fisheries:** Coordinate mapping spawning sites and basic oceanography
- Productivity:** Compile current data on patterns of upwelling/nutrients

Given the results of the Management Capacity Assessment wherein two of the three areas ranked lowest in developed capacity – Ecological Network Development and Resilience to Climate Change – relate directly to recruit dynamics, the goals were set to create an integrated network of MPAs, both ecologically and cooperatively.

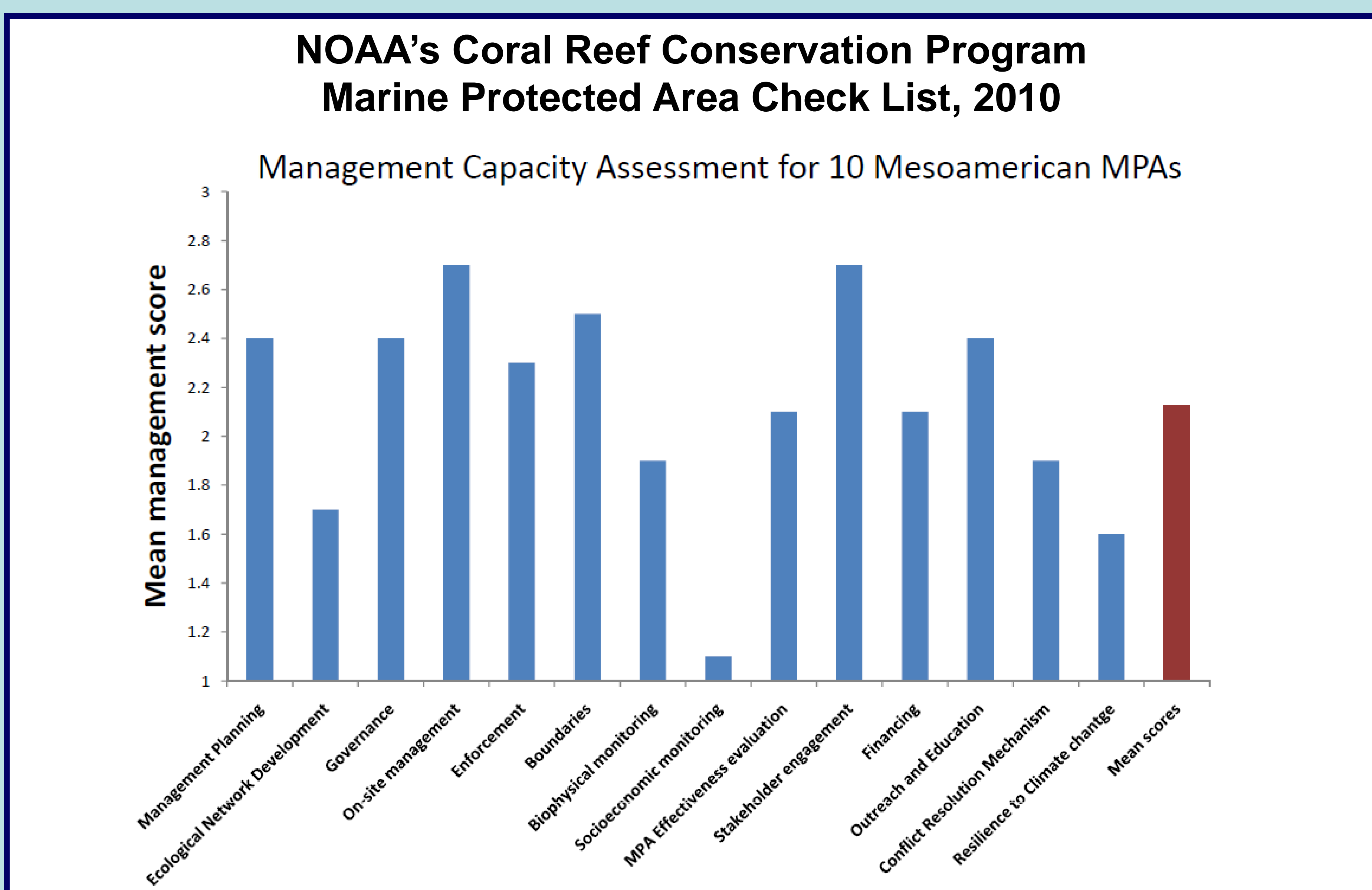


Figure 2. Representatives of 13 regional MPAs were surveyed to self-assess their current management capacity by category. Scale = 1 represents little to no capacity to 3 representing fully realized and implemented capacity.

1 Grazers: Ecologically Important Species

In April 2009, the Minister of Fisheries – Belize, signed new laws that protect parrotfish and other grazers, such as doctor and surgeon fish, allow for potential recovery after years of overfishing and localized population declines. Given the ecological value of these families via grazing, a consensus was reached by all managers within the network to pool all existing data and investigate both long and cross shore currents in relation to protected areas (Fig 3). Questions as to whether MPAs downstream from the newly protected grazers would benefit secondarily from the Belize population was listed as a top priority. Understanding such dynamics allows for more efficient management and resource-use both regionally and locally. Basic oceanographic equipment along the coast, will be vital to answer these questions.

