ECOSYSTEM-BASED FISHERIES MANAGEMENT OF COMMERCIALLY IMPORTANT SPECIES: DESIGNING A NETWORK OF *REFUGIOS* IN BAJA CALIFORNIA SUR, MEXICO

PREPARED BY
RYAN ARNOTT
LIAM CARR
MITTY MOHON
ANNA SANTOS
FRANCES TOLEDO
SARAH TRIMBLE
CARENA J. VAN RIPER
JACKIE ZIEGLER

UNDER THE SUPERVISION OF
DR. WILLIAM HEYMAN

TEXAS A&M UNIVERSITY, DEPARTMENT OF GEOGRAPHY

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PURPOSE OF DOCUMENT

The purpose of this report is to provide perspective and possible guidance on how best to implement a new fisheries law in Mexico that allows for the creation of marine *refúgios* as a fisheries management tool for commercially important fish stocks. To do so, we provide a a case study of the Corredor San Cosme y Punta Coyote, as an example of how to implement this fishery law in other areas in Mexico. To streamline the document and increase readability for a wide audience, it is written in a semi-technical style, omitting most literature citations, but references are provided at the end. The document summarizes findings of a desktop analysis, conducted by a graduate class in Marine Spatial Planning at Texas A&M University. The analysis was requested by and provided to Amy Hudson Weaver at *Niparajá* (*Sociedad de Historía Natural Niparajá*).

EXECUTIVE SUMMARY

The Gulf of California is one of the most biologically productive regions in the world and is home to over 800 species of fish, more than 4500 invertebrates, 17 species of seabirds, and 5 species of sea turtles. Fisheries are an important source of food and livelihood for many communities within the Gulf of California. However, artisanal fisheries are not regulated and many of the once bountiful species are now showing signs of decline. Concerns have been raised over the sustainability of these activities and interest has been raised in implementing a new fisheries law that would allow the creation of marine reserves whose primary focus is to help recover commercially important fisheries species.

Recognizing their dependence on diminishing marine resources, community members in the Corredor San Cosme a Punta Coyote, Baja California Sur in Mexico have initiated the development process for a network of marine protected areas (MPAs) and other local management measures designed to sustain their marine resources and their traditional way of life. In support of that effort, this document provides scientific feedback for community members based on case studies from other locations, and based on analysis of existing biophysical, ecological, socioeconomic, and political data. This document illustrates best practices and provides a dynamic method for identifying and developing MPA networks or *refúgios* that contribute to sustainable fisheries management, while focusing on the Corredor San Cosme a Punta Coyote, Baja California Sur, Mexico. The ideas presented here examine marine resources and their use as a social-ecological system (SES) across international, national, regional, and local scales. These methods and results can be used to inform decision-making regarding sustainable use of marine resources.

Deliberately examining marine resources in terms of their existence as a SES allows for stakeholders' interests to be considered in the planning process. This is a departure from other styles of resource management, which too often have neglected or marginalized local users and communities because of their lack of political standing, perceived lack of experience or knowledge, and/or distrust that they would develop or support plans that would lead to overexploitation.

The main findings from the study are as follows:

- The communities have already accomplished the most difficult task of conservation: they have identified and articulated the problems, they are working together towards a common solution, and they have requested the assistance and support of local non-governmental organizations (NGOs) and the federal government of Mexico.
- The current network of reserves proposed by the communities is unlikely to meet their intended goal because the total area is too small (13 km^2 or only 0.2% of the *corredor*), and the coverage does not represent the full range of critical habitats needed for the maintenance of the three most important commercial stocks in the area (mainly *huachinango*, *cabrilla*, and *pargo alazan*).
- Instead, we propose six, expanded *refúgios* that protect a total of 448 km^2 or 6% of the *corredor*, including a large extent of critical nursery and breeding habitat, which represents a thirty fold increase in the area protected compared to the initial community-proposed *refúgios*.
- Based on a review of multiple case studies focusing on MPA effectiveness, 20 – 30% of the full range of representative critical habitats is sufficient to provide the desired social/ecological outcomes. Proposed zoning plans have been provided herein for consideration.
- Since management can be adaptive, this study recommends full support should be offered to community members to pursue their goal of sustainable fisheries and livelihoods via marine conservation and provides specific guidelines.

1. INTRODUCTION

The Gulf of California is one of the most productive and species rich ecosystems in the world. It is home to over 800 species of fish, more than 4,500 invertebrates, 17 species of seabirds, 5 species of sea turtles, and the Vaquita (*Phocoena sinus*), a highly endangered and endemic cetacean. Fisheries are an important source of food and livelihood for many communities within the Gulf of California. However, artisanal fisheries are not regulated and many of the once bountiful species are now showing significantly lower abundance. Concerns have been raised over the sustainability of these activities and interest has been raised in implementing a new fisheries law that would allow the creation of marine reserves whose primary focus is to help recover commercially important fisheries species.

1.1. Rationale for Cooperative & Adaptive Spatial Management

Marine ecosystems are increasingly affected by human impacts and shaped by unsustainable management practices. Coastal and marine ecosystems across the globe are in decline due to over-fishing and loss or destruction of habitats from both anthropogenic and natural causes. One management approach designed to reduce or reverse these losses is the establishment of marine protected areas (MPAs), which are:

> A clearly defined geographical space, recognized, dedicated and managed through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values (IUCN 2008).

It has been widely recognized that spatial planning tools, including MPAs, can be used to address deteriorating marine systems by identifying, defining, and protecting high priority areas to maintain long-term processes and functions at ecologically relevant scales. An approach that considers humans and the natural environment as intertwined elements of a complex system, known as a social-ecological system (SES), identifies areas that provide 'ecosystem services' (i.e. characteristics and functional processes of the natural environment that provide benefits to sustain and fulfill human life, Costanza et al., 1997; De Groot et al., 2002) (e.g. productive fishing grounds) and cultural values to local communities. This SES approach then incorporates the identified services and values into the overall management structure and long-term goals of the MPA.

Community involvement and representation in the decision-making process is critical for developing successful MPAs. A process that 'decentralizes' political power and decision-making from national or regional agencies to include local governments and/or stakeholders works to integrate those stakeholders' perspectives into policy outcomes in a cooperative manner that is largely absent from traditional 'top-down' or centralized governance regimes. Community-based conservation, co-management between communities and government officials and/or non-governmental organizations (NGOs), and participatory management programs are various forms of resource management that address the goal of balance between the needs of local communities and conservation agendas.

Decentralized co-management is generally considered more ethical and more efficient than top-down management because it aims to promote equity, participation, and sustainable livelihoods by placing power in the hands of those most connected to the resources. Such empowerment allows decisions and rules to be made in a style that builds up 'social capital,' strengthening the shared bonds of stakeholders; this serves to reinforce cooperation and participation in local management efforts. Decentralization also reduces the distance between decision-makers and stakeholders, increases accountability for decisions, and presents tremendous opportunities for interaction with stakeholders through regular public forums and meetings, which can lead to adopting cooperative management tools. The more participatory the process, and the more opportunities stakeholders have to work cooperatively with decision-makers, the higher the probability that their needs will be considered and incorporated, which can galvanize support for the resulting MPA.

In the implementation of decentralized co-management plans, a range of underlying institutions (i.e., formal and informal rules) is required for successful implementation of conservation strategies, which can require substantial time and effort to establish. More specifically, there needs to be a complimentary system of rules and regulations, proper training of local actors, a willingness by authorities to accept rules and devolve power, and a clear definition of property rights to prevent over-exploitation and facilitate the protection of natural resources.

Equally as important in cooperative management considerations is the recognition that resource management approaches must be responsive and adaptive to changing conditions or elements of uncertainty. System uncertainty can derail goals and undermine community support for management. To counter this, an adaptive management approach that can quickly assimilate new or changing information is preferable to one with greater institutional inertia.

1.2. Spatial Management – the Baja Mexico Perspective

In 2010, six communities totaling nearly 600 individuals in Baja California Sur, Mexico, expressed an interest in using a MPA-style management tool termed *zonas de refúgio* to protect their local marine environment from outside fishing pressure while simultaneously allowing themselves access to fish, as well as to preserve key ecosystem services and functions. Through negotiations, these communities, stretching northward from the city of La Paz for nearly 100 km, reached a consensus to research the potential for *zonas de refúgio* as part of a locally developed management program. The Mexican government defines *refúgios* as "areas of federal waters, with the principal objective to conserve and contribute, naturally or artificially, to the development of fisheries resources with the motive of their reproduction, growth, and recruitment, as well as to preserve and protect the surrounding environment" (General Law of Sustainable Fishing and Aquaculture, Ley General de Pesca y Acuacultura Sustentables, LGPAS Art.4, LI. 2007). Mexico has previously used *refúgios* as an instrument for protecting freshwater resources but has not yet implemented them in the coastal and marine environment.

The six southern Baja communities envision designing a network of *refúgios* along the coast from San Cosme to Punta Coyote that acts to maintain the ecosystem processes forming the basis of their fishery resources. This Corredor San Cosme a Punta Coyote would serve as the major management tool for small-scale fishing within and between these communities, while simultaneously affording them special status and rights to *corredor* resources for the prevention

of access and exploitation by outside fishing interests. In essence, the *corredor* would create a sense of ownership, building the communities' responsibility for the continued health of the marine resources, and developing incentives for local communities to manage and enforce the *refúgios* for the benefit of all communities. To work toward protecting the health and function of the system, the six communities identified several areas critical to the life history of their exploited stocks. The areas identified include spawning and nursery sites as well as other areas where the communities felt that fishing pressure should be eased.

1.3. Fisheries Overview

There is a dearth of information regarding the size and extent of the artisanal fisheries in the Gulf of California, as well as the health of the targeted fish stocks and their basic biology and ecology. Fisheries must meet three main criteria in order to be considered sustainable; they must have (1) sustainable fish stocks, (2) minimal ecosystem impacts, and (3) effective management. The lack of this basic, yet vital information for the fish stocks of the *corredor* coupled with the lack of fisheries regulations, such as minimum size requirements, fishing bans or quotas, seriously hinders any attempt to create effective management plans and thus achieve long-term sustainability of the fisheries.

Studies of the status of the artisanal fisheries in Baja California Sur, which encompasses the study area of the *corredor*, highlight potentially unsustainable activities. The Lutjanidae (snapper) and Serranidae (grouper) families represented 70% of fish caught in artisanal fisheries in the Gulf of California, with Pacific red snapper (*huachinango*) (43%) being the most important fish in the fishery. Of concern, fish are captured year round regardless of reproductive season, and half of the fish caught in the Pacific red snapper fishery were undersize and immature, which would increase the effects of overexploitation. The baqueta (rooster hind, *Hyporthodus acanthistus*) fishery in the Gulf of California is considered unsustainable and a major threat to the species.

The artisanal elasmobranch fishery in the Gulf of California reveals similar concerns. Mexico is the sixth largest producer of shark products in the world and nearly half of the catch (15,000 tons) comes from the Gulf of California. This fishery is opportunistic and targets multiple species in shallow shelf waters, including a significant number of young of the year, juveniles, and gravid females in pupping areas (i.e. 50% of reported catch). Besides directed fishing effort of the artisanal fisheries in the Gulf of California, many elasmobranchs form an important fraction of accidental by-catch in commercial trawl fisheries (e.g. hake, shrimp), with bycatch numbers believed to exceed total catch numbers of the artisanal fishery. The sustainability of the elasmobranch fishery is difficult to achieve because of their K-selected life history traits (i.e. long lived, few young, late maturation), which makes sharks less resilient to exploitation compared to other species and less likely to recover once exploited. Many shark fisheries in Mexico are already in decline, with an overall decline in shark catches at the national level from 45,250 tons in 1996 to an average of 33,971 tons per year for 2000 to 2008. An accurate assessment of the status of shark fisheries in Mexico is difficult because the current reporting system (i.e. five broad categories: *tiburón* (sharks >1.5 m), *cazón* (sharks < 1.5 m), *angelito* (angel sharks), *manta* and *guitarra* (guitarfishes)) is not species specific, does not differentiate between juvenile and small sharks, and underestimates catches because it does not include all shark fishing camps (especially remote ones).

1.4. Ecosystem-based fisheries management

The significant decline in commercially important marine resources within the Gulf of California, along with the lack of available data on species-specific stock data, including basic biology and ecology (refer to Appendix II and III) of the targeted species, highlights the importance of using a precautionary approach when managing these stocks. Potential solutions to improve the overall sustainability of these artisanal fisheries in the literature focus on a need to implement fishery regulations such as bans or quotas. However, this approach disregards the importance of protecting critical habitats and life history stages of targeted species. A more effective option would be to use ecosystem-based fisheries management (EBFM), in which the overarching goal is to protect ecosystem health and the fisheries they support, rather than taking the traditional single species approach. Specifically, EBFM should (1) avoid degrading the ecosystem through monitoring indicators of system health, and (2) minimize the risk of irreversible change to species assemblages and ecosystem functions, (3) maximize long-term socio-economic benefits, and (4) create a greater understanding of ecosystem processes such that human impacts on these processes can be understood and reduced. EBFM also stresses the importance of the precautionary principle (i.e. to err on the side of caution in terms of action when scientific understanding of impacts is not available).

In the case of the *corredor*, EBFM could involve the implementation of new fishery regulations with a network of *refúgios* that specifically protect critical habitat (e.g. feeding or breeding/nursery habitat) of important fish species. The *corredor* area has already been identified as an area of critical importance for the conservation of biodiversity in the Gulf of California and the communities of Agua Verde and El Pardito have been identified as key nursery habitat for the Pacific angel shark (*Squatina californica*), while the southern Gulf of California is important breeding area for manta species, especially offshore seamounts, and for spawning aggregations of reef fishes. Furthermore, the fishers of the *corredor* have identified key nursery habitat for commercially important fish species in the *corredor*. Thus, an important next step towards fishery sustainability in the area is to identify critical areas within the *corredor* (e.g. significant overlap of critical habitat for multiple commercially important species) as potential sites for a network of *refúgios* that would be managed within an EBFM framework.

1.5. Study Objectives

The primary goal of this paper is to evaluate the network of community-proposed fisheries *refúgios* in the *corredor* and offer an alternate proposal of EBFM *refúgios* based on multi-disciplinary scientific analyses. The analysis included a meta-analysis of important case studies to identify MPA best practices and lessons learned, as well as using fisher knowledge and biophysical site characteristics within ArcGIS to identify potential new and/or expanded sites for *refúgios* within the *corredor*.

2. SITE DESCRIPTION

2.1. Geographic Description

The *corredor* consists of a series of small communities dotting the eastern coastline of the southern half of the Baja California peninsula, directly on the Gulf of California (Figure 1). They stretch over more than 100km of coastline, from Agua Verde in the north to Punta Coyote in the south. The largest nearby towns/cities are Loreto in the north and La Paz in the south. There are several islands and seamounts located just offshore in the Gulf of California, the largest of which is Isla San Jose, situated near the southern end of the proposed *corredor* at the mouth of Bahia Coyote. These communities are very rural and difficult to reach; the rugged Sierra de la Giganta mountain range runs parallel to the coastline down the entire state of Baja California Sur, making approach by car from the west difficult. Some of the communities can only be reached by boat.

2.2. Physical Description- Geologic Setting

The Gulf of California is a 1100 km long, wide semi-enclosed basin, bounded on both sides and only open at the mouth. It widens from a narrow head to 200 km at the mouth. The Northern Gulf is shallow in part because river (fluvial) transported sediment, but reaches depths of 3000m near the mouth. Broadly, Baja California and the Gulf result from a transform fault boundary and rifting of sea floor. The East Pacific Rise originates in the middle of the Pacific Ocean and terminates near the mouth of the Gulf (Figure 1). The Baja California Peninsula began to break away from the mainland 4 million years ago along the San Andreas Transform fault and moves at a rate of ~ 6.0 mm/y.

2.3. Physical Description – Climate

The climate in this part of Baja California is classified by the Koppen Climate Classification System as low-latitude desert (BWh); the area is characteristically hot and arid. Daily high temperatures range from 25 – 38°C, and average annual rainfall is 104mm. Baja California is situated in a region of increased tropical cyclone activity, due to warm ocean temperatures and prevailing wind patterns. In the 2011 season (15 May – 30 November) there were thirteen named storms that crossed the Baja peninsula.

Since 1949, there have been 31 storms that have passed near or over La Paz. Of these 31, two reached Category 4 strength (210-249 km/h), five were Category 3 (178-209 km/h), and 14 were either Category 1 or 2 (119 – 177 km/h). Tropical storms of all strengths bring potential for heavy rainfall, changes in ocean currents produced by large, intense wind fields, and changes in sea surface temperatures (SSTs). Heavy rainfall and high winds can cause flooding and erosion, greatly increasing the sediment load of the surrounding rivers. As a result, storms provide strong pulses of fresh water and sediment to the marine environment.

2.4. Physical Description – Oceanography

Oceanographic patterns in the Gulf result from complex interactions between three major currents, seasonally changing patterns in winds speed and direction wind, and tidal mixing. Cold water from the North Pacific from the California Current, warm waters from the eastern equatorial region of the Pacific, and high salinity waters from within the gulf are perpetually mixing at the mouth of the gulf. A northward shift of the Inter-tropical convergence zone in the summer months alters the prevailing wind direction, which in turn drives resulting circulation patterns and the location and intensity of the zones of upwelling. Upwelling brings nutrient rich

cold water from the depths of the gulf to the surface allowing supporting areas of high primary and secondary (fisheries) productivity. Primary production is also a result of the near continuous vertical mixing that occurs from below the shallow pycnocline and into the euphotic zone. The mean upwelling rate for the southern gulf coast has been estimated at 1-3 meters per day.

Figure 1. Map of the communities of the Corredor San Cosme y Punta Coyote, Gulf of California, Mexico.

During summer months weak southeasterly winds induce cyclonic circulation and weak upwelling along the coast of the peninsula. Alternately, during winter months, strong northwesterly winds induce anticyclonic circulation and strong upwelling along the mainland coast. In the summer months water enters the gulf along the mainland coast and circulates out

along the peninsula coast and during the winter months where waters enter the gulf along the peninsula and exit the gulf along the mainland coast. Velocities in this circulation reach can reach 0.1 m/s down to 300 m, with larger velocities possible near the surface. Although large scale variations in atmospheric circulation responsible for the El-Nino/Southern Oscillation (ENSO) do not appear to have significant impact on primary production in the central gulf, they do affect the variations in sea surface temperatures. During positive phases of (ENSO) there is an increase in sea surface temperature and increases in thermocline depth resulting in a deeper boundary between warm waters and cooler waters. The increased depth decreases the amount of nutrient rich water available for primary production. The southern Gulf of California is the warmest resulting in the deepest thermocline. Water temperatures range from ~26.5^{o}C in the southern gulf to ~23^{o}C in the northern gulf with variations in temperature due to seasonal changes in ocean and atmospheric circulations.

Tidal mixing is also important in nutrient distribution and ultimately in the productivity of the area. The Gulf tides are a result of the co-oscillation with the tides of the Pacific Ocean. Tidal ranges vary from close to 0.3m near the mouth to 6.0m in the upper gulf. The central region differs greatly as there is a virtual amphidromic point in the region resulting in a tidal range close to zero. Variability exists between diurnal and semi-diurnal tides creating a mixed tidal setting. Specifically the corredor is located south of the central region and tidal ranges vary between 0.3m and 1.8m throughout the year. Tidal mixing and its influence on productivity are limited in the corredor, compared to the upper Gulf.

2.5. Physical Description – Coastal Pedology & Vegetation

The southern portion of the Baja peninsula is dominated by loosely packed, unconsolidated and undeveloped regosol and cambisol soils, while further to the north, strongly saline solonchak and litosol soils become more common. Local vegetation, including the family of drought-adapted, or xerophilic, matorral shrubs, is typical of dry tropical forest, although there is some seasonality to precipitation and the potential of tropical storms throughout the summer months. Other dominant flora include large cacti stands and thornscrub, while along the extreme southern tip of the peninsula, a deciduous tropical forest and a small pocket of oak-pine forest appear.

2.6. Physical Description – Marine Ecosystem

The Gulf of California marine system is noted for its high productivity and biodiversity. Within the region, there are 835 identified fish species (77 endemic), at least 4800 intertidal invertebrate species (740 endemic), 17 species of seabirds, and five species of sea turtles. Forty percent of the world's cetaceans also can be found within the Gulf, including the endemic and endangered Vaquita**.**

3. SOCIAL & ECONOMIC CHARACTERISTICS OF THE *CORREDOR*

The *corredor* consists of thirteen communities and approximately 630 inhabitants. Small-scale subsistence and commercial fishing are primary occupations for these communities. There are approximately 160 commercial fishers, with nearly all fishing from small 6 – 9m vessels called *pangas*.

The communities that are situated along the *corredor* are incredibly remote, with nearly half only reachable by boat. Many communities are without regular electricity or secure potable water sources. There is only limited phone and radio communications.

The role of fisheries is central to the existence of communities living within the *corredor*. Fishing is a primary activity and many individuals depend on related community-based work for their livelihoods. As a result, fishing and dependence on the marine ecosystem greatly infuses their cultural identity and thus there is a strong interest within these communities to sustain and sustainably manage their marine resources. Recently, their focus has turned to forming rules and regulations that would restrict unsustainable fishing methods, mitigate impacts contributing to declining resources, and manage fishing effort throughout the *corredor*. Currently, less than 50% of fishers in the *corredor* have fishing licenses or commercial concessions.

3.1. Legal Context of Localized Fisheries Management in the Corredor

All marine waters in Mexico fall under federal jurisdiction, granted by Article 27 of the Constitution of Mexico. The General Law of Ecological Equilibrium and Environmental Protection (Ley General del Equilibrio Ecológico y la Protección al Ambiente, LGEEPA) codified in 1998 provides the legal justification for establishing local access rights to the proposed *corredor*, stating: "communities living at the moment in an area to be established for protection are authorized to use natural resources". The capacity to identify and develop *refúgios* is granted by both Article 4 of the General Law of Sustainable Fishing and Aquaculture (Ley General de Pesca y Acuacultura Sustentables, LGPAS) and the General Law of Wildlife (Ley General de Vida Silvestre, LGVS). LGVS aims to identify and protect vulnerable species and their habitat, while LGPAS works to protect and develop fishery resources by identifying areas important for reproduction, growth, and recruitment through the National Commission of Aquaculture and Fishing (Comisión Nacional de Acuacultura y Pesca, CONAPESCA). In the case of *corredor* fishery resources, the creation and development of *refúgios* falls under the jurisdiction of CONAPESCA and the LGPAS, under Article 38, which states:

> For the case of protection for over-exploited fish species, the Secretariat, through the National Fisheries Institute (Instituto Nacional de Pesca, INAPESCA), dictate the necessary steps for recovery, which may include the establishment of *refúgios*, these measures should be recorded in a Fishery Management Plan (Plan de Manejo de Pesca, PMP) and Fisheries in the National Charter. In these cases, the initial specific objective of the PMP should be the recovery of the targeted fishery species.

Article 38 shows that for the legal creation of *refúgio*, there must be a prior opinion of INAPESCA, which must be stated in a PMP, and with the specific purpose of preserving over-exploited fish stocks. Once a PMP has been developed, CONAPESCA, through Article 7 of the LGPAS, has the power to:

> Establish the methods and measures for the conservation of fishery resources and the restocking of fishing areas in coordination with competent authorities and regulate *refúgios* to protect aquatic species that require it, and set the times and areas closed.

Under these provisions, LGPAS supports the creation of *refúgios* for both conservation and the development of fisheries resources and the environment, and allows CONAPESCA to set the methods and measures for conservation of fishery resources and the re-population of fisheries using *refúgios*. Despite these legal justifications, CONAPESCA has not established the procedures for creating, modifying and managing *refúgios*.

3.2. Corredor Fisheries & Communities

The communities in the *corredor* target 46 species of fish and invertebrates. The key species for the local artisanal fishery, as identified by the local fishers, include grouper (*cabrilla*), snapper (*pargo mulato*, *huachinango*, *pargo alazan*), amberjack (*jurel*), ocean whitefish (*pierna*), finescale triggerfish (*cochito*), clam (*almeja*), and angelshark (*angelito*) (Figure 2). The most important species is the Pacific red snapper, *Lutjanus peru* (huachinango). Species summaries for the important species in the regional fisheries are included in Appendix II and III. The importance of these species varies between communities, and fishing effort varies by season. The fishing method and gear used also vary according to fishing target and season. Fishing methods include the use of seines, gillnets, lines, hooks, and diving. Overall, 93% of the fishers use hand lines and 36% use gill nets. Most fishermen depend on fishing as their main source of income, however alternative sources of income exist, including livestock farming, tourism, and construction.

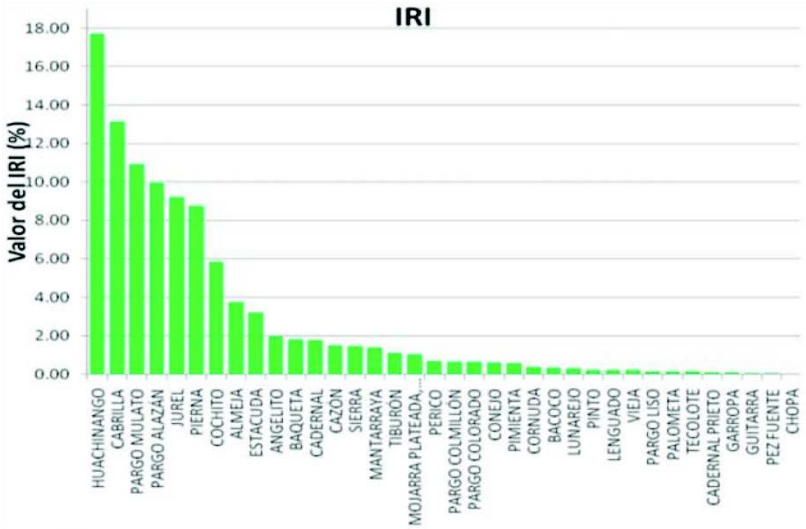

Figure 2. List of species fished in the *corredor* in order of importance (refer to Appendix x for scientific names and relevant biological information).

According to a Weaver and Rivera Campos (2011) socioeconomic analysis of nine communities in the *corredor*, the average age of fishers is 38.5 years, with the majority of interviewed fishers having resided in the *corredor* at least 10 years, and 91% having resided in a single community. Land tenure remains an ongoing challenge for *corredor* communities, as only 8% of premises are titled, 24% are in the legal process of gaining title, and 56% are in dispute or owned by third parties. Local social services are meager in the area, especially access to education and health services. Fully 20% of fishers have not received any formal schooling, while 36% completed primary school, and 16% attended and/or graduated from secondary schools.

4. METHODOLOGY

4.1. Spatial Analyses

Surveys were administered to 86 fishers from the 13 communities. Included in the questionnaire was a map of the *corredor*, onto which the fishers were instructed to highlight areas where species aggregate as adults, as juveniles, or to spawn. A Geographic Information System (GIS) was then used to digitize the information on these documents, rendering digital files. These can now be used to better visualize and analyze the local knowledge. For the purposes of this study, analyses were focused on the areas designated as *criaderos* (fisher-described reproductive and/or nursery habitat), or as the prime fishing zones for the four main species harvested from the *corredor*: the *cochito* (a type of triggerfish), *cabrilla* (which refers to several species of grouper but most importantly the leopard grouper, *Mycteroperca rosacea*), *huachinango* (*Lujanus peru* or Pacific red snapper), and *pargo alazán* (*Lutjanus argentiventris* or yellow snapper).

In order to compare this local knowledge with existing publicly available data a search was conducted for any additional GIS information regarding biodiversity of species or physical geomorphology of the study area. This led to a confirmed suspicion: there is a paucity of such data available for this remote region. To compensate, bathymetric data was digitized from scanned and georeferenced Russian maps of the region created from ship sounding data gathered between the 1880s and 1980s. The United States' National Oceanic and Atmospheric Association also has a bathymetric data repository where modern ship sounding data is stored (http://www.ngdc.noaa.gov/mgg/bathymetry/relief.html). Several ship's trackline data were downloaded from this website in the form of discreet points. These combined data were then used to generate a Digital Elevation Model (DEM) to provide a continuous physical model of the seafloor. Improved bathymetric contour lines were then derived from this dataset. All of this combined physical data was used to verify and analyze fisher's local knowledge of nursery and fishing grounds along with published data regarding species' known habit preferences.

In addition, the digitized fisher maps were aggregated to highlight trends in the data. For example, through a process called a "union," multiple polygons (in this case, the individual fishers' designated *criaderos*) are overlain one atop the other to generate a new set of polygons. In this instance, each new polygon is assigned a value to denote how many fishers agree that a given area provides nursery habitat for a given species. This helps highlight areas most likely to be nurseries for that species - and can help guide and focus the effort to preserve or protect it. These aggregated data combined with the physical data provide the beginnings of a database that can contribute to planning the size, shape, and placement of *refúgios*.

The criteria used to design our suggested EBFM *refúgios* included critical nursery and adult habitat for the most important fish stocks (i.e. *huachinango*, *cabrilla* and *pargo alazan*), location and shape to facilitate enforcement, and areas originally identified as potential reserve sites by the fishers.

4.2. Biological & Ecological Analyses

Fish life history for major stocks of the *corredor* were collected from numerous publications. For each stock, the geographic range, relevant biological information, and known fishing effort were summarized.

4.3. Case Studies

A wide variety of globally distributed case studies were examined in order to evaluate different MPA management approaches around the world. For each case study the rationale for the protection of the area, the type of management, biological characteristics, community and stakeholder involvement, governance type, size of reserve, percentage of no-take area, and the effectiveness of the reserve were evaluated. The case studies examined were selected based on their completeness and relevance to the present study, and this dataset included both top-down, and community-driven (bottom-up) examples of MPAs.

5. RESULTS & DISCUSSION

5.1. Biophysical Description & Bathymetry

The digitized bathymetry and ship sounding data provides the beginnings of a digital elevation model; however the intervals between data input points were inconsistently coarse (e.g. bathymetric line intervals ranged from 10m inshore to up to 300m in deeper waters). For improved and more accurate results, additional input data is necessary. Because detailed, published maps of this area do not appear to be easily accessible (and may not exist), fieldwork may be necessary to ensure all possible habitats are included. For example, local knowledge dictates that there are two known seamounts located a few kilometers southeast of Isla Monserrat, but the location, shape, and depth of these seamounts is currently missing from the dataset. Such data are crucial for identifying and protecting critical habitat for species of interest.

The authors of this document propose the establishment of six *refúgios* within the *corredor* which are described as "ecoystem based management refugios." These are based on fisher local ecological knowledge (LEK) of critical reproduction and nursery habitat for important commercial fish species (*huachinango*, *cabrilla* and *pargo alazan*, Appendix I Figures 3a,b, 4a,b, and 5a,b). A summary map of the fisher-proposed *refúgios* and our ecosystem-based management *refúgios* (Appendix I Figure 6) and their areal coverage and physical characteristics are shown (Table 1).

Table 1. Proposed *refúgios* in Corredor San Cosme-Punta Coyote

Name	Proposed *refúgio* area (km^2)	Critical habitat protected	Coordinates
El Pardito	100	*cochito*, sea turtles	24.9°N, 110.6°W;

			24.9°N, 110.5°W; 24.8°N, 110.6°W; 24.8°N, 110.5°W
Palma Sola	35	*pargo alazan*	25.14°N, 110.73°W; 25.14°N, 110.68°W; 25.06°N, 110.73°W; 25.06°N, 110.68°W.
Isla Santa Cruz y San Dieguito	120	*cabrilla, pargo alazan*	25.33°N, 110.74°W; 25.33°N, 110.67°W; 25.16°N, 110.74°W; 25.16°N, 110.17°W
Agua Verde y San Marcial	80	*huanchinango, pargo alazan, cabrilla*	n/a
Tembabiche	110	*huachinango, pargo alazan*	n/a
La Habana	3	*huachinango*	110.872, 25.138; 110.872, 25.125; 110.851, 25.138; 110.851, 25.125
Total area	448		

The seven suggested EBFM *refúgios* are detailed below:

1. Near El Pardito, we suggest that the current *refúgios* be extended to include all of El Francisquito Island and the southern shelf of Isla San Jose. This new *refúgio* will encompass two smaller *refúgios* currently proposed by the fishers of the *corredor*, and will adequately protect important fisher-identified *criaderos* for *cochito*, and a well-known sea turtle nesting site and the estero at the south end of Isla San Jose (Appendix I Figure 7).
2. We suggest that the fisher-proposed *refúgio* near Isla Santa Cruz and San Dieguito be expanded to include critical fisher-identified spawning sites for *Epinephelus* and *Lutjanus* spp. (i.e. *pargo alazan*, *cabrilla, and huachinango*) particularly around San Dieguito and at the northeast point of Santa Cruz. We propose a square *refúgio* so boundaries align with lines of latitude/longitude (Appendix I Figure 8) and make it easier to enforce.
3. We suggest an expansion of the fisher-proposed San Marcial *refúgio* near Agua Verde. We suggest a circular-shaped *refúgio* with a 6 km radius centered at San Marcial that extends from the coastline at Agua Verde to just east of the shelf break off San Marcial (Appendix I Figure 9). This would provide extensive protection for fisher-identified

nursery areas of *huachinango*, *pargo alazan*, and *cabrilla* and reproductive habitat for *cochito*.

