

A SEMINAR PAPER ON  
**CHALLENGES IN THE MARINE FISHERIES SECTOR FOR DEVELOPING BLUE  
ECONOMY IN BANGLADESH**

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# **CHALLENGES IN THE MARINE FISHERIES SECTOR FOR DEVELOPING BLUE ECONOMY IN BANGLADESH<sup>1</sup>**

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## **ABSTRACT**

Bangladesh started the discussions on blue economy after the settlement of maritime boundary (Bay of Bengal) demarcation dispute with Myanmar (2012) and India (2014). The productive blue economy sectors are emphasized and considered in attaching the full utilization of ocean based resources within the present maritime boundary of Bangladesh. The Bay of Bengal enriched with huge marine, coastal and inland water resources having great fisheries potentials. But there is some obstacle behind the development of this economy sector. This paper clarifies the major challenges of marine fisheries sectors to the development of blue economy and highlights the recommendation in achieving this goal in Bangladesh. The major problems behind the development of marine fisheries sectors are overexploitation, increased fish trawling, lack of consciousness about mariculture, poor management systems, climate change include warming trend, cyclone, sea level rise, droughts, erosion, tidal surge, saline water intrusion and ocean acidification, marine pollution, non-compliance of act and policies, lack of maritime research and education. So, Proper attention is needed in every aspect of exploitation, processing, surveying, mariculture, marine pollution, as well as in biological and institutional management strategies. If proper management and development attention is given to the marine fisheries sector, it would be possible to achieve substantial production from marine fisheries sector.

Keywords: Marine Fisheries, Blue economy, Bay of Bengal, Mariculture

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## CHAPTER I

### INTRODUCTION

Blue Economy deals with the use of sea and its resources for sustainable economic development. It denotes to any economic activity in the maritime sector, whether sustainable or not. At the same time some review also explain sustainable Blue Economy which ensures that the economic development of the ocean contributes to true prosperity, today and long into the future (Jafrin *et al*, 2016). Blue economy is considered as appropriate use of marine assets that entirely reduce ecological hazard and enhance human prosperity. It contains all economic exercises related with the seas, ports, coastal zones and others ocean-based exercises. Some authors defined that the content of Blue Economy is related to economic growth through the sustainable utilization of ocean resources with technological inputs to progress livelihoods (Hussain, 2010). These resources are categorized into living, nonliving, renewable resources and trade and commerce. It has center assurance in the socio-economy and identified with ocean-borne exchange and business, seas science and such other economic activities. Nationally and universally it benefits to the nations which are utilizing marine assets (Islam, 2003).

The Blue Economy in Bangladesh are covered by The Bay of Bengal. It is one of the world's 64 Large Marine Ecosystems (LMEs). The Bay is bounded by eight countries like Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand (Khan, 2010). In Bangladesh is considering its present maritime border a total 26 productive blue economy development and economic sectors have been identified for full utilization of ocean-based resources (Hoq, 2012). Some important sectors are fishery, maritime trade and shipping, energy, tourism, coastal protection, maritime safety and surveillance, among these sectors have been prioritized as major sectors including Marine Fisheries and Aquaculture. The fisheries resources play important roles in fulfill the demand of animal protein and socio-economic development of the country. More than 16 million people (about 11% of total population) of the country directly or indirectly depend on the fisheries sector for their livelihood (FAO, 2014). Fish alone supplies about 60% of animal protein intake (DoF, 2018). Bangladesh is enriched with vast marine, coastal and inland water resources having great fisheries production potential, contributing 3.57% to the Gross Domestic Product (GDP) of the country and almost one-fourth (25.30%) to the agricultural GDP (DoF, 2018). The marine fisheries resources of Bangladesh contributed about only 16% of the total fisheries production of 4.267 million MT during 2017-18 (DoF, 2018). Therefore,

the marine fisheries sector has been recognized as crucial for the economy of Bangladesh. The country's marine fisheries have two subsections, artisanal and industrial fisheries (M. S. U. Khan, 2007) contributing to approximately 92% and 7.26% of the total marine production, respectively. So, artisanal fisheries are the major contributor of marine and coastal fisheries in Bangladesh (Hoq *et al*, 2013).

Since Bay of Bengal contain a huge marine ecosystem so the management of its living resources and its habitats is the responsibility of Bangladesh but also an exclusive task for all the neighboring countries to resolve the existing problems (Khan, 2010). Due to the geographical position and climatic condition the biological and ecological values of the Bay of Bengal have been pointed out by many authors. The coastal and marine fisheries have been playing considerable roles not only in the social and economic development of the country but also in the regional ecological balance (Rahman, 2017). A enormous quantity of commercially important fishes have long been exploited which are of high export values. Culture of Shrimp has become a highly traded export-oriented industry for the last few decades. In spite of having optimistic prospects, marine aquaculture on a commercial basis as well as marine stock enhancement and sea ranching are yet to be developed. The marine fisheries sector has been suffering from chronic disintegration and mismanagement that have led to many consequences (Islam *et al*, 2018). Proper attention is needed in every aspect of exploitation, mariculture, proper stock assessment, as well as in biological and institutional management strategies.

