



Bay of Bengal Large Marine Ecosystem Project



Status of Marine Protected Areas and Fish Refugia in the Bay of Bengal Large Marine Ecosystem

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Status of Marine Protected Areas and Fish Refugia in the Bay of Bengal Large Marine Ecosystem

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ECOSYSTEM PROGRAMME

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ABBREVIATIONS

ADB	Asian Development Bank
ACRBC	ASEAN Centre for Biodiversity Conservation
ASEAN	Association of South-East Asian Nations
BOB	Bay of Bengal
BOBLME	Bay of Bengal Large Marine Ecosystem
BOBP	Bay of Bengal Programme for Sustainable Fisheries Development
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species
CMS	Convention on the Conservation of Migratory Species
CTI	Coral Triangle Initiative
ECA	Ecologically Critical Area
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
FAO	Food and Agriculture Organization of the United Nations
GEF	Global Environment Facility
GDP	Gross domestic product
GIS	Geographic Information System
IUCN	International Union for the Conservation of Nature
LME	Large Marine Ecosystem
MPA	Marine Protected Area
MMA	Marine Managed Area
RAMSAR	Convention on Wetlands of International Importance
SACEP	South Asia Co-operative Environment Programme
SEAFDEC	South-East Asian Fisheries Development Centre
TNC	The Nature Conservancy
WCS	Wildlife Conservation Society
WHC	World Heritage Convention
WWF	World Wildlife Fund
MARPOL	International Convention for the Prevention of Pollution from Ships
NOAA	National Oceanic and Atmospheric Administration
SAUP	Sea Around Us Project
UNCLOS	United Nations Convention on the Law of the Sea
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

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Dr. Kuperan Viswanathan facilitated the Penang workshop, with active input from country representatives from all eight countries and the BOBLME management team (for a full list of participants, see Appendix D). The authors wish to acknowledge these country representatives, who provided feedback on draft country profiles and recommendations. The authors are also grateful to the IUCN office in Bangladesh and Dr. Md. Giasuddin Khan for feedback on the Bangladesh draft profile.

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EXECUTIVE SUMMARY

The Bay of Bengal is one of the world's sixty-four Large Marine Ecosystems (LMEs), and includes the coastal waters of the Maldives, Sri Lanka, India, Bangladesh, Myanmar, Thailand, Malaysia and Indonesia. Coastal and marine resources play a critical role in these eight countries, and more than 400 million people in the region depend upon this 6.2 million km² marine ecosystem for their food, livelihoods and security. Ensuring the health of this Large Marine Ecosystem (LME) will have direct bearing upon the ability of both current and future generations to meet their needs.

This study was produced as part of the ongoing UN Food and Agriculture Organization's Bay of Bengal Large Marine Ecosystem (BOBLME) Programme. The Programme is a regional initiative that works to build support for coordinated, inter-governmental management of the coastal and marine resources that span the Bay of Bengal.

This study reviews the status of marine protected areas (MPAs) and fish refugia in the Bay of Bengal and recommends priority interventions. One of the goals of MPAs is to enhance and sustain fisheries productivity and maintain marine biodiversity. By conducting the first regional review of MPAs across the eight Bay of Bengal countries, this study seeks to (1) provide baseline information necessary to build support for a more comprehensive approach to the establishment and management of MPAs across the region and (2) where possible, discuss current and potential linkages between MPAs and fisheries management in hopes of one day more effectively linking food security and conservation objectives.

Methods include a detailed review of published, industry and government literature. Country 'profiles' systematically present information on MPA objectives, legislation, governance, effectiveness and threats. GIS maps are presented alongside each profile, and a full inventory of MPAs in each country is presented in Appendix E. Case studies, which explore issues such as collaborative governance, socioeconomic considerations, and financing models are presented after the country profiles. Recommendations are structured around an IUCN social-ecological framework for MPA networks, and are designed to elicit priority actions that would strengthen regional capacity development and MPA management. In order to validate the initial findings of this study as well as build support for this initiative more generally, a regional workshop was held from 18-19 January 2011 in Penang, Malaysia that brought together MPA and fisheries experts from each of the eight countries. Feedback on the report was generally positive, though specific improvements were made to the MPA descriptions and recommendations. This feedback has been incorporated into this report.

In general, despite the need for marine and coastal protection, MPAs are not used consistently in the region. Terms, objectives, and levels of protection vary widely from country to country (though most countries do make use of standardized IUCN categories). Chronic challenges include a lack of basic social and ecological information that is needed for MPA design and management processes; jurisdictional overlap and ambiguity; a lack of monitoring and evaluation studies; and a shortage of funding that has bearing upon day-to-day management and enforcement at MPA site levels.

Other significant trends include:

- There are very few community-based and co-managed MPAs throughout the region.
- Many 'MPAs' in the region are actually terrestrial parks that encompass parts of the marine environment (e.g. in Bangladesh and India).

- Most MPAs in the region were established for conservation or tourism purposes. This is starting to change, however, with regional governments now setting aside areas for the explicit purpose of improving fisheries (e.g. hilsa ‘closed-season’ areas in Bangladesh and fish refugia sites in Thailand).
- Many countries have (or are in the process of establishing) MPA coordinating bodies and committees to address inter-agency jurisdictional issues.

Key recommendations include:

- Conducting field (country-level) assessments of MPAs to further validate this report and identify priority steps, with broad input from various institutions and sectors.
- Introducing a series of MPA pilot sites in which MPA best practices (as represented by these recommendations and other sources) should be field-tested.
- Establishing a BOBLME MPA learning network to facilitate communication among MPA practitioners and help the diffusion of innovative practices.
- Establishing a working group for MPA assessment and implementation within the BOBLME program, consisting of leaders primarily from government, non-government and resource sector organizations.
- Organizing a high profile meeting of government officials to launch MPA system within the BOBLME.
- Developing a regional MPA capacity development program (coordinating the effort with the ongoing US Coral Triangle Support Program and the US NOAA MPA training program).

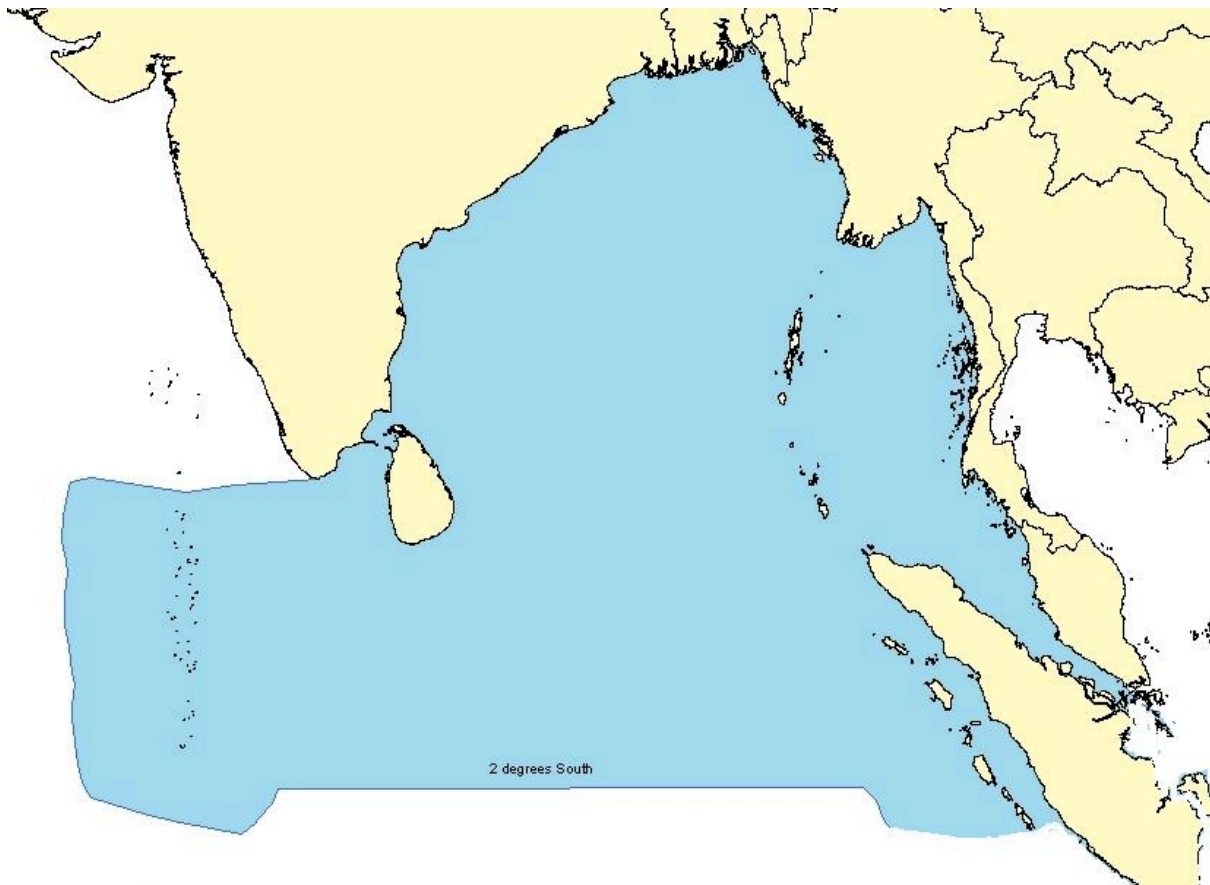


The BOBLME Region. *Photo courtesy of BOBLME Programme.*

I. INTRODUCTION

The Bay of Bengal Large Marine Ecosystem

The Bay of Bengal Large Marine Ecosystem (LME) is bounded by the Maldives, Sri Lanka the east coast of India, Bangladesh, Myanmar, the west coast of Thailand, Peninsular Malaysia and Indonesia. The LME includes the coastal areas, islands, reefs, continental shelves and coastal/marine waters of the Bay of Bengal, the Andaman Sea and the Straits of Malacca, and spans a total area of approximately 6.2 million km². While much of the LME lies within the exclusive economic zones of these eight countries, a significant proportion is on the high seas and not subject to any national jurisdiction.



The Bay of Bengal Large Marine Ecosystem (study area in blue). Map provided by the Sea Around Us Project, 2010.

Many large rivers influence the LME, including the Ayeyawady, Ganges-Brahmaputra, Mahanadi, Godavari, Krishna and Kaveri (Islam 2003). These rivers carry vast quantities of freshwater and sediment into the LME, resulting in reduced salinity of near shore surface waters in deltaic regions like Bangladesh (Islam 2003). Approximately 3.63% of the world's coral reefs are found within this LME, with major formations in the Lakshadweep-Maldives-Chagos ridge, Andaman and Nicobar Islands, the Gulf of Mannar between India and Sri Lanka, and along the eastern coasts of Thailand, Malaysia and Indonesia.

Approximately 400 million people live in the Bay of Bengal catchment area, many of whom live in poverty. Many of these people depend wholly or in part upon fishing for their livelihood, and marine resources contribute significantly to income, livelihood, food security and employment (NOAA and SAUP 2007). Approximately two million fishermen are

directly involved in coastal capture fisheries, the majority of whom are in Bangladesh, India, the Maldives and Sri Lanka (Verlaan 2004). Important fisheries include inshore small pelagics, demersal fish species, shrimp fisheries and offshore tuna, and species of particular significance include Indian mackerel (*Rastrelliger kanagurta*), hilsa (*Tenualosa ilisha*) and various shark species (Sampath 2003). Marine fish yield has increased four-fold over the last thirty years, and as of 2003, stood at approximately 4 million tones (Sampath 2003). This increased fishing pressure over the past several decades has resulted in declines in catch per unit effort as well as the average size and weight of key species (NOAA and SAUP 2007). Fishing pressure is likely a key driving factor behind biomass changes in the LME (Sherman et al. 2003; NOAA and SAUP 2007).

The Bay of Bengal LME Program

The United Nations Food and Agriculture Organization (FAO) has worked in the region for over 25 years, providing technical assistance and advice to improve fisheries and environmental management (Sherman et al. 2007). Cognizant of the transboundary nature of marine ecosystems and the need for regional management, the eight countries of the Bay of Bengal worked with FAO to submit a proposal to the Global Environment Facility (GEF) to begin managing the area as a Large Marine Ecosystem (LME) (BOBLME Programme Website 2010). First introduced by the US National Oceanic and Atmospheric Administration (NOAA) in 1984, the LME concept revolves around an ecosystem-based approach to the management of living marine resources and their environments. The defining features of the LME approach include delineation based upon four ecological criteria (bathymetry, hydrography, productivity and trophic relationships) and the application of a “five-module strategy” to measure change and take remedial action (productivity, fish and fisheries, pollution and ecosystem health, socioeconomics and governance) (NOAA LME Website 2010). There are currently sixty-four LMEs throughout the world, which together produce around 80% of the world’s annual marine fish catch and contribute \$12.6 trillion in goods and services to the global economy (NOAA LME Website 2010).

FAO is both the Implementation as well as the Executing Agency for the BOBLME Programme. Development partners include NOAA, NORAD and the Swedish International Development Cooperation Agency (SIDA). Financial support for the BOBLME Programme totals \$30.5 million, and includes co-funding and in-kind contributions from NOAA and the governments of the eight countries (Sherman et al. 2007).

One of the main objectives of the BOBLME Programme is to enhance food security and reduce poverty in the coastal communities of the eight countries (Sherman et al. 2007). In order to achieve this key objective, the Programme is currently focusing on:

- Establishing national and regional co-ordination mechanisms,
- Synthesizing and assessing existing information on the status of living marine resources and identifying transboundary issues
- Holding regional and national workshops to identify and discuss transboundary issues, constraints and priorities
- Reviewing, updating and preparing for consultation and approval of the Transboundary Diagnostic Analysis (TDA) as the basis for the Strategic Action Plan (SAP) to be developed.

(BOBLME Programme Website 2010).

BOBLME Priority Issues

According to the results of the first and second Regional Workshops of the BOBLME Programme, key transboundary environmental issues, listed in order of perceived severity, include:

1. **Overexploitation of living marine resources.** Many marine and fishery resources are heavily exploited, a situation expected to worsen if fishing is allowed to continue unregulated. This could have profound socioeconomic consequences on the many small-scale fishers who depend upon fisheries for their livelihoods and food security.
2. **Degradation of critical habitats.** The degradation of coral reefs, mangroves, estuaries, sea grass beds – all of which serve as critical fish spawning and nursery areas – is of growing concern. Degradation of these habitat types is occurring mainly due to land conversion and reclamation, sedimentation, overexploitation and destructive tourism and fishing practices.
3. **Land-based sources of pollution.** Pollutants from land-based sources impact basic marine ecosystem processes, degrade fish spawning and nursery areas, and are responsible for fish kills and possible alterations in the LME's trophic structure. Though little is known about the assimilative capacity of the Bay of Bengal, there is evidence that most pollutants end up as estuarine sediments with a smaller proportion washed far offshore.
4. **Ship-based sources of pollution** (including dumping). This region experiences some of the heaviest boat traffic in the world.

(World Bank 2005; Verlaan 2004)

Study Purpose

As stated in the BOBLME Subcomponent 3.2, the purpose of this study is “to develop a better understanding of and promote a more comprehensive approach to the establishment and management of marine protected areas (MPAs) and fish refugia for sustainable fish management and biodiversity conservation objectives.” This study compiles information about the status of MPAs and fish refugia in the region, and presents country-specific profiles that explore MPA inventory, objectives, legislation, governance, effectiveness and threats. The report also introduces a social-ecological framework to assess MPA status and effectiveness, and concludes with recommendations to strengthen the management of MPAs in the region.

Methodology and Limitations

Methods include a detailed review of published, industry and government literature and online databases. GIS maps were developed by The WorldFish Centre, and accompany the country profiles. The list of MPAs presented in this report was first developed using the UNEP-WCMC World Database on Protected Areas, and then modified and expanded based upon the results of an extensive literature review and feedback from country delegates.

This study is limited by the availability of data and information. Published information about MPAs in the region is limited, and reports are often out of date, and even contradictory. In order to address this limitation as well as build support for this BOBLME Subcomponent, a regional workshop was held from 18-19 January 2011 in Penang, Malaysia to introduce and vet the preliminary findings of this report. Feedback from participants is incorporated into the report in order to improve the accuracy of the information presented (referred to as “BOBLME MPA Workshop 2011” throughout the report).

Terminology

The countries of the Bay of Bengal use different terminology to describe protected areas in the marine environment. Examples of country-specific terms include: marine park, ecologically critical area, site of special area management, wildlife sanctuary, national park and dive site among many others. There are also sites that do not necessarily meet internationally recognized standards for MPAs, but are nevertheless considered marine protected areas by national governments and stakeholders.

This study uses the widely accepted definition of an MPA, as follows:

“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.”

(Dudley 2008, Page 8).

The report also references ‘fish refugia’, which can be defined as areas managed to control fishing gear types and to protect vulnerable life history stages in order to improve fisheries sustainability.

Recent years have also seen the introduction and growing use of the term ‘Marine Managed Area’ (MMA). As a concept, ‘MMA’ is more inclusive than either ‘Fish Refugia’ or ‘MPA’, as it includes areas set aside for *both* conservation and sustainable use/fisheries purposes. Given the wider recognition of the term ‘MPA’, however, this report uses the term ‘MPA’ to refer collectively to the many different types of protected areas throughout the Bay of Bengal region.

Given the lack of *consistent* usage of the term MPA, however, it is difficult to accurately identify and count the number of MPAs in the Bay of Bengal Region. The degree of protection within MPAs is also difficult to ascertain. For example, the extent of ‘no-take’ MPA areas, where extractive activities are prohibited, is largely unknown in the region. The state of knowledge and terminology has implications beyond the current study, and has led to discrepancies in the literature and MPA databases about specific MPA lists.

While certain countries in the region might use the same terminology for specific types of MPAs (i.e. the term ‘marine national park’ is used in both Thailand and Myanmar), the objectives and regulations might vary between countries. Furthermore, some MPAs contain both terrestrial and marine components, and are not explicitly identified as MPAs at the country-level. Finally, some protected areas that encompass mangrove habitat are considered MPAs in certain countries (i.e. the Sundarbans in India).

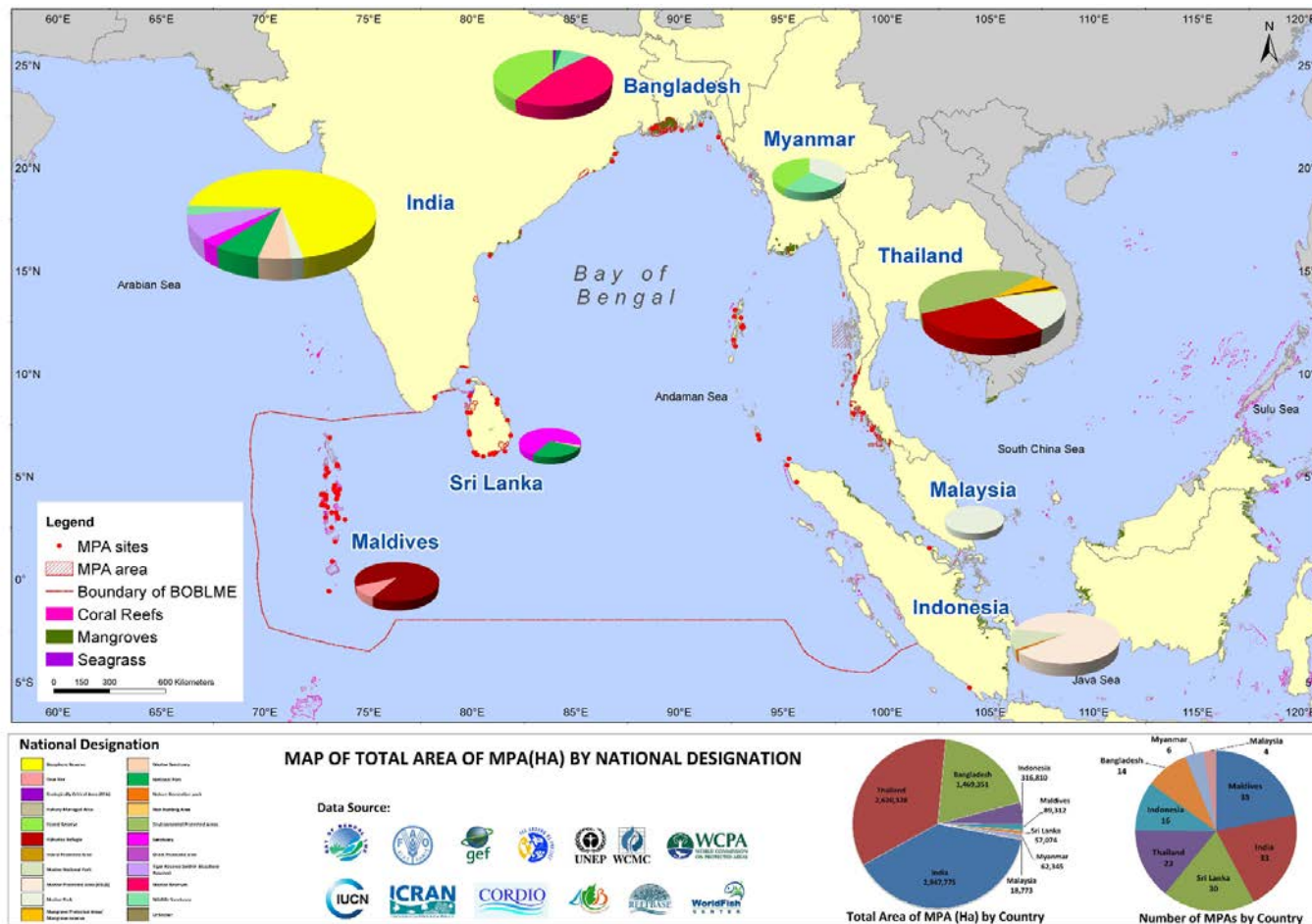
As will be illustrated in the country profiles, MPAs are often managed by different agencies across the region. Most commonly, responsibilities for MPAs are vested in fisheries, environment or forestry agencies, depending on the MPA goals, location and context. Sometimes, more than one agency is in charge. The implications of jurisdictional overlaps for effective MPA management are discussed throughout the report. Most MPAs are declared by national agencies, but some receive special status under international regimes (i.e. UNESCO Biosphere Reserves). Other international designation systems used in the region include UNESCO World Heritage Sites, Ramsar Sites, and ASEAN Heritage Sites. Sites with such status not only receive international recognition, but also are frequently eligible for direct

funding assistance. Few of the MPAs in the region are declared or managed by local resource user communities or local governments.

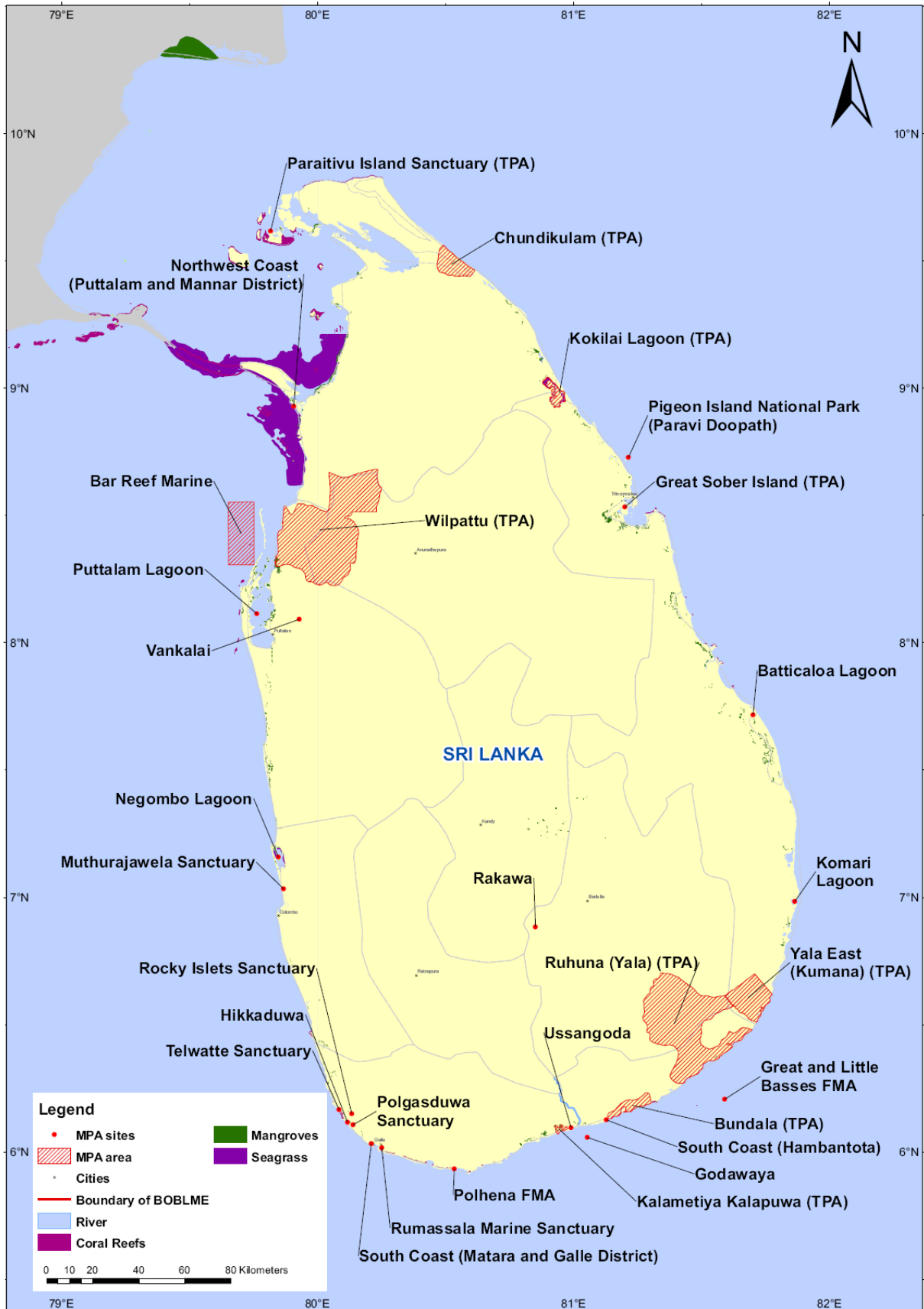
Despite the usage of inconsistent terminology throughout the region, many of the MPAs in the region have been assigned an IUCN category (Ia, Ib, II, III, IV, V, VI). These categories were developed by IUCN in 1994, in part to facilitate cross-country comparisons by creating 'a common language'. Definitions for the seven IUCN categories are found in Appendix B.

II. MPAs and FISH REFUGIA IN THE BAY OF BENGAL LME

This section presents country-specific information on MPAs in the Bay of Bengal. Detailed country maps, compiled by The WorldFish Centre, accompany each country profile. A full list of MPAs across the entire region is provided in Appendix E (along with country-level analysis graphs). Appendix F provides regional analysis of MPAs across the region.



Country Profile: Sri Lanka



Country Overview

The Republic of Sri Lanka is located 31 km south of India, and has an area of approximately 65,610 km² and a coastline of 1,620 km. Approximately 100,000 individuals are directly employed in the coastal fisheries industry in Sri Lanka, with an additional 100,000 in fishery-related sectors. Fisheries products provide nutrition for about 1.25 million, contributing just below 70% of animal protein intake and 2.7% of the national GDP (Joseph 2005).

The country has a wide variety of coastal habitat types, including estuaries and lagoons, mangroves, sea grass beds, salt marshes, coral reefs, barrier beaches, spits and dunes (Joseph 2005). Reef types include coral, sandstone and rocky reefs, and take the form of fringing, patch or platform reefs. Reefs cover approximately 68,000 hectares throughout the country, the most extensive of which are found in northern Sri Lanka in the Gulf of Mannar (Rajasuriya 2004). The southwestern coast is mostly characterized by rocky headlands, and is subject to strong winds and waves from the southwest monsoon (Rajasuriya 2004). The eastern (and leeward side) of the country, by contrast, is characterized by fringing reefs (Rajasuriya 2004).

History and Current Status of MPAs in Sri Lanka

Sri Lanka is known for being one of the world's first island nations to take an integrated approach to coastal management (Powell et al. 2009; Lowry and Wickremerantne 1988). The country began actively managing the 'coastal zone'¹ as a distinct entity as early as 1981, when it established the Coast Conservation Department (CCD) (Powell et al. 2009) and introduced the Coastal Conservation Act to address coastal zone resource degradation.

Sri Lanka's first marine protected areas predate this movement towards integrated coastal management, and were declared in the 1970s: Hikkaduwa Marine Sanctuary was declared in 1978, and Pigeon Island Sanctuary was declared in 1974². A complete list of protected areas in Sri Lanka is provided in Appendix E. In addition to MPAs, the country also protects marine biodiversity through fishery-managed areas (FMAs) and certain terrestrial protected areas (TPAs) that have marine components. Finally, there are *de facto* no take zones in the northern and eastern parts of the country (due to recent conflict), where fishing was only allowed from 6am- 6pm. There is also a *de facto* no-take zone in the Colombo Harbor that has led to increased lobster catch. These sites are discussed in further detail in the case study entitled "MPAs for Fisheries Management".

Despite almost fifty years of experience with protected areas in the marine environment, the "acceptance and use of MPAs as a conservation tool has been slow in Sri Lanka", as will be explored in the following sections (Perera and de Vos 2007).

MPA Legislation

Protected areas in Sri Lanka are declared and managed by the Department of Wildlife Conservation (DWLC) under the 1993 Fauna and Flora Protection Ordinance (FFPO). Though the act is primarily used for terrestrial biodiversity conservation, four areas of the marine environment have been protected under the FFPO (Perera and de Vos 2007) as marine national parks and marine sanctuaries. Marine parks (such as Hikkaduwa and Pigeon Island)

¹ Defined as 300 meters inland from the high water line and 2km seaward of the mean low water line.

² It was not until 2003 that the adjacent coral reefs were included in the sanctuary borders.

are afforded the highest level of protection possible, and all forms of resource extraction are prohibited (Perera and de Vos 2007). Marine sanctuaries, by contrast, are open to nonextractive uses, as well as limited artisanal resource extraction activities with a permit (Perera and de Vos 2007). The FFPO is also used to designate terrestrial parks, which sometimes contain areas of the coastal zone and marine nearshore.

The 1996 Fisheries and Aquatic Resources Act (FARA) is also used as an instrument to manage marine areas. Administered by the Department of Fisheries and Aquatic Resources (DFAR), the Act allows the Department to protect any area of Sri Lanka’s waters (or adjacent land) by declaring ‘fishery-managed areas’ (Kamau and Perera 2005). While recreational activities are allowed within FMAs, fishing is limited to a restricted number of permitted operators (Perera and de Vos 2007). Section 37 of the Act also forbids mining and the collection of aquatic resources from within FMAs, unless a permit is obtained (Kamau and Perera 2005).

MPA Governance

The Coastal Conservation Department (CCD), under the Ministry of Environment, has primary authority over all coastal areas in Sri Lanka. It is responsible for developing national management plans, as well as overseeing current management and research. Other agencies central to the management of marine resources include the previously mentioned DFAR (part of the Ministry of Fisheries), which has the power to regulate gear type, declare fisheries reserves and implementing licensing systems for fishing operations (Joseph 2003). As previously discussed, the Department of Wildlife Conservation (DWLC) also has control

Table 1. Sri Lankan Government Agencies and Organizations Involved in Marine and Coastal Management (with emphasis on environment, habitats and fisheries)
Urban Councils
Pradeshiya Sabha (elected local authorities)
Grama Niladhari Divisions (village level-administration councils)
Coast Conservation Department (CCD)
Dept of Wildlife Conservation (DWLC)
National Aquatics Resources Research and Development Agency (NARA)
Department/Ministry of Fisheries and Aquatic Resources Development (DFAR and MFARD)
Central Environmental Authority (CEA)
Urban Development Authority (UDA)
Sri Lanka Tourist Board (TB)
Disaster Management Center (DMC)
Marine Pollution Prevention Authority (MPPA)
Forest Conservation Department (FCD)
Ministry of Land and Land Development (MLLD)
Water Supply and Drainage Board

(Powell et al. 2009)

over certain activities in the marine zone, and its mandate includes “protect[ing] certain categories of endangered animals and plants wherever they are found, including threatened species of corals, fish, turtles and their nesting habitats and all marine mammals in Sri Lankan waters” (Joseph 2003). The DWLC can also declare national reserves, marine reserves and marine sanctuaries (Joseph 2003).

In addition to these three key agencies, there are many other government local, district and federal government agencies that manage activities in the coastal

zone, as listed in Table 1 (developed based on Powell et al. 2009).

It terms of non-governmental actors, Section 32 of the Fisheries and Aquatic Resources Act provides guidelines for establishing Fisheries Committees in Fishery Managed Areas. Such committees are composed of at least 51% fishermen (both local and migrant). These committees may be transformed into a Fisheries Management Authority, which in turn is a recognized actor in the management process, capable of advising the Ministry of Fisheries on

recommended closed seasons, fishing times, and activities within the FMA among other things (Joseph 2003).



Members of a fisheries cooperative group, Eastern Sri Lanka. *Photo Credit: K. ole-MoiYoi*

Threats and Challenges

MPAs throughout Sri Lanka face a variety of challenges. According to a 2007 study, the majority of MPAs in Sri Lanka are poorly managed, and resource extraction and habitat degradation remain major issues (Perera and de Vos, 2007). As described in the following sections, MPAs face design, governance, enforcement and funding obstacles in particular.

Problems with Design

It is possible to trace some of the challenges facing MPAs in Sri Lanka to flawed design processes. According to Perera and de Vos (2007), MPAs are currently delineated and managed without sufficient regard for biological, socioeconomic and management factors. Instead, new MPAs are declared in the hopes that they will be successful, even though other, previously-established MPAs have yet to achieve their management objectives (i.e. In 2003, the Rumassala Marine Sanctuary was declared and the Pigeon Island Marine Sanctuary was upgraded to a National Park, despite evidence that Hikkaduwa National Park and the Bar Reef Marine Sanctuary were not meeting their management objectives). Indeed, disproportionate emphasis has been placed on creating new legislation and declaring new protected areas, rather than strengthening management in existing protected areas (Perera and de Vos 2007).

Similarly, delays in the implementation process can be detrimental: Even though a seemingly promising management plan was developed for Hikkaduwa in the late 1990s, it had yet to be implemented as of 2007. In the intervening period, both socioeconomic and biological

conditions changed to such an extent as to render the plan impractical (Perera and de Vos 2007).

Coverage

There are concerns that MPAs in Sri Lanka do not adequately protect coastal resources due to insufficient habitat coverage. Existing MPAs protect coral reefs disproportionately, leaving other critical habitats like sandstone reefs and sea grass beds with inadequate protection (Perera and de Vos 2007). Furthermore, many of MPAs in the country are small, and as such, may not sufficiently protect species with wide habitat ranges or those reliant upon dispersal reproductive strategies (Perera and de Vos 2007). There is indeed potential evidence of this concern, and the relatively small Hikkaduwa National Park has “shown poor recovery and coral recruitment since the 1998 mass coral bleaching event [when] compared with larger areas such as the Bar Reef” (Perera and de Vos 2007; Rajasuriya and Karunarathna 2002). Finally, studies indicate that attempts to zone MPAs for varied uses (i.e. no-take areas, research, snorkeling etc) are unsuccessful if the MPA is too small and the borders between zones are difficult to enforce (Perera and de Vos 2007).

Violations and Enforcement

Compliance with MPA regulations is low throughout the country, with the possible exception of the Hikkaduwa (Tamelander 2008). Such violations are often attributed to poverty and a lack of viable sources of income. Despite the introduction of alternative livelihood programs in some areas, illegal activities persist, notably in the Great and Little Bases FMA and the Bar Reef Marine Sanctuary (Perera and de Vos 2007). In the case of Bar Reef Marine Sanctuary, the overexploitation of reef fish and pelagic species is occurring because of the use of illegal purse seines (Rajasuriya 2004). Though the authorities have attempted to control exploitation through a licensing program, critics worry that too many licenses are issued, and that monitoring is poor. Past reports also noted incidences of blast fishing and purse seining in the Pigeon Island National Park and Rumassala Sanctuary (Rajasuriya 2004).

In addition to illegal extraction, zoning violations also occur in the case of multi-zone parks. This is especially true in small parks such as Hikkaduwa, where poor enforcement has led to frequent trespassing into areas zoned for alternative uses (glass-bottom boats in particular are guilty of venturing into restricted areas) (Perera and de Vos 2007).

Though the Fisheries and Aquatic Resources Act prohibits reef harvesting, it does not explicitly prohibit the use of scuba for resource extraction. A special committee was formed in 2004 to address this oversight, but problems persist and there have been reports of harvesting sea cucumbers, chanks and lobsters within MPAs such as the Bar Reef Marine Sanctuary (Rajasuriya 2008).

Governance Challenges

The sectoral approach to management poses significant challenges in Sri Lanka (Perera and de Vos 2007). While the Department of Wildlife Conservation is responsible for declaring and managing national parks, sanctuaries and nature reserves, the Department of Fisheries and Aquatic Resources has authority over the declaration and management of FMAs, and a wholly different government agency – the Coast Conservation Department – is charged with implementing Special Area Management projects (described in greater detail in the next section). Further complicating this situation is the fact that none of these agencies control land-based threats to MPAs (such as pollution). Excessively convoluted interagency arrangements also impact marine legislation – to cite one example, there are contradictions

over which marine species are even protected when comparing the FFPO to FARA (Perera and de Vos 2007). In short, effective marine management is hard to attain with such a sectoral approach, and “individual organizations are often unwilling to take responsibility for management, especially with regard to enforcement of regulations” (Perera and de Vos 2007).

Studies have also identified a lack of political will as one of the key factors responsible for poor management in the marine sector. As is the case in other developing coastal economies, there are profound challenges when trying to balance the short-term needs of local fishing communities with the implementation of sufficient conservation measures. Both biased enforcement and “political interference in the legal process” are cited as causes of ineffective marine management in Sri Lanka, and “MPAs have failed to attract necessary government support because many politicians are partial toward the immediate needs of local communities for both economic and political reasons” (Perera and de Vos, 2007).

Funding

Finally is the issue of funding. Though MPA organizations and agencies often develop extensive and costly management plans, an ability to secure long-term funding for implementation has been identified as a barrier to effective management (Perera and de Vos 2007; Milne et al. 2005). Even when initial funds for implementation are in place (i.e. to procure buoys, signs and patrol boats), a lack of consistent funding has led to problems with maintenance, and as in the case of Hikkaduwa, infrastructure and equipment has become unusable after several years (Perera and de Vos 2007).

Socioeconomic Considerations

Recognizing that MPA success rests in part, upon social acceptance, the Coast Conservation Department initiated the Special Area Management (SAM) process in order to solicit the input and participation of local communities. Designating an area for SAM triggers a participatory stakeholder process, and local communities are given a central role alongside government agencies in determining how to improve the management of biologically significant and economically important areas (Powell et al. 2009; Joseph 2003). There are currently SAM plans underway for the Hikkaduwa National Park and the Bar Reef Marine Sanctuary.

Despite governmental recognition of the importance of placing communities at the forefront of management processes, these two sites are currently the sole examples of an attempt to increase community-based management in the marine environment. Limited community participation in management is far more common throughout the country, and communities are typically reliant upon state institutions for MPA management and enforcement (Perera and de Vos 2007). As governmental funding and capacity for such management are not always in place, however, many MPAs suffer from a “breakdown of management mechanisms” (Perera and de Vos 2007).

A failure to include local communities in planning and management processes has created other challenges. Fisheries-dependent communities surround the Bar Reef Marine Sanctuary, for example, many of which were not adequately consulted during the initial design phases of park development. This led to tension between local resource-users and MPA managers, and there have been many reported instances of park violations. Similarly, the declaration of MPAs is not always publicized, and park boundaries are rarely demarcated (with the

exception of Hikkaduwa National Park). This has led to confusion over regulations and an increase in violations (Perera and de Vos 2007).

Effectiveness of MPAs

A 2007 study to rate the effectiveness of six major MPAs in the country found that no MPA is effectively attaining its objectives. While Hikkaduwa National Park was given a score of 15 out of 27, the other five received scores of 7 of 27 (Perera and de Vos, 2007, based on the scorecard approach of Staub and Hatzios 2004).

The National Aquatic Resources Research and Development Agency (NARA) is charged with conducting research and monitoring activities around marine parks, and has made important progress in the last decade (Perera and de Vos 2007). There are, however, “major deficiencies in the available data”, notably caused by a lack of funding. Private entities and research institutions also carry out monitoring studies, often at the site-level. Such studies are frequently undertaken without regard to larger context, however, limiting the reach of their findings (Perera and de Vos 2007).

MPAs in Sri Lanka face numerous challenges, and most of the country’s MPAs can be classified as “paper parks” that are not meeting their management objectives (Perera and de Vos 2007). The habitats within many MPAs that are ostensibly under protection in reality continue to degrade, and fish numbers have reportedly decreased (Perera and de Vos 2007; Rajasuriya et al. 2002, 2005; Rajasuriya 2005). While there is active management in the Hikkaduwa National Park, others such as the Bar Reef Marine Sanctuary, Rumassala Marine Sanctuary and Pigeon Island National Park are unmanaged, and subject to illegal activities such as destructive fishing (Perera and de Vos 2007).

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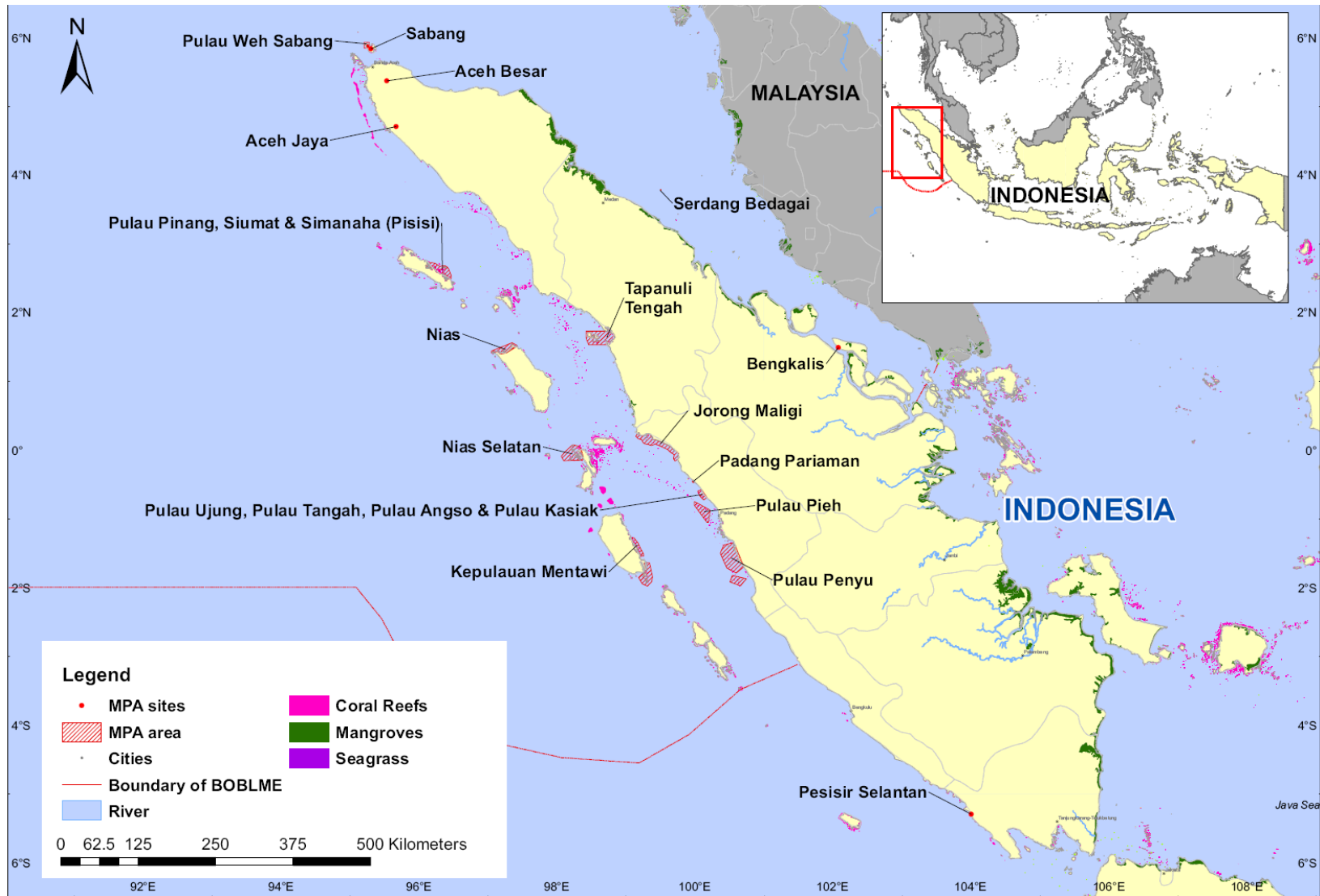
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Country Profile: Indonesia



Country Overview

Indonesia is the world's largest archipelagic nation, and has over 17,805 islands that stretch from the Indian Ocean to the Pacific Ocean (Suharsono 2005). With over 230 million inhabitants, it is one of the most populated countries in the world. It also houses the greatest collection of marine biodiversity anywhere on earth, and is home to over 2,500 species of fish, 590 species of stony corals, 42 species of mangroves, 13 species of sea grass, 782 species of algae, 850 species of sponge, 2,500 species of mollusk, 1,500 species of crustacean and 745 species of echinoderm (Suharsono 2005).

Estimates for total coral reef coverage vary widely, though the country is thought to house about 14% of all coral reefs worldwide (Suharsono 2005). Of all known coral genera, 75% are found within Indonesia's coastal waters, though species composition is highest in the eastern parts of the country (outside of the BOBLME) (Suharsono 2005). Countrywide, there are more than 30 million people employed in fisheries and fisheries-related industries, and marine activities and products make up 20.6% of GDP, and (Suharsono 2005).

