

**A Seminar paper**

**On**

**Fisheries Resources of Bangladesh and its Future Potentials**

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# **Fisheries Resources of Bangladesh and its Future Potentials**

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**Abstract**

Bangladesh is one of the leading fish producing countries in the world. Bangladesh ranked 3rd and 5th in position in inland open water capture and world aquaculture production respectively. Fisheries resources refers to elements of a natural aquatic resource which can be legally caught by fishing. Fisheries resources in Bangladesh is divided into inland capture, inland culture and marine. The country has huge coastal, marine and inland fisheries resources with great fisheries production potential. This paper reviews the fisheries resources in Bangladesh and its future potentials using data collected from secondary sources. Inland open water and inland closed water covers 39,27,142 and 7,97,851 ha respectively. There are 260 fresh water, 475 marine water fish species, 56 species of shrimps and prawn, 16 species of crabs, 301 species of molluscs available in Bangladesh. Bangladesh is rich with 133 species of seaweed and eight of them are commercially important. Fisheries sector provides living and livelihood for more than 11% people of the country. About 60% of animal protein intake comes from fish. Aquaculture has increasingly been playing a major role in total fish production of the country. 84% fisheries production comes from inland sources and only 16% comes from marine. Although, Bangladesh has 710 km long coastline. A large portion of the open water bodies is suitable for finfish, shrimp, prawn, crab and seaweed farming. Though inland closed water production has increased over the recent years, but inland open water and marine fisheries production has not yet attained to its optimum level. Biofloc technology, pen and cage culture is the new approach to increase the fish production in inland closed and open water bodies, respectively. The newly settled maritime boundary with neighboring states, Myanmar and India, up to 200 nautical miles from the coastline comprise of 118,813 sq. km of maritime water. Additionally, the concept of Blue economy has recently increased the prospects of marine resources in various ways, such as marine aquaculture, nutritional security, biotechnology, marine tourism and transport etc. Proper utilization of the marine resources can boost up the total fisheries production of Bangladesh through pen culture, cage culture and Ocean ranching. However, scientific information on marine resources is essential for harvesting the marine resources rationally and for planning and implementing the management strategies to detail coordination between blue economy sectors and stakeholders to ensure sustainable development.

**Keywords:** Fisheries, Aquaculture, Marine, Diversity, Bangladesh

## Table of Contents

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<b>Contents</b>	<b>Page Number</b>
Abstract	<b>i</b>
Table of Contents	<b>ii</b>
List of Tables	<b>iii</b>
List of Figures	<b>iv</b>

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<b>Particulars</b>	<b>Page number</b>
Introduction	<b>1-2</b>
Approach of the preparation	<b>3</b>
Review of Findings	<b>4-21</b>
Conclusions	<b>22</b>

---

## List of Tables

Table No.	Title	Page No.
1	Inland open water fish production of Bangladesh (2017-18)	<b>4</b>
2	Inland closed water fish production of Bangladesh (2017-18)	<b>5</b>
3	The domesticated indigenous fishes of Bangladesh	<b>7</b>
4	Exotic fishes introduced into the freshwaters of Bangladesh	<b>8</b>
5	Commercial fishing grounds in Bangladesh	<b>10</b>
6	List of commonly harvested shrimp and prawn in Bangladesh	<b>11</b>
7	List of economically important crab species in Bangladesh	<b>12</b>
8	Commercially important seaweeds in Bangladesh	<b>13</b>
9	Fishing gear used in the coastal/marine water in Bangladesh with target species and depth of operation	<b>16</b>
10	Year-wise annual export of fish and fish product	<b>17</b>

## List of Figures

---

<b>Figure No.</b>	<b>Title</b>	<b>Page No.</b>
<b>1</b>	Sources of data and information used in the present paper	<b>3</b>
<b>2</b>	Species-wise annual production in inland fisheries, 2017-18. <i>Major Carp</i> ; Rui, Catla, Mrigal, <i>Other Carp</i> ; Kalibaus, Bata, Ghania, <i>Exotic Carp</i> ; Silver Carp, Grass Carp, Common Carp, Mirror Carp, Big Head Carp, Black Carp, <i>Other Cat Fish</i> ; Boal, Air, Silon, Rita, <i>Snake Head</i> ; Shol, Gazar, Taki, Live Fish; Koi, Singhi, Magur. Other Fish (Inland and Marine) - Includes all other fishes except those mentioned above	<b>6</b>
<b>3</b>	Trend in inland fish production in Bangladesh	<b>6</b>
<b>4</b>	Maritime area of Bangladesh	<b>9</b>
<b>5</b>	Coastal and Marine fisheries resources in Bangladesh	<b>10</b>
<b>6</b>	Species-wise annual production in marine fisheries, 2017-18	<b>13</b>
<b>7</b>	Production of shrimp/prawn from 2005-06 to 2016-17	<b>14</b>
<b>8</b>	Different sectors related to blue economy in Bangladesh	<b>19</b>