4. We suggest a *refúgio* surrounding the community of Palma Sola, located at the north end of Isla San Jose. This would provide protection for fisher-identified critical reproductive habitat for *huachinango* and *pargo alazan* and nursery habitat for *huachinango* and *cabrilla* (Appendix I Figure 10).
5. We suggest a *refúgio* surrounding La Habana that expands the fisher-proposed *refúgio* in the same area. We would expand the width of this rectangle a half kilometer in all directions which brings the edges of the *refúgio* out to the 100 m depth contour in the east and includes more of the shallows on all sides and additional nursery habitat for *huachinango* (Appendix I Figure 11).
6. We suggest a *refúgio* that incorporates three fisher-proposed reserves near Tembabiche that includes protection for Ensenada Los Pargos and stretches south to Montealban, thus centered on Tembabiche and protecting important coastal *pargo alazan* and *huachinango* nursery habitat (Appendix I Figure 12).

The analysis suggests that the fisher proposed *refúgios* in the *corredor* are too small to provide adequate protection of fish reproduction and nursery habitats and thus to promote sufficient species growth or recovery (Table 2 and 3, Appendix I Figure 14). We propose an area that will protect 60% of critical nursery habitat identified by the fishers (up from 4%) and 6% of total area within the *corredor* (up from 0.2%).

Table 2. Comparison of the amount of protected critical species habitat by *refúgio* type (i.e. fisher vs. ecosystem-based fisheries management).

Species	Total critical habitat (km^2)	Critical habitat within EBFM refúgio in km^2 (percent total critical habitat)	Percent of the total proposed protected area	Critical habitat within fisher refúgio in km^2 (percent total critical habitat)	Percent of the total proposed protected area
Huachinango	59	41 (70%)	13%	0.1 (0.2%)	0.1%
Cabrilla	23	3 (13%)	0.3%	2 (9%)	2%
Pargo alazan	20	18 (90%)	0.3%	2 (10%)	2%
Total	102	62 (61%)	23%	4.1 (4%)	

We would also suggest adding *refúgios* near Isla Monserrat (part of Loreto National Park), another near San Mateo, and possibly around Las Animas but we do not feel we have enough information to design these areas.

Table 3. Comparison of total area protected for fisher-proposed *refúgios* and ecosystem-based fisheries management *refúgios*.

	Area (km^2)	% Corredor
Fisher-proposed total area	14	0.2
EBFM-proposed total area	448	6.4
Corredor total area	7000	100

5.2. Spatial Comparison of Fisher Generated Maps with Selected Ecological Criteria

Of the three most important fishery species analyzed through aggregation of digitized fisher surveys, two species showed the most overlap (agreement) among fishers. In certain shallow areas very near the banks of Isla Monserrat, seven fishers agree that there appears to be a nursery of *cabrilla*. Three or more also highlighted nearly the entire coastline of Isla San Jose.

Of the 30 fishers who designated possible *huachinango* nurseries, there was agreement of up to eight fishers in certain areas, but these nurseries were concentrated along the coastline of the mainland further south (stretching between Tembabiche and Punta Coyote). They were all located in waters less than 20m deep, which is consistent with data published on both of these species (Appendix II). Fishers rarely agreed on the critical habitats of the two other species we focused on (*pargo alazan* and *cabrilla*).

Unfortunately, these areas of high agreement share no overlap with the currently proposed *refúgios* (Appendix I Figure 14). This is one of our motivations for proposing an expansion of the current community-proposed *refúgio* areas. Of the total area designated by fishers as *huachinango* nursery habitat, only 0.2% is currently designated as proposed *refúgio*. Under our proposed protected areas, 70% of the total nursery area would be protected. The fisher-designated *refúgios* protect 11% of the *pargo alazan* nursery habitat compared to 90% in the EBFM-designated *refúgios*. C*abrilla* nursery area protected under the fishers' current plan is 9% of the total fisher identified nursery habitat, but 12% of the *cabrilla* nursery area would be protected under the proposed EBFM *refúgios.*

5.3. Case Studies

Thirty MPA case studies were assessed to extract lessons learned and best practices from around the world (Appendix IV and V). MPAs are widely used throughout the world to prevent overfishing and conserve biodiversity, but uncertainties remain about their optimal design and the factors leading to their success. The results of the assessment revealed a number of key factors (e.g. biophysical, ecological, socioeconomic, political) that must be included for the successful design and implementation of MPAs. Lessons learned from the case studies are divided into the following categories, (1) importance and size of no-take zones and incorporating multiple and representative habitats, (2) importance and value of incorporating stakeholders in design and management, (3) economic benefits of reserves, (4) importance of enforcement, (5) importance of community outreach and education, and (6) importance of multi-disciplinary research and monitoring.

(1) Size of no-take zones and incorporating multiple and representative habitats

The majority (80%) of the MPAs analyzed included a no-take zone or core zone. Marine no-take zones, in which fishing is completely prohibited, are vital tools for the recovery of biodiversity in areas that have experienced harmful extraction practices including overfishing. No-take zones aim to protect critical habitat (e.g. nursery habitat, feeding and breeding grounds) necessary for the survival of various species. Thus, it is important to protect different areas that provide critical habitat for different species at different life stages so that they can successfully develop and reproduce. No-take zones vary greatly in size from approximately 4% of total MPA area in the Arrabida MPA, Portugal to 99% in the Folkestone Park and Marine Reserve, Barbados. The remaining areas of the MPA, which are not in a no-take zone, are designed for different purposes to accommodate a variety of activities (e.g. tourism, research, and recreational fishing).

A recent re-design of the Great Barrier Marine Park, Australia expanded the no-take zone from 4.5% to 33% of the total area and incorporated multiple critical habitats. During the first zoning of the area in 1975, more than 80% of the no-take zone was coral reef. Although coral reefs are an important habitat within the MPA with a high degree of connectivity, reefs only represent 6% of the total area of the GBRMPA, while other habitats (e.g., seagrass beds, algal or sponge gardens, sandy or muddy seabed communities, and deep ocean trenches) that are interlinked with coral reefs constitute the remaining 94% of the park area making these no-take areas inadequate to ensure the protection of the entire park. GBRMPA management identified major bioregions within the park using biophysical data, existing regionalizations, and expert advice. These bioregions were then used as the major planning units to ensure that all habitat types within the park were considered for protection. At the end of the re-design, the new network of no-take areas had at least 20% protection per identified bioregion, minimum sizes of at least 10 or 20 km across, as well as provided minimum levels of protection for all habitats and special features.

Important steps required to achieve this outcome included: clarifying to interested stakeholders why the current level of protection was inadequate, outlining the conservation objectives of establishing new no-take areas, working with experts to determine the best scientific process to deliver on these objectives, describing the biodiversity (e.g., map bioregions), defining operational principles needed to achieve the objectives, seeking community input on all of the above, assessing the degree to which no-take zone principles and objectives were met, and determining how to address negative impacts that occur. Key factors for GBRMPA success that have global relevance include: focusing initial communication on the problem to be addressed; incorporating the precautionary principle; using independent experts; facilitating input to decision making; conducting extensive and participatory consultation; having an existing marine park that encompassed much of the ecosystem; having legislative power under federal law, generating a high-level of support; ensuring agency priority and ownership, and being able to address the issue of displaced fishers.

(2) Importance and value of incorporating stakeholders in design and management

The majority of the analyzed case studies involved MPAs that were co-managed. Support from government, community and stakeholders are desired for the successful protection of the marine resources. The Flamborough Head Marine Reserve located in the United Kingdom, 80% of which is designated as a no-take zone, was developed through a collaborative process involving

key stakeholders such as fishers, scientists, and policy makers to determine the appropriate size and location of the no-take zone. The no-take zone was designed by balancing the conservation needs with those of the reserve's users in order to benefit the stakeholders involved, provide ecological benefits, as well as commercial and recreational activities. With help from the local fishing industry, scientific research monitoring activities are now underway to assess the effects of protection on the diverse species and habitats at Flamborough Head. Increases in lobster numbers and sizes occurred at a rapid rate. The success of a reserve is closely linked to the level of stakeholder involvement and the level of support from the local community. A well designed protected area will include zones that can sustain a variety of uses appropriate for each group of stakeholders involved.

The creation and implementation of St. Eustatius Marine Park (STENAPA), Lesser Antilles, on the other hand, occurred without input from the local dive shops, fishers, and other stakeholders. Thus, community awareness and education are now a primary focus of the marine park in order to generate local support for the park. The participatory process is a long and work-intensive process. Compromises need to be made and all stakeholder concerns should be shared, which helps to gain the confidence of the stakeholders.

(3) Economic value of marine protected areas

There are a variety of habitats in the ocean that are critical in maintaining biodiversity and productivity, such as coral reefs, as they may harbor rare or endemic species, as well as provide critical life habitat for commercial marine species. The value of coral reefs to the global community is estimated to be in the billions and is derived through the provision of goods and services such as food (including fish), coastal protection, recreation, tourism, and wider ecosystem maintenance. Marine reserves can offer both socio-economic impacts and opportunities. In the majority of the case studies evaluated, tourism developed after the successful establishment of the MPA resulted in increased economic returns to local communities. For example, St. Eustatius Marine Park (STENAPA), established in the Lesser Antilles in 1998, contributes income for 70% of the islands population employed in restaurants, hotels and other services. The aggregated value of the fishery sector is also an important factor to the island economy. The total lobster catch for 2003 was estimated to be approximately 4 tons, which represents a gross value of approximately US$56,000.

Tourism is the primary source of income in the area of the Abrolhos Marine National Park, Brazil, and the regulations for the area are crucial to avoid any negative impacts. To improve income from local fisheries, Conservation International (CI) Brazil is working to strengthen local fishing associations, engage the market, and establish incentives for local businesses to buy directly from associated fisherman who can provide higher quality product. CI Brazil is also working to increase fishers' income by sustainably improving commercialization of local fish products from Corumbau and Canavieiras Extractive Reserves. To secure funding to cover management costs, CI-Brazil is working with partners to establish the Abrolhos Trust Fund. This fund would be endowed and then used for complementary management costs such as monitoring, awareness building and patrolling, when government funds are scarce. The economic evaluations and cultural roles studies demonstrated that even remote marine managed areas like Abrolhos National Park can generate substantial economic value, with annual net revenues from fishing estimated at $1.65 million and annual visitation fees totaling $50,000. After the implementation

of the reserve, ecotourism, fishing, and local business have increased and become successful, providing tangible benefits to the community.

(4) The importance of enforcement

The main purposes of protecting marine areas are to protect biodiversity and sustainable socio-economic benefits for local communities near the reserve. Another important purpose is to avoid the overfishing of local fish stocks. However, an MPA will not be successful without effective enforcement. There are different laws in different countries that are used and implemented in the protection of these resources. One example relative to this case is Cabo Pulmo National Park (CPNP) in Mexico, which uses a community approach to enforcement in which boat captains, dive masters, and local people in general participate in various activities to enforce the regulations of the park, including surveillance, fauna protection (e.g. sea turtle nesting sites), and beach and ocean cleaning programs. Capo Rizzuto Marine Reserve in Italy implemented a remote camera system that allows them to monitor human uses in the restricted zones on a continuous yearlong basis. Total fish density was on average 1.15 times greater in the reserve than in fished areas. Higher levels of enforcement are correlated with an increase in diversity and density of species. Well enforced reserves have on average 2.65 times greater fish biomass than reserves with poor enforcement.

The Apo and Sumilon Island Marine Reserves in the Philippines provide strong evidence for the importance of enforcement in successful biodiversity conservation. Sumilon Island Marine Reserve has a complex history of management due to changes in local governance. First established and protected under local government, confusion over which organization had legal authority to manage the reserve resulted in the temporary suspension of the reserve's fully protected status twice since it was established in 1974 and fish abundance decreased sharply when the area was opened to fishing. After full protection was reinstated, the number of fish gradually increased again, confirming that enforcement of the fishing ban has a clear effect on fish stocks and marine biodiversity. Apo Island Marine Reserve, on the other hand, has experienced continuous protection since its establishment in 1982, but lacked community support because a significant portion of the reserve is closed to fishing. However, noticed increases in fish catch near the reserve won the support of local fishers resulting in the formalization of the sanctuary. The nearly 800 people from the local community benefit from the reserve through increased catch per effort and tourism revenues of approximately US$110,000 in 2008. The community now plays an active role in reserve enforcement. Regular enforcement of the restrictions and laws that govern the reserve prevents or reduces illegal activities carried out inside the reserve, an important concern considering the fact that the fishers in this area participated in illegal and destructive fishing practices including dynamite fishing. Government support in the maintenance and management of these areas is required to reach the established goals.

(5) Community outreach and education

Community involvement in the creation and success of a protected area is indispensable. Community support benefits the area by reducing illegal activities and promoting conservation goals. Cabo Pulmo National Park (CPNP) consists of 7,111 ha, 35% of which is officially a no-take zone, and, unofficially, the local fisherman banned fishing activities from the entire park

area. Community members were determined to protect and restore the overfished areas; they hold an empowered role, are initiating change and enforcing it. This is a great example of a bottom up approach for the protection of a marine habitat. The local community wanted to protect what they understood to be their future. Research carried out by the Universidad Autónoma de Baja California Sur (UABCS) under the direction of the lead biologist Dr. Oscar Arizpe provided strong evidence supporting the biological relevance of Cabo Pulmo and the Sea of Cortez. The success of CPNP is largely due to local leadership, effective self-enforcement by local stakeholders, and the general support of the broader community. The community is organized and dedicated to the protection of the marine reserve carrying out enforcement activities including surveillance, fauna protection (e.g. sea turtle nesting sites), and beach and ocean cleaning programs. Today this area is considered a biodiversity hotspot. A recent study found that the locally owned, small-scale tourism operators in Cabo Pulmo generated US$538,800 in 2006. The MPA provides livelihood options for the local community; for example, a recently developed ecotourism industry reduced local poverty and re-invigorated the local economy. The community has learned that they play an important role in the protection and conservation of this area. Environmental awareness pervades the community. Children make signs showing park rules, help with clean-ups, and release turtle hatchings, taking their role very seriously. Locals have also resisted large-scale tourism endeavors because they know such programs are not sustainable for the reserve.

The Florida Keys National Marine Sanctuary (FKNMS), United States receive more than 3 million visitors each year and make about US$1.2 billion annually. Direct impacts from resource users include overfishing, fishing practices that damage habitats directly, damage to coral reefs from tourism (e.g. boaters dragging anchors and divers touching corals), and occasional large ship groundings. Indirect effects from increasing populations result in additional impacts to coral reef ecosystems including reduced freshwater input to Florida Bay, inadequate storm water and wastewater management and resultant coral disease, shifts in coral cover, and increased algal domination. Despite active management, the sanctuary continues to face declines of healthy corals. Education and outreach efforts are aimed primarily at tourists, recreational users, residents and students. One of FKNMS' achievements has been the creation of successful education programs. These education campaigns focus primarily on managing boating, fishing, SCUBA diving and snorkeling because these activities have the potential to seriously damage coral reefs and seagrasses if they are conducted carelessly.

(6) Research and monitoring

Research and monitoring are needed to evaluate the effectiveness of an MPA before and after its implementation, and also to select the appropriate areas that need protection and represent all habitat and ecosystem types. For example, research conducted prior to the establishment of the Las Cruces Marine Reserve (LCMR), Chile, provided important information regarding key species, predation, and trophic interactions. Monitoring is very important and constantly conducted at this reserve. Long-term monitoring studies (>5 years) provided information on fisheries resources, rates of recovery, and multi-scale ecosystem dynamics. This reserve helped to increase the biomass and production of a popular snail, called *locos*, within only 10 years. There was also an increased abundance of several other species of shellfish, macroalgae, and kelp after only 2 to 4 years of banning extractive activities. LCMR provides some valuable lessons. After the implementation of the marine reserve there was a reform of Chile's national

fisheries laws, some of which granted rights to local organizations to fish and manage their own sections of the coastline. The presence of valuable benthic resources for small-scale fisheries helped convince the Fisheries Administration to incorporate the management and exploitation areas in the Fishery and Agricultural laws. Fishers show an understanding of their role in and the consequences of marine conservation, which has been generated through co-management experiences. Change in the attitudes of fishers was not only with respect to fishing, but more importantly with regard to the conservation and future sustainability of resources.

In the Kisite Marine National Park of Kenya, it was observed that there was more biodiversity in the marine reserve and it provided more protection to branching corals than fished areas. Scientific research can be used to identify and monitor valuable areas that are threatened by natural and human factors. Research indicates that these marine habitats are connected and that various species of fish may use these multiple habitats throughout their life cycles. A series of studies provide strong evidence supporting the biological relevance of Cabo Pulmo, now considered a biodiversity hotspot. The total number of fish in the reserve has increased by over 460% including large fish such as sharks that take longer to mature, the number of predator species has increased 30% per year, and there is five times more biomass in the MPA than in non-protected areas. Spawning aggregations in the protected area have increased in biomass after 10 years of study. It is important to protect areas that provide habitat for different species at different life stages for their development and reproduction. If the appropriate areas are being protected, an increase in biodiversity, biomass, species diversity and weight among other factors are noticeable.

Summary of lessons learned:

- Increased trust and collaboration between scientists and fishers is essential to designing MPAs that can benefit both conservation and fisheries.
- Incorporating fishers' input is especially critical as it reduces skepticism toward scientists, and increases the likelihood that fishers will support MPA regulations.
- Fishers often improve their attitudes and support for MPAs, after they see the success that they bring.
- Population growth and urban development are some of the greatest indirect threats to coral reefs.
- It is important to have baseline data of the area's biophysical and ecological characteristics in order to monitor the effectiveness of a reserve.
- Well-enforced reserves have on average 2.65 times greater fish biomass than fished areas.
- Stakeholder and community involvement in decision-making and management is crucial for the success of a marine reserve.
- Tourism is an important source of income when a MPA is established, but can also create negative impacts to coral reef ecosystems.

- Education is necessary for the ongoing and future protection of MPAs. Local communities, not just scientists, need to understand the ecological and economic benefits and functions of a successful MPA.

6. CONSIDERATIONS

6.1. Ecological Considerations

Refúgios should be established based on currently available scientific *and* local knowledge of species populations and ecological processes. Spawning and nursery habitat should be a focus when designing *refúgios* because these areas represent critical habitat necessary for the survival of the species, especially areas in which multiple species share common critical habitats (i.e. overlap of key spawning and breeding grounds). Areas identified as critical habitat by multiple fishers should be primary focus areas.

6.2. Governance Considerations

Community-based conservation, co-management, and participatory resource management are increasingly common practices in marine and coastal resource management. These approaches often arise when the creation of a MPA is community driven, as is the case with the *corredor*. These "bottom-up" approaches are considered a more appropriate and ethical choice because they provide local stakeholders, who are the most directly impacted by management decisions, a significant role in the decision-making process. Participation in decision-making also allows for the consideration and use of local ecological knowledge (LEK), which can contribute to locally relevant management and conservation of marine resources. Finally, institution building for marine resource management should occur at all appropriate scales. Local management structures and goals should work to develop adaptive management strategies. Institutions for zoning, no-take zones, and other mechanisms that impact small-scale SES should be locally-borne and rely on place-based policies.

6.3. Case Study Lessons & Considerations

The successful development of marine reserves requires local and national government agencies to work cooperatively and to focus on providing the necessary regulatory structures and avenues to develop stakeholder interest, participation, and ultimately support for decisions. Mutual respect and cooperation in the development and maintenance of fishery conservation strategies must also be fostered at the international level, as the life history of most fished stocks are often not restricted by one country's borders. While the Gulf of California is relatively unique in that it is totally surrounded by Mexican EEZ waters, a large international fishing fleet works to both the south and west, while fishing fleets from the eastern coast actively fish throughout the Gulf.

Informed decision-making at all regulatory levels is best achieved by maintaining an active research and monitoring program that follows biophysical, ecological, and socioeconomic indicators for system health. Fishers can and should participate in the design, data collection and analysis of these monitoring programs. Designating appropriate areas for protection as *refúgios* that will contribute effectively to the maintenance of fisheries stocks requires a deep understanding of system functions. Where traditional scientific programs cannot, or have not yet been established, the local knowledge of fishers and other stakeholders is an extremely valuable

resource for identifying essential habitats, trends, and seasonality in productivity. Examining how these resources are exploited provides a lens for tying the ecology of the *corredor* to its socioeconomic contributions to local communities including La Paz and Loreto. Additionally, encouraging alternative, non-extractive industries (including ecosystem monitoring, dive tourism, sport-fishing, and value-added fishery products) can lead to an increase in local revenues and a diminishing reliance on fishing as a livelihood. Programs designed to educate and inform community members about the ecology of the system, as well as economic alternatives training can build understanding and support for conservation and management measures. A broader understanding, increased economic base, and support and coordination by communities within the *corredor* should increase support for large and effective *refúgios*, and decrease tolerance for illegal or destructive practices that threaten this fragile but growing economy.

A diminished tolerance for illegal practices will lead to increased demand for a suitable enforcement presence. Within the *corredor* communities, self-enforcement through agreements, mutual respect, and a shared sense of responsibility in the long-term viability of the *corredor* is likely to provide an effective social pressure. Yet outside threats remain, most visibly in the continued presence of large fishing vessels from the Sinaloa coast to the east. To reduce or prevent the continued harvesting inside the *corredor* and bolster respect for the local *refúgios*, federal and state government agencies should likely be called upon to codify access rights and then provide the necessary facilities, vessels, and equipment to provide a level of surveillance, enforcement, and financial resources that local communities could not otherwise provide.

The case studies examined encourage the development of zoning and multiple-use areas within the overall marine reserve design. Zoning is a valuable tool, particularly in areas like the *corredor*, where community identity and welfare is inextricably linked to the marine system. Properly designed multiple-use areas provide a mechanism that works to ensure the sustainability of both the natural resources and the communities themselves. A strong understanding of how to place and link these zones for both ecological and socioeconomic benefits can help achieve overall conservation goals without disenfranchising the *corredor* communities.

Successfully implemented marine reserves have the capacity to increase the biomass, abundance, and density of both targeted and untargeted stocks at relatively short time scales (three to five years), depending on stock life histories, current level of exploitation and stock composition, and habitat health. Other anticipated benefits include improving system biodiversity and total spawning effort, which positively affects stock structure. With time, a working *refúgio* may improve catch rates and improve fishing efficiency through the 'spillover effect,' where a healthy stock population protected within the *refúgio* borders exports biomass through migration, and larval export into fishable waters.

7. MANAGEMENT IMPLICATIONS

7.1. Ecological Tools to Enhance Conservation

In developing a network of multiple-use MPAs, as the *corredor* seeks, decision-makers must remain acutely aware of habitat connectivity, seeking to identify and protect a portion of each

stock through each of its life stages. Given that instantaneous mortality rates for marine species are greatest at its earliest hours and days, priority areas should focus on reproduction and juvenile settlement sites, because any incremental improvement in survivability will have tremendous benefits to subsequent adult recruitment classes. In the case of snappers and groupers, which aggregate to spawn over only a few days or weeks during the year, it is critical to protect these spawning aggregation sites, as concentrated fishing effort at those locations and times can quickly decimate the adult stock and future cohort classes.

When attempting to identify a target goal of protected areas for a network of MPAs, a commonly quoted value of at least 20% of all essential habitats is given, although there remains tremendous debate about what this benchmark represents or should define. Unilaterally closing 20% of the *corredor* to fishing without the full support of all affected communities is unlikely and may quite possibly stir resentment and retaliation. Instead, as has been seen in the network of MPAs along Belize's Meso-American Barrier Reef system, it is wiser for decision-makers to work with stakeholders to identify the essential areas that all parties recognize are valuable for the continued health and productivity of the *corredor* fishery, regardless of the total size. Recognizing that management initiatives will not disappear once established, gaining community support and participation will garner their support for the managed marine system to strengthen, and, in an adaptive management program, allow participants to regroup and discuss the status of the protected area during the regular review period. In this manner, while conservation goals may not be reached immediately, they are more likely to be achieved and maintained in the long term than they might be without the support, participation, and guidance of stakeholders.

7.2. Governance Tools to Enhance Conservation

As is the case for many data-poor fisheries, a complete understanding, replete with forecasting or predicative capabilities, is not currently possible for the *corredor*. Accepting the limitations that arise from system uncertainty is important for both decision-makers and stakeholders if they are to move productively toward sustainable management goals. Where quantitative data may not exist, or may be impractical to collect, experienced, senior fishers can help describe the system. This same uncertainty should not be used as an excuse to delay or slow management plans; if decision-makers adopt adaptive management strategies, they will be able to move forward and later adjust plans as understanding and data collection improve.

A participatory, inclusive approach to managing the *corredor* and its fishing communities is preferred over other methods for several reasons. First, this approach engages key stakeholders, increases public participation and helps generate social capital. This level of engagement further clarifies the roles that stakeholders can play throughout the decision-making process, and potentially minimizes the risk of social conflict by addressing gaps between local stakeholders and government agencies. Second, a decentralized decision-making process maintains equity, fulfills ethical obligations held by people in positions of power, and provides a means and forum for the public's voice to be heard against traditionally dominant political voices like state and federal agencies. Third, a participatory, locally-focused approach encourages the development of instruments for improving transparency and accountability in the decision-making process, which ultimately can lead to legitimate policy outcomes.

In participatory marine resource governance, councils or committees can assume an important role as the governance structure and decision-making body for the reserves, protected areas or community-managed areas. The marine extractive reserve (MER) in Brazil may be used as a model for creating a local governance structure. MERs require the creation of a deliberative council, which is the local decision-making body for co-management of a particular MER. They are comprised of 50% + one community/resource user members and the remaining members represent various levels of government, NGOs, private actors, etc. Council meetings are open to the public and decisions regarding resource use are made within this forum. In the case of the *corredor*, if the fishing communities are going to be key actors in marine resource management of the *refúgio*, it is highly recommended that the communities and local government form a council for public deliberation and decision-making. This council might cut across all scales of management and stakeholders, facilitating dialogue and meetings with the regional fisheries council.

Locally sanctioned programs stand a greater chance to succeed than programs enforced by 'outsiders' because of community norms present in places, which hold people accountable to agreed-upon forms of behavior and practices. These norms extend upward to the level of regulatory compliance by creating an informal system of community policing via social pressure. Formal enforcement may also see greater success under a decentralized, locally supported management program because cooperation and participation in management provides opportunities for individuals to experience a sense of ownership rights. Finally, this approach is designed to improve the distribution of goods and services by enabling stakeholders to access resources and allocate power on their own accord.

7.3. Political, Legal and Economic Tools to Enhance Conservation

In addition to establishing *refúgios* through LGPAS and LGVS, communities and partnered decision-makers in the *corredor* may investigate the potential of utilizing legal tools that focus on economic incentives. The Marine Conservation Toolkit (MCAT) identifies instruments that support the delivery of conservation agreements or concessions to protect marine resources. These include Mexico's General Law of National Assets (LGBN), and Marine Conservation Agreements (MCAs), which are defined by The Nature Conservancy (TNC) as:

> any formal or informal understanding in which one or more parties commit to delivering explicit economic incentives in exchange for one or more other parties committing to take certain actions, refrain from certain actions, or transfer certain rights and responsibilities to achieve agreed-upon ocean or coastal conservation goals.

The MCA initiative is led by TNC and a partnership of other non-governmental organizations (NGOs). According to TNC, MCAs can be used to augment and act as catalysts for establishing marine reserves and enable collaborative management and partnerships for successful marine conservation. One example of a successful MCA is Chumbe Island Coral Park, an MPA established in the semi-autonomous Zanzibar Archipelago of Tanzania. It is privately managed by Chumbe Island Coral Park Ltd. through an agreement with the local Zanzibari government. The MPA has been credited with both improving the local economy while conserving the island's marine ecosystem for over 15 years.

The structure of the LGBN is more formal and government-centered than MCAs. LGBN, through Article 120, promotes sustainable use and exploitation of the federal maritime zone (ZOFEMAT) and recovered submerged lands. Additionally, LGBN states that maritime beaches and the defined ZOFEMAT are to be classified as common goods, which allows all Mexican nationals access and use without restriction beyond regulations already adopted. For other, special uses, which may potentially include the development of the *corredor*, special use concessions and permits may be created. This permitting and concession structure would create a defined agreement between participating communities and the Mexican government. Concessions are titles for the exclusive use or exploitation of the defined ZOFEMAT for a specific time period, which is generally renewable or extendable. Concessions are frequently granted for tourism developments, hotels and resorts, restaurants, marinas, aquaculture farms, fishing camps, and coastal mining. Meanwhile, permits allow for a specific activity to be pursued for one year and is not renewable or extendable. Permits are, however, able to be re-requested, as has been seen with beach vendors or for activities wishing to commence while a concession agreement is developed, reviewed, and granted. Both of these 'special use' agreements could compliment or strengthen the institutionalization of community-created *refúgios* in the *corredor* and in Mexico since granting of ZOFEMAT concessions give priority to *ejidos* (cooperative land tenure agreements) or *comunidades* (communities), among other constituents.

8. FUTURE NEEDS

- Allow fishers to respond to and react to this EBFM *refúgio* proposal and come up with a plan for implementation that meets their needs while still protecting important ecosystem functions
- Conduct further studies of the spatial biogeography of commercially exploited species to inform fisheries management decisions (including verifying critical habitat)
- Offer capacity building for local stakeholders in reserve monitoring and enforcement which will foster their participation in cooperative management of the EBFM *refúgios* network along with government and NGOs
- Develop and implement a biophysical and socioeconomic monitoring system for the reserve network, including baseline assessments, that includes fishers, scientists, NGOs and government
- Design and implement a transparent, enforceable, legally binding governance structure for the *corredor* that includes provisions for co-management, and limited entry for local communities

9. CONCLUSION

Community members living in the *corredor* have proposed a network of 11 *refúgios* designed to protect marine ecosystem function to sustain the commercial fisheries on which they depend. We provide a desktop analysis of their proposal based on principles of Ecosystem Based Fisheries Management and a meta-analysis of case studies of marine reserves from around the world. We

provide an alternate zoning proposal that includes six, expanded *refúgios*, that protect a total of 448 km^2 or 6% of the *corredor*, including a large extent of critical nursery and breeding habitat. Our proposal represents a thirty fold increase in the area protected compared to the initial community-proposed *refúgios* network. This proposal is considered as a scientifically-based contribution towards an iterative and adaptive process of reserve design based on collaboration between community fishers, NGOs, government, and scientists.

The fishing communities of the *corredor* have already displayed impressive leadership and high social capital in their ability to both work together with the conservation NGO, *Niparajá* (*Sociedad de Historia Natural Niparajá*) and other partners in promoting the establishment of EBFM *refúgios* to protect the resources they depend upon. In doing so, they have already overcome the most challenging aspect of marine reserve creation, sharing their LEK of fisheries resources, and energizing their own communities to support the creation of the *corredor*. We hope that the alternate zoning proposal for a network of *refúgios* within the *corredor* will be considered and evaluated by community members, other scientists, and Mexico's authorized agencies to institutionalize those efforts.

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APPENDIX I PROPOSED REFUGIOS

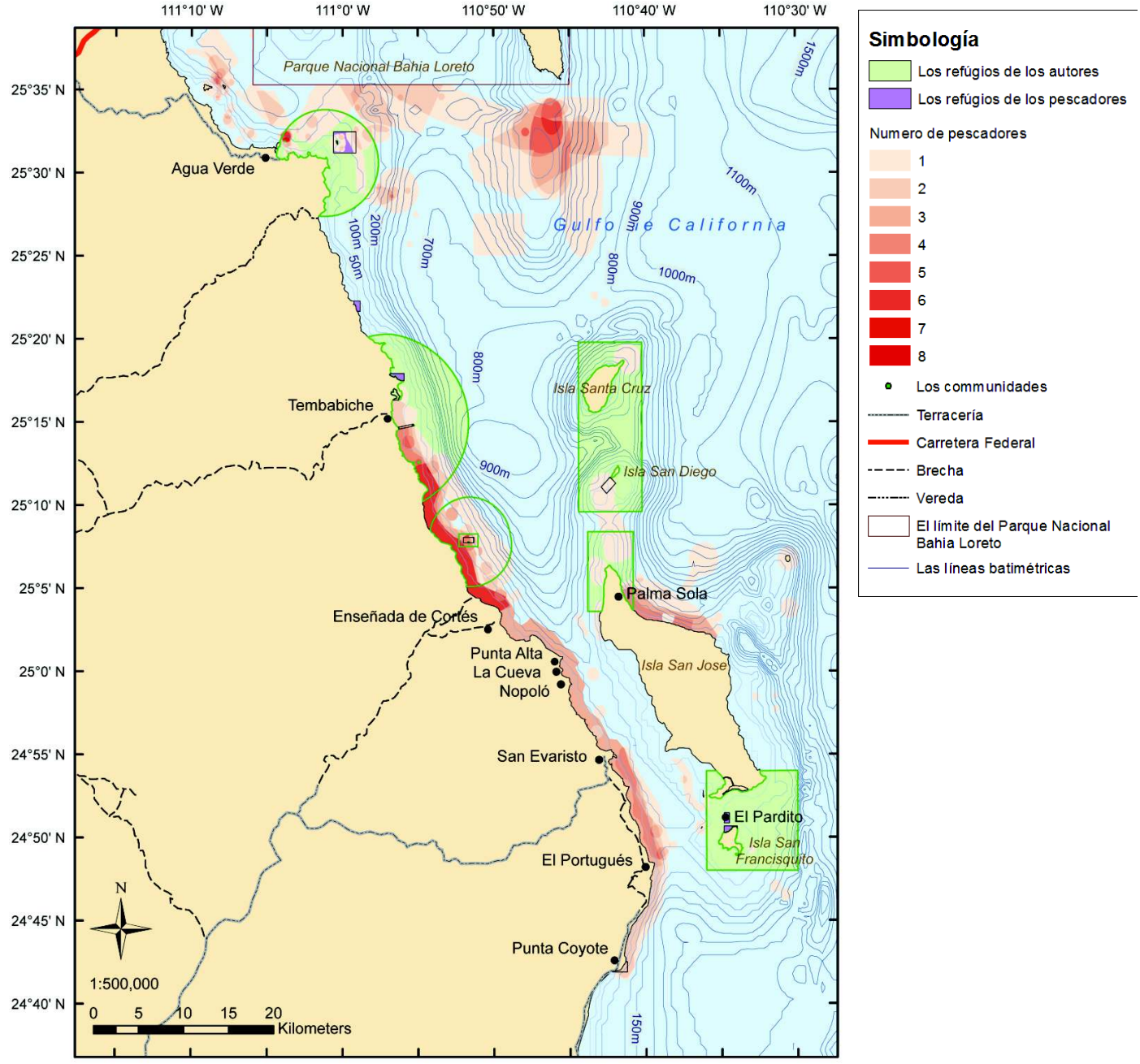


Figure 3a. All potential critical habitat for *huachinango* as indicated by 1 to 8 fishers.

