



National Framework for Establishing and Managing Marine Protected Areas (MPAs) in Bangladesh



INTERNATIONAL UNION FOR CONSERVATION OF NATURE



Supported by the Bay of Bengal Large Marine Ecosystem Project

National Framework for Establishing and Managing Marine Protected Areas (MPAs) in Bangladesh

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Table of Contents

Executive Summary	xi
Chapter-1: Background	01
1.1 Bay of Bengal	02
1.2 Coastal Areas of Bangladesh	03
1.3 Marine Fisheries Capability of Bangladesh	04
1.4 Destructive Fishing	05
1.5 Marine Pollution	05
1.6 Knowledge Gap on the Sea and its Content	05
1.7 Joint Initiative by BOBLME and IUCN to Draft a Marine Protected Area Framework	06
1.8 Purpose of this Framework	07
1.9 Framework Development Process	08
Chapter-2: Concept of MPA in Bangladesh: Its Status, Potentials and Challenges	11
2.1 Introduction	12
2.2 Importance and Benefits of Marine Protected Areas	12
2.3 Economic Value of Marine Protected Areas	14
2.4 History and Current Status of Marine Protected Areas in Bangladesh	15
2.5 Marine Protected Area Legislation in Bangladesh	17
2.6 Marine Protected Area Governance in Bangladesh	18
2.7 Current Management of Marine Fisheries and Scope	18
2.8 Threats and Challenges	19
2.9 Socio-economic Considerations and Perceptions of Marine Protected Areas	22
2.10 Effectiveness of Marine Protected Areas	23
2.11 Studies Necessary to Implement Marine Protected Areas	24
2.12 Necessity for Effective Partnership	24
2.13 Coastal Communities and Livelihoods	25
2.14 Conservation Organizations	26
2.15 Fishing and Aquaculture Interests	26
2.16 Coastal Communities and Organizations	27
2.17 Sea and Ocean Industries	28
2.18 Coastal Districts and Municipal Government Agencies	28
2.19 Government Ministries and Field Agencies	28
2.20 International Cooperation on Marine Protected Areas	28
2.21 Information Gap on Knowledge Base	29

Chapter-3: Framework to Establish and Manage Marine Protected Areas (MPAs) in Bangladesh	31
3.1 Introduction	32
3.2 Framework to Establish and Manage Marine Protected Areas	32
3.3 Selection, Designation and Management of Marine Protected Areas under Emergency Situation	45
3.4 Community Awareness and Learning	46
3.5 Education through Hands-on Training and Awareness Building	46
 Chapter-4: Proposed MPA Sites	 49
 References	 65
 Annexure	 69
Annex 1: Renewable and Non-Renewable Marine Resources	70
Annex 2: Existing Coastal and Sea Based PA, ECA and Fishing Ban	81
Annex 3: Policy Gap Analysis	83
Annex 4: Stakeholder Consultation and Consensus Building Workshops at Regional and National Level	95

Foreword

Bangladesh, India, Indonesia, Malaysia, the 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.

The objective of the BOBLME Project Component 3 (Improved Understanding and Predictability of the BOBLME Environment) is to share information with other regional and global environmental monitoring 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 gain consensus on approaches to the establishment and management of marine protected areas and fish refugia for sustainable fish management and biodiversity conservation objectives.

Designation of Marine Protected Areas (MPAs) comes with a commitment to protect the marine environment and is at the same time an important fisheries management tool. In Bangladesh, it is a priority to conserve the marine ecosystem and biodiversity, to safeguard rational resource utilization and to regulate overexploitation of certain commercial species. Bangladesh is also committed to declare 10% (the Aichi target fixed at Nagoya COP of CBD) of its 112,000 km² of EEZ by 2020, after judicious selections of sites and executable management planning. IUCN with support of the BOBLME Project has conducted a study on some preliminary selection procedures for MPA framework formulation in Bangladesh. This MPA framework report was prepared by IUCN Bangladesh Country Office based on findings, discussions and suggestions through a series of stakeholder consultations. Relevant ministries (Fisheries and Livestock, Environment and Forests), their agencies (Department of Fisheries, Bangladesh Fisheries Research Institute and Forest Department), other concerned government agencies (Navy, Coast Guard, Department of Environment, National Oceanographic Research Institute and universities), local administration and civil society organisations have been engaged in the formulation of this document. It is now essential that the contents of this document get widely disseminated, and the country also enhances its capacity to implement the above mentioned MPA framework effectively. This IUCN-BOBLME collaboration was designed to strengthen national capacity on establishing and managing MPAs in Bangladesh.

I am grateful and appreciative of all institutions and individuals who have contributed their efforts, skills, and enthusiasm to the drafting and completion of this framework for establishing MPAs in Bangladesh, and I am looking forward to seeing this framework widely disseminated and put to good use, for the conservation of critical habitats and marine and coastal resources of Bangladesh.

Chris O' Brien PhD
Regional Coordinator
Bay of Bengal Large Marine Ecosystem Project

Acknowledgement

This Framework for the Establishment and Management of Marine Protected Areas (MPAs) in Bangladesh is prepared by IUCN Bangladesh Country Office based on findings, discussions and suggestions from several regional workshops, focus group discussions, various interviews of key informants, two national level stakeholders consultation workshops and analysis of existing policies on Protected Areas and Marine Protected Areas at home and abroad.

IUCN would like to thank FAO and BOBLME - Bay of Bengal Large Marine Ecosystem Project for helping us to implement the project 'Strengthening National Capacity on Managing Marine Protected Areas of Bangladesh'. In addition, we would like to thank Ministry of Fisheries and Livestock, Ministry of Environment and Forests, as well as their respective agencies; Department of Fisheries, Bangladesh Fisheries Research Institute, Department of Environment and Forest Department for their relentless support, cooperation and sharing their knowledge, which have greatly enriched the framework.

We want to thank Bangladesh NAVY, Bangladesh Coast Guard, National Oceanographic Research Institute and universities, local administration and members of the civil society organizations. Our thanks are due to Mr. Arne C. I. Andreasson, Dr. Rudolf Hermes of BOBLME/FAO, Dr. Munir Hossain and Dr. Giasuddin Khan for reviewing the document and imparting scholastic suggestions. We also acknowledge the contribution of Dr. Haseeb Md. Irfanullah for his editorial support which significantly increased the clarity of the text.

We are indebted to Professor Dr. Md. Abul Hossain for his guidance and advice. Without his technical support, the framework would not have been compiled. We also express our gratitude to Mr. Aal Maruf Russell, Mr. Md. Selim Reza, Mr. Muhammad Mizanur Rahman and Mr. Saad Mahmood for their remarkable contribution.

We have used lot of photographs from Save our Sea - a national NGO involved in preparing this document. We profoundly acknowledge their contribution. We would also like to thank our colleague Mr. A. J. M. Zobaidur Rahman Soeb for his support in coordinating the pre-press work of this publication. Thanks are also due to Mr. Sheikh Asaduzzaman for his advice on editorial design and layout.

Last but not the least, we also like to sincerely thank and acknowledge all the participants of different workshops and discussions, without their input the process would not have been completed. We hope that our modest effort will be helpful in understanding the various aspect of marine biodiversity conservation and ensuring sustainable marine fisheries production in Bangladesh and the management perspectives of the framework will guide future marine conservation initiatives.

Ishtiaq Uddin Ahmad
Country Representative
IUCN Bangladesh Country Office



Message

It is my immense pleasure to know that the 'National Framework for Establishing and Managing Marine Protected Areas (MPAs) in Bangladesh' has been finalized to publish.

The Bay of Bengal is endowed with rich biodiversity, especially fisheries resources. Owing to this fact, the coastal communities of Bangladesh have been supported their lives from the fisheries resources they extract from the Bay of Bengal. The increasing number of coastal inhabitants and a boost in commercial fisheries has been a concern in recent years. Thereby, a sustainable exploitation of marine resources (especially fisheries) through MPAs is an intervention that the Ministry of Fisheries and Livestock appreciates.

I hope that 'National Framework for Establishing and Managing Marine Protected Areas (MPAs) in Bangladesh' will set a roadmap towards establishing and managing Marine Protected Areas (MPAs) in the Bay of Bengal in coming years. In addition, the report promises to be a stepping stone towards the sustainable management of the fisheries resources which in turn will help sustaining an improved and secured livelihood for fisher communities.

On behalf of the Ministry of Fisheries and Livestock, Government of the People's Republic of Bangladesh, I would like to thank Food and Agriculture Organization of the United Nations (FAO) and the Bay of Bengal Large Marine Ecosystem (BOBLME) Project for supporting the project. I would also like to convey gratitude to IUCN Bangladesh Country Office for implementing the project and publishing this MPA framework.

Md. Maksudul Hasan Khan

Secretary

Ministry of Fisheries and Livestock

Government of the People's Republic of Bangladesh



Message

Being a sub-tropical country in the Ganges Delta and holding the stretch of the longest beach line along the dynamic Bay of Bengal, the denizens of Bangladesh are blessed with natural resources. Incorporating a sustainable management of these resources in harmony with global conservation initiatives, Bangladesh has been signatory to several multilateral environmental agencies. Thereby, Bangladesh is committed to bring her marine resources under sustainable management practices.

On the above contexts, Bangladesh has become engaged with Bay of Bengal Large Marine Ecosystem (BOBLME) project together with countries sharing the Bay of Bengal. The initiative leads to the formation of the 'National Framework for Establishing and Managing Marine Protected Areas (MPAs) in Bangladesh'. The Ministry of Environment and Forests appreciates this very first framework for marine biodiversity in the country and envisions execution of rigorous management and conservation strategies.

The Government of Bangladesh has recently settled legitimate rights over a maritime boundary of more than 118,813 sq km of territorial sea. This bewildering expansion has boosted up bright possibilities in sectors like fisheries, aquaculture, mariculture, renewable energy, submarine mining, biotechnology, maritime trade, shipping and tourism.

On behalf of the Ministry of Environment and Forests, I hope that this document will strengthen and facilitate the coordination and promotion of national efforts for ensuring the continual conservation practice and management of marine biodiversity of the country. I would request all the stakeholders including ministries, divisions, departments, agencies concerned, NGOs and private sectors to play proactive roles in expansive dissemination and exhaustive implementation of this framework.

Finally, I thank IUCN Bangladesh for making this maiden initiative to strengthen national capacity for establishing and managing MPAs in collaboration with BOBLME project.

Dr. Kamal Uddin Ahmed
Secretary
Ministry of Environment and Forests
Government of the People's Republic of Bangladesh

List of Abbreviations

AOC	Area of Curiosity
AOI	Area of Interest
AOM	Area of Mind
AOS	Area of Significance
BDFC	Bangladesh Fisheries Development Corporation
BFRI	Bangladesh Fisheries Research Institute
BOB	Bay of Bengal
BOBLME	Bay of Bengal Large Marine Ecosystem
BOBP	Bay of Bengal Programme
CBD	Convention on Biological Diversity
CCCRF	Code of Conduct for Responsible Fisheries
CPUE	Catch per Unit Effort
CITES	Convention on International Trade of Endangered Species
CMI	Convention on Migratory Species
COC	Code of Conduct
COP	Conference of Parties
CZM	Coastal Zone Management
DFID	Department of International Development (UK)
DoE	Department of Environment
DoF	Department of Fisheries
ECA	Ecological Critical Area
ECFC	Empowerment of Coastal Fisheries Communities
EEZ	Exclusive Economic Zone
EMRD	Energy and Mineral Resources Division
FD	Forest Department
FGD	Focal Group Discussion
GEF	Global Environment Facility
HCR	Head Count Ratio
ICM	Integrated Coastal Management
ICRI	International Coral Reef Initiative
IPAC	Integrated Protected Area Co-management
ITLOS	International Tribunal for the Law of the Sea
LG	Local Government
LME	Large Marine Ecosystem
LOA	Letter of Agreement
M&E	Monitoring and Evaluation
MFF	Mangroves for the Future
MOEF	Ministry of Environment and Forests
MOFL	Ministry of Fisheries and Livestock

MPA	Marine Protected Area
MOWR	Ministry of Water Resources
MSY	Maximum Sustainable Yield
NBSAP	National Biodiversity Strategy and Action Plan
NCS	National Conservation Strategy
NEMAP	National Environment Management Action Plan
NGO	Non-governmental Organization
PA	Protected Area
PSC	Project Steering Committee
RAMSAR	Convention on Wetlands of International Importance
SACEP	South Asia Co-operation Environment Programme
SRF	Sundarbans Reserved Forest
SIZ	Sundarbans Impact Zone
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Programme
WCMC	World Conservation Monitoring Centre
WHC	World Heritage Convention

Executive Summary

This MPA framework is prepared by IUCN Bangladesh with support from Bay of Bengal Large Marine Ecosystem (BOBLME) project based on findings, discussions and suggestions from six regional workshops and six focus group discussions (FGDs), various interviews of key informants at both regional and central level, two national level stakeholders consultation workshops (inception, where policy analysis was presented; and a final national workshop, where this document was validated together with other issues) and analysis of existing policies and documents on various Marine Protected Areas (MPAs). This project was implemented from April 2012 to April 2015. Relevant ministries i.e. Ministry of Fisheries and Livestock (MoFL) and Ministry of Environment and Forests (MoEF), their agencies namely Department of Fisheries (DoF), Bangladesh Fisheries Research Institute (BFRI), and Forest Department (FD), Department of Environment (DoE), other concerned government organizations (Bangladesh NAVY, Coast Guard, National Oceanographic Research Institute and Universities), local administration and civil societies were involved in the formation of this document. In addition to this framework, IUCN has prepared three documents viz. Policy gap analysis, Stakeholders analysis and Review of secondary literatures; which are also summarized in different sections of this framework.

The document is based on an analysis of the Bay of Bengal (BoB) basin, coastal configurations, ecosystems, habitats, current status and management of marine fisheries and foreseen socio-economic and ecological benefits which may originate from the protection of Ecologically Critical Areas (ECAs) and probable MPA declarations and implementation. Characteristics of coastal communities related to protection and conservation of fragile natural habitat and resources, their organizations, if any, livelihoods dependency on marine resources, conservation initiatives, partnership needed for MPA under public- private initiatives, coastal industries, land and sea-based pollution sources, marine resources related knowledge gaps and probable international cooperation as part of the preliminary requirements for MPA initiatives were also discussed. Therefore, while preparing the document, attempts were

made to incorporate reviewed scientific findings on the Bay of Bengal (BoB), information and knowledge gaps on marine ecosystem and its contents, resource use capabilities, exploitation, pollution and socio-economic aspects of coastal inhabitants and other related matters.

Although the list of biotic entities in the Exclusive Economic Zone (EEZ) of Bangladesh is long, it is incomplete for many groups of organisms that need further exploration. An initial attempt was undertaken to discuss current status of renewable marine resources which are commercially harvested or accidentally caught during commercial exploitations. Such groups include fish, shrimp and other crustaceans, molluscs, marine reptiles, sea birds, cetaceans and sea weeds. Their current status, within and between groups diversity and threats of extinction due to anthropogenic interventions and activities are discussed.

There are reasonably good numbers of documents available on marine and estuarine fisheries, coastal zone and environment management, climate change, biodiversity and related matters. However, only very few worthwhile reports or data related to MPA can be found. Consequently, attempts were taken to review existing documents available on the BoB with special emphasis on Bangladesh and its EEZ. Related documents were collected from online sources to understand how other countries have formulated their MPA frameworks. It is factual to state that a preliminary outline of steps and actions is needed to prepare a framework for MPAs. It will be the first step in the right direction and there is still a long way to go to demarcate, designate, declare and implement MPAs in a sea area where so many stakeholders depend on its resources for their livelihoods and subsistence. The framework prepared incorporates opinion of grass-root level stakeholders and some key informants who often have conflicting interest.

Under the prevailing situation, attempts were made to outline an immediate course of actions that could be followed in different steps, based on experience of other countries. Replicating the processes taken by others, however, might not serve the real purpose. Therefore, attempts were made to consider all the diverse elements while formulating the framework to be used in Bangladesh. IUCN's best practice

Guidelines for Protected Areas and FAO Guidelines for “Marine Protected Areas and Fisheries” can be followed during implementation of the proposed framework as guiding principles for the steps detailed out in Chapter 3.

The fisheries, marine fisheries and allied policies need to be amended so that these could be “all clear-cut” or “all-inclusive” policy documents. Since there is no specific marine environmental and/or ecosystem based policy available in Bangladesh, a wide range framework document was formulated, which will facilitate relevant agencies in monitoring and follow-up. The modified marine policy papers were broadened to incorporate all necessary elements, reflecting sustainability based on long term perspectives and wider national marine development policy and planning framework.

Declaration of MPA can be done either jointly or independently by the Ministry of Fisheries and Livestock (MoFL) and Ministry of Environment and Forests (MoEF). There should be a national committee for MPA declaration, possibly headed by Ministry of Fisheries and Livestock (MoFL) and also regional committees to ensure sustainable management and participatory governance. The Marine Fisheries Ordinance (1983) of Bangladesh, though does not directly incorporate provisions on establishing MPAs, but has a provision for protecting marine habitats and resources. Under these provisions the concept of MPA could be accommodated. However, designation and/or titling of newly created MPA will not be a problem as Bangladesh Government is committed to the establishment of MPAs in the EEZ. Necessary rules may be formed under the existing Marine Fisheries Ordinance 1983 or by amending it to strengthen policy support. Under the Wildlife (Conservation and Security) Act, 2012, Chapter 4 (Protected Area) Section 13(2) Subsection 1 there is a clause to declare MPA for marine wildlife which can also be used. It can also be done under the Bangladesh Environment Conservation Act 1995. However, MPA designation process can proceed alongside MPA management planning.

It is worth mentioning that the general framework is a broad outline, but each individual MPA should have its specific guideline or pathway. To establish

a typical MPA, following steps are suggested in this framework:

Step 1: Identification of Areas of Significance (AoSs)

Step 2: Initial sieving of preliminary selected AoSs

Step 3: AoSs validation, assessment and suggestions

Step 4: Formulation of Management Plan for Candidate MPA Sites

Step 5: Designation or titling of MPA

Step 6: Management guideline for individual MPA within the framework

Step 7: Declaration of MPA

Step 8: Code of Conduct (CoC) for specialized MPAs

Based on the opinions and suggestions of local level stakeholders from coastal regions, key-informants from government and non-government organizations and civil society members, a number of coastal interfaces, off-shore islands and open sea areas are suggested as future MPAs. The suggested sites/places with their inherent merits and demerits, human interference on its natural character, ecosystem, biodiversity and related matters are also discussed for considerations as MPA candidates. Approximately 67 sites are identified or suggested as probable MPAs, however, most are not well demarcated, and only longitude and latitude are indicated. All suggested places do not carry equal importance or significance; hence, initially suggested sites are differentiated into 4 categories; Area of Significance (AoS), Area of Interest (AoI); Area of Curiosity (AoC), and Area of Mind (AoM). But almost all proposed sites for future MPA incidentally are either in coastal areas and or in territorial waters as those who participated in these workshops and FGDs were not very familiar with the high sea part of the EEZ.

Therefore, in a final workshop it was decided that among the proposed sites a few would be taken into consideration for MPA as pilot sites for the immediate future, and based on the outcome of pilot initiatives broader approaches will be taken afterward. A total of 14 sites were identified as AoS which again could be summarized mainly in four broad sites to declare as MPAs, those are: St Martin’s Island and its adjacent water area (approx. 100 Km²), Nijum Dwip Island and its adjacent water area (approx. 300 Km²), Marine Reserve area

declared by DoF in the South Patches and Middle Ground of BoB (approx. 698 Km²), and Outer Periphery of Sundarbans (up to 10 nautical miles).

Implementation of the MPA framework can be done in 3 different phases to achieve the primary goal of AICHI targets to declare 10 percent of the marine area of Bangladesh worth 12,000 km² as MPA by 2020. It is difficult to forecast based on little information and facts to suggest 12,000 km² as future MPAs because of limited background information. If pilot initiatives appear successful, the area of MPA could be expanded. Even current PAs are not big enough to cover 12,000 km² and a mere declaration without proper studies will not be useful. However, this framework suggests a roadmap towards sustainable MPA management to implement it in three phases through a long term programme, beyond the primary goal of declaring 10% of EEZ by 2020 and targets to declare 15,000 km² by 2026.

Successful partnership and sharing responsibility by concerned public and private partners is required to implement the MPA framework. A coordinated approach is needed at national level on how the concerned agencies will work together. Cooperative agreements and joint planning exercises between Bangladesh and her BoB neighbours are also very important. Monitoring is vital for any programme implementation; therefore it is essential to establish a Monitoring & Evaluation system to conclude whether the objective/s of a given MPA have been achieved successfully. The indifferent attitude to conserve marine ecosystem and biodiversity, irrational and unsustainable resource utilization, abusive harvest of threatened species, inadequate attention to critical habitats have made implementation of the MPA framework urgent in Bangladesh, with a commitment to protect marine ecosystems.



A large, white, sans-serif number '1' is positioned in the upper left quadrant of the image. The background is a photograph of a vast, blue ocean meeting a pale, overcast sky at a distant horizon. The water has a textured surface with small, dark ripples. The sky is a uniform, light blue-grey color.

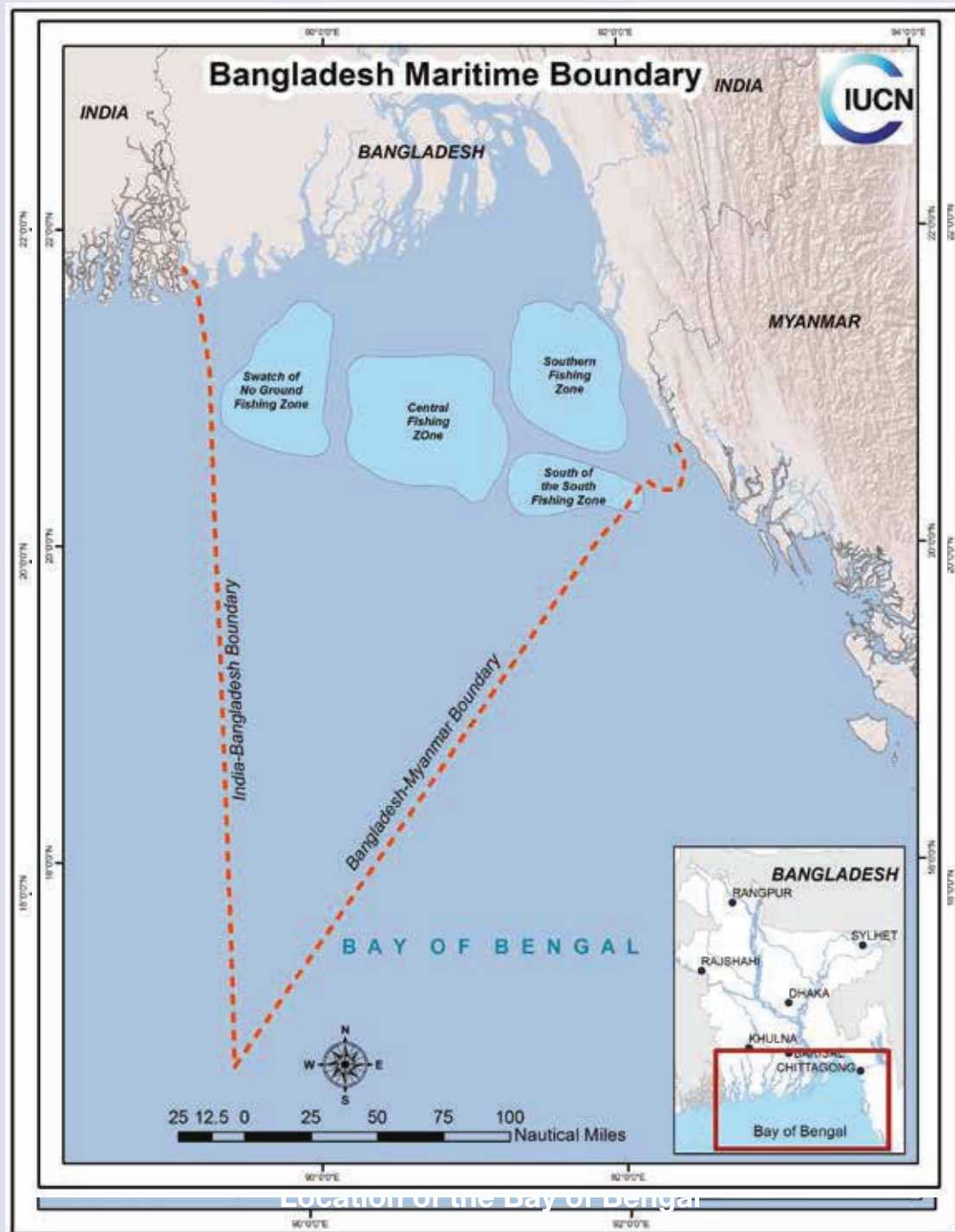
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Background

1.1 Bay of Bengal

The Bay of Bengal (BOB) is one of the world's 64 Large Marine Ecosystems (LME)¹. Approximately 1.6 billion people live in the eight BOB countries, constituting about 25 percent of the world's population. Of these, about 400 million live in the Bay's catchment area, many subsisting at or below the poverty level. The Bay is located at the mouth of

the three largest rivers in the Asian continent, which drains large amounts of monsoon water. There are eight countries surrounding the Bay in the north, east and west, Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand. To the south, the Bay is connected to the Indian Ocean. The BOB countries are densely populated; relatively poor and significantly dependent on the Bay and its resources for their



¹ Support to Sustainable Management of the Bay of Bengal Large Marine Ecosystem (BOBLME) Project. Progress Report. Bangladesh Fisheries Research Institute. 2012.

livelihoods. Due to lack of modern technology, coastal dwellers of the BOB countries overexploit in-shore coastal seas and probably underexploit open off-shore resources.

The management of non-renewable resources in respective Exclusive Economic Zone (EEZ) of each country is a national responsibility as long as extraction methods follow responsible methods and create minimum pollution. However, the management accountability of all exploitable living and renewable resources and its habitats is not only the responsibility of a single country, but a collective responsibility for all countries around the Bay. The eight countries have realized the importance of cooperation and they are now working together for sustainable management of the fisheries resources of the BOB and its large marine ecosystem under a project, named Bay of Bengal Large Marine Ecosystem Project (BOBLME).

The main problem in the BOB countries is overexploitation of fish resources and unsustainable harvesting of renewable resources. The coastal regions and territorial waters are overexploited by artisanal fishers. They cannot go to deeper water due to the lack of engines, inefficient fishing gears and lack of cold storage on board. Besides, open access to marine resources creates conflicts between professional fishers and others. There is an urgent need to bring artisanal fisheries under regulations to ensure their sustainability. Unregulated fishing will worsen the situation and adversely impact the large number of small-scale fishers, who are dependent on these resources for their livelihoods and food security.



A sandy beach in Saint Martin's Island

© IUCN/ Aal Maruf Russell

1.2 Coastal Areas of Bangladesh

The coastal areas in Bangladesh are relatively less developed than other parts of the country, disaster prone, inhabited by poorer people but have better access to marine and mangrove natural resources. The rate of landless farmers in coastal areas are higher than the rest of the country. Also, the coastal lands are less productive due to salinity and in most areas a single crop is harvested. The socio-economic conditions of fisher communities in coastal areas is impoverished and unsustainable exploitation of fish by over fishing has decreased catch per unit effort. Further, illegal intrusion of foreign fishing fleets in Bangladesh' EEZ are often reported. Bangladesh has few large scale fishing vessels and instead of fishing in deeper and blue seas, fishing is concentrated in the continental shelf within 40m depth that are supposed to be for artisanal fishing. This situation has increased antagonism and divergence, which should be allocated to small-scale fisheries. Bottom trawling (both finfish and shrimp) by the industrial fishing vessels is destructive for the bottoms and they destroy coral beds and the benthic fauna. Huge number of artisanal fishing boats continue to

degrade highly productive estuarine, coastal, mangrove and near shore marine habitats, migratory routes, vital fish spawning and nursery

grounds. Irresponsible and abusive fishing practices are expected to reduce marine landings further in the future, if corrective measures are not taken.

1.3 Marine Fisheries Capability of Bangladesh

World fisheries are predominantly marine and food habits are adapted to marine fish; while in Bangladesh fisheries mainly are fresh water. Fish produced in the country comes from wild open fresh water sources and fresh water based aquaculture. This is one of the reasons why the authorities have not paid attention to marine fisheries and it has not developed at the same pace as fresh water fisheries.

Marine fisheries sub-sector has an estimated 27,699 non-mechanized and 30,164 mechanized fishing boats and nearly 184 licensed industrial trawlers. Over 5,16,000 fishers are employed in the sector (DoF, 2014). The sector earns foreign exchange through export of various marine products including shrimp, frozen, dried and salted

fish and shark fins. There has been a 258 percent increase in fishing efforts since the start of mechanized fishing in 1975-76. The sector provides much needed animal protein to masses, earns foreign exchange through export of various marine products.

1.4 Destructive Fishing

Estuarine set bag-nets operate in large numbers, in river mouths and estuaries, and catch fry and juvenile marine species, resulting in reduced growth of commercially important species. Decline in catch

per unit effort (CPUE) for motorized boats using large mesh gill nets have been noticed. Shrimp trawlers are experiencing declining CPUE and are currently concentrating in shallow waters and come in conflict with artisanal boats. Management of marine fisheries is highly focused on activities of the industrial trawl sector. There is no management and monitoring of the artisanal sector, which operates from coastal areas, where fishing pressure is increasing alarmingly.

1.5 Marine Pollution

Bangladesh is not heavily industrialized, but sea-based sources of pollution include oil spills, ship breaking debris, and offshore oil and gas



Indiscriminate fishing of Shark

exploration. Other concerns include land conversion and reclamation, over-exploitation, sedimentation by river flows, sand washout towards sea during monsoon, city pollution towards sea by river flow, and unregulated tourism. There are also the potential adverse impacts related to the future potential development of seabed minerals.

The cumulative effects of land and sea based pollution are causing disruption of basic processes and functioning of the marine ecosystem. These include dilapidation and loss of fish habitat, breeding, spawning and nursery areas, fish kills and possible changes of marine trophic structure. The



Thrown can polluting the sea bed

fate and effect of pollutants has not been studied extensively. There is growing evidence that most of the pollutants are deposited in estuarine and coastal sediments, while a smaller portion may flush out to deeper waters. We are not yet sure about the pollution assimilating capacity of the ecosystem, though some argue that the ecosystem's assimilative capacity as a whole has not been compromised and that pollution problems are localized in nature.

1.6 Knowledge Gap on the Sea and Its Content

Bangladeshis are known to be skilled sailors and people from the coastal districts have traditionally roamed the seas of the world, work for shipping companies of developed countries. Despite the long history of sea traveling, our knowledge and information on our backyard sea is scanty. There are many unknown elements, many uncertainties, many undiscovered species, habitats, breeding, feeding, nursing and migratory grounds/routes about the Bay's status, ecosystem and environmental and biological, hydro biological functioning, much of it could be due to the lack of comprehensive and reliable data and information. Analyses of existing information of the marine resources are given in Annex 1.

There are a number of institutions designated to gather data and information on the sea and its contents. Bangladesh has a few of them but they do not function properly. None of them appear to have the authorization, capacity, organizational strength and scope to support an initiative based on Large Marine Ecosystem or Marine Protected Area based approaches. Recently the Bangladesh Navy has taken initiatives to explore the bottom characteristics of the

EEZ. This is one step forward towards the right direction.

The Bay of Bengal Program (BOBP) did a study as a basis for the management of marine resources, but the information generated by BOBP cannot resolve the aforementioned issues. What is needed is gathered previous information, knowledge and experience. Institutional mechanisms need to be developed for maintenance of records and continuously updating information. It is important to evaluate the gaps in knowledge which are impediments to progress in the work on MPA establishment.

The ongoing BOBMLE gives emphasis to the importance of the health, well-being and livelihoods of the millions of people living in the BOBMLE region and tries to address their problems.

The BOBP was active for a long period and implementing long and medium term regional fisheries programs. BOBP has done significant work in Bangladesh, India, Indonesia, Malaysia, Maldives, Sri Lanka and Thailand as active partners and in Myanmar as an observer. Initially BOBP focused mainly on improving the socio-economic conditions of the coastal dwelling fishers of small-scale countries collaboration. Their focus was mainly to develop and promote latest and

pioneering techniques and technologies suitable to local fishers. In the later stage, the project addressed more directly the vital management problems faced by the fishers' active in Bay of Bengal. During the extensive work done by BOBP, the countries recognized the necessity to manage the estuarine, coastal and marine resources. Initially, the environmental threats were not considered as important socio-economic aspects but later, environmental issues were recognized as vital for the management of marine resources in a coordinated, comprehensive and integrated manner.