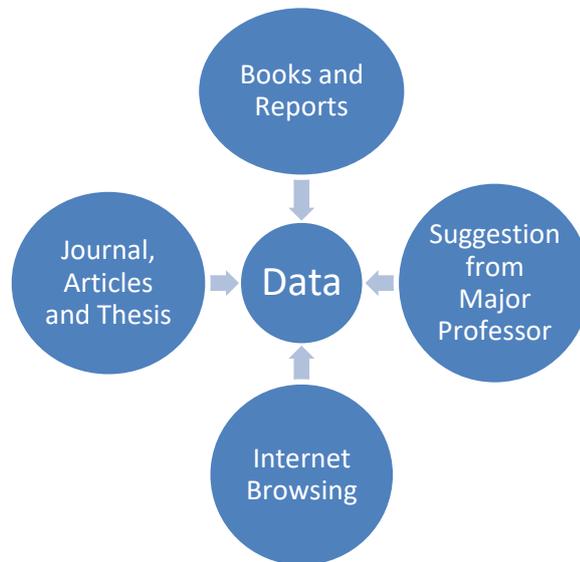
Keeping these considerations in view, the present review study was aimed with the following objectives

- To identify the obstacles in marine fisheries toward the development of Sustainable Blue growth in Bangladesh and
- To find out possible options to overcome the constrains behind the development of marine fisheries.

## CHAPTER II

### MATERIALS AND METHODS

This seminar paper is completely a review paper so all of the information were collected from the secondary sources. The key information which has been used during the preparation of this paper were collected from various related books, journals, reports, publications etc. Findings related to seminar paper have been prepared from e-library facilities of Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU) and related internet web sites were used to accumulate information. The other valuable suggestions and information were carried out by course instructors, major professor and other resource personnel. All the available data and collected information were systematically and chronologically rearranged to enrich the manuscript.



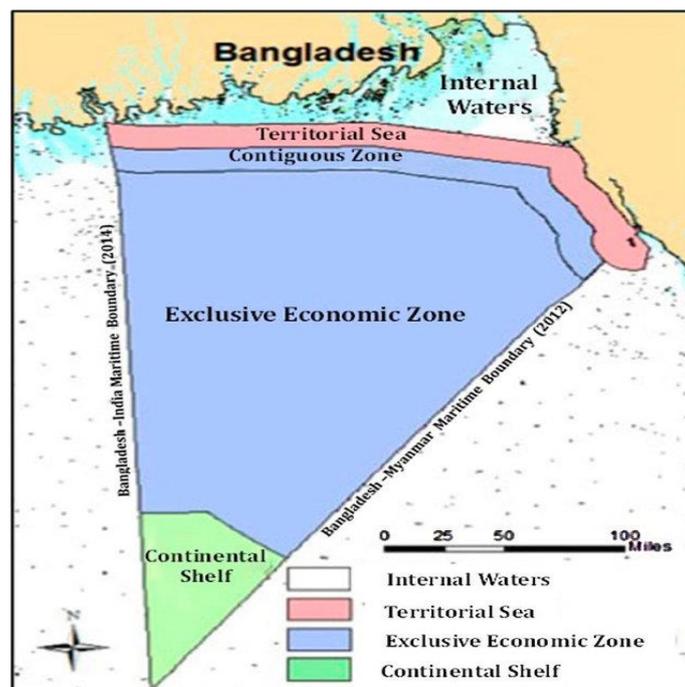
**Figure- 01: Sources of data and information used in the present paper**

## CHAPTER III

### REVIEW OF FINDINGS

#### 3.1 Blue economy in Bangladesh

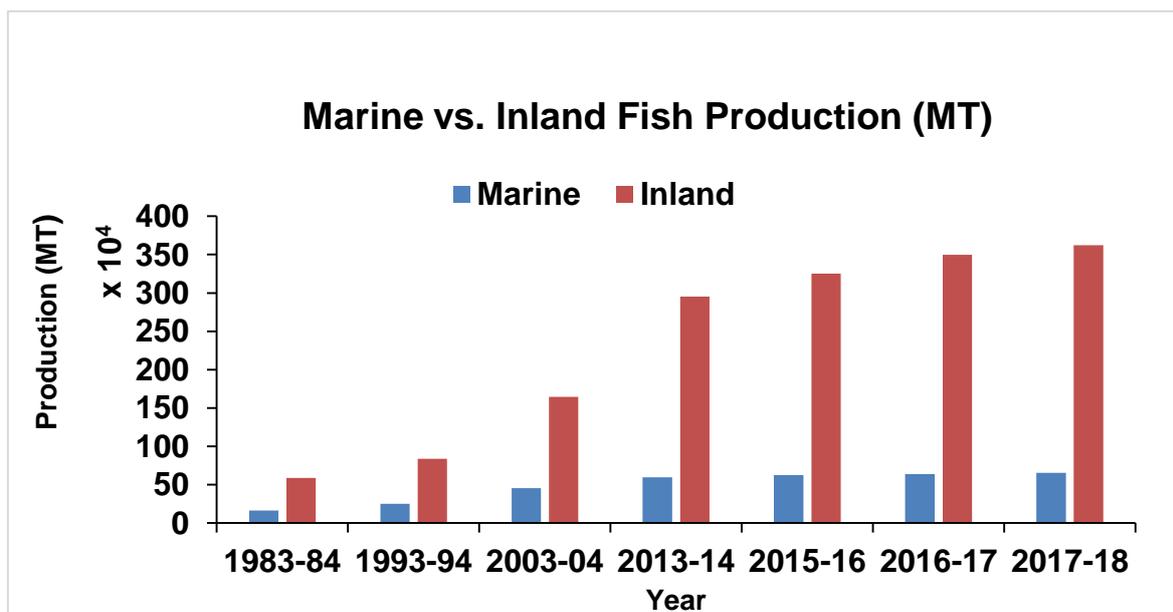
The concept of Blue Economy was first introduced by Professor Gunter Pauli in 1994 which earned global attention during the United Nations Conference on Sustainable Development held in Reo de janeiro in 2012 (Islam *et al*, 2018). The discussion on blue economy in Bangladesh started after Judgment regarding Bangladesh-Myanmar maritime boundary by The International Tribunal for Law of the Sea (ITLOS) in 2012 and the Arbitration on India-Bangladesh maritime boundary in 2014 (Hussain *et al*, 2017). After this settlement, Bangladesh gained sovereign rights over almost 118,813 sq. km in the Bay of Bengal (Figure-02). A new horizon has opened after this alteration and increased opportunities through creating jobs and boosting growth in different sectors such as marine fisheries, marine aquaculture, tourism, trade and energy. Toward ensure ecological growth in support of the long-term development of the country, marine resources must be managed in a sustainable way. In pursuit of that, since 2014, the Government of Bangladesh (GoB) has initiated discussions with stakeholders in order to adopt the concept of a ‘blue economy’ across relevant policies and strategies. This Issue focuses on Bangladesh’s transition to a blue economy through the exploration of potential sectorial opportunities and constraints.



