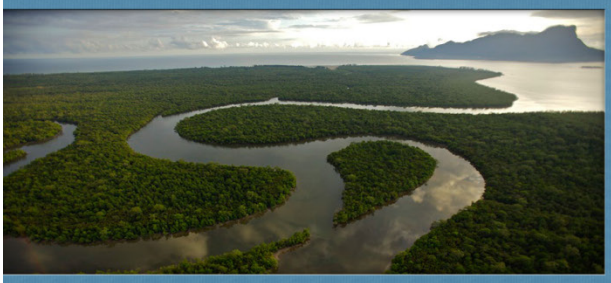
Bay of Bengal Large Marine Ecosystem Project



Report of the

MPA Atlas and the interactive online database portal of the Bay of Bengal Large Marine Ecosystem

BOBLME-2014-Ecology-15

BOBLME contract: LOA/RAP/2013/11

For bibliographic purposes, please reference this publication as:

BOBLME (2014) Report of the MPA Atlas and the interactive online database portal of the Bay of Bengal Large Marine Ecosystem. BOBLME-2014-Ecology-15

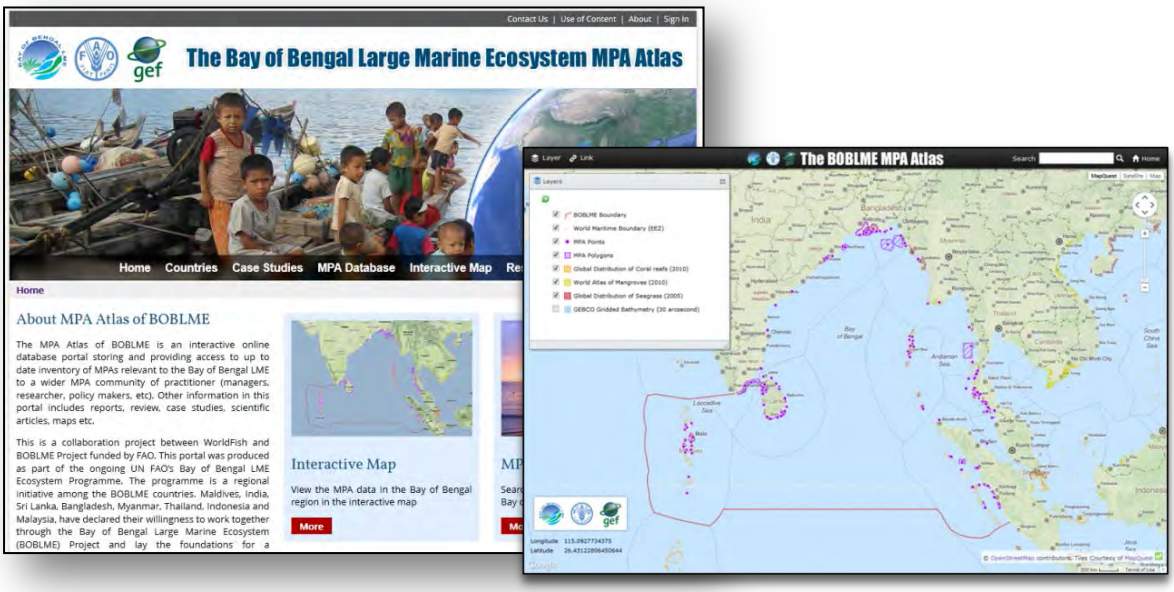
The MPA (Marine Protected Area) Atlas of the Bay of Bengal Large Marine Ecosystem (BOBLME)

Final report prepared for the provision of services relating to developing interactive online database portal on MPAs relevant to the Bay of Bengal

Terms of Agreement LOA/RAP/2013/11

by WorldFish

July 2014



http://boblme.reefbase.org

Bangladesh India Indonesia Malaysia Maldives Myanmar Sri Lanka Thailand

Authors

Teoh Shwu Jiau (Project Leader)

Nurulhuda Ahmad Fatan

Stanley Tan See Lay

Jason Jon Benedict

Douglas Beare

This report describes the process and details of developing interactive online database portal on Marine Protected Areas (MPAs) relevant to the Bay of Bengal. The report was prepared for the provision of services between FAO and WorldFish (LOA/RAP/2013/11).

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EXECUTIVE SUMMARY

The use of the World Wide Web as a primary information network is rising, and the number of users accessing the Web is increasing. Websites are also a quicker, easier and more cost-effective to update with the latest information. The Bay of Bengal Large Marine Ecosystem Marine Protected Area (MPA) Atlas website (http://boblme.reefbase.org) was created by WorldFish in Penang. It is an information system, and database portal storing information MPAs relevant to the Bay of Bengal region. The website is Public Access. The objective of the website is to provide access to the latest information on MPAs relevant to the Bay of Bengal region to a wider community of marine scientists, managers, and conservationists. The main features of the website are the BOBLME MPA database and online, geospatial interactive maps with multiple data layers including MPAs, important habitats such as coral reefs, the BOBLME boundaries and bathymetry. The website was also designed with a user friendly interface and searchable features for straightforward navigation.

1.0 INTRODUCTION

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

The BOBLME project component 3.2 "*Marine Protected Areas in the conservation of regional fish stocks*" works toward obtaining consensus on approaches to the establishment and management of marine protected areas and fish refugia for sustainable management and biodiversity conservation objectives. In the BOBLME 2012 annual work plan states BOBLME contributes to existing databases on MPAs (UNEP-WCMC, SACEP, WorldFish ReefBase and ICRI).

The BOBLME network has already completed a study on "Status of Marine Protected Areas and Fish Refugia in the Bay of Bengal Large Marine Ecosystem"[1]. The findings were discussed at a regional validation workshop held in Penang Malaysia on 18th and 19th January 2011, wherein one major recommendation was to establish a BOBLME Marine Protected Area (MPA) Learning Network to facilitate communications among MPA practitioners and help in the diffusion of innovative practices.

To date, WorldFish already maintains a range of online databases, e.g. FishBase, TrawlBase, ReefBase, and the Coral Triangle Atlas. ReefBase is internationally recognized as the global information system on coral reefs, see http://blogs.discovermagazine.com/citizen-science-salon/2014/07/11/reefbase/. ReefBase has over 20 years experience in database development in support of coral reef research and management. The databases comprise an advanced system for cross-referenced data and information, designed to assist policy makers, managers, researchers and

[1] BOBLME (2011) Status of Marine Protected Areas and Fish Refugia in the Bay of Bengal Large Marine Ecosystem. BOBLME-2011-Ecology-10. http://www.boblme.org/documentRepository/BOBLME-2011-Ecology-10.pdf.

educators with an interest in coral reefs and relevant ecosystems. It also houses an interactive mapping system (GIS), with updated datasets on marine protected areas, coral bleaching incidents, monitoring sites and etc.

In the above context, WorldFish was contracted to create an interactive online database portal for the BOBLME project. Thus, WorldFish has created the BOBLME MPA Atlas (http://boblme.reefbase.org) to provide access to up-to-date information on MPAs relevant to the Bay of Bengal – to a wider MPA community of practitioners (managers, researchers, policy makers etc.). Information will include MPA literatures (reports, reviews and scientific articles), data, and maps etc. Data outputs are in the form of tables, maps and geospatial information.

2.0 OBJECTIVE AND MAJOR OUTPUTS/OUTCOMES

The objective of this project is to develop an online database portal storing and providing access to up-to-date information on MPAs relevant to the Bay of Bengal. The online portal has incorporated the following features:

- online interactive maps with multiple data layers
- downloadable MPA data and publications
- rapid data search capabilities to find data of interest
- user friendly interface and navigation.

WorldFish also organized and facilitated a two day BOBLME Marine Protected Area (MPA) Working Group meeting, subsequently assisting in the preparation of the meeting report. The objective of the meeting was to build a network of MPA managers in the region and ensure that the data in the database were as reliable and up-to-date as possible.

The overall outcome will be an improvement in knowledge management for the governance of MPAs in the Bay of Bengal and capacity building for the MPA managers in the BOBLME countries.

3.0 PROJECT ACTIVITIES AND DELIVERABLES

To address the objectives above, the project incorporated these principal activities below:

- collation of available MPA data and information (e.g. from the BOBLME MPA review and associated GIS information derived from WorldFish and other regional sources)
- development of the MPA Atlas on the WorldFish web platform
- organize and facilitate a two day BOBLME Marine Protected Area (MPA) Working Group Meeting in Penang
- validate and update the MPA database.

3.1 Collation of available MPA data and information

The status of marine protected areas (MPAs) in the Bay of Bengal was revisited in order to compile the most recent and up-to-date MPA information for the region. The backbone of the latest MPA data compilation was based on the report of "Status of Marine Protected Areas and Fish Refugia in the Bay of Bengal Large Marine Ecosystem"[2]. However, with the assumption that the data in the report were already out of date, more recent data from 2011 to the present was sourced from the Coral Triangle Atlas[3]; particularly for Indonesia and Malaysia which are member countries of both the Coral Triangle Initiative (CTI) and BOBLME regional initiative. Data for all countries were cross-checked with the World Database on Protected Areas (WDPA)[4] and various secondary sources, including published reports, government reports and scientific articles.

The sources of the MPAs for each country in summary are as follows:

- **Bangladesh**: MoEF (2013), Banglapedia (2013) & WDPA (2013);
- **India**: Singh (2003), WDPA (2013), Burke et al. (2011) & MoEF (2013);
- **Indonesia**: CT Atlas (2013), KKJI (2013) & UPMSI et al. (2002);
- **Malaysia**: CT Atlas (2013), DMPM (2012) & UPMSI et al. (2002);
- **Maldives**: EPA (2013);
- **Myanmar**: UPMSI *et al*. (2002) & WDPA (2013);
- **Sri Lanka**: RAMSAR (2011) & WDPA (2013);
- **Thailand**: Phongsuwan (2012) & WDPA (2013)

This collation allows us to compile the most recent list of MPAs in the BOBLME region. These data were used to populate the website of the MPA Atlas in the first instance as a kind of 'strawman' in anticipation of the BOBLME MPA Working Group at which participants would be encouraged to comment and validate the layers uploaded. The detail report on the collation of the MPAs data and maps for each country is available in **Appendix 1.**

3.2 Development of the MPA Atlas on the WorldFish web platform

The development of the MPA Atlas on the WorldFish web platform consisted of:

- Designing the MPA Atlas website interface
- Developing the data visualization tool and testing
- Populating the online database with MPA layer and information
- Documenting the interactive online database portal
- Ongoing management and maintenance of the portal

[2] BOBLME (2011) Status of Marine Protected Areas and Fish Refugia in the Bay of Bengal Large Marine Ecosystem. BOBLME-2011-Ecology-10. http://www.boblme.org/documentRepository/BOBLME-2011-Ecology-10.pdf.
[3] The Coral Triangle Atlas http://ctatlas.reefbase.org/
[4] World Database on Protected Area (WDPA). 2013. http://www.protectedplanet.net/ last accessed 2013

The website was designed to effectively communicate the MPA information to the wider public. The MPA website is hosted by ReefBase (http://reefbase.org) in a 'cloud' computing service provided by Amazon Elastic Compute Cloud (Amazon EC2) (http://aws.amazon.com/ec2).

Figure 1 illustrates the overall interaction between clients and server through network technology to describe the framework of web application and back end database server.

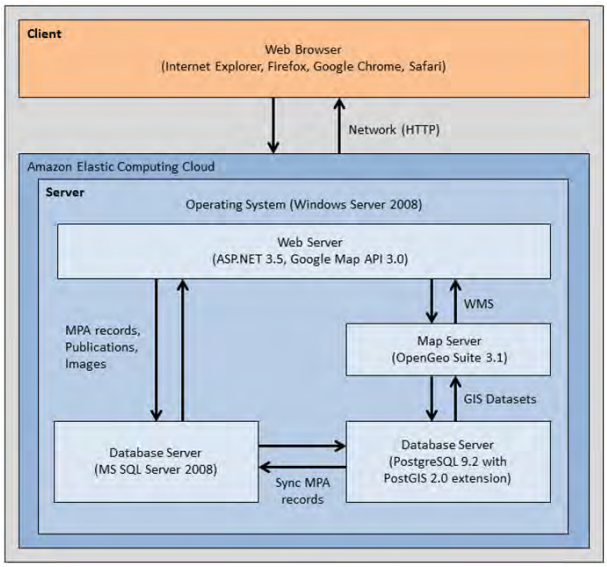


Figure 1. The architecture of the web-based BOBLME MPA Atlas

The website (http://boblme.reefbase.org) contains a list of pages (a sitemap) which provides relevant information pertaining to the BOBLME project, and the MPAs in all eight countries. Figure 2 shows the sitemap of the BOBLME MPA Atlas, which consists of six modules namely, *Home, Countries, Case Studies, MPA Database, Interactive Map* and *Resources*.

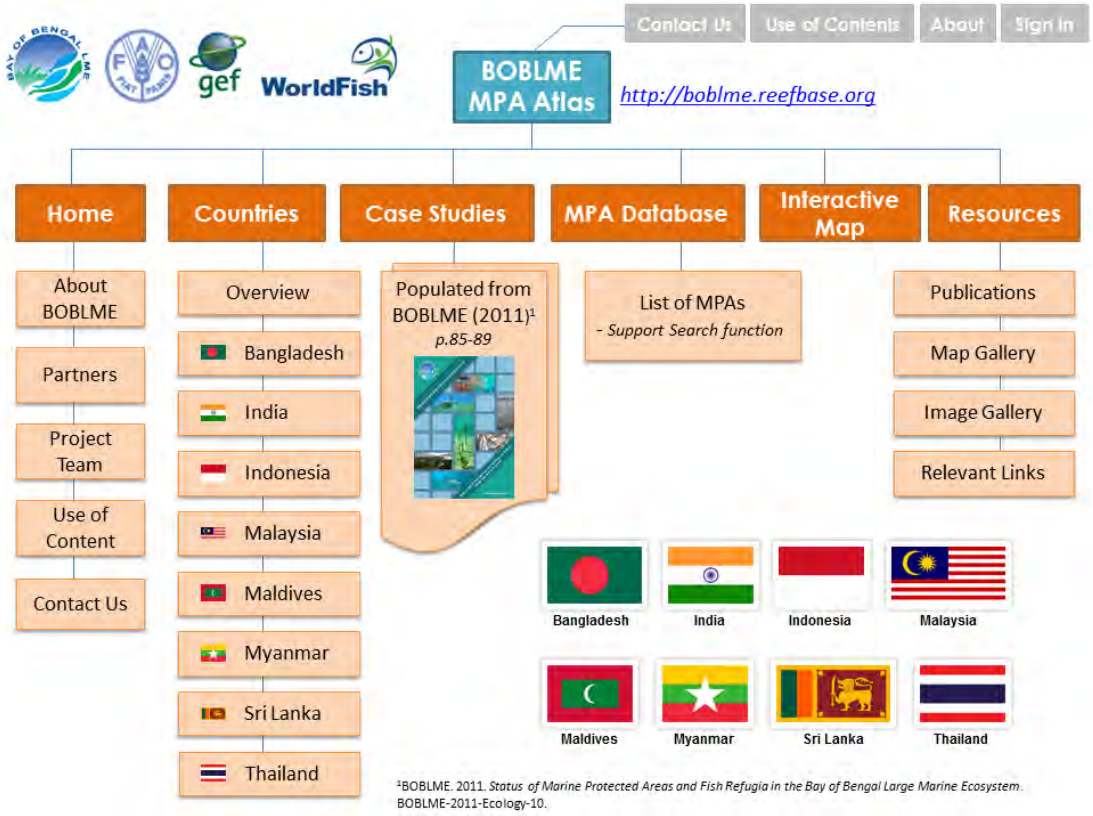


Figure 2. The sitemap of the BOBLME MPA Atlas

The website is completely open to public access; anyone can view and download the MPA datasets in Excel format without any authentication. We also identified a Focal Person from the BOBLME network responsible for the MPA data for their country. For their convenience WorldFish created *Administrator* accounts which have privileges allowing them to upload new data layers and edit existing ones. Each country *Administrator,* who was identified during the MPA Working Group Meeting on February 2014 in Penang, has a separate login name and password provided by WorldFish through email.

The *home* page of this website is divided into a number of sections and contains a brief introduction about the MPA Atlas and the project. The header at the top of the page contains quick links to; *"Contact Us", "Use of Content", "About",* and also *"Sign In"* features for any of the *Administrators* (country focal MPA people). The logos of donors, BOBLME's partners and the flags of the BOBLME countries are also shown on the page. Figure 3 illustrates the home page of the website.

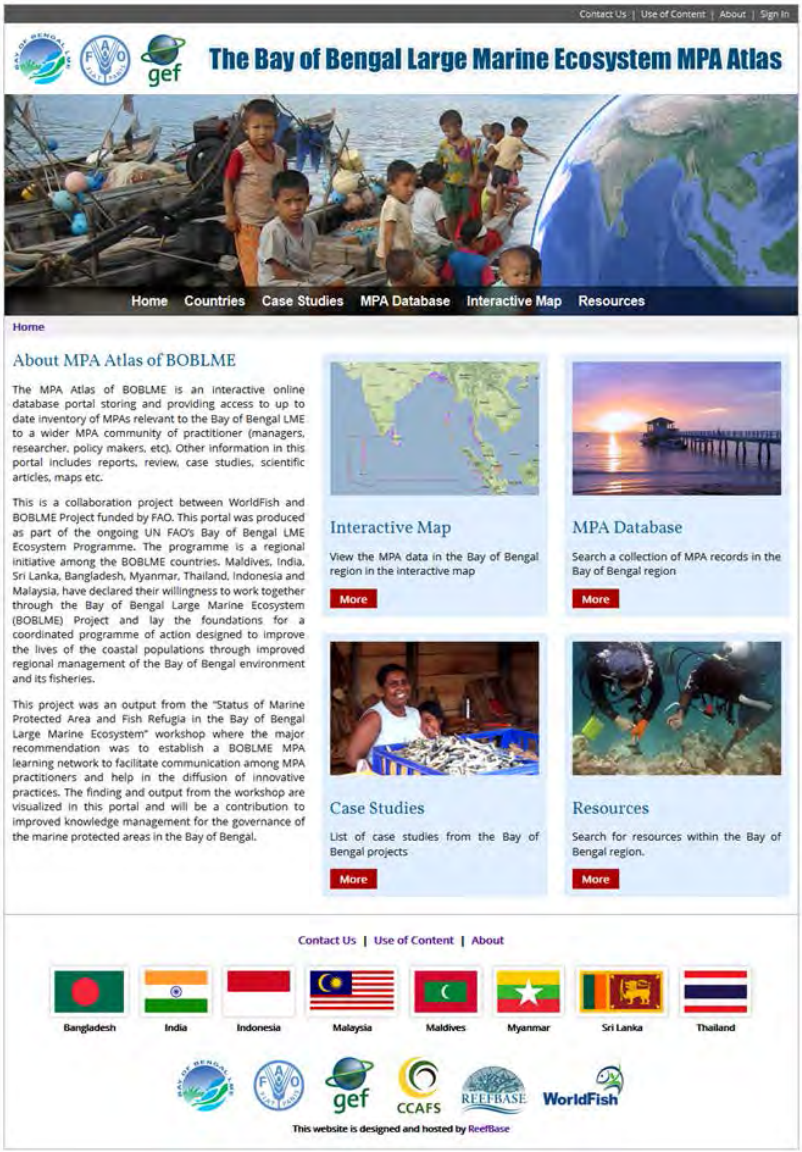
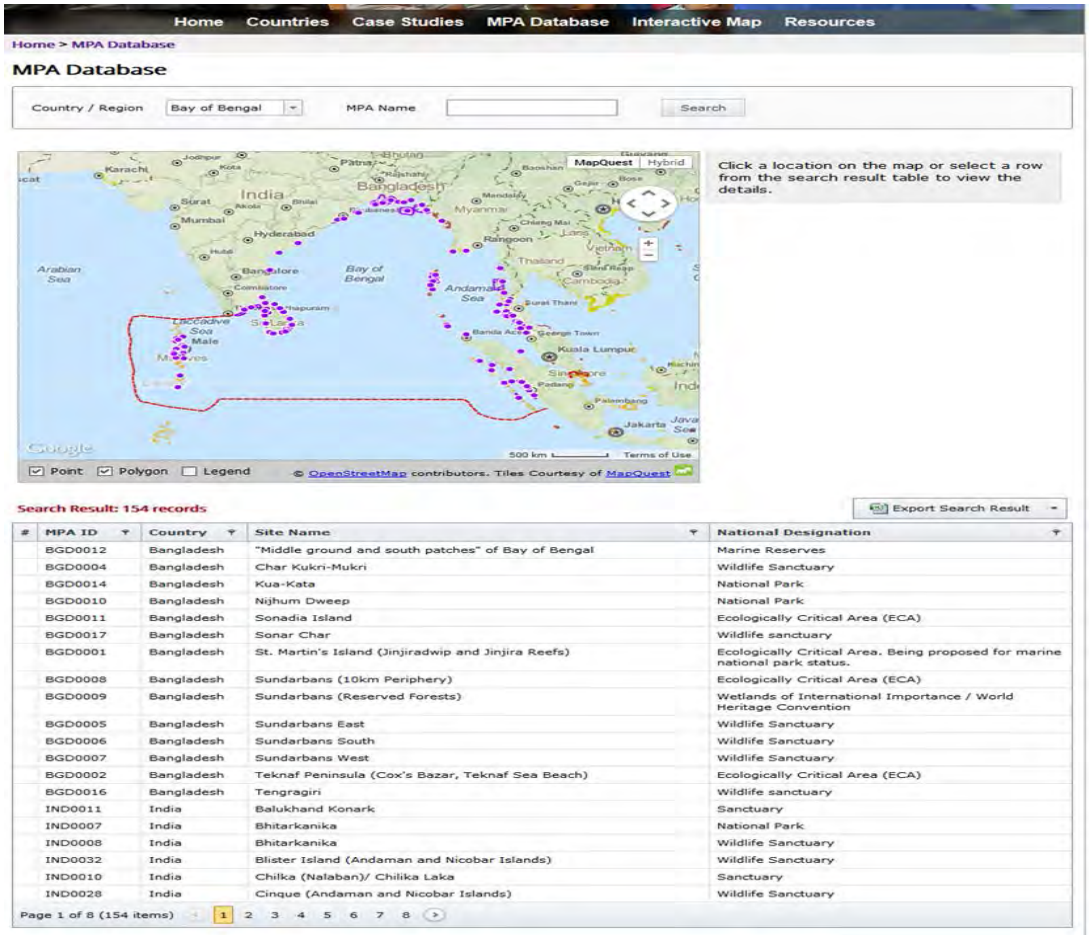


Figure 3. The Home page of the BOBLME MPA Atlas

The most important feature of the website is *MPA database* module. The module was designed to store all the MPA data information and users can also update the information online. Figure 4 shows the *MPA database* module which combines the search function, the small embedded interactive map, and returned search results in a single page. The *MPA database* can be accessed through:

- MPA Page: http://boblme.reefbase.org/mpadatabase.aspx
- Online Interactive Map: http://boblme.reefbase.org/map/default.aspx?layers=70,69,66,27,24,28,67



#	MPA ID	Country	Site Name	National Designation
	BGD0012	Bangladesh	"Middle ground and south patches" of Bay of Bengal	Marine Reserves
	BGD0004	Bangladesh	Char Kukri-Mukri	Wildlife Sanctuary
	BGD0014	Bangladesh	Kua-Kata	National Park
	BGD0010	Bangladesh	Nijhum Dweep	National Park
	BGD0011	Bangladesh	Sonadia Island	Ecologically Critical Area (ECA)
	BGD0017	Bangladesh	Sonar Char	Wildlife sanctuary
	BGD0001	Bangladesh	St. Martin's Island (Jinjiradwip and Jinjira Reefs)	Ecologically Critical Area. Being proposed for marine national park status.
	BGD0008	Bangladesh	Sundarbans (10km Periphery)	Ecologically Critical Area (ECA)
	BGD0009	Bangladesh	Sundarbans (Reserved Forests)	Wetlands of International Importance / World Heritage Convention
	BGD0005	Bangladesh	Sundarbans East	Wildlife Sanctuary
	BGD0006	Bangladesh	Sundarbans South	Wildlife Sanctuary
	BGD0007	Bangladesh	Sundarbans West	Wildlife Sanctuary
	BGD0002	Bangladesh	Teknaf Peninsula (Cox's Bazar, Teknaf Sea Beach)	Ecologically Critical Area (ECA)
	BGD0016	Bangladesh	Tengragiri	Wildlife sanctuary
	IND0011	India	Balukhand Konark	Sanctuary
	IND0007	India	Bhitarkanika	National Park
	IND0008	India	Bhitarkanika	Wildlife Sanctuary
	IND0032	India	Blister Island (Andaman and Nicobar Islands)	Wildlife Sanctuary
	IND0010	India	Chilka (Nalaban)/ Chilika Laka	Sanctuary
	IND0028	India	Cinque (Andaman and Nicobar Islands)	Wildlife Sanctuary

Page 1 of 8 (154 items) 1 2 3 4 5 6 7 8

Figure 4. MPA database module

The *Interactive map* module is a web based map that allows users to zoom in or zoom out of an area of interest to visualize the MPA data that has clickable points. When clicked, these MPA points reveal an information box that describes what is known about the MPA. The user can access the module by clicking on the *interactive map* menu on the *home* page. Alternatively the user can directly type the following address (http://boblme.reefbase.org/map/) into his or her web browser.

The map is defaulted to display the extent of the eight BOBLME countries surrounding the Bay of Bengal. The map also shows the other relevant layers such as MPAs, habitats (mangroves, sea grass and coral reefs), Economic Exclusive Zones (EEZ) and the bathymetry (Figure 5).

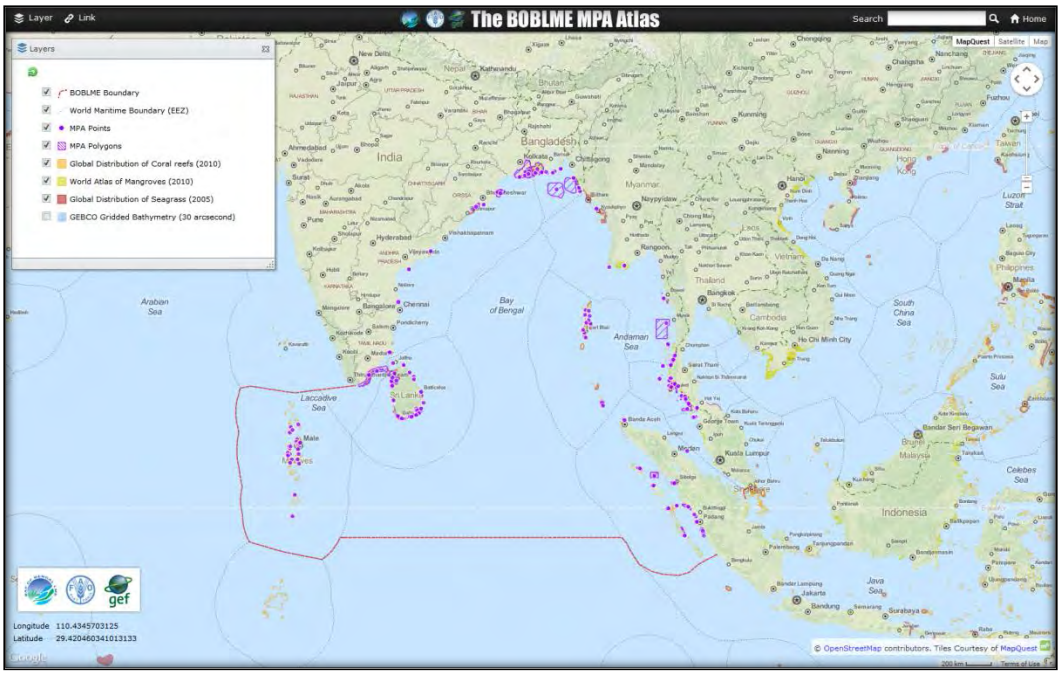


Figure 5. Interface of interactive online map in BOBLME MPA Atlas

The detailed development process of the BOBLME MPA Atlas website, documentation of the website interface and MPA database can be found in **Appendix 2**.

3.3 BOBLME Marine Protected Areas (MPA) working group meeting

WorldFish organized and hosted the BOBLME MPA Working Group Meeting. The meeting was held on 11-12 February 2014, in Penang, Malaysia. It was attended by MPA experts and practitioners from the eight BOBLME countries, i.e. Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand, and included participants from the WorldFish BOBLME project team, IUCN Bangladesh, Flora and Fauna International and a facilitator from Malaysia.

The main objectives of the workshop were as follows:

- to undertake a review and update the MPA data and information posted on the web portal (http://boblme.reefbase.org/mpadatabase.aspx) and the 'status paper'. In particular this requires validation and additional information on MPA locations and information relating to their initial gazetting.
- to finalize the MPA Policy Briefs for each country along the same lines of the brochure developed for Thailand. This requires that prospective participants have drafted and validated relevant summarized text for their respective country, following the Thailand sample.
- to discuss, develop and recommend a future course of action and policy directions for sustainable management of MPAs for fisheries and biodiversity conservation, both from country and trans-boundary perspectives.

The Working Group Meeting also noted the progress made to date in the implementation of pilot activities on MPAs and deliberated on the application of MPA Management Effectiveness Assessment Tools (MPA MEAT).

The key outputs expected from the workshop were to:

- Validate and complete data and information for inclusion in the MPA data base and status paper
- Prepare final drafts of the BOBLME MPA Country Policy Briefs
- To update information on the progress and status of MPA pilot site interventions
- To disseminate information on MPA Management Effectiveness Assessments
- To recommend capacity development and other potential project interventions from both country and trans-boundary perspectives

During the workshop, WorldFish requested country delegates to provide a contact person for help in validating and updating the MPA database. The list of country focal persons is as below:

Country	Full name	E-mail Address
Bangladesh	Mr Quazi Sarwar Imtiaz Hashmi	*quazihashmi@gmail.com*
India	Dr P U Zachariah	*zachariapu@yahoo.com*
Indonesia	Mr Suraji	*suraji_a@yahoo.com*
Malaysia	Mr Abd. Muntalib Juli	*muntalib@nre.gov.my*
Maldives	Mr Rifath Naeem	*rifath.naeem@epa.gov.mv*
Myanmar	U S. Julius Kyaw/ Mya Than Tun	*irnp.dof@gmail.com*
Sri Lanka	Dr Vasantha Pahalawattaarachchi	*vasalanka@gmail.com*
Thailand	Mr Ronawon Boonprakob	*ronawon@hotmail.com*

The report of the workshop can be found in **Appendix 3**.

3.4 Validate and update the MPA database

During compilation of the list of MPAs, initial efforts focused on the collection of major information characterizing the MPAs (attributes) and point-source information on location in geographic coordinates (longitude and latitude). This work then continued throughout the next phase searching maps for any boundary information to delineate the MPAs. GIS layers of polygons were created to present this boundary information. The project aims to collect polygon data as much as possible so the true spatial extent of MPAs can be assessed. Only by knowing this information can the actual extent of habitats under protection be gauged.

The MPA information gathered from all the secondary data was carefully evaluated to ensure its accuracy and reliability. Therefore, the list and maps of MPAs that were presented to the BOBLME MPA Working Group meeting in February in Penang were thoroughly checked by each country expert. Some countries pointed out discrepancies in the data, such as newly established MPAs and corrected some attributes or metadata during the meeting. The WorldFish Team collected this important feedback and updated the database accordingly.

Following up the MPA Working Group Meeting, WorldFish emailed each country's focal MPA representative the dedicated *Administrator* log-in account and password so they could review the online database after the changes were made. This secure log-in allows each country representative to update the information in MPA database directly. The country representative was also supplied with a User Guide **(Appendix 4)**, which illustrates how to update, add new, or exclude MPA data. Similarly, copies of the User Guide can be downloaded from the website after signing in (Figure 6).

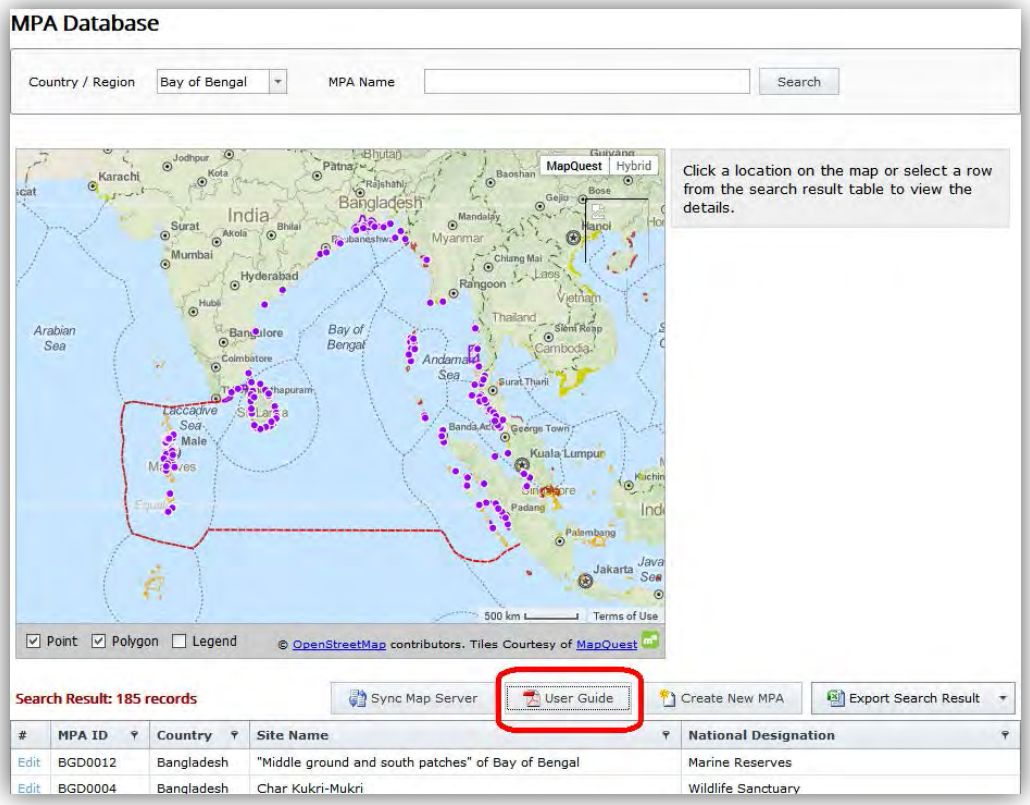


Figure 6. User Guide link in MPA database page

There were, however, no responses from the first round of emails circulated in April 2014. Later, a second reminder email was sent to each BOBLME national coordinator in mid-June 2014. The email stated that, if no feedback was received by the 10th of July 2014, WorldFish would assume that the MPA database hosted at the BOBLME Atlas website was the latest available, accurately reflecting the countries' MPA status. Maldives, Myanmar, Bangladesh and Indonesia all provided feedback to confirm the accuracy of the database and we heard no news from the other four BOBLME countries. The latest version of the MPAs, hosted in the current MPA Atlas website can be found in **Appendix 5**.

The latest MPA database shows that the number of MPAs has been increasing compared to the BOBLME (2011)[5]. This is due to the establishment of some new MPAs after the report was accomplished, i.e. Indonesia, Malaysia, Maldives and Sri Lanka. Figure 7 shows the comparison of

[5] BOBLME (2011) Status of Marine Protected Areas and Fish Refugia in the Bay of Bengal Large Marine Ecosystem. BOBLME-2011-Ecology-10. http://www.boblme.org/documentRepository/BOBLME-2011-Ecology-10.pdf.

numbers of MPAs from a compilation in the BOBLME (2011) report and the most recent compilation by WorldFish in 2014. Two MPAs were lost from Thailand as no information could be found on these despite an intensive literature search. For Bangladesh and India the number of MPAs remained the same.

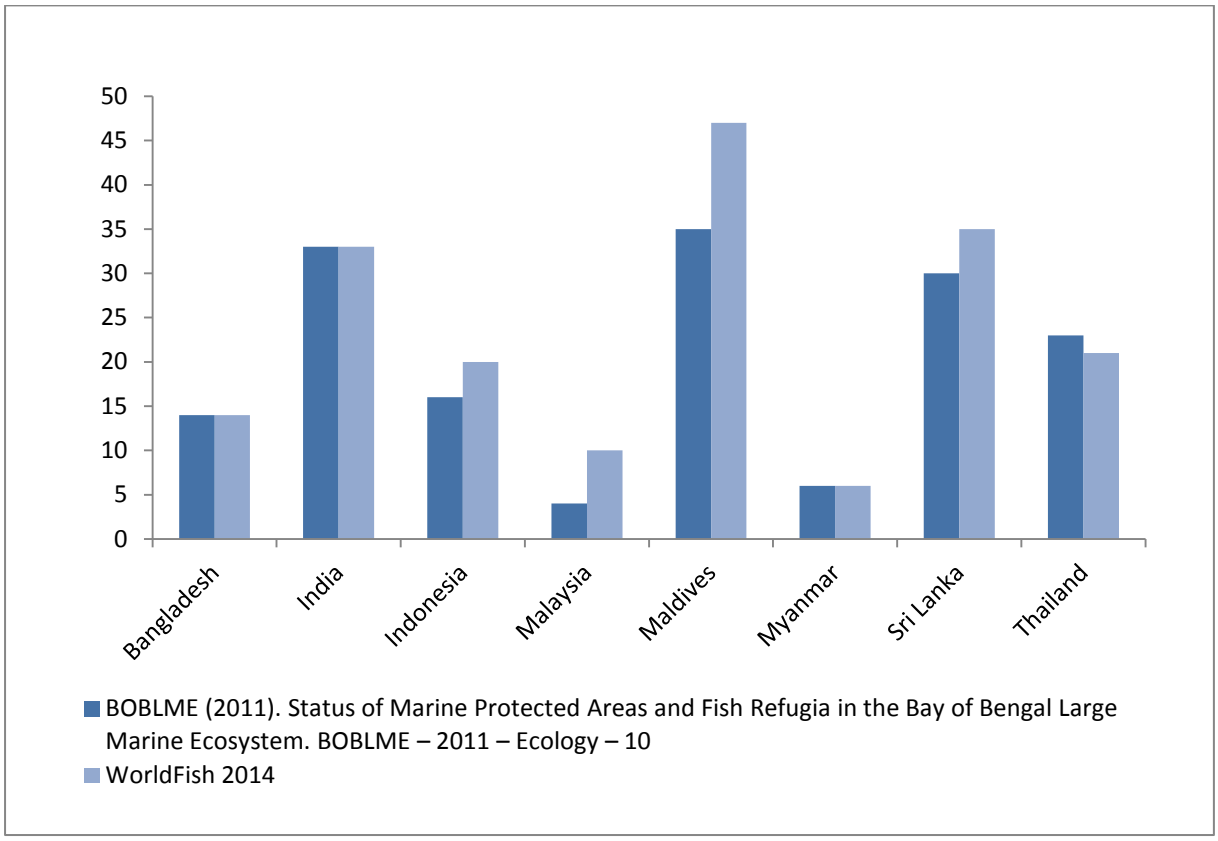


Figure 7. Comparing the number of MPAs in the BOBLME region according to reports published in 2011 and 2014

With regard to the MPA polygon data, there are still some gaps. The MPAs without polygons have to be presented in the interactive map using 'point' features only. It would be great if we could get more detailed information on these 'point' MPAs. Figure 8 shows the current status of polygon data that have been collected.

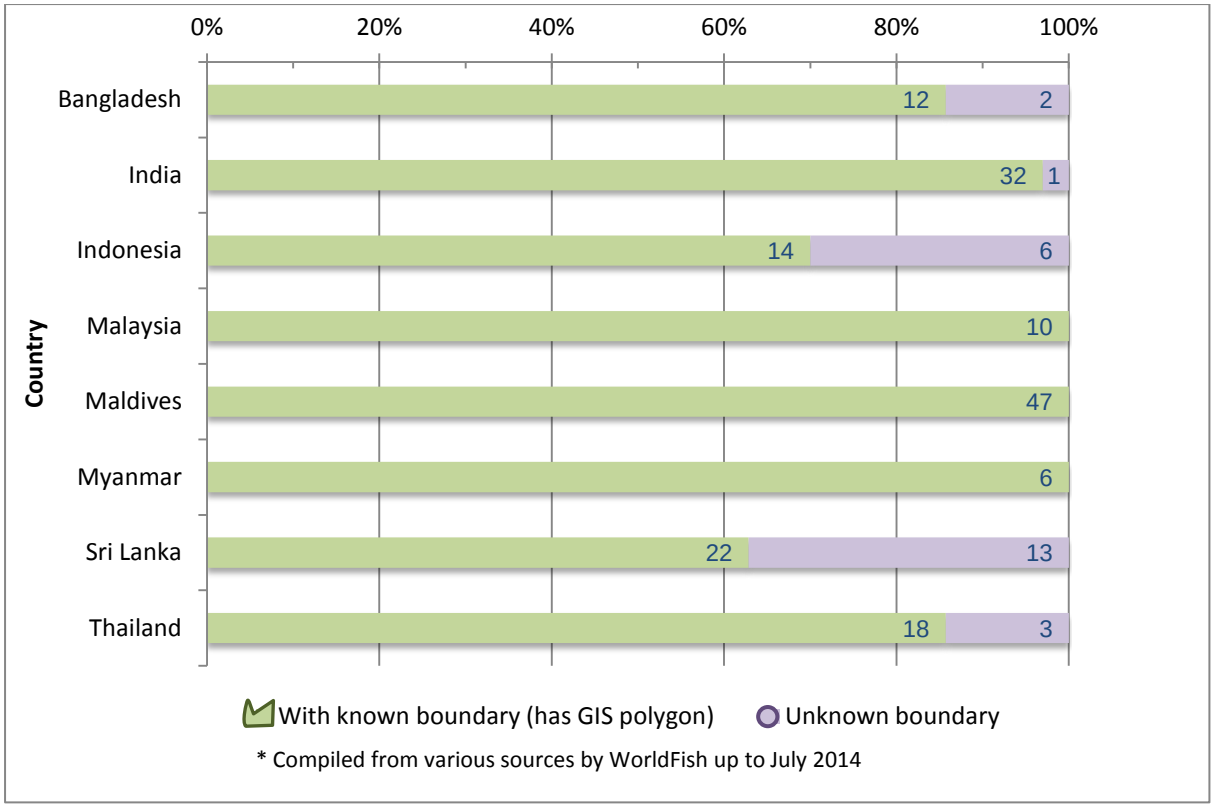


Figure 8. The status of data collection for MPAs with known boundaries

4.0 CONCLUSIONS

The biggest challenges in developing any online database portal are to: (i) make sure it works well; (ii) that the data are accurate, up-to-date; and (iii) to make it useful for sharing information with users. Throughout the project duration, WorldFish faced barriers to getting the MPA data validated. After the BOBLME Working Group Meeting, the Country Representatives were not very responsive to the review process and to verifying the data online through the *Administrator* account as provided by WorldFish. Only four countries' representatives responded to our requests to confirm the accuracy of the MPA datasets. This lack of feedback forced the WorldFish Team to make some unilateral decisions, having to assume that all the data were correct and indeed reflected their countries' MPAs in the Bay of Bengal. The process instigated is clearly sub-optimal, and will lead to inaccuracies.

A sustainable website requires ongoing maintenance so it can attract, educate and provide information to the user. To maintain a website, it must be constantly updated and filled with new content. This requires a lot of input and time. Another constraint is that the cost of hosting websites is expensive. The BOBLME MPA Atlas is currently hosted by ReefBase. We believe that it is essential to make certain that the portal is functioning, and accessible to the public, beyond the project duration. ReefBase will contribute to sustaining the BOBLME website as long as its funding continues. Any further development, ongoing updates of the MPA database may be retarded due to lack of funding.

Appendix 1:

The MPAs in the BOBLME

Marine Protected Areas in the Bay of Bengal Large Marine Ecosystem (BOBLME)

Report prepared for the provision of services relating to developing interactive online database portal on MPAs relevant to the Bay of Bengal

Terms of Agreement LOA/RAP/2013/11

by WorldFish

October 2013

http://boblme.reefbase.org

Bangladesh India Indonesia Malaysia Maldives Myanmar Sri Lanka Thailand

Table of Contents

Figures

Tables

1.0 Introduction

Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand are working together through the Bay of Bengal Large Marine Ecosystem (BOBLME) Project 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.

BOBLME has completed a study on "Status of Marine Protected Areas and Fish Refugia in the Bay of Bengal Large Marine Ecosystem". The findings were discussed in a regional validation workshop held in Penang Malaysia on 18th and 19th January 2011, wherein one major recommendation was establishing a BOBLME Marine Protected Area (MPA) learning network to facilitate communications among MPA practitioners and help in the diffusion of innovative practices.

In the above context it was proposed to create an interactive online database portal storing, and providing access to up-to-date information on MPAs relevant to the Bay of Bengal – to a wider MPA community of practitioners (managers, researchers, policy makers etc.). Information will include MPA literature (reports, reviews, and scientific articles), data, and maps etc. It will contain links to other MPA portals (e.g. WDPA, ReefBase, etc). Data outputs will take the form of tables, maps and geospatial information.

WorldFish Penang, Malaysia was contracted to develop and maintain the MPA database for the BOBLME database portal. To date, WorldFish already maintains a range of online databases, e.g. FishBase, TrawlBase, ReefBase, and the Coral Triangle Atlas.

2.0 Project activities

2.1 Collation of MPA data and MPA Shapefile

The BOBLME region encompasses the larger Bay of Bengal which is among those considered to be a 'large marine ecosystem', a concept developed by the National Oceanic and Atmospheric Administration of the US (Figure 1). The Bay of Bengal Large Marine Ecosystem (BOB LME) area is rich in biodiversity and natural resources and is extremely important for supporting the livelihoods of the its coastal communities. Over 400 million people in the Bay of Bengal area are dependent on coastal and marine resources for their food, livelihood and food. The rapid increase in human population growth, coastal development and urbanisation has resulted in habitat degradation, and the overexploitation of resources such as fish stocks. This phenomenon has led to considerable uncertainty relating to whether the ecosystem will be able to support the livelihoods of the coastal populations in the future.

In this report we summarize information on the status of marine protected area (MPA) in the Bay of Bengal Large Marine Ecosystem (BOBLME). The backbone of the data collated, and presented here were compiled during the recent project on "Status of Marine Protected Areas and Fish Refugia in the Bay of Bengal Large Marine Ecosystem". Feedback on these data was also received from country

representative during a regional MPA validation workshop held in Penang Malaysia between 18th and 19th January 2011.

Country profiles are also provided in this report which give general overview of the country, including its natural resources, the status of its MPAs, and issues around their legislation and governance. The GIS maps and lists of MPAs are presented together with the country profile.

The list of MPAs in this report was developed using the MPA data from the previous project described above. This list was reviewed with the assumption that the data will already be out of date. In order to update, and complete the gaps in the available data, the WorldFish team searched for new information from different sources including published reports, government websites and the scientific literature.

There are many difficulties involved in this process: there are limited published data on MPAs in BOBLME countries, publications and reports quickly become out-of-date, and therefore inaccurate. We also have to deal with contradictory information from the multifarious sources available. In order to make sure that the MPA list that is compiled is as accurate as possible, validation of the MPA data we collect needs to be done by respective country agencies; a process which is on going and will realistically never stop.