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## CHAPTER I

### INTRODUCTION

Fisheries resources refers to elements of a natural aquatic resource which can be legally caught by fishing. Bangladesh is one of the top fish producing countries in the world. Bangladesh is full of vast inland, coastal and marine water resources having great fisheries production potential. This sector contributing 3.57% to the country's Gross Domestic Product (GDP) and contributing to the agricultural GDP, almost one-fourth (25.30%) (DoF, 2018). The fisheries sector in our country are divided into two groups such as Inland and Marine fisheries. Inland fisheries resources has two sub sectors such as Inland Capture and Inland Culture fisheries. Inland open water and inland closed water covers 39,27,142 and 7,97,851 ha respectively. The fisheries sectors play an important role in fulfilling the demand of animal protein and socio-economic improvement of the country. More than 11% of total population of Bangladesh is involved in this sector on full time and part time basis for their livings (FAO, 2018). About 60% of animal protein consumption comes from fish (DoF, 2018).

Although, over the last three decades, the fish production is increased more than five times (7.54 MT in 1983-84 to 42.77 lakh MT in 2017-18) due to dissemination of improved aquaculture technology and need-based extension services at farmer's level at low cost.

The inland capture, inland culture and marine fisheries properties of Bangladesh contributed about 28%,56% and 16% of the country's total fisheries production during 2017-18, respectively (DoF, 2018). The inland open water habitat river and estuary (853,863 ha), Sundarbans (177,700 ha), beel (114,161 ha), Kaptai lake (68,800 ha) and floodplain (hoar) (2,695,529 ha). Although, inland capture fisheries are an important source of the total fish production, but their contribution has been declined. Due to pollution and degradation of aquatic resources, the contribution of inland capture fisheries has been reduced remarkably during the recent past decades. In 1983-84, inland capture and culture fisheries share to the total fish production were 62.59 and 15.53 percent, respectively; whereas in 2017-18, inland capture and culture fisheries share to the total fish production were 28.45 and 56.24 percent, respectively (DoF, 2018).

As a result, several socio-eco-friendly programs are being implemented to increase the productivity of inland open waters in the recent past years. Such as community based fisheries management program, establishment of beel nursery management, stocking of fingerlings in

the water bodies, restoration of the aquatic habitats, establishment and maintenance of fish sanctuaries, increase in water area under cage and pen farming (Dof, 2018). Biofloc technology, pen and cage culture is the new approach to increase the fish production in inland water bodies. To increase the fish production in open water bodies, the installation of Cage and pen offer scope for avoiding more land based fish farm. In cage culture system fish are reared from fry to fingerling, fingerling size to marketable size in a confined space that permits the free exchange of water with the surrounding water body. In Pen culture system fish are reared in a volume of water enclosed on all sides except bottom. Cage and pen culture contributed 0.10% and 0.24% to the total fish production in the year of 2017-2018, respectively (DoF 2018).

According to Hussain and Hoq (2010), production of fish from Bay of Bengal (BoB) has improved over the last few decades, but its share in fisheries sector has declined. This is due to the unavailability of scientific information and complications in implementing management strategies. Fishing without adequate information on the present status of the fish stock leads to over-exploitation of inshore and under exploitation of offshore fishery resources. The newly settled maritime boundary with Myanmar and India, up to 200 nautical miles from the coastline comprise of 118,813 sq. km of maritime water. Thus, the country has huge potential for marine fisheries in artisanal, industrial and coastal sub-sectors. Despite having the long coastline and huge marine water area, the marine fisheries sector is underdeveloped compared to other industrial sectors in Bangladesh. Though fisheries production has increased over the recent years, but marine fisheries production has not yet attained to its optimum level.

A large portion of the open water bodies is suitable for finfish, shrimp, prawn, crab and seaweed farming. Proper application of these resources can increase the total fisheries production of Bangladesh.