The western island of Sumatra is the only part of Indonesia within the Bay of Bengal LME. In addition to the mainland, Sumatra is made up of about 100 islands and has approximately 1,400 km of coastline (Kunzmann 2002). It has two fisheries management and conservation areas: WPP 571, which is within the Strait of Malacca and WPP 572 in the Indian Ocean. Total coral reef coverage around Sumatra is estimated at 900km² (Kunzmann 2002). Sumatra has relatively high concentration of mangrove forest, and total coverage is estimated around 4,170km² (UP MSI et al. 2002).

There are four provinces in Sumatra that border the Bay of Bengal LME – Nanggro Aceh Darussalam (Aceh) Province, North Sumatra Province, West Sumatra Province and Riau Province. As of 2001, approximately 127,611 fishers operated in these four provinces (Purnomohadi 2003).

History and Current Status

The momentum to create Indonesia's MPA system began in 1984 with the development of the Marine Conservation Data Atlas – a collaborative effort between IUCN, WWF and the Directorate General of Forest Protection and Nature Conservation (Pet-Soede 2006). This

Table 2: Goal of the MPA Plan (IUCN, WWF, GoI)

“To establish and manage a system of marine protected areas which functions to preserve the value of sites in each province for tourism, fisheries, research, interpretation, and education; protection of endangered species; and conservation of included biota and habitats.”

(Pet-Soede 2006)

initiative led to a formal plan for MPAs in the country, and (1) described a goal to eventually protect 10 million hectares of marine habitat, (2) provided guidance on identifying candidate sites, and (3) put forth 180 potential MPA sites for consideration (Pet-Soede 2006; Salm and Halim 1984). As a direct

result of the plan, the Government of Indonesia established the country's first formal MPA in 1989 in Manado Bay (North Sulawesi).¹

¹ Terrestrial protected areas (with marine components) existed prior to this date, such as the Pulau Berkeh Nature Reserve and the Karang Gading Langkat Timur Laut Game Reserve.

Twenty-five years later (in 2009), the Government achieved its goal of protecting 10 million hectares of marine habitat (BOBLME Project Report 2009). There are currently almost 88 formal MPAs throughout the country, of which 32 are under the Ministry of Forestry while the remaining 56 are under MMAF and local government authorities. Many of these sites “are the result of the 1984 plan and the legal framework that arose from it” (Pet-Soede 2006), as well as a recent policy that encourages local/district governments to establish and manage their marine resources. The country most recently established a goal to protect 20 million hectares of marine habitat by 2020 (Pet-Soede 2006).

According to participants at a 2011 MPA BOBLME Workshop, there are currently sixteen marine protected areas in Sumatra that lie within the boundaries of the Bay of Bengal LME, amounting to a total of 4,083.66 km².¹ There is very little information available online about other types of protected areas in the region, such as fisheries management areas (FMA/WPP) and fisheries refugia areas (most online data and reports are in Bahasa Indonesia, making regional analysis challenging).

Riau Province is located in the Strait of Malacca, and is just south of Singapore and Malaysia. Riau Province was subdivided into two provinces in 2002, and most MPAs are in the new province, Riau Kepulauan. The only marine conservation area in Riau Province is a fisheries sanctuary for Ikan Terubuk (*Temulosa macrura*), a fish species endemic to Bengkalis District. This sanctuary was declared through Bengkalis District Regulation in 2010.

The **Northern Sumatra Province** borders Riau Province, but stretches across the width of Sumatra to include shorelines along both the Strait of Malacca and the Indian Ocean. The coastline along the Strait of Malacca is characterized by several large rivers, which flush the coastal zone with high levels of nutrients and freshwater, thereby supporting the development of extensive mangrove systems (Suharsono 2005). This coastline has relatively little coral coverage, though information about the true extent of coral reefs, mangroves and sea grasses is limited (Purnomohadi 2003). There are four local marine protected areas (KKLDs) in the province, including Serdang Bedagai, Nias, Nias Selatan and Tapanuli Tengah (the names of KKLDs usually correspond with the district name. To date, there are no specific names for each KKLD).

Nanggro Aceh Darussalam (NAD) Province encompasses the northern most point of Sumatra, and has shallow fringing and steeply sloping coral reefs (Yulianto and Mukminin 2009). The reefs of Aceh Province support a wide array of marine biodiversity and endemic species. Ecological assessments conducted in the wake of the 2005 tsunami show that while most reefs were unaffected by the tsunami waves, reefs had been degraded as a result of destructive fishing activities and land-based coastal development (Herdiana et al. 2008). Marine protected areas in Aceh Province include:

- Pulau Weh in Sabang Regency encompasses 39 km² of both terrestrial and marine habitat. It is known for a rare megamouth shark that washed up on shore. The protected areas is part of Weh Island, which is a volcanic island just off the coast of in the Andaman Sea, and home to a wide array of western Indonesian coral and reef fish species (Yulianto and

¹ Information about MPAs in Sumatra is generally sparse, and often contradictory. The list of MPAs presented in this report is based on a 2009 presentation by the Ministry of Marine Affairs and Fisheries (Kasasiah 2009), the MPAs listed in Regulation 26, the MPA Global Database, and feedback from the 2011 BOBLME MPA Status Workshop in Penang.

- Mukminin 2009).

 - There are four local/district marine protected areas (KKLD) in Aceh Jaya, Aceh Besar, Sabang and Seumelu MPAs (the Pulau Pinang, Siumat and Simanaha MPA is abbreviated as 'Pisisi'). This latter MPA was declared in 2006, and consists of dozens of islands and adjacent marine habitat, mangroves, fringing reefs, and both small and large pelagic fish. Inhabitants living in the area are typically farmers, fishermen, traders, artisans and laborers (DCMNP 2010).

In addition to these MPAs, there is also the Kawasan Wisata tourism conservation area (207 hectares), and a traditional Acehnese management area that is administered through a traditional governance system known as *Panglima Laot* (206 hectares) (TNC 2010).

The Wildlife Conservation Society (WCS) is currently active in Aceh, where it is working with partners to build a network of community-supported MPAs. According to the results of a 2008 study, the optimal approach will be to establish many small MPAs rather than a few large areas (Herdiana et al. 2008). MPAs proposed for inclusion include some of the healthiest reefs in northern Aceh, turtle nesting habitat, and areas frequented by whale sharks, manta rays, dolphins and reef sharks (WCS 2010). WCS is also working to identify critical fishery spawning areas, which would be included within the MPA network (TNC 2010).

The **West Sumatra Province** borders the Indian Ocean, and is home to six MPAs: The Pulau Pieh MPA, Pasaman Bart (Jorong Maligi MPA), Kepulauan Mentawi MPA, Pesisir Selatan, Padang Pariaman and Pariaman (the Pulau Ujung/Tengah/Angso/Kasiak MPA). Two chains of small islands run parallel to West Sumatra Province, and patch and fringing reefs surround both the coral islands in the northern part of the chain as well as the volcanic islands in the south.

MPA Legislation

Prior to the 1984 MPA plan, Indonesia had weak regulatory mechanisms to protect marine resources. At the time, the only relevant legal provisions were two ordinances left over from the colonial period, and there were no legal categories for MPAs (Pet-Soede 2006). The 1984 plan led to the passage of a ministerial decree in 1990 (The Conservation of Living Natural Resources and their Ecosystems Act), which provided the legal basis for establishing marine protected areas (Pet Soede, 2006). This Act continues to provide the main legislative framework for managing marine protected areas (UP MSI et al. 2002). The Act defines four types of protected areas: (1) national parks; (2) strict nature reserves; (3) wildlife sanctuaries; and (4) nature recreation zones (Pet-Soede 2006). The decree also provides a legal basis for designating UNESCO biosphere reserves.

Most recently, Indonesia introduced new regulations in 2004 (Law 31/2004 and revised by Law 45/2009 on Fisheries and Governance Regulation No. 60 on Fish Resources Conservation). This paved the way for local governments to manage and introduce MPAs. Such MPAs are known as *Kawasan Konservasi Laut Daerah* (KKLD). As illustrated in the Indonesia MPA inventory list, thirteen locally managed MPAs have been introduced in the BOBLME since the passage of these regulations in 2004.

Other relevant legislation includes the 1997 Management of the Living Environment Act, and Law No 27/2007 on Coastal and Small Islands Management, which also provides a strong basis for the implementation of integrated marine, coastal and small island management in Indonesia.

Internationally, Indonesia is party to the CBD, CITES, and Ramsar, and participates in the World Heritage Convention, the UNESCO Man and Biosphere Programme and the ASEAN Convention on the Conservation of Nature and Natural Resources (ASEAN 2010; UP MSI et al. 2002).

MPA Governance

Prior to Indonesia's independence in 1949, the management of protected areas fell under the responsibilities of the Forest Department (which was within the Ministry of Agriculture) (UP MSI et al. 2002). Approximately twenty years after independence, the government established the Directorate of Nature Conservation and Wildlife (PPA), and mandated that it establish and manage protected areas (UP MSI et al. 2002).

1999 was a significant year for marine resource management in Indonesia. It was during this time that much of the authority shifted from central control to provincial and district level governments (Act No. 22) (UP MSI et al. 2002). This year also saw the creation of the Ministry of Marine Affairs and Fisheries (MMAF), the government agency currently tasked with designing and implementing policy related to the marine and fisheries sector throughout the country (MMAF 2010). Following the creation of this Ministry, eight protected areas previously under the Ministry of Forestry have been transferred to MMAF. This is considered a significant move, as it has led to improved institutional collaboration and management of MPAs.

In addition to MMAF, other focal government agencies currently involved in MPA management include the Ministry of Environment, the Indonesian Forestry and Nature Conservation Department (PHKA, formerly known as the Directorate for Forest Protection and Nature Conservation [PHPA]) under the Ministry of Forestry (Pet-Soede 2006; UP MSI 2002).

NGOs also play a critical role in marine management across Indonesia. There are over 400 NGOs that work throughout the country (both within and around MPAs), on issues ranging from building public awareness, strengthening participatory management, and resource planning (UP MSI et al. 2002). Some of the larger NGOs involved in the field include WWF-Indonesia, The Nature Conservancy, Conservation International, World Conservation Society and local groups such as WALHI, MPLH and HUALOPU (UP MSI et al. 2002).

Though most MPAs are government-administered, there are a few examples of community-based MPA management in North Sulawesi and the Maluku Islands (both outside of BOBLME boundaries) (UNEP 2002; UP MSI 2002).

Threats and Challenges

There is a pervasive lack of available information about the status of MPAs and associated resources on Sumatra. Furthermore, it can be difficult to distinguish between terrestrial parks with marine components, terrestrial parks with no marine components, and marine protected areas. This reality makes it difficult to verify both the total number of marine protected areas in the region and the total area figures (UP MSI et al. 2002).

In general, much of the MPA literature for Indonesia seems to focus either on national-level issues and threats, or, on MPAs located in Eastern Indonesia (the site of much NGO activity, and part of the Coral Triangle). As such, while the following section attempts to provide as

much site-specific information as possible, much of it speaks to the challenges facing MPAs at a national level.

Anthropogenic Threats

Marine resources around Sumatra are threatened by exploitation, deforestation, run off, sedimentation, oil pollution, sewage, pesticide use and industrial pollution (BOBLME Project Report 2009). The usage of destructive fishing techniques is high around Northwest Sumatra, and coral mining is an issue in Riau Province and close to the Mentawai Island chain off of Western Sumatra (UP MSI et al. 2002).

Demands for live reef fish are on the rise, and Indonesia is currently the largest supplier to the Asian market (Suharsono 2005). Historically, cyanide was used adjacent to Mentawai Islands to capture groupers and wrasse for the live fish trade, resulting in the degradation of local coral reefs (Kunzmann 2002). Though this latter activity occurred very close to a marine park, it was tolerated as the involved enterprises paid taxes, provided income/loans for local fishers, and invested in education and training (Kunzmann 2002). Although this “large-scale enterprise” operated as recently as 2002, little information is available about the current extent of such activities.

Along the mainland of Western Sumatra (Padang), reefs are threatened by sedimentation and waste generated by local agricultural, forestry and mining industries (Kunzmann 2002). Industries in Padang include palm oil, rubber and cement production, and there is a fishing harbour, plywood factor and oil-landing pier along Padang. There is evidence that these activities not only affect the health of the local marine environments, but in doing so, also conflict with local tourism (Kunzmann 2002).

At a national level, other anthropogenic threats to MPAs include overfishing, global warming, population pressures, siltation, tourism activities and the conversion of coastal habitat to agricultural land (UP MSI et al. 2002). It is unclear how pressing these threats are at the level of individual MPAs within the Bay of Bengal LME.

Design and Implementation Challenges

A 2002 UNEP report identified a need to address the following MPA management gaps at a national level:

- Strengthening and involving communities in enforcement
 - Increasing local capacity for coral reef management
 - Developing extension services
 - Increasing public awareness for coral reef management
 - Incorporating financial incentives into conservation
 - Replicating existing good practice models for national and community MPAs
- (UNEP 2002)

The report further emphasized the importance of strengthening decentralized approaches to MPA management and strengthening field implementation.

Despite high levels of international and national investment, “management has not been able to keep pace with the expanding protected areas network” (UP MSI et al. 2002). This is in part due to insufficient funds, a lack of fully trained personnel, motivation and enforcement (UP MSI et al. 2002). The majority of MPAs throughout the country do not have significant management activities, and there are “only minimal levels of management in the marine

national parks and some NGO activities are evident in a few sites” (UP MSI et al. 2002). Green et al. (in press) highlight similar conditions for MPAs in eastern Indonesia. As of 2002, only two of the country’s marine national parks (Komodo and Bunaken, neither of which is in the Bay of Bengal) had management plans in place (UNEP 2002).

Though the network of MPAs is growing in order to meet the 2020 goal of protected 20 million hectares, there are many challenges. In recent years, the Ministry of Marine Affairs and Fisheries put forth more than seventy sites for MPA status, but the nominations were “entirely arbitrary and reflect[ed] no systemized consideration of ecological criteria (biodiversity, representativeness, ecosystem status, resilience, importance of fisheries, etc)” (Pet-Soede 2006).

Governance Capacity and Intergovernmental Cooperation

In terms of improving intergovernmental cooperation between marine management agencies and organizations, there are signs of progress. The government recently established a task force (the “National Committee for Marine Conservation”), whose membership base includes representatives from PHKA, the Ministry of Fisheries and Marine Affairs, the Ministry of Environment, and several NGOs (Pet-Soede 2006). The mission of the task force is to examine existing MPAs and better quantify their contributions towards sustainable fisheries and biodiversity conservation (Pet-Soede 2006).

There are also governance capacity constraints that have appeared since the transition of MPA management responsibilities to local governments. According to participants at the 2011 MPA BOBLME Workshop, there are now approximately 40 KKLDS/MPAs throughout the country that are managed by local governments. Though the central government provides guidelines and support to such local governments on MPA management, challenges remain at a local level. As part of activities under the Coral Triangle Initiative (<http://www.cti-secretariat.net/>), there are efforts underway to set up a School for Marine Protected Area Management. This effort is based on collaborative efforts between the Government of Indonesia and The Nature Conservancy primarily, and aims to help MMAF build the skills of 11,000 mid-level officers (US CTI 2010). In collaboration with NOAA and NGO partners, the government (MMAF) has been establishing a system for MPA management capacity building, which includes activities such as:

1. Establishing curriculum and modules for MPA training,
2. Conducting training for trainers and MPA managers
3. Standardizing curriculum and corresponding competencies.

Community Participation in Management

Cognizant that poverty, a lack of public awareness and low public participation were hindering MPA success throughout the country, the Government established the Coral Reef Rehabilitation and Management Program (COREMAP) in 1998. This Program aims to develop systems of co-management in order to better protect, rehabilitate and promote the sustainable use of coral reefs, while simultaneously enhancing community standards of living. The program is planned for a fifteen year period, which is divided into three phases: Coremap Phase 2 runs from 2004 until 2009 (extended until 2011), and includes parts of Riau Kepulauan, and North and West Sumatra Provinces (UP MSI et al. 2002). Coremap 3 is under preparation. To date, national level activities have focused on developing public awareness campaigns, piloting community-based management schemes, supporting institutional development activities and creating a monitoring system (UP MSI et al. 2002).

The Coral Triangle Initiative is also supporting the development of a MPA system to the east of the BOBLME area. A series of workshops and planning exercises is currently underway to improve the systematic MPA management.

Though the usage of customary laws and traditional governance (*Panglima Laot*) has protected marine resources, there are challenges. *Panglima Laot* marine management in Aceh province has not always prevented encroachment. Specifically, adjacent and distant communities do not always recognize the regulations set forth by *Panglima Laot*, which has prompted efforts to place customary laws within more widely-recognized legal frameworks (Yulianto and Mukminin 2009).

Socio-economic Considerations and Perceptions of MPAs

There is very little information available online about the socioeconomic impacts of MPAs in Sumatra. It is envisioned that such information will emerge through the BOBLME planning process.

Effectiveness of MPAs

While there is information assessing the health of coral reefs in Sumatra, there is very little information available online about the effectiveness of MPAs in Sumatra. Again, it is envisioned that such information will emerge through the BOBLME planning process.

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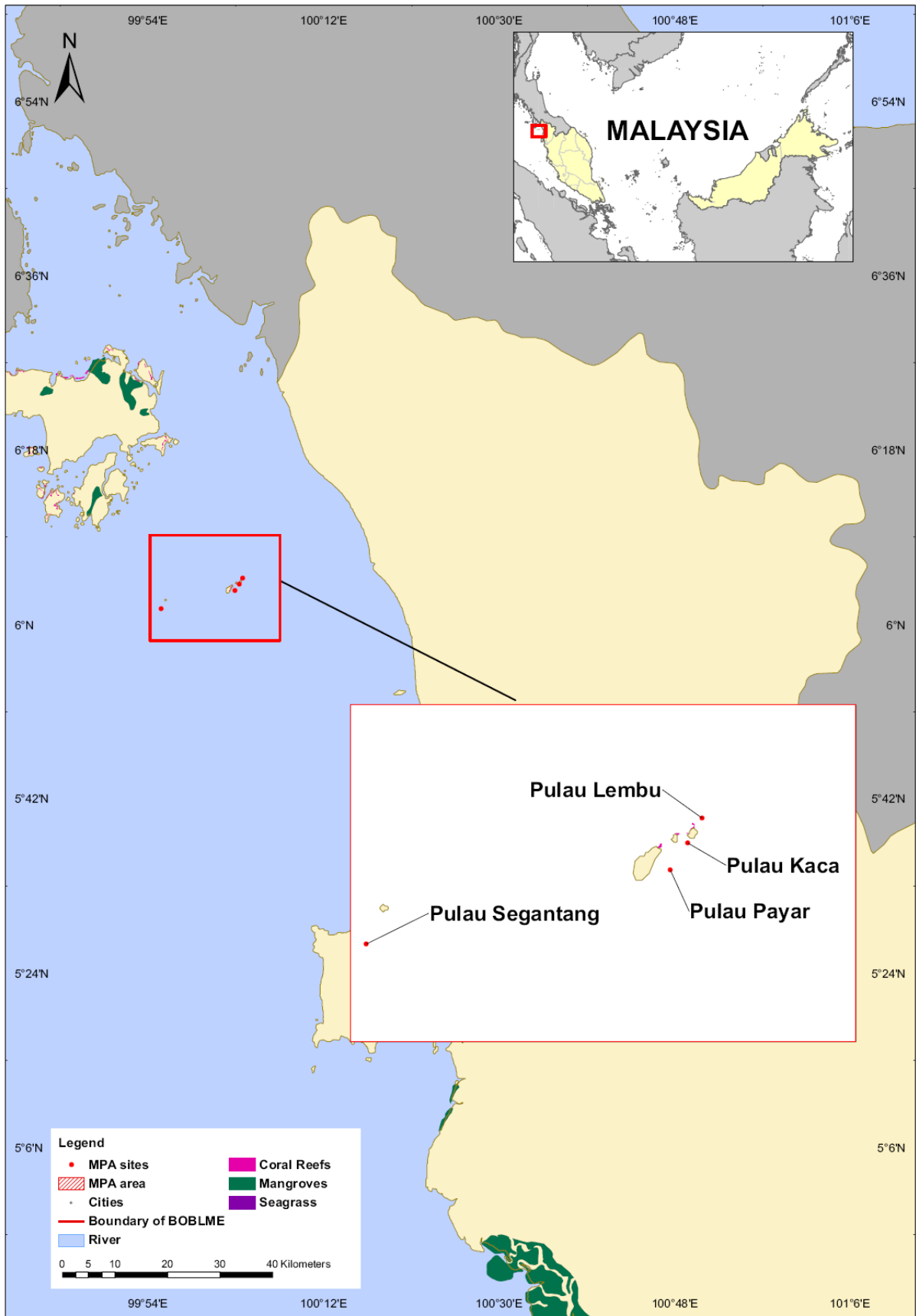
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Country Profile: Malaysia



Country Overview

Malaysia is made up of three main landmasses, namely Peninsular Malaysia, Sabah and Sarawak. Of these, only the west coast of Peninsular Malaysia falls within the boundaries of the Bay of Bengal LME. This coastline traces the eastern boundary of the Andaman Sea and the Straits of Malacca, and is characterized by mangroves, estuaries, coral reefs, sea grass beds, algae beds, mudflats, beaches and small islands (Omar et al. 2003). The coastline stretches approximately 600 nautical miles from north to south, beginning at the Thai border and ending at the Malaysia-Singapore border (Omar et al. 2003).

Coastal states bordering the Bay of Bengal LME include Perlis, Kedah, Penang, Perak, Selangor, Negeri Sembilan, Malacca and West Johor (Omar et al. 2003). Though there are small patches of fringing reef along the west coast of Peninsular Malaysia, coral growth is limited as a result of relatively turbid water, muddy substrates and exposure to Southwest monsoons (UP MSI et al. 2002).

Approximately 17% of the country's mangrove forests are located on Peninsular Malaysia (UP MSI et al. 2002). The majority of these are found along the sheltered west coast in the states of Kedah, Perak, Selangor and Johor. Small patches of mangrove forests occur along the rocky shores, and include those found in Pulau Langkawi (Kedah), Pulau Pangkor (Perak) and in Port Dickson (Negeri Sembilan). In the south, mangroves are found in the estuaries of Sungai Pulai and Sungai Johor, which drain into the straits of Johor, and the remaining mangroves are found along the straits of Johor (UMS 2009).

Malaysia is a middle-income country, and has transitioned from primarily producing raw materials in the 1970s to a multi-sector economy with relatively high a GDP. Industry (including high technology, pharmaceuticals and other sectors) is responsible for 40.9% of GDP, the services sector contributes 49.7% and agriculture contributes 9.4% (CIA World Fact book 2011).

History and Current Status of MPAs

Malaysia's marine park system is relatively well developed, and dates back to 1983 (Cheung 2002). Spurred by concerns over declines in marine resources, the government initially began declaring marine protected areas in order to enhance fisheries resources (DMPM 2010; Ramli 1999). Today, the primary goals of marine parks are to "protect, conserve and manage in perpetuity representative marine ecosystems of significance, particularly coral reefs and their associated flora and fauna, so that they remain undamaged for future generations" (Lim 1998). Other key objectives of marine parks are listed in Table 3.

The country's first MPA, Pulau Redang, was established off Terengganu on the east coast of Peninsular Malaysia (not within the Bay of Bengal) (DMPM 2010). With few exceptions, marine parks are declared in coastal waters surrounding offshore islands (DMPM 2010). Specifically, MPAs typically encompass all habitats within a two nautical mile distance from the lowest watermark (DMPM 2010). There are currently 53 such island MPAs throughout the country, of which 42 are in Peninsular Malaysia, 3 are in Sarawak and 8 are in Sabah (Isnain 2010). Of these, only one is within the BOBLME.

In addition to these 'island marine parks', there are other types of protected areas elsewhere in the country that contain parts of the marine environment. These include three state parks in Sabah, and three "Fisheries Prohibited Areas" in Sarawak (which also function as turtle

sanctuaries), three marine bird sanctuaries on Sabah, several MPAs designated for dive tourism purposes, and forest/virgin jungle reserves throughout the country that protect mangroves (FAO Report).

Table 3: Objectives of Marine Parks in Malaysia.
To inculcate public understanding, appreciation and enjoyment of our marine heritage.
To afford special protection to aquatic flora and fauna, and to protect, preserve and manage the natural breeding grounds and habitats of aquatic life with particular regard to species of rare or endangered flora and fauna
To allow for the natural regeneration of aquatic wildlife where such life has been depleted
To promote scientific study and research
To preserve and enhance the pristine state and productivity of the environment
To regulate recreational and other activities in order to avoid irreversible damage to the environment

(Fisheries Act 1985)

The Pulau Payar Marine Park is located in the northern part of the Straits of Malacca, and consists of four different islands and their surrounding marine ecosystems (Pulau Payar, Pulau Lembu, Pulau Kaca and Palau Segantang). The area was declared a marine park in 1994 under the Fisheries Act 1985 (Amended 1991) (DMPM 2010). Prior to this declaration, (which made it illegal to fish within the park), the marine park served as fishing grounds for nearby communities, who used drift nets,

purse-seines, long-lines and bottom traps to obtain their catch (Lim 1998).

Tourist visitation rates to the Pulau Payar Marine Park have increased in recent years. Between 1988 and 2010, the annual number of day-trippers to Pulau Payar grew from 1,373 to 1,230,462 (DMPM 2010). Many of these tourists came to the area to stay on nearby Langkawi Island, which is renowned for its natural beauty, historical sites, duty-free status and international airport (Lim 1998). Over the past ten years, the annual visitation rate has hovered around 100,000 each year, with the majority of visitors coming from foreign countries (DMPM 2010). Indeed, a visit to the Pulau Payar Marine Park is frequently sold as part of the tour package to visitors staying on Langkawi Island (Lim 1998).

Of the forest and virgin jungle reserves along the BOBLME coastline, one of the most significant is Pulau Kukup. This Ramsar site consists of an inhabited mangrove island adjacent to the southwestern tip of the peninsula, and is considered one of the “few intact sites of this type left in Southeast Asia” (Ramsar Site 2010). Unique biodiversity includes IUCN Red Book species like flying foxes, bearded pigs, long-tailed macaques and smooth otters.

The Pulau Payar Marine Park. *Photo credits: malaysiasite.nl*



MPA Legislation

The Fisheries Act is the primary piece of legislation used to designate MPAs throughout Malaysia. MPAs were initially designated as ‘fisheries prohibited areas’ under the 1963 Fisheries Act (DMPM 2010). The act was amended in 1985, in part to allow for the conversion of ‘fishery prohibited areas’ into ‘marine parks’ (Karim 1999). The updated legislation also introduced more stringent and comprehensive regulations to govern these protected areas (Karim 1999). Specifically, the regulations made it illegal to fish, attempt to fish, remove or possess any aquatic animal or plant (dead or alive), erect any building structure, extract sand, discharge pollutants, anchor, destruct or deface any object in a marine park (Karim 1999). Finally, Section 41 of the Fisheries Act of 1985 enabled the government to declare new marine parks in Malaysian waters for conservation purposes (Karim 1999). The 1989 Marine Parks Malaysia Order strengthened the legislative framework for marine protected areas, and paved the way for the designation of the Pulau Payar Marine Park several years later in 1994 (DMPM 2010).

The Fisheries Act was again amended in 1994, and regulations were expanded to ban the collection of shells, mollusks and corals within marine parks, as well as define marine park boundaries to include the waters extending 2 nautical miles seaward of the low tide mark of any marine park island (Karim 1999).

Other relevant legislation and policies include the National Environment Policy, the National Policy on Biological Diversity (which reflects Malaysia’s commitments to implement the CBD), the 1999 Fisheries Regulations (which protect species of whales, dolphins, whale sharks and giant clams), and the 1984 National Forestry Act, which allows for the declaration of forest and virgin jungle reserves.

Internationally, Malaysia is party to the Ramsar Convention, the World Heritage Convention, CITES, MARPOL, UNCLOS, the Montreal Protocol, the Basel Convention, UNFCCC and the CBD.

MPA Governance

Governance of marine parks in Malaysia corresponds to a three-tiered system involving the Federal Government, State Government and Local Authority (Isnain 2010). Policies formulated at the federal level broadly guide national development, while the State Government is responsible for overseeing land matters on islands that are adjacent to marine parks. Local authorities, such as district and land offices, are responsible for the implementation of policies, as well as managing development activities (Isnain 2010).

Historically, marine parks in Peninsular Malaysia were managed by the Fisheries Department under the Ministry of Agriculture (Ramli 1999). This changed in 2004, however, following the creation of the Ministry of Natural Resources and Environment. The Department of Marine Park Malaysia (DMPM 2010) was placed within this new Ministry, and given the responsibility for managing all marine parks throughout the country (DMPM 2010).

In order to streamline operations, the 42 protected islands around Peninsular Malaysia are subdivided into six ‘Marine Park Centres’ (one of which is the Pulau Payar Marine Park). The Centres act as focal points for all administration and management activities within the park, and also provide a base for enforcement activities (Hiew 1999). The Marine Park Enforcement Division oversees all enforcement activities, and regularly works with other enforcement agencies such as MMEA (Malaysian Maritime Enforcement Agency). The

Centres not only provide visitors with educational materials, but in the case of Pulau Payar, also provide R&D facilities for researchers from government agencies, NGOs and foreign and local universities (Hiew 1999).

In addition to DMPM, the National Advisory Council for Marine Parks and Marine Reserves is also involved in marine park management. The Council has broad stakeholder representation, and includes members from environmental agencies, NGOs, businesses, universities and federal/state agencies (Hiew 1999). The primary responsibilities of the Council include determining national-level guidelines for MPA implementation, coordinating developments within MPAs, providing the State Government with technical advice, and ensuring that development on islands does not threaten marine ecosystems (Hiew 1999).

Funding for marine parks comes from a variety of sources. Though money was initially allocated solely through the '5-Year Malaysia Plans', the government decided to bolster funding streams by creating the Marine Parks Trust Fund in 1987. The Fund initially received a government grant of approximately \$13 million, and current contributions come from the collection of 'conservation fees' from tourists; the sale of coffee table books; the rental of chalets, equipment and facilities at Marine Park Centres, and charitable donations (Ramli 1999; Hiew 1999). Despite initial resistance, it is reported that tourists and the private sector are generally supportive of the conservation fees, which are collected at all marine parks throughout the country. The Fund was initially used to procure boats, vehicles and needed infrastructure, but is currently used primarily for conservation, rehabilitation and R&D activities (DMPM 2011).

Over the years, the government has spearheaded an array of other significant management initiatives with relevance to Pulau Payar, including:

- 1989: Development of the "National Marine Parks Malaysia: Policy and Concept"
- 1991: Development of a training manual for Marine Park Management (created in collaboration with UNDP)
- 1993: Development of a training manual for Coastal Zone Management (created in collaboration with UNDP)
- 1994: Development of the 'Marine Park Island Management Conceptual Plan for Peninsular Malaysia (created in collaboration with WWF and Canada Fund Malaysia)
- 1998: Production of the 'Marine Park Education Kit' (created in collaboration with WWF and the Ministry of Education)
- 1998: Production of the 'Carrying Capacity Assessment of Pulau Payar Marine Park' (created in collaboration with WWF and the Bay of Bengal Programme).
- 1999: Introduction of 'marine park conservation fees' in all marine parks (\$1.32/visit for both foreign and local adult residents, though this is currently under review and new rates are being considered) (P. Gangaram 2010, personal communication)
- 2002: Production of Strategic Plan for the Management of Marine Parks in Malaysia
- 2003: Enactment of Fees Order
- 2004: Transfer of the 'Marine Park Section' from the Fisheries Department to the Ministry of Natural Resources and Environment
- 2005: Initiation of Coral Reef Conservation Project, with activities in Pulau Payar
- 2007: Marine Park Section changes name to 'Dept of Marine Park Malaysia'
- 2011: Production of New Strategic Plan for the Management of Marine Parks (Yeo 2004; DMPM 2011).

NGOs involved in marine resource management in Peninsular Malaysia include WWF-Malaysia, the Malaysian Nature Society, Sahabat Alam Malaysia (Friends of the Earth

Malaysia), the Environmental Protection Society of Malaysia, the Consumers' Association of Penang and the Malaysian Society for Marine Sciences (UP MSI et al. 2002)

Threats and Challenges

When compared across the region, there is evidence that Malaysian governmental institutions have relatively high capacity for effective marine resource management (UNEP, 2002). Indeed, national coral reef management programs are amongst the most successful in the region, and the marine park system serves as regional model in many regards (UNEP 2002). Nevertheless, there are certain challenges and growing threats, as outlined below.

Studies over the past decade point to a schism between the activities of state and federal authorities. While the Federal Government (Department of Fisheries and DMPM) oversees marine resource management within two nautical miles, terrestrial resources are under the jurisdiction of State authorities. Because the federal government has no authority over lands adjacent to marine parks, it is challenging to stem marine resource degradation that occurs as a result of sedimentation and pollution from inland sources (UP MSI et al. 2002). With recent developments, however – namely the creation of the Ministry of Natural Resources and Environment, and multi-stakeholder representation on the National Advisory Council for Marine Parks and Marine Reserves – it is unclear to what extent this remains a problem.

Major threats to marine ecosystems of West Peninsular Malaysia include sedimentation, dredging, and domestic/agricultural pollution (UP MSI et al. 2002). Within the Pulau Payar Marine Park in particular, there are also concerns over the rapid growth of tourist numbers (UNEP 2002). A 1998 BOBP study advised against further expansion of the tourism industry, and made several recommendations to instead build the 'carrying capacity' of the Pulau Payar Marine Park through the following measures:

- Increasing public awareness
- Regulating reef activities
- Zoning reefs
- Laying moorings at popular sites
- Creating alternatives to diving and snorkelling
- Providing artificial reefs

(Lim 1998)

Given the potentially harmful impacts from increased tourism, the Pulau Payar Marine Park might make "an ideal first candidate" for a management plan that outlines how to plan for and mitigate the potentially deleterious effects of tourism (UNEP 2002).

Though the country's marine parks receive high performance ratings (UP MSI et al. 2002), it is notable that there are few community-managed or co-managed MPAs in Malaysian waters (such as Tengku Abdul Rahman Park in Sabah). Management is instead typically overseen by state agencies or the DMPM. Limited citizen engagement may make parks controversial with resource users and result in vulnerabilities if formal institutional commitment to parks declines. Local stakeholder involvement is increasing, however, notably through participation in Community Consultative Committees (since 2008).

On a national level, there are reportedly challenges in carrying out enforcement activities, including the following:

- Given the number of marine parks, ensuring adequate enforcement in all areas remains a

- challenge
- Apprehending vessels involved in illegal activities, as such vessels are often equipped with fast engines and able to escape capture
- Lengthy prosecution times in court

(Bin Lamin 1999)

Though it is unclear how pervasive these issues are within the Pulau Payar Marine Park, there is general consensus that better inclusion of stakeholders in management activities will curb offenses and minimize the need for enforcement (Bin Lamin 1999). The country also currently utilizes radar to monitor for illegal fishers, an initiative that has helped rangers improve enforcement (UNEP 2002).

Finally, protection of diverse habitat types within MPAs is necessary for the protection of distinct life history stages for marine species. As noted, there is only one true marine park within Malaysia's Bay of Bengal waters, and the Strait of Malacca is one of the two parts in the country least represented by MPAs (UP MSI et al. 2002).

Socio-economic Considerations and Perceptions of MPAs

As the islands within the Pulau Payar Marine Park are uninhabited, studies of socioeconomic considerations and perceptions of MPAs within Malaysia emphasize the experiences of tourists. Most visitors rate their park experience as satisfactory overall, and facilities at the Centre were recently upgraded in 2009. When tourists were asked if "an increase in visitor numbers would affect their enjoyment of Pulau Payar, 73.97% answered affirmatively" (Lim 1998).

Effectiveness of MPAs

Although no information is available for the Pulau Payar Marine Park specifically, all of the country's island marine parks were given a "well managed, A rating" in 2002 (UP MSI et al. 2002). There is also anecdotal evidence that anchovy populations around the Pulau Payar Marine Park have increased (Hiew 1999). However, there is a need to conduct a comprehensive study of the effectiveness of the current MPA management practices (P. Gangaram 2010, personal communication).

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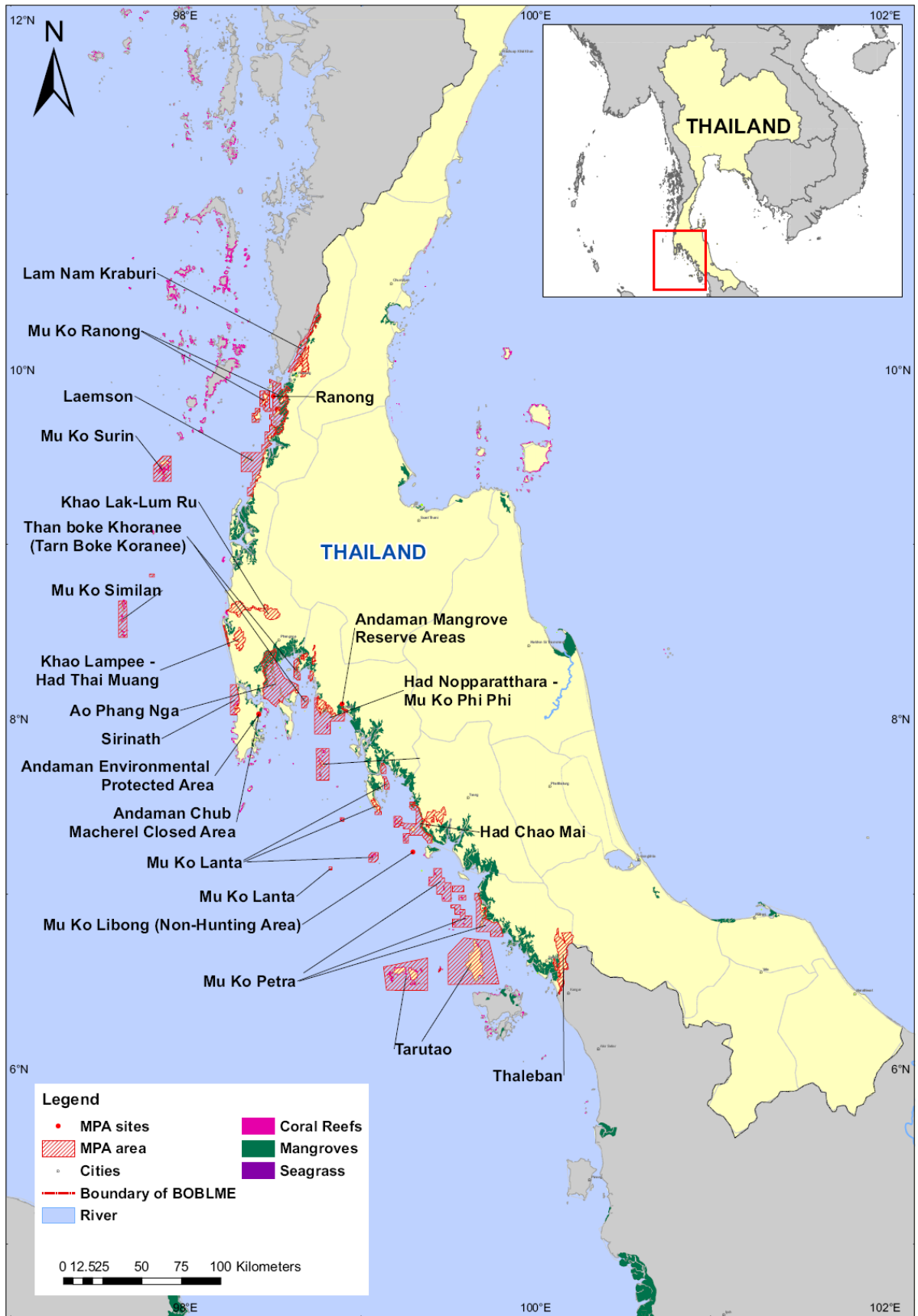
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Country Profile: Thailand



Country Overview

Thailand's western coast along the Andaman Sea extends 740 kilometers from the border with Myanmar south to the border with Malaysia (Juntarashote 2003) and covers a marine area of 112,498.9 km². Predominant ecosystems along the coastline include mangrove forests, sea grass beds and fringing coral reefs (Juntarashote 2003).

There are six provinces along Thailand's Andaman Sea coastline, and from north to south include Ranong, Phang Nga, Phuket, Krabi, Trang and Satun. Major economic activities in the region include fisheries (small-scale and commercial), aquaculture, tourism, agriculture and mining. Mangrove coverage along the Andaman coastline is approximately 1,747.62 km², of which 50% is in the provinces of Phang-nga, Satun, Trang, Krabi and Ranong. There are approximately 400 hard coral species in Thai waters, and total coverage is estimated at 78km² along this coastline (of which 62% is under the protection of a marine park) (Yeemin 2005). Sea grass bed coverage is around 94.78 km², of which about 34% is within the boundaries of a marine park area. Eleven species (58 species worldwide) of sea grasses are found in the Andaman Sea.

The Andaman Sea is renowned for its rich ecological diversity and is home to many threatened species such as dugong, several dolphin species, and four species of sea turtles (leatherback, green, hawksbill and olive ridley) (Panjarat 2008). Tourism is an important economic activity in the region, and as a result, the government has invested a significant amount of effort to ensure adequate conservation and management of the marine environment (Juntarashote 2003). Approximately 10 million visitors journey to the Andaman Coast each year (both local and foreign), and many of the reefs see very high levels of reef-based tourism activities (particularly the southern provinces of Phuket, Trang and Krabi (Juntarashote 2003).

Fisheries products play a critical role in Thai food security, and account for more than 50% of annual protein intake across the country (Thailand Report on Protected Areas). The marine capture industry contributes significantly to GDP, and was valued at \$1.57 billion in 2004 (Panjarat 2008). The fisheries of the Andaman Sea account for one third of total marine capture in the country (Juntarashote 2003). There are thousands of local semi-nomadic seafaring indigenous groups in the area, including the Mokem, Moklen, Urak Lawoi (collectively referred to as Chao Ley) (Arriaga 2006). Declines in fishery resources along this coast are of growing concern, primarily fueled by overexploitation by fishing fleets and the use of destructive fishing gear in coral reef and sea grass areas (Juntarashote 2003). There is movement away from small-scale fisheries, however, and many fishermen in recent years have converted their fishing boats into tour and diving boats (Yeemin 2005).

History and Current Status of MPAs

The history of national parks in Thailand dates back to the 1960s. It was during this time that the Wild Animals Reservation and Protection Act was passed, which paved the way for the establishment of the country's first national park in 1966 (Andaman Sea Nature Reserves Proposal 2011). Today, Thailand ranks amongst the top in the world in terms of the proportion of its territory placed under protection. Approximately 20% of the country's total terrestrial environment is protected through 123 terrestrial national parks and 57 wildlife sanctuaries (Thailand CBD Application 2008). In the coming decade, the government plans to increase this ratio to 25% (Thailand CBD Application 2008). There is also currently a proposal to create the 'Andaman Bioregion World Heritage Management Area', which would

cover more than 80% of Thailand’s Andaman Sea and include many of the existing protected areas along this coastline (Andaman Sea Nature Reserves Proposal 2011). If this proposal moves forward, the total area under protection would span 1.6 million hectares, and extend across the provinces of Ranong, Phang-nga, Phuket, Krabi, Trang and Satun. The proposed management area would also include terrestrial components, and extend as much as twenty five kilometers inland in certain areas (Andaman Sea Nature Reserves Proposal 2011).

There are currently 22 marine national parks countrywide, which together cover 5,810 km² or 8% of the territorial seas (Thailand CBD Application 2008). Sixteen of these MPAs are in the Andaman Sea, and are distributed throughout the six coastal provinces. These MPAs are characterized by high biodiversity, and considered some of the best diving sites in the world (ICEM 2003). One area is currently being proposed for national park status (Mu Ko Ra-Ko Phra Thong, in Phang Nga Province).

The objectives for all Thai national parks revolve around the maintenance and preservation of ecological integrity and the provision of ecosystem services (Table 4) (Arriaga 2006). The existing approach to management stresses the prioritization of biological and cultural preservation above all else, and “tourist activity and park rules and regulations cannot be justified on economic incentives...if the biological or cultural integrity within the park is being degraded” (Arriaga 2006).

In addition to marine national parks, Thailand also has other types of protected areas that include marine ecosystems. These include non-hunting areas, fisheries sanctuaries, fish refugia, mangrove reserve areas, environmental protection areas, Ramsar sites and UNESCO

Table 4: Objectives of Thai National Parks
To preserve and maintain the ecosystem integrity, biodiversity, and scenic beauty for use by the present and future generations without compromising them
To provide the general public as a ground for education and research;
To provide the general public the opportunities for nature tourism and recreation, which are compatible with the park ecosystem and its carrying capacity.

(Arriaga 2006)

Biosphere Reserves (ICEM 2003, BOBLME MPA Workshop 2011). Along the Andaman coastline, there is one non-hunting area and one UNESCO biosphere reserve. Four existing parks carry the status of ‘Ramsar sites’, and four are listed as ‘ASEAN Heritage Parks’ (with some overlap). The main fisheries spawning grounds are located in Phang Nga Bay and its adjacent areas, which covers most of Phang Nga Province, East of Phuket, West of Krabi and Northern part of Trang (BOBLME MPA Workshop 2011).