Among the eight countries under BOBLME, Bangladesh is different in terms of her land, coast line configurations and the nature of her adjacent sea, especially the EEZ. Being largely covered by low floodplains, only a few meters above sea level, her territory interacts with Bay of Bengal (BOB) more closely compared to most other coastal countries. Since the nature of sea adjacent to Bangladesh is different, its ecosystem, habitat, marine and estuarine wildlife also tends to differ. Very few coastal seas receive so much fresh water and top soil washout as Bangladesh's part of the BOB, from combined flows of the mighty rivers Ganges, Brahmaputra, Meghna, Karnafuli and their tributaries. Over all the Bay's bio-physical status, ecosystem, hydrological and biological functioning are not well known. There is need for rigorous scientific studies of the BOB.

1.7 Joint Initiative by BOBLME and IUCN to Draft a Marine Protected Area Framework

The objective of Subcomponent 3.2 (Marine Protected Areas in the Conservation of Regional Fish Stocks) of BOBLME is to gain consensus on approaches to the establishment and management of marine protected areas (MPA) and fish refugia for sustainable fisheries management and biodiversity conservation. The BOBLME Project Work plan for 2011, adopted by the Project Steering Committee (PSC) in March 2011 had the following activity: A MPA workshop held to review the draft MPA status report to finalize it.

IUCN Bangladesh Country Office developed a proposal for the establishment of MPAs combining objectives of marine biodiversity conservation and ensuring sustainable marine fisheries production. In a move that clearly links protected area development with fisheries management, Government of Bangladesh declared Hilsa sanctuaries in recent years - four such sanctuaries are located in two of the country's most productive fishing grounds - the 'Middle Ground' and 'South Patches' areas. Hilsa fishing is banned in these sanctuaries during certain months of the year. Besides, the Department of Environment (DoE) has declared some protected areas situated in the



National consultative workshop on developing the MPA framework

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coastal region. However, no common understanding of MPAs currently exist in Bangladesh. There are a number of areas in the BOB within EEZ that are important for their sensitivity to many marine species but yet to be declared as MPAs. The coastal zone is important for sustaining marine biodiversity and characterized as mangroves, estuaries, mud flats, saline/brackish water, protected bays and islands. It is also vital for other marine wildlife including sea birds, winter fowl, dolphins, turtles, coral reefs and aquatic weeds. The BOBLME Project is collaborating with IUCN on several activities, ranging from critical habitat management to Integrated Coastal Management (ICM). Support to LME monitoring, assessment, management, and biodiversity conservation, through capacity building and socioeconomic studies, is one of the focal areas of IUCN's Global Marine Programme. Through the current Letter of Agreement (LoA), BOBLME intends to strengthen the cooperation between IUCN and the overall LME Programme for the benefit of the BOBLME project implementation.

BOBLME participated in FAO's MPA Workshop to launch the Technical Guidelines (FAO, 2011), which included to nominate 1 or 2 MPA pilot (learning, best practices) sites per country for BOBLME support and prepare proposals for project interventions (e.g. management effectiveness monitoring, awareness raising, and compliance generation). A Working Group of MPA experts (policy level) was constituted and convened to draft/endorse a work plan on the basis of the recommendations. Capacity development measures on MPA management were implemented in cooperation with Indonesian (NOAA) training experts. BOBLME participated in a (FAO led) Regional Workshop to increase awareness on MPA guidelines and promote the use of MPAs as fisheries management tools. BOBLME contributes to existing databases on MPAs; United Nations Environment Programme's (UNEP) World Conservation Monitoring Centre (WCMC), South Asia Cooperative Environment Programme (SACEP), World Fish Reef base and International Coral Reef Initiative (ICRI). A Working Group of practicing MPA managers was constituted for the meeting in 2012. For each BOBLME Project country, an allocation of around US\$ 50,000 was provided in 2011 to undertake MPA and ICM related activities in accordance with the BOBLME

Project objectives.

The IUCN Bangladesh Country Office in Dhaka, has an excellent network of researchers, research institutions, and coastal resources management practitioners, and BOBLME expects to benefit by connecting to this network. Therefore, IUCN is the logical implementation partner for BOBLME to undertake the MPA framework development activity covered by this LoA. BOBLME and IUCN have a solid track record of collaboration; including in Sri Lanka where IUCN produced a literature review and synthesis of findings on "Integrated Coastal Management (ICM) Best Practices and Lessons Learned" (Bangladesh, India, Maldives, Sri Lanka) and organized and implemented BOBLME's "ICM Best Practices Workshop" LoA/RAP/2010/23, and more recently in Bangladesh, where IUCN co-organized the Regional ICM Workshop with BOBLME. They also have a major partnership with IUCN's Mangroves for the Future (MFF) initiative (LoA/RAP/2010/26; LOA/RAP/2011/59) and 3 MFF-BOBLME collaborative communications workshops. BOBLME in 2010 has commissioned a review of the status of marine protected areas and fish Refuge in the Bay of Bengal Large Marine Ecosystem. The 10-page country profile of Bangladesh contained in this report will be a major input for this activity. The profile contains information on legislation and governance, aspects also covered by the BOBLME's Draft Policy Review.

1.8 Purpose of this Framework

The EEZ of Bangladesh has expanded recently by the verdicts of the International Tribunal for the Law of the Sea (ITLOS) between Bangladesh and Myanmar; and Bangladesh and India. According to the AICHI targets fixed at Nagoya Conference of Parties (COP) of the Convention on Biological Diversity (CBD), as a signatory of this document Bangladesh pledged to declare 10 percent of her EEZ as Marine Protected Areas (MPAs) by 2020. That means roughly 12,000 km². There is no single habitat or important marine zone large enough to be an MPA to fulfil the national commitment.

One of the main objectives of establishing an MPA is to create Fish Refugia in the marine environment. Fish Refugia is a hide away; in some cases known as wellness area for relaxation and recovering of

fishes. It is an area that has escaped ecological changes occurring elsewhere and/or suitable habitat for relict species. Fisheries management in the sea and large aquatic ecosystems must balance the interests of multiple stakeholders, dependence of coastal communities on fisheries, overfishing, destructive fishing practices, incidental capture of endangered species, and the inherently complex nature of the tropical multi-species fisheries.

Overall, the framework preparation activity is intended to contribute towards the goal to ensure sustainable marine fisheries production and protection of other wildlife through establishing Marine Protected Areas (MPAs) as a tool of biodiversity conservation and restoration of fish resources in the Bay of Bengal. It will also feed into the AICHI targets to declare 10 percent of its marine area as protected within 2020.

1.9 Framework Development Process

This "Framework Development Phase" is considered the preparatory phase of a longer term initiative, to be followed by a development phase and a consolidation phase. The main objective of the preparatory phase was to prepare a framework for establishing MPAs in Bangladesh waters through developing consensus among relevant

stakeholders. This has been achieved through participatory consultations and dialogue among key players of this sector in Bangladesh. IUCN has created a common platform for all relevant stakeholders using its inherent strength of influencing policy makers, government and non-government agencies, civil society, scientists, private sector, resource users and politicians to develop consensus that fed into formulation of the MPA framework. Care has been taken to ensure ownership by the government agencies by involving them in all steps and also advocacy. Intensive review and gap analysis exercises were another means of accumulating information and sharing those to appropriate levels to identify the hot spots that would need conservation measures. A total of eight workshops (of which six at regional level and two at national level) have been conducted with all relevant stakeholders. Besides, all kind of resource users were also consulted through various Focus Group Discussions (FGDs) along the coast. A number of key informants have also been interviewed for this purpose. Key Government agencies like Ministry of Fisheries and Livestock (MoFL), Department of Fisheries (DoF), Ministry of Environment and Forests (MoEF), Department of Environment (DoE), Forest Department and Bangladesh Fisheries Research Institute (BFRI) have given emphasis in authorizing the MPA framework, which is the ultimate output of this current initiative.



Focus Group Discussion

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2

Concept of MPA in Bangladesh: Its Status, Potentials and Challenges



2.1 Introduction

As a signatory of the Nagoya protocol, Bangladesh government is committed to declare 10 percent of its EEZ as an MPA by the year 2020. When the commitment was made, the EEZ was roughly about 60,000 km², but now it has increased to 118,813 km² due to the final settlement of maritime border disputes with neighboring states Myanmar and India in 2012 and 2014 respectively (MoFA, 2014). The length of Exclusive Economic Zone (EEZ) has also been increased from 200 nautical mile to 354 nautical miles. The expanded area of EEZ has become important both from ecological, biodiversity and economic viewpoints. The EEZ part of the Bay of Bengal is home to 475 species of fish, 17 species of marine reptiles, 11 species of marine mammals, 20 species of birds, 28 species of crabs (including brackish water and fresh water), 4 species of lobster, 33 species of shrimp, 437 species of marine and brackish water mollusks and 165 species of marine algae and sea weed, which have been identified so far. The mangrove ecosystem adjacent to coastal areas of south-western Bangladesh is very important as breeding and nursing grounds for many marine species. In addition to providing habitats to numerous species, the EEZ of Bangladesh also supports livelihoods for about eleven million people in the coastal zone.

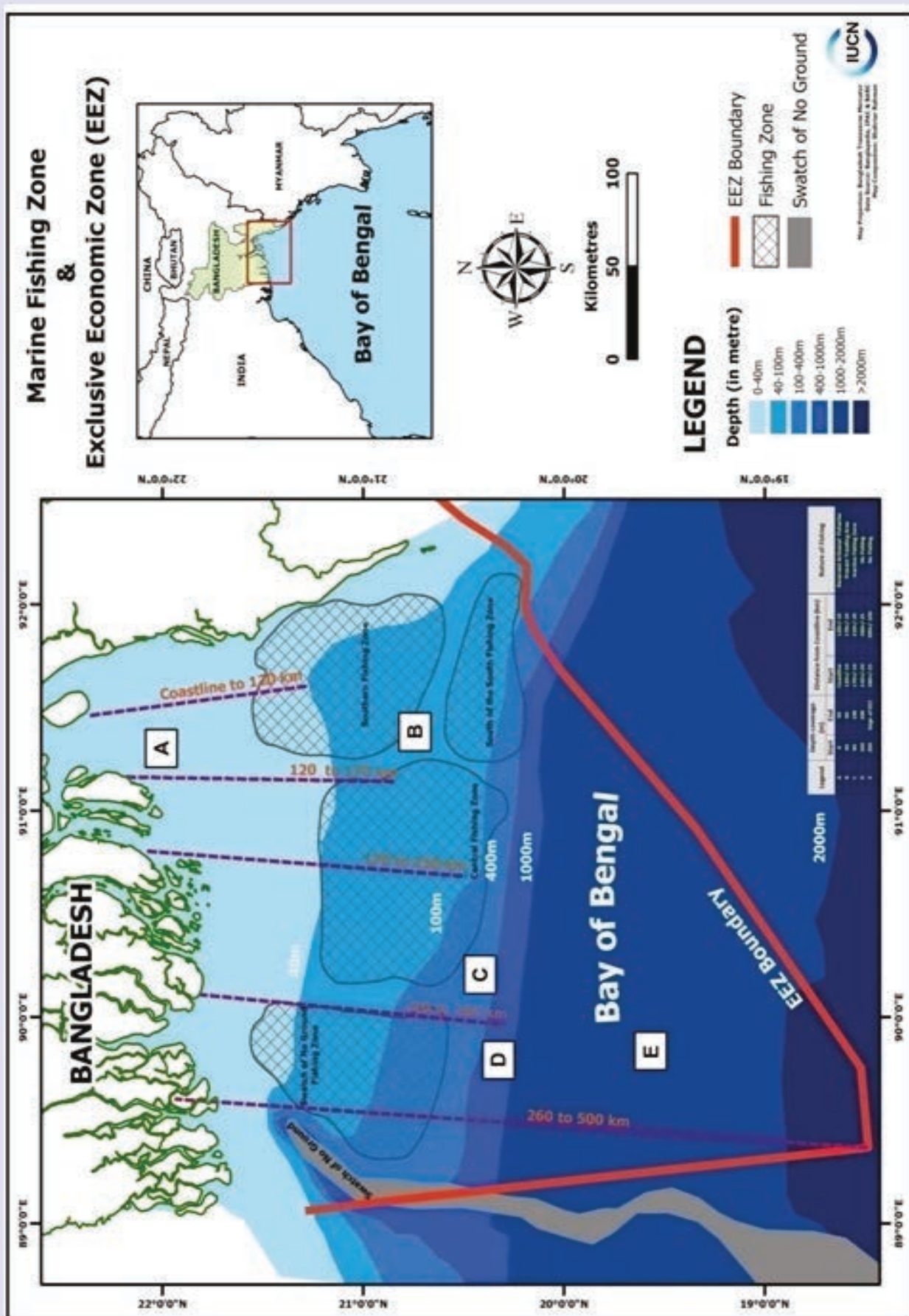
The EEZ is a relatively less studied habitat for biodiversity and there is inadequate administrative and management control over exploitation of renewable biological resources. Currently, natural gas survey and exploration is ongoing under the Energy and Mineral Resources Division (EMRD) of Ministry of Power, Energy and Mineral Resources, which also needs to be operated in a planned way to avoid destruction of biological resources.

2.2 Importance and Benefits of Marine Protected Areas

MPAs, like any other protected areas, are regions in which human activity has been placed under restrictions in the interest of conserving the natural environment, its surrounding waters and the ecosystems, and any cultural or historical resources that may require preservation or management. Marine protected areas' boundaries always include some area of ocean, even if it is only a small fraction of the total area of the territory. Traditionally, marine resources are protected by local, state, territorial, native, regional, or national authorities and this may differ substantially from nation to nation. This variation includes different limitations on development, fishing practices, fishing seasons and catch limits, mooring facilities, bans on removing or disrupting marine life of any kind.



Traditional ferry boats moored at a ghat in Saint Martin's island



Marine fishing zone and EEZ

Fishers all over the world are proponents of conserving the marine resources upon which they depend as they believe an MPA will enrich their fishing grounds, but they object when it comes to sacrificing profit margins. In Bangladesh fisher groups raise objections whenever a protected area is proposed. It was also observed during national workshops, regional meetings and focus group discussions. This is partly due to the lack of understanding of MPAs and their ultimate goal and partly due to the lack of awareness.

The coastal region is the most unstable, vulnerable and naturally disaster prone area of the country. There are human settlements throughout the coastal region except in the Sundarbans. The coastal areas are now heavily populated and sustain their livelihoods on field crops and resources from the sea. The coastal areas covered with mangroves are declared as reserved forest, and people are not allowed to live there. However, thousands of people are involved in subsistence livelihoods by harvesting/collecting various resources from the Sundarbans Reserved Forest (SRF). The coastal areas resource or mangrove forest resource consumers, particularly the primary users are from the 19 district and 51 upazilas in the coastal region under six greater districts. We need to first identify the natural resource users before declaring/designating MPAs.

We have scanty information on land holding by the vulnerable groups living in coastal zones as newly formed chars are usually occupied by the local elite. A detailed study covering the entire coastal zone has not yet been carried out. Scattered studies by local and international development agencies have shown that for populations living in peripheral areas of Sundarbans the average land holdings of all SRF actors is low (less than one acre or 88 decimals and half an acre or 49 decimals for ownership and operation respectively (IUCN, 2012). The poverty situation of coastal districts shows a dismal picture compared to rest of the country. Islam, 2010 studied head count ratios (HCR) for the Sundarbans adjacent districts and upazilas (SIZ), and showed a much higher poverty rate (0.42) compared to non-SIZ upazilas in Bangladesh (0.26). Although agriculture is still the mainstay of the economy in the region, the SRF provides varied sources of livelihoods to SIZ people which are not commonly available in other parts of the country.

Unfortunately, Bangladeshi people's attitude towards public or community resources are not positive for preservation and restoration. People consider public property as everybody's property when it comes to exploitation, but consider it as nobody's property when comes to preservation or restoration. This attitude in a densely populated country is not conducive for conservation of fragile natural resources and ecosystems, unless strict monitoring and stringent measures are taken against violators.

2.3 Economic Value of Marine Protected Areas

Bangladesh is a land scarce country housing over 160 million people on a landmass of only 14.4 million ha. Natural resource exploitation rate in Bangladesh is one of the highest in the world. If natural resources are not utilized in a sustainable manner then the gradual decline of renewable natural resources can not be arrested. By a recent estimate, roughly 17 percent of the country's land mass seasonally or perennially comes in contact with salt or hypo-saline water and this zone of roughly 2.5 million ha is termed coastal land. Coastal people not only depend on land for their survival, they also harness natural resources from the sea for their livelihoods. Economic information on the sea and its content and importance for the wellbeing of Bangladesh's coastal dwellers is not an easy task to quantify. There is a common assumption in Bangladesh that the BOB is a mine of unlimited source of resources. This is ofcourse not true; the only unlimited resource in the Bay of Bengal contains is perhaps salt. Besides salt, all other living or non-living resources are finite and thus will end one day, if they are not exploited in a sustainable manner.

Prospect of maximum sustainable yield (MSY), from EEZ under no-intervention plays an important role in formulating management plans for protection of ecosystem, conservation strategies for biodiversity, habitat and particular species. Besides, promoting programs for the conservation of biodiversity and ecosystem services is also important.

Currently the size of EEZ constitutes almost 70 percent of the size of Bangladesh but fish landing constitutes the same 23 percent of total production.



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Hilsa is an iconic fish of the Bengali culture

There has been no organized evaluation of the probable exploitable quantity of fish. The total fish production (in MT) from the marine waters is shown in Table 1. This amount of harvested biomass is roughly 9.1 ton per square kilometer of the EEZ,

Table 1. Total landing from EEZ of Bangladesh (2010-2011); Source DOF

Species/Group	Volume in ton
Hilsa	225,325
Other marine fish/shrimp	321,000
Total	546,333

calculated on the old area. If the expanded sea area in EEZ is taken into consideration, unit area production is only 4.9 ton/km². We know that the territorial waters are overexploited and that the rest of the EEZ is underexploited. The expanded EEZ may be explored and deployed to harvest the unexploited marine resources to increase overall landings. Research and surveys by DoF and BFRI are not adequate and lack resources.

The marine products can be broadly divided into six

categories: fish, shrimp, crabs, shells, sea weeds and salts. DOF in its routine publications usually does not mention salt as it is not considered a product of fisheries. A recent publication by DOF (DOF, 2011) indicated that roughly 11.1 million people obtain all or part of their income from marine resources. Several million fishermen living in coastal areas have fishing as their only livelihood option. The marine fishermen are usually landless. With the introduction of shrimp farming in the coastal area, a big number of the landless tenant farmers and their families are now engaged in seasonal harvesting of shrimp, prawn and mullet fingerlings to be used as seeds in shrimp polyculture.

2.4 History and Current Status of Marine Protected Areas in Bangladesh

There is very little information available about the status of protected areas in the marine environment in Bangladesh. While some of the country's terrestrial protected areas encompass parts of the coastal zone, there are no explicit 'marine protected

areas' as defined through legislation. As such, the following sections review information about Bangladesh's terrestrial parks that contain marine components as well as other place-based marine conservation measures, drawing primarily upon journal articles and government reports.

Under the Wildlife (Conservation and Security) Act, 2012, Chapter 4 (Protected Area) Section 13(2) Subsection 1 there is the clause to declare an area as MPA which can also be used for MPA in Bangladesh. Country's first designated MPA was declared in 2014 under the act in the Swatch of No Ground to protect dolphins and whales. In addition, MPA can be declared under the Bangladesh Environment Conservation Act 1995.

Another type of protected area 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 degradation. Of the four ECAs in the marine zone, the most well-known includes St. Martin's Island and the Teknaf Peninsula/Cox's Bazaar (Mukul, 2007). There are also ECAs within the Sundarbans. Bangladesh's only coral reefs are found in the former ECA 'Jinjira Reefs' (currently being considered for marine national park status), where they occupy an area less than 50 km² (Rajasuriya *et al.*, 2004). Of all protected areas with

marine habitat in the country, only one – the Sundarbans is recognized internationally for possessing unique ecological diversity and accordingly listed as both a World Heritage Site and a Ramsar Site (Mukul, 2007). The status of existing protected areas are given in Annex 2.

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



Gathering information from locals of St. Martin's Island

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Ecologically Critical Areas (ECAs) are geographically delineated areas which by themselves or in a network have distinguishing ecological characteristics, and are important for maintaining habitat heterogeneity or the viability of a species, or contribute disproportionately to an ecosystem's health, including its productivity, biodiversity, function, structure, or resilience.

Unfortunately, due to the lack of adequate information and knowledge, no area of the EEZ of Bangladesh has been declared an ECA, though the entire length of Cox's Bazar beach including Sonadia and Saint Martin island falls in the category of ECA as declared by the DoE. There is a straight-forward method of declaring a site as ECA based on criteria, like legal boundary and a map for each of ECAs and it should be delineated by the government along with a management plan. In Bangladesh, declarations of ECAs around 10 km periphery of the Sundarbans, has been done. However, no map was prepared and there are no management plans, which are obligatory for an ECA. Nonetheless, some measures, like harvest of natural resources, hunting and killing of wild animals, destruction of habitats, establishment of industries which can pollute the environment, are prohibited. The Environmental Conservation Act of 1995 that was amended in 2010 states that the legal boundary and map for each of ECA should be made on land based ECA. Now, we need similar initiatives on the marine habitat, ecosystem and environments to protect biodiversity and ensure sustainable exploitation of natural resources.

2.5 Marine Protected Area Legislation in Bangladesh

After signing the 1982 United Nations Convention on the Law of the Sea (UNCLOS), Bangladesh sought new ways to manage and conserve its marine resources (Chowdhury, 1998). It took the first steps by introducing the Marine Fisheries Ordinance in 1983, which outlines rules that continue to provide the main legal framework for controlling activities, conservation and development in the marine zone (Chowdhury, 1998). Among other things, the Ordinance allows for the establishment of protected areas in any part of the country's EEZ (Chowdhury, 1998). On an international level, Bangladesh is party to the five

primary conventions with bearing on marine biodiversity conservation: CBD, Convention on International Trade in Endangered Species (CITES), Convention on Migratory Species (CMS), RAMSAR and the non-profit group of corporations, conservation organizations and individuals dedicated to restoring and enhancing wildlife habitat, Wildlife Habitat Council (WHC) (Mukul, 2007).

As previously mentioned, many of Bangladesh's 'marine' protected areas are actually terrestrial parks with marine components. These protected areas are typically declared under the Bangladesh Wildlife (Conservation and Security) Act, (2012). The Act uses a very narrow definition of 'wildlife' however, which includes only vertebrate species. As such, the Act fails to provide legal protection for a significant number of marine species, such as corals and molluscs (Mukul 2007).

Other relevant legislation and policies are:

- The National Conservation Strategy (NCS), which provides a country-level strategy for the conservation and sustainable use in eighteen different sectors. Efforts to protect the mangrove systems in St. Martin's Island are implemented through the NCS (Mukul 2007);
- The National Environment Management Action Plan (NEMAP), which was developed collaboratively by the MOEF and local communities, Non-Governmental Organizations (NGO), professional groups and others. It provides the policy framework for environmental development and broad sectoral guidelines to inform such development (Mukul 2007);
- The National Biodiversity Strategy and Action Plan (NBSAP), which outlines the country's commitments and plans to meet goals under the Convention on Biological Diversity (Mukul 2007);
- The Coastal Zone Policy (2005). Described in greater detail in the following section;
- Coastal Zone Strategy (2006);
- Bangladesh Climate Change Strategic Action Plan (2008);
- National Fisheries Policy (1998) and Fisheries Strategy 2006. In particular, the Marine Fisheries Sub-strategy addresses marine fisheries spawning and nursery grounds;

- National Water Policy (1999);
- National Tourism Policy (1992).

2.6 Marine Protected Area Governance in Bangladesh

There is no such primary government agency concerned with the declaration and management of MPAs. 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 DoF is responsible for identification and declaration of MPAs in other forms (such as hilsa-closed seasons, fisheries sanctuaries and marine reserves).

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 Ministry of Environment and Forests;
- 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 entrusted with enforcing regulations governing marine resources more generally;
- Fisheries and Marine Resource Technology School of Khulna Science and Technology University, which is involved in academic research;
- Bangladesh Fishery Development Corporation (BFDC) is also important in marine fisheries improvement (Hussain, 2009; Hossain, 2004).

The DoE and MoEF are currently implementing an array of projects in the marine environment, including the UNDP/ Global Environment Facility (GEF)-funded Coastal and Wetland Biodiversity Management Project in Cox's Bazaar and Hakaluki Haor. The goal of the project is to design and implement an innovative system for managing Ecologically Critical Areas, and in doing so, serve as a demonstration site for other ECAs elsewhere in

the country (DoE Website, 2010). In an attempt to protect Olive Ridley and Green sea turtle populations around St. Martin's Island, the MoEF initiated a project in 1996, which subcomponents include monitoring nesting turtles, *in situ* conservation, and awareness-raising activities with local coastal communities. Furthermore, per DoF regulations and the Marine Fisheries Ordinance, all industrial trawlers in the Bay must use Turtle Excluding Devices (Bangladesh Marine Fisheries Ordinance).

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

- Attaining "meaningful" conservation in Ecological Critical Areas (ECA), heritage sites and marine reserve;
- Supporting institutional strengthening/capacity building programs;
- Fortifying the regulatory framework for environmental protection;
- Expanding the role of the Coast Guard such that "it can be used on behalf of all relevant institutions as a common resource for enforcement of different regulations applicable to the coastal zone";
- Harmonizing existing environmental laws. (MOWR, 2005).

2.7 Current Management of Marine Fisheries and Scope

Some areas of the EEZ in Bangladesh are declared as protected areas. All are associated with hilsa and/or black tiger shrimp fisheries. Besides, reserve forest in Sundarbans mangroves contains huge brackish water ways (roughly 180,000 ha against total area of 600,000 ha of Sundarbans) which is

under protection of the Department of Forest. The water areas under limited protection are protected not by DoF but by the Forest Department (FD) and DoE under the World Heritage Site, inscribed in 1997. The total area of the World Heritage Site is about 1,400 km², of which 490 km² is water with rich biodiversity. Unfortunately, the management aspect of fisheries in the SRF only covers revenue collection. The management of fishery resources in SRF from a technical point of view was started in 1989 with the closing of 18 canals to accelerate fish breeding (IUCN, 2012). Closed season and wildlife sanctuary regulations were introduced recently. However, under the management of the FD, illegal poaching has been prevented.

2.8 Threats and Challenges

The biodiversity of protected areas of Bangladesh faces enormous pressure from anthropogenic sources (Mukul *et al.* 2006). The government has responded, in part, by setting aside protected areas encompassing both marine and terrestrial environments across the country. Nonetheless, there is a noticeable lack of information about the status of protected areas in Bangladesh. While this may be due to the relatively small number of protected areas with marine components, it could

also be due to the fact that many were established in recent years. Regardless, there is a need for additional studies and better information dissemination. Having access to such information would help determine if the protected areas are meeting their objectives, as well as to identify success stories that might be replicated elsewhere (such as the hilsa closed seasons, which are reportedly responsible for increased fish catch) (Patkar, 2004). Given the absence of information about marine protected areas, the following section describes some of the challenges of protected area management in Bangladesh more generally. It also explores the literature available on Cox's Bazar and St. Martin's Island, as many of the ongoing marine conservation efforts are focused in these two ECAs.

2.8.1 Governance and Management Challenges

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



Illegal fishing nets are widely used in the coastal regions of Bangladesh

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Collection of coral for business is a major threat to biodiversity

available information produced by the local marine science community (Islam, 2003).

Historically, the government has tended to follow a single sector and single agency approach in protected area management (Iftekhar, 2006). As elsewhere in the BOBLME, this had led to challenges in the field of protected area management. Notable consequences include the implementation of unilateral actions based on departmental priorities; overlapping, redundant activities; and a failure to coordinate efforts (Iftekhar, 2006; Mukul, 2007). Cognizant of these limitations, multi-agency cooperation is becoming increasingly common (Iftekhar, 2006). Similarly, a lack of clear legislation and definition creates challenges in protected area management. ECAs are a relatively new category in Bangladesh, and there is uncertainty as to which legislation is applicable: "Until ECA regulations are formally acknowledged in Bangladesh law, all ECA management enforcement could become ineffective in reality, with no real benefit for biodiversity conservation" (Molony *et al.*, 2006).



A dead turtle in Saint Martin's island

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

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

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

- Incorporating conservation policies into management plans;
- Ensuring management of protected areas corresponds to their multipurpose usefulness;
- Strengthening local participation in natural resource management;
- Increasing research on local ecological processes and marine biodiversity, and identifying threats to coastal resources (Kamal and Khan, 2009).

At the moment, the government does not have the manpower necessary to enforce marine regulations, and capacity and lack of training are both pronounced issues faced by protected areas throughout the country (Kamal and Khan, 2009). As noted earlier, there are plans to extend the mandate of the Coast Guard to help numerous government agencies with

enforcement efforts (MoWR, 2005). There is also a marine wing within the DoF, which has a marine surveillance team.

2.8.2 Other Local and Transboundary Threats

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

‘Upstream’ development activities also have serious effects upon the health of local marine ecosystems. Though such activities only have indirect bearing upon MPAs, they are nevertheless worthy of mention: The use of sluice gates and barrages in construction activities affect natural siltation processes, and in the past have been responsible for silting up rivers (Islam, 2003). This in turn leads to block migration routes, as occurred in the case of hilsa populations in the Kumar River following the Ganges-Kobadak project (Islam, 2003).

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

management approaches will not suffice and integrated long-term management is more appropriate” (Shi and Singh, 2003; Iftekhar, 2006).

2.9 Socio-economic Considerations and Perceptions of Marine Protected Areas

With much of the population dependent upon the extraction of natural resources for their livelihoods, there are difficulties in balancing biological conservation with socioeconomic development. Unsustainable resource extraction is an issue in and

around the reefs of St. Martin’s Island for example, and there is mounting pressure on local reef systems from human activities, a growing tourism industry and increased shoreline construction (Kamal and Khan, 2009; Rajasuriya *et al.* 2004). There is reportedly indiscriminate harvesting of corals and associated fauna around St. Martin’s Island and the protected area is listed as “degraded” (Rajasuriya *et al.* 2004). The St. Martin Pilot Program (2000 – 2001) sought to curb harmful activities by carrying out awareness raising activities and better enforcement, resulting in decline in the illegal collection of curios during peak tourism seasons (Dudley, 2008). Problems persist, however,

and the “management of wild collection and regulation of the trade at Cox’s Bazaar, together with increased awareness among visitors is essential to protect the remaining reef resources of Bangladesh” (Dudley, 2008). It is also notable, that some of the products (coral skeletons) that appear in local markets may also come from neighbouring Myanmar (Rajasuriya *et al.*, 2004).

Information about the positive and negative socio-economic effects of protected areas on human populations is extremely limited. The literature does contain enough examples of attempts to increase community participation in marine management. Some such examples include:

- UNDP/GEF-funded “Community Mobilization for Biodiversity Conservation at Cox’s Bazar” Project (2006). Conducted in conjunction with the DOE and MOEF, this project entailed gathering feedback from community members on perceived problems, issue prioritization and consensus building in Cox’s Bazar (Bangladesh Poush and Prattaya, 2006);



A fisherman with his catch

- Mainstreaming community participation and empowering coastal communities through the CZM Policy (2005). Noteworthy tenets include (1) instituting co-management procedures which “bring decision-making power to the grassroots level” (2) Addressing the vulnerabilities of coastal communities (3) adopting initiatives that maintain the cultural heritage of coastal communities (MoWR, 2005);
- Activities led by the BOBP to promote the involvement of fishing communities in marine management through awareness-raising programs (Chowdhury, 1998);
- The FAO and Department of Fisheries-sponsored Empowerment of Coastal Fishing Community (ECFC), which sought to increase coastal fishermen capacity at Cox’s Bazar (IUCN, 2010);
- Fourth Fisheries Project, funded by the World Bank, DFID and GEF had as one component of a GEF study on coastal and hilsa biodiversity (DoF, 2004);
- Strengthening Marine Fisheries Capacity of Bangladesh, an ongoing project of the Department of Fisheries, with funding through the Organization of Islamic Countries (IUCN, 2010);
- Integrated Coastal Zone Management Programme (Phase I) of the Water Resources Planning Organization (IUCN, 2010).

2.10 Effectiveness of Marine Protected Areas

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



Captured commercially important fish

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

Other programs in Cox's Bazar include the MoFL/FAO "Empowerment of Coastal Fishing Communities", the MoEF "Conservation of Biodiversity, Marine Park Establishment and Eco-tourism Development Project at St. Martin's Island" and the "Integrated Coastal Zone Management" program funded by the World Bank and Government of the Netherlands. Very little information is available on the effectiveness of protected areas with marine components elsewhere in the country.

2.11 Studies Necessary to Implement Marine Protected Areas

Before declaring a site as PA or MPA it is rational to outline why the site is important (biodiversity, habitats, ecosystem etc) and what benefit it will provide to the nation and to the society. Productive roles of biodiversity and ecosystem functions of any selected site should be considered in a participatory manner if these are linked with livelihoods of local people, who ultimately are influenced by enhanced production.