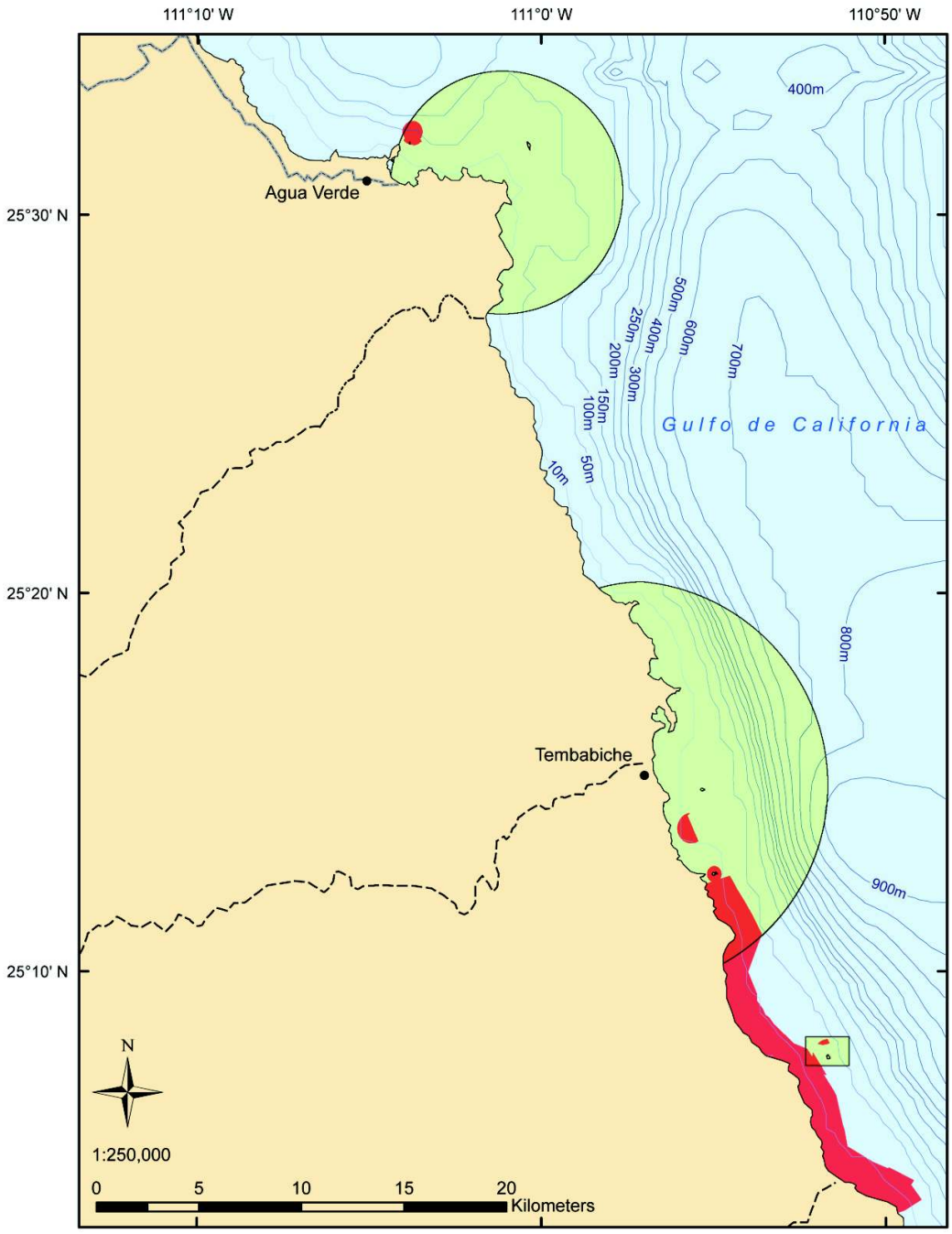


Figure 3b. Critical habitat for *huanchinango* (in red) and proposed ecosystem-based fisheries management *refúgios* in the Corredor San Cosme y Punta Coyote. Critical habitat was identified as any area indicated by 5 or more fishers as a *criadero* for this species because 8 was the maximum number in agreement for any area outside of Loreto National Park.

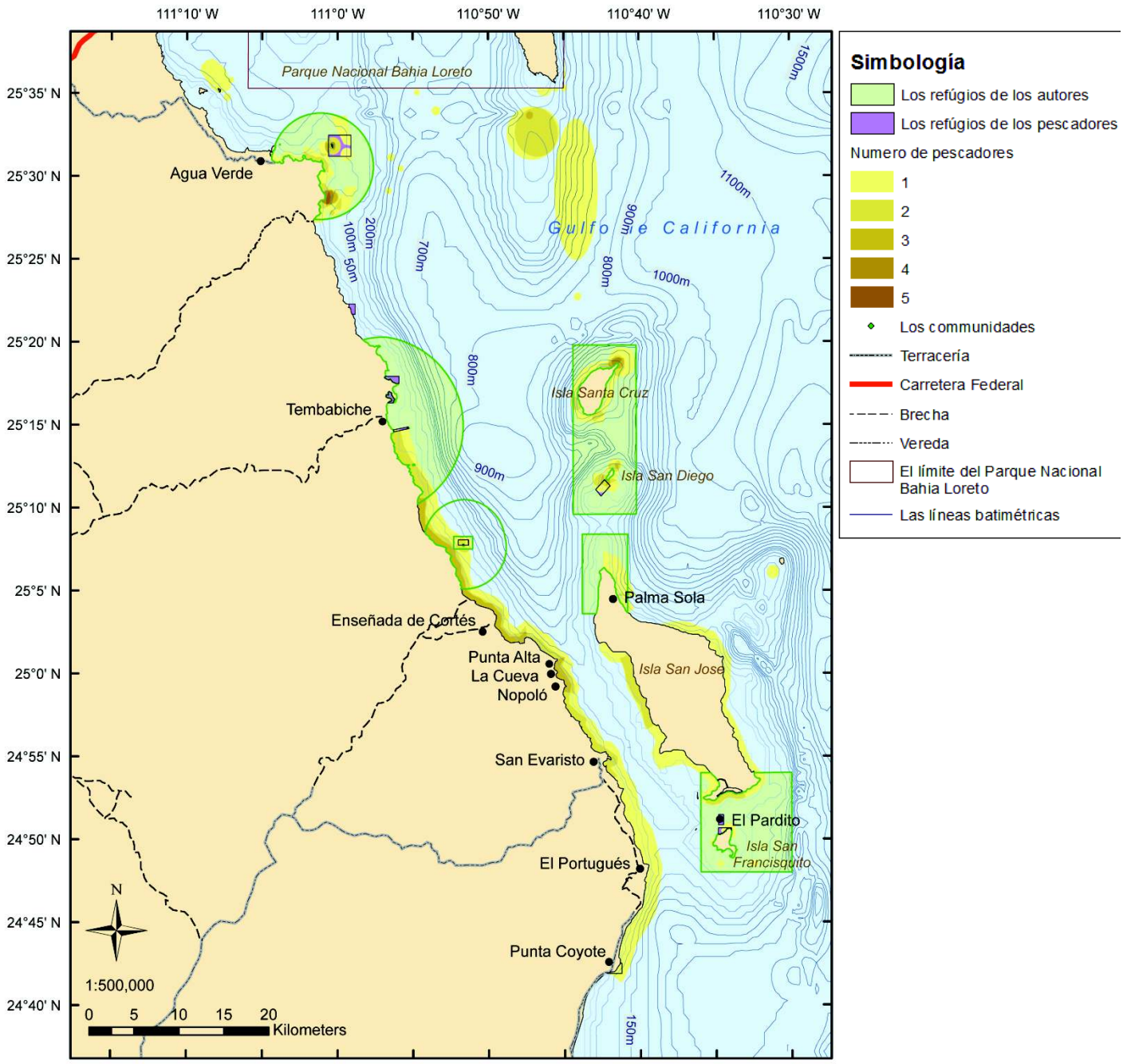


Figure 4a. All potential critical habitat for *cabrilla* as indicated by 1 to 5 fishers.

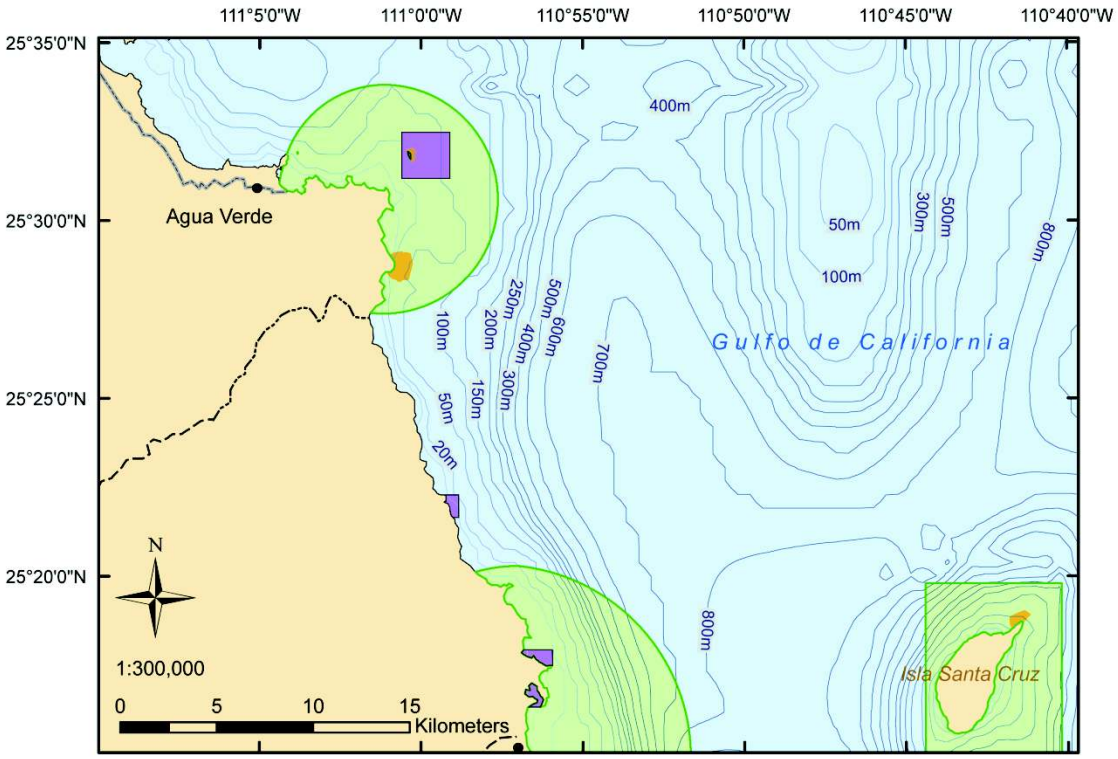


Figure 4b. Critical habitat for *cabrilla* (in golden brown) and ecosystem-based fisheries management *refúgios* proposed by the authors in the Corredor San Cosme y Punta Coyote. Critical habitat was identified as any area indicated by 4 or more fishers as a *criadero* for this species because 5 was the maximum number in agreement for any area outside of Loreto National Park.

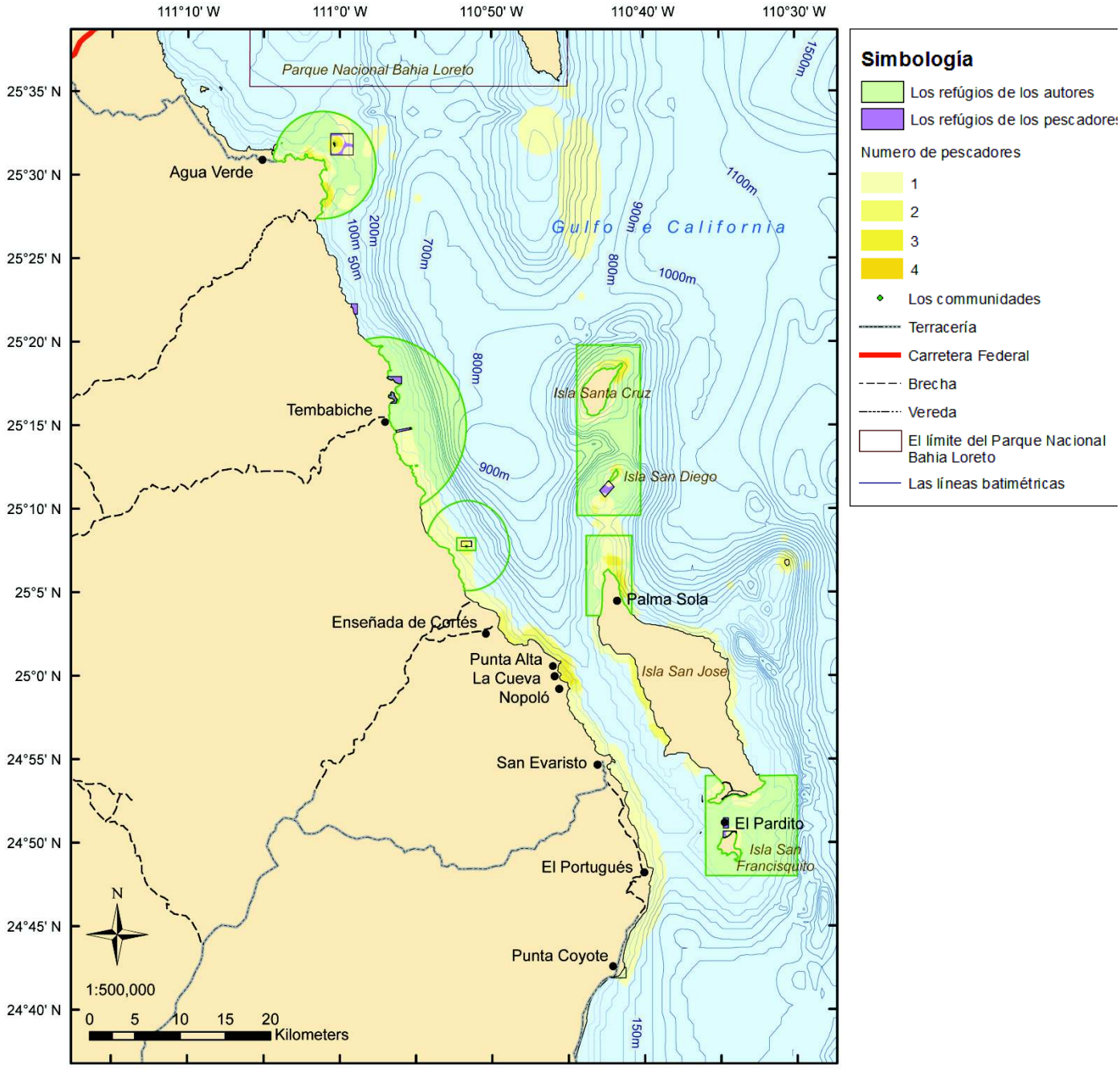


Figure 5a. All potential critical habitat for *pargo alazan* as indicated by 1 to 4 fishers.

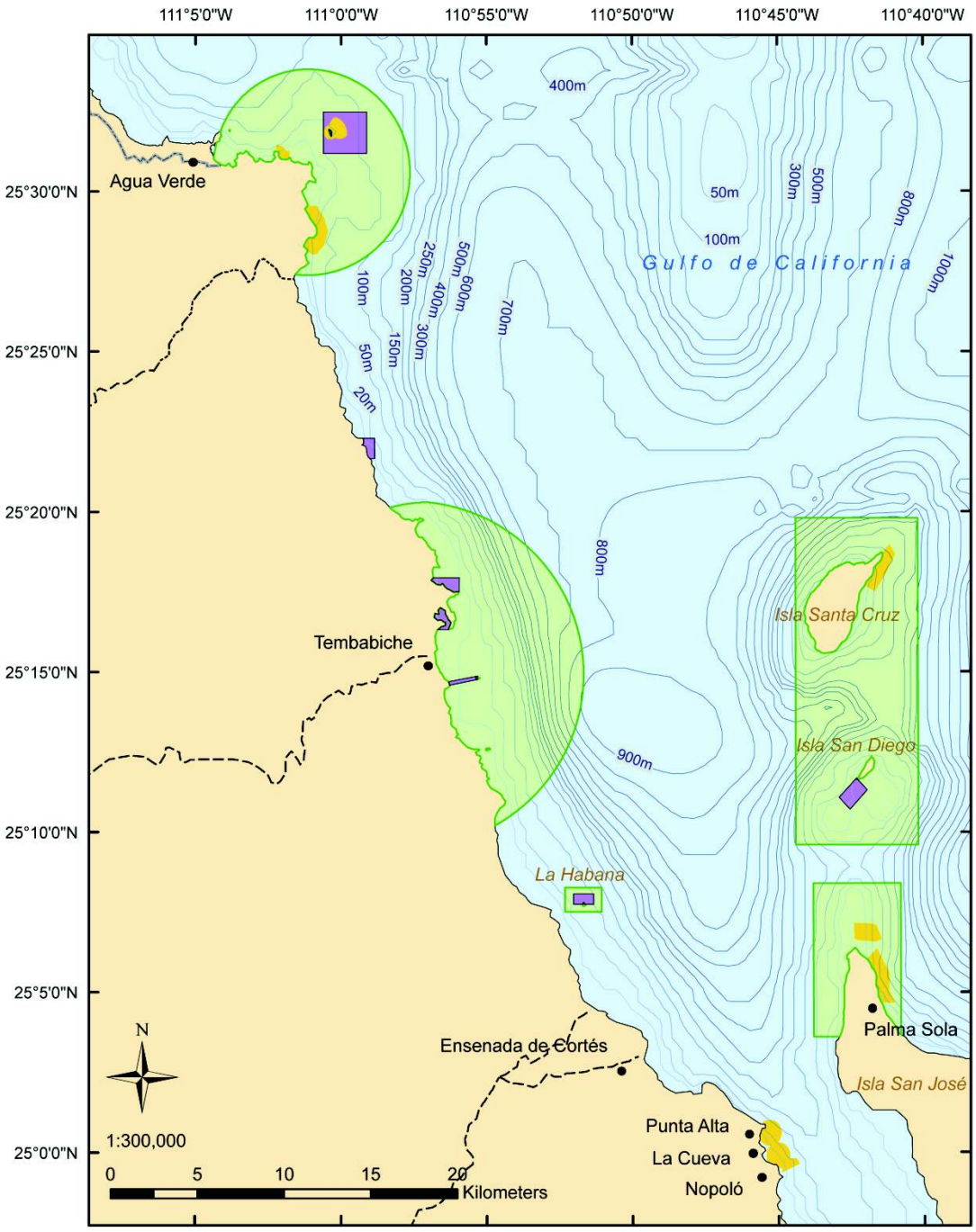


Figure 5b. Critical habitat for *pargo alazan* (in yellow) and ecosystem-based fisheries management *refúgios* (green) proposed by the authors in the Corredor San Cosme y Punta Coyote. Critical habitat was identified as any area indicated by 3 or more fishers as a *criadero* for this species because 4 was the maximum number in agreement for any area outside of Loreto National Park.

Figure 6. Map of fisher-proposed *refúgios* (purple) and ecosystem-based fisheries management *refúgios* (green) proposed by the authors in the Corredor San Cosme y Punta Coyote.

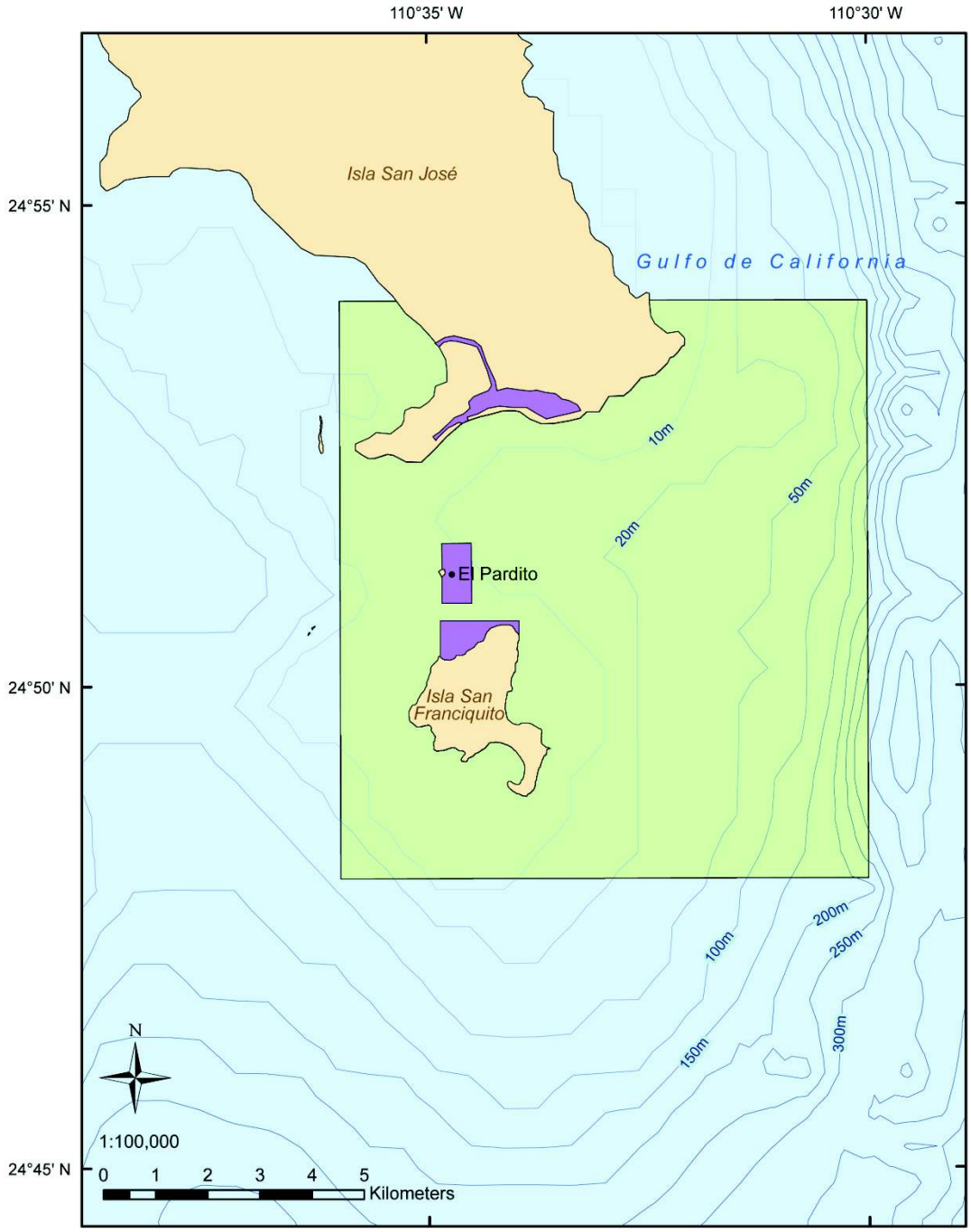


Figure 7. Comparison of fisher-proposed (purple) and ecosystem-based fisheries management *refúgios* (green) proposed by the authors for El Pardito, in relation to critical habitat. While some fishers did indicate *criaderos* in this location for both *cabrilla* and *pargo alazan*, fewer than 4 and 3 fishers indicated this (respectively), and so no "critical" habitat appears in this map, although it may exist and the agreement among fishers that *refugio* should be placed here (as indicated by the purple polygons) did encourage us to place a *refugio* here.

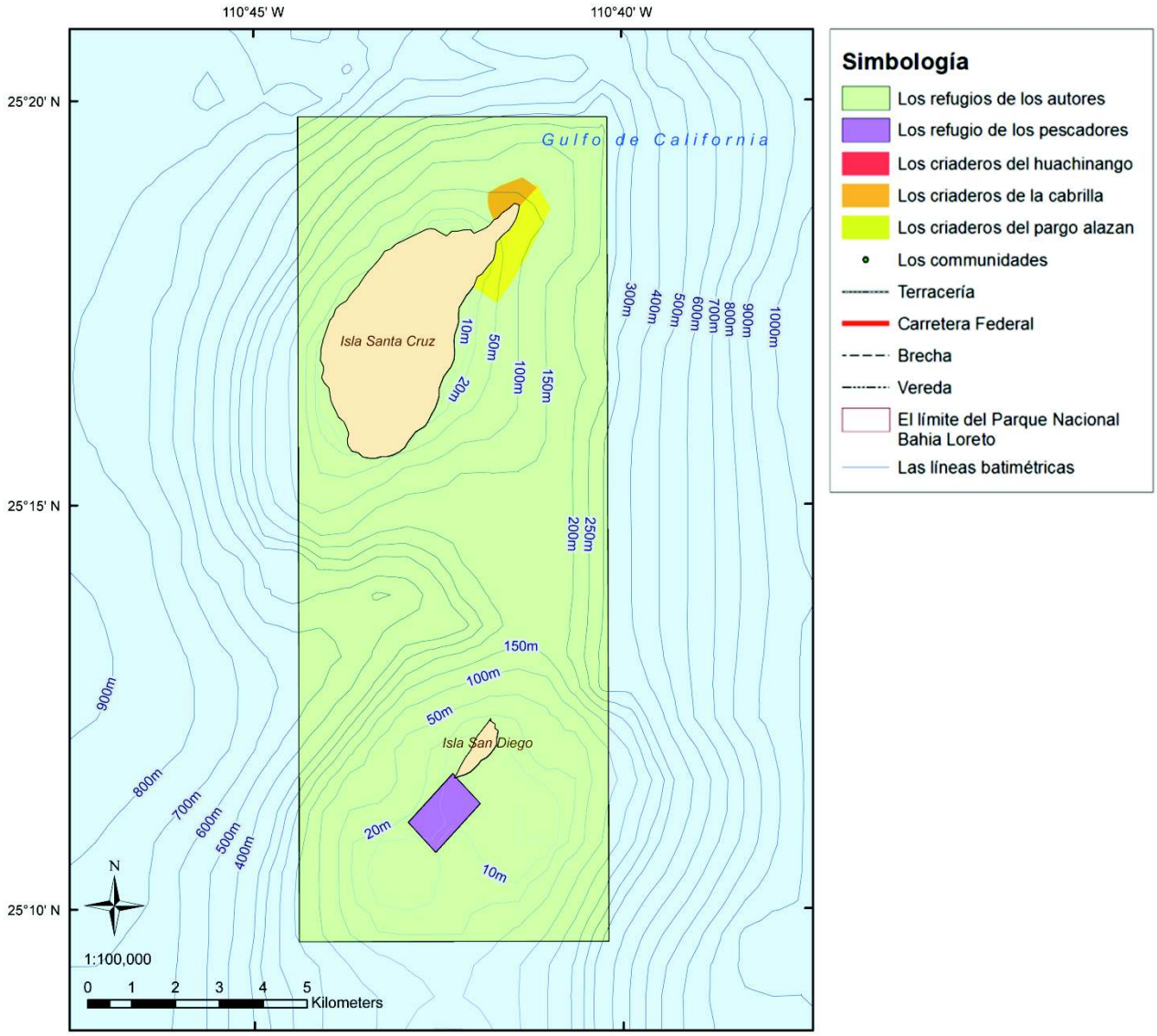


Figure 8. Comparison of fisher-proposed (purple) and ecosystem-based fisheries management *refúgios* (green) proposed by the authors for Islas Santa Cruz and San Diego, in relation to critical habitat.

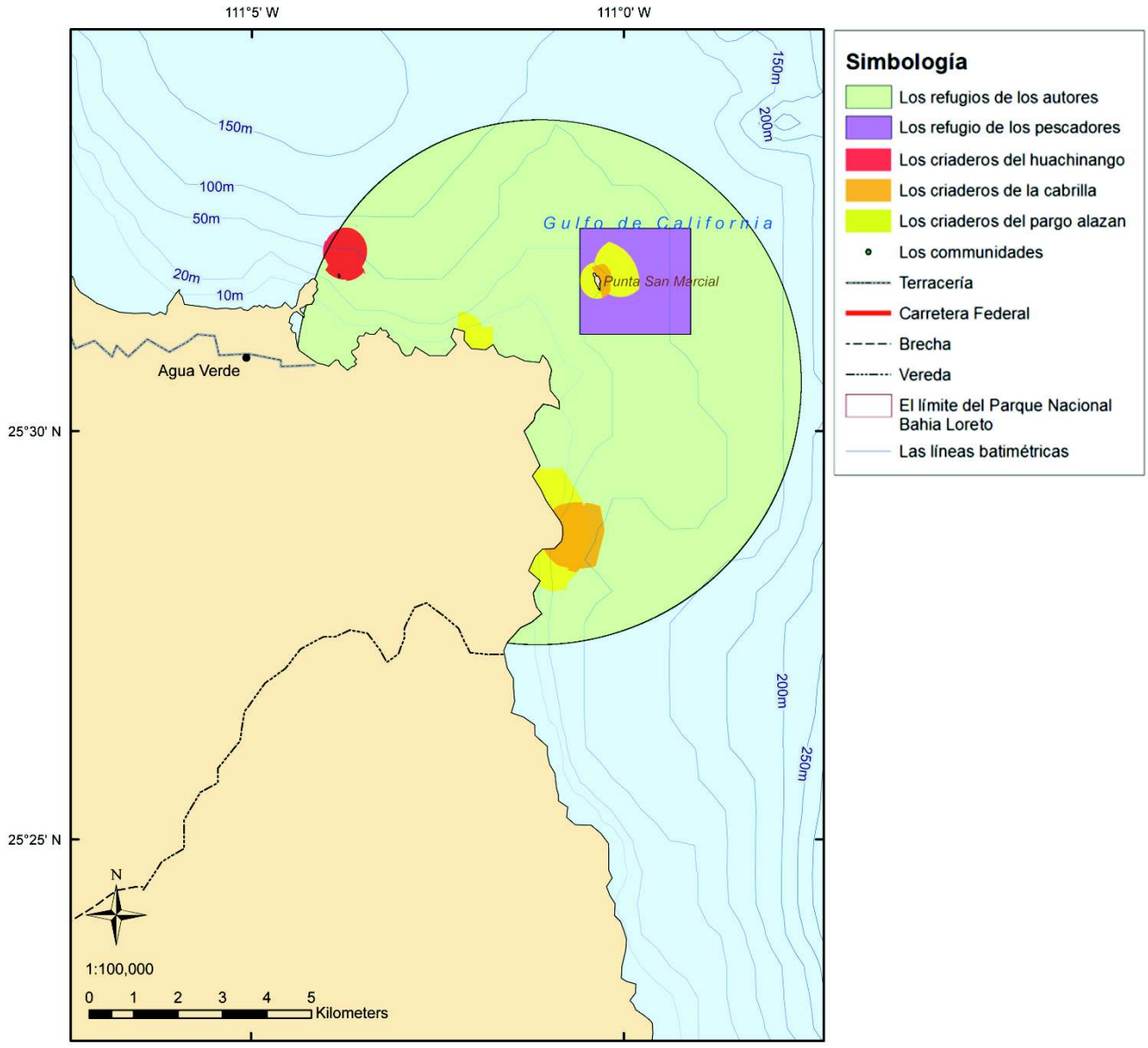


Figure 9. Comparison of fisher-proposed (purple) and ecosystem-based fisheries management *refúgios* (green) proposed by the authors for Agua Verde and Punta San Marcial, in relation to critical habitat.