Ranong Province shares a border with Myanmar, and is home to three marine national parks: Laemson, Lam Nam Kraburi and Mu Ko Ranong. The Ranong Biosphere Reserve spans approximately 300 km², of which 40% is in the marine environment. Designated in 1997, the Reserve abuts against the Laemson Marine National Park (UNESCO 2010; Sethapun 2000). More than 300 animal species live and 24 mangrove species are found within the boundaries of the Reserve (UNESCO 2010). Approximately 4000 people live within the Reserve, who earn their living primarily through fishing and shrimp farming (UNESCO 2010). The area is a hub for scientific research, and has drawn about 10,000 researchers in the past five years (UNESCO 2010). The Laemson Marine National Park – together with surrounding estuaries, is listed as a Ramsar site, and has the largest area of mangrove forest remaining in the country (Ramsar 2010).

Just south of Ranong is **Phang Nga Province**, which is home to five marine national parks. These include Ao Phang Nga, Mu Ko Surin and Mu Ko Similan Marine National Parks, all three of which are ASEAN Heritage Sites (ASEAN 2010). Mu Ko Surin and Mu Ko Similan are considered two of the best managed marine parks in the country (UP MSI et al. 2002). Ao Phang Nga is famous for its prehistoric rock art and natural resources, and is amongst the most frequently visited marine national parks in the country (ASEAN 2010). Within the Park are 42 islands, which jut out of the sea to form steep cliffs. Local people traditionally fished around many of these islands, and several are currently inhabited by artisanal fishing communities (ASEAN 2010). Local flora and fauna include crab-eating macaques, dusky leaf monkeys, gibbons, 24 fish species, 14 shrimp species, 15 crab species, and 16 manta ray, shark and game fish species (ASEAN 2010). The two other MPAs in Phang Nga Province include Khao Lam Pee-Had Thai Muang and Khao Lak-Lam Ru Marine National Parks.

Phuket Province has only one MPA, the Sirinath National Marine Park.

Krabi Province, just south of Phuket, is home to three marine parks, including Had Nopparatthara (Mo Ko Phi Phi), Mu Koh Lanta, and Tarn Boke Koranee Marine National Parks. These areas are very popular with tourists, and were affected widely by coral bleaching events in 2010.

Trang Province has two marine national parks (Had Chao Mai and Mu Ko Phetra). Had Chao Mai is known for supporting some of the healthiest and most diverse sea grass ecosystems in the country (Ramsar 2010). The Province also has one “non-hunting area” (Mu Ko Libong) that encompasses parts of the marine environment and was designated with the explicit purpose of protecting intact mangrove forests (ICEM 2003).

Satun is the southern most province on this coastline, and is home to three marine parks – Mu Ko Phetra, Thalebun and Tarutao. The Tarutao Marine National Park is made up of 51 islands and is the oldest MPA in the country. It is listed as an ASEAN heritage site, and its name means “old, mysterious and primitive” (ASEAN 2010). For centuries, these islands served as a home for the Chao Lay sea-faring communities, and over the past hundred years were used as a pirates’ haven and a penal colony (ASEAN 2010). Today, the park is best known for its spectacular marine life, beaches, coral reefs, and sea turtle nesting grounds (ASEAN 2010). Only one of the 51 islands is inhabited (ASEAN 2010).

MPA Legislation

There are five types of protected areas in Thailand. These include national parks, national marine parks, wildlife sanctuaries (also known as wildlife conservation areas), forest parks and non-hunting zones (UP MSI et al. 2002). National marine parks are established primarily to conserve coastal habitat and islands, and with few exceptions, have little bearing upon inland activities and larger issues

Table 5: Marine Park Regulations in Thailand
WITHIN MARINE PARKS, IT IS ILLEGAL TO:
<i>Occupy, build or clear land</i>
<i>Collect, or take out any plants and animals, or harm anything</i>
<i>Change the watercourse or stream, block the watercourse, etc</i>
<i>Collect or harm any orchids, honey, charcoal, bat guano, flowers, leaves, fruits etc</i>
<i>Take any vehicles into undesignated areas</i>
<i>Take off or land any aircraft in undesignated areas</i>
<i>Take any pets or domestic animals into the parks</i>
<i>Do anything for profit, unless granted special permission</i>
<i>Post unauthorized signs or posters, or write graffiti</i>
<i>Carry any hunting equipment or weapons into parks</i>
<i>Use firearms, explosives or light fireworks</i>
<i>Make any loud noises that may disturb other visitors or animals</i>
<i>Drop litter or leave any ignitable matter</i>

(Andaman Parks Handbook, 2002)

like watershed management (UP MSI et al. 2002).

Marine protected areas are established under the 1961 National Park Act and the 1947 Fisheries Law (amended in 1994) and the recently proposed Fisheries Law Amendment, which is currently being considered by Parliament (ICEM 2003; BOBLME MPA Workshop 2011). The former law describes general protection measures for parks, and prohibits the removal of any species, while the latter regulates fishing activities (Sethapun 2000). Table 5 provides a list of activities banned in marine national parks. The Fisheries Law also allows for the establishment of fisheries conservation areas, which extend 3 kms from the shoreline (ICEM 2003). Within these areas, certain types of fishing gear are allowed (e.g. those that do not rely upon engines). As mentioned earlier, another type of protected areas is the seasonal closure at fisheries spawning ground. Government authorities are able to completely close such areas to fishing from April 1 to June 30 each year, as well as:

- Prohibit the use of intoxicants, toxic substances, electricity or explosives for fishing;
- Determine the sizes and kinds of fishing implements that are permitted in fisheries;
- Prohibit the capture of certain rare species such as marine turtles and dugong;
- Establish spawning and nursery seasons of particular commercially important species such as *pla tu* (Indo-Pacific chub mackerel) and prohibit the use of certain types of fishing gear during these seasons; and
- Prohibit of the use of certain types of fishing gear in certain areas.

(ICEM 2003).

Other relevant legislation includes 1964 National Forest Reserve Act, the 1992 Wildlife Conservation Act and the 1975 Enhancement and Conservation of National Environmental Quality Act (ICEM 2003; Yeemin 2005).

Thailand has a National Coral Reef Strategy, which outlines measures to improve the condition of coral reefs both within and outside of MPAs. Though adopted by the cabinet in 1992, coral degradation continued in many areas, in part due difficulties in implementing the provisions of the plan at a local level (Chou 2002). As a result, the government revised the Strategy in 2004, and began implementing 98 projects across the country, which range in scope from strengthening the effectiveness of coral reef legislation to launching public information campaigns (Yeemin 2005).

According to the 2011 MPA BOBLME Workshop feedback, other relevant legislation National Policy, Strategies and Action Plan for the Conservation and Sustainable Use of Biodiversity (2008 – 2012); The National Action Plans (NAP) for Mangrove Management Five Year Plan (2009-2013); The Strategy and Action Plan on Sea grass and Dugong Management; and The National Guideline for Management of Sea Turtle's Nesting Ground.

MPA Governance

Management responsibilities for protected areas have changed hands repeatedly over the past few decades. Historically, the Royal Forest Department (RFD) served as the primary agency responsible for marine park management (Arriaga 2006). Within the RFD, the National Park Division was charged with managing both terrestrial and marine parks. This changed in 1993, however, following the formation of the Marine National Park Division (MNPD) (Sethapun 2000). Management responsibilities shifted again following public sector reforms in late 2002, during which a number of new, independent agencies were established. This included the Ministry of Natural Resources and Environment (MONRE), which is currently responsible for the protection and conservation of protected areas, water resources, mineral

resources, marine and coastal resources, and environmental quality. In addition to and within MONRE, implementing agencies include:

- Department of National Parks, Wildlife and Plant Conservation (implementing agency for MPA management)
- Office of Natural Resources and Environmental Policy and Planning (implementing agency for general environmental policy)
- Royal Forest Department (forest production in areas surrounding MPAs)
- Department of Marine and Coastal Resources (DMCR) (responsible for conservation of marine and coastal resources)

According to feedback received at the 2011 BOBLME MPA Workshop, relevant policies and plans stress amongst other things the need for stakeholder participation, de-centralization, self-reliance, sustainable natural resource management and conservation. In recent years, a Decentralization Act and an Information Disclosure Act have also been promulgated.

The Department of Fisheries (DoF) also has governance responsibilities, and is charged with enforcement and coral reef protection (both inside and outside of marine park boundaries) (Arriaga 2006). In cooperation with DMCR, the DoF is also responsible for declaring and managing protected fisheries spawning areas.

Other important governmental bodies include the National Mangrove Committee, which analyzes proposed development projects that may affect mangrove forests, and provides policy recommendations to the government. There is also a National Park Committee, which plays the same role but focuses on marine parks (UP MSI et al. 2002). The Ministry of Tourism and Sport and the Royal Thai Navy are also involved in MPA implementation activities.

Given the complexities in managing such a vast network of marine parks, NGOs are actively involved in marine park governance (Arriaga 2006). There is a dynamic NGO network throughout the country, which works at a community level in particular to help foster local management of coral reefs, forests and mangroves (Arriaga 2006). Indeed, community-based approaches to improve coastal ecosystems are becoming increasingly prevalent, as discussed in future sections (UP MSI et al. 2002). NGOs are especially active in southern Thailand, “where trial projects have been encouraging” (UP MSI et al. 2002). Today, there are local, provincial, national and international NGOs that work in protected area management across the country (ICEM 2003).

Other key stakeholders involved in marine park governance include:

- Local government authorities, including elected councils under the *Tambon* Administrative Organizations (TAO). TAO are responsible for site level environmental planning, and infrastructure development.
- Local communities, which make decisions through the *Village Headman Structure (Phu Yai Baan)*
- Community based organizations
- Private sector stakeholders (e.g. private tour operators and commercial fishermen)
- Research centres (e.g. Phuket Marine Biological Centre)
- Academic Institutions

(ICEM 2003; Yeemin 2005)

Revenue collected by marine parks is sent to the DNWP in Bangkok. Five percent is automatically returned to local administration authorities (*Tambon* Administrative Organizations) (Yeemin 2005). Individual parks can then request up to 9.5% to spend on day-to-day expenses (like gasoline, equipment maintenance) and up to 47.5% for park development projects (Yeemin 2005). The remaining 38% remains within the DNWP, and is allocated based upon priority activities and departmental policies (Yeemin 2005).

Threats and Challenges

The provinces along the Andaman Coast have undergone rapid development in the past fifty years, resulting in numerous threats to the coastal environment (Juntarashote 2003). The challenges facing marine parks in Thailand can be grouped into three categories, including legislative and jurisdictional limitations, management and implementation constraints, and anthropogenic threats. As will be described, pollution and development are considered the most serious threats, followed by tourism activities, siltation and destructive fishing (UP MSI et al. 2002).

Legislative and Jurisdictional Limitations

There is ambiguity over the many laws affecting MPAs, and existing regulations for marine resource management are notably complex (Arriaga 2006). Policies and programs governing marine resource use are often “inconsistent and fragmented”, and communication/collaboration is not always efficient between the many government agencies involved in implementing regulations (Weigel 2009; Yeemin 2005). Enforcement can be particularly challenging, as “the language of the law and the subsequent regulations are often unclear or incomplete” (Yeemin 2005).

There are clear linkages between the health of ecosystems within marine parks and activities that occur outside of marine park boundaries. For instance, land-based pollution and infrastructure development can have detrimental effects on ecosystem health. As MPA governing bodies have limited authority over adjacent terrestrial areas, however, it can be difficult to achieve MPA success (Arriaga 2006). More specifically, effective management is hindered by “overlapping and ambiguous jurisdictions between the authorities responsible for parks, fisheries and harbours and beach tourism development” (ICEM 2003). Signs of progress on this front include the recent establishment of a new coordination board for protected areas (BOBLME MPA Workshop 2011). In December 2010, the Ministry of Natural Resources and Environment also established the Multilateral Consultative Sub-Committee on Protected Areas (under the National Committee on Conservation and Sustainable Uses of Biodiversity).

Management and Implementation Constraints

Though recent years have seen notable improvements in the management of marine parks, challenges remain. Most notable, there is insufficient training of personnel, funding shortages and poor enforcement. In regards to the latter, enforcement is not only difficult in marine parks, but also within the three kilometre exclusion zones of protected fisheries spawning grounds (ICEM 2003). Enforcement officials often lack the equipment needed to apprehend offenders, even in particularly sensitive areas afforded the highest legal protection (ICEM 2003). Furthermore, it is reportedly difficult to control entry into some marine parks (such as Mu Ko Phi Phi), resulting in unrealized revenue (Sethapun 2000).

Anthropogenic Threats

Anthropogenic-based threats to Thailand's MPAs are numerous. Though on the decline, overfishing and the use of destructive fishing methods like trawling, blast fishing and cyanide currently threaten 60% of coral reefs in the country (ICEM 2003). Population increases and the "strong mobility of natural resource users" have intensified demographic pressures around MPA boundaries, in turn accelerating the loss of biodiversity in Thailand's marine parks (Weigel 2009). Efforts to overcome these challenges are often hampered by economic realities, however, and unequal wealth distribution and poverty sometimes limit the livelihood options available to local fishing communities (Weigel 2009).



The coastal tourism industry has expanded unchecked in many regards, and tourism infrastructure development is frequently associated with the deterioration of near-shore marine habitat (Thailand CBD Application 2008). The tourism boom of the 1980s fuelled rapid development along coastal areas, much of which was poorly planned (UP MSI et al. 2002). The coastline is now dotted with hotels, resorts, restaurants, shops and entertainment parlours, and the area is seeing increased and unsustainable visitation rates. Sewage and pollution problems are of growing concern, and treatment facilities are often non-existent or under-utilized (Thailand CBD Application 2008; Juntarashote 2003). A 2000 study found that over 100,000 visitors enter certain parks each year, fuelling concerns over the carrying capacity of parks (Sethapun 2000). The ecological impacts of high

visitation rates may become particularly pressing, as domestic tourism is expected to rise given the improved purchasing power of the middle class throughout the country (Thailand CBD Application 2008). Though the tourism industry brings in large sums of money, there are questions about the sustainability of the industry, as environmental costs are not factored into revenue calculations (UP MSI et al. 2002). Similarly, there is reportedly higher emphasis on accommodating visitor use rather than focusing upon conservation of ecosystems and enforcement of regulations (Yeemin 2005)

Other threats include direct extraction of resources, such as the clearing of mangrove forest to pave the way for aquaculture (Thailand CBD Application 2008; UP MSI et al. 2002).

Chemical fertilizers, insecticides and untreated wastewater from agricultural production and shrimp farms are sometimes discharged directly into coastal waterways and the sector remains largely unregulated (Juntarashote 2003). Mining activities also occur in the area, and dredging for tin in mangrove swamps is also a concern in Phuket and Phang Nga (causing increased siltation and the smothering of coral reefs) (UP MSI et al. 2002).

Socio-economic Considerations and Perceptions of MPAs

Public support for coral reef management has grown significantly since the late 1980s (Yeemin 2005). This support is attributed, in part, to extensive public outreach campaigns and in-depth media coverage of coral reef issues (Yeemin 2005). These efforts helped trigger voluntary, 'non-regulatory measures' to conserve reefs across the country (Yeemin 2005). Such initiatives include education/scientific activities, and management measures like the installation of mooring buoys and mangrove restoration projects (Yeemin 2005; Juntarashote 2003). According to the Forest Department, mangrove coverage along the Andaman Sea is increasing as a direct result of such collaborative projects between stakeholders (Juntarashote 2003). Other such initiatives include joint projects between the Tourism Authority and diver/tour boat operator associations to educate boat drivers and reef visitors on coral reef ecology and introduce techniques to minimize ecosystem damage during visitation (Yeemin 2005).

Despite notable progress and the greater inclusion of stakeholders in marine park management, barriers still remain. According to a government report, there are "relatively few mechanisms available to promote the involvement and coordination of civil society in the design, establishment and management of PAs" (Thailand CBD Application 2008). Case studies from Trang and Phang Nga Provinces indicate that although governmental support for participatory management is strong, "genuine participatory approaches are still limited, and communities do not perceive benefits, particularly from the growth in tourism in PAs" (ICSF 2008). Instead, conflicts persist between stakeholders who prioritize conservation, and traditional resource-users who believe their economic and social needs have been overlooked during park designation and management phases (Yeemin 2005). In the absence of direct incentives and the needed technical and financial support, there is generally weak institutional and stakeholder capacity to manage natural resources (Weigel 2009). In order to rectify these problems, priorities include developing a national protected area system with an appropriate and more streamlined legal and institutional framework; creating policies that balance conservation with economic needs; and building formal processes for multi-stakeholder consultation (Thailand CBD Application 2008).

Effectiveness of MPAs

There is evidence that coral reefs within protected area boundaries are typically in better condition than unprotected reefs (Arriaga 2006). Nevertheless, the overall health of reefs in MPAs has degraded in the past ten to fifteen years, and threats persist (Arriaga 2006). Bleaching of coral reefs within Thai MPAs is widespread and represents a serious threat to their ecological and economic/tourism viability. Reduction of multiple threats to coral reefs within MPAs may improve their resilience to bleaching events.

Though there is relatively extensive monitoring of coral reef health throughout the country – The Department of Marine and Coastal Resources monitors coral coverage in both the Andaman Sea and the Gulf of Thailand – there is relatively little information available about the overall effectiveness of marine parks, and no known studies that quantify variables such as spill over rates for marine protected areas specifically.

According to a study presented at a 2010 conference, yearly monitoring of protected *spawning* areas has occurred since 1986. Per the results of this study, there is indeed overlap between critical spawning areas for demersal fish and shrimp and the area actually under protection. Furthermore, fish yields/values have remained constant (Nootmorn and Koh 2010).

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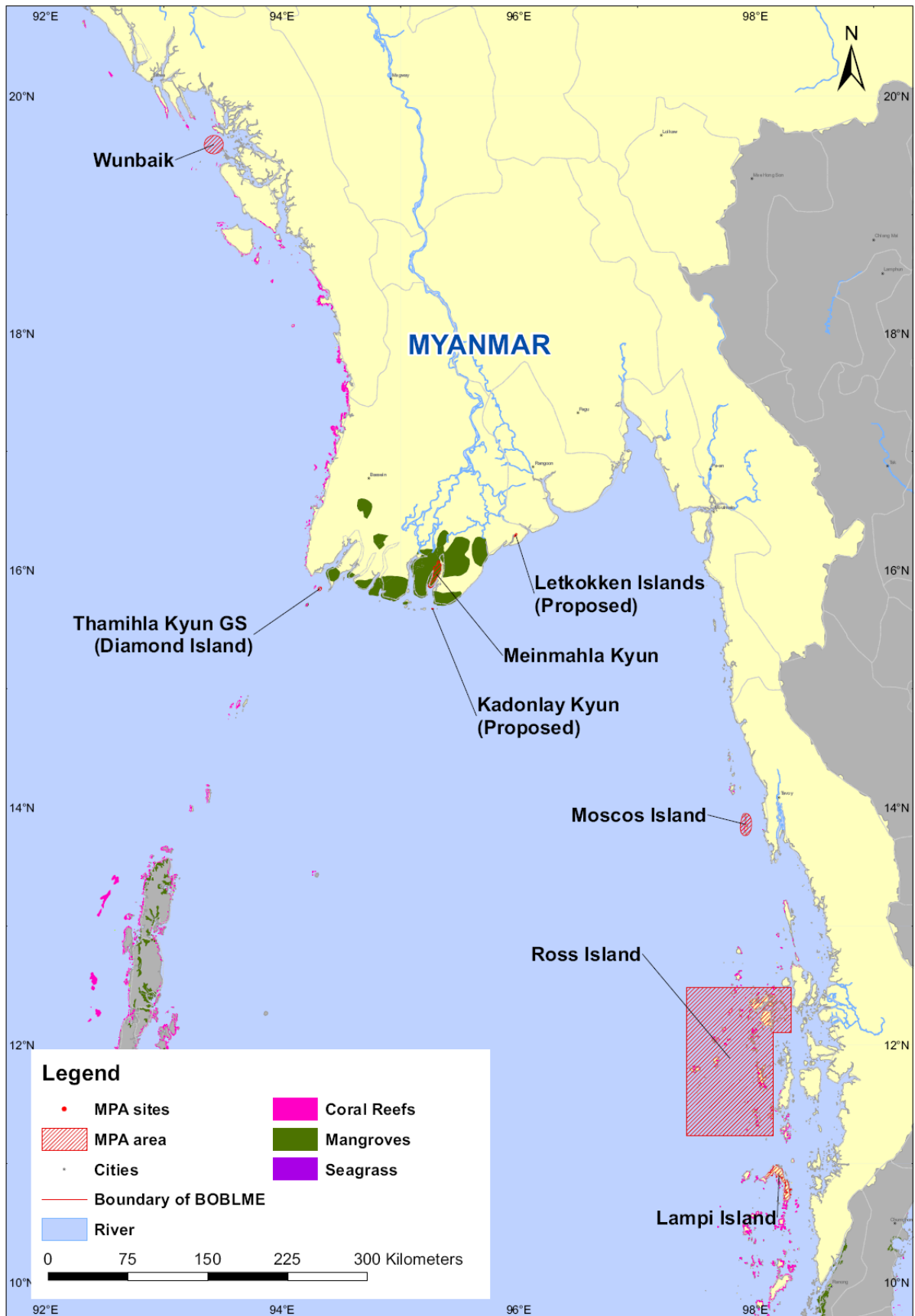
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Country Profile: Myanmar



Country Overview

Myanmar has a coastline of 2,832 kilometres, which is characterized by estuaries, deltas, coral reefs, sea grass beds, sandy beaches, mudflats and mangroves (UP MSI et al. 2002). Though much of its marine life has not been surveyed, the country is likely endowed with extensive marine resources (Myanmar CBD Report 2009). Upwelling zones off the coast create areas of high productivity, and the migratory routes of many marine species pass through Myanmar's waters (Pe, 2004).

Total mangrove coverage is estimated at 4,219km², of which approximately 0.6% is protected (UP MSI et al. 2002). National coral reef coverage is estimated around 1,500 km², of which 2% is protected in MPAs (Tun et al. 2008). Coral reefs are most prolific in the southern parts of the country close to the Thai border, and are mainly clustered around the string of 800+ islands that make up the Myeik (Mergui) Archipelago (UP MSI et al. 2002). Many of the reefs in this archipelago are believed to be in relatively pristine condition, and could prove to be critical refuge for coral reef species given declines elsewhere in the region (Tun et al. 2008). There are also coral reefs surrounding the Coco Islands, which are located just north of India's Andaman Islands in the Bay of Bengal (UP MSI et al. 2002).

The coastline of Myanmar is covered by a network of 5,000 km² of swampland, which provides critical spawning habitat, nursery grounds and feeding areas for marine and aquatic species (Myanmar CBD Report 2009). Estuaries and mudflats are most common at the mouth of the Ayeyawady River, which is located midway down the coast.

The fisheries sector plays a critical role in the national economy and local food security (Myanmar CBD Report 2009). Coastal communities rely upon marine resources for their livelihoods, and the sector is thought to indirectly benefit over 2 million people (Pe 2004). Fisheries products are the country's fourth largest foreign exchange earner, and while no precise figures are available, shrimp most likely dominates exports (Pe 2004). Like neighbouring Bangladesh, Myanmar is also heavily dependent upon the hilsa fishery (*Tenualosa ilisha*), both for local consumption and export purposes (Pe 2004).

History and Current Status of MPAs

The concept of a 'protected area' has a very long history in Myanmar. The development of protected areas is believed to have coincided with the introduction of Buddhism in the 11th century, and kings over the years often set aside "threat-free" forest areas in which all animals (often including their eggs) were protected (Aung 2007). The British established more formal protected areas under colonial rule (1826 – 1947), and began specifically designating 'reserve forests' and 'protected forests'.¹ Marine protected areas are generally designated for species conservation purposes (Win, Sein and Win 2011).

The first official marine conservation efforts date to 1927, when the government established the Moscos Wildlife Sanctuary in south eastern Myanmar in order to protect coastal flora and fauna (Rao 2001). This protected area spans 49.21 km², and was designated in order to protect turtle species and water birds. It is notable, however, that the protected area does not

¹ Though these parks were established in part out of "the interest of respecting existing rights and interests", problems developed (Aung 2007). Specifically, "reserve forests" were set aside for the government-run timber industry, and local communities were no longer allowed to extract timber products. Over the years, rural populations lost customary rights to timber as a result of these designations (Aung 2007).

include any marine habitat, and is instead limited to terrestrial beach habitat (UP MSI et al. 2002).

The Wunbaik Reserved Forest is Myanmar's northern most MPA. Declared in 1931, and just south of the Bangladeshi border, this PA encompasses an area of 229.2 km² of mangrove forest. The main objective of the reserve was to improve supplies of fuel wood for salt production, brick baking and charcoal production. Although deforestation in the reserve has been significant, it still has better mangrove forest coverage than any area in the Ayeyawady Delta (Win, Sein and Win 2011). Generally, there is very little information about this protected area, however, and it is unknown if it even includes parts the marine environment within park boundaries.

Further south along the coast is the Thamihla Kyun Wildlife Sanctuary (also known as Diamond Island Wildlife Sanctuary). Declared in 1970, the Sanctuary is located at the mouth of the Ayeyawady Delta and spans 0.88 km² (Rao 2001; UP MSI et al. 2002). It was initially established in order to protect sea turtles populations, and like the Moscos Island Marine Sanctuary, only protected terrestrial habitat (Rao 2001). Like Moscos Island, there are proposals to expand the boundaries of Thamihla Kyun to include surrounding waters and coral reefs (UP MSI et al. 2002).

The Meinmahla Kyun Wildlife Sanctuary was set up in 1993, and is also located on the banks of the Ayeyawady River. It spans 136.7 km², and was established to conserve local mangroves that provide habitat for estuarine crocodiles and waterfowl (Rao 2001; ASEAN Heritage Parks, 2010). The mangroves within the protected area provide critical breeding habitat for fish and prawn species. The Sanctuary is believed to be "one of the last remaining strongholds for mangrove associated species in the country" (ASEAN Heritage Parks, 2010). The Wildlife Conservation Society has worked in the area in past years, primarily helping obtain data on saltwater crocodile and freshwater turtle species. There are no current WCS activities in the Sanctuary. At the moment, the Ministry of Forestry is implementing a crocodile conservation program, which consists of a captive breeding and reintroduction (ASEAN Heritage Parks, 2010).

The Lampi Island Marine National Park is located in the Myeik Archipelago, and is the southern most protected area in the country. Declared in 1996, it covers an area of 205 km², and was designated with to protect coral reefs (UP MSI et al. 2002; Rao 2001). The park contains not only Lampi Island, but also several adjacent islands and the surrounding seas (Burma Introduction, undated). It is home to rich marine and terrestrial life, and local species include green, hawksbill, olive ridley and leatherback turtles; spinner, spotted and striped dolphins; pilot whales, false killer whales, dugongs, spiny lobster, jacks, tuna barracuda and other large fish (ASEAN Heritage Parks, 2010). Lampi Island is characterized by high biodiversity, is covered by several forest types (including mangrove, tropical evergreen, beach and dune) and is surrounded by an extensive coral reef system (Win, Sein and Win 2011). There is a small, permanent fishing community that inhabits Lampi Island, living within the borders of the protected area (Burma Introduction, undated). Other fishing groups such as the Moken also travel to the area on a seasonal basis to fish, hunt, and collect marine invertebrates such as sea cucumbers (ASEAN Heritage Parks, 2010; Burma Introduction, undated).

Finally, Myanmar also has a variety of fish refugia sites and fishery management measures that are akin to *de facto* protected areas. These include:

- ‘Shark protected areas’ along the Tanintharyi coastal region (Ross Island) where it is illegal to fish, collect, sell or carry all species of shark,
 - ‘Crab protected zones’ (565 acres in Tanintharyi region, 7900 acres in Chaungson township, 1148 acres in Rakhine state and 400 acres in the Ayeyawady region),
 - An inshore fishing zone that is important fish breeding/nursery habitat, that is protected from commercial fishing (for conservation purposes),
 - There are also plans underway to declare a ‘lobster protected zone’ of 696 acres in Thanbyuzayat township (Mon state).
 - Temporal closed seasons to protect specific species (e.g. Pomfret)
- (Win, Sein and Win 2011).

MPA Legislation in Myanmar

The policies pertaining to protected areas in Myanmar are found within nineteen different pieces of legislation, which were developed both during and after the colonial era (Aung 2007). The most important legislation is outlined below.

The 1994 Protection of Wildlife and Protected Areas Law (which is an update to the 1936 Burma Wildlife Protection Act) provides the legal structure that governs all protected areas throughout the country. The law provides the framework for designating both protected areas and protected species (Myanmar CBD Report 2009). In addition to providing for habitat/ecosystem protection, it is also used to control activities within wildlife sanctuaries (ASEAN Heritage Parks, 2010). The Law also identifies seven different types of protected areas, including scientific reserves, national parks, marine parks, managed nature reserves, wildlife sanctuaries, protected landscapes and ‘other’ protected areas (Rao 2001). Table 6 outlines some of these in greater detail.

The 1995 Myanmar Forest Policy and 1992 Forest Law also have bearing on marine protected areas, as many include large areas of mangrove forest. While the latter is used to declare mangrove forests as protected areas (and prohibit fishing within three hundred yards), the former calls not only for the protection of natural resources, but also incorporates principles of sustainable use, prioritizes meeting the basic needs of people, and calls for the participation of local communities in conservation management (Myanmar Ministry of Forestry; Pe 2004).

Myanmar also has sector-specific legislation that influence the conservation of marine resources, including:

1. The Law Relating to Aquaculture (1989), The Law Relating to the Fishing Rights of Foreign Fishing Vessels (1989), The Myanmar Marine Fisheries Law (1990) and the Freshwater Fisheries Law (1991), which together dictate the development of fisheries, protect fishing habitat and guard against overfishing. They also stipulate regulations concerning licensing, resource extraction, gear type, and water pollution.
2. The National Environment Policy (1994), which (like to the Forest Policy), calls for a balance between environmental conservation and human development. The policy also lays the framework for formulating environmental strategies programs and plans.
3. The Territorial Sea and Maritime Zone Law (1997), which grants authority to the State to protect and conserve the marine environment

(CBD 2009; Pe 2004)

National Park	Declared to conserve biodiversity and ensure habitat representativeness. No settlements or extraction are permitted. Visitors allowed.
Marine National Park	Same as a national park, but in marine, island and coastal environments. One of the existing MPAs is a marine national park (Lampi Island)
Wildlife Sanctuary	Used to protect specific species. Human settlements and natural resource extraction are not permitted. Three of the existing MPAs are wildlife sanctuaries (Meinmahla Kyun, Moscos Island, Thamihla Kyun)

Based on UP MSI et al. 2002.

On an international level, Myanmar is party to numerous conventions and agreements, including the Convention on Biodiversity (ratified); the Convention on Conservation of World's Cultural Heritage (ratified); the UN Convention on the Law of the Sea (ratified); CITES, the Ramsar Convention; the World Heritage Convention; the ASEAN Agreement on the Conservation of Nature and Natural Resources of 1985 (signatory); the ASEAN Declaration on Heritage Parks and Reserves (signatory); and the Agreement on the Establishment of the ASEAN Centre for Biodiversity (signatory) (CBD 2009).

MPA Governance in Myanmar

Like elsewhere in the BOBLME, there are numerous government agencies that share responsibility when it comes to marine protected areas. While the Ministry of Forestry is mandated to govern all protected areas (in both marine and terrestrial environments), the Fishery Department, Ministry of Livestock and Fisheries and the Defense Ministry (army and navy) also share responsibilities over the governance of non-forest and marine resources (UP MSI et al. 2002; Rao 2001).

Within the Ministry of Forestry, the Nature and Wildlife Conservation Division (NWCD) is charged with PA management. This Division was created in 1990, in part out of response to recommendations from the 1981 – 1984 FAO-UNDP Nature Conservation and National Parks Project (Aung 2007). Since the creation of NWCD, the total number of parks in the country has more than doubled (Aung 2007). Nevertheless, the number of parks in the marine environment remains limited, and the coastal habitat is considered underrepresented in the overall park system (Aung 2007).

In order to improve collaboration between various agencies involved in MPAs, the government established the National Commission for Environmental Affairs (NCEA) in 1990 (Rao 2001). In addition to facilitating communication between domestic agencies, the NCEA also liaises with other countries and international organizations on environmental issues (Rao 2001; Aung 2007).

Threats and Challenges

Coverage and Habitat Representation

As recently as 20 years ago, more than half of all of mainland Southeast Asia's forests were found in Myanmar (Aung 2007). Despite success over the years in maintaining such large stretches of terrestrial habitat, modern pressures such as increased regional demand for timber, fish and wildlife are growing threats, making “an effective PA system essential for the long-term conservation of Myanmar's biodiversity” (Aung 2007).

Taken together, established marine and terrestrial parks cover approximately 5.65% of the country as of December 2010 (and an additional 1.07% is under consideration for future

protected areas) (BOBLME MPA Workshop 2011). Marine parks are underrepresented in the overall park system, however, and are limited in both number and size (Aung 2007). Indeed, while approximately 91% of the parks in Myanmar are in the terrestrial realm, and 7% are in wetland zones, a mere 2% encompass marine habitat (Aung 2007). As detailed in the recommendations section of this report, the government should consider not only expanding the marine habitat types represented in the PA system, but also possibly set aside conservation areas for the hilsa fishery (as neighboring Bangladesh has done).

Interagency Coordination

While the NWCD (within the Forest Department) is charged with managing MPAs, the Ministry of Livestock and Fisheries serves as the management authority for all marine habitats and associated fisheries (Aung 2007). The NCEA was established as an umbrella group to address perceived disconnect and overlapping mandates, and many initially believed it might address the “sectoral limitations to environmental issues held over from colonial time, such as conflicts between agriculture, communities and PAs” (Aung 2007). The NCEA was not given sufficient authority to implement its mandate, however, and as a commission (versus a Ministry), it “lacks the authority powers and expertise needed to carry out its functions at optimal effectiveness” (Aung 2007; Tan 1998).

Limited Human and Financial Resources

Given competing socioeconomic priorities, the country also faces constrained human and financial resources for park management. Though budgetary support increased 11% between 1996 and 2007, existing funding is insufficient to support the needs of parks (Aung 2007). This lack of funding has translated into insufficient manpower, a lack of trained personnel and inadequate infrastructure at many protected areas throughout the country (Aung 2007; Pe 2004).

Furthermore, there are indications that enforcement has been a challenge in past years (UP MSI et al. 2002; Pe 2004). This is starting to improve, however, and the Myanmar Navy currently patrols MPAs (Win, Sein and Win 2011).

Lack of Information and Scientific Data

A pervasive lack of information about the marine environment in Myanmar hinders effective management (UP MSI et al. 2002). There is a lack of trained divers to conduct surveys, and areas lacking baseline surveys include the Myeik Archipelago (which is believed to contain significant coral reefs), the islands along the northern coast, and the islands between the Ayeyawady Delta and the Andaman Islands (UP MSI et al. 2002). As such, it is difficult to quantify the anthropogenic and natural threats to marine resources, and determine appropriate policy responses.

There are nevertheless signs of overexploitation, including a 90% decline in marine turtle nesting populations in Thamihla Kyun, significant losses in dugong populations and the clearing of mangrove forests to pave the way for aquaculture ponds and paddy cultivation (particularly in the Ayeyawady Delta) (UP MSI et al. 2002; Pe 2004). Coral reefs are threatened by sedimentation from logging operations as well as dynamite fishing by foreign poachers, anchor damage, overfishing and over-harvesting (UP MSI et al. 2002). There are concerns that reefs along the southern border of the Myeik Archipelago are exploited by Thai-based dive tourism operators. There are also “unconfirmed reports [that] reveal harvesting of live coral (for marine aquarium) and of coral skeletons (for use as souvenirs or medicine)” (UP MSI et al. 2002).

Though existing information does indeed paint a picture of overexploitation, more comprehensive scientific data is clearly needed to better understand the true status of marine resources in the country (UP MSI et al. 2002). According to participants at the BOBLME MPA Workshop in 2011, current needs include:

- Collecting data on the Myeik Archipelago (notably forest, wildlife and marine resources, as well as resource use)
- Collecting socioeconomic data in the Myeik Archipelago

(Win, Sein and Win 2011)

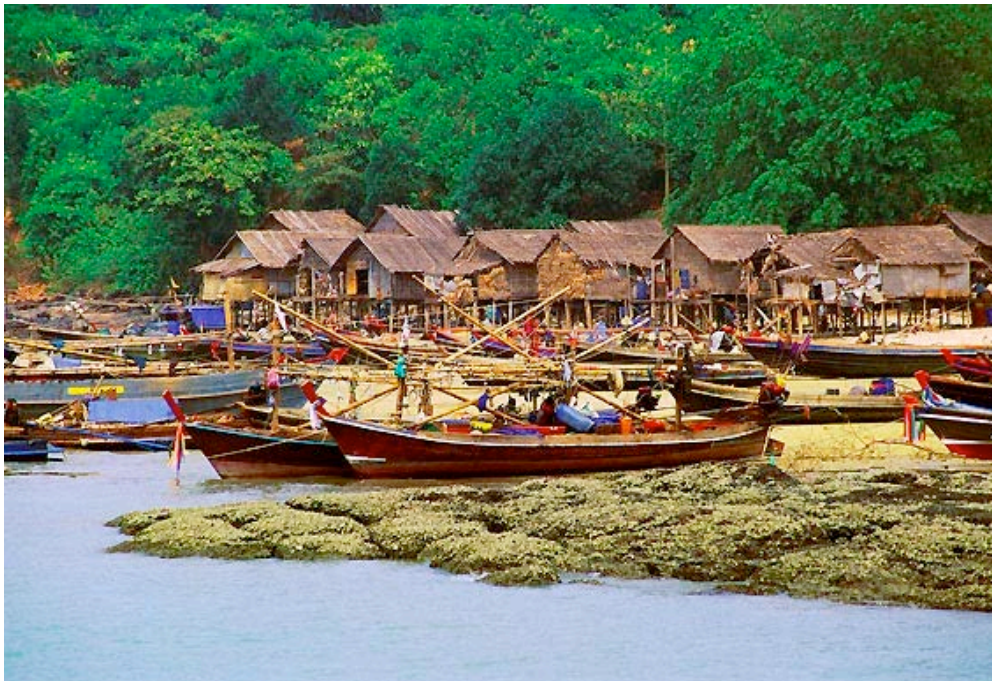
Ongoing efforts to improve scientific information about the marine environment include:

- A collaborative project to strengthen the existing knowledge base (Department of Fisheries, SEAFDEC, IOSEA and the Wildlife Conservation Society),
- A tagging program to better understand the movements and migratory routes of pelagic species (Department of Fisheries and SEAFDEC),
- A tagging program to understand the movements of sea turtles,
- A hilsa conservation program (in cooperation with BOBLME), which among other things, aims to collect information on migratory routes and feeding/spawning grounds.

(Win, Sein and Win 2011)

Socio-economic Considerations and Perceptions of MPAs

There is very little information available about the socioeconomic impacts of MPAs. Though rural communities living adjacent to certain terrestrial parks reap financial benefits through nature tourism, it is unclear if fishing communities experience similar benefits (Pe 2004). While there is some evidence that rural populations are typically unsympathetic towards government efforts to conserve biodiversity through protected area management (UP MSI et al. 2002), available information is too limited to draw any substantial conclusions. According to participants at the BOBLME MPA Workshop in 2011, priorities include organizing meetings and workshops with local communities and other stakeholders for networking/awareness raising purposes (Win, Sein and Win 2011).



Island Village, Mergui Archipelago. *Photo Credit: allmyanmar.com*

Effectiveness of MPAs

Though NWCD operates PA management in protected areas across the country (through a Park Warden Office), there is very little information available about the effectiveness of MPAs in Myanmar (BOBLME MPA Workshop 2011). According to a 2008 study, of the six “actively managed” MPAs in the country, none receive a good management rating (Tun et al. 2008). As described earlier, many of the MPAs in the country can be classified as ‘paper parks’ (Aung 2007).

Nevertheless, a lack of comprehensive baseline biological and socioeconomic data prevents more meaningful analysis on the effectiveness of MPAs.

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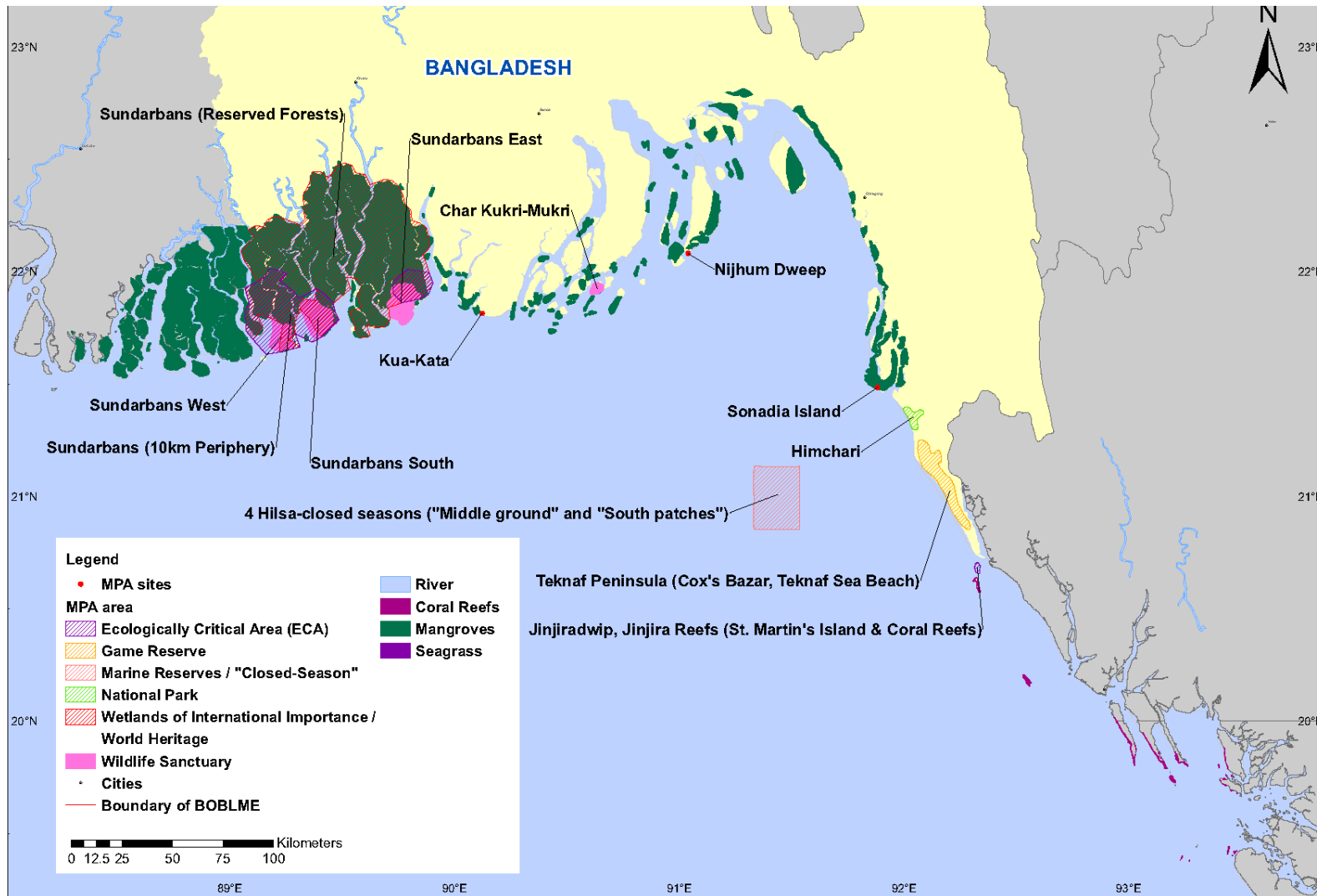
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Country Profile: Bangladesh



Country Overview

Bangladesh has a coastline of about 480 kilometres, and is the world's largest deltaic region (Mukul 2006; Mome 2007). Its alluvium soils deposited by large rivers and tributaries make it highly fertile, and the coastal zone is characterized mangroves, estuaries, mud flats, saline/brackish water, protected bays and islands (Mukul 2006; Kamal 2009). An intricate network of rivers and channels cuts through the coastal zone, together covering approximately 10 percent of the total coastal area (Ifkethar 2009). With much of the country's elevation under 40 meters, Bangladesh experiences annual flooding events, and possesses the largest flood-basin in South Asia (Mukul 2007). The area also houses extensive economic activity, and is home to urban and industrial areas, ports, and rural settlements (Ifkethar 2009; Mome 2007).

Bangladesh has the largest single mangrove ecosystem in the world, the Sundarbans, which stretch across the country's southwestern border into India (Ifkethar 2009). This area is one of the most biologically productive regions in the world, and houses the most significant nursing grounds for many commercially important marine species in the Bay of Bengal (Hussain 2009; Islam 2003). The adjacent offshore waters (known as "South Patches") are one of the most productive fishing grounds in the Bay of Bengal, with an estimated standing stock of 11.4 – 16 mt per sq km (Mome 2007). The Sundarbans contains a rich array of marine and terrestrial biodiversity, and is the last standing habitat for the Bengal Tiger (Ifkethar 2009). St. Martin's Island on the southeastern coast contains the country's only coral reefs, and the forested Teknaf Peninsula to the east along the Myanmar border has the longest, unbroken sandy beach in the world (Rajasuriya 2004; Ifkethar 2009).

The fisheries sector is vastly important to the country, and contributes about 5% of total GDP. Approximately 1.2 million people directly derive their livelihoods from fishing and fishery-based activities, and according to estimates, fish products account for 63% of total protein intake (Mome 2007). It is notable, however, that total fish production is higher in inland waters than in the marine environment (Chowdhury 1998). The majority of coastal fisheries in Bangladesh are small-scale: artisanal fisheries contribute 93.4% of total marine landings, while the industrial, trawl-based fishery contributes a mere 6.6% to overall fish landings (Hussain 2009).