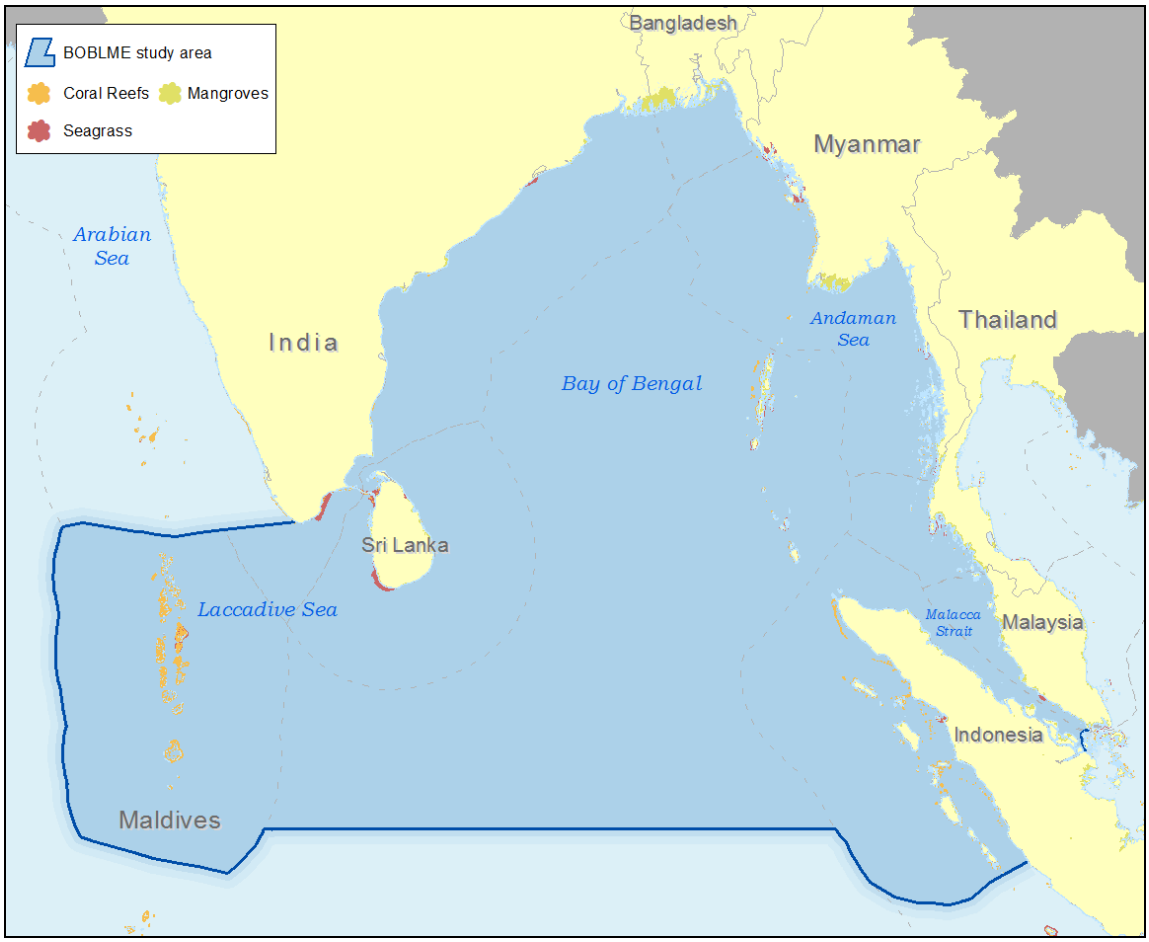


Figure 1. The Bay of Bengal Large Marine Ecosystem (BOBLME).

3.0 Country Profiles

3.1 Bangladesh

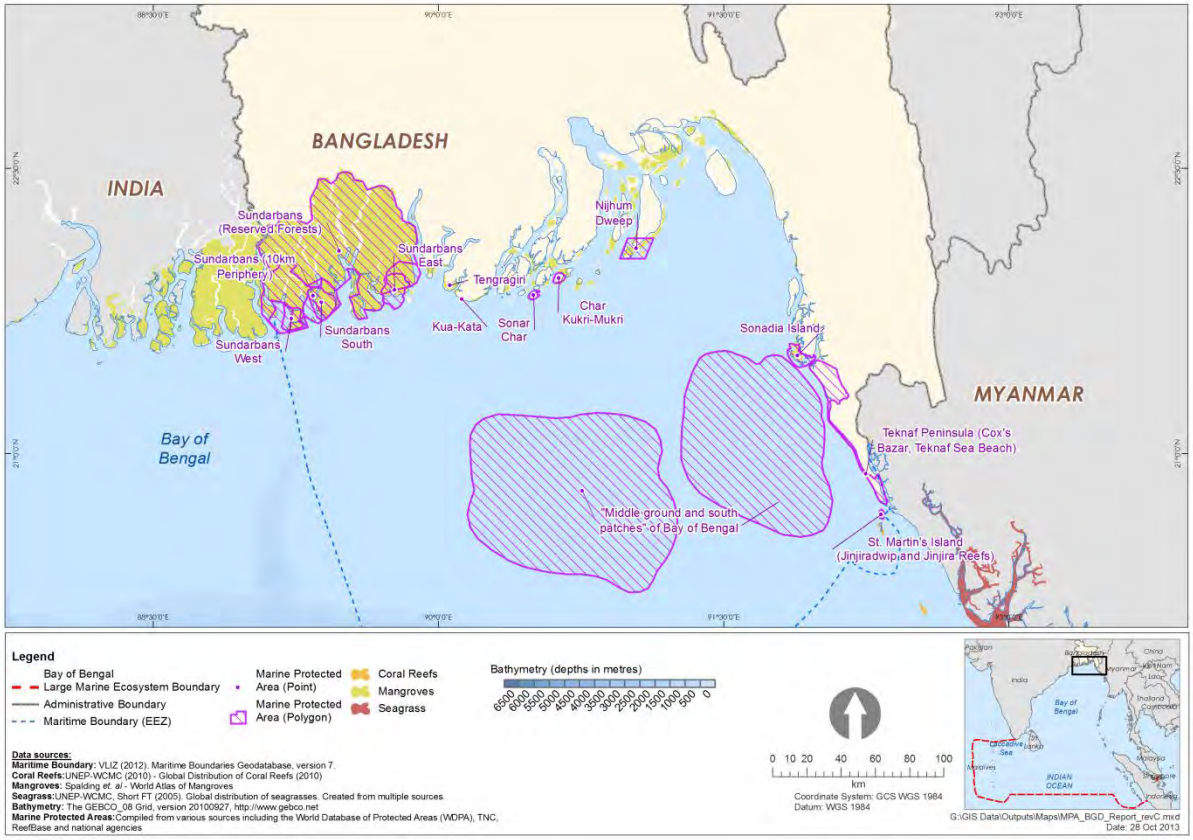


Figure 2. Distribution of MPAs in the Exclusive Economic Zone of Bangladesh.

Country Overview

Bangladesh situated in the North eastern part of South Asia. It lies in the active delta of three major rivers Brahmaputra, Ganges, and Meghna, and their numerous tributaries flowing to the Bay of Bengal. The country covers an area of 1, 47,570 km^2 and is bounded by India from the West, North and East, while Myanmar lies on the South Eastern edge. Bangladesh's coastline has 710 kms on the Bay of Bengal, stretching from the South-West corner of the Sundarban Mangrove Forest (SMF) to Cheradip on St. Martin's Island in the South-East.

Bangladesh has the largest single mangrove ecosystem in the world, the Sundarbans, which stretches across the country's south western border into India (Ifkethar, 2009). Sundarban is the largest mangrove wetland in the world. It covers an area of about 1 million ha, of which 60% is located in Bangladesh and the remaining western portion, comprising 40%, lies in India (Rahman and Assaduzzaman, 2010). It has been actively managed for more than a century. This area is one of the biologically most productive regions in the world, and houses the most significant nursery grounds for many commercially important marine species in the Bay of Bengal (Haque, 2003).

The fisheries sector is extremely important for supporting livelihoods in Bangladesh contributing 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).

MPAs in Bangladesh

The majority of the areas under conservation management in Bangladesh are actually protecting its important mangrove ecosystems, although some fishing grounds are also protected. Protected Area designations in Bangladesh include Wildlife Sanctuaries, National Parks and Game Reserves (MoEF, 2013). Their definitions are included in the Bangladesh Wildlife (Preservation) Order, 1973 (henceforth Wildlife Order). 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. At present, WorldFish has compiled 14 identified marine protected areas in Bangladesh. Figure 2 shows the distribution of the MPAs in Bangladesh and a detailed list of MPAs is compiled in Table 1 (BOBLME, 2011; IRG 2012).

Wildlife Sanctuaries are defined as areas closed to hunting, shooting or trapping of wild animals and are declared by the government as undisturbed breeding grounds, primarily for the protection of wildlife inclusive of all natural resources such as vegetation soil and water. National Parks are comparatively large areas of outstanding scenic and natural beauty. Their primary objective is the protection and preservation of scenery, flora and fauna in the natural state, to which access for public recreation and education and research may be allowed. Game Reserves area is gazetted by the government for the protection of wildlife, increasing the populations of important species. The capture of any wild animals in Game Reserves is unlawful.

Bangladesh is also creating 'hilsa closed seasons' in especially productive fishing grounds; e.g. the 'Middle Ground' and 'South Patch' areas (Hussain 2009; Hossain 2004).

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, 2013). 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.

Table 1. List of MPAs in Bangladesh.

No	Site Name	Longitude	Latitude	National Designation	International Status	Established Year	Total Area (km^2)	IUCN Category	Habitat Types	Has Polygon
1	"Middle ground and south patches" of Bay of Bengal	90.76	20.80	Marine Reserves		2000				√
2	Char Kukri-Mukri	90.63	21.92	Wildlife Sanctuary		1981	0.4	IV	Coastal mangrove habitat	√
3	Kua-Kata	90.12	21.81	National Park		2006	56.61		Mangrove forest	X
4	Nijhum Dweep	91.04	22.08	National Park		2001	163.52	Unset	Coastal mangrove	√
5	Sonadia Island	91.89	21.52	Ecologically Critical Area (ECA)		1999	49.16		Offshore barrier island, sand dunes and mangrove habitat	√
6	Sonar Char	90.50	21.83	Wildlife sanctuary		2011	2.027		Mangroves	√
7	St. Martin's Island (Jinjiradwip and Jinjira Reefs)	92.33	20.68	Ecologically Critical Area. Being proposed for marine national park status.		1999	5.9	Unset	Coral reef habitat, habitat for wildfowl and turtle nesting site	√
8	Sundarbans (10km Periphery)	89.34	21.83	Ecologically Critical Area (ECA)		1999			Mangrove habitat	√
9	Sundarbans (Reserved Forests)	89.48	22.07	Wetlands of International Importance / World Heritage Convention	Ramsar Site	1992	6017		Mangrove habitat	√
10	Sundarbans East	89.77	21.86	Wildlife Sanctuary	World Heritage Site and Ramsar Site	1960	312.26	IV	Mangrove forest.	√
11	Sundarbans South	89.38	21.79	Wildlife Sanctuary	World Heritage Site and Ramsar Site	1996	369.7	IV	Mangrove forest.	√
12	Sundarbans West	89.23	21.71	Wildlife Sanctuary	World Heritage Site and Ramsar Site	1996	715.02	IV	Mangrove forest.	√
13	Teknaf Peninsula (Cox's Bazar, Teknaf Sea Beach)	92.17	21.08	Ecologically Critical Area (ECA)		1999	104.65	Unset	Sandy beach	√
14	Tengragiri	90.06	21.88	Wildlife sanctuary		2010	4.05		Mangrove	X

Sources: BOBLME 2011, MoEF 2013, Banglapedia, WDPA 2013

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3.2 India

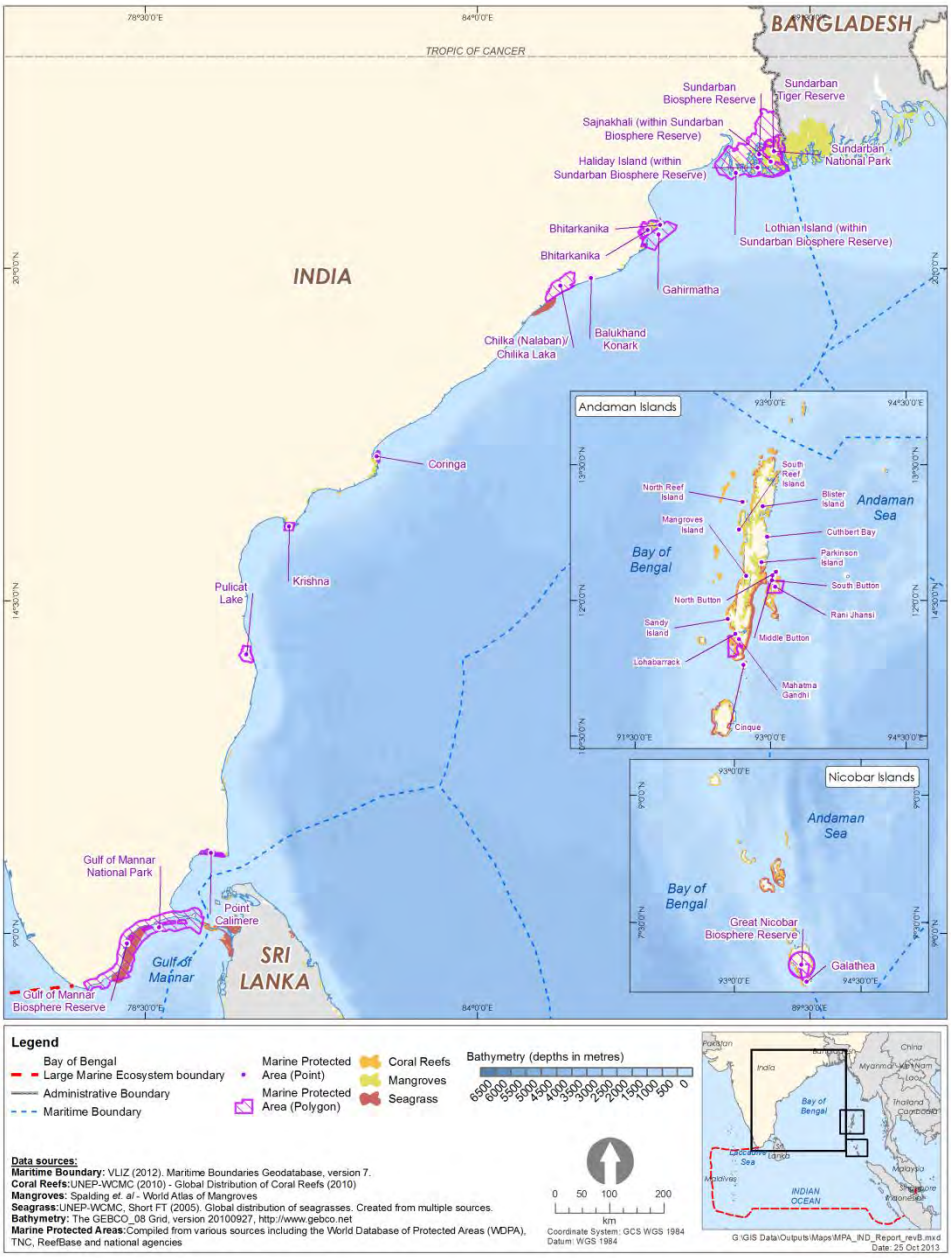

Figure 3. Distribution of MPAs in India.

Country Overview

The Indian mainland stretches from 8°4' to 37°6' N latitude and from 68°7' to 97°25' E longitude. India is the seventh-largest country by area in the world, and the second-most populous country with over 1.2 billion people. India neighbours with Tibet, the Republic of China, Nepal, Bhutan, Pakistan and Burma. The Southern peninsula extends into the tropical waters of the Indian Ocean with the Bay of Bengal lying to the south-east and the Arabian Sea to the south-west. The sea around India is part of the great Indian Ocean, and the Indian subcontinent forms a major physical division between the Arabian Sea and the Bay of Bengal of the Indian Ocean. The Bay of Bengal LME

extends from the northern coastal state of West Bengal to the country's southernmost point. Several major rivers discharge into the Bay of Bengal along the coastline, including the Ganges, Brahmaputra, Mahanadi, Godavari, Krishna and Cauvery (Sampath, 2003).

India has a coastline of 8,118 km, of which 4,645 km is part of the Bay of Bengal LME (Sampath 2003). India has a wide range of ecosystem types, including mangroves, creeks, tidal flats, mud flats and coral reefs. Coral reefs spread over an area of 7,392 km^2 within the country's territorial waters, and which represents about 2.6% of the world total. Thirty-two percent of these are within the Bay of Bengal area (BOBLME, 2012). It is worth noting that the Andaman and Nicobar Islands alone provide 88% of the coral reefs of India (BOBLME, 2012).

Total fish production by India is about 7.85 million tonnes, out of which marine capture fisheries contribute 3.32 million tonnes: a sector that provides nutrition and livelihoods for at least 40 million people (Salim and Narayanakumar, 2012).

MPAs in India

The marine protected area network in India has been used as a tool for managing natural marine resources for biodiversity conservation, and for the well - being of people dependent on them. The government first began formally setting aside marine areas for conservation purposes for the protection of wetland and bird migrating in 1967, despite the lack of clear legislation.

Marine protected areas in India have been officially declared for: (i) conserving and protecting either critical ecosystems or species; and (ii) for maintaining coastal and marine biodiversity. To date, however, they have not yet been established as tools for fisheries management (Rajagopalan, 2008). Figure 3 shows the distribution of marine protected area in India while they are listed in Table 2 (BOBLME, 2011).

According to the Constitution of India, both the State and Central governments have the power to legislate on the subject of forests and the protection of wild animals. India has designated the main Central legislation relevant for the designation of PAs, as national parks, wildlife sanctuaries, community reserves, conservation reserves and tiger reserves. It is the Wild Life (Protection) Act, 1972 (WLPA 1972) as amended in 2002 and 2006.

At the national level, the Ministry of Environment and Forests 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. The Coast Guard (under the Department of Defence) enforces many of the regulations in marine parks and sanctuaries.

The Departments of Fisheries (DoF) of the state governments also play a tangential role in MPA management by managing fisheries resources through the enactment of legislation and regulations. For instance, the DoF Orissa 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).

Table 2. List of MPAs in India.

No	Site Name	Longitude	Latitude	National Designation	International Status	Establishment Year	Total Area (km^2)	IUCN Category	Habitat Types	Has Polygon
1	Balukhand Konark	85.88	19.84	Sanctuary		1984	71.72	IV		√
2	Bhitarkanika	87.03	20.72	National Park		1988	145	II	Mangrove forest	√
3	Bhitarkanika	86.82	20.63	Wildlife Sanctuary		1975	672			√
4	Blister Island (Andaman and Nicobar Islands)	92.92	13.04	Wildlife Sanctuary		1987	0.26			√
5	Chilka (Nalaban)/ Chilika Laka	85.38	19.71	Sanctuary	Ramsar site	1987	15.53	IV	Brackish lake separated from the Bay of Bengal by a long sandy ridge and subject to sea water exchange	√
6	Cinque (Andaman and Nicobar Islands)	92.71	11.29	Wildlife Sanctuary		1987	9.51			√
7	Coringa	82.34	16.89	Sanctuary		1978	235.7	IV	Mangrove, delta, mudflats, sandy beaches	√
8	Cuthbert Bay (Andaman and Nicobar Islands)	92.97	12.70	Wildlife Sanctuary		1987	5.82			X
9	Gahirmatha	86.77	20.29	Marine Sanctuary		1997	1435		Mangrove forests, sandy beach, barrier island	√
10	Galathea (Andaman and Nicobar Islands)	93.86	6.80	Wildlife Sanctuary		1997	11.44			√
11	Great Nicobar Biosphere Reserve (Andaman and Nicobar Islands)	93.80	7.00	Biosphere Reserve		1989	885			√
12	Gulf of Mannar Biosphere Reserve	78.20	8.83	Biosphere Reserve		1989	10500		21 islands with estuaries, beaches, sea grasses, coral reefs, salt marshes and mangroves.	√
13	Gulf of Mannar National Park	78.73	9.10	National Park (core area of Biosphere Reserve)	UNESCO Biosphere Reserve	1986	560	Ib	21 islands with coral ecosystems, seagrass ecosystems, and mangrove ecosystems.	√
14	Haliday Island (within Sundarban Biosphere Reserve)	88.64	21.66	Sanctuary		1976	5.95	IV		√
15	Krishna	80.88	15.73	Wildlife Sanctuary		1999	194.81			√
16	Lohabarrack (Andaman and Nicobar Islands)	92.62	11.63	Wildlife Sanctuary		1987	100			√
17	Lothian Island (within Sundarban Biosphere Reserve)	88.28	21.58	Sanctuary		1976	38	IV		√
18	Mahatma Gandhi (Andaman and Nicobar Islands)	92.66	11.57	Marine National Park		1983	281.5	II	Mangrove, coral reef, beach, sand	√
19	Mangroves Island (Andaman and Nicobar Islands)	92.74	12.27	Wildlife Sanctuary		1987	0.39			√
20	Middle Button (Andaman and Nicobar Islands)	93.03	12.27	National Park		1987	0.64			√
21	North Button (Andaman and Nicobar Islands)	93.07	12.31	National Park		1987	0.44			√
22	North Reef Island (Andaman and Nicobar Islands)	92.70	13.09	Wildlife Sanctuary		1987	3.48			√
23	Parkinson Island (Andaman and Nicobar Islands)	92.91	12.42	Wildlife Sanctuary		1987	0.34			√

No	Site Name	Longitude	Latitude	National Designation	International Status	Establishment Year	Total Area (km^2)	IUCN Category	Habitat Types	Has Polygon
24	Point Calimere	79.59	10.33	Sanctuary	Ramsar site	1967	17.26	IV	Mangrove habitat, intertidal flats, sand bars, lagoons.	√
25	Pulicat Lake	80.17	13.61	Sanctuary		1980	153	IV		√
26	Rani Jhansi (Andaman and Nicobar Islands)	93.08	12.25	Marine National Park		1996	256.1	II	Coral reef	√
27	Sajnakhali (within Sundarban Biosphere Reserve)	88.86	21.76	Sanctuary		1976	362.4	IV		√
28	Sandy Island (Andaman and Nicobar Islands)	92.53	11.79	Wildlife Sanctuary		1977	1.58			√
29	South Button (Andaman and Nicobar Islands)	93.02	12.22	National Park		1987	0.03			√
30	South Reef Island (Andaman and Nicobar Islands)	92.66	12.78	Wildlife Sanctuary		1987	1.17			√
31	Sundarban Biosphere Reserve	88.67	21.88	Biosphere Reserve	UNESCO Biosphere Reserve	1989	9600		Largest (single) mangrove forest system in the world, 54 islands, tidal rivers, low-lying floodplain,	√
32	Sundarban National Park	88.91	21.93	National Park (Core area within Tiger Reserve)		1984	1330	Ia	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.	√
33	Sundarban Tiger Reserve	88.90	21.95	Tiger Reserve (within Biosphere Reserve)		1973	2585			√

Sources: BOBLME 2011, Singh 2003, WDPA 2013, Burke et al. 2011, MoEF 2013

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3.3 Indonesia

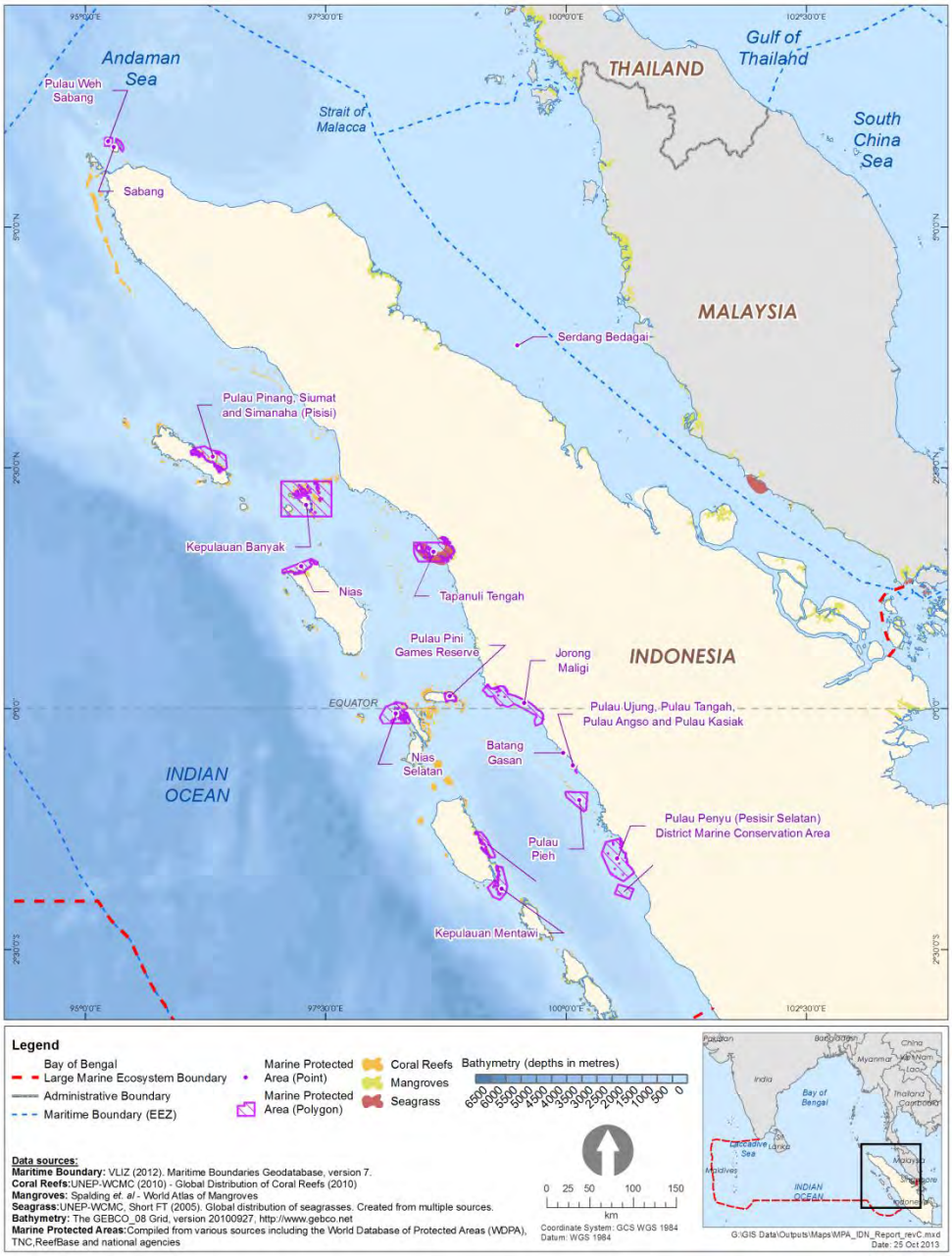

Figure 4. Distribution of MPAs in Indonesia within BOBLME.

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 also one of the most populated countries in the world. It supports the greatest collection of marine biodiversity anywhere on earth (Suharsono, 2005). The western island of Sumatra is the only part of Indonesia within the Bay of Bengal LME. 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. Sumatra is made up of about 100 islands and has approximately 1,400

kms 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.

The Indonesian part of the Bay of Bengal is one of the richest coastal/marine areas in the country. Various marine habitats, such as mangroves, seagrass beds, coral reefs and estuaries exist along the Straits of Malacca as well as on the west coast of Sumatra. Sumatra also has a relatively high concentration of mangrove forests. The total mangrove area in Indonesia has been estimated at around 3.80 to 4.25 million ha, of which around 0.38 million ha are located along the East Coast of Sumatra. Sumatera has also most diverse coral reef species in Indonesia (Brown, 2007). Most of the coral reef species are fringing reefs species and their abundance is highest on the Southern coasts of Sumatra. There are only a few patches of coral reefs in the Straits of Malacca, but these are nevertheless highly productive marine ecosystems, supporting a tremendous diversity of living organisms. There are very productive fisheries in the surrounding seas. Several numbers of marine plants and invertebrates are harvested from the reefs for human consumption.

MPAs in Indonesia

MPAs in Indonesia were first established in the 1970s with the declaration of several national marine parks. Since that time, numerous MPAs have been established, so that presently 108 MPAs exist together, covering more than 17 million ha of legally protected and managed marine habitat, waters and coastal areas. Indonesia is progressing toward the more recent commitment of establishing 20 million ha of MPAs by 2020.

In Indonesia, marine area protection is implemented in various legal forms, such as Marine Nature Tourism Park (Taman Wisata Perairan), Strict Marine Reserve (Suaka Perairan), Marine Sanctuary (Daerah Perlindungan Laut), Regional Marine Conservation Area (Kawasan Konservasi Laut Daerah), Coastal Reserve (Suaka Pesisir), Fisheries Reserve (Suaka Perikanan) and Marine National Parks (Taman Nasional Perairan).

In previous decades, the Government of Indonesia's Departments of Forestry and of Agriculture both had duties concerning MPAs, but in 2009, the responsibility for marine protected areas was assigned exclusively to the Ministry of Marine Affairs and Fisheries (KKJI, 2013).

There are 15 Marine protected areas located in Sumatra and which are also in the BOBLME area. Figure 4 shows the distribution of marine protected areas in Indonesia (BOBLME area) and Table 3 lists the marine protected areas, compiled by WorldFish from many different sources. These MPAs were established to conserve and protect marine and coastal biodiversity such as coral reefs; mangrove, sea grass and others threatened species.

According to the Government Regulation No. 60 of 2007 it is stated that Marine Protected Areas (MPA) are indeed marine protected areas, managed by zoning systems, to create sustainable fisheries resources and the environment. MPAs consist of Marine National Parks, Marine Nature Tourism Parks, Marine Wildlife Reserves, and Fisheries Reserves.

Table 3. List of MPAs in Sumatera Indonesia.

No	Site Name	Longitude	Latitude	National Designation	International Status	Established Year	Total Area (km^2)	IUCN Category	Habitat Types	Has Polygon
1	Batang Gasan	99.97	-0.46	District Marine Conservation Area		2010	0.684			√
2	Jorong Maligi	99.57	0.06	Local/District Marine Protected Area (KKLD)		2007	0.1	VI	Mangrove habitat	√
3	Kepulauan Banyak	97.30	2.11	Marine Nature Recreational Park		1996	2275	V	mangrove	√
4	Kepulauan Mentawi	99.33	-1.87	Local/District Marine Protected Area (KKLD)		2006	505.32	VI	Coral reefs and mangrove habitat	√
5	Nias	97.25	1.48	Local/District Marine Protected Area (KKLD)		2007	290		Tourism, fishery, coral reefs, mangrove habitat	√
6	Nias Selatan	98.23	-0.05	Local/District Marine Protected Area (KKLD)		2008	560		Tourism, fishery, coral reefs, mangrove habitat	√
7	Pulau Penyu (Pesisir Selatan) District Marine Conservation Area	100.54	-1.55	District Marine Conservation Area		2003	7.33	V		√
8	Pulau Pieh	100.14	-0.95	Marine Recreation Park		2000	399	V	Pieh Island, adjacent reefs. Coral reefs, ornamental fish, nyph swamp area, wetland	√
9	Pulau Pinang, Siumat and Simanaha (Pisisi)	96.33	2.62	Local/District Marine Protected Area (KKLD)		2006	500	VI	Coral reefs, mangroves, ornamental fish, protected fish species	√
10	Pulau Pini Games Reserve	98.79	0.13	Game Reserve		1996	83.5	VI		√
11	Pulau Ujung, Pulau Tangah, Pulau Angso and Pulau Kasiak	100.08	-0.59	Local/District Marine Protected Area (KKLD)		2006		VI	Coral reefs, marine biota, turtle species	√
12	Pulau Weh Sabang	95.24	5.89	Nature Recreation Park		1982	39	V	Mangrove, coral reef, ornamental fish, protected fish species	√
13	Sabang	95.30	5.83	Local/District Marine Protected Area (KKLD)		2010	32	VI		√
14	Serdang Bedagai	99.50	3.77	Local/District Marine Protected Area (KKLD)		2008	12.4		Coral reefs, turtle species	√
15	Tapanuli Tengah	98.63	1.63	Local/District Marine Protected Area (KKLD)		2007	812.43		Tourism, fishery, coral reefs, mangrove habitat	√

Sources: BOBLME 2011, CT Atlas 2013, KKJI 2013; UPMSI et al, 2002

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3.4 Malaysia

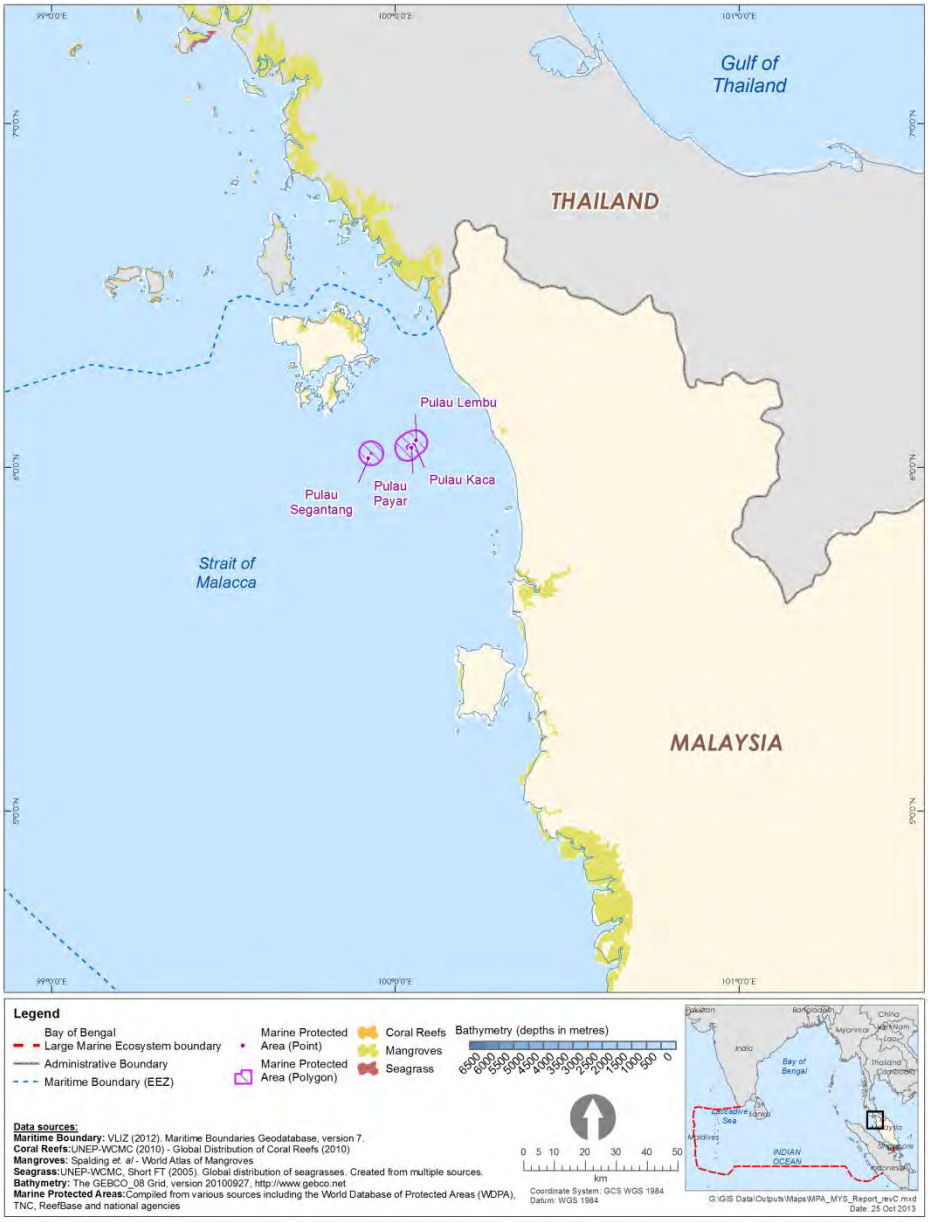

Figure 5. Distribution of MPAs in Malaysia within BOBLME

Country overview

Malaysia consists of thirteen states and three federal territories with a total land area of 329,847 square kilometres separated by the South China Sea into two main regions: Peninsular Malaysia and Malaysia Borneo namely, 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 1100 km from north to south, beginning at the Thai border and ending at the Malaysia-Singapore border (Omar et al., 2003).

MPAs in Malaysia

Malaysia's marine park system is relatively well developed and managed. MPAs in Malaysia were first established in 1983. In response to serious declines in marine resources, the government initially began declaring marine protected areas in order to enhance fisheries resources (DMPM, 2012). 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" (DMPM, 2012). Marine Parks in Malaysia are mainly administered by the Marine Park Department of Malaysia. However, there are also other types of protected area elsewhere in the country that protect the marine environment. These include five state parks in Sabah, and three marine parks in Sarawak.

Marine Parks in Kedah state is the only marine park within the boundary of BOBLME. This 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). Figure 5 shows the distribution of marine protected area in Malaysia and Table 4 lists the marine protected areas in Malaysia (BOBLME region). The area was declared a marine park in 1994 under the Fisheries Act 1985 (Amended 1991, DMPM, 2012). 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).

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, 2012). The act was amended in 1985, in part to allow for the conversion of 'fishery prohibited areas' into 'marine parks' (DMPM, 2012). The updated legislation also introduced more stringent, and comprehensive regulations govern these protected areas.

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 (DMPM, 2012). In 2004, the Marine Park Malaysia was moved to a different ministry with the creation of the Ministry of Natural Resources and Environment and given the responsibility for managing the federal marine parks throughout the country (DMPM 2012).

Table 4. List of MPAs in Malaysia within BOBLME boundary.

No	Site Name	Longitude	Latitude	National Designation	International Status	Establishment Year	Total Area (km^2)	IUCN Category	Habitat Types	Has Polygon
1	Pulau Kaca	100.06	6.07	Marine Park		1994	42.9	II	Surrounding marine habitat up to two nm from lowest watermark	√
2	Pulau Lembu	100.06	6.08	Marine Park		1994	46.13	II	Surrounding marine habitat up to two nm from lowest watermark	√
3	Pulau Payar	100.05	6.06	Marine Park		1994	54.91	II	Surrounding marine habitat up to two nm from lowest watermark	√
4	Pulau Segantang	99.92	6.03	Marine Park		1994	44.19	II	Surrounding marine habitat up to two nm from lowest watermark	√

Sources: BOBLME 2011, CT Atlas 2013, DMPM 2012; UPMSI et al, 2002

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3.5 Myanmar

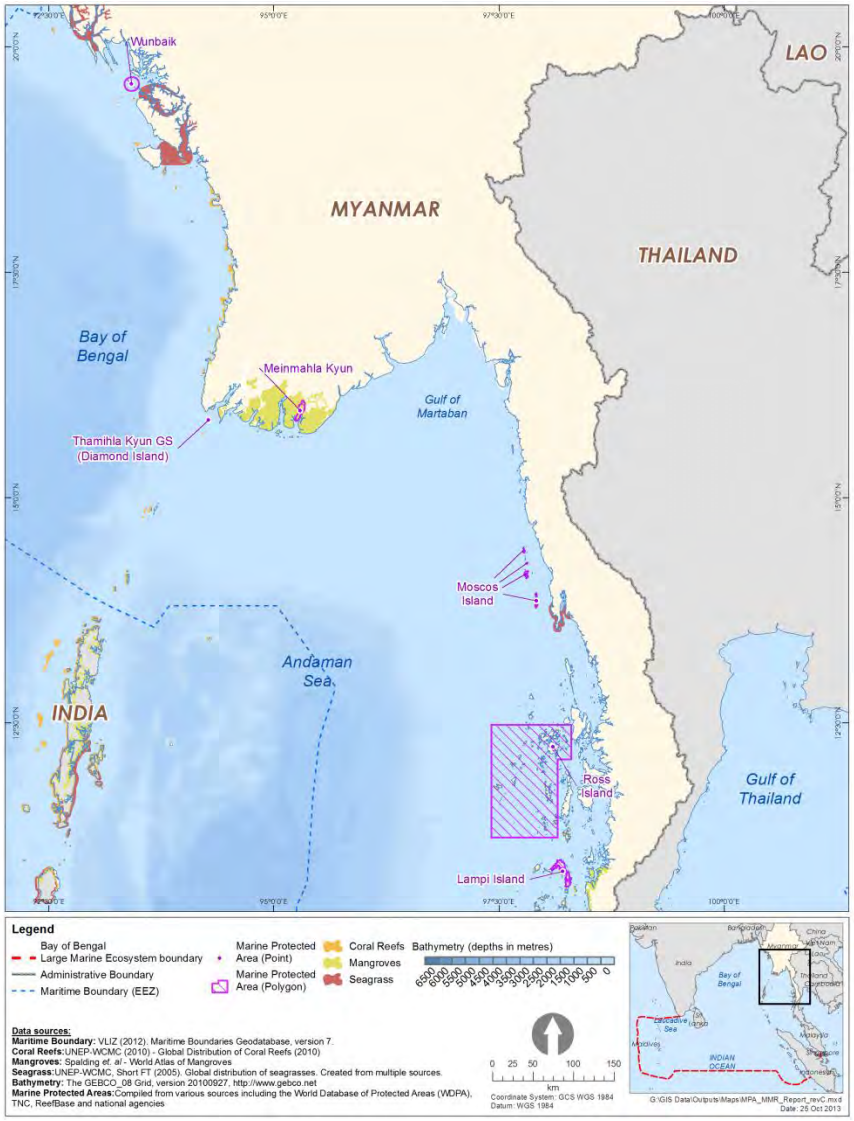

Figure 6. Distribution of MPAs in Myanmar

Country Overview

Myanmar is the largest country in mainland Southeast Asia and is located between China, India, and Thailand. To the West, along a 1,930 km coastline (CIA, 2013) is the Andaman Sea and the Bay of Bengal. The total area of Myanmar is 678,500 km^2 where 657,740 km^2 occupies the land and 20,760 km^2 occupies the water which provides critical spawning habitats, nursery grounds and feeding areas for marine and aquatic species (Myanmar CBD Report, 2009).

Myanmar has a rich coral reefs, seagrass beds and mangrove flourish, particularly around the Myeik archipelago. Estuaries and mud flats are common at the Ayeyarwady delta, while beach and dunes occur throughout the coastline.

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).

MPAs in Myanmar

The establishment of protected areas in Myanmar includes national parks, shark protection areas, wildlife sanctuaries and mangrove reserves. MPAs have been designed to protect Myanmar's biodiversity including coral reefs, mangroves, threatened species, and also to sustain the fisheries resources. Figure 6 show the distribution of MPAs in Myanmar and Table 5 lists them.

The first official marine conservation efforts in Myanmar started in 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 km^2, and was designated in order to protect turtle species and water birds.

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).

Table 5. List of MPA in Myanmar

No	Site Name	Longitude	Latitude	National Designation	International Status	Establishment Year	Total Area (km^2)	IUCN Category	Habitat Types	Has Polygon
1	Lampi Island	98.21	10.86	Marine National Park	ASEAN Heritage Park	1996	204.84	Ib	Mangrove habitat, coral reef (warm).	√
2	Meinmahla Kyun	95.30	15.97	Wildlife Sanctuary	ASEAN Heritage Park	1993	136.7	IV		√
3	Moscos Island	97.92	13.86	Wildlife Sanctuary		1927	49.24	IV	Mangrove, coral reef and evergreen forest.	√
4	Ross Island	98.10	12.24	Shark Protected Area					Shark refugia site.	√
5	Thamihla Kyun GS (Diamond Island)	94.28	15.86	Wildlife Sanctuary		1970	0.88	IV	Protected turtle habitat.	√
6	Wunbaik	93.42	19.59	Reserved Forest		1931	229.2		Mangrove habitat	√

Sources : BOBLME, 2011; UPMSI et al; 2002; WDPA 2013

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3.6 Sri Lanka

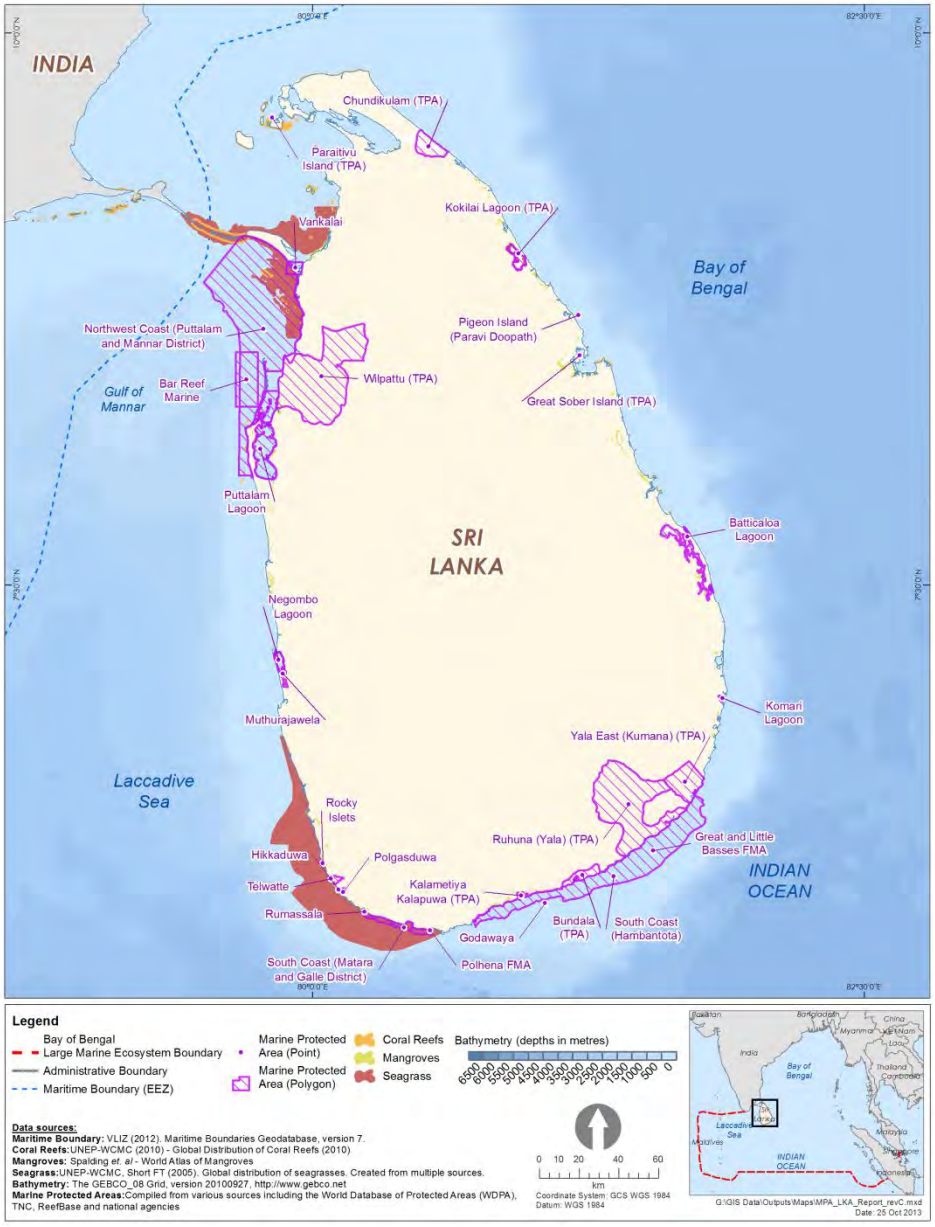

Figure 7. Distribution of MPAs in Sri Lanka

Country overview

The Republic of Sri Lanka is located 31km south of India, separated by a shallow sea, the Palk Strait. Sri Lanka and the Southern tip of India are on the same continental shelf. Sri Lanka has an area of approximately 65,610km^2 and a coastline of 1,620 km. 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, 2003). These habitats contain a rich component of the country's biodiversity. 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, et al. 2004). The south western coast is mostly characterized by rocky headlands, and is subject to strong winds and waves from the southwest monsoon. The eastern (and leeward side) of the country, by contrast, is characterized by fringing reefs (Rajasuriya, et al. 2004).

MPAs in Sri Lanka

Marine protected areas in Sri Lanka are designed as national park, marine sanctuaries and fishery management areas. MPAs have been established to manage the coastal zone, and to address coastal zone resource degradation. Most of Sri Lanka's MPAs are aimed at protecting biodiversity particularly on and around coral reefs, mangroves, and sea grass beds. Besides these marine protected areas the country also protects marine biodiversity through fishery-managed areas (FMAs), and certain terrestrial protected areas (TPAs) that also have marine components. Figure 7 shows the distribution of MPA sin Sri Lanka and Table 6 lists them.

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). 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).