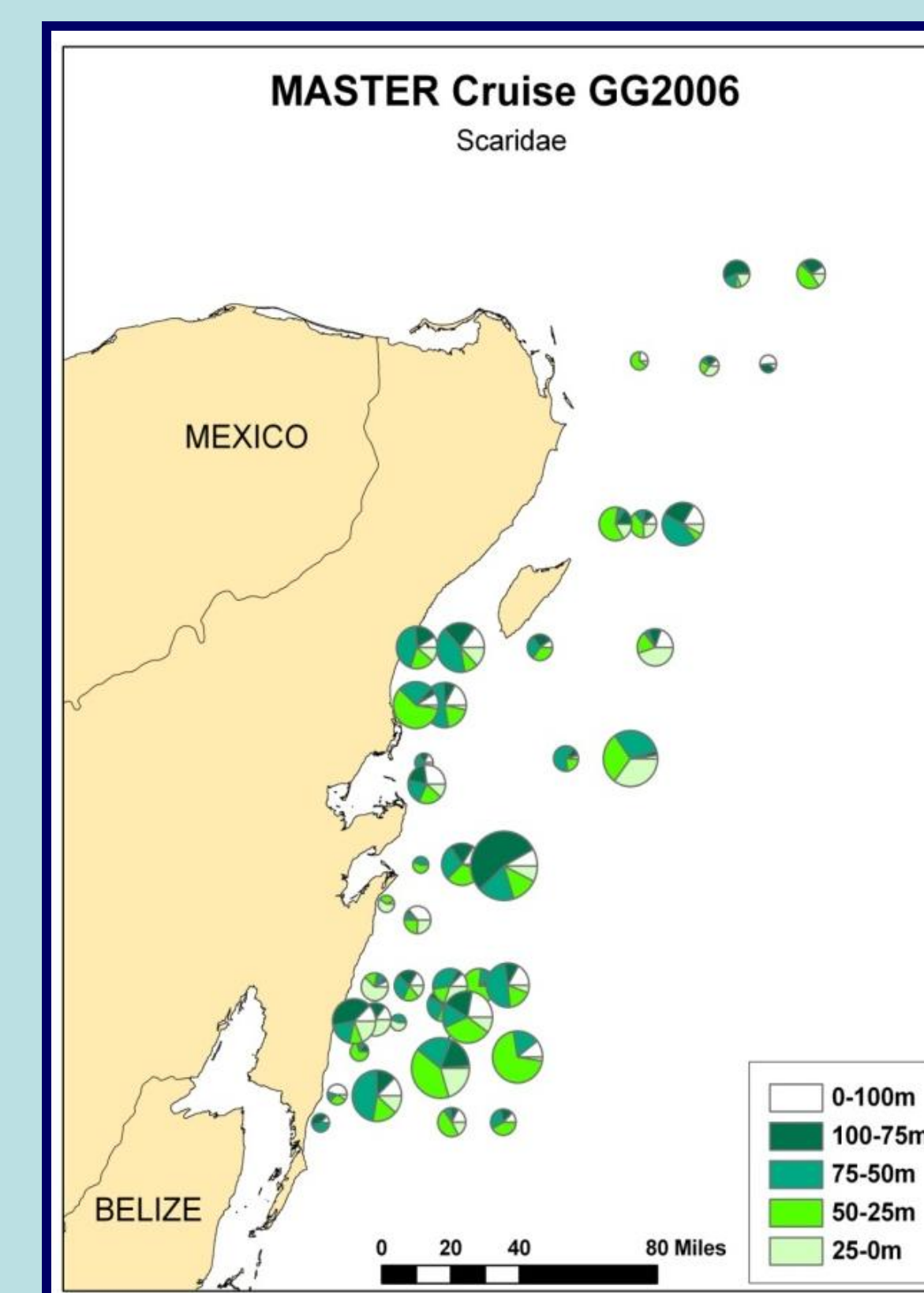


Figure 3. Distribution, by depth, of larval scarids off the Yucatan coast.

2 Lionfish: Invasive Species



Figure 4. Juvenile lionfish collected off the Yucatan.

According to REEF (Reef Environmental Education Foundation) dives surveys database, from 1992-98, invasive lionfish were reported only in Florida; by 2007 they were reported Caribbean-wide. In 2009, reports increased along the Mesoamerican reef (Fig 4).

Collections of young and juvenile lionfish (*Pterois volitans*) from MPAs in Yucatan are on-going by the early life history team at ECOSUR in Mexico. Concurrently, collections are also taking place from MPAs in the northern Yucatan such as Cozumel Reef National Park. By coordinating collection timing and methodologies and data analysis across the network of 13 MPAs, managers can understand the scope and spread of the species; and by sharing results, begin to determine downstream impacts.