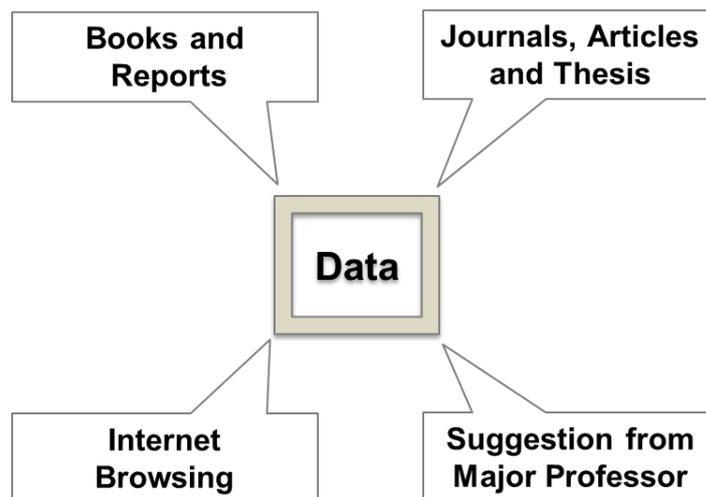
Keeping these considerations in view, the present review study is aimed with the following objectives-

- i. To review the fisheries resources currently available in Bangladesh, and
- ii. To identify the prospects, challenges and possible solutions for fisheries resources in Bangladesh.

## CHAPTER II

### MATERIALS AND METHODS

This seminar paper is entirely a review paper. Therefore, all the data and information presented in this paper were mainly collected from secondary sources. The data acquisition (Figure 1) were carried out from the various relevant books and reports, journal articles and thesis paper, which are available in the library of Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Gazipur, Bangladesh. Recent information were also gathered from internet browsing. Further, appropriate suggestions with valuable information from my honorable major professor and other course instructors were taken into consideration to improve the paper quality. Finally, all collected data were sequentially arranged and presented in the paper.



**Figure 1:** Sources of data and information used in the present paper.

## CHAPTER III

### REVIEW OF FINDINGS

**Fisheries resources** refers to components of a natural aquatic resource which can be correctly caught by fishing. Sometimes the habitat of such resources is called fisheries resources. The fisheries sector in Bangladesh is divided into three sub-sectors: inland capture, inland culture and marine fisheries (DoF, 2018). Small-scale fisheries follow on inland water bodies such as ponds, rivers, beels, floodplains, haors, lakes, dead rivers (baor), wetlands, reservoirs etc. in inland locations.

### 3. Present status of inland fisheries resources of Bangladesh

#### 3.1 Inland fish production

Inland fisheries is the capturing and culturing of fishes in inland water. According to FAO report (2018), Bangladesh ranked 3rd and 5th in position in inland open water capture and world aquaculture production respectively. Currently Bangladesh ranks 4th in the world tilapia production and 3rd in Asia. National fish hilsa only contributes around 12 percent to the total fish production in the country. For this reason, Geographical Indication Registration Certificate has been awarded to National fish hilsa.

#### 3.1.1 Inland open water annual fish production of Bangladesh (2017-18)

The inland open water fish production such as river, beel, floodplain and Kaptai lake in 2017-18 are 3.21 lakh MT, 0.99 lakh MT, 7.68 lakh MT and 0.10 lakh MT respectively (Table 1) and corresponding growth rates are 18.02, 1.10, 0.34 and 1.70 percent respectively. Its contributions to total production are 7.50, 2.32, 17.97 and 0.24 percent. Fish production has been increased compare to previous year. The production of Sundarbans fishery has increased, its production is 0.18 lakh M.T, its contribution is 0.43 percent to total production and consequently its growth rate is 0.77 percent.

**Table 1: Inland open water fish production of Bangladesh (2017-18)** (Source: DoF, 2018)

Inland open water	Water Area (Hectare)	Production (Metric Ton)	Productivity
River and Estuary	853863	320598	376 kg/ha
Sundarbans	177700	18225	103 kg/ha
Beel	114161	99197	869 kg/ha
Kaptai Lake	68800	10152	148 kg/ha
Floodplain	2712618	768367	283 kg/ha