Table 6. List of MPA in Sri Lanka

No	Site Name	Longitude	Latitude	National Designation	International Status	Establishment Year	Total Area (km2)	IUCN Category	Habitat Types	Has Polygon
1	Bar Reef Marine	79.70	8.43	Sanctuary (SAM Site)		1992	306.7	IV	Coral reef and sandstone reef. Sea grass habitats.	√
2	Batticaloa Lagoon	81.70	7.72	Fishery Managed Area		2001		VI		√
3	Bundala (TPA)	81.22	6.18	National Park	UNESCO MAB/Ramsar Site	1969	34.4	IV	Beach, sand dunes, coastal vegetation, coastal wetlands (subtital rocky reef adjacent to PA). Important site for migratory shorebirds.	√
4	Chundikulam (TPA)	80.53	9.49	Sanctuary		1938	111.49	IV	Lagoon system	√
5	Godawaya	81.05	6.06	Sanctuary		2006	2.26	IV		X
6	Great and Little Basses FMA	81.54	6.29	Fishery Managed Area		2001		VI	Rocky reefs	X
7	Great Sober Island (TPA)	81.21	8.54	Sanctuary		1963	0.647	IV	Coral reefs adjacent to PA	√
8	Hikkaduwa	80.12	6.12	National Park (SAM Site)		1978	0.44	IV	Coral reef (warm)	√
9	Kalametiya Kalapuwa (TPA)	80.95	6.09	Sanctuary		1984	25.25	IV	Lagoon, mangroves. Estuary and adjacent wetland/riverine environment	√
10	Kokilai Lagoon (TPA)	80.93	9.00	Sanctuary		1951	29.95	IV	Lagoon system and wetlands	√
11	Komari Lagoon	81.86	6.98	Fishery Managed Area		2010		VI		√
12	Muthurajawela	79.86	7.10	Sanctuary		1996	12.85	IV	Mangroves	√
13	Negombo Lagoon	79.85	7.16	Fishery Managed Area		1998		VI		√
14	Northwest Coast (Puttalam and Mannar District)	79.78	8.66	Fishery Managed Area		2010		VI		√

No	Site Name	Longitude	Latitude	National Designation	International Status	Establishment Year	Total Area (km2)	IUCN Category	Habitat Types	Has Polygon
15	Paraitivu Island (TPA)	79.82	9.62	Sanctuary		1973	0.18	IV	Subtital reefs adjacent to PA	X
16	Pigeon Island (Paravi Doopath)	81.21	8.72	National Park		1974	4.71	IV	Coral reef. Includes large and small Pigeon Islands and surrounding coral reefs	X
17	Polgasduwa	80.14	6.11	Sanctuary		1988	1.9	IV		√
18	Polhena FMA	80.53	5.93	Fishery Managed Area		2001			Coral reef	X
19	Puttalam Lagoon	79.76	8.11	Fishery Managed Area		2010		VI		√
20	Rocky Islets	80.05	6.24	Sanctuary		1940	0.012	IV	Coral reefs	X
21	Ruhuna (Yala) (TPA)	81.43	6.50	National Park		1938	73.28	II	Beach, sand dunes, coastal vegetation, coastal wetlands (subtital rocky reef adjacent to PA).	√
22	Rumassala	80.24	6.02	Marine Sanctuary		2003	17.07	IV	Coral reef	X
23	South Coast (Hambantota)	81.37	6.18	Fishery Managed Area		2010		VI		√
24	South Coast (Matara and Galle District)	80.42	5.94	Fishery Managed Area		2010		VI		√
25	Telwatte	80.08	6.17	Sanctuary		1938	14.25	IV		√
26	Vankalai	79.92	8.94	Sanctuary	Ramsar Site	2008	48.38	IV		√
27	Wilpattu (TPA)	80.04	8.44	National Park		1938	63.38	II	Beaches, cliff coast, coastal vegetation (sea grass beds adjacent to PA).	√
28	Yala East (Kumana) (TPA)	81.69	6.61	National Park		1970	25.12	II	Beach, sand dunes, coastal vegetation, coastal wetlands (subtital rocky reef adjacent to PA)	√

Sources: BOBLME 2011; RAMSAR 2011; WDPA 2013

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3.7 Thailand

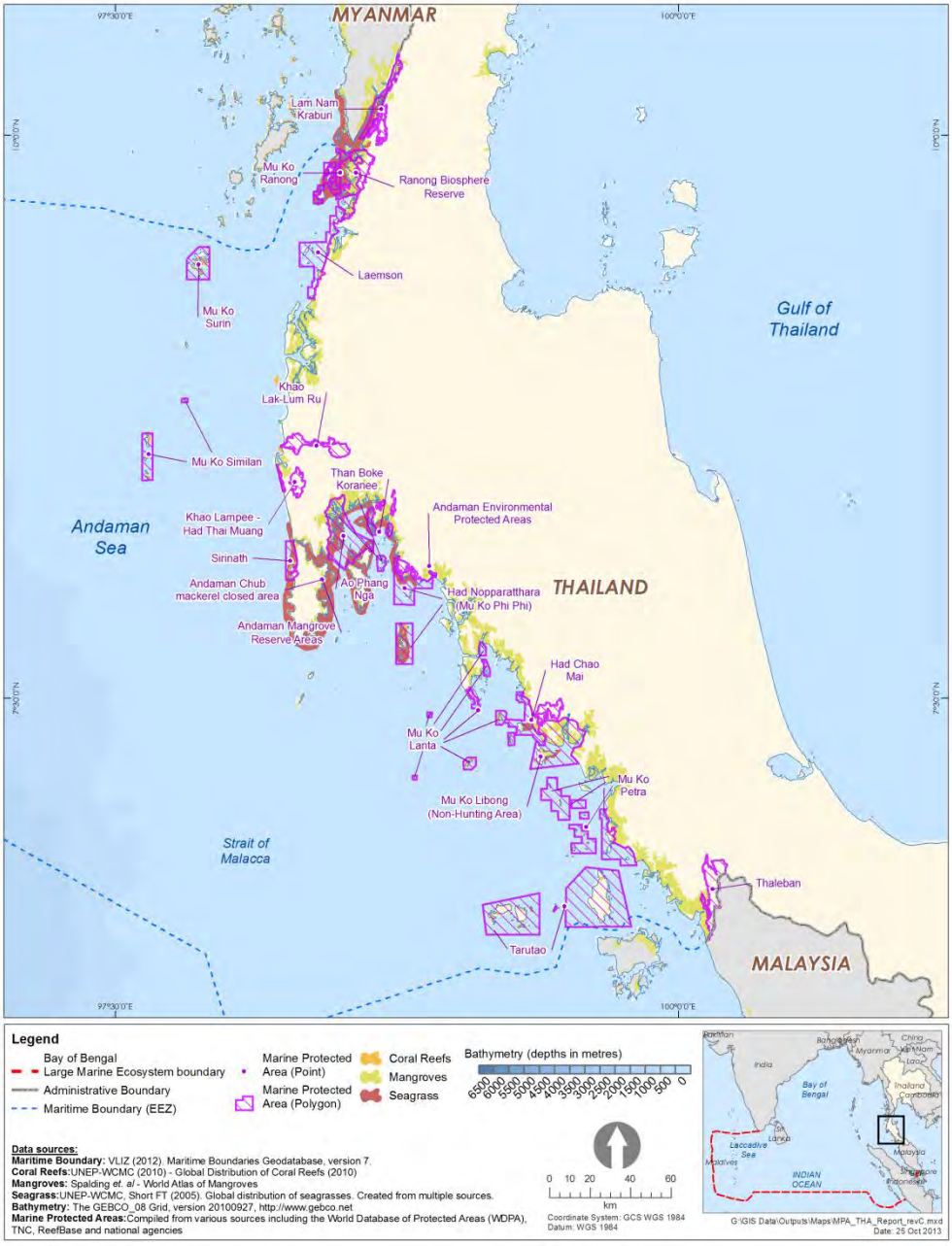

Figure 8. Distribution of MPAs in Thailand

Country overview

The Thai coastline in the BOBLME is along the Andaman Sea on the west of the peninsula and extends about 740 km from the border with Myanmar at the north and with Malaysia at the south and covers a marine area of 112,498.9 km^2. Predominant ecosystems along the coastline include mangrove forests, sea grass beds and fringing coral reefs (Juntarashote, 2003) There are approximately 400 hard coral species in Thai waters, and total coverage is estimated at 78km^2 along this coastline, of which 62% is under the protection of a marine park (Yeemin, 2005).

Mangrove coverage along the Andaman coastline is approximately 1,747.62 km^2, of which 50% is in the provinces of Phang-nga, Satun, Trang, Krabi and Ranong. Sea grass bed coverage is around 94.78 km^2, of which about 34% is within the boundaries of a marine park area. Eleven species (there are only 58 species worldwide) of sea grasses are found in the Andaman Sea.

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).

MPAs in Thailand

MPAs in Thailand are characterized by high biodiversity, and are considered as some of the best SCUBA dive sites in the world (ICEM, 2003). 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).

Other than these, some MPAs have also been designated, internationally, as Ramsar sites and UNESCO Biosphere Reserves (ICEM, 2003; BOBLME, 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, 2011). Figure 8 show the distribution of MPA in Thailand and Table 7 lists the compiled MPA in Thailand.

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. 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. These 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).

Table 7. List of MPA in Thailand.

No	Site Name	Longitude	Latitude	National Designation	International Status	Establishment Year	Total Area (km2)	IUCN Category	Habitat Types	Has Polygon
1	Andaman Chub mackerel closed area	98.42	8.03	Fisheries refugia (Phuket-Phangnga-Krabi-Trang)		2008	4386	IV	Closed area during fish spawning and breeding season (April 1 – June 30, every year)	X
2	Andaman Environmental Protected Areas	98.89	8.09	Environmental Protected Areas (Phuket, Phangnga, Krabi)			11674	VI	Set aside to prevent/reduce undesirable impacts of development activities (e.g. urban, industrial and tourism development)	X
3	Andaman Mangrove Reserve Areas	98.42	8.03	Mangrove reserved areas			1747.62			X
4	Ao Phang Nga	98.51	8.22	Marine National Park	ASEAN Heritage Park, Ramsar Site	1981	400	II	Mangrove, coral reef (warm)	√
5	Had Chao Mai	99.35	7.40	Marine National Park	Ramsar Site	1981	230.9	II	Mangrove, seagrass, coral reef (warm), beach. 1.29 km2 of coral reefs, wetland areas.	√
6	Had Nopparatthara (Mu Ko Phi Phi)	98.78	7.99	Marine National Park		1983	387.9	II	Mangrove, seagrass, coral reef (warm). 7.77 km2 of coral reef.	√
7	Khao Lak-Lum Ru	98.39	8.62	Marine National Park		1991	125	II	Beach	√
8	Khao Lampee - Had Thai Muang	98.30	8.46	Marine National Park	Undergoing nomination process to be Ramsar Site	1986	72	II	Beach, sea turtle nesting site, beach forest, mangrove	√
9	Laemson	98.40	9.48	Marine National Park	Ramsar Site	1983	315	II	Mangrove coral reef (warm),	√
10	Lam Nam Kraburi	98.68	10.12	Marine National Park		1999	160	II	Mangrove	√
11	Mu Ko Lanta	99.11	7.45	Marine National Park		1990	134	II	Mangrove, seagrass, coral reef (warm). 8.24 km2 of coral reefs.	√
12	Mu Ko Libong (Non-Hunting Area)	99.39	7.24	Non Hunting Area	Undergoing nomination process	1979	447.5	III	Island that is important bird nesting habitat.	√
13	Mu Ko Petra	99.59	6.93	Marine National Park		1984	494.4	II	Mangrove, coral reef (warm), beach. 4.77 km2 of coral reefs.	√
14	Mu Ko Ranong	98.50	9.83	Marine National Park		2010	365.7	II	Coral reef, beaches, swamp forest, islands, mangrove	√
15	Mu Ko Similan	97.65	8.58	Marine National Park	ASEAN Heritage Park	1982	140	II	Coral reef (warm), beach. 3.39 km2 of coral reefs.	√
16	Mu Ko Surin	97.87	9.43	Marine National Park	ASEAN Heritage Park	1981	135	II	Mangrove, seagrass, coral reef (warm), beach. 12.01 km2 of coral reefs.	√
17	Ranong Biosphere Reserve	98.57	9.83	UNESCO Biosphere Reserve	UNESCO Biosphere Reserve	1997	303.09	IV	Over 300 animal species and 24 mangrove species	√
18	Sirinath	98.28	8.11	Marine National Park		1981	90	II	Mangrove, coral reef (warm), beach. 2.06 km2 of coral reefs, wetland areas.	√
19	Tarutao	99.50	6.58	Marine National Park	ASEAN Heritage Park	1976	1490	II	Mangrove, coral reef (warm), beach. 12.58 km2 of coral reefs.	√
20	Thaleban	100.15	6.65	Marine National Park		1980	196	II	Beach, coral reefs.	√
21	Than Boke Koranee	98.67	8.24	Marine National Park		1998	104	II	Beach, coral reef.	√

Sources: BOBLME 2011; Phongsuwan 2012; WDPA 2013

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3.8 Maldives

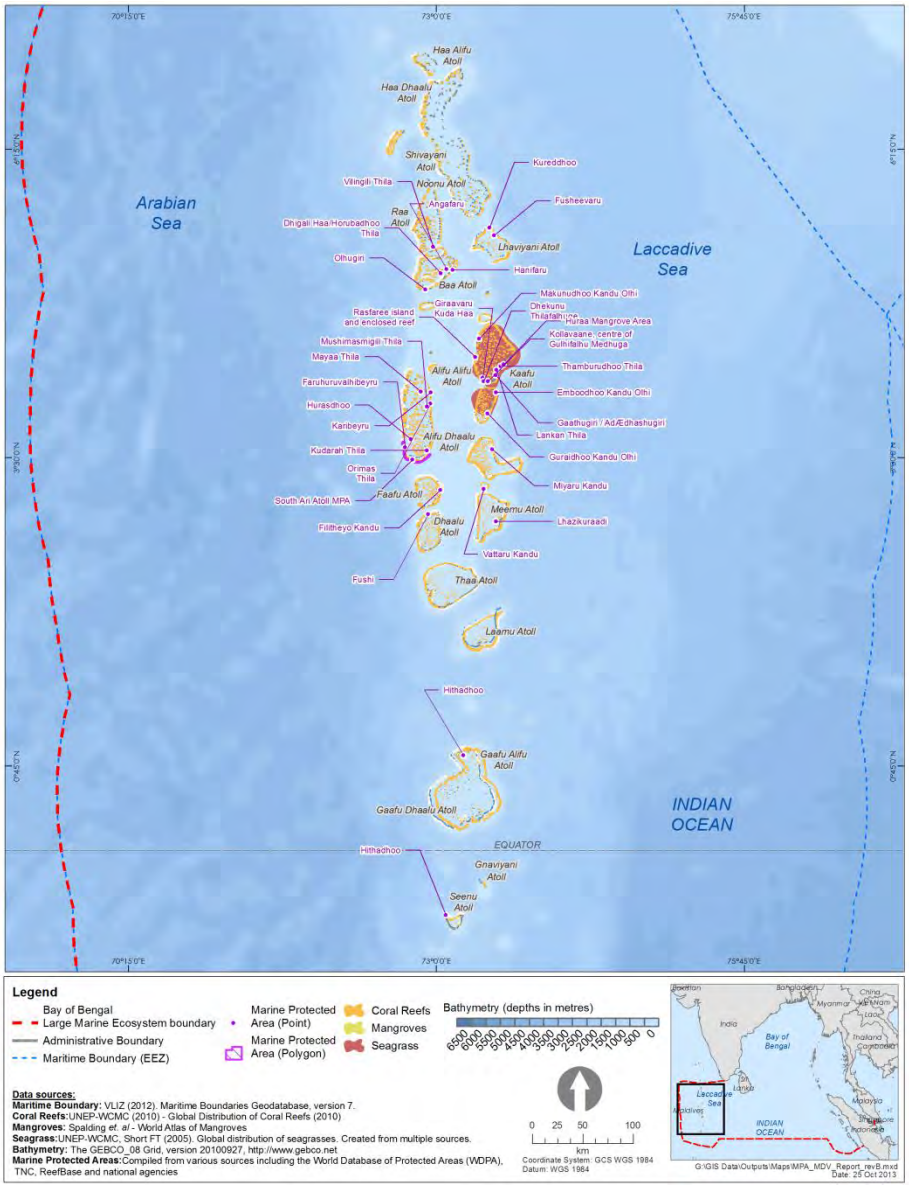

Figure 9. Distribution of MPAs in Maldives.

Country Overview

The Maldive Islands, also known as The Republic of Maldives, is an island nation in the Indian Ocean located to the southwest of Sri Lanka, and between Minicoy Island (the southernmost part of Lakshadweep, India) and the Chagos Archipelago (British Indian Ocean Territory).

The country is made up of 26 atolls, and some 1190 islands. The Maldives consist of 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). The islands are relatively small, with an average size of 0.25 km^2.

The Maldives pretty much consist entirely of coral reefs, the most diverse of all marine ecosystems. Much effort has been put into the study of the bio-diversity and dynamics of reefs in general but in the Maldives; however, the remoteness of its many reefs, and their wide distribution makes it comparatively difficult to conduct research work (Hoon, 1997). The Maldives support a great diversity of coral reefs, with at least 200 species of stony coral, and associated coral reef organisms (Wilkinson, 2008). Coral reef coverage in the Maldives is 4,513 km^2 (MRC, 2013). This includes rim and oceanic reefs (3,701.93 km^2 or 82.5% of total reef area), as well as patch reefs inside of atoll lagoons (791.92 km^2 or 17.5% of total reef area) (Naseer and Hatcher, 2004). Other important habitats include sea grass beds, mangrove habitats and sandy lagoons. Due to the diversity of coral reefs, the Maldives is very dependent on the reef for its two vital industries which are tourism and fisheries. However coral reefs in Maldives are under pressure from coral bleaching and other anthropogenic disturbances such as coral mining, siltation and general pollution (Jalel, 2013).

MPA Overview

In order to prevent over exploitation, and improve conservation and preservation, Marine Protected Areas or MPAs were first established in the Maldives in 1995 under the Environment Act 4/93. This was a first step to protecting specified areas from the negative and harmful consequences of over-fishing, coral mining, anchor damage and garbage dumping (Jalel, 2013).

According to the State of Environment Report 2001, the Government of Maldives has initiated several measures for the protection of important habitats and threatened species. The Government designated 15 Marine Protected Areas as the country's first MPA in 1995, and 10 more in 1999. These initial sites were established at the behest of the tourism industry for the explicit purpose of dive tourism. Other purposes include banning export of important bait fish as aquarium fish; banning fishing from the 'house' reefs of tourist resorts; and the protection of threatened marine species such as sharks, sea turtles, giant clams, and black coral.

Currently, the Maldives has 33 marine protected areas (dive sites), in which only diving and bait fishing are allowed. Figure 9 show the distribution of MPAs in Maldives, and Table 8 lists them.

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.

The environmental protection policy of the Maldives is articulated in the National Environment Action Plan (NEAP). The first Action Plan, formulated in 1989, focused on the nation's environmental planning and management needs, providing a combined approach to resolving existing problems,

and establishing mechanisms for future more sound management of the environment. The principal aim outlined in this Action Plan is to "protect and preserve the environment of the Maldives, and to manage its resources sustainably for the collective benefit and enjoyment of present and future generations". A second NEAP was adopted in 1999, and a policy to identify sites of high biological significance for the conservation of biological diversity, tourism, and other sustainable development opportunities, and designate them as protected areas.

Recently the Maldives has launched the Grouper Fishery Management Plan (December 25, 2012). The biological nature of groupers, such as their longevity, late maturity, characteristic change of sex from females in their early life stages to become mature males, formation of spawning aggregations make them extremely vulnerable to overfishing. The management was a response to a need to manage the Maldivian grouper fishery to ensure sustainability of the resource for future generations.

Shark fisheries, intensified from the 1970s onward, became a threat to the resource (Ushan et al., 2012). At the same time, Maldives is the high dependence on the marine environment to attract visitors. Diving and snorkelling are the two main recreational activities and the main attraction is the coral reef environment and large fish, especially reef sharks. Shark diving is a big business in the Maldives, and there was therefore considerable pressure from the tourism industry to preserve reef shark stocks (Andersen and Waheed, 1999). In response, the Maldives government has enforced legislations pertaining to the shark fisheries since the late 1990s. A 10 year moratorium was declared in 1998 on all type of shark fishing inside and within 12 miles from the rim of 7 major tourism atolls in the Maldives (Ushan et. al., 2012). This was followed by a national shark fishing ban, practically turning the Maldives territorial waters and EEZ into a sharks sanctuary.

Table 8. List of MPAs in Maldives.

No	Site Name	Longitude	Latitude	National Designation	International Status	Establishment Year	Total Area (km^2)	IUCN Category	No Take Zone	Habitat Types	Has Polygon
1	Angafaru	73.09	5.18	Dive site		2009	4.04	Unset	Unknown	Green and Hawksbill turtles, groupers, whale sharks and manta rays	√
2	Dhekunu Thilafalhuge	73.43	4.18	Dive Site		1995	0.62	Unset	Unknown	Stonefish.	X
3	Dhigali Haa/Horubadhoo Thila	73.04	5.15	Dive Site		1999	0.13	Unset	Unknown	Coral reefs. Previous records of grey reef sharks, white-tipped reef sharks, barracudas, jacks and turtles	X
4	Emboodhoo Kandu Olhi	73.53	4.08	Dive Site		1995	1.2	Unset	Unknown	Grey Reef Sharks, and other large fish. Soft corals	X
5	Faruhuruvalhibeyru	72.72	3.59	Dive Site		1999	1.53	Unset	Unknown	Manta season from December to March	X
6	Filitheyo Kandu	73.04	3.22	Dive Site		1999	0.2	Unset	Unknown		X
7	Fusheevaru	73.52	5.48	Dive Site		1995	0.33	Unset	Unknown	Two Manta cleaning stations and abundant fish species.	X
8	Fushee Kandu	72.93	3.00	Dive Site		1999		Unset	Unknown	Various shark species, sea turtles, spotted eagle rays and snappers.	√
9	Gaathugiri / AdÆdhashugiri (Banana Reef)	73.53	4.24	Dive Site		1995	0.35	Unset	Unknown	Reef fish, coral reefs.	X
10	Giraavaru Kuda Haa	73.42	4.22	Dive Site		1995	0.13	Unset	Unknown	Coral reef habitat, rich fish biodiversity	√

No	Site Name	Longitude	Latitude	National Designation	International Status	Establishment Year	Total Area (km^2)	IUCN Category	No Take Zone	Habitat Types	Has Polygon
11	Guraidhoo Kandu Olhi	73.46	3.89	Dive Site		1995	1.98	Unset	Unknown	Rich fish biodiversity, manta rays, sharks and coral reefs.	X
12	Hanifaru	73.15	5.18	Dive Site		2009	3.03	Unset	Unknown	Feeding aggregation site for whale sharks and manta rays	√
13	Hithadhoo (Eidhigali Kilhi and Koattey Area)	73.08	-0.58	Mangrove Protected Area		2004	2.83	Unset	Unknown	Largest frigate bird nesting site in the country	√
14	Hithadhoo (Gaafu Alifu Atoll)	73.24	0.85	Island Protected Area		2006	1.24	Unset	Unknown	Island, lagoon and surrounding reef protected. Most important roosting site for frigate birds in Maldives. Important roosting site for other birds. Turtle nesting area	X
15	Huraa Mangrove Area	73.60	4.34	Mangrove Protected Area		2006	0.09	Unset	Unknown	Resting place for some protected birds. Mangrove habitat	X
16	Hurasdhoo	72.77	3.67	Island Protected Area		2006	0.71	Unset	Unknown	High diversity of marine invertebrates and fish	X
17	Karibeyru /Kashibeyru Thila	72.95	4.08	Dive Site		1999	0.66	Unset	Unknown	Whale sharks, mantas, grey reef sharks, white tip sharks, napoleon wrasses, schools of tunas and snappers	X
18	Gulhifalhu Medhuga onna Kohlaavanee	73.46	4.18	Dive Site		1995	0.8	Unset	Unknown	Rich fish biodiversity	X
19	Kudarah Thila	72.92	3.57	Dive Site		1995	0.12	Unset	Unknown	Rich fish biodiversity including occasional sharks.	√
20	Kuredhu Kandu Olhi	73.48	5.55	Dive Site		1999	0.98	Unset	Unknown	Coral reefs, grey reef sharks and many pelagic species. Home to globally endangered Ornate Eagle Ray	X
21	Lankan Thila	73.54	4.29	Dive Site		1999	0.12	Unset	Unknown	Sharks, napoleon wrasse, mantas, baracudas, eagle rays and coral reefs.	√
22	Lhazikuraadi	73.53	2.93	Dive Site		1999	0.13	Unset	Unknown	Eagle rays, grey reef sharks, Anemone garden, sharks, eagle rays, bannerfish, jackfish and turtles.	X
23	Makunudhoo Kandu Olhi	73.38	4.56	Dive Site		1995	4.7	Unset	Unknown	White-tip reef sharks, rich fish biodiversity and sea turtles	X
24	Mayaa Thila	72.86	4.09	Dive Site		1995	0.8	Unset	Unknown	Grey Reef sharks, Whitetip Reef sharks, Stonefishes, other fishes	√
25	Miyaru Kandu	73.50	3.58	Dive Site		1995	1.1	Unset	Unknown	Soft corals, rich fish biodiversity, Eagle Rays, Grey Reef and White-tipped Sharks. Occasional Hammer head and Sail fish	X
26	Mushimasmigili Thila	72.92	3.96	Dive Site		1995	0.8	Unset	Unknown	Coral reef, Grey Reef Sharks	√
27	Olhugiri	72.91	5.00	Island Protected Area		2006	0.53	Unset	Unknown	Regular roosting Frigate birds, breeding red-billed trophic bird, nesting turtles	√
28	Orimas Thila	72.95	3.98	Dive Site		1995	2.25	Unset	Unknown	Coral reefs, and small reef fish. White-tipped shark and whale sharks.	X
29	Rasfaree island and enclosed reef	73.35	4.40	Dive Site		1995	12.86	Unset	Unknown	Grey Reef Sharks, Manta Rays, rich fish biodiversity	X

No	Site Name	Longitude	Latitude	National Designation	International Status	Establishment Year	Total Area (km^2)	IUCN Category	No Take Zone	Habitat Types	Has Polygon
30	South Ari Atoll MPA	72.79	3.49	Dive Site		2009	48.63	Unset	Unknown	Aggregation area for whale sharks	√
31	Thamburudhoo Thila	73.58	4.32	Dive Site		1995	0.2	Unset	Unknown	Reef fish, coral reefs.	X
32	Vattaru Kandu	73.43	3.23	Dive Site		1999	0.61	Unset	Unknown	Sharks, seafans, leopard sharks, mantas, sea turtles, High diversity of marine invertebrates and fish	√
33	Vilingili Thila	72.97	5.38	Dive Site		1999	0.12	Unset	Unknown	Coral reefs. Sharks and mantas are frequnetly sighted.	X

Sources: BOBLME 2011, EPA 2013

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Appendix 2:

The Development of the MPA Atlas in the BOBLME

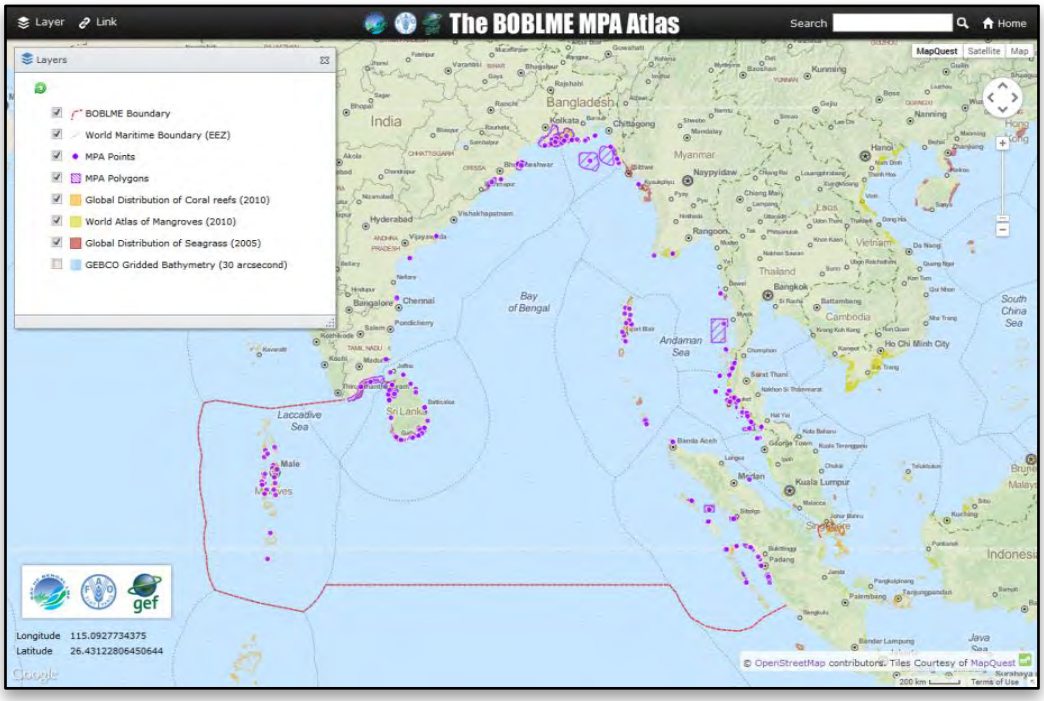
The Development of the MPA Atlas of the Marine Protected Areas in the Bay of Bengal Large Marine Ecosystem (BOBLME)

Report prepared for the provision of services relating to developing interactive online database portal on MPAs relevant to the Bay of Bengal

Terms of Agreement LOA/RAP/2013/11

by WorldFish

January 2014



http://boblme.reefbase.org

Bangladesh India Indonesia Malaysia Maldives Myanmar Sri Lanka Thailand

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Figures

1.0 Introduction

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

BOBLME has completed a study on "Status of Marine protected Areas and Fish Refugia in the Bay of Bengal Large Marine Ecosystem". The findings were discussed at a regional validation workshop held in Penang Malaysia on 18th and 19th January 2011, wherein one major recommendation was to establish a BOBLME Marine Protected Area (MPA) Learning Network to facilitate communications among MPA practitioners and help in the diffusion of innovative practices.

In the above context, WorldFish was contracted to create an interactive online database portal for the BOBLME project. Thus, WorldFish has created the **BOBLME MPA Atlas** (http://boblme.reefbase.org) to provide access to up-to-date information on MPAs relevant to the Bay of Bengal – to a wider MPA community of practitioners (managers, researchers, policy makers etc.). Information will include MPA literatures (reports, reviews, and scientific articles), data, and maps etc. To date, WorldFish already maintains a range of online databases, e.g. FishBase, TrawlBase, ReefBase, and the Coral Triangle Atlas. Data outputs are in the form of tables, maps and geospatial information.

The BOBLME MPA Atlas has the following features:

- Online GIS interactive maps with multiple data layers
- Downloadable MPA data and publications
- Searchable features
- User friendly interface and navigation

Basically the website is still under continuous development and is being constantly updated. We anticipate that new content will need to be added continuously. Its features will also need to be adapted to meet the evolving needs of its users. Thus this deliverable should be regarded merely as a 'snapshot' of the website at the point of release of this report (January 2014).

2.0 Website Design and Development

Nowadays all businesses, corporations, and organizations exploit the internet and websites for communicating, broadcasting and interacting with their potentially broad spectrum of users. As computer and internet resources grow, the opportunities and possibilities that a website brings will in our opinion prove increasingly invaluable. BOBLME and WorldFish, via the MPA project collaboration recognize this potential and have designed a website to effectively communicate the MPA information to the wider public.

2.1 Website architecture and hosting

The website is hosted by ReefBase (http://www.reefbase.org) in a 'cloud' computing service provided by Amazon Elastic Compute Cloud (Amazon EC2) (http://aws.amazon.com/ec2). It uses Microsoft ASP.NET 3.5 web application framework as the web development tool with Microsoft's SQL Server 2008 as the back end database. The GIS online interactive map was developed using Google Map API 3.0. GIS datasets are stored in the PostgreSQL 9.2 database server with PostGIS 2.0 as a spatial database extension. The OpenGeo Suite 3.1 is served as a middle-tier server to 'render' the datasets stored in the database into Web Map Service (WMS) format map layers and publishes them into the interactive map.

The interaction between clients and servers through network technology is illustrated in Figure 1.

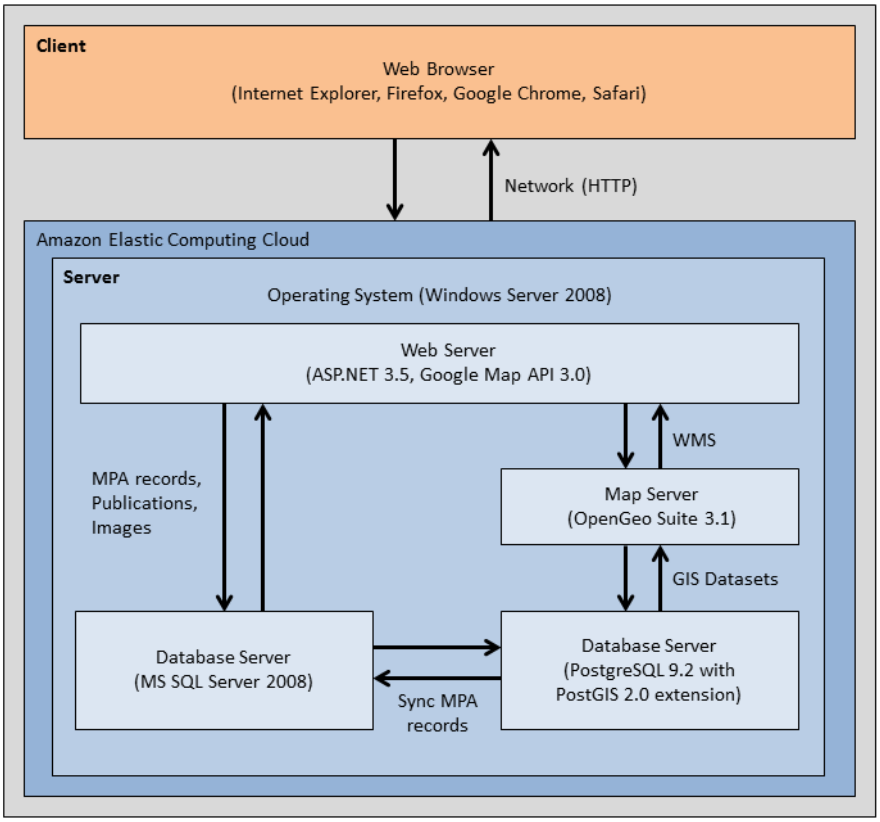


Figure 1. The architecture of the web-based BOBLME MPA Atlas.

2.2 Database design

The back end database is a combination of two different servers. The Microsoft SQL Server is the main database server which stores the data such as MPA details, publications and images. The PostgreSQL server is used to store the GIS datasets in spatial format.

2.3 System requirements

The website is designed for Microsoft Internet Explorer, Mozilla Firefox, Google Chrome and Safari. It may also work for the other web browsers, but have not been properly tested. The BOBLME MPA Atlas will perform best on computers with a high-speed internet connection, especially the interactive map module which needs a high-speed and reliable connection to transmit the spatial data layers.

2.4 User authentication

Two levels of user can access this website:

1) Public User

   Basically, the MPA Atlas of BOBLME website is open, and anyone can access the website and download the MPA datasets in Excel format without requiring any authentication whatsoever.

2) Administrator

   The Administrator has the privileges necessary to edit the MPA database which is a 'special' right which will be given only to specific people. To be an Administrator, a User has to log in using the "Sign in" hyperlink which is located at the upper right of the *Home* page. If the User clicks the hyperlink, the "Admin Sign In" page will appear and the User will need to fill in his or her user name and password as shown in Figure 2. The details of how to edit the MPA records will be described in the Chapter on the MPA database.

Figure 2. The *Sign In* page for administrator.

3.0 Website Content and Structure

3.1 Overview

The BOBLME MPA Atlas can be accessed through the URL http://boblme.reefbase.org . The objective of the website is to be a point of access for a wide range of information relating to marine protected areas (MPAs) in the Bay of Bengal Large Marine Ecosystem. The information in the website is presented in a logical and easy to use format, allowing users to quickly navigate to the information they need. The website contains a list of pages (a sitemap) which provides relevant information pertaining to the BOBLME project, and the MPAs in all eight countries. Figure 3 shows the sitemap of the BOBLME MPA Atlas, which consist of six modules namely, *Home, Countries, Case Studies, MPA Database, Interactive Map* and *Resources*.

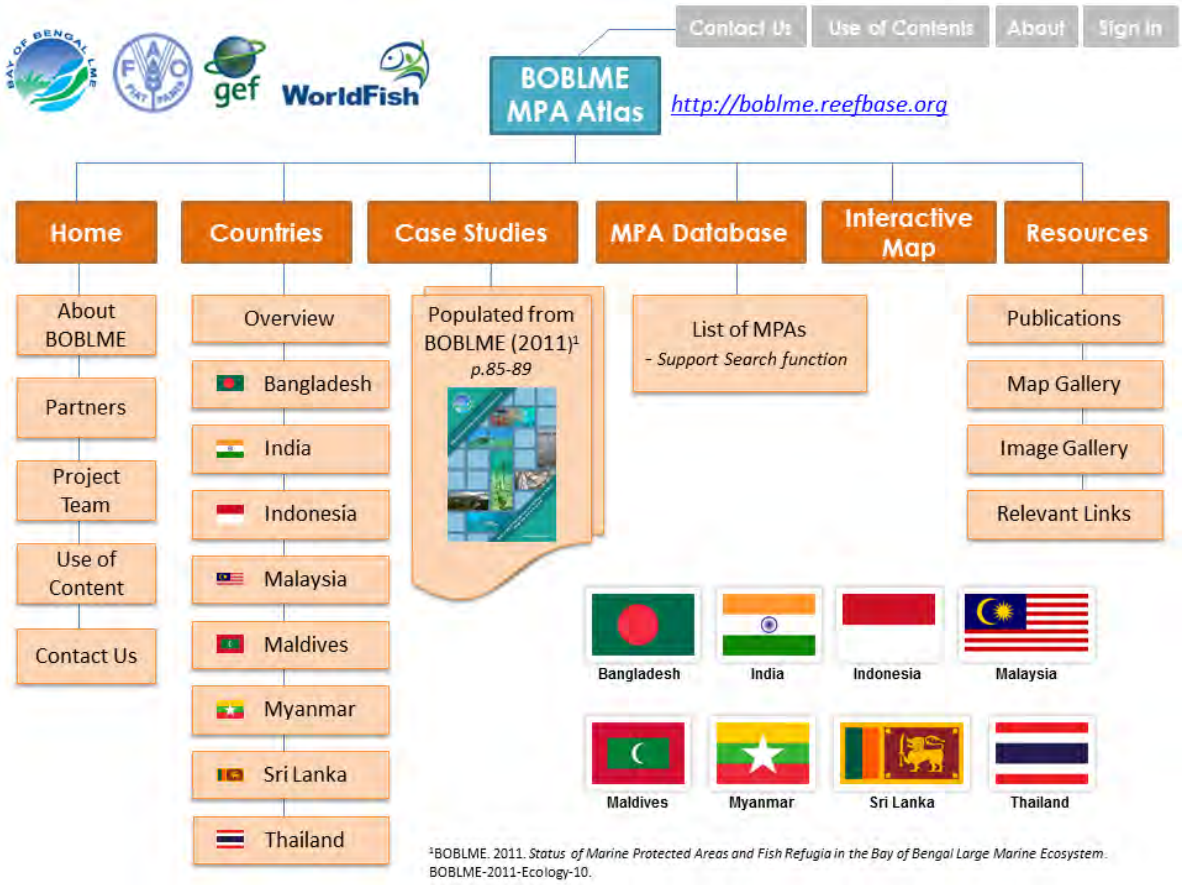


Figure 3. The sitemap of the BOBLME MPA Atlas.

3.2 The home page

The home page is automatically loaded when a User enters the URL of the BOBLME MPA Atlas, i.e. http://boblme.reefbase.org. Figure 4 presents the home page of the website. The page is divided into a number of sections and contains a brief introduction about the MPA Atlas and the project.

The header at the top of the page contains the quick links to the *"Contact Us", "Use of Content", "About"* and also *"Sign In"* feature for any Administrator. The logos of donors, BOBLME's partners and flags of BOBLME countries are also shown on the page.

The main menu section contains links to six main modules of *"Home", "Countries", "Case Studies", "MPA Database", "Interactive Map"* and *"Resources"*. Each these modules will be explained in the following section.

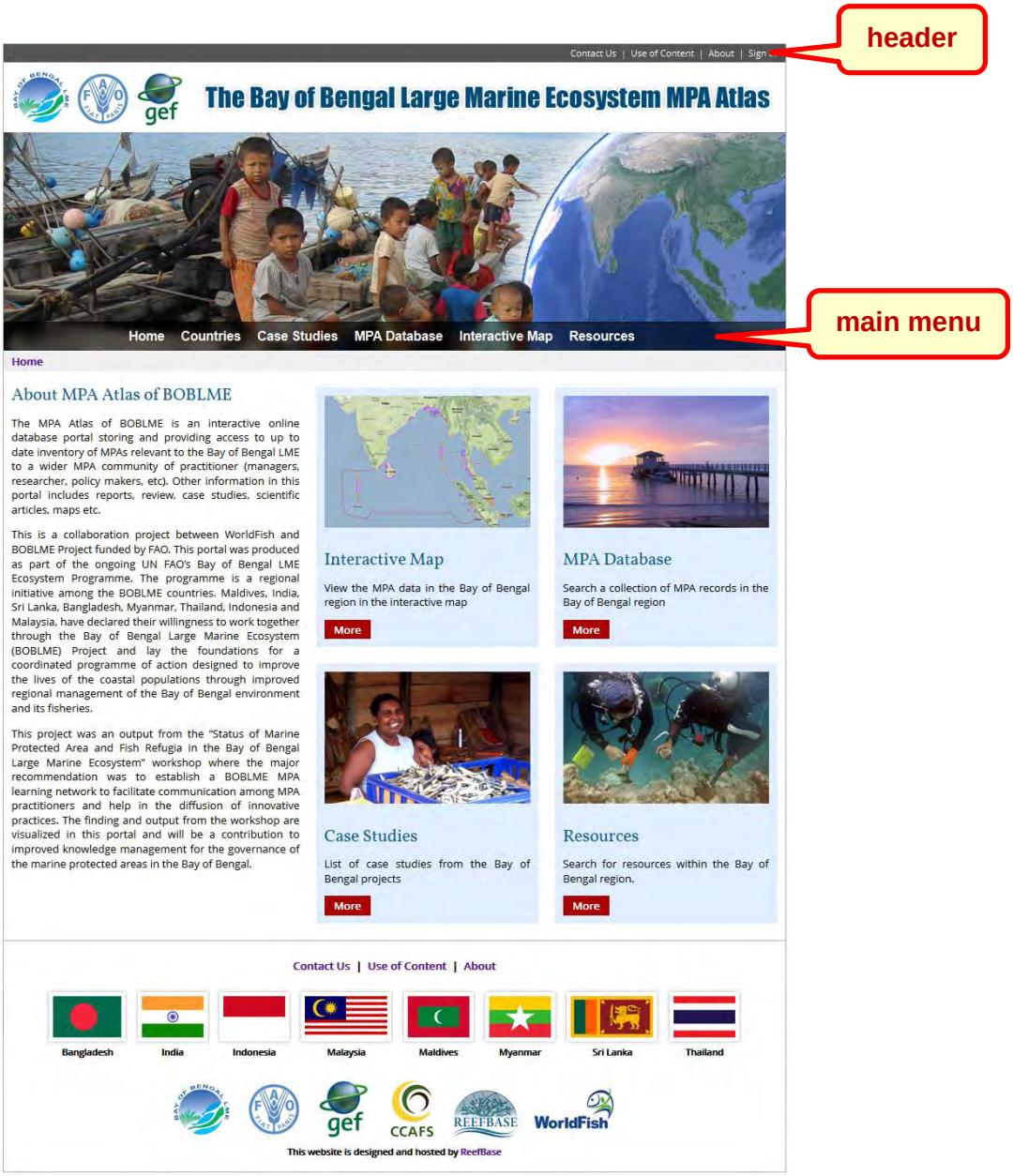


Figure 4. The Home page of the BOBLME MPA Atlas.

3.3 Home module

The *Home* module provides further information about BOBLME, the partners, project team member including the use of content and the contact information. It can be accessed through the dropdown list of the *Home* menu (Figure 5).

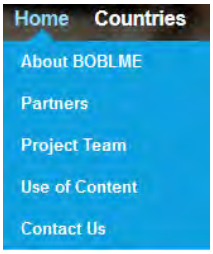


Figure 5. The dropdown list of the *Home* menu.

3.4 Countries module

The *Countries* module has individual page to serve each BOBLME countries. The page provides the information about the MPAs in the country. Figure 6 shows the *country* page of Malaysia.

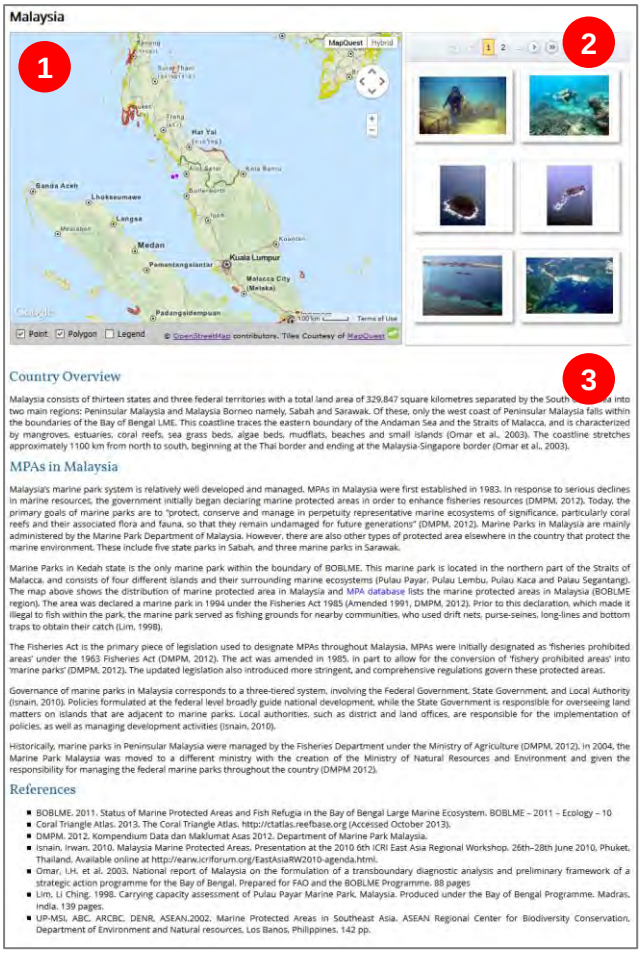


Figure 6. The *Country* page of Malaysia.

The *country* page is consists of three sections:

1. Interactive map which shows the geographic area of MPAs in the country; provides options to either show the MPAs in point or polygon, display the legend; and support users to zoom in or zoom out at their preferred scale;
2. Image collection contains the photos of the specific country which was contributed by ReefBase users;
3. Text about the overview of the country and status of MPAs in the country.

3.5 Case studies module

The 'Case studies module' highlights the case studies of the selected countries in the BOBLME region. The case study was extracted from the report of Status of Marine Protected Areas and Fish Refugia in the Bay of Bengal Large Marine Ecosystem (BOBLME, 2011)[1].

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.

Buoy marking boundary of the Hikkaduwa Marine Reserve, Sri Lanka. Photo credit: Arjan Rajasuriya

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.

Figure 7. The *Case Studies* page.

[1] BOBLME. 2011. Status of Marine Protected Areas and Fish Refugia in the Bay of Bengal Large Marine Ecosystem. BOBLME-2011-Ecology-10.

3.6 Resources module

The 'Resources module' provides access to the page of *Publications, Map Gallery, Image Gallery* and *Relevant Links* (see Figure 8).