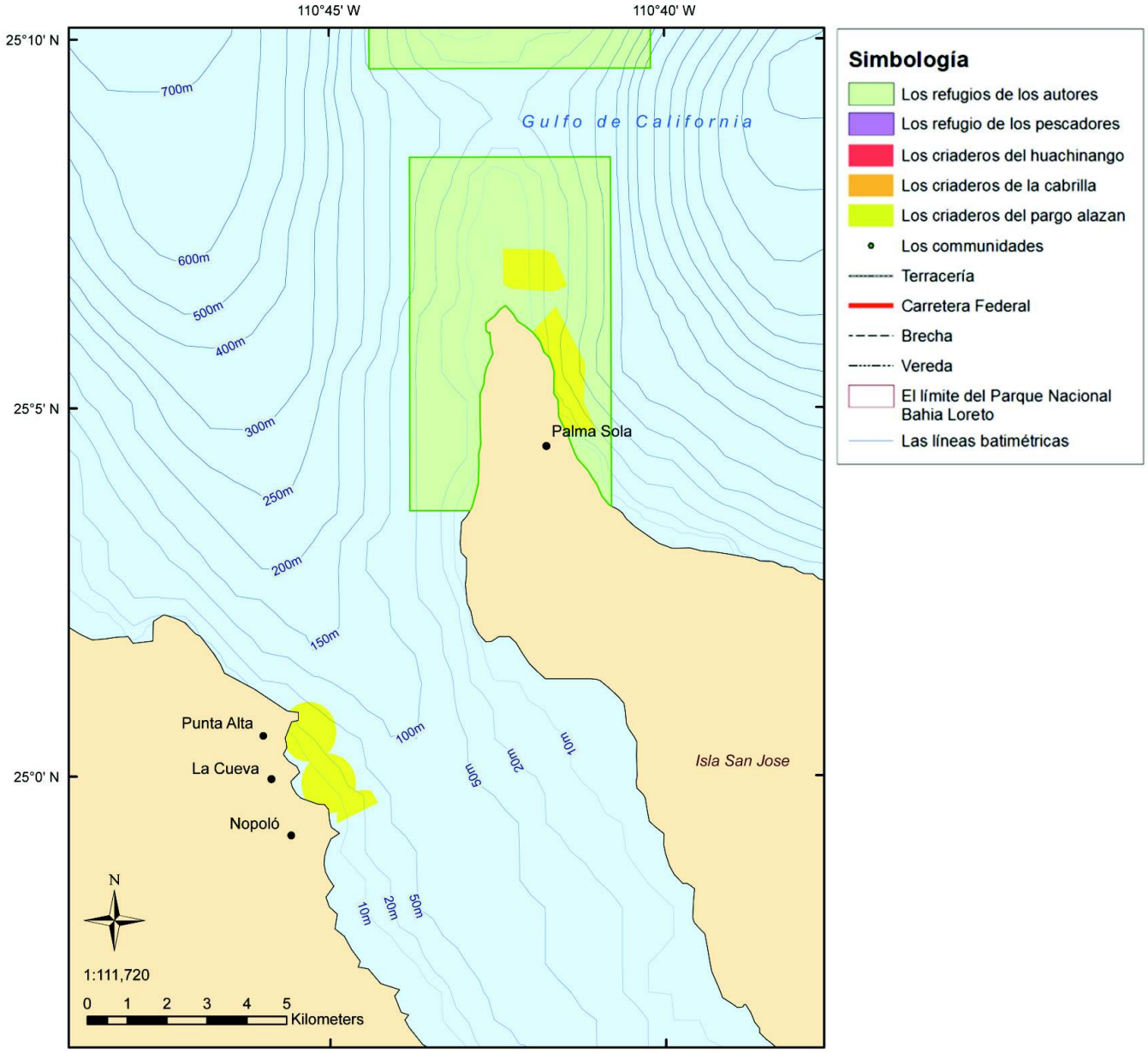


Figure 10. Comparison of fisher proposed (purple) and proposed ecosystem-based fisheries management *refúgios* (green) for Palma Sola, in relation to critical habitat.

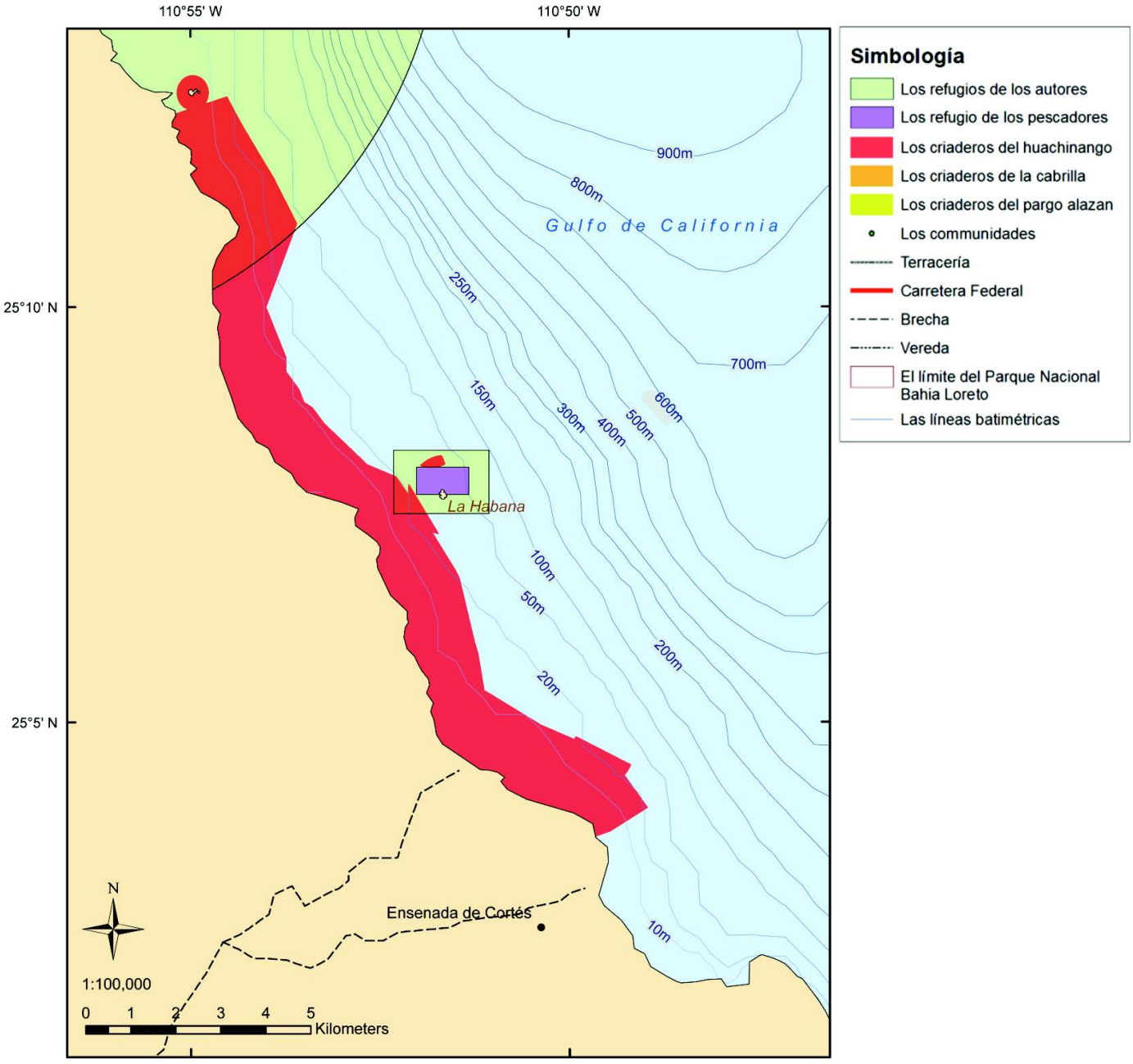


Figure 11. Comparison of fisher-proposed (purple) and ecosystem-based fisheries management *refúgios* (green) proposed by the authors for La Habana, in relation to critical habitat.

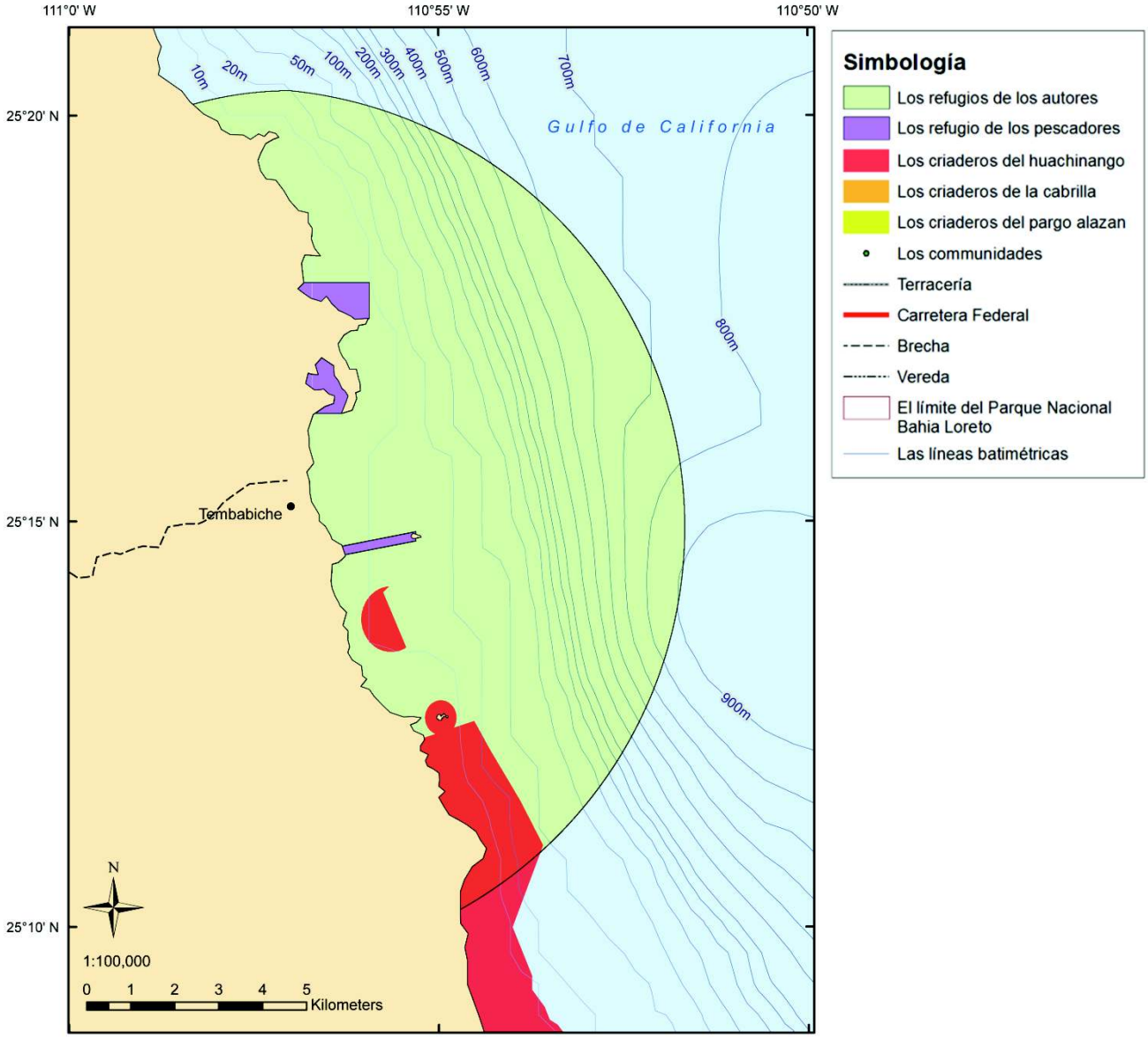


Figure 12. Comparison of fisher-proposed (purple) and ecosystem-based fisheries management *refúgios* (green) proposed by the authors for Tembabiche, in relation to critical habitat.

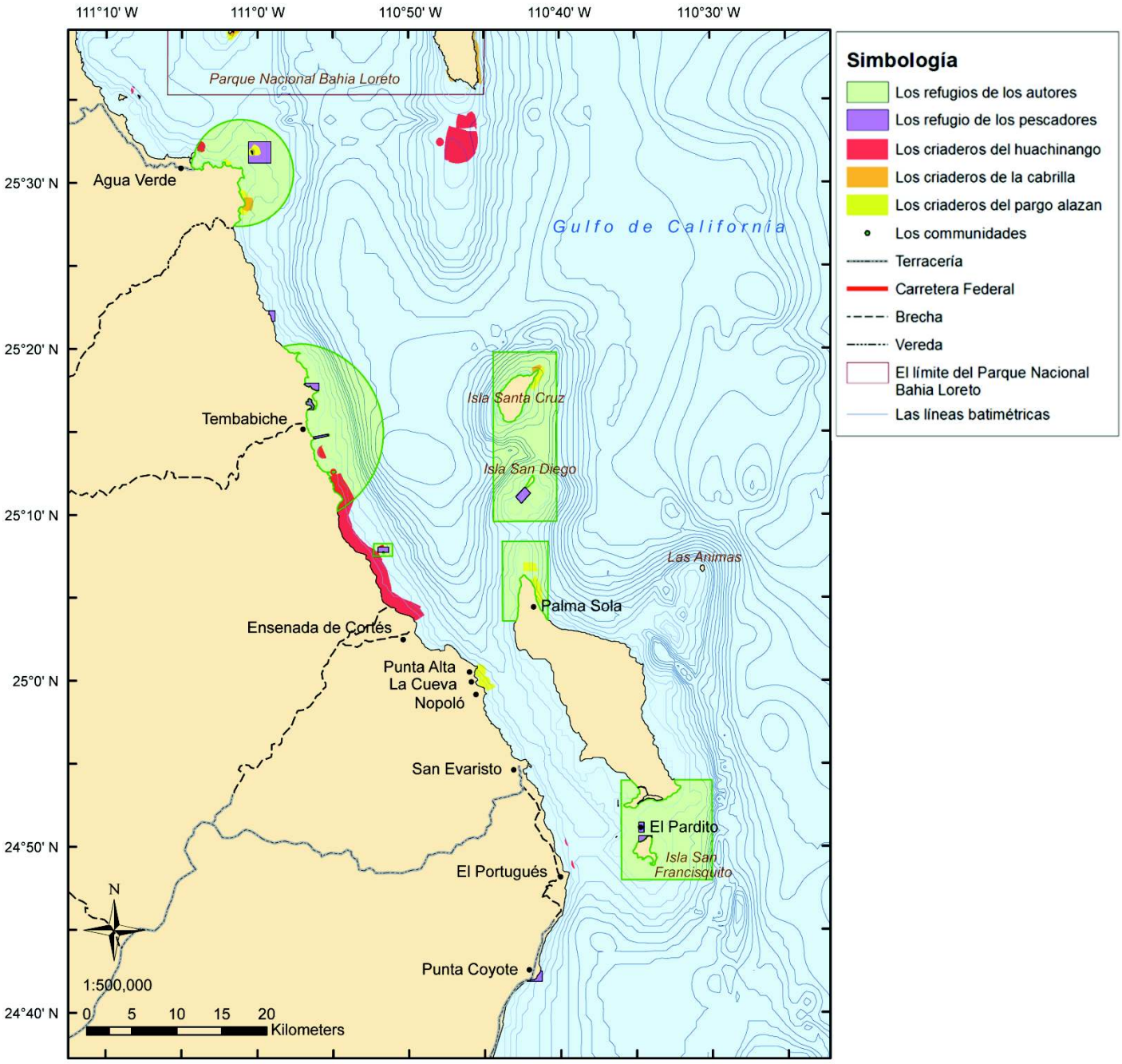


Figure 14. Comparison of fisher-proposed (purple) and ecosystem-based fisheries management *refúgios* (green) with respect to critical habitat (*criaderos*) for commercially important fish species (*cabrilla, huanchinango* and *pargo alazan*).

APPENDIX II SPECIES SUMMARIES

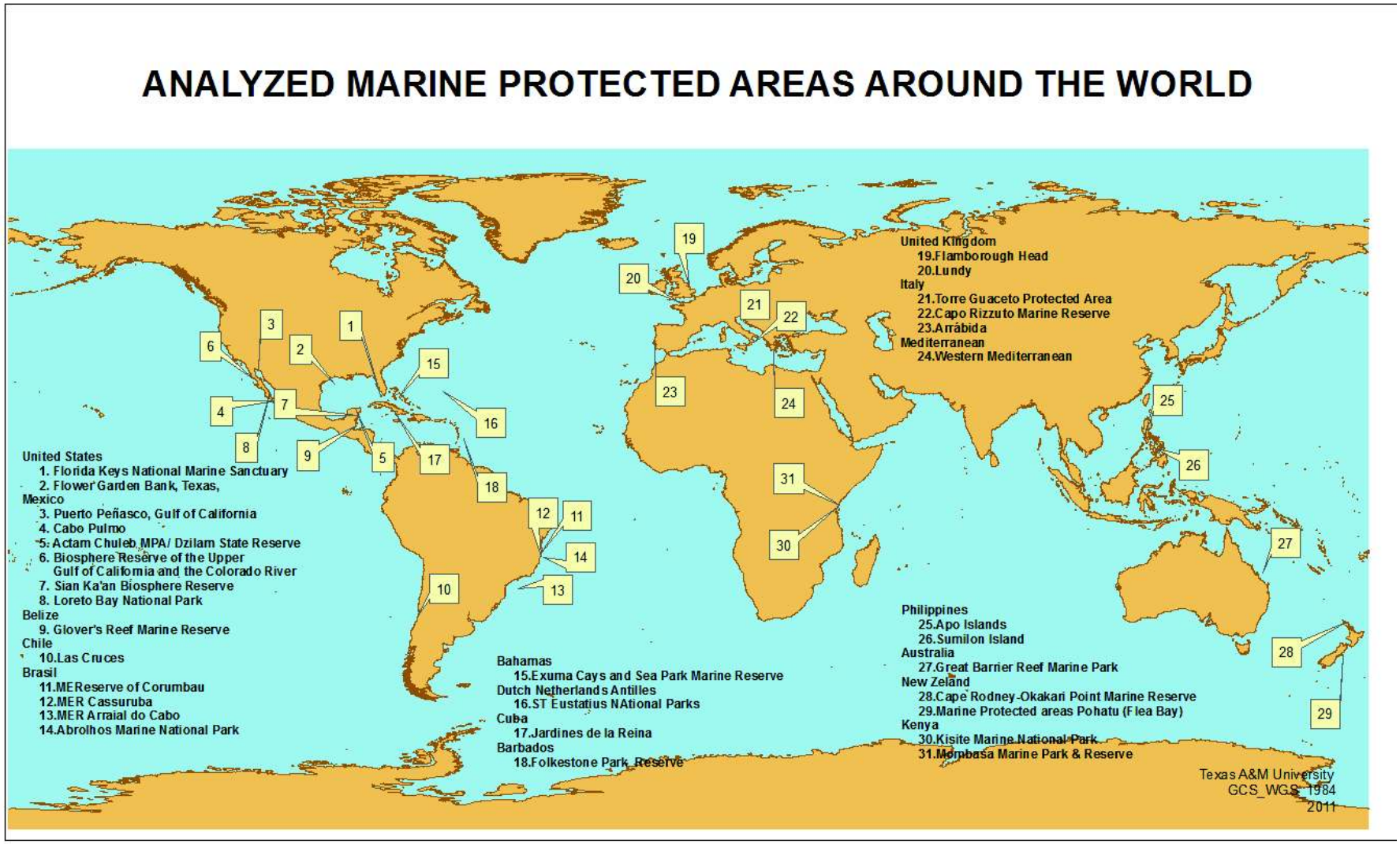
Table 1. Species summaries for the species listed as important in the fishery of the Corredor San Cosme to Punta Coyote.

Class	Family	Species	Common name	Local name	Fishing method	Habitat	Age at maturity	Size at reproduction	Fecundity	Depth
Cephalopoda	Ommastrephidae	*Dosidicus gigas*	jumbo squid, Humboldt squid	calamar		pelagic	unknown	530 to 750 mm	10 to 14 million eggs	200 to 700 m
Chondrichthyes	Myliobatidae	*Gymnura marmorata*	California butterfly ray	manta blanca	beach seines, bottom gill nets	nearshore intertidal areas, sandy/mud bottom	unknown	40 to 60 cm	4 to 16 pups	0 to 22 m
		Manta sp.	manta ray	mantarraya	gillnets, harpoons, baited hooks	shallow reefs, sandy bottoms, seagrass beds	8 to 10 years	400 cm	1 pup	up to 1000 m
		Mobula sp.	mobula ray	manta	gillnets, harpoons	pelagic, shallow waters	unknown	150 cm	1 pup	100 m
	Rhinobatidae	*Rhinobatos productus*	shovelnose guitarfish	guitarra	harpoons, gillnets, trawls	sandy / muddy bottoms of bays, sloughs, estuaries	7 years	70 to 100 cm	1 to 16 pups	typically < 12 m, but up to 100 m
	Sphyrnidae	*Sphyrna lewini*	scalloped hammerhead	cornuda	gillnets, longlines	coastal, semi-oceanic	M 10 years, F 15 years	M 140 – 198 cm; F 210-250 cm	12 to 38 pups	275 m
	Squatinidae	*Squatina californica*	Pacific angelshark	angelito	nets	mud, sandy bottoms	13 years	90 to 100 cm TL	up to 11 pups	3 to 205 m
Perciforms	Balistidae	*Balistes polylepis*	finescale triggerfish	cochito	nets and lines	reef-associated	4 years	31 cm	unknown	3 to 50 m
	Carangidae	*Seriola lalandi*	yellowtail amberjack	jurel (y jurel castilla)		pelagic/ demersal off kelp beds, rocky areas and reefs	unknown	about 51 cm	unknown	3 to 825 m
		Trachinotus rhodopus	gafftopsail pompano, pompanito, pompano	palometa		reef-associated, inshore sandy areas	unknown	unknown	unknown	up to 30 m
	Gerreidae	*Eucinostomus argenteus*	spotfin mojarra, silver mojarra	mojarra plateada		reef-associated; soft bottoms in bays and shallow inshore waters	unknown	unknown	unknown	up to 12 m
	Haemulidae	*Pomadasys macracanthus*	longspine grunt	bacoco		benthopelagic, mangroves	unknown	unknown	unknown	up to 20 m
	Kyphosidae	*Kyphosus elegans*	Cortez chub	chopa	gillnet	reef-associated, rocky and sandy bottoms	unknown	unknown	unknown	1 to 40 m
	Lutjanidae	*Lutjanus argentiventris*	yellow snapper	pargo alazan (amarillo,		reef-associated over hard	unknown	19 to 20 cm	unknown	3 to 60 m

				clavellino)		substrate				
		Lutjanus colorado	Colorado snapper	pargo colorado o liso		reef-associated, offshore rocky reefs	unknown	unknown	unknown	up to 70 m
		Lutjanus guttatus	rose snapper, spotted rose snapper	lunarejo, pargo lunarejo		reef-associated, inshore reefs, sandy bays, estuaries	unknown	17 to 18 cm	unknown	over 100 m
		Lutjanus novemfasciatus	dog snapper, Pacific cubera snapper, Pacific dog snapper	pargo colmillon		reef-associated	unknown	unknown	unknown	up to 60 m
		Lutjanus peru	Pacific red snapper	huachinango		reef-associated, rocky bottoms offshore	unknown	unknown	unknown	up to 100 m
		Caulolatilus princeps	ocean whitefish	pierna		reef-associated, rocky substrate, soft sand and mud bottoms	unknown	unknown	unknown	10 to 90 m
		Hoplopagrus guentherii	barred pargo, greenbar snapper, Mexican barred snapper	pargo mulato	handlines	reef-associated, rocky substrate near coral reefs	unknown	unknown	unknown	up to 50 m
		Trachurus symmetricus	jack mackerel, mackereljack, Pacific jack mackerel, scad	macarela	nets	pelagic, offshore; young in kelp beds	unknown	unknown	unknown	up to 400 m
	Malacanthidae	*Caulolatilus affinis*	Pacific golden-eyed tilefish	conejo	hook and line	deep-water demersal	unknown	unknown	unknown	20 to 240 m
	Mullidae	*Mulloidichthys dentatus*	goatfish	chivato		reef-associated, sand, mud and rock substrates	unknown	unknown	unknown	up to 60 m
	Paralichthyidae	*Paralichthys californicus*	fine flounder	lenguado		sandy bottoms in bays and estuaries	unknown	unknown	unknown	up to 180 m
	Scombridae	*Scomber japonicus*	Pacific chub mackerel	macarela	purse seines, gill nets, traps, beach seines, trawls	coastal pelagic	2 to 4 years	about 26 cm	100,000 to 400,000 eggs per female	up to 300 m
	Serranidae	*Hyporthodus*	rooster hind,	baqueta		demersal,	unknown	90 to 100 cm	unknown	46 to 90

		acanthistus	Gulf coney			reefs/sandy bottoms				m
		Epinephelus analogus	spotted grouper	Cabrilla pinta o pinto		reef-associated, patch/rocky reefs	unknown	unknown	unknown	at least 10 m
		Epinephelus labriformis	starry grouper	Cabrilla piedrera	hook and line	demersal, rocky coastal areas	unknown	unknown	unknown	5 to 30 m
		Hyporthodus niphobles	star-studded grouper	estacuda		demersal, deep water	unknown	unknown	unknown	50 to 130 m
		Mycteroperca jordani	Gulf grouper	garropa	hook and line	rocky reefs, kelp beds	6 or 7 years	19 to 20 cm	unknown	5 to 30 m
		Mycteroperca prionura	sawtail grouper	pimienta	spearfishing	reef-associated, large boulders/ gorgonians	unknown	unknown	unknown	8 to 50 m
		Mycteroperca rosacea	leopard grouper, golden grouper	cabrilla sardinera		reef-associated, rocky areas in shallow waters; seamounts	F 1 to 3 years; M 4 years	F 32 – 38 cm; M 36 cm	unknown	50 m
		Paranthias colonus	Pacific creolefish	cadernal		reef-associated	unknown	unknown	unknown	10 to 70 m
	Sparidae	*Calamus brachysomus*	Pacific porgy	mojarra mueluda		reef-associated, sandy bottoms	unknown	unknown	unknown	3 to 80 m
	Triakidae	*Mustelus californicus*	gray smoothhound	cazon	trawl, bottom gill nets	demersal, continental shelves, shallow muddy bays	about 2 years	70 to 90 cm	3 to 16 pups	

APPENDIX III MARINE PROTECTED AREA MAP OF CASE STUDY ANALYSIS



Name:	Great Barrier Reef Marine Park (GBRMPA)		
Location:	Australia		
Size (ha):	34,540,000 /over 33% is designated as a no take zone		
Date declared / established:	1975		
Purpose of protection:	Conservation and reasonable use		
Habitat:	Sea grass areas, intertidal areas, mangrove estuaries, algal and sponge gardens, sandy or muddy bottoms, continental slopes, deep ocean and coral reef.		
Type of Management / Management plan:	Co-Management / YES		
Zoning type	Marine Reserve has 3 zoning types		
Integral	X	No take zones	
Partial (restricted sports and fishing)	X	Restricted sport and commercial fishing	
General (low impact activities)	X	Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	Protection for damaging activities, such as commercial fishing and commercial shipping traffic		
Agencies involved	YES	NO	
Governance:	X		Government of Australia through the Great Barrier Reef Marine Park Authority in partnership with the Government of Queensland.
Organization support:	X		The marine tourism industry
Enforcement:	X		Great Barrier Reef Marine Authority, Queensland Parks, and Wildlife Service
Stakeholders:	X		Public participation and community involvement in the development and implementation of management.
Economics:	X	X	Zoning regime on 1975 did not include any studies, zoning plan of 2003 included studies carried out by committees involved.
Social:	X	X	Zoning regime on 1975 did not include any studies, zoning plan of 2003 included studies carried out by committees involved.
Research:	X	X	Zoning regime on 1975 did not include any studies, zoning plan of 2003 included studies carried out by committees involved.
Monitoring:	X		Long-term monitoring (site specific and regional scale), site-specific impact monitoring (high use areas after incidents, like vessel groundings), baseline monitoring, reactive monitoring (assessing environmental impacts). Australian Institute of Marine Science set up a long term monitoring program in 1192 in conjunction with GBRMPA.
Biological:	X	X	Zoning regime on 1975 did not include any studies, zoning plan of 2003 included studies carried out by committees involved. 1,500 fish species, 400 coral species, breeding ground for whales and dolphins, marine turtles other endangered and rare species present.
Ecological:	X	X	Zoning regime on 1975 did not include any studies, but the zoning plan of 2003 included studies carried out by committees involvement because of it extraordinary biological diversity. It has become one the most richest and complex natural systems on earth.
Community involvement:	X		Public participation and community involvement in the development and implementation of management.
Committee:	X		Local Marine Advisory Committees, Tourism and Recreation Advisory Committee, Scientific Steering Committee, Social, Economic, and Cultural Steering Committee.
Donations or Revenue:	X		Tourism provides about A$700 million per annum; commercial fishing around A$250 million per annum and the large recreational fishing and recreational boating sector is worth about A$270 million per annum.
Successes:	Successful communications, it helped build more robust and justifiable bioregions and involved the community, via a non-confrontational mechanism.		
Lessons Learned:	Management must be addressed at various scales; zoning is not adequate for many areas with a local purposes. Description and zone boundaries visibility are necessary for a good understanding from the public. Too many zone types with only minor differences have been shown to confuse to users and complicate enforcement. Areas need occasionally reviewed to ensure the protection of biodiversity. Different management strategies apply when zoning		

Lessons Learned:	Management must be addressed at various scales; zoning is not adequate for many areas with a local purposes. Description and zone boundaries visibility are necessary for a good understanding from the public. Too many zone types with only minor differences have been shown to confuse to users and complicate enforcement. Areas need occasionally reviewed to ensure the protection of biodiversity. Different management strategies apply when zoning different areas like near shore and offshore also across jurisdictions. Community understanding of the range of threats to the GBRMP was generally poor; the lesson learned was that introducing a solution without clarifying the problem would not work.
References:	1. Day, J.C. (2002). Zoning-Lessons from the Great Barrier Reef Marine Park. Ocean & Coastal Management 45 (2002) 139–156. 2. Day, J. (2002). Marine park management and monitoring: lessons for adaptive management from the Great Barrier Reef. In: Managing protected areas in a changing world: proceedings of the Fourth International Conference on Science and Management of Protected Areas, 14-19 May 2000. Staff Papers. http://ioc3.unesco.org/marinesp/files/Adaptive%20management%20SAMPA.pdf

Name:	Folkestone Park and Marine Reserve (FPMR)		
Location:	Barbados		
Size (ha):	220 / 99% no take zone, 12% is designated as a scientific research area or use with a special permit		
Date declared / established:	1981		
Purpose of protection:	Tourism, recreation and conservation		
Habitat:	Sea grasses, intertidal sandy beach, fringing reef, patch reefs, offshore bank reef, sponges and white mangrove.		
Type of Management / Management plan:	Government / YES		
Zoning type	Marine Reserve has 2 zoning types		
Integral	X	No take zones	
Partial (restricted sports and fishing)		Restricted sport and commercial fishing	
General (low impact activities)		Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)	X	Areas designated for fast speed watercraft use, recreation including swimming and snorkeling.	
Protection regime:	Preservation, Enhancement and conservation of marine resources		
Agencies involved	YES	NO	
Governance:	X		The National Conservation Commission
Organization support:	X		Caribbean Conservation Association
Enforcement:	X		Folkestone Park and Marine Reserve, The Barbados Coast Guard, Barbados Police Force and the National Conservation Commission park
Stakeholders:		X	When the FPMR was first established in 1981, many of the major stakeholders were not involved, fisherman in particular had no input and their issues were not taken into consideration. Extensive stakeholder consultations carried out between 1998 and 1999 as part of a project to review park management.
Economics:		X	Barbados's economy and many livelihoods are heavily dependent upon tourism of the reserve.
Social:		X	Reserve provided economic growth to the community based on park activities. Also provide educational opportunities and recreational use
Research:	X		There is a scientific zone in the marine reserve; it is also accessible with a special permit only.
Monitoring:		X	Strengthen monitoring of coastal and marine resources; it has been carried out for fish abundance and species composition.
Biological:	X		Benthic fauna, hawksbill turtles, green turtles, feather dusters, scorpion fish. The nesting success of endangered marine turtles is constrained by beach habitat quality and beach front lighting. Low fish abundance partially due to historic overfishing.
Ecological:		X	Monitoring is being carried out to improve management of coral reef biodiversity and related resources at Folkestone Marine Reserve
Community involvement:	X		Successfully increased since implementation of the marine reserve.
Committee:		X	Community-Based Coral Reef Monitoring And Management
Donations or Revenue:	X		Founding by Canadian International Development Agency (CIDA) through Caribbean Conservation Association (CCA). Had to rely on government funding as part of the overall National Conservation Commission (NCC) budget, which covers, among other things, land-based parks, cleaning of foreshore areas, and life guard services.
Successes:	Large, trappable fish were approximately twice as abundant in the protected area, and 18 of 24 species were bigger.		
Lessons Learned:	The participatory process is a long and work-intensive process, compromises need to be made. All stakeholder concerns should be shared; this helps to gain the confidence of the stakeholders. Non-organized groups are hard to engage, it is difficult to find acceptable representatives. The stakeholders who will be the most active are those who have something to		

Lessons Learned:	The participatory process is a long and work-intensive process, compromises need to be made. All stakeholder concerns should be shared; this helps to gain the confidence of the stakeholders. Non-organized groups are hard to engage, it is difficult to find acceptable representatives. The stakeholders who will be the most active are those who have something to gain, such as fishermen. Local community and tourist need to understand the restrictions of the marine protected and the authorized activities.
References:	1. Cumberbatch, J. (2001). Case Study of the Folkestone Park and Marine Reserve, Barbados. Caribbean Natural Resources Institute (CANARI) Technical Report, Number 281. 2. Barbados ReefFix. (2010). Draft Report: Economic Valuation of Goods and Services Derived from Coral Reefs in the Folkestone Park and Marine Reserve. Inter-American Biodiversity Information Network and Organization of American States. 3. Geoghegan, T., Smith, A.H. and Thacker, K. (2001). Characterization of Caribbean Marine Protected Areas: An Analysis of Ecological, Organizational and Socio-0Economic Factors. Caribbean Natural Resources Institute (CANARI) Technical Report N. 287