It is known that the coastal ecosystems, incorporating mangroves and inter-tidal zones, are rich in biodiversity. But this region is also facing high rates of exploitation due to human pressure. The shallow coastal region, especially the Sundarbans may be considered as ecologically critical zones. Besides the coastal zone, the rest of the EEZ is void of investigations. Recognizing the importance and ensuring conservation of the existing biodiversity of the EEZ, exploring habitat and ecological profile of the area, a comprehensive program needs to be developed that will address challenges.

2.12 Necessity for Effective Partnership

Even PAs on terrestrial environment are not widely accepted in Bangladesh and awareness about PAs is still inadequate. MPA is a new concept in Bangladesh, which needs support from national government agencies, local bodies, non-government organizations and most importantly coastal communities. Cooperation among all stakeholders should be encouraged in all steps of the identification and establishment of MPAs. The concept of cooperation and partnership is vital to the MPA Program and its implementation and ultimately its success. To have a successful MPA, various interest groups need to work together. Important program areas or sites are dependent on effective partnership, collection of information and knowledge on environment, ecosystem, biodiversity and other related issues. Hence, conducting studies, planning and implementation of interventions and enforcements of regulations and code of conducts will be required.

The number and classification of stakeholders based on coastal areas, who rely upon living aquatic/marine resources will vary with geographic locations, demographic distributions, regional needs, attitudes of coastal dwellers, awareness on importance of MPA and biodiversity for future food security. The level of participation and responsibility of stakeholders depend on the purpose of the MPA, its proximity to commercial fishing grounds and its oceanographical characteristics. It was experienced during regional workshops that many participants suggested apparently suitable sites for MPAs outside known fishing grounds. When enquired about the suitability, they claimed that an MPA would protect the livelihoods of fishermen and women. Also, a group thought that because the Government is committed to declare 10 percent of EEZ as MPA, a declaration of MPA on the offshore part of the EEZ, would serve the purpose of international commitment. It is important to note, that a mere declaration without its inherent quality to become an MPA will be a waste of time and energy. An MPA should be judiciously selected. And the implementation of MPA will need successful partnerships and responsibility by concerned public and private parties.

2.13 Coastal Communities and Livelihoods

Roughly, 17 percent of the territory of the country is considered as coastal, based on salinity in the aquatic ecosystem. That comprises roughly 2.5 million ha in 16 coastal districts with almost 25 million people. The coastal region prone to natural disasters such as cyclones tidal bores, tsunami and river erosion, and occasional floods. The livelihoods of the people living in the coastal region is unstable and their economic dividend is also low compared to rest of the country. In Chandpur almost half of Haimchar Upazilla has eroded into the Meghna estuary making thousands of people landless over

group discussions in which primary stakeholders dependent on sea participated. The same opinion was also expressed in dialogues among key stakeholders in regional meetings. Conservation is needed where biodiversity is rich and those grounds are usually associated with fishing grounds. From the project it was repeatedly stated that a well-managed MPA will support more livelihoods by protecting biodiversity of renewable resources in a particular area, with enhanced production in areas outside the MPA.

In coastal based MPA planning and management, Local Government (LG) leaders, local elected bodies, local/regional organizations and coastal



© Alifa Bintha Haque

Fishing is the main occupation to earn a livelihood in the coastal region

the last few years. Farmers are now opting for subsistence living. The coastal region of Bangladesh is similar, large number of floating people live on coastal fisheries and mangrove resources.

Though the MPA program provides opportunities for communities and resource users in the long run, they consider that the declaration of an MPA will deprive them from harvesting resources. The same opinion was repeatedly expressed during focus

communities should have the opportunity to play a prominent role. Co-management of declared sites should be determined by consultations among all stakeholders and initiatives should be taken to create public awareness. The rganizations/agencies entrusted to nominate an MPA could become a partner in the management of the site.



Fish drying in Saint Martin's island

© IUCN/ Aal Maruf Russell

2.14 Conservation Organizations

Unlike developed countries, Bangladesh lacks strong environmental conservation organizations working for PAs and MPAs. The local, regional and national conservation groups, should be involved in conservation activities in the marine environment and demarcating MPAs. There should be dialogue among conservation organizations, other stakeholders, NGOs and public agencies regarding MPA issues.

2.15 Fishing and Aquaculture Interests

Fishing and aquaculture industries often have conflicting interests with MPAs. Therefore, it is essential to involve all associated parties prior to the declaration of an MPA. Also, a code of conduct regarding the MPA, fishing rights and rights of all vested groups including commercial and artisanal fish harvesters, recreational fishers, businesses, processing companies, and the fishing-dependent communities, should be introduced for the MPA process management.

The fisheries and aquaculture group possess information and knowledge to add to the scientific facts that shape the approaches of management of MPAs. Reports and experience gained elsewhere² suggests that for MPA implementation, strong support from all fishing interests, particularly, if the MPA will restrict, is vital. Support for MPAs grows when fishers become involved in the many stages of the MPA establishment process. The development of the Canadian Code of Conduct for Responsible Fishing Operations in Atlantic Canada complements the MPA process and encourages cooperative approaches to management of the fisheries resources process². IUCN's contribution to road mapping of MPA guidelines lead by Kelleher and Kenchington, 1992 is also a pioneering work in the area.

Aquaculture is a fast-growing industry in Bangladesh with annual growth rates of 4-5 percent and a yearly landing over one million tons. Most of the aquaculture production comes from fresh and or brackish water farming. The interests of aquaculture are seldom in conflict with marine resources, except



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Mechanized fishing boats on the way to sea for fishing

with regards to the harvest of prawn and shrimp seeds from wild and resulting destruction of marine larval biodiversity. However, in the long run, like the fishing industry, aquaculture will be closely involved in the consideration of individual MPA sites with particular reference to generating alternative livelihoods for the partly or fully displaced fishers.

2.16 Coastal Communities and Organizations

Many coastal communities like artisanal fishers, landless farmers harvesting shrimp and prawn seeds, day labourers working on fishing boats, workers working at landing centers and fishing input sellers and traders and related organizations should have a strong interest in conserving marine resources for their livelihood. However, while conducting FGDs in coastal regions it was found that there was hesitance and only half hearted support for MPAs in these groups. While declaring some protected areas in estuaries and river mouth to protect migratory hilsa resources, affected hilsa

fishing communities were provided with VGF (Vulnerable Group Feeding) cards so that poor fisher families could get some staple food support during harvest-banned period. This is a step in the right direction. If the fishing communities are convinced, there is an opportunity for them to participate in the establishment and management of MPAs. A realistic MPA policy can be framed by working closely with fisher communities as it will result in sharing of scientific knowledge and skill along with traditional knowledge.

While planning and establishing MPAs special consideration to traditional fisherman's activity in the marine area is required by law enforcement on marine fishing it will be a difficult task for the Bangladesh Navy and Coast Guard without support from the fishing community. Partnering arrangements will be encouraged to integrate fishers' interests into the MPA Program. Effective organization among coastal or marine fishing community is non-existent, some societies exist but those are led by non-fishing people, who prevent holding a fruitful and viable dialogue at the moment.

²:National Framework for Establishing and Managing Marine Protected Areas, Canada. Approach to DFO's Marine Protected Areas Program.

2.17 Sea and Ocean Industries

In many countries implementation of MPAs for ecosystem or biodiversity protection restricts human activities in designated areas. The traditional use of marine resources mainly concentrates on fisheries, however, seas are now not restricted to fisheries or navigations, but also for many ocean industries, including oil and gas companies, marine mining interests, tourism, shoreline developers, shipping agencies, and other users. They will have a direct interest in the development of an MPA program.

If, MPAs are declared for ecosystem and biodiversity protection, people using the sea for other purpose may be displaced. As a result, the MPA selection procedures need to be discussed with current or future potential users, otherwise their interests may be threatened and the objectives of the MPA declaration will not be fulfilled.

2.18 Coastal Districts and Municipal Government Agencies

In Bangladesh, there is no district level elected government. The Zilla Parishad are not elected bodies and the district level administration appointed by the central government wield the power. Therefore while conducting regional meetings IUCN invited district level general and police administration. During the formulation of MPA guidelines district and local level public official's active participation will be vital.

The district and municipal authorities though are not in control of sea and ocean or coastal water but their participation is vital as they are accountable for running most of the land-based actions that have an effect on the coastal and marine environment and potential MPAs like affluent discharge, city discharge, city based pollutions, water and sewerage systems, tourism, and shoreline development.

2.19 Government Ministries and Field Agencies

Bangladesh does not have a sea or ocean act, though there is a marine fisheries ordinance, which needs to be updated. Bangladesh Government, through its field departments and agencies, is committed to the identification, designation and management of protected areas in the marine environment. A national approach is needed on how DoF and DoE should work together with other departments and agencies, like the departments for maritime transport, shipping and energy. The Navy, Coast Guard and Police need to be consulted for assistance in addressing specific issues and in considering particular sites. In line with the stated approaches, the present initiative has initiated a dialogue with different stakeholders at national and regional levels on future MPAs in the EEZ of Bangladesh.

2.20 International Cooperation on Marine Protected Areas

The Protected Area concept is not widely understood and an MPA concept is almost non-existent, except for the declaration of a few breeding/nursing grounds and migratory routes of important aquatic species on seasonal/weekly basis as protected areas in the sea, estuaries and river mouths. Cooperative agreements with other countries and joint planning exercises between Bangladesh and her BOB neighbours are difficult.

There are many migratory marine fish, cetaceans, birds, turtles and cephalopods, which do not confine their habitat in a channel or pocket of a marine habitat. Their migratory route may extend several hundred kilometres in and outside the Bangladesh EEZ. It may require a network of protected areas based on the spawning and recruitment areas, along their migratory routes with international cooperation. Some potential marine protected area sites in EEZ of Bangladesh may fall in close proximity to India and Myanmar, and cooperation between these countries will be vital. Bangladesh has cooperative agreements with India on the protection of the Bengal tiger. Similar agreements on marine protected areas will be helpful after extensive studies.

2.21 Information Gap on Knowledge Base

Information is very important for selection and management of any MPAs; therefore, it is required to ensure that all available information on EEZ of Bangladesh is gathered. The resident as well as migratory animals' population dynamics should be understood and their response to anthropogenic activities need to be recorded. As part of its discipline based mandates, DoF and DoE together with other related agencies should continue to collect data for understanding the EEZ of Bangladesh, and its living, renewable and non-living resources, including fisheries, biological, mineral, hydrographic, sea bottom structure, sea currents, oceanography, and other marine data.

Different agencies are mandated to develop different resources, therefore, a number of coastal databases need to be established, but coordination among the performing agencies is essential for decision-making for the management of MPAs. Based on effective coordination an effective coastal zone information management system could be established. Coastal communities, which gather natural resources for their livelihood and conservation groups, may possess vital information that may be helpful in an MPA program and may become important tools in decision-making.

The most important constraints in proposing and planning for MPAs in Bangladesh EEZ are the limited information, knowledge and understanding of the dynamism of the BOB in general and the EEZ of Bangladesh in particular, its marine habitat, bottom topography, currents, ecosystems, diverse

aquatic plants and animals thriving there. Since our information, knowledge and understanding of BOB is limited, planning and management decisions should be taken based on studies, analyzing secondary data and grey literature and on a precautionary basis.

The MPA planning, implementable program and management should focus on the following:

- Focus mainly on integrated coastal zone management taking man, resource and nature into consideration;
- Pursue sustainable development of the sea and its resources with an precautionary approach;
- Judicious selection of MPA sites with thoughtful considerations;
- Initial selection of MPAs should be considered as a learning opportunity on adaptive management principles;
- Ensure effective monitoring as part of MPA management;
- MPAs should be considered as living concepts not as an unchangeable documents;
- MPAs should be considered as natural laboratories and should facilitate continuous environment, habitat, resources, species and ecosystem based research.

Monitoring programs are vital for any program implementation. Therefore it is essential to establish a Monitoring and Evaluation (M&E) system to conclude whether the objectives of a given MPA have been successfully achieved. Environmental and ecological parameters need to be scrutinized to determine natural and man-made changes in habitats and ecosystems. If the accomplishment of objectives is established and proves to be worthy, support for more MPAs establishment would gain momentum.



Traditional fishing boats



Blue Ringed Angelfish (*Pomacanthus Annularis*) in Saint Martin's coral habitat
© Mahammad Arju/ Save Our Sea

An underwater photograph of a marine environment. In the foreground, a large, white, stylized number '3' is superimposed on the left side. Below the number, a blue and white striped fish is swimming towards the viewer. The background shows a sandy seabed with patches of green and brown algae or coral. The water is clear and blue.

3

Framework to Establish and Manage Marine Protected Areas (MPAs) in Bangladesh

3.1 Introduction

MPA declarations should follow an established and well formulated set of guidelines. There are no guidelines available for Bangladesh and the following step-wise framework has been drafted.

With a small number of marine MPAs compared with terrestrial PAs there is less experience and understanding of applying the categories to MPAs. Application of the categories to MPAs has often been inaccurate and inconsistent. This framework has been drafted so that it can be implemented following IUCN's guidelines and thus aimed at ensuring that the IUCN categories can be effectively applied to all types of MPAs as well as to any marine components of adjoining terrestrial protected areas, provided a site meets the IUCN definition for a protected area (IUCN, 1994 and IUCN, 2012).

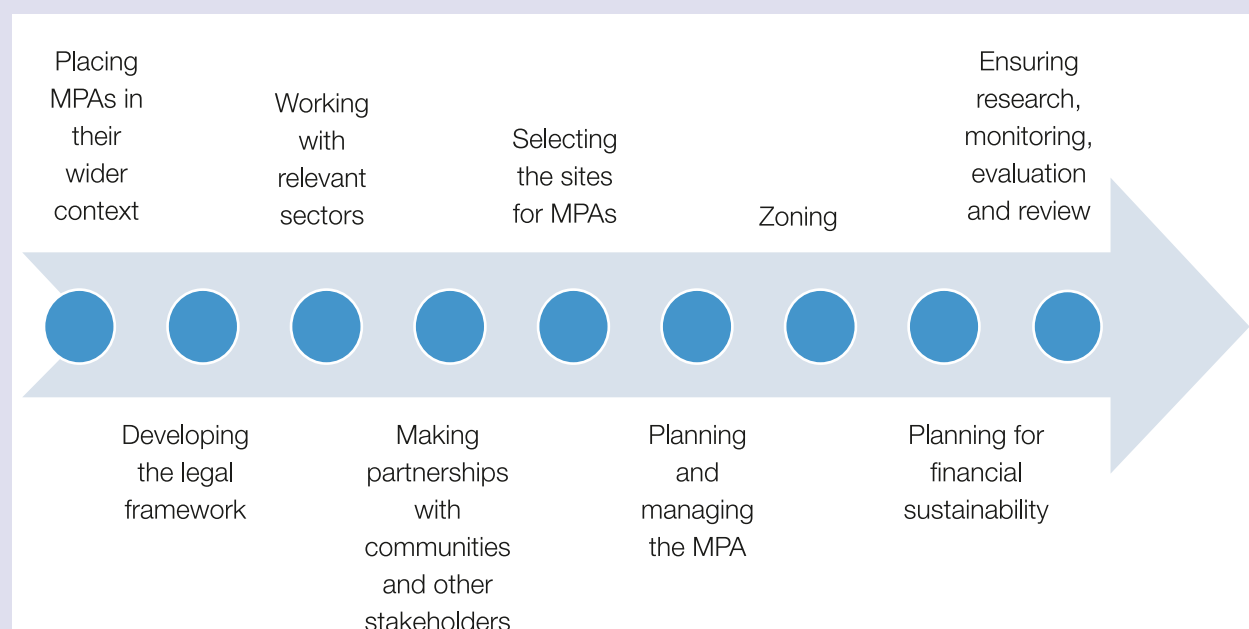
Because fisheries is the major renewable resource for Bangladesh from its EEZ, emphasis was given to the FAO Technical Guidelines for Responsible Fisheries No. 4, Suppl. 4 (Fisheries Management. 4. Marine protected areas and fisheries) (FAO, 2011). Hence a synchronized approach has been followed during formulation of the framework.

It needs to be understood that establishing MPAs may not follow a set formula by which all MPAs can be selected. Each MPA is an independent entity

based on its special characteristics. At first a marine area may be selected as a candidate Area of Interest (AoI) or Area of Significance (AoS) for a proposed MPA. Bangladesh does not have a Sea or Ocean Act, MPAs may be incorporated in the marine fisheries ordinance for the time being until a Sea or Ocean Act is adopted. Through this initiative, good number of coastal and off-shore sites were suggested by stakeholders to be designated as MPAs. However, through discussion in the stakeholder consultations, it was decided to categorize all suggested sites in four different categories. Later, the initially selected sites and their categories were vetted at a national seminar and some corrections were also made. The prioritized groups in descending order are Area of Significance (AoS), Area of Interest (AoI); Area of Curiosity (AoC), and Area of Mind (AoM). In the Initial phase only a few sites can be brought under a pilot program, so understandably, AoS will get highest preference.

3.2 Framework to Establish and Manage Marine Protected Areas

The general framework is a broad outline, but individual MPA should have its own specific guidelines or pathways. Selection and implementation pathways can be summarized as indicated in the following flow chart:



To establish an individual MPA, the following steps can form the framework:

Step 1: Identification of Areas of Significance (AoSs)

Step 2: Initial sieving of preliminary selected AoSs

Step 3: AoSs validation, assessment and suggestions

Step 4: Formulation of Management Plan for Candidate MPA Sites

Step 5: Designation or titling of MPA

Step 6: Management guideline for individual MPA within the framework

Step 7: Declaration of MPA

Step 8: Code of Conducts (CoC) for specialized MPA

This is a indicative general approach, therefore if any new information/data comes to surface, it should be incorporated for that particular MPA and subsequent appropriate mediatory management measures should be undertaken. Concurrent decisions may be taken by the management authority based on new information. MPA declaration by different countries is the mandate of different authorities. In some countries, the Minister of Fisheries is responsible for recommendations on MPAs and concerned competent authority of the respective region, district, or province declaring it. In case of Bangladesh, it was decided in a national stakeholder consultation workshop held on 10 September, 2014, to form a national MPA committee under the Ministry of Fisheries and Livestock (MoFL) with active cooperation of other agencies. Ministry of Environment and Forests (MoEF) is also a vital actor in this regard.

Regional fishery officers, consulting with other departments, concerned non-government organizations, and civil groups may recommend an MPA to the appropriate competent authority, which can take the responsibility of declaring an MPA after discussion with all relevant agencies. There should be a national committee for MPA declaration, possibly headed by the Ministry of Fisheries and Livestock. Also, there should be regional committees. The MPAs should be guided with flexibility. To reflect the necessary flexibility, DoF, in consultation with DoE (if the designated sites is coastal and land based), may develop specific guidelines for local marine conservation and protection needs. Regional guidelines to select an

MPA must follow the National Framework and guidelines to be prepared in consultation with respective sectoral policies and strategies of the government. It will also preserve all data and information on the steps and phases that were considered for the selection and declaration of an individual MPA.

3.2.1 Step 1: Identification of Areas of Significance

The first stage in establishing an MPA is to identify potential sites, depending on primary and secondary information, importance for species, habitats, ecosystems or other environment factors, which are vital for the protection of at least one of the elements of the particular area.

3.2.1.1 Identification of sites

To identify a prospective site the participation and opinions of all relevant stakeholders is the key ingredient of success. In line with these approaches IUCN arranged six regional meetings in Noakhali, Chandpur, Patuakhali, Khulna Chittagong and Cox's Bazar. After each regional meeting, a focus group discussion followed by active participation of directly involved fishing industry people. Other related initiatives for identification of AoSs may include:

- A. Ecosystem studies and overviews
- B. Marine fisheries regulation and management planning
- C. Past initiatives (Public and Private)
- D. Integrated coastal zone management proposal and processes
- E. Individual stakeholder suggestion
- F. Other appropriate approaches, if commensurate with the initiative

To designate a certain marine ecosystem or specific area as an MPA, the local or regional committee, in collaboration with local stakeholders, will propose areas, citing reasons of its importance and how it is going to contribute to protecting species, habitats or ecosystems. This should initiate a logical chain of events and create an opportunity for interested groups to work together in identifying possible sites.

Once a few MPAs are designated, it is also essential

to follow a systematic approach to identify new locations to form a network of MPAs, which will facilitate the management and scientific purposes identified in the marine fisheries ordinances and sub-strategy under the National Fisheries Strategy 2006.

3.2.1.2 Description of Areas of Significance

The identification of an AoS is important, and the identification should incorporate a detailed description of the area and its importance to be considered an AoS. The AoS may incorporate the following:

- A.** The proposing authority, organization, agency, or individual and its contact information.
- B.** A statement of significance which should incorporate the following:
 - Why the proposed site and or area has merits as MPA site and status;
 - How the planned or project area/site/spot meets the aims and objectives defined for MPAs under existing policies;
 - How the projected or proposed area meets the principles of other marine protected area legislation of the country.
- C.** Recommended site/spot/ location, boundaries and current status of the area
 - Analysis of national, international, and stakeholders jurisdictions.
- D.** Habitat, Biodiversity, Environment and ecology related data and information such as:
 - Presence of biologically important, endangered and or rare species, their conditions, habitat integrity and requirements;
 - Ecological services;
 - Significant and vital ecosystem and habitat characteristics, including environmental status and known stressors and threats;
 - Special marine and oceanographic characteristics, appearance or features (e.g., upwelling, rivers and estuaries, land-based runoff, and nutrient areas);
 - Abiotic processes (e.g., physical, chemical, climatic, and geological processes).
- E.** Geophysical, social and economic characteristics within and near the area, such as:
 - Present and historic resources utilization;
 - All types of human activities with actual or potential impacts on the area such as oil and gas activities, shipping, aquaculture, tourism, recreation, and food gathering;
 - All livelihoods options and subsistence population's past and present commercial, recreational, and coastal dwellers fishing activities and opportunities;
 - Presence of coastal dweller or ethnic groups with land claims which are not registered with authorities;
 - Potential socio-economic impacts from the designation of the area as AoS.
- F.** Alternatives to MPA protection, such as:
 - Protection mechanisms already in place within the AoS;
 - Other types of designations, e.g., park, conservation area, ecological reserve, wildlife management area;
 - Other types of regulations or conservation measures, e.g., fisheries closure.
- G.** A list of groups and individuals interested in the development of the MPA, including proposed partnering arrangements
- H.** Proposed Management Strategies and Regulations inside the MPA and the rationale for each, such as:
 - Suggestions on management objectives and priorities, zoning system and pattern, and other controls on AoS;
 - Proposition or arrangements for research and monitoring, surveillance and enforcement;
 - Suggestions for marking and public awareness.

3.2.2 Step 2: Initial Sieving of Preliminary Selected Areas of Significance

3.2.2.1 Objectives

The initial screening phase associated with an evaluation of an AoS should conclude, if it needs to be evaluated in more detail.

Recommended AoSs will be validated to ensure that the aims and objectives for the proposed AoS indeed fit MPAs under the existing legislation. If such provisions are missing or weak in the existing laws, the rules may be formed.

Data required for the Screening of proposed site/s

At this stage, detailed data may not be necessary. However, the types of data on the proposed sites that may be needed are:

The site and location of the preliminarily selected and proposed AoS;

- A concise biological and physical explanation and socio-economic outline of the AoS and adjacent areas;
- The probable category of management actions, policy and rules to apply to the area to make it an effective MPA;
- The focal person, group or agency leading or facilitating the MPA process;
- A brief outline of the reason and underlying principle for establishing an MPA in this location, describe a rationale of the selection in terms of its contingency to the existing policies;
- The active involvements of partners and other stakeholders or sponsors in the future management of the proposed MPA;
- Supplementary information, data sources, if necessary.

Issues to be considered before selecting significant areas:

Primary conservation goal	Level of Protection	Permanence of Protection
<ul style="list-style-type: none"> Natural Heritage Cultural Heritage Sustainable Production 	<ul style="list-style-type: none"> No Access No Impact No Take (Catch) Zoned With No-Take Areas Zoned Multiple Use Uniform Multiple Use 	<ul style="list-style-type: none"> Permanent Conditional Temporary
Constancy of Protection	Scale of Protection	Allowed Extractive Activities
<ul style="list-style-type: none"> Year-Round Seasonal 	<ul style="list-style-type: none"> Ecosystem Focal Resource 	<ul style="list-style-type: none"> Commercial Fishing Recreational Fishing Subsistence Hunting/Fishing Scientific/Educational Collecting Mineral/Energy Extraction Other

3.2.2.2 Areas of Significance list

Proposed areas of interest, which may be considered significant and may qualify for MPA status based on reasons for establishing MPAs under the existing laws, will be placed on a prospective AoS list. The AoS list will be made available to the main stakeholders, Government departments as well as to the general public and mass media for validation, reactions and suggestions.

The listed AoSs will be scrutinized if their numbers are large and will be monitored to ensure that the ecological integrity of the proposed area remains undamaged or unchanged, in anticipation of a final suggestion relating to MPA status and declarations of MPAs. The ecological, biological, habitat and biodiversity integrity of an AoS may be endangered by human activities. In those cases interim protection measures may be needed, on an ad-hoc basis if MPA declaration takes time because of administrative, procedural and/or logistic delays.

3.2.2.3 Interim protection and its purpose

The identification and preliminary selection of a prospective site as an AoS or even as an MPA does not provide immediate protection to an area; the law needs to be enacted first and then protective measures can be undertaken. If a significant site appears to be threatened or endangered at any step throughout the assessment of an AoS, the Government may impose provisional actions to preserve the potentially affected resources, ecosystems or habitats.

3.2.2.4 Probable interim protection measures

The Government can enact a variety of actions and measures to protect the marine ecosystem, resources, biodiversity and habitats on a temporary, short, medium or longer-term basis before a final decision is made into law. Interim protective measures will be necessary, once a site is tentatively selected.

Types of some protective measures may be:

- Wide circulated notification to all stakeholders to discourage uses of the preliminary sites,

which conflict with the purpose of the AoS;

- Compliance with existing protected area regulatory mechanisms;
- Implementing Bangladesh Shipping Act regulations such as anchoring, navigation, and pollution restrictions;
- Requests to other public agencies to defer establishment of tenures such as leases, licenses, or other rights to area of significance/interest that occupy the site;
- Arrangements with the fishing industry and other marine related stakeholders to look after the preliminary selected areas;
- Overall imposition of controls by public agencies on the preliminarily selected AoS.

3.2.3 Step 3: Areas of Significance Validation, Assessment and Suggestions

3.2.3.1 Rationale

The rationale is to classify and evaluate the environmental, ecological, biological and habitat quality, technical, and logistics support base, socio-economic merits of an AoS, to encourage public participation in the process to assess and evaluate the AoS, and to put forward whether the AoS should be established as an MPA.

3.2.3.2 Evaluation related Actions

Evaluation related action may comprise two or three actions:

- a. Evaluation of the AoS
- b. Recommendation/suggestion
- c. Urgently required measures

3.2.3.3 Proposal on probable marine protected areas

In order to judge an AoS for a probable MPA status, a comprehensive and detailed proposal will be required, incorporating all necessary criteria. The proposal should be based on existing situations of the prospective and preliminary selected site(s), with a detail planning procedure that brings together associated agencies and interests. All available information on the prospective site(s) should be evaluated. The regional fisheries office

should coordinate activities related to evaluation of prospective MPA and AoS sites. Stakeholders who are interested, should contact regional fisheries offices for further information on procedures for evaluation of proposed MPA sites.

3.2.3.4 Evaluation of areas of significance and its purpose

The first step of evaluation is needed to determine the applicability of an MPA. Therefore, it is essential to assess the merits of preliminarily selected AoS on technical and logistic aspects. Any AoS should go through a validation and evaluation process so that its relevance is not questioned later.

3.2.3.5 The evaluation

In general, an evaluation is performed to determine the suitability of the proposed site. In this context, all available information, scientific, traditional, local knowledge and words of mouth should be taken into consideration. Also, all information should be evaluated based on the merits of an AoS. A basic discussion paper containing a guideline on how to develop a Marine Protected Area, and what types of queries are necessary, should be considered in the assessments. All associated and interested parties should have an opportunity to participate in the evaluation process.

A simple evaluation process is not enough; it should be followed by a brief summary of information and knowledge relevant to the assessment, including underlying principles for accepting or refusing a candidate site as an MPA. All prescribed evaluation documents should be formulated through pilot MPA reviews.

3.2.3.6 Assessment activities

The AoS appraisal will involve of the following assessments:

- i. Environmental and ecological assessment
- ii. Scientific and technological assessment
- iii. Geophysical and socio-economic assessment

These assessments may be done at the same time or in succession. Once all appear positive in favour of an AoS, undoubtedly it should be the principal candidate for selection for a future MPA.

3.2.3.7 Environmental and ecological assessment

The environmental and ecological assessments should be based on specific criteria. However, answers to the following queries are helpful to determine a correct decision:

- Whether the preliminarily selected and draft proposed site for an MPA complies with the true essence for MPAs stated in the conservation and protection of fragile ecosystem, habitat and biodiversity?
- Does it comply with terms and conditions of existing PA policies/regulations? Or not contrary to established rules and regulations?
- Does the draft proposal have ecological merits sufficient to be considered as an MPA under existing geophysical and socio-economic conditions?
- Is the draft proposal based on adequate information gathered at the local level?
- Are the ecological, biodiversity and habitat based merits significant enough for MPA?
- Does the draft proposal fulfil international commitments of the Government?
- Have ecological considerations contained in the FAO Code of Conduct for Responsible Fisheries (CCRF) been considered?
- Do the sites proposed for MPA declaration meet the criterion of any of the IUCN's protected area categories?

Besides available information and knowledge, the assessment should be based on visible activities of the people that may appear harmful to the ecosystem, habitat, biodiversity and may need to be controlled to protect the ecosystem.

If any destruction has already been made that needs restoration, then the extent of damage should be quantified, if it is measurable and if the destruction is qualitative then assessments should be done how to mitigate those.

If the environmental and ecological assessment is not deemed appropriate for an initially selected AoS site, the process should not go through any further

evaluation or judgment. An MPA is very important but it should not go against the existing law or the social norms of the country, which may lead to conflict. It is also necessary to ensure that the MPA declaration and establishment is done in a pro-poor context.

3.2.3.8 Scientific and technological assessment

It is essential to determine the scientific and technical assessment on some queries that are practical, applicable, and implementable and fulfill the criteria based on which draft proposals are made. Answers to the following queries are needed for decision making of the process.

- Whether the draft proposal is feasible from a scientific and technical point of view?
- Is the proposed site for an MPA practical from management perspective?
- Does the draft proposal have room for adjustments to practical needs?
- Will the proposal improve viability and expediency?
- Are the boundaries of the proposed AoS definite or quantifiable?
- Does the local public or stakeholders in the area support the proposed AoS? If not, are their judgments/logics valid from an ecological restoration point of view?
- Whether livelihood of local people, poor living on subsistence will be affected? If so what could be the alternatives?
- The probable nomenclature of the site based on area of recognition so that it could be recognized as by a suitable name of designation;
- The suitability of the planned site borders in terms of management and regulations;
- Whether the proposed site fulfils the proposed management objectives in line with the National Fisheries Strategy and action plans;
- The capacity of the local authority of the proposed site for adequate planning and management;
- The local and regional resource users of the propose site, general public and associated stakeholder support on the draft proposal;
- Whether there are any cooperative partnering or co-management arrangements, if there are any, type and nature of cooperation agree-ments that may be helpful for running of the MPA;
- Probable disagreement or conflict with the resources users of proposed sites, and mitigation measures to reduce the said disagree-ment or conflict so that effective implementation of the MPA could be materialized;
- How the conservation purposes will be served and whether there is any demonstration value of the site for conservation.

The scientific and Technological Assessment determines the following:

- It reveals the previous acknowledgment of the preservation value of the proposed site, as for example recognition by national, regional or civil body and/or professional societies of site's importance/significance;
- Whether there was any prior international recognition on the proposed site;
- What would be the contributions of the proposed site to the existing or probable integrated coastal zone management principles;

The technical assessment is also necessary to refine the draft proposal so that necessary modifications can be made to improve the document. The technical assessment also minimizes scientific and technical dilemmas related to the design of the proposed MPA. It is also helpful to develop mutual partnerships, joint management, or joint designation with other agencies to meet site objectives. As a final point, the assessor must also examine whether other actions, conventions or rules may be more suitable for preserving and defending the available resources (e.g. fisheries closures or harvest regulations).

3.2.3.9 Geophysical and socio-economic assessment

A geophysical and Socio-economic Assessment answers the following queries:

- Whether the proposed MPA, if implemented, in any way is going to affect human activities, and if so, to what extent? How can the influence on human activities be minimized to lessen the general public's antagonism against the proposed MPA;
- The MPA is for the protection of ecosystem and biodiversity, which ultimately helps the community to enhance and sustain their resource base and so creating awareness among the public;
- How can socio-economic benefits of the MPA be enhanced or the costs reduced?