3 Grouper & Snapper: Economically Important Species

Each of the 13 priority MPAs in the network either directly or indirectly supports local fisheries. Managers agreed to prioritize the coordination and integration of known spawning sites across the region and use web-based tools to create maps that overlay with existing, basic oceanographic data.

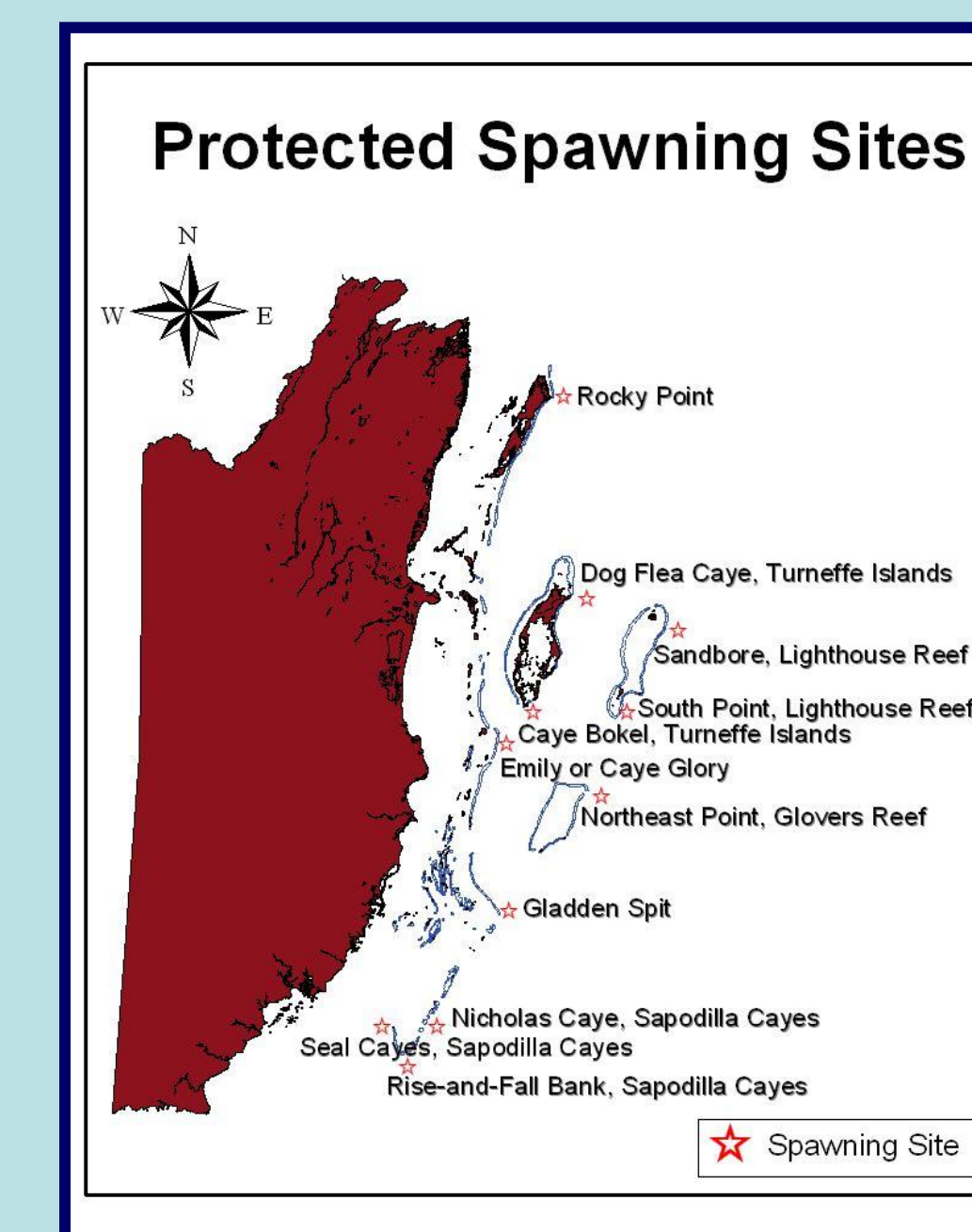


Figure 5. Example, currently available spawning sites data. (tidebelize.wordpress.com)

4 Migrations and Productivity: Mapping

MPAs within the region function to protect certain migration and feeding grounds (such as whale sharks at the newly formed Yum Balam Flora & Fauna protected area in northern Yucatan). The Mesoamerican reef is an important region in which, connectivity science is very relevant ecologically and commercially. The goal is to map the physical, biological and chemical parameters of these areas beginning with already available data. Results will be part of a shared web-based tool for all managers in the connectivity network.

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