Name:	Exuma Cays and Sea Park Marine Reserve		
Location:	Bahamas		
Size (ha):	45,583.79 (43252.801 are marine) / 80% is a designated as a no take zone		
Date declared / established:	1959 / 1986		
Purpose of protection:	Fisheries replenishment and enhance of spawning stock biomass, also to preserve natural heritage.		
Habitat:	Sea grass, coral reefs, hard-bottoms, sand flats and mangroves		
Type of Management / Management plan:	Non-Governmental Organization / YES		
Zoning type	Marine Reserve has 1 zoning type		
Integral	X	No take zones	
Partial (restricted sports and fishing)		Restricted sport and commercial fishing	
General (low impact activities)		Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	Sustainability of fisheries resources		
Agencies involved	YES	NO	
Governance:	X		Bahamas Government and Bahamas National Trust
Organization support:	X		Since 2000 the Nature Conservancy founds research and ongoing monitoring
Enforcement:	X		Bahamas National Trust and support from the Bahamian Defense Force
Stakeholders:		X	Consultations are being conducted with all stakeholders to identify areas of conflict that would contribute to the management aspect of each marine reserved once Officially implemented. Started in 1990.
Economics:		X	Caribbean spiny lobster which relies on coral reef habitats as adults but algal nursery habitats as juveniles is one of the country's most valuable exports, accounting for more than $61 million in 1998. The park supports local fishermen as well as sport fishing and other lucrative tourist industries in the Exumas.
Social:		X	In traditional subsistence fishing has been practiced for generations (MPA Proposals for 3 new areas).
Research:		X	Recently Researchers are being supported by the Perry Institute for Marine Science (PIMS). Caribbean Marine Research Center (CMRC) is investigating the efficacy of marine reserves to increase the abundance and reproductive potential of spiny lobster, Queen conch, and Nassau grouper.
Monitoring:		X	Lack of historical data. Carried out to analyze species composition, density, size and biomass. Also the reproductive output of some species and larval abundance. Available data supports that the reserve has maintained a high spawning stock biomass relative to fish areas.
Biological:	X		Nassau grouper (third most important commercial), queen conch, spiny lobster and rare stromatolites reefs.
Ecological:		X	Monitoring of Reserve. Projects and studies like the indirect effects of reserves on biodiversity arise from species interactions and trophic cascades; they are generally complex and may have surprising outcomes.
Community involvement:	X		Community Consultation for the new Management plan (1990)
Committee:	X		Andros Conservancy and Trust (ANCAT), Exuma Tourism and Environmental Advisory Committee (TEAC)
Donations or Revenue:	X		Inventories and establish fees for boaters who use anchors or permanent mooring buoys. Mooring fee charged to boats visiting the park.
Successes:	Compared to fished areas, the reserve had 7 times more biomass of Nassau grouper and 30 times higher density of queen conch and late stage larval densities were 4-17 times higher (Queen conch). Some adult Nassau grouper tagged in the marine reserve moved out into fished areas. Very young conch (larvae) produced in the marine reserve appear to be carried outside by ocean currents. Commercially fished species increased in density or biomass inside the		

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Lessons Learned:	Models of ocean currents and larval dispersal may be important tools for determining the most effective locations of marine reserves. Reserves can be successful at a regional scale if they contain contiguous habitats from bank to deeper shelf environments, minimize other threats, such as coastal development, and provide protection of unique features such as spawning aggregations. The effectiveness of the park is likely to be a result of its size and inclusion of a variety of habitats these species (Nassau grouper, queen conch, spiny lobster) utilize during various life stages.
References:	1. Chiappone, M. and Sullivan-Sealey, K.M. (2000) Evaluating the Success of the Exuma Cays Land and Sea Park, a Large Marine Reserve in the Central Bahamas. Proceedings of the Gulf and Caribbean Fisheries Institute, Vol. 51 (2000), pp. 509-524 2. The Bahamas National Trust. (2009). The Success of the Exuma Cays Land and Sea Park as a Marine Fishery Reserve. http://www.bnt.bs/marine_reserve_success.php 3. Protect the Planet Ocean. (2010). Exuma Cays and Sea Park, Bahamas. http://www.protectplanetocean.org/collections/successandlessons/casestudy/exuma/caseStudy.html 4. Sasko D. and Jury, S. (2000). Marine Reserve Research to Protect Fisheries in the Caribbean. NOAA's Undersea Research Program. http://www.nurp.noaa.gov/Spotlight/MarineReserve.htm 5. Sluka, R., Chiappone, M., Sullivan, K.M. and Wright, R. (1997) The benefits of a marine fishery reserve for Nassau Grouper *Epinephelus striatus* in the Central Bahamas. Proc 8th Int Coral Reef Sym 2 :1961-1964 6. Sobel, J.A. and Dahlgren, C.P. (2004). Marine Reserves: A Guide to Science, Design and Use. Island Press

Name:	Glover's Reef Marine Reserve		
Location:	Belize		
Size (ha):	30,735 / 30% is a no take zone		
Date declared / established:	1972 / 1993		
Purpose of protection:	To promote long-term conservation and management of the Belize Barrier Reef complex through in-situ research, cooperative management, training, and education. Considered a World Heritage Site (Belize Barrier Reef World Heritage Site (BBRWHS))		
Habitat:	Sea grass , large tidal channels , atoll reefs, diversity of reef types, sand flats , mangroves, sponge and algae		
Type of Management / Management plan:	Co-Management / YES		
Zoning type	Marine reserves has 3 zoning types		
Integral	X	No take zones	
Partial (restricted sports and fishing)	X	Restricted sport and commercial fishing	
General (low impact activities)	X	Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	Long term conservation and sustainable use		
Agencies involved	YES	NO	
Governance:	X		The Belize Fisheries Department
Organization support:	X		Wildlife Conservation Society
Enforcement:	X		Park Staff
Stakeholders:		X	In 1988, Consultations with local users and draft management plan proposed. . Fishers felt that they had not been consulted enough, or in some cases not at all; that regulations had been imposed on them and that any efforts had been made to compensate them for loss of earnings. 1993 Stakeholders were consulted on design of zoning system. The traditional fishermen are increasingly involved in management activities (such as monitoring of commercial marine species),
Economics:		X	Expand sustainable livelihood opportunities of communities that use the protected area, surrounding community relies heavily in the resources of the marine protected (fisheries and tourism revenues).
Social:		X	Develop capacities of Community-Based Organizations (CBO's) and other Associations whose existence and future prospects are linked to the reserve. Enhance the institutional capabilities of CBO's to participate in the co-management of marine protected areas.
Research:	X		In 1992, a preliminary assessment of coral cover and lobster and conch population densities was conducted by the Fisheries Department at two sites, prior to the implementation of reserve protection. A study was also initiated to investigate the effectiveness of the reserve in enhancing fish catches. Many studies that have been carried out in the reserve focus on applied and management related research.
Monitoring:		X	Staff is involved in some monitoring activities like reef health, the status of the commercial species (especially lobster and conch), and the spawning aggregation sites. More recently they have become involved in monitoring sea turtles, including nesting activity and conducting in-water surveys. Belize Fisheries Department, Wildlife Conservation Society, Fisheries Catch Data Collection Program, Glover's Reef Long-term Atoll Monitoring Program are some of the programs or Agencies involved in the monitoring activities. Glover's Reef was one of three sites in Belize for the coral reef monitoring component of the CPACC (Caribbean Planning for Adaptation to Climate Change) project. The atoll is also included in the national survey and monitoring program to assess the sites of fish spawning aggregations. A monitoring program is currently being developed to measure the success of conservation strategies, as an integrated component of the Seascape planning process. In 1996 WCS Research Station introduced a Long-term Atoll Monitoring Program.
Biological:		X	Critical nursery and feeding ground for sea turtles, sharks, rays, and numerous

Biological:		X	Critical nursery and feeding ground for sea turtles, sharks, rays, and numerous fish species; lobster is present. Important grouper spawning bank.
Ecological:		X	Large-scale change in their ecology over the past 2 decades resulting in the loss of hard coral cover and reefs dominated by various forms of fleshy alga (315% increase, 75% reduction of coral cover, 1998)
Community involvement:		X	Increase awareness of value and protection of the Belize Barrier Reef World Heritage Site (BBRWHS). Develop capacities of community-based organizations (CBO's), NGO's and other Associations whose existence and future prospects are linked to the BBRWHS. Enhance the institutional capabilities of CBO's to participate in the co-management of marine protected areas.
Committee:		X	Glover's Reef Marine Reserve (GRMR) Local Advisory Committee first met 1997. Compose of 4 representatives from fisher co-operatives, two representatives from the Glover's reef atoll, one representative from Coastal Zone Management Authority and Institute, Belize, one representative from Wildlife Conservation Society, one representative from the Co-operative department and one representative from The Belize Tourism Industry Association and 1 representative from the Belize Audubon Society (BAS) National Parks Environmental Advisory Committee.
Donations or Revenue:	X		Glover's Reef Marine Reserve, while generating sufficient funds from tourism to run the protected area, is not considered sustainable, as entrance fees go into a centralized Government treasury fund rather than returning directly into management. Covers only basic cost like salaries and fuel. The benefit from targeted funding from collaborations and caye owners who assist with provisions and an extra staff member (enforcement) and equipment.
Successes:	Only 3 years later (from 1998), the reserve had triple the density of lobsters outside. Individual lobsters also grew bigger inside the reserve. By 2001, their total biomass - the combined weight of all individuals—was 45 times greater in the reserve than outside		
Lessons Learned:	Management of the coral reef must extend to land-based activities outside marine reserves if reefs are to be protected from siltation and land-based sources of pollution, the approach of integrated coastal zone management should be chosen to ensure the long- term viability of both the protected areas and the reef system in general. Develop of specific research and monitoring activities. Sustainable resource use practices are, therefore, not a matter of values or lack of information, but related to economic survival, which must be considered a priority within the larger development framework for Belize.		
References:	1. McClanahan, T. and Muthiga, N.A. (1998). An ecological shift in a remote coral atoll of Belize over 25 years. *Environmental Conservation* 25 (2): 122–130. 2. Wildlife Conservation Society. (2011). Glover's Reef Seascape, Belize. http://www.wcs.org/saving-wild-places/ocean/glovers-reef-seascape-belize.aspx 3. McClanahan, T.R., Bergman K., Huitric M., McField M., Elfwing, T., Nyström, M. & Nordemar, I. Response of fishes to algae reduction on Glovers Reef, Belize. Mar Ecol Prog Ser Vol. 206: 273–282 4. Garaway, C. and Esteban, N. (2002). The impact of marine protected areas on poorer communities living in and around them: institutional opportunities and constraints: Appendix 4 – case study of Glover's Reef Marine Reserve, Belize. December 2002. 5. Glover's Reef Marine Reserve / Wildtracks / Wildlife Conservation Society. (2007) Management Plan Glover's Reef Matine Reserve World Heritage Site 2008- 2013. http://www.gloversreef.org/grc/pdf/Glovers-Reef-Management-Plan_Final.pdf		

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Name:	Marine Extractive Reserve of Corumbau (Part of the Abrolhos Network of Marine Protected Areas)		
Location:	Brazil		
Size (ha):	89500		
Date declared / established:	2000		
Purpose of protection:	Protect marine biodiversity and improve local community livelihoods by fostering the sustainable use and management of the fisheries.		
Habitat:	Seagrasses, intertidal zones, reefs, major reef benthos, open ocean (pelagic zone), deep sea, hard corals, rock or sediment, sand flats, mangroves, estuaries and islands		
Type of Management / Management plan:	Co-Management/ YES		
Zoning type	Marine Extractive reserves has 2 zoning type		
Integral	X	No take zones	
Partial (restricted sports and fishing)	X	Restricted sport and commercial fishing	
General (low impact activities)		Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	Extractive use		
Agencies involved	YES	NO	
Governance:	X		Co-managed by Chico Mendes Institute for Conservation of Biodiversity (ICMbio), a group of NGOs, including Conservation International Brazil (CI), and members of the local communities.
Organization support:	X		National Fund for the Environment approved a project entitled "Strengthening MERC's Participatory Management," involving Brazilian Institute for the Environment and 11 other institutions (four NGOs, São Carlos Federal University, and six fishers associations). Association for Coastal and Marine Studies of Abrolhos (ECOMAR).
Enforcement:	X		Brazilian Institute for the Environment (IBAMA)
Stakeholders:	X		Because the no-take zoning was agreed upon by reserve council members and the community is a Co-manager, fishing regulation compliance is high.
Economics:	X		Develop low-impact and profitable community-based tourism and fishing practices. Villages already face problems related to the carrying capacity for tourism activity, development and grow of large shrimp farms. The users association, Chico Mendes Institute for Biodiversity Conservation (ICMBio) and NGOs are fiercely opposed to this (farms) but the project is backed by important politicians and investors who have a strong lobby in the State parliament.
Social:	X		The three users associations function unevenly, depending on the type of leadership they have and the conflicts that exist in each community. Conflicts with tourism seem to rank. Some communities have requested the authorities to extend the protected status to the land but hotel owners in the region are against the proposal. According to it, the villagers are organized in three users' Associations but only a small percentage of them are aware of the norms that regulate the MER and the need to participate in its activities–14% in Cumuruxatiba, 25% in Corumbau and 45% in Caraiva. Great distances between villages and problems of communication. promote environmental education and communication
Research:		X	Reef recuperation initiatives developed by Conservation International Brazil (CI) with Chico Mendes Institute for Biodiversity Conservation ICMBio at the Corumbau Extractive Reserve.
Monitoring:		X	Implementation of a long-term monitoring strategy with no external aid is another major challenge, one that may even be unachievable.
Biological:	X		Region of rich biodiversity included in the UNESCO's World Heritage List in 1999. Most important mangroves along the coast of Brazil, it supports the Abrolhos marine fauna, protecting source populations of innumerous species.
Ecological:	X		Some monitoring has occurred since reserve establishment. Most important mangroves along the coast of Brazil, it supports the Abrolhos marine fauna,

Ecological:	X		Some monitoring has occurred since reserve establishment. Most important mangroves along the coast of Brazil, it supports the Abrolhos marine fauna, protecting source populations of innumerous species.
Community involvement:	X		Corumbau Reserve Association, Associacão dos Pescadores Artesanais e Amigos da Costa do Descobrimento from Imbassuaba, Barra do Caí Associacão dos Pescadores e Agricultores Rurais from Veleiro, and Associacão dos Nativos from Caraùiva.
Committee:		X	Corumbau Reserve Association (AREMACO) representing fishers from the entire reserve. Associacão dos Pescadores Artesanais e Amigos da Costa do Descobrimento from Imbassuaba, Barra do Caí Associacão dos Pescadores e Agricultores Rurais from Veleiro, and Associacão dos Nativos from Caraùiva. The Deliberative Council MERC's main decision-making body
Donations or Revenue:	X		The annual IBAMA budget for the MERC was US$5,500.00 in 2006 and 2007 (excluding the salary of the only public servant), which is clearly insufficient to fund basic governmental duties. Lack of government financial support National Fund for the Environment
Successes:	Increased fish biomass and spillover and stable catches. Bigger fish within the reserve boundaries compared to areas outside of the Reserve. Fish density has doubled. This no-take zone promotes spillover and improvement of adjacent fisheries		
Lessons Learned:	Inconsistent external support also impedes the periodic revision of fishing rules, which should be backed up by high-quality data with consistent time series. Well defined boundaries are necessary to ovoid confusion. Increase participation and compliance especially to enhance cohesion and communication among fishers and to help in the conflict resolution mechanism. Incorporate traditional knowledge and management practices. Define beneficiaries early in the process to avoid future conflicts.		
References:	1. Rodrigo Leão De Moura, Carolina Viviana Minte-Vera, Isabela Baleeiro Curado,Ronaldo Bastos Francini-Filho, Hélio De Castro Lima Rodrigues, Guilherme Fraga Dutra, Diego CorrêaAlves & Francisco José Bezerra Souto (2009): Challenges and Prospects of Fisheries Co-Managementunder a Marine Extractive Reserve Framework in Northeastern Brazil, Coastal Management, 37:6,617-632 2. Diegues, A.C. Marine Protected Sreas and Artisanal Fisheries in Brazil. International Collective in Support of Fish workers. 3. Di Ciommo R.C. (2007) Gender, Tourism, and Participatory Appraisals at the Corumbau Marine Extractive Reserve, Brazil. Vol. 14, No. 1, http://www.humanecologyreview.org/pastissues/her141/diciommo.pdf 4. Conservation International, Brasil. Marine Ecosystems in Brazil. http://www.conservacao.org/ https://library.conservation.org/Published%20Documents/2008/Fact%20Sheet_Programa%20Marinho%20ENG.pdf 5. Amend, M. & Reid, J. (2009) Economic Valuation of Marine Managed Areas in Brazil. Marine Management Area Science Program Center for Applied Biodiversity Science and		

Name:	Marine Extractive Reserve Cassuruba (Part of the Abrolhos Network of MPA's)		
Location:	Brazil		
Size (ha):	100,687		
Date declared / established:	2009		
Purpose of protection:	Sustainable use and preservation of the natural environment, the local culture and traditions and to improve the population's quality of life.		
Habitat:	Intertidal Zones, reefs, open ocean (pelagic zone), sand flats, mangroves, estuary, watershed, and coastal habitat		
Type of Management / Management plan:	Co-Management / YES		
Zoning type	Marine Extractive Reserve has 2 zoning types		
Integral	X	No take zones	
Partial (restricted sports and fishing)	X	Restricted sport and commercial fishing	
General (low impact activities)		Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	Extractive use		
Agencies involved	YES	NO	
Governance:	X		Chico Mendes Institute (Brazil's protected area agency) under a consultative council of local users, NGOs, the Brazilian Navy, the private sector and state government.
Organization support:	X		National Fund for the Environment approved a project entitled "Strengthening MERC's Participatory Management," involving Brazilian Institute for the Environment and 11 other institutions (four NGOs, São Carlos Federal University, and six fishers associations). Association for Coastal and Marine Studies of Abrolhos (ECOMAR).
Enforcement:	X		Brazilian Institute for the Environment (IBAMA)
Stakeholders:	X		The idea of the Cassaruba Marine RESEX arose from requests by shellfish collectors, extra activists, and fishers worried about crab collectors coming from other regions, real estate speculation, and other threats to the ecosystems which guarantee the sustenance of local families. .
Economics:	X		Conservation International Brazil has offered technical support to the proposal by preparing the biological and socio-economic inventories needed for the creation of the reserve and contributing to efforts of community engagement. Socioeconomic study helped determined who the beneficiaries are. Economic benefits not stated but claims to create jobs for 20,000 fishers. Largest shrimp farming project in the country, Coopex, a business considered incompatible with the conservation of the area and which generated many conflicts in the region.
Social:	X		CI has offered technical support to the proposal by preparing the biological and socio-economic inventories needed for the creation of the reserve and contributing to efforts of community engagement Two livelihood systems at the MER: traditional fisher-folk and small-scale cultivation. Over 1,000 families depend on the Cassuruba mangrove area, more than the 250 families' estimated in government data.
Research:	X		With the information from the cross-shelf and the SocMon (Core Socioeconomic and Governance Monitoring) studies, CI-Brazil was able to use rigorous, science-based evidence to show that Cassuruba had both ecological and socioeconomic benefits and needed to be protected, the shrimp farm project was terminated and oil exploration plans were eliminated for the closest parcels.
Monitoring:	X		Fisheries monitoring project with the Ministry of Fisheries and Aquaculture. Fisheries monitoring information linking with information from ecological monitoring to the rest of the Network.
Biological:	X		Exceptionally high fish and coral endemism, approximately 50 percent of Abrolhos coral species and 20 percent of reef fish species are found nowhere else in the world. Is also home to the spectacular chapeirao – mushroom-shaped coral pinnacles up to 25m high. Humpback Whale breeding grounds. Giant Grouper, vast number of crabs species, various mollusks, sea turtles, shrimp,

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Ecological:	X		Polygon determined by scientific experts, Conservation International**,** Brazilian Institute of Environment and Renewable Natural Resources, and other NGOs
Community involvement:	X		Involved in all the process
Committee:	X		Deliberative Council
Donations or Revenue:	X		Conservation International Center for Applied Biodiversity Science. International Conservation Found of Canada.
Successes:	The Abrolhos MER has been effective in increasing fisheries production, thereby benefitting both fishers and tourism operators develop of strong links have been built between Conservation International Brazilian Institute and several universities, and the capacities of several local organizations have been significantly enhanced. Inclusion of the Abrolhos parrotfish on IUCN Red List. Mapping and surveying of the Abrolhos Bank led to the discovery of large areas of unmapped reefs and other important marine habitats. Biological monitoring demonstrated the positive effects of no-take reserves on fish biomass within the reserves as well as the spill-over effects to surrounding areas.		
Lessons Learned:	The establishment of the Cassaruba Reserve is very recent, and the outcomes are not clear at this time		
References:	1. Mangrove Action Project. (2009). New Brazilian Conservation Area Will Protect Mangroves, Corals, Fisheries. Compiled from reports by Conservation International, Instituto Terramar, and Coalizão SOS Abrolhos. http://mangroveactionproject.org/news/the-map-news/new-brazilian-conservation-area-will-protect-mangroves-corals-fisheries/ 2. Wells, M.P., Hastings. J.G. & Moure, J. (2011). Assessment of Science-to-Action (S2A) Impacts in Abrolhos, Brazil; Belize; Fiji; and Panama. Conservation International Marine Management Area Science (MMAS) Program. http://www.science2action.org/files/s2a/s2aprogramassessment.pdf 3. MacLennan, A. (2009) Connecting the Dots for Fisheries. Conservation International.		

Name:	Marine Extractive Reserve Arraial do Cabo		
Location:	Brazil		
Size (ha):	56769		
Date declared / established:	1997		
Purpose of protection:	Sustainable exploitation and conservation of renewable natural resources traditionally used by local artisanal fishers and mollusk harvesters.		
Habitat:	Intertidal Zones , open ocean (Pelagic Zone), sand or mud flats		
Type of Management / Management plan:	Co-Management / YES (Network)		
Zoning type	Marine Reserve has 2 zoning types		
Integral	X	No take zones	
Partial (restricted sports and fishing)		Restricted sport and commercial fishing	
General (low impact activities)	X	Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	Protected area with sustainable use of natural resources to benefit the traditional fisher population		
Agencies involved	YES	NO	
Governance:	X		Brazilian Institute of Environment and Renewable Natural Resources, Poor effectiveness and Deliberative Council is the decision-making body.
Organization support:	X		National Fund for the Environment approved a project entitled "Strengthening MERC's Participatory Management," involving Brazilian Institute for the Environment and 11 other institutions (four NGOs, São Carlos Federal University, and six fishers associations). Association for Coastal and Marine Studies of Abrolhos (ECOMAR), Federal University of Rio de Janeiro.
Enforcement:		X	A lack of vigilance has allowed industrial fisheries to operate within the limits of 2 nautical miles mandated in the legislation. Brazilian Institute for the Environment (IBAMA)
Stakeholders:	X		In-depth interviews were conducted with key stakeholders to find out about assets and barriers in local fisheries management. The analysis helped recognize conflicts among resource users, identify issues of securing access and user rights and it contributed to the discussion on responsible forms of use of coastal and fishery resources by fishing communities. Groups Fisheries/aquaculture, tourism, industry, research and national defense. Process wasn't involved by many stake holders, even fishers had little involvement. Consequently , fishers are not becoming decisive players in the decision-making process
Economics:		X	Income derived from fisheries has declined, migrating to other sectors such as tourism.
Social:	X		Complex socio-economic and environmental conflicts over the local resources need to be solved to secure sustainable fisheries management. Increased beach tourism and related infrastructure development pushed the fishing communities to take refuge in hill slopes and tops, far from their beach landing crafts and gear.
Research:	X		Researchers at Federal University of Rio de Janeiro (UFRJ) are engaged in developing appropriate co-management procedures and policy recommendations as part of the ongoing research project on the socio-environmental management of Reserva Extrativista Marinha de Arraial do Cabo (RESEX) for ecological conservation. A participatory survey was conducted in 2007 to collect base line information of the fishing communities
Monitoring:	X		There are indications that the climate change is impacting marine fauna in the southeastern Brazilian coast. During the field study period, repetitive observations were made on a daily basis regarding the mortality of marine fauna on the beaches of Arraial do Cabo. Large numbers of penguins, certain species of fish/krill, and marine seals (uncommon to the warm waters of Arraial do Cabo) were found dead and washed ashore – famine is the cause of death in all cases. Lack of funding, consequently equipment, makes it difficult to carry

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Biological:	X		Fishery in this region is privileged by rare marine phenomena known as "up-dwelling", which brings nutrient rich water from the sea floor to the surface. Complex socio-economic and environmental conflicts over the local resources need to be solved to secure sustainable fisheries management. Pelagic species.
Ecological:	X		Upwelling areas, increases primary productivity and consequently fisheries resources.
Community involvement:	Only 4% of fishers are members of this organization which prides itself with the broadest based membership of all local formal institutions. Fishers complained that associations created to represent them have often been taken over by the local elite and membership who have utilized these organizations for personal benefit.		
Committee:	Deliberative Council, Marine Extractives Reserve (MER) decision making body		
Donations or Revenue:	Lack of government and financial support		
Successes:	Recognition and legitimization of local, traditional knowledge with full participation of local resource users is the key to successful resource management.		
Lessons Learned:	Resulted in conflict between fishers and between stakeholders.		
References:	**1.** Community Based Research Laboratory. (2007). Socio-Environmental Management of Marine Extractive Reserves for Eco-development. http://cbrl.uvic.ca/en/Projects/brazilianfisheries.html **2.** Carlos Digues, A. (2008) Marne Protected areas amnd Artizanal fishing in Brazil. International Collective in Support of Fishworkers. www.icsf.net		

Name:	Abrolhos Marine National Park (Part of the Abrolhos Network of Marine Protected Areas)		
Location:	Brazil		
Size (ha):	91235		
Date declared / established:	1983		
Purpose of protection:	environmental preservation, biodiversity protection, and creation of tourism opportunities,		
Habitat:	Seagrasses, algae bottoms, submerged, emergent reefs, open Ocean (Pelagic Zone), mangroves, estuary, watershed, islands, and group of small volcanic islands.		
Type of Management / Management plan:	Government / YES		
Zoning type	Marine Reserve has 1 zoning types		
Integral	X	No take zones	
Partial (restricted sports and fishing)		Restricted sport and commercial fishing	
General (low impact activities)		Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	To conserve the area's unique biodiversity and ensure long-term livelihood opportunities for local people, several marine protected areas (MPAs) have been established		
Agencies involved	YES	NO	
Governance:	X		administered by the Brazilian Environmental Agency Chico Mendes Institute for Conservation of Biodiversity (ICMbio),
Organization support:	X		National Fund for the Environment approved a project entitled "Strengthening MERC's Participatory Management," involving Brazilian Institute for the Environment and 11 other institutions (four NGOs, São Carlos Federal University, and six fishers associations). Association for Coastal and Marine Studies of Abrolhos (ECOMAR), Federal University of Rio de Janeiro.
Enforcement:	X		Brazilian Institute for the Environment (IBAM), effective-makes arrests but do not occur often
Stakeholders:	X		Main stakeholders for the Marine Park are government, tourism sector and NGOs.
Economics:	X		Tourism is now the primary source of income in the region, and its regulation is crucial to avoid any negative impacts that it might have. Conservation International Brazil (CI) is working to increase fishermen's income through sustainably improving commercialization of local fish products in Corumbau and Canavieiras Extractive Reserves. To improve incomes from local fisheries, CI Brazil is working to strengthen local fishing associations, engage the market and establish incentives for buyers to procure directly from associated fishermen who can provide higher quality product.
Social:	X		For over a decade, CI-Brazil and its partners have been conducting both ecological and socio-economic research to improve priority-setting and inform management decisions. Most recently, much of CI-Brazil's research has been conducted as part of the Marine Managed Areas Science (MMAS) program, a CI-led initiative to conduct research in several important marine areas worldwide.
Research:	X		Research indicates that these habitats (different Marine Extractive Reserves) are connected and that various species of fish may use these multiple habitats throughout their life cycles. Local Knowledge contributed in a few of scientific studies that were carried out. Scientific knowledge and Local Knowledge resulted in a Abrolhos Bank habitat mapping and biological assessments Pro Abrolhos Project A large sampling program, funded by *National Council for Scientific and Technological Development* (CNPq) to study the area at local and regional scales. The work is led by the Oceanographic Institute of the University of São Paulo and iscomposed of a network of 11 Brazilian research institutions. The main aim of the project is to understand the coastal and oceanic processes that govern the Abrolhos ecosystem in order to create better policies for its management and rational use. Team of scientists from Conservation International, Rio de Janeiro Botanical Gardens, São Paulo State University and

Monitoring:	X		Alliance for Marine Conservation, a partnership between CI-Brazil and the SOS Mata Atlântica Foundation..
Biological:	X		The Abrolhos Bank is comprised of a mosaic of marine and coastal ecosystems that encompasses the highest biodiversity in the South Atlantic, the largest reefs in this region, as well as several endemic and red-listed marine species. The region's unique reef type, locally known as "chapeirão", consists of mushroom-shaped pinnacles built predominantly by Brazilian endemic species, covered with fans of fire coral and round knobs of brain corals, also unique to Abrolhos. Anthozoans-39 species, Reef and Shore fish-more than 266 species, Macrophytes-100 species, Soft-bottom mollusks-293 species, Soft-bottom polychaetes-90 species, Crustaceans-535 species.
Ecological:	X		Ecological monitoring demonstrated the positive effects of no-take reserves on fish biomass within the reserves as well as the spill-over effects to surrounding areas. Monitoring also documented extensive distribution of disease in Abrolhos reef communities, which could lead to the extinction of important reef builders, such as brain coral, if infection rates do not change. Brazil is working toward ecological sustainability by establishing protected areas and implementing appropriate use rules.
Community involvement:	X		CI-Brazil's model combines institutional commitment, good science, and strong partnerships to develop an effective ecosystem-based management system for the region. Local-level results are amplified through a series of concrete activities that influence regional and national policy, build local capacity, and increase awareness. The coastal communities of Bahia also share many cultural characteristics—religion, traditional festivities, and strong community structure supported by family and "*compadrio*" ties—that play a significant role in community organization and influencing resource management decisions
Committee:	X		Management council only informs decisions.
Donations or Revenue:	X		To secure funding to cover management costs, CI- Brazil is working with partners to establish the Abrolhos Trust Fund. This fund would be endowed and then used for complementary management costs such as monitoring, awareness building and patrolling, when government funds are scarce.
Successes:	There is minimal illegal activity and tourism brings in revenue. MMAS researchers discovered one of the largest and most concentrated larval recruitment pulses ever recorded in the Western Atlantic for a commercially important snapper species *(the dog snapper, Lutjanus jocu) in Abrolhos National Marine* Park, Brazil. The economic valuation and cultural roles studies demonstrated that even remote MMAs like Abrolhos National Park can generate substantial economic value, with annual net revenues from fishing estimated at $1.65 million and annual visitation fees totaling $50,000. Fish populations are stable inside multiple-use reserves such as Corumbau while they continue to decrease outside the reserves. This clearly demonstrates a strong potential for achieving food security for over 15,000 people relying on the MPAs. Also, reef fish species abundance has increased not only inside MPAs, but also close to their borders, demonstrating the positive spill-over effects of conservation. Results		

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Lessons Learned:	Research indicates that Abrolhos MPAs have had important successes to be replicated. As fish multiply in the no-take zones, they spill over into the regions where fishing is permitted. Since 2000, CI's monitoring efforts have demonstrated an increase in fish abundance of up to 300 percent for some commercially important species. "Now, 83 percent of fishermen surveyed support the system, as they have seen direct benefits" says the fisherman Neves. CI- Brazil has designed a program for high school students that give them school credit for conducting research projects. Many of these students are descended from generations of fishermen, yet they are among the first to see what actually goes on under the water's surface.
References:	1. Conservation International, Brasil. Marine Ecosystems in Brazil. http://www.conservacao.org/ https://library.conservation.org/Published%20Documents/2008/Fact%20Sheet_Programa

Name:	Las Cruces		
Location:	Chile		
Size (ha):	4.8 / 100% no take zone		
Date declared / established:	1982 Marine Reserve / 2005 No take Zone		
Purpose of protection:	Research and preservation of marine biodiversity		
Habitat:	Rocky shore and subtidal area		
Type of Management / Management plan:	Co-Management / YES		
Zoning type	Marine reserves has 1 zoning type		
Integral	X	No take zones	
Partial (restricted sports and fishing)		Restricted sport and commercial fishing	
General (low impact activities)		Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	Full protection research and preservation of marine biodiversity		
Agencies involved	YES	NO	
Governance:	X		Private Organizations and Non-profit organizations. Pontificia Universidad Católica de Chile (PUC)
Organization support:	X		Pontificia Universidad Católica de Chile
Enforcement:		X	The high cost of enforcement may have prevented the protection of marine concessions administered by Chilean universities.
Stakeholders:		X	
Economics:		X	The export of fish, fish products, invertebrates, and algae from both exploited wild populations and aquaculture is one of the nation's most important sources of income.
Social:		X	critical for the understanding of human impact on coastal communities in Chile
Research:	X		Some research was developing during the 1970, no directly correlated to the Reserve implementation but yet it was developed in key species, trophic models and predations of the specie that latter were protected. During the past 20 years of growth, scientists from the PUC and Chilean and foreign collaborators have carried out research at ECIM on a variety of topics in ecology, biology, and coastal oceanography along most of the Chilean coast. Major research areas at ECIM have included trophic interactions and community regulation; recruitment and dispersal of marine invertebrates, fish and algae; the biogeography, biodiversity and macro-ecology of Chilean marine ecosystems; life histories and eco-physiology of marine invertebrates, fish and algae; ecotoxicology; biology and infectious diseases of macro-algae; coastal oceanographic processes; and resource management and conservation; as well as many others.
Monitoring:	X		Constant, there is a research station on the reserve. In essence, research from long-term studies (> 5 years) in Las Cruces provided information on natural restocking of fishery resources, rates of resource recovery and multi-scale ecosystem dynamics.
Biological:	X		Snail (Loco), key-hole limpets, mussels, shell fishes, macro-algae, sea urchin and kelp.
Ecological:	X		Exclusion of human harvesting greatly changed the ecological community, Removal of key stone species.
Community involvement:	X		Fisher Association of Quintay
Committee:		X	
Donations or Revenue:	X		Proyecto de Cooperación Italiana (CICS-EULA) through grants devoted to education and research in sustainable management of coastal benthic resources (1993). Chilean National Fund for Research and Technology.