**Figure No- 02: Map of Maritime Boundary of Bangladesh** (Source- Hoq *et al*, 2013).

### 3.2 Contribution of Marine fisheries in total fish production

The Bay of Bengal (BoB) is enriched with a diverse range of marine organisms such as 442 fishes, 36 shrimps, 336 mollusks, 15 crabs, 13 lobster and 168 seaweed species (Rahman, 2014). In addition of this according to IUCN (2015) 3 sponge, 10 frog, 24 snakes and 3 species of otter have so far been recorded in Bangladesh territorial water. Despite having vast marine resources coastal and marine fisheries in Bangladesh is underdeveloped compared to freshwater fisheries. The marine fisheries of Bangladesh contributed only 16% of the country's total fisheries production (DoF, 2018). According to DoF (2018), total marine production of Bangladesh in 2003-04 was 4.6 lakh MT, which has very slowly increased and reached to 6.5 lakh MT in 2017-18 (Figure-03). Whereas the total inland production of the country was 16.5 lakh MT in 2003-04 and has become 36.2 lakh MT by 2017-18 (DoF, 2018).



**Figure No-03: Inland and marine fisheries production in Bangladesh** (Source- DoF, 2018)

This survey showed the lower production of marine fisheries sector which is a challenge toward the development of Sustainable Blue growth in Bangladesh. There are many constrains noticed behind the slow production rate of the marine fisheries in Bay of Bengal.

### 3.3 Challenges in marine fisheries in developing Blue Economy

#### 3.3.1 Challenges in Marine Capture Fisheries

The capture fisheries of Marine wild are crucial to the food and livelihood security for millions of people, supplying approximately 53% of fish food among the 110 million tonnes of wild capture fisheries and aquaculture (FAO, 2009). But it is noticed that the relative economic efficiency of the marine fishing industry has significantly declined in Bangladesh due to overexploitation and the consequent reduced yield from fish stocks (T. K. Kar and K. Chakraborty, 2011). In BOB the commercial fishery may easily lead to overexploitation, mainly attributed to the higher corresponding fishing effort. Whereas coastal and marine waters of BoB are rich in fisheries diversity with over 475 (Rahman, 2017) fish species, as well as various species of crustaceans (shrimp, lobster, crabs), molluscs (clams, oysters, mussels) and cephalopods (squid, cuttlefish, octopus), only a few species such as Hilsa, Bombay duck, Indian salmon, pomfrets, jewfish, catfishes etc. are harvested commercially in high volume year after year (Figure-04).