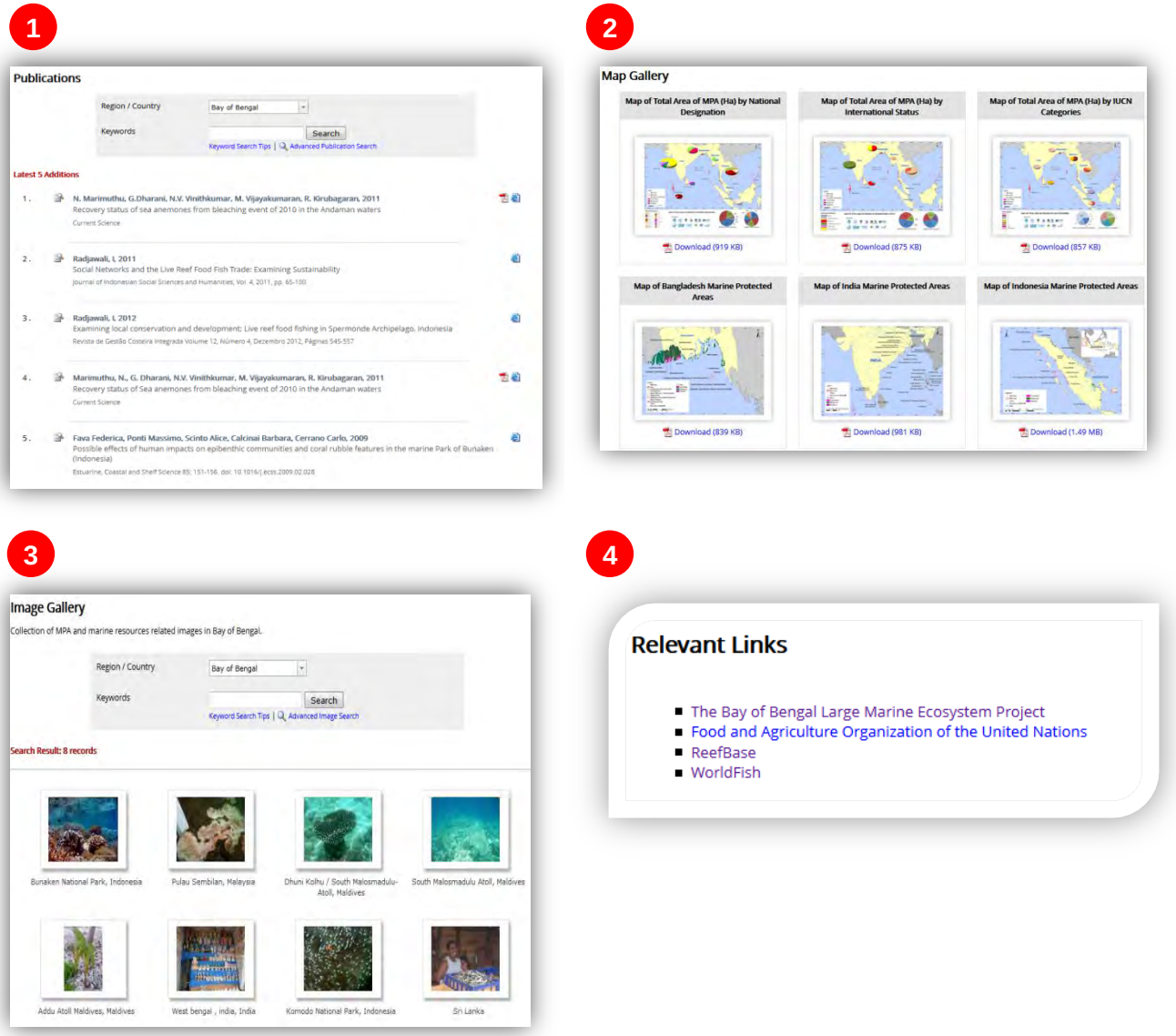


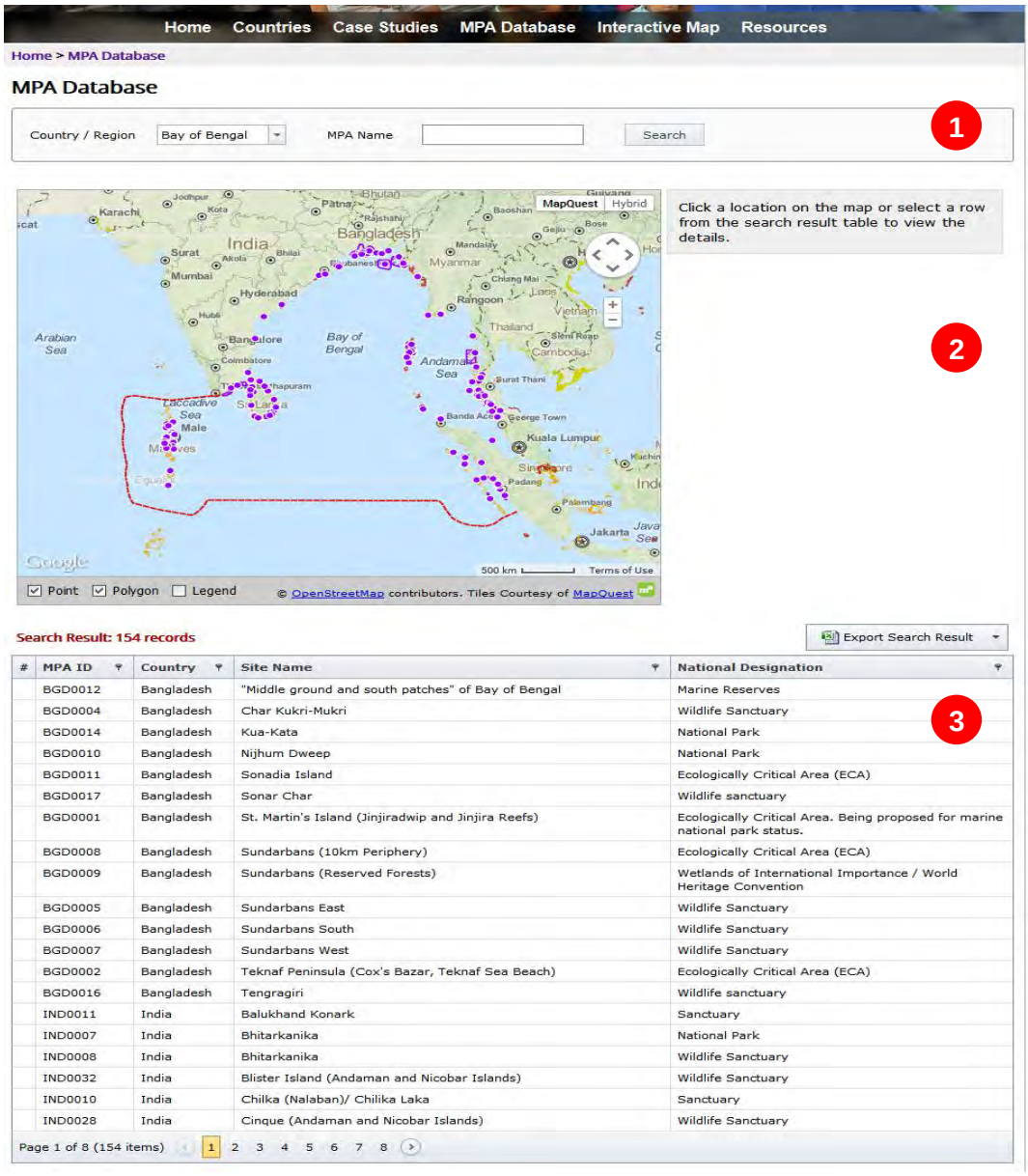
Figure 8. The *Resources* module.

1. *Publications* include various literatures that have study area in the Bay of Bengal;
2. *Map Gallery* contains static maps to show the MPAs in the regional or national level;
3. *Image Gallery* presents a collection of images for the BOBLME countries which was contributed by the ReefBase users;
4. *Relevant Links* provides quick links to organizations working on BOBLME project.

Users can save the static maps from the *map gallery* by clicking on the respective "Download" link under each map thumbnail. The map is in pdf format. To download the publications and images, user will be redirect to ReefBase's website to sign in as a ReefBase user before proceeding with the download.

4.0 MPA Database Module

WorldFish team members are responsible for collecting, compiling and updating information for all the MPAs and put it together on a central database. Figure 9 shows the MPA database module which combines the search function, the small embedded interactive map, and returns the search results in a single page.



#	MPA ID	Country	Site Name	National Designation
	BGD0012	Bangladesh	"Middle ground and south patches" of Bay of Bengal	Marine Reserves
	BGD0004	Bangladesh	Char Kukri-Mukri	Wildlife Sanctuary
	BGD0014	Bangladesh	Kua-Kata	National Park
	BGD0010	Bangladesh	Nijhum Dweep	National Park
	BGD0011	Bangladesh	Sonadia Island	Ecologically Critical Area (ECA)
	BGD0017	Bangladesh	Sonar Char	Wildlife sanctuary
	BGD0001	Bangladesh	St. Martin's Island (Jinjiradwip and Jinjira Reefs)	Ecologically Critical Area. Being proposed for marine national park status.
	BGD0008	Bangladesh	Sundarbans (10km Periphery)	Ecologically Critical Area (ECA)
	BGD0009	Bangladesh	Sundarbans (Reserved Forests)	Wetlands of International Importance / World Heritage Convention
	BGD0005	Bangladesh	Sundarbans East	Wildlife Sanctuary
	BGD0006	Bangladesh	Sundarbans South	Wildlife Sanctuary
	BGD0007	Bangladesh	Sundarbans West	Wildlife Sanctuary
	BGD0002	Bangladesh	Teknaf Peninsula (Cox's Bazar, Teknaf Sea Beach)	Ecologically Critical Area (ECA)
	BGD0016	Bangladesh	Tengragiri	Wildlife sanctuary
	IND0011	India	Balukhand Konark	Sanctuary
	IND0007	India	Bhitarkanika	National Park
	IND0008	India	Bhitarkanika	Wildlife Sanctuary
	IND0032	India	Blister Island (Andaman and Nicobar Islands)	Wildlife Sanctuary
	IND0010	India	Chilka (Nalaban)/ Chilika Laka	Sanctuary
	IND0028	India	Cinque (Andaman and Nicobar Islands)	Wildlife Sanctuary

Figure 9. *MPA database* module.

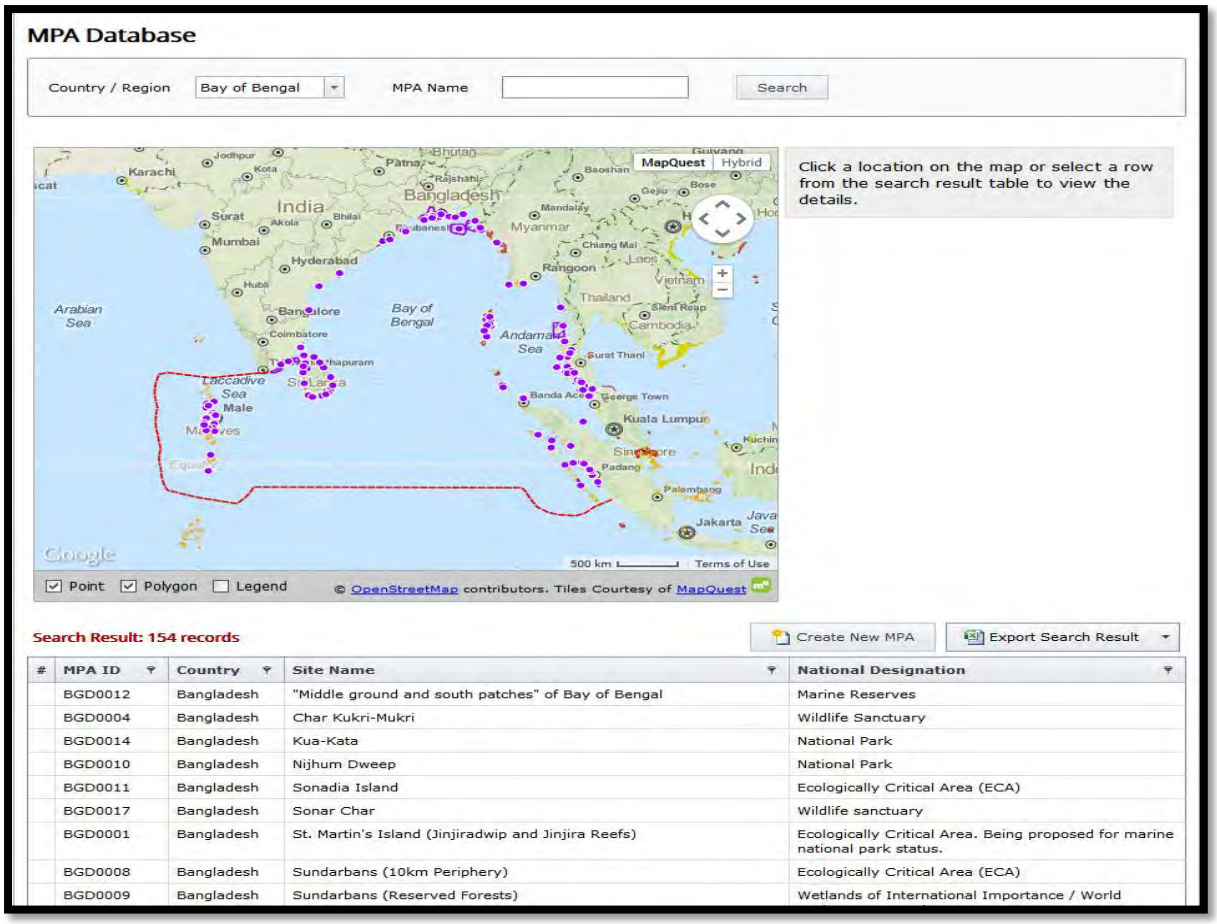
The MPA database can be filtered by using the ❶ Search function. Users can select to view the MPAs for a particular country or the entire Bay of Bengal. He/She can also key in, either part of the MPA name, or the entire name as the search string, and the search engine will return accordingly those MPAs that match the search string. For example, the user might type in either “Payar” or “Pulau Payar”, to limit the returned list of search results.

Once the user clicks the Search button, the list of MPAs will be returned and listed in the table of Result section ❸. Users can then export the search results in MS Excel format for further analysis. The export function can be found on the upper right corner of the table list.

To view the location of the particular MPA, the User can select the specific row in the search results table, and the ❷ interactive map will auto-zoom to the area that shows the MPA accordingly. For easier viewing of the details of the MPA, the User can click the MPA point on the interactive map; all attributes will then be extended to display on the right-pane of the map.

4.1 Edit the MPA

The ‘MPA edit’ feature was developed specifically for country partners so they will have an authorization to update their country’s MPA data. In order to update the MPA, each User or country partner need first to sign-in as Administrator using the user name and password provided by WorldFish. Once the user signs in as an Administrator and clicks the *MPA database* menu, they will be directed to the MPA database page that has an additional function for editing and creating a new MPA (Figure 10).



#	MPA ID	Country	Site Name	National Designation
	BGD0012	Bangladesh	"Middle ground and south patches" of Bay of Bengal	Marine Reserves
	BGD0004	Bangladesh	Char Kukri-Mukri	Wildlife Sanctuary
	BGD0014	Bangladesh	Kua-Kata	National Park
	BGD0010	Bangladesh	Nijhum Dweep	National Park
	BGD0011	Bangladesh	Sonadia Island	Ecologically Critical Area (ECA)
	BGD0017	Bangladesh	Sonar Char	Wildlife sanctuary
	BGD0001	Bangladesh	St. Martin's Island (Jinjiradwip and Jinjira Reefs)	Ecologically Critical Area. Being proposed for marine national park status.
	BGD0008	Bangladesh	Sundarbans (10km Periphery)	Ecologically Critical Area (ECA)
	BGD0009	Bangladesh	Sundarbans (Reserved Forests)	Wetlands of International Importance / World

Figure 10. The edit page of MPA database.

The MPA information (metadata, attributes) can also be edited using the “Edit” hyperlink at the first column on the left side of the table as shown in Figure 11. Each country partner is restricted to be able to edit or update only their own country data, and thus the “Edit” hyperlink only appears for the MPAs of their country.

#	MPA ID	Country	Site Name	National Designation
Edit	MYS0001	Malaysia	Pulau Kaca	Marine Park
Edit	MYS0002	Malaysia	Pulau Lembu	Marine Park
Edit	MYS0003	Malaysia	Pulau Payar	Marine Park
Edit	MYS0004	Malaysia	Pulau Segantang	Marine Park

Figure 11 Table of MPA list with “Edit” hyperlink

Once user clicked the “Edit” hyperlink, the edited MPA form will appear (Figure 12) and user can start to update the MPA attributes. Click “Update” once finish the editing.

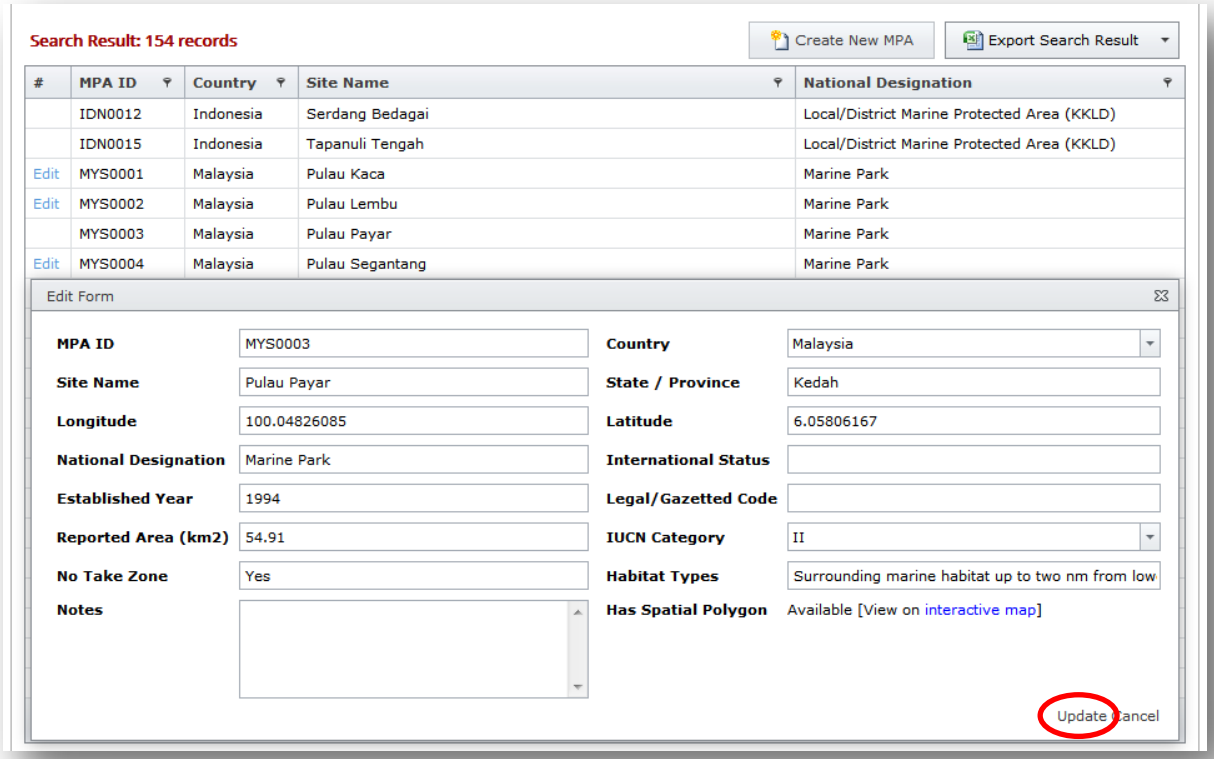


Figure 12. Edit MPA form.

4.2 Create new MPA

To create the new MPA, user can click the "Create New MPA" button at the upper right corner of the MPA search results table (Figure 13).

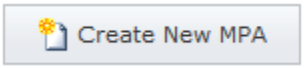


Figure 13. Create new MPA.

The form to create a new MPA will appear (Figure 14). The User then needs to fill in all the necessary information to complete the attribute for the MPA. The compulsory input is the MPA "site name" and "country". The description for all attributes is given in the **Appendix 1**. The User clicks the "Update" at the bottom right of the form to save the new MPA. The System will then auto-generate a unique identifier "MPA ID" for each MPA created.

If a user already has a GIS file to delineate the extent boundary for the MPA, he/she can email the files separately to reefbase@cgiar.org.

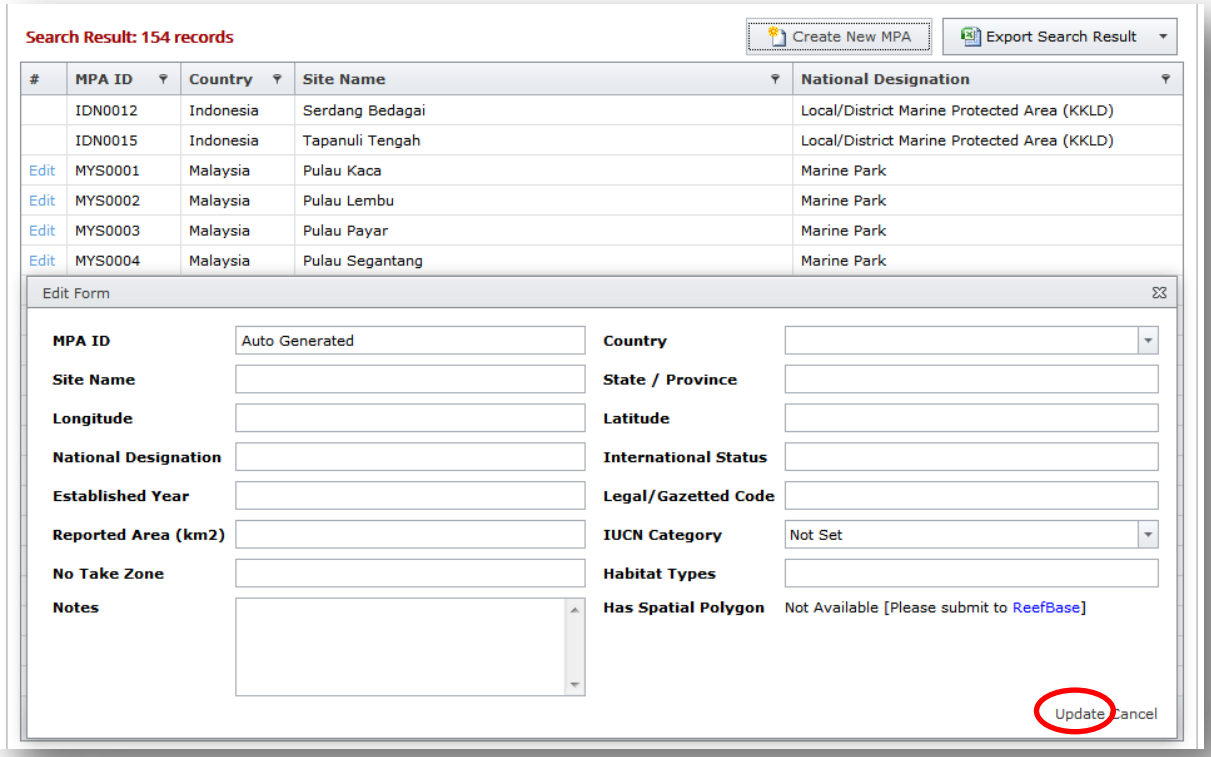


Figure 14. Create New MPA form.

5.0 Interactive Map Module

Web-based GIS applications have been recognized as an important solution for disseminating geographical information throughout the internet. This is because such applications are independent, interactive and widely accessible. The GIS online map was designed to be user friendly and easy to navigate. The application window is divided up into a series of frames that contain the map and tools that used to interact with the map data. Each frame and its contents are described in more detail in the sections that follow.

5.1 Map layout

In order to access the interactive map, the user has to click on the *interactive map* menu on the *home* page. Alternatively the user can directly type the following address (http://boblme.reefbase.org/map/) into the web browser.

The map is defaulted to display the extent of eight BOBLME countries within the Bay of Bengal. The map also shows the other relevant layers such as the MPAs, habitats (mangroves, seagrass and coral reefs), Economic Exclusive Zones (EEZ) and the bathymetry (Figure 15).

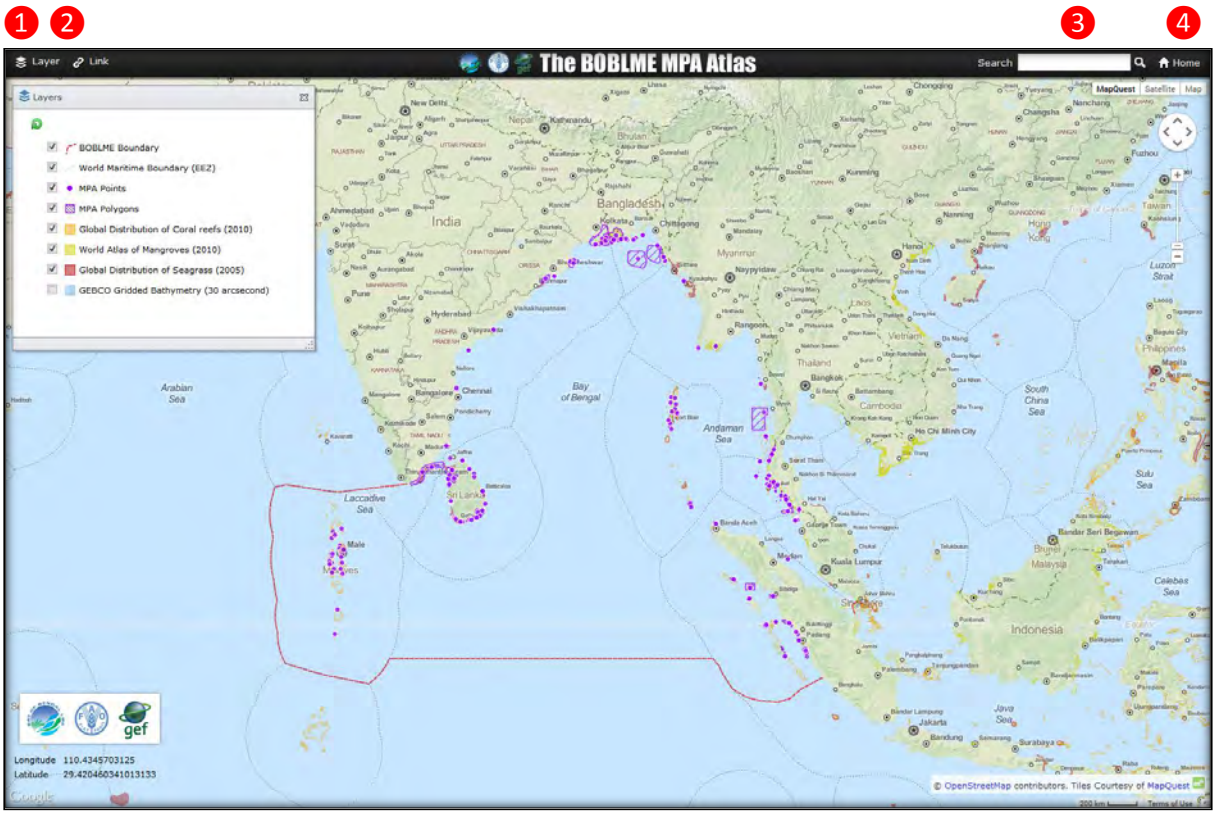


Figure 15. Online GIS interactive map interface.

The Header at the top of the web application contains the logos and the link to show the 1 *Layers* box, 2 copy link features, 3 search MPA or place name function and 4 back to the *home* page.

The User can view the spatial layers of interests by clicking on the *Layers* link at the map header (Figure 16). It has different thematic layers of geographic information shown in the box, and allows user to turn these layers on and off. To view the information for a particular layer, user can clicks on the respective layer. Another layer info box contains description about the layer will then pop-up.

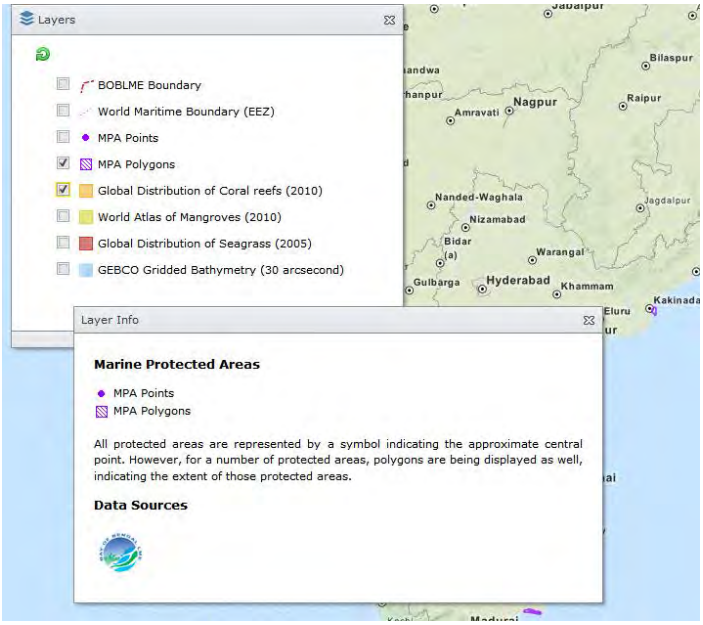


Figure 16. Layer information box.

5.2 Tools

The interactive map has several standard tools which ease user navigation. To navigate around the map, the user can use the mouse to scroll the map in the direction and by the amount you choose. To use this tool, click on the map and drag the distance and direction you would like to scroll on the map. Other functions are listed below:

1) Zoom in/out and pan control

The zoom and pan control tools are available at the right side of the map Figure 17. The *Zoom In* tool will zoom in to any area of the map. The tool can be used to zoom into a fixed amount by clicking on an area of the map that you would like to see more detail for, or to zoom in on a specified extent by clicking and dragging a rectangle around the area you would like to zoom in to. The *Zoom Out* tool performs the opposite function of the *Zoom In* tool. It can be used to zoom out a fixed amount by clicking on an area of the map for which you would like to see less detail for, or to zoom out on a specified extent by clicking and dragging a rectangle around the area you would like to zoom out on. The *Pan* control is used to navigate the area of the map. The pan control is navigated in the four directional arrows. When the user clicks on a directional arrow, the map is panned by to that direction.

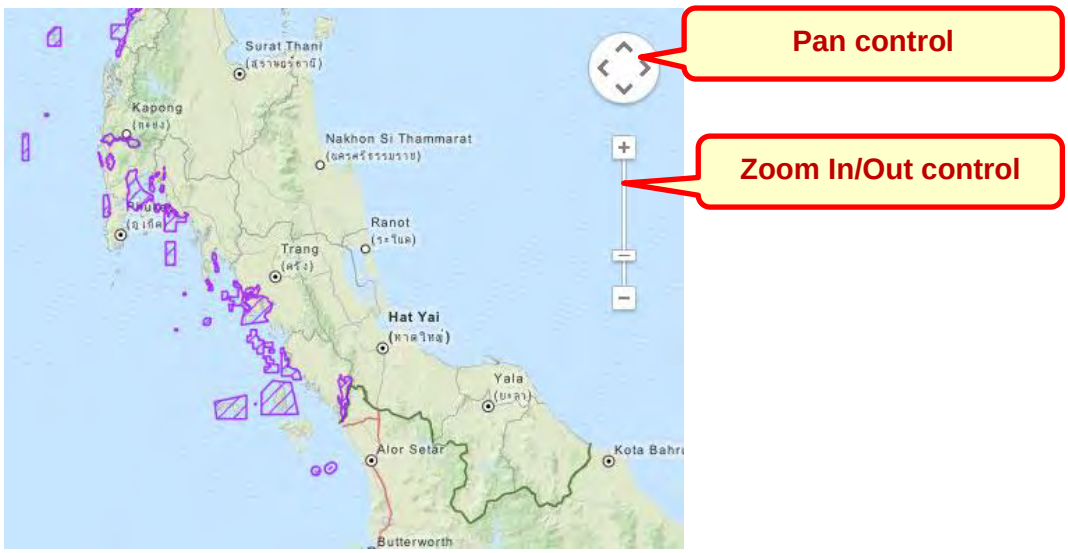


Figure 17. Pan and zoom control on the interactive map.

2) Attributes Information box

The *Attributes* Information box provides access to the attribute information associated with each feature on the map. Clicking on the layer or feature of interest on the map brings up the *Information box* window as shown in Figure 18 that shows the attributes for the top most layer in the Map Contents that has attribute information.

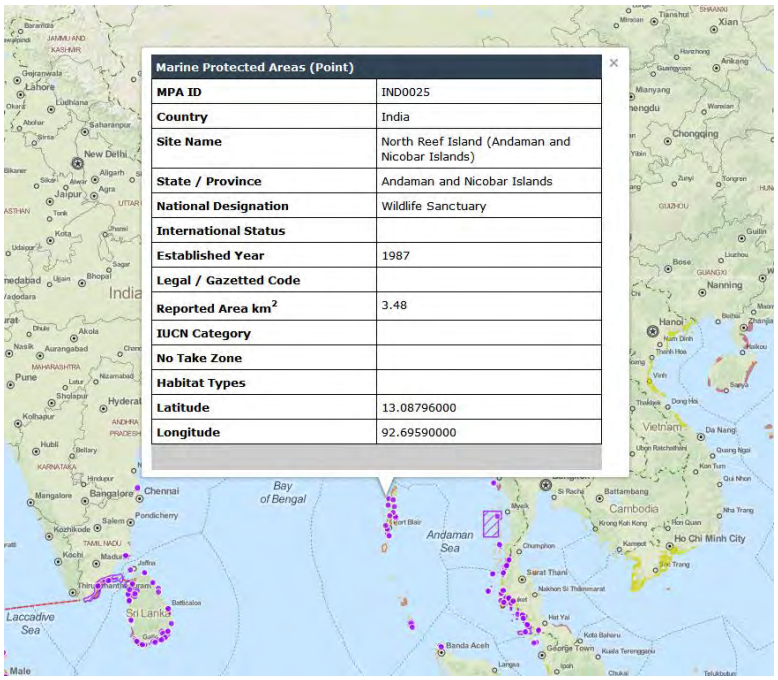


Figure 18. Attributes information box on the interactive map.

Appendix 1: The attributes of the MPA database

Attributes	Explanatory notes
MPA ID	A unique identification number assigned by system.
Site Name	The official name of the protected area.
Country	Bangladesh | India | Indonesia | Malaysia | Maldives | Myanmar | Sri Lanka | Thailand
Sub-national unit	The principle administrative subdivision that a protected area geographically resides within (e.g. state, province, and district).
Longitude	Longitudinal coordinates.
Latitude	Latitudinal coordinates.
National Designation	The type of protected area as legally/officially established/recognized (e.g. national park, sanctuary, and fishery managed area).
International Status	Designation of MPA by an international convention/program (e.g. Ramsar site, World Heritage Site, Unknown).
Established Year	Year of the MPA established legally/formally.
Legal Gazetted code	The legal or formal declaration reference number that established the MPA.
Reported area (km^2)	The extent of protected area in square kilometers including terrestrial and marine based on legal/formal status declaration.
IUCN Category	The classification of IUCN Management Category (Ia, Ib, II, III, IV, V or VI) adopted.
No Take Zone	Listed when part or all of a MPA is no take (the taking of fish or living resources is strictly prohibited in the no take area).
Habitat Types	Main habitat in the MPA.
Has Spatial Polygon	Yes | No. Has GIS polygon to represent the extent area of the MPA.
Notes	Additional notes/remarks about the MPA.

Appendix 3:

MPA Working Group Meeting Report

The Development of the MPA Atlas of the Marine Protected Areas in the Bay of Bengal Large Marine Ecosystem (BOBLME)

Report prepared for the provision of services relating to developing interactive online database portal on MPAs relevant to the Bay of Bengal
Terms of Agreement LOA/RAP/2013/11

Report of the "Marine Protected Areas Working Group Meeting"

11-12 February 2014

WorldFish, Penang, Malaysia

Prepared by

K. Kuperan Viswanathan
Northern University of Malaysia

Nurulhuda Ahmad Fatan
Teoh Shwu Jiau
WorldFish, Penang, Malaysia

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Appendices

ACKNOWLEDGEMENTS

The financial support of the BOBLME project toward the organization and running of the Working Group Meeting is kindly acknowledged here. The participation and active inputs of the country delegates contributed to a very productive workshop. The excellent support and logistics facilities provided by WordFish, Penang, Malaysia is greatly appreciated.

1.0 BACKGROUND

This report presents the proceedings of the Bay of Bengal Large Marine Ecosystems Project's Marine Protected Areas (MPA)[1] Working Group Meeting held on the 11-12 February 2014, at Penang, Malaysia. The meeting was hosted by WorldFish, Penang, Malaysia and was attended by Marine Protected Area Specialist and practitioners from the eight BOBLME countries namely, Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand. These are the countries working together through the Bay of Bengal Large Marine Ecosystem (BOBLME) Project. The BOBLME project hopes 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. A few resource persons and a facilitator supported the proceedings of the meeting.

The meeting focused on the Subcomponent 3 (Improved Understanding and Predictability of the BOBLME Environment) to share information with other regional and global environmental assessment programs for improved understanding of the BOBLME ecological functions and processes. The objective of the Subcomponent 3.2 (Marine Protected Areas in the Conservation of Regional Fish Stocks) 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[2] for sustainable fish management and biodiversity conservation objectives.

2.0 THE MPA WORKING GROUP MEETING

The BOBLME MPA Working Group first met in January 2011 in Malaysia (BOBLME-2011-Ecology-06) to discuss and validate the MPA status review "Status of Marine Protected Areas and Fish Refugia in the Bay of Bengal Large Marine Ecosystems" (BOBLME-2011-Ecology-10), prepared by BOBLME implementing partners University of Washington and

[1] Marine Protected Areas(MPAs) are defined by IUCN as "any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment", IUCN, CORIDO and ICRAN 2008

[2] Fish refugia are MPAs that have been set up to protect a fishery resource during some part of its life history, usually during spawning or during the juvenile stage. IUCN, World Commission on Protected Areas (IUCN-WCPA) 2008

WorldFish; to identify gaps in MPA networks and prepare recommendations for capacity building and potential interventions to strengthen MPA management in the region. A second meeting was held in Thailand in February 2012 (BOBLME-2012-Ecology-07) to follow up on this work, noting the progress made in the implementation of pilot activities; gain an understanding of the FAO Technical Guidelines on MPAs and Fisheries (http://www.fao.org/docre/015/i2090e/i2090e.pdf) and to provide input to the drafting process of the BOBLME MPA brochure and policy advisories.

3.0 OPENING OF THE WORKSHOP

3.1 Opening remarks by Dr. Sarah Park, Natural Resources Management, Discipline Director, WorldFish

Dr. Sarah Park welcomed the participants to Penang and to WorldFish and mentioned WorldFIsh's role in participating and supporting the activities that work to increase food security and reduce poverty among stakeholders dependent on marine environments. She mentioned the importance of the BOBLME project and the use of MPA's as central instrument for reducing conflicts in the marine environment and balancing ecosystem services.

3.2 Opening remarks by Mr. Ku Kassim bin Ku Yaacob, Fisheries Research Institute, Malaysia

Mr. Ku Kassim in giving the opening address on behalf of Mr. Ismail Ishak, the BOBLME national coordinator welcomed all the participants to Malaysia and brought to the attention that this is the third meeting on the topic of MPA for the BOBLME project. He thanked WorldFish for hosting the event and highlighted the objective of the workshop to develop and recommend a future course of action and policy directions for sustainable management of MPAs for fisheries and biodiversity conservation both from a country and transboundary perspective.

3.3 Opening remarks by Mr. Abd Muntalib bin Juli, Department of Marine Parks, Malaysia

Mr. Abd Muntalib from the Department of Marine Parks Malaysia spoke on behalf of Dr. Sukarno bin Wagiman the director general of the Department of Marine Parks, Malaysia. He welcomed all the participants to beautiful Penang. He highlighted the fields of fisheries management, environmental management and marine protected areas management in which he is involved in as an ideal combination of fields for him to say a few words in opening the meeting.

He mentioned the fact that 70 per cent of the earth's surface consists of oceans and more than 3.5 billion people depend on the oceans for food, energy and income. Naturally therefore the protection of oceans through Marine Protected Areas will play a central role in addressing some of the global development challenges of our time such as food and energy security and poverty and climate change problems.

He highlighted that marine protected areas now cover some 2.8 per cent of the global oceans – an area larger than Europe. There has been an increase of 0.6 per cent in the ocean areas protected since 2012. In 2010, most of the world governments agreed to protect at least 10 per cent of the world's marine and coastal zones by 2020. To achieve that target the protected areas need to increase by one per cent each year.

He mentioned that Malaysia as a part of the "Coral Triangle" is recognised by scientists to have the world's highest marine biodiversity. Coral diversity is highest in East Malaysia with an estimated 550 species while Peninsular Malaysia has over 360 species of corals. Coral reefs represent an economically important ecosystem and are the foundation of a significant percentage of Malaysia's tourism industry. It is estimated that the coral reef related businesses in Malaysia are worth approximately US$635 million annually in food, fisheries and tourism.

He also mentioned that MPAs can be a complementary tool but would not be a substitute for other fisheries management measures. He reiterated that to achieve better outcomes from MPA management, improved collaboration and involvement of both environment and fisheries stakeholders are required.

He concluded by mentioning that the way forward is filled with challenges and opportunities especially with the approach of developing MPAs with multiple objectives. The need for engaging fishers and fishing communities, enabling empowerment, capacity building, knowledge generation and leadership development are seen as the kinds of support needed to further realise the opportunities that MPAs can deliver in the management of the ecosystems.

4.0 WORKSHOP OBJECTIVES AND EXPECTED OUTPUTS

4.1 Objectives

The workshop facilitator Dr. K. Kuperan Viswanathan presented the workshop objectives and the expected output process to the participants. The main objectives of the workshop are:

- Undertake a review and update the MPA data and information posted on the web portal (http://boblme.reefbase.org/mpadatabase.aspx) and the status paper. In

particular this requires validation and additional information on MPA locations and their gazette information.

- Finalise the MPA policy briefs for each country along the same lines of the brochure developed for Thailand. This requires that prospective participants have drafted and validated relevant summarized text for their respective country, following the Thailand sample.

- Discuss, develop and recommend a future course of action and policy directions for sustainable management of MPAs for fisheries and biodiversity conservation both from a country and Tran's boundary perspective.

The Working Group Meeting will also note the progress made to date in the implementation of pilot activities on MPAs and deliberate on the application of MPA Management Effectiveness Assessment Tools. (The meeting agenda is as shown in Appendix 1).

4.2 Workshop Output

The key output expected from the workshop is as follow:

- Validated and completed data and information for inclusion in the MPA database and status paper

- Final drafts of the BOBLME MPA Country Policy Briefs

- Updated information on the progress and status of MPA pilot site interventions

- Information on MPA Management Effectiveness Assessments disseminated

- Recommendations for capacity development and other potential project interventions from a country and transboundary perspective

4.3 Mechanism of the workshop

The country delegates at the workshop were briefed by the workshop facilitator on the mechanism for undertaking the meeting. The delegates were introduced and the participants were expected to provide updates on their respective countries activities and developments with regard to MPAs. There were 24 participants from the eight BOBLME project countries, six participants from WorldFish, one participant from BOBLME project team, one participant from IUCN Bangladesh, one participant from Flora and Fauna International and one facilitator/resource person from Malaysia. (The participant list is provided in Appendix 2).

First day:

The country delegates at the workshop provided updated information on respective countries approach to Protected Area management and governance across sectorial institution.

The country delegates at the workshop were given presentations on the BOBLME MPA Atlas by the WorldFish team. This was follow by a presentation on MPA management Effectiveness tool (MEAT) by Mr Len Garces from WorldFish Philippines office. Delegates were then required to work on some exercise on how to fill in the assessment form.

Second day:

The workshop revisited the validation of the MPA database and also looked at the results of the exercises carried out from the previous day on the MEAT presentation. Draft information for MPA country Policy Brief and brochures was presented by Dr. Rudolf Hermes, the Chief Technical Advisor of the BOBLME project. Country delegates then worked to finalize the MPA Country Policy Briefs and presented the draft policy briefs.

5.0 PRESENTATIONS

5.1 Country updates and the progress on MPA pilot intervention

5.1.1 Bangladesh

- Coastline of Bangladesh extends about 710 km long stretching from south-west corner of the Sundarbans Mangrove Forest to the St. Martin's Island in the south-east.
- Total continental shelf area covers roughly 66,400 km^2 and the exclusive economic zone (EEZ) spans 166,000 km^2 towards open sea up to 200 nautical miles outwards from baseline.
- As a signatory of Nagoya protocol, Bangladesh has committed to extend its MPAs to cover about 10% of its EEZ by 2020.
- The EEZ of Bangladesh including the coastal water supports over million fishers directly and indirectly to sustain their livelihoods.
- The total contribution of the marine landings to the total fish production in the country is about 20% and the total production is 3.4 million metric tonnes. Of that more than half million tonnes is fisheries which are very rich in fish species and other biodiversity.
- Mangroves are very important in Bangladesh and this ecosystem is also shared between Bangladesh and India, and more than 50% of the mangroves are in Bangladesh territory.
- The current MPA status in Bangladesh is not very clear and no explicit definition of "marine protected area" exists.
- The Government is currently framing the Bangladesh Fisheries Policy.

- In recent years, Protected Areas (PAs) developed mainly for hilsa fisheries management. Declaration of 'hilsa-closed seasons' – Hilsa fishing is banned in the four declared sanctuaries of
    - the 'Middle Ground' and 'South Patch' areas (located in the most productive fishing grounds)
    - March to April in three sanctuaries, and November to January in the fourth
- Bangladesh also declares closed seasons at key shrimp spawning sites.

Q&A:

Q1: How fishers in Bangladesh can survive during the fishing closed seasons?

A1: During the closed seasons, poor fishers are supported by the government.

5.1.2 India

- India marine profile:
    - Length of coastline (8129 km);
    - Exclusive Economy Zone (2.02 km^2)
- Human component: Marine fishers population is about 4.0 million but only 0.9 million are active fishers.
- Infrastructure component: landing centres, fishing harbour, and mechanised vessel motorised vessel, non-motorised vessel.
- India implements:
    - *Closed season for mechanized sector:*
        i. June to August (45 days): Gujarat, Maharashtra, Goa, Karnataka, Kerala
        ii. April to May (45 days): Tamil Nadu, Andhra Pradesh, Orissa, West Bengal
    - *Spatial closure*: Some states have restriction on the vessel jurisdiction area. Traditional vessel fishing area confined for operation up to 10 km from the coast while mechanized vessel can go up to beyond 23 km.
    - *Minimum legal size:* Specific for prawn and fish catches based on their weight and length.
- Currently there are 31 MPAs in India.
- MPA area: 7815.6 $km^2$of total continental shelf area (1.67% of total continental shelf area).
- Four Coastal Regulation Zone Act 1991 – CRZ Category 1 is to protect ecologically sensitive areas like mangroves, coral reefs, marine national parks, sanctuaries
- To provide protection to these ecologically important areas, GOI initiated action through state governments to create a network of MPAs under Wildlife (Protection) Act, 1972.
- To strengthen biodiversity conservation further, three biosphere reserves were notified in 1989 – A & N, GOMBR, Sundarbans.
- Issues in MPA:

- MPA management is not strong, managed by Wildlife Department but it's only concern on the protection of wildlife. MPA management is not fully evolved.
- Legal issues, boundary demarcation, protection to infrastructure, absence of scientific management plan are major issues.
- No legally defined MPAS in Indian law. What are reported are selected sanctuaries and national parks declared under WLP (A) 1972 and WL (P) Amendment Act 1991. These are brought under a new heading protected area under WL (P) amendment Act, 2001.
- Poor MPA governance limits effectiveness.
- Lack of coordination between ministries (MoEF and MoA).
- No participation from local communities in any fisheries and MPA development especially during the declaration of new MPAs.
- Ineffectiveness of fisheries regulation and impact on the traditional fisheries.
- Fisheries rights are not considered into the procedure for notifying and declaring protected areas. Fisheries low in the political and governance agenda. While declaring CRZ notifications local communities are to be involved right from beginning and to be taken into confidence.
- MPAs or other conservation measures affect primarily traditional fishers but not commercial fishing interests. Though fisheries regulation exists effective implementation is lacking except for very few like closed season.
- Lack of clarity in MPA classification.
- None of the MPAs existing in India are for fisheries purpose.

5.1.3 Indonesia

- Country profile:
  - Length of coastline 95,186 km (coastline) – the second longest in the world
  - Approximately 17,504 islands
  - 5.8 million km^2 of EEZ area
- Legal basis for MPAs: amendment in Law no 27/2007 on Integrated coastal zone and small island management came into law on January 2014 where all MPAs will be managed by one institution, the Ministry of Marine Affairs and Fisheries (MMAF).
- Developed ministerial decree on designation mechanisms for zoning for MPA management plan, boundary mapping and MPA management effectiveness evaluation.
- In Indonesia, MPA is not only protected but a zoning system is implemented that supports marine biodiversity, sustainable fisheries and tourism. There are four zones in terms of paradigm: core zone, sustainable fisheries zone inside the MPA, utilization zone, and other zones
- MPA management: National MPAs managed by the national authorities and local MPAs managed by the local community.