Successes:	There was 20 times more abundant snails (locos). Locos produce 40 times more eggs after 10 years, increases in the abundance of several species of shellfish, macro-algae, kelp occurred after only 2–4 years of banning extractive activities. Reform of Chile's national fisheries laws; these laws now grant rights for local organizations to fish and manage their own sections of the coastline. Managers used findings from the marine reserve at Las Cruces to improve management of other MPA.

Lessons Learned:	Valuable benthic resource for small-scale fisheries in Chile helped convince the Fisheries Administration to incorporate the management and exploitation areas in the Fishery and Aquaculture Law. Fishers show an understanding of their role in and the consequences of marine conservation, which has been generated through co-management experiences. Change in the attitudes of fishers not only with respect to fishing but more important with regard to the conservation and future sustainability of resources.
References:	1. Lubchenco, J., S. Gaines, K. Grorud-Colvert, S. Airame, S. Palumbi, R. R. Warner, and B. S. Smith. (2007). The Science of Marine Reserves (2nd edition, Latin America and the Caribbean). Partnership for Interdisciplinary Studies of Coastal Oceans. www.piscoweb.org. 2. Manríquez, P.H. & Castilla, J.C. (2001). Significance of marine protected areas in central Chile as seeding grounds for the gastropod Concholepas concholepas. Mar Ecol Prog Ser Vol. 215: 201–211, 2001 3. Castilla, J.C. & Dúran, L.R. (1985). Human exclusion from the rocky intertidal zone of central Chile: the effects on Concholepasc oncholepas(Gastropoda) Oikos, Vol. 45, No. 3 (Dec., 1985), pp. 391-399 4. Castilla, J.C. & Gelcich (2008) Case studies on fisheries self-governance) FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONSFAO Fisheries Technical Paper 504. Pag 441 - 453

Name:	Jardines de la Reina, Cuba		
Location:	Cuba		
Size (ha):	13,000/ approx. 66% no take zone (2/3)		
Date declared / established:	1996		
Purpose of protection:	Conservation of marine ecosystem		
Habitat:	Reefs, mangrove swamps, over 600 Islands and keys, and sandy beaches.		
Type of Management / Management plan:	Co-management / YES		
Zoning type	Zone Under Special Regime of Use and Protection		
Integral		No take zones	
Partial (restricted sports and fishing)	X	Restricted sport and commercial fishing	
General (low impact activities)		Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	Protection of marine resources.		
Agencies involved	YES	NO	
Governance:	X		Council of Ministers of the Republic of Cuba, *Marine Research Center (ICM)*
Organization support:	X		WWF Canada and Ministry of Science, Technology and Environment of Cuba
Enforcement:	X		This area is closely guarded and accessed by only a few Cuban lobster boats, foreign divers and light-tackle fishers. Strictly enforced government laws against poaching protect the area.
Stakeholders:		X	The processes of stakeholder consultation occur at the political level rather than the management level. The government has granted Avalon a license to operate a substantial catch and-release fishing camp. As a by-product, the permit system makes it in the company's best interest to ensure that nobody affects the area.
Economics:	X		Economic benefit: Finfishing, spiny lobster catch and spillover of species with high commercial value. An economic study carried out to determine the economic benefit from the designation of the area as a Marine Park was carried out. The number of benefits in a Scenario with conservation and management tools is higher. Direct benefits of the protected area could be higher, with protecting tools and appropriate management decisions.
Social:		X	Good marine management combined with local economic development has helped to end unsustainable fishing.
Research:		X	Ministry of Science, Technology and Environment (research activities, monitoring and management of the area by scientific institutions, mainly the Coastal Ecosystems Research Center). 3.
Monitoring:	X		Ministry of Science, Technology and Environment
Biological:	X		Contains one of the healthiest reef fish communities in the entire Caribbean, hosting abundant sharks and other large predatory fish such as Nassau grouper.
Ecological:	X		It yields 55 % of the total fishing capture of the country, 35 % fish; almost 100 % shrimp; and around 10 % lobster. The fore reefs have high species diversity, well preserved benthic communities and some of the most spectacular fish assemblages of the world.
Community involvement:		X	
Committee:	X		1978 National Committee for the Protection and Conservation of Natural Resources and the Environment (*Comarna*)
Donations or Revenue:		X	
Successes:	A marine reserve in Cuba had 3 times greater fish biomass overall than in fished areas outside. Sharks, large groupers and snappers, and other top predators had the biggest increases in abundance and body size. Their biomass was 10 times greater inside the reserve than in non-reserve areas. New taxa for Cuba and the world have been discovered in both, terrestrial and marine habitats and many charismatic species occur there.		

Lessons Learned:	Economic Analysis carried out demonstrated the benefit from a no take zone (Marine Park) in Cuba.

References:	1. Figueredo Martín, T., Pina Amargós, F. and Angulo Valdés, J. (2010) Economical feasibility of the implementation of the Jardines de la Reina National Marine Park. http://www.bioecon.ucl.ac.uk/12th_2010/Figueredo%20Mart%EDn.pdf 2. Geoghegan, T., Smith, A.H. and Thacker, K. (2001). Characterization of Caribbean Marine Protected Areas: An Analysis of Ecological, Organizational and Socio-0Economic Factors. Caribbean Natural Resources Institute (CANARI) Technical Report N. 287 3. Convention on Biological Diversity. (2003). Report of the Executive Secretary on the Financial and Administrative Performance of the Secretariat and the Budget for the trust funds of the Convention. Follow-up report on the fellowship program. http://www.cbd.int/doc/meetings/cop/cop-07/information/cop-07-inf-19-en.pdf 4. Becker, N. and Y. Choresh. 2006. Economic Aspects of Marine Protected Areas (MPAs). Ed:UNEP-MAP RAC\SPA.Tunis.

Name:	Torre Guaceto Protected Area		
Location:	Italy		
Size (ha):	2200 / 15 % no take zone		
Date declared / established:	1992		
Purpose of protection:	Protection and promotion of the marine and coastal natural heritage, especial water quality, geomorphology, and local fauna and flora		
Habitat:	Seagrass, coastal dunes, rock and sandy sea beds, coral reefs, sandy shallow bay		
Type of Management / Management plan:	Co-Management / YES		
Zoning type		Forbidden activities that may cause damage or disturbance to the study and scientific research programs. (2000-2005 entirely a no take zone)	
Integral	X	No take zones	
Partial (restricted sports and fishing)		Restricted sport and commercial fishing	
General (low impact activities)	X	Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	Buffer zone surrounding no-take zones, regulating fishing effort to avoid overfishing of local resources		
Agencies involved	YES	NO	
Governance:	X		Administrated by Consorzio di Gestione di Torre Guaceto.
Organization support:	X		Italy World Wildlife Fund
Enforcement:	X		The TGMR covers about 2220 ha (entirely a no-take area at the time the study was done) and was formally established in 1992, although enforcement started being successful some years later (2000) when effective control by local authorities and reserve personnel began.
Stakeholders:	X		Scientists and fishermen worked together to select fishing gear that would minimize harm to the underwater habitats and protect functionally important fish predators and young fishes. Fishermen also agreed to fish only one day per week in the MPA. Management plan was designed to sustain fishermen's income while also limiting fishing impacts. Collaboration and co-management among fishermen, managers and scientists allowed for the maintenance of sustainable fisheries and the avoidance of overfishing in the partially protected area in Torre Guaceto. Many fishermen support the MPA, including the marine reserve portion, because of the long-term benefits they receive for their fishery
Economics:	X		Immediately after fishing was allowed in the partially protected area of the MPA, fishermen saw an increase in their income. After a few years, catch rates within the partially protected area had stabilized to a level that was greater than double the catch rates outside the MPA.
Social:	X		If in several years the socioeconomic impacts will be significant to the fishermen, the marine protected area will permit them to fish within the zones of the protected area that allow fishing.
Research:	X		Before the opening, we developed a protocol with local fishers and the MPA authority aimed at regulating fishing effort to avoid overfishing of local resources in the newly opened buffer zone of the MPA. We previously conducted a pilot study to select fishing gear (net type, length, and mesh size) to limit impact on fish species preying on sea urchins (to avoid ecosystem collapse, i.e., the transition from macroalgal beds to barrens caused by overgrazing by sea urchins [*Paracentrotus lividus* and *Arbacia lixula*]; juvenile fish stages; and benthic communities and habitats.
Monitoring:	X		Fishing inside the MPA started on 22 January 2005, and we collected data up to 10 April 2008. Experimental fishing outside the MPA started on 2 February 2005 and lasted until 14 March 2008. All catch data from all fishing trips were obtained.
Biological:	X		Distribution patterns of fish, sea urchins, and benthos were assessed at two protected and two unprotected sea breams and sea urchins and

Ecological:	X		Immediately after fishing was allowed in the partially protected area of the MPA, fishermen saw an increase in their income. There are biological/ecological studied like this study aims at investigating distribution patterns of fish predators, sea urchins and the extent of barrens (bare rocks with

Ecological:	X		Immediately after fishing was allowed in the partially protected area of the MPA, fishermen saw an increase in their income. There are biological/ecological studied like this study aims at investigating distribution patterns of fish predators, sea urchins and the extent of barrens (bare rocks with or without encrusting algae) in shallow Mediterranean rocky habitats, at the marine protected area (MPA) of Torre Guaceto and adjacent fished locations. Striped red mullet, octopus, and peacock wrasse
Community involvement:	X		Scientists and fishermen who collaboratively studied the MPA designed an adaptive co-management plan to allow fishing in a partially protected area of the MPA. Working with local fishermen for the next several years to help them develop fishing activities in other areas and avoid the entire marine protected area.
Committee:	X		Consortium of Management (Municipalities of Brindisi, Carovigno and WWF Italy) Consultative Committee: Reserve committee
Donations or Revenue:		X	
Successes:	Catch rates of commercially fished species including striped red mullet, octopus, and peacock wrasse averaged 4 times higher than catch rates outside of the MPA. After a few years, catch rates within the partially protected area had stabilized to a level that was greater than double the catch rates outside the MPA. By 2003, the MPA had 2 to 10 times as many sea breams, which are important commercial fishes, compared to a fully fished area. Sea urchins, which are eaten by sea breams, were 10 times less abundant inside the reserve because of the higher numbers of their fish predators (see figure below). The decrease in urchins, which eat seaweed, cascaded further down the food web, increasing the cover of large seaweed to 47 percent of the seabed inside the reserve. Meanwhile, surrounding fished areas where seaweed is grazed down by urchins had only 15 percent cover of seaweed. A recent study provided an indirect assessment of the fishing impact. The comparison of fishing yield inside and outside the TGMR showed that quantities of commercial fishes extracted from the protected area with trammels were roughly fourfold greater than those obtained outside the reserve.		
Lessons Learned:	Increased trust and collaboration between scientists and fishermen is essential to designing marine reserves within MPAs that can benefit both conservation and fisheries. Incorporating fishers' input, in particular, alleviates their skepticism toward scientists, increases the likelihood they will respond positively to marine reserves, and can be one of the most important criteria for successful fisheries management.		
References:	1. Guidetti, P. (2006) Marine Reserves Re-establish lost predatory interactions and cause Community Changes in Rocky Reefs. Ecological Applications, 16(3), 2006, pp. 963–976 by the Ecological Society of America		

Name:	Capo Rizzuto Marine Reserve		
Location:	Italy		
Size (ha):	14,721 / 4% prohibiting most access (585 ha)		
Date declared / established:	1991		
Purpose of protection:	The preservation of a stretch of coastline that is unique from an enviromental point of view, with over 42 kilometres of small bays, and the protection of the vast and full archaeological heritage on its seabed.		
Habitat:	Coral Reefs 7. Rocky coast and bank currents, creating mazes with tunnels and gorges		
Type of Management / Management plan:	Co-Management / YES		
Zoning type	Marine Reserve has 3 zooning types		
Integral	X	No take zones	
Partial (restricted sports and fishing)	X	Restricted sport and commercial fishing	
General (low impact activities)	X	Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	Sustainable development and promote the knowledge of the Marine Protected Area		
Agencies involved	YES	NO	
Governance:	X		The Italian Ministry of Environment is the supervising body, day to day management is placed with the Province of Crotone.
Organization support:		X	
Enforcement:	X		The site has also implemented a state of the art remote camera system allowing it the ability to monitor, 24/7/365, human uses in the restricted zones. Violators observed on camera doing illegal activities were met by the coast guard and port police often while still in the protected zones.
Stakeholders:		X	Thanks to agreements made with the fishing operators, the Park Authority has promoted new services of fruition in Capo Rizzuto Marine Reserve, developing a project of "fishing and tourism" which already represents a reality in other Marine Protected Areas. Thanks to the availability of small fishing boats and to the collaboration of the fishermen who own them, it will be possible to accompany tourists and fishing areas' residents close to bays and little inlets where, provided with the adequate fishing equipment (fishing lines, rods, and reels) they will be given the opportunity to fish only pre-arranged quantities
Economics:	X		Define an optimal pattern of integrated management of the site, the study and planning of a rational management of the fish resources in order to carry out fishing activities in a way sustainable with respect to conservation of nature, promotion of socie-economic development compatible with naturalistic landscape giving priority to local traditional activities.
Social:	X		The marine protected area runs an aquarium, the only one in Calabria that serves as a regional education center about oceans and the marine protected area.
Research:	X		Carrying out of study and scientific research programs
Monitoring:	X		Aim to a long term monitor program to assess the Scleractinia corals diversity, abundance, distribution, association with other benthic communities and health.
Biological:	X		Stretch of Mediterranean Sea characterized by the variety of natural environments and by the particular geomorphology of the coast. It is the great variety of the sea bottom which makes the Marine Reserve a unique environment from a naturalistic point of view, an environment which is necessary to protect and preserve, with its widespread grasslands of *Posidonia Oceanica*, the madreporic reefs of *Cladocora Caespitosa*, the *Diplodus vulgaris*, and the *Euscarus Cretensis*. There are a number of fish species which find shelter and food here: groupers, barracudas, little tunnies, and sometimes dolphins. 10 species of coral, 20 app of sponges. The marine environment is rich in various species of algae; there is also an immense sea bed of Posidonia sea grass. In the area, you can find several types of banks, sandy and rocky

Biological:	X		Stretch of Mediterranean Sea characterized by the variety of natural environments and by the particular geomorphology of the coast. It is the great variety of the sea bottom which makes the Marine Reserve a unique environment from a naturalistic point of view, an environment which is necessary to protect and preserve, with its widespread grasslands of *Posidonia Oceanica*, the madreporic reefs of *Cladocora Caespitosa*, the *Diplodus vulgaris*, and the *Euscarus Cretensis*. There are a number of fish species which find shelter and food here: groupers, barracudas, little tunnies, and sometimes dolphins. 10 species of coral, 20 app of sponges. The marine environment is rich in various species of algae; there is also an immense sea bed of Posidonia sea grass. In the area, you can find several types of banks, sandy and rocky ones, each with various and different population and species. The rich diversity of animal species includes: Porifer, Cnidarian, Molluscan, Annelids, Crustaceans and Echinoderms. Common fish are: Groper, Striped Red Mullet, and Rainbow Wrasse, Rock fish, Barracuda, Moray, European Conger, small Tuna fish and the rare and tropical colourful parrotfish. Science staff of the protected area, also uses the aquarium facilities to rehabilitate sea turtles (*Caretta caretta*), with about a dozen treated for injuries and released each year.
Ecological:		X	The seabed has vast prairies of seagrass, a marine plant endemic to the Mediterranean, which has a fundamental role in the ecological system.
Community involvement:		X	
Committee:	X		The Committee is named with the decree of the Ministry of the Environment and Protection of the Territory and has the following settlement
Donations or Revenue:		X	
Successes:	Total fish density was on average 1.15 times greater in reserves that in fished areas. Higher level of enforcement is correlated with a increase of density of species.		
Lessons Learned:	Well enforced reserves have on average ~2.65 times greater fish biomass.		
References:	1. Provincial di Crotone. (2011). Area Marina Protetta Capo Rizzuto. http://www.parks.it/riserva.marina.capo.rizzuto/Epar.php 2. Scovazzi, T. (1999) Marine specially protected areas: the general aspects and the Mediterranean regional system Volume 52 of International environmental law and policy series. Kluwer Law International 3. Fenner, D., Riolo, F., and Vittorio, M. (2008). A survey of the corals within diving depths of Capo Rizzuto Marine Protected Area, Calabria, southern Italy, 2008. 4. Guidetti, P., Milazzo, M, Bussotti, S., Molinaric, A., Murenud, M., Pais, A., Spanò, N. Balzano, R., Agardy, T., Boero, F., Carrada, G., Cattaneo-Vietti, R., Cau, C., Chemello, R., Greco, S., Manganaro, A., Notarbartolo di Sciarak, G., Fulvio Russo, G., and Tunesi, L. (2008) Italian marine reserve effectiveness: Does enforcement matter? Biological Conservation 1 4 1 (2 0 0 8) 6 9 9 –7 0 9		

Name:	Kisite Marine National Park, Kenya		
Location:	Kenya		
Size (ha):	1100 / 10% no take zone		
Date declared / established:	1973 / 1990		
Purpose of protection:	Promotion of tourism and the need to conserve marine bio-diversity for use by prosperity.		
Habitat:	Coral-reef, coral gardens, mangroves, seagrass, intertidal, and subtidal		
Type of Management / Management plan:	Pilot Project on Partnerships / developing		
Zoning type	Marine Reserves have 2 zooning types		
Integral	X	No take zones	
Partial (restricted sports and fishing)		Restricted sport and commercial fishing	
General (low impact activities)	X	Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	Protection of biodiversity and fishing grounds.		
Agencies involved	YES	NO	
Governance:	X		Managed by Kenya Wildlife Service
Organization support:		X	Partnership for Interdisciplinary Studies of Coastal Oceans The World Conservation Union.
Enforcement:	X		In 1990, when the management of KMNP switched from a government department to the parasternal Kenya Wildlife Service, management and protection activities were considerably strengthened in the MPA, Kenya Wildlife Service (KWS) Enforcement by police in 1989.
Stakeholders:		X	Kisite was the first Marine National l Park created 1973. In 1976 the park boundaries were revised and re-demarcated, and shifted outwards. In 1978 Mpunguti was declared as a Marine National Reserve following local disputes over the loss of fishing grounds caused by the establishment of the strict National Park, which they see as being unfairly dominated by outsiders
Economics:		X	Quantified Value KSh 145 mill/yr. Local gains in tourist-related income and employment are minimal and still far outweighed by the opportunity costs of fishing and marine resource utilization activities foregone in the park area. Which local see as being unfairly dominated by outsiders. KWS revenues are far higher than the benefits that local communities gain from the utilizations of MPA resources (some US $39,000 in 1998), and these local benefits are overshadowed by the opportunity cost of fishing activities foregone (some US$ 172,000).
Social:		X	No studies were carried out, users of the areas (mostly fisherman) have protested against the reserve zones. Local population dependent on fishing (often only revenue) and tourism. Potential conflict between fishers and people relate d to tourism industry for access to resources. The park is seen as depriving fishers of fishing grounds.
Research:	X		The scientists determined that reduced use of destructive fishing gear in the fished MPA had successfully increased fish stocks and had kept ecological diversity the same over the 8-year period.
Monitoring:		X	
Biological:	X		Snapper, rabbit fish, parrotfish, wrasse, puffer fish, emperor fish, groupers, king fish, lobsters, crabs, and prawns. The reserve contains one of the most productive fishing grounds and contains a higher diversity of marine resources. Spawning seasons of reef fishes belonging to 21 families and 73 species along the East African coast. Dolphins present and 45 varieties of coral
Ecological:	X		Ecological assessment was review after the implementation, relies heavily in ecosystem services and their value. Defined as an Eco-regionally important area. The reef, mangrove and seagrass habitats in KMNP/MMNR support and maintain local fisheries and marine resource production because they provide breeding grounds, nursery and habitat. Snappers, emperors and groupers were

Ecological:	X		Ecological assessment was review after the implementation, relies heavily in ecosystem services and their value. Defined as an Eco-regionally important area. The reef, mangrove and seagrass habitats in KMNP/MMNR support and maintain local fisheries and marine resource production because they provide breeding grounds, nursery and habitat. Snappers, emperors and groupers were more abundant in the park and appear to be spilling over into fishing grounds. Protection did not affect species number or diversity. Reserves helped to support regional diversity by protecting species that were unable to persist in fished areas. Of the 110 species recorded on protected reefs, 52 were not found in fished areas (McClanahan1994).
Community involvement:		X	These communities are becoming less and less willing and less able to afford, to support MPAs in which they have no economic stake and which yield them no tangible benefits.
Committee:		X	
Donations or Revenue:	X		The reserve made 1.23 mill pear year (U.S.), US 1.6 million from tourism and US 39,000 from fisheries. Almost 47% of Kenya's tourism occurs here. US$ 5 per adult overseas visitor. The projected budget requirements for KMNP/MMNR average US$ 135,000 a year over the period 2000-2004 (KWS 2000). This is nearly eight times the allocation that KMNP/MMNR receives from KWS central funds, and exceeds revenues generated by the park.
Successes:	Fish biomass was 11.6 times greater. Species with long life spans can take decades to recover. Survey in Sept. 1992 and Jan. 1994 for commercial species: higher densities of some commercial species than the Mpunguti MNP (34, 35). More sea urchins in the reserve than the park because of overfishing of their predators. Large predators were four times denser and sea urchins 100 time less numerous in protected reefs. Species diversity was also higher in protected areas. Catches have risen steadily over the 1990s, and are approximately 1.5 tons/ km^2.		
Lessons Learned:	More biodiversity compared to the MPA and provided more protection to branching corrals than fished areas. Conflict Resolution: Tourism Licensing Committee has minimized conflicts between Fisheries Department and the Kenya Wildlife Service		
References:	1. Guénette, S, Chuenpagdee, R., and Jones, R. (2000). Marine Protected Areas with an Emphasis on Local Communities and Indigenous Peoples: a Reviewthe Fisheries Centre, University of British ColumbiaVolume 8 Number 1 2. Emerton, L. and Tessema, Y. (2001) Marine Protected Areas: the Case of Kisite Marine National Park and Mpunguti Marine National Reserve, Kenya. 3. Partnership for Interdisciplinary Studies of Coastal Oceans. 2007. The Science of Marine Reserves (2nd Edition, International Version). www.piscoweb.org. 22 pages. 4. Roberts, C.M. and J.P. Hawkins. 2000. Fully-protected marine reserves: a guide. WWF Endangered Seas Campaign, 1250 24th Street, NW, Washington, DC 20037, USA and Environment Department, University of York, York, YO10 5DD, UK.		

Name:	Flower Garden Bank		
Location:	Texas		
Size (ha):	14568.68		
Date declared / established:	1992		
Purpose of protection:	It was this wonderful biological diversity and breathtaking beauty that prompted researchers and recreational divers to seek protection for the Flower Gardens education, science, resource protection, and regulatory programs		
Habitat:	sandy bottoms, open water, and coral and rocky reefs underwater mountains called salt		
Type of Management / Management plan:	Adaptive Management / YES		
Zoning type	Marine Reserve has 2 zooning types		
Integral	X	No take zones	
Partial (restricted sports and fishing)		Restricted sport and commercial fishing	
General (low impact activities)	X	Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	No take zones and buffer zones		
Agencies involved	YES	NO	
Governance:	X		National Oceanic and Atmospheric Administration (NOAA) office of National Marine Sanctuaries and National Marine Sanctuaries
Organization support:	X		Audubon Aquarium of the Americas, Texas State Aquarium, Tennessee Aquarium and The Aquarium at Moody Gardens, National Marine Sanctuary Program.
Enforcement:	X		A variety of regulations were put into place enabling the sanctuary to provide additional protections to the natural resources present (NOAA, 2001a). While fishing is permitted within the sanctuary it is restricted to conventional hook and line and take of other resources is generally prohibited. Enforcement and surveillance is difficult within the FGBNMS due to the distance from shore and inaccessibility of the site. The sanctuary relies greatly on assistance from the U.S. Coast Guard, NOAA Fisheries and state enforcement agencies for an enforcement presence. Although these agencies have been extremely cooperative, there is very little enforcement activity within the sanctuary at this time.
Stakeholders:		X	The 16 voting council seats represent a variety of regional interests and stakeholders, including: Recreational Diving, Diving Operations, Oil and Gas Industry, Conservation, Education, Research, Commercial Fishing, and Recreational Fishing. In 2006, FGBNMS staff initiated the MPR process by sponsoring several public scoping meetings to discuss proposed management alternatives and to solicit public comment on the future of the sanctuary. fishing activities within the sanctuary are not well documented
Economics:		X	The East and West Flower Garden Banks, there are currently 15 production platforms and approximately 111 miles (179 km) of pipeline (half of which are dedicated oil pipelines). From 2004-06, three of these platforms and approximately 83 miles (134 km) of pipeline were added within the MMS four-mile regulatory zones of the East and West Flower Garden Banks. A gas pipeline has been constructed within the sanctuary near East Flower Garden Bank to connect HIA389A to a subsea station outside of the sanctuary boundaries. Social and economic aspects of potential changes to the management plan have been initiated. Conventional hook and line fishing, both recreational and commercial, is allowed within the sanctuary. Research is needed to understand the economic impacts of the changes on users such as fishermen, the oil and gas industry, and diver operators.
Social:		X	In the Gulf of Mexico, recreational fishers account for up to 64 percent of the total catch of fish species of concern (Coleman et al. 2004). The red snapper stock is “overfished” and has been undergoing overfishing in the Gulf of Mexico since the late 1980s Social and economic aspects of potential changes to

Social:		X	In the Gulf of Mexico, recreational fishers account for up to 64 percent of the total catch of fish species of concern (Coleman et al. 2004). The red snapper stock is “overfished” and has been undergoing overfishing in the Gulf of Mexico since the late 1980s Social and economic aspects of potential changes to the management plan have been initiated.

Research:	X		Wide range of research activities are conducted in the sanctuary: monitoring reef health, cephalopod, elasmobranch and sea turtle surveys, mass coral spawning, genetics, fish censuses, and deep-water remotely operated vehicle surveys. Researchers from universities, Ocean Exploration, government and non-government organizations, and other institutions regularly assist us in evaluating and exploring the reaches of our sanctuary. In the late 1960's, Robert Alderdice and James Covington established the Flower Gardens Ocean Research Center (FGORC), heralding a period of intense multi-agency, interdisciplinary research, which continues to this day. The sanctuary strongly encourages researchers and students to conduct scientific studies at the site. In particular, the sanctuary encourages science that supports management concerns:
Monitoring:	X		Monitoring, in many different forms, is an essential part of the science efforts at Flower Garden Banks National Marine Sanctuary. Click on the links below to visit each of the following categories: Water Quality, Long-Term Monitoring, Coral Bleaching, Coral Spawning, Hurricanes and Tropical Storms, Marine Debris. As the agency responsible for offshore leasing, the Minerals Management Service has been involved in wide ranging research, monitoring, and regulatory programs associated with the Flower Gardens. Long-term monitoring of the coral cap regions of the sanctuary is designed to examine the health of the reef through direct measurements of the percent of coral cover, the occurrence of coral mortality, coral diversity, and growth or retreat of coral tissue. The earliest quantitative data on coral and other reef invertebrates at the East and West Flower Garden Banks was collected in 1972. The first regularly collected data on benthic communities began in 1978 with Continental Shelf Associates, Inc. and Texas A&M University researchers, and continued through 1983. A comprehensive long-term monitoring program was developed for the Flower Garden Banks by academia, industry, and the Minerals Management Service (MMS) in the late 1980's. A contract for the first monitoring effort under this program was initiated in 1988. This long-term monitoring contract continues today and is maintained by both the MMS and the FGBNMS.
Biological:	X		This diverse group includes bony fishes, as well as cartilaginous fishes such as sharks, skates, and rays Approximately 20 species of sharks and rays have been documented at the Flower Garden Banks, some. Loggerhead and hawksbill sea turtles reside at all three banks of the sanctuary throughout the year. Loggerheads are most often seen at. Although fishing pressure is perceived to be moderate, the impact on local fish populations is unknown at this time. Snapper, grouper, wahoo, king mackerel and jacks are believed to be the primary species targeted at the Flower Garden Banks. spawning sites. On various occasions, some species have been observed aggregating in small groups, expressing courtship and reproductive behavior. It is critical to protect these animals from focused fishing efforts during these periods. The marbled grouper is of particular concern, as it is a rare species throughout the Gulf of Mexico and the Caribbean.
Ecology:	X		Together the bank zones containing high diversity coral reefs cover over 450 acres. $345,896 Long-Term Monitoring at the East and West Flower Garden Banks. Virtually no significant long-term changes have been detected in coral reef populations, cover, or diversity at the Flower Garden Banks since quantitative surveys of the reefs began.
Community involvement:			The Council is a way to get community members involved in sanctuary efforts and develop a sense of stewardship toward the sanctuary. The Sanctuary Advisory Council holds open meetings to ensure continued public input on management issues and to increase public awareness and knowledge of the sanctuary environment. Public participation at these meetings is welcomed and encouraged. Fishing rights Alliance The FGB staff has proposed several changes in the management plan, including boundary expansion, gear limitation and activity restrictions. Some of these changes will cost us jobs, economic activity and our right to use the resource.