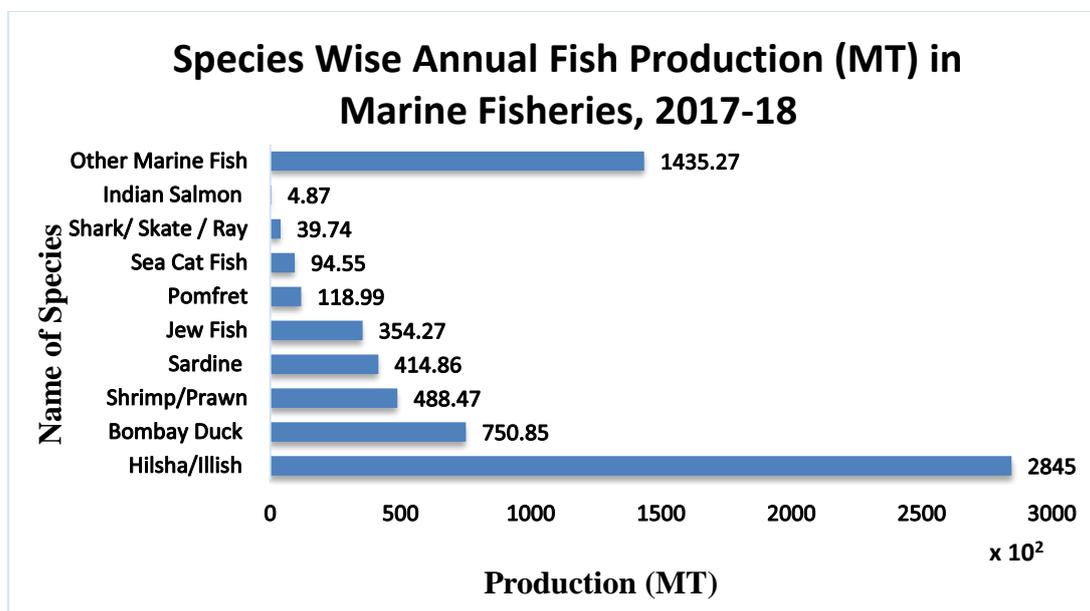


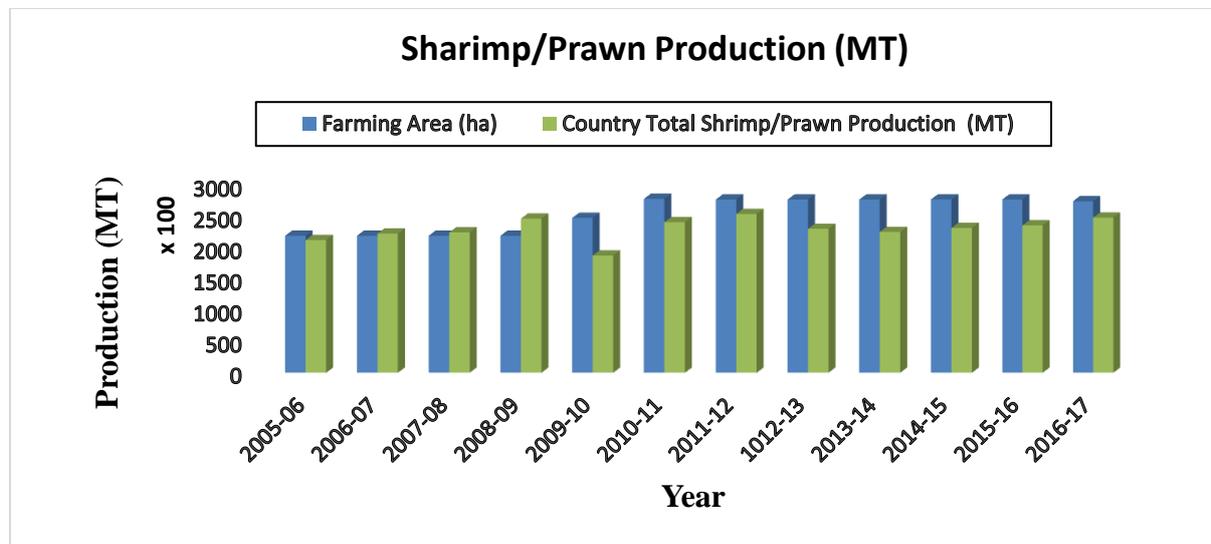
Figure no-04: Species-wise annual production in marine fisheries, 2017-18 (Source- DoF, 2018).

This way of capture fishing would eventually lead definite fish stocks to be overfished. Even now, the near-shore fisheries zones of the Bay of Bengal are believed to be overexploited

which reproduced in the fact as catch per unit fishing effort is falling and several species of marine shrimp and fish stocks are in decline (Hussain and Hoq, 2010).

### 3.3.2 Constrains in Mariculture

Consider other countries Bangladesh is one of the most resourceful with its wide range of marine aquatic bio diversities. There are about 1093 marine aquatic organisms where 44.35% are finfish, 32.23% shellfish, 15.10% seaweeds and only 8.32% are other organisms (Rahman, 2014). Despite the high potential for developing commercial coastal aquaculture industries in Bangladesh, commercial culture of any brackish water finfish species has not yet been started (Shamsuzzaman, 2017; Islam 2003). Traditional culture of seabass and mullet is being carried out on a small-scale basis. On the other hand coastal aquaculture mainly refers to the culture of shrimp and prawn (Azad *et al*, 2009). Country total shrimp and prawn production has been increased from 2.22 lakh MT in 2005-06 to 2.46 lakh MT in 2016-17(Figure-05) (DoF, 2018). Frozen shrimp and prawn is the second largest export earning sector of Bangladesh (Karim *et al*, 2019).



**Figure-05: Production of shrimp/prawn from 2005-06 to 2016-17** (Source-DoF, 2018).

But from the last couple of years export earnings from shrimp fall both in term of value and volume. Rahman (2017) reported that Bangladesh is falling behind in competition with *Vannamie* shrimp because of its low price and high productivity. Many Asian countries has started *Vannamei* culture but not yet reported in Bangladesh.

Crab is the second most important shellfish species in term of expert earning in Bangladesh (Hoq, 2014). There are 15 species belonging to genera *Scylla*, *Portunus*, *Charybdis*, *Matuta*,

*Varuna* and *Sartorina* are available in the coastal and marine habitats of Bangladesh but Mud crab *Scylla serrate* is the only species that is cultured on a small scale (Islam *et al*, 2018). There is no commercial crab hatchery and scientific report on the standing stock of the crab is available in Bangladesh.

Molluscs of a variety of forms are available in the Bay of Bengal and coastal areas. They include bivalves, clams, oysters, scallops, snails and slugs, cuttlefish, squids, octopuses, etc. Ahmed (1990) reported 301 species of coastal and marine molluscs in Bangladesh. Limited information is available about their occurrence and biology. Although there have suitable site for mollusc culture but no commercial culture of mollusk is reported yet in coastal water of Bangladesh. Mollusc aquaculture can generate alternative livelihood and create employment opportunities for coastal communities (Hossain, 2019).