The geophysical and socio-economic appraisals also decide how the founding mechanism of an MPA may influence the following:

- Fishing rights, fishing on specific species, fishing harming non-target species like marine turtles, cetaceans, cephalopods, shell fish beds, corals and/or sea weed beds;
- Community beneficial activities or uses (collecting firewood, wax, honey, building materials, wild fruits from mangrove; wild fish, shrimps, crabs, shells and cephalopods, from rivers, creeks and inter-tidal zones inside mangroves, local recreation, anchoring, food gathering);
- Coastal dweller's interest (claims on coastal natural resources, mangrove and mangrove related resources, fishing industry, hatcheries, cultural or traditional activities);
- Economic and financial activities (transportation, shipping, oil and gas, minerals, sand and gravel, aquaculture, sea beaches, sea resort uses, ports, harbors, docks, Navy, coast guards, defense and maritime security interests, coastal based airports and aircraft facilities);
- Recreational, cultural and tourism values and uses (mangrove based tourism, Sea beach based tourism, wildlife viewing, ship breaking yards, ship building yards, wrecks, educational opportunities, recreational seashores or water areas).

A geophysical socio-economic assessment may be conducted concurrently with the technical assessment or may be done step by step. Whatever the method,

both are essential for successful designation of an MPA.

3.2.3.10 Priorities to designate AoS as first step for the establishment of Marine Protected Areas

It needs to be understood that there are always possibilities of errors while making a decision on a new site with a lot of unknown qualities and factors. Precaution must be taken but precaution does not necessarily guarantee faultless initiatives. We should understand that it is always difficult to take decisions about sensitive marine resources, biodiversity and habitats. This suggests that in an Area of interest's (Aol) ecological values may be more important than technical and socio-economic considerations. In such areas, the overriding concern may be to provide special protection for these values.

3.2.3.11 Recommendations

At the end of the assessment, concerned public agencies will analyze the available data and information and formulate a recommendation on the site either to be chosen as an MPA candidate or a category less important than an MPA, but may be chosen for another form of preservation or protection.

Every agency has its strategy (if not the regulatory measures/regulatory guidelines for establishment or management of MPAs) for conservation and protection. Under such scenario, it is recommended that a new institutional framework is developed to review the department's regulatory regime and to make amendments or adjustments to translate them into an MPA management perspective. Stakeholders and Public Participation on MPA Initiatives:

All concerned people will be given equal chances to contribute to the appraisal of an AoS. They will be notified of the proposal and their active participation will be encouraged. Public debate before enacting any declaration is always healthy; top down decisions may not bring desired results. Based on the assessment procedure and all stakeholders and public inputs, proposal may be made to accommodate the following:

- Removal of the AoS from further contemplation is better, if it is already decided next step may be taken;
- Initiatives should be taken to gear up other than MPA status for defending or safeguarding the area's sensitive resources and habitats for which it is selected as a candidate MPA;
- Submit the AoS to another agency expressing an interest in considering the site under their legislation;
- Adjourn further consideration of the AoS until more data is collected;
- Last but not least, this stage will be the right time to step forward to develop an MPA management plan that is executable.

3.2.3.12 Provisional preservation and protection

In a resource scarce heavily populated country like Bangladesh, a simple declaration of an AoS is not enough. It is vital to undertake some preliminary measures for the protection of newly designated MPAs.

3.2.4 Step 4: Formulation of Management Plan for Candidate MPA Sites

3.2.4.1 Objective of the management plan

It should be self-explanatory why a management plan is necessary for MPA. The goals and objectives of MPA and how these goals and objectives will be achieved need to be described. The result indicators by which success of the MPA will be measured will need to be explained as well. Usually separate management plan for each MPA is necessary as each MPA is unique in its position and content. A management plan should be prepared based on draft proposals and appraisal reports, suggestions of all concerned stakeholders, the local people, and local concerned government agencies. The planning process should focus on all related issues and all apprehensions of interested and associated stakeholders in line with stated objectives and goals of the designated MPA.

3.2.4.2 Formulation of a management plan

The preliminary formulation process of an MPA management plan starts when AoS judgment and appraisal is completed. The implementation of a management plan is time consuming. It needs to be understood that effective planning will depend on practical and implementable timetables, focusing on specific sites or habitats with few species at a time. Most importantly ensure cooperation of interested stakeholders associated with the program. Management planning should not be done only by an apex body in Dhaka. Local governments and district level as well as Upazila level agencies, local people and organizations, NGOs and general public should be involved as well.

It is essential and also helpful to define aims and objectives of an MPA prior to formulation of an effective management plan. A management planning approach may be prepared based on habitat, biodiversity and overall ecosystem overviews of the selected AoS. The plan should also include information and data gathered from primary and secondary sources on the biological, ecological, technical, and socio-economic studies and inputs from available stakeholders and the general public aware of or living adjacent to the designated MPA.

3.2.4.3 Code of conduct for the planning

The MPA concept is new to Bangladesh, therefore, the management plan should contain an elaborate discussion on MPA in general terms and also provide details on how the MPA was selected, how it will be managed and what benefit is expected. It will make available a number of parameters for effective management such as the location and tentative boundaries of the designated MPA, zoning mechanism, prohibited activities with the designated MPA, and other relevant regulations and specific CoCs. The MPA management plan may also provide additional policies, strategies, or other management tools for achieving the purposes stated for the MPA.

The general perception is that the declaration of an MPA is more important than the management. It is

assumed that the declaration itself is enough to protect it from further deterioration. However, this is wrong. The declaration may be done through paper work, but management needs to be done in a real world situation. So, establishing an MPA may require implementing a variety of initiatives to manage the designated area, including studies on resources (inventories, research and monitoring), general awareness on MPA benefits and necessity, education, surveillance, enforcement and resource use management. All of these elements should be included in the MPA management plan for its successful implementation.

The following checklist will provide guidelines on elements that an MPA management plan should address. These fundamentals may vary based on overall purposes of establishing the MPA, its location, partnering arrangements, and other factors.

- purpose and scope of the plan;
- background and history of the site;
- location and boundaries of the area and surroundings;
- descriptive information; such as,
 - i. physical, biological, social, and cultural resources;
 - ii. existing activities and uses in or near the MPA;
 - iii. existing and potential threats to the MPA and how these might affect the MPA and its management;
 - iv. existing legal and management framework.
- management goals and objectives;
- interpretation of regulations (e.g. details on zoning and activity prohibitions);
- core and special use zones management;
- buffer areas and management of surrounding areas;
- resource studies plans (inventory, research, monitoring);
- awareness, interpretation, and education;
- markers, signs, buoys, and charting;
- surveillance and enforcement;

- resource enhancement or restoration proposals;
- resource harvesting and use management;
- visitor management;
- continuing traditional Aboriginal or community uses;
- participation, including advisory committees;
- partnering agreements;
- administration (staffing, training, facilities and equipment, budget);
- evaluation cycles and procedures for assessing MPA effectiveness and benefits;
- planning cycles and update procedures.

3.2.4.4 Partnering arrangement

In general, MPAs may be effectively managed unilaterally by a single agency or co-managed with one or more organizations. The management plan should specify the scope of work for each participating partner. This will minimize overlapping and ensure effective management procedures. The involvement of the resource users and other stakeholders in the management entity may also be taken into consideration.

3.2.4.5 Source of finance

The proposed management plan should name and classify the sources of finance with line items of expenditure in detail. Besides, the projected management budget also should describe in detail how budgetary provisions will support program interventions and activities under a time frame.

3.2.4.6 Surroundings and background information and resource analyses

The management plan for a specific MPA should incorporate a brief description of natural resources available in and around the site. Additional data and information may be obtained for detailed area planning from diverse sources, and data and information sources should be validated to ensure their authenticity.

3.2.4.7 Designated diverse Marine Zones

In Bangladesh, EEZ zoning is based on depth, not on ecosystem, habitat or biodiversity. The marine fisheries ordinance has no bar for zoning, but that was not incorporated in the document. However, zones defining levels of protection will be necessary to be established within MPAs. The MPA management plan will include all zoning provisions that specifies which activities will be permitted or prohibited within each zone, demarcate tentative boundaries for specific activities and permitted uses and prescribe rules of use and restrictions on various activities.

The zoning system is not fixed. It may vary depending on circumstances. The number, type and category of zoning and grouping will vary depending on the purpose of an individual MPA.

Under strict systems there may be provisions for 'no take' or 'no activity' areas, to protect and preserve the habitat, ecosystem and biodiversity. There are also areas where controlled use of the habitat and ecosystem, limited resource exploitation, limited fishing activities, or other human interventions are allowed under specified rules and regulations. The temporary zoning categories are usually designed based on diverse ecological conditions. The temporary zoning may include variable provisions depending on seasons or climatic conditions and other criteria as spawning, migration, breeding, nursing and feeding periods of diverse groups of marine lives.

MPA and Adjacent Buffer Zones

It is essential to protect and preserve the MPA. However, protection and preservation alone would be difficult if there is no buffer zone surrounding the MPA. Buffer zones are areas around the MPA to protect it from unnecessary encroachment of human activities, which may damage important species or habitats. Buffer zones may be considered as the first line of defence to protect and preserve its resources. Uses within buffer zones are managed in a manner that conserves and protects the marine resources and habitats within the MPA.

3.2.4.8 Banned or prohibited activities

The Marine Fisheries Ordinance empowers the Government of Bangladesh to enact rules and

regulations to preserve the protected areas, habitat, species and to establish marine protected areas and at the same time prohibiting interventions and activities within an MPA deemed destructive to MPA. This can also be done under the ECA Act and Wildlife Act. This power permits the government/agencies take comprehensive actions to exclude activities that would conflict with the purposes, aims and objectives of the AoS and MPA establishment.

3.2.4.9 Protection and preservation standards

It is desired that each MPA management plan will be exclusive, based on the needs of its aims and objectives for its establishment. The kinds of actions, intervention, which are banned or permissible, within an MPA are specific to each MPA based on the reasons for its establishment. When the activities allowed or not allowed are specified, no additional protection and preservation standards are necessary.

3.2.4.10 Activities within the designated Marine protected area

When a new area is designated as an MPA there may be some existing activities, which might be in conflict with the conservation and protection aims and objectives. Therefore careful scrutinizing will be necessary to accommodate existing and new rules and regulations. All existing activities cannot not be phased out immediately. Therefore, the management plan should provide opportunities for a step by step phasing out of activities.

It may happen that existing users have legal rights or fixed tenures permitting them to exploit marine resources of the area or they may have multinational involvements. For example, a hydrocarbon exploration in sea bed by foreign companies, an aquaculture farm, a fishing company or a resort operator may have a mutual agreement for digging and lease to operate a business within the proposed MPA. In such scenario, agreements will be sought with the company, operator or other governments and responsible authorities for protection of the area's resources, not altering physical configuration or destruction of habitat and exploitation of endangering and threatened species. Open water and resource management agencies,

including DoF, other related departments and agencies, and coastal area based local governments, may have powers for regulating the use of resources and leasing of some areas.

3.2.4.11 Formulation of a set of laws for description of the marine protected area

The MPA management plan should incorporate different processes that may provide important data, statistics and information for documentation on what should be included or omitted in the regulations designating an MPA. The description and designation regulations should confirm requirements, which will be regulated in the final MPA management plan.

It is quite natural that the general management plan of an MPA will incorporate operational details under a time frame and fixed geographical boundaries as well as awareness programs, which will not be included in the initial regulations. Like all policy documents, MPA management plans should be treated as living documents with a provision to update it.

3.2.4.12 Expected outcome of management planning

Once the MPA management plan has been developed, reviewed, validated and updated by concerned authorities, the corrected version should be forwarded to the highest approving authority with a strong recommendation so that the MPA can be designated through regulations under the existing laws of respective agencies.

3.2.4.13 Regulatory bodies

This will describe the name and jurisdiction of the ‘authority’ for regulating an MPA. The most direct and relevant agencies under the ordinance of MoFL/DoF and or the MoEF/DoE or FD.

3.2.5 Step 5: Designation or Titling of Marine Protected Area

3.2.5.1 Objectives

The Marine Fisheries Ordinance, 1983, does not

directly incorporate provisions for the establishment of MPAs, but it has provisions for protecting marine habitats and resources. Similarly, ECA Act has also got no direct provision of MPA, but has special provisions of protecting marine habitats. The latest Wildlife Act has got a provision to declare MPA only for some targeted marine species. Under these provisions the concept of MPA could be accommodated. What will be needed is to pass rules and regulations to this end. The designation process of MPAs may proceed alongside the MPA management planning.

3.2.5.2 The Designation process

An AoS is a marine area proposed for MPA designation under existing regulations. Once an AoS has been suggested, it will be referred to as a probable MPA designated site. In order to designate an MPA a series of different legal steps and procedures are required. The MPA management strategy, in line with the existing policies as well as the FAO Code of Conduct for Responsible Fisheries (CCRF) needs to be outlined and shared with DoF and other related agencies and then passed through to the MoFL/MoEF. To facilitate this approval process, a working paper may be required for discussion and endorsement by the Cabinet Division. Guidelines for Protected Area (IUCN, 1994) can be the guiding principle in this respect. Under Bangladesh conditions the following steps are necessary:

- The competent authority will draft rules and regulations for designation;
- Then, designating marine protected areas will be shared with the DOF/DOE/FD once it is passed by the designated professional forum/body i.e. National MPA Committee;
- The prescribing measures may include but not be limited to
 - Zoning of MPAs
 - Provision of programmed activities within MPAs
 - Any other matters consistent with the purpose of designation

3.2.5.3 Implementation of Marine Protected Area and its provisions

Implementation of designation and MPA management plans may require completion of partnership arrangements between partnering organizations. The agreement may be considered as public private partnerships when governments, private organizations and/or NGOs are involved. Community based implementation of a MPA is a possibility, when stakeholders get direct benefits out of it. Best example of such initiatives is Halda river protected area for indigenous carp species from genetic corruptions resulting from inbreeding. Protection of genetic resources by nearby communities directly benefits the fisher community of the area.

The Marine Fisheries Ordinance-1983 has provisions for enforcement of violators of law and regulations though these are not effectively enforced. However, declines of some renewable resources from marine habitat have encouraged Bangladesh Government to enforce laws and regulations so that enforcing agencies with magisterial powers could fine violators. The law enforcement authorities provide services to seasonal protection of hilsa breeding grounds and preventions of Jatka catches. Similar enforcement of law and regulations may be done for MPAs.

3.2.6 Step 6: Management Guideline for Individual MPA within the Framework

3.2.6.1 Marine protected area based management

Selection, validation and designation of probable new MPA are usually desk or workshop based. MPAs will be managed using existing data, statistics, information, previous research findings, on-going research, and traditional ecological information from a variety of stakeholders and general public. Interventions and activities necessary for achieving the aims and objectives of the MPA may include site planning, on the spot inspections, research, sampling monitoring and evaluation, surveillance, enforcement, visitor management, and apprenticeship initiatives.

3.2.6.2 Responsibility for management and execution of the plan

Each MPA should be looked after by a management team comprising representatives from all stakeholders and regional bodies and all of the team members should abide by the management plan. However, local committees should be accountable to the national MPA committee as an umbrella body.

All MPAs should be operated and managed by mutual collaboration of other associated organizations.

3.2.6.3 Research, monitoring and management plan

Terrestrial environment, ecosystem, biodiversity and habitat are known to people for generations; but many environmental processes and structures within marine ecosystems are unknown and often poorly studied and understood. Marine areas in comparison to terrestrial ecosystem are vast and there are areas where human penetration is recent and there are many sites humans have not reached yet or studied.

However, sea exploration is not the aims and objectives of MPAs, but scientific research and monitoring is essential and should be conducted within and outside MPAs, where it is possible and appropriate, to understand the marine environment, habitat and ecosystems and to provide valuable data, information and knowledge on changes on environment and biodiversity.

3.2.6.4 Public awareness to protect and preserve marine protected areas

No environmental initiative becomes successful, it does not matter how holistic it is, if human beings living within the periphery of the area continue to exert harmful pressures on it. The best way to ensure compliance is active participation and cooperation of all stakeholders. Similarly, compliance with MPA regulations and management plans depend on the awareness and cooperation of the general public living or active within or in the peripheral areas of a designated MPA.

Interpretation, information and knowledge dissemination on MPA and education programs on the importance of preservation and protection of environment, habitat, ecosystem and biodiversity should be done so that public awareness is created as it is vital for the success of any MPA. It is necessary to explain in plain language the aims and objectives of the MPA to the general public, its expected benefits in short, medium and long term perspectives and to provide all information and appropriate activities within an MPA. Awareness should also be associated with a plan for Alternative Income Generating Activities (AIGA) for the people to refrain from illegal and destructive practices and to support management initiatives.

3.2.6.5 Periodic review and evaluation

Each MPA should be evaluated periodically with inputs from the public, to determine whether it is fulfilling its purposes. It is also important to monitor whether the management plan is being followed. If purposes are not met or the management plan is not properly executed; changes may be recommended.

MPAs are not necessarily established for eternity, there is always scope for re-adjustment and remodelling. Climatic change alone can alter the aims and objectives of an MPA. Besides, many other factors influence, including changes in purposes, environmental conditions, as mentioned earlier - climate, and biodiversity. Periodic reviews will determine whether an existing MPA might be enlarged, sized-down, discontinued, relocated, or redesigned to serve the intended purposes.

3.2.7 Step 7: Declaration of Marine Protected Area

3.2.7.1 Legal and institutional framework for declaration of Marine Protected Area

There is need for amendment of fisheries, marine fisheries and allied policies because there is no specific marine environmental and ecosystem based policy. The modified marine policy paper needs to be broadened to incorporate all necessary elements, reflecting sustainability based on long term perspectives and wider national marine

development policy and planning framework. Declaration of MPAs can be done either jointly or independently by the MoFL and MoEF. There should be a national committee for MPA declaration, possibly headed by MoFL. Also, there should be regional committees. MPA can also be declared and managed by adding clauses the Environmental Conservation Rules, 1997.

3.2.8 Step 8. Code of Conducts (CoC) for Specialized Marine Protected Area

The elaboration of a CoC for a specific MPA may be a better decision prior to declaration of an MPA, MPAs associated with eco-tourism, commercial fishing grounds and popular sea beaches require special attention. As mentioned earlier each MPA is a different entity and usually designated for a particular reason. Therefore, MPA specific CoCs will be helpful for management. As observed during the preparatory work for this framework paper, one of the best tourist attractions in the country, St. Martin's Island, is facing abusive tourism. It is overpopulated and heavy pressure during tourist season is endangering the delicate ecosystem of the tiny island. Tourists are collecting corals and discarding waste.

3.3 Selection, Designation and Management of Marine Protected Areas under Emergency Situation

3.3.1 Purpose

So far, MPAs for the preservation and protection of marine ecosystem and biodiversity have been described. Based on conventional MPA selections, designation and management plan has been discussed for a generalized framework preparation. However, some emergency situations may arise, which make it necessary to take initiatives under unforeseen situations.

Due to a natural disaster, a drastic change in an ecosystem may occur. Destruction of nesting grounds of marine birds on a remote island may endanger a species' existence. In such scenarios, the Government or any competent authority may designate an emergency, for short-term or medium term protection. This power may be used when the

concerned ministry is of the opinion that a marine resource, an ecosystem, or habitat is, or is likely to be, at risk of extinction.

3.3.2 Limits on Provisional or Emergency Marine Protected Area Designation

An emergency or provisional MPA establishment order will remain in effect for a limited period of a few days or weeks, or a year at the most. The time limit can vary from region to region. For example, Bangladesh banned fishing on gravid hilsa on its migratory route to breeding grounds for only 11 days. This period may be optimum to protect the resources from declining, however, this time period may be extended or decreased based on proper monitoring and evaluation.

Provisional or emergency MPA orders must be consistent with country's law and should not contradict other claims or livelihood options, land or sea area claims agreements that have been ratified or approved by a competent authority.

3.4 Community Awareness and Learning

Community awareness and learning on any protected area, including MPAs, is very important for its effective operation and maintenance.

The aims and objectives of the MPA programs should be clearly defined and must be understood by all stakeholders. Community and public awareness and mass learning would necessitate the development of tools for diverse stakeholders, including school children, community people, resource users, public officials and other public agencies, and non-public agencies. A variety of instructive materials can be used, e.g. awareness enhancing group discussions, general mass meetings, advertising material like posters, booklets, leaflets and audio-visual materials and videos.

Effective learning and community support can reduce enforcement necessities through encouraging active involvement of interested

communities. This generates awareness and understanding among the public. Besides, creating a forum through active and voluntary partnering arrangements to address the protection of habitat, species and ecosystem will be helpful. Here the effective management of the MPAs should follow a thematically 'community based co-management' system. Such approaches to management of sanctuaries have proven to be successful. The models need to be customized but the lessons learned from the IPAC (Integrated Protected Area Co-management) project of USAID could be used.

3.5 Education through Hands-on Training and Awareness Building

The main aim of formulating the MPA framework is to make it workable, implementable step by step so that the main objectives are fulfilled. Therefore, it is essential to arrange hands-on training sessions among the partners and stakeholders. The MPA framework should be routinely validated to facilitate methods of reorganization and adaptation based on the needs of MPAs and associated stakeholders.



Nypa leaves produce livelihoods for many
©IUCN/ Enamul Mazid Khan Siddique



4

Proposed MPA Sites



Suggestions on potential MPA sites were received during stakeholders' consultations. These are preliminary suggestions. On the spot inspections, more information and screening are needed for further steps towards MPA designation. A large number of sites mentioned by the concerned people, especially those who are directly engaged with fishing, are mainly based on their experience of fishing and resource exploitation.

Almost everyone wants protection of habitat, they suggested sites for AoS, but they want to retain their fishing rights; fishing periods should not be reduced. Most of the suggested sites with rationales and brief comments, are documented below. A relatively large number of sites were suggested, but all do not have equal significance. However, to avoid top-down approaches all areas mentioned by participants in the dialogue are listed with their locations by longitude and latitude. The sites are categorized on priority basis as:

- (a) Area of Significance (AoS);
- (b) Area of Interest (AoI);
- (c) Area of Curiosity (AoC) and
- (d) Area of Mind (AoM).

The initiative tried to identify potential areas where few pilot scale MPAs could be initiated. It is difficult to forecast, based on little information and facts to suggest 12,000 km² as future MPAs because of the limited background information. If pilot initiatives appear successful, the area of an MPA could be expanded. Even current PAs are not large enough to cover 12,000 km² and a mere declaration without proper studies will not be useful. However, this framework suggests a roadmap towards sustainable MPA management to implement it in three phases through a long term programme which is considered beyond the primary goal of declaring 10% of EEZ by 2020 and targets to declare 15,000 km² by 2026.

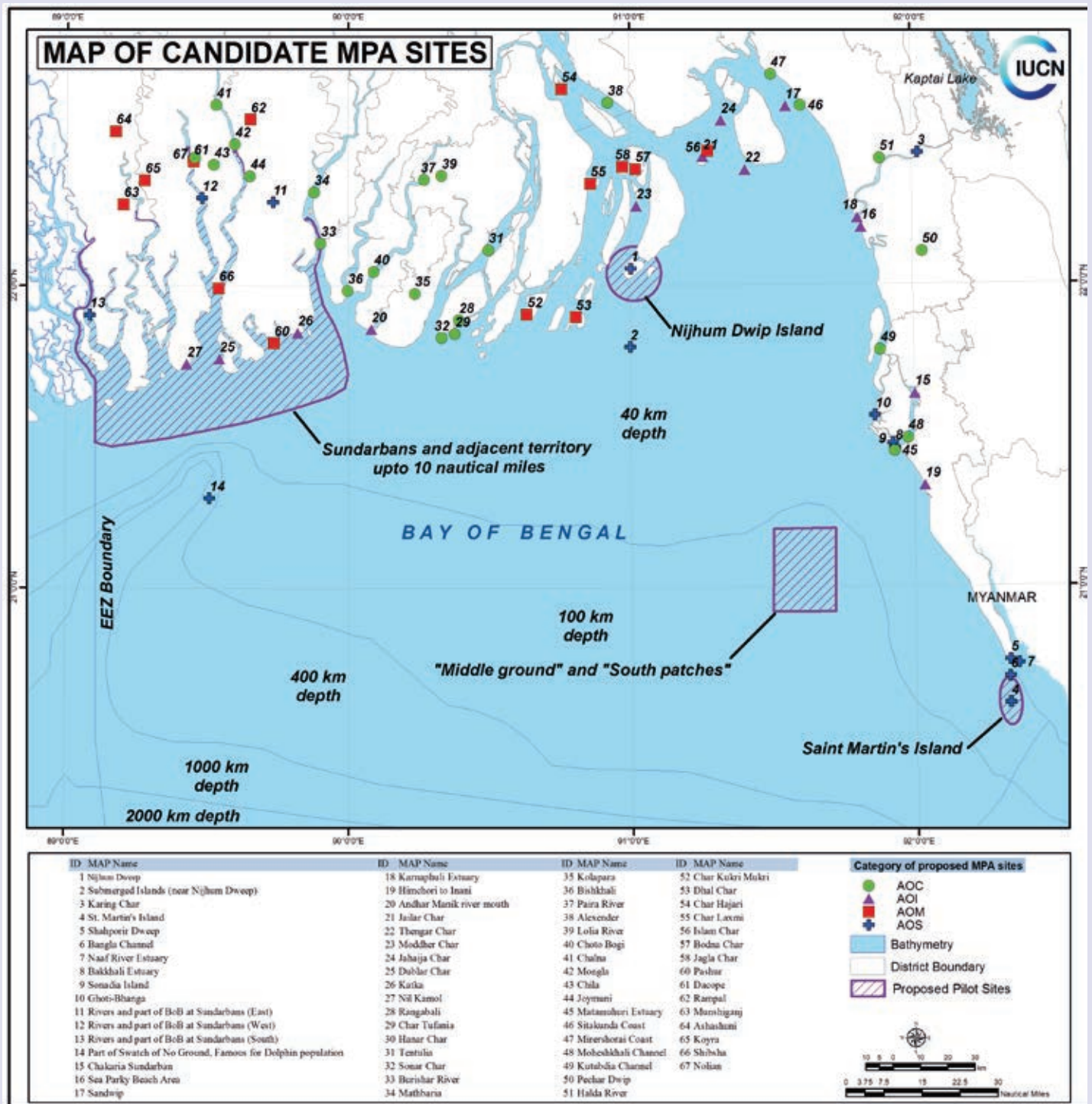
Proposed MPA Sites

A total of 67 sites are listed in the following table along with their importance. Out of all sites, 14 are proposed as AoS and must be given priority to declare and manage as MPAs. To start with, four sites are recommended by the stakeholders to implement MPA framework through piloting at initial stage. Those are: St. Martin's Island, Nijhum Dwip and its adjacent area, Outer periphery of Sundarbans (up to 10 nautical miles) and Marine Reserve declared by DoF in the South Patches and Middle Ground of BoB.

Roadmap towards sustainable MPA management

- Phase 1:** Preparatory Phase in pilot sites by 2018 (3-5 years, coverage area 6,000 km²)
- Phase 2:** Development Phase by 2022 (in 6-10 years, coverage area 12,000 km²)
- Phase 3:** Consolidation Phase by 2026 (in 11-15 years, coverage area 15,000 km²)

Map of Candidate MPA Sites



Site Specific MPA List

Sl. No.	Site/ Name of Site	Categories* & Comments	Geographic Location	Current Status & Agency to be vested**	Reason/s	Current Specific Threat (if, there is any)	
						Anthropogenic	Natural
1	Nijhum Dweep	AOS	Noakhali 22°3'25.92"N 90°59'57.63"E	PA DoF/FD/PC	This small island is already under PA by Forest Department. The peripheral water around the island is claimed to be breeding ground of some important commercial species like Hilsa (<i>Tenualosa ilisha</i>), over fished, breeding ground & nursing ground); Koral/Sea bass (<i>Lates calcarifer</i>) considered as Riverine & estuary based fish, currently overfished; Pangas (<i>Pangasius pangasius</i>), Riverine and estuarine fish, endangered in the red list of IUCN Bangladesh (2000), Rita (<i>Rita rita</i>) critically endangered in the red list of IUCN Bangladesh (2000), Bagda (<i>Penaeus monodon</i>), its nursing ground; Golda, (<i>Macrobrachium rosenbergii</i>), important source of brood and breeding and nursing ground. Grass root level participants at Noakhali region advocated for the site as Area of Significance (AOS) for future MPA.	A popular tourist attraction; bad tourist management; and indiscriminate collection of terrestrial & aquatic samples	Soil erosion
2	Submerged Island near Nijhum Dweep	AOS	20-25 km South of Nijhum Dweep. 21°47'52.50"N 90°59'46.34"E	DoF	This site was also suggested by some participants of the workshop and FGD in Noakhali. The submerged char is reported to be the habitat of many marine organisms (fish <i>Tenualosa ilisha</i> , <i>Pangasius pangasius</i>); (shrimp <i>Penaeus monodon</i>); (common bottlenose dolphin <i>Tursiops truncatus</i>). The char rises above sea level during low tide and submerges during high tide.	Over-fishing, irresponsible exploitation of fish & other aquatic organisms	Not known
3	Caring Char	AOS SL# 1, 2 & 3 may be combined in one MPA	Noakhali 22°26'6.60"N 91°11'55.78"E	DoF	The site was suggested by the same group mentioned above in Noakhali and reportedly important as a nursing ground for many marine organisms including some fish mentioned above (<i>Tenualosa ilisha</i> , <i>Penaeus monodon</i> , <i>Macrobrachium rosenbergii</i>).	Over-fishing specifically on under sized individuals	Not known

Sl. No.	Site/ Name of Site	Categories* & Comments	Geographic Location	Current Status & Agency to be vested**	Reason/s	Current Specific Threat (if, there is any)	
						Anthropogenic	Natural
4	St. Martin's Island	AOS	Cox's Bazaar 20°36'50.30"N 92°19'36.07"E	EOA DoF/DoE/PC	<p>This is the only coral reef based island in the country and an EOA, heavily populated and a tourist attraction. The island itself could be declared as a PA on eco-tourism with strict restrictions on number and activities. There are 114 reported coral reef fishes and most of the species can be found around this island. The surrounding sea and coral atoll is suggested to be AOS for a future MPA.</p> <p>Important species in the area are: Lobster; <i>Panulirus polyphagus</i>, <i>Panulirus versicolor</i>, <i>Thenus orientalis</i>; many fishes; Topshe; Tapsi; Paradise threadfin; <i>Polynemus paradiseus</i>; Vola mach, (hole korol) giant grouper; <i>Epinephelus lanceolatus</i>. Balla Poa, Amoy crocker; <i>Argyrosomus amoyensis</i>; in the red list of IUCN (2000), highly commercial boro poa; Tiger toothed croaker; Otolith ruber; in the red list of IUCN (2000), once a highly commercial species. Dhari poa; Goatee Croaker (<i>Dendrophysa russelli</i>) minor commercial species but in red list of IUCN (2000) Metepoa; sharp nose hammer poa; <i>Johnius borneensis</i>, minor commercial but in red list of IUCN (2000) Table coral; <i>Acropora parapharaonis</i>; Lesser star coral; <i>Goniastrea pectinata</i>; large star coral: <i>Favites complanata</i>, Brain coral: <i>Platygyra daedalea</i>; Zebra coral: <i>Oulastrea crispata</i> Mushroom coral: <i>Fungia echinata</i>; Common sea fan: <i>Gorgonia flabellum</i>; common sea fan: <i>Subergorgia mollis</i>, Sea whip: <i>Ellisella</i> sp.; many coral reef dwelling organisms/species like <i>Cephalopholis formosa</i>; <i>C. sonnerati</i>; <i>Epinephelus malabaricus</i>, <i>E. latifasciatus</i>; <i>E. mera</i>, <i>E. morrhua</i>, <i>Cromileptis altivelis</i>, <i>Grammistes sexlineatus</i> and <i>Priacanthus hamrur</i> and many others; Sea weeds like brown algae (<i>Padina</i> sp.), brown algae (<i>Dictyota</i> sp.), red nori (<i>Halymenia floridana</i>), calcified red algae (<i>Ligora</i> sp.); green algae (<i>Ulva lactuca</i> var. <i>rigida</i>).</p>	Very popular tourist area. Bad tourist management and abusive collection of terrestrial & marine samples	Heavy siltation from Naf river during monsoon