### 3.1.2 Inland closed water annual fish production of Bangladesh (2017-18)

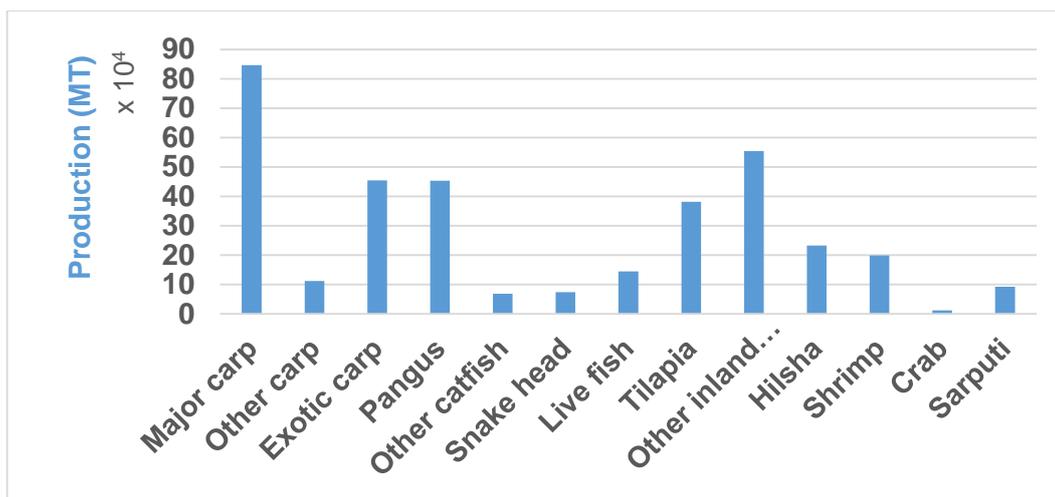
The fish production (aquaculture) in 2017-18 of pond, seasonal cultured waterbody, baor, shrimp farm, pen culture and cage culture are 19.00, 2.16, 0.08, 2.54, 0.10 and 0.04 lakh MT respectively (Table 2). Subsequently, the corresponding contributions to total production are 44.43, 5.06, 0.19, 5.95, 0.24 and 0.10 percent respectively. The corresponding growth rates are 3.67, 0.37, 0.87, 3.23, (-) 23.06 and 70.80 percent respectively. The aquaculture production became more than double (9.19 lakh MT in 2005-06 to 24.05 lakh MT in 2017-18) during the last ten years. The overall growth performance from inland closed water shows a moderate, reasonable and admirable increasing trend.

**Table 2: Inland closed water fish production of Bangladesh (2017-18)** (Source: DoF, 2018)

Inland closed water	Water Area (Hectare)	Production (Metric Ton)	Productivity
<b>Pond</b>	391753	1900298	4851 kg/ha
<b>Seasonal cultured water body</b>	136622	216353	1584 kg/ha
<b>Baor</b>	5488	8072	1471 kg/ha
<b>Shrimp/Prawn Farm</b>	258681	254367	983 kg/ha
<b>Crab</b>	9854	11787	1196 kg/ha
<b>Pen Culture</b>	5294	11015	2081 kg/ha
<b>Cage Culture</b>	1.29 lakh cu. meter	3523	27 kg/cu. m

### 3.1.3 Species/Group wise annual fish production(MT) in inland water bodies (2017-18)

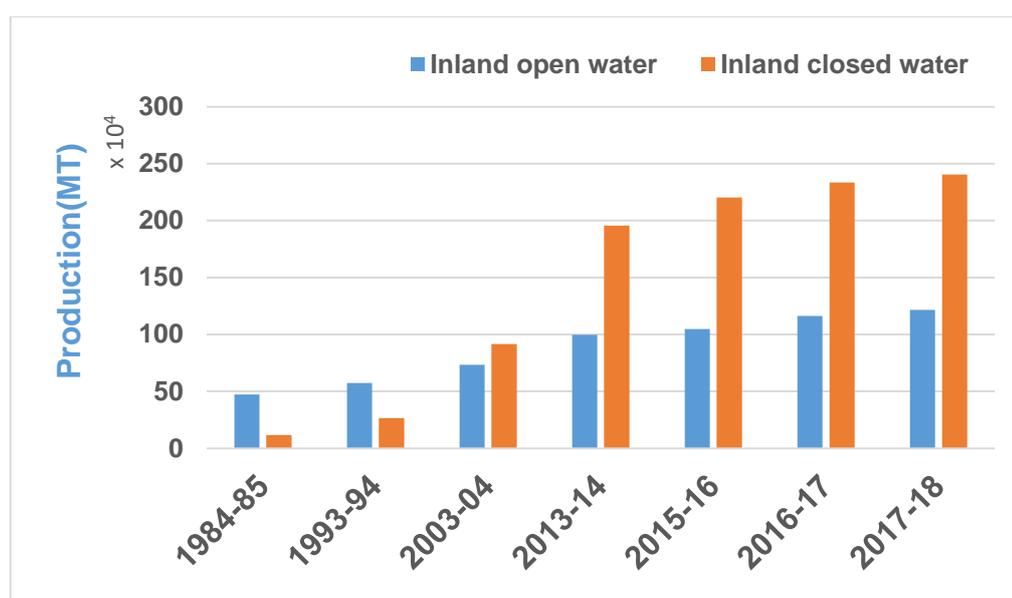
Major carps, Exotic carp, Pangus, Tilapia, Other inland fish and Hilsha are the dominant species from inland water area (Figure 2) (DoF, 2018). Ilish alone contributes 12% of the country's total fish production. The economic value of the contribution is around 1% of country's GDP. According to the Fisheries Statistical Report of Bangladesh 2017-18, the country's total Hilsha production is **517198** MT of which 232698 MT from inland source and 284500 MT from marine catches (DoF, 2018).