The hilsa shad (*Tenualosa ilisha*) comprises the largest single fishery in Bangladesh's marine waters, employing about 2% of the country's total population and contributing 1% to total GDP (Ifkethar 2009; Mome 2007). Hilsa is commercially important and a major source of food security not only in Bangladesh, but also in neighbouring Myanmar and India (Mome 2007). Bangladesh produced the greatest quantity of the fish, however, providing an estimated 50-60% of global catch (Mohiuddin et al. undated). The anadromous fish alternates its life stages between freshwater rivers and the marine environment, and is known to spawn in six major breeding grounds in Bangladesh's coastal waters (Mome 2007).

The majority of commercially important aquatic fish species of the Bay of Bengal are overexploited (including *Hilsa ilisha*, *Pangasius pangasius*, *Plotossus canius* and *Scylla serrata*) (Ifkethar 2009; Canonizado and Hossain, 1998). As will be discussed in later sections, major threats include pollution of the coastal zone, habitat destruction through illegal harvesting, and rapid population growth/increased demand for natural resources (Ifkethar 2009; Islam 2004). There are also growing concerns over the potential impacts of sea level rise, and the increased intensity of storms during the cyclone period (worldwide,

approximately 53% of human mortalities due to cyclones occur in Bangladesh) (Ifkethar 2009).

History and Current Status of MPAs in Bangladesh

There is very little information available online about the status of protected areas in the marine environment in Bangladesh. While some of the country's terrestrial protected areas encompass parts of the coastal zone, there are no explicit 'marine protected areas' as defined through legislation in the Bangladesh. As such, the following sections review information about Bangladesh's terrestrial parks that contain marine components as well as other place-based marine conservation measures, drawing primarily upon journal articles and government reports.

The Bangladesh Wildlife Preservation Act of 1974 defines national parks and wildlife sanctuaries.¹ There are examples of both of these protected area categories in the marine environment (Mukul 2007). In total, there are currently 15 national parks and 13 wildlife sanctuaries throughout the country, 7 of which encompass parts of the marine environment (notably mangrove ecosystems) (IUCN, personal communication 2010).



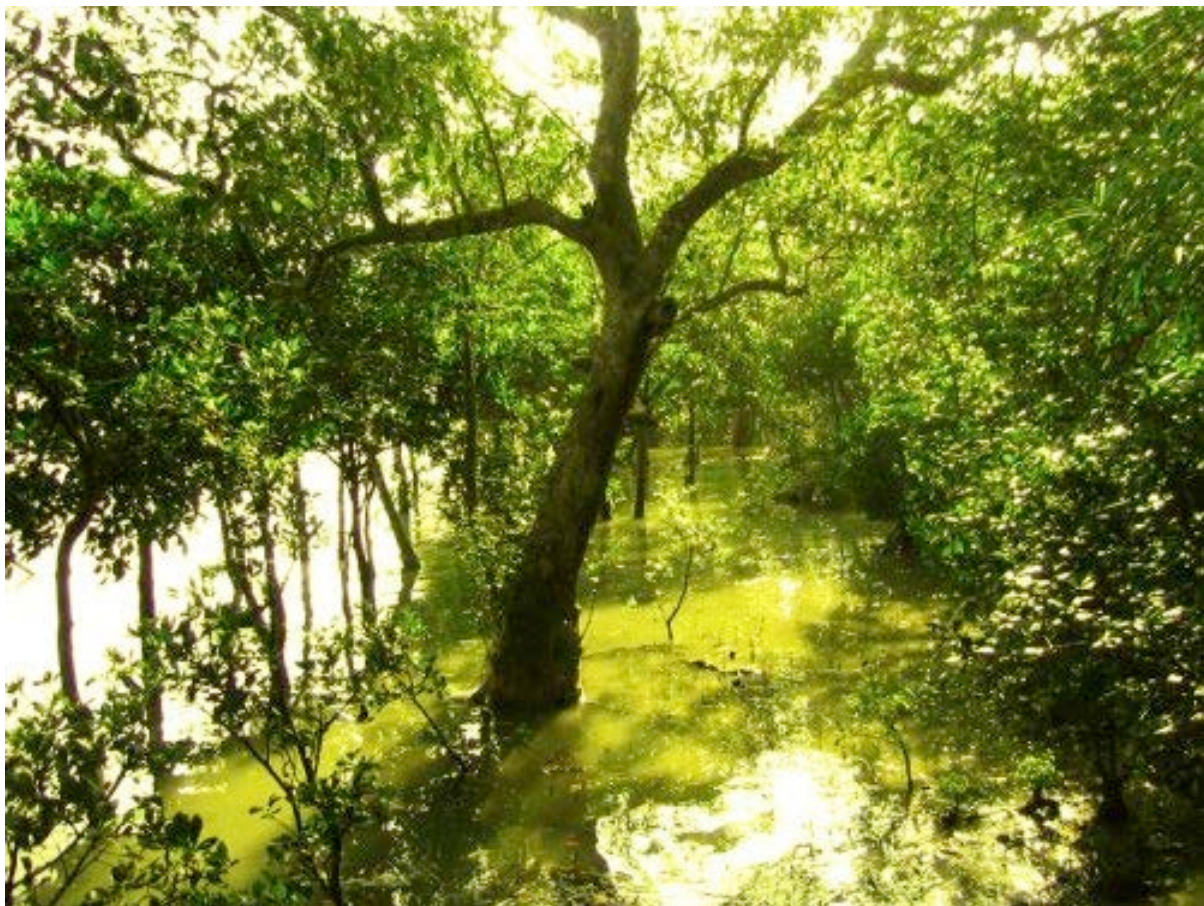
St. Martin's Island. *Photo Credit: "Discover Cox's Bazaar" website.*

Another type of protected area in Bangladesh is the 'ecologically critical area' (ECA), which is declared under the Environmental Conservation Act of 1995. ECAs are typically declared in areas that have suffered from intense ecological destruction. Of the four ECAs in the marine zone, the most well known include St. Martin's Island and the Teknaf

¹ While 'game reserves' were part of the 1974 Act, the government has since redesignated this category as 'wildlife sanctuary'.

Peninsula/Cox's Bazaar (Mukul 2007). There are also ECAs within the Sundarbans. Bangladesh's only coral reef communities are found in the former ECA 'Jinjira Reefs' (currently being considered for marine national park status), where they occupy an area less than 50km² (Rajasuriya 2004). Of all protected areas with marine habitat in the country, only one – the Sundarbans – is recognized internationally for possessing unique ecological diversity and accordingly listed as both a World Heritage and a Ramsar Site (Mukul 2007).

In a move that clearly links protected area development with fisheries management, Bangladesh began declaring 'hilsa-closed seasons' in recent years. It began by declaring four of these areas, located in two of the country's most productive fishing grounds – the 'Middle Ground' and 'South Patch' areas (Hussain 2009; Hossain 2004). These sanctuaries were established to "achieve the desired development of the hilsa fishery" (Mome 2007; Hussain 2009). Hilsa fishing is banned in these sanctuaries during certain months of the year (March to April in three sanctuaries, and November to January in the fourth). The country also regulates the hilsa fishery by imposing zone restrictions for artisanal and commercial and trawling operators, as well as banning hilsa catch outright during the peak spawning season in October in all major fishing grounds (Mome 2007). Bangladesh also declares closed seasons at key shrimp spawning sites (shrimp trawling is banned at certain points during the year).



The Sundarbans. *Photo Credit: UNESCO WHS Programme.*

MPA Legislation in Bangladesh

After signing the 1982 United Nations Convention on the Law of the Sea, Bangladesh sought new ways to responsibly manage and conserve its marine resources (Chowdhury 1998). It took the first steps towards this goal by introducing the Marine Fisheries Ordinance in 1983,

which outlined rules that continue to provide the main legal framework for controlling activities, conservation and development in the marine zone (Chowdhury 1998). Among other things, the Ordinance allows for the establishment of protected areas in any part of the country's exclusive economic zone (Chowdhury 1998). On an international level, Bangladesh is party to the five primary conventions with bearing on marine biodiversity conservation:

CBD, CITES, CMS, RAMSAR and WHC (Mukul 2007).

Table 7. Types of protected areas in the coastal zone in Bangladesh and corresponding legislation
Bangladesh Wildlife Preservation Act (1974)
<i>National Park</i>
<i>Wildlife Sanctuary</i>
Protection and Conservation of Fish Act of 1950
<i>Hilsa 'Closed Season'</i>
Bangladesh Environment Conservation Act (1995)
<i>Ecologically Critical Areas</i>

(Mukul 2006; Mukul 2007; Mome 2007; Hussain 2009)

As previously mentioned, many of Bangladesh's 'marine' protected areas are actually terrestrial parks with marine components.

These protected areas are typically declared under The Bangladesh Wildlife Preservation Act (1974). The Act uses a very narrow definition of 'wildlife' however, which includes only vertebrate species. As such, the Act fails to provide legal protection for a significant number of marine species, such as coral and mollusks (Mukul 2007).

Other relevant legislation and policies include:

- **The National Conservation Strategy (NCS)**, which provides a country-level strategy for the conservation and sustainable use in eighteen different sectors. Efforts to protect the mangrove systems in St. Martin's Island are implemented through the NCS (Mukul 2007);
- **The National Environment Management Action Plan (NEMAP)**, which was developed collaboratively by the Ministry of Environment and Forests and local communities, NGOs, professional groups and others. It provides the policy framework for environmental development and broad sectoral guidelines to inform such development (Mukul 2007);
- **The Bangladesh Environment Conservation Act (1995) and the Environment Conservation Rules (1997)**, which serve as the main legislative framework for environmental protection by setting requirements for environmental impact assessments among other things. The Act allows for the creation of Ecologically Critical Areas (Mukul 2007).
- **The National Biodiversity Strategy and Action Plan (NBSAP)**, which outlines the country's commitments and plans to meet goals under the Convention on Biological Diversity (Mukul 2007).
- **The Coastal Zone Policy (2005)**. Described in greater detail in the following section.
- **Coastal Zone Strategy (2006)**
- **Bangladesh Climate Change Strategic Action Plan (2008)**
- **National Fisheries Policy (1998)**. In particular, the Marine Fisheries Sub-strategy addresses marine fisheries spawning and nursery grounds.
- **National Water Policy (1999) National Tourism Policy (1992)**.

MPA Governance in Bangladesh

The primary government agency concerned with the declaration and management of marine protected areas is the Department of Environment (DoE), which operates under the Ministry of Environment and Forest (MoEF) (Bangladesh DOE Website 2010). The DoE has the authority to declare ecologically critical areas (ECAs) if it deems an area under threat. The Forest Department is responsible for declaring national parks and sanctuaries, while the

Fisheries Department is responsible for identification and declaration of MPAs in other forms (such as hilsa-closed seasons and fisheries sanctuaries).

Other agencies with a peripheral role in the management of marine protected areas (especially hilsa-closed seasons) include:

- The Ministry of Fisheries and Livestock
- The Bangladesh Fisheries Research Institute (runs the Marine Fisheries and Technology Station in Cox's Bazaar)
- Academic Institutions such as the Institute of Marine and Fisheries Science at Chittagong University
- The Bangladesh Navy and Coast Guard, which are charged with enforcing regulations governing marine resources more generally.
- Fisheries and Marine Resource Technology School of Khulna Science and Technology University, which is involved in academic research
- Bangladesh Fishery Development Corporation (BFDC) is also important in marine fisheries improvement

(Hussain 2009; Hossain 2004; IUCN 2010, personal communication).

The DoE and MoEF are currently implementing an array of projects in the marine environment, including the UNDP/GEF-funded Coastal and Wetland Biodiversity Management Project in Cox's Bazaar and Hakaluki Haor. The goal of the project is to design and implement an innovative system for managing Ecologically Critical Areas, and in doing so, serve as a demonstration site for other ECAs elsewhere in the country (DoE Website, 2010). In an attempt to protect Olive Ridley and Green sea turtle populations around St. Martin's Island, the MoEF initiated a project in 1996, whose subcomponents include monitoring nesting turtles, *in situ* conservation, and awareness-raising activities with local coastal communities. Furthermore, per Department of Fisheries regulations and the Marine Fisheries Ordinance, all industrial trawlers in the BoB must use Turtle Excluding Devices (Bangladesh Marine Fisheries Ordinance).

The country also recently began bolstering its integrated coastal zone management policy, drawing funding from the World Bank and the Government of Netherlands for the endeavour (Mukul 2007). These efforts stem from recognition that "the lack of a clear-cut government policy was a bottleneck" (Iftekhar 2006). Though work is still underway, there is general consensus that the passing of the 2005 Coastal Zone Policy helped implement nationwide ICZM (Mukul 2007; Iftekhar 2006). In regards to protected areas, this new policy outlines several goals, including:

1. Attaining "meaningful" conservation in ECAs, heritage sites and marine reserve;
2. Supporting institutional strengthening/capacity building programs;
3. Fortifying the regulatory framework for environmental protection;
4. Expanding the role of the Coast Guard such that "it can be used on behalf of all relevant institutions as a common resource for enforcement of different regulations applicable to the coastal zone";
5. Harmonizing existing environmental laws.

(MoWR 2005)

Threats and Challenges

With widespread poverty and one of the highest rural population densities in the world, the biodiversity and protected areas of Bangladesh face enormous pressure from anthropogenic sources (Mukul 2006). The government has responded, in part, by setting aside protected

areas encompassing both marine and terrestrial environments across the country. Nonetheless, there is a noticeable lack of information online about the status of protected areas in Bangladesh. While this may be due to the relatively small number of protected areas with marine components, it could also be due to the fact that many were established in recent years. Regardless, there seems a need for additional studies/better information dissemination. Having access to such information would help determine if such protected areas are meeting their objectives, as well as help identify success stories that might be replicated elsewhere (such as the hilsa closed seasons, which are reportedly responsible for increased fish catch) (Patkar 2004). Given the absence of information about marine protected area, the following section describes some of the challenges facing protected area management in Bangladesh more generally. It also explores the literature available on Cox's Bazaar and St. Martin's Island, as many of the ongoing marine conservation efforts are focused in these two ECAs.

Coverage

According to personal communication with the Bangladesh IUCN office, there are a number of sensitive marine areas within Bangladesh's Bay of Bengal region that are not adequately protected. Attempts should be made to protect such areas, which include the coral reefs around St. Martin's Island, elephant points (shrimp breeding grounds), Naf River Estuary, Meghna River Estuary (contains hilsa and other fish breeding grounds), parts of No. group (important for dolphin and shrimp), the marine areas along the Chakaria Sundarbans (important nursery grounds), and the marine areas bordering the Sundarbans. The organization also recommends conducting surveys at marine sites in deeper waters, as such locations might also warrant protection.

Governance and Management Challenges

The government agencies of Bangladesh are closely aligned with the country's main economic sectors. This has resulted in management that disproportionately values natural resources for their economic value over nonmonetary attributes such as contribution to overall ecosystem functioning (Islam 2003). Consequently, high-level government decisions do not always draw upon the best available information produced by the local marine science community (Islam 2003).

Historically, the government has tended to follow a single sector/single agency approach in protected area management (Iftekhar 2006). As elsewhere in the Bay of Bengal LME, this had led to challenges in the field of protected area management. Notable consequences include the implementation of unilateral actions based on departmental priorities; overlapping, redundant activities; and a failure to coordinate efforts (Iftekhar 2006; Mukul 2007). Cognizant of these limitations, multi-agency cooperation is becoming increasingly common, however (Iftekhar 2006).

Similarly, a lack of clear legislation and definitions create challenges in protected area management. ECAs are a relatively new category in Bangladesh, and there is uncertainty as to which legislation is applicable to ECAs:

“Until ECA regulations are formally acknowledged in Bangladesh law, all ECA management enforcement could become ineffective in reality, with no real benefit for biodiversity conservation”

- Molony et al. 2006.

Throughout the country more generally, fishery resources are threatened by the overexploitation of inshore marine resources. The indiscriminate take of post larvae and juvenile shrimp/finfish in mangrove ecosystems is of particular concern (Hossain 2004; Mahmood et al. 2004). According to one study, the collection of tiger prawn seed for aquaculture farming results in massive by catch, with 97% of (other) shrimp fry and finfish larvae discarded on dry land (Hossain 2004).

Artisanal fisheries mostly occur close to the shoreline, within 10-20 meters of depth. Non-mechanized and semi-mechanized boats are used in this area, many of which use a destructive gear (marine set bag net) known as *Behundi Jaal*. According to IUCN, these artisanal fisheries exert tremendous pressure on numerous fish stocks (Personal Communication, 2010). Industrial fisheries also operate within 20-30 meters of depth, and are thought responsible for the decline of major species. Within fisheries management more generally, there are concerns over the introduction of policies despite insufficient scientific information: In recent years, twenty squid operators were granted licenses to operate in waters of 40 meter depths, despite a lack of information on stock size (Chowdhury 2005).

In an effort to address these as well as other unsustainable uses, priorities for the coastal zone with relevance to protected areas include:

- Incorporating conservation policies into management plans
- Ensuring management of protected areas corresponds to their “multipurpose usefulness”
- Strengthening local participation in natural resource management
- Increasing research on local ecological processes and marine biodiversity, and identifying threats to coastal resources

(Kamal 2009)

At the moment, the government does not have the manpower necessary to enforce marine regulations, and capacity/lack of training are both pronounced issues facing protected areas throughout the country (Kamal 2009). As noted earlier, however, there are plans to extend the mandate of the Coast Guard to help numerous government agencies with enforcement efforts (MoWR 2005). There is also a marine wing within the Department of Fisheries, which has a marine surveillance team (developed during the last phase of the FAO BOBP).

Other Local and Transboundary Threats

Pollution from upstream sources threatens marine biodiversity in Bangladesh’s waters (and indeed beyond). Major sources of pollution include industrial waste, municipal waste, agrochemical waste and oil pollution (Islam 2003; Mukul 2007). There are currently over 900 polluting industries, which directly or indirectly discharge untreated liquid and solid wastes into coastal rivers and other waterways that eventually make their way into the Bay of Bengal (Islam 2003). Nonetheless, there are few, if any reports on the direct effects of effluents on local fish stocks and post-larvae/juvenile marine species in nursery grounds (Islam 2003). According to IUCN (personal communication, 2010), control measures to prevent land-based and *in situ* marine pollution in the Bay of Bengal are largely ineffective, as are efforts to curb the discharge of ballast and bilge water. While the government has moved to ban certain noxious agrochemicals, problems persist (Islam 2003; Mukul 2007).

‘Upstream’ development activities also have serious effects upon the health of local marine ecosystems. Though such activities only have indirect bearing upon MPAs, they are nevertheless worthy of mention: The use of sluice gates and barrages in construction

activities affect natural siltation processes, and in the past have been responsible for silting up rivers (Islam 2003). This in turn leads to blocked migration routes, as occurred in the case of hilsa populations in the Kumar River following the Ganges-Kobadak project (Islam 2003).

Like the Maldives, Bangladesh will likely suffer disproportionately from the effects of climate change. With its relatively low topographic profile, it is expected that a third of the country may become fully inundated. Taken together with salinity intrusion, this will have profound implications on existing coastal ecosystems like mangrove forests (Mukul 2007). Other impacts will likely include increased temperatures and higher rates of precipitation/more intense cyclones (Iftekhar 2006). While these concerns are not unique to Bangladesh, local experts posit that “conventional management approaches will not suffice and integrated long-term management is more appropriate” (Shi and Singh 2003; Iftekhar 2006).

Socio-economic Considerations and Perceptions of MPAs

With much of the population dependent upon the extraction of natural resources for their livelihoods, there are profound difficulties in balancing biological conservation with socioeconomic development. Unsustainable resource extraction is an issue in/around the reefs of St. Martin’s Island for example, and there is mounting pressure on local reef systems from human activities, a growing tourism industry and increased shoreline construction (Kamal 2009; Rajasuriya 2004). There is reportedly indiscriminate harvesting of corals and associated fauna around St. Martin’s Island (Rajasuriya 2004), and the protected area is listed as “degraded” ((Rajasuriya 2004). The St. Martin Pilot Program (2000 – 2001) sought to curb harmful activities by carrying out awareness-raising activities and better enforcement, resulting declines in the illegal collection of curios during peak tourism seasons (IUCN 2008). Problems persist, however, and the “management of wild collection and regulation of the trade at Cox’s Bazaar, together with increased awareness among visitors is essential to protect the remaining reef resources of Bangladesh” (IUCN 2008). It is also notable, that some of the products (notably coral skeletons) that appear in local markets may also come from neighbouring Myanmar (Rajasuriya 2004).

Nevertheless, information about the positive and negative socioeconomic effects of protected areas on human populations is extremely limited. The literature does contain examples of *attempts* to increase community participation in marine management, however. Some such examples include:

- **UNDP/GEF-funded “Community Mobilization for Biodiversity Conservation at Cox’s Bazar” Project** (2006). Conducting in conjunction with the DoE and MoEF, this project entailed gathering feedback from community members on perceived problems, issue prioritization and consensus building in Cox’s Bazar (Bangladesh Poush 2006)
- Mainstreaming community participation and empowering coastal communities through the recently passed **CZM Policy** (2005). Noteworthy tenets include (1) instituting co-management procedures which “bring decision-making power to the grassroots level” (2) Addressing the vulnerabilities of coastal communities (3) adopting initiatives that maintain the cultural heritage of coastal communities (MoWR 2005)
- Activities led by the **Bay of Bengal Programme** to promote the involvement of fishing communities in marine management through awareness-raising programs (Chowdhury 1998).
- The FAO and Department of Fisheries-sponsored **Empowerment of Coastal Fishing Community (ECFC)**, which sought to increase coastal fishermen capacity at Cox’s Bazar (IUCN 2010, personal communication).
- **Fourth Fisheries Project**, which is a GEF study on coastal and hilsa biodiversity (DoF

- 2004)
- **Strengthening Marine Fisheries Capacity of Bangladesh**, an ongoing project of the Department of Fisheries, with funding through the Organization of Islamic Countries (IUCN 2010, personal communication).
 - **Integrated Coastal Zone Management Programme** (Phase I) of the Water Resources Planning Organization (IUCN 2010, personal communication).

Effectiveness of MPAs

There are reports on the success of the hilsa-closed seasons. According to one study, the production of hilsa increased following the institutions of such closed seasons/the ban on catching hilsa fry (Patkar 2004). It is worth pointing out that these closed seasons occur in *both* marine and freshwater zones. In other words, it is possible that the observed increases in biomass are due to a multi-pronged effort to conserve the species in its many habitats.

The St. Martin's Island/Cox's Bazaar ECA initially had relatively poor management as a direct result of a lack of resources (Rajasuriya 2004). This has started to change in recent years, however, in part thanks to the introduction of the UNDP/GEF funded program in the area. This program is putting a regulatory framework in place, and conducting ECA mapping/boundary definition activities. It is also conducting community mobilization efforts in conjunction with local NGOs, and performing ecological/economic baseline information (DOE website 2010).

Other programs in Cox's Bazaar include the MOFL/FAO "Empowerment of Coastal Fishing Communities", the MOEF "Conservation of Biodiversity, Marine Park Establishment and Eco-tourism Development Project at St. Martin's Island" and the "Integrated Coastal Zone Management" program of the World Bank/Government of the Netherlands.

Very little information is available on the effectiveness of protected areas with marine components elsewhere in the country.

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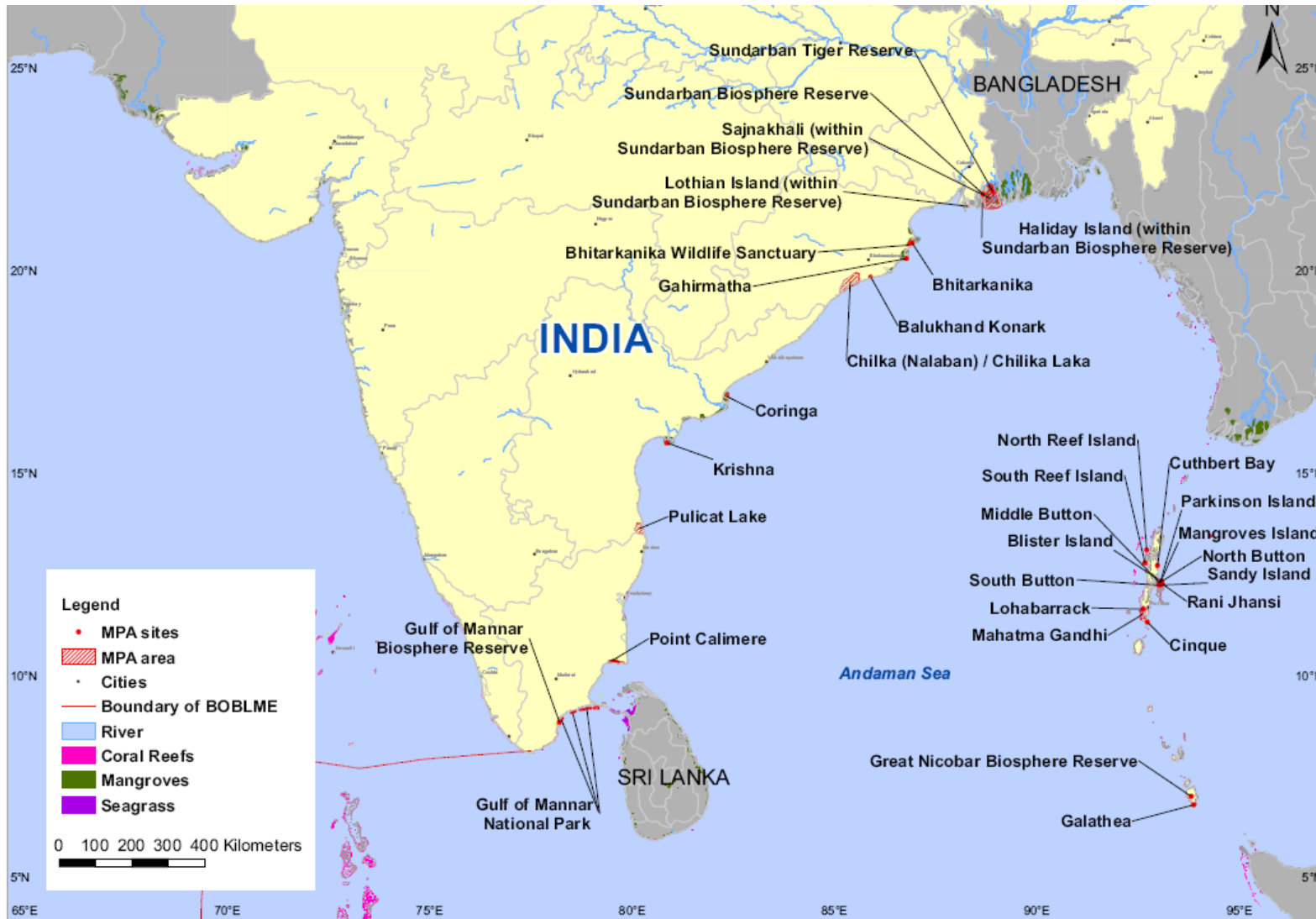
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Country Profile: India



Country Overview

India has a coastline of 8,118 km, of which 4,645 km is part of the Bay of Bengal LME (Sampath 2003). The area is characterized by a variety of ecosystem types, including mangroves, creeks, tidal flats, mud flats and coral reefs. Coral reefs spread over an area of 5,790 km² within the country's territorial waters, and within the Bay of Bengal, are most prolific along the southern coast around the Gulf of Mannar and in the Andaman and Nicobar Islands (Rajasuriya 2004).

India ranks eighth in the world in terms of overall production in the fisheries sector (FAO 2010). The sector contributes just over 1% of GDP, and the majority of total catch comes from relatively shallow, near shore coastal waters. In 2007, overall landings were composed of 57% pelagic finfish, 25% demersal fish, 14% crustaceans and 4% molluscs, and major species include Indian oil sardines (*Sardinella longiceps*), various species of shrimp (both penaeids and non-penaeids), Indian mackerel (*Rastrelliger kanagurta*), and Bombay duck (*Harpadon nehereus*) (FAO 2010).

The boundary of the Bay of Bengal LME extends from the northern coastal state of West Bengal to the country's southern most point. Coastal states, territories and regions of significance bordering the LME include West Bengal, Orissa, Andhra Pradesh, Tamil Nadu, Puducherry (Pondicherry), and the Andaman and Nicobar Islands. Several major rivers discharge into the Bay of Bengal along the coastline, including the Ganges, Brahmaputra, Mahanadi, Godavari, Krishna and Cauvery (Sampath 2003). The total population within this area exceeds 225 million, and there are six major and five minor ports along the shoreline (Sampath 2003).

History and Current Status of MPAs

The government first began formally setting aside marine areas for conservation purposes in the 1960s, despite the lack of clear legislation. It began by declaring the Point Calimere Wildlife Sanctuary in 1967, which is an intertidal mudflat area in the Bay of Bengal that was set aside for to protect waterfowl birds (FAO 2010, Rajagopalan 2008). Building upon the momentum of this first park, the country then passed the Wildlife Protection Act in 1972, and has since declared dozens of protected areas in the marine environment throughout the country (FAO 2010). According to the national government, there are 31 MPAs in the country, of which 16 are within the Bay of Bengal LME.

It is notable, however, that the lack of a clear legal definition for MPAs has caused ambiguity over the total number of MPAs countrywide: While the national government stated in a report to the CBD that there are 31 MPAs throughout the country, the Wildlife Institute of India counts 26 and the Ministry of Environment and Forests counts 5 (FAO 2010).

The Government of India is currently planning to extend its network of MPAs. Its most recent "five year plan" articulates a need to designate more protected areas in order to protect coral reefs, and in a 2006 report to the CBD, the Government noted that it plans to increase MPAs in island areas from 18.5 to 35.14 percent, and MPAs in "coastal biogeographic zones" from 6.16 to 7.12 percent (FAO 2010).

The majority of MPAs are declared to protect critical ecosystems or species, not as tools for fisheries management (FAO 2010; Rajagopalan 2008). For instance, the Gahirmatha (Marine) Wildlife Sanctuary was established explicitly to protect Olive Ridley turtles and their

nesting/breeding habitat, the Point Calimere Wildlife Sanctuary was set up to protect waterfowl birds, and the Sundarban Tiger Reserve was created to protect tigers in inter-tidal waters (FAO 2010). There are concerns, nevertheless, that MPAs do not protect ecosystems across sufficient spatial scales: Because there is “no transparent ecological planning and analysis” that informs the objectives of MPAs, questions remain as to whether the existing MPAs together form a network that truly takes ecological connectivity into account (FAO 2010). Insufficient reporting of MPA data further compounds this issue. In its 2009 report to the CBD, the Government specifically identifies the need to improve the connectivity of protected areas through the establishment of corridors (CBD 2009).

The following section provides an overview of MPAs along the Bay of Bengal.

West Bengal is India’s northern most coastal state. It shares a border with Bangladesh, which is straddled by the world’s single largest mangrove forest system (the Sundarbans). Like Bangladesh, India declared its part of the Sundarbans as a Biosphere Reserve under the UNESCO MAB program. About 55-60% of the total area of the Sundarbans falls within Bangladesh, while the remaining 40-45% is in India. This UNESCO protected World Heritage Site serves as the breeding and nursery grounds for many of the major fisheries in the Bay of Bengal. The Biosphere Reserve consists of the national park, three wildlife sanctuaries (Sajnekhali Wildlife Sanctuary, Lothian Island Sanctuary and Haliday Island Sanctuary), a large buffer area, and a core area that is designated as a tiger reserve (Rajagopalan 2008). Many parts of West Bengal are experiencing rapid development, including the reclamation of mangroves in order to pave the way for human settlement, aquaculture ponds and agricultural farms (Sampath 2003). There are also concerns about high levels of effluent, and according to estimates, the Sundarbans is subjected to 400 tonnes of untreated municipal sewage from Kolkata each day (Sampath 2003).

Moving south along the coast is the state of **Orissa**. The state is famous for housing the largest known rookery of Olive Ridley turtles in the world, as well as the breeding grounds for two rare species of horseshoe crabs (Sampath 2003). Marine protected areas within the state include Bhitarkanika Wildlife Sanctuary, Gahirmatha Marine Sanctuary and Chilka Lake. The Gahirmatha Marine Sanctuary protects the largest known nesting grounds of Olive Ridley turtles, and between 0.2 to 0.7 million turtles migrate to the sanctuary each year to lay eggs (Sampath 2003). With an area of 1,450 km², the Sanctuary is the largest protected marine area in India (Rajagopalan 2008)¹. Chilka Lake is a brackish lake subject to seawater exchange, and was designated a Ramsar site in 1981 (Ramsar, 2010). The site was recently removed from this list, however, thanks to the successful conservation, development and management measures put in place by the Chilka Development Authority (Sampath 2003).

Southward of Orissa is **Andhra Pradesh** state, which has a relatively long coastline of 974 km. The state boasts long sandy beaches as well as extensive deltas with mangrove forests (Sampath 2003). The Krishna Wildlife Sanctuary and the Coringa Wildlife Sanctuary are both within this state. Coringa was designated in 1978 to protect mangrove forests (Sampath 2003). Like West Bengal, the state is undergoing rapid development, and mangrove forests are being converted for aquaculture ponds and agricultural farms (Sampath 2003).

¹ As described later, many of India’s MPAs contain both terrestrial and marine components. Gahirmatha Marine Sanctuary is the largest in terms of the amount of marine habitat under protection.

To the south, **Tamil Nadu** also has a very long coastline (1076 km), and is home to extensive sand dune formations, long sandy beaches and mangrove forests. Approximately 80% of the industrial development of the state occurs on the coastline, and there are concerns about pollution from coal-fired thermal power plants, the discharge of untreated sewage and industrial effluents (Sampath 2003). Tamil Nadu contains the Point Calimere Wildlife and Bird Sanctuary (Ramsar, 2010), which was established to protect its 257 species of birds, including the vulnerable Spoonbill Sandpiper, Gray Pelican and Greater/Lesser Flamingos. The Union Territory of **Puducherry** has a coastline of just 45 kilometres, and does not contain any marine protected areas.

The **Gulf of Mannar** is continental India's southern most region bordering the Bay of Bengal. This area is made up of 21 islands, with extensive coral reefs, mangrove forests and a shallow sea that extends southward towards Sri Lanka. The world famous Gulf of Mannar Marine Biosphere Reserve spans these 21 islands, and is the first Marine Biosphere Reserve not only in India, but indeed all of South and Southeast Asia (Sampath 2003). The Biosphere Reserve spans an area of 10,500 km² (including a national park of 560 km²), making it the largest MPA in the country (when both terrestrial and marine components are considered) (Rajagopalan 2008). Like other Biosphere Reserves, it contains a national park that forms the core area, as well as a buffer zone (Rajagopalan 2008). It is one of the most biologically rich marine ecosystems in India, and houses an abundance of coral reefs, seaweed species, sea grasses, pearl banks, sacred chank beds, fin and shellfish species, mangroves and endangered species like dugongs (Sampath 2003). Approximately 125 fishing villages engage in small-scale fishing activities in the Gulf of Mannar, which include seaweed and sea cucumber collection (Rajagopalan 2008). Larger-scale threats to marine resources in the Gulf of Mannar include indiscriminate trawling, dynamite fishing, and the harvesting of specific species like ornamental fish, invertebrates and endangered dugongs and turtles (Sampath 2003).

Finally, the **Andaman and Nicobar Islands** lie 1,750 km to the southeast of India, and are made up of approximately 530 islands. These islands are characterized by extensive coral reefs and 18% of the country's total mangrove forests (Rajasuriya 2004; Sampath 2003). There are two marine national parks within the area (Mahatma Gandhi Marine National Park and the Rani Jhansi Marine National Park), and one UNESCO biosphere reserve (Great Nicobar Biosphere Reserve), as well as three national parks and ten wildlife sanctuaries that contain portions of the marine environment. Though the majority of islands within this region are uninhabited, the South Andaman Island of Port Blair has seen increased urbanisation and infrastructure/tourism developments in recent years. Finally, while many of the country's coral reefs were severely impacted by the 1998 worldwide bleaching events, the fringing reefs of the Andaman and Nicobar Islands were minimally impacted (Rajasuriya 2004). It is notable, however, that over 300km² of reefs in the Andaman and Nicobar Islands were slightly to moderately damaged by the 2004 tsunami (Tamelander 2008).

Finally, there are 38 protected mangrove sites and four protected coral reef sites throughout the country. New money is set aside for these areas during every five-year planning period. The Government of India has also proposed 33 new sites as MPAs, based in part upon the recommendations that emerged from an MPA Workshop in March 2009.



Olive Ridley hatchlings, Gahirmatha Reserve. *Photo Credit: Top News/Law.*

MPA Legislation

India has no legislation that deals with MPAs explicitly (Rajagopalan 2008). Similar to neighbouring Bangladesh, MPAs are created when the government declares the following protected area types in marine environments:

1. National Parks (IUCN Category II). Afforded the highest level of protection, and all activities are prohibited unless they enhance conservation efforts (tourism is permitted). Extraction of natural resources is banned in all areas. Typically focus upon large-scale ecosystem protection and recreation.
2. Sanctuaries (IUCN Category IV). Frequently established to conserve a particular species or habitat. Certain extractive activities are permitted, such as traditional non-commercial fishing. Many sanctuaries contain a core area, in which extraction of natural resources is banned.
3. Tiger Reserves (Core area under IUCN Category II and IV. Buffer area under IUCN Category VI). Typically straddle the land/sea interface, and are notable for taking into consideration the 'co-existence' of man and biodiversity, paying considerable attention to the rights and livelihoods of communities living in surrounding buffer zones. Emphasis placed on conservation and sustainable use as mutually beneficial.
4. Community Reserves and Conservation Reserves. There are currently no community reserves or conservation reserves in the marine environment.

(FAO 2010; Rajagopalan 2008)

All of the above PA types are declared under the Wildlife Protection Act (WLPA) of 1972 (amended in 2002 and 2006). The Act primarily deals with terrestrial management, and does

not have explicit definitions for either MPAs or MCPAs (Rajagopalan 2008).¹ As mentioned earlier, India also three biosphere reserves in the Bay of Bengal.

Other national-level legislation, policy documents, guidelines and action plans with relevance to MPAs include:

- The Environment (Protection) Act (1986)
- The National Conservation Strategy and Policy Statement for Environment and Sustainable Development (1992)
- The Coastal Regulation Zone Notification (1991, replaced by updated version, 2011)
- The National Environment Policy (2006)
- The Wildlife Conservation Strategy/National Wildlife Action Plan (2002)
- The Guidelines for Integrated Management Action Plan for Wetlands, Mangroves and Corals
- The Guidelines for Protection, Maintenance, Research and Development in the Biosphere Reserves in India (1999)
- The National Biodiversity Action Plan (2008)
- The National Environment Policy (2006)

(FAO 2010)

At an international level, India is party to an array of agreements with bearing upon MPAs. These include the CBD, the Ramsar Convention, WHC, the International Convention for the Regulation of Whaling and the Convention on the Conservation of Migratory Species of Wild Animals (FAO 2010).

In January 2011, India also passed the Coastal Regulation Zone Notification (to replace the 1991 CRZ). This recent legislation seeks to more comprehensively protect and conserve the coastal environment, and, when compared to the original 1991 notification, will better account for the varied marine ecosystems of India, better regulate pollution from land-based activities, and attempt to minimize negative impacts of protected areas on local communities among other things.

MPA Governance

At the national level, the Ministry of Environment and Forests (MoEF) is the primary agency responsible for the conservation of India's biodiversity. It is responsible for implementing the WLPA and the Environmental Protection Act, and works through the Department of Forests (DoF) at the state level. The DoF is in turn is directly charged with managing protected areas (FAO 2010). The Coast Guard (under the Department of Defence) enforces many of the regulations in marine parks and sanctuaries.

The Department of Fisheries (DoF) also plays a tangential role in MPA management by managing fisheries resources through the enactment of legislation and regulations (FAO 2010). For instance, the DoF has worked to protect turtle nesting grounds in the Gahirmatha (Marine) Wildlife Sanctuary in Orissa since 2003, by introducing zoning and fishing regulations on an annual basis (FAO 2010). Other government agencies involved in MPAs include the Ministry of Science and Technology and the Ministry of Agriculture – both of which conduct research on coastal and marine ecosystems (FAO 2010).

¹ It does have certain provisions that pertain to the marine environment, however. These provisions only have indirect bearing upon MPAs, and deal with regulations such as the right of innocent passage for ships and guidance for dealing with local boats that inadvertently cross into MPA boundaries (FAO 2010 2009).

The 2002 and 2006 amendments to the WLPA triggered a series of changes in MPA governance in India. The amendments paved the way for the creation of the National Board of Wildlife and the State Board of Wildlife, whose mission is to collaborate with other government agencies, local government representatives, local self-governing institutions and NGOs on protected area management (FAO 2010). The amendments also called for the establishment of “advisory committees” for protected areas. These committees are comprised of local government officials, who are responsible for recommending methods to improve the conservation and management of sanctuaries (FAO 2010).

Community participation in MPA governance is also on the rise. The WLPA amendments expanded protected area types to include community reserves, conservation reserves and tiger reserves – all of which recognize the principle of sustainable use and involve communities in participatory management (FAO 2010). With the exception of tiger reserves, however, these community focused PA types have yet to be declared in any marine environments.

Threats and Challenges

Coordination

Like other countries in BOBLME, coordination between government agencies remains a challenge to effective protected area management (Rajagopalan 2008). While the Fisheries Department is responsible for fisheries management within the coastal zone, the Department of Forests remains responsible for managing marine protected areas (Rajagopalan 2008). According to studies, a consequence of this sectoral approach is that “the expertise and experience of the Fisheries Departments in dealing with fishing communities and fisheries management are not sufficiently used in PA management” (Rajagopalan 2008). It should be noted, however that recent efforts (such as the WLPA amendments) have attempted to streamline the work of key agencies involved in PA management. The inclusion of DoF representatives on the State Board of Wildlife is producing beneficial synergies, for instance, and there are reports of successful inter-agency collaboration in the Gahirmatha (Marine) Wildlife Sanctuary and the Gulf of Mannar National Park (FAO 2010).

Nevertheless, there is a much larger contingent of agencies that oversee activities in the coastal zone. Such activities can indirectly (yet significantly) affect MPAs. For instance, MPAs face threats from oil spills, the unregulated discharge of pollutants, tourism activities and industrial development (Singh 2002). It is important to note that the recently passed Coastal Regulation Zone Notification (Jan 2011) will likely address many of these issues, however.

The Pressure of Development

There are reports that conservation takes a second seat behind development priorities (Singh 2002). While politicians and stakeholders “appreciate conservation, [the] development of ports and industries is on top of their agenda” (Singh 2002). Consequently, the needs and recommendations of environmental government agencies such as the MoEF receive less attention than those working directly with industries (Singh 2002).

Given the connectivity of marine ecosystems, MPAs are threatened by development and industrial activities that occur outside of MPA boundaries (Singh 2002). In the case of the Point Calimere Wildlife Sanctuary, for instance, there are approximately 35,000 fishermen and agricultural families living on the borders of the sanctuary (Ramsar, 2010). The recent establishment of small-scale aquaculture and salt ponds on the sanctuary’s edge, coupled with widespread deforestation threaten the PA. An estimated 40% of the mangrove forest has been

cut for firewood, which has a domino effect across the ecosystem, including increased coastal erosion and a decrease in the amount of nutrients running into coastal waters to support fish production (Sampath 2003). Similarly, the coral reefs in the Gulf of Mannar face “considerable stress due to the proximity of the mainland and high coastal populations, urban centres and land-based activities...[and] sediment loads appear to have increased over the last 10 years” (Tamelander 2008). The Gulf of Mannar is also susceptible to risks posed by dredging, port construction, shipping canals and the existence of oil and gas pipelines (Rajagopalan 2008). Taken together, these risks not only threaten the natural resources of the region, but also the welfare of the surrounding communities who rely upon marine resources for food security.

Management and Implementation Challenges

MPAs across the country face an array of challenges related to management and implementation. Despite the establishment of dozens of parks, the management of MPAs “has yet to reach its maturity” (Singh 2003). Some of the most pronounced and pervasive issues facing the parks include:

- Legal issues, especially those concerning resettlement of populations and the demarcation of boundaries
- Lack of science-based management plans for the majority of MPAs
- Lack of infrastructure needed for management
- Insufficient numbers of technical and scientific personnel in management roles
- Lack of monitoring programs

(Singh 2003)

In its fourth report to the CBD, however, India details ongoing efforts to address some of these obstacles (India CBD Report 2009).

Socio-economic Considerations and Perceptions of MPAs

Historically, much of conservation in India has been top-down with a focus on ‘keeping people out’ (Rajagopalan 2008). Fishing communities have not been centrally involved in designating and managing MPAs in many cases, and existing management plans often focus upon restricting human activities (Singh 2002; FAO 2010). In many cases, such fishing communities “have been deprived of their means of livelihoods following establishment”. As a result, it is challenging to obtain local support, foster partnerships and build self-enforcement mechanisms (FAO 2010; Singh 2002).

Orissa is one of the poorest states in the country, and almost half of the population lives below the poverty line. Fishing restrictions and conservation measures not only reduced access to fishing grounds, but also reduced the number of annual fishing days from 240 to less than 100 (FAO 2010). Local fishermen sometimes travel through the Sanctuary on their way to nearby landing centres, and as a result have had their boats and catch confiscated, received fines and even been imprisoned (FAO 2010). As a result of these restrictions, many local fishermen have declining incomes, face high levels of debt, and are unable to find alternative sources of income. According to a local NGO, this has led to mass outmigration, intense mental distress, and even suicide (ICSF 2008). As explained in future sections, it is therefore critical that “fishworkers [are] made equal and effective partners in identifying socially just conservation and management measures, and specific steps to cushion the socioeconomic impacts of conservation should be implemented” (ICSF 2008). It is equally critical to couple such efforts with improved collection of socioeconomic data, in order to fully understand the potential socioeconomic impacts of conservation measures (ICSF 2008).