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						Anthropogenic	Natural
5	Shahparir Dweep	AOS	Cox's Bazaar 20°45'25.50"N 92°19'40.91"E	DoF/FD	Sea area at the southern tip of <i>Teknaf peninsula</i> . Due to its proximity to St. Martins island most of the species found there are also found in this habitat.	Popular tourist site, over fishing on larval marine lives by collection of post larvae of shrimp	Sand deposition in coastal areas
6	Bangla Channel	AOS	Cox's Bazaar 20°42'6.23"N 92°19'33.78"E	DoF	Same as above	Heavy traffic of fishing & other boats	Sedimentation by river flow
7	Naf river Estuary	AOS SL# 4 to 7, may be combined in one MPA	Cox's Bazaar 20°44'43.80"N 92°21'27.37"E	DoF/FD	Same as above	Same as above	Same as above
8	Bakikhali Estuary	AOS	Cox's Bazaar 21°27'36.27"N 91°55'43.99"E	DoF/FD	Estuary at the mouth of Bakikhali river in Cox's Bazar. Polluted by fishing boat discarding garbage. Important nursing ground for <i>P. monodon</i> and <i>M. rosenbergii</i>	Same as above	Same as above
9	Sonadia Island	AOS	Cox's Bazaar 21°28'34.25"N 91°55'17.62"E	ECA/DoF/DoE	Off shore island in the Cox's Bazar estuary adjacent to Moheshkhali Island. Seasonally used a dry fish yarding garbage. Southern part of adjacent sea is reportedly good bed of many shells <i>Trochus niliticus</i> , <i>Anadara granosa</i> , <i>Lambis lambis</i>) and echinoderms usually starfish etc., (<i>Cenometra bella</i> , <i>Stephanometra indica</i> , <i>Astropecten euryacanthus</i> , <i>Ophiactis savigny</i>); nursing ground of many marine organisms including marine shrimps; tiger shrimp, <i>P. monodon</i> , white shrimp, <i>P. indicus</i> , banana shrimp, <i>P. marginatus</i> , green tiger shrimp, <i>P. semismaculatus</i> , speckled shrimp, <i>Metapenaeus monoceros</i> , yellow shrimp, <i>M. brevicornis</i> . South of Sonadia some important commercial species like Guzzia giant sea catfish; <i>Arius thalassinus</i> and <i>Arius maculatus</i> are also reportedly over-harvested.	Tourist site, Fish drying yard	Same as above

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10	Ghotibhanga	AOS SL# 8 to10, may be combined in one MPA	Cox's Bazaar 21°34'2.95"N 91°51'35.10"E	DoF/FD	Southern tip of Moeshkhali island. Important nursing ground for many marine lives mentioned in Sonadia; besides it was once important shell fish ground, now with alarming rate of decline of species like Crab; <i>Scylla olivacea</i> , <i>Scylla sp</i> ; Oyster: <i>Placuna placenta</i> ; Clam: <i>Perna viridis</i> ; Ornamental shell: <i>Tonna tessellate</i> , <i>Oliva olive</i> at off shore area. Reported as nursing ground for many marine species of fishes.	Over-exploitation of aquatic resources	
11	Rivers & Part of BoB at Sundarbans (East)	AOS	Bagerhat 22°16'46.78"N 89°43'50.16"E	PA DoF/FD	Part of rivers and their tributaries flowing inside Sundarbans (East) and adjacent sea southward. Habitat for many marine organisms. Many of them are overfished and reportedly declining: salt water crocodile (<i>Crocodylus porosus</i>); different species of dolphins; Hump-backed dolphin (<i>Sousa chinensis</i>); Irrawaddy dolphin (<i>Orcaella brevirostris</i>); spotted dolphin (<i>Stenella attenuata</i>); spinner dolphin (<i>Stenella longirostris</i>); different shrimp species (<i>P. monodon</i> , <i>P. indicus</i> , <i>Parapenaeopsis sculptilis</i> , <i>Metapenaeus monoceros</i> ; Sea Snake, 11 species of sea snakes common narrow-head sea snake (<i>Hydrophis gracilis</i>) pelagic sea snake (<i>Pelamis platurus</i>); Sea birds & Seagulls.; 20 species. Mainly Gull; <i>Larus brunnicephalus</i> ; <i>Larus ridibundus</i> ; and tern (<i>Sterna hirundo</i> , <i>Sterna bengalensis</i>); different species of fish (<i>Lates calcarifer</i> , <i>Harpodon nehereus</i> , <i>Epinephelus lanceolatus</i> , <i>Polydactylus paradiseus</i> , <i>Epinephelus lanceolatus</i> , <i>Acanthopagrus latus</i> , <i>Pomadasys argenteus</i> , <i>Johnius borneensis</i> shark; (kamot) <i>Carcharinus melanopterus</i> ; milk shark kamot <i>Rhizoparinodon acutus</i> ; Dog fish; <i>Scoliodon laticaudus</i> ; hammer headed shark: <i>Sphyrna zygaena</i> ; skate; <i>Glaucostegus granulatus</i> ; and many other brackish water and salt water species.	Over-exploitation of aquatic resources, often poisoning	Salinity increase
12	Rivers, part of BoB at Sundarbans (West)	AOS	Khulna 22°17'35.53"N 89°28'41.68"E	PA DoF/FD	Part of rivers, creeks and their tributaries flowing inside Sundarbans (south) and adjacent sea southward. Important habitat of many important marine species mentioned above for Sundarbans East.	Same as above	Same as above

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						Anthropogenic	Natural
13	Rivers, part of BoB at Sundarbans (South)	AOS	Satkhira 21°54'19.67"N 89° 4'52.76"E	PA DoF/FD	Part of rivers, creeks and their tributaries flowing inside Sundarbans (West) and adjacent sea southward. Important habitat of many important marine lives mentioned above for Sundarbans East.	Same as above	Same as above
14	Part of Swatch of no ground famous for Dolphin population	AOS	G. Khulna 21°17'59.53"N 89°30'25.52"E	MPA/DoF/FD	This location is known as breeding and feeding ground for dolphins and other cetaceans. This is also an important fishing ground. Presence of many fish probably lures dolphins to the site. Therefore, part of it may be designated as MPA for cetaceans.	Same as above	Same as above
15	Chakaria Sundarban	AOI; SL# 11 to 14 may be combined in one MPA	Cox'sbazaar 21°38'22.32"N 92° 0'4.19"E	DoF/FD	This was the second largest mangrove forest in Bangladesh after Sundarbans. Roughly 3000 ha of forested land have been converted into shrimp farming sites. The mangrove forested area and its peripheral rivers are claimed to be nursing grounds for many marine organisms. The surrounding sea, estuaries and rivers are suggested to be an AOS for future MPA. Reported to be habitat and nursing ground for many marine organisms (Fish, <i>Lates calcarifer</i> , <i>Epinephelus lanceolatus</i> , <i>Polydactylus paradiseus</i> , <i>Acanthopagrus latus</i> , <i>Pomadasys argenteus</i> , <i>Setipinna breviceps</i> , <i>Eleutheronema tetradactylum</i>); <i>Frasa</i> , anchovy; <i>Setipinna breviceps</i> ; crab (<i>Scylla olivacea</i> , <i>Scylla sp</i>) shrimp and prawn <i>Penaeus monodon</i> , <i>Macrobrachium rosenbergii</i> , Oyster: <i>Placuna placenta</i> , Clam: <i>Perna viridis</i> , sea birds; Gull; <i>Larus brunnicephalus</i> ; <i>Larus ridibundus</i> ; and Tern (<i>Sterna hirundo</i> , <i>Sterna bengalensis</i>).	Converted to shrimp farms; over exploitation of coastal/marine resources	Not known
16	Parky sea beach area	AOI	Chittagong 22°11'23.89"N 91°48'56.26"E	DoF	This is located at the Karnaphuly river mouth to Potenga sea beach area. Reported to be breeding and nursing ground of some important marine species.	Sea pollution due to commercial activity	Not known
17	Sandweep Channel	AOI	Chittagong 22°35'29.11"N 91°33'5.64"E	DoF	The sea between Chittagong coast line and Sandeep island; reported to be breeding and nursing ground of some important marine species.	Same as above	Soil erosion and siltation

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18	Karnaphuli Estuary	AOI	Chittagong 22°13'18.51"N 91°48'14.57"E	DoF	Estuary at the mouth of Karnaphuli river at Chittagong coast; reported to be breeding and nursing ground of some important marine species.	Same as above	Siltation
19	Sea & beach along Himchori to Inani	AOI	Cox's Bazaar Sea & beach along Himchori to Inani 21°20'6.38"N 92° 2'1.13"E	ECA/FD/DoE	Part of Cox's Bazar to tip of Teknaf peninsula. Gradually becoming a busy tourist site. This part of the beach was once a known nesting ground for some marine turtles; loggerhead (<i>Caretta caretta</i>); green turtle (<i>Chelonia mydas</i>); hawksbill (<i>Eretmochelys imbricata</i>); and leatherback (<i>Dermochelys coriacea</i>). The adjacent part of the sea is reportedly good bed of many shells <i>Trochus niliticus</i> , <i>Anadara granosa</i> , <i>Lambis lambis</i>) and echinoderms usually starfish etc., (<i>Ctenometra bella</i> , <i>Stephanometra monacantha</i> , <i>Astropecten euryacanthus</i> , <i>Ophiactis savignyi</i>); nursing ground of many marine lives including many marine shrimps; tiger shrimp, <i>P. monodon</i> , white shrimp, <i>P. indicus</i> , banana shrimp, <i>P. merguensis</i> , green tiger shrimp, <i>P. semisulcatus</i> , speckled shrimp, <i>Metapenaeus monoceros</i> , yellow shrimp, <i>M. brevicornis</i> . Occasional landing of lobsters (<i>Panulirus polyphagus</i> , <i>Panulirus versicolor</i> , <i>Thenus orientalis</i>) in the beach is also seen. The beach is seen to harbor hundreds of shrimp post larvae (PL) collectors. However, fry collectors are unable to selectively harvest and kill hundreds of species of larval marine lives.	Popular tourist site, abusive tourist management; over fishing on larval marine lives by collection of post larvae of shrimp	Soil erosion at beach area
20	Anadhermanik river mouth	AOI	Barisal 21°51'30.51"N 90° 4'41.68"E	DoF/FD	TIt site was suggested at a workshop and by FGD groups in Chandpur areas, Chandpur being the hilsa harvesting and landing site, most suggestions for AOS are hilsa protection areas. Hilsa (<i>Tenualosa ilisha</i>), over fished, the sites is also breeding & nursing ground of hilsa; Koral/Sea bass (<i>Latescal carifer</i>) considered as Riverine & estuary based fish, currently overfished; Pangas (<i>Pangasius pangasius</i>) is also overfished;., Haushpata: Dasyatisbenmetti; Riverine and estuarine fish Rita, <i>Rita rita</i> , endangered and in red list of IUCN, Bangladesh (2000), Bacha: Eutropichthysmurius. mainly river and estuarine fish. Not in red list but Eutropichthysvacha similar species and critically endangered and in red list.	Same as above	Siltation

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21	Jaillar Char	AOI	Noakhali 22°25'32.34"N 91°15'22.52"E	DoF/FD	The site was suggested to be AOS for dual purposes of plantation in adjacent seas for the protection of marine lives. Reportedly habitat for riverine and estuarine fishes mentioned above for Anadhermanik river mouth.	Same as above	Siltation
22	Thengar Char	AOI	Noakhali 22°22'57.77"N 91°24'19.28"E	DoF/FD	Same as above suggested as PA at workshop and FGD groups. Reportedly habitat for riverine and estuarine fishes mentioned above for Anadhermanik river mouth.		
23	Moddher Char	AOI	Noakhali- Monpura 22°15'48.92"N 91°1'9.75"E	DoF/FD	Same as above; habitat for riverine and estuarine fishes mentioned for Anadhermanik river mouth.	Same as above	Siltation
24	Jahajja char	AOI	Noakhali 22°32'44.73"N 91°19'18.97"E	DoF/FD	Same as above, suggested as PA and habitat for riverine and estuarine fishes mentioned for Anadhermanik river mouth.	Same as above	Siltation
25	Dublar-Char	AOI	Bagerhat 21°45'35.53"N 89°32'28.08"E	DoF/FD	Same or similar to those of Sundarbans East, South and West suggested earlier in AOS.	Fish drying yard. Marine discards	Siltation, salinity increase
26	Kotka	AOI	Bagerhat 21°50'48.29"N 89°49'2.45"E	DoF/FD	Similar to those of Sundarbans East.	Tourist site and abusive tourist management	Salinity increase
27	Nilkomol	AOI	Khulna 21°44'35.97"N 89°25'30.90"E	DoF/FD	Same as those of Sundarbans East, South and West.	Same as above	Same as above
28	Rangabali	AOC	Patuakhali 21°53'18.11"N 90°23'17.91"E	DoF/FD	Same as above	Same as above	Same as above
29	Char Tuphania	AOC	Patuakhali 21°50'34.54"N 90°22'29.83"E	DoF/FD	Same as above	Same as above	Same as above
30	Hanarchar	AOC	Chandpur 23°8'32.81"N 90°38'41.99"E	DoF/FD	Same as above	Same as above	Same as above

Similar to those of Sundarbans East.

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31	Tentulia	AOC	Patuakhali 22°7'11.98"N 90°29'37.67"E	DoF	The site was suggested as an important area for breeding ground for some important Riverine and estuarine fish like; Hilsa, <i>Tenualosa ilisha</i> , Sea bass, vetki, koral; <i>Latescal carifer</i> , mullets Liza sp., and prawn brood <i>Macrobrachium rosenbergii</i> raising ground.	Over exploitation of resources by catching undersized fish and shrimps	Same as above
32	Sonar Char	AOC	Patuakhali 21°49'47.76"N 90°29'28.98"E	DoF	Same as above	Same as above	Same as above
33	Burishar river	AOC	Barguna 22°8'34.09"N 89°53'55.05"E	DoF	Same as above	Same as above	Same as above
34	Mothbaria	AOC	Pirojpur 22°18'44.21"N 89°52'31.17"E	DoF	Same as above	Same as above	Same as above
35	Kolapara	AOC	Patuakhali 21°58'35.79"N 90°13'56.87"E	DoF	Same as above	Same as above	Same as above
36	Bishkhali	AOC	Patuakhali 21°59'8.10"N 89°59'40.03"E	DoF	Same as above	Same as above	Same as above
37	Paيرا River	AOC	Patuakhali 22°21'11.84"N 90°15'59.36"E	DoF	Same as above	Same as above	Same as above
38	Char Alexander	AOC	Bhola –Laxmipur 22°36'21.45"N 90°55'11.19"E	DoF	Same as above	Same as above	Same as above
39	Lolia River	AOC	Patuakhali 22°21'57.05"N 90°19'39.78"E	DoF	Same as above	Same as above	Same as above
40	ChotoBogi	AOC	Barisal- Patuakhali 22° 2'54.66"N 90° 5'15.58"E	DoF	Same as above	Same as above	Same as above

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						Anthropogenic	Natural
41	Chalha	AOC (Similar to 3 Sunderban sites)	Greater Khulna 22°36'3.54"N 89°31'39.44"E	DoF/FD	This site was cited as important habitat, breeding and nursing ground for some important and over-exploited commercial fishes like Hilsa, <i>Tenualosa ilisha</i> ; Pangas, <i>Pangasius pangasius</i> , Riverine and estuarine fish in the redlist of IUCN; Fhasa; anchovy; <i>Setipinna brevicauda</i> ; Taposi; <i>Paradise threadfin</i> ; <i>Polydactylus paradiseus</i> ; Vola mach, (phole korol) giant grouper; <i>Epinephelus lanceolatus</i> ; Hangor; black fin shark; (kamot) <i>Carcharias melanopterus</i> ; milk shark kamot <i>Rhizoparinodon acutus</i> ; Dog fish; <i>Scoliodon laticaudus</i> ; different shrimp species (<i>P. monodon</i> , <i>P. indicus</i> , <i>Parapenaeopsis sculpsilis</i> , <i>Metapenaeus monoceros</i>); hangor, Susuk dolphin (<i>Sousa chinensis</i>); Irrawaddy dolphin (<i>Orcaella brevirostris</i>); spotted dolphin (<i>Stenella attenuata</i>); spinner dolphin (<i>Stenella longirostris</i>); Nunia mach; <i>Urotheutis duvacei</i> ; <i>Sepia pharaonis</i> ; Crab; <i>Scylla olivacea</i> , <i>Scylla</i> sp.	The site is heavily populated area and resources are being overexploited	Same as above
42	Mongla	AOC	Bagerhat 22°28'14.92"N 89°35'38.65"E	DoF/FD	More or less same as Chalha	Same as above	Same as above
43	Chila	AOC	Bagerhat 22°24'11.60"N 89°37'10.07"E	DoF/FD	Similar to Chalha	Same as above	Same as above
44	Joymoni	AOC	Greater Khulna 22°21'55.31"N 89°38'54.03"E	DoF/FD	Same as Chalha	Same as above	Same as above

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						Anthropogenic	Natural
45	Matamuhuri Estuary	AOC	Chittagong-Cox's Bazaar coast 21°26'59.21"N 91°55'37.15"E	ECA/DoF/FD	Estuary at the mouth of Matamuhuri river at Chittagong coast, important habitat for some commercial species and nursing ground for many marine lives. Pangas, <i>Pangasius pangasius</i> , Riverine and estuarine fish in the red list of IUCN; Taposi; <i>Paradise thread fin: Polyductylus paradiseus</i> ; Tailla: Threadfin: <i>Eleutheronemata dactylum</i> ; Sada Chanda fry. (silver Pomfret); <i>Pampus argenteus</i> ; Dog fish; <i>Scoliodon laticaudus</i> ; different shrimp species (<i>P. monodon</i> , <i>P. indicus</i> , <i>Parapenaeopsis sculpiilis</i> , <i>Metapenaeus monoceros</i> ; Hangor, Susuk dolphin (Sousa chinensis); Irrawaddy dolphin (<i>Orcaella brevirostris</i>); spotted dolphin (<i>Stenella attenuata</i>); spinner dolphin (<i>Stenella longirostris</i>); Nuniamach; <i>Photoligoduvaeuelli</i> ; <i>Sepla pharaonis</i> ; Crab; <i>Scylla olivacea</i> , <i>Scylla sp.</i> Gull; <i>Larus brunicephalus</i> ; <i>Larus ridibundus</i> and tern (<i>Sternahirundo</i> , <i>Sterna bengalensis</i>).	The site is heavily populated area and resources are being overexploited, sea pollution by urban waste.	Same as above
46	Sitakundu coast	AOC	Chittagong 22°35'40.46"N 91°36'17.70"E	DoF/FD	More or less same as Matamuhuri Estuary	Same as above	Same as above
47	Mirersharai Coast	AOC	Chittagong 22°41'51.14"N 91°30'0.28"E	DoF/FD	Same as Matamuhuri Estuary	Same as above	Same as above
48	Moheshkhali channel	AOC	Chittagong-Cox's Bazaar coast 21°29'35.08"N 91°58'32.83"E	DoF/DoE	Similar to Matamuhuri Estuary	Same as above	Same as above
49	Kutubdia Channel	AOC	Chittagong-Cox's Bazaar coast 21°47'7.33"N 91°52'47.52"E	DoF/DoE	More or less same as Matamuhuri Estuary	Same as above	Same as above

Sl. No.	Site/ Name of Site	Categories* & Comments	Geographic Location	Current Status & Agency to be vested**	Reason/s	Current Specific Threat (if, there is any)	
						Anthropogenic	Natural
50	Pechar Dweep	AOC	Cox's Bazar 21°19'28.52"N 92° 1'53.64"E	ECA DoF/DoE	This small site is a coral atoll without human settlers adjacent to St. Martin Island, hence included in AOS mentioned earlier.	Same as above	Same as above
51	Halda River	AOC	Chittagong 22°25'1.53"N 91°53'1.76"E	PA DoF	This not a marine habitat but a single entity of community based PA for fisheries in a hilly creek system where inbred free Indian major carp broods are protected for natural fish seed collections. Some biologists believe there are a few endemic FW species that exists there but is no published materials to be found.	The site is under community management, a PA to protect brood fish of indigenous fishes	Not Known
52	Char Kukri-mukri	AOM	Bhola 21°54'23.78"N 90°37'49.91"E	DoF/FD	Little information was provided by informants about status of the site and why it is important and deserves to be nominated as a protected area. Participants talked about hilsa (<i>Tenualosa ilisha</i>) and most FGD members focused on the type of fish they usually catch. However, since these names were suggested by the participants we recorded all of them so that in future validation can be done.	Over-exploitation of aquatic resources	Not Known
53	Dhal Char	AOM	Bhola 21°53'51.60"N 90°48'11.27"E	DoF/FD	Same as above	Same as above	Same as above
54	Char Hazari	AOM	Bhola 22°39'7.95"N 90°45'21.79"E	DoF/FD	Same as above	Same as above	Same as above
55	Char Iaxmi	AOM	Bhola 22°20'18.67"N 90°51'27.62"E	DoF/FD	Same as above	Same as above	Same as above
56	Islam Char	AOM	Noakhali 22°26'43.21"N 91°16'26.99"E	DoF/FD	Same as above	Same as above	Same as above
57	Bodnar Char	AOM	Bhola 22°23'9.77"N 91° 0'58.33"E	DoF/FD	Same as above	Same as above	Same as above
58	Jaglar Char	AOM	Bhola 22°23'38.05"N 90°58'15.56"E	DoF/FD	Same as above	Same as above	Same as above
59	Kalam Char	AOM	Noakhali-Laxmipur	DoF/FD	Same as above	Same as above	Same as above

Sl. No.	Site/ Name of Site	Categories* & Comments	Geographic Location	Current Status & Agency to be vested**	Reason/s	Current Specific Threat (if, there is any)	
						Anthropogenic	Natural
60	Pashur	AOM	Khulna 21°48'46.19"N 89°43'9.40"E	DoF/FD/DoE	Same as above	Same as above	Same as above
61	Dacope	AOM	Khulna 22°24'46.49"N 89°26'52.07"E	DoF/FD/DoE	Same as above	Same as above	Same as above
62	Rampal	AOM	Khulna 22°33'10.48"N 89°38'57.17"E	DoF/FD/DoE	Same as above	Same as above	Same as above
63	Munshigonj	AOM	Satkhira 22°16'16.25"N 89°11'58.48"E	DoF/FD/DoE	Same as above	Same as above	Same as above
64	Ashashuni	AOM	Satkhira 22°31'42.82"N 89°10'48.16"E	DoF/FD/DoE	Same as above	Same as above	Same as above
65	Koyra	AOM	Khulna 22°21'4.35"N 89°16'28.61"E	DoF/FD/DoE	Same as above	Same as above	Same as above
66	Shibsa	AOM	Khulna 21°59'39.77"N 89°32'17.31"E	DoF/FD/DoE	Same as above	Same as above	Same as above
67	Nolian	AOC	Khulna 22°25'33.68"N 89°27'7.92"E	DoF/FD/DoE	More or less same as Chalna	Same as above	Same as above

* Area of significance (AOS), (b) Area of interest (AOI), (c) Area of curiosity (AOC) and (d) Area of mind (AOM)

**FD: Forest Department; DoF: Department of Fisheries; PC: Parjatan Corporation (Tourist Bureau); DoE: Department of Environment





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Annexure

Annex 1: Renewable and Non-Renewable Marine Resources

1.1 Fishes

Bangladesh's coastline is un-broken and made up mostly by silt and sand with almost no stony beaches. The coastline is roughly 714 km, the EEZ comprises an extended shallow continental shelf. The EEZ has been extended to 118,813 km² after a verdict of ITLOS in 2012 and 2014. The marine waters and coastal waters of Bangladesh are rich in diversity of fish and shellfish resources.

Over 400 species have been recorded (the latest count documented 402 marine species by Asiatic Society in 2009) of finfish including sharks and rays, shellfish including 36 species of shrimp and non-traditional species such as cuttle fish, octopus, oysters and mussels.

1.1.1 Fish Resources

More than 90 species are commercially important of which hilsa fish is contributes over 40% of coastal landing. Commercially, important species include the black-finned shark (*Carchahinus melanopterus*), Hammerheaded shark (*Eusphyra blochii*), Blue-spotted sting ray (*Dasyatis kuhlii*), Sawfish (*Pristis microdon*), and Devil ray (*Mobula diabolus*) among cartilaginous fishes. Other commercially important bony fishes include Wolf herring (*Chirocentrus dorab*), Bombay-duck (*Harpadon nehereus*), Conger eel (*Congresox telabonoides*), Flat-head mullet (*Mugil cephalus*), Fourfinger threadfin (*Eleutheronema tetradactylum*), Giant-sea bass (*Lates calcarifer*), Lady-fish (*Sillago sihama*), Bluefin trevally (*Caranx melampygus*), Mackerel scad (*Scomberoides commersonnianus*), Triple-tail (*Lobotes surinamensis*), Long jewfish (*Otolithoides pama*), Panna croaker (*Panna microdon*), Indian mackerel (*Rastrelliger kanagurta*), King mackerel (*Scomberomorus commerson*), Pomphret (*Pampus argenteus*), Whipfin mojarra (*Gerres filamentosus*), Red grunter (*Pomadasys argenteus*) etc^{4a}.

1.1.2 Fish diversity

All fish recorded from the Bangladesh EEZ are edible, but not all of those are consumed as food by

the majority of the population. Sharks, rays, and many others like clams, oyster, abalone, crabs, other gastropods, and cephalopods are not commonly eaten. Some species have a market elsewhere and are harvested and exported. We do not know the detailed the ecological, symbiotic or biodiversity related significance of most of the marine organisms in the EEZ. There are 51 species of cartilaginous fishes recorded from Bangladesh of which 26 are sharks^{4a} (carpet shark, zebra shark, whale shark, requiem shark, hound shark and Hammerheaded shark) under three orders and nine families. There are 19 species of rays (butterfly rays, sting rays, eagle rays, devil rays, and cow nosed rays) under a single order and five families.

Electric rays (family: Narcinidae) include three species^{4a}, saw fishes (family: Pristidae) include 3 species and guitarfishes (family: Rhinobattidae) include only four species. The whale shark is the largest shark in Bangladesh waters, with a length of 50 feet. This is also the largest living fish in the world that is a filter feeder. This shark feeds primarily on plankton, which it collects on a sieve-like mesh over its gills. It may also feed on other pelagic species, which comes into its huge mouth while straining the water^{4a}.

In the order Elopiformes, there is a single family (Elopiade), a single genus and a single species, the big eye herring or Lady Fish (*Elops machnata*). Little information is available on these species.

There are 12 species of marine eels in EEZ of Bangladesh in four families and nine genera. Marine eels carry no commercial importance in Bangladesh and these are relatively less studied fish species in the country.

The order Clupeiformes includes the most important marine fishes of the country, the herrings, anchovies and big eyes; including the national fish hilsha. This group contributes roughly 40 percent of the total marine catch in Bangladesh. This group is rich with record 14 genera and 24 species under four families.

Siluriformes is another group of fishes (Order) including catfishes. This group under a single family with nine genera and 18 species. All marine catfishes belong to this group of bottom dwelling

^{4a} Rahman, A.K.A., Kabir, S.M.H., Ahmed, M., Ahmed, A.T.A., Ahmed, Z.U., Begum, Z.N.T., Hasan, M. A. and Khondker, M. (eds.), 2009. Encyclopedia of Flora and Fauna of Bangladesh Vol.. 24. Marine Fishes. Asiatic society of Bangladesh, Dhaka 485 pp.

fleshy fishes are highly commercial in the country. Aulopiformes are commonly known as Grinners. A few species, like Bombay Duck (*Harpodon nehereus*), are highly commercial in Bangladesh. This Order of fish includes a total of eight species under three families.

Gadiformes with two families and only three species under three genres is one of the smallest groups of fish. This group of fish has almost no commercial value.

Ophidiiformes is the family of Cusk eels, not commercial and having a few representative species in living conditions. So far in Bangladesh waters two species in one family and two genera were identified.

The fish belonging to the Order Lophiiformes though not commercial has an interesting group of deep sea fishes popularly known as Monk fish. There are three families under the order with three families, three genera and only three species that have been identified.

The flying fish, garfishes and halfbeaks belong to the order Beloniformes. There are three families in the order and eight genera in those families. So far, a total of 11 species in eight genera in this order have been identified in Bangladesh waters.

The Spinyfishes, Eequirrel fishes and Slimeeheads belong to the order Beryciformes and have three families with five species. Some of these species carry economic significance like white tail squirrelfish.

The Order, zeiformes have only two families, two genera and two species. These fish have no commercial importance and are some of the least studied species.

The famous and popular sea horse fish falls in the category of Syngnathiformes with two families and three species.

The colourful and pretty Scorpion fishes and flatheads belong to the order Scorpaeniformes. This group has six families and 11 species. These species have minor economic value, except as ornamental fish.

Perciformes is by far the largest group of fish in Bangladesh waters. Almost half of recorded species in the EEZ of country belongs to this order. There are 53 families recorded so far, with over two hundred species. Many of them are commercially important. Among the commercial important families are; Serranidae, Theraponidae, Priacanthidae, Sillaginidae, Lacteriidae, Rachycentridae, Carangidae, Coryphaenidae, Leiognathidae, Lutjanidae, Gerreidae, Haemulidae, Sparidae, Lethrinidae, Nemipteridae, Scaenidae, Serranidae, Pomacentridae, and Polynemidae.

Carangidae is the largest family of Perciformes fish which includes mackerels and scads. There are record 29 species in 16 genera. Most species of this group are fast moving, highly predatory that hunt in the waters above reefs.

Groupers of the family Serranidae is a large family of marine fishes characterized by an oblong body, more or less compressed, covered with adherent scales of moderate or small size. Most of the species in the group inhabits inshore coral reefs. There are ten species under four genera.

Drums croakers (Family: Sciaenidae) are commercially important fishes known to produce drumming sound with the aid of their swim bladder. There are about 14 species under ten genera in the EEZ of Bangladesh.

The demersal fishes of the family Pomacentridae are one of the most abundant groups of coral reef fishes. Few are more than 15 cm in length, and are typically brightly coloured. They are deep bodied, active and aggressive with a small mouth. They display remarkable diversity with regard to feeding habits and behavior. There are 13 species under ten genera in EEZ of Bangladesh.

Snappers of the family Lutjanidae have deep body, a continuous slightly notched dorsal fin, and a slightly forked tail fin. There are ten species in this family under a single genus. These are important food and sports fish in Bangladesh waters.

Scombridae is the family of the mackerels, tuna, and bonitos, including many of the most important and familiar food fishes. The family is represented by ten species under seven genera in Bangladesh part of the Bay of Bengal.

Table : List of fish species under threat of extinction currently or in long run (IUCN, 2000)

Species	Common Name	Status in BD Waters	Presence in IUCN Red List
<i>Carcharhinus dussumineri</i>	Wide cheek shark	Near Threatened	Yes
<i>Carcharhinus falciformis</i>	Silky shark Stickle shark	Vulnerable by overfishing	No
<i>Carcharhinus macroti</i>	Hardnose shark	Near Threatened	Yes
<i>Glyphis gangeticus</i>	Ganges Shark	Critically endangered	Yes
<i>Rhizoprionodon acutus</i>	Milk shark	Vulnerable by overfishing & pollution	No
<i>Eusphyra blochii</i>	Winghead shark	Near Threatened by harvest	Yes
<i>Sphyrna lewini</i>	Scalloped Hammerheaded	Threatened worldwide not in BD	No
<i>Gymnura poecilura</i>	Long tail butterfly Ray	Vulnerable by overfishing	No
<i>Aetobatus narinari</i>	Spotted Eagle Ray	Near Threatened	No
<i>Aetomylaeus nichofii</i>	Banded Eagle Ray	Vulnerable by overfishing	No
<i>Mobula japonica</i>	Spinetail Mobula	Very high Vulnerability	Yes
<i>Anoxypristis cuspidata</i>	Saw shark	Endangered	Yes
<i>Pristis microdon</i>	Lonetooth Sawfish	Endangered	Yes
<i>Gymnothorax favagineus</i>	Leopard Moray	Very rare	No
<i>Escualosa thoracata</i>	White sardine	Overfishing by set bag-net	No
<i>Plotosus lineatus</i>	Striped catfish	Overfishing	No
<i>Hippocampus kuda</i>	Sea-horse	Threatened	Yes
<i>Epinephelus lanceolatus</i>	Giant grouper	Threatened	No
<i>Epinephelus malabaricus</i>	Malabar grouper	Overfishing	No
<i>Lutjanus gibbus</i>	Hampback snapper	Overfishing	No
<i>Pamadasys argenteus</i>	Silver grunter	Threatened by over fishing	No
<i>Pamadasys hasta</i>	Lined silver grunter	Threatened by over fishing	No
<i>Mulloidichthys vanicolensis</i>	Yellow-fin goatfish	Threatened due to coral destruction	No
<i>Upeneus sulphureus</i>	Sulphur goatfish	Threatened due to coral destruction	No
<i>Sphyaena barracuda</i>	Great Buarrakuda	Rare in Bangladesh water	No
<i>Eleutheronema tetradactylum</i>	Fourfinger threadfin	Overfishing	No
<i>Leptomelanosoma indicum</i>	Indian treadfin	Overfishing	No
<i>Polydactylus sextarius</i>	Blackspt threadfin	Overfishing	No
<i>Thunnus obesus</i>	Bigeye Tuna	Vulnerable	Yes
<i>Xiphias gladius</i>	Swordfish	Rare in BD waters	No
<i>Makaira indica</i>	Sail fish	Rare in BD water	o
<i>Pampus argenteus</i>	Silver Pompret	Overfishing	No
<i>Pampus chinensis</i>	Chinese Pompret	Overfishing	No

Threadfins (*Polynemidae*) resemble mullets but are different group of fish. The Indian salmon (*Leptomelanosoma indicum*) was one of the most prized and important fish in Bangladesh but is currently rare. There are records of existence of six species of this group of fish under four genera.