**Figure 2:** Species-wise annual production in inland fisheries, 2017-18. *Major Carp*; Rui, Catla, Mrigal, *Other Carp*; Kalibaus, Bata, Ghania, *Exotic Carp*; Silver Carp, Grass Carp, Common Carp, Mirror Carp, Big Head Carp, Black Carp, *Other Cat Fish*; Boal, Air, Silon, Rita, *Snake Head*; Shol, Gazar, Taki, Live Fish; Koi, Singhi, Magur. Other Fish (Inland and Marine) - Includes all other fishes except those mentioned above (DoF, 2018).

### 3.1.4 Inland open water vs. Inland closed water fish production (MT)

According to DoF (2018), total inland open water fish production of Bangladesh in 2003-04 was **7,32,067 MT**, which is very slowly increased and reached to **12,16,539 MT** in 2017-18 (Figure 3). Whereas the total inland closed water fish production of the country was **9,14,752 MT** in 2003-04 and has become **24,05,415 MT** by 2017-18. That means that the inland closed water fish production of Bangladesh has increased more than double by the last decades, but inland open water production has not increased that much.



**Figure 3:** Trend in inland fish production in Bangladesh (source: Adapted from DoF, 2018).

### 3.2 Inland fish biodiversity

Bangladesh has huge open water resources with a wide range of aquatic diversity. Biodiversity is also enriched; 260 freshwater fish species is available in the inland waterbodies.

#### 3.2.1 The domesticated indigenous fishes of Bangladesh

Domestication of wild fishes gives benefits both the fish farmer and the environment (Hossain, 2010). In Bangladesh, to date about 20 fish species have been domesticated and their breeding and rearing protocols have been developed. Around 50% of the domesticated fishes are cypriniforms and now under nation-wide aquaculture (Table 3).

**Table 3: The domesticated indigenous fishes of Bangladesh** (Source: Hossain and Wahab, 2009)

Order	Fish	Culture status
<b>Cypriniformes</b>	<i>Labeo gonius</i>	Country-wide commercial
	<i>Labeo rohita</i>	Country-wide commercial
	<i>Catla catla</i>	Country-wide commercial
	<i>Labeo bata</i>	Country-wide commercial
	<i>Labeo calbasu</i>	Small scale, sporadic
	<i>Cirrhinus mrigala</i>	Country-wide commercial Breeding protocol developed
	<i>Tor putitora</i>	Small scale, sporadic
	<i>Puntius sarana</i>	Breeding protocol developed
	<i>Botia dario</i>	Small scale, sporadic
	<i>Chitala chitala</i>	Small scale, sporadic
<b>Osteoglossiformes</b>	<i>Ompok bimaculatus</i>	Small scale, sporadic
	<i>Ompok pabda</i>	Small scale, sporadic
<b>Siluriformes</b>	<i>Mystus vittatus</i>	Small scale, sporadic
	<i>Mystus gulio</i>	Breeding protocol developed
	<i>Clarias batrachus</i>	Small scale, sporadic
	<i>Heteropneustes fossilis</i>	Small scale, sporadic
	<i>Mastacembelus armatus</i>	Breeding protocol developed
<b>Synbranchiformes</b>	<i>Macrornathus aculeatus</i>	Breeding protocol developed
	<i>Anabas testudineus</i>	Breeding protocol developed
<b>Perciformes</b>	<i>Colisa fasciata</i>	Breeding protocol developed

### 3.2.2 Exotic fishes introduced into the freshwaters of Bangladesh

Exotic species have been recognized as an agent of the loss of indigenous biodiversity. Alteration of species and ecosystem caused by exotic invasive animals and plants influence the functioning and overall health of the affected ecosystems (Ameen 1999).