- There is a strategic national plan with an objective to reserves 10 per cent of marine area into MPA. The target is 30 million ha of MPAs and is progressing to achieve 20 million ha in 2020. Currently 15.7 million hectares of MPAs have been established and has exceeded the target for 2014.
- MPAs within the BOBLME project in 2011 declared 5 new MPAs , Aceh Jaya, Aceh besar, Agam, Padang City and Bengkalis
- Pulau Pini game reserved should be excluded from BOBLME MPA database
- Bengkalis (for Tenulosa macruca; Decree 69/ 2012) – Terubok closed system
- MPA management Effectiveness:
    - Developed national standard and has been declare by DG
    - The principles of E-MPA: adapted from several authors and also based on Indonesia's regulation. Included support, governance, socioeconomic and biophysical aspects
    - 5 colours level and most of MPAs in Indonesia still in red level
    - BOBLME Pilot sites: (a) Sabang (local government); and (b) Pulau Pieh
        - To document management status of Pulau Pieh NMRP and Sabang District MPA.
        - To measure management effectiveness level as a basis for improving management of these MPAs over time
        - Providing scientific information for adaptive management in the future
        - Both Sabang and Pulau Pieh E-MPA result: Still in yellow towards green. Recommendation to improve both management effectiveness levels towards green.

<u>Q&A:</u>

Q1: Who is actually managing the MPA sites?

A1: National government and local communities in some area

Q2. Do you have any such document to share on the management of Indonesia MPA?

A2: Can visit the website ; http://kkji.kp3k.kkp.go.id/

Q3. How the Indonesian government managing the pollution issue?

A3: Monitoring of pollution is conducted by the directorate of surveillance in MMAF, collaboration between managers unit with clear guidelines on the sanctions

Q4: Question for BOBLME and WorldFish, is there is any clear definition for considering and area as an MPA?

A4: WorldFish did not provide any clear definition but the metadata produced by WorldFish should give some idea on what is the MPA. Basically in this region MPA is only used by environment department but fish sanctuary is used by fisheries department. However there is similarity in both terms as these are used for protection in area based management and

this should be the basis for the definition. At the moment the list used by WorldFish contains both MPAs and fish sanctuaries.

5.1.4 Malaysia

5.1.4.1 Marine Parks Departments presentation

- Marine Park is under the Marine Park department of Malaysia management. This department was established in 2007
- The governance of MPA is through a series of national, state and local management
- There are 42 areas declared as Marine Parks, a no-take-zone of two nautical miles around the 38 islands and one nautical mile around 4 islands with a total area of 235,723 hectares
- Pulau Payar is the only MPA in the BOBLME boundary
- Legal arrangement: The Fisheries Act 1985 and amendment made in 2011 due to the establishment of new department in 2007 applies.

Q&A:

Q1: What is the definition that WorldFish use to define the MPA in the database (FFI)

A1: To compile list of MPA in Malaysia, WorldFish refer to the booklet published by Marine Park Department (2012 Compendium) However, WorldFish is aware that the list of MPAs for Malaysia is incomplete after receiving comments from the Fisheries Department. The list should also include Fisheries Prohibited Area and WorldFish has incorporated the comment. WorldFish realizes that BOBLME also focuses on fisheries protection.

Q2: How do you focus on the MPA development for tourism and coral protection?

A2: Malaysia has a Standard procedure that is followed by all the relevant departments for developing MPAs.

Q3: Is there any penalty imposed on people who break the rules for protecting the environment especially on pollution?

A3: In managing pollution, the Department of Marine Parks collaborates with the Environmental department which is also under the same ministry.

5.1.4.2 Fisheries Malaysian Department presentation

- Provide comment to the MPA database: Anticipating changes in Pulau Kaca to Pulau Kacha (amendment in 2012)
- Fisheries department has gazetted Fisheries Protected Area and MPA in Pulau Besar, Tanjung Tuan, Pulau Singa Besar and Pulau Sembilan (state park)

5.1.5 Maldives

- There are additional three new MPA were declared in island of Fuvamulah:
  - *Dhandimagu kilhi* - Mangrove Area
  - *Bandaara kilhi* (mangrove) and surrounding wetland area
  - *Thund*i Area- Beach (including the Reef area)

- 5 sites protected under the Maldives Grouper Fishery Management Plan. The 5 sites have been identified as some of the top grouper spawning aggregation sites and cannot be used for any purpose, except as a transportation route. All types of fishery, including bait fishery will be prohibited in those areas. Diving, anchoring and waste disposal are also prohibited.
  - *Lhaviyani* atoll - *Aligaa* channel
  - *Kaafu* atoll - *Dhiffushi* channel
  - *Vaavu* atoll - *Boamas* channel
  - *Meemu* atoll - *Muli and Mulah* channels
  - *Dhaalu* atoll - Kudahuvadhoo channel

- Management and Enforcement:
  - Hanifaru Management plan has been implemented.
  - Expansion of boundaries of existing MPAs – so the boundary expanded from 200m landwards to 1000 m seawards
  - GREEN FUND - trust fund dedicated for managing the protected area started in 2013
- Has 47 protected areas:
  - 4 mangroves, 5 islands, 1 beach area and 37 marine protected area

<u>Q&A:</u>

Q1: Who is managing the MPA?
A1: Maldives has 2 different offices:

a) The ministry of fisheries managing the Grouper management fishery
b) Environment protection agency (EPA) managing other MPAs

Q2: How about the enforcement in the MPA areas?
A2: Enforcement is under EPA

Q3: Is boundary data available in Maldives to show the exact location? Can the shape file be shared with WorldFish?
A3: The polygon is the administrative polygon and the MPA name is there. It is not in the online GIS data yet but it is available in the EPA office. All MPA polygons are available except for 5 grouper fishery sites. The polygon will be shared with WorldFish later.

Q4: How is the waste management implemented in Maldives?
A4: Waste management is a challenge for Maldives, but Maldives has finalised the regulation on waste management and the regulation provides guideline on how to manage the waste which applies to lakes and marine areas.

5.1.6 Myanmar

- Country profile:
  - Coastline – 2832 km;
  - Continental shelf – 228,781 km^2
  - Territorial sea; 486,000 km^2
- MPAs in Myanmar:
  - Protected area included national parks, shark protection areas, wildlife sanctuaries and mangrove reserves. Protected biodiversity including coral reefs, mangroves and threatened species.
  - There are only 6 MPAs in Myanmar

Q&A:
Q1: Who suggests for new MPAs? Is it NGOs, government of others stakeholder?
A1: Usually the government.

5.1.7 Thailand

- Thailand provide an example of one of the MPA in Thailand, Segarass protected zone management project at *Koh Sarai Satun* Province
- There are two new projects currently:
  - Catalysing Sustainability of Thailand's Protected Area System (CATSPA) – This project developed the protected area management system on six National Parks (5 inland, 1 marine); Mu Ko Tarutoa
  - Strengthening Andaman Marine Protected Areas Network (SAMPAN) - This project seeks to improve the natural resources management of three Marine National Parks; Mu Ko Surin, Mu Ko Similan and Mu Ko Lanta.

Q&A:
Q1: Do you consider artificial reef as MPA?
A1: Worldfish suggest it should be considered if there is an element of protection.

5.1.8 Sri Lanka

- MPA status:
  - National park (6), Marine sanctuaries (13), Fishery management areas (12)
  - Declared and managed by the Department of Wildlife Conservation (DWLC) under the 1993 Fauna and Flora Protection Ordinance (FFPO)
  - After 2010 no declaration on any new MPA
  - Provisions for Protected Areas is under the Amended Coast Conservation and Coastal Resource Management Act
  - Three coastal and marine sites are conserved and managed through co-management (Pigeon islands, Uppar lagoon and Potuwil-Panama sand dunes)
- Bar reef Marine Sanctuary – Pilot sites under BOBLME
  - declared in 1992 under the Fauna and Flora Protection Ordinance
  - The largest marine protected area in Sri Lanka (306.7 km^2)

5.2 Introduction to MPA database and Reefbase

- Ms Teoh Shwu Jiau presented the overview of the BOBLME MPA database and provided a demo on how to use the website and the interactive map
- Provided the URL http://boblme.reefbase.org
- Group work: Validation of database and documentation of added information
- Country delegates were provided with the map and list of MPA for their country. Country delegate was required to check the map and the list to validate the information. (These maps are as shown in Appendix 3).

5.3 MPA management Effectiveness tools

- Len Garces provided a presentation on the MPA management effectiveness assessment tool. The tool was developed based on the Philippines experience. This tool is evidence based/scoring template.
- Len also demonstrated how to fill in the MEAT form and interpret the indicators obtained from filling in the scores.
- Group work: Country delegates worked in groups and they were provided with the softcopy of the form. They need to select one of their MPAs for the MEAT assessment. The objective was to provide experience to the country delegates on how to fill in the MEAT form. (The MEAT template is provided in Appendix 4).

6.0 SUMMARY

Overall, day one of the meeting was used to look at the current situation with regard to MPAs in the eight countries and exchange information on the problems and approaches for

dealing with the issues at hand. The participants were reminded of the need to work on the policy briefs that need to be completed by the country delegate for the second day activity.

7.0 REVISITED: INTERACTIVE MAP WALKTHROUGH AND MPA DATABASE OVERVIEW

The second day of the meeting was used to look at the maps and database of the MPAs.

Ms. Shwu Jiau provides a demonstration on:

- how to use the interactive map
- how to edit the MPA database

She also requested country delegates to provide contact person for updating the MPA database. The list of country focal MPA person for MPA databases is as below:

Country	Full name	E-mail Address
Bangladesh	Mr Quazi Sarwar Imtiaz Hashmi	*quazihashmi@gmail.com*
India	Dr P U Zachariah	*zachariapu@yahoo.com*
Indonesia	Mr Suraji	*suraji_a@yahoo.com*
Malaysia	Mr Abd. Muntalib Juli	*muntalib@nre.gov.my*
Maldives	Mr Rifath Naeem	*rifath.naeem@epa.gov.mv*
Myanmar	U S. Julius Kyaw/ Myat Than Tun	*irnp.dof@gmail.com*
Sri Lanka	Dr Vasantha Pahalawattaarachchi	*vasalanka@gmail.com*
Thailand	Mr Ronawon Boonprakob	*ronawon@hotmail.com*

7.1 MPA verification

Below is the updated information provided by the countries representative in validation of MPA list in the database:

7.1.1 Bangladesh

- Minor changes on the list
- Only some information in the table are missing and they will do the necessary to update the table

7.1.2 India

- No changes on the list
- Missing information on the habitat type and IUCN category, they will provide the information

7.1.3 Indonesia

- 5 additional new MPA should be included
- Indonesia will provide the missing shape file

7.1.4 Malaysia

- Minor changes
- Need to check and make clear the status of Tanjung Tuan and Pulau Sembilan

7.1.5 Maldives

- Detected some errors in the spelling of some MPAs
- 7 new sites: 5 spawning aggregation sites, 2 house reef
- Should revise the site area because of the boundary expansion
- Ask to double check the Seagrass area

7.1.6 Myanmar

- Only six MPAs in Myanmar
- Additional information on the habitat type should be included: crocodile protection and mangrove protection areas

7.1.7 Sri Lanka

- Four MPA sites are missing in the MPA database
- Will provide the GPS coordinates for all the sites

7.1.8 Thailand

- Identified three MPA sites with no polygon, and they will supply the file
- Few sites with incorrect geographical area and they will send the correct boundary

7.2 MPA MEAT sharing result

Len Garces continued with the MEAT sharing result and showed a few examples from the data provided by the country delegates. The delegates got a feel of how to interpret the results and use the MEAT template for assessing the MPAs.

7.3 Presentation of Draft information for Country policy brief and brochure

Mr. Rudolf Hermes presented the template for country policy brief and brochure. This work is still in developing progress since two years ago and was discussed during the last meeting group at Bangkok in 2012. Questionnaires were sent to all the countries. Some countries have submitted the policy brief draft but still need some revision on the text. Some of the suggestion was the text should be shorter to catch decision makers' attention; it should cover all MPAs information in the country. Thus, the objective of this session is to complete the draft policy briefs.

The country policy brief content should include key messages as in the list below:

- Title: Country's Marine Protected Areas
- General Message (What, Why, Threats – General)
    - MPAs are Critical to Ecological Integrity and Human Well-Being
- Key Message 2 (Why – Value for People)
    - Marine Resources Provide Valuable Ecosystem Services
- Key Message 3 (How – Governance)
    - Regulatory Framework; Area sizes; Numbers
- General Message
    - MPAs Face Serious Challenges
- Key Message 4 (Human Impacts)
    - Human Impacts Cause the Degradation and Depletion of Natural Resources
- Key Message 5 (Governance challenges)
    - Poor MPA Governance Limits Effectiveness
- Recommendations for Improving MPAs

(The sample MPA Policy Brief for case of Thailand is provided in Appendix 5).

7.4 Presentation on Final Policy Brief Input

The country delegates presented the output of their policy brief draft and the draft was open for comment during the presentation

7.4.1 Myanmar

- **MPAs are critical to ecological integrity and human well being**
    - Suggested to put some figures on how much marine resources contributes to the nation
- **Marine resources provide valuable ecosystem services**
    - The last two sentences should be changed because at the moment tourism activities are limited within MPA. Revenue from tourist is expected to increase as currently it's limited.

7.4.2 Maldives

- **Marine Resources Provide Valuable Ecosystem Services**
  - The sentences "It provides almost 71% of the national employment, 49% of public revenue, 98% of the exports and generates roughly 89% of the national GDP" – Should show the disaggregation whether the value are coming from fisheries or tourism.
- **Regulatory Framework**
  - Suggestion to add the total area of the MPAs in hectare or square km.
- **MPAs Face Challenges**
  - "Improve the Environmental Assessment process" – suggested to change word improve to strengthened

7.4.3 Sri Lanka

- **Marine Resources Provide Valuable Ecosystem Services**
  - Suggestion to add the economic value of tourism also
- **Multiple Regulations**
  - In the paragraph, it should mention the role of the Coastal conservation department and Environment Department in managing the MPA
- **Environmental and physical challenge face**
  - Merge some of the text because it has the same meaning

7.4.4 Malaysia

  - Overall comment is to add more texts.
- **Marine Resources Provide Valuable Ecosystem Services**
  - Suggestion to add value from fisheries sector
- **Poor MPA governance limits effectiveness**
  - Need additional bullet regarding community participation and also involvement with other stakeholders. It should focus on governances and not only government. The question is there enough involvement from the community and to identify whether this a challenge or limitation?

7.4.5 India

- **Marine resources provide valuable ecosystem services**
  - Suggestion to merge the last bullet with the upper paragraph because it looks same
  - Suggestion to add Gulf of Mannar (third bullet)

7.4.6 Bangladesh

- **Marine Resources Provide Valuable Ecosystem Services**
  - Shark fin as the marine product should be removed from the paragraph. BOBLME is now working hard with fisheries department to develop the national plan of action for shark.

7.4.7 Indonesia

- **Recommendations for improving MPAs**
  - In the sentence and recommendation for BOBLME Project, it was suggested to just write general statements.
  - Specific detail on the MPA network

7.4.8 Thailand

- **Recommendations for improving MPAs**
  - Bullet number 2 – word "multistakeholder consultation" can be stressed using the word "participation"
  - Last bullet – to add FAO international guideline

7.5 Recommendation for MPA database completion and maintenance

Participants have provided a valuable input to validate and update the MPA database and next step are:

- Will update the database using the participants' feedback
- Will send notification e-mail to the country focal points on the update and will ask them to check again the data on the website
- Provide link to the relevant MPA data provider
  - Put other information especially for MPA managers to monitor their MPA such as oceanography data (eg: SST anomalies to predict coral bleaching)

Q&A:

Q1: How is the mechanism to sustain the website after the project is ended?
A1: BOBLME website can be migrated to FAO or APFIC website and similar also with the BOBLME MPA website. However it depend on the WorldFish funding, whether WorldFish is able to maintain the website. But, will think about the mechanism to sustain the websites.

7.6 Recommendation for completion process of policy brief and MPA brochure

- Participants have tolerated all the comments and together with the input from the workshop, the draft policy brief has been successfully written.
- The next process will involve two stages:
    1) The draft will be given to Science committee editor to polish and perhaps to condense the text. Will build a feedback loop and will ask the country to check and compare the content if it still the same as what has been discussed during the workshop.
    2) Draft will be directed to Science committee team for design and layout. Two pages policy brief will be produced. Countries will be contacted if there are other needs such as photos. Soft copy and hardcopy of the policy brief will be produced.
    - Time frame: 5-6 months

7.7 Recommendation for capacity development and other potential project interventions from a country and Transboundary perspectives

7.7.1 Bangladesh

- Status of the project on Developing Framework for new MPAs:
    - BOBLME and Bangladesh are working together to develop a framework for establishment of new MPA in Bangladesh.
    - The progress is quite slow.
    - In the last year, several consultations has been conducted with the stakeholder as part of this activity
    - Now, the framework is still under endorsement process by the ministry, however it has received good feedback.
- Next steps
    - Piloting three sites (St. Martin, Hilsha ground and Sundarban) , however some data limitations are there, such as species data.
    - Proposal to develop national secretary for supporting the declaration of new MPA
    - Suggestion on Capacity building on the effectiveness assessment of the MPA

7.7.2 Sri Lanka

- Sri Lanka is working with BOBLME on the assessment of Bar reef sites however it has been delayed due to the administration issue, thus Sri Lanka requested for no cost extension of the project
- Sri Lanka recommended for the introduction of the MPA management effectiveness assessment tool and assistance to develop the tool for the country.

- Dr. Rudolf suggested Mr. Len Garces to assist in the development of management effectiveness assessment tools and conduct training in different MPAs and the output will be the assessment tool that will be adopted by Sri Lanka.

7.7.3 Maldives

- Recommendation to provide capacity building on the management effectiveness assessment tools for Maldives

7.7.4 Indonesia

- Current project – piloting management effectiveness in two MPAs in west coast of Sumatera
- Proposed – continue the assessment for another 19 MPAs with additional activities as follows:
  - Conduct monitoring, ecology, social economy surveys in every site
  - Develop MPA network
  - Continuity of the effectiveness assessment
  - Training for MPA managers
  - Trans boundary MPA management plan for the eight countries

7.7.5 Malaysia

- Mr. Muntalib from Marine Park Department suggested inviting Malaysian Forestry Department in the next meeting for additional information on the marine managed area for mangroves

7.8 Transboundary MPA project in the Strait of Malacca sub-region preliminary concept note

- Presenter: Dr. Rudolf Hermes
- Preliminary concept note for a trans boundary MPA project
- Will involve three neighbouring countries: Malaysia, Thailand and Indonesia
- There are several trans boundary areas in BOBLME region:
  - GoM
  - Malacca strait
  - Sundarban
  - Mergui/ Meyeik archipelago
- This project will focus on the Malacca straits area
- "Marine Managed Area" for fisheries purposes, with an emphasis on the management of shared stocks of small pelagic and neritic tuna species

- Currently not much information available online about other types of protected areas in the region, such as fisheries management areas and fisheries refugia areas
- Objective: to contribute to improved sustainability of the utilisation of the northern Straits of Malacca marine space and its aquatic resources for the benefit of coastal states and communities through the establishment of a Marine Managed Area
- Project components:
  - *Institutional* component (sub-regional, national and local levels): Establishment of trans boundary management of the Straits of Malacca marine and coastal area
  - *Fisheries management* component (sub-regional and national levels): Development of fisheries management strategy and plan for key fishery resources in the northern Straits of Malacca (in particular with regard to Indian mackerel and neritic tuna resource conservation)
  - *MPA co-management* component (national and local level, addressing trans boundary issues as required):
- Marine pollution?
- Potential start-up activities:
  - a characterisation/study of the region - sectors, players, ecosystem valuation
  - modify an existing/set up a platform for dialogue
  - discuss MMA / marine spatial planning (or whatever acronym is acceptable)
  - goals - identify goals of the existing stakeholders; international obligations; national goals; shared goals etc
  - Undertake a range of activities in support of the goals, including continue dialogue, development of a plan etc.
  - pilot a MMA - including training managers, stakeholders; support a MMA process - with review mechanism.
- This project will take about 5 years
- Project partners: Fisheries, environment and parks authorities in Indonesia, Malaysia and Thailand, relevant NGOs, fishing community, CSOs, SEAFDEC, WorldFish, other regional projects.

8.0 CLOSING

The meeting was closed by Dr. Rudolf Hermes, Chief Technical Advisor of BOBLME. He thanked the delegates for taking the time to attend the workshop and provide valuable information to update the information on MPAs and MPA activities in their respective countries. Their inputs will go a long way in meeting the objectives of the BOBLME project.

9.0 REFERENCES

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IUCN, CORDIO and ICRAN (2000) *Managing Marine and Coastal Protected Areas: A Toolkit for South Asia.* IUCN, Gland, Switzerland and Bangkok, Thailand; CORDIO, Kalmar, Sweden; and ICRAN, Cambridge, UK.

IUCN World Commission on Protected Areas (IUCN-WCPA) (2008) *Establishing Marine Protected Area Networks-Making It Happen.* Washington, D.C.: IUCN-WCPA, National Oceanic and Atmospheric Administration and the The Nature Conservancy. 118p.

1.0 Background

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

The objective of **BOBLME Component 3 (Improved Understanding and Predictability of the BOBLME Environment)** is to share information with other regional and global environmental assessment programmes for improved understanding of the BOBLME ecological functions and processes. The objective of the **Subcomponent 3.2 (Marine Protected Areas in the Conservation of Regional Fish Stocks)** 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.

2.0 The MPA Working Group Meeting

The BOBLME MPA Working Group first met in January 2011 in Malaysia (BOBLME-2011-Ecology-06) to discuss and validate the MPA status review "Status of Marine Protected Areas and Fish Refugia in the Bay of Bengal Large Marine Ecosystem" (BOBLME-2011-Ecology-10), prepared by BOBLME Implementing Partners University of Washington and WorldFish; to identify gaps in MPA networks and prepare recommendations for capacity building and potential interventions to strengthen MPA management in the region. A second meeting was held in Thailand in February 2012 (BOBLME-2012-Ecology-07) to follow up on this work, noting the progress made in the implementation of pilot activities; gain an understanding of the FAO Technical Guidelines on MPAs and Fisheries (http://www.fao.org/docrep/015/i2090e/i2090e.pdf) and to provide input to the drafting process of the BOBLME MPA brochure and policy advisories.

Objectives

The objectives of the MPA Working Group meeting in February 2014 are to

- undertake a review and update of the MPA data and information posted on the web portal (http://boblme.reefbase.org/mpadatabase.aspx) and the status paper. In particular this requires validation and additional information on MPA locations and their gazette information.
- finalise the MPA policy briefs for each country along the same lines of the brochure developed for Thailand. This requires that prospective participants have drafted and validated relevant summarized text for their respective country, following the Thailand sample.
- discuss, develop and recommend a future course of action and policy directions for sustainable management of MPAs for fisheries and biodiversity conservation both from a country and transboundary perspective.

The Working Group Meeting will also note the progress made to date in the implementation of pilot activities on MPAs and deliberate on the application of MPA Management Effectiveness Assessment Tools.

Expected Outputs

- Validated and completed data and information for inclusion in the MPA data base and status paper
- Final drafts of the BOBLME MPA Country Policy Briefs
- Updated information on the progress and status of MPA pilot site interventions
- Information on MPA Management Effectiveness Assessments disseminated
- Recommendations for capacity development and other potential project interventions from a country and transboundary perspective.

Date and Venue

The workshop will be held at WorldFish on 11-12 February 2014 in Penang, Malaysia.

Draft Agenda

Day 1	**Tuesday 11 February 2014**
08.30	Registration
09.00	Opening remarks and welcome *Dr. Sarah Park, Discipline Director of NRM, WorldFish* *Mr. Ku Kassim bin Ku Yaacob, FRI Penang, DoF* *Mr Abd. Muntalib Juli, DMP, MoNRE, Putrajaya*
	Workshop Objectives, Overview of the Agenda, Introduction of Participants *Dr. Kuperan, Facilitator*
	Country Updates, Progress on MPA Pilot Interventions *Country Participants* (10-12 minutes each, incl. brief discussions) *Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka, Thailand*

12.30	*Lunch*
13.30	Country Updates (cont'd)
	Introduction to MPA Database (and Reefbase) *Ms. Teoh Shwu Jiau, WorldFish*
	Group Work: Validation of Database and Documentation of Added Information
	MPA Management Effectiveness Assessment Tools *Mr. Len Garces, WorldFish*
	Facilitated Discussion of Experience with the Application of Assessment Tools Recommendations
17.00	Closing for Day 1
	Home work: Completion of Additional Database Inputs

Day 2 Wednesday 12 February 2014

09.00	Revisit: Validation of Database and Documentation of Added Information
10.00	Presentation of Draft Information for MPA Country Policy Briefs (and Brochure) Thailand, Sri Lanka, Myanmar, Maldives, Malaysia, Indonesia, India, Bangladesh Plenary Discussion
	Group work: Finalization of MPA Country Policy Briefs
12.00	*Lunch*
13.00	Group work (cont'd)
	Presentation of Final Policy Brief Input
	Recommendations for Completion Process of Policy Briefs and MPA brochure
	Recommendation for MPA Data Base Completion and Maintenance
	Recommendations for Capacity Development and other Potential Project Interventions from a Country and Transboundary Perspective
	Any other matters
17.00	Closing

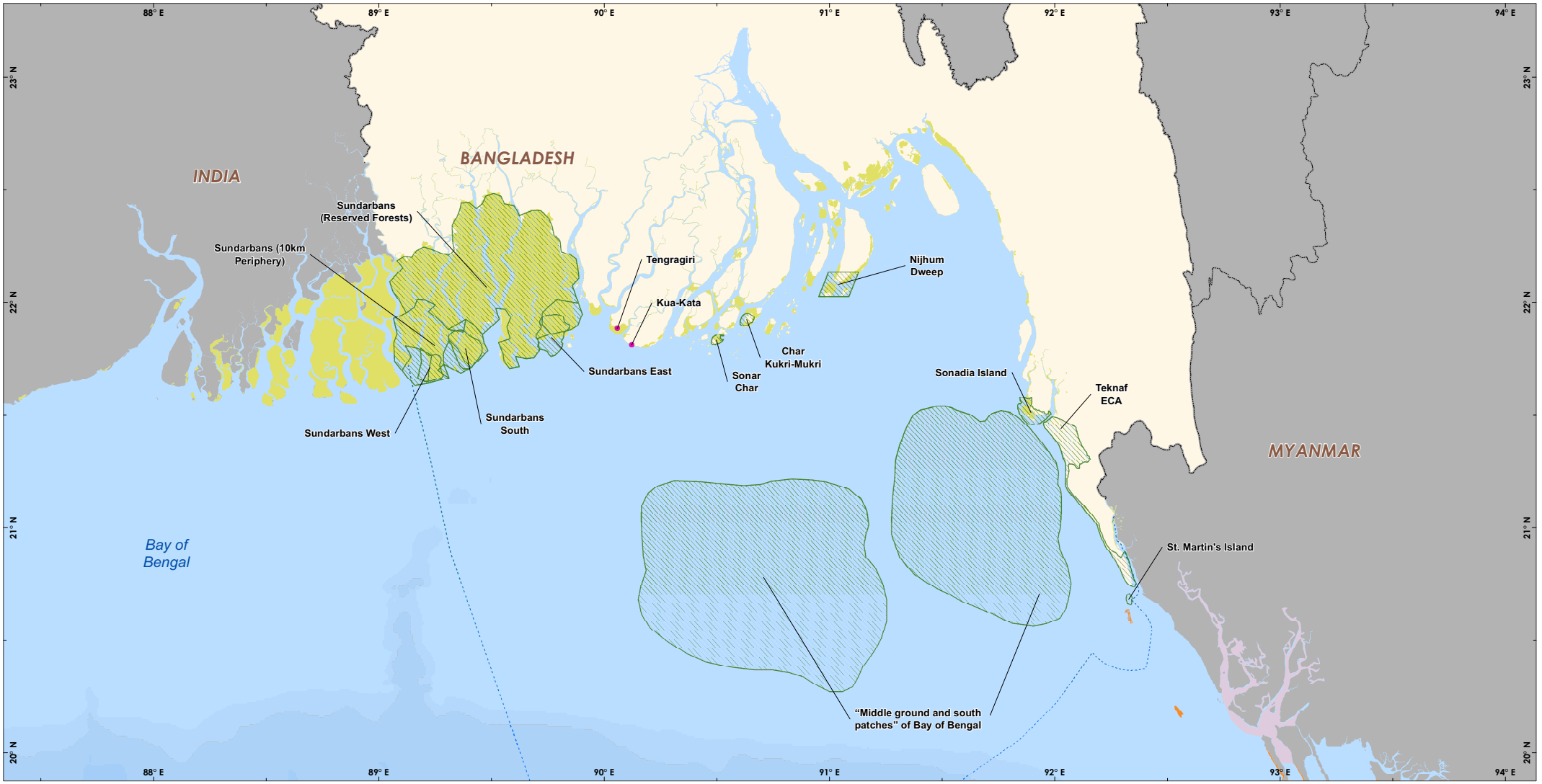
Appendix 2

Participant List				
Country	**Full name**	**E-mail Address**	**Position**	**Organisation**
Bangladesh	Mr Habibur Rahman	habib_6882@yahoo.com	Senior Assistant Secretary	Ministry of Environment & Forests
Bangladesh	Mr Quazi Sarwar Imtiaz Hashmi	quazihashmi@gmail.com	Director	Department of Environment
Bangladesh	Dr Md Istiak Sobhan	istiak.sobhan@iucn.org	Programme Coordinator	IUCN Bangladesh Country Office
Bangladesh	Mr Mohammad Shahad Mahabub Chowdhury	shahad.mahabub@iucn.org	Project Manager	IUCN (International Union for Conservation of Nature)
Bangladesh	Nasiruddin Md. Humayun	nasir_dof@yahoo.com	Director	Marine Fisheries Office, Department of Fisheries (DOF)
India	Dr P U Zachariah	zachariapu@yahoo.com	Head	Demersal Fisheries Division CMFRI
Indonesia	Mr Suraji	suraji_a@yahoo.com	SP, M.Si	Directorate of Marine and Aquatic Resources Conservation
Indonesia	Mr Aris Budiarto	arisbudiarto@gmail.com	S.Pi	Directorate of Fisheries Resources Management
Indonesia	Mr Teguh Satria Gunawan	teguh.satria@gmail.com	ST	Directorate of Marine and Aquatic Resources Conservation
Malaysia	Mr Abd. Muntalib Juli	muntalib@nre.gov.my	Marine Parks Officer	Department of Marine Park Malaysia Ministry of Natural Resources and Environment
Malaysia	Ms Cheryl Rita Kaur	cheryl_rk@mima.gov.my	Head	Centre for Coastal and Marine Environment Maritime Institute of Malaysia (MIMA)
Malaysia	Mr Ku Kassim Bin Ku Yaacob	kukassim@gmail.com	Research Officer	Department of Fisheries
Malaysia	Dr Aileen Tan	aileen@usm.my		School of Biological Sciences Universiti Sains Malaysia
Maldives	Mr Mohamed Ahusan	mohamed.ahusan@gmail.com; mahusan@mrc.gov.mv	Senior Research Officer	Marine Research Center Ministry of Fisheries and Agriculture
Maldives	Mr Rifath Naeem	rifath.naeem@epa.gov.mv	Assistant Director	Environment Protection Agency
Maldives	Ms Fahmeeda Islam	fislam@mrc.gov.mv	Senior Research Officer	Marine Research Centre Ministry of Fisheries and Agriculture
Myanmar	Sophie Benbow	Sophie.Benbow@fauna-flora.org	Programme Manager (Marine) Asia-Pacific	Fauna & Flora International
Myanmar	U Phone Htut	irnp.dof@gmail.com	Staff officer	Forest Department Ministry of Environmental Conservation and Forestry
Myanmar	Daw San San Nwe	trdd.fd@gmail.com	Officer	Department of Forestry
Myanmar	U S. Julius Kyaw	irnp.dof@gmail.com	Fishery Officer	Department of Fisheries
Sri Lanka	Mr W K G Pushpakumara	pushpaccd@yahoo.com	Planning Assistant (Coastal Resource Development)	Coast Conservation and Coastal Resource Management Department
Sri Lanka	Mr B H J Premathilake	bhjprem@yahoo.com	Assistant Director	Coast Conservation Department
Sri Lanka	Mr A. J. M. Gunasekare	ajm12_2000@yahoo.com	Manager- Operation (Acting)	Marine Environmental Protection Authority (MEPA)

Sri Lanka	Dr Wasantha Pahalawathhaarachchi	vasalanka@gmail.com	Principal Scientist	Inland and Aquaculture Resources Division NARA
Sri Lanka	Mr M Marcus	mmallikage@yahoo.com	Deputy Director	Department of Fisheries and Aquatic Resources
Thailand	Mr Ronawon Boonprakob	ronawon@hotmail.com		Marine and Coastal Resources Research and Development Institute Department of Marine and Coastal Resources
Thailand	Mr Withaya Panthakit	putae1973@gmail.com	Fisheries Biologist	Andaman Sea Fisheries Research and Development Centre Phuket
Thailand	Dr Rudolf Hermes	rudolf.hermes@boblme.org	Chief Technical Advisor	Bay of Bengal Large Marine Ecosystem Project (BOBLME)
Malaysia	Dr Kuperan Viswanathan	kuperan@gmail.com	Facilitator	University Utara Malaysia
Philippines	Mr Garces, Len	l.garces@cgiar.org	Research Fellow	WorldFish
Malaysia	Dr Douglas Beare	d.beare@cgiar.org	Senior Scientist	WorldFish
Malaysia	Teoh Shwu Jiau	s.teoh@cgiar.org	GIS Manager	WorldFish
Malaysia	Nurulhuda Ahmad Fatan	n.ahmadfatan@cgiar.org	Research Analyst	WorldFish
Malaysia	Stanley Tan	s.l.tan@cgiar.org	Senior System Analyst	WorldFish
Malaysia	Jason Jon Benedict	j.benedict@cgiar.org	Geospatial Data Analyst	WorldFish

Appendix 3: MPA Maps of the BOBLME Countries

MARINE PROTECTED AREAS - BANGLADESH



Legend

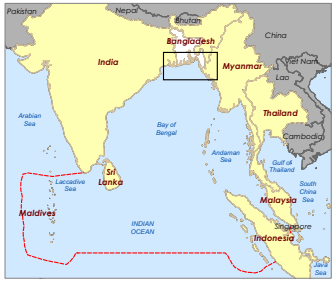
- Bay of Bengal
- Large Marine Ecosystem Boundary
- Administrative Boundary
- Exclusive Economic Zone (EEZ)
- Marine Protected Area (Unknown Boundaries)
- Marine Protected Area (Polygon)
- Coral Reefs
- Seagrass
- Mangroves

Bathymetry (depths in metres)

6500 6000 5500 5000 4500 4000 3500 3000 2500 2000 1500 1000 500 0

0 10 20 30 40 50 km

Coordinate System: GCS WGS 1984
Datum: WGS 1984



Date: 04 Feb 2014

Data sources:

Exclusive Economic Zone (EEZ): VLIZ (2012) Maritime Boundaries Geodatabase, version 7

Coral Reefs: UNEP-WCMC (2010) Global Distribution of Coral Reefs

Mangroves: Spalding *et. al* (2010) World Atlas of Mangroves

Seagrass: UNEP-WCMC, Short FT (2005) Global distribution of seagrasses.

Bathymetry: The GEBCO_08 Grid, version 20100927, http://www.gebco.net

Marine Protected Areas: Compiled from various sources including ReefBase, BOBLME (2011), MoEF (2013), Banglapedia (2013) and WDPA (2013) by WorldFish up to October 2013

MARINE PROTECTED AREAS - INDONESIA

Legend

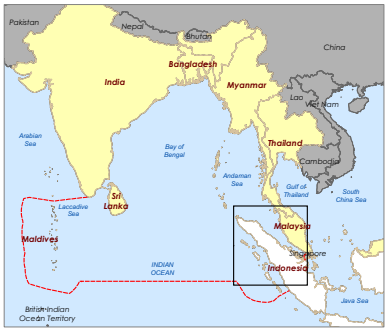
- Bay of Bengal Large Marine Ecosystem Boundary
- Administrative Boundary
- Exclusive Economic Zone (EEZ)
- Marine Protected Area (Unknown Boundaries)
- Marine Protected Area (Polygon)
- Coral Reefs
- Seagrass
- Mangroves

Bathymetry (depths in metres)

6500 6000 5500 5000 4500 4000 3500 3000 2500 2000 1500 1000 500 0

0 50 100 150 km

Coordinate System: GCS WGS 1984
Datum: WGS 1984

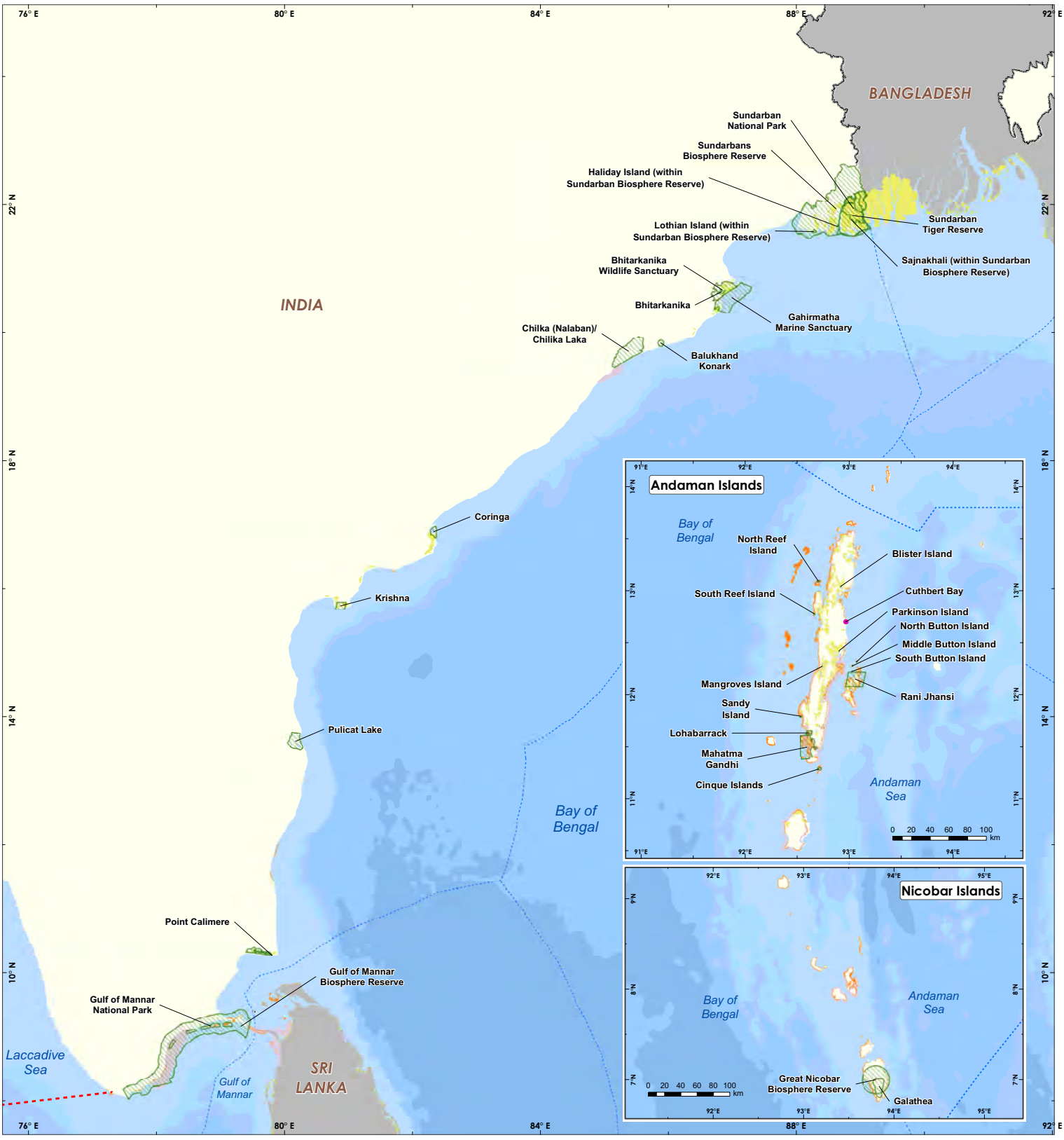


Date: 04 Feb 2014

Data sources:

Exclusive Economic Zone (EEZ): VLIZ (2012) Maritime Boundaries Geodatabase, version 7.
Coral Reefs: UNEP-WCMC (2010) Global Distribution of Coral Reefs
Mangroves: Spalding *et. al* (2010) World Atlas of Mangroves
Seagrass: UNEP-WCMC, Short FT (2005) Global distribution of seagrasses.
Bathymetry: The GEBCO_08 Grid, version 20100927, http://www.gebco.net
Marine Protected Areas: Compiled from various sources including ReefBase, BOBLME (2011), CT Atlas (2013), KKJI (2013) and UPMSI et al. (2002) by WorldFish up to October 2013

MARINE PROTECTED AREAS - INDIA



Legend

- Bay of Bengal Large Marine Ecosystem Boundary
- Administrative Boundary
- Exclusive Economic Zone (EEZ)
- Marine Protected Area (Unknown Boundaries)
- Marine Protected Area (Polygon)
- Coral Reefs
- Seagrass
- Mangroves

Bathymetry (depths in metres)

6500 6000 5500 5000 4500 4000 3500 3000 2500 2000 1500 1000 500 0

Data sources:

Exclusive Economic Zone (EEZ) VLIZ (2012) Maritime Boundaries Geodatabase, version 7.
Coral Reefs: UNEP-WCMC (2010) Global Distribution of Coral Reefs
Mangroves: Spalding *et. al* (2010) World Atlas of Mangroves
Seagrass: UNEP-WCMC, Short FT (2005) Global distribution of seagrasses
Bathymetry: The GEBCO_08 Grid, version 20100927, http://www.gebco.net
Marine Protected Areas: Compiled from various sources including ReefBase,BOBLME (2011), Singh (2003), WDPA (2013), Burke et al. (2011) and MoEF (2013) by WorldFish up to October 2013

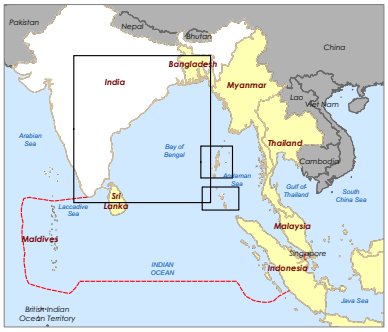
BAY OF BENGAL LME

FAO FIAT PANIS

WorldFish

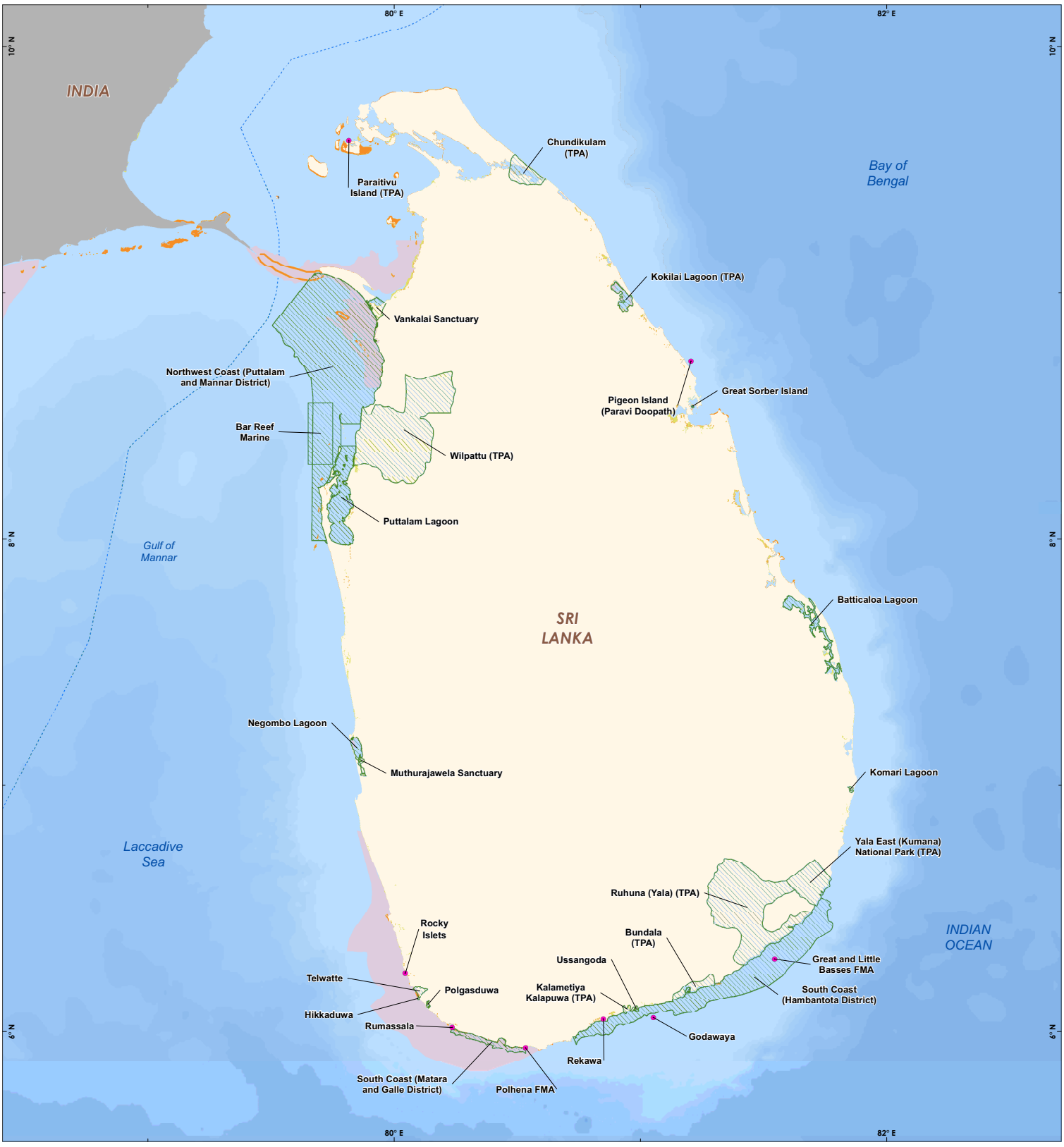
0 50 100 150 200 km

Coordinate System: GCS WGS 1984
Datum: WGS 1984



Date: 04 Feb 2014

MARINE PROTECTED AREAS - SRI LANKA



Legend

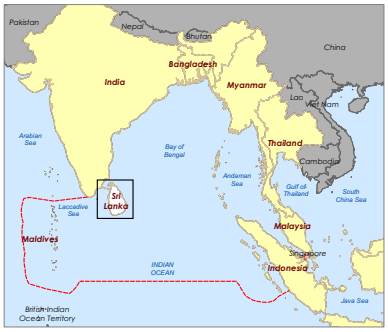
- Bay of Bengal Large Marine Ecosystem Boundary
- Administrative Boundary
- Exclusive Economic Zone (EEZ)
- Marine Protected Area (Unknown Boundaries)
- Marine Protected Area (Polygon)
- Coral Reefs
- Seagrass
- Mangroves

Bathymetry (depths in metres)