The Gobies, which are considered very prominent among the fish fauna of Bangladesh, are a diversified group. The commonest of all gobies in Bangladesh is the Bele or Bailla. The mud skippers are also belongs to this group.

Scorpaeniformes with six families and 14 species in Bangladesh waters is also a fairly big group of fishes. They have large, heavily ridged and spined head and also possess venomous spine at dorsal side.

1.1.3 Fish Species under threat of extinction

A total of 402 marine fish species has been listed as marine fish fauna in Bangladesh waters of EEZ. Out of these species, 33 are listed as threatened (table-2). However, only those which are listed in IUCN Red List (IUCN, 2000) as endangered species needs special protection.

There are certain marine fish, which may be threatened elsewhere but are relatively abundant in Bangladesh. Endangered, threatened and extremely rare and on the verge of extinction species in Bangladesh EEZ are listed below.

1.2 Crustacean

Crustaceans are a large group of arthropods, comprising roughly 52,000 species^{4b}. The majority are aquatic, living in either fresh water or marine environments, but a few groups like terrestrial crabs, terrestrial hermit crabs and wood lice have adapted to terrestrial life. Most are free living but a few are parasitic and sessile. So far 185 (under 89 genera and 45 families) species of crustaceans have been identified and described in detail from Bangladesh's marine and brackish water ecosystems.

Most of the crustaceans are minute and are food organisms for other aquatic animals.

Unfortunately, the ecological importance of most of the crustacean species, role in marine food chain, complex life cycles of associated organisms, their role within intra and inter- species relationships are not well understood. Besides some planktonic crustacean, notably copepods are used as live food organisms in hatcheries and some shrimps as food for farmed animals. Biology and ecological relationships of the most of marine crustaceans have not been studied yet.

Out of the hundreds known crustaceans' species, only a few are commercially harvested. Most of these are shrimps, crabs and lobsters. The rest of the crustaceans are mostly unknown.

1.2.1 Shrimps and shrimp like creatures^{4b}

Most shrimp species are edible. However exploitation and commercial harvesting of shrimp from the marine environment is dependent on their body (tail usually) meat content and market value.

1.2.2 Mantis shrimp

Mantis shrimps are elongated, flattened and shrimp-like or lobster like crustaceans. These groups are found in shallow bottom of sub-tropical seas. Mantis shrimp has little economic value in Bangladesh but is considered a delicacy elsewhere in the world. In Bangladesh these marine creature are non-target species and when harvested in bulk used to produce fish-feed.

1.2.3 Mantis shrimp diversity

Only a few species of this group from Bangladesh EEZ have been identified and described. Little work on this group of marine fauna has been done. All Mantis shrimp found in Bangladesh have almost no economic importance other than as raw material for low quality fish feed.

1.2.4. Mantis Species under threat of extinction

We know little about these creatures, their ecological relationship with other animals or their role on marine habitat and food chain. However, their presence in marine bottom by-catch indicates

^{4b} Ahmed, A.T.A., Kabir, S.M.H., Ahmed, M., Rahman, A.K.A., and Haque, E.U., Ahmed, Z.U., Begum, Z.N.T., Hasan, M. A., and Khondker, M. (eds.). 2008. Encyclopedia of Flora and Fauna of Bangladesh, Vol.18. Part II. .Arthropoda: Crustacea. Asiatic society of Bangladesh, Dhaka 226 pp.

that these creatures are not threatened in the EEZ of Bangladesh.

1.2.5. Shrimp^{4b}

The biology, ecology, habitat and reproductive cycles of commercially important shrimp species have been studied in detail. Most commercial shrimps are in the order of decapods, like other important groups of crabs and lobsters.

1.2.6 Shrimp diversity^{4b}

The EEZ of Bangladesh is rich with shrimp fauna. As mentioned above, mostly marine shrimps are incorporated in eight families (Penaeidae, Solenoceridae, Sergestidae, Atyidae, Palaemonidae, Alpheidae, Hippolytidae and Pandalidae), 18 genera and altogether 58 species. Some of the 58 species also live in freshwater and brackish water but for a few water species, the life cycles is not complete without movement in salt water.

Most popular species of marine shrimp, the penaeid are extensively harvested because of its demand in the world market. Their protection needs are urgent and declaring MPA can save some of these species from overexploitation.

Another important penaeid shrimp genus is *Metapenaeus*, which has 6 species. These all are also relatively large shrimps and important food organisms and are also over-fished. For some species of *Metapenaeus* and *Penaeus* the demand can't be met with wild supply and extensive studies on their life cycles has lead to mass seed production in hatcheries and commercial farming. Besides these two commercial genera, the other six genera *Parapeneopsis* has 5 species, *Metapenaeopsis* has 1.

The family Solenoceridae with its one genus has four species; family Sergestidae has one genus with four species. Similarly, family Atyidae that mostly contains fresh water has four species. Family Palaemonidae contains shrimp of both freshwater and marine species. Fresh water giant prawn, the largest shrimp among decapods belongs to this group. This family of *Hassix* genera has largest genus *Macrobrachium* with 12 species. The seven

remaining genera each have a single species. The family, Alpheidae has one genus and a single species. Similarly, family Hippolytidae is with a single genus and species. The family, Pandalidae is also with a single genus and species.

1.2.7. Shrimp species under threat of extinction

Out of 58 species of shrimp identified and studied in EEZ of Bangladesh, estuaries and river mouth most are commercial in nature and extensively harvested. There is heavy fishing pressure on "*Penaeus indicus*, *P. latisulcatus*, *P. monodon*, *P. penicillatus* and *Metapenaeus affinis* are relatively larger sized shrimps. This is evident by gradual decline of their commercial landings. However, none of the species is listed as threatened or endangered.

There is real danger with *P. monodon*, the black tiger shrimp, their broods are systematically caught for the hatcheries for seed production, their post larvae (PL) are indiscriminately harvested with mosquito nets in estuaries and sea beaches. Their existence is not yet endangered and not on the Red List of IUCN, but this species needs special protection for biological as well as protection of livelihoods of fisher communities. *Metapenaeus* and *Parapanopsis* genera also contain some species, which are relatively smaller in size but have commercial importance. None of these species are threatened.

Besides, one major commercial important fresh-cum-brackish water species *Macrobrachium rosenbergii* is subjected to over fishing due to brood, food and post larvae (PL) harvest from nature. As a species they do not face danger of extinction, but their stock is rapidly declining in natural habitat.

1.2.8. Lobster^{4b}

There are no broken sea coast and stony beaches and sea bottom, which can be defined as lobster beds. Therefore, lobster resources in EEZ of Bangladesh are few and commercially exploitable stocks are small. Lobster landing are considered as accidental catch with other bottom fish. However, high export prices and demand has created a situation which encourages fishermen to device new methods of lobster fishing.

^{4b} Ahmed, A.T.A., Kabir, S.M.H., Ahmed, M., Rahman, A.K.A., and Haque, E.U., Ahmed, Z.U., Begum, Z.N.T., Hasan, M. A., and Khondker, M. (eds.). 2008. Encyclopedia of Flora and Fauna of Bangladesh, Vol.18. Part II. .Arthropoda: Crustacea. Asiatic society of Bangladesh, Dhaka 226 pp.

1.2.9. Lobster diversity

The few species of lobster have been categorized into two families; Palinuridae (spiny lobster and langoustes) and Scyllaridae (Slapper lobster). The Palinuridae family has only one genus and three species, all are commercial in nature and harvested and exported. Both spiny and mud lobsters from Bangladesh has good demand abroad. The beautifully colored spiny lobster and its juveniles are recognized as aquarium specimen. The family Scyllaridae has a single genus and a single species.

1.2.10. Lobster species under threat of extinction

Out of four species of lobsters identified and studied in Bangladesh are scarce but not threatened in any respect. Low fishing pressure on all four species is a good sign for their survival. All four species have high market demand and also fetch good market price. Most of the harvested specimens are exported and very few lobsters are served in different restaurants of Bangladesh. None of the species is listed as threatened or endangered.

1.2.11. Hermit crabs^{4b}

Hermit crabs have appendages like crabs, but their tail is fused and they make a nest inside a shell of molluscs by attaching the fused tail parts inside the wall of the shell. These animals are mostly marine, but some of the species lives on land and have adapted to terrestrial life. They are not commonly eaten in Bangladesh and have no commercial value but the accidental catch by bottom trawling is sometimes used in poultry feed as calcium source. Their role in the aquatic ecosystem is not well understood. In this report only sea based hermit crabs are included though there are land based species of this group.

1.2.12 Hermit crabs diversity

There are two families, one lives in shallow water and the other in deep water habitats. Both families have one genus each and only one species in each genus. Since they nest inside a suitable shell of a mollusc, in ancient times based on types of shells they were categorized as different species. Now,

based on the creature inside the shell, the number of species has greatly reduced. In Bangladesh waters there are only two species; *Pagurus bernhardus* (shallow water hermit crab) and *Parapagurus nudus* (deep water hermit crab). However, the number and types of hermit crabs are not complete yet. Further studies are necessary as these were identified based on landings and not collection from the sea bed.

1.2.13 Hermit crabs species under threat of extinction

We know very little about the ecology of these species. The only man-made threat to the hermit crabs is pollution. Their complex lifestyles may limit their population and ultimately threaten their existence.

1.2.14 Crabs^{4b}

Crabs are an important sea food and considered a delicacy in many parts of the world. Crab meat is eaten only by a minority of the population in Bangladesh and crabs were not extensively harvested earlier until the export market opened opportunities. Still there is limited demand domestically and most of the crabs are exported either live or frozen.

There are indications that some species of crabs, especially those lives in inter-tidal zone or in mud-flats in mangrove forested areas are over fished. Due to its commercial prospect, coastal dwellers currently practice crab fattening. The practice is gaining popularity among coastal fishers as an alternative livelihood option.

1.2.15 Crabs diversity

Crabs are one of the dominant groups of decapods after shrimps. Bangladesh waters harbor a large variety of crabs. There are 11 different families and most families includes species which are marine. Out of 11 families only two families are exclusively fresh water, the rest are partly or wholly marine. There are 36 species of crabs in Bangladesh under 22 genera; and most of them are marine as mentioned earlier. The largest crab families are Ocypodidae and Dardorfidae with nine species under three genera and nine species under four

^{4b} Ahmed, A.T.A., Kabir, S.M.H., Ahmed, M., Rahman, A.K.A., and Haque, E.U., Ahmed, Z.U., Begum, Z.N.T., Hasan, M. A., and Khondker, M. (eds.). 2008. Encyclopedia of Flora and Fauna of Bangladesh, Vol.18. Part II. .Arthropoda: Crustacea. Asiatic society of Bangladesh, Dhaka 226 pp.

genera, respectively. The family Portunidae also has genera and eight species. The rest of the crab families are less diverse with lesser number of genus and species. The family Carpilidae has a single genus and a single species. Similarly, Potamidae has two genera with only two species. Parathelusidae has one genus and one species; Varunidae with two genera has two species. The family Grapsidae has four genera but only five species.

1.2.16 Crabs species under threat of extinction

Crabs in Bangladesh are not in danger of extinction, though some species are under heavy fishing pressure like mud crab (*Scylla olivacea*) and mangrove crab (*Scylla serrata*). These two crabs are commercially collected from coastal muddy areas, Sundarbans and other mangrove forest shores. These species are vulnerable to humans as they live in shore in the inter-tidal zones and burrow holes in the soft mud, at low tide. Fishers can easily identify their holes on exposed mud and collect them. Habitat protection and species conservation through strict implementation of environmental regulations and proper stock management is needed. The FD sometimes imposes seasonal bans on crab harvest in the Sundarbans, but that is not a permanent measure.

1.3 Molluscs^{4c}

Molluscs are a large group of invertebrates, comprising thousands of species worldwide on land and in water. Some molluscs are famous and appreciated sea food, like cephalopods (squid and cuttle fish), abalone, oysters, clams, mussels and scallop. The majority are aquatic, living in freshwater, brackish waters or marine environments. The majority are sessile, but a few are parasitic. They constitute an important component of the marine biodiversity of Bangladesh. A total of 437 marine and brackish water molluscan species have been discovered in Bangladesh waters.

Only a few mollusc species are commercially harvested, most of them for human and/or animal food. Shrimp farming in Bangladesh uses molluscan meat; shells of molluscs are used to prepare moist calcium carbonate. In Bangladesh currently a thriving industry has been formed to crush

mollusc shells and used in poultry feed where high egg yielding poultry birds need adequate calcium.

1.3.1 Molluscan diversity

Molluscs are of four classes; polyplacophora, gastropoda, cephalopoda and bivalvia; and as mentioned above have 20 orders in four classes; 90 families and 437 species in Bangladesh marine and brackish water environments^{4c}. By far, gastropoda and bivalvia are the two largest groups. Some species of three classes of molluscs are edible and considered a delicacy in many countries are endangered due to over fishing. However, in Bangladesh local people except some indigenous groups do not eat shell fishes and no species of the molluscan group are considered endangered or threatened due to anthropogenic activities.

The genus, Cypraea with 30 species is the biggest genus of molluscs in Bangladesh waters, under the family of Cypraeidae, order Mesogastropoda and class gastropoda. The second largest genus of molluscs is Conus with 14 species in the family of Conidae, order Neogastropoda under also in class gastropoda. Genus Oliva is also a large group with 12 species in the family of Olividae, also in the order Neogastropoda; followed by genus Thais with 11 species in sub-family of Thaidinae, family Muricidae and also in order of Neogastropoda. Genus Nerita under family Neritidae order gastropoda contains 10 species. Other species rich genus are Strombus (nine species, family Vermetidae); genus Mitra (nine species, family Mitridae); genus Tellina (seven species, family Tellinidae); genus Nassarius (seven species, family Nassariidae); genus Mactra (seven species, family, Mactridae); genus Natica (six species, family Naticidae); genus Crassostrea (six species, family Ostreidae); genus Donax (six species, family Donacidae). Besides, these families and their representative genera and associated species, there are many others in the mollusc group.

1.3.2 Molluscan species under threat of extinction

Unlike fish, molluscs can't be harvested using conventional nets. Special devices are needed to collect them. Because shell fishes are not usually consumed locally and no species are exported they are not threatened by fishing pressure.

^{4c} Siddiqui, K.U., Islam, M.A., Kabir, S.M.H., Ahmad, M., Ahmed, A.T.A., Rahman, A.K.A., Haque, E.U., Ahmed, Z.U., Begum, Z.N.T., Hassan, M.A., Khondker, M. and Rahman, M.M. (eds.). 2007. Encyclopedia of Flora and Fauna of Bangladesh, Vol. 17. Molluscs. Asiatic Society of Bangladesh, Dhaka 415 pp.

Few studies have been conducted on molluscan population, its biology, life cycle, habitat, ecosystem and biodiversity. So, it is difficult to say whether there is any other cause apart from human intervention, that may threaten their existence.

1.4 Cephalopods^{4c}

Worldwide, cephalopods are appreciated as sea food. Octopus, squid and cuttlefish fisheries are popular cuisines in some countries. In Bangladesh, mainstream population do not eat them, may be due to their appearance and myths about these marine creatures. Cephalopods are used as food by some tribal people and also used as animal feed in shrimp and poultry farming industries. All cephalopods in Bangladesh are accidental catch.

1.4.1 Cephalopods diversity

There are ten species of cephalopods recorded in Bangladesh waters; commonly known nautilus one species in one genera (Nautilus); three cuttle fish species (two species in the genera of Sepia and one species in Sepiella), two species of squid (one each in Lololus and Photololigo genera) is also available in EEZ. There are four reported species of octopuses (one under Cistopus and three under Octopus).

1.4.2 Cephalopods species under threat of extinction

Cephalopods are a small group and almost no studies on this important group of commercially important species have been done. All information on this group comes from elsewhere. Ten species have been reported from Bangladesh waters. Most the cephalopods are accidentally caught during fishing and usually dried on the open beach to be used in poultry and shrimp industries as feed. Since their stock is unknown and there is no organized fishing, it is difficult to ascertain their status or vulnerability.

1.5 Marine Reptiles^{4d}

So far, 17 species of marine reptiles have been reported in Bangladesh. The marine reptiles are categorised into three families, of which only one

crocodile species (*Crocodylus porosus*), family Crocodylidae is not true marine but lives in coastal swamp, estuaries, coastal rivers and mangrove forest mainly in Sundarbans.

Beside crocodiles, the other major group of reptiles that requires protection is green marine turtle, long headed turtle, Hawksbill turtle etc.

1.5.1 Marine reptiles diversity

The most famous marine reptile in Bangladesh is salt water crocodile (*Crocodylus porosus*), family Crocodylidae. Besides crocodiles, other famous marine reptiles are turtles, but unlike crocodiles, turtles illustrate little more diversity. There are two families of sea turtles in the sea areas of Bangladesh; family Cheloniidae contains four species under four genera. The other family, Dermochelidae has a single genus and one species.

Out of the five species of marine turtles which occur in Bangladesh, only three species have been confirmed to nest in Bangladesh waters. Among them, Olive Ridley (*Lepidochelys olivacea*) and Green Turtles (*Chelonia mydas*) are common, while Hawksbills (*Eretmochelys imbricata*) are rare. There has been one anecdotal nesting record of a Loggerhead (*Caretta caretta*).

Olive Riddleys nest on sandy beaches all along the mainland coast and islands stretching from the Sunderbans mangrove forest in the southwest (Dimerchar of Sundarban West Sanctuary and Dublar char of the Sunderbans, Bagerhat), to Dolghata of Moheshkhali, Cox's Bazar and Bordail area of Cox's Bazar-Teknaf and St. Martin's Island in the southeast.

A total of 19 nesting sites have been identified in Bangladesh. Those are Bordal, Cox's Bazar-Teknaf Peninsula, Dubla Island (Dublar Char), Egg Island (Dimer Char), Hiron Point, Inani, Katka Beach, Kocchopia, Kutubdia Island, Mandarbaria, Moheshkhali Island, Monkhali, Najirertek, Nijhum Dwip, Sandweep Island, Shahporir Dweep, Sonadia Island, Teknaf and St. Martins Island.

Harvesting of marine turtles is illegal under the Bangladesh Wildlife (Conservation and Security) Act, 2012 and also under the Environment

^{4c} Siddiqui, K.U., Islam, M.A., Kabir, S.M.H., Ahmad, M., Ahmed, A.T.A., Rahman, A.K.A., Haque, E.U., Ahmed, Z.U., Begum, Z.N.T., Hassan, M.A., Khondker, M. and Rahman, M.M. (eds.). 2007. Encyclopedia of Flora and Fauna of Bangladesh, Vol.17. Molluscs. Asiatic Society of Bangladesh, Dhaka 415 pp.

^{4d} Encyclopedia of flora and fauna of Bangladesh, vol. 26. Amphibian and Reptiles. Asiatic Society of Bangladesh, Dhaka.

Conservation Act, 1995. Use of Turtle Exclusion devices (TEDs) is limited at present. However the Government of Bangladesh (GOB) has given a blanket protection to all wildlife including marine turtles. The Environment Conservation Act 1995 has restricted killing or capturing of marine turtles. They have been included in the list of protected animals in the revised Bangladesh Wildlife (Conservation and Security) Act, 2012.

“One or two important nesting sites (among the 19 nesting sites) should be declared as protected area so that any future alterations of the nesting sites could be ensured.”

The nesting areas may be included in the proposed MPAs. If not, they should be highlighted and prioritized for protection.

Besides, crocodiles and turtles, other important marine reptile groups are sea snakes. There are eleven species in Bangladesh belonging to a single family, Hydrophiidae.

Eleven sea snakes are in five genera of which the genus *Hydrophis* has seven species. The remaining genera have a single species each.

1.5.2 Marine reptiles species under threat of extinction

All sea reptiles other than the sea snakes in Bangladesh are endangered animals. The number of marine crocodiles has become so low that once it was considered almost extinct. Fortunately, efforts by FD to artificial by breed and restock the creature in Sundarbans creeks and rivers may have lifted the danger of their extinction. However, release of few dozens of crocodiles in an ecosystem of several thousand km² is not enough to increase the population. The hatchery produced baby crocodiles are somewhat domesticated and vulnerable to predation especially during early stages.

All sea turtles in Bangladesh waters are endangered. The causes of the decline of sea turtles are various; accidental catch by fishers at sea and their accidental death due to being submerged in the nets. Besides getting accidentally caught by fishers, humans have greatly hampered turtles collecting their eggs as they are considered

as delicacy among the tribal people in Bangladesh. Besides human and dogs, other land-based reptiles and rodents steal turtle eggs.

Turtles do not guard the eggs in incubation, so the mortality is high. There were initiatives by some development organizations including IUCN to protect marine turtles by collecting fertilized eggs incubating, nursing them and then releasing them in the open sea.

Sea snakes are not harvested commercially or intentionally and are not considered as endangered animals. Sea snakes are not used in any form in Bangladesh and little research has been done on these marine creatures. It may be mentioned that all marine reptiles need terrestrial habitat for reproduction and all of them bury fertilized eggs in sand dunes that makes their eggs vulnerable to predators.

1.6 Marine Birds^{4e}

Some bird families like Laridae are generally considered sea birds as they spend most of the time on sea and exclusively prey on sea animals, mostly fish. Other marine birds use their resting places on islands or seas coast, on either trees or rocky shores, cliffs, side of mountains adjacent to sea.

Many birds are seen to circle and prey on fishing boat discards and fishing boats and fish trawlers are surrounded by sea birds. Sea gulls were from ancient times considered as friends of sailors and in absence of modern navigational equipment indicate sailors that they are close to land.

1.6.1 Marine birds diversity

The sea bird family, Laridae are medium to large seabirds with stout bill, webbed feet and generally rounded tails. Most of the species of the family are easy to identify by observing the white belly, pale grey to black back and wings, some with dark hood during breeding season. The family Laridae has 20 species in Bangladesh though it is reported that worldwide total number of bird species in the family is over 120 species.

There are six genera with 20 species and one genus contains nine species. Major types are jaeger

^{4e} Siddiqui, K.U., Islam, M.A., Kabir, S.M.H., Ahmad, M., Ahmed, A.T.A., Rahman, A.K.A., Haque, E.U., Ahmed, Z.U., Begum, Z.N.T., Hassan, M.A., Khondker, M. and Rahman, M.M. (eds.). 2008. Encyclopedia of Flora and Fauna of Bangladesh, Vol. 26. Birds. Asiatic Society of Bangladesh, Dhaka.662 pp.

(*Stercorarius parasiticus*), pomarine skua (*Stercorarius pomarinus*), indian skimmer (*Rynchops albigollis*), brown headed gul (*Larus brunnicapillus*), yellow legged gull (*Larus cachinnans*), heuglin's gull (*Larus heuglini*), great black headed gull, (*Larus ichthyaeetus*), common black-headed gull (*Larus ridibundus*), gull-billed tern (*Gelochelidon nilotica*), black headed gull (*Sterna acuticauda*), little tern (*Sterna albifrons*), river turn (*Sterna aurantia*), lesser crested tern (*Sterna bengalensis*), swift tern (*Sterna bergii*), caspian tern (*Sterna caspia*), common tern (*Sterna hirundo*), sandwich tern (*Sterna sanvicensis*), black-naped tern (*Sterna sumatrana*), whiskered tern (*Chlidonias hybrida*), and white-winged tern (*Chlidonias leucopterus*). Besides, Herons, egrets, diving ducks, fish-eagles, ibises, sandpipers, spoonbills, plovers and their allies, some of which are winter migrants to coastal marine habitats may also be included in the marine birds.

1.6.2 Marine birds species under Threat of extinction now or in long run

Work on birds in Bangladesh is scarce and research on sea birds is almost nil. Therefore, the status of sea birds with regard to vulnerability is difficult to ascertain. Since Bangladesh does not have any barren hilly islands, dense human population in coastal areas may become a danger for sea birds. Detailed studies on sea birds, their habitat, life style, reproductive cycle and migration is urgently needed.

1.7 Cetaceans (Marine Mammals)^{4f}

Marine mammals are whales, dolphins and porpoises and they are the largest creatures on earth. Except sperm whales, killer whales and dolphins, most cetaceans are not carnivore and feed on fish shoals, thus affecting livelihoods of fishers. The BOB is not a rich ground for whales or dolphins. Information on the occurrence of marine mammals in Bangladesh waters is scarce and insufficient.

The term marine mammals essentially includes all mammals, which thrive in the sea and its adjacent habitats and depend on its contents for their lives. Except cetaceans, not all marine mammals spend their lives in water. Cetaceans can't survive out of water though all marine mammals need air to

breath. However, sea lion, seal, beavers spent considerable periods of time on the sea shore and are in the sea only when they prey for food. The young marine mammals other than cetaceans spend their childhood on shore and depend on their parents for milk and initial external food. The rich mammal grounds are usually found in colder regions of the sea and ocean.

The world's second largest documented population of Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) lives at the northern tip of the Swatch-of-No-Ground (SoNG) in Bangladesh. The Eastern SRF is the only location in the world, where Asia's two last remaining species of freshwater dolphins, the Ganges River dolphin (*Platanista gangetica gangetica*) or Shushuk and Irrawaddy dolphin (*Orcaella brevirostris*), are known to co-occur. The Sundarbans and adjacent estuarine waters provide habitat for the world's largest population of Irrawaddy dolphins, estimated at about 6,000 individuals, with about 450 occurring in the mangrove forest. A population of about 190 Indo-Pacific humpbacked dolphins (*Sousa chinensis*) were individually identified through photo-ID, occupy coastal waters off Sundarbans might be a new third form or subspecies. A population of about 1,400 Finless porpoises (*Neophocaena phocaenoides*) occupies the coastal waters of Bangladesh with a small sub-population migrating into Sundarbans forest in winter. A possible year round population of Bryde's whale (*Balaenoptera edeni*) are present at the northern head of the SoNG^{4h}.

The Pantropical spotted dolphin (*Stenella attenuata*), spinner dolphin (*S. longirostris*), rough toothed dolphin (*Steno bredonensis*), and the false killer whale (*Pseudorca crassidens*) also reside at the SoNG^{4h}.

- Cetacean diversity in Bangladesh should be conserved right now, while the current population sizes of a number of species at global risk are known to be sufficient for long-term survival if threats can be reduced.
- Protected area network should be used as a mechanism for coping with and better understanding the ecological impacts of declining freshwater supplies and global climate change.

^{4f} Ahmed, A.T.M., Kabir, S.M.H., Ahmed, M., Ahmed, Z.U., Begum, Z.N.T., Hasan, M.A. and Khondker, M. (eds). 2009. Encyclopedia of Flora and Fauna of Bangladesh. Vol. 27. Mammals. Asiatic Society of Bangladesh. Dhaka. 264 pp.

- The Bangladesh Cetacean Diversity Project (BCDP) team suggested the Government of Bangladesh to declare, three new Wildlife Sanctuaries to conserve freshwater dolphins in the eastern Sundarbans mangrove forest. In January 2012, BCDP's work led to the declaration of those channel segments as Wildlife Sanctuaries under the current Bangladesh Wildlife (Conservation and Security) Act, 2012 (Fahrni and Mansur 2012⁴⁹). The first MPA was declared in 2014 in the outer marine territory of SRF.

1.7.1 Marine mammals diversity

In Bangladesh waters, 11 species of marine mammals have been reported, eight of them belong to the order Cetacea. As mentioned earlier all cetaceans are aquatic during their lives. Only the otters (order-Carnivora, family-Mustelidae) share both aquatic and terrestrial lives.

The marine mammals which have been reported from Bangladesh waters include Bryde's whale (*Balaenoptera brydei*) and the Fin Whale (*Balaenoptera physalus*) belong to the family Balaenopteridae, and sperm whale (*Physeter macrocephalus*) to the family of Physeteridae. The occasional presence of these massive creatures in Bangladesh water do not necessarily mean the Bay is their feeding, breeding grounds or migratory routes. It may be due to stray movement of the whales as fishermen did not confirm the regular/routine/seasonal presence of these whales in Bangladesh waters.

Other marine mammals reported from this part of the aquatic world include Irrawaddy Dolphin (*Orcaella brevirostris*), the indo-pacific hump-backed dolphin (*Sousa chinensis*), the Pantropical spotted dolphin (*Stenella attenuata*), the spinner dolphin (*Stenella longirostris*), and the common bottlenose dolphin (*Tursiops truncatus*) under the family Delphinidae.

Besides, Indian Ocean finless porpoise (*Neophocaena phocaenoides*) family-Phocoenidae, the short clawed otter (*Aonyx cinerea*) and the smooth coated otters (*Lutra perspicillata*) of the family Mustelidae are reported marine mammals, seen or their dead bodies caste ashore on Bangladesh coast.

1.7.2 Marine mammals' species under Threat of Extinction

We have little information on marine mammals in Bangladesh waters. The presence of big whales in BOB is not routine so it is difficult to say whether these are fauna from this part of the seas or not. This is difficult to count the population of these massive creatures and their habitat, life cycles in Bangladesh waters to determine threats to these species or whether these are endangered or not. However, large cetaceans are threatened worldwide due to poaching by the Japanese and Eskimos.

1.8 Marine Algae and Sea Weeds⁴⁹

Only a few locations along the Bangladeshi coast provide a substratum for extensive growth of algae and sea weeds. However, some areas in mangrove forest of Sundarbans with submerged tree roots and trees and in St. Martin's island few coral beds provide substratum for benthic algae and sea weed beds. Commercial prospect for the exploitation of sea weeds in Bangladesh is limited. However, it is important to protect the available marine algae and sea weed because of the limited habitats.

1.8.1 Algae and sea weeds diversity

There are reportedly 165 species of marine algae and sea weeds in EEZ of Bangladesh. 165 species belongs to 77 genera of Chlorophyta, Chrysophyta, Phaeophyta, Rhodophyta and Cyanophyta. Altogether there are 77 genera in above mentioned five groups.

1.8.2 Algae and weeds species under threat of extinction

As mentioned earlier, suitable substratum for benthic algae and sea weed growth is limited and over exploitation and habitat degradation is threatening the existing algal and seed weed beds in coastal areas in the country. Besides increased turbidity in coastal water due to top soil washout by rivers prevents transparency of coastal waters that is vital for sunlight penetration to shallow bottom for the growth of benthic algae and sea weeds.

⁴⁹ Ahmed, Z.U., Begum, Z.N.T., Hasan, M. A., Khondker, M., Kabir, S.M.H., Ahmed, M., Ahmed, A.T.A., Rahman, A.K.A., and Haque, E.U. (Eds.) 2008. Encyclopedia of Flora and Fauna of Bangladesh Vol.. 3. Algae: Chlorophyta (Aphanochaetaceae- Zygnemataceae). Asiatic society of Bangladesh, Dhaka 812 pp.