**Table 4: Exotic fishes introduced into the freshwaters of Bangladesh** (Source: Modified from Rahman, 2005)

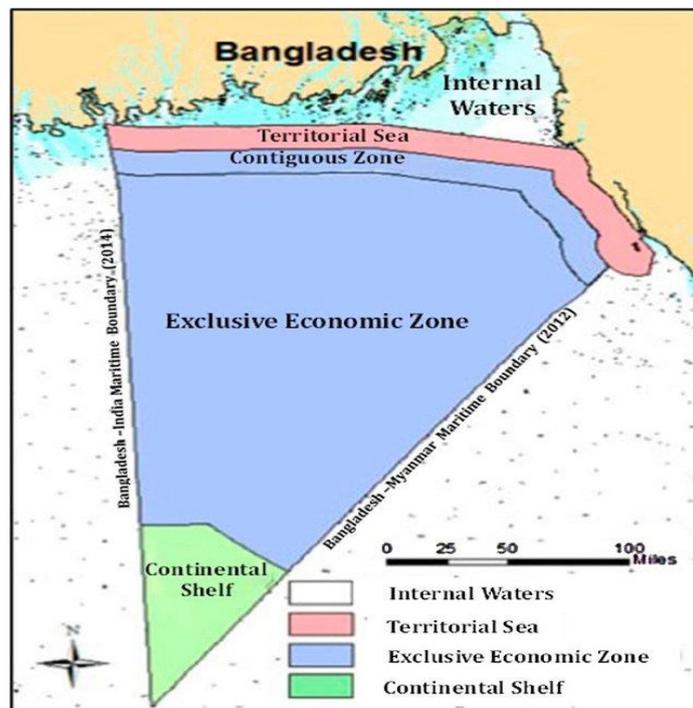
<b>Common name</b>	<b>Scientific Name</b>	<b>Source</b>	<b>Year of introduction</b>
<b>Siamese gourami</b>	<i>Trichogaster pectoralis</i>	Singapore	1952
<b>Tilapia</b>	<i>Oreochromis mossambicus</i>	Thailand	1954
<b>Guppy</b>	<i>Poecilia reticulata</i>	Thailand	1957
<b>Goldfish</b>	<i>Carassius auratus</i>	Pakistan	1953
<b>Common carp</b>	<i>Cyprinus carpio</i>	India, Nepal	1960
<b>Mirror carp</b>	<i>Cyprinus carpio</i>	India, Nepal	1979
<b>Grass carp</b>	<i>Ctenopharyngodon idella</i>	Hong Kong	1966
<b>Silver carp</b>	<i>Hypophthalmichthys molitrix</i>	Hong Kong	1969
<b>Nilotica</b>	<i>Oreochromis niloticus</i>	Thailand	1974
<b>Thai sarpunti</b>	<i>Barbonymus gonionotus</i>	Thailand	1977
<b>Bighead carp</b>	<i>Hypophthalmichthys nobilis</i>	Nepal	1981
<b>African magur</b>	<i>Clarias gariepinus</i>	Thailand	1990
<b>Thai pangas</b>	<i>Pangasius hypophthalmu</i>	Thailand	1990

### 3.3. Present status of marine fisheries resources of Bangladesh

Fish and other aquatic organisms living in the sea is called marine fisheries resources.

#### 3.3.1 Maritime area of Bangladesh

The International Tribunal for Law of the Sea (ITLOS) Judgment regarding Bangladesh-Myanmar maritime boundary of 2012 and the Arbitration Award on India-Bangladesh maritime boundary of 2014 have provided an opportunity for Bangladesh to share and use the maritime resources of the Bay of Bengal. Thus, the country could finally establish its sovereign rights on more than 118,813 sq kms of territorial sea (Figure 4), 200 nautical miles (nm) of Exclusive Economic Zone (EEZ) and all kinds of animal and non-animal resources under the continental shelf up to 354 nm from the Chittagong coast (MoFA, 2014).



**Figure 4:** Maritime area of Bangladesh (Source: MoFA, 2014)

#### 3.3.2 Commercial marine fishing grounds in Bangladesh

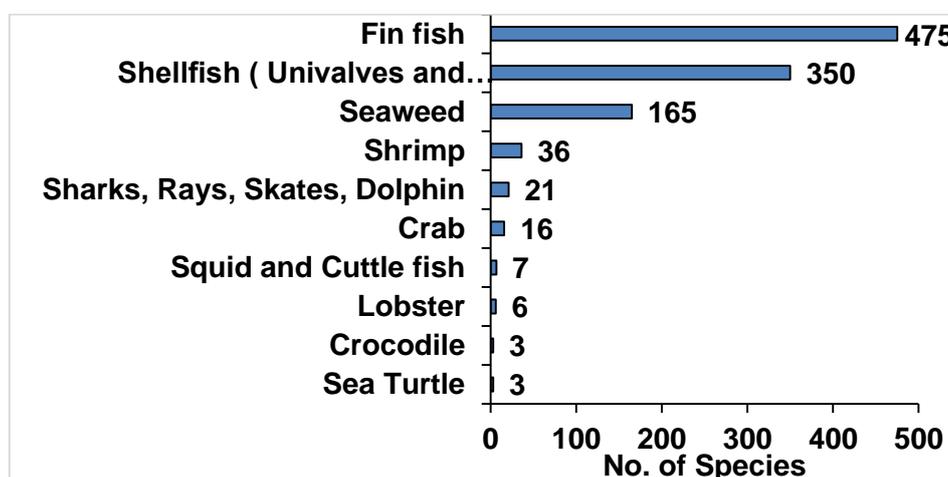
Although fish and other aquatic organisms are found in the Bay of Bengal, they get concentrated in the fishing grounds in some particular sites. Till now, four fishing grounds have been identified (FAO, 2010). They are south patches, south of south patches, middle ground and Swatch of no Ground (Table 5).