6500 6000 5500 5000 4500 4000 3500 3000 2500 2000 1500 1000 500 0

0 25 50 75 km

Coordinate System: GCS WGS 1984
Datum: WGS 1984

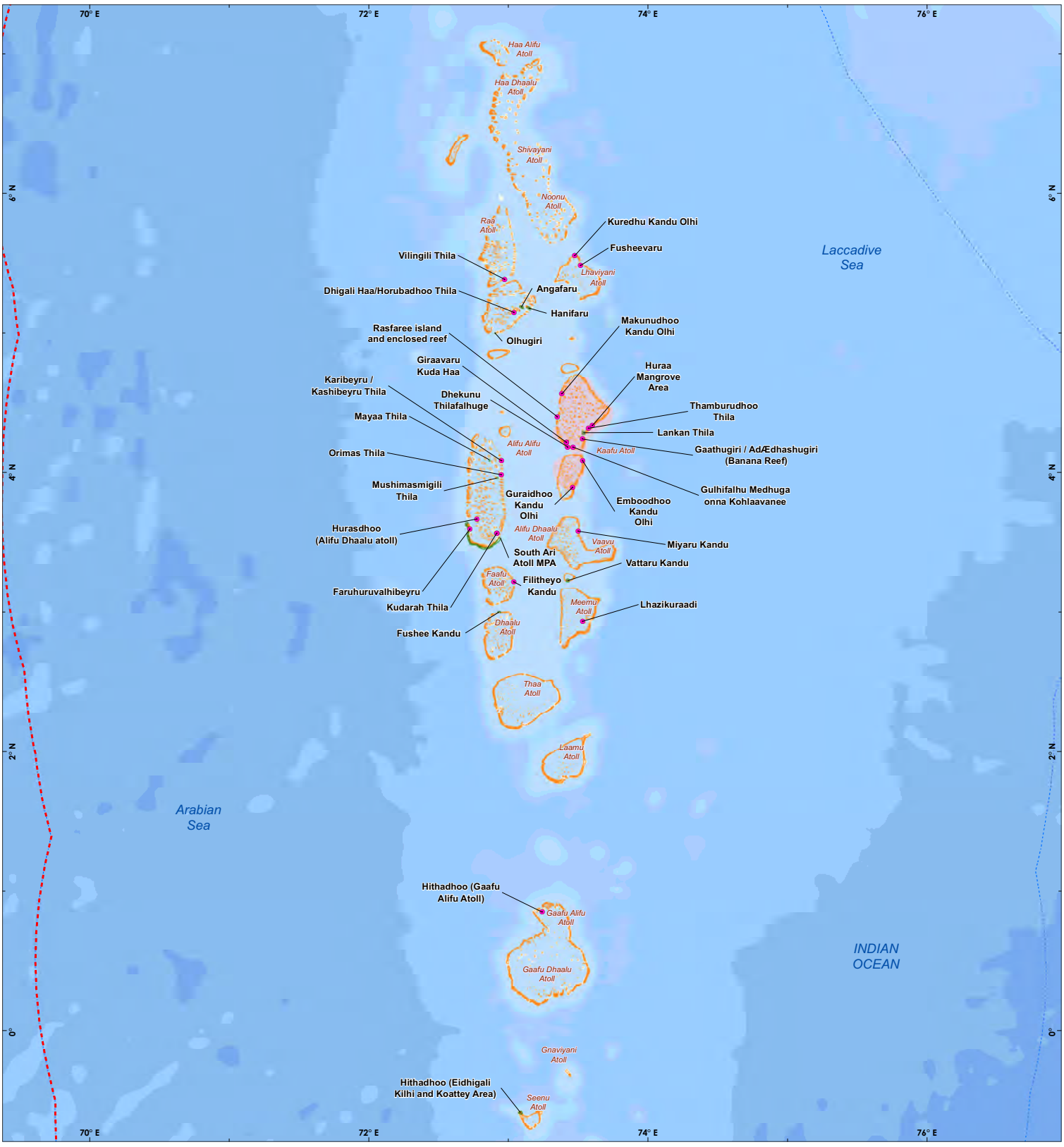


Date: 07 Feb 2014

Data sources:

Exclusive Economic Zone (EEZ): VLIZ (2012) Maritime Boundaries Geodatabase, version 7
Coral Reefs: UNEP-WCMC (2010) Global Distribution of Coral Reefs
Mangroves: Spalding *et. al* (2010) World Atlas of Mangroves
Seagrass: UNEP-WCMC, Short FT (2005) - Global distribution of seagrasses
Bathymetry: The GEBCO_08 Grid, version 20100927, http://www.gebco.net
Marine Protected Areas: Compiled from various sources including ReefBase, BOBLME (2011), RAMSAR (2011) and WDPA (2013) by WorldFish up to October 2013

MARINE PROTECTED AREAS - MALDIVES



Legend

- Bay of Bengal Large Marine Ecosystem Boundary
- Administrative Boundary
- Exclusive Economic Zone (EEZ)
- Marine Protected Area (Unknown Boundaries)
- Marine Protected Area (Polygon)
- Coral Reefs
- Seagrass
- Mangroves

Bathymetry (depths in metres)

6500 6000 5500 5000 4500 4000 3500 3000 2500 2000 1500 1000 500 0

Data sources:

Exclusive Economic Zone (EEZ) VLIZ (2012) Maritime Boundaries Geodatabase, version 7.
Coral Reefs: UNEP-WCMC (2010) Global Distribution of Coral Reefs
Mangroves: Spalding *et. al* (2010) World Atlas of Mangroves
Seagrass: UNEP-WCMC, Short FT (2005) Global distribution of seagrasses
Bathymetry: The GEBCO_08 Grid, version 20100927, http://www.gebco.net
Marine Protected Areas: Compiled from various sources including ReefBase, BOBLME (2011) and EPA (2013) by WorldFish up to October 2013

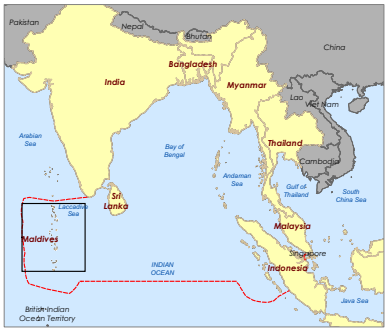
BAY OF BENGAL LME

F A O FIAT PANIS

WorldFish

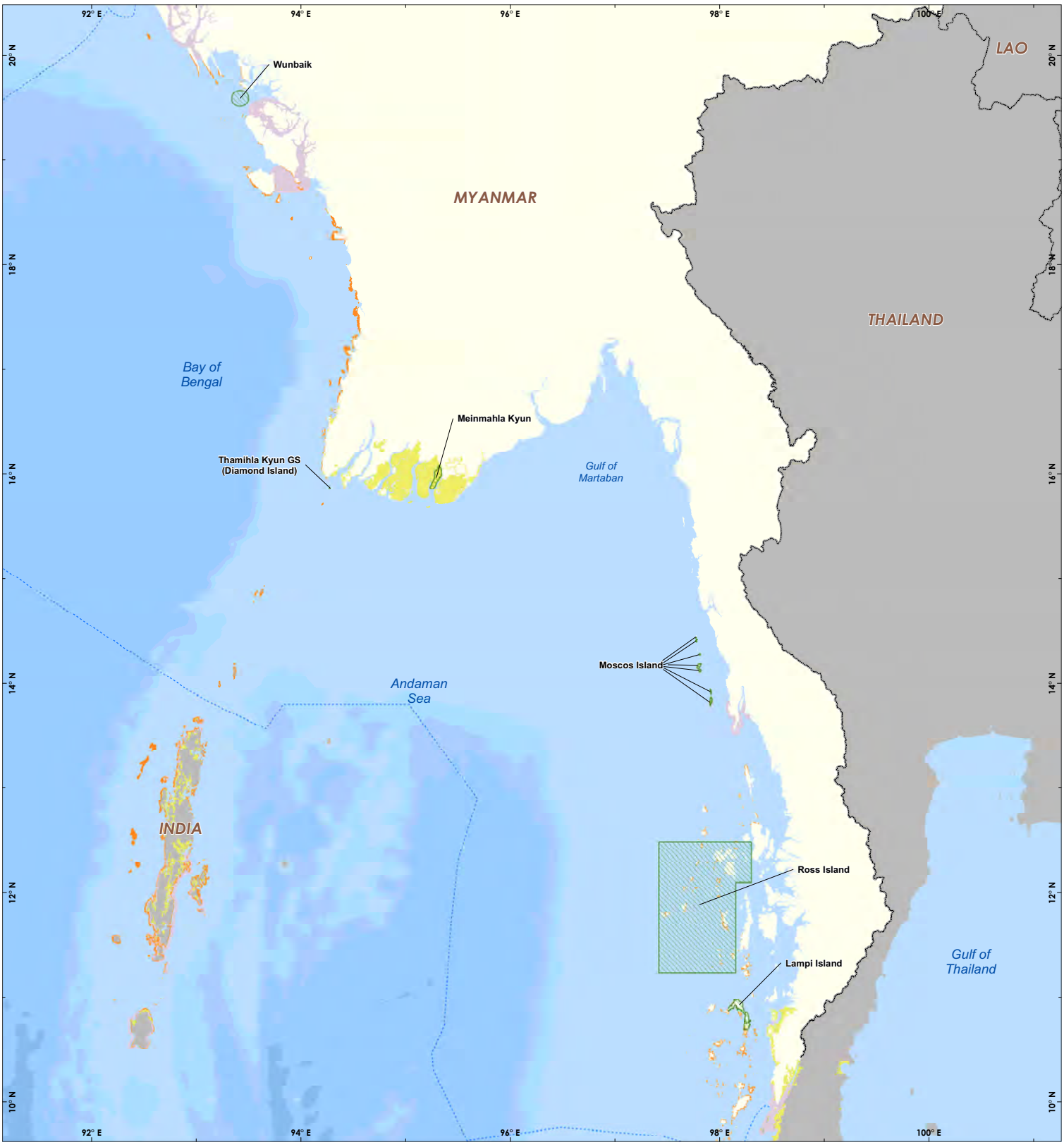
0 25 50 75 100 km

Coordinate System: GCS WGS 1984
Datum: WGS 1984



Date: 04 Feb 2014

MARINE PROTECTED AREAS - MYANMAR



Legend

- Bay of Bengal Large Marine Ecosystem Boundary
- Administrative Boundary
- Exclusive Economic Zone (EEZ)
- Marine Protected Area (Unknown Boundaries)
- Marine Protected Area (Polygon)
- Coral Reefs
- Seagrass
- Mangroves

Bathymetry (depths in metres)

6500 6000 5500 5000 4500 4000 3500 3000 2500 2000 1500 1000 500 0

Data sources:

Exclusive Economic Zone (EEZ): VLIZ (2012). Maritime Boundaries Geodatabase, version 7
Coral Reefs: UNEP-WCMC (2010) Global Distribution of Coral Reefs
Mangroves: Spalding *et. al* (2010) World Atlas of Mangroves
Seagrass: UNEP-WCMC, Short FT (2005) Global distribution of seagrasses
Bathymetry: The GEBCO_08 Grid, version 20100927, http://www.gebco.net
Marine Protected Areas: Compiled from various sources including ReefBase, BOBLME (2011), UPMSI et al. (2002) and WDPA (2013) by WorldFish up to October 2013

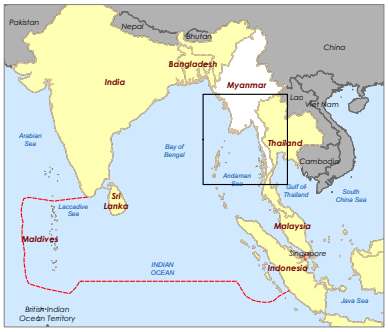
BAY OF BENGAL LME

FAO FIAT PANIS

WorldFish

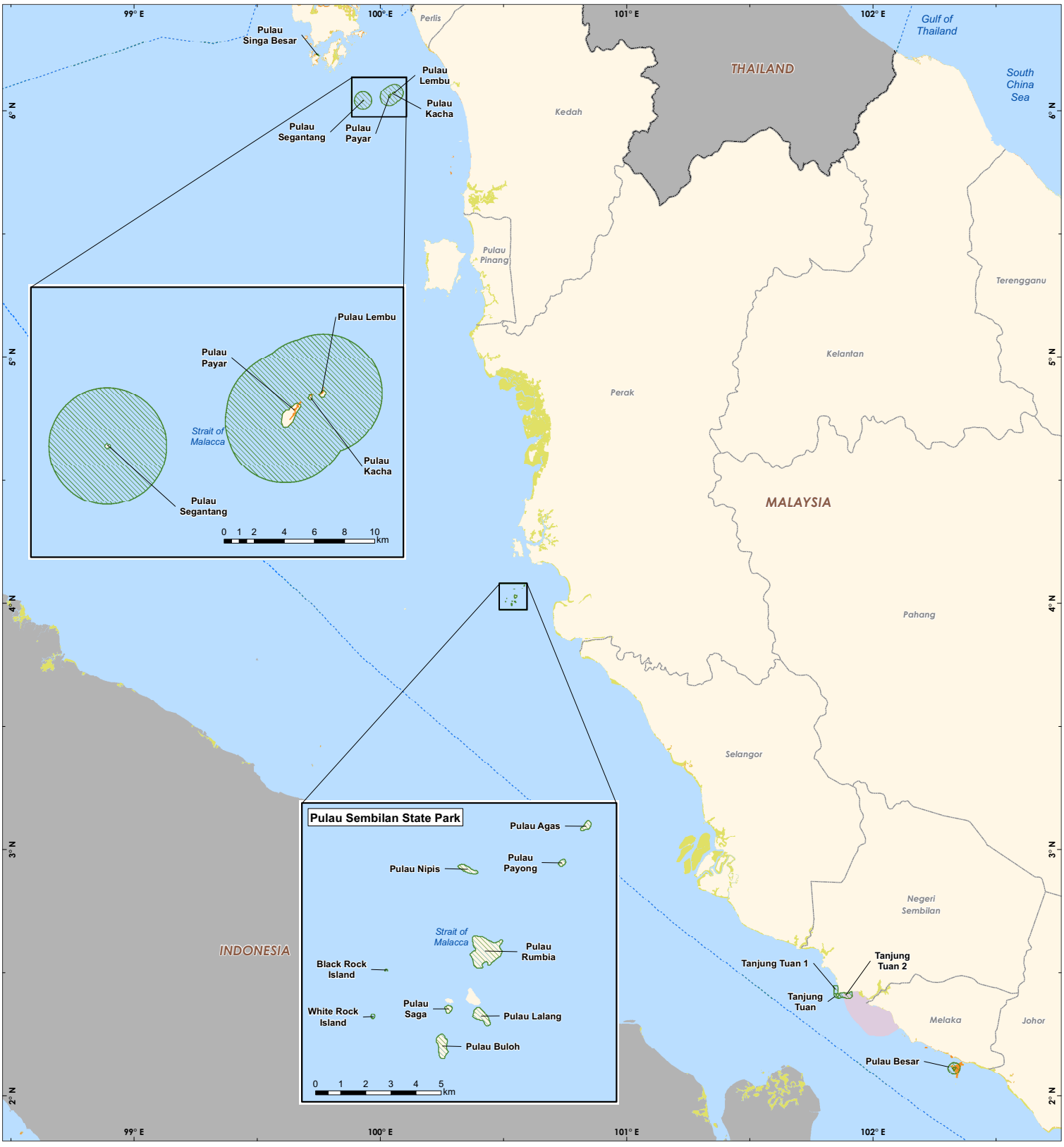
0 50 100 150 200 km

Coordinate System: GCS WGS 1984
Datum: WGS 1984



Date: 04 Feb 2014

MARINE PROTECTED AREAS - MALAYSIA



Legend

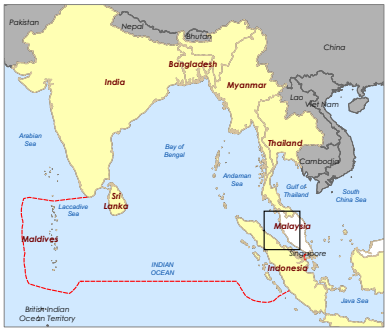
- Bay of Bengal Large Marine Ecosystem Boundary
- Administrative Boundary
- State Boundary
- Exclusive Economic Zone (EEZ)
- Marine Protected Area (Unknown Boundaries)
- Marine Protected Area (Polygon)
- Coral Reefs
- Seagrass
- Mangroves

Bathymetry (depths in metres)

6500 6000 5500 5000 4500 4000 3500 3000 2500 2000 1500 1000 500 0

0 10 20 30 40 50 km

Coordinate System: GCS WGS 1984
Datum: WGS 1984

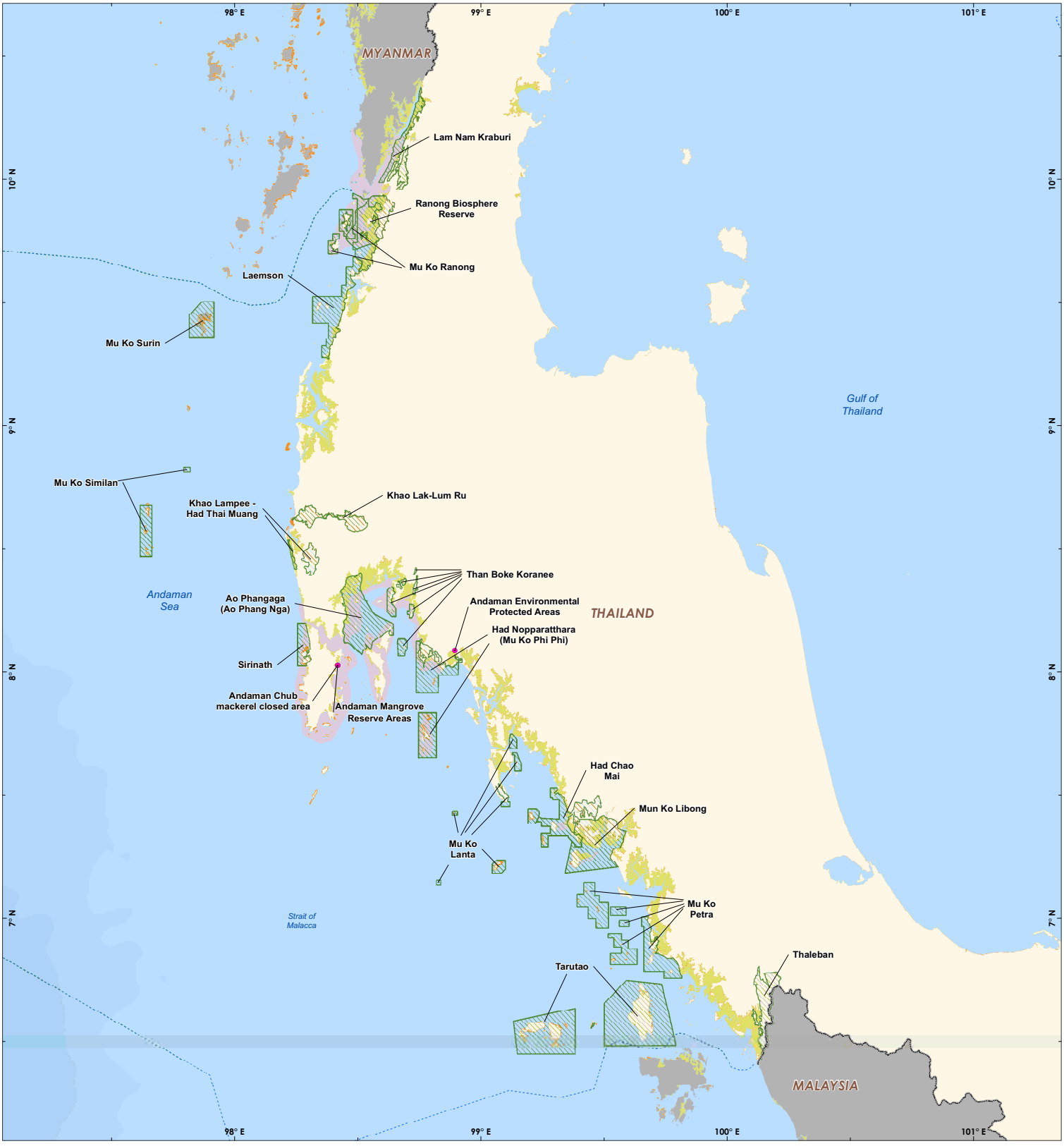


Date: 06 Feb 2014

Data sources:

Exclusive Economic Zone (EEZ): VLIZ (2012) Maritime Boundaries Geodatabase, version 7
Coral Reefs: UNEP-WCMC (2010) Global Distribution of Coral Reefs
Mangroves: Spalding *et. al* (2010) World Atlas of Mangroves
Seagrass: UNEP-WCMC, Short FT (2005) Global distribution of seagrasses
Bathymetry: The GEBCO_08 Grid, version 20100927, http://www.gebco.net
Marine Protected Areas: Compiled from various sources including ReefBase, BOBLME (2011), CT Atlas (2013), DMPM (2012), FRI (2013), WWF (2013), UPMSI et al. (2002) by WorldFish up to October 2013

MARINE PROTECTED AREAS - THAILAND



Legend

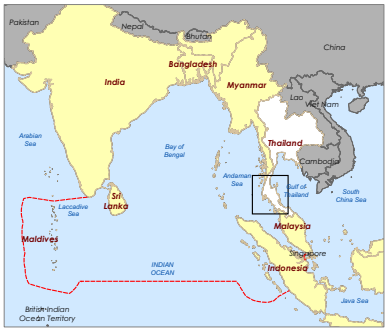
- Bay of Bengal Large Marine Ecosystem Boundary
- Administrative Boundary
- Exclusive Economic Zone (EEZ)
- Marine Protected Area (Unknown Boundaries)
- Marine Protected Area (Polygon)
- Coral Reefs
- Seagrass
- Mangroves

Bathymetry (depths in metres)

6500 6000 5500 5000 4500 4000 3500 3000 2500 2000 1500 1000 500 0

0 10 20 30 40 50 km

Coordinate System: GCS WGS 1984
Datum: WGS 1984

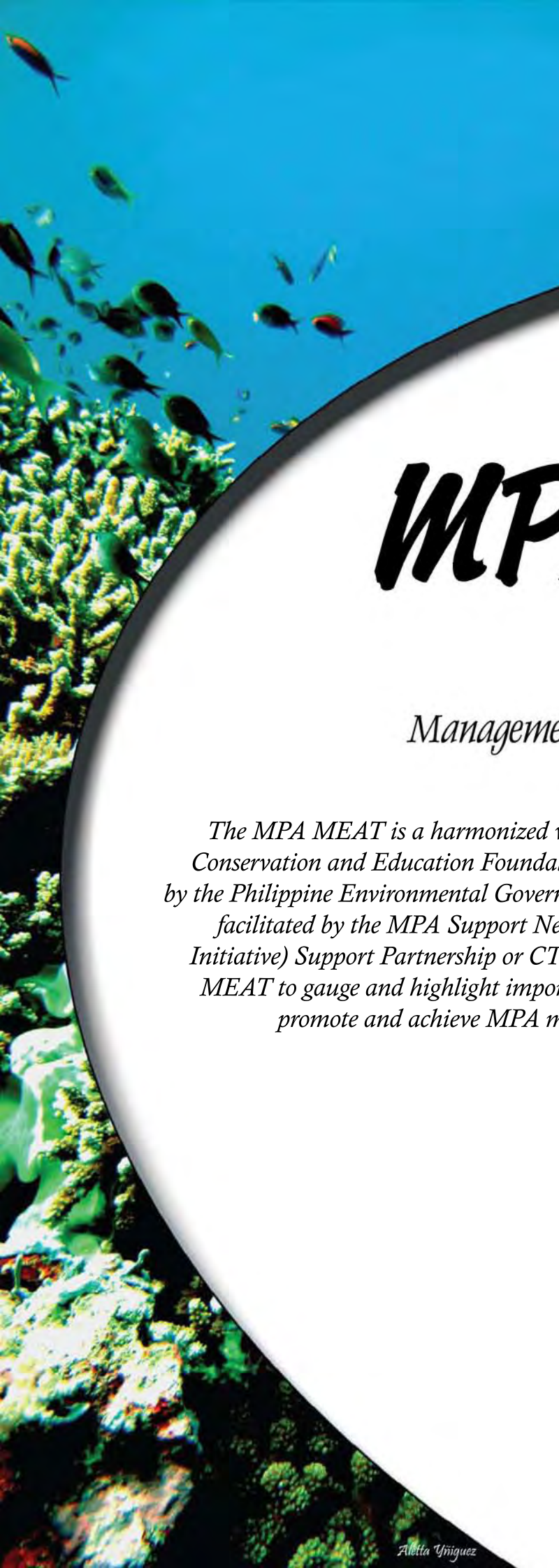


Date: 04 Feb 2014

Data sources:

Exclusive Economic Zone (EEZ): VLIZ (2012) Maritime Boundaries Geodatabase, version 7
Coral Reefs: UNEP-WCMC (2010) Global Distribution of Coral Reefs
Mangroves: Spalding *et. al* (2010) World Atlas of Mangroves
Seagrass: UNEP-WCMC, Short FT (2005) Global distribution of seagrasses.
Bathymetry: The GEBCO_08 Grid, version 20100927, http://www.gebco.net
Marine Protected Areas: Compiled from various sources including ReefBase, BOBLME (2011), Phongsuwan (2012) and WDPA (2013) by WorldFish up to October 2013

Appendix 4: MEAT Template



MPA MEAT

Marine Protected Area Management Effectiveness Assessment Tool

The MPA MEAT is a harmonized version of the MPA Report Guide of the Coastal Conservation and Education Foundation, Inc. (CCEF, White et al. 2004) as modified by the Philippine Environmental Governance Project 2 (EcoGov2), (Arceo et al. in prep), facilitated by the MPA Support Network (MSN) through the CTI (Coral Triangle Initiative) Support Partnership or CTSP. Some elements are incorporated in the MPA MEAT to gauge and highlight important threshold indicators and processes that help promote and achieve MPA management effectiveness outputs and outcomes.

The MPA MEAT was initiated by the:

National CTI Coordinating Committee

version: 01 Feb. 2011

MPA MEAT

What is the MPA MEAT?

The MPA MEAT aims to assess governance in terms of enforcement, implementation and maintenance. However, MPA management in the context of governance approaches in the Philippines is not limited to the physical management of the MPA only but also includes direct and indirect uses, threats, people, and the systemic interaction between people and resources.

What is an effectively managed MPA?

IUCN defines management effectiveness as the degree to which management actions are achieving the goals and objectives of a protected area (Hockings et al., 2000). Management effectiveness is defined, in the context of the MPA MEAT, according to four different levels: (1) established, (2) strengthened, (3) sustained, and (4) institutionalized. MPA effectiveness, on the other hand based on several criteria and/or governance indicators in combination with the biophysical and socioeconomic impact indicators.and socioeconomic impact indicators.

Where to use the MPA MEAT?

MPA MEAT is a management tool to help measure MPA effectiveness using simplified tools allowing an objective evaluation of MPAs. It can be applied to locally-managed MPAs and marine areas declared under the National Integrated Protected Area System Act (RA 7586). It can be implemented through an assisted self-evaluation or key informant interviews. Documents provide proof of completion of targets. For NIPAS marine areas, consider only the areas within the seascape that are directly managed or linked to the PAMB.

How to use the MPA MEAT?

The 48-item modification of the CCEF rating to incorporate other indicators and weighted importance values takes into account the suggestion of the WB score card (Staub and Hatziolas 2004) and of certain threshold governance processes (EcoGov2 in prep., Arceo et al.) to help gauge some outputs/outcomes and define effectiveness (Hockings et al. 2000).

Each level in the MPA MEAT have criteria and activities that need to be satisfied as described in the guide questions. The thresholds indicated with an asterisk (*) are given higher points. The minimum score including all the scores of the thresholds should be satisfied to pass the level. For levels 3 and 4, the age of the MPA is considered also as a prerequisite for proving "sustainability" and "institutionalization".

The levels in this tool are sequential. The highest level, which the MPA being assessed has satisfied the minimum score, is its Management Level. The cumulative score is used to measure the MPA management rating. The minimum number of years of MPA operation in Levels 3 and 4 should be satisfied in order to pass these levels.

BACKGROUND

MPA MEAT AS BENCHMARKING TOOL FOR CTI NPOA GOAL ON MPAS

The benchmarking of Marine Protected Area (MPA) management effectiveness is a crucial part in improving functionality of governance and management of MPAs in the Philippines. It serves as a baseline for the monitoring of the Coral Triangle Initiative (CTI) Philippines' National Plan of Action (NPOA) areas and dovetails with tracking of commitments to the Convention on Biological Diversity (CBD).

The MPA Management Effectiveness Assessment Tool (MPA MEAT) was developed as a benchmarking tool as a result of considerable cooperative work between several institutions and individuals working to help establish and sustain MPA as an important strategy to adaptively manage the coastal and marine areas of the Philippine Archipelago.

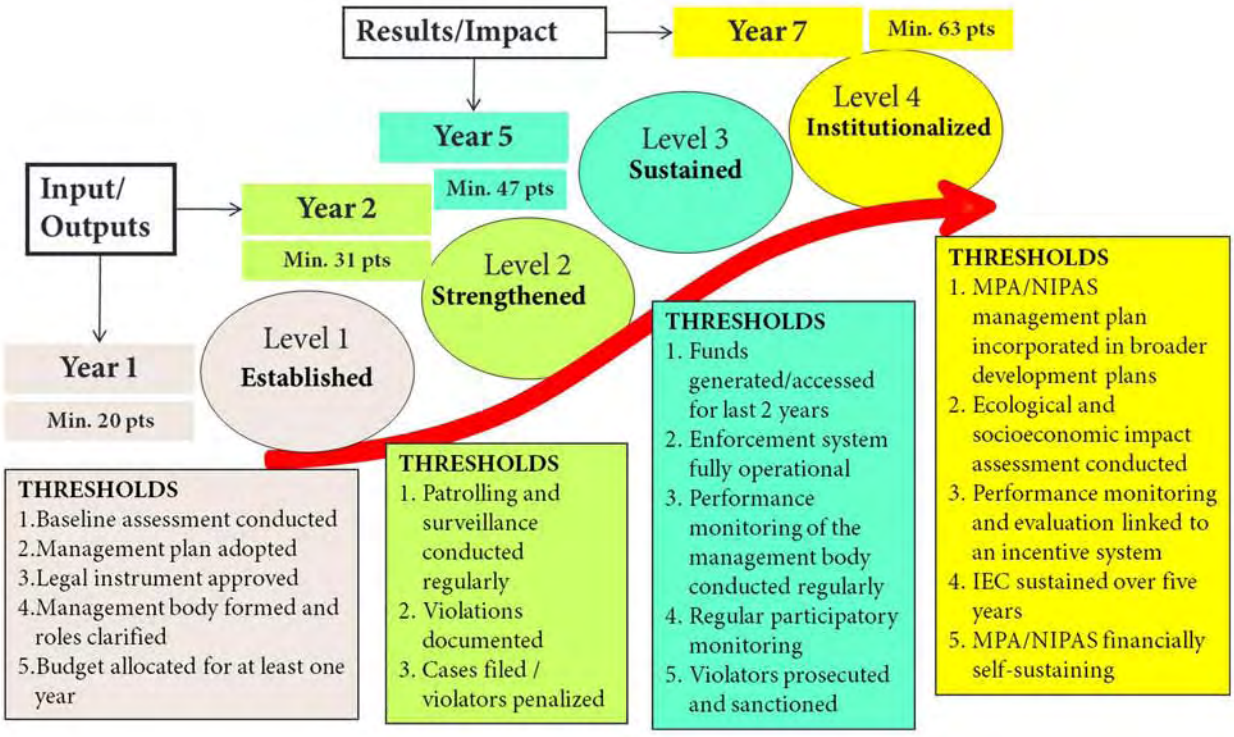
It is envisioned that the MPA MEAT will be implemented widely to help pursue the goal of improving effectiveness of MPAs in the Philippines as part of the CTI (see CTI Goal on MPAs). It can be used as a minimum set of standards for compliance to the CTI NPOA.

How to interpret the results of the MPA MEAT?

There are three ways to interpret the MPA MEAT results: through an overall score or rating, gauging by management effectiveness level, and by categorizing responses into management focus. With the MPA MEAT, an MPA can be "excellent" in terms of level of effort put into MPA management but only get a Level 2 rating (MPA Management is Effectively Strengthened) if not all of the thresholds for Level 3 are met. Grouping the answers into Management Focus will help the management body determine which areas they are doing well and which management focus require improvements.

Interpretations	Description
1. Overall score	- Measures the level of effort devoted to MPA management - Higher scores mean greater effort put into MPA management and can potentially increase MPA effectiveness
2. Management Effectiveness Level	- Incorporates significantly-important activities called **"thresholds"** that MPA management bodies must undertake to enable effective governance of an MPA - The following factors must be met in order to achieve a given Management Effectiveness Level: o Minimum number of years since establishment o Minimum overall score o All **"threshold"** questions satisfied for that Level and those before it
3. Management focus	- MPA management activities can be divided into key categories which help in improving effectiveness of MPAs - These are: Management plan, Management body, Legal instrument, Community participation, Financing, IEC activities, Enforcement, Monitoring, and Development - By grouping the questions into these categories, the MPA management body can gauge where its strengths and weaknesses lie and objectively identify areas for improvement

The MPA MEAT can also be used as a guide for improving MPA management effectiveness using the threshold activities identified. Consolidating the experiences of various institutions and non-government organizations, the MPA MEAT presents a compilation of parameters that enable effective management of MPAs.



COMMUNITY PERCEPTION SURVEY FORM

This perception survey can be used to gauge the level of awareness of stakeholders, their perceived benefits from the MPA, their perception on the functionality of the management body and their willingness to support the MPA. Results of this perception survey may be used by the management body to adjust their community awareness programs and activities.

Introduction statement: *Good morning/afternoon. Can you spare a few minutes of your time? I would like to interview you regarding the (Name of the MPA) in (Barangay), (Municipality/City). (Municipality/City) is currently conducting its regular Community Perception Survey. I only have 6 questions to ask your opinion. The information generated from this survey will be used to improve the management of the (Name of the MPA).*

{Once the person agrees, politely introduce yourself -- name and LGU designation [e.g. "I am Juan Dela Cruz. I am a Fisheries Technician of the (name of LGU)]." Then proceed to conduct the interview}

Fisher stakeholder no._____ **Non-fisher stakeholder no.** _____

Name: _____ **Age:** _____

Address: _____

No. of years residing in the Barangay: _____ **Occupation:** _____

1. Do you know about the (*interviewer states the name of the MPA and place*)?
   [ ] Yes
   How did you know? _____
   What are the functions & benefits of the MPA? (Cite at least 2) _____
   _____
   [ ] No
   Why_____

2. FOR DIRECT (fishers) STAKEHOLDERS:
   Did your fish catch increase because of the MPA?
   [ ] Yes [ ] No [ ] Undecided
   Why? _____

   FOR Non-fisher STAKEHOLDERS:
   Have you benefitted from the MPA?
   [ ] Yes [ ] No [ ] Undecided
   In what way? _____

3. Is there an increase or decrease in the incidence of illegal fishing activities in the area since the MPA was established?
   [ ] Increase [ ] Decrease [ ] Undecided
   To what would you attribute the change? _____

4. Do you think that the MPA management group is functional?
   [ ] Yes [ ] No [ ] Undecided
   If yes, in what ways is it functional? _____
   If no or undecided, why? _____

5. Do you think the MPA efforts can be sustained?
   [ ] Yes [ ] No [ ] Undecided
   Why? _____

6. Will you support the continued management of the MPA?
   [ ] Yes
   How will you support it? _____
   [ ] No
   What would make you support it? _____

MPA MANAGEMENT EFFECTIVENESS ASSESSMENT TOOL

version: 01 Feb 2011

MPA Type:

☐ Locally-managed MPA

☐ NIPAS Seascape *(for **NIPAS sites**, please **skip this page** and proceed to the next)*

MPA information for single MPAs or locally-managed MPAs (provide maps if available)

MPA Name:	Complete Name	
	Short Name	
	Sitio, Barangay(s)	
Location:	Municipality(ies)	
	Province	

	Corner / Point	**Longitude**	**Latitude**
Boundary Coordinates (Latitude & Longitude)	Point 1		
	Point 2		
	Point 3		
	Point 4		
	Point 5		
	Point 6		
	Point 7		
	Point 8		

Size	*Hectares*	
MPA Type:	*Sanctuary/Reserve/Combination*	
Ecosystems Protected:	*Coral reef, mangrove, seagrass, etc.*	
Coral Cover	*Percent live coral cover (include year)*	
Fish biomass / density	*indicate units (kg/ha. or individual/ha.)*	
Year Established:	*Based on legal document*	
Legislation:	*Name and code of ordinance / R.A.*	

Evaluation date: *mm/dd/yyyy*

Evaluator(s) details:

Name	Affiliation	Email address(es)	Contact number(s)

* The third biennial MPA Awards and Recognition (Para El MAR 2011) will be using this form as a nomination form.
If you wish to nominate your MPA, kindly mail or email your form to the secretariat (contact details at the end of this document)

MPA Information for MPAs under NIPAS Act

(provide maps if available)

NIPAS Name:	Complete Name	
	Short Name	
Encompassing:	Municipality(ies)	
	Province	

	Corner / Point	**Longitude**	**Latitude**
Boundary Coordinates (Latitude & Longitude)	Point 1		
	Point 2		
	Point 3		
	Point 4		
	Point 5		
	Point 6		
	Point 7		
	Point 8		

Size	*marine area (hectares)*	
Size	*land area (hectares)*	
Coral Cover	*Percent live coral cover (include year)*	
Fish biomass / density	*Indicate units (kg/ha. or individual/ha.)*	
Year Established:	*Based on legal document*	
Legislation:	*Name and code of ordinance / R.A.*	
Evaluation date:	*mm/dd/yyyy*	

Evaluator(s) details:

Name	Affiliation	Email address(es)	Contact number(s)

For each management zone or MPA in the NIPAS Seascape

(provide additional pages if necessary; provide maps if available)

Management zone or MPA name	Complete name	
Size	Hectares	
Zone/MPA type:	*Sanctuary, reserve, etc.*	

Boundary Coordinates (Latitude & Longitude)	**Corner / Point**	**Longitude**	**Latitude**
	Point 1		
	Point 2		
	Point 3		
	Point 4		
	Point 5		
	Point 6		
	Point 7		
	Point 8		

Year Established:	*Based on legal document*	
Legislation:	*Legal document name*	

For each management zone or MPA in the NIPAS Seascape

(provide additional pages if necessary; provide maps if available)

Management zone or MPA name	Complete name	
Size	Hectares	
Zone/MPA type:	*Sanctuary, reserve, etc.*	

Boundary Coordinates (Latitude & Longitude)	**Corner / Point**	**Longitude**	**Latitude**
	Point 1		
	Point 2		
	Point 3		
	Point 4		
	Point 5		
	Point 6		
	Point 7		
	Point 8		

Year Established:	*Based on legal document*	
Legislation:	*Legal document name*	

LEVEL 1 - MPA IS ESTABLISHED (17 Items, 27 Points)				
Criteria / Guide Questions		Allowable Points	Actual Points	Remarks / Means of verification
1.1 Establishment based on Participatory Process (5/5) **MPA established with the participation of the community based on informed decisions**				
1.1.1	MPA concept explained to stakeholders	0 or 1		
Was the MPA concept explained to the stakeholders? *Affected stakeholders have been oriented on MPA concepts and benefits*				• Minutes of consultations & public hearings • Activity report / proceedings of the consultation
1.1.2	MPA accepted and approved by the community or local government	0 or 1		
Was the MPA accepted by the community (for local MPAs) or local governments (for NIPAS seascapes)? *Public consultation on site selection should be conducted in order to gain community approval and acceptance*				• Resolution(s) • Minutes of meeting
1.1.3	**BASELINE ASSESSMENT CONDUCTED ***	**0 or 3**		
Were the stakeholders engaged in baseline assessment using standard methods / any acceptable methods? *Baseline assessment survey includes biophysical assessment and community profile*				• Biophysical assessment report • PCRA/PRA report • Technical reports of consultants • BMS (for NIPAS seascapes) • Names of local participants
1.2 Adoption of a Legitimate Management Plan (6/6) **Management plan is adopted and legitimized by the LGU or Protected Area Management Board (PAMB) or similar legal body**				
1.2.1	Management Plan Drafted	0 or 1		
Has the management plan been drafted?				• Any draft of management plan
1.2.2	MPA plan prepared in a consultative and participatory manner	0 or 1		
Was the MPA/NIPAS plan prepared in a consultative and participatory manner?				• Documentation of public consultation about the MPA plan
1.2.3	Functions of MPA management body explained through IEC	0 or 1		
Were the functions of the MPA management body and benefits from the MPA explained through initial IEC activities?				• IEC materials
1.2.4	**MANAGEMENT PLAN ADOPTED ***	**0 or 3**		
Has the management plan been finalised and adopted?				• Management Plan • Resolution or ordinance
1.3 Legislations (Municipal Ordinance / Presidential Proclamation / Republic Act) (5/5) **Management plan is adopted and legitimized by the LGU or Protected Area Management Board (PAMB) or similar legal body**				
1.3.1	Legal instrument declaring the MPA has been drafted	0 or 1		
Has the legal instrument declaring the MPA been drafted? *For locally-managed MPAs: The Barangay Ordinance is in place and the Municipal Ordinance has been drafted.* *For NIPAS seascapes: a **Republic Act** has been drafted*				• Draft or final ordinance / resolution • Draft Republic Act (for NIPAS)
1.3.2	Consultations on legal instrument with stakeholders conducted	0 or 1		
Were there public hearings / community consultations on the legal instrument declaring the protected areas?				• Minutes of public consultations • Resolutions of endorsement
1.3.3	**LEGAL INSTRUMENT APPROVED ***	**0 or 3**		
Has the legal instrument establishing the MPA or NIPAS been approved? *For locally-managed MPAS: a Municipal Ordinance declaring the MPA should have been enacted* *For NIPAS seascapes: a **Republict Act** should have been enacted by Congress*				• Municipal Ordinance declaring the MPA for the locally-managed MPAs • Republic Act (for NIPAS)

LEVEL 1 - MPA IS ESTABLISHED (17 Items, 27 Points)				
Criteria / Guide Questions		Allowable Points	Actual Points	Remarks / Means of verification
1.4 Management body formed and functional (11/11) **MPA established with the participation of the community based on informed decisions**				
1.4.1	Management body determined and identified	0 or 1		
Have the members of the management body been determined and identified? *The management core group should have been identified (e.g., BFARMC, MFARMC, or PAMB)*				• List of members of PAMB or management body; management structure; appointment papers
1.4.2	**MANAGEMENT BODY FORMED AND ROLES CLARIFIED ***	**0 or 3**		
Has the management body been formed and have their roles been clarified?				• Minutes showing committees • Organizational chart with clear roles • Enabling documentation (e.g., appointment papers)
1.4.3	**BUDGET ALLOCATED FOR AT LEAST ONE YEAR ***	**0 or 3**		
Has the budget for at least one (1) year of MPA implementation been allocated?				• Approved Work and Financial Plan • Document appropriating funds from the General Appropriations Act (for NIPAS seascapes) or from the LGU (for locally-managed MPAs)
1.4.4	IEC activities coordinated by the management body?	0 or 1		
Have Information, Education, and Communication (IEC) activities been coordinated by the management body? Are signboards / billboards posted along the coastline / shoreline and visible to key stakeholders?				• IEC plan or similar document • Minutes showing IEC activities • Reports on IEC activities • Photographs of billboards / signboards and IEC materials
1.4.5	MPA boundaries delineated	0 or 1		
Are the MPA's boundaries properly delineated in the most appropriate manner and boundary markers installed? *When possible, the MPA boundaries should be marked by anchor buoys made with appropriate and sturdy materials.* *For large areas like NIPAS seascapes, information materials (e.g., banners, billboards, posters) that clearly show the boundaries of the protected area and zones established should be accessible and visible to key stakeholders.*				• Photograph of marker buoys showing status • Maps on billboards, banners, posters
1.4.6	MPA enforcers identified	0 or 1		
Have the MPA enforcers already been identified?				• Document showing names of enforcers (e.g., Bantay Dagat, PNP Maritime Group, Coast Guard, etc.); appointment papers
1.4.7	Biophysical monitoring activities coordinated by the management body	0 or 1		
Are the biophysical monitoring activities coordinated by the management body?				• Biophysical monitoring report • Resolutions approving monitoring activities
TOTAL SCORE FOR LEVEL 1		**27**		
Thresholds are in BLOCK CAPITALS. Minimum score of 18 points and all Thresholds should have been met to pass this Level.				

LEVEL 2 - MPA MANAGEMENT IS EFFECTIVELY STRENGTHENED (9 Items, 15 Points)				
Criteria / Guide Questions		Allowable Points	Actual Points	Remarks / Means of verification
2.1 The MPA is effectively strengthened (15/15)				
2.1.1	Enforcement plan, or its equivalent, in place	0 or 1		
The MPA should have a clear and feasible enforcement plan				• Enforcement plan (i.e., schedules, SOP, etc)
2.1.2	Marine enforcement group trained	0 or 1		
Have the marine enforcement team members been trained on enforcement procedures and protocols? (e.g., apprehension, para-legal, use of GPS, safety, etc.)				• Training report with names of participants • Certificate of attendance to training(s) • Deputization ID
2.1.3	**PATROLLING AND SURVEILLANCE CONDUCTED REGULARLY ***	**0 or 3**		
Are patrolling, surveillance, and other violation detection measures (e.g., watchtowers, radars, community reporting, etc.) being conducted regularly?				• Attendance of patrollers • Patrol logs • Back to office reports (after patrols) • Mission order
2.1.4	**VIOLATIONS DOCUMENTED ***	**0 or 3**		
Are violation reports / apprehensions being documented properly? *Even if there are no violations observed, these should be reported as "no observed violations" .*				• Back-to-office report of patrol team • Logbook of apprehensions / report violations • Police blotter
2.1.5	**CASES FILED OR VIOLATORS PENALIZED ***	**0 or 3**		
Are cases filed for apprehended violators or are they penalized (e.g., administrative fines)? *Violators are at least required to pay administrative fines or other penalties provided for in the ordinance or any enabling law. Confiscation of gears can also serve as a form of sanction as well as undergoing a seminar for first time violators.*				• Case reports • Legal documents • List of violators penalized • Logbooks • Record of fines collected • List / pictures of gears confiscated
2.1.6	Funds accessed and used	0 or 1		
Allocated funds should have been accessed and used for MPA management. Funds can also come from other sources (e.g., donors, projects, etc.)				• Expenditure reports • Financial statements
2.1.7	Infrastructures maintained	0 or 1		
Are the MPA billboards, boundary markers, anchor buoys, guardhouse, boats, or other infrastructures for MPA management being maintained?				• Photograph of infrastructures showing their condition • Expenditure reports on maintenance of infrastructures
2.1.8	IEC program conducted to sustain public awareness and compliance	0 or 1		
Is the IEC program being implemented to sustain public awareness and compliance?				• Documentation of IEC activities • IEC materials
2.1.9	Participatory biophysical monitoring in the last 3 years	0 or 1		
*Biophysical surveys should have been conducted **at least in the last three (3) years**. Surveys should be properly documented, with the data kept safely for review and updating purposes. For NIPAS seascapes, Biodiversity Monitoring System (BMS) or other monitoring methods should have been done and reported at least over the last three years.*				• Data or report over the last three years
TOTAL SCORE FOR LEVEL 2		**15**		
Thresholds are in BLOCK CAPITALS. To achieve Level 2, Level 1 requirements must have been passed and a minimum of 11 points obtained from Level 2 with all Thresholds met.				

LEVEL 3 - MPA MANAGEMENT IS EFFECTIVELY SUSTAINED FOR AT LEAST 5 YEARS (11 Items, 21 Points)				
Criteria / Guide Questions		Allowable Points	Actual Points	Remarks / Means of verification
3.1 The MPA management is effectively sustained for at least 5 years (21/21)				
3.1.1	Management plan and ordinance reviewed and updated	0 or 1		
Has the MPA management plan reviewed or updated in response to emerging needs and challenges?				• Updated management plan or amendments to the plan • Minutes of meeting that reviewed the plan
3.1.2	**FUNDS GENERATED OR ACCESSED FOR LAST 2 YEARS ***	**0 or 3**		
Are financial sources generated or accessed for the last 2 or more consecutive years? (e.g., budget from LGU / IPAF or from external sources)				• Audited expenditure report for the last 2 years
3.1.3	Management body able to supervise management activities of the MPA and access technical assistance, if necessary	0 or 1		
Management body is fully functioning and has shown capacity to locate and access technical assistance to improve MPA management and status				• Letters with reply from partner for technical assistance • Reports with other partners • Minutes of meetings w/ action points
3.1.4	**ENFORCEMENT SYSTEM FULLY OPERATIONAL IN THE LAST FIVE CONSECUTIVE YEARS ***	**0 or 3**		
The enforcement plan is fully implemented. Patrolling activities, violations reporting and apprehension, and sanctioning of violators should have been on-going over the last five years.				• Logbook with records of patrolling apprehensions • Annual enforcement reports (for 5 years)
3.1.5	IEC program enhanced	0 or 1		
IEC materials are regularly reproduced or updated and disseminated				• IEC Program progress reports (including dissemination details) • Updated IEC materials
3.1.6	**PERFORMANCE MONITORING OF THE MANAGEMENT BODY CONDUCTED REGULARLY ***	**0 or 3**		
Performance monitoring of the management body should be done regularly as defined in the management plan or at least every 2 years. Management evaluation tools such as the MPA MEAT can be used to assess management performance.				• Performance evaluation reports for the management body
3.1.7	**REGULAR PARTICIPATORY MONITORING CONDUCTED ***	**0 or 3**		
*Biophysical surveys should have been conducted **at least in the last five (5) years**. Surveys should be properly documented, with the data kept safely for review and updating purposes. For NIPAS seascapes, the Biodiversity Monitoring System (BMS) should have been reported at least every three years.*				• Monitoring data showing trends • Attendance sheets showing names of locals who participated in monitoring activities
3.1.8	Socioeconomic monitoring conducted regularly	0 or 1		
"Regular" as defined in the management plan or at least annually. Minimum socioeconomic data which may be used by the management body to adjust management plans & strategies include: income, livelihood activities, population, resource use, fish catch, etc.				• Socioeconomic data showing trends
3.1.9	Sustainable financing strategy established	0 or 1		
Is there an internally generated revenue scheme?				• Resolution or ordinance imposing fees • Financial guidelines • Private-public partnership agreements
3.1.10	**VIOLATORS PROSECUTED AND SANCTIONED ***	**0 or 3**		
Are the prosecution process requirements, if any, satisfied by the MPA management body?				• Appearance in court or court decision • Other sanctions implemented
3.1.11	Feedback system in place (for monitoring)	0 or 1		
Is there a feedback system in place?				• Minutes of public hearings / presentations
TOTAL SCORE FOR LEVEL 3		**21**		
Thresholds are in BLOCK CAPITALS. To achieve Level 3, Level 1 & 2 requirements must have been passed and a minimum of 16 points obtained from Level 3 with all Thresholds met.				