Committee:	X		Flower Garden Banks National Marine Sanctuary established a Sanctuary Advisory Council (Council) in the fall of 2005. The Council consists of 21 members: 16 non-governmental voting members and 5 governmental non-voting members. The 16 voting council seats represent a variety of regional interests and stakeholders represent a variety of regional interests and stakeholders, including: Recreational Diving, Diving Operations, Oil and Gas Industry, Conservation, Education, Research, Commercial Fishing, and Recreational Fishing. holds open meetings to ensure continued public input on management issues and to increase public awareness
Donations or Revenue:	X		The National Marine Sanctuary Foundation, Gulf of Mexico Foundation, and Sea Space are some of our financial supporters. Minerals Management Service (MMS)
Successes:	Reef foundation formed by large, stony corals (e.g. brain and star corals), about 23 coral species, over 850 other reef invertebrate species, ~250 fish species, and 125+ algae species. Long-term monitoring studies of the coral reef areas since the mid 1970's indicate no significant detrimental impacts related to oil and gas activities. Enhancing everyone's appreciation for them environment that is being protected and for fostering a better understanding between government and industry personnel with a mutual interest in the area. Success has come through communication and cooperation between industry and government agencies such as the National Oceanic and Atmospheric Administration and the Environmental Protection Agency. Monitoring results have shown that the living corals of the FGB remain healthy and growing.		
Lessons Learned:	Minimize run-off to reduce pollution in the ocean. Vessels are not allowed to discharge untreated sewage. These are designed to aid in management and protection of sanctuary resources and the reefs and banks of the northwestern Gulf of Mexico that are ecologically connected to the sanctuary		
References:	1. National Oceanic and Atmospheric Administration (2007) National Marine Sanctuaries. Flower Garden Banks State of the Sanctuary Report. 2. Cluck, R.D. (2011). Mineral Management Service. *Case Study: Adaptive* Management of the Flower Garden Banks. http://www.boemre.gov/envmonitoring/PDFs/AdapManCaseStudy.pdf 3. http://www.thefra.org/fgb.htm 4. Levesque, J.C. (2011). Commercial fisheries in the northwestern Gulf of Mexico: possible implications for conservation management at the Flower Garden Banks National Marine Sanctuary. Mar. Sci. first published online September 27, 2011 doi:10.1093/icesjms/fsr155 5. National Oceanic and Atmospheric Administration (2010) Flower Garden Banks National Marine Sanctuary Socioeconomics. http://sanctuaries.noaa.gov/science/assessment/pdfs/fgbnms_socioeconomics.pdf		

Name:	St. Eustatius Marine Park (STENAPA)		
Location:	St. Eustatius/ Netherlands		
Size (ha):	2700 / 18 % no take zone		
Date declared / established:	1996/1998		
Purpose of protection:	Protect and manage the island's marine resources.		
Habitat:	Diverse coral reef, seagrass, sandy seabed and open ocean communities. s biologically diverse coral reefs, seagrass beds, sandy bottom, and open ocean communities		
Type of Management / Management plan:	Integration of Co-Management / 1998		
Zoning type:	Marine Reserve has 2 zoning types		
Integral	X	No take zones	
Partial (restricted sports and . fishing)	X	Restricted sport and commercial fishing	
General (low impact activities)	X	Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	Conservation, protect and manage the island's marine resources.		
Agencies involved	YES	NO	
Governance:	X		St Eustatius National Parks Foundation (STENAPA) - a local nongovernmental. STENAPA is legally mandated by the Island Government to manage all the island's protected areas.
Organization support:		X	The marine Park recruits scientifically qualified volunteers to engage in marine research.
Enforcement:	X		Local Police, lack of appropriated trained staff
Stakeholders:	X	X	The creation and implementation of the Marine Park occurred without input from the local dive shops, fishers, and other stakeholders. Therefore STENAPA has many challenges to face, and community awareness and education are now a primary focus of the marine Park. Fishermen primarily fish on the narrow shelf surrounding the island. In 1996 STENAPA was granted effective control over the island shelf from the high water mark to the 30 meter (100 ft) depth contour. Stakeholders have been involved throughout the planning process in particular with the determining the location and developing the rules for the reserves. The island of St. Eustatius is very small and the STENAPA staff is in touch with stakeholders on a regular basis through informal meetings. Additionally, stakeholders have participated in management activities in the past, specifically when there are issues that could use the knowledge and skills of specific stakeholder groups. For example, fishermen and divers have been asked to help implement a lionfish action plan to identify and eradicate the invasive species.
Economics:		X	Contributing to income for the 70% of the islands population employed in restaurants, hotels and other services. The aggregated value of the fishery sector is also an important factor to the island economy. The spiny lobster fishery is without doubt the most important fishery on the island, where chicken wire and bamboo traps are used. The total lobster catch for 2003 is estimated to be approximately 4 tons, which represents a gross value of 100,000 NAf ($55,000). There are some on-going socio-economic assessments that are conducted which include recreational use information. Additionally an economic valuation was carried out for one of the marine reserves. In the 2007 a willingness to pay study was also carried out by STENAPA staff, to estimate the monetary value of a dive experience.
Social:		X	The creation and implementation of the Marine Park occurred without input from the local dive shops, fishers, and other stakeholders. Therefore STENAPA has many challenges to face, and community awareness and education are now a primary focus of the marine Park.
Research:			Scientific research has played and important part in the development of the Marine Protected park. I have served as the basis for the surveying and

Monitoring:	X		Biological monitoring is conducted by STENAPA on an annual basis. The main focus of this work is on the marine reserves and the park on the Caribbean side of the island; the Atlantic side is too rough for regular monitoring. A variety of information is collected using the Coral Watch, DCNA Bird Monitoring, Reef Check, Sediment analysis, Fisheries Assessment, and Turtle Monitoring protocols.
Biological:	X		Healthy coral and fish populations. Area is used by at least 14 IUCN Red List species including the Threatened queen conch. There are 3 types of coral reef within the marine park, other species include angelfish, butterfly fish, flying gurnard, Moray eels, spotted drums, Frogfish, sea horses, octopus, lobster, Rays, sharks, and turtles.
Ecological:		X	The Statia Marine Park was designed to be part of an ecological network across countries in the Caribbean that were part of the Dutch Caribbean (previously the Netherland Antilles).
Community involvement:	X		STENAPA has high visibility on the island and most residents know about the park and the organization. Most people support the site because they recognize the unique beauty of the area and want to maintain its health. There are some stakeholders, however, those have been impacted by site regulations and do not support the site.
Committee:	X		Executive Council
Donations or Revenue:	X		Year passes are sold for US$20 and single dive passes are sold for US$4. User fees are not sufficient to sustain the marine park due to lack of substantial tourism. Worldwide volunteer program was established in 2001. In 2001, Executive Council issued power to the marine Park to issue permits that required divers to pay visitor fees. Dutch Caribbean Nature Alliance, Coral Reef Alliance.
Successes:	Install a Vessel Monitoring System with alerts to unsustainable practices. Monitor the current status, ongoing damage and recovery of the coral reefs. Establish a protocol for response and restoration after damage has occurred. Anchors cause damage to coral reefs during setting, retrieval, and while at anchor. Setting: Corals are broken, fragmented, or overturned as the anchor drops into		
Lessons Learned:	Maintaining scientific interest in the Marine Park is necessary for St. Eustatious to insure the future of its unique marine environment and full fill the socio-economic requirement for the island tourism industry.		
References:	1. Plummer, K.L. and De Witt, P. (2004). St. Eustatius Marine Park: A case of MPA Problems and Solution in the Caribbean. GCFI :55 In: 55 Proceedings of the Fifty Fifth Annual Gulf and Caribbean Fisheries Institute.-- Xel HaMexico.-- Pp. 675-684 2. MacRae, D.R. and Esteban N. (2007), *St. Eustatius Marine Park Management Plan*. Coastal Zone Management (UK) and St Eustatius National Parks Foundation (STENAPA) 3. Dutch Caribbean Nature Alliance (2011) *Management Success Data Report January – December 2010, St. Eustatius The Quill National Park, Boven and Botanical Garden, St Eustatius National Marine Park*. Unpublished DCNA report. 4. Gombos, M., A. Arrivillaga, D. Wusinich-Mendez, B. Glazer, S. Frew, G. Bustamante, E. Doyle, A. Vanzella-Khouri, A. Acosta, B. Causey, C. Rolli and J. Brown. 2011. A Management Capacity Assessment of Selected Coral Reef Marine Protected Areas in the Caribbean. Commissioned by the National Oceanic and Atmospheric Administration (NOAA) Coral Reef Conservation Program (CRCP), the Gulf and Caribbean Fisheries Institute (GCFI) and by the UNEP-CEP Caribbean Marine Protected Area Management Network and Forum (CaMPAM). 269 pp.		

Name:	Mombasa Marine National Park and Reserve		
Location:	Kenya		
Size (ha):	20,000/ 63% of fishing area is fully protected		
Date declared / established:	1986/ 1989		
Purpose of protection:	Fishing ground, promotion of tourism and the need to conserve marine bio-diversity for use by prosperity.		
Habitat:	Seagrass beds, coral reef areas, coral garden, channels, and cliffs.		
Type of Management / Management plan:	Co-Management/ YES		
Zoning type	Marine reserve has 2 zoning types		
Integral	X	No take zones	
Partial (restricted sports and fishing)	X	Restricted sport and commercial fishing	
General (low impact activities)		Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	The park is a no take zone, while the reserve can be fished with gear restrictions, licenses to fish are required		
Agencies involved	YES	NO	
Governance:	X		Kenya Wildlife Service (KWS)
Organization support:	X		Fisheries Program of the Kenya Marine and Fisheries Research Institute, from Lamu and Vanga.
Enforcement:	X		Began in mid-1990's and KWS is responsible
Stakeholders:		X	Negative attitudes due to lack of alternatives of resources for income and consultations between them and authorities.
Economics:		X	Not enough compensations or alternatives for fisherman, who were prohibited to fish in their own prime areas.
Social:		X	Most fishermen were not educated on vocational achievement and still living within a form of extended family setup. This implies that fisherman have minimal or no alternatives for employment.
Research:		X	Lack of information on fish stocks and unreliable data have been a major concern in the management of the marine resources of Kenya.
Monitoring:	X		An observed benefit was a short- term increase in fish catches in the Reserve attributed to a spillover effect from the Park but, over the years, catches have returned to lower levels. The data from the reserve shows a trend in recovery of reefs after establishment of the MPA, but the 1997/98 El Niño bleaching event lead to dramatic decreases of coral cover due to mortality in all MPAs. This demonstrates the value of long-term consistent monitoring as many of these trends have management implications.
Biological:	X		Demersal species 42%; pelagic species 18%; crustaceans 11%; sharks, rays and similar species 18%; mollusks and echinoderms 4%; deep sea and game fish 6%
Ecological:	X		More than 50 species recorded in 2002 with more than 100 individuals. Fishing areas lacked large sized fish in all families
Community involvement:	X		Organizations for boat tour operators, beach curio traders and fishermen have been established and regular meetings are organized with the warden.
Committee:		X	
Donations or Revenue:	X		IUCN donated US$2000–3000 to the reserve to cover some of the costs, such as meetings or hiring additional assistance. Annual revenues from citizen and foreign visitors may be increased by 60% to $261,932 through the implementation of proposed higher park fees of $3.10 for citizens and $15 for foreign visitors.
Successes:	Catch per unit effort of fish traps has increased and have concluded that fully protected reserves are vitally important in preventing the destruction of Kenya's coral reefs by grazing sea urchins.		
Lessons Learned:	Learned how to work closer and communicate better to community and stakeholders involved in the park and reserve. Lack of information on fish stocks, in addition to inadequate and unreliable data, have been a major concern in the management of marine resources in Kenya. It is often necessary to patrol reserves at night to control illegal fishing. Catches are enhanced close to the boundaries of no-take zones through spillover.		

References:	1. Cosmas Nzaka Munga, M. O.-G. (2010). Resource Users Perceptions on Continued Existence of the Mombasa Marine Park and Reserve, Kenya. Western Indian Ocean J. Mar. Sci. Vol. 9, No. 2, pp. 213-225. 2. Ngugi, I (2002). Economic Impacts of Marine Protected Areas: A Case Study of the Mombasa Marine Park (Kenya), The University of Dallas – Graduate School of Social Sciences ergo, Vol.1 N.1

Name:	Western Mediterranean		
Location:	Mediterranean		
Size (ha):	9,741,000/ Studies suggest 35% need to have no-take reserves		
Date declared / established:	1975		
Purpose of protection:	Ranges from full protection, no take zones to partial protection were some activities are permitted.		
Habitat:	Seagrass meadows, kelp forest, rocky and vermetid reefs, open oceans for the migration of pelagic species, deep sea corals, hydrothermal vents, sand and mud flats bottoms, estuary, Balearic Islands, seamounts, upwelling zones, caves, lagoon, salt marsh, mangrove, canyon and cold seep Network of protected areas		
Type of Management / Management plan:	Co-management/ 26 of 57 have a management plan, 13 of 57 are under development, and 18 don't have any.		
Zoning type	Marine reserve has 3 zoning types		
Integral	X	No take zones	
Partial (restricted sports and fishing)	X	Restricted sport and commercial fishing	
General (low impact activities)	X	Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	Ranges from full protection, no take zones to partial protection were some activities are permitted		
Agencies involved	YES	NO	
Governance:	X		IUCN
Organization support:	X		WWF and MedPAN
Enforcement:	X		Enforcement is not effective due to a variety of illegal activities, no visible makers, man power or personnel, and lack of appropriate equipment.
Stakeholders:		X	Not taken into consideration
Economics:		X	Only some communities that are not directly affected by the implementation of the MPA had some economic benefits.
Social:		X	Has been noted notes that the continuation of present day exploitation rates and methods will have huge economic and social impacts, because of the degradation and loss of valuable natural resources
Research:		X	Establishing a network of marine reserves is fundamental to protecting natural resources and providing a sustainable future for many economic activities in the Mediterranean, and to ensure a high quality of life for the people living close to the Mediterranean
Monitoring:	X		24 MPA's (39% of 62 questioners) stated that there are regular monitoring programmes to support management objectives set up in their MPA, and only in 14 MPAs (or 23%) managers plan to carry out studies to assess the effectiveness of their management
Biological:	X		The Mediterranean supports between 8% and 9% of the world's biodiversity, over 20 species of cetaceans, nesting area for sea turtles, and home to endangered species like the sperm whale, seals, and sea turtles.
Ecology:	X		The proposed network is based on available information on species and habitats of the Mediterranean Sea. Data on status of habitats and species under protection and management show that ecological information is not easily accessible for many managers. Very few MPAs reported information on the increase or decrease of different marine features and habitats within the protected area.
Community involvement:	X		According to the managers, 58% of the community supports the MPA
Committee:		X	
Donations or Revenue:		X	
Successes:	Average fish biomass was 4.7 times higher and average fish weight was 3.4 times higher inside the reserves than in the surrounding fished areas.		
Lessons Learned:	Adult fishes moved outside the reserve and eggs drifted outside the spanning areas. It is important in a network of MPA's to insure adequate space between MPA's to ensure		

Lessons Learned:	Adult fishes moved outside the reserve and eggs drifted outside the spanning areas. It is important in a network of MPA's to insure adequate space between MPA's to ensure coherence

References:	1. International, Greenpeace. (n.d.). *Marine Reseves for the Mediterranean Sea.* Ottho Heldringstraat 5, 1066 AZ Amsterdam, Netherlands: Greenpeace. 2. Protect Planet Ocean (2010). *Western Mediterranean*. http://www.protectplanetocean.org/collections/successandlessons/casestudy/westernmed/caseStudy.html

Name:	Puerto Peñasco Marine Reserves		
Location:	Mexico		
Size (ha):	18 km of coastline/ 30% of an entire fishing sector's fishing grounds		
Date declared / established:	1998/ 2002		
Purpose of protection:	The reserve network protected an offshore (near an island) where species where abundant, another are with moderate abundance, and one area near the port that was high in abundance but recently had been heavily fished.		
Habitat:	Rocky reefs, small eroding beach-rocks habitat harbor's disproportionately high species, giving them priority for protection.		
Type of Management / Management plan:	Co-management/ YES		
Zoning type	Marine reserve has 3 zoning types		
Integral	X	No take zones	
Partial (restricted sports and fishing)	X	Restricted sport and commercial fishing	
General (low impact activities)		Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	Full protection		
Agencies involved	YES	NO	
Governance:	X		Local community and Mexican Government. Governance relied primarily on a set of simple rules and means of enforcement, meeting venues that allowed for feedback between the social and ecological subsystems
Organization support:	X		Non-government organizations helped in the development of the reserves
Enforcement:	X		Local people patrolled the reserves for a short time, but there was no legal basis for enforcement. 2.Within a few years, fishermen from elsewhere began poaching
Stakeholders:	X		Fishermen in Puerto Peñasco, Mexico, decided to create a network of marine reserves to help recover and enhance their scallop and black murex snail fisheries in surrounding waters. Puerto Peñasco divers have established various management guidelines, including season and area closures.
Economics:		X	Only after the implementation the Mexican government granted the local fishing cooperative exclusive access to their fishing grounds.
Social:	X		Governance relied primarily on a set of simple rules and means of enforcement, meeting venues that allowed for feedback between the social and ecological subsystems, fishers' participation in monitoring, and the leadership role of key members of the group.
Research:	X		Local knowledge of previous existing population and tides with science regarding reproduction among other factors where used for the selection of the sites. Divers approached researchers and non-governmental organizations (NGO) for support to quantify changes in one of their most important fishing areas. Currents and tides came from previous local knowledge. The one of the most important category was the protection of high density areas as well as breeding aggregations.
Monitoring:	X		Fisherman participated in monitoring and research of their benthic resources since 19992.
Biological:	X		Black murex snail and rock scallop. Small eroding beach-rocks habitat harbor's disproportionately high species, giving them priority for protection.
Ecological:	X		Previous local knowledge of currents, biological survey data, and information about reproduction was used. The overall population of juveniles (< 2 years old) of rock scallop and black murex snail had increased in coastal reserves and fishing areas. Visual censuses revealed that density of young rock scallop had increased by up to 40.7% within coastal reserves and by 20.6% in fished sites. Changes were also evident for black murex, with more than a three- fold increase in the density of juveniles within fished sites
Community involvement:	X		Mostly a fishery based community. Incentives that triggered cooperation for the development of collective management decisions: a decline in the availability of the main species targeted, and year-round dependence on their fishery resources.

Committee:		X	However, local fisherman and divers reached out to researchers and NGO to protect their resources. Local knowledge was considered a valuable resource and local fishers were trained on monitoring techniques; they helped during the case study development and local management of the resources.
Donations or Revenue:	X		Researchers and funding organizations that enabled it to an afford the costs of self-organizing into a common-property regime.
Successes:	Visual censuses revealed that density of young rock scallop (individuals recruited since reserve establishment) had increased by up to 40.7% within coastal reserves and by 20.6% in fished sites in only two years. Black murex, increased with more than a three-fold increase in the density of juveniles within fished sites. The reserve got recognition at a National level and led to their selection to receive Mexico's National Conservation Award in 2003.		
Lessons Learned:	Science can be used to make informed decisions about marine reserves. Involvement of stakeholders is vital for design, management, and enforcement of marine reserves. Support from local government is critical for long-term effectiveness of marine reserves.		
References:	1. Cudney-Bueno, Richard (2007), *Marine Reserve, Community-Based Management, and Small-Scale Benthic Fisheries in the Gulf of Mexico*. The University of Arizona School of Natural Resources (Graduate College). 2. Protect Planet Ocean (2010). *Puerto Peñasco, Gulf of California, Mexico* http://www.protectplanetocean.org/collections/successandlessons/casestudy/penasco/caseStudy.html 3. Partnership for Interdisciplinary Studies of Coastal Oceans. 2008. *The Science of Marine Reserves* (2nd Edition, Latin America and Caribbean).www.piscoweb.org. 22 pages. 4. Cartron, Jean-Luc E (2005). *Biodiversity, Ecosystems, and Conservation in Northern Mexico*. Jean-Luc E. Cartron, Gerardo Ceballos, Richard Stephen Felger." *Google Books*. Oxford University Press. Web. 08 Dec. 2011. http://books.google.com/books?id=kRmVvuLptBAC 5. Cudney-Bueno R, Lavín MF, Marinone SG, Raimondi PT, Shaw WW (2009) *Rapid Effects of Marine Reserves via Larval Dispersal*. PLoS ONE 4(1): e4140. doi:10.1371/journal.pone.0004140		

Name:	Actam Chuleb MPA/ Dzilam State Reserve		
Location:	Mexico		
Size (ha):	3,000		
Date declared / established:	1989		
Purpose of protection:	Fishing ground, spawning and nursery habitat		
Habitat:	Breeding aggregations and benthic habitat where fish species are present.		
Type of Management / Management plan:	Co-management/ Yes		
Zoning type	Marine reserve has 1 zoning types		
Integral		No take zones	
Partial (restricted sports and fishing)	X	Restricted sport and commercial fishing	
General (low impact activities)		Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	MPA to protect fishing grounds		
Agencies involved	YES	NO	
Governance:	X		Community and non-governmental organizations (NGO)
Organization support:	X		Government, NGO, and private
Enforcement:	X		Enforcement body- first community and municipality but "In 2004, a conflict broke out between the fishing cooperative and the municipality, apparently due to partiality shown during patrolling and in the granting of some sanctions, and also because the MPA did not have a legal framework authorizing it to levy fines"- later in 2005 a local NGO assumed the role.
Stakeholders:	X		Reserve was created by local agreement held by the local fishermen's cooperative due to the overexploitation of fisheries resources, and set according to their ecological knowledge, once they acknowledged the natural high productivity of the area.
Economics:	X		There are economic sanctions if you fish illegally. The Mayor takes your fishing nets, and the first time, you will be charged 5,000 pesos to get them back. The second time 10,000 pesos, and the third time, well: expulsed.
Social:	X		There were benefits of the reserve such as contributing to the local economy were well recognized by the fishing community but locals had to ready the reserve to receive sport-fishing tourists, now that hotel owners, primarily in Cancun, have made arrangements to assure a steady stream of visitors
Research:		X	These areas constitute a geographic network for conservation and sustainable development initiatives that are becoming strategic assets for Mexico, and with new methodologies and scientific knowledge the value of the goods and services they generate can be estimated in economic terms, and elements of judgment can be derived for guiding private and public decisions affecting conservation. This area wants to do future research for conservation and economic purposes.
Monitoring:		X	There had been restoration projects of natural habitat and restoration of the reserve itself.
Biological:	X		The creation of the reserve was determined on the basis of biological and economic considerations relating to fisheries management
Ecological:	X		Creating protected areas was justified as a way of halting ecological deterioration of the country's most representative ecosystems, safeguarding ecological capital for national development, and ensuring that the areas could be handed down to future generations. The Ecological Balance Act (Ley General de Equilibrio Ecológico, LGEEPA) was passed in 1988.
Community involvement:	X		Community driven and first co-managed between municipality and community and later by NGOs.
Committee:	X		Village council originally involved in management but later fell through. Now Co-managed by community and NGO.
Donations or Revenue:		X	After the implementation of the reserve donations that the fishing cooperative received came from two sources, the United Nations Development Programme (UNDP) and the Nature Conservancy Fund, for its conservation and

Successes:	Recognized for its local economic benefits and bottom up approach.
Lessons Learned:	Support from local government is critical for long-term effectiveness of marine reserves.
References:	1. Fraga & Jesu (2008) *Coastal and Marine Protected Areas in Mexico* 2. Bjorkan, Maiken (2009). *Putting MPAS to Work: A Mexican Case Study on Community Empowerment.* Norwegian College of Fisheries, University of Tromso. MAST. Vol 8 pages 11-31 3. Fraga, J, Arias, Y, and Angulo, J (2006). *Chapter 4: Communities and Stakeholders in Marine Protected Areas of Mexico, Dominican Republic, and Cuba*. Coastal Resource Management in the wider Caribbean, Resilience, Adaptation, and Community Diversity Book, IDRC, document 8 of 13

Name:	Biosphere Reserve of the Upper Gulf of California and the Colorado River Delta		
Location:	Mexico		
Size (ha):	934,756/ 26% no-take zone		
Date declared / established:	1993		
Purpose of protection:	Fishing grounds and to protect species inhabiting that region, some of which were commercially important, endemic or under risk of extinction, and its management plan is designed to promote both sustainable use activities and biodiversity conservation.		
Habitat:	Open ocean and land, rocky intertidal habitats (with beach rock, granite and basalt substrates) and sandy beaches dominate the landscape surrounding.		
Type of Management / Management plan:	Co-Management / YES		
Zoning type	Marine reserve has 2- zoning types		
Integral	X	No take zones	
Partial (restricted sports and fishing)	X	Restricted sport and commercial fishing	
General (low impact activities)		Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	Biosphere reserve and target vaquita (Phocoena sinus) for protection		
Agencies involved	YES	NO	
Governance:	X		Mexican legislation recognizes that it is through the participation of the local communities affected by these measures that the objectives of agreements can be achieved. Facing this challenge requires a clear definition of common goals in fisheries management and conservation, all expressed in a single policy.
Organization support:	X		A non-profit corporation the Intercultural Center for the Study of Deserts and Oceans (CEDO, created in 1980) advances and shares knowledge about the Upper Gulf of California and surrounding Sonoran Desert, promoting conservation and sustainable use of the region's natural and cultural resources.
Enforcement:	X		Enforcement of fishing regulations is split between Mexico's Institute of Ecology and the Environmental Attorney General
Stakeholders:	X		Fishermen catch reports and interviews about their dependency on the marine resources. Nearly 24 per cent of the fishermen said they would demand compensation and 19.6 per cent said they would ask for credit to start a new business or switch occupations (such as becoming a plumber, carpenter or construction worker).
Economics:	X		Lack of economic alternatives. Six artisanal fisheries are the most important in the Upper Gulf from economic study evaluation: shrimp, corvina, bigeye croaker, Spanish mackerel, rays (several species) and sharks (several species).
Social:	X		2,554 catch reports by artisanal fishermen in three fishing communities
Research:		X	There is endangered species conservation biology program to help out endangered species from going extinct in the wild. Will be conducting climate variables monitoring program, Marine and freshwater fisheries population monitoring.
Monitoring:		X	Will be conducting climate variables monitoring program, Marine and freshwater fisheries population monitoring
Biological:	X		"totoaba" (Totoaba macdonaldi), the endemic croacker and a rare species of porpoise the "vaquita".
Ecological:		X	Frequent lack of government recognition and support when it comes to traditional management practices based on the local ecological knowledge of fishing communities.
Community involvement:		X	There are also all the typical conflicts of interest between conservationists and local resource users, whose rights are frequently violated when they are forced to abandon ways of earning a livelihood in the name of "conservation".
Committee:		X	
Donations or Revenue:		X	
Successes:	The success of an MPA in the Upper Gulf of California as a conservation tool depends on how carefully it considers all social aspects (like the social importance of fishing activities).		

Lessons Learned:	Involvement of stakeholders is vital for design, management, and enforcement of marine reserves." The success of an MPA in the Upper Gulf of California as a conservation tool depends on how carefully it considers all social aspects (like the social importance of fishing activities)."
References:	1. Fraga. J, Jesus. A (2008). *Coastal and Marine Protected Area in Mexico*, Samudra

Monograph, International Collective in Support of Fishworkers, www.icsf.net
2. CEDO International (2011). *Upper Gulf of California and Colorado River Delta Biosphere Reserve*. Apartado Postal #53, Puerto Peñasco, Sonora, México 83550, Phone & Fax 011-52-638- 38-20113 or 011-52-638-382-0115, http://www.cedointercultural.org/uppergulf.htm
3. UNSCO (2007). *Biosphere Reserve Information, Mexico Alto Golfo de California*. Av. Jalisco 903 entre calle 9 y 10, Col. Sonora, 83404 San Luis Río Colorado, Sonora. www.conanp.gob.mx

Name:	Cabo Pulmo National Park		
Location:	Mexico		
Size (ha):	7, 111/ 35% no-take zone		
Date declared / established:	1995		
Purpose of protection:	Fishing grounds subjected to small and commercial fishing, spawning areas		
Habitat:	Hard coral reefs and sea fans. 7 of the 11 species of hard coral in the Gulf of California are in Cabo Pulmo.		
Type of Management / Management plan:	Co-Management/ YES		
Zoning type		Marine reserve has 3 zoning types	
Integral	X	No take zones	
Partial (restricted sports and fishing)	X	Restricted sport and commercial fishing	
General (low impact activities)	X	Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	Some of the area (35%) is a no take zone. Dedicated villagers unofficially banned fishing along their entire coast, protecting the entire park area.		
Agencies involved	YES	NO	
Governance:	X		National Commission of Natural Protected Areas (CONAP) and Government
Organization support:	X		International conservation groups. There are many programs in operation, funded by NGOs, the government and academic institutions.
Enforcement:	X		No government but locals have enforced strict fishing restriction
Stakeholders:	X		Community members were determined to protect and restore the over fished areas. They held an empowered role, initiating change and enforcing it. Community support made it possible
Economics:		X	After the implementation of the reserve development of eco-tourism, poverty has decreased locally, and the economy has rebounded, because the park supplies livelihoods for local areas.
Social:	X		Environmental consciousness pervades the close-knit community, as an article in Baja Life Magazine explored in 2005. Children make signs showing park rules, help with clean-ups, and release turtle hatchlings, taking their role very seriously, says the author. Locals have also resisted large-scale tourism endeavors because they know such programs aren't sustainable for the reserve.
Research:	X		A series of studies at Universidad Autónoma de Baja California Sur (UABCS) directed by lead biologist Dr. Oscar Arizpe to provided strong evidence supporting the biological relevance of Cabo Pulmo and the Sea of Cortez. Based on his findings, on June 15, 1995 President Ernesto Zedillo declared the 7,111 hectares and waters surrounding Cabo Pulmo a National Marine Park. Changes in fish diversity and biomass (10 year period) and increases in no take zones
Monitoring:	X		Locals monitor reefs and sea turtle nesting areas, clean up the beaches, conduct surveillance, and enforce regulations.
Biological:	X		Today this area is considered a biodiversity hot spot. Sustains groupers, snappers, jacks, gulf groupers, dog snappers, leopard groupers, parrotfishes, sharks, lobsters, octopuses, rays and small fish etc. It is located in an area of high productivity driven from both the spatial heterogeneity generated by long basaltic dykes that run parallel to the coast and its location in the transition zone between the enclosed Gulf of California and the open waters of the Pacific Ocean. Spawning aggregations present in the protected area and increases in biomass, study after 10 years of protection.
Ecological:	X		A series of studies at UABCS were directed by lead biologist Dr. Oscar Arizpe to provide strong evidence supporting the biological relevance of Cabo Pulmo and the Sea of Cortez. Based on his findings, on June 15, 1995 President Ernesto Zedillo declared the 7,111 hectares and waters surrounding Cabo Pulmo a National Marine Park. The ecosystem has improved so much that researchers call it a hotspot for biodiversity.
Community involvement:	X		The success of Cabo Pulmo National Park is greatly due to local leadership, effective self-enforcement by local stakeholders, and the general support of the broader community

Community involvement:	X		The success of Cabo Pulmo National Park is greatly due to local leadership, effective self-enforcement by local stakeholders, and the general support of the broader community

Committee:	X		The community is organized and dedicated to the protection of the marine reserve. Boat captains, dive masters, and local people in general participate in various activities to enforce the regulations of CPNP to visitors and among themselves, including surveillance, fauna protection(e.g. sea turtle nesting sites), and beach and ocean cleaning programs.
Donations or Revenue:	X		A recent study found that the locally owned, small-scale tourism operators in Cabo Pulmo generated US$538,800 in 2006
Successes:	Total number of fish in the reserve has increased by over 460% including large fish such as sharks witch take longer to mature. 30% of annual increase on predator species. 5 time more biomass than no protected zones. Successful eco-tourism that provide income to local communities.		
Lessons Learned:	Community supports is important for the success of a Marine Reserve. Biological and ecological data before and after implementation of the reserve is necessary in order to determine accurately the management success.		
References:	1. Aburto-Oropeza, O., Erisman, B., Galland, G.R., Mascareñas-Osorio, I., Sala, E., Ezcurra, E. (2011). *Large Recovery of Fish Biomass in a No-Take marine Reserve.* PlosOne: accelerating thepublication of peer-reviewed science, http://www.plosone.org/article/info:doi/10.1371/journal.pone.0023601 2. SCRIPPS Institution of Ocean (2011). *Gulf of Mexico's Cabo Pulmo, protected by locals, rebounds as a biological 'hot spot' flourishing with marine life*, University of California, San Diego. http://scrippsnews.ucsd.edu/Releases/?releaseID=1180 3. Martin, Melanie J. (2011). *Marine reserve's dramatic recovery shocks scientist,* Earth Times, Environmental Issues and News, Nature http://www.earthtimes.org/nature/marine-reserves-dramatic-recovery-shocks-scientists/1242/ 4. CONAP (2011). *Bienvenidos Al Sito Internet Dedicado al Parque Nacional Cabo Pulmo,* Dirección del Parque Nacional Cabo Pulmo CONANP, http://pncabopulmo.conanp.gob.mx/		

Name:	Sian Ka'an Biosphere Reserve		
Location:	Mexico		
Size (ha):	526,091.334/ 54% no-take zones		
Date declared / established:	1986 (World Heritage Site 1987)		
Purpose of protection:	Highest diversity of habitat types, historical site, flora, fauna, and ecosystems		
Habitat:	Sea grass, inlets, coral reefs, mangroves, marshes, coastal and in-land lagoons		
Type of Management / Management plan:	Co-Management/ YES		
Zoning type	Marine reserve has 2 zoning types		
Integral	X	No take zones	
Partial (restricted sports and fishing)		Restricted sport and commercial fishing	
General (low impact activities)	X	Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	Cover a total area of almost 700,000 acres, most limited activity (permission to scientific research)		
Agencies involved	YES	NO	
Governance:	X		Mexican government with United Nations Educational, Scientific and Cultural Organization (UNESCO) (government and federal) and the National Commission of Protected Natural Areas (CONANP)
Organization support:	X		The Centro Ecologico Sian ka'an and Amigos de Sian Ka'an
Enforcement:	X		Guards employed by the governmental The Ministry of Environment and Natural Resources (SEMARNAT) organization are stationed at every entrance to enforce the Reserve regulations
Stakeholders:	X		Fishermen got organized to control their fishing grounds
Economics:	X		The main economic activities are fishing for lobster and fin-fish.
Social:	X	X	Sian Ka'an faces the greatest challenge of conservation: to find a way to integrate human activities without compromising other forms of life contained within its boundaries
Research:	X		Research on better fishing techniques to minimize impacts. Basic studies started in 1982 to know the potentiality of the resources and to propose management plans. These two programmes were ecologically complementary and chronologically simultaneous.
Monitoring:		X	
Biological:	X		Common species include spiny lobster, tarpon, grouper, permit, nurse shark, hammerhead, black tipped shark, and snapper. 103 species of mammals, 276 species of crustaceans, 84 species of coral.
Ecological:	X		The state research center, Center for International Climate and Environmental Research (CIQRO) and the autonomous University of Mexico City (UNAM) develop basic biological and ecological research projects.
Community involvement:	X		Linking the creation of a tourism infrastructure with income-generating opportunities for local people and biodiversity conservation.
Committee:	X		A local council was established, including representatives of the fisherman, coconut growers, cattle owners, peasants, scientist, representative of Municipalities, and from the Steering Committee. Since 1984 this council had held bi-monthly meetings.
Donations or Revenue:	X		The reserve receives financial and technical support from the Amigos de Sian Ka'an and there is a charge of $ 4 USD as a fee entrance to the Reserve per person per day.
Successes:	Amigos has promoted participatory research and development projects with the local communities inside the reserve (horticulture, lobster management, diversification of fisheries, management of useful wild palms, eco-tourism) and in the surrounding ejidos (improved agriculture techniques, wildlife management, crocodile ranching).		
Lessons Learned:	Creating of a tourism infrastructure with income-generating opportunities for local people and having community involvement is essential.		
References:	1. Centro Ecologico Sian Ka'an (CESiaK) (2011). *About Sian ka'an; Sian Ka'an Facts,* Federal Road (307) Cancun-Tulum, #68 Tulum, Quintana Roo, Mexico,		

	2. Ornat, Arturo Lopez (n.d). *Sian Ka'an Coastal Biosphere Reserve and Surrounding Forests,* MEXICO

Name:	Cape Rodney-Okakari Point Marine Reserve (Goat Island /Leigh)		
Location:	New Zealand		
Size (ha):	525		
Date declared / established:	1975		
Purpose of protection:	While Goat Island's marine reserve was created for scientific purposes, tourism and education benefits sprang up, including a glass-bottom boat business, marine education center, dive shop, restaurants and accommodation.		
Habitat:	Kelp and seaweed forest, intertidal and sub-tidal zone, rocky reefs, basement rocks, sandy beaches 13sponge gardens		
Type of Management / Management plan:	Co-Management/ not known		
Zoning type	Marine reserve has 2 zoning types		
Integral	X	No take zones	
Partial (restricted sports and fishing)		Restricted sport and commercial fishing	
General (low impact activities)	X	Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	Marine reserve has 2 zoning types		
Agencies involved	YES	NO	
Governance:	X		The Marine Department (later replaced by the Ministry of Agriculture and Fisheries in this context) merely considers the application, reviews the objections and makes a decision (via the Minister), which is final. Department of Conservation in accordance with the Conservation Act 1987 (marine reserve), the Conservation Amendment Act 1996 (for the land reserves) and the Resource Management Act 1991 (affecting the entire reserve complex.
Organization support:	X		The New Zeeland Sciences Society and New Zealand Underwater Association
Enforcement:	X		During 1977 rangers were appointed and notices erected
Stakeholders:	X		The beginning years there was a management committee with representatives from various stakeholders (local councils, fisheries, divers, university)
Economics:		X	The Total Output in Rodney dependent on the existence of the marine reserve is estimated to be $18.6 million per year.
Social:		X	The community has to deal with 375,000 visitors per year, it is a popular spot for snorkelers and scuba-divers, due to the abundance and diversity of fish now living within the reserve, after over 30 years of protection
Research:	X		Scientific study found that kelp beds had recovered dramatically in the marine reserve, covering most of the seafloor. The existence of a marine laboratory in the area for more than a decade before the creation of the reserve has meant that a good base of knowledge already exists, unlike many such reserves overseas.
Monitoring:	X		They have dived and monitored Goat Island's marine life since the 1970s and gradually witnessed an increase in fish numbers.
Biological:	X		Snapper, moki, blue cod, leather jackets, rock lobsters, sea urchins. Spanning from Cape Rodney to Okakari Point, the marine reserve includes the waters 800m from shore including Goat Island.
Ecology:		X	No ecological impact were incorporated but there was 8.7 times more abundant and spiny lobsters 3.7 times more abundant in the marine reserve than in the outside fished areas
Community involvement:	X		The people of Leigh are very 'protective' of the reserve, and demonstrate a strong sense of community ownership. They report poachers to DOC staff or honorary rangers. Commercial fishers have actively protected the reserve from poaching trawlers, while people within the community also keep watch on the activities of divers and 'boaties' from outside the district.
Committee:	X		The management committee comprises an officer of the Fisheries Management Division (as Chairman), a scientist (nominated by Auckland University), two nominees of the local authority and a nominee of the NZ Underwater Association.
Donations or Revenue:	X		Some $12.1 million of $18.6 million is direct spending by visitors, and the balance is the result of flow-on effect through the district economy.
Successes:	Inside the marine reserve, 8.7 times more snapper and 3.7 times more lobsters led to flourishing kelp forests because these predators ate kelp-eating urchins.		