**Table 5:** Commercial fishing grounds in Bangladesh (Source: FAO, 2010)

Name	Location	Major commercial species
South Patches	90°10'- 91°50'E 21°10'-21°40'N	Indian salmon, Hilsa, pomfret, ribbonfish, Bombay duck, carangids, eel, jew fish, catfish, sharks and rays
South-west of South Patches (Middle ground)	90°30'-91°40'E 20°45'- 21°1 0'N	Pomfret, red snappers, ribbonfish, silver Jew, Carangids, shrimp
East of Swatch of No Ground	90°00'-90°40'E 21°00'-21°25'N	Indian mackerel, snappers, groupers, Jew fish,
Swatch of No Ground	89°00'-90°00'E, 21°00'-21°40'N	Shrimps, Hilsa, pomfret, ribbonfish Bombay duck, Jew fish

### 3.3.3 Coastal and marine biodiversity

Marine fisheries is the capturing and culturing of fishes in marine water. The Bay of Bengal (BoB) is enriched with a diverse range of marine organisms such as fishes, shrimps, mollusks, crabs, mammals and seaweeds, etc. (Figure 5). Finfish has 475 species, while shellfish, seaweeds and shrimp have 350, 165 and 36 species, respectively (FAO, 2014).



**Figure 5:** Coastal and Marine fisheries resources in Bangladesh (Source: Adapted from FAO, 2014).

#### 3.3.3.1. Fish

475 species of fish under 13 families has been identified from the coastal and marine waters of the Bay of Bengal. Till date, the significant fish families are Sciaenidae, Ariidae, Nemipteridae,

Carangidae, Mullidae, Synodontidae, Trichiuridae, Leiognathidae, Pomadasyidae, and Clupeidae, which collectively make up about 47% of the total biomass (DoF, 2015).

### 3.3.3.2. *Shrimp and prawn*

In addition to large number of fish species, the mangroves also support many species of shrimps and prawn, which have high commercial value. There are 56 species of shrimps and prawn belonging to five families available in Bangladesh. Commercially exported only four species of shrimp and prawn to the world and 10 species are commercially exploited (Mondal, 2013) (Table 6).

**Table 6:** List of commonly harvested shrimp and prawn in Bangladesh (Source: Mondal, 2013)

Group	Bengali name	English name	Scientific name
Prawn	Golda chingri	Giant Freshwater Prawn	<i>Macrobrachium rosenbergii</i> *
Shrimp	Bagda chingri	Giant tiger Shrimp	<i>Penaeus monodon</i> *
	Baghtara chingri	Green tiger Shrimp	<i>Penaeus semisulcatus</i>
	Baghtara chingri	Kuruma Shrimp	<i>Penaeus japonicus</i>
	Chaga chingri	White Shrimp	<i>Penaeus indicus</i> *
	Bagha chama	Blue-tail Shrimp	<i>Penaeus merguensis</i>
	Horney chingri	Speckled Shrimp	<i>Metapenaeus monoceros</i> *
	Nona chingri	Yellow Shrimp	<i>Metapenaeus brevicornis</i>
	Ghora chingri	Kadal Shrimp	<i>Metapenaeus dobsoni</i>
	Gura chingri	Roshma Shrimp	<i>Palaemon styliferus</i>
	Ruda chingri	Rainbow Shrimp	<i>Parapenaeopsis sculptilis</i>

\* indicates commercially exportable species

### 3.3.3.3. *Crab*

About 16 species of crabs have been identified in the coastal and marine habitats of the BoB, among which 11 are purely marine. Only three species, namely *Scylla serrata* (mudcrab or mangrove crab), *Portunus pelagicus*, and *P. sanguinolentus* are reported as commercially important (Table 7) (Siddiqui and Zafar, 2002). Coastal water body is suitable for mud crab, *Scylla serrata* and abundantly available. The seeds of this species are also available throughout the coastal belt (Kamal, 2000). However, no scientific report is available on the standing stock of the crab resources in Bangladesh.