Seaweed is another important sector in Bangladesh. There are 133 species of seaweed and 19 of them are commercially important (Al, 2020; Sarker, 2016). These could be produced commercially in a large scale. BFRI has also developed the culture technology of 3 seaweed species such as *Caulerpa racemosa*, *Hypnea musciformis* and *Enteromorpha intestinalis* in coast line of Bangladesh. But still no large scale commercial culture of seaweed in coastal water is reported yet in Bangladesh. The major difficulties in the seaweed industry of Bangladesh include lack of information on seaweed cultivation, lack of technology, socio-economic constraints and shortage of skilled manpower for wild seaweed harvesting. Large-scale commercial seaweed culture is required experienced manpower (Ahmed *et al*, 2005).

The major constraints to be addressed to increase the marine production in a sustainable manner by reducing capture in the sea which will have tremendous and long-term impact on living are given below-

- Limitation of awareness about Mariculture like cage culture
- Inadequate technology for Mariculture which will be best fit in Bangladesh
- Inadequate infrastructures in relation to information & communication, transportation, hatcheries for seeds, market, etc.
- Little skill and human resources in this field
- The areas for Mariculture not yet demarcated by the government
- Lack of finance to the sector

### 3.3.3 Climate change

Climate change will increasingly drive extreme events and the impact of these will stress social stuff in Bangladesh. Disaster-related records of Bangladesh show that the number of cyclones increased over the last 50 years (Islam *et al*, 2018). The geographical location of Bangladesh makes the country vulnerable from adverse impact of climate change. Climate change extreme events include warming trend, cyclone, sea level rise, droughts, erosion, tidal surge, saline water intrusion, flood, change in precipitation trend and ocean acidification. International Disaster Database showed that the frequency of storm, flood and extreme temperature are higher than any other climate related extreme events in Bangladesh from 1990 to 2014 (Hasan *et al*, 2013). Climate change events has several adverse effects on marine environment (Table 1).

**Table 01- A list of different climatic condition with the effects on marine environment**  
(Source-Sarker *et al*, 2019)

<b>SL. No.</b>	<b>Different Climatic condition</b>	<b>Effects on Marine Environment</b>
01	Warming	Coral belching, species migration, biodiversity loss, altered species life style, disruption in marine food chain.
02	Cyclone	Loss of coastal resources, degrade coastal habitats, loss of infrastructure facilities.
03	Sea level rise	Reduction in photosynthesis, disruption in mangrove ecosystem.
04	Erosion	Clogging of air bladder of fish, mortality of the species, loss of coastal resources, degrade coastal habitats, loss of infrastructure facilities.
05	Saline water intrusion	Shift of species habitat
06	Ocean acidification	Biodiversity loss, species migration, altered species life style, disruption in marine food chain.

Extreme weather events connected with climate change are also making the coastal and marine resources vulnerable which may hamper the smooth Blue Economy development in Bangladesh.

### 3.3.4 Stock Assessment

Several surveys have been undertaken in the past to evaluate abundance (i.e. stock status) and promote marine fishery management in Bangladesh's water. According to Hoq (2013), total 26 surveys have been carried out in the bay of the Bengal for 1857 to 2007 (Table 02). Early surveys were for identifying fishing grounds and later surveys were for fisheries stock assessment. The stock surveys are of more than 13 years old and no recent stock assessment was done since then. There are wide discrepancies among the survey results, possibly due to differing methodologies, different area coverage and seasonal variation.

**Table 02- A list of 10 important surveys which were carried out in BOB since 1857-2007**  
(Source- Hoq *et al*, 2013)

SL. NO	Name of Vessel	Survey Area	Year	Country
01	R. V. Novara	Oceanographic and functional in nature	1857-1859	Austria
02	R. V. Investigator	Oceanographic and functional in nature	1865-1902	UK
03	R. V. Golden Crown	1 <sup>st</sup> exploratory Trawling	1908-1909	UK
04	R. V. Kinki Maru	2 year Trawling in coastal regions	1961-62	Japan
05	R. V. Jalwa	8 years Marine biological and oceanographic studies	1962-1970	Pakistan
06	R. V. Meen Sandhani	Fisheries research	1965-70:	FAO/ Pakistan
07	Mitajava	01 year oceanographic research	1976-1977	Japan
08	R.V. Dr. Fridtjof Nansen	(FAO/NORAD/BGD) through a joint FAO/ Norway fishery research programme	1979-1980	Norway
09	R.V. Machranga	Bangladesh Fisheries Resources Survey, demersal trawling	1988-1989	Bangladesh
10	BIMSTEC-SEAFDEC	Survey of the northern part of the Bay of Bengal specifically describes the large pelagic species	2007	Myanmar, India, Bangladesh)

### 3.3.5 Fishing Grounds

Four fishing grounds were identified in the Bay of Bengal (Table 3) through the survey of Sagar Sandhani and Meen Sandhani from 1968 to 1971 (Hoq *et al*, 2013). After that no survey was conducted to find new fishing grounds in the Bay of Bengal. Several studies reported that distribution of fish stock shifts over time due to various reasons like climate change or intensive fishing pressure (Engelhard, 2014; Katikiro, 2014). Therefore to identify new fishing ground and assessment of standing stock for sustainable exploitation, survey needs to be carried out in extended maritime boundary.