LEVEL 4 - MPA MANAGEMENT IS EFFECTIVELY INSTITUTIONALIZED FOR AT LEAST 7 YEARS (11 Items, 21 Points)				
	Criteria / Guide Questions	Allowable Points	Actual Points	Remarks / Means of verification
4.1 MPA management effectively institutionalized for at least 7 years (21/21)				
4.1.1	Political support from the provincial council or LGUs	0 or 1		
The Provincial Council (for locally-managed MPAs) or local governments (for NIPAS seascapes) have committed to give the MPA institutional support to strengthen enforcement and collaboration. Political support = budget, manpower, or technical				• Contracts / MOA / MOU • Annual Investment Plan (for NIPAS) • SP Resolution committing/providing support
4.1.2	**MPA MANAGEMENT PLAN INCORPORATED IN BROADER DEVELOPMENT PLANS ***	**0 or 3**		
The MPA or NIPAS seascape is incorporated within the long-term LGU or provincial development plans (e.g., Comprehensive Land Use Plans, Provincial Development Plans, etc.)				• Higher level plans where the MPA is integrated
4.1.3	Management body capable of outsourcing funds	0 or 1		
Is the management body able to get funds for the MPA / NIPAS seascape from external sources?				• Proposals submitted (received copy) • Grant agreements entered into by the management body
4.1.4	Coordination with LGUs and other groups clearly defined and formalized	0 or 1		
Is the coordination with appropriate national & local agencies on CRM / MPA policies and with other LGUs achieved? Are the accountabilities and working relationships among collaborating institutions clearly defined and formalized?				• Memorandum of Agreement • Partnership contracts / documents
4.1.5	**ECOLOGICAL AND SOCIOECONOMIC IMPACT ASSESSMENT CONDUCTED ***	**0 or 3**		
Assessment of resource status and long-term trends should be conducted together with an assessment of benefits obtained from the MPA by stakeholders. Impacts should also be assessed vis-a-vis the overall objective of the MPA or NIPAS seascape.				• Trends and temporal assessments of ecological & socio-economic impacts • Impact assessment report
4.1.6	**PERFORMANCE MONITORING AND EVALUATION SYSTEM LINKED TO AN INCENTIVE SYSTEM ***	**0 or 3**		
Recognition / awards are regularly being given to outstanding members, law enforcers, etc. Incentives can also include granting of available loans or supplementary livelihood opportunities.				• Awards / Recognition received • Announcement of competition / performance incentives
4.1.7	**IEC SUSTAINED OVER SEVEN YEARS ***	**0 or 3**		
Has the IEC program for the MPA been sustained over the past seven years?				• IEC program progress reports for 7 years • IEC long-term plan
4.1.8	Management body can adjudicate certain cases	0 or 1		
Does the management body adjudicate administrative cases?				• Proceedings of adjudications • Letters of complaints
4.1.9	Expansion strategies or resource enhancement programs initiated	0 or 1		
MPA coverage or core zones (for local MPAs) expanded. Advance conservation and resource enhancement activities implemented (e.g., coral reef restoration, mangrove reforestation, giant clam restocking, etc.).				• Reports
4.1.10	Support facilities constructed	0 or 1		
Facilities to support MPA enterprises or improve conservation efforts are constructed (e.g., guardhouse, visitors' center, education / training center, watchtowers, etc.)				• Photographs of infrastructure
4.1.11	**MPA FINANCIALLY SELF-SUSTAINING IN THE LAST SEVEN (7) CONSECUTIVE YEARS ***	**0 or 3**		
Revenues (internally generated and/or obtained from external sources) should be enough to cover operating expenses of the MPA in the last seven (7) years				• Audited financial report for the last seven years
TOTAL SCORE FOR LEVEL 4		**21**		
Thresholds are in BLOCK CAPITALS. To achieve Level 4, Levels 1 to 3 requirements must have been passed and a minimum of 16 points obtained from Level 4 with all Thresholds met.				

Summary of MPA MEAT Results

Name of MPA : _____

Location : _____

Date accomplished : _____

MPA level achieved : _____

Total cumulative score * : _____

Remarks : _____

MPA Level	Year requirement met?	Total Score Per Level	All threshold questions satisfied?	MPA level satisfied?
1 - Established - At least 1 year - at least 20 Total Cumulative Score - all Level 1 Thresholds met	☐ MPA is at least 1 year old		☐	☐
2 - Strengthened - At least 3 years - at least 31 Total Cumulative Score - all Level 1 & 2 Thresholds met	☐ MPA is at least 3 years old		☐	☐
3 - Sustained - At least 5 years - at least 47 Total Cumulative Score - all Level 1, 2, & 3 Thresholds met	☐ MPA is at least 5 years old		☐	☐
4 - Institutionalized - At least 7 years - at least 63 Total Cumulative Score - all Thresholds met	☐ MPA is at least 7 years old		☐	☐
TOTAL CUMULATIVE SCORE		_____ out of 84 points *		

* Total Cumulative Score: <24 points = "Fair"; 25 to 39 = "Good"; 40 to 61 = "Very Good"; 62 to 84 = "Excellent"
If your MPA does not meet the basic Level 1 category, your MPA is still under the process of establishment. Basic activities should be conducted soon to fully "establish" the MPA and make it operational.

MPA Management Focus (for each focus, add the points for all the questions in the 2nd column below):

Management Focus	Item Numbers in MPA MEAT Form	Total Available Points	Actual Score per Management Focus	Actual Score divide by Total Available Points
Management Plan	1.2.1 + 1.2.2 + 1.2.4 + 3.1.1 + 4.1.2			
Management Body	1.2.3 + 1.4.1 + 1.4.2 + 3.1.3 + 3.1.6 + 4.1.1 + 4.1.4			
Legal Instrument	1.3.1 + 1.3.2 + 1.3.3			
Community Participation	1.1.1 + 1.1.2			
Financing	1.4.3 + 2.1.6 + 3.1.2 + 3.1.9 + 4.1.3 + 4.1.11			
IEC	1.4.4 + 2.1.7 + 2.1.8 + 3.1.5 + 4.1.7			
Enforcement	1.4.5 + 1.4.6 + 2.1.1 + 2.1.2 + 2.1.3 + 2.1.4 + 2.1.5 + 3.1.4 + 3.1.10 + 4.1.8			
Monitoring & Evaluation	1.1.3 + 1.4.7 + 2.1.9 + 3.1.7 + 3.1.8 + 3.1.11 + 4.1.5 + 4.1.6			
Site Development	4.1.9 + 4.1.10			

NOTES:

Developed in partnership with:

The institutionalization of the MPA MEAT is still being processed. In the meantime, you may send your filled-up MPA MEAT forms to the MPA Support Network c/o:

Prof. Porfirio M. Aliño, PhD
The Marine Science Institute
University of the Philippines
Velasquez St., Diliman
Quezon City 1101
Philippines
Tel / Fax: +63 2 4331806
Email: mpameat@gmail.com

Appendix 5

Thailand's Marine Protected Areas

MPAs are critical to ecological integrity and human well-being

Thailand's Andaman Sea coastline is renowned for its rich ecological diversity which includes mangroves, seagrass beds, fringing coral reefs and sandy beach. It is home to many globally threatened species including dugong, dolphins, and sea turtles. These resources and habitats provide support for the fishing and tourism industries, and provide shoreline protection to millions of people.

Yet these valuable resources are undergoing threat from overfishing, destructive fishing practices, sedimentation, pollution, habitat destruction, coastal erosion and climate change. Marine protected areas (MPAs) provide a critical means of ensuring the long-term sustainability of these resources and socio- economic benefits underpinning human well-being.

Marine Resources Provide Valuable Ecosystem Services

The marine resources along Thailand's western coast provide a wealth of fisheries and tourism-related services that directly benefit coastal communities and the national economy. One third of the nation's fisheries, which contribute USD $1.57 billion to the gross domestic product, are from the Andaman Sea. Seafood provides national food security, accounting for more than 50% of annual protein intake across the country. The MPAs along the Andaman coast are considered some of the best diving sites in the world with approximately 10 million visitors, both local and foreign, each year. These MPAs have tremendous economic value. For example, the coral reefs at the Phi Phi Islands National Park generate benefits to tourism estimated at USD $500 million annually.

Multiple Regulations Support A Growing Network of MPAs

Conservation of Thailand's marine resources dates back to the 1960s when the first national park was established. Since then, 21 MPAs have been established in the form of national parks, non-hunting areas, fisheries sanctuaries, Environmental protected area, fisheries refugia, mangrove reserve areas, and biosphere reserves. There have also been efforts to expand the current MPA system to cover a large portion of Thailand's Andaman Exclusive Economic Zone of 120,812.12 square kilometers, through nomination to the Marine Protected Areas Network and World Heritage. Given the complexities in managing a network of MPAs, local government authorities and key stakeholders are increasingly involved in site level

Thailand's Andaman Sea coastline features

- 120,812.12 square kilometer exclusive economic zone (EEZ)
- 1,093 kilometers of coastline
- 21 formal marine protected areas covering 5,810 square kilometers (5% of EEZ)
- 300 hard coral species, 11 seagrass species, 30 mangrove species
- 1,767.83 square kilometers of mangrove area, 137.76 square kilometers of seagrass area, 105.24 square kilometers of coral reef area

MPAs face serious challenges

Though recent years have seen notable improvements in the management of marine protected areas, challenges remain.

Human impacts cause the degradation and depletion of natural resources

- Overfishing and the use of destructive fishing methods (trawling, push net, aquarium animal trade), threaten 60% of coral reefs in the country.
- The direct discharge of chemical fertilizers, insecticides, and untreated wastewater from agricultural production and shrimp farms into coastal waterways pollute coastal habitats.
- Insufficient sewage treatment facilities for coastal development that is intensified by tourism sector cause deterioration of near-shore marine habitat.
- Clearing mangrove forests for aquaculture ponds, resource extraction activities, and dredging increases siltation and subsequently smothers coastal habitats.
- Coastal structure development (such as bridge, jetty) cause for coastal erosion and change marine habitat.

Poor MPA governance limits effectiveness

- Without direct incentives, technical knowledge, and financial support, there is generally weak institutional and stakeholder capacity to manage natural resources.
- Lack of resources limit effective law enforcement.
- Participatory approaches are limited, and conflicts persist among stakeholders' traditional resource uses and conservation priorities.
- Jurisdictions among the authorities responsible for parks, fisheries, harbors and coastal tourism development overlap and are ambiguous.
- Laws affecting marine protected areas are unclear, and existing regulations for marine resource management are complex, making enforcement particularly challenging.

Recommendations for improving MPAs

The following actions respond to the challenges highlighted above and aim to ensure ecosystem health while meeting the needs of coastal communities.

- Develop a streamlined legal and institutional framework for a cohesive national protected area system.
- Establish formal multi-stakeholder consultation and information sharing mechanisms.
- Promote sustainable use of resources through incentive-based approaches that generate compliance.
- Strengthen law enforcement through efficient multi-agency collaboration and provision of appropriate penalties to enable managers to effectively regulate their MPAs.
- Monitor biological and socio-economic conditions to enable adaptive management strategies.
- Establish a new MPAs or develop MPAs use international guidelines : IUCN, CBD
-

Thailand's Marine Protected Areas

MPAs Are Critical to Ecological Integrity and Human Well-Being

Thailand's Andaman Sea coastline is renowned for its rich ecological diversity which includes mangroves, seagrass beds, and fringing coral reefs. It is home to many globally threatened species including dugong, dolphins, and sea turtles. These resources and habitats provide support for the fishing and tourism industries, and provide shoreline protection to millions of people.

Yet these valuable resources are undergoing threat from overfishing, destructive fishing practices, sedimentation, pollution, habitat destruction, and climate change. Marine protected areas (MPAs) provide a critical means of ensuring the long-term sustainability of these resources and socio-economic benefits underpinning human well-being.

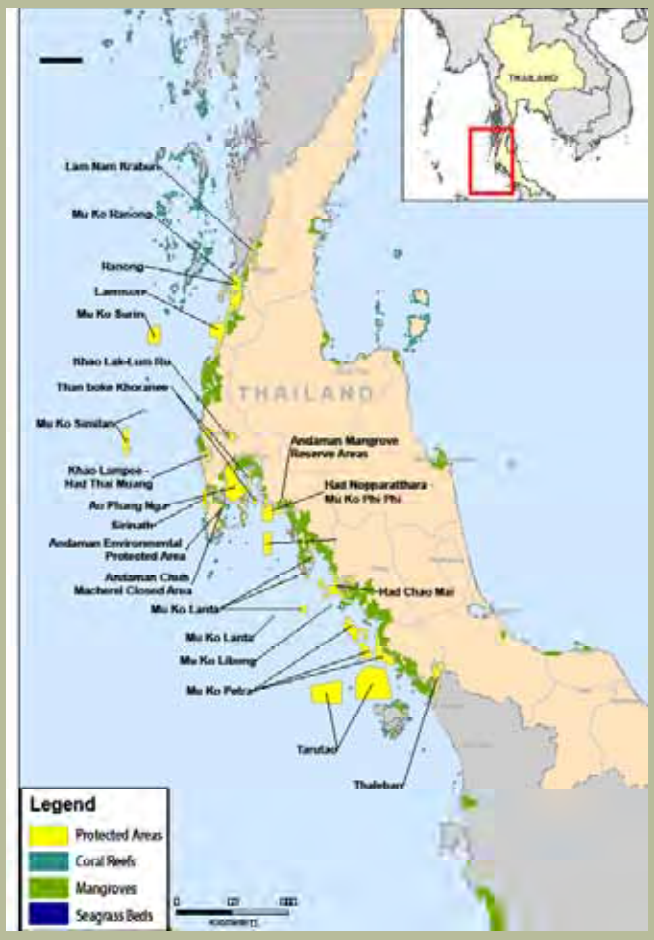
Marine Resources Provide Valuable Ecosystem Services

The marine resources along Thailand's western coast provide a wealth of fisheries and tourism-related services that directly benefit coastal communities and the national economy. One third of the nation's fisheries, which contribute USD $1.57 billion to the gross domestic product, are from the Andaman Sea. Seafood provides national food security, accounting for more than 50% of annual protein intake across the country. The MPAs along the Andaman coast are considered some of the best diving sites in the world with approximately 10 million visitors, both local and foreign, each year. These MPAs have tremendous economic value. For example, the coral reefs at the Phi Phi Islands National Park generate benefits to tourism estimated at USD $500 million annually.

Multiple Regulations Support A Growing Network of MPAs

Conservation of Thailand's marine resources dates back to the 1960s when the first national park was established. Since then, 22 MPAs have been established in the form of national parks, non-hunting areas, fisheries sanctuaries, fisheries refugia, mangrove reserve areas, and biosphere reserves. There have also been efforts to expand the current MPA system to cover a large portion of Thailand's Andaman Exclusive Economic Zone of 116,280 square kilometers, through nomination to the Marine Protected Areas Network and World Heritage. Given the complexities in managing a network of MPAs, local government authorities and key stakeholders are increasingly involved in site level

Coral reefs in the Andaman Sea, considered one of the most biologically rich habitats in the world, support the livelihoods of millions of people in the region. Timely conservation efforts at the local scale, such as the establishment of marine protected areas are critical for maintaining coral reef health and can increase the resilience of coral reefs to global threats, such as climate change.



Thailand's Andaman Sea coastline features

- 116,280 square kilometer exclusive economic zone (EEZ)
- 740 kilometers of coastline
- 22 formal marine protected areas covering 5,810 square kilometers (5% of EEZ)
- 400 hard coral species, 11 seagrass species, 22 mangrove species
- 1747 square kilometers of mangrove area, 95 square kilometers of seagrass area, 78 square kilometers of coral reef area

MPAs face serious challenges

Though recent years have seen notable improvements in the management of marine protected areas, challenges remain.

Human impacts cause the degradation and depletion of natural resources

- Overfishing and the use of destructive fishing methods (trawling, blast fishing, cyanide), threaten 60% of coral reefs in the country.
- The direct discharge of chemical fertilizers, insecticides, and untreated wastewater from agricultural production and shrimp farms into coastal waterways pollute coastal habitats.
- Insufficient sewage treatment facilities for coastal development that is intensified by tourism sector cause deterioration of near-shore marine habitat.
- Clearing mangrove forests for aquaculture ponds, resource extraction activities, and dredging increases siltation and subsequently smothers coastal habitats.

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.

Poor MPA governance limits effectiveness

- Without direct incentives, technical knowledge, and financial support, there is generally weak institutional and stakeholder capacity to manage natural resources.
- Lack of resources limit effective law enforcement.
- Participatory approaches are limited, and conflicts persist among stakeholders' traditional resource uses and conservation priorities.
- Jurisdictions among the authorities responsible for parks, fisheries, harbors and coastal tourism development overlap and are ambiguous.
- Laws affecting marine protected areas are unclear, and existing regulations for marine resource management are complex, making enforcement particularly challenging.

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.

Cast net fishing, which is one of the few well-managed uses, is regulated and managed through fishing cooperatives, ensuring long-term viability of fish stocks.

Recommendations for improving MPAs

The following actions respond to the challenges highlighted above and aim to ensure ecosystem health while meeting the needs of coastal communities.

- Develop a streamlined legal and institutional framework for a cohesive national protected area system.
- Establish formal multi-stakeholder consultation and information sharing mechanisms.
- Promote sustainable use of resources through incentive-based approaches that generate compliance.
- Strengthen law enforcement through efficient multi-agency collaboration and provision of appropriate penalties to enable managers to effectively regulate their MPAs.
- Monitor biological and socio-economic conditions to enable adaptive management strategies.

For more information:
Regional Coordination Unit (RCU) of BOBLME
Bay of Bengal Large Marine Ecosystem Project
77 Moo 7 Sakdidej Road, Makham Bay
T. Vichit, A. Muang, Phuket 83000 Thailand

Ph. +66 76 391861
Fax. +66 76 391864
http://www.boblme.org
rcu@boblme.org

Appendix 6: Group Photo of Delegates

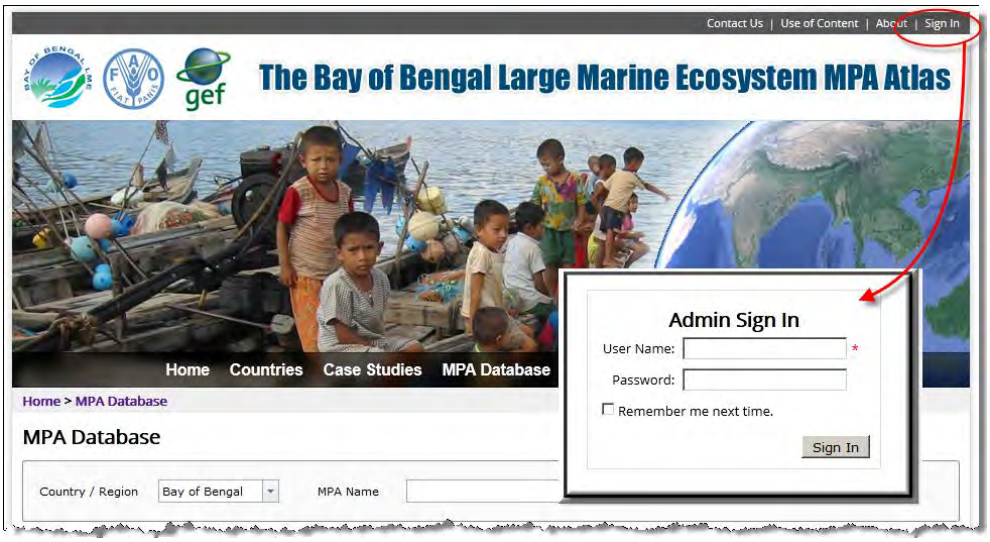
Appendix 4:

Guide to edit
the online MPA database
for *Administrator*

1. To update an existing MPA

a) **Attribute & Point data** (interactive map will display any update of the latitude-longitude on the fly)

- MPA Database page http://boblme.reefbase.org/mpadatabase.aspx
- Log in with user account using the username and password as provided in the email



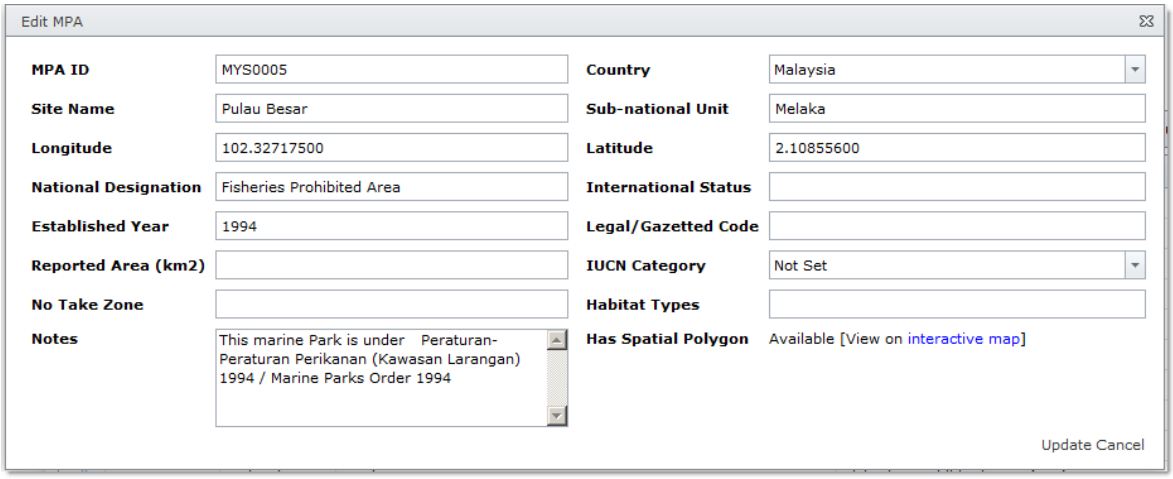
- Select the country and the country table will be displayed

Search Result: 10 records

Create New MPA | Export Search Result

#	MPA ID	Country	Site Name	National Designation
Edit	MYS0005	Malaysia	Pulau Besar	Fisheries Prohibited Area
Edit	MYS0001	Malaysia	Pulau Kacha	Marine Park
Edit	MYS0002	Malaysia	Pulau Lembu	Marine Park
Edit	MYS0003	Malaysia	Pulau Payar	Marine Park
Edit	MYS0004	Malaysia	Pulau Segantang	Marine Park
Edit	MYS0010	Malaysia	Pulau Sembilan	State Park
Edit	MYS0009	Malaysia	Pulau Singa Besar	Fisheries Protected Area for Cucumber
Edit	MYS0008	Malaysia	Tanjung Tuan	Fisheries Prohibited Area (FPA)
Edit	MYS0006	Malaysia	Tanjung Tuan 1	Fisheries Prohibited Area (FPA)
Edit	MYS0007	Malaysia	Tanjung Tuan 2	Fisheries Prohibited Area (FPA)

- The 'Edit' hyperlink is shown at the first column of each MPA record
- Click the 'Edit' to show the Edit Form. Type in the information in the attributes as required. Click 'Update' once done. The "Update" is at the bottom right corner of the form



b) Polygon data

- Email BOBLME WorldFish team member Teoh Shwu Jiau (s.teoh@cgiar.org) or Nurulhuda Ahmad Fatan (N.AhmadFatan@cgiar.org) the updated polygon data.

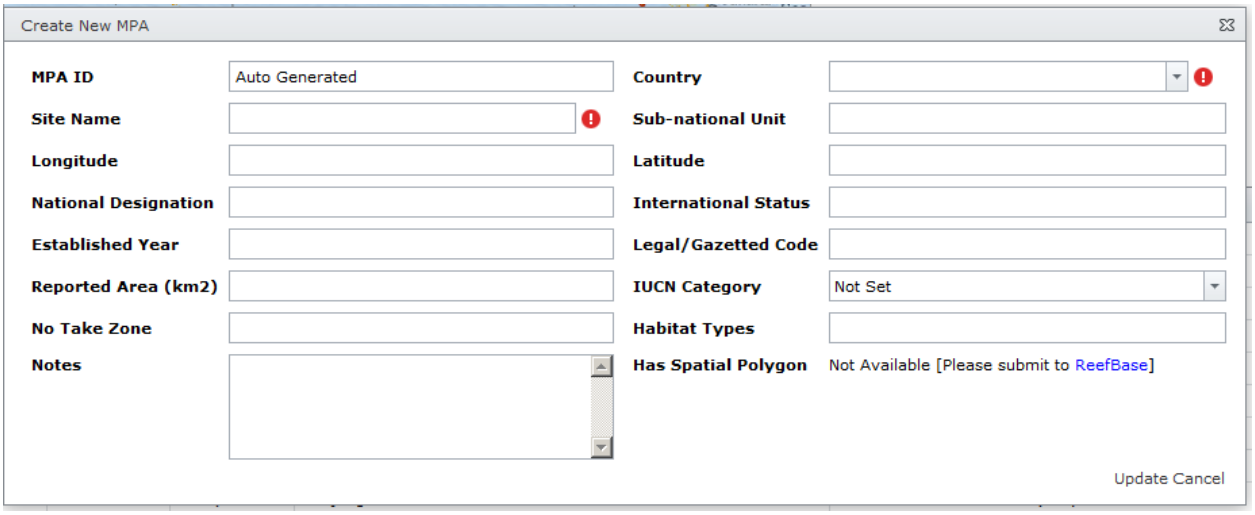
2. To add new MPA

- MPA Database page http://boblme.reefbase.org/mpadatabase.aspx
- Log in with user account using the username and password as provided in the email

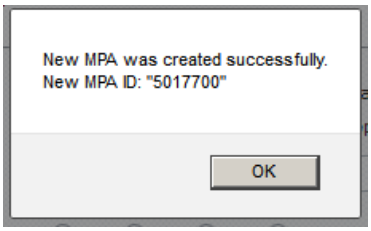
a) Point data

- Click 'Create New MPA" button at the top of the table. This will display the Edit form

- Fill in the Edit form for new MPA. Please note that the "Site Name" and "Country" are compulsory inputs to complete the creation of new MPA record.



Click 'Update' once done. The system will assign the new auto-generated number of "MPA ID".



Record the new "MPA ID", number and label the respective MPA polygon (if available) with this number. Then, send the MPA polygons separately to BOBLME WorldFish team member. If forget to record down the "MPA ID", just go back to search the related MPA on MPA Database page, and click the respective MPA record to see the detail of attribute page.

b) Polygon data

- Email BOBLME WorldFish team member Teoh Shwu Jiau (s.teoh@cgiar.org) or Nurulhuda Ahmad Fatan (N.AhmadFatan@cgiar.org) the new polygon data and follow the instruction above.

3. To exclude the MPA

- Email BOBLME WorldFish team member Teoh Shwu Jiau (s.teoh@cgiar.org) or Nurulhuda Ahmad Fatan (N.AhmadFatan@cgiar.org) the name of the MPA site and "MPA ID" to be remove from the MPA database.

Appendix 5:

The final version of MPAs
in the BOBLME
(compiled as at 15th of July 2014)

MARINE PROTECTED AREAS - BANGLADESH

Legend

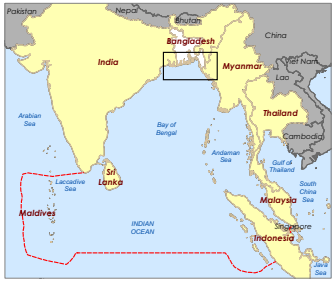
- Bay of Bengal
- Large Marine Ecosystem Boundary
- Administrative Boundary
- Exclusive Economic Zone (EEZ)
- Marine Protected Area (Unknown Boundaries)
- Marine Protected Area (Polygon)
- Coral Reefs
- Seagrass
- Mangroves

Bathymetry (depths in metres)

6500 6000 5500 5000 4500 4000 3500 3000 2500 2000 1500 1000 500 0

0 10 20 30 40 50 km

Coordinate System: GCS WGS 1984
Datum: WGS 1984



Date: 27 Mar 2014

Data sources:

Exclusive Economic Zone (EEZ): VLIZ (2012) Maritime Boundaries Geodatabase, version 7

Coral Reefs: UNEP-WCMC (2010) Global Distribution of Coral Reefs

Mangroves: Spalding *et. al* (2010) World Atlas of Mangroves

Seagrass: UNEP-WCMC, Short FT (2005) Global distribution of seagrasses.

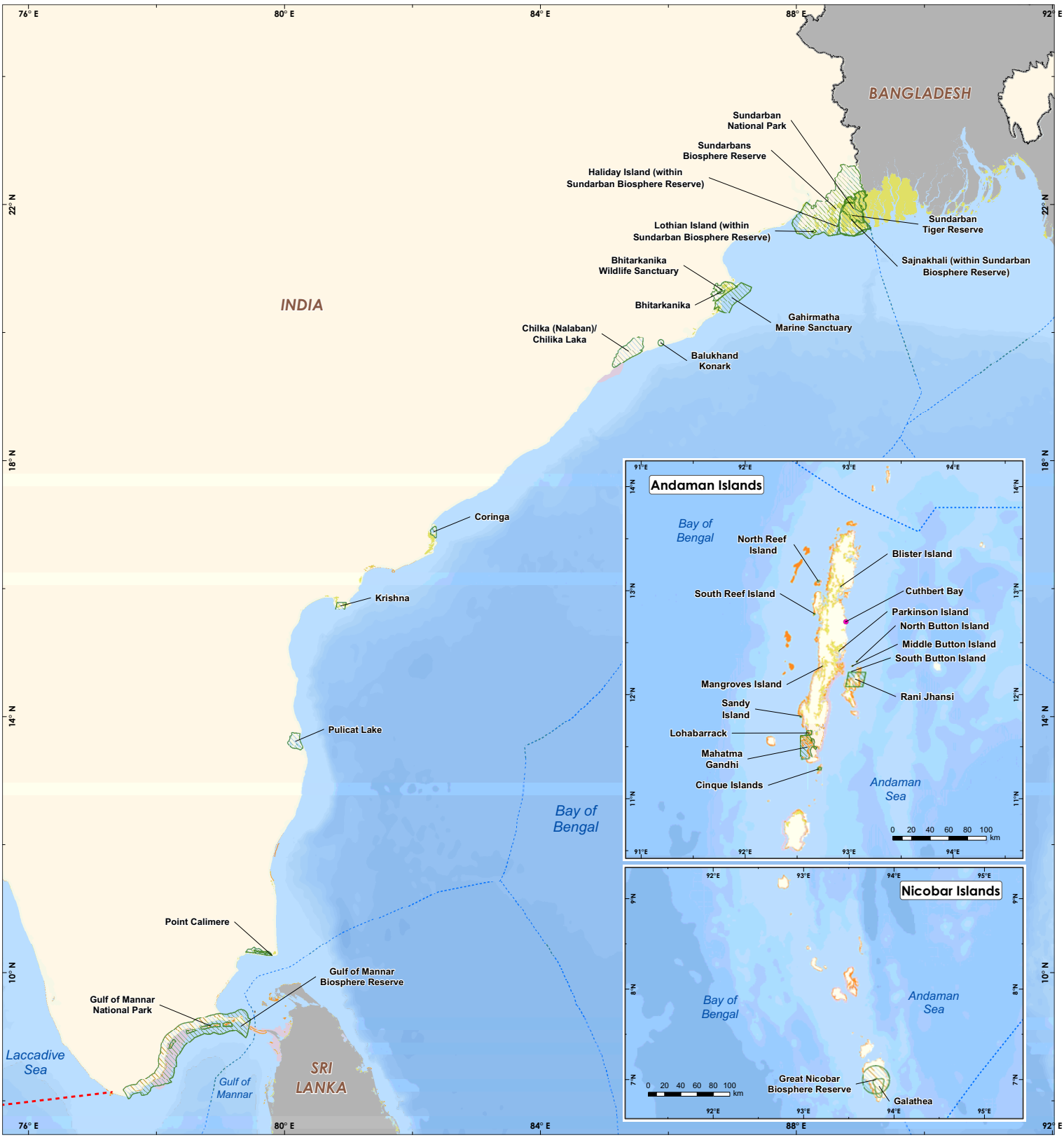
Bathymetry: The GEBCO_08 Grid, version 20100927, http://www.gebco.net

Marine Protected Areas: Compiled from various sources including ReefBase, BOBLME (2011), MoEF (2013), Banglapedia (2013) and WDPA (2013) by WorldFish up to October 2013

Bangladesh

No	Site Name	Longitude	Latitude	National Designation	International Status	Established Year	Legal/Gazetted Code	Reported Area (km2)	IUCN Category	No Take Zone	Habitat Types	Has Spatial Polygon
1	"Middle ground and south patches" of Bay of Bengal	91.44	20.99	Marine Reserves		2000	Unknown	698				Yes
2	Char Kukri-Mukri	90.63	21.92	Wildlife Sanctuary		1981		0.4	IV	Unknown	Coastal mangrove habitat	Yes
3	Kua-Kata	90.12	21.81	National Park		2006		56.61			Mangrove forest	No
4	Nijhum Dweep	91.04	22.08	National Park		2001		163.52	Unset		Coastal mangrove	Yes
5	Sonadia Island	91.89	21.52	Ecologically Critical Area (ECA)		1999		49.16			Offshore barrier island, sand dunes and mangrove habitat	Yes
6	Sonar Char	90.50	21.83	Wildlife sanctuary		2011		2.027			Mangroves	Yes
7	St. Martin's Island (Jinjiradwip and Jinjira Reefs)	92.33	20.68	Ecologically Critical Area. Being proposed for marine national park status.		1999		5.9	Unset	Unknown	Coral reef habitat, habitat for wildfowl and turtle nesting site	Yes
8	Sundarbans (10km Periphery)	89.34	21.83	Ecologically Critical Area (ECA)		1999					Mangrove habitat	Yes
9	Sundarbans (Reserved Forests)	89.48	22.07	Wetlands of International Importance / World Heritage Convention	Ramsar Site	1992		6017				Yes
10	Sundarbans East	89.77	21.86	Wildlife Sanctuary	World Heritage Site and Ramsar Site	1996		312.26	IV	Unknown	Mangrove forest.	Yes
11	Sundarbans South	89.38	21.79	Wildlife Sanctuary	World Heritage Site and Ramsar Site	1996		369.7	IV	Unknown	Mangrove forest.	Yes
12	Sundarbans West	89.23	21.71	Wildlife Sanctuary	World Heritage Site and Ramsar Site	1996		715.02	IV	Unknown	Mangrove forest.	Yes
13	Teknaf Peninsula (Cox's Bazar, Teknaf Sea Beach)	92.25	20.89	Ecologically Critical Area (ECA)		1999		104.65	Unset	Unknown	Sandy beach	Yes
14	Tengragiri	90.06	21.88	Wildlife sanctuary		2010		4.05			Mangrove	No

MARINE PROTECTED AREAS - INDIA



Legend

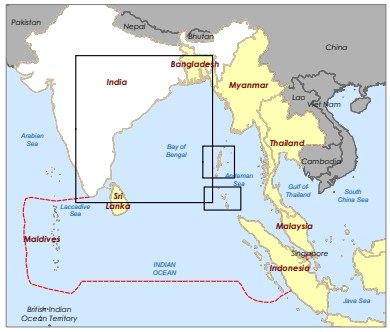
- Bay of Bengal Large Marine Ecosystem Boundary
- Administrative Boundary
- Exclusive Economic Zone (EEZ)
- Marine Protected Area (Unknown Boundaries)
- Marine Protected Area (Polygon)
- Coral Reefs
- Seagrass
- Mangroves

Bathymetry (depths in metres)

6500 6000 5500 5000 4500 4000 3500 3000 2500 2000 1500 1000 500 0

0 50 100 150 200 km

Coordinate System: GCS WGS 1984
Datum: WGS 1984



Date: 27 Mar 2014

Data sources:

Exclusive Economic Zone (EEZ) VLIZ (2012) Maritime Boundaries Geodatabase, version 7.
Coral Reefs: UNEP-WCMC (2010) Global Distribution of Coral Reefs
Mangroves: Spalding *et. al* (2010) World Atlas of Mangroves
Seagrass: UNEP-WCMC, Short FT (2005) Global distribution of seagrasses
Bathymetry: The GEBCO_08 Grid, version 20100927, http://www.gebco.net
Marine Protected Areas: Compiled from various sources including ReefBase,BOBLME (2011), Singh (2003), WDPA (2013), Burke et al. (2011) and MoEF (2013) by WorldFish up to October 2013

India

No	Site Name	Longitude	Latitude	National Designation	International Status	Established Year	Legal/Gazetted Code	Reported Area (km2)	IUCN Category	No Take Zone	Habitat Types	Has Spatial Polygon
1	Balukhand Konark	85.88	19.84	Sanctuary		1984		71.72	IV	Unknown		Yes
2	Bhitarkanika	87.03	20.72	National Park		1988		145	II	Yes (entire park)	Mangrove forest	Yes
3	Bhitarkanika	86.82	20.63	Wildlife Sanctuary		1975		672				Yes
4	Blister Island (Andaman and Nicobar Islands)	92.92	13.04	Wildlife Sanctuary		1987		0.26				Yes
5	Chilka (Nalaban)/ Chilika Laka	85.38	19.71	Sanctuary	Ramsar site	1987		1100	IV	Unknown	Brackish lake separated from the Bay of Bengal by a long sandy ridge and subject to sea water exchange	Yes
6	Cinque (Andaman and Nicobar Islands)	92.71	11.29	Wildlife Sanctuary		1987		9.51				Yes
7	Coringa	82.34	16.89	Sanctuary		1978		235.7	IV	Unknown	Mangrove, delta, mudflats, sandy beaches	Yes
8	Cuthbert Bay (Andaman and Nicobar Islands)	92.97	12.70	Wildlife Sanctuary		1987		5.82				No
9	Gahirmatha	87.00	20.55	Marine Sanctuary		1997		1435		Core area = 725.4 km2	Mangrove forests, sandy beach, barrier island	Yes
10	Galathea (Andaman and Nicobar Islands)	93.86	6.80	Wildlife Sanctuary		1997		11.44				Yes
11	Great Nicobar Biosphere Reserve (Andaman and Nicobar Islands)	93.80	7.00	Biosphere Reserve		1989		885				Yes
12	Gulf of Mannar Biosphere Reserve	78.20	8.83	Biosphere Reserve		1989		10500			21 islands with estuaries, beaches, sea grasses, coral reefs, salt marshes and mangroves.	Yes
13	Gulf of Mannar National Park	78.73	9.10	National Park (core area of Biosphere Reserve)	UNESCO Biosphere Reserve	1986		560	Ib	Yes (entire park)	21 islands with coral ecosystems, seagrass ecosystems, and mangrove ecosystems.	Yes
14	Haliday Island (within Sundarban Biosphere Reserve)	88.64	21.66	Sanctuary		1976		5.95	IV	Unknown		Yes
15	Krishna	80.88	15.73	Wildlife Sanctuary		1999		194.81				Yes

No	Site Name	Longitude	Latitude	National Designation	International Status	Established Year	Legal/Gazetted Code	Reported Area (km2)	IUCN Category	No Take Zone	Habitat Types	Has Spatial Polygon
16	Lohabarrack (Andaman and Nicobar Islands)	92.62	11.63	Wildlife Sanctuary		1987		21.57				Yes
17	Lothian Island (within Sundarban Biosphere Reserve)	88.28	21.58	Sanctuary		1976		38	IV	Unknown		Yes
18	Mahatma Gandhi (Andaman and Nicobar Islands)	92.66	11.57	Marine National Park		1983		281.5	II	Unknown	Mangrove, coral reef, beach, sand	Yes
19	Mangroves Island (Andaman and Nicobar Islands)	92.74	12.27	Wildlife Sanctuary		1987		0.39				Yes
20	Middle Button (Andaman and Nicobar Islands)	93.03	12.27	National Park		1987		0.64		Yes (entire park)		Yes
21	North Button (Andaman and Nicobar Islands)	93.07	12.31	National Park		1987		0.44		Yes (entire park)		Yes
22	North Reef Island (Andaman and Nicobar Islands)	92.70	13.09	Wildlife Sanctuary		1987		3.48				Yes
23	Parkinson Island (Andaman and Nicobar Islands)	92.91	12.42	Wildlife Sanctuary		1987		0.34				Yes
24	Point Calimere	79.59	10.33	Sanctuary	Ramsar site	1967		17.26	IV	Unknown	Mangrove habitat, intertidal flats, sand bars, lagoons.	Yes
25	Pulicat Lake	80.17	13.61	Sanctuary		1980		153	IV	Unknown		Yes
26	Rani Jhansi (Andaman and Nicobar Islands)	93.06	12.15	Marine National Park		1996		256.1	II	Unknown	Coral reef	Yes
27	Sajnakhali (within Sundarban Biosphere Reserve)	88.86	21.76	Sanctuary		1976		362.4	IV	Unknown		Yes
28	Sandy Island (Andaman and Nicobar Islands)	92.53	11.79	Wildlife Sanctuary		1977		1.58				Yes
29	South Button (Andaman and Nicobar Islands)	93.02	12.22	National Park		1987		0.03		Yes (entire park)		Yes
30	South Reef Island (Andaman and Nicobar Islands)	92.66	12.78	Wildlife Sanctuary		1987		1.17				Yes
31	Sundarban Biosphere Reserve	88.67	21.88	Biosphere Reserve	UNESCO Biosphere Reserve	1989		9600			Largest (single) mangrove forest system in the world, 54 islands, tidal rivers, low-lying floodplain,	Yes

No	Site Name	Longitude	Latitude	National Designation	International Status	Established Year	Legal/Gazetted Code	Reported Area (km2)	IUCN Category	No Take Zone	Habitat Types	Has Spatial Polygon
32	Sundarban National Park	88.91	21.93	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.	Yes
33	Sundarban Tiger Reserve	88.90	21.95	Tiger Reserve (within Biosphere Reserve)		1973		2585				Yes

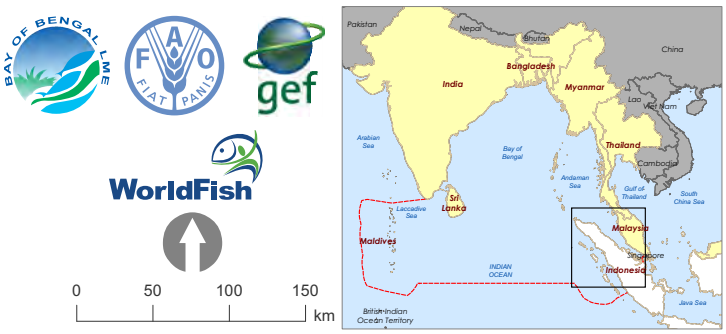
MARINE PROTECTED AREAS - INDONESIA

Legend

- Bay of Bengal Large Marine Ecosystem Boundary
- Administrative Boundary
- Exclusive Economic Zone (EEZ)
- Marine Protected Area (Unknown Boundaries)
- Marine Protected Area (Polygon)
- Coral Reefs
- Seagrass
- Mangroves

Bathymetry (depths in metres)

6500 6000 5500 5000 4500 4000 3500 3000 2500 2000 1500 1000 500 0



0 50 100 150 km

Coordinate System: GCS WGS 1984
Datum: WGS 1984

Date: 27 Mar 2014

Data sources:

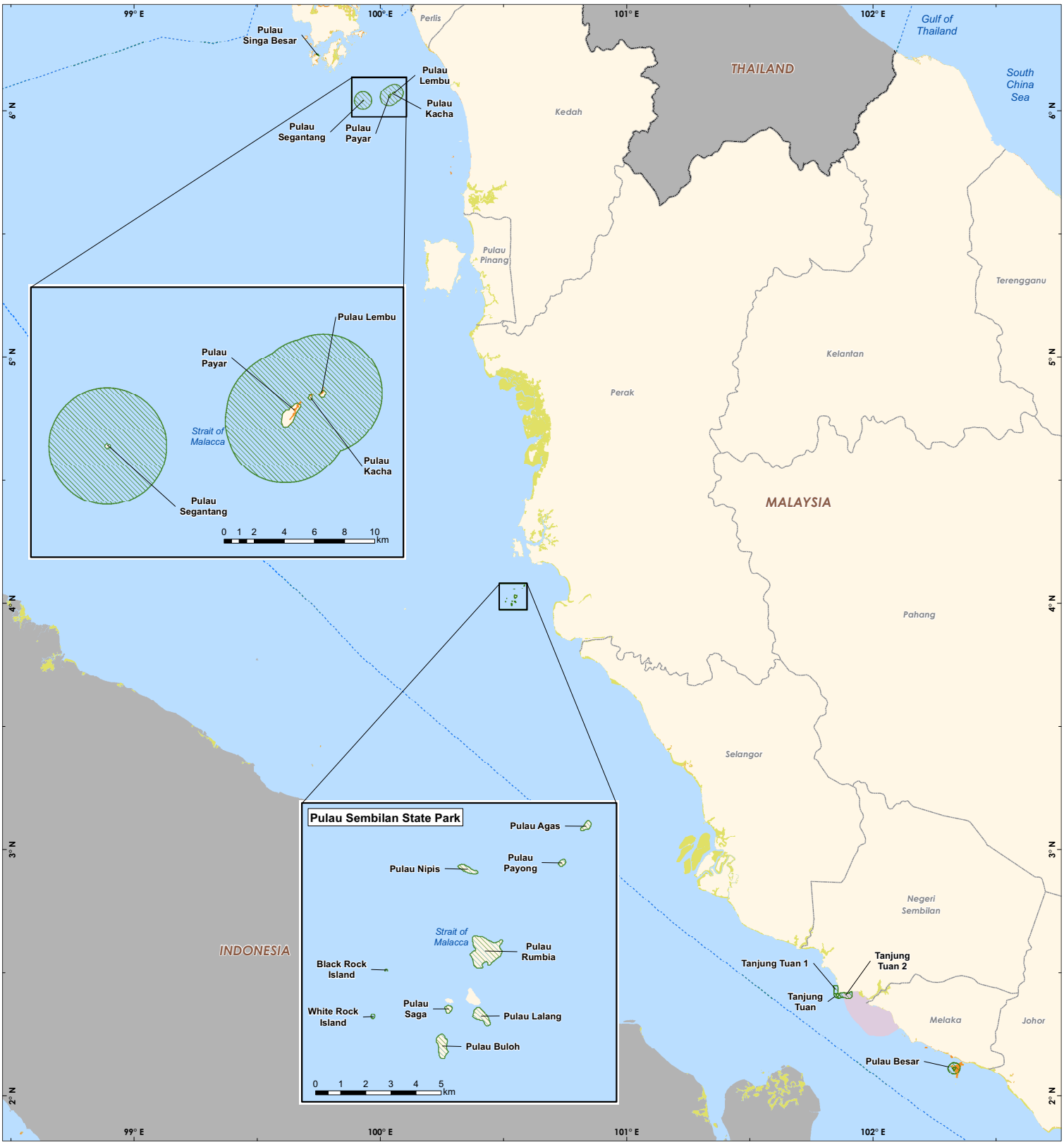
Exclusive Economic Zone (EEZ): VLIZ (2012) Maritime Boundaries Geodatabase, version 7.
Coral Reefs: UNEP-WCMC (2010) Global Distribution of Coral Reefs
Mangroves: Spalding *et. al* (2010) World Atlas of Mangroves
Seagrass: UNEP-WCMC, Short FT (2005) Global distribution of seagrasses.
Bathymetry: The GEBCO_08 Grid, version 20100927, http://www.gebco.net
Marine Protected Areas: Compiled from various sources including ReefBase, BOBLME (2011), CT Atlas (2013), KKJI (2013) and UPMSI et al. (2002) by WorldFish up to October 2013