There is movement towards more inclusive MPA management approaches, however. The amendments to the WLPA allow for the creation of community reserves, and there is increased emphasis on improving human well-being and addressing socioeconomic concerns at the level of individual MPAs. In the Gulf of Mannar Marine National Park, for instance, efforts are underway to collect socioeconomic data, introduce alternative livelihood programs and use participatory processes to development management plans (Rajagopalan 2008). Furthermore, the Government of Orissa recently submitted a proposal to declare the Rushikulya sea turtle rookery as a community reserve (Rajagopalan 2008). Despite this promising first attempt, there is an administrative hurdle hindering similar efforts: community reserves can only be declared in property owned either privately, or by the community. As such, while it is possible to designate MPAs with *terrestrial* components as community reserves, doing so in coastal waters remains impossible due to lack of tenure (Rajagopalan 2008). Finally, the National Wildlife Action Plan (2002 – 2016) outlines guidelines for local community involvement in protected area management, and states that participatory management committees should be established in each protected area throughout the country (FAO 2010).

There appears to be a real window of opportunity to improve collaboration. According to data gathered, communities rarely outright oppose conservation measures (FAO 2010; ICSF 2008). Instead, many simply feel marginalized in decision-making processes and disproportionately targeted by conservation restrictions (Rajagopalan 2008; ICSF 2008). There is reportedly much emphasis on regulating small-scale fishing activities, while surrounding industrial activities are allowed to continue (and even expand) (FAO 2010). According to data gathered around the Gulf of Mannar, for instance, local communities would like to see more rigorous regulation of trawling activities that deplete local stocks, as opposed to the current focus on regulating their “relatively low-impact fishing practices...catching the wrong end of the stick, as it were” (Rajagopalan 2008). In conclusion, despite noteworthy progress towards participatory management, much work remains ahead (Rajagopalan 2008; ICSF 2008).

Effectiveness of MPAs

There are various initiatives underway to improve the collection and usage of protected area monitoring data. In its 2009 report to the CBD, the Government of India reports of ongoing coral surveys throughout the country to update existing baseline information (CBD Report 2009). The MoEF also recently completed an evaluation of the management effectiveness of both marine and terrestrial protected areas throughout the country (MoEF and WII 2008). According to results, Bhitarkanika National Park, Mahatma Gandhi National Park, and Gulf of Mannar National Park are all doing relatively well (MoEF et al. 2008).

There are also long-term ecological monitoring projects in place for many marine protected areas (e.g. In the Sundarbans, ‘monitoring plots’ have been in place for the past ten years) (BOBLME Workshop Feedback 2011). Throughout the country, there are over 100 ongoing research projects being implemented by many government agencies and institutions, which have bearing upon protected areas (BOBLME Workshop Feedback 2011).

There is a need to expand the scope of such studies, however, to include the collection (and usage) of socioeconomic data that sheds light on the costs/benefits of protected areas on indigenous and local communities (CBD Report 2009). Additionally, in a June 2010

workshop, participants from across the country came together to identify the research gaps in coastal and marine biodiversity conservation.

Like the ‘hilsa-closed seasons’ in Bangladesh, there is evidence of the positive ecological effects of temporal-based fisheries conservation measures (note that such measures are not connected to MPAs). Though not in the Bay of Bengal, there is evidence from Kerala that the “monsoon ban” put into place during certain times of year is yielding positive ecological effects on demersal and benthic communities (FAO 2010). Also of interest are claims by the Fisheries Department that better enforcement of trawling activities/destructive fishing methods would yield significant ecological benefits, thereby limiting the need for other conservation measures such as the establishment of protected areas (FAO 2010).

Nevertheless, there is little information about the direct impacts of MPAs on fisheries and spill-over. This lack of information can partially be attributed to a mismatch in agency mandates: As the Department of Forests establishes and manages protected areas, MPA objectives rarely align with a fisheries management framework (FAO 2010). As such, fisheries data is not collected for marine protected areas in a comprehensive and consistent manner (FAO 2010).

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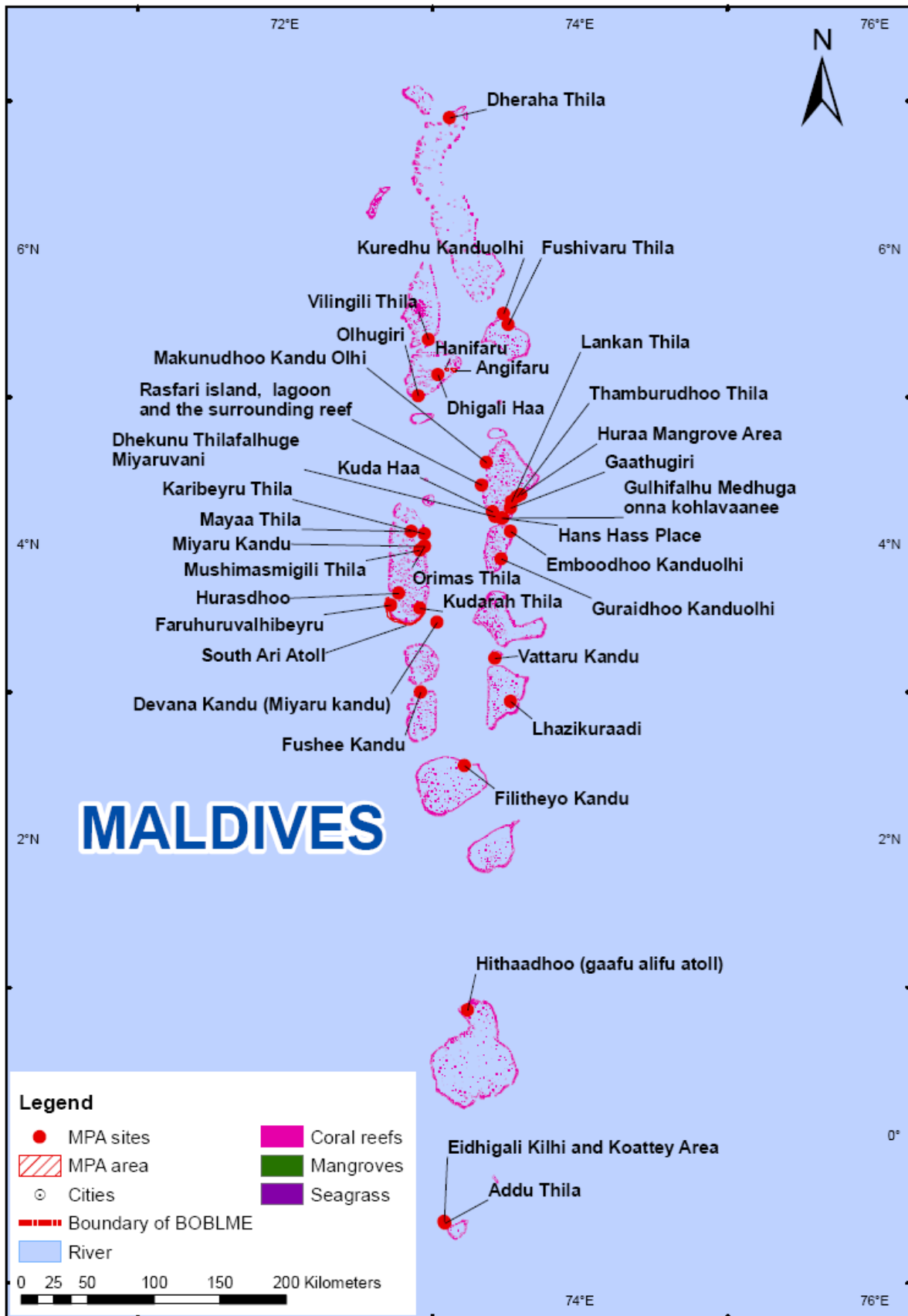
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Country Profile: Maldives



Country Overview

Located southwest of Sri Lanka in the Lacadive-Chagos submarine ridge, the Maldives is an archipelago nation that stretches over a total area of 859,000 km² (MPND 2008). The country is made up of 16 atolls, five oceanic faros and four oceanic platform reefs, which together with all coral reef and lagoon habitat cover an area of approximately 20% of the Maldives' Territorial Sea (Naseer and Hatcher, 2004). Of the country's 1,192 islands, 193 are inhabited, 93 are leased out as tourist resorts, 55 are leased for industrial, agricultural and mariculture purposes and approximately 800 are uninhabited. The islands are relatively small, with an average size of 0.25 km².

Coral reef coverage in the Maldives is 4,513.14±225.65 km². This includes rim and oceanic reefs (3,701.93 km², or 82.5% of total reef area), as well as patch reefs inside of atoll lagoons (791.92 km², or 17.5% of total reef area) (Naseer and Hatcher 2004). The Maldives has particularly rich coral reef fauna, as well as sea grass beds, mangrove habitat and sandy lagoons among other habitat types. The atoll ecosystems are especially rich in biodiversity, and contain over 1,090 fish species and 187 coral species (Maldives CBD Application 2008).

With a relatively small terrestrial area, marine resources provide the main base of economic activity, contributing to employment, food, protection and shelter (Maldives State of the Environment Report 2002). Tourism currently accounts for the largest share of GDP, followed by the fisheries sector. According to the Sixth National Development Plan, "the tropical island environment and the marine biological diversity of the Maldives have proved to be unique marketable assets, in a country which is devoid of any other commercially exploitable resources" (MPND 2002).

The tourism industry officially began in 1972 with the development of two resorts. In the early years of the industry, most tourist resorts were located in the central region of the country due to proximity to the Malé International Airport. This has changed, however, and under a more recent policy, uninhabited islands have become available for tourism development, as have plots of land on inhabited islands. In 1985, the tourism sector officially overtook the fisheries sector in 1985 to become the country's largest income earner. As of 2009, there were 97 operating resorts throughout the country, 3 new resorts just coming online (one in Seenu Atoll and two in Gaafu Alifu Atoll), and a further 88 sites leased for future resort/hotel development (MoTAC 2010).

Fisheries products remain the country's primary export, and tuna and tuna-related species make up over 85% of total fish catch (Maldives State of the Environment Report 2002). The fisheries sector has accounted for around 4 – 6% of GDP in recent years, and contributes to Maldives' earning of foreign exchange through exports of skipjack and yellow fin tuna in particular. Fishing for tuna using live bait and pole-and-line is widely practiced throughout the country, and forms a large part of traditional Maldivian culture. Approximately 15,000 fishermen and their families depend on fishing, and there are about 1,200 pole-and-line vessels and 350 hand line large yellow fin vessels according to records maintained by the Ministry of Fisheries and Agriculture (MOFA). Though tuna continues to dominate the sector, the collection of reef species such as lobsters and reef fish has grown in recent years in order to meet demand from the burgeoning tourist industry (Maldives State of the Environment Report 2002).

While Maldivians have traditionally based their livelihoods on marine resource extraction, the environmental impacts of local marine-based activities were generally low throughout history (Maniku 2001; Ali 2004). This has changed, however, with an almost doubling of the population between 1985 and 2000¹. As explained in the following sections, local marine environments are currently threatened by deleterious extractive activities as well as the by-products of industrial development (this is true close to the capital, Male, in particular).



Photo Credit: Atoll Ecosystem Conservation Project

History and Current Status of MPAs in the Maldives

MPAs are a very recent development in the Maldives. In the early 1990s, local resorts and dive operators were growing increasingly concerned with mounting fishing pressures on reef systems, particularly extractive activities occurring on the ‘house reefs’ adjacent to the resorts (Ali 2004). Fishermen were not only catching baitfish on such reefs, but were also fishing for reef fish and sharks around popular dive sites (Ali 2004). A 1993 IUCN study recommended that the government consider establishing a network of protected areas, and shortly thereafter, The Environment Ministry, The Marine Research Centre (Ministry of Fisheries, Agriculture and Marine Resources) and the Ministry of Tourism began identifying sites around the country to be considered for protected area status. Fifteen sites were soon thereafter declared as the country’s first MPAs in 1995.

In 1996, a workshop on Integrated Reef Resources Management (IRRM) was convened to discuss marine protected area management. Participants identified MPA targets, which were subsequently incorporated in the National Environmental Action Plan (NEAP). During the workshop, the Ministry of Tourism emphasized the interdependence between environmental quality and tourists’ experience, and expressed that protected areas are important tools to maintain the quality of dive sites. During this meeting, the Ministry of Atolls Administration discussed the social and economic concerns of the people of Vaavu, Meemu, Faafu and Dhaalu Atolls, many of whom were facing declining fisheries at the time. As a result of the

¹ The population grew from 183,595 in 1985 to 305,027 in 2008 (World Bank Development Indicators)

workshop, it became clear that a national protected area system must take into account multiple objectives of varied user groups, and be put in place using a holistic integrated government approach. The Maldives then declared an additional ten ‘dive sites’ in 1999. It is notable that these initial 25 sites were established at the behest of the tourism industry for the explicit purpose of dive tourism (IUCN 2008; Sinan 2010).

In 2002, various marine stakeholders converged to discuss the key needs of the Maldives’ protected areas (MoHAHE 2002). Key priorities to emerge included:

- Identifying/mapping bio-regions in order to establish adequate protected areas,
- Identifying and understanding the behaviour of “keystone species” in order to determine their habitat needs;
- Building the capacity of institutions and protected area managers, and
- Increasing community participation in management

(MoHAHE 2002)

In relation to transboundary stocks, the country also outlined a need to identify migratory species and identify/manage nursery areas and habitats that support significant numbers of migratory species (MoHAHE 2002). Since 2006, an additional 10 marine protected areas have been declared in the Maldives.

Despite the existence of so many protected areas, there is still no comprehensive management structure in place (Ali 2004; Maldives CBD Funding Application 2008). Furthermore, the existing protected area classification system does not correspond to IUCN categories¹, and, given the lack of comprehensive management, user conflicts are expected to increase in the future (Ali 2004).

As a party to the CBD, the Maldives received funding in 2008 to further these, as well as other objectives in protected area management. Most notably, the country is currently receiving funding for two significant activities:

- Scoping the requirements and establishing the mechanisms for developing a protected areas system plan;
- Developing the capacity to manage existing protected areas, based on appropriate forms of governance that generate positive incentives to support their long-term integrity and maintenance.

(Maldives CBD Funding Application 2008)

These activities are now fully underway (for a complete status update on individual activities, see Maldives CBD Project Status website link in reference section). There are currently plans underway to expand the existing protected area network, with plans to designate more marine and coastal protected areas in particular (Maldives CBD Funding Application 2008). The Environmental Protection Agency also recently compiled a Sensitive Area List, which should aid practitioners in allocating resources, as well as provide better protection for key sites (from adverse effects of development projects) by prescribing EIA review processes. More recently, the Government announced a Request for Proposals for the Management of MPAs in Male’ Atoll in December 2010.

¹ According to the CBD PAP (2008), however, efforts are underway to assign IUCN categories to the existing MPAs in the Maldives.

MPA Legislation in the Maldives

At the moment, the Maldives does not have any specific legislation that deals explicitly with protected areas (Maldives CBD Funding Application 2008). Instead, policies and action plans concerning protected areas appear in national policy documents, such as (1) The National Biodiversity Strategy and Action Plan, which stresses the need to work towards a representative system of MPAs, (2) The National Environment Action Plan (NEAP), (3) The National Development Plans, and (4) The Strategic Action Plan (National Framework for Development 2009-2013), which stresses the balance between conservation and the sustainable use in order to ensure maximum ecosystem benefits.

Given the lack of specific legislation, the country's existing protected areas were established under the 1993 Environment Protection and Preservation Act (Law No. 4/93). This law also provides the regulatory/institutional framework for environmental protection throughout the country (Maldives CBD Funding Application 2008). Nevertheless, the current lack of legislation (specific to protected areas) does pose certain challenges: While certain activities are prohibited in MPAs¹, it is difficult to completely deter illegal activities without stronger, national-level legislation (Maldives CBD Project Status).

In terms of international legislation and conventions, the Maldives is party to the Convention on Biological Diversity. It has also ratified the Convention concerning the Protection of the World Cultural and Natural Heritage (though there are no national sites currently included in the World Heritage List). Unlike some of the other countries in the BOBLME, the Maldives is not part of the Ramsar Convention, and it contains no UNESCO biosphere reserves (though there are plans to designate the Baa Atoll as a UNESCO Biosphere Reserve).

Other relevant legislation includes species-specific catch bans (such as regulations on catching/harvesting various types of sharks, sea birds, and sea turtles), as well as the Fisheries Law (Law No. 5/87), which among other things, empowers the Ministry to protect any living marine species from by banning fishing for a particular species, declare its habitat as a protected area, or declaring a moratorium on its exploitation. However, difficulty in enforcing these regulations has led to continued exploitation.

MPA Governance in the Maldives

Table 8. Government Agencies and Organizations Involved in Marine Management in the Maldives
Ministry of Housing and Environment, Environmental Protection Agency
Ministry of Tourism, Arts and Culture
Ministry of Home Affairs

¹ Prohibited activities include anchoring, fishing (with the exception of traditional bait-fishing), coral/sand mining, dumping waste, and destructive activities such as the use of dynamite, guns, explosives, and chemicals to catch fish (<http://www.maldivestourism.net/maldives/protected/> and <http://www.bluepeacemaldives.org/protectedmarinesites.htm>)

There are twenty-six geographic atolls in the Maldives, which are grouped into twenty administrative units (commonly referred to as ‘atolls’). The Ministry of Housing and Environment is responsible for environmental management activities throughout the country more generally, and the Environmental Protection Agency is the lead agency responsible for managing protected areas.

Ministry of Fisheries and Agriculture Marine Research Centre
Department of National Planning
Tourist Resorts and dive operators
NGOs (i.e. BluePeace Maldives) and international organizations/donors
Environmental Consultancy Firms

Source: Maldives CBD Funding Application 2008

The country approved a constitutional reform in 2008, and the government is currently undergoing a period of decentralization. Under decentralization, locally elected councils are responsible for fostering the social and economic well-being and development of the community as well as ensuring safe, healthy and ecologically-diverse environments.

It should be noted that given the young age of MPAs in the Maldives, the management of marine protected areas is “currently in its infancy” (Maldives CBD Funding Application 2008). At the moment, current priorities include:

- Developing management plans for individual marine protected areas (the majority of MPAs do not have management plans at the moment);
- Identifying/implementing new types of management regimes for protected areas
- Developing a national level plan for protected areas;
- Introducing more integrated marine policies that bridge the current sectoral approach
- Strengthening the extent to which scientific information informs fisheries decisions (Ali 2004; Maldives CBD Funding Application 2008).

Threats and Challenges

The constantly expanding, marine-dependent population of the Maldives is using the country’s natural resource base with increasing intensity. A shortage of alternative income opportunities outside of Male’ and tourist resorts is only adding to this pressure, and the dependency of the majority of the population on a diminishing resource base makes conservation a significant challenge (MoHAHE 2002). In addition to the overexploitation of marine species, the coastal environment is also threatened by harbor developments and land reclamation projects. The most pressing issue to the marine environment is the management of waste from all islands and the different users. Like elsewhere in the BOBLME, the government of the Maldives is seeking to strike a balance between biodiversity conservation and the sustainable utilization of natural resources (MoHAHE 2002).

Like other countries in the BOBLME, the Maldives must prioritize the provision of basic services over environmental conservation. As a result, there are pervasive funding shortages for natural resource management (MoHAHE 2002). This lack of funding permeates all areas of protected area management, and is a common thread that runs throughout the issues described below. Though funding has increased in recent years, it is still insufficient to ensure the effective management of existing protected areas, let alone begin working to establish a network of representative protected areas (Maldives CBD Funding Application 2008).

Availability of Data

Insufficient information about the marine environment is cited as a barrier to effective decision-making (Maldives CBD Funding Application 2008; Manik 2001). The country does not have a centralized environmental information system in place, and the results of studies are often found within unpublished reports and documents housed in different government agencies (Manik 2001). While the government is currently working to build such a dissemination system, it is unclear how much progress has been made on this front. It is notable, however, that the government does house an impressive online database containing a wide array of information on the country's protected areas¹ (size, year of establishment, maps, habitat types etc).

At a more fundamental level, there is insufficient baseline information about the marine environment, particularly as one moves away from Male' Atoll (Manik 2001). Existing monitoring efforts typically focus upon a single species or area, rather than seeking to elicit information about an entire ecosystem (Atoll Ecosystem Report 2008). Existing knowledge stems primarily from studies of commercially important species and activities, or foreign scientific expeditions/the work of individual researchers (MoHAHE 2002). This leads to a lack of the information needed to manage at the appropriate spatial and temporal scales, and decisions that are not based upon strong scientific evidence (Atoll Ecosystem Report 2008).

Governance Challenges

Much of the policy-making and management concerning marine biodiversity in the Maldives occurs in a fragmented, sectoral manner (Atoll Ecosystem Workshop Report 2008). The different line ministries involved with management in the marine environment – notably fisheries, tourism and home affairs – have overlapping mandates, yet different decision-making systems (Maldives CBD Funding Application 2008). It is particularly challenging to assign specific responsibilities to one Ministry or another, especially in the case of smaller, isolated atolls (Maldives CBD Funding Application 2008). Efforts are underway to address this problem, in part by creating a countrywide, comprehensive MPA management plan and structure (Maldives CBD Funding Application 2008). Furthermore, there are some examples of successful collaboration across sectors, such as the institution of the countrywide ban on coral mining (Atoll Ecosystem Report 2008).

Such fragmentation is also apparent in the legislative realm, however, and “the legal framework is weak and lacks the cohesiveness to bring together the disparate sectoral environmental policies and regulations under one ‘roof’” (ADB Maldives Environmental Assessment 2002). Regulations concerning the marine environment are formulated and overseen by different government agencies in “an uncoordinated manner”, thereby making on-the-ground management a profound challenge (Maldives CBD Funding Application 2008). Furthermore, many of the existing regulations take the form of localized, species-specific bans, which have proven ineffective, as many threatened marine species are highly migratory (Atoll Ecosystem Report 2008).

Enforcement

While MPA regulations exist on paper, the capacity to identify and deal with violations is generally weak throughout the country (MoHAHE 2002). Discussions with the dive operators reveal that the conflict between fishers and divers is especially prevalent in the North Ari Atoll. According to local experts, much of the damage that occurs within marine protected areas is from diver use and anchoring of vessels. Enforcement remains a challenge, as many

¹ Available online at: http://epa.gov.mv/index.php?option=com_contentandview=categoryandid=5andItemid=25

MPAs have no institutional presence whatsoever, while others have insufficient personnel who are not always provided with the trainings needed for effective management (Maldives CBD Funding Application 2008).

Transboundary Threats

The marine environment of the Maldives faces several transboundary threats. Chief among these are climate change and its associated environmental impacts like increased coral mortality. The coral bleaching that occurred during 1998 caused significant damage to the country's reefs, reducing coral cover from 30 – 35% to an average of 2.1% (Maldives CBD Funding Application 2008). As global mean temperatures rise, the possibility of future bleaching events is a profound concern, particularly as the Maldives's two largest sectors (in terms of GDP) rely upon a healthy marine resource base.

Other transboundary threats include contaminants from the industrial/agricultural discharges of countries to the north (heavy metals and pesticides are of particular concern), and the threat of oil spills from increased tanker traffic (Ali 2004). How these threats may impact – and be mitigated by – protected areas is a topic in need of further study.

Socio-economic Considerations

Given the wide geographic distribution of the population, there is recognition of the need for community participation in natural resource management (MoHAHE 2002). Historically, the Maldives did indeed practice a type of self-governance at the atoll level ('*vaaru*'), and rights to resources were well established (MoHAHE 2002). Though certain communities still rely upon this system to an extent, by and large this traditional system has disintegrated.

There are currently concerns that local communities and marine resource users are not adequately engaged in decision-making processes (Maldives CBD Funding Application 2008). Decisions are instead typically made at level of the central government, without much community consultation (Atoll Ecosystem Report 2008). When community consultations do occur, they are frequently too short to sufficiently gather the depth and breadth of information that might allow for meaningful incorporation of feedback (Maldives CBD Funding Application 2008). This has translated into low levels of community participation in management, and a lack of public awareness about the potential socio-economic benefits of protected areas (Maldives CBD Funding Application 2008). Local communities reap few, if any benefits from MPAs directly (Maldives CBD Funding Application 2008; Waheed Personal Communication 2011). Nevertheless, there are instances of communities benefitting indirectly from MPAs: Resorts will sometimes 'adopt' neighbouring islands by investing in infrastructure and basic services, as well as bringing tourists to purchase locally-made handicrafts, providing employment and purchasing catch from local fishermen (IUCN 2008; Waheed Personal Communication 2011). Cognizant of the need to address the prevailing lack of community benefits from MPAs, the government is currently working to broaden the type of stakeholder groups involved in marine management, and is presently undertaking a countrywide effort involving government agencies, local business, dive schools, hotels, local communities and NGOs (Maldives CBD Funding Application 2008).



Photo Credit: Atoll Ecosystem Conservation Project

Effectiveness of MPAs

Of the thirty-five MPAs in place, many remain ‘paper parks’, and there is “little information on the sites, no clear procedures for boundary definition, no rangers, no management plans or management activities, inadequate communication with local communities, and no monitoring or condition assessment” (Atoll Ecosystem Workshop Report 2008).

With a persistent lack of funding and capacity for protected area implementation, little priority is typically afforded to monitoring the effectiveness of protected area interventions (Maldives: State of the Environment 2002). As such, it is very difficult to gauge the effectiveness of MPAs in attaining their goals, and according to one NGO, the country “has very little resources to dispense in monitoring the life in protected areas” (BluePeace Maldives website). Given the poor domestic funding climate, much of the research-based projects of the Marine Research Center and the Environmental Protection Agency have been implemented using foreign donor funds.

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III. CASE STUDIES

Improving Governmental Collaboration in Sri Lanka, India and the Maldives

Developing effective coordination between government agencies is critical for MPA success. MPAs are affected by terrestrial activities including agricultural runoff, industrial development, aquaculture, port construction and tourism infrastructure. Coral reefs are particularly sensitive to sedimentation, which increases with deforestation. Given the interconnectedness between marine and terrestrial ecosystems, it is not surprising that MPAs are commonly subject to regulation by multiple government agencies. MPA success can rest upon upward and downward institutional accountability, in a system in which local government institutions are accountable to national agencies, and as a result, are supported with national agency funds and technical assistance. Ensuring such collaboration and effective coordination between agencies remains a challenge across much of the region, however, and overlapping mandates and limited jurisdictional control can hamper MPA success.

Sri Lanka has a relatively long history of integrated coastal management (ICM). ICM can be defined as “the process by which multiple use of the coastal and marine environment is managed so that a wide range of needs are catered for, including both biodiversity protection and sustainable use, allowing all stakeholders...to participate and benefit” (IUCN et al. 2008, page 43). ICM further allows for the integration of terrestrial and marine management by empowering managers to protect ‘downstream’ resources from ‘upstream’ activities. Sri Lanka’s Coastal Conservation Department created a Coastal Zone Management Plan (CZMP), which provides the basis for managing the coastal zone in an “integrated, holistic manner” (IUCN et al. 2008). The CZMP mandates that marine management activities must be designed for specific geographic contexts, and consider the connections between human activities and changes in coastal ecosystems (IUCN et al. 2008). The CZMP further deals with issues that indirectly impact MPAs, such as coastal erosion and unregulated coastal development – both of which are particularly pronounced issues in Sri Lanka. The CZMP also allows for the establishment of Special Area Management (SAM) sites, which enable the implementation of ICM at a site level. The Hikkaduwa National Marine Park was declared a SAM site in 1992, and as a result, has experienced improved collaboration between local organizations and government agencies. It now has a management plan to address major social, environmental and economic challenges in the area. Finally, by bringing the governance of coastal activities under a single umbrella, the CZMP helps facilitate communication between different government agencies. For instance, in order for the Fisheries Ministry to declare fisheries reserves, they must first consult with the Ministry of Environment. Lastly, the CZMP provides a basis to improve community collaboration with government agencies, and in the case of Hikkaduwa National Park and the Bar Reef Marine Sanctuary, the Community Coordination Committees play a pivotal role in management by acting as facilitators between all stakeholders.

In India, the government is working to improve interagency collaboration by including representatives from the Department of Fisheries on the State Board of Wildlife (the focal MPA agency). This has led to inter-agency collaboration in the Gulf of Mannar National Park, where an advisory group (Gulf of Mannar Biosphere Reserve Trust) not only provides technical advice and recommendations, but is also responsible for implementation of

activities (FAO 2010). Despite notable progress towards improved collaboration, a 2008 mid-term evaluation found that more work is needed, however. Specifically, there is a “lack of engagement of crucial line departments and programs...[and] the Biosphere Reserve management program must integrate the responsibilities of Fisheries, Coastal Management, Pollution Control Board, Forestry and Wildlife...into a single Authority” which would hold ultimate responsibility for Reserve management (Hunnam and Sankaran 2008, page 5).

Elsewhere in the Bay of Bengal, non-government actors play a pivotal role in helping facilitate communication between government agencies. In the case of the Maldives, the private sector works in close collaboration with the government to declare and manage protected areas.

Balancing the Needs of Local Communities with MPAs in Thailand and India

Balancing conservation priorities with the needs of local and indigenous communities living in or near protected areas remains a challenge throughout the Bay of Bengal region. This is especially true in relatively poor areas, where local communities rely upon the extraction of natural resources for their livelihoods. Orissa, which is home to the Gahirmatha Marine Wildlife Sanctuary, is one of the poorest states in India. Communities in the area report that stringent fishing restrictions and other conservation measures have resulted in declining incomes, increased indebtedness, and even mass emigration (ICSF 2008). In the Mahatma Gandhi Marine National Park in the Andaman Islands, perceived inequities between local fishermen and tour boat operators led to much strife. Prior to the establishment of the park, local fishermen brought tourists to the area, which helped generate interest in the local marine environment. Indeed, it was thanks to such exposure that the MPA was eventually declared. Following the official designation of the park, however, local fishermen were barred from using their boats within park boundaries, as only larger boats from businesses based in Port Blair were permitted to lead tourist excursions (IUCN et al. 2008). Though this particular issue was eventually resolved, it limited income opportunities for fishermen, and is an example of the potential consequences of failing to take the needs of local communities into account.

The availability and usage of socioeconomic data in planning processes can help assure that negative socioeconomic impacts of MPAs are avoided or mitigated. In Thailand, efforts are underway to improve the collection of such data at the Surin Islands Marine National Park and the Turutao National Marine Park, which are used/inhabited by the Moken people and the Urak Lawoi people respectively. Specifically, a local program (the ‘Andaman Pilot Project’) is working to use socioeconomic data to improve understanding of traditional livelihoods and identify economic opportunities that “promote cultural survival as well as natural conservation” (UNESCO 2007). The project is specifically analyzing indicators such as employment security, land use security, and financial capacity such as income, debt and savings. Though this project only operates within the Surin and Turutao MPAs, there are opportunities to scale up the methodology and framework elsewhere in Thailand, and indeed, across the Bay of Bengal.

It is also possible to minimize negative socioeconomic impacts of MPAs by fully engaging local communities in MPA design and management processes. According to data gathered in India, it is rare for communities to outright oppose conservation efforts – instead, more

common is frustration over their lack of inclusion in governance and decision processes, which in turn, can result in inadequate prioritization of their needs and resistance to MPAs (IUCN et al. 2008). In the Gulf of Mannar Biosphere Reserve in India, the government worked with local communities to increase such participation. Specifically, mechanisms were put in place to facilitate local participation, and local ‘Eco-Development Committees’ developed geographically specific plans for their areas that addressed conservation and development issues (IUCN et al. 2008). These committees received support from both the government and local NGOs, and over the period of four years, 54 such plans were developed and implemented in the area. This type of collaborative management can not only minimize adverse socioeconomic impacts, but also improve community support for MPAs (thereby increasing rule compliance and reducing the resources needed for enforcement). The development of effective co-management of MPAs will require leadership, laws, and experience to ensure that MPA goals are balanced.

Balancing between Tourism and Conservation: Examples from Malaysia and the Maldives

Balancing between tourism and conservation can be a profound challenge. On the one hand, the purpose of many MPAs is to create an opportunity for people to enjoy marine environments, often through recreational activities like diving, snorkelling, boating and site seeing. If unregulated, such activities can undermine conservation efforts by causing the degradation of marine resources. Negative impacts can include the generation of waste, the removal of natural “souvenirs”, trampling of reefs, and the indirect impacts associated with the development of tourism infrastructure. In the case of Thailand, there are growing concerns over the impacts associated with the coastal tourism industry. Though the industry brings in considerable sums of revenue, over 100,000 visitors enter some marine parks each year, and there are growing concerns over sewage, pollution and the problems associated with poorly planned coastal infrastructure.

In Malaysia, researchers initiated a tourism carrying capacity study of the Pulau Payar Marine Park, a popular tourism destination off the western coast of Peninsular Malaysia known for its coral reefs. The Park, which encompasses four different islands, experienced exponential growth in visitation rates between 1988 and 2000, during which point the number of annual visitors grew from 1,373 to 102,855. Based upon the results of the study and concerns that the surmounting pressures of rapid tourism growth might degrade the Park, the researchers concluded, “further expansion of tourism development and related activities is not acceptable...due to the potential negative impacts on the marine environment” (Lim 1998). In addition to advocating for the curtailment of visitation numbers, planners also responded by developing a detailed management strategy to minimize negative impacts on the coral reefs, as well as develop recommendations for zoning, increasing public awareness, and other management actions. Visitation rates have since reached a plateau over the past decade, although recommended visitation rates vary from park to park (DMPM 2010). By assessing and understanding MPA carrying capacity, it is possible to take action that not only maximizes visitor enjoyment, but also helps maintain the health of MPA ecosystems and their very ability to provide ecosystem services.

The Maldives is taking a different approach to balancing tourism and conservation. The government has carefully regulated the growth of the industry by limiting the number of resorts allowed, and requiring detailed environmental impact assessments for all planned

developments (IUCN et al. 2008). The government further requires that tourism facilities adhere to stringent operational guidelines regarding waste disposal, recreational activities and possible cultural impacts (IUCN et al. 2008). Local resorts and dive operators spearhead much of the marine conservation work, by helping (and sometimes leading) the coral reef management, promoting responsible tourism activities, and even instigating the process to declare MPAs.

MPAs for Fisheries Management: Examples from Bangladesh and Sri Lanka

Planning which balances fisheries and conservation goals is essential for MPA success, especially in contexts with active fisheries. Planners must consider biodiversity and fisheries assessments when devising recommendations. Both scientific knowledge and local resource user knowledge should be utilized, and collaborative planning processes must balance the interests of diverse constituencies.

One of the goals of MPAs is to enhance fisheries productivity by enabling a ‘spill-over’ effect. ‘Spillover’ is said to occur when fish biomass increases outside of MPA boundaries as a result of protecting critical habitat and allowing marine life to mature to a reproductive age. In order to increase the likelihood of spillover, planners typically recommend protecting spawning aggregation sites, nursery grounds, and key migratory corridors. Unfortunately, there is very little evidence of spillover effects across the Bay of Bengal region, in part due to a lack of baseline data and consistent monitoring. No-take areas, especially large ones, are also difficult to implement. For instance, the designation of 306km² of the Bar Reef Marine Sanctuary as a no-take zone has been difficult to implement due to a lack of political will, funding, staff and equipment. The local fishing communities have also expressed concerns about impacts on their livelihoods, as the demarcation meant lost access to important fishing grounds.

Recent efforts in Bangladesh demonstrate the potential benefits of establishing protected areas for the explicit purpose of improving fisheries management. The government recently declared ‘hilsa closed-seasons’ in some of the country’s most productive fishing grounds. This species, which requires freshwater habitat to reproduce, is the most commercially valuable fish species in Bangladesh, and plays a critical role in food security. Fishing is banned in these sanctuaries during certain periods of the year, and there are zone restrictions on both artisanal and commercial operators. According to studies, hilsa catch has increased by approximately 100,000 tonnes following the declaration of four ‘hilsa closed-seasons’ and a ban on the collection of hilsa fry in freshwater zones (Patkar 2004).

Elsewhere in the region, there are ‘fishery-managed areas’ in Sri Lanka and ‘fisheries spawning grounds’ in Thailand, but very little information about these sites is available online. Similarly, there are protected areas that explicitly seek to protect fish breeding grounds, such as the Sundarbans Biosphere Reserve in India/Bangladesh, and the Meinmahla Kyun Wildlife Sanctuary in Myanmar.

Another example comes from Sri Lanka, where the Government established a security zone in the Colombo harbor in the late 1990s (banning all fishing and diving, among other things). This led to the formation of a *de-facto* no take zone, which was patrolled by the Sri Lankan navy. According to available studies, this has led to increased lobster abundance on reefs in

the harbor (IUCN et al. 2008). Though this particular initiative did not explicitly identify resource management as a motivating goal, it demonstrated that “no-take zones are beneficial for the lobster fishery and with time may receive support from fishermen” (IUCN et al. 2008, page 192).

Towards Sustainable MPA Financing in Malaysia and India

A lack of funding plagues many MPAs across the Bay of Bengal region. Since insufficient funding can translate into lowered capacity for management and hamper MPA success, it is essential to plan and implement sustainable finance policies at the outset. Identifying sustainable funding sources and developing a strategic and equitable allocation plan are essential elements, as is the transparent allocation of funds.

In order to respond to MPA funding needs, the Malaysian government created the Marine Park Trust Fund in 1987. The Fund helped cover considerable MPA start-up costs, and was initially used to help build Marine Park Centres and procure vehicles and equipment. Though initially established with a government grant of approximately \$13 million, the Fund is currently replenished through the collection of conservation fees from tourists, charitable donations, and the sale/rental of souvenirs, books, equipment and facilities at the Marine Park Centres throughout the country (Ramli 1999; Hiew 1999). It is notable that the Fund was established for the explicit purpose of “achieving a status of self-financing in the near future” (Ramli 1999, page 83). In other words, although the Fund required an initially large government investment, it helped pave the way towards sustainable MPA financing and now draws revenue through the collection of fees and sales.

In India, implementing partners of the Gulf of Mannar National Park and Biosphere Reserve have been working to establish a long-term, autonomous funding mechanism that would enable the Reserve to eventually end its reliance on government funding for core operations. According to a 2008 mid-term program evaluation, the success of this effort has been mixed, however (Hunnam and Sankaran 2008). GEF provided \$1 million to capitalize the trust fund, with the expectation that the Government would match this investment with \$4 million. It was estimated that the \$5 million would yield around \$350,00 each year, which could be used for management activities (Hunnam and Sankaran 2008). As of the evaluation, however, the \$4 million had not been deposited, and almost all of the \$1 million had been used to set up and provide capital for 252 community micro-funds. Though this latter action deviates from the initial project plan, the evaluation discusses the successes of the community micro-funds, which “provide an appropriate, innovative and reasonably strong foundation for establishing the Long Term Funding Mechanism” (Hunnam and Sankaran 2008).

In a second example from Malaysia, researchers employed economic valuation tools in the late 1990s to explore potentially untapped revenue streams. Though the government initially imposed a flat ‘conservation fee’ of US \$1.32 on domestic and foreign visitors in 1999 (Yeo 2004), some believed that it might be possible to capture greater MPA revenue. As such, researchers began conducting ‘willingness to pay’ surveys around the Pulau Payar Marine Park, and found that 91% of visitors expressed a willingness to pay if the “money collected were to be used exclusively to improve the management of the park” (Yeo 2004). Foreign visitors expressed a willingness to pay approximately double the amount expressed by domestic tourists, indicating the need for multi-tier pricing in order to capitalize on potential revenue. Such multi-tier pricing systems can not only boost park revenue, but are oftentimes more equitable, as “international tourists receive substantial enjoyment from the [park]

experience, yet pay low (if any) entrance fees [or] taxes to support the park, and do not bear the opportunity costs of not using the resource for agriculture, logging or other activities” (Lindberg 1991; Yeo 2004). Though the Department of Marine Parks in Malaysia has yet to introduce such a system, this particular study can serve as a model for MPAs elsewhere in the region to help identify new funding streams. Indeed, a similar study in the Mu Ko Similan Marine National Park in Thailand found that divers are willing to pay an average of \$27.55 in scuba diving fees, which is considerably higher than the \$4.80 fee in place, and could result in economic gains of \$932,520 per year (Asafu-Adjaye and Tapsuwan 2008).

IV. INTEGRATED STATUS ASSESSMENT AND RECOMMENDATIONS

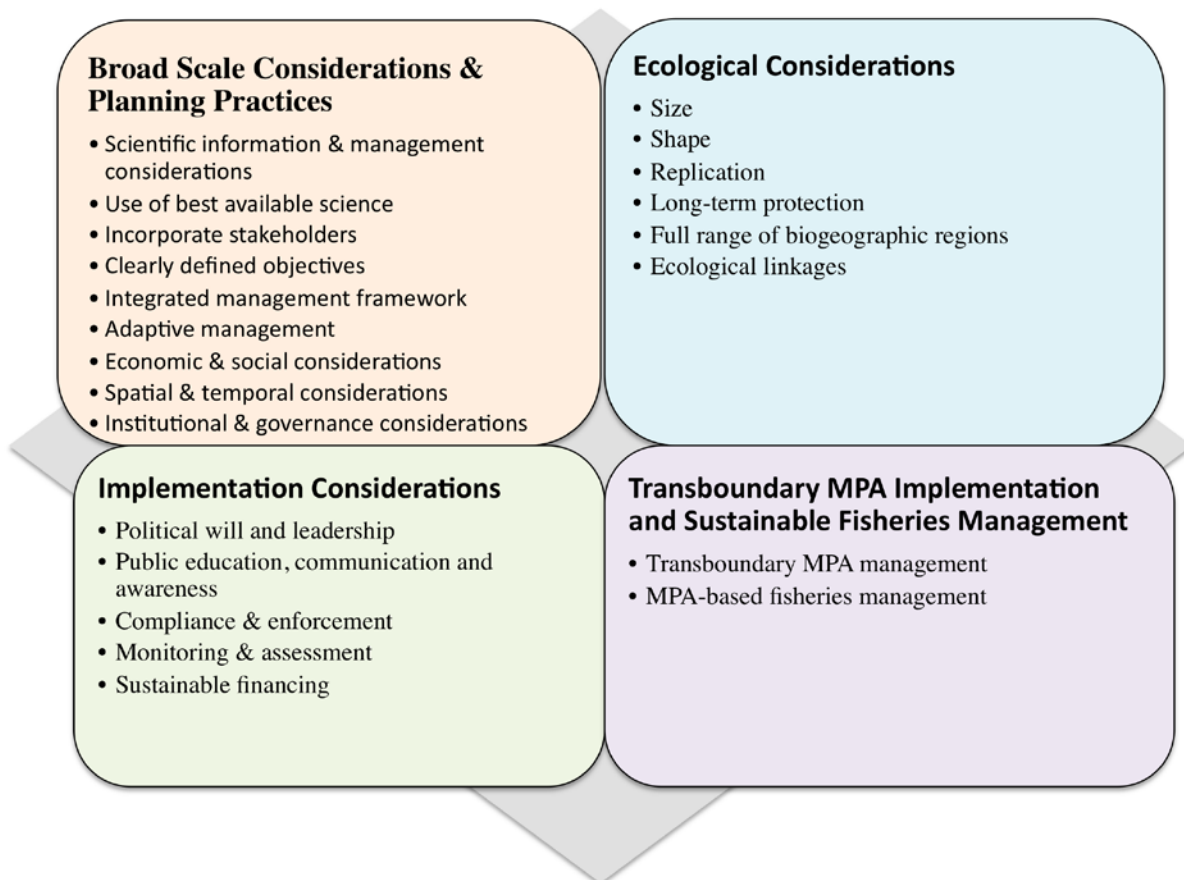
Drawing from the country profiles, the following section contains a general evaluation of the status of MPAs in the BOBLME and offers recommendations. Evaluative comments and recommendations are organized using the IUCN WCPA (2008) guidebook framework for MPA network self-assessment. Following the IUCN WCPA framework, the recommendations are made within three main categories:

- A. Broad Scale Considerations and Planning Practices
- B. Ecological Considerations
- C. Implementation Considerations

Within each broad category, more specific topics are addressed. The assessment categories that appear below and the italicized explanation are quoted directly from the IUCN guidebook. Although some redundancies exist with the IUCN WCPA framework, this recommendation section retains all topics (even if redundant) in order to facilitate adoption of the IUCN WCPA evaluation metrics to BOBLME. Additional recommendations are also made in the final section:

- D. Transboundary MPA Implementation and Sustainable Fisheries Management

The following figure provides a visual overview of the way in which recommendations are organized.



Recommendations are based primarily on published best MPA management practices, prior regional and national MPA assessments, and comments made by BOBLME country representatives at the January 2011 validation workshop held in Penang, Malaysia.

Overall, key recommendations include:

- Field assessments of MPAs status at a national and possibly site level are needed to validate this report and identify priority steps with broad input from various institutions and sectors. Participants in the January 2011 validation workshop expressed interest in these assessments, which should involve regional and external expertise.
- A series of MPA pilot sites should be identified in which MPA best practices (as represented by these recommendations and other sources) should be field-tested.
- A BOBLME MPA learning network should be established to facilitate communication among MPA practitioners and help the diffusion of innovative practices.
- A working group for MPA assessment and implementation should be established within the BOBLME program. This working will consist of leaders primarily from government, non-government and resource sector organizations. The working group's mandate should be to improve, at the LME scale, the understanding of MPA status, strategic planning, and facilitation of MPA monitoring. Participants at the 2011 MPA Workshop in Penang nominated institutions from each country that would form the core members of the working group (Appendix C).
- The BOBLME program should organize a high profile meeting of government officials to launch MPA system within the BOBLME and to foster political will.
- The BOBLME program should develop a regional MPA capacity development program. Coordination with the US Coral Triangle Support Program and the US National Oceanographic and Atmospheric Administration MPA training program would help ensure quality and consistency within the region and with the similar Coral Triangle Initiative. Other opportunities, such as coordination with Indonesia's MPA training program, may exist and require feasibility assessment.