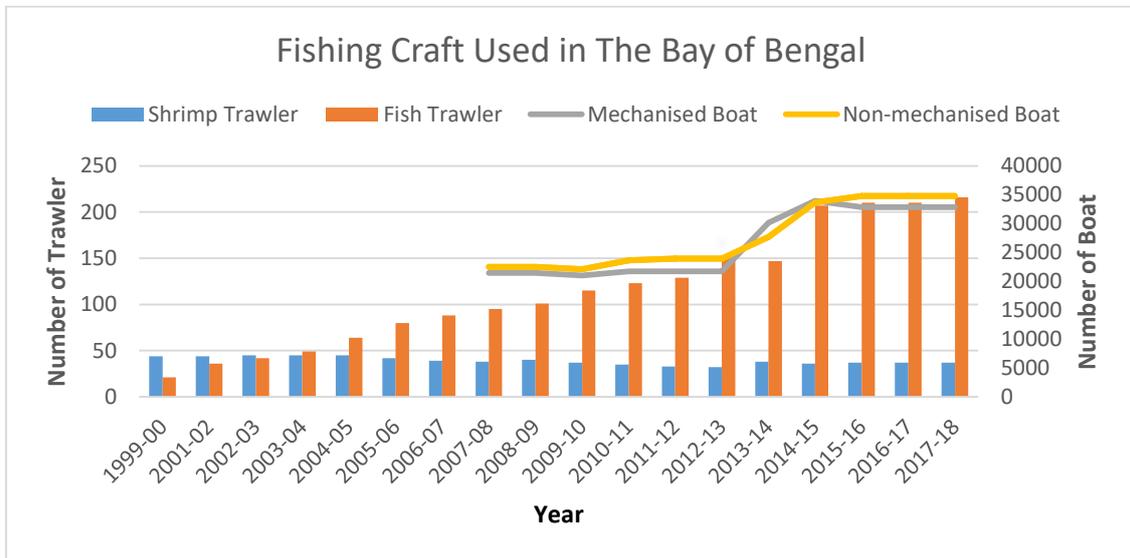
**Table -03: Commercial fishing grounds in Bangladesh** (Source: Hussain, 2010)

Name	Location	Area (km <sup>2</sup> )	Major commercial species
South Patches	90°10'- 90°50'E 21°10'-21°40'N	3,662	Indian salmon, Hilsa, Pomfret, Ribbon fish, Bombay duck, Eel, Croaker, Catfish, etc.
South-west of South Patches	90°30'-90°40'E 20°45'- 21°1 0'N	2,538	Pomfret, Red snapper, Croaker, Carangids, Grunter, Ribbon fish, Shrimp, etc.
East of Swatch of No Ground	90°00'-90°40'E 21°00'-21°25'N	4,600	Snapper, Grouper, Croaker, Shrimp, etc.
Swatch of No Ground	89°00'-89°50'E, 21°00'-21°40'N	3,800	Hilsa, Pomfret, Ribbon fish, Bombay duck, Croaker, Shrimp,etc.

### 3.3.6 Fishing craft and fishing vessel

Bangladesh Fisheries Development Corporation (BFDC) started commercial fishing of four fishing grounds in 1972 with only 11 fishing trawlers (Islam, 2003). In last twenty year industrial (fish and shrimp trawler) and artisanal (mechanized and non-mechanized boat) fishing has increased in the Bay of the Bengal. The number of fish trawlers has increased from 21 in 1999-20 to 216 in 2017-18 which is more than ten times higher (Figure-06). At present 32,859 mechanized and 34,810 non-mechanized boats are exploiting mainly for demersal fishes (DoF, 2018). Pelagic and deep-sea marine fisheries resources are still unexploited (Shamsuddoha *et al*, 2017). Some destructive fishing gears like estuarine set bag net (ESBN), gill net and their indiscriminate uses are destroying fry and juveniles of fish and

other marine resources. Both the industrial and artisanal fisheries are exploiting fishery resources without any appropriate management plan due to the unavailability of scientific information and management strategies (Hoq *et al*, 2013). Therefore, a multidisciplinary baseline research programme needs to be developed in the Bay of Bengal.



**Figure No-06: Fishing crafts used in the Bay of Bengal from 2000 to 2018** (Source: Adapted from Hoq, 2013 and DoF, 18)

Nonstop increasing fishing efforts in the coastal/marine fisheries has led to artisanal fisheries being too non-remunerative to survive. Under the present level of exploitation, it is realized that some of the fishing gears are harmful to the growth, regeneration and maintenance of balance in the biological cycle of the marine community and there are some indications, that coastal fish stocks are over-exploited year after year (Habib *et al*, 2014).

### 3.3.7 Illegal fishing and sea piracy

Many foreign fishers with their vessel enter into the Bangladesh maritime sector for illegal fishing of deep-sea assets. Fishers from India, Thailand, Sri Lanka and Myanmar regularly invade maritime boundary of Bangladesh. These illegal fishers porch fishery resources, physical attack the fishers and looted fishery resources of Bangladeshi fishers. This illegal looting by foreign fishers pretenses a threat to sustainability marine resources of Bangladesh. Piracy on the fishing vessel is on the rise where fishermen not only lose their valuable fish catch but also have to lose their lives (Hussain *et al*, 2017).