Indonesia

No	Site Name	Longitude	Latitude	National Designation	International Status	Established Year	Legal/Gazetted Code	Reported Area (km2)	IUCN Category	No Take Zone	Habitat Types	Has Spatial Polygon
1	Aceh Jaya	95.21	5.37	Local/ District Marine Protected Area (KKLD)		2010	Keputusan Bupati NAD Jaya Nomor : 3 Tahun 2010	1.75	VI		Coral reefs, Mangrove	No
2	Agam	99.77	-0.33	Local / District Marine Protected Area		2012	Keputusan Bupati NAD Besar Nomor : 190 Tahun 2011	0.1	VI		Coral reef, Mangroves, Turtle	No
3	Batang Gasan	99.97	-0.46	District Marine Conservation Area		2010	Decree Region No 02 Kep/BPP/2010	0.684	VI		Mangrove, Coral reefs	Yes
4	Bengkalis	102.09	1.44	Fishery Reserve		2011	MMAF Decree No 59 Kep/ MEN/2011	79.95			*Tenualosa macrura*	No
5	Jorong Maligi	99.57	0.06	Local/District Marine Protected Area (KKLD)		2007	Decree Region No.188.45/326/BUP-PASBAR/2007	0.1	VI		Mangrove habitat	Yes
6	Kepulauan Banyak	97.30	2.11	Marine Nature Recreational Park		1996	Menteri Kehutanan No. 596/Kpts-II/1996	2275	V		mangrove	Yes
7	Kepulauan Mentawai	99.33	-1.87	Local/District Marine Protected Area (KKLD)		2006	Decree Region 188.45/42 /2012	1721.9	VI		Coral reefs and mangrove habitat	Yes
8	Kota Padang	100.36	-1.05	Local/ District Marine Protected Area		2011	Keputusan Walikota Padang Nomor 224 Tahun 2011	18.15			Small islands, turtle, coastal beds	No
9	Lampuuk, Amad Rhang Manyang, Ujong Pancu, Pulau Aceh	95.37	4.91	Local/ District Marine Protected Area (KKLD)		2010	Decree Region no. 43. Tahun 2010	2.0			Coral reef, turtle	No
10	Nias	97.25	1.48	Local/District Marine Protected Area (KKLD)		2007	Decree Region no. 050/139/K/2007	290			Tourism, fishery, coral reefs, mangrove habitat	Yes
11	Nias Selatan	98.23	-0.05	Local/District Marine Protected Area (KKLD)		2008	Decree Region no 523/371/K/2008	560			Tourism, fishery, coral reefs, mangrove habitat	Yes

No	Site Name	Longitude	Latitude	National Designation	International Status	Established Year	Legal/Gazetted Code	Reported Area (km2)	IUCN Category	No Take Zone	Habitat Types	Has Spatial Polygon
12	Pulau Penyu (Pesisir Selatan) District Marine Conservation Area	100.54	-1.55	District Marine Conservation Area		2003	Decree Region No.53 Tahun 2003	7.33	V			Yes
13	Pulau Pieh	100.14	-0.95	Marine Recreation Park		2000	Kep. Men 70/Men/2009	399	V		Pieh Island, adjacent reefs. Coral reefs, ornamental fish, nyph swamp area, wetland	Yes
14	Pulau Pinang, Siumat and Simanaha (Pisisi)	96.33	2.62	Local/District Marine Protected Area (KKLD)		2006	Decree Region No. 523.1/104/Tahun 2006	500	VI		Coral reefs, mangroves, ornamental fish, protected fish species	Yes
15	Pulau Ujung, Pulau Tangah, Pulau Angso and Pulau Kasiak	100.08	-0.59	Local/District Marine Protected Area (KKLD)		2010	Decree Mayor No.334/523/2010	115	VI		Coral reefs, marine biota, turtle species	Yes
16	Pulau Weh Sabang	95.24	5.89	Nature Recreation Park		1982	KEPMEN-KP No. 57/ 2013	39	VI	Unknown	Mangrove, coral reef, ornamental fish, protected fish species	Yes
17	Sabang	95.30	5.83	Local/District Marine Protected Area (KKLD)		2013	Decree Mayor : 729/2010 ; KEP 57/ MEN 2013	32	VI		Coral Reef	Yes
18	Serdang Bedagai	99.50	3.77	Local/District Marine Protected Area (KKLD)		2008	Decree of Region No. 97/523/2008	12.4	VI		Coral reefs, turtle species	Yes
19	Tapanuli Tengah	98.62789	1.63046	Local/District Marine Protected Area (KKLD)		2007	Decree Region No. 1421/DKP/Th 2007	812.43	VI		Tourism, fishery, coral reefs, mangrove habitat	Yes
20	Mukomuko	101.6632324	-2.6	Local/District Marine Protected Area (KKLD)		2010	Local Decree No 4 Tahun 2010		VI			No

MARINE PROTECTED AREAS - MALAYSIA



Legend

- Bay of Bengal Large Marine Ecosystem Boundary
- Administrative Boundary
- State Boundary
- Exclusive Economic Zone (EEZ)
- Marine Protected Area (Unknown Boundaries)
- Marine Protected Area (Polygon)
- Coral Reefs
- Seagrass
- Mangroves

Bathymetry (depths in metres)

6500 6000 5500 5000 4500 4000 3500 3000 2500 2000 1500 1000 500 0

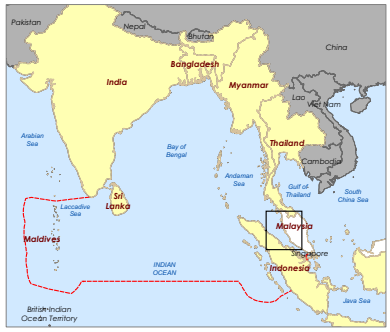
Data sources:

Exclusive Economic Zone (EEZ): VLIZ (2012) Maritime Boundaries Geodatabase, version 7
Coral Reefs: UNEP-WCMC (2010) Global Distribution of Coral Reefs
Mangroves: Spalding *et. al* (2010) World Atlas of Mangroves
Seagrass: UNEP-WCMC, Short FT (2005) Global distribution of seagrasses
Bathymetry: The GEBCO_08 Grid, version 20100927, http://www.gebco.net
Marine Protected Areas: Compiled from various sources including ReefBase, BOBLME (2011), CT Atlas (2013), DMPM (2012), FRI (2013), WWF (2013), UPMSI et al. (2002) by WorldFish up to October 2013

BAY OF BENGAL LME | FAO FIAT PANIS | gef | WorldFish

0 10 20 30 40 50 km

Coordinate System: GCS WGS 1984
Datum: WGS 1984

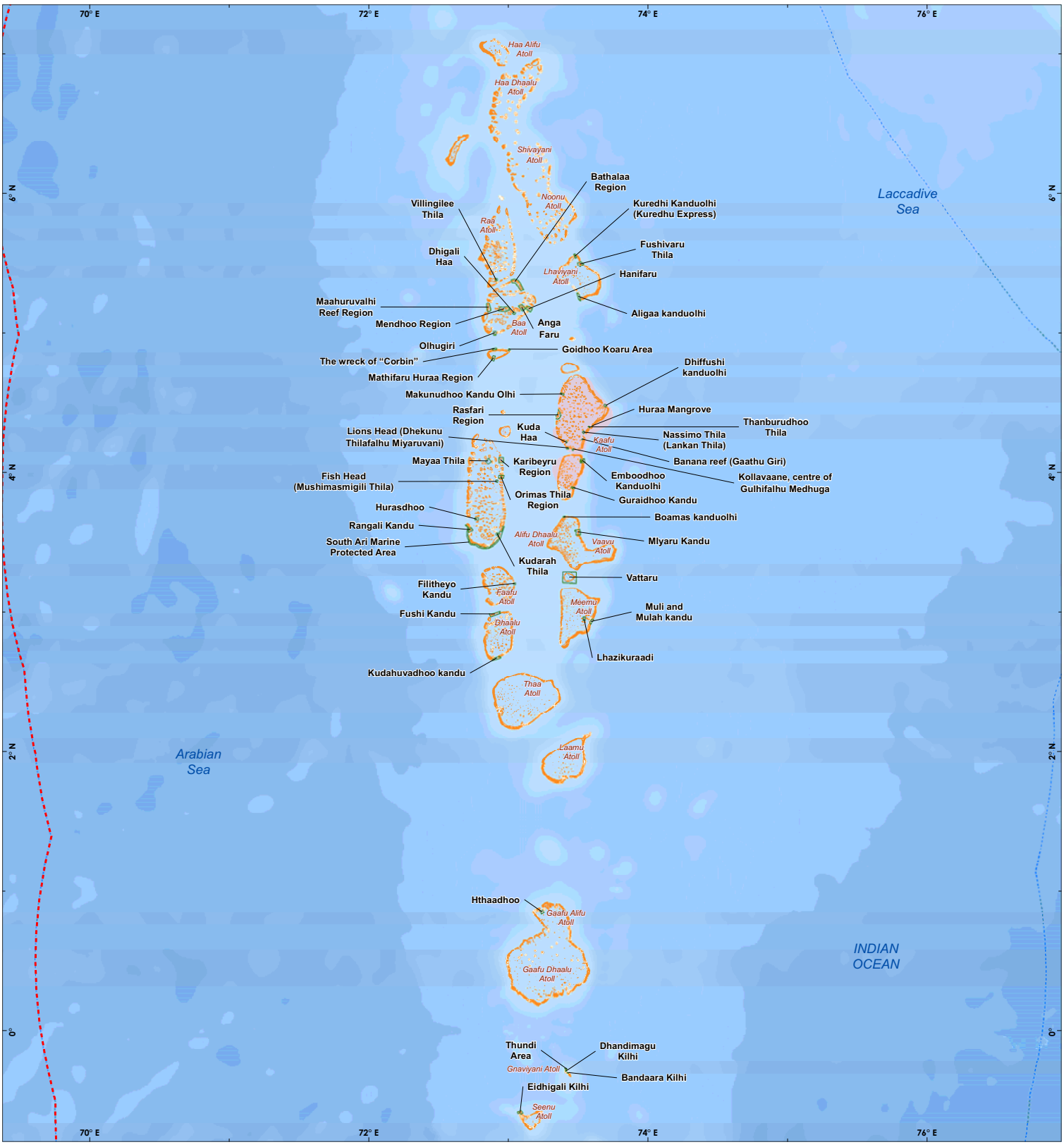


Date: 26 Mar 2014

Malaysia

No	Site Name	Longitude	Latitude	National Designation	International Status	Established Year	Legal/Gazetted Code	Reported Area (km2)	IUCN Category	No Take Zone	Habitat Types	Has Spatial Polygon
1	Pulau Besar	102.33	2.11	Fisheries Prohibited Area		1994						Yes
2	Pulau Kacha	100.05	6.07	Marine Park		1994	Fisheries Act 1985 (Marine Park Order 1994)	42.9	II	Yes	Surrounding marine habitat up to two nm from lowest watermark	Yes
3	Pulau Lembu	100.06	6.07	Marine Park		1994	Fisheries Act 1985 (Marine Park Order 1994)	46.13	II	Yes	Surrounding marine habitat up to two nm from lowest watermark	Yes
4	Pulau Payar	100.04	6.06	Marine Park		1994	Fisheries Act 1985 (Marine Park Order 1994)	54.91	II	Yes	Surrounding marine habitat up to two nm from lowest watermark	Yes
5	Pulau Segantang	99.93	6.04	Marine Park		1994	Fisheries Act 1985 (Marine Park Order 1994)	44.19	II	Yes	Surrounding marine habitat up to two nm from lowest watermark	Yes
6	Pulau Sembilan	100.55	4.03	State Park		2010	Notification of Reservation and Declaration of Pulau Sembilan, Lumut as a State Park (under PSPC Enactment 2001)					Yes
7	Pulau Singa Besar	99.74	6.23	Fisheries Protected Area for Cucumber		2010	Fisheries (Protected Aarea for sea-cucucmber) Regulations 2010				Sea cucumber	Yes
8	Tanjung Tuan	101.85	2.41	Fisheries Prohibited Area (FPA)		1994						Yes
9	Tanjung Tuan 1	101.85	2.43	Fisheries Prohibited Area (FPA)		1994						Yes
10	Tanjung Tuan 2	101.89	2.41	Fisheries Prohibited Area (FPA)		1994						Yes

MARINE PROTECTED AREAS - MALDIVES



Legend

- Bay of Bengal Large Marine Ecosystem Boundary
- Administrative Boundary
- Exclusive Economic Zone (EEZ)
- Marine Protected Area (Unknown Boundaries)
- Marine Protected Area (Polygon)
- Coral Reefs
- Seagrass
- Mangroves

Bathymetry (depths in metres)

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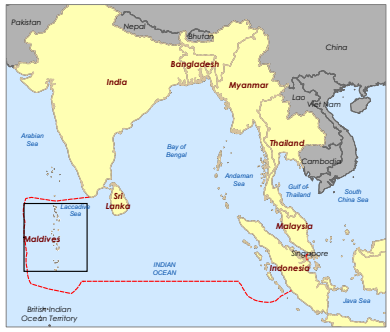


0 25 50 75 100 km

Coordinate System: GCS WGS 1984
Datum: WGS 1984

Date: 27 Mar 2014

Data sources:

Exclusive Economic Zone (EEZ) VLIZ (2012) Maritime Boundaries Geodatabase, version 7.
Coral Reefs: UNEP-WCMC (2010) Global Distribution of Coral Reefs
Mangroves: Spalding *et. al* (2010) World Atlas of Mangroves
Seagrass: UNEP-WCMC, Short FT (2005) Global distribution of seagrasses
Bathymetry: The GEBCO_08 Grid, version 20100927, http://www.gebco.net
Marine Protected Areas: Compiled from various sources including ReefBase, BOBLME (2011) and EPA (2013) by WorldFish up to October 2013

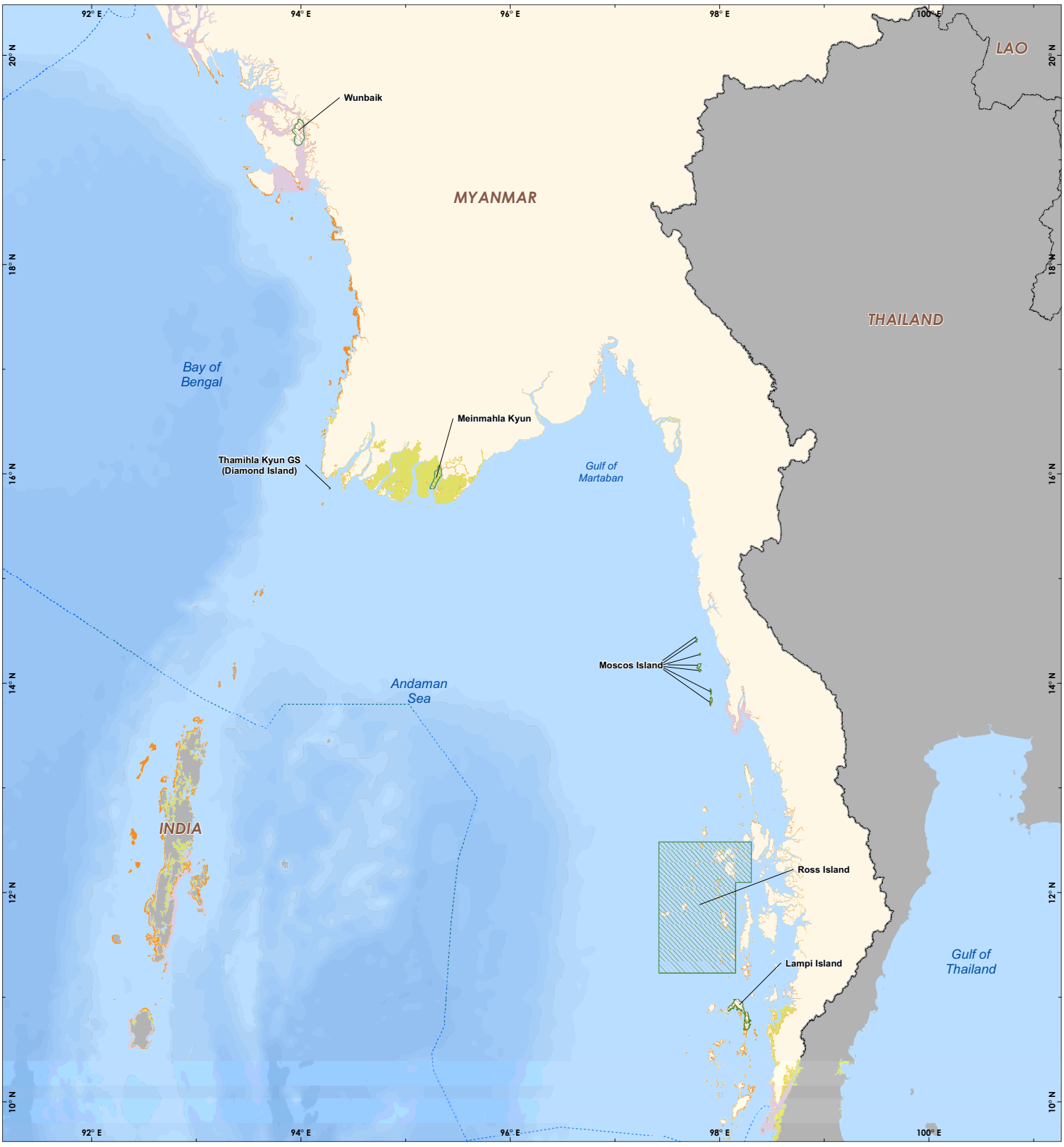
Maldives

No	Site Name	Longitude	Latitude	National Designation	International Status	Established Year	Legal/Gazetted Code	Reported Area (km2)	IUCN Category	No Take Zone	Habitat Types	Has Spatial Polygon
1	Aligaa kanduolhi	73.50	5.26	Protected Area	Unset	2014	2013/R-41				Reef and channel	Yes
2	Angafaru	73.09	5.18	Protected Area	UNESCO Biosphere Reserve	2009	138-EE/2009/19	13.20	Unset	Yes	Reef/Lagoon/Sand bank	Yes
3	Bandaara kilhi	73.43	-0.30	protected area	unset	2012		0.528		yes	Mangrove/ Wetland	Yes
4	Bathalaa Region	73.07	5.35	Protected Area	UNESCO Biosphere Reserve	2011	138-EE/2009/19	33.7762		Yes	Island/Reef	Yes
5	Boamas kandu/ Boamas Kanduolhi	73.40	3.68	Protected area	Unset	2014	2013/R-41			Yes	Reef and channel	Yes
6	Dhandimagu kilhi	73.42	-0.29	Protected Area	Unset	2012		0.63		yes	Mangrove/ Wetland	Yes
7	Dhekunu Thilafalhuge Miyaruvani /Lions Head	73.43	4.18	Protected Area	Unset	1995	E/95/32	1.51	Unset	Unknown	Reef	Yes
8	Dhiffushi kandu/Dhiffushi kanduolhi	73.70	73.70	Protected Area	Unset	2014	2013/R-41			Yes	Reef and channel	Yes
9	Dhigali Haa and Dhigali Giri	73.04	5.15	Protected Area	UNESCO Biosphere Reserve	1999	10-C/99/38	0.13	Unset	Unknown	Coral reefs. Previous records of grey reef sharks, white-tipped reef sharks, barracudas, jacks and turtles	Yes
10	Eidhigali Kilhi and Koattey Area/ Hithadhoo	73.08	-0.58	protected area	Unset	2004	20-H3/2004/67	0.16	Unset	Yes	Island/Reef/Lagoon	Yes
11	Emboodhoo Kandu Olhi	73.53	4.08	protected area	unset	1995	E/95/32	6.21	Unset	Unknown	Reefs	Yes
12	Faruhuruvalhibeyru / Rangali Kandhu	72.72	3.59	Protected Area	unset	1999	10-C/99/38	7.51	Unset	Yes	Reefs	Yes
13	Filitheyo Kandu	73.04	3.22	protected area	Unset	1999	10-C/99/38	0.2	Unset	Unknown	Reef	Yes
14	Fushee Kandu	72.93	3.00	protected area	Unset	1999	10-C/99/38	23.51	Unset	Yes	Reef	Yes
15	Fushivaru Thila	73.52	5.48	protected area	Unset	1995	E/95/32	13.847	Unset	Yes	TReefs	Yes
16	Gaathugiri /Aiydha Shugiri/ Banana Reef	73.53	4.24	protected area	E/95/32	1995	E/95/32	1.785	Unset	Yes	Reef	Yes
17	Goidhoo Koaru Area	73.00	4.88	Protected Area	UNESCO Biosphere Reserve	2011	138-EE/2009/19	0.139		Yes	Wetland and waterbody	Yes
18	Guraidhoo Kanduolhi	73.46	3.89	protected area	Unset	1995	E/95/32	3.52	Unset	Yes	Marine Protected Area	Yes
19	Hanifaru area	73.15	5.18	protected area	UNESCO Biosphere Reserve	2009	138-EE/2009/19	11.6887	Unset	Unknown	Island/Reef/Lagoon	Yes

No	Site Name	Longitude	Latitude	National Designation	International Status	Established Year	Legal/Gazetted Code	Reported Area (km2)	IUCN Category	No Take Zone	Habitat Types	Has Spatial Polygon
20	Hithadhoo	73.24	0.85	protected area	Unset	2006	174-AB1/2006/13	8.03	Unset	Unknown	Island, lagoon and surrounding reef protected. Most important roosting site for frigate birds in Maldives. Important roosting site for other birds. Turtle nesting area	Yes
21	Huraa Mangrove Area	73.60	4.33	Protected Area	Unset	2006	174-AB1/2006/13	0.0539	Unset	Yes	Mangroves	Yes
22	Hurasdhoo	72.77	3.67	Protected Area	Unset	2006	174-AB1/2006/13	5.14	Unset	Yes	Island/Reef/Lagoon	Yes
23	Karibeyru Thila	72.94	4.09	protected area	Unset	1999	10-C/99/38	13.187	Unset	Yes	Reef	Yes
24	KoKollavaane, centre of Gulhifalhu Medhuga/ Hans Hass Place; HP Reef	73.47	4.17	protected area	Unset	1995	E/95/32	1.02	Unset	Yes	Reef	Yes
25	Kuda Haa	73.42	4.22	protected area	Unset	1995	E/95/32	2.60	Unset	Yes	Reef	Yes
26	Kudahuvadhoo kandu	72.91	2.67	Protected Area	Unset	2014	2013/R-41			yes	Reef and channel	Yes
27	Kudarah Thila	72.92	3.56	Protected Area	Unset	1995	E/95/32	2.00	Unset	Yes	Reef	Yes
28	Kuredhu Kanduolhi/ Kuredu Express	73.48	5.55	protected area	Unset	1999	10-C/99/38	3.90	Unset	Yes	C10-C/99/38	Yes
29	Lankan Thila/ Nassimo Thila	73.54	4.29	protected area	Unset	1999	10-C/99/38	2.67	Unset	Yes	Reef	Yes
30	Lhazikuraadi / Hakuraa Thila	73.54	2.95	protected area	Unset	1999	10-C/99/38	0.13	Unset	Yes	Reef	Yes
31	Maahuruvalhi Reef Region	72.86	5.19	Protected area	UNESCO Biosphere Reserve	2011	138-EE/2009/19	18.726		Yes	Reef	Yes
32	Makunudhoo Kandu Olhi / Kuda Faru/ Manukudhoo channel	73.38	4.56	protected area	Unset	1995	E/95/32	3.09	Unset	Yes	Reef	Yes
33	Mathifaru Huraa Region	72.89	4.82	Protected Area	UNESCO Biosphere Reserve	2011	138-EE/2009/19	7.52		Yes	Island/Reef	Yes
34	Mayaa Thila	72.85	4.08	Protected Area	Unset	1995	E/95/32	10.28	Unset	Yes	Reef	Yes
35	Mendhoo Region	72.97	5.17	protected area	UNESCO Biosphere Reserve	2011	138-EE/2009/19	21.40			Island/Reef	Yes
36	Miyaru Kandu/ Dhevana Kandu	73.50	3.57	protected area	Unset	1995	E/95/32	1.1	Unset	Unknown	Reef	Yes
37	Muli and Mulah kandu	73.59	2.93	protected area	Unset	2014	2013/R-41			Yes	Reef and channel	Yes
38	Mushimasmigili Thila /Fish Head	72.92	3.94	protected area	Unset	1995	E/95/32	26.88	Unset	Unknown	Reef	Yes
39	Olhugiri	72.90	5.00	Protected Area	UNESCO Biosphere Reserve	2006	174-AB1/2006/13	5.73	Unset	Unknown	Island/Reef/Lagoon	Yes

No	Site Name	Longitude	Latitude	National Designation	International Status	Established Year	Legal/Gazetted Code	Reported Area (km2)	IUCN Category	No Take Zone	Habitat Types	Has Spatial Polygon
40	Orimas Thila	72.95	3.97	protected area	Unset	1995	E/95/32	13.15	Unset	Unknown	Reef	Yes
41	Rasfari Region/ Rasfari beyru	73.36	4.41	Protected Area	unset	1995	E/95/32	24.47	Unset	Yes	Island/Reef	Yes
42	South Ari Atoll MPA	72.83	3.53	Protected Area	Unset	2009	138-EE/2009/19	38.45	Unset	Unknown	Reef	Yes
43	Thamburudhoo Thila/ Girifushi Thila	73.58	4.33	protected area	Unset	1995	E/95/32	1.45	Unset	Yes	Reef	Yes
44	The wreck of “Corbin”	72.90	4.89	Protected Area	UNESCO Biosphere Reserve	2011	138-EE/2009/19	3.30		Yes		Yes
45	Thundi Area-Fuvahmulah	73.42	-0.27	Protected Area		2012		1.66		Yes		Yes
46	Vattaru Kandu (Vaavu atoll)	73.44	3.25	protected area	Unset	1999	10-C/99/38	97.8707	Unset	Yes	Reef	Yes
47	Vilingili Thila	72.9123764	5.3799671	protected area	Unset	1999	10-C/99/38	0.12	Unset	Yes	Reef	Yes

MARINE PROTECTED AREAS - MYANMAR



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- Mangroves

Bathymetry (depths in metres)

6500 6000 5500 5000 4500 4000 3500 3000 2500 2000 1500 1000 500 0

Data sources:
Exclusive Economic Zone (EEZ): VLIZ (2012). Maritime Boundaries Geodatabase, version 7
Coral Reefs: UNEP-WCMC (2010) Global Distribution of Coral Reefs
Mangroves: Spalding *et. al* (2010) World Atlas of Mangroves
Seagrass: UNEP-WCMC, Short FT (2005) Global distribution of seagrasses
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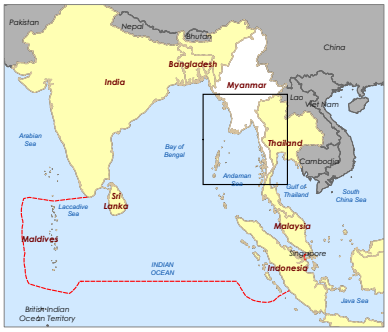
Marine Protected Areas: Compiled from various sources including ReefBase, BOBLME (2011), UPMSI et al. (2002) and WDPA (2013) by WorldFish up to October 2013

BAY OF BENGAL LME · FAO FIAT PANIS · gef · WorldFish

0 50 100 150 200 km

Coordinate System: GCS WGS 1984
Datum: WGS 1984

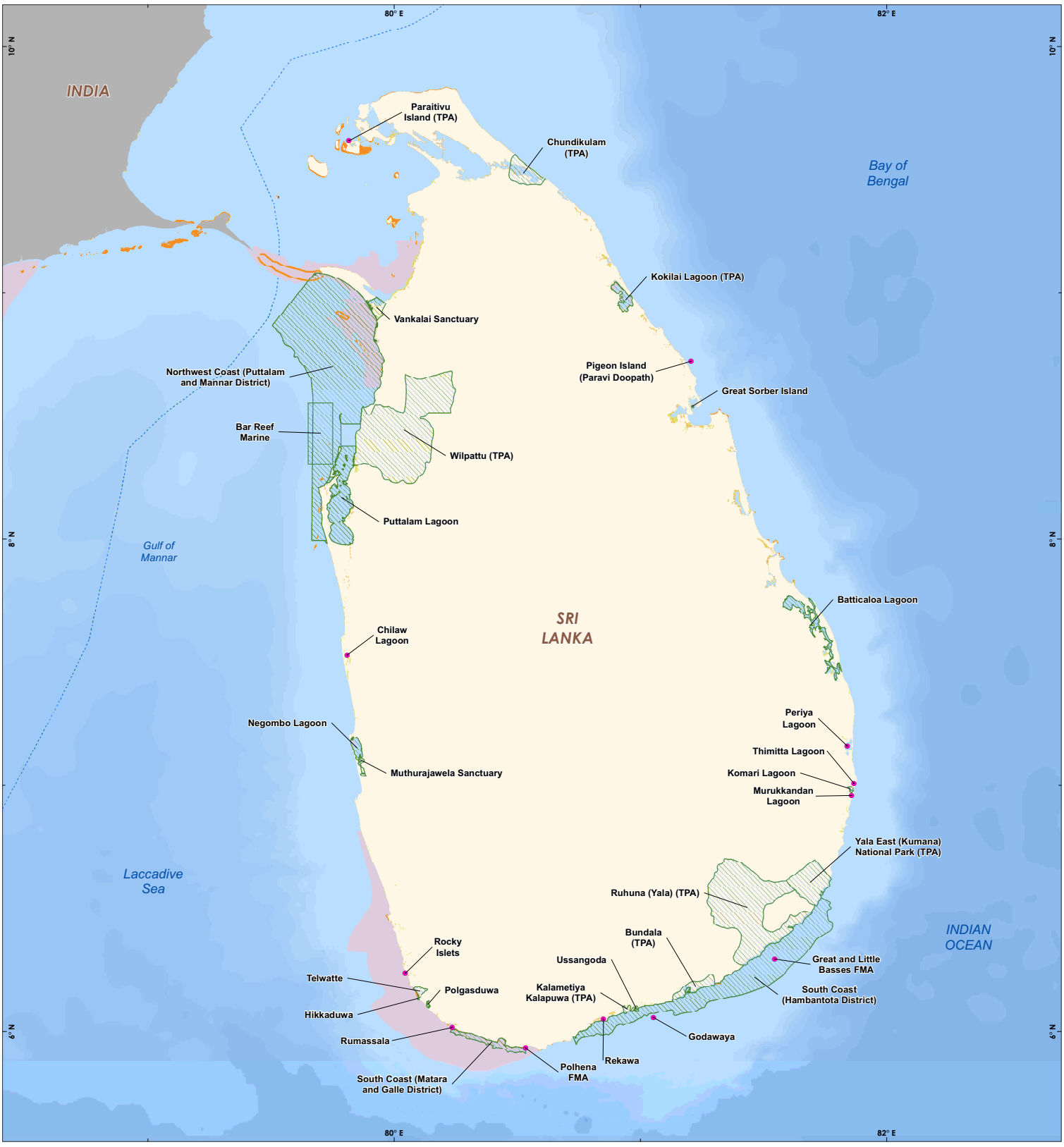


Date: 27 Mar 2014

Myanmar

No	Site Name	Longitude	Latitude	National Designation	International Status	Established Year	Legal/Gazetted Code	Reported Area (km2)	IUCN Category	No Take Zone	Habitat Types	Has Spatial Polygon
1	Lampi Island	98.21	10.86	Marine National Park	ASEAN Heritage Park	1996		204.84	Ib		Mangrove habitat, coral reef (warm).	Yes
2	Meinmahla Kyun	95.30	15.97	Wildlife Sanctuary	ASEAN Heritage Park	1993		136.7	IV	Yes	Mangrove, crocodile conservation	Yes
3	Moscos Island	97.92	13.86	Wildlife Sanctuary		1927		49.24	IV		Mangrove, coral reef and evergreen forest.	Yes
4	Ross Island	98.10	12.24	Shark Protected Area							Shark refugia site.	Yes
5	Thamihla Kyun GS (Diamond Island)	94.28	15.86	Wildlife Sanctuary		1970		0.88	IV		Protected turtle habitat.	Yes
6	Wunbaik	93.988098	19.25391	Reserved Forest		1931		229.2			Mangrove habitat	Yes

MARINE PROTECTED AREAS - SRI LANKA



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Bathymetry (depths in metres)

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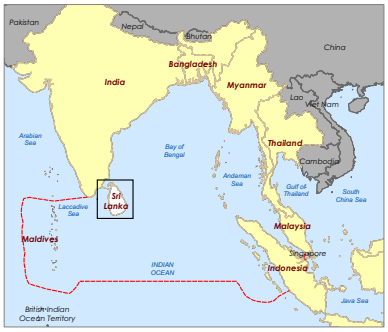
Coordinate System: GCS WGS 1984
Datum: WGS 1984



Date: 01 Apr 2014

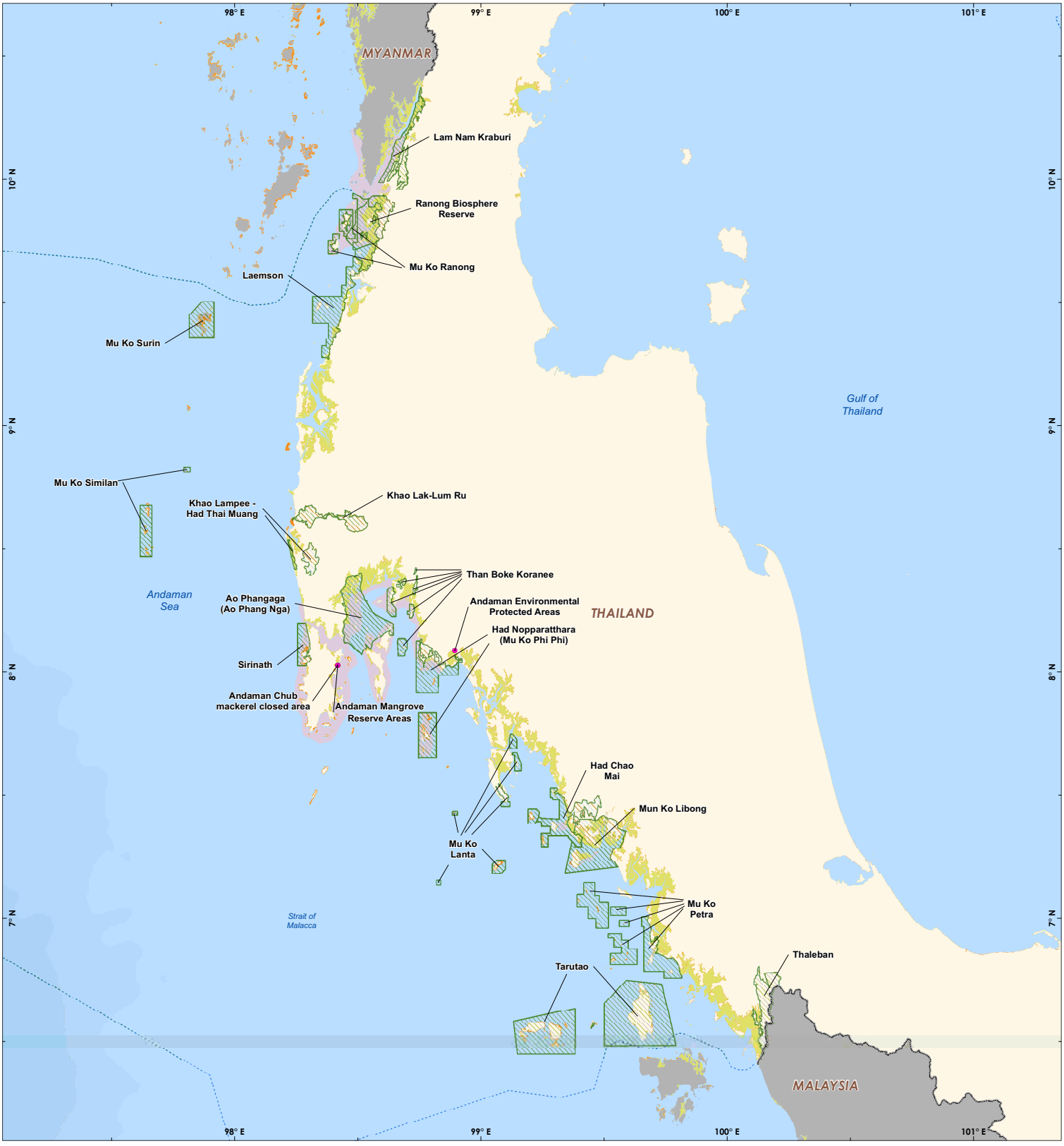
Data sources:
Exclusive Economic Zone (EEZ): VLIZ (2012) Maritime Boundaries Geodatabase, version 7
Coral Reefs: UNEP-WCMC (2010) Global Distribution of Coral Reefs
Mangroves: Spalding *et. al* (2010) World Atlas of Mangroves
Seagrass: UNEP-WCMC, Short FT (2005) - Global distribution of seagrasses
Bathymetry: The GEBCO_08 Grid, version 20100927, http://www.gebco.net
Marine Protected Areas: Compiled from various sources including ReefBase, BOBLME (2011), RAMSAR (2011) and WDPA (2013) by WorldFish up to October 2013

Sri Lanka

No	Site Name	Longitude	Latitude	National Designation	International Status	Established Year	Legal/Gazetted Code	Reported Area (km2)	IUCN Category	No Take Zone	Habitat Types	Has Spatial Polygon
1	Bar Reef Marine	79.70	8.43	Sanctuary (SAM Site)		1992		306.7	IV	None	Coral reef and sandstone reef. Sea grass habitats.	Yes
2	Batticaloa Lagoon	81.70	7.72	Fishery Managed Area		2001		141.18	VI	None		Yes
3	Bundala (TPA)	81.22	6.18	National Park	UNESCO MAB/ Ramsar Site	1969		34.4	IV	None	Beach, sand dunes, coastal vegetation, coastal wetlands (subtital rocky reef adjacent to PA). Important site for migratory shorebirds.	Yes
4	Chilaw Lagoon	79.81	7.53	Fishery Management Area		2013				none		No
5	Chundikulam (TPA)	80.53	9.49	Sanctuary		1938		111.49	IV	None	Lagoon system	Yes
6	Godawaya	81.05	6.06	Sanctuary		2006		2.26	IV	None		No
7	Great and Little Basses FMA	81.54	6.29	Fishery Managed Area		2001			VI	None	Rocky reefs	No
8	Great Sober Island (TPA)	81.21	8.54	Sanctuary		1963		0.647	IV	None	Coral reefs adjacent to PA	Yes
9	Hikkaduwa	80.10	6.14	National Park (SAM Site)		1978		0.44	IV	Partial	Coral reef (warm)	Yes
10	Kalametiya Kalapuwa (TPA)	80.95	6.09	Sanctuary		1984		25.25	IV		Lagoon, mangroves. Estuary and adjacent wetland/riverine environment	Yes
11	Kokilai Lagoon (TPA)	80.93	9.00	Sanctuary		1951		29.95	IV	None	Lagoon system and wetlands	Yes
12	Komari Lagoon	81.86	6.98	Fishery Managed Area		2010		4.26	VI	None		Yes
13	Murukkandan Lagoon	81.86	6.96	Fishery Management Area		2010	Section 31 of the Fisheries and Aquatic Resources Act, No. 2 of 1996					No
14	Muthurajawela	79.86	7.10	Sanctuary		1996		12.85	IV	None	Mangroves	Yes
15	Negombo Lagoon	79.85	7.16	Fishery Managed Area		1998		35	VI	None		Yes
16	Northwest Coast (Puttalam and Mannar District)	79.78	8.66	Fishery Managed Area		2010			VI	None		Yes
17	Panama Lagoon (FMA)	81.82	6.77	Fishery Managment Area						None	Lagoon, Mangroves, Estuaries	No
18	Paraitivu Island (TPA)	79.82	9.62	Sanctuary		1973		0.18	IV	None	Subtital reefs adjacent to PA	No

No	Site Name	Longitude	Latitude	National Designation	International Status	Established Year	Legal/Gazetted Code	Reported Area (km2)	IUCN Category	No Take Zone	Habitat Types	Has Spatial Polygon
19	Periya Lagoon	81.82	7.21	Fishery Management Area		2009				None	Lagoon	No
20	Pigeon Island (Paravi Doopath)	81.21	8.72	National Park		1974		4.71	IV	None	Coral reef. Includes large and small Pigeon Islands and surrounding coral reefs	No
21	Polgasduwa	80.14	6.11	Sanctuary		1988		1.9	IV	None		Yes
22	Polhena FMA	80.53	5.93	Fishery Managed Area		2001					Coral reef	No
23	Puttalam Lagoon	79.76	8.11	Fishery Managed Area		2010		364.26	VI	None		Yes
24	Rekawa	80.85	6.05	Turtle Sanctuary		2006		2.26	IV		Turtle	No
25	Rocky Islets	80.05	6.24	Sanctuary		1940		0.012	IV	None	Coral reefs	No
26	Ruhuna (Yala) (TPA)	81.43	6.50	National Park		1938		73.28	II	None	Beach, sand dunes, coastal vegetation, coastal wetlands (subtital rocky reef adjacent to PA).	Yes
27	Rumassala	80.24	6.02	Marine Sanctuary		2003		17.07	IV	None	Coral reef	No
28	South Coast (Hambantota)	81.37	6.18	Fishery Managed Area		2010			VI	None		Yes
29	South Coast (Matara and Galle District)	80.42	5.94	Fishery Managed Area		2010			VI	None		Yes
30	Telwatte	80.08	6.17	Sanctuary		1938		14.25	IV	None		Yes
31	Thimitta Lagoon	81.87	7.01	Fishery Management Area		2010	Section 31 of the Fisheries and Aquatic Resources Act, No. 2 of 1996					No
32	Ussangoda	80.98	6.10	National Park		2010		3.49	II		Important nesting sites for marine turtles	Yes
33	Vankalai	79.92	8.94	Sanctuary	Ramsar Site	2008		48.38	IV	None		Yes
34	Wilpattu (TPA)	80.04	8.44	National Park		1938		63.38	II	None	Beaches, cliff coast, coastal vegetation (sea grass beds adjacent to PA).	Yes
35	Yala East (Kumana) (TPA)	81.69	6.61	National Park		1970		25.12	II	None	Beach, sand dunes, coastal vegetation, coastal wetlands (subtital rocky reef adjacent to PA)	Yes

MARINE PROTECTED AREAS - THAILAND



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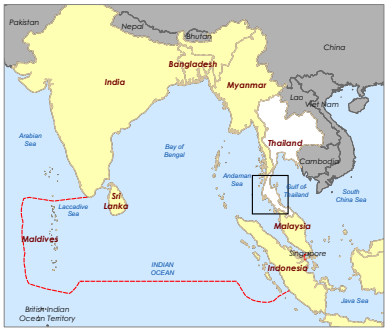
6500 6000 5500 5000 4500 4000 3500 3000 2500 2000 1500 1000 500 0

0 10 20 30 40 50 km

Coordinate System: GCS WGS 1984
Datum: WGS 1984



Date: 27 Mar 2014

Data sources:
Exclusive Economic Zone (EEZ): VLIZ (2012) Maritime Boundaries Geodatabase, version 7
Coral Reefs: UNEP-WCMC (2010) Global Distribution of Coral Reefs
Mangroves: Spalding *et. al* (2010) World Atlas of Mangroves
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Thailand

No	Site Name	Longitude	Latitude	National Designation	International Status	Established Year	Legal/Gazetted Code	Reported Area (km2)	IUCN Category	No Take Zone	Habitat Types	Has Spatial Polygon
1	Andaman closed area	98.42	8.03	Fisheries refugia (Phuket-Phangnga-Krabi-Trang)		2008		4386	IV	To commercial fishing gear	Closed area during fish spawning and breeding season (April 1 – June 30, every year)	No
2	Andaman Environmental Protected Areas	98.89	8.09	Environmental Protected Areas (Phuket, Phangnga, Krabi)			National Resources and Environmental Policy and Planning	11674	VI		Set aside to prevent/reduce undesirable impacts of development activities (e.g. urban, industrial and tourism development)	No
3	Andaman Mangrove Reserve Areas	98.42	8.03	Mangrove reserved areas			Royal Forest Department	1747.62			Mangrove	No
4	Ao Phang Nga	98.51	8.22	Marine National Park	ASEAN Heritage Park, Ramsar Site	1981	Department of National Park, Wildlife and Plant Conservation	400	II	All	Mangrove, coral reef (warm)	Yes
5	Had Chao Mai	99.35	7.40	Marine National Park	Ramsar Site	1981	Department of National Park, Wildlife and Plant Conservation	230.9	II	All	Mangrove, seagrass, coral reef (warm), beach. 1.29 km2 of coral reefs, wetland areas.	Yes
6	Had Nopparat thara (Mu Ko Phi Phi)	98.78	7.99	Marine National Park		1983	Department of National Park, Wildlife and Plant Conservation	387.9	II	All	Mangrove, seagrass, coral reef (warm). 7.77 km2 of coral reef.	Yes
7	Khao Lak-Lum Ru	98.39	8.62	Marine National Park		1991	Department of National Park, Wildlife and Plant Conservation	125	II	All	Beach	Yes
8	Khao Lampee - Had Thai Muang	98.30	8.46	Marine National Park	Undergoing nomination process to be Ramsar Site	1986	Department of National Park, Wildlife and Plant Conservation	72	II	All	Beach, sea turtle nesting site, beach forest, mangrove	Yes
9	Laemson	98.40	9.48	Marine National Park	Ramsar Site	1983	Department of National Park, Wildlife and Plant Conservation	315	II	All	Mangrove (largest concentration remaining in country), coral reef (warm), beach, wetland areas.	Yes
10	Lam Nam Kraburi	98.68	10.12	Marine National Park		1999		160	II	All	Mangrove	Yes

No	Site Name	Longitude	Latitude	National Designation	International Status	Established Year	Legal/Gazetted Code	Reported Area (km2)	IUCN Category	No Take Zone	Habitat Types	Has Spatial Polygon
11	Mu Ko Lanta	99.11	7.45	Marine National Park		1990	Department of National Park, Wildlife and Plant Conservation	134	II	All	Mangrove, seagrass, coral reef (warm). 8.24 km2 of coral reefs.	Yes
12	Mu Ko Libong (Non-Hunting Area)	99.39	7.24	Non Hunting Area	Undergoing nomination process	1979	Department of National Park, Wildlife and Plant Conservation	447.5	III	Unknown	Island that is important bird nesting habitat.	Yes
13	Mu Ko Petra	99.59	6.93	Marine National Park		1984	Department of National Park, Wildlife and Plant Conservation	494.4	II	All	Mangrove, coral reef (warm), beach. 4.77 km2 of coral reefs.	Yes
14	Mu Ko Ranong	98.50	9.83	Marine National Park		2010	Department of National Park, Wildlife and Plant Conservation	365.7	II	All	Coral reef, beaches, swamp forest, islands, mangrove	Yes
15	Mu Ko Similan	97.65	8.58	Marine National Park	ASEAN Heritage Park	1982	Department of National Park, Wildlife and Plant Conservation	140	II	All	Coral reef (warm), beach. 3.39 km2 of coral reefs.	Yes
16	Mu Ko Surin	97.87	9.43	Marine National Park	ASEAN Heritage Park	1981	Department of National Park, Wildlife and Plant Conservation	135	II	All	Mangrove, seagrass, coral reef (warm), beach. 12.01 km2 of coral reefs.	Yes
17	Ranong Biosphere Reserve	98.57	9.83	UNESCO Biosphere Reserve	UNESCO Biosphere Reserve	1997	Department of Marine Coastal resources and UNESCO	303.09	IV		Over 300 animal species and 24 mangrove species	Yes
18	Sirinath	98.28	8.11	Marine National Park		1981	Department of National Park, Wildlife and Plant Conservation	90	II	All	Mangrove, coral reef (warm), beach. 2.06 km2 of coral reefs, wetland areas.	Yes
19	Tarutao	99.50	6.58	Marine National Park	ASEAN Heritage Park	1976	Department of National Park, Wildlife and Plant Conservation	1490	II	All	Mangrove, coral reef (warm), beach. 12.58 km2 of coral reefs.	Yes
20	Thaleban	100.15	6.65	Marine National Park		1980	Department of National Park, Wildlife and Plant Conservation	196	II	All	Beach, coral reefs.	Yes

No	Site Name	Longitude	Latitude	National Designation	International Status	Established Year	Legal/Gazetted Code	Reported Area (km2)	IUCN Category	No Take Zone	Habitat Types	Has Spatial Polygon
21	Than Boke Koranee	98.67	8.24	Marine National Park		1998	Department of National Park, Wildlife and Plant Conservation	104	II	All	Beach, coral reef.	Yes

Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand are working together through the Bay of Bengal Large Marine Ecosystem (BOBLME) Project to lay the foundations for a coordinated programme of action designed to better 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.

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