A. Broad Scale Considerations and Planning Practices

1. Scientific and Information Management Considerations.

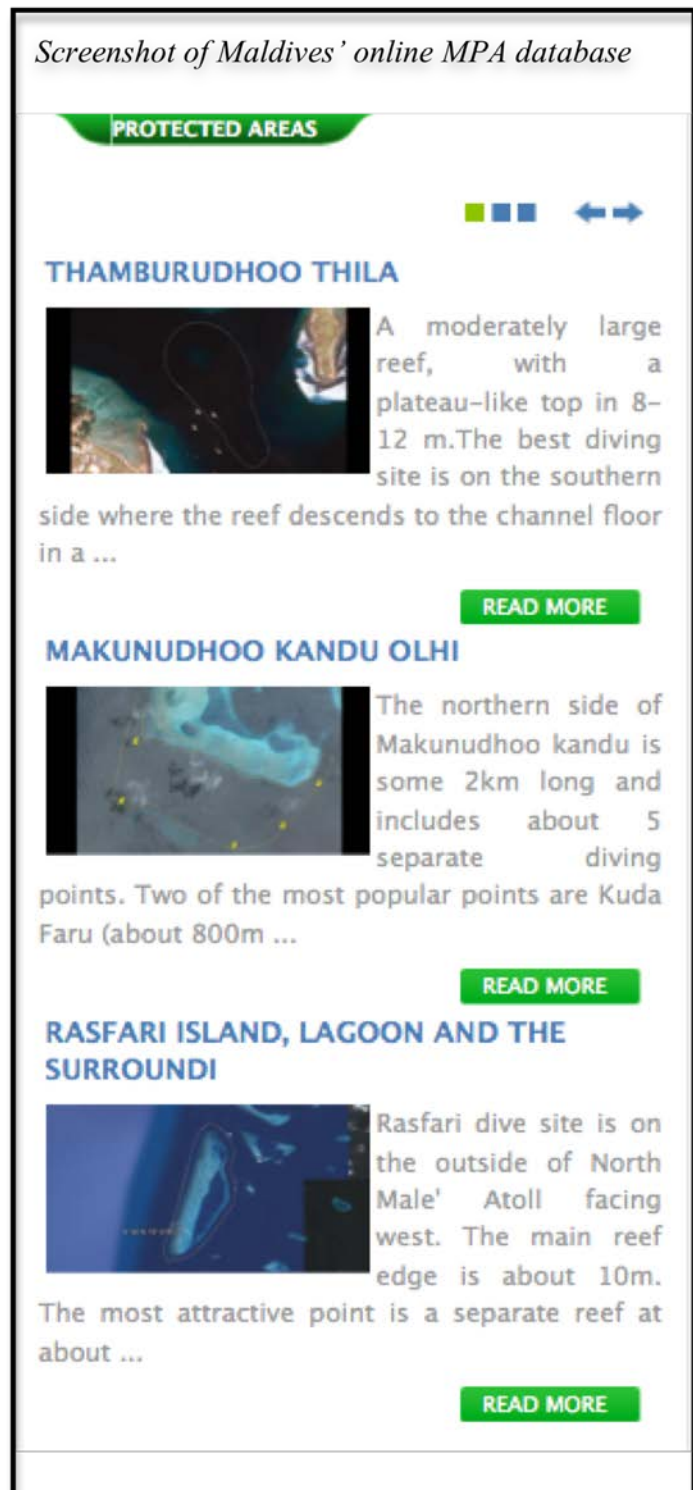
“Has all available scientific information and local knowledge of stakeholders been used to support planning and management, and is it is regularly updated and used for effective decision-making?”

The collection of relevant social and ecological information within the BoBLME region is episodic and context dependent (Perera and de Vos 2009; UPMSI et al. 2002). Though there are global databases that contain basic information about MPAs in the BOBLME region, much of this information is outdated and inconsistent with country-level reports. A regional BOBLME scientific data management system is lacking. In many BOBLME countries, only basic MPA information is gathered and widely disseminated. Some countries, such as the

Maldives and Malaysia, store MPA information in online databases in an easily accessible format (e.g., http://epa.gov.mv/index.php?option=com_content&view=category&id=5&Itemid=25). Some of the most up-to-date information and reports are in local languages, which can pose barriers when attempting to draw region-wide conclusions. Relevant local knowledge exists, but is not systematically gathered or utilized in MPA planning.

Some countries, such as Malaysia and Thailand, have the capacity and have invested in the collection of relevant habitat and biological information. Elsewhere in the region, funding shortages limit the systematic collection of MPA data. In Sri Lanka, though private entities and research institutions collect monitoring data, such studies are typically site-specific, thereby limiting the reach and comparability of data at national and regional levels (Perera and de Vos 2007). In Indonesia, though extensive information is collected in the eastern part of the country, relatively little data is available about MPAs within the BOBLME area. The systematic collection of relevant social and MPA management effectiveness data is uncommon across the region.

Social and ecological information generally are not integrated as part of MPA planning or implementation, either because of missing information, or, because of challenges in translating scientific data into policy recommendations. In the Maldives and Myanmar, for instance, MPA decision-making processes are hampered by insufficient information about the marine environment (Maldives CBD Funding Application 2008; Manik 2001; UP MSI et al 2002). There is an unmet need for individuals trained to develop and, most importantly, analyze multi-disciplinary data sets and translate them into policy-relevant recommendations and educational materials. Regional and international research bodies such as WorldFish Centre and foreign academic institutions depend on periodic grants and local funding sources are limited.



Recommendations:

Ongoing investment in regional scientific capacity is essential to improving marine resource management, especially as large scale, diffuse, and high impact processes (e.g., climate change, food insecurity, poverty) seriously degrade marine resources. The development of fully integrated scientific knowledge systems is unrealistic in the timeframe of the BOBLME. Frequently, MPA policies and other positive recommendations are hampered by the expectation of scientific certainty. Considering the importance of knowledge-based decision making and institutional limitations, the BOBLME program should develop and adopt a context-appropriate and incremental science strategy that considers scientific capacity, need, and priorities. The use of sophisticated decision support tools for MPA planning, such as computer based MARXAN, are not likely to be context appropriate given the size and diversity within the BOBLME.

Given the current gaps in basic knowledge of MPA status as well as the lack of current published information, the **BOBLME should invest initially in in-country status and needs assessments**. These assessments should draw from distinct information sources, and should include a significant field component. This field-based assessment should build from this report and focus on documenting MPA management effectiveness—including the degree of rule compliance and enforcement, opportunities for co-management, and field staff needs. The degree of resource protection (e.g., extent of enforced no-take area, protection of habitat and marine resource nursery areas) in each (or at least priority) MPA should be documented. A multidisciplinary, international assessment team will be required, which would work closely with in-country MPA government agencies and MPA implementation partners. Once these assessments are completed, a basic trend and gap analysis can be conducted. Basic criteria (e.g., habitat coverage, protection of important fishery life cycle stages, opportunities for economic development through tourism, etc) can be used to prioritize new MPA declarations. It should be kept in mind, however, that improving management of existing MPAs should be the priority. Declaring new MPAs when existing ones are poorly implemented is counterproductive.

WorldFish Centre (WFC) should play a central role in data management and dissemination for the MPA component of the BOBLME. WFC is active in related regional databases (e.g. Reefbase) and management exercises (e.g., the Coral Reef Initiative). Countries should develop websites with basic descriptive information regarding MPAs similar to the Maldives' website. The WFC or the BOBLME program website could link these country-specific websites.

Standard protocols for monitoring the state of marine resources and habitats over time should be followed (Pomeroy et al. 2004). Careful attention should be paid to using monitoring protocols and units so that outputs are comparable to other regional efforts (e.g., CTI, ICRI, etc.). To develop methods and buy-in, the BOBLME program should host a side meeting/workshop of scientists and MPA experts at one of the international marine sciences conferences in 2011 or 2012. This workshop should produce a realistic and comparable framework for MPA monitoring.

2. Use of Best Available Science and Precautionary Design

“Is the MPA system configured to take into consideration all or most of the scientific and socioeconomic information and traditional knowledge within the area, while uncertainty and lack of information has not delayed decision-making?”

The collection and diffusion of relevant information is inconsistent within or beyond national boundaries. While some overview regional assessments exist (IUCN et al. 2008; Schuttenberg and Bizot 2002; UP-MSI et al. 2002), information about the status of marine environment, coastal communities, and MPA management effectiveness is lacking and not readily available to policy makers. Some countries, such as the Maldives, have basic MPA data available online:

http://epa.gov.mv/index.php?option=com_content&view=category&id=5&Itemid=25

The precautionary principle is not a central planning tenet in the BOBLME (or in any region of the world). MPAs have been established under uncertainty, which is increasing due to climate change impacts.

Recommendations:

The BOBLME should create two websites, with complementary but distinct purposes.

In parallel with the CTI, the BOBLME program should create an Internet repository of MPA-relevant data, literature and produce a map-based atlas of marine resource and coastal areas. This internet-based database should, at a minimum, include basic and relevant data on human communities, resource use patterns, habitat extent and condition, and resource management/MPA management effectiveness. In order to increase usage and applicability, it will be important to engage marine policy makers, government officials, and NGO leaders in the definition, production of, and launching of this product.

Linked to the data, the BOBLME program should create a second user-friendly website (e.g., www.oneocean.org) that presents scientific, policy and popular information in manner that is useful to policy makers and the public. Some materials should be available in the principal national languages.

The BOBLME should host a workshop of policy makers and resource user organization leaders to initiate a process to collect and engage relevant local knowledge in MPA policy making. **The feasibility and utility of a learning network (e.g., Locally Managed Marine Area (LMMA) network (<http://www.LMMAnetwork.org>) among resource users and community leaders, which fosters local knowledge collection and co-management, should be explored.** The LMMA network has fostered the proliferation of community-based MPAs throughout the Indo-Pacific region. Using face-to-face and internet-based communication modes, members share MPA management experiences and monitoring information.

3. Incorporate Stakeholders

“Has a wide range of stakeholders (including local and regional stakeholders) been directly involved in planning the system and assisting the managers by being involved in virtually all of the planning and management decisions for the system?”

Most MPA planning has been government-implemented with limited stakeholder incorporation. This is starting to change, however, with the formation of MPA committees and advisory boards in several BOBLME countries. Though such groups have wider stakeholder representation, their effectiveness remains questionable, as they are not necessarily empowered with funding and true management authority. NGOs and other private institutions are becoming increasingly involved in places like the Maldives and Myanmar,

though this is typically on an *ad hoc* basis. Legal mandates for stakeholder engagement vary in the region, but generally do not require extensive consultation or co-management with stakeholders (Perrera and de Vos 2007). In only limited cases, are MPA constituency groups (e.g., India) formed and involved in MPA co-management. Peer-to-peer learning networks are not well developed.

Recommendations:

Drawing from site assessments (described above), the BOBLME program should conduct a Strength/Weakness/Opportunities/Threats (SWOT) assessment of co-management opportunities in the BOBLME region. Special attention should be paid to the legal and socio-cultural conditions that foster or inhibit co-management. Co-management may not be feasible in some contexts, or may require planning and implementation timelines that span decades. As a first step, the BOBLME program should initiate a general policy of identifying and engaging resource user representatives in technical and planning meetings and organizations. Resource users should be represented on any multi-sectoral BOBLME program management board established.

The feasibility of a learning network among resource users and community leaders, which fosters local knowledge collection and co-management, should be explored. The procedures utilized by the LMPA network (<http://www.IMPAnetwork.org/>) should inform the creation of a BOBLME learning network.

As took place in the Philippines in the 1980s and 1990s, the BOBLME program should document the process and outcome of successful co-management MPA or marine resource management that exist in the region. These findings should be disseminated through scientific and popular media. The development of case studies may serve to inspire other efforts and legal decentralization (as it did in the Philippines).

The use of context-appropriate conflict resolution methods should be introduced in BOBLME pilot sites, especially in contexts in which MPAs are surrounded by people dependent on marine resources who might be displaced by a MPA.

4. Clearly Defined Objectives

“Is there a range of clear, achievable and measurable objectives (including ecological, social and economic objectives) defined for the MPA system and derived from the legislation?”

Global targets for MPAs have been articulated at an international level, but implementation in South Asia is lagging (Regional Resource Coordination and Mobilisation Workshop report 2006). International and national investment in MPAs is not commensurate with international MPA target expectations. Objectives for individual MPAs are national MPA systems are developed inconsistently and informally. Indonesia has a national plan for MPAs and the process used to develop this plan could be emulated elsewhere.

Most individual MPAs or MPA systems do not have management plans. Social and economic objectives for MPAs are especially poorly developed regionally.

Recommendations:

The BOBLME program should host a series of MPA-relevant capacity development workshops that parallel the Coral Reef Initiative (CTI, www.cti-secretariat.net/) efforts

sponsored by the United States Coral Triangle Support Program (USCTSP, www.uscti.org/). A MPA working group should be created within the BOBLME program. Workshops and planning events should draw together a consistent group of scientific, governmental and NGO policy and organized resource user institutions to define MPA system goals, objectives, and evaluative metrics. These will be informed by the results of the in-country MPA assessments, which should also identify gaps at the country-level (e.g. do individual MPAs have management plans in place that clearly identify site-specific goals and objectives?). Guidebooks for MPA and MPA network planners (e.g., FAO in press; IUCN-WCPA 2008; Pomeroy et al. 2004) should guide this process. Given the breadth of contexts, capacities and interests within the BOBLME, MPA systems should be developed on regional and national levels. General objectives should be developed for a BOBLME-wide MPA system complemented with country-specific MPA system objectives. Special attention should be paid to multi-level MPA governance mechanisms, transboundary collaborative opportunities, and means to facilitate co-management and decentralized decision-making.

5. Integrated Management Framework

“Does the MPA system fit within a clear integrated and holistic framework, including both planning and management at differing scales (ranging from national planning frameworks, through to regional/local planning and site planning)?”

Integrated coastal management is established in some countries (e.g., Sri Lanka), but faces numerous challenges including institutional overlaps and funding and personnel limitations (Perera and de Vos 2009). Emerging ecosystem-based frameworks (e.g., ecosystem approach to fisheries or ecosystem-based management) are not formally implemented, but some elements (e.g., habitat protection) are present in countries like India and Bangladesh which both protect critical mangrove habitat in order to improve local fisheries (the Sundarbans). Plans or mechanisms to manage MPAs and MPA systems at multiple governance levels (local to international) are not developed (Rajagopalan 2008). Nested institutional design principles suggests that local level MPA management should be supported with resources and technical support from higher (provincial, national, and international) institutional levels. Local and national management goals should be mutually reinforcing.

Recommendations:

Since integrated management regimes are generally weak in the region and complex to establish in such large and complex context, the BOBLME should begin with a feasibility assessment and capacity development activities. Sri Lanka, as the country with the most advanced experience in ICM, may serve as a leader within the BOBLME for this effort. Capacity development workshops should raise awareness of integrated frameworks and strive to develop attainable initial commitments toward ICM or ecosystem-based frameworks.

In parallel with the CTI, the BOBLME should develop a marine ecosystem-based management working group. This working group, consisting of a standing group of scientists, policy makers, and resource group representatives, should begin their efforts with a feasibility assessment that emphasizes context-appropriate and incremental steps toward EBM (Christie et al. 2007).

The BOBLME program should collaborate with other ICM and integrated marine resource management programs within the region. Such programs might include:

- The SAMPAN (Strengthening Andaman Marine Protected Area Networks) Program in Thailand
- The SACEP “Institutional Strengthening and Capacity Development for Long-Term Management and Conservation of MCPAs” Program
- Protected Area programs under the ASEAN Centre for Biodiversity
- The Atoll Ecosystem Conservation Project in the Maldives

6. Adaptive Management

“Is the MPA system readily able to incorporate changes such as new information from field experience or as a result of changing external circumstances?”

Adaptive management is rarely planned for or practiced in the region. National MPA plans or management regulations are rarely updated, although Indonesia has a national plan for MPAs, which has been updated. Policy responses to climate change, sea temperature elevation, sea level rise, or acidification do not appear to be incorporated in MPA management plans.

Incorporating management effectiveness data from current MPAs into planning for new MPAs is uncommon. In Sri Lanka, for instance, MPAs are delineated and managed without sufficient regard for biological and socioeconomic impacts, and new MPAs are declared even if older, previously-established MPAs have yet to achieve their objectives (Perrera and de Vos 2007).

Recommendations:

Adaptive management, with inputs from monitoring and evaluation efforts, should be implemented initially in BOBLME program pilot sites. Management plans for regional and national BOB MPA systems and MPA pilot sites should be periodically updated with inputs from monitoring programs. The evolution of adaptive planning processes should be well documented to encourage international interest and planning transparency.

As learning networks are created within the BOBLME, they should be engaged in periodically reviewing BOB MPA system plans with their comments used to update plans.

BOBLME MPA management plans should be coordinated with regional initiatives for adaptation to climate change. An initial scoping of programs and studies that document climate change adaptation strategies should be conducted with findings used to inform MPA planning efforts.

7. Economic and Social Considerations

“Does the design and implementation of the MPA system consider the economic and socio-cultural setting, as well as the real benefits and costs of the system (including both tangible and intangible benefits and costs)?”

Poverty and food security concerns are frequently an overarching concern that influence MPA implementation and which commonly override biodiversity conservation objectives. Systematic cost-benefit assessments are rare, but some MPAs are developed to improve fishery yields (e.g., Bangladesh hilsa fishery MPAs). Reduced access to fishing grounds and limited livelihood possibilities remain a concern to impoverished communities in some countries (e.g. India), especially if there are few socioeconomic benefits from the MPA. Similarly, the equitable distribution of benefits from MPAs is of concern in many of the

BOBLME countries. Mechanisms to improve equitable benefit distributions in various contexts are poorly understood, especially given the lack of relevant socioeconomic data for communities living adjacent to MPAs.

Recommendations:

Any MPA system in the BOBLME should be planned with careful attention to social impacts. Social impact analysis methods (World Bank 2010) should be conducted as standard MPA planning practice, and introduced in existing MPA sites that have no history of collecting socioeconomic data.

The development of alternative and sustainable livelihoods which complement MPA goals, benefit local resource users and foster commitment (e.g., ecotourism, fishery processing, etc.) should be developed with BOBLME support. Field assessments of MPA status should consider including an MPA-associated livelihoods component to assess current activities, constraints and interests.

8. Spatial and Temporal Considerations

“Does the MPA system design include a wide range of spatial and temporal considerations, such as ecological processes, connectivity and external influences, and do managers continue to consider these factors as part of ongoing implementation?”

MPAs are generally individually planned without consideration of ecological processes, connectivity, and external influences at either the individual or network level. MPA systems have been developed (e.g., in Thailand and Malaysia) to protect particular habitats (e.g., coral reefs) and threatened species (e.g., marine turtles in Myanmar). Some MPAs close and open to fishing in accordance to fish life history (e.g., Bangladesh hilsa fishery MPAs).

Recommendations:

MPA and MPA planning guidelines (FAO in press; IUCN WCPA 2008; Pomeroy et al. 2004) recommendations for planning for spatial and temporal ecological considerations should be included as standard MPA planning practice. **The feasibility of a map-based assessment of MPA coverage by ecosystem type should be conducted, as feasible.** Habitat maps may not be extensive enough in many contexts to conduct this assessment at present. In cases where data gaps exist, the BOBLME program should invest in documenting habitat coverage, as well as exploring the geographic range of key marine species (e.g., hilsa).

Thai and Malaysian experience and capacity for habitat monitoring should be capitalized on and expanded with BOBLME program resources.

9. Institutional and Governance Considerations

“Does the MPA system have well-established mechanisms for horizontal integration among all levels of government and vertical integration among agencies with different mandates, as well as involving local communities, indigenous peoples and regional groups?”

Most MPAs are designed and managed by national agencies. While some countries have a government agency devoted exclusively to managing MPAs (e.g. the Department of Marine Parks in Malaysia), the majority of BOBLME countries have numerous government agencies with MPA responsibilities. This can lead to collaboration and communication issues, ambiguity over the many laws affecting MPAs (e.g. Thailand), redundancies, and inconsistent/fragmented programming and policies. Similarly, while the different line

ministries involved in MPA management might have overlapping mandates, different decision-making processes can hinder MPA effectiveness (e.g. the Maldives). Decentralized MPA governance and community involvement are lacking in many BOBLME countries (Perrera and de Vos 2007). Sustained inter-institutional collaborative mechanisms are uncommon (Perrera and de Vos 2007; Rajagopalan 2008).

Jurisdictional overlaps between environmental and fisheries management agencies are common. Environmental and fisheries management policies are generally not integrated, although some linkages exist between agencies within countries (e.g., India). Linkages between national entities and international NGOs or externally-funded marine resource management projects are sporadic. Some regional organizations (e.g., WorldFish Centre and the International Coral Reef Initiative) have standing commitments to the region.

Effective communication within and between country agencies involved in MPA monitoring and management is essential to effective MPA planning and implementation (World Bank 2004). Currently, communication between MPA policy makers and scientists at the international level appears to be irregular. It is difficult to determine specifics, but a review of published and online resources suggests that communication about MPAs within countries is also irregular.

Recommendations:

A BOBLME MPA working group including scientific, governmental and NGO policy and organized resource user institutions should be created to represent each member country in MPA system planning. The BOBLME program should foster national-level social and institutional networks to encourage linkages between government, NGO and resource user groups to establish MPA co-management processes. As a first step, institutional integration should be tested and documented in BOBLME pilot MPA sites.

Improved communication about MPAs will require various strategies. The feasibility of multiple modes of communication should be considered. Modes of communication might include periodic updates in an atlas or newsletter format, policy making working groups at national and international levels, and websites for data and general education.

B. Ecological Considerations

1. Size

“Has specific consideration been given to the size of the individual MPAs within the system to account for adult species movement ranges and larval dispersal distances to maximize the system’s effectiveness in achieving its ecological objectives?”

MPA coverage in South Asia region is among the lowest in the world (SACEP 2010). Some countries have exceeded international targets for protection of some ecosystems (e.g., Malaysia and coral reefs) within MPAs. No MPA have large no-take areas designed to protect mobile organisms. MPA boundaries generally have not been set based on organism movement ranges and larval dispersal distances (Perrera and de Vos 2007). Networks of small MPAs have not been designed or implemented.

2. Shape

“Has specific consideration been given to the shape of the individual MPAs within the system to account for edge effects and the enforceability of regularly shaped boundaries with clear delineation?”

The consistent use of ecologically-based criteria for MPA shape and boundaries was not identified through this study. Some MPA systems do systematically protect vulnerable nearshore areas and use consistent boundaries. Malaysia MPAs typically encompass the coastal waters within 2 nautical miles of selected offshore islands (DMPM 2010). Boundary delineation with buoys or signage is inconsistent in the region. MPA rule enforcement is a major challenge in all countries except Malaysia.

3. Replication

“Does the MPA system include spatially separated replicates of no-take areas within the ecoregions to spread risk?”

Multiple MPAs commonly protect the same ecosystems (e.g., coral reefs, mangroves) within country and region. Some ecosystems and habitat types (e.g., offshore/high seas, seagrass, soft bottom habitat, etc.) are underrepresented within the MPA system. Some countries (e.g., Malaysia) have a high degree of replication for coral reef areas, while others have very low coverage for any marine ecosystem.

Recommendations (for size, shape and replication categories):

MPA and MPA planning guidelines (FAO in press, IUCN-WCPA 2008; Pomeroy et al. 2004) recommendations for planning for spatial and temporal ecological considerations should be included as standard MPA planning practice.

Thai and Malaysian experience and capacity for habitat monitoring should be capitalized on and expanded with BOBLME program resources.

As with the CTI MPA planning track, a series of workshops should be held in the region that involve regional and international experts and raise awareness of ecological design principles.

Regional and international research institutions should be commissioned to conduct necessary scientific studies to redesign and inform future MPAs. The initial emphasis should be on developing a consistent description of MPA and ecosystem distribution that can be mapped.

4. Long-Term Protection

“Does the MPA system have an efficient combination of legislative instruments (statutes, laws, regulations) and/or administrative instruments (policies) at various levels (local/state/national) that collectively provide long-term protection for the MPA system and ensure its viability?”

Legislative instruments for MPA establishment, as defined by this report (including spatially explicit fisheries closures), are in place in all countries, however terminology and levels of protection are not standardized in the region. Redundant or unclear institutional jurisdictions are common (UPMSI et al. 2002). Policies and management plans to implement MPAs are unequally developed in the region. Most legislative instruments and policies are implemented

at national governance levels, with little consideration of decentralized governance or co-management of MPAs. The role of NGOs is unclear and country-specific.

Having adequate MPA management personnel is also a basic requirement for long-term protection of MPAs. At present, staffing of most MPAs is inadequate.

Recommendations:

Legal instruments should be thoroughly reviewed with recommendations to reduce institutional jurisdictional overlaps. Opportunity and feasibility assessments for legal and institutional reform should be explored for decentralized MPA management.

Decentralized management of marine resources may be most appropriate in contexts with low enforcement capacity and high reliance on marine resources.

A workshop for the BOB MPA working group and international experts should review the status of MPA policies and legislation in the region and explore the possible benefits of terminology and implementation standardization within the BOBLME.

Investment in human and institutional capacity is essential for long term MPA sustainability (Christie and White 2007; Christie et al. 2009). **Personnel needs for the BOBLME MPA system are unknown and should be documented and advocated for by the BOBLME program with national governments and international agencies. The BOBLME program should invest in the development of a series of technical workshops on MPA basic concepts, management strategies, and evaluations, which will upgrade the skills of MPA practitioners and policy makers. The South Asia Cooperative Environment Programme (SACEP, based in Colombo), the ASEAN Centre for Biodiversity (ACB), and the US government NOAA are logical partner in the development of these workshops. Additional opportunities for human capacity development should be explored in partnership with the US Coral Triangle Support Program.**

5. Full Range of Biodiversity in Biogeographic Region

“Does the MPA system fully represent the region by capturing the full range of biodiversity, ensure representation across depth ranges and biogeography, and ensure ecosystem integrity?”

All MPAs within the region are in near-shore coastal areas. Knowledge of the distribution of high biodiversity areas is not complete, but important areas are surely not protected by MPAs, and there are no MPAs in the BOBLME high seas. Coral reefs and mangroves are most commonly protected by MPAs. Information on MPA coverage per depth or biological system has not been systematically gathered.

6. Ecological Linkages

“Is the MPA system purposefully designed to maximize all ecological processes (spatial and/or temporal) known to occur in the area?”

Generally, spatial or temporal ecological processes are not central to MPA planning in the region. Some MPAs are in place to protect fish nursery areas (e.g., estuaries in India, Myanmar and Bangladesh) and marine turtle nesting sites (in India and Myanmar).

Recommendations: (Same as above recommendations)

MPA and MPA planning guidelines (FAO in press; IUCN WCPA 2008; Pomeroy et al. 2004) recommendations for planning for spatial and temporal ecological considerations should be included as standard MPA planning practice.

Thai and Malaysian experience and capacity for habitat monitoring should be capitalized on and expanded with BOBLME program resources.

As with the CTI MPA planning track, a series of workshops should be held in the region that involve regional and international experts and raise awareness of ecological design principles.

Regional and international research institutions should be commissioned to conduct necessary scientific studies to redesign and inform future MPAs. The initial emphasis should be on developing a consistent description of MPA and ecosystem distribution that can be mapped.

C. Implementation Considerations

1. Political Will and Leadership

“Is there strong and effective leadership, commitment and support at both the political and agency levels, with a shared vision and capacity to achieve success?”

Interest to improve MPA management exists among a small group of donors, policy makers, scientists and government agencies. The marine-based tourism industry has an interest in effective MPAs in some contexts (e.g., Maldives), however tourism impacts are notable in some contexts (e.g., Thailand and Malaysia). Resistance to and conflict over MPAs has been significant in India, Sri Lanka and Thailand, which has reduced political will to enforce MPA rules or establish new MPAs (Perrera and de Vos 2007; Rajagopalan 2008). High dependency on marine resources, ubiquitous poverty, non-participatory planning, and unclear rules for benefit sharing tend to reduce interest in MPAs throughout the region (Rajagopalan 2008; UPMSI et al. 2002). Some resource users are likely to support MPA implementation as long as benefits are clear. Leadership development and social support networks for MPA advocates and scientists are generally weak, although some international donor programs have invested intermittently in MPA capacity development (Rajagopalan 2008).

Recommendations:

A high-level launching event announcing the development of a BOBLME MPA system should be hosted by the BOBLME involving national leaders (similar to the CTI World Oceans meeting in Manado in 2009: <http://www.cti-secretariat.net/events/upcoming-events/47-cti-summit-on-woc>). This meeting will provide a clear message to agency personnel that MPAs are a high priority.

In addition to the BOBLME MPA working group creation, learning networks should be established at multiple levels of governance, with priority for engagement of MPA field staff and associate agency personnel.

The results of social ecological impact assessments and ongoing monitoring for MPAs should be widely disseminated among policy and impacted resource user groups. The results of benefit-distribution studies should underpin MPA management plans to improve the likelihood of equitable distribution.

The development of MPA leaders and champions for local, national, and international contexts is essential to long-term MPA sustainability. A system of capacity development and recognition of excellence (e.g., awards) will encourage individuals to become champions (as it has in the Philippines). The use of cross visits between MPA sites is a means, complementary to a learning network, to improve leadership and the diffusion of innovative ideas. MPA pilot areas can serve as locations to host learning exercises and cross visits.

2. Public Education, Communication and Awareness

“Is the community (including the local communities and the wider public) aware of the MPA system and the management agency(ies), through effective education outreach and communication plans?”

The degree of awareness of the importance of marine systems, conditions of marine resources, and role of MPAs is unknown, but likely varies significantly among social groups and contexts. Though public awareness campaigns frequently target local resource-users, it is also important to promote awareness among tourists – particularly in MPAs with visitation rates that threaten marine biodiversity.

Instances of, and information about MPA-specific education, outreach, and participatory planning is limited, though some sporadic information exists (UPMSI et al. 2002). In Thailand, for instance, extensive public outreach campaigns and media coverage of marine issues have improved public support for MPAs (Yeemin 2005). In Bangladesh, a pilot program sought to halt illegal collection of marine curios to sell to tourists (IUCN 2008). Elsewhere, regional organizations (e.g., ICRI and the South Asia Cooperative Environment Program) have developed marine resource awareness campaigns. The use of multi-media, social media, or systematic participatory education for marine issues is rare. Social stratification, limited Internet access, and limited financial resources for education and communication are serious barriers.

Recommendations:

A multi-media and context-appropriate plan for public education, communication, and awareness should be immediately developed. This plan should foster two-way communication between MPA proponents, policy makers, and impacted resource users. The intent of the strategy should not be to convince MPA sceptics; rather it should be to use their opinions as essential inputs into MPA planning.

The websites suggested prior, which would host scientific and popular information should be developed.

A series of best-practices guidebooks (similar to those produced by the Coastal Resources Management Program in the Philippines, available www.oneocean.org) should be produced to provide guidance on best practices for MPA management in the region.

Visitation lodging quarters should be available for all MPA pilot sites to help facilitate MPA awareness and cross learning (World Bank 2004).

3. Compliance and Enforcement

“Are feasible enforcement programs and methods to build compliance considered in the MPA system?”

Self-compliance or community-level compliance with MPA rules are generally low due to limited stakeholder planning involvement or benefit distribution. Enforcement of MPA rules is generally weak, with the exception of Malaysia. Little information is available about community-declared and enforced MPAs, and it is possible that they do not exist. The private sector is involved in MPA enforcement in some contexts, such as in the Maldives where dive operators acting as enforcers likely helped curb illegal fishing and sand/coral exploitation in MPAs (IUCN 2008).

Recommendations:

Given differences in policies and capacities, the BOBLME program should initiate capacity development programs for enforcement and compliance. The capacity development program should emphasize the tailoring of compliance and enforcement policies and implementation to context.

The role of the private sector and resource user communities for enforcement and compliance should be expanded (as allowed by local law).

The feasibility of decentralized enforcement systems, as practiced in the Philippines, should be explored. If legally feasible, capacity development (on evidence collection, etc) should be emphasized.

MPA enforcement will require adequate supplies and materials, including boats, radios, and radar. The BOB LME program should coordinate with the appropriate government policy officials and pursue opportunities for ensuring adequate equipment.

Ultimately, self-compliance with MPA rules should be the goal. Increased stakeholder participation in design and management can reduce need for enforcement by building support for MPA.

4. Monitoring and Assessment

“Does a monitoring and evaluation system exist showing progress against most, if not all, of the MPA system objectives being monitored regularly? Are the results widely disseminated and used in adaptive management?”

Systematic MPA monitoring and evaluation are uncommon. Information about coral reefs in the region is collected on a periodic basis by organizations such as CORDIO, but such information is not systematically linked to MPAs. Monitoring and evaluation is not generally linked to progress toward MPA social ecological objectives, and studies are lacking throughout the region because of limited funding and other barriers. A lack of monitoring data hinders ability to gauge MPA success, which in turn can translate into planning challenges for a system of MPAs. MPAs that are not functioning well not might receive the appropriate support, partially since the effectiveness of the MPA is unknown.

The results of current monitoring and evaluation are not widely disseminated through print/electronic media or other education systems. The studies that do exist typically focus upon a particular habitat type (e.g. coral or mangroves) and are part of a global monitoring effort (e.g. coral reef monitoring initiatives led by the Global Coral Reef Monitoring Network). Scientific meetings are occasional venues for information dissemination among policy makers and scientists, but not marine resource users.

Recommendations:

Standard guidelines for monitoring and evaluation (e.g., FAO in press; IUCN WCPA 2008; Pomeroy et al. 2004) should be incorporated in BOBLME MPA planning. The BOBLME program should foster a linkage with the USCTSP, which is developing a monitoring and evaluation program for CTI MPAs. As outlined in the IUCN guidebook for MPAs in South Asia (IUCN et al. 2008), monitoring and evaluation commonly focuses on:

- Review of management plans;
- Regular tracking of implementation through planning and reporting schedules;
- Long-term monitoring of environmental and socioeconomic parameters;
- Assessing management success;
- Evaluations and reviews of donor-funded projects.

This, and other sources (Pomeroy et al. 2004), provide useful and easy-to-use forms to guide monitoring and evaluation efforts.

5. Sustainable financing

“Does the MPA system have a well-developed and periodically audited program of long-term funding (assessed, and if necessary, increased against a recognized financial index) to meet both core and emerging costs?”

Funding for marine and fisheries resource management is generally lacking, especially with increasing MPA mandates (UPMSI et al. 2002). With the exception of the Malaysian Marine Parks Trust Fund, funding is lacking and uncertain throughout much of the region. Collection of and transparent planning of user fees is uncommon.

Recommendations:

The feasibility of expanding the Malaysian Coral Reef Trust to other contexts (especially Thailand and Maldives) should be explored.

Within BOBLME pilot sites, cost-benefit and willingness-to-pay studies should be conducted to determine appropriate MPA user fees. The collection of user fees for all tourism destination MPAs should be encouraged as standard practice.

Transboundary MPA Implementation and Sustainable Fisheries Management

In addition to the above framework for MPA system implementation, the condition and opportunities for transboundary MPA implementation and sustainable fisheries management through MPAs need to be considered.

Transboundary MPA management

This review identified little evidence of multi-national collaboration for MPA management. Regional scientific meetings provide some opportunities to share MPA-relevant information. The above recommendations for multi-national learning networks and working group also represent a form of transboundary collaboration toward the development of necessary capacity.

Recommendations:

Possible site-based transboundary collaborative opportunities between India and Bangladesh may exist for the Sundarbans area and between India and Sri Lanka for the Gulf of Mannar area. The Megui Archipelago, located within Myanmar and accessed by tourism boats from Thailand, is also a priority area for potential transboundary collaboration. A site feasibility assessment is the first logical step toward site-based transboundary collaboration.

Much of the above recommendations involve multi-national (or transboundary) collaborations. **The creation of a MPA working group and learning network to improve communications, education and monitoring activities represents a first logical step toward collaborative management of international MPA sites or joint enforcement.**

MPA-Based Fisheries Management

MPAs are used for the management of some important fish stocks (e.g., hilsa). They are also used to protect important marine habitats such as coral reefs and mangroves that underpin important fisheries. This investigation did not identify examples of MPAs used to define communal marine tenure or establish communally based marine extractive reserves. Brazil has established extensive marine extractive reserves to assure limited access to coastal fishery resources (World Bank 2006). Traditional societies in the Pacific have detailed communally-defined marine tenure rights.

FAO recently developed guidelines for the use of MPAs for fisheries management (FAO in press). Amongst other topics, this guidebook provides detailed guidance on integration of MPAs with an Ecosystem Approach to Fishers (EAF) by consider ecological and social impacts of MPAs on fisheries and suggests entry points for the introduction of MPAs into the fisheries planning process.

Recommendations:

Field assessments should identify whether traditional marine tenure institutions exist which limit access or fishing gear type in the region. The BOB LME program should encourage the development of legal frameworks that recognize the rights of local fishing communities to nearshore coastal areas and fisheries. Areas with highly reliant and vulnerable coastal fishing communities (e.g., India, Bangladesh), where MPAs with no-fishing areas have generated some resistance from fishing communities, may be a logical priority.

Representatives from fishery organizations whose constituents are affected by MPAs should have a role in BOBLME MPA organizations such as the learning network and working group to ensure that opportunities and impacts of MPAs are voiced.

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METADATA SOURCES FOR MAP LAYERS

Data layer	Source	Version/Date of dataset
Coral Reefs	<p>Millennium Coral Reef Mapping Project validated maps provided by the Institute for Marine Remote Sensing, University of South Florida (IMaRS/USF) and Institut de Recherche pour le Développement (IRD, Centre de Nouméa), with support from NASA.</p> <p>Millennium Coral Reef Mapping Project unvalidated maps provided by the Institute for Marine Remote Sensing, University of South Florida (IMaRS/USF), with support from NASA.</p> <p>Unvalidated maps were further interpreted by UNEP-WCMC. Institut de Recherche pour le Développement (IRD, Centre de Nouméa) do not endorse these products.</p> <p>Other data have been compiled from multiple sources by UNEP-WCMC. Full source information is attached to individual polygons.</p>	V 1.0 March 2010
Seagrass	Seagrasses extracted from version 2.0 of the global polygon and point dataset compiled by UNEP World Conservation Monitoring Centre (UNEP-WCMC), 2005. For further information, email: spatialanalysis@unep-wcmc.org	2005
Mangrove	This global dataset shows the distribution of mangroves and was compiled by UNEP-WCMC in collaboration with the International Society for Mangrove Ecosystems (ISME). These data were published in: Spalding, M.D., Blasco, F. and Field, C.D. (Eds). 1997. "World Mangrove Atlas". The International Society for Mangrove Ecosystems, Okinawa, Japan. 178 pp	1997
BOBLME Boundary	Data from Sea Around Us Project	
Marine Protected Areas (MPA)	World Database on Protected Areas (WDPA) 2009 dataset downloaded from World Database on Marine Protected Areas website (http://www.wdpa-marine.org/#/countries/about). This dataset was reviewed by in-country experts through BOBLME Project Workshop, the data incorporated from MPA data in ReefBase database and feedback from country contacts.	

Bathymetry	The bathymetry (ocean depth) data originates from National Geophysical Data Center TerrainBase Global DTM Version 1.0. This data represent an estimate of depth for each 5-minute cell (~10km horizontal resolution).	
Country / Coastline	National Imagery and Mapping Agency (NIMA) - From the Vector Map (Vmap) Level 0, by the National Imagery and Mapping Agency (NIMA). Vector Map (VMAP) Level 0 is an updated and improved version of the Digital Chart of the World (DCM)	
Cities	A list of reef-relevant place names was compiled by ReefBase. This list includes: cities, towns, bays, straits, coral reefs, dive sites and other types of locations, and was compiled using a variety of sources.	
River	Lehner, B. and P. Döll (2004): Development and validation of a global database of lakes, reservoirs and wetlands. Journal of Hydrology 296/1-4: 1-22.	
Administrative Level	Data from ESRI ArcGIS 9.2	

Geographic Coordinate System: GCS_WGS_1984

Datum: D_WGS_1984

Angular Unit: Degree



APPENDIX A: FAO TERMS OF REFERENCE

The review will identify and evaluate the existing information on MPAs and fish refugia in the BOBLME region, focussing on (i) inventory (including maps where applicable) of existing MPAs and fish refugia in the BOBLME, (ii) objectives of the MPA/fish refugia, (iii) supporting legislation, (iii) management including executing agency, enforcement agency (including self-enforcement), and (iv) effectiveness. The report should then identify gaps in the MPA/fish refugia network, and identify areas where policies, management, monitoring and evaluation of MPAs/fish refugia can be strengthened and harmonized across BOBLME countries.

The main outcome will be a baseline on the existing MPAs/fish refugia and recommendations for future BOBLME project activities, noting that the BOBLME consists of agencies and other partners from both fisheries and the environment, and that MPA/fish refugia are one of many tools that can be used to implement EBM/EAF.

The review will be targeted at fisheries and environment managers, as well as development professionals working within the South and Southeast Asia region and be written in a style that will facilitate their understanding of the issues and recommendations.

Case studies / examples of the types of best practices should be included in the review, where these will describe approaches, actions and outcomes which particularly well illustrate successes in promoting more effective MPAs/fish refugia. [One example could be the now famous Olive Ridley turtle reserve in Orissa, India and the tension and conflict that exists between those whose livelihoods depend on fishing coastal waters and the conservation objective of the reserve]. These can also cover policy level interventions and how the benefits or negative effects involve the major stakeholders (e.g. improved compliance of MPA/fish refugia rules and regulations; devolution and sharing of management; financial support to local agents to facilitate MPA/fish refugia management; investment in management; subsidies or incentives; and market interventions).

APPENDIX B: IUCN PROTECTED AREA DEFINITIONS

The following table provides the definitions of the IUCN Protected Area Categories. Information is excerpted from Dudley 2008.

CATEGORY Ia:	Strict Nature Reserve: protected area managed mainly for science
Definition	Area of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species, available primarily for scientific research and/or environmental monitoring.
CATEGORY Ib	Wilderness Area: protected area managed mainly for wilderness protection
Definition	Large area of unmodified or slightly modified land, and/or sea, retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition.
CATEGORY II	National Park: protected area managed mainly for ecosystem protection and recreation
Definition	Natural area of land and/or sea, designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible.
CATEGORY III	Natural Monument: protected area managed mainly for conservation of specific natural features
Definition	Area containing one, or more, specific natural or natural/cultural feature which is of outstanding or unique value because of its inherent rarity, representative or aesthetic qualities or cultural significance.
CATEGORY IV	Habitat/Species Management Area: protected area managed mainly for conservation through management intervention
Definition	Area of land and/or sea subject to active intervention for management purposes so as to ensure the maintenance of habitats and/or to meet the requirements of specific species.
CATEGORY V	Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation and recreation
Definition	Area of land, with coast and sea as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area.
CATEGORY VI	Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems
Definition	Area containing predominantly unmodified natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.

APPENDIX C: PROPOSED WORKING GROUP MEMBERS

Participants at the 2011 MPA Workshop in Penang put the following candidates for the proposed working group.

Bangladesh

- Bangladesh Fisheries Research Institute
- Dept of Fisheries
- Dept of Environment

India

- Wildlife Institute of India
- CMFRI
- Center for Living Marine Resources & Ecology (CLMRE)

Indonesia

- MMAF
- Dir of Marine, Coast & Small Islands
- Ministry of Forestry

Malaysia

- Dept of Marine Parks (Ministry of National Resources & Environment)
- Dept of Fisheries
- Dept of Environment

Myanmar

- Dept of Fisheries (Min of Livestock & Fisheries)
- Planning and Stats Dept (Ministry of Forestry)
- NCEA

Sri Lanka

- Dept of Wildlife Conservation (Ministry of Aquatic Resources)
- NARA
- Dept of Fisheries

Thailand

- Dept of Marine and Coastal Resources
- Dept of National Parks
- Dept of Fisheries

Maldives

- Environmental Protection Agency
- Ministry of Fisheries

APPENDIX D: 2011 MPA WORKSHOP PARTICIPANTS

The following individuals participated in the Jan 2011 MPA Workshop in Penang, and provided key input to this report.