### 3.3.8 Marine pollution

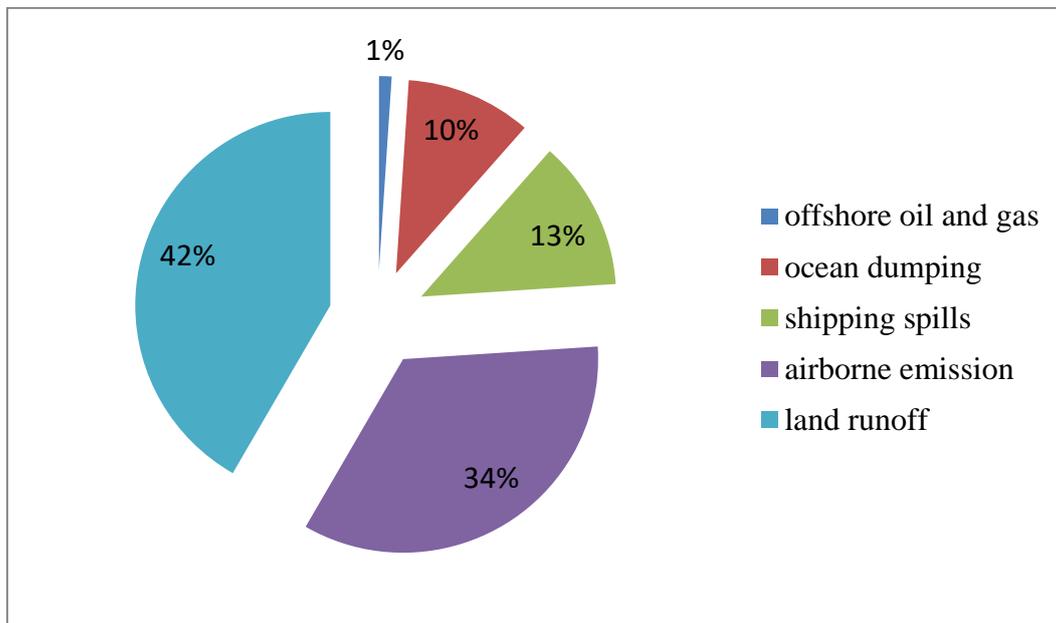
Contaminants from point and no-point sources are often their ways in the Bay of Bengal. Some point sources are ship breaking activities in Chittagong, Municipal Wastes (Khulna city (Hossain *et al*, 2017), municipal wastes from Chittagong city through Karnaphuli river. However, scrapping activities generate various hazards for the coastal and marine surroundings by releasing loads of pollutants, including toxic waste, harmful chemicals (Table-04).

**Table 04- Marine pollution with effects on marine environment** (Source- Alam, 2014)

SL. No	Sources of Pollution	Cause of Pollution	Effects on Marine Environment
01.	Domestic sources	Unplanned growth and lack of proper disposal system	Eutrophication and aquatic vegetation proliferate, makes the waters anoxic
02.	Industrial sources	Dumping of untreated toxic or non- toxic effluent	Create problems with the growth of coral reefs
03.	Agrochemicals	Application of fertilizers and pesticides	Killing plankton and affecting their production
04.	Siltation and sedimentation	The silt load carried by the river systems	Slowing the flow of stream, causing silt, changing water current
05.	Oil pollution	Mainly from the crude oil transplantation systems, from ships and mechanized vessels	Makes the waters anoxic, disturbance on natural habitat and spawning ground
06.	Ship breaking activities	Various refuse and disposable materials are being discharged and spilled from scrapped ships	Negative impact on coastal environment and biodiversity, damaging intertidal habitat.
07.	Microbial Pollution	Fecal contamination due to improper sanitary inspection	Cause of disease

Most of the pollution to the marine environment comes from the land (Figure-07). Nonpoint source pollution is one of the biggest sources of pollution, which occurs as a result of runoff. Little water pollution actually starts as air pollution, which settles into waterways and oceans.

Highest soil or silt from fields or construction sites can run off into watercourses, harming fish and wildlife habitats.



**Figure-07: Percentage of Marine Pollution Source** (Source- Khan, 2010)

### 3.3.9 Marine act and regulations

There are some important fishery related acts and ordinance in Bangladesh. These legislations cover all aspects of the fisheries sector from capture fisheries to fish marketing (Table-05). These laws deal with overall fisheries i.e. inland and marine. The major aim of these laws is to protect and conserve the fisheries along with conducting research in the field of fish production, processing and marketing, quality control of fish and fish product etc. But implementation of these laws and policies are often met by conflicts as well as non-compliance by the stakeholders (Kuperan, 2020). Particularly, in hilsa sanctuaries fishers often violate ban season prohibitions and continue to use a banned current jal. Hence, (Jahan et al, 2014) argued that the noncompliance with fishing rules and regulations are increasing fishing pressure, use of destructive fishing approaches and gears, and a tendency to fish whatever is available, including larvae and juveniles. Ignorance, probability of getting higher catches, weak enforcement and limited livelihood opportunities has been identified as the major factor for non-compliance (Shamsuddoha *et al*, 2017).