Table: List of Protected Area in the Coastal Region of Bangladesh

Sl	Protected Area	Ecosystem	Conservation Focus	Location	Area (ha.)
1.	Himchari National Park	Mixed Evergreen		Cox's Bazar	1729
2.	Kaptai National Park	Mixed Evergreen		Chittagong Hill Tracts	5464.78
3.	Nijhum Dweep National Park	Planted Mangrove Forest	Deer and Bird	Noakhali	16352.23
4.	Medha Kassapia National Park	Mixed Evergreen		Cox's Bazar	395.92
5.	Baraiyadhala National Park	Mixed Evergreen		Chittagong	2933.61
6.	Kuakata National Park	Planted Mangrove Forest		Patuakhali	1613
7.	Char Kukri-Mukri Wildlife Sanctuary	Planted Mangrove Forest		Bhola	40.00
8.	Sundarban (East) Wildlife Sanctuary	Natural Mangrove Forest	Bengal Tiger	Bagerhat	31226.94
9.	Sundarban (West) Wildlife Sanctuary	Natural Mangrove Forest	Bengal Tiger	Satkhira	71502.1
10.	Sundarban (South) Wildlife Sanctuary	Natural Mangrove Forest	Bengal Tiger	Khulna	36970.45
11.	Pabla Khali Wildlife Sanctuary	Mixed Evergreen	Asian Elephant	Chittagong Hill Tracts	42069.37
12.	Chunati Wildlife Sanctuary	Mixed Evergreen	Asian Elephant	Chittagong	7763.97
13.	Fashiakhali Wildlife Sanctuary	Mixed Evergreen	Asian Elephant	Cox's Bazaar	1302.42
14.	Dudhpukuria-Dhopachari Wildlife Sanctuary	Mixed Evergreen	Hoolock Gibbon, Elephant	Chittagong	4716.57
15.	Hazarikhil Wildlife Sanctuary	Mixed Evergreen		Chittagong	1177.53
16.	Shangu Wildlife Sanctuary	Mixed Evergreen		Bandarban	2331.98
17.	Teknaf Wildlife Sanctuary	Mixed Evergreen	Asian Elephant & common langoor	Cox's Bazaar	11614.57
18.	Tengragree Wildlife Sanctuary	Natural Mangrove Forest	Bird and Deer	Barguna	4048.58
19.	Sonarchar Wildlife Sanctuary	Planted Mangrove Forest	Bird and Deer	Patuakhali	2026.48
20.	Chandpai Wildlife Sanctuary	River/ Marine	Ganges River Dolphin	Bagherhat	560
21.	Dudmukhi Wildlife Sanctuary	River/ Marine		Bagherhat	170
22.	Daingmari Wildlife Sanctuary	River/ Marine		Bagherhat	340
23.	Middle ground and south patches Marine Reserve	Marine	Marine Fish and Shrimp	Bay of Bengal	698
24.	Sonadia Island Ecologically Critical Area	Offshore barrier island, sand dunes and mangrove habitat	Bird	Cox's Bazaar	49.16
25.	St. Martin's Island (Jiniradwip and Jinjira Reefs) Ecologically Critical Area	Coral reef habitat	Wildfowl and turtle nesting site	Cox's Bazaar	5.9
26.	Sundarbans Ecologically Critical Area	Mangrove habitat		(10km Periphery) of Sundarbans covering Bagherhat, Satkhira and Khulna	
27.	Teknaf Peninsula Ecologically Critical Area	Sandy beach	Bird, turtle and Asian Elephant	Teknaf Sea Beach, Cox's Bazar	104.65
28.	Swath of No Ground Marine Protected Area	Marine	Dolphins, Whales, Sharks, and Sea Turtles	Bay of Bengal	173800.00

Annex 3: Policy Gap Analysis

Summary

This document scrutinized policy papers, acts, policy progressions, policy draft and policy accomplishments with regards to marine stocks, capture fisheries, the marine ecosystem, marine environment, integrated coastal management (ICM), land use policy, marine environment policy, biodiversity policy in Bangladesh in the context of an important coastal delta based country participating in BOBLME (Bay of Bengal Large Marine Ecosystem) project. Bangladesh is unique among 8 countries under BOBLME as it is almost entirely a delta; a land mass that interacts with sea/ocean more intimately compared to other landmasses. The document made analysis of existing policy documents; plans, policies, ordinances, and relevant literature to find out gaps. It made policy recommendations to amend the existing policies or to formulate an entire new policy guidelines.

There are fairly large numbers of policies related papers, act, action plans, strategy papers on Bangladesh fisheries, marine fisheries, coastal zone, environment management, climate change, biodiversity etc. However, scanty information is reported on MPA or LME. Attempt was made to study/review existing policies to devise strategies and action plan in light of large marine ecosystem (LME) and suggestions for realization of action plans for renewable resources including fish, shrimps and other aquatic resources and marine environmental management. The existing policy on fisheries and marine fisheries in particular in Bangladesh has mixed success. It is true that existence of a nominal policy is better than no policy, because a policy can be the foundation for new initiative. This is not the task of an international agency. They can facilitate the initiative. It is expected the details of policy would differ between pre and post International Tribunal for the Law of the Sea (ITLOS) verdict on Exclusive Economic Zone (EEZ) between Bangladesh and Myanmar and between Bangladesh and India. Therefore, it will be necessary to develop an updated policy and methods of implementation. However, the issues included in policy and the strategies being used to manage the exploitation fisheries resources are not

based on scientific data, stocks or quantification of resources. The review suggests that the policy on the marine fisheries is not well specified and Bangladesh can improve the policy content. Greater challenges may lie in implementing the modified policy and in improving the policy processes. The main problems among the existing policies are that most of them are focused on outcomes rather than output.

Though fisheries resource exploitation policy is well documented, marine environmental policy and processes are not well established. Following an initial period of enthusiastic policy formulation in late 1980s, there has been an apparent lack of adequate review and advancement of the development of new policies or policy amendments. This has resulted in comparatively less attention given to conserve marine resources and attempts to protect marine environment and ecosystems. If the current trend continues, Bangladesh will face problems in declaring 10% of its sea area in EEZ as MPA by 2020 that was agreed upon earlier. The recent ITLOS verdict on dispute between Bangladesh and Myanmar has made the task more urgent as more areas need to be incorporated in MPA.

1. Existing Fisheries, Marine Fisheries, Environment, Biodiversity and allied Policies Review

The existing Fisheries Policy (modified and amended based on original fish act of 1950) and Marine Fisheries Ordinance are the de-facto policy papers on marine fisheries for the country. A policy may be simple guidelines with few objectives or it may be an official and well recognized law of the country and mandatory regulations used to achieve a set of given objectives. For sectoral development, each country formulates an applicable and specific national policy. The sectoral policy is the basis of efficient strategic planning in the sector and timely execution of it is important. In the past, Bangladesh had a few sectoral policies and reportedly the country adopted its fisheries policy ahead of agriculture policy. Proclamation of a sectoral policy is important and it should be considered as a living document. As such it is vital that the policies are reviewed and updated with time. Besides Marine fisheries policy there are many relevant sectoral policies in the country (appendix-1).

1.1 Major Gaps in the Existing Marine Fisheries Related Policies

1.1.1 Lack of stakeholder influences on policy formulation

It appears that the documents/policies/acts/ordinances are drafted/proclaimed without detailed background work. The procedure of setting the marine fisheries policy 1983, fisheries policy 1998 and other related documents had been adopted following a 'top down' approach where national development plan got priority in a conventional or routine manner. The policy paper reflected some elements, those that are mainly regulatory matters such as: definitions and provisions, the roles and responsibilities on the administration and impositions of the ordinance, delegation of power, license on fishing and fishing vessels, local marine fishing operations; local vessel registration, vessel certifications, local marine fishing operations; local vessel registration, vessel certification, prohibited fishing methods like use of explosives and small mesh nets and fishing gear, power of concerned authorities to regulate operational aspects of fishing vessels and policing, offences and legal procedures and power to proclaim rules/regulations. In some policy papers, a small part or sections of few lines dealt with ecosystem, habitat, marine reserves and sanctuaries. The policy formulation process did not deal with diverse stakeholders who are directly involved on sea, estuary, offshore islands, mangrove and their contents for their livelihoods as key informants on the subject.

1.1.2 Inadequate wider participation in marine development related policies

It is perceptibly necessary to be consistent with wider national marine fisheries development policy. It is progressively more evident that marine fisheries policy must also fulfill the aspiration of national interest, scientific need, protection of natural resources, and specific requirements of sector participants' at all diverse levels. Customarily, it has been observed that relatively more powerful stakeholders are in favourable positions and they generally have a greater say in policy formulation than the secondary or tertiary stakeholders. Though it is relatively unproblematic to include powerful, educated, knowledgeable and rich and larger

stakeholders, it may be difficult to ensure participations from micro, small and marginal fishers and the large number of cross-sectoral participants.

1.1.3 Insufficient local initiative to broaden marine policy

Though there are diverse policies on marine or marine related sectors, two policies are more relevant than the others. The inception of marine fisheries ordinance in 1983 and national fisheries policy in 1998 indicate that the sector is well ahead of others on policy matters. Since their inception, a number of initiatives have been taken to amend the documents but these were not enough. No serious approaches in recent years have been taken to broaden participation in policy development for conservation and protection of natural resources. International organizations like IUCN has undertaken initiatives to facilitate the fisheries policies in countries bordering the Bay of Bengal. These approaches have included more open workshop processes to develop policy, as well as the publication of 'position papers' or 'white papers' for public comment and response, in an attempt to improve transparency and provide mechanisms to increase stakeholder influence. After the recent ITLOS verdict, a lot of enthusiasm has been stirred up within the media that needs to be used to broaden marine policy.

1.1.4 Overwhelmingly bureaucratic/top down participation on decision making

The primary and vital policy setters in fisheries in general and marine fisheries policy formulation in particular typically remains the technical government staff in the fisheries ministry/department of fisheries and single research institute staff at national level with occasional participation by a few university faculties. Non-sectoral political government staff, NGOs, academicians and other stakeholders are less represented at national level. The technical fisheries staff at district and local-level are the next most influential groups. Compared to the marine fisheries ordinance of 1983, the 1998 and 2006 National Fisheries Strategies in Bangladesh were designed to shift representation towards greater community participation and consultation. However, that is not enough.

1.1.5 Influence by specific species and fishing gears

In the existing fisheries and marine fisheries policies/ordinance, it appears that this policies are influenced by interest of certain kind of fisheries (most prominently hilsa and black tiger shrimp, bagda). In Bangladesh hilsa and shrimp fisheries are thus bound by certain resolution on operations of fishing vessels, license etc. and even seasonal protection through declaration of fishing bans. Certain important fisheries may have an influence on national policy development, either through needing to conform to certain conditions or as a result of awareness developed and consequently representative participation by people associated from these groups. Environment Policy 1992 in one of its subsection advocated maintaining status-quo on exploitation of coastal and marine fishes in such a way that balance may be maintained. The Environment Conservation Rules-1997 updated the terms and condition of Environment Policy 1992 to a certain extent.

1.1.6 Lack of marine fisheries policy related review and update

In Bangladesh, it is reported that fisheries policies (that also include marine fisheries) are reviewed roughly every 5 years, but it is not a routine work and fixed. Moreover stereo-type and mechanical update is not worthwhile. Policy review to update the marine fisheries sector is not just to update the existing formal policy documents, but to take in to consideration all associated developments like ITLOS verdicts and declaration and protection of LME and MPA issues more seriously. Ad-hoc decision is not sufficient, sectoral need based formal decisions should be taken, with the participation of all concerned stakeholders. Study and research should be a deciding factor in all decision making on marine fisheries development initiatives. Policies adopted by neighboring countries/other maritime countries could be used as a living documents to validate existing policies.

1.1.7 Lack of long term policy perspective

The existing marine fisheries policies and related documents are inadequate in long term perspective for quantification, judicious exploitation, restoration

and protection of marine resources. Marine fisheries policies should be frequently reviewed, for example during every 10 year planning cycle and the review process should include concerned experts and capacity building in the area in line with changes in government policy, climatic changes, and international code of conduct with changes in strategic thinking. Fisheries research plans should be based on same planning cycle and can thus inform policy updates at national revision points. In Bangladesh when the Department of Fisheries and Bangladesh Fisheries Research Institute consider changes are necessary, some initiatives are usually undertaken.

1.1.8 Lack of marine environmental /ecosystem based policy process or proper aquatic ECA policy

Bangladesh has no marine environmental or ecosystem based policies for seas, but has some sort of national environmental planning, including biodiversity conservation strategies importantly due to awareness on climatic change issues and/or periodic requirements of Department of Environment. In the Environment Conservation Act, 1995, Government of Bangladesh agreed to declare environmentally critical region as “ecologically critical area (ECA)” by notification in the official gazette. However, separate notification is needed to ban activities considered improper in ECAs. Environment Policy 1992 in its one of the sub-section advocated preserving coastal and marine ecosystems. Bangladesh environment protection law-1995 also outlined need for ECA declaration, if such situation arises. The Environment Conservation Rules 1997 updated policy related issues concerning coastal and marine ecosystem. The Department of Environment usually focuses on land based or forest based environmental issues. The national marine environmental strategies and the main implementing strategies under national environmental planning require frequent and close collaboration between DoE and DoF and are well elaborated and listed in appendix- 2.

1.1.9 Outdated policy plan and implementation by temporary action plan

In Bangladesh marine environmental policy planning

does not exist elaborately and Department of Environment formulated policies vary widely and have some specific environmental issues, although a number of these are outdated. In most cases these are implemented through some form of national action plan which usually includes marine environmental elements. National action plans in Bangladesh are usually formed to address the sudden crisis and often forgotten when crisis is somehow overcome temporarily. In existing fisheries and marine policies, “coastal and marine policy” is scarcely specified as separate policy. It is apparently implanted in a wider environmental policy with some elements to be found in sectoral policies.

1.1.10 No comprehensive marine fisheries policy incorporating all elements

As mentioned earlier the fisheries and marine fisheries policies are not clear-cut or an all-inclusive policy documents. This review and analysis simply tried to identify the gaps and evaluate the main principles involved under current existing scenarios, so that appropriate measures could be taken. Since there is no specific marine environmental and/or ecosystem based policy, the current implementation of plans need to be broadened to incorporate all necessary elements, reflecting sustainability based on long term perspectives and wider national marine development policy and planning framework.

Advocating for establishment of MPA by no means ignore basic needs and opportunities of livelihood options of coastal dwellers. The fisheries and marine fisheries policies do not specify this element adequately. Coastal Zone Policy 2005 addressed the issue in line with the 2002 World Summit on Sustainable Development (WSSD) to meet basic needs of the coastal people and enhance livelihood opportunities in detail.

1.1.11 Scarce policy targets

The fisheries and marine fisheries policies together with other associated policies appear to be mainly based on outcome. Marine environmental policy targets should focus towards ‘outcome’ than ‘output’ as output based policies have less rather sustainability. It is not rational to look at the area of

a certain habitat to be demarcated as protected or the number of management plans prepared rather than the outcomes in terms of increases in biodiversity or improvement in water quality. All policies, management plan and interventions should be thoughtfully planned based on definite policy target/s and rationally executed to acquire desired results.

1.1.12 Ignored principle marine environmental/ ecosystem targets

It should be acknowledged that the existing fisheries and marine fisheries policies were formulated decades ago and understandably these did not reflect or incorporated some important marine environmental/ecosystem targets like: marine protected areas (MPA), large marine ecosystem (LME), species protection, coastal water quality, coastal, estuarine and marine biodiversity protection, pollution control, adequate stock assessment based exploitation, poverty of coastal dwellers and climate change. These are necessary elements to be incorporated in any marine policy/document. In Environment Conservation Act, remedial measures for injury to wider ecosystem were suggested that may include aquatic ecosystem as well. However, nothing concrete is suggested. A comprehensive policy formulation and incorporation of marine environmental/ecosystem targets in it will need in-depth consultation, under ownership of a concerned public agency.

1.1.13 Lack of monitoring and impact assessment on policy implementation

A major part of fisheries/marine fisheries policy implementation is the effective monitoring of policy status and assessing the effectiveness of fisheries/marine fisheries policy management and mitigation approaches, ensuring in the desired decrease of marine fisheries stresses and improved fish and fisheries quality on output basis. So far, it appears that fisheries/marine fisheries and related policies/documents lack proper clauses of adequate evaluation and monitoring and impact assessments based on policy implementation/ interventions. For a sensible process inter-agency cooperation and coordination is a must. IUCN can only act as catalyst, if it is needed and asked for.

1.1.14 Inadequate coastal development EIA system

Bangladesh has a comprehensive environmental impact assessment (EIA) schedules and implementation structures. But there are inadequacies and there is some concern over the follow-up processes, the lack of homogeneous methodologies and jurisdictional conflicts and lack of intelligibility and effective public participation. In most cases the EIA process is considered as a bureaucratic hindrance rather than an opportunity to improve the design of a project. In fact, no program could be successfully implemented if there is no effective EIA system that helps correct the deviations from planning so that project can run smoothly and reach its goal. Therefore, formulation of a comprehensive policy will need wide ranging consultations and available information, knowledge and skill available locally or elsewhere.

1.1.15 No recurrent State of Environment (SOE) reporting

State of the Environment (SoE) review and reporting on coastal and marine aspects should be a must. Though this is a new concept, it is very important. Bangladesh has not published yet a SoE report or review. Reportedly, most of the Bay of Bengal countries their belong to BOBLME have such review. The SoE should include details of air, noise, river water, ground water and marine (island) water quality monitoring.

The existing fisheries/marine fisheries and related policies made no obligations for reporting on the CBD in Bangladesh coastal, brackish or marine waters. However, a BOBLME review reported that Bangladesh indeed produced a national report on the CBD that includes a chapter entitled "Marine and Coastal Biodiversity" and provided a brief assessment of the status and threats. The CBD report should be regular and routine. National Biodiversity Strategy and Action Plan for Bangladesh-2004 (NBSAP) outlined 16 strategies to develop and direct the actions towards achieving the goals and objectives of the NBSAP. It also suggested to integrate biodiversity conservation into the national development making, planning and processes. State of environment reporting should be comprehensive initiatives by national land and sea based environment and natural resource

management related agencies depending on which a framework needed to be outlined. Bangladesh needs to submit SoE periodically and DoE and DoF other allied agencies may contribute to this process.

1.1.16 The rich but deteriorating Bangladesh biodiversity

Bangladesh being a delta has expansive, interconnected river systems, with rich diverse biodiversity of many species. There is indication that many species are in danger of extinction due to over exploitation and abuse in their habitat and apathy of the population about their conservation. National Biodiversity Strategy and Action Plan for Bangladesh-2004 (NBSAP) outlined need for the biodiversity conservation in general terms. However, based on dynamism of aquatic biodiversity and marine biodiversity a biodiversity index needs to be formulated. Unfortunately, the extent of deteriorating conditions of the species is not clear. The status evaluation and protection is needed.

1.1.17 Conflicting mandates of diverse institutions on land and water body

Bangladesh is densely populated with natural habitats is it contradictory institutional mandates on natural resources makes it difficult for management and conservation. Publicly owned lands, forest and wet lands are under constant threat and abusive use of these causes loss of valuable biodiversity. In Coastal Zone Policy 2005, need for measures to formulate an appropriate institutional framework and to enact necessary laws and regulations in order to harmonize and coordinate all development activities in the coastal zone was incorporated. However, it should be to cover whole EEZ that will facilitate future MPA declaration. Environment Policy 1992 in its one of the subsection advocated jurisdiction of preserving environment under as many as 11 ministries and numerous organizations and agencies. A total of 30 ministries were suggested to take part of responsibility for biodiversity in NBSAP 2004.

1.1.18 Lack of constraints analysis in marine fisheries policy

Any policy paper should outline the constraints based on detailed sectoral studies in the sector and

appropriate measures. Various systemic issues on the effective implementation of fisheries and marine fisheries policy should be scored from 1 to 5 on a scale with the most critical being scored 1 and least critical as 5. In fisheries and marine fisheries policy implementation, the clarity in the roles and responsibilities between different implementation parties should be considered the most important potential constraint to effective marine environmental policy implementation. This reflects the multi-sectoral nature of environmental management.

1.1.19 Lack of adequate Integrated Coastal Management (ICM)

The existing fisheries/marine fisheries and related policies did not cover Integrated Coastal Management (ICM). The ICM is a planning and management included concept that incorporates all policies, sectoral and individual interests. ICM also considers a wide array of chronological and spatial scales involving all stakeholders in a participatory way. ICM should involve all governing authorities and address sustainability: socio/cultural, economic and environmental issues.

In Bangladesh Coastal Zone Policy 2005 of the Ministry of Water Resources Integrated Coastal Zone Management (ICZM) focused mainly towards water resources and natural calamities. One of the main goals in coastal zone management (CZM) policy should be to meet the Code of Conduct for Responsible Fisheries, and the sustainable development of livelihoods based on coastal/marine resources should be a central premise of the CZM policy. It should be properly documented and the responsibility may be vested to DoF. In this connection, it may be mentioned that initiative by marine fisheries road map under marine fisheries sub-strategy 2006 also highlighted this need.

1.1.20 Lack of adequate environmental conservation

In the existing policy framework of fisheries/marine fisheries and related policies on environment and ecosystem remained unspecified. However, environmental conservation should be the highest priority in any marine, estuarine, coastal, inshore and off-shore or brackish water management.

Unfortunately, in the existing policies nothing is mentioned about ecosystem, environmental conservation. The environmental abuse in Bangladesh coastal waters are random and urgent mitigation is needed. In environment policy 1992 and in its one subsection outlined need for conservation of natural aquatic habitat, prevention of wetland degradation, and arrest degradation of ecosystem and coastal mangroves. The Environment Conservation Rules 1997 updated conservation initiatives and an appropriate authority may be designated.

1.1.21 Insufficient biodiversity conservation

Biodiversity is an area where Bangladesh is scoring poorly. A land scarce country with most densely populated and solid demographic distribution in every meter of the territory made it difficult for biodiversity protection. To make things worse, natural calamities and disasters also pose a continuous threat to biodiversity in the areas. In the existing fisheries marine fisheries and related policies, clauses for conservation of biological diversity in estuarine, coastal brackish and/or marine water has not been addressed. It did not reflect any biodiversity value of the coastal or marine zones. The oldest wildlife conservation act in the country was “Bangladesh Wildlife (Preservation) Order-1973” and it was subsequently amended in 1974 to differentiate between ordinary animals (including domesticated) and wild animals and its presentation. This law is the root of biodiversity conservation in the country. It was updated in 2012 which also includes marine biodiversity.

The economic importance of preserving biodiversity for an integrated coastal zone management as well as marine fisheries management and rational exploitation of renewable resources based on maximum sustainable yield (MSY) is very important. Biodiversity conservation also incorporates protection of mangroves, inshore and off-shore islands, sea beaches, migratory routes, eco-tourism and coastal protection. The apparent lack of adequate biodiversity conservation in most of the policy papers was somehow addressed in “Environment Policy-1992” (Bengali version) where forest, wildlife and biodiversity protection got importance. Though the policy basically addressed lands based biodiversity, it may be used a principle

while aquatic and marine policies are updated the National Biodiversity Strategy and Action Plan 2004 (NBSAP) so far detailed conservation strategies but its focus is mainly towards land based biodiversity or land adjacent wetland based biodiversity. However, this document is most descriptive among all available plans and strategies to protect biodiversity on Bangladesh soil and water. In this regard, close collaboration between DoE and DoF is necessary.

1.1.22 Lack of policy guideline on crisis mitigation like climatic change issues

Being the largest delta of the world, Bangladesh is also the most helpless country to mitigate climate change related impacts on coastal areas. Delta is called a living landmass and Ganges delta is more than living due to deforestation in upper lands and mighty rivers carrying huge amount of sand silt to Bay of Bengal while washing down the top soil. This dynamism of Ganges delta creates new submerged and tide-level lands and subject to a series of climatic events in coastal belt. In coastal zone policy 2005, though reduction of vulnerabilities among coastal dwellers due to cyclone, drainage congestion, land erosion and drought that take toll on life and property and depletion of natural resource base are addressed but probable climate change issues are scarcely mentioned. Climate change and global sea level rise and its effect on ecosystem and probable economic loss, cyclones, tidal bore and tsunami related events need to be visualized. Especially, inundation of coastal plains may create havoc in demographic distribution and research for likely events is necessary. A national framework on Bangladesh Biodiversity on land and water should follow United Nations Framework Convention on Climate Change (UNFCCC). A proposed national biodiversity policy was outlined in NBSAP 2004, and that could be considered as stepping stone to formulate biodiversity strategy for EEZ of Bay of Bengal. Bangladesh Climate Change Strategy and Action Plan 2008 in its six important pillars incorporated comprehensive disaster management as one of the pillars to further strengthen the country's disaster management system to deal with increasingly frequent and severe natural calamities.

1.1.23 Inadequate concept on marine protected areas (MPAs)

Marine Protected Areas (MPAs) are relatively new concept though land based protected areas are centuries old. MPA poses new identification, declaration and management challenges for Bangladesh that may need diverse initiatives to protect areas in sea and coastal areas important ecologically and for resources. MPAs need to be considered seriously in Bangladesh and by 2020 the country needs to declare and manage roughly 12,000 km² coastal region as marine protected area. In one of their 16 strategies, the National Biodiversity Strategy and Action Plan-2004 (NBSAP) advocated enhancing protected area management, recognizing the benefits of collaboration with local communities in their management (co-management).

1.1.24 Scarce policy against aquatic pollution

In most of the policy papers environmental pollution received scarce attention. Bangladesh environment act banned hydrocarbon emission related air pollution and that is remotely responsible for water pollution or marine pollution. Environment Policy 1992 in its one of the subsection advocated prevention of aquatic and marine pollution to preserving coastal and marine ecosystem. Bangladesh Environment Protection Law 1995 also outlined need to restrict emission of hydrocarbon related air pollution by machines and vehicles. The Environmental Pollution Control Ordinance, 1977 (Ordinance XIII of 1977) was replaced by Bangladesh Environment Protection Law 1995.

1.1.25 Lack of integrated and sustainable natural resource management

Most of the policy papers related to natural resources in land or sea formulated in Bangladesh is sectoral in nature. Marine and coastal zone is full of diverse natural resources, abiotic and biotic; freshwater, brackish water and marine fisheries; fish, shrimp, crabs, sea weeds, corals, cetaceans, mangrove, salt, minerals, sources of renewable energy like tide, water temperature, wind and solar energy. Time bound (mainly long and medium term) government policy on integrated and sustainable

abiotic and biotic coastal and marine resources is needed. The Coastal Zone Policy 2005 incorporated coastal based natural resource management only; vast marine resource management lacks policy guidelines. It needs closed collaboration among DoE, DoF and MoWR.

1.1.26 Lack of Strategic Planning and Program Development (SPPD)

Any policy guideline should include a development strategy for poverty reduction, economic growth and social development without compromising with environment and ecosystem. The marine strategy should be time and resource-bound specification of the priority actions in marine resource development with an eye on ecosystem and future probable MPA establishment. Most of the policy papers lack strategic planning and program development though Coastal Zone Policy 2005 mentioned SPPD for coastal areas and it could be used a guideline for broader EEZ based marine policy law in future.

2. Policy Recommendation/s

No sectoral policy is independent; rather it is an interdependent document with other associated policy papers. The fisheries/marine fisheries and other related policies in Bangladesh are fractional documents that have close relationships with other allied sectoral policy of Bangladesh. In most countries in the world fisheries essentially means marine fisheries. In contrast, Bangladesh fisheries means 75-80% fresh water fisheries and therefore, fisheries policy of the country is dominated by fresh water fisheries where diverse issues exist and marine fisheries components get relatively less importance. The current paper deals with marine fisheries policy with multifarious objectives in the country and gap analysis has been give above. Since some gaps have been identified those may be highlighted and explored further. A few policy recommendations are suggested below to mitigate the gap.

2.1 Ensured Stakeholder Participation in Policy Formulation

“Top down” approach in formulating policy papers should be avoided and widespread participation should be ensured when national development plan is being formulated. The policy documents are living

documents and should not be followed though mechanical manner. The marine fisheries policy papers should incorporate all elements that exist in costal and marine fisheries. The future marine policy formulation process should deal with real and diverse stakeholders associated with the sector and the policy dialogue should not be confined to the capital. Most of the stakeholders on marine fisheries are indeed living outside urban areas and their opinion should be gathered through on the spot inspection and detailed discussion.

2.2 Wider Participation in Marine Development Policy

It is necessary to be consistent with wider national marine fisheries development policy based on existing situation specifically in light of ITLOS verdict. The marine sector in Bangladesh recently has become huge and diverse and there are many unknown elements. So, it is increasingly more urgent that marine fisheries policy must address the ambitious, scientific and specific requirements of sector participants’ at all diverse levels. All stakeholders; powerful and minors should get equal chances to express their respective views on the issue/s. Large, medium, small, micro and marginal fisheries stakeholders and the large number of cross-sectoral participants should get access to the dialogue. Therefore a consensus based policy frame work will serve the interest of segment of the population in a sustainable way.

2.3 Initiative to Broaden Marine Policy

Serious attempt should be taken to broaden the marine fisheries policy documents with wide participation in policy development. International development organizations support may be sought but initiatives must be taken by the concerned Bangladesh agencies. Initiative should come within assistance and/or facilitation will be welcomed. Expert opinion, expertise from any quarter will be an added advantage.

2.4 Judicious Policy for Renewable Resource Exploitation

The marine fisheries are vital for a large number of stakeholders and coastal dwellers. Aquatic renewable resource exploitation and management

is integral part of the environment, ecosystem and angroves. Coastal areas and mangroves are associated with coastal dwellers and their active participation will be vital for the protection of these fragile resources and ecosystem. Therefore, primary and vital policy setters in marine fisheries policy should come from grass-root levels. Besides active participations of locals, NGO people and development partners should be incorporated with public sector people. Academicians and other elite stakeholders should be represented at national level. The policy formulation procedures should be designed to ensure representation towards greater community participation and consultation.

2.5 Marine Policy Should Not Focus Towards Only A Specific Goal

Commercial fishing together with environmental and ecological matters should get equal importance. One thing must be remembered that when environment or biodiversity protection is preached, it never advocates at the expenses of commercial fishing as this is a source of livelihood for millions. By advocating preservation of environment and of biodiversity, mangroves, marine protected areas, sanctuaries ensure sustainability of the environment. Protection is also needed for the sustainable commercial fishing together with all associated matters on exploitation of renewable resources that may lead to catastrophe.

2.6 Routine Review and Update of Marine Fisheries Policy

In Bangladesh sectoral policies are seldom reviewed, if it does not face any critical criticism. Comprehensive initiatives should be taken to review and update the marine fisheries policy in line with changing scenarios after ITLOS verdict. Declaration and protections of Large Marine Ecosystem (LME) and some selected Marine Protective Areas (MPA) in Bangladesh part of EEZ of Bay of Bengal is of vitally importance. Bangladesh is committed to declare 10% of EEZ as MPA by 2020. Therefore, updated policy framework should accommodate well judged and properly identified areas under MPAs under new ideas. Besides, marine policies of other countries especially those adjacent to Bay of Bengal should be carefully reviewed to update the Bangladesh marine policy.

2.7 Marine Policy Based on Environmental /ecosystem

The marine environment unlike terrestrial ones are relatively more homogeneous region wise and environmental policy formulation based on marine environment and ecosystem is relatively easier than the land based policy. However, marine environment and ecosystem are less studied and less understood. Therefore, the environmental and ecosystem based policies for seas should be incorporated to accommodate national environmental planning, biodiversity conservation strategies importantly and climate change issues.

2.8 Comprehensive Marine Policy

The fisheries, marine fisheries and allied policies need to be amended as “an all-inclusive” policy documents. In the existing framework there is no specific marine environmental and/or ecosystem based policy, attempt should be taken to formulate a wide ranging policy document with a provision of routine review and follow-up. The modified marine policy paper needs to be broadened to incorporate all necessary elements, reflecting sustainability based on long term perspectives and wider national marine development policy and planning framework.

2.9 Declaration of Principle Diverse Marine Protected Area Targets

To make the existing marine fisheries policy eco-friendly, important and well-judged marine environmental/ecosystem targets areas like; Marine Protected Area/s (MPA), Species Safeguard Area/s (SSA), Biodiversity Protection Area/s (BPA), Mangrove Protected Area/s (MAP); Coral reef Protected Area/s (CPA), Sea Weed Protected Area/s (SWDA) needs to be incorporated. Ultimately, the country should proceed towards declaring 10% of its marine area as protected within 2020 (Aichi target fixed at Nagoya COP of CBD, Bangladesh pleaded).

2.10 Guidelines on Marine Protected Areas (MPAs)

As MPAs are new concept for Bangladesh, internationally accepted guidelines for selection and declaration of MPAs could be followed. IUCN is the

sole international organization dealing with environment and nature and their support/facilitation in the areas of policy guidelines may be helpful. Once it is incorporated into policy documents it gets legal status to be made into rules and regulations.

2.11 Marine Protected Areas (MPAs) in Designated Sites

Marine Protected Areas (MPA) by their specific character/s appears vigilant matching sets of diverse management challenges that may need specific initiatives to a particular protected area in terrestrial environments. On the other hand, some of the specific uniqueness of sea based protected areas, are comparatively exceptional on land. Therefore, selection of sea based MPAs should not copy the experiences and examples on land based protected areas. Land based protected areas are usually two dimensional, whereas marine protected areas are usually three dimensional environments. Therefore, different management approaches will be needed for MPAs. Judicious selection is needed for MPAs.

2.12 CBD Reports on Marine Resources

The Coastal and Marine Biodiversity (CBD) reporting is the mirror on the health of marine, brackish water and coastal renewable resources. Bangladesh has submitted a national report to the CBD that include a chapter entitled “Marine and Coastal Biodiversity” and provided a brief assessment of the status and threats. However, we need a regular CBD reporting on coastal, brackish or marine waters on routine basis based on actual data.

2.13 Long Term Policy Perspective

The marine fisheries policy should have long term outlook for quantification, restoration and protection of marine resources. The long term policy frame work with 10 year planning cycle and provision of frequent review will make it sustainable. The anticipated change should be in line with Government policy with far-reaching strategic thinking. Fisheries research plans should be based on same planning cycle and can thus inform policy updates at national revision points.

2.14 Up-to-date Policy Plan and its Proper Implementation

The marine environmental policy planning should be up-to-date with specific environmental issues. The marine policy should incorporate, “coastal, inshore, off-shore and marine policy” as an integral part and environmental matters must be addressed adequately. Coastal zone management, ecologically threatened area demarcations, fragile ecosystem preservations, inter-tidal zone management, diverse biodiversity protections should be prime objectives of the marine policy frame work.