List Of Participants	
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BOBLME	Ms. Sucharat Tong-on Secretary Bay of Bengal Large Marine Ecosystem Project (BOBLME) C/- Andaman Sea Fisheries Research Development Center 77 Sakdidej Rd Phuket 83000 Thailand
BOBLME	Mr. Nishan Deepal Sugathadasa Technical Office Bay of Bengal Large Marine Ecosystem Project (BOBLME) C/- Andaman Sea Fisheries Research Development Center 77 Sakdidej Rd Phuket 83000 Thailand

APPENDIX E: INVENTORY OF MPAs IN THE BAY OF BENGAL LME

Sri Lanka

	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km ²)	IUCN Category	No Take Zone	Habitat Types
1	Sri Lanka	Hikkaduwa	National Park (SAM Site)		1978 (Sanctuary), 1998 (Nature Reserve), 2002 (National Park)	0.44	IV	Partial	Coral reef (warm)
2	Sri Lanka	Bar Reef Marine	Sanctuary (SAM Site)		1992	306.7	IV	None	Coral reef and sandstone reef. Sea grass habitats.
3	Sri Lanka	Pigeon Island (Paravi Doopath)	National Park		1974 (Sanctuary), 2003 (National Park)	4.71	IV	None	Coral reef. Includes large and small Pigeon Islands and surrounding coral reefs
4	Sri Lanka	Rumassala	Marine Sanctuary		2003	17.07	IV	None	Coral reef

	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km ²)	IUCN Category	No Take Zone	Habitat Types
5	Sri Lanka	Bundala (TPA)	National Park	UNESCO MAB/Ramsar Site	1969/1993	34.4	IV	None	Beach, sand dunes, coastal vegetation, coastal wetlands (subtidal rocky reef adjacent to PA). Important site for migratory shorebirds.
6	Sri Lanka	Ruhuna (Yala) (TPA)	National Park		1938	73.28	II	None	Beach, sand dunes, coastal vegetation, coastal wetlands (subtidal rocky reef adjacent to PA).
7	Sri Lanka	Wilpattu (TPA)	National Park		1938	63.38	II	None	Beaches, cliff coast, coastal vegetation (sea grass beds adjacent to PA).
8	Sri Lanka	Yala East (Kumana) (TPA)	National Park		1970	25.12	II	None	Beach, sand dunes, coastal vegetation, coastal wetlands (subtidal rocky reef adjacent to PA)
9	Sri Lanka	Chundikulam (TPA)	Sanctuary		1938	111.49	IV	None	Lagoon system

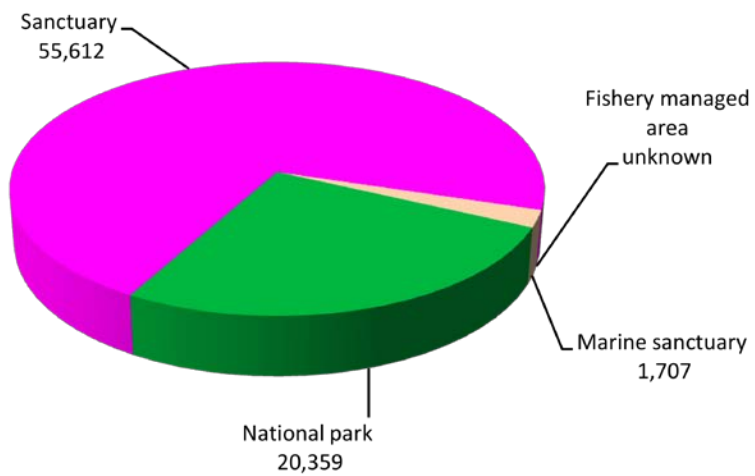
	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km2)	IUCN Category	No Take Zone	Habitat Types
10	Sri Lanka	Great Sober Island (TPA)	Sanctuary		1963	0.647	IV	None	Coral reefs adjacent to PA
11	Sri Lanka	Kalameiya Kalapuwa (TPA)	Sanctuary		1984	25.25	IV		Lagoon, mangroves. Estuary and adjacent wetland/riverine environment
12	Sri Lanka	Kokilai Lagoon (TPA)	Sanctuary		1951	29.95	IV	None	Lagoon system and wetlands
13	Sri Lanka	Paraitivu Island (TPA)	Sanctuary		1973	0.18	IV	None	Subtital reefs adjacent to PA
14	Sri Lanka	Muthurajawela	Sanctuary		1996	12.85	IV	None	Mangroves
15	Sri Lanka	Rocky Islets	Sanctuary		1940	0.012	IV	None	Coral reefs
16	Sri Lanka	Telwatte	Sanctuary		1938	14.25	IV	None	
17	Sri Lanka	Polgasduwa	Sanctuary		1988	1.9	IV	None	
18	Sri Lanka	Rakawa	Sanctuary		2006	2.26	IV	None	
19	Sri Lanka	Godawaya	Sanctuary		2006	2.26	IV	None	
20	Sri Lanka	Vankalai	Sanctuary	Ramsar Site	2008	48.38	IV	None	
21	Sri Lanka	Ussangoda	National Park		2010	2.26	IV	None	
22	Sri Lanka	Great and Little Besses FMA	Fishery Managed Area		2001	Unclear	VI	None	Rocky reefs
23	Sri Lanka	Polhena FMA	Fishery Managed Area		2001	Unclear			Coral reef
24	Sri Lanka	Negombo Lagoon	Fishery Managed Area		1998	Unclear	VI	None	
25	Sri Lanka	Batticaloa Lagoon	Fishery Managed Area		2001	Unclear	VI	None	

	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km ²)	IUCN Category	No Take Zone	Habitat Types
26	Sri Lanka	Puttalam Lagoon	Fishery Managed Area		2010	Unclear	VI	None	
27	Sri Lanka	Komari Lagoon	Fishery Managed Area		2010	Unclear	VI	None	
28	Sri Lanka	South Coast (Matara and Galle District)	Fishery Managed Area		2010	Unclear	VI	None	
29	Sri Lanka	South Coast (Hambantota)	Fishery Managed Area		2010	Unclear	VI	None	
30	Sri Lanka	Northwest Coast (Puttalam and Mannar District)	Fishery Managed Area		2010	Unclear	VI	None	

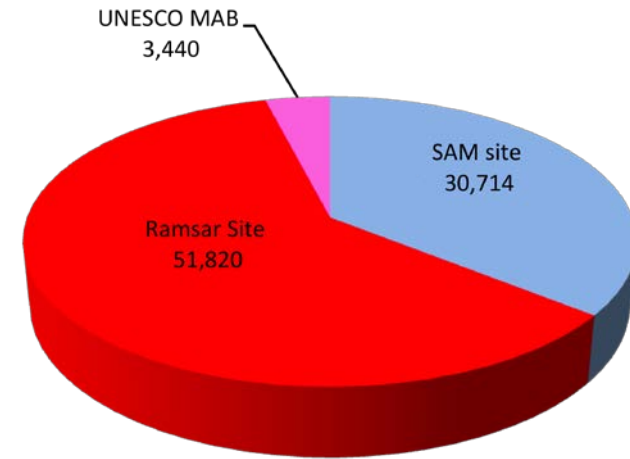
Sri Lanka Data Sources:

1. Wood, L. J. (2007). MPA Global: A database of the world's marine protected areas. Sea Around Us Project, UNEP-WCMC & WWF. www.mpaglobal.org
2. World Database on Protected Areas (WDPA) Annual Release 2009 (web download version), February 2009. The WDPA is a joint product of UNEP and IUCN, prepared by UNEP-WCMC, supported by IUCN WCPA and working with Governments, the Secretariats of MEAs and collaborating NGOs. For further information protectedareas@unep-wcmc.org
3. Leslie, J. 2003. National report of Sri Lanka on the formulation of a transboundary diagnostic analysis and strategic action plan for the Bay of Bengal Large Marine Ecosystem Programme. GEF PDF Block B Phase of FAO/BOBLME Programme. Chennai India
4. Perera, N. & Asha de Vos. 2007. Marine protected areas in Sri Lanka: A review. Environmental Management, 40 (727-738).
5. IUCN, CORDIO and ICRAN (2008). Managing Marine and Coastal Protected Areas: A Toolkit for South Asia. IUCN, Gland, Switzerland and Bangkok, Thailand; CORDIO, Kalmar, Sweden; and ICRAN, Cambridge, UK.
6. Participant feedback at BOBLME MPA Workshop, January 18-19, 2011. Penang, Malaysia.

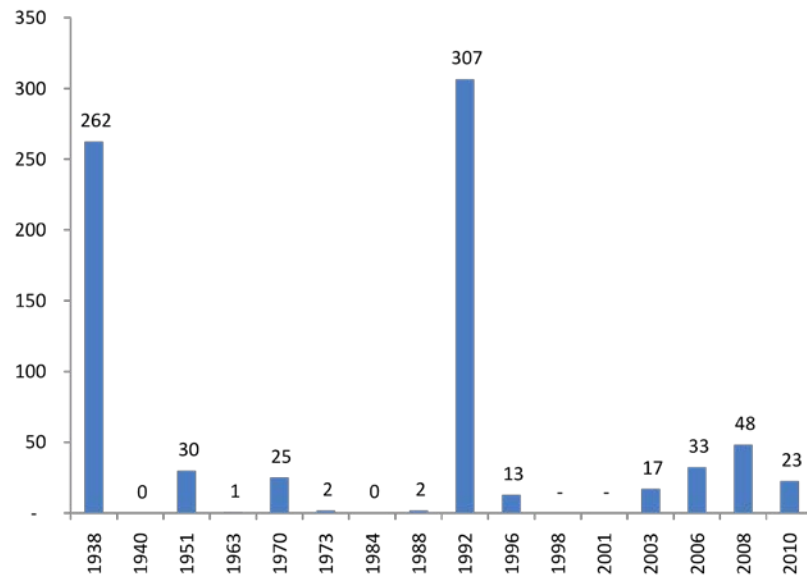
Sri Lanka Analysis



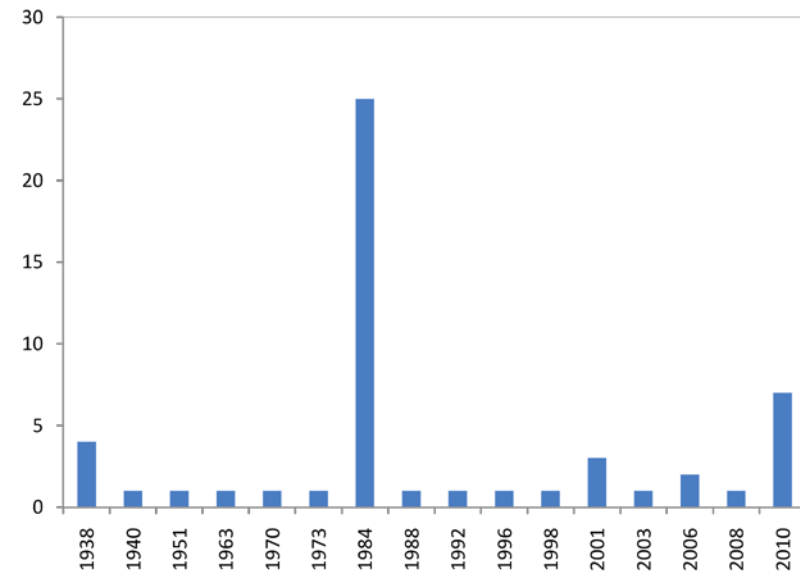
Total area of MPA (ha) by National designation



Total area of MPA (Ha) by International Status



Total area of MPA (ha) by Designated year



Number of MPAs by Designated year

Indonesia

	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km ²)	IUCN Category	No Take Zone	Habitat Types
31	Indonesia	Pulau Weh Sabang	Nature Recreation Park		1982	39	V	Unk	Mangrove, coral reef, ornamental fish, protected fish species
32	Indonesia	Pulau Pinang, Siumat and Simanaha (Pisisi)	Local/District Marine Protected Area (KKLD)		2006	500	VI		Coral reefs, mangroves, ornamental fish, protected fish species
33	Indonesia	Aceh Jaya	Local/District Marine Protected Area (KKLD)		2010	1.75	VI		Coral reefs, mangroves, ornamental fish, protected fish species
34	Indonesia	Aceh Besar	Local/District Marine Protected Area (KKLD)		2010	2	VI		
35	Indonesia	Sabang	Local/District Marine Protected Area (KKLD)		2010	32	VI		
36	Indonesia	Pulau Pieh	Marine Recreation Park		2000	399	V		Pieh Island, adjacent reefs. Coral reefs, ornamental fish, nyph swamp area, wetland

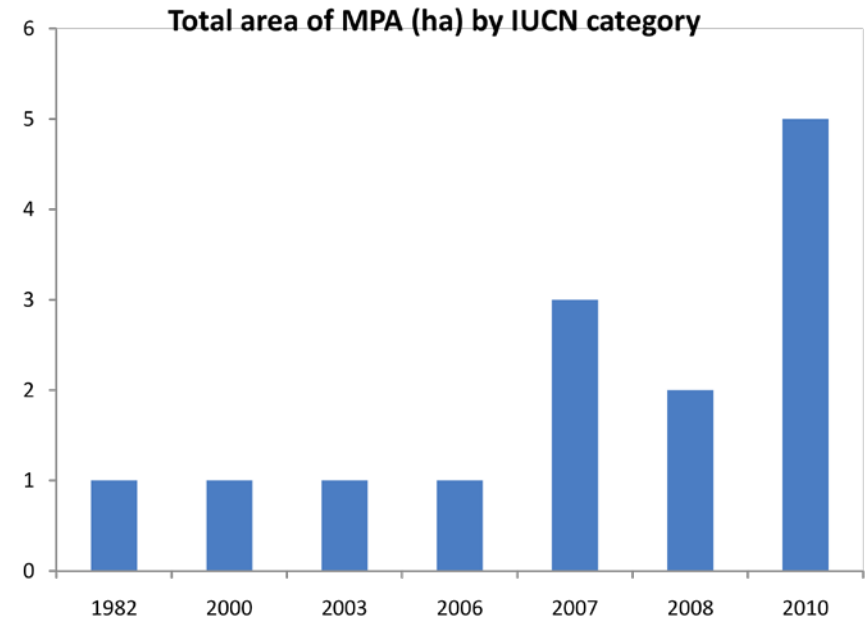
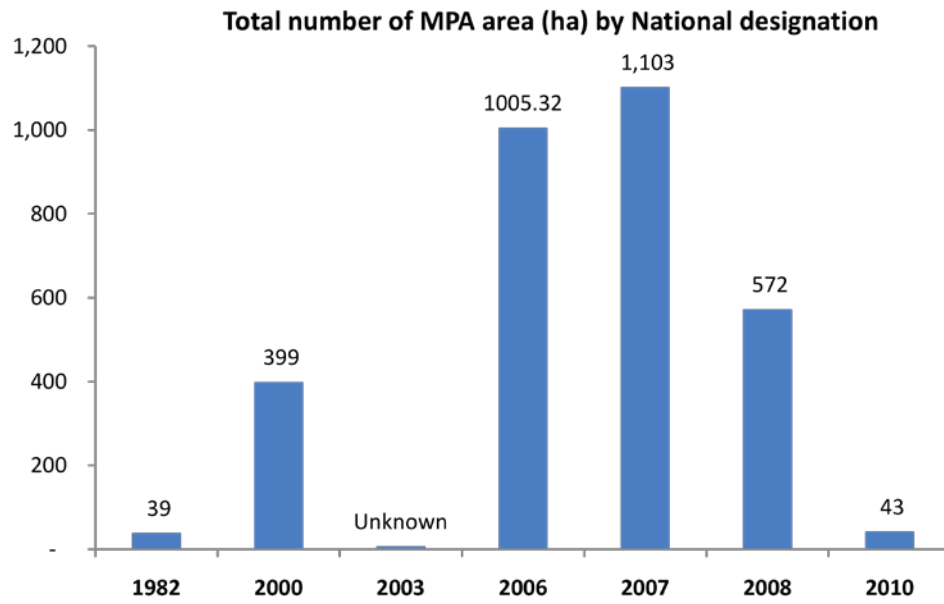
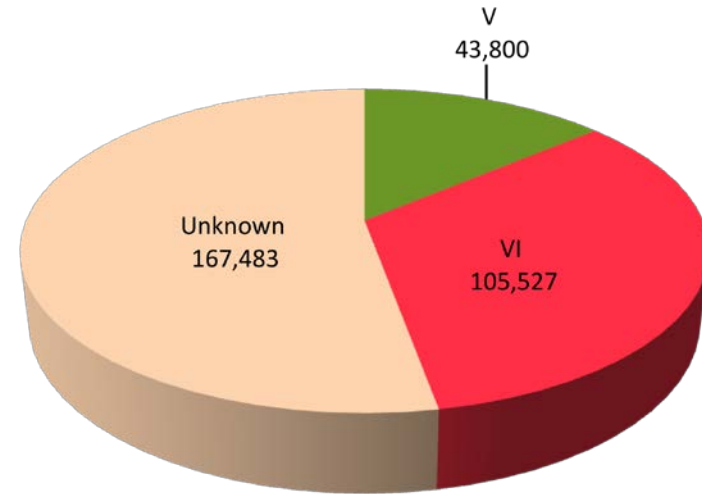
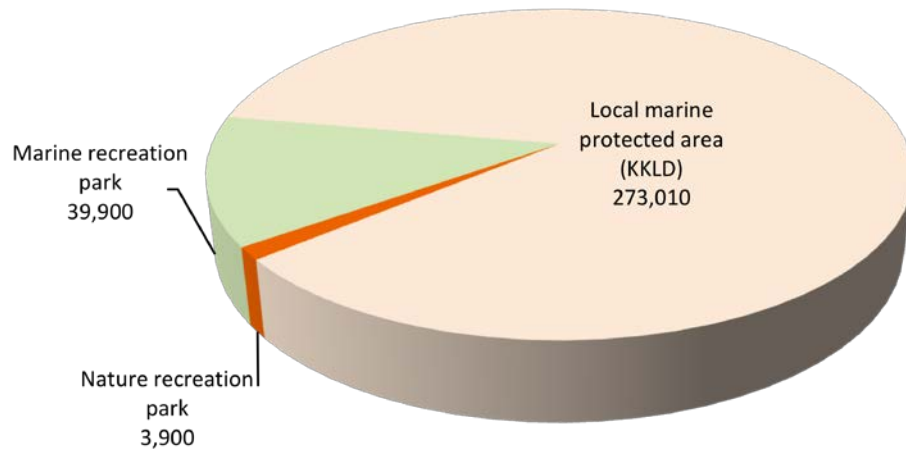
	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km ²)	IUCN Category	No Take Zone	Habitat Types
37	Indonesia	Pulau Ujung, Pulau Tengah, Pulau Angso and Pulau Kasiak	Local/District Marine Protected Area (KKLD)		2006	Unk	VI		Coral reefs, marine biota, turtle species
38	Indonesia	Jorong Maligi	Local/District Marine Protected Area (KKLD)		2007	0.1	VI		Mangrove habitat
39	Indonesia	Kepulauan Mentawi	Local/District Marine Protected Area (KKLD)		2006	505.32	VI		Coral reefs and mangrove habitat
40	Indonesia	Pesisir Selantan	Local/District Marine Protected Area (KKLD)		2003	7.3	VI		Turtle habitat
41	Indonesia	Padang Pariaman	Local/District Marine Protected Area (KKLD)		2010	6.8	VI		
42	Indonesia	Serdang Bedagai	Local/District Marine Protected Area (KKLD)		2008	12.4			Coral reefs, turtle species
43	Indonesia	Nias	Local/District Marine Protected Area (KKLD)		2007	290			Tourism, fishery, coral reefs, mangrove habitat

	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km ²)	IUCN Category	No Take Zone	Habitat Types
44	Indonesia	Nias Selatan	Local/District Marine Protected Area (KKLD)		2008	560			Tourism, fishery, coral reefs, mangrove habitat
45	Indonesia	Tapanuli Tengah	Local/District Marine Protected Area (KKLD)		2007	812.43			Tourism, fishery, coral reefs, mangrove habitat
46	Indonesia	Bengkalis	Fish Sanctuary		2010				Habitat of Terubuk (<i>Tenualosa macrura</i>), including rivers, estuary, coastal waters

Indonesia Data Sources:

1. Wood, L. J. (2007). MPA Global: A database of the world's marine protected areas. Sea Around Us Project, UNEP-WCMC & WWF. www.mpaglobal.org.
2. World Database on Protected Areas (WDPA) Annual Release 2009 (web download version), February 2009. The WDPA is a joint product of UNEP and IUCN, prepared by UNEP-WCMC, supported by IUCN WCPA and working with Governments, the Secretariats of MEAs and collaborating NGOs. For further information protectedareas@unep-wcmc.org.
3. Kasasiah, Ahsanal. 2009. Nested MPA networks in Indonesia. Presentation by the Ministry of Marine Affairs and Fisheries (MMAF) in Manila, Philippines, November 24, 2009.
4. Participant feedback at BOBLME MPA Workshop, January 18-19, 2011. Penang, Malaysia.

Indonesia Analysis



Total area of MPA (ha) by Designated Year

Number of MPAs by Designated year

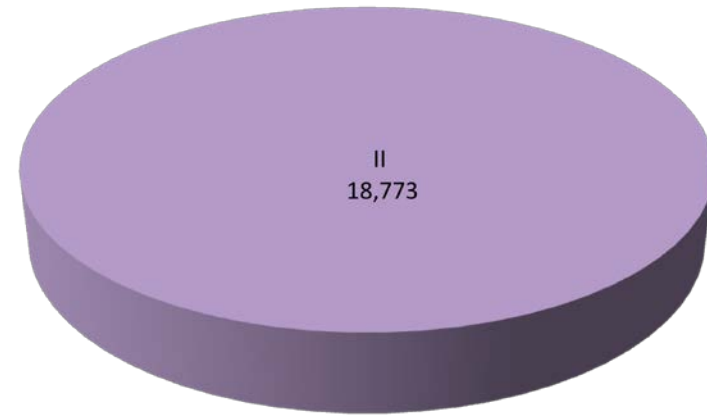
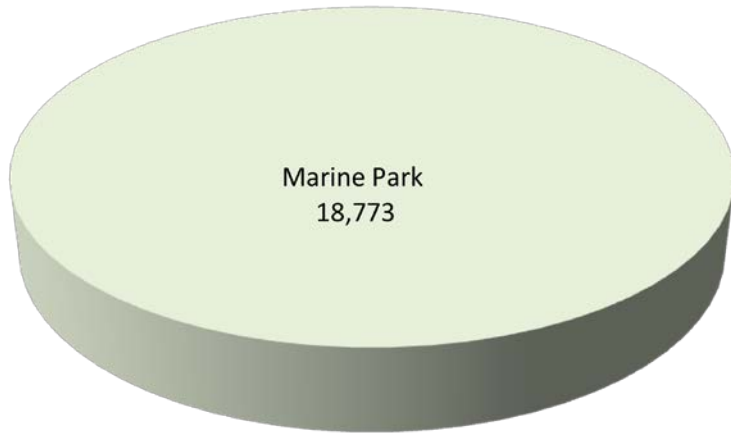
Malaysia

	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km ²)	IUCN Category	No Take Zone	Habitat Types
47	Malaysia	Pulau Kaca	Marine Park		1994	42.9	II	Yes	Surrounding marine habitat up to two nm from lowest watermark
48	Malaysia	Pulau Lembu	Marine Park		1994	46.13	II	Yes	Surrounding marine habitat up to two nm from lowest watermark
49	Malaysia	Pulau Payar	Marine Park		1994	54.91	II	Yes	Surrounding marine habitat up to two nm from lowest watermark
50	Malaysia	Pulau Segantang	Marine Park		1994	44.19	II	Yes	Surrounding marine habitat up to two nm from lowest watermark

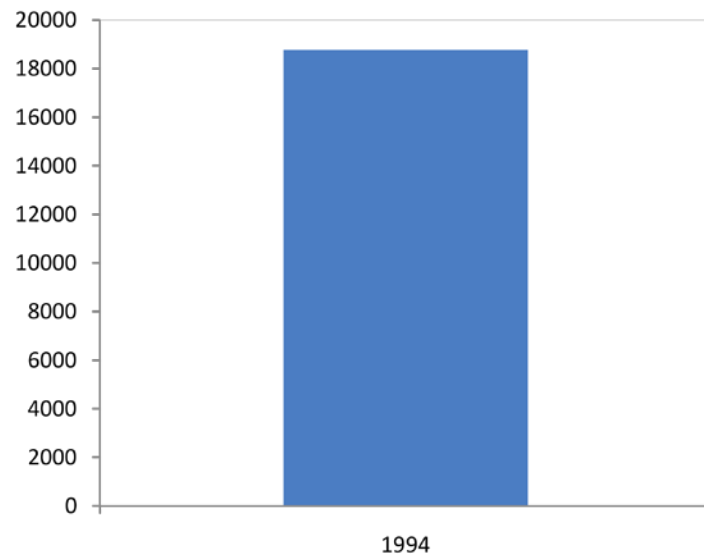
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Malaysia Analysis

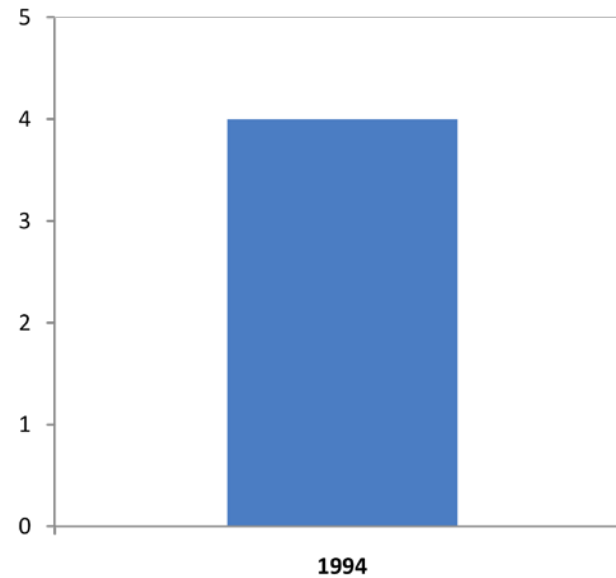


Total area of MPA (ha) by National Designation



Total area of MPA (ha) by Designated year

Total area of MPA (ha) by IUCN category



Number of MPAs by designated year

Thailand

	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km ²)	IUCN Category	No Take Zone	Habitat Types
51	Thailand	Laemson	Marine National Park	Ramsar Site	1983	315	II	All	Mangrove (largest concentration remaining in country), coral reef (warm), beach, wetland areas.
52	Thailand	Lam Nam Kraburi	Marine National Park		1999	160	II	All	Mangrove
53	Thailand	Mu Ko Ranong	Marine National Park		2010	365.7	II	All	Coral reef, beaches, swamp forest, islands, mangrove
54	Thailand	Ao Phang Nga	Marine National Park	ASEAN Heritage Park, Ramsar Site	1981	400	II	All	Mangrove, coral reef (warm)
55	Thailand	Mu Ko Similan	Marine National Park	ASEAN Heritage Park	1982	140	II	All	Coral reef (warm), beach. 3.39 km ² of coral reefs.
56	Thailand	Mu Ko Surin	Marine National Park	ASEAN Heritage Park	1981	135	II	All	Mangrove, seagrass, coral reef (warm), beach. 12.01 km ² of coral reefs.

	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km ²)	IUCN Category	No Take Zone	Habitat Types
57	Thailand	Khao Lampee - Had Thai Muang	Marine National Park	Undergoing nomination process to be Ramsar Site	1986	72	II	All	Beach, sea turtle nesting site, beach forest, mangrove
58	Thailand	Khao Lak-Lum Ru	Marine National Park		1991	125	II	All	Beach
59	Thailand	Sirinath	Marine National Park		1981	90	II	All	Mangrove, coral reef (warm), beach. 2.06 km ² of coral reefs, wetland areas.
60	Thailand	Had Nopparatthara (Mu Ko Phi Phi)	Marine National Park		1983	387.9	II	All	Mangrove, seagrass, coral reef (warm). 7.77 km ² of coral reef.
61	Thailand	Than Boke Koranee	Marine National Park		1998	104	II	All	Beach, coral reef.
62	Thailand	Mu Ko Lanta	Marine National Park		1990	134	II	All	Mangrove, seagrass, coral reef (warm). 8.24 km ² of coral reefs.
63	Thailand	Had Chao Mai	Marine National Park	Ramsar Site	1981	230.9	II	All	Mangrove, seagrass, coral reef (warm), beach. 1.29 km ² of coral reefs, wetland areas.
64	Thailand	Mu Ko Petra	Marine National Park		1984	494.4	II	All	Mangrove, coral reef (warm), beach. 4.77 km ² of coral reefs.

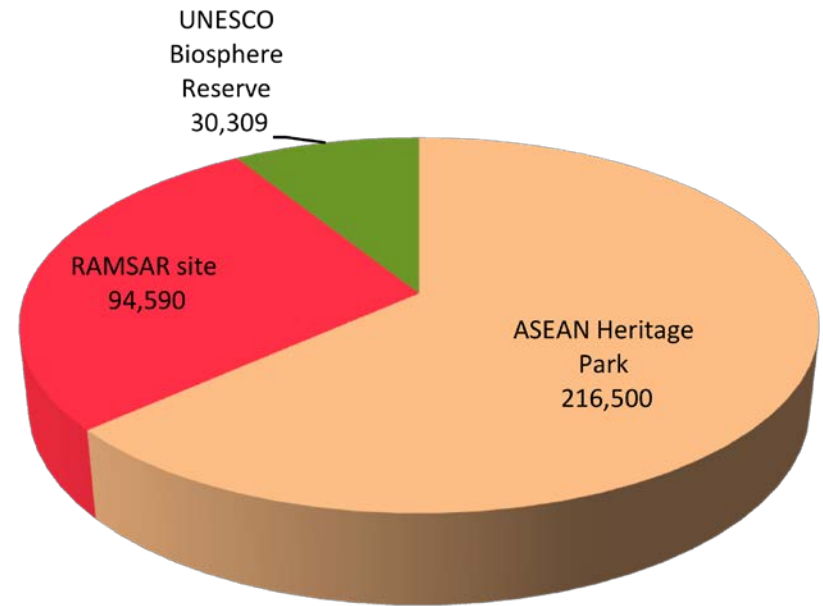
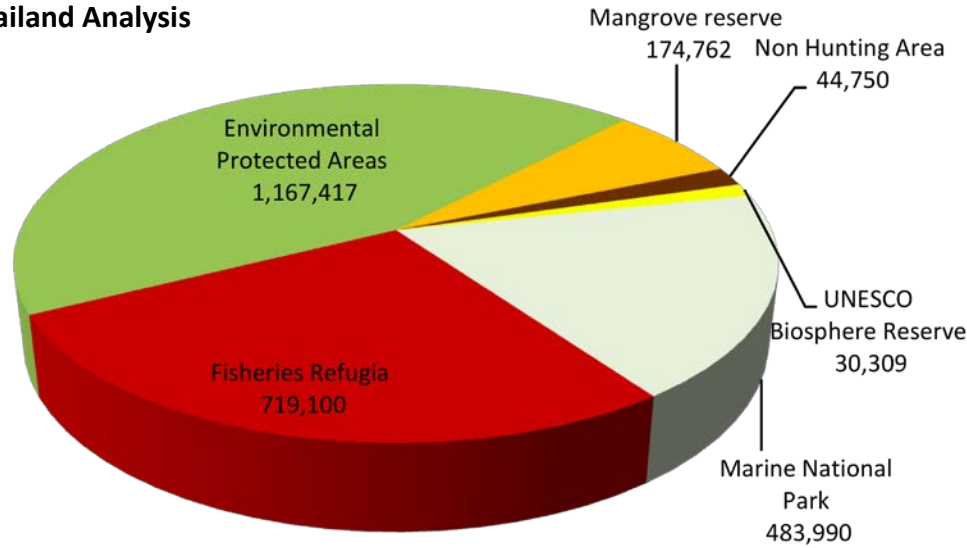
	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km2)	IUCN Category	No Take Zone	Habitat Types
65	Thailand	Tarutao	Marine National Park	ASEAN Heritage Park	1976	1490	II	All	Mangrove, coral reef (warm), beach. 12.58 km2 of coral reefs.
66	Thailand	Thaleban	Marine National Park		1980	196	II	All	Beach, coral reefs.
67	Thailand	Mu Ko Libong (Non-Hunting Area)	Non Hunting Area	Undergoing nomination process	1979	447.5	III	Unk	Island that is important bird nesting habitat.
68	Thailand	Ranong Biosphere Reserve	UNESCO Biosphere Reserve	UNESCO Biosphere Reserve	1997	303.09	I, IV		Over 300 animal species and 24 mangrove species
69	Thailand	Andaman Chub mackerel closed area	Fisheries refugia (Phuket-Phangnga-Krabi-Trang)		2008	4,386	IV		Closed area during fish spawning and breeding season (April 1 – June 30, every year)
70	Thailand	Coastal Fisheries Conservation Area	Fisheries refugia		1992	2,805	IV		Prohibition on any kind of fishing gear used with boat engine (such as trawlers/push nets etc) within any area 3 km from shore
71	Thailand	12 Fisheries Sanctuaries	Fisheries sanctuaries		Since 1963		IV	All	Protected areas for marine animals (e.g. coral reefs)
72	Thailand	Andaman Mangrove Reserve Areas	Mangrove reserved areas			1,747.62			

	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km2)	IUCN Category	No Take Zone	Habitat Types
73	Thailand	Andaman Environmental Protected Areas	Environmental Protected Areas (Phuket, Phangnga, Krabi)			11,674	VI		Set aside to prevent/reduce undesirable impacts of development activities (e.g. urban, industrial and tourism development)

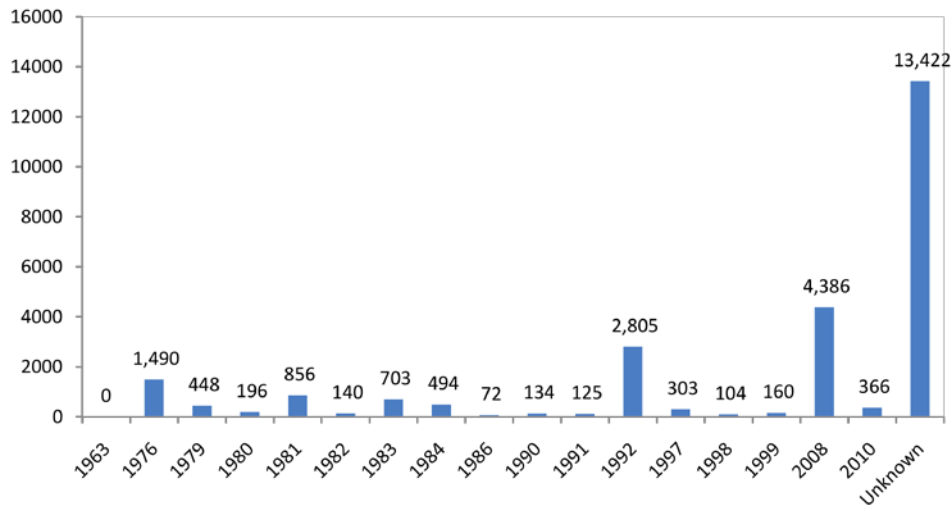
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Thailand Analysis

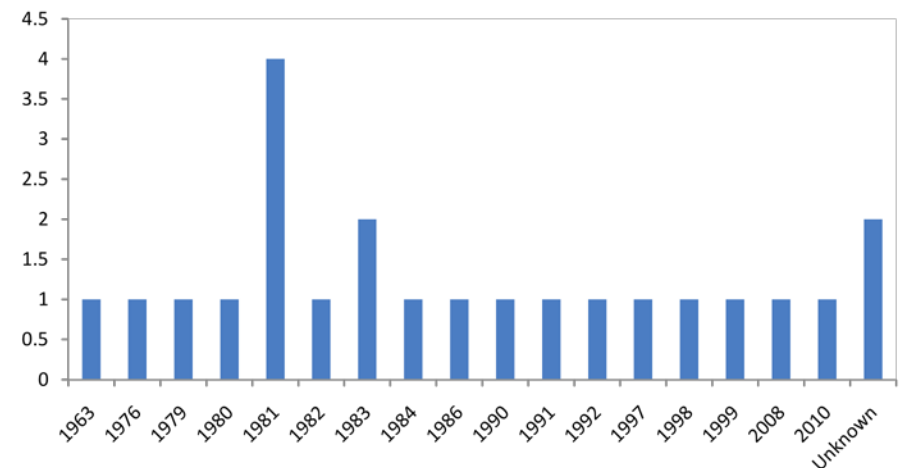


Total area of MPA (ha) by National designation



Total MPA area (ha) by designated year

Total area of MPA (ha) by International Status



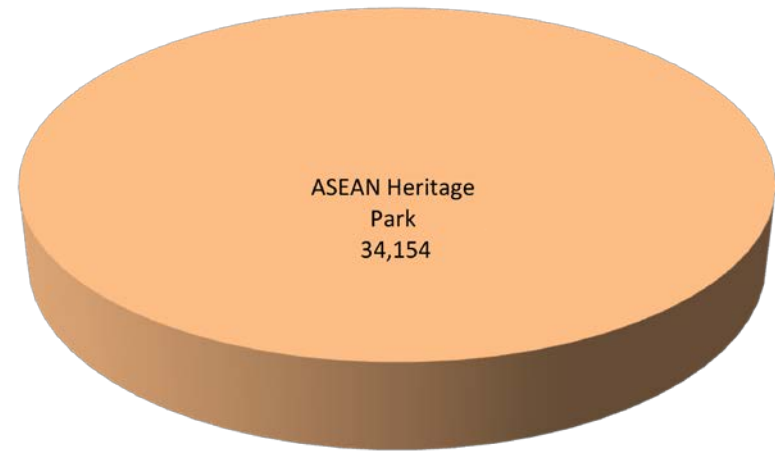
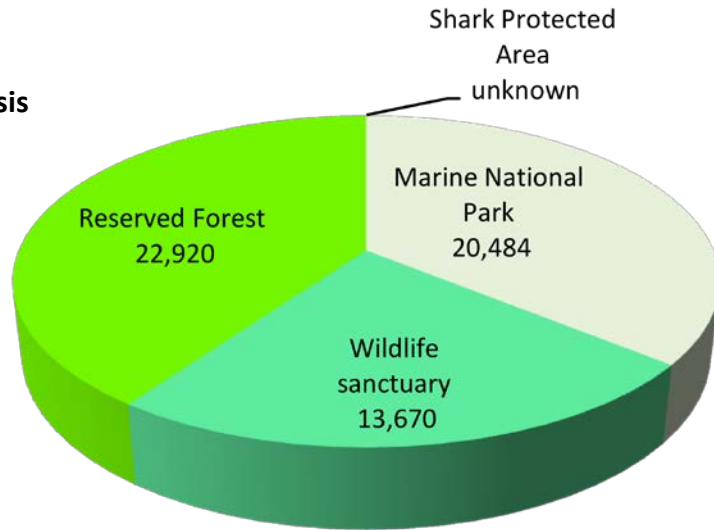
Number of MPAs by Designated year

Myanmar

	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km ²)	IUCN Category	No Take Zone	Habitat Types
74	Myanmar	Lampi Island	Marine National Park	ASEAN Heritage Park	1996	204.84	Ib		Mangrove habitat, coral reef (warm).
75	Myanmar	Wunbaik	Reserved Forest		1931	229.2			Mangrove habitat
76	Myanmar	Meinmahla Kyun	Wildlife Sanctuary	ASEAN Heritage Park	1993	136.7	IV	Yes	
77	Myanmar	Moscos Island	Wildlife Sanctuary		1927	49.24	IV		Mangrove, coral reef and evergreen forest.
78	Myanmar	Thamihla Kyun GS (Diamond Island)	Wildlife Sanctuary		1970	0.88	IV		Protected turtle habitat.
79	Myanmar	Ross Island	Shark Protected Area						Shark refugia site.

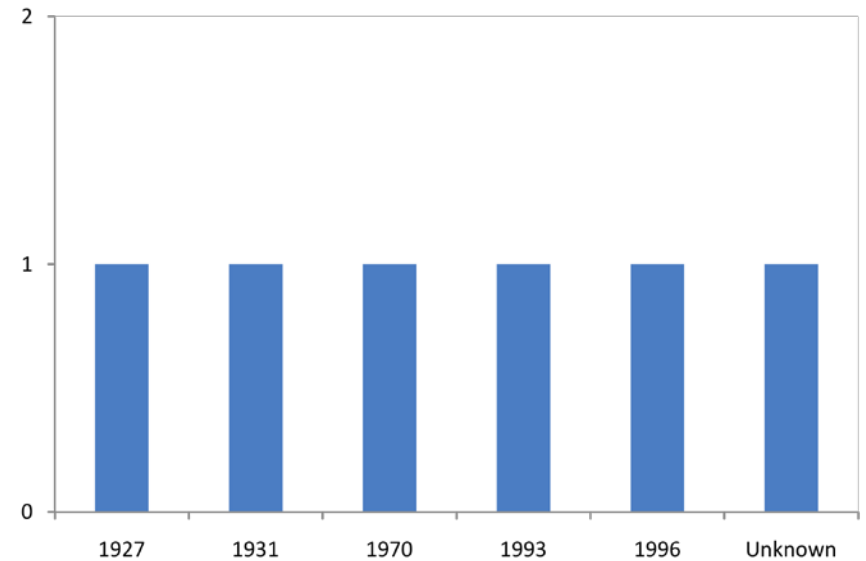
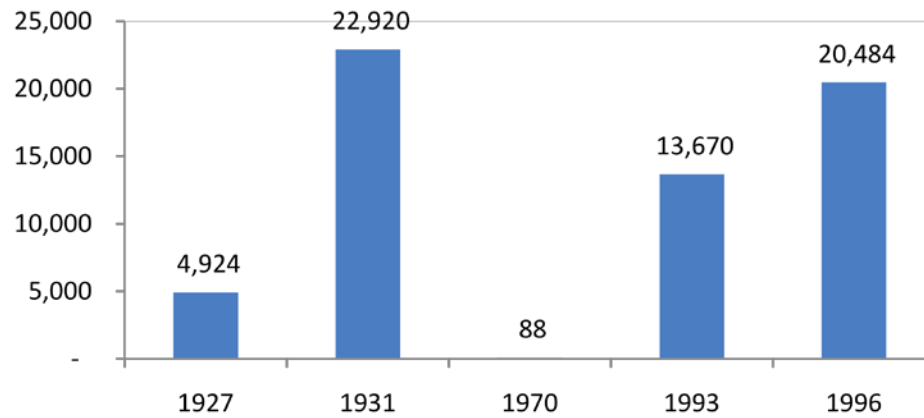
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Myanmar Data Sources:									
									<ol style="list-style-type: none"> 1. Wood, L. J. (2007). MPA Global: A database of the world's marine protected areas. Sea Around Us Project, UNEP-WCMC & WWF. www.mpaglobal.org 2. World Database on Protected Areas (WDPA) Annual Release 2009 (web download version), February 2009. The WDPA is a joint product of UNEP and IUCN, prepared by UNEP-WCMC, supported by IUCN WCPA and working with Governments, the Secretariats of MEAs and collaborating NGOs. For further information protectedareas@unep-wcmc.org. 3. UP-MSI, ABC, ARCBC, DENR, ASEAN, 2002. Marine Protected Areas in Southeast Asia. ASEAN Regional Centre for Biodiversity Conservation, Department of Environment and Natural Resources, Los Baños, Philippines. 142 pp., 10 maps. 4. "ASEAN Heritage Parks". Profiles of Meinmahla Kyun Wildlife Sanctuary and Lampi Marine National Park. ASEAN Centre for Biodiversity. Accessed in October, 2010. Available at: http://bim.aseanbiodiversity.org/biss/index.php?option=com_content&view=article&id=33%3Ameinmahla-kyun-wildlife-sanctuary&catid=3%3Aasean-heritage-parks-programme&Itemid=32 5. Rao, M., Rabinowitz, A. & Saw Tun Khaing, 2002. Status review of the protected-area system in Myanmar, with recommendations for conservation planning. Conservation Biology 16 (2), 360–368 6. Participant feedback at BOBLME MPA Workshop, January 18-19, 2011. Penang, Malaysia.