Lessons Learned:	Outside the marine reserve, urchins were so abundant that even a decrease in their numbers after a mass die-off did not restore kelp forests. The existence of a marine laboratory in the area for more than a decade before the creation of the reserve has meant that a good base of knowledge already exists, unlike many such reserves overseas
References:	1. Department of Conservation (DOC) (2011). *Cape Rodney-Okakari Point Marine Reserve (Goat Island),* Conservation for prosperity, http://www.doc.govt.nz/conservation/marine-and-coastal/marine-protected-areas/marine-reserves-a-z/cape-rodney-okakari-point-goat-island/ 2. Hunt, L (2008). *Economic Impact Analysis of the Cape Rodney Okakari Point (Leigh) Marine Reserve on the Rodney District*, Investigation number 4052, Report prepared by the Department of Conservation 3. Ballantine, W.J., Gordon, D.P. (2003). New Zealand's first marine reserve, Cape Rodney to Okakari point, Leigh

Name:	Pohatu (Flea Bay) Marine Protected Areas		
Location:	New Zealand		
Size (ha):	215		
Date declared / established:	1997/1999		
Purpose of protection:	provides habitat and important breeding area for white-flipper penguins		
Habitat:	Coralline encrusted rocks 13. kelp forest, underwater caves		
Type of Management / Management plan:	Co-Management/ No, but in progress		
Zoning type	Marine reserve has 1 zoning types		
Integral	X	No take zones	
Partial (restricted sports and fishing)		Restricted sport and commercial fishing	
General (low impact activities)		Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	Full protection		
Agencies involved	YES	NO	
Governance:	X		Canterbury Marine Recreational Fishers Association, the Akaroa Harbour Recreational Fishing Club, and managed by the Department of Conservation (DOC)
Organization support:	X		Akaroa Harbour Recreational Fishing Club
Enforcement:	X		No honorary rangers have been appointed; though sea and weather conditions make it difficult for the local DOC officer, based near Akaroa, to adequately patrol the reserve. There is also some help from the community.
Stakeholders:	X		They were involved in the marine reserve and the reserve has a stakeholder committee.
Economics:		X	The employment generated by the reserve is minimal. A local farmer rents kayaks and guides visitors to the penguin colony in particular. The Reserve adds to the attractions of the Banks Peninsula walking track. The number of direct visitors is small.
Social:	X		It is a natural seafood collecting place for the marine as stocks are good, and the sheltered position of the cove makes it safe for fishing. Fishers counteracted the proposal for Dan Rogers by applying for the smaller, Pohatu Marine Reserve, which is located outside Akaroa Harbour. In effect, the Pohatu reserve was nominated because it was a less contentious site.
Research:		X	There was no baseline research conducted prior to the opening of the reserve.
Monitoring:		X	As part of any biological monitoring programme it should be recognized that Pohatu Marine Reserve presents logistical problems related to conducting field work. In particular, water visibility is below that considered suitable for underwater visual fish counts for most of the year.
Biological:	X		Biological data set for Pohatu Marine Reserve and appropriate control sites and to compare densities and sizes of particular species between the reserve and control treatments; elect sites suitable for monitoring potential changes in relation to retirement from fishing within Pohatu Marine Reserve; and establish the appropriate level of sampling (i.e. to define the size and number of replicates appropriate to sample each target species). Based on results collected during the present study the following points should be considered as options for ongoing monitoring of the Pohatu Marine Reserve.
Ecological:	X		Biomass of large predatory fish has increased 8-fold in the reserve, and biomass and species diversity have also increased. Nesting turtles have been observed in the island's shores, and the Green Sea and Hawksbill turtles in fact frequent the sanctuary. Bump head parrotfish also visit these waters, as well as the occasional whale shark. The island is home to several species of giant clams and famous for huge schools of jacks in its fish sanctuary.
Community involvement:		X	The community, who were once skeptical of the sanctuary before it was created, is now participating in guarding and defending their marine resources.
Committee:			Pohatu is one of six marine reserves in New Zealand that has a stakeholder committee. The committee represents a range of interest groups including recreational and commercial fishers, the local iwi, residents, DOC, Forest and

Committee:			Pohatu is one of six marine reserves in New Zealand that has a stakeholder committee. The committee represents a range of interest groups including recreational and commercial fishers, the local iwi, residents, DOC, Forest and Bird, and the applicant group for a reserve inside the harbour, at Dan Rogers
Donations or Revenue:		X	
Successes:	It is too early to tell if there are changes in fish populations.		
Lessons Learned:	It is too early to tell if there are changes in fish populations. The Helps have won a number of conservation awards for protecting penguins on their land for over two decades.		
References:	1. Taylor, N. and Buckenham, B. (2003). *Social impacts of marine reserves in New Zealand.* Science of Conservation 217, published by Department of Conservation (DOC) pages 1-58 2. Davidson, R.J., Barrier, R., and Pande, A. (2001). *Pohatu Marine Reserve Baseline Survey,* Biological Monitoring of Pohatu Reserve, www.doc.govt.nz 3. Davidson, R. J. and Abel, W. (2003). *Second sampling of Pohatu Marine Reserve, Flea Bay, Banks Peninsula* (September 2002). Prepared by Davidson Environmental Limited for Department of Conservation, DeVauchelle, Canterbury. Survey and Monitoring Report No. 443.		

Name:	Apo Islands Marine Reserve		
Location:	Philippines		
Size (ha):	72 with 106 ha coral reef		
Date declared / established:	1982		
Purpose of protection:	Research for the University and for ecosystem degradation		
Habitat:	Coral reefs, volcanic island, sponge		
Type of Management / Management plan:	Co-Management/ YES		
Zoning type	Marine reserve has 3 zoning types		
Integral	X	No take zones	
Partial (restricted sports and fishing)	X	Restricted sport and commercial fishing	
General (low impact activities)	X	Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	Research for the University and for ecosystem degradation		
Agencies involved	YES	NO	
Governance:	X		Local community, local government, and university. (Community-managed marine reserve). The Marine Management Committee of the Apo Island. Community managed Apo Island marine reserve from the early 1980s to 1994. Beginning in 1994, the Protected Area Management Board under the Department of Environment and Natural Resources took over management. The PAMB is composed of representatives from national, provincial, municipal and local levels.
Organization support:	X		Siliman University in the Philippines and National Integrated Protected Areas System (NIPAS)
Enforcement:	X		Enforcement from the Philippine Constabulary
Stakeholders:	X		Improvement in fish catch caught the interest of the fishermen so that in 1985 the island community and local council formalized the sanctuary, declaring waters surrounding the island up 500 meters from the shore a marine reserve and a portion of the coast in the south-eastern part of the island a no-take fish sanctuary.
Economics:	X		Fishing is the major source of livelihood for the island's 760 people who benefit from the abundant marine life teeming in the waters around the reserve
Social:	X		Effects of the sanctuary on their fish catch, most fishermen responded positively, claiming that their catch doubled because of the presence of the fish sanctuary
Research:	X		The Apo Island Marine Sanctuary is an area serving as an observatory and laboratory for scientists studying its undisturbed habitat making it a place of learning as well as of recreation and leisure
Monitoring:		X	Doesn't mention anything about monitoring but most fishermen responded positively, claiming that their catch doubled because of the presence of the fish sanctuary.
Biological:	X		650 species of fish and 400 species of corals. Moray eels fusiliers, angelfishes, scorpion fishes snappers and sweetlips, turtle, flounder, sea moth, long nose hawk fish, scorpion fish and frogfish.
Ecological:	X		Effects of the sanctuary on their fish catch, most fishermen responded positively, claiming that their catch doubled because of the presence of the fish sanctuary.
Community involvement:	X	X	The community, who were once skeptical of the sanctuary, is now participating in guarding and defending their marine resources.
Committee:	X		The Apo Marine Management Committee managed the reserve (sanctuary) from 1985 to mid-1994. However, The Silliman Marine Laboratory, and later also the Silliman University-Angelo King Center for Research and Environmental Management (SUAKCREM), continued overseeing the project during the next succeeding years.
Donations or Revenue:	X		Visitors spent 5.2 million pesos (ca 110, thousand US dollars) for user fees in 2008. Other contributions between US $31,900 & $113,000.
Successes:	The primary benefit the local community gets from the marine reserve is increased fish catch in less fishing time (more catch per unit effort).		

Lessons Learned:	They are likely to be most effective if local government units and local communities are fully involved in their management. Several human generations are required to ensure the attainment of the carrying capacity of these reserves, underscoring the usefulness of community-based management approaches.
References:	1. Alcala, A.C. (2001) *Marine Reserves as Tools for Fishery Management and Biodiversity Conservation: Natural Experiments in the Central Philippines, 1974-2000.* UNEP/Siliman University-Angelo King Centre for Research and Environmental Management, Dumaguete city, Philippine 2. Ormond, R.F.G and Gore, M.A. (2005). *No-take zones: does behavior matter?* University Marine Biological Station Millport (University of London), Isle of Cumbrae, Scotland, UK KA28 0EG

Name:	Sumilon Island Marine Reserve		
Location:	Philippines		
Size (ha):	23 with 50ha of coral reef		
Date declared / established:	1974		
Purpose of protection:	Increase fisheries		
Habitat:	Coral reef		
Type of Management / Management plan:	Unstable/ None		
Zoning type	Marine reserve has 2 zoning types		
Integral	X	No take zones	
Partial (restricted sports and fishing)		Restricted sport and commercial fishing	
General (low impact activities)		Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)	X	Open access because reserve was temporarily suspended	
Protection regime:	Bounced between no-take zones to open ocean which caused a lot of confusion		
Agencies involved	YES	NO	
Governance:	X		A local government ordinance established the Sumilon Marine Reserve. The succeeding years from 1987 to the present have been characterized by an unstable period of management of the reserve under the control of the mayor of Oslob, because of its inability to assert its legal authority to manage under Food and Agricultural Organization 128 (FAO), to whom Bureau of Fisheries and Aquatic Resources (BFAR) presumably gave an authority to manage.
Organization support:	X		Silliman University set up a marine conservation program on a nearby island
Enforcement:	X		Silliman Marine Laboratory implemented a research program on the island and assigned an experienced fisherman to serve as caretaker his duties included the enforcement of the no-fishing rule in the reserve
Stakeholders:	X		Local fishers were also being educated about how the proposed reserve would benefit them, although it later emerged that many people had been unclear about the purpose of the reserve. Nevertheless, enough people respected the closure to fishing for benefits from the reserve to start to filter through.
Economics:		X	But fishing is a source of food and income
Social:		X	BFAR issued Fisheries Administrative Order No. 128 series of 1980. This issuance caused resentment among the residents and local government officials of the two towns. They argued that the control of Sumilon should not be under a national agency but under the local government of Oslob.
Research:	X		Science contributed to the reserve process when scientists and residents discussed basic marine ecological concepts, and the idea of creating a marine reserve evolved
Monitoring:	X		Calculate fish yields, estimate catch per unit effort, quantitative abundance estimates of target and non-target species (fishery-independent), and measure density of large predatory fish.
Biological:	X		Manta rays and sting rays, barracudas, sea turtles and snakes and whale sharks
Ecological:	X		Implemented measures appear to improve the performance of ecological indicators but simultaneously resulted in the decrease of human social and economic dimensions
Community involvement:		X	There is no local community on the island, but it is used by about 100 small-scale fishers from the neighboring islands of Oslob, Santander and southern Cebu
Committee:		X	There is no local community on the island
Donations or Revenue:		X	
Successes:	Management plan was designed to include local fishery. Ecological indicators attained higher scores after the implementation of the management plan. Implemented measures appear to improve the performance of ecological indicators but simultaneously resulted in the decrease of human social and economic dimensions. An improvement in the ecological dimension, namely concerning habitat recovery goals and biodiversity preservation. Increase in the effectiveness of this fisheries dimension, which may be an important step towards attaining the MPA fisheries goals and an important support against illegal fishing activities.		

Lessons Learned:	Science can be used to make informed decisions about marine reserves. Involvement of stakeholders is vital for design, management, and enforcement of marine reserves. Support from local, national, and international government is critical for long-term effectiveness of

Lessons Learned:	Science can be used to make informed decisions about marine reserves. Involvement of stakeholders is vital for design, management, and enforcement of marine reserves. Support from local, national, and international government is critical for long-term effectiveness of marine reserves. Baseline data collected before the implementation of marine reserves is essential to disentangle the effects of natural variation in ecosystems from the direct results of protection
References:	1. Roberts, C.M. and J.P. Hawkins. (2000). *Fully-protected marine reserves: a guide*. WWF Endangered Seas Campaign, 1250 24th Street, NW, Washington, DC 20037, USA and Environment Department, University of York, York, YO10 5DD, UK. 2. Alcala, A.C. (2001) *Marine Reserves as Tools for Fishery Management and*

Name:	Arrabida Marine Protected Area		
Location:	Portugal		
Size (ha):	10,800/ 3.7% no-take zone		
Date declared / established:	1976		
Purpose of protection:	Resources over exploited		
Habitat:	Seagrass meadows, reefs, and bed rocks		
Type of Management / Management plan:	Co-Management/ YES		
Zoning type	Marine reserve has 3 zoning types		
Integral	X		No take zones
Partial (restricted sports and fishing)	X		Restricted sport and commercial fishing
General (low impact activities)	X		Low-impact tourism; restrictions on size, fishing techniques, and types of boats
Other (specify)			
Protection regime:	Preserve biodiversity and recover overexploited resources; recover habitats; promote scientific research; encourage environmental awareness and education; support progressive adaptation of the general rules of effluent emission; promote nature oriented tourism and sustainable development; and economic, cultural regional activities, such as traditional long-line fishery		
Agencies involved	YES	NO	
Governance:	X		Endowed with supervisory powers to United Nations Educational, Scientific and Cultural Organization (UNESCO), World Heritage recognition
Organization support:	X		Instituto Nacional de Investigação Agrária e das Pescas (INIAP), Portugal Instituto da Conservação da Natureza (ICN), Portugal Instituto Superior de Psicologia Aplicada (ISPA), Portugal Consejo Superior de Investigaciones Científicas (CSIC), Portugal
Enforcement:	X		UNESCO World Heritage
Stakeholders:	X		These collaborative monitoring approaches ensure community involvement in conservation and reserve management.
Economics:	X		Economic impact had some considerations, contribute to local sustainability.
Social:	X		One of the objectives of the management plan to contribute to the sustainability of local fisheries.
Research:		X	True monitoring plan or a baseline collection of multi-disciplinary scientific data for the period prior to its implementation. Science can be used to make informed decisions about marine reserves.
Monitoring:		X	The Arrábida MPA does not have a true monitoring plan or a baseline collection of multi-disciplinary scientific data for the period prior to its implementation
Biological:	X		It contains more than 1100 marine species of fauna and flora. Arrabida's marine ecosystems are of the greatest national and international importance. temperate reef fish (over 110 fish species).
Ecology:		X	No data for the period prior to its implementation.
Community involvement:	X		These collaborative monitoring approaches ensure community involvement in conservation and reserve management.
Committee:		X	No information found
Donations or Revenue:		X	
Successes:	Management plan was designed to include local fishery. Ecological indicators attained higher scores after the implementation of the management plan. Implemented measures appear to improve the performance of ecological indicators but simultaneously resulted in the decrease of human social and economic dimensions. An improvement in the ecological dimension, namely concerning habitat recovery goals and biodiversity preservation. Increase in the effectiveness of this fisheries dimension, which may be an important step towards attaining the MPA fisheries goals and an important support against illegal fishing activities.		
Lessons Learned:	Science can be used to make informed decisions about marine reserves. Involvement of stakeholders is vital for design, management, and enforcement of marine reserves. Support from local, national, and international government is critical for long-term effectiveness of marine reserves. Baseline data collected before the implementation of marine reserves is essential to disentangle the effects of natural variation in ecosystems from the direct results of protection		

References:	1. Emanuel J. Gonçalves, Miguel Henriques, and Vítor . Almada (2002) .The Establishment of a Marine Protected Area. AEco-Ethology Research Unit, ISPA, R. Jardim do Tabaco 34, 1149-041 Lisboa, Portugal. BArrábida Nature Park . ICN,

Praça da República, 2900 Setúbal, Portugal.
2. Cunha, Alexandra (2008). *BIOMARES project LIFE06/NAT/P/000192: Non-technical report nº1,* Project BIOMARES: Centro de Ciências do Mar do Algarve, Universidade do Algarve - Gambelas, 8005-139 Faro, Portugal. Telephone 351 289 800 051. www.icnb.pt
3. Marisa I. Batista, Filipa Baeta, Maria J. Costa, Henrique N. Cabral (2011). MPA as management tools for small-scale fisheries: *The case study of Arrábida Marine Protected Area (Portugal),* Universidade de Lisboa, Faculdade de Ciências, Centro de Oceanografia, Campo Grande. Ocean & Coastal Management 54, pages 137-147 www.elsevier.com/locate/ocecoaman

Name:	Flamborough Head Marine Reserve		
Location:	United Kingdom		
Size (ha):	6312/ 80% no-take zone		
Date declared / established:	1993/2001		
Purpose of protection:	Fishing grounds, tourism, research, wind energy and shipping		
Habitat:	Coastal chalk cliffs		
Type of Management / Management plan:	Co-Management/ YES		
Zoning type	Marine reserve has 3 zoning types		
Integral	X	No take zones	
Partial (restricted sports and fishing)	X	Restricted sport and commercial fishing	
General (low impact activities)	X	Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	From no take zone to partially protected		
Agencies involved	YES	NO	
Governance:	X		Flamborough Head Management Group. The Conservation (Natural Habitats) Regulations 1994 require relevant authorities to exercise their functions so as to secure compliance with the Habitats Directive
Organization support:	X		East riding yorkshire council, Natural England, Enviromental Agency,2. The Flamborough Fisheries Liaison Group, The Flamborough Headland Environmental Assets Partnership
Enforcement:		X	
Stakeholders:	X		Through a collaborative process, fishermen, scientists and policy makers determined the size and location of the no-take zone by balancing the closed area with the other uses in the MPA. It is designed to provide benefits to everyone one of the stakeholders involved. effective way to integrate the ecological benefits of reserves and the value of commercial and recreational activities.
Economics:	X		The Habitats Directive aims to promote the maintenance of biodiversity, taking account of economic, social, cultural and regional requirements, and sets out measures to maintain or restore natural habitats and species of European Union interest at favorable conservation status. Encourage the development and exploration of access opportunities for as wide a range of the public as possible, whilst ensuring they are compatible with the natural environment at Flamborough.
Social:	X		Through a collaborative process, fishermen, scientists and policy makers determined the size and location of the no-take zone by balancing the closed area with the other uses in the MPA.
Research:	X		Aims to integrate and disseminate knowledge and experience on marine biodiversity, and contribute towards a decision support system for valuing marine biodiversity and ecosystem functioning. Designated as a Special Area of Conservation under European legislation due to its extensive coastal chalk cliffs and its rich sub-tidal biodiversity.
Monitoring:	X		With help from the local fishing industry, scientific research and monitoring are now underway to assess the effects of protection on the diverse species and habitats at Flamborough Head.
Biological:	X		Commercially fished species, lobsters, grey seal Halichoerus, sea fan. Some sea fans, home to rare species of bird, insect, mammal, marine and plant life.
Ecological:	X		A Management Scheme has been developed to fulfill the requirements of the Conservation (Natural Habitats &c.) Regulation 1994 (Regulation 34) for the Flamborough Head European marine site, comprising Flamborough Head candidate Special Area of Conservation (cSAC) and Flamborough Head & Bempton Cliffs Special Protection Area (SPA)
Community involvement:	X		Lundy Marine Nature Reserve Advisory Group, drawn from local councils, fisheries interests, conservation groups, landowners and user groups such as dive charter interests.
Committee:	X		Flamborough Head Maritime Forum, focus for stakeholder involvement in the management of the Flamborough Head EMS and is open to all stakeholders not present on the Management Group. Other groups The Flamborough Fisheries

Committee:	X		Flamborough Head Maritime Forum, focus for stakeholder involvement in the management of the Flamborough Head EMS and is open to all stakeholders not present on the Management Group. Other groups The Flamborough Fisheries Liaison Group. The North Eastern Sea Fisheries Committee with responsibilities to both the commercial fishing industry and marine ecology management, aims to manage, regulate, develop and protect the fisheries within its area of jurisdiction, with a view to ensuring the sustainability of the marine environment both now and into the future
Donations or Revenue:		X	
Successes:	Over time, more lobsters of larger sizes inside a reserve may lead to increased lobster catches in surrounding fished areas, as they did in a Spanish marine reserve. Increases in lobster numbers and sizes occurred at a rapid rate. increase in lobster size and abundance at Lundy, however, suggests that even a small reserve may benefit some species		
Lessons Learned:	Science can be used to make informed decisions about marine reserves. Involvement of stakeholders is vital for design, management, and enforcement of marine reserves. Support from local, national, and international government is critical for long-term effectiveness of marine reserves. Baseline data collected before the implementation of marine reserves is essential to disentangle the effects of natural variation in ecosystems from the direct results of protection.		
References:	1. Flamborough Head . (2000). *English Nature's advice for the Flamborough Head European marine site given under Regulation 33(2) of the Conservation (Natural Habitats)Regulations 1994.* Issued 14, http://www.hull.ac.uk/coastalobs/media/pdf/reg33.pdf		

Name:	Lundy Marine Reserve		
Location:	United Kingdom		
Size (ha):	400/ 100% no-take zone		
Date declared / established:	1971/ 2003		
Purpose of protection:	To manage the protected area for the benefit of the wildlife and to actively promote the ecologically sustainable use of resources and the use of the reserve for education and enjoyment of all aspects of marine conservation.		
Habitat:	Rocky reefs, bedrocks, sandy bottoms, sea caves, underwater canyons, sub-tidal sand banks.		
Type of Management / Management plan:	Co-Management/ No but in progress		
Zoning type	Marine reserve has 1 zoning types		
Integral	X	No take zones	
Partial (restricted sports and fishing)		Restricted sport and commercial fishing	
General (low impact activities)		Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)			
Protection regime:	Complete no take zone		
Agencies involved	YES	NO	
Governance:	X		East Riding of Yorkshire Council, Natural England, Environment Agency, North Eastern Sea Fisheries Committee, North Yorkshire County Council, Scarborough Borough Council, Trinity House, Yorkshire Water Services Ltd., The Bridlington Harbour Commissioners & local community. T he Management Scheme is revised every year and places a duty on each of the Competent and Relevant Authorities to complete the actions identified.
Organization support:	X		National Trust, Royal Society for the Protection of Birds (RSPB), Department for Environment, Food and Rural Affairs (DEFRA) and Lundy Field Society
Enforcement:	X		English Nature and the Landmark Trust fund a warden who voluntarily enforces bylaws and undertakes education programs. In the government, April 2008, it was agreed that an area within the Flamborough Head Special Area of Conservation was to be chosen as an experimental No Take Zone (NTZ) which is to be enforced by the implementation of a Bylaw.
Stakeholders:	X		Some local fishermen supported the Lundy marine reserve in the hopes that they would see higher catches of European lobster, an important commercial species, outside the reserve.
Economics:		X	Proposed: To maintain a viable agricultural economy that delivers maximum environmental benefit, whilst contributing to the farming economy. Tourism and fisheries are the two economic sectors, which stand to benefit most from.
Social:	X		Bring public environmental and sustainability awareness and knowledge through educational programs. Levels of understanding of human impact on resources. Recreational opportunities and perceptions of non-market and non-use value.
Research:		X	No previous studies but scientist did detect increases in sizes and numbers of lobster after only 18 months of full protection. By 2007, legal-sized lobsters were 5 times more abundant within the reserve than in fished areas. Scientists also found that lobsters were 9% larger inside the reserve than in the fished areas (see figures below). Legal-sized lobsters adjacent to the reserve had not increased in size or abundance within the 4 years of the study. However, there was an increase in abundance of sub-legal lobsters adjacent to the reserve during the study.
Monitoring:	X		From 2003-2007, scientists monitored lobsters inside the Lundy marine reserve as well as in surrounding fished areas.
Biological:	X		Commercially fished species, lobsters, grey seal Halichoerus, and sea fan. Some sea fans, home to rare species of bird, insect, mammal, marine and plant life.
Ecological:	X		The zone was set up in 2003 and is being monitored by a team of professional scientists who, over a five-year study period, are looking into the effects of the zone on the habitats and species it is designed to protect. The first 5 years have

Community involvement:	X		Lundy Marine Nature Reserve Advisory Group, drawn from local councils, fisheries interests, conservation groups, landowners and user groups such as dive charter interests
Committee:	X		Lundy Field Society, which has been carrying out conservation work supporting research on the island and publishing the results in the Annual Report of the Lundy Field Society. The warden also collects data on fishing effort, sea angling.
Donations or Revenue:		X	
Successes:	They detected increases in sizes and numbers of lobster after only 18 months of full protection. By 2007, legal-sized lobsters were 5 times more abundant within the reserve than in fished areas. Lobsters were 9% larger inside the reserve than in the fished areas		
Lessons Learned:	Over time, more lobsters of larger sizes inside a reserve may lead to increased lobster catches in surrounding fished areas, as they did in a Spanish marine reserve. Increases in lobster numbers and sizes occurred at a rapid rate. increase in lobster size and abundance at Lundy, however, suggests that even a small reserve may benefit some species		
References	1. Protect Planet Ocean (2010). *Lundy Marine Reserve, UK, http://www.protectplanetocean.org/collections/successandlessons/casestudy/lundy/caseStudy.html* 2. World Wildlife Fund –UK (2005) Evaluating the Management Effectiveness of Marine Protected Areas: *Using UK sites and the UK MPA programme to illustrate different approaches, http://www.wwf.org.uk/filelibrary/pdf/mpa_mgmteff0705.pdf*		

Name:	Florida Keys National Marine Sanctuary		
Location:	United States		
Size (ha):	751,097/ 6% fully protected zones		
Date declared / established:	1990		
Purpose of protection:	Five types of zones with varying levels of protection		
Habitat:	Bank barrier coral reefs, patch reefs, hard bottoms, seagrass, and mangroves		
Type of Management / Management plan:	Co-Management/ YES		
Zoning type	Marine reserve has 5 zoning types		
Integral	X	No take zones (3 different types)	
Partial (restricted sports and fishing)		Restricted sport and commercial fishing	
General (low impact activities)	X	Low-impact tourism; restrictions on size, fishing techniques, and types of boats	
Other (specify)	X	Wildlife management area and ecological reserve	
Protection regime:	Five types of zones with varying levels of protection		
Agencies involved	YES	NO	
Governance:	X		National Oceanic and Atmospheric Administration (NOAA) and the State of Florida
Organization support:	X		The sanctuary also enforces specific regulations that protect and preserve ecological, recreational, research, educational, historical and aesthetic resources, and aim to minimize conflicts among users. These regulations pertain to boating, fishing, submerged land use, submerged cultural resource use and recreational activities.
Enforcement:	X		The sanctuary also enforces specific regulations that protect and preserve ecological, recreational, research, educational, historical and aesthetic resources, and aim to minimize conflicts among users. These regulations pertain to boating, fishing, submerged land use, submerged cultural resource use and recreational activities.
Stakeholders:	X		Knowledge, attitudes and perceptions of Sanctuary Management Strategies and Regulations were evaluated and studied; Commercial fishermen, Dive Shop Owners/Operators and Members of Local Environmental Groups. In 1995-96, researchers at RSMAS and the University of Florida through the Florida Sea Grant Program, established baseline measures for the knowledge, attitudes and perceptions of proposed management strategies and regulations, especially the no-take areas.
Economics:	X		The islands receive more than 3 million visitors each year. The majority of visitors go snorkeling and scuba diving hoping to experience clean, clear water and healthy coral reefs with abundant and diverse marine life. Visitors annually spend $1.2 billion while in the Keys. Commercial fishing is the second-most economically important industry of the Florida Keys with commercial landings of $70 million (dockside value) every year
Social:	X		Those who opposed the sanctuary feared excessive regulations, economic losses, and possible displacement of traditional users and uses. The community was interested in improving water quality, but it also was concerned about possible restrictions placed on boating activities, commercial and recreational fishing, recreational use of cultural and historical resources, and general land use
Research:	X		Long-term researches studies help identify changes in habitats and marine life, as well as the role humans' play in those environmental changes.
Monitoring:	X		Monitor Use Patterns on Existing Artificial and Natural Reefs Surrounding Sites for Sinking New Artificial Reefs. Monitor Use Patterns of the Entire Sanctuary and the Market and Non-market Economic Values of Sanctuary Resources.
Biological:	X		More than 6,000 species of marine life
Ecological:	X		The marine component of the ecosystem is composed of tropical to subtropical waters that contain diverse benthic community types.
Community involvement:	X		Encountered both support and opposition from the Florida Keys community and can be part of the sanctuary council.
Committee:	X		The Florida Keys National Marine Sanctuary Advisory Council is a great way for members of the community to get involved with the sanctuary.

Donations or Revenue:	X		Visitors annually spend $1.2 billion while in the Keys. Commercial fishing is the second-most economically important industry of the Florida Keys with commercial landings of $70 million (dockside value) every year
Successes:	Successful education programs and a significant decrease in the number of major ship groundings on the coral reefs.		
Lessons Learned:	The Florida Keys have been a popular destination for explorers, scientists and tourists for centuries. However, their popularity has led to pollution of the marine ecosystem and overuse of resource		
References:	1. National Oceanic and Atmospheric Administration and National Marine Sanctuary Program (2011). *Florida Keys National Marine Sanctuary,* National Ocean Service, http://floridakeys.noaa.gov/welcome.html 2. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service, and National Marine Sanctuary Program (2007). *Florida Keys National Marine Sanctuary Revised Management Plan,* Florida Keys National Marine Sanctuary.		