**Table 05: Related marine fisheries policies, laws, rules acts and ordinances in Bangladesh** (Source- Hussain, 2010)

Fisheries Laws	Main Issues
The Private Fisheries Protection Act, 1889	This act provides for the protection of private right for fishing.
The Protection And Conservation Fish Rules Act, 1950	Conservation of fisheries resources as a whole. The text of the act consists of 9 sections: short title, extent, and commencement
The Protection And Conservation Fish Rules, 1985	Regulation on protection and conservation of fish. The text contains 11 sections about various measures of protection and conservation.
Marine Fisheries Ordinance, 1983	Marine fisheries conservation & management
Marine Fisheries Rules, 1983	Marine fisheries conservation & management
National Shrimp Policy, 2014	Flourish the shrimp industry, raise employment opportunity, alleviate poverty, export earnings and meet up the nutritional demand of the people.
Territorial Water And Maritime Zone Act, 1974	Conservation, management,& development of marine fisheries

### 3.3.10 Maritime Education and Research

The various sectors under the blue economy require highly skilled technical manpower and motivated cadre of research scientists. Although in Bangladesh, there are a number of public and private universities and academies/departments, where marine and oceanography related subjects are taught under limited technical facilities (Hussain *et al*, 2017). In regard to maritime research, no solely technical institutions are available in Bangladesh except the Marine and Technology Station of Bangladesh Fisheries Research Institute (BFRI) (Table-06). Research accommodations at BFRI's marine research station in Cox's are not yet adequate to carry out need based marine and oceanographic research. To support this area, recently the National Oceanographic Research Institute (NORI) has been initiated for coastal and oceanic research at Ramu, Cox's Bazar, which is presently under construction (Hussain *et al*, 2017)

**Table 06: Marine research organization and institution established in Bangladesh**

(Source- Wikipedia, May 2, 2020)

SL. NO	Government Organizations and Institutions	Headquarter	Since
01	Department of Fisheries under the Ministry of Fisheries and Livestock (DoF)	Dhaka	1976
02	Bangladesh Fisheries Research Institute (BFRI)	Mymensingh	1984
03	Bangladesh Fisheries Development Corporation (BFDC)	Dhaka	1973
04	Bangladesh Agricultural Research Council (BARC)	Faridpur	1973
05	Bangladesh Marine Fisheries Academy	Chattogram	1973
06	Department of fisheries, oceanography and zoology in different public Universities	-	-

### 3.4 Possible options to Overcome these Constrain

- At present the marine fisheries sector needs to have a large group of appropriate human resources in the field of oceanography, marine dynamics, marine engineering, biotechnology, marine fisheries, marine trade, offshore engineering, naval architectural engineering, marine geological aspect, marine environment and ecosystem science etc. aimed at sustainable blue growth and better utilization of maritime resources.
- Innovation of technology and assume measures are needed for mariculture and sea ranching in the continental shelf of the Bay of Bengal. The potentially of such practice would release pressure of over-exploitation on fisheries and improved well-being of the population. Mariculture needs stock improvement through artificial breeding & spawning of cultivable marine species.
- Determination of population structure of selected marine stocks. Fishing effort needs to be limited for all coastal and marine fisheries. This will require the licensing and registration of all mechanized fishing vessels and limits set on their overall capacity and individual effort. There is an urgent need for improved gear technology and development in Bangladesh (Hoq *et al*, 2013). This will allow the gradual replacement of all non-selective gears with more sustainable methods that will still provide a reasonable living.

This development will have to be matched with changes in the results and regulations governing gear specification and use, as well as the ability to enforce these. It is noticeable that, for Maximum Sustainable Yield, resource rent cannot be maximized without significant effort reduction.

- To understand the effect of climate change, marine environment needs to be closely studied. Undertake measures to limit marine pollution and curtail over fishing which might have positive effect on the ability of marine ecosystems to adapt to climate change impacts 9 (Sarker *et al*, 2019).
- Improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally (Hussain *et al*, 2017).
- Conduct exploratory survey for stock assessment of all major species of commercial importance (Alam, 2014). Assess stock of untapped/less explored pelagic fishery resources, like tuna and other non- traditional fishery resources, such as squid, cuttlefish, octopus, oysters, mussels, lobsters, crabs, sea cucumbers and seaweeds with a view to their sustainable exploitation within the Exclusive Economic Zone of Bangladesh.
- The marine fisheries policy requires updating to reflect both the precautionary approach as well as the ecosystem approach that recognizes that fisheries will impact the structure, function and biological diversity of the wider ecosystem (Hussain *et al*, 2019)
- Other policy areas that need greater emphasis include minimizing inter-sectoral resource and spatial conflicts, the development of co-management and community-based fisheries management (CBFM) and other approaches to reduce the vulnerability of small-scale fishers.

## **CHAPTER V**

### **CONCLUSIONS**

The concept of Blue economic means the growth through the sustainable utilization of ocean resources with technological inputs to improve livelihoods and meet the growing demands for jobs without hampering the health of the ocean ecosystem. The potential development of marine fisheries sector has not yet been fully explored. This paper offers an overview of focuses on the major constraints and challenges behind the development of marine fisheries sector as well as probable suggestion to minimize the problems. To enlarge its Blue Economy, Bangladesh must focus on marine fisheries, non-traditional species, marine biotechnology, mariculture, marine pollution, climatic condition and marine spatial planning. However, this paper finds that lack of implementation and enforcement, of management measures, limited planning and coordination are hinder the development marine fisheries sector of Blue Economy in Bangladesh. Thus, research, scientific management strategies, government policy specialized for marine resources, implementation of acts and rules, etc. are required for protection and conservation of marine fisheries resources, and development of Blue economy.

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