Myanmar Analysis



Total area of MPA (ha) by National designation

Total area of MPA (ha) by International Status



Total area of MPA (ha) by Designated Year

Number of MPAs by Designated Year

Bangladesh

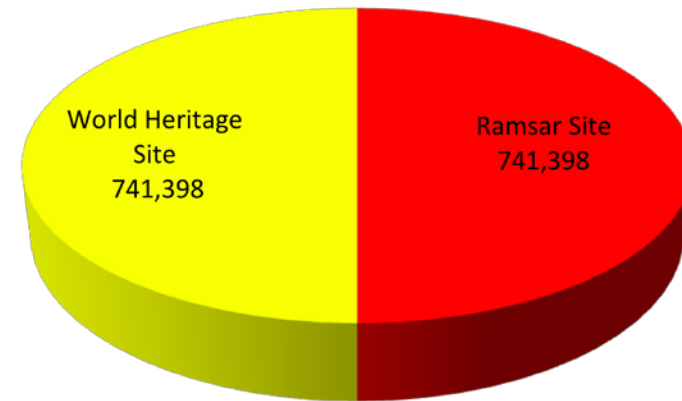
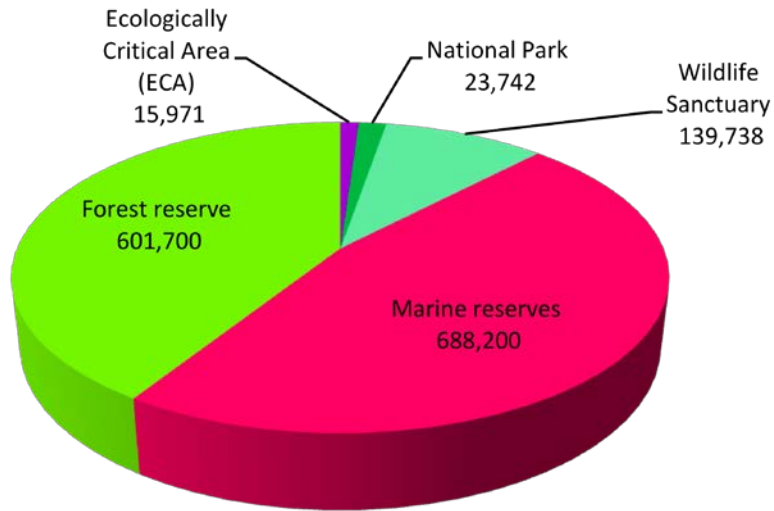
	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km ²)	IUCN Category	No Take Zone	Habitat Types
80	Bangladesh	St. Martin's Island (Jinjiradwip and Jinjira Reefs)	Ecologically Critical Area. Being proposed for marine national park status.		1999	5.9 (plus coral reef)	Unset	Unk	Coral reef habitat, habitat for wildfowl and turtle nesting site
81	Bangladesh	Teknaf Peninsula (Cox's Bazar, Teknaf Sea Beach)	Ecologically Critical Area (ECA)		1999	104.65	Unset	Unk	Sandy beach
82	Bangladesh	Himchari	National Park		1980	17.29	V	Unk	Unk
83	Bangladesh	Char Kukri-Mukri	Wildlife Sanctuary		1981	0.4	IV	Unk	Coastal mangrove habitat
84	Bangladesh	Sundarbans East	Wildlife Sanctuary	World Heritage Site and Ramsar Site	1960/1996	312.26	IV	Unk	Mangrove forest.
85	Bangladesh	Sundarbans South	Wildlife Sanctuary	World Heritage Site and Ramsar Site	1996	369.7	IV	Unk	Mangrove forest.
86	Bangladesh	Sundarbans West	Wildlife Sanctuary	World Heritage Site and Ramsar Site	1996	715.02	IV	Unk	Mangrove forest.
87	Bangladesh	Sundarbans (10km Periphery)	Ecologically Critical Area (ECA)		1999	Area yet to be defined			Mangrove habitat

	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km ²)	IUCN Category	No Take Zone	Habitat Types
88	Bangladesh	Sundarbans (Reserved Forests)	Wetlands of International Importance / World Heritage Convention	Ramsar Site	1992	6017			
89	Bangladesh	Nijhum Dweep	National Park		2001	163.52	Unset		Coastal mangrove
90	Bangladesh	Sonadia Island	Ecologically Critical Area (ECA)		1999	49.16			Offshore barrier island, sand dunes and mangrove habitat
91	Bangladesh	“Middle ground and south patches” of Bay of Bengal	Marine Reserves		2000				
92	Bangladesh	4 Hilsa-closed seasons (“Middle ground” and “South patches”)	“Closed-Season”		2000	6,882 (cumulative)			
93	Bangladesh	Kua-Kata	National Park		2006	56.61			Mangrove forest

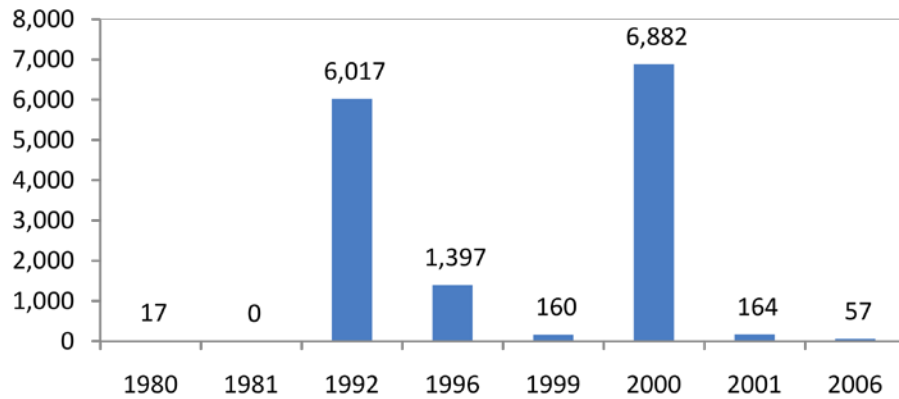
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Bangladesh Analysis

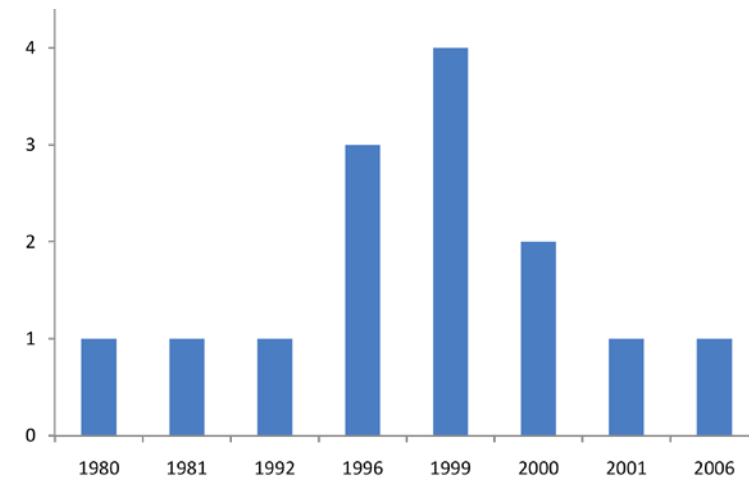


Total area of MPA (ha) by National designation



Total area of MPA (ha) by Designated year

Total area of MPA (ha) by International Status



Number of MPAs by Designated year

India

	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km ²)	IUCN Category	No Take Zone	Habitat Types
94	India	Sundarban Biosphere Reserve	Biosphere Reserve	UNESCO Biosphere Reserve	1989	9600			Largest (single) mangrove forest system in the world, 54 islands, tidal rivers, low-lying floodplain,
95	India	Sundarban Tiger Reserve	Tiger Reserve (within Biosphere Reserve)		1973	2585 (985 sq km over water)			
96	India	Sundarban National Park	National Park (Core area within Tiger Reserve)		1984	1330	Ia	Yes (entire park)	Largest (single) mangrove forest system in the world, 54 islands, tidal rivers, low-lying floodplain, only marshy mangrove tiger land in a World Heritage Site.
97	India	Haliday Island (within Sundarban Biosphere Reserve)	Sanctuary		1976	5.95	IV	Unk	
98	India	Lothian Island (within Sundarban Biosphere Reserve)	Sanctuary		1976	38	IV	Unk	

	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km ²)	IUCN Category	No Take Zone	Habitat Types
99	India	Sajnakhali (within Sundarban Biosphere Reserve)	Sanctuary		1976	362.4	IV	Unk	
100	India	Bhitarkanika	National Park		1988	145	II	Yes (entire park)	Mangrove forest
101	India	Bhitarkanika	Wildlife Sanctuary		1975	672			
102	India	Gahirmatha	Marine Sanctuary		1997	1435		Core area = 725.4 km ²	Mangrove forests, sandy beach, barrier island
103	India	Chilka (Nalaban)/ Chilika Laka	Sanctuary	Ramsar site	1987	15.53	IV	Unk	Brackish lake separated from the Bay of Bengal by a long sandy ridge and subject to sea water exchange
104	India	Balukhand Konark	Sanctuary		1984	71.72	IV	Unk	
105	India	Coringa	Sanctuary		1978	235.7	IV	Unk	Mangrove, delta, mudflats, sandy beaches
106	India	Point Calimere	Sanctuary	Ramsar site	1967	17.26	IV	Unk	Mangrove habitat, intertidal flats, sand bars, lagoons.
107	India	Pulicat Lake	Sanctuary		1980	153	IV	Unk	

	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km ²)	IUCN Category	No Take Zone	Habitat Types
108	India	Gulf of Mannar Biosphere Reserve	Biosphere Reserve		1989	10500			21 islands with estuaries, beaches, sea grasses, coral reefs, salt marshes and mangroves.
109	India	Gulf of Mannar National Park	National Park (core are of Biosphere Reserve)	UNESCO Biosphere Reserve	1986	560	Ib	Yes (entire park)	21 islands with coral ecosystems, seagrass ecosystems, and mangrove ecosystems.
110	India	Mahatma Gandhi (Andaman and Nicobar Islands)	Marine National Park		1983	281.5	II	Unk	Mangrove, coral reef, beach, sand
111	India	Rani Jhansi (Andaman and Nicobar Islands)	Marine National Park		1996	256.1	II	Unk	Coral reef
112	India	Great Nicobar Biosphere Reserve (Andaman and Nicobar Islands)	Biosphere Reserve		1989	885			
113	India	North Button (Andaman and Nicobar Islands)	National Park		1987	0.44		Yes (entire park)	
114	India	Middle Button (Andaman and Nicobar Islands)	National Park		1987	0.64		Yes (entire park)	

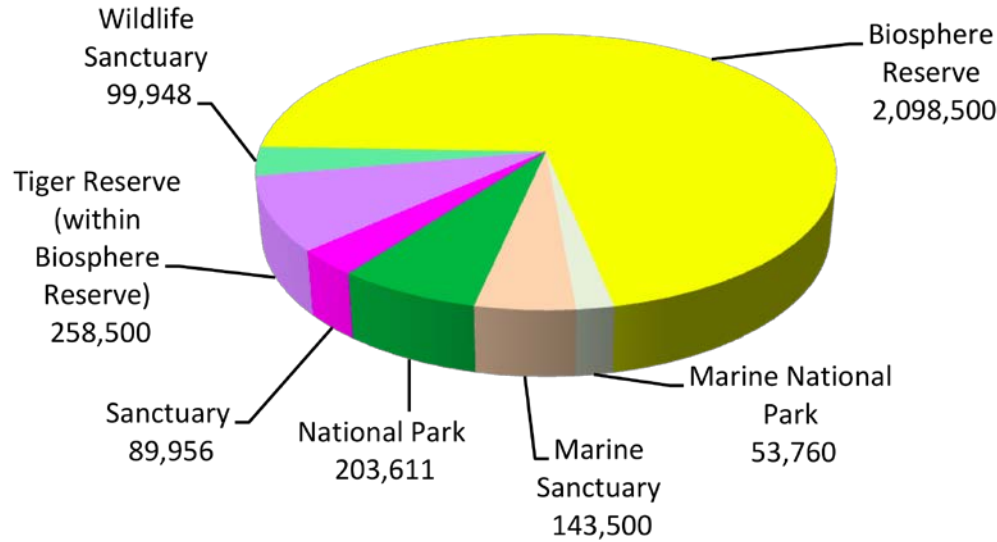
	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km ²)	IUCN Category	No Take Zone	Habitat Types
115	India	South Button (Andaman and Nicobar Islands)	National Park		1987	0.03		Yes (entire park)	
116	India	Krishna	Wildlife Sanctuary		1999	194.81			
117	India	Lohabarrack (Andaman and Nicobar Islands)	Wildlife Sanctuary		1987	100			
118	India	North Reef Island (Andaman and Nicobar Islands)	Wildlife Sanctuary		1987	3.48			
119	India	South Reef Island (Andaman and Nicobar Islands)	Wildlife Sanctuary		1987	1.17			
120	India	Cuthbert Bay (Andaman and Nicobar Islands)	Wildlife Sanctuary		1987	5.82			
121	India	Cinque (Andaman and Nicobar Islands)	Wildlife Sanctuary		1987	9.51			
122	India	Galathea (Andaman and Nicobar Islands)	Wildlife Sanctuary		1997	11.44			
123	India	Parkinson Island (Andaman and Nicobar Islands)	Wildlife Sanctuary		1987	0.34			
124	India	Mangroves Island (Andaman and Nicobar Islands)	Wildlife Sanctuary		1987	0.39			

	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km ²)	IUCN Category	No Take Zone	Habitat Types
125	India	Blister Island (Andaman and Nicobar Islands)	Wildlife Sanctuary		1987	0.26			
126	India	Sandy Island (Andaman and Nicobar Islands)	Wildlife Sanctuary		1987	0.26			

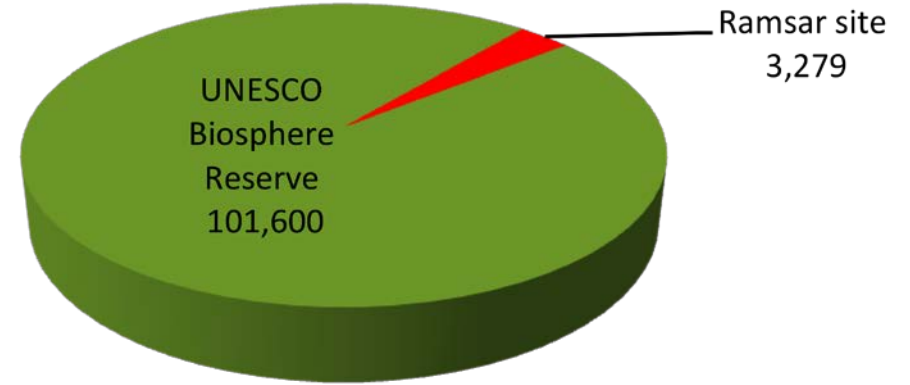
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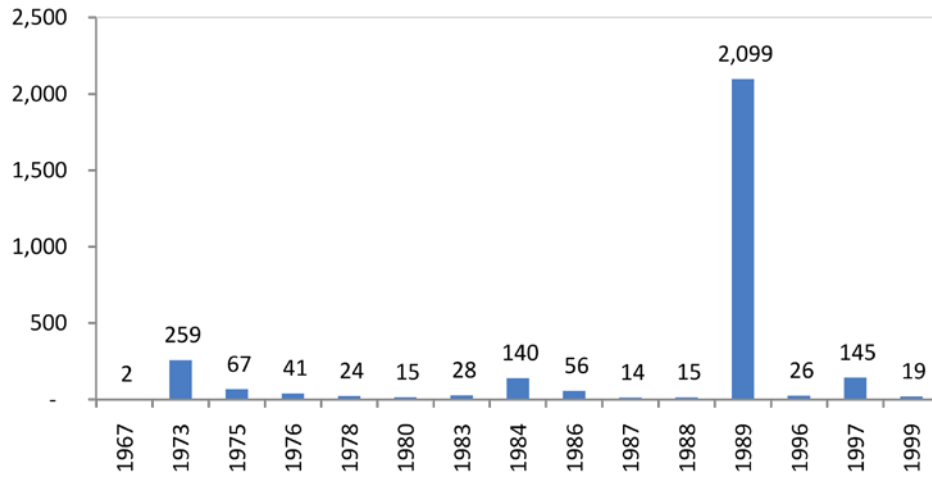
India Analysis



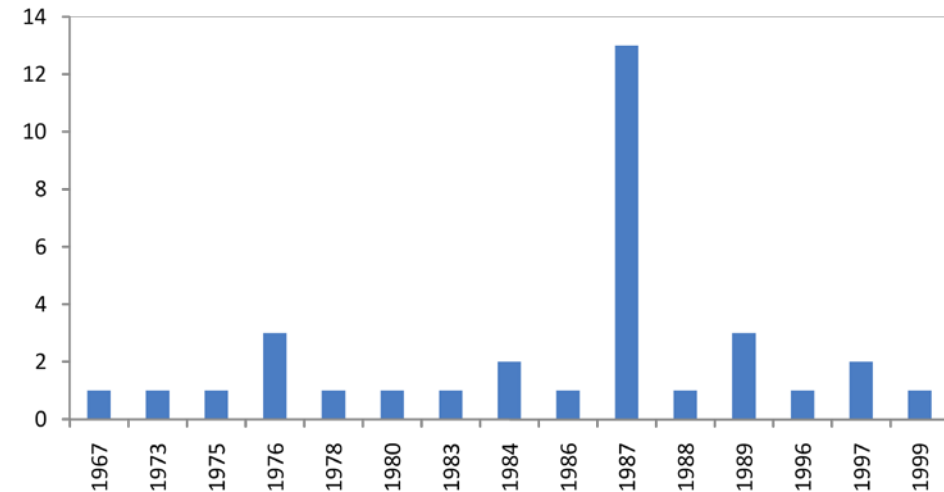
Total area of MPA (ha) by National Designation



Total area of MPA (ha) by International Status



Total area of MPA (ha) by Designated year



Number of MPAs by Designated year

Maldives

	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km ²)	IUCN Category	No Take Zone	Habitat Types
127	Maldives	Vilingili Thila (Anenome City) (Raa Atoll)	Dive Site		1999	0.12	Unset	Unk	Coral reefs. Sharks and mantas are frequently sighted.
128	Maldives	Dhigali Haa/Horubadhoo Thila (Baa Atoll)	Dive Site		1999	0.13	Unset	Unk	Coral reefs. Previous records of grey reef sharks, white-tipped reef sharks, barracudas, jacks and turtles
129	Maldives	Fusheevaru (Fushivaru) Thila (Lhaviyani Atoll)	Dive Site		1995	0.33	Unset	Unk	Two Manta cleaning stations and abundant fish species.
130	Maldives	Kureddhoo (Kuredhu) Kanduu Olhi (Kuredu Express) (Lhaviyani Atoll)	Dive Site		1999	0.98	Unset	Unk	Coral reefs, grey reef sharks and many pelagic species. Home to globally endangered Ornate Eagle Ray

	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km ²)	IUCN Category	No Take Zone	Habitat Types
131	Maldives	Makunudhoo Kandu Olhi (Kandu Faru/Manukudhoo channel) (Kaafu Atoll)	Dive Site		1995	4.7	Unset	Unk	White-tip reef sharks, rich fish biodiversity and sea turtles
132	Maldives	Rasfaree island and enclosed reef (Rasfari, Rasfari beyru) (Kaafu Atoll)	Dive Site		1995	12.86	Unset	Unk	Grey Reef Sharks, Manta Rays, rich fish biodiversity
133	Maldives	Thamburudhoo Thila (Girifushi Thila) (Kaafu Atoll)	Dive Site		1995	0.2	Unset	Unk	Reef fish, coral reefs.
134	Maldives	Gaathugiri/AdÆdh ashugiri (Banana Reef)	Dive Site		1995	0.35	Unset	Unk	Reef fish, coral reefs.
135	Maldives	Giraavaru Kuda Haa (Kuda Haa) (Kaafu Atoll)	Dive Site		1995	0.13	Unset	Unk	Coral reef habitat, rich fish biodiversity
136	Maldives	Dhekunu Thilafalhuge (Miyaruvani) (Lions Head) (Kaafu Atoll)	Dive Site		1995	0.62	Unset	Unk	Stonefish.
137	Maldives	Kollavaane, centre of Gulhifalhu Medhuga (Hans Hass Place, HP Reef) (Kaafu Atoll)	Dive Site		1995	0.8	Unset	Unk	Rich fish biodiversity

	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km ²)	IUCN Category	No Take Zone	Habitat Types
138	Maldives	Emboodhoo Kandu Olhi (Kaafu Atoll)	Dive Site		1995	1.2	Unset	Unk	Grey Reef Sharks, and other large fish. Soft corals
139	Maldives	Guraidhoo Kandu Olhi (Kaafu Atoll)	Dive Site		1995	1.98	Unset	Unk	Rich fish biodiversity, manta rays, sharks and coral reefs.
140	Maldives	Lankan Thila (Kaafu Atoll)	Dive Site		1999	0.12	Unset	Unk	Sharks, napoleon wrasse, mantas, baracudas, eagle rays and coral reefs.
141	Maldives	Mayaa Thila (Alifu Alifu Atoll)	Dive Site		1995	0.8	Unset	Unk	Grey Reef sharks, Whitetip Reef sharks, Stonefishes, other fishes
142	Maldives	Orimas Thila (Alifu Alifu Atoll)	Dive Site		1995	2.25	Unset	Unk	Coral reefs, and small reef fish. White-tipped shark and whale sharks.
143	Maldives	Mushimasmigili Thila (Fish Head) (Alifu Alifu Atoll)	Dive Site		1995	0.8	Unset	Unk	Coral reef, Grey Reef Sharks

	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km2)	IUCN Category	No Take Zone	Habitat Types
144	Maldives	Kudarah Thila (Girifushi Thila) (Alifu Alifu Atoll)	Dive Site		1995	0.12	Unset	Unk	Rich fish biodiversity including occasional sharks.
145	Maldives	Karibeyru (Kashibeyru) Thila (Alifu Alifu Atoll)	Dive Site		1999	0.66	Unset	Unk	Whale sharks, mantas, grey reef sharks, white tip sharks, napoleon wrasses, schools of tunas and snappers
146	Maldives	Faruhuruvalhibeyru (Alifu Dhaalu Atoll)	Dive Site		1999	1.53	Unset	Unk	Manta season from December to March
147	Maldives	Miyaru Kandu (Dhevana Kandu) (Vaavu atoll)	Dive Site		1995	1.1	Unset	Unk	Soft corals, rich fish biodiversity, Eagle Rays, Grey Reef and White-tipped Sharks. Occasional Hammer head and Sail fish

	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km2)	IUCN Category	No Take Zone	Habitat Types
148	Maldives	Vattaru Kandu (Vaavu atoll)	Dive Site		1999	0.61	Unset	Unk	Sharks, seafans, leopard sharks, mantas, sea turtles, High diversity of marine invertebrates and fish
149	Maldives	Lhazikuraadi (Hakuraa Thila) (Meemu atoll)	Dive Site		1999	0.13	Unset	Unk	Eagle rays, grey reef sharks, Anemone garden, sharks, eagle rays, bannerfish, jackfish and turtles.
150	Maldives	Filitheyo Kandu) (Faafu atoll)	Dive Site		1999	0.2	Unset	Unk	
151	Maldives	Fushi (Fushee) Kandu) (Dhaalu atoll)	Dive Site		1999	Unk	Unset	Unk	Various shark species, sea turtles, spotted eagle rays and snappers.
152	Maldives	Hithadhoo (Eidhigali Kulhi) (Seenu atoll)	Mangrove Protected Area		2006	Unk	Unset	Unk	Largest frigate bird nesting site in the country
153	Maldives	Hurasdhoo (Alifu Dhaalu atoll)	Island Protected Area		2006	0.71	Unset	Unk	High diversity of marine invertebrates and fish

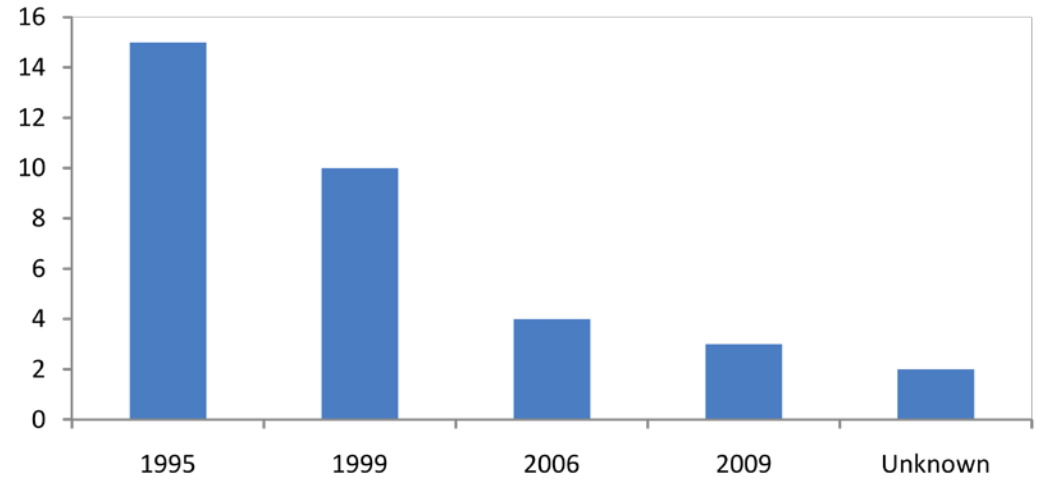
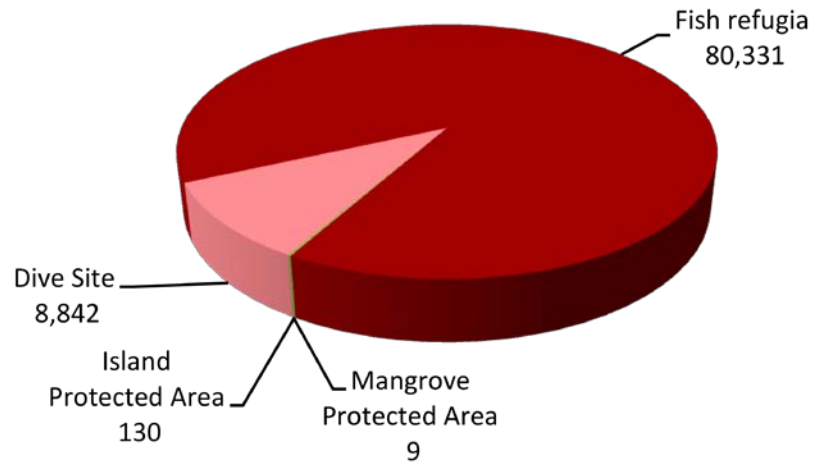
	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km2)	IUCN Category	No Take Zone	Habitat Types
154	Maldives	Olhugiri (Baa atoll)	Island Protected Area		2006	0.53	Unset	Unk	Regular roosting Frigate birds, breeding red-billed tropic bird, nesting turtles
155	Maldives	Huraa (Kaafu atoll)	Mangrove Protected Area		2006	0.09	Unset	Unk	Resting place for some protected birds. Mangrove habitat
156	Maldives	Hithaadhoo (Gaafu Alifu Atoll)	Island Protected Area		2006	1.24	Unset	Unk	Island, lagoon and surrounding reef protected. Most important roosting site for frigate birds in Maldives. Important roosting site for other birds. Turtle nesting area
157	Maldives	Hanifaru (Baa Atoll)	Dive Site		2009	3.03	Unset	Unk	Feeding aggregation site for whale sharks and manta rays
158	Maldives	Angafaru (Baa Atoll)	Dive site		2009	4.04	Unset	Unk	Green and Hawksbill turtles, groupers, whale sharks and manta rays

	Country	Site Name	National Designation	International Status	Establishment Date	Total Area (km ²)	IUCN Category	No Take Zone	Habitat Types
159	Maldives	South Ari Atoll MPA	Dive Site		2009	48.63	Unset	Unk	Aggregation area for whale sharks
160	Maldives	Dheraha thila	Fish refugia			203.31	Unset	Unk	Spawning and aggregating site for pelagic species, especially tuna
161	Maldives	Addu thila (Seenu Atoll)	Fish refugia			600	Unset	Unk	Spawning and aggregating site for pelagic species, especially tuna

Maldives Data Sources:

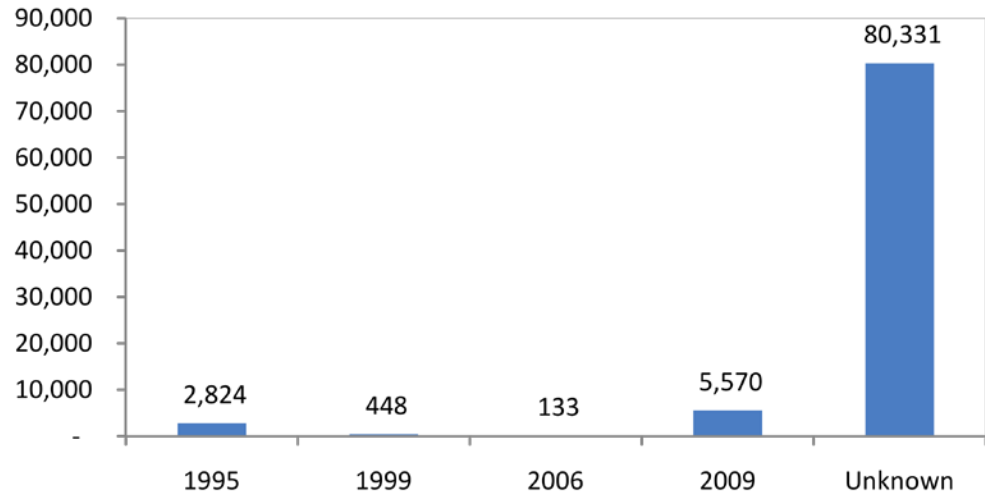
1. Wood, L. J. (2007). MPA Global: A database of the world's marine protected areas. Sea Around Us Project, UNEP-WCMC & WWF. www.mpaglobal.org
2. World Database on Protected Areas (WDPA) Annual Release 2009 (web download version), February 2009. The WDPA is a joint product of UNEP and IUCN, prepared by UNEP-WCMC, supported by IUCN WCPA and working with Governments, the Secretariats of MEAs and collaborating NGOs. For further information protectedareas@unep-wcmc.org.
3. Maldives Application for Funding: Supporting Country Action on the Convention for Biological Diversity (CBD) Programme of Work on Protected Areas. 2008. Environment Research Centre Ministry of Environment, Energy and Water, Maldives. 19 pp.
4. Protected Areas of the Maldives. Online information repository. Environment Protection Agency, Republic of the Maldives. Available online at: http://epa.gov.mv/index.php?option=com_content&view=category&id=5&Itemid=25
5. Participant feedback at BOBLME MPA Workshop, January 18-19, 2011. Penang, Malaysia.

Maldives Analysis



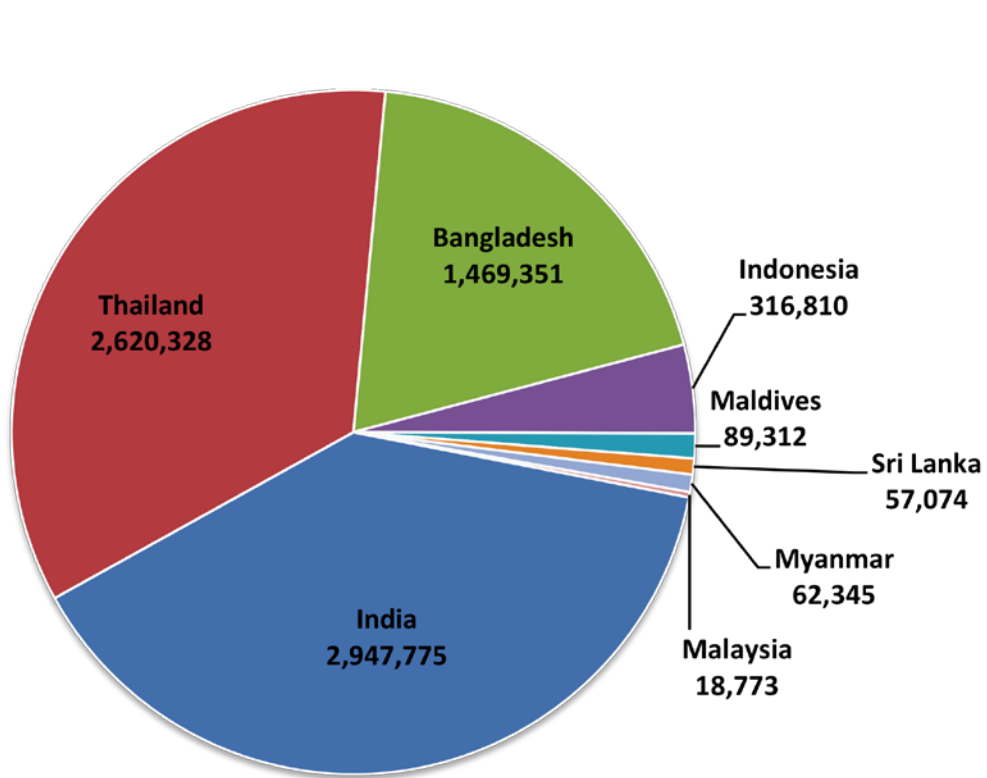
Total area of MPA (ha) by National Designation

Number of MPAs by Designated year

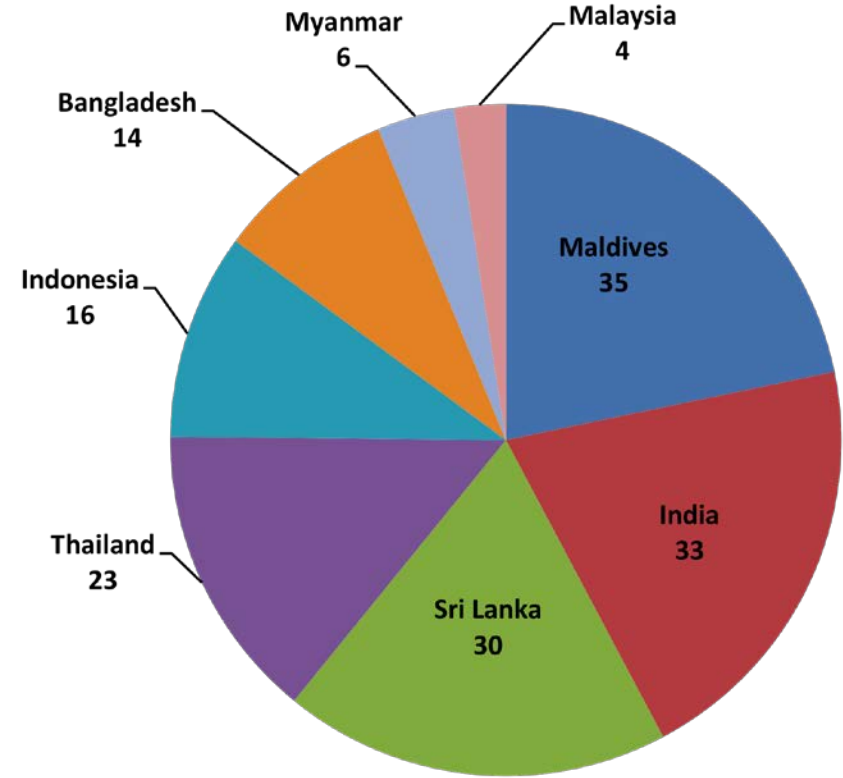


Total area of MPA (ha) by Designated year

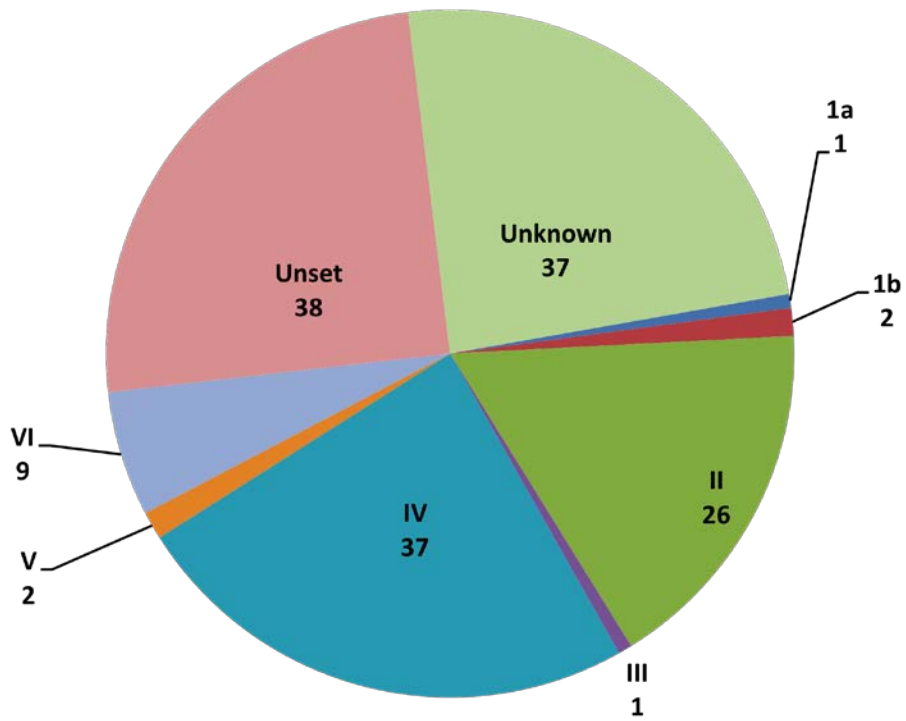
APPENDIX F: REGIONAL ANALYSIS OF MPAs IN THE BAY OF BENGAL LME



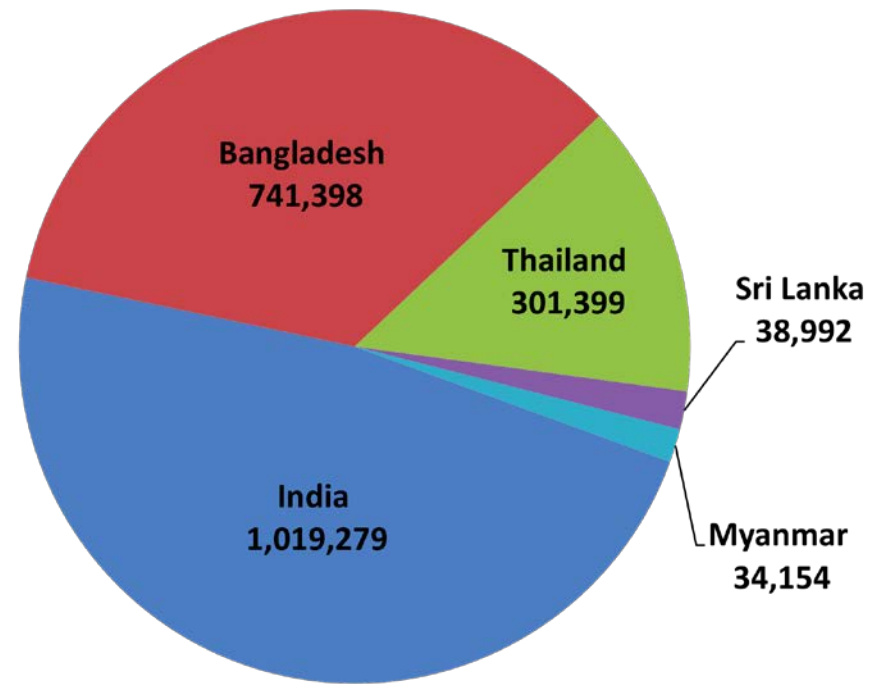
Total Area of MPA (Ha) by National Designation



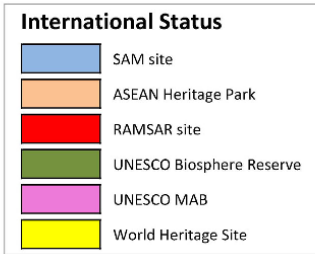
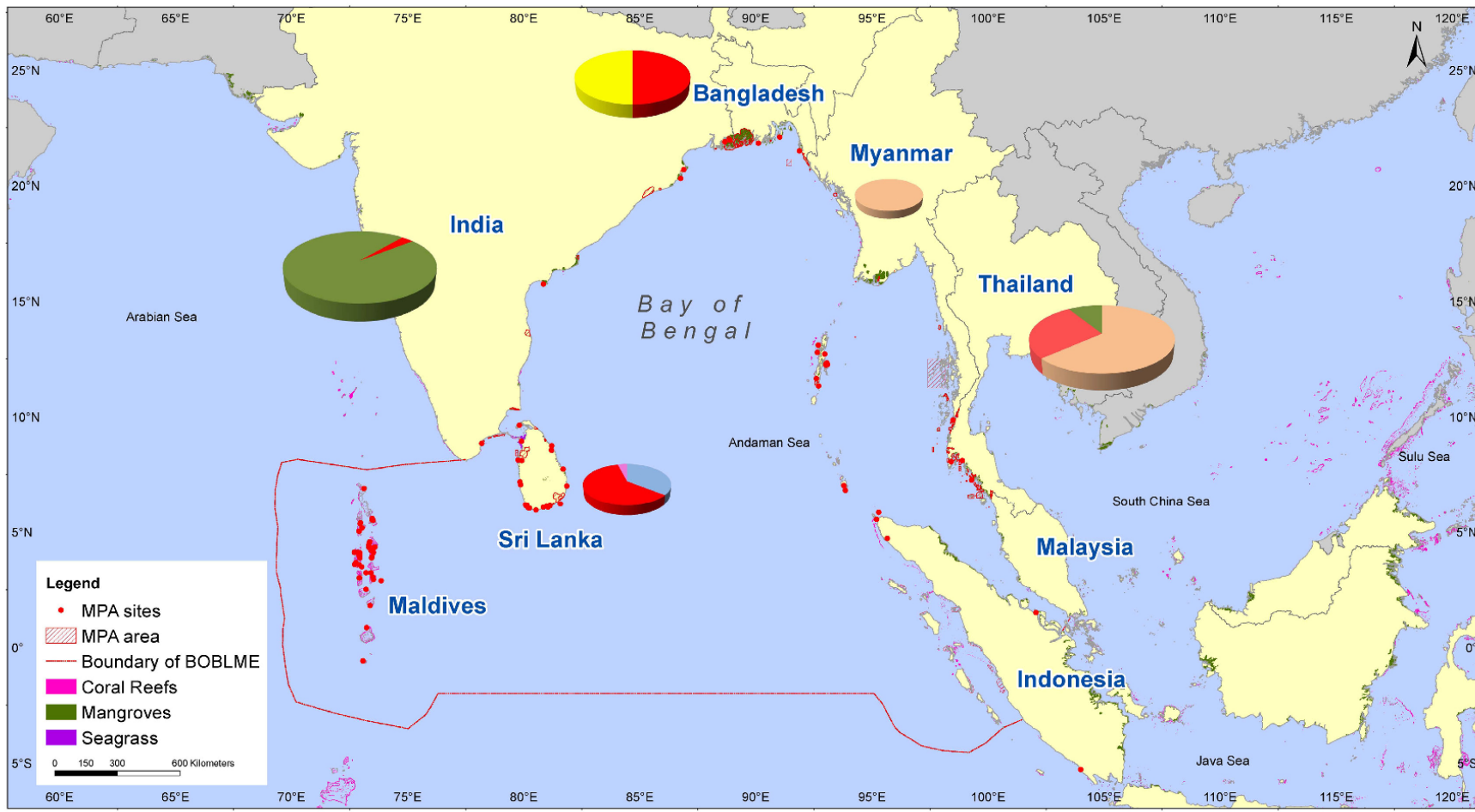
Number of MPAs by National Designation



Number of MPAs by IUCN Category

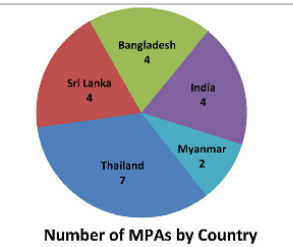
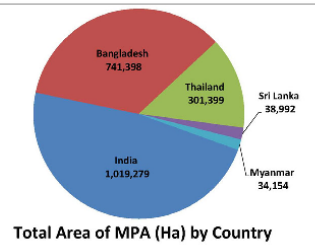


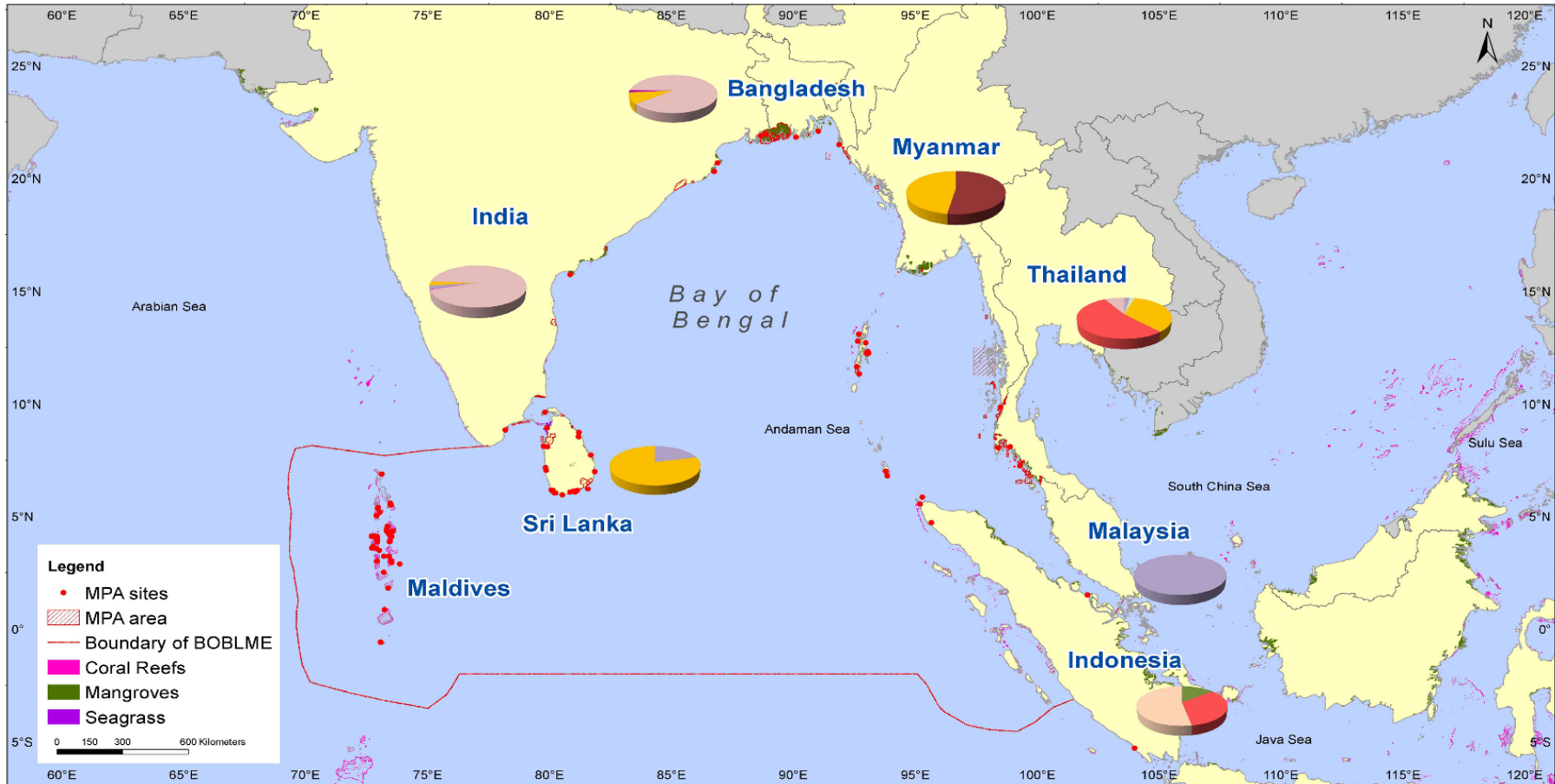
Total area of MPAs (ha) (with International Status) by country



MAP OF TOTAL AREA OF MPA(HA) BY INTERNATIONAL STATUS

Data Source:







Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand are working together through the Bay of Bengal Large Marine Ecosystem (BOBLME) Project and to lay the foundations for a coordinated programme of action designed to improve the lives of the coastal populations through improved regional management of the Bay of Bengal environment and its fisheries.

The Food and Agriculture Organization (FAO) is the implementing agency for the BOBLME Project.

The Project is funded principally by the Global Environment Facility (GEF), Norway, the Swedish International Development Cooperation Agency, the FAO, and the National Oceanic and Atmospheric Administration of the USA.

For more information, please visit www.boblme.org



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