2.15 Policy Targets should be Diverse and Judiciously Planned

The current outcome focused fishers/marine fisheries and related policies should be remodeled towards output focused documents. The marine policy frame work should undertake provision by which a minimum of 10% marine habitat including a few existing ones with some sort of protection /areas be brought under management; large marine ecosystem, marine protected areas, coastal mangrove based protected areas, marine national park, sanctuaries, biodiversity protected areas, etc. Different types of protected areas could perform similar works, though aim of declaration may vary.

2.16 Monitoring and Impact Assessment

Marine fisheries policy formulation should give proper importance on monitoring and impact assessment. Implementation of policy framework should go side by side with effective monitoring of policy status and assessing the effectiveness of interventions/management approaches undertaken. The implementation process is expected to decrease marine fisheries stresses, protection of fishing grounds, mangrove ecosystem and improve fish and fisheries quality on output basis. All marine resources physical, biological including fisheries should be under proper monitoring and recognized impact assessments procure based on policy implementation so that fragile ecosystem is not over-stressed.

2.17 Strengthened EIA System for Coastal Development

Comprehensive environmental impact assessment (EIA) schedules and its implementation structures should be further strengthened, if there is any even in rudimentary form; otherwise a trustworthy EIA should be formulated. The follow-up processes be more frequent, standardized methodologies and jurisdictional conflicts be mitigates quickly. Transparency and effective public participation should be ensured. The EIA process may be harmonized by reviewing all existing policies to improve the design of a project and it is an opportunity, so it should be free from bureaucratic hindrances.

2.18 Regular SoE Reporting

Regular and trustworthy State of the Environment (SoE) review and reporting on coastal and marine aspects should be ensured. SoE reporting elsewhere has proved to be very effective to know the status of environment of a region and their adjacent areas. Since Bangladesh has not yet published SoE on sea, the process could be initiated. This has become urgent after ITLOS verdict, as most of the Bay of Bengal countries have such review. The SoE should include details of air, noise, river water, ground water and marine (island) water quality monitoring together with pollution control, stock assessments based exploitation, poverty of coastal dwellers and climate change.

2.19 Constraints Analysis for Effective Marine Fisheries Policy

Any policy without adequate constraints scrutiny and judicious planning will be a piece of paper. Constraints identification leads to appropriate and sensible mitigate measures. In marine fisheries policy formulation and implementation, the “clarity in the roles and responsibilities” between different implementation parties and stakeholder should be well-defined. Apathy on constraints should be considered the most important potential constraint to effective marine environmental policy implementation. Marine sector is not a single entity; rather it is multi-sectoral in nature of resource, environmental and biodiversity management.

Therefore, multifarious approaches should be taken for marine fisheries policy formulation.

2.20 Appropriate ICM

Coastal areas in a delta are vital as living landmass and always interacts with sea and ocean and create coast line and shape coastal zone/s. Therefore, coastal zone management is important and integrated coastal management (ICM) is necessary and vital for physical and biological resources conservation, biodiversity protection and renewable resource exploitation. In the fisheries/ marine fisheries policy, the ICM as a concept incorporate all policies, sectoral and individual interests. ICM is an appropriate platform to involve all stakeholders in a participatory way. ICM should involve all governing authorities and should address sustainability: socio/cultural, economic, geographical and environmental. ICM will be helpful to implement code of conduct for responsible fisheries, and the sustainable development of livelihoods based on coastal/marine resources are also a central premise of the CZM policy.

2.21 Environmental Conservation

Environmental conservation should be the highest priority in any aquatic ecosystem; sea, estuary, coastal area whatever it maybe. This is very important under the current likely changes in global climatic conditions. Low lying countries like Bangladesh are more likely to be affected by sea level rise and inundation of coastal areas and natural depressions with salt waters. In Bangladesh marine fisheries policy, green and ecologically sustainable environmental conservation approaches should be promulgated. This has become more important as Bangladesh is gradually taking lead in climate change and blue carbon issues. The government declaration on climatic issues should be adequately reflected in policies in the sectoral areas.

2.22 Sufficient Biodiversity Conservation

As mentioned earlier, conservation of biological diversity in costal, brackish and/or marine water is vital for renewable resource conservation, exploitation and sustainability. Besides, sedentary renewable resources like mangrove is of prime importance for biodiversity conservation and it

should be dealt in an appropriate way. Awareness creation among all stakeholders on preservation of biodiversity and its value of the coastal or marine zones may prevent current destruction in coastal areas and harvesting of economically important larval lives. The economic importance of preserving biodiversity for an integrated coastal zone management as well as marine fisheries management and rational exploitation of renewable resources based on maximum sustainable yield (MSY) should be propagated. Biodiversity conservation also incorporates protection of mangroves, eco-tourism and coastal protection.

Besides, unpredictable weather and climatic patterns and unforeseen tremendous climatic events like cyclone, tsunami, tidal bore related event mitigation measures should be kept in mind while policy formulation is being done.

2.23 The Rich but Deteriorating Bangladesh Biodiversity should be Protected

Bangladesh has an inimitable composition of fused, expansive, interconnected river systems that combined drain over million km² from many countries of Asia in Himalaya and vast plains at its foot. The geophysical location of the country is blessed with rich biodiversity of numerous species excellently evolved to exist in this dynamic ecosystem. Unfortunately, one species, *Homo sapiens* dominates others causing threats to others violently. The trend must be averted and threatened species should be protected.

2.24 Conflicting Mandates of Diverse Institutions be Hammered Out

A rapidly growing population of roughly over 150 million on 144,000km² of landmass, development activities, gaps in policy and laws, and contradictory institutional mandates, most of the natural land based and mangrove forest, freshwater wetlands and coastal inter-tidal waters are lost or degraded. IUCN in 2000 classified 40% of Bangladesh's freshwater fish species as threatened with national extinction. Therefore, coordinated approaches are needed among diverse institutions.

The Global Climate Change (GCC), especially sea-level rise and frightening ranges of environmental issues. Sea level rise will alter demographical distribution in low lying and coastal plains in Bangladesh. Saltwater invasion to coastal plains and low lying areas will create immense problems will also make matters worse in coastal aquatic ecosystem. Fisheries/marine policy guideline should address these issues adequately.

Annex 4: Stakeholder Consultation and Consensus Building Workshops at Regional and National Level

Introduction

The EEZ of Bangladesh is over exploited in some areas and under exploited in others. The EEZ of Bangladesh was expanded recently by the verdict of ITLOS between Bangladesh, Myanmar and India. Bangladesh is committed to declaring 10% of her EEZ as Marine Protected Areas (MPA) by 2020. That means roughly 12,000 km² of EEZ in the Bay of Bengal needs to be protected based on internationally accepted criteria as an MPA. There is no single habitat or important marine zone large enough to be a large MPA to fulfill the national commitment. Recognizing its importance and uniqueness, some land based sites have been declared as protected areas mostly by the Department of Environment and the Department of Forest they also include aquatic ecosystem both in freshwater and marine habitats, but the total areas of these are negligible. Bay of Bengal Large Marine Ecosystem (BOBLME) Program has initiated preparation of a framework for the establishment and management of Marine Protected Areas where the mandate was to arrange six regional grass-roots level meetings to build consensus among stakeholders on MPAs and one at the national level to disseminate and share the draft MPA framework. This report includes proceedings of six regional meetings held throughout the coast of Bangladesh and a national workshop in Dhaka. The goal of the regional workshops was to provide specific recommendations on who will be key stakeholders and how the probable MPAs will be selected and managed. The EEZ extends up to 320 km from the coast line/territorial water. Government of Bangladesh (GoB) should prepare rules and regulations for MPAs and IUCN is facilitating this to speed up the initiative.

First Regional Workshop at Noakhali

The arrangement of six regional meetings/workshops are scheduled under proposed activities to achieve part of the objectives of the project. The regional workshops are on, identification of stakeholders and consensus building MPAs and

identifying probable sites/locations in the respective region/s for the protection of habitats, ecosystem, biodiversity and marine resources. As a part of the approach, IUCN Bangladesh Country Office organized the first workshop/meeting at Noakhali at the conference room of Noakhali Science and Technology University. The first workshop was attended by 22 participants from University, local educational institutes, local administration, forest and fisheries departments, regional research centres, local NGOs, local press and some key informants. The 3 hour workshop/meeting incorporated brief presentations, detailed discussion of multiple stakeholders identifying the sites, locations based on threatened species, habitat, fish flocks livelihood, migratory route of important species, newly emerging chars and mangrove forest, both natural and man made areas in Noakhali and adjacent coastal regions. In addition to the mentioned workshop/regional meeting combined with the focus group discussions helped in identifying a range of primary stakeholders and their relations with the resources in Noakhali's coastal areas, trends and its exploitation. Findings at the workshop and focus group discussion were summarized in tabular form and details are incorporated in the final report:

Item	Workshop		FGD
Date	24 May, 2012		24 May, 2012
Location	NSTU, Sonapur, Noakhali		Chairman Ghat, North Hatia, Noakhali
Venue	Conference Room, NSTU		at a resting room of a leading fishermen,
Participants	22		15
Professional areas of participants	Education, Administration, Law enforcement, research, extension, NGO, Mass media, local elites and fisher representative		Trawler owner, Fishermen, Whole seller, retail seller, input supplier, supply chain representative
Took part in discussion	18		15
Site mentioned for MPA	Carring Char- Crab breeding Ground; Jahajjar Char- Crab Breeding Ground; Nijhum Deep- Fish, Forest, Crab, Turtle, Bird, Deer; Submerged Island 100km South of Nijhum Deep- Fish, Bird, Cetaceans; Jaillar Char- For afforestation, Fry living ground ; Thengar Char- For afforestation, Fry living ground; Char Kabira- For afforestation, Fry living ground; Domar Char- For afforestation, Fry living ground; Char Alim- For afforestation, Fry living ground; Char Jonak- For afforestation, Fry living ground; Char Tomiruddin-For afforestation, Fry living ground		Thangar char, Islam char, Jahajjar char, Jaglar char, Bodnar char, Tallar char, Kalam char, Domar char
Protection needed for Species	Hilsa, Pangas, Rita, Mangrove, Deer		Hilsa, Sea bass, Pungas, Rita, Bagda, Golda
Responsibility for protection	Department of Fisheries & Department of Forest, local people		Government and Fishermen
Special Remarks	MPA is essential but make sure Communities Alternate Livelihood option, Avoid all sorts of conflict, Coordination necessary from bottom level		Protection is needed but livelihood should not be threatened

Second Regional Workshop at Chandpur:

As mentioned earlier, arrangement of 6 regional meetings/workshops was scheduled under proposed activities and accordingly, the second regional workshops as part of the approach. IUCN Bangladesh Country Office organized the second workshop/meeting at Chandpur on the 26 May, 2012 at a conference room of BFRI. The second workshop was attended by 18 participants from the research institute, local administration, forest and fisheries departments, regional research centres, local NGOs, local press and some key informants. The three hour workshop/meeting incorporated brief presentations, detailed discussion of multiple stakeholder identified sites, locations based on threatened species, habitat, fish flocks livelihood, migratory routes of important species, newly emerging chars. In addition to the above mentioned workshop/regional meeting combined with the focus group discussions helped in identifying a range of primary stakeholders and their relations with the resources in Chandpur river adjacent and coastal areas, trends and its exploitation. Findings at the workshop and focus group discussion were summarized in tabular form and detailed in the final report:

Item	Workshop	FGD
Date	26 May, 2012	26 May, 2012
Location	Baburhat, Chandpur	Fish landing Ghat, Meghan, Chandpur
Venue	Conference Room, BFRI, Riverine Station.	Primary School at Fish landing center,
Participants	18	19
Professional areas of participants	Fish Research, Fish Extension, Agril extension, Hilsa research, Education & training, NGO, Mass media, local elites and fisher representative	Fishing boat owner, Fishermen, seasonal fishermen, retired fishermen, Whole seller, retail seller, input supplier, supply chain representative
Took part in discussion	18	15
Site mentioned for MPA	Adhere Manik river Mouth- For Hilsa and other Species; Dharma gonj River; Ranga Bali; Rupsha; Char Mesha- Aire Fish breeding ground; Moddhar Char; Ishan Bala; Haum Char; Rajrasejshar; Bhanga bazaar; Fatajang bazaar; Jahajmara; Shasta ghanda boro char; Char Kashim; Char Eliot	Rajrasejshar; Ishan Bala; Ranga Bali; Char Mesha- Aire Fish breeding ground; Moddhar Char; Haum Char; Bhanga bazaar, Rupsha;
Protection needed for Species	Hilsa, Pungas	Hilsa, Pungas, Rita, Bacha
Responsibility for protection	Department of Fisheries, Local people	Government
Special Remarks	Hilsa sanctuary is good but it could not implemented without awareness and alternative employments	Stop catching hilsa is no good. Not-netting should be for all, otherwise will not be successful

Third Regional Workshop at Patuakhali

Third regional workshop as part of the approach, IUCN Bangladesh Country Office organized it in Patuakhali on the 12 June, 2012 at a conference room of Anirban Samaj Unnayan Shangstha.

The third workshop was attended by 20 participants from diverse professional areas and 2 resource persons were also present. The professionals included people from educational institutes, administration, Fisheries Extension, Environment and Forest, NGO, mass media, development organizations, local administration, fisheries survey units and some other local key informants. The three hour workshop/meeting incorporated a brief presentation from as IUCN hired short term consultant. Suggestions were received from district level administration officials, district level fisheries officers and other key informants. After the presentation and comments, a detailed discussion by multiple stakeholders was facilitated by the STC and documentations of the deliverables were done by two of IUCN staff, one program assistant and an intern. To avoid duplications participants were requested to discuss to go for less unrelated talks, but to make concrete suggestions about what should be done to demarcate and declare probable land cum coastal area based MPA and to protect biodiversity, habitat and ecosystem. The identified sites, locations based on threatened species, habitat, livelihood of fisher flocks, migratory route of important species and newly emerging chars.

Compared to Noakhali and Chandpur regions, Patuakhali district town and adjacent areas are a little far from estuaries and coast lines and it is mainly riverine areas and the concern of people in the area is basically to protect fishing rights in peripheral rivers. Most of the people, in the regional meeting and FGD, blamed the bag net operators for declaiming fish landings in the area. They said that the mesh sizes of the set bag nets are so small that it strains small fish fries as well. Instead of declaring protected areas, most of the participants expressed their opinion to ban set bag nets from the river system or strictly restrict mesh sizes so that small fish could escape from the mesh.

As mentioned earlier, a focus group discussion (FGD) was followed by a regional meeting. The FGD was also facilitated by the local NGO, Anirban at Paryagonj a ferry-ghat on the road that connects Patuakhali and Barisal and it is also a famous local fish landing centre. The FGD was attended by mostly hilsa fishers, boat operators and whole sellers. The group actively participated in discussion, question and answer session and willingly helped in identifying a range of primary stakeholders and their relations with the resources in Patuakhali river adjacent and coastal areas, trends and its exploitation. It was apparent from the discussion that the fisher flocks have hazy ideas on protected areas and they feel that declaring a PA threatens their livelihood. However, after discussing the matter with the STC, program assistant and intern of IUCN they became convince that declaration of a PA or an MPA will indeed be helpful for their livelihood in the long run. Findings at the workshop and focus group discussion were documented in tabular form and details incorporated in the final report:

Item	Workshop		FGD
Date	12 June, 2012		12 June, 2012
Location	Gorosthan Road , Patuakhali		Gilabonia, Payragonj, Patuakhali
Venue	Conference Room, Anirban Somaj Unnyan Shangstha, .		Primary School cum Shelter center,
Participants	20		22
Female participants	2		0
Professional areas of participants	Education, Administration, Fisheries Extension, Environment and Forest , NGO , Mass media, Development Organization		Fishing boat owner, Fishermen , , retired fishermen, Whole seller, retail seller, input supplier, supply chain representative Arottdar, NGO active in Fisheries sector
Took part in discussion	20		22
Site mentioned for MPA	Adhere Manik river Mouth- Ranga Bali; Char Tapuria, whole Coastal belt up to 30-35 km seaward, All River Estuary, Baleshar, Matbaria, Burishar, Kakra Char, Kolapara, Bish Khali, Latachapali, Payra, Lalua River , Tentulia, Sonar Char, Kurkimurki, Alekgender, Adjacent Part of newly accreted land		Amtoli, Taltoli, Purakata, Kakrabonna, Titkata, Vikha Khali, Kalikapur, Lavukhali, Batbunia, Gulsakhali, Kalichenna, Patra Char, AndarChar, Sonar Char, Latar Char, Dhal Char, Janajimara, Kassimer char, Rangabali, Payra
Protection needed for Species	Hilsa, Pungas, Fry of various fish species		Hilsa, Pungas, Rita, Bacha, all Fry
Responsibility for protection	Department of Fisheries, Administration, local people, NGO		Government with more honest surveillance
Special Remarks	AIGS, VGP during partial ban of Hilsa breeding, Awareness Increase		Current Net, ESNB should stop immediate for jatka and other fry of fish species

Fourth Regional Workshop at Khulna

Fourth workshop was scheduled in Khulna and accordingly it was arranged on the 14th of June, 2012 together with a focus group discussion at a peripheral area of Khulna city.

The fourth workshop was attended by 24 participants from diverse professional backgrounds from university, other educational institutes, general administration, Police administration, the Bangladesh Navy, Fisheries Extension, Environment and Forest, NGO, mass media, development organizations, fisheries survey units, processing plant owners, fish exporters and some local key informants. The four hour workshop/meeting incorporated a brief presentation from IUCN and suggestions by local divisional level administration and police officials, district level fisheries and forest officers, university professors and other key informants. After the presentation and comments, a detailed discussion by multiple stakeholders was facilitated by IUCN and documentation of the deliverables was also done. It may be mentioned that Khulna region being host of the Sundarbans is very concerned about its preservation, protection and restoration of its biodiversity. There was a social movement recently involving the Sundarbans to be designated as a natural wonder of the world, and it got the global significance when Sundarbans was initially selected as one of the 20 most important natural wonders of the world. “Vote for Sundarbans” got momentum worldwide in general where Bengali speaking population are living in 6 continents and especially in Bangladesh and West Bengal state of India. So it became an emotional issue to the Khulna people. That is the reason why MPA discussed protection of Sundarbans and its peripheral areas were mentioned repeatedly.

As time was short and participants had more expectations, participants were requested to go for less unrelated talks, and instead make concrete suggestions that would be helpful to designate some areas as future MPAs to protect biodiversity, habitat and ecosystem. The identified sites, locations were based on threatened species, habitat, fish flocks livelihood, migratory route of important species and newly emerging chars. Since protected area concept is not new in this part of the country, the discussion was lovely and

repeatedly the Sundarbans ecosystem was mentioned that it is a protected forest for a long time and a UNESCO declared world heritage site.

Beside the regional workshop/meeting at Khulna, an FGD was also arranged at Botiagata, 40 minutes away from the Ava centre. The aim of the FGD was to identify a range of primary stakeholders and their relations with the resources of the coastal belt including Sundarbans and adjacent coastal areas, trends and its exploitation. Findings at the workshop and focus group discussions were documented in tabular form and details incorporated in the final report:

Item	Workshop		FGD
Date	14 June, 2012		14 June, 2012
Location	Khulna City		Botiaghata
Venue	Conference Room, Ava centre, Rupsha Strand Road, Nutun Bazar, Khulna		By the bank of Pasur river adjacent to old Botiaghata ferry ghat
Participants	20		22
	24 (2 females)		26 (18 females)
Professional areas of participants	Education, Administration, Police administration, Navy, Fisheries Extension, processing industry, exporters, Environment and Forest, NGO, Mass media, Development Organization		Fishing boat owner, Fishermen, retired fishermen, Fry collector, fish retailers, landless fisher flocks and subsistence gatherer
Took part in discussion	20		22
Site mentioned for MPA	Sundarbans and its shrouding rivers, Nilkamal, Kotka Koera, Paikgasa, Asasuni, Mongla, Rampal, Munsigonj, Dubla char, Swatch of no ground, Pasur, Shippa, Kalabogi, Chalar Char, Narkal baria, Shipsum, Dharkup		Kalabogi, Chalna, Lolia, Chotokhali, Chunpuri, Mongla, Chilai, Shipsum, Joymoni, Kotka, Narikabali, Koila Tola, Golakata, Champa, Balir gang, Chandabuni, Nolin
Protection needed for Species	Hilsa, Pungas, Fry of various fish species		Fhasa, Lona Cingri, Shada Chingri, Misti Chingri, Topasha, Vola mach, Baila Poa, Chewa, Golda, Hangor, Suhuk and all other fry.
Responsibility for protection	Department of Fisheries, Administration, Local people, NGO		Government with more honest surveillance
Special Remarks	AIGS, VGP during partial ban of Fry Collection		Current Net, ESNB should stop immediate for jatka and other fry of fish species
Special Remarks	AIGS, VGP during partial ban of Hilsa breeding, Awareness Increase		Current Net, ESNB should stop immediate for jatka and other fry of fish species

Fifth Regional Workshop at Chittagong

The fifth meeting was held in Chittagong and accordingly it was arranged on the 16th of July, 2012 together with a focus group discussion at a Fishery Ghat of Chittagong city on the same day. The regional workshop/meeting was half day long and held at Circuit House.

The fifth workshop was attended by 26 participants from diverse professional resources from Chittagong University, other educational institutes, general administration, police administration, navy, fisheries extension, environment and forest, NGO, mass media, development organizations, marine fisheries survey unit, processing plant owners/representatives, fish exporters and some local key informants. Like other workshop/meetings the Chittagong meeting also incorporated a brief presentation from IUCN and suggestions from local divisional level administration and police officials, district level fisheries and forest officers, university professors and other key informants. The workshop was conducted by the Programme Coordinator of IUCN, Bangladesh Country Office. The whole programme was facilitated by IUCN on the spot management was done by an IUCN Programme Assistant, an Intern and an Admin Assistant. After the presentation and comments, a detailed discussion by multiple stakeholders was facilitated by the STC and documentation of the deliverables was done by the program assistant and the intern.

As time was short and participants were more than expectations, the STC requested those who participated in the discussion to avoid unrelated talks and make concrete suggestions that will be helpful to designate some areas as future sites for MPA, its usefulness to protect biodiversity, habitat and ecosystem. The identified sites were suggested on the basis of apparent threatened species, habitat, migratory route of important species, livelihood of fisher flocks and newly emerging chars and their adjacent areas. Since protected area concept is not new in this part of the country, the discussion was lively.

Beside the regional workshop/meeting at Chittagong, an FGD was also arranged at Fishery Ghat, 25 minutes away from the Hotel Golden Inn.

The aim of the FGD was to identify a range of primary stakeholders and their relations with the resources of the coastal belt and adjacent coastal areas, trends and its exploitation. Findings at the workshop and focus group discussion were documented in a table and details incorporated in the final report:

Item	Workshop	FGD
Date	16 July, 2012 (Morning, before lunch)	16 July, 2012 (afternoon, after lunch)
Location	Chittagong City	Fishery Ghat (A local fish landing center where most of the fish trawlers gather for unload and supplies)
Venue	Conference Room, Government Circuit House	By the bank of Karnafuli River, Upstream of Chittagong port
Participants	26	22
Professional areas of participants	Education, Administration, Police administration, Navy, Fisheries Extension, Environment and Forest, processing industry, exporters, NGO, Mass media, Development organization	Fishing boat owner, Fishermen, retired fishermen, Fry collector, fish retailers, landless fisher flocks and subsistence gatherer
Took part in discussion	20	18
Site mentioned for MPA	Matamuhuri Estuary, Bakkhali Estuary, Karnafuli Estuary, Halda River, Chakaria Sundarban, Parky beach area, Sandip Channel, Sitakundu coast, Muhuri River Estuary, Stakundu Mirersharai Coast	Some offshore islands south of Chittagong, channel between Sandip and Chittagong coast line
Protection needed for Species	Lambu, Poa, Datina, Hilsha, Shrimp, Koral and many others fry of marine fin fish (descriptions of fish and other marine organisms were listed in vernacular and local dialect and later validated to find scientific names and incorporated in final report)	Lotta, Chanda, Kailla, Lakha, Datina, Khaus, Turtle, Dolphin, sea Snake, Seagul, other shore based birds, and sea bird. (descriptions of fish and other marine organisms were listed in vernacular and local dialect and later validated to find scientific names and incorporated in final report)
Responsibility for protection	Department of Fisheries, Administration, Navy, Coast Guard local people, NGO	Government with more honest surveillance
Special Remarks	AIGS, VGF during partial ban of Fry Collection	Current Net, ESNB should stop immediately for jhatka harvest and exploitation other fry of fish species

Sixth Regional Workshop at Cox's Bazar

Sixth workshop was scheduled in Cox's Bazar and accordingly it was arranged on the 5th and 6th of August, 2012. The workshop was arranged at a local hotel and a focus group discussion at BFDC Ghat of Cox's Bazar town. IUCN organized it at a Conference Room of Hotel Shaibal on 5th August, 2012.

As this was the last of the series of regional workshops/meetings and the location was very important from an ecological and tourism point of view, a wide range of participation was ensured. The sixth workshop was attended by 57 participants from diverse professional backgrounds from university, other educational institutes, research organizations, administration, Bangladesh Navy, Fisheries Extension, Environment and Forest, NGO, mass media, development organizations, fisheries survey units, processing plant owners, fish exporters and some local key informants. As this

was the last regional workshop, the country representative and project manager of IUCN, Bangladesh office also participated. The 5 hour workshop/meeting incorporated a brief outline of the program by the country representative, a short presentation from project manager, and IUCN hired short term consultant, concise speech cum suggestions by local public officials and professionals, researchers and key informants. After the presentation and comments, a detailed discussion by multiple stakeholders was facilitated by the STC and documentation of the deliverables was done by two of IUCN staff, one program assistant and an intern.

The identified sites, locations were based on threatened species, habitat, mangroves, migratory route of important species and newly emerging chars and adjacent areas with budding naturally grown mangroves, fishers livelihoods. Since protected area concept is well known in Cox's Bazar and Teknaf



Consensus Building Meeting

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peninsula, the discussion was attractive and informative. The discussion session was concluded by the country representative who thanked all the participants for their support and active participation.

Beside the regional workshop/meeting at Cox's Bazar, an FGD was also arranged at BFDC Ghat, 20 minutes away from the Hotel Shaibal on the following day. The aim of the FGD was to identify a range of primary stakeholders and their relations with the resources of the coastal belt and adjacent coastal areas, trends and its exploitation. Findings at the workshop and focus group discussion were documented in a table and details incorporated the final report:

Item	Workshop	FGD
Date	5 th August, 2012	6 th August, 2012
Location	Cox's Bazar Town	BFDC Ghat
Venue	Conference Room, Hotel Shaibal	By the bank of Banskhal River
Participants	57	20
Professional areas of participants	Education, Administration, Research, Fisheries Extension, processing industry, exporters, Environment and Forest, NGO, Mass media, Development Organization	Fishing boat owner, Fishermen, retired fishermen, Fry collector, fish retailers, landless fisher flocks and subsistence gatherer
Took part in discussion	35	14
Site mentioned for MPA	Matamuhuri Estuary, Bakhkhali Estuary, Karnafuly Estuary, Halda River, Chakaria Sundarban, Parky beach area, Sandip Channel, Sitakundu coast, Muhuri River Estuary, Stakundu Mirsharai Coast, Sonadia Island, Cox's Bazar to Teknaf coast, Bangla Channel, Shahparir dwip, Patchar dip, Naf river	Moheshkhali channel, Bakhkhali estuary, Matamuhuri estuary, Bangla Channel, Shahparir dip, St martin, 5-7 km west of St martin, Chara dip, Sonadia Island etc.
Protection needed for Species	Lambu, Poa, Datina, Hilsha, Shrimpa, Koral, Red crab, Turtle, Shore birds, Dolphin, and many others fry of marine fin fish (the name mentioned in vernacular were validated to find scientific names and incorporated in final report in detail)	Fry, Lotta, Chanda, Kailla, Lakha, Datina, Khaus, Turtle, Dolphin, sea Snake, Seagul, Shore bird, Red crab, oyster, Coral etc., (the name mentioned in vernacular were validated to find scientific names and incorporated in final report in detail)
Responsibility for protection	Department of Fisheries, Administration, Navy, Coast Guard local people, NGO	Government with more honest surveillance
Special Remarks	AIGS, VGP during partial ban of Fry Collection	Current Net, ESNB should, Bihundi net stop immediate for jhatka and other fry of fish species

National Consultative Workshop on Marine Protected Area (MPA) Framework in Bangladesh

The Consultative Workshop was held on 24 September, 2014 which was organized by the Bay of Bengal Large Marine Ecosystem Programme and IUCN Bangladesh. Mr. Ishtiaq Uddin Ahmad, Country Representative, IUCN Bangladesh Country Office was the chair while Rear Admiral Khurshed Alam, Secretary, Maritime Affairs Unit, Ministry of Foreign Affairs was the Chief Guest.

Mr. Mohammad Shahad Mahabub Chowdhury, Project Manager, IUCN Bangladesh gave a presentation on the draft 'National Framework for Establishing and Managing Marine Protected Areas (MPAs) in Bangladesh. He said that the framework was formulated to define direction and line of actions with a view to engage relevant stakeholders so that they can play vital role. After that a technical presentation was given by Prof. Dr. Abul Hossain, Technical Advisor, Strengthening National Capacity of Managing Marine Protected Areas (MPA) in Bangladesh Project, IUCN Bangladesh. The presentation pointed out the activities and steps required to establish an MPA, those are - Step 1: Identification of Areas of Significance (AoSs), Step 2: Initial sieving of preliminary selected AoSs, Step 3: AoSs validation, assessment and suggestions, Step 4: Formulation of Management Plan for Candidate MPA Sites, Step 5: Designation or titling of MPA, Step 6: Management guideline for individual MPA within the framework, Step 7: Declaration of MPA and Step 8: Code of Conducts (CoC) for specialized MPA. He also explained policy requirements suggested in the draft framework required to declare and manage an MPA.

Another presentation on Implementation of MPA Framework: Way forward was given by Mr. Mohammad Shahad Mahabub Chowdhury. The presentation denoted that the draft framework is a guiding document, to implement it, more issues need to be considered; those are-Primary Conservation Goal, Level of Protection, Performance of Protection, Constancy of Protection, Scale of Protection and Allowed Extractive Activities. Mr. Chowdhury also mentioned some criteria for selecting an MPA and a roadmap towards implementation of the MPA framework. The framework also proposed four pilot MPA sites viz. 1. St. Martin's Island and its

adjacent water area, 2. Nijhum Dwip and its adjacent water area, 3. Already declared Marine Reserve area by DoF in the South patches and Middle ground of the BoB, and 4. Outer periphery of the Sundarbans (up to 10 Nautical miles).

Rear Admiral Khurshed Alam, Secretary, Maritime Affairs Unit, Ministry of Foreign Affairs, GoB gave a presentation on policy guidelines to establish MPAs in Bangladesh. In his presentation, he described primary goals of MPAs and emphasized increasing knowledge on marine ecosystems. He stressed on minimizing the gap between departments of the GOB, policy makers and general people.

After the technical session, participants took part in an open discussion. Various leading questions were asked to the participants regarding unresolved MPA issues, on which consensus among stakeholders was needed. The workshop, finally, came up with the following recommendations to be included in the final MPA framework:

1. MPA framework will be endorsed by the both MoFL and MoEF to be implemented it by respective govt. agencies through a National MPA Committee;
2. DoF, DoE and FD will take joint initiatives to declare four proposed pilot sites viz. 1. St. Martin's Island and its adjacent water area, 2. Nijhum Dwip and its adjacent water area, 3. Already declared Marine Reserve area by DoF in the South patches and Middle ground of the BoB, and 4. Outer periphery of the Sundarbans (up to 10 Nautical miles) as designated MPAs following the steps suggested in the MPA framework;
3. DoF will take the initiative to formulate an intra-ministerial 'National MPA Committee' under the MoFL in which other concerned ministries (i.e. MoEF, MoFA, MoS, MoHA, MoD), line agencies, NGOs working on protected areas, research organizations, civil society members, IUCN Bangladesh, Bangladesh NAVY, Coast Guard, etc. will be members;
4. All designated MPAs should have a separate management plan that will be governed by a local MPA authority.

About IUCN

IUCN, International Union for Conservation of Nature, helps the world find pragmatic solutions to our most pressing environment and development challenges.

IUCN's work focuses on valuing and conserving nature, ensuring effective and equitable governance of its use, and deploying nature-based solutions to global challenges in climate, food and development. IUCN supports scientific research, manages field projects all over the world, and brings governments, NGOs, the UN and companies together to develop policy, laws and best practice.

IUCN is the world's oldest and largest global environmental organization, with more than 1,200 government and NGO Members and almost 11,000 volunteer experts in some 160 countries. IUCN's work is supported by over 1,000 staff in 45 offices and hundreds of partners in public, NGO and private sectors around the world.



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