**Table 7:** List of economically important crab species in Bangladesh (Siddiqui and Zafar, 2002)

Family	Bengali name	English name	Scientific name
Portunidae	Shila Kankra	Giant Mud Crab	<i>Scylla serrata</i> *
	Sataru Kankra	Swimming Crab	<i>Portunus pelagicus</i> *
	Tin Fota Kankra	Three-spot Swimming Crab	<i>Portunus sanguinolentus</i> *
Grapsidae	Gasho Kankra	Paddler Crab	<i>Metopograpsus thukuhar</i>
	Gasho Kankra	Paddler Crab	<i>Metopograpsus messor</i>
	-	-	<i>Parasesarma plicatum</i>
	Kankra	Violet Vinegar Crab	<i>Episesarma versicolor</i>
Potamoniade	Kata Kankra	Freshwater Crab	<i>Potamon woodmasoni</i>
	Chimta Kankra	Spiny Crab	<i>Potamon martensi</i>
	Pati Kankra	Sartotina Crab	<i>Paratelphusa lamellifrons</i>
Ocypodidae	Holdepa Kankra	Fiddler Crab	<i>Uca urvillei</i>
	Kankra	Ghost Crab	<i>Uca annulipes</i>
	Lal Kankra	Horned-eyed Ghost Crab	<i>Ocypode ceratophthalmus</i>
Paguridae	-	-	<i>Anapagurus laevis</i>
Leucosiidae	-	-	<i>Ebalia cranchii</i>

\* indicates commercially exportable species

#### 3.3.3.4. Molluscs

Ahmed (1990) reported 301 species of coastal and marine molluscs in Bangladesh. Limited information is available about their occurrence and biology. A variety forms of molluscs are available in the Bay of Bengal and coastal areas such as bivalves, clams, oysters, scallops, snails and slugs, cuttlefish, squids, octopuses, etc. Two types of clam, called blood clams and the thick-shelled clam, are available in Bangladesh. Sarker and Alam (1988) identified two blood clam species, namely *Anadara granosa* and *A. rhombea*. Oysters are found in the littoral and inter tidal zones and they are sedentary animals growing on gravel, rocks, tree roots, and hard objects. Only three types of oysters namely the edible oyster, the pearl oyster, and the window pane oyster are reported to occur in the coastal waters of the Bay of Bengal.

#### 3.3.3.5. Seaweeds

The natural abundance of commercially important seaweeds is reported to be very low in Bangladesh (Ahmed and Taparhudee, 2005). Only 30 km area are suitable for natural growth of seaweeds which got rocky substratum in the coastline and St. Martin Island. Taxonomical studies on the seaweeds in these areas reported that 20-22 species of naturally growing seaweeds are available in St. Martin Island. (Sarker, 1992) reported that *Hypnea* was the most abundant species. However, species level identification for most of the seaweeds has not yet

been conducted. Commercially important seaweed species available in the Bay of Bengal is listed in Table 8.

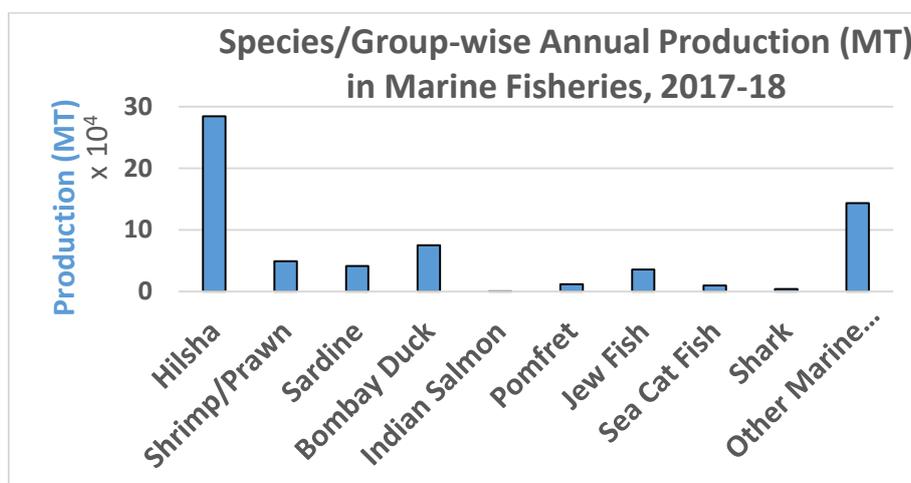
**Table 8:** Commercially important seaweeds in Bangladesh (Source: Ahmed and Tafarhudee, 2005)

SL No.	Genus	Species	Type
1	<i>Caulerpa</i>	<i>Caulerpa racemosa</i>	Green seaweed
2	<i>Enteromorpha</i>	<i>Enteromorpha sp</i>	Green seaweed
3	<i>Gelidiella</i>	<i>Gelidiella tenuissima</i>	Red seaweed
4	<i>Gelidiella</i>	<i>Gelidiella pusillum</i>	Red seaweed
5	<i>Halymenia</i>	<i>Halymenia discoidea</i>	Red seaweed
6	<i>Hypnea</i>	<i>Hypnea pannosa</i>	Red seaweed
7	<i>Hydroclathrus</i>	<i>clathratus</i>	Brown seaweed
8	<i>Sargassum</i>	<i>Sargassum sp</i>	Brown seaweed

### 3.3.4. Coastal and marine fisheries production

#### 3.3.4.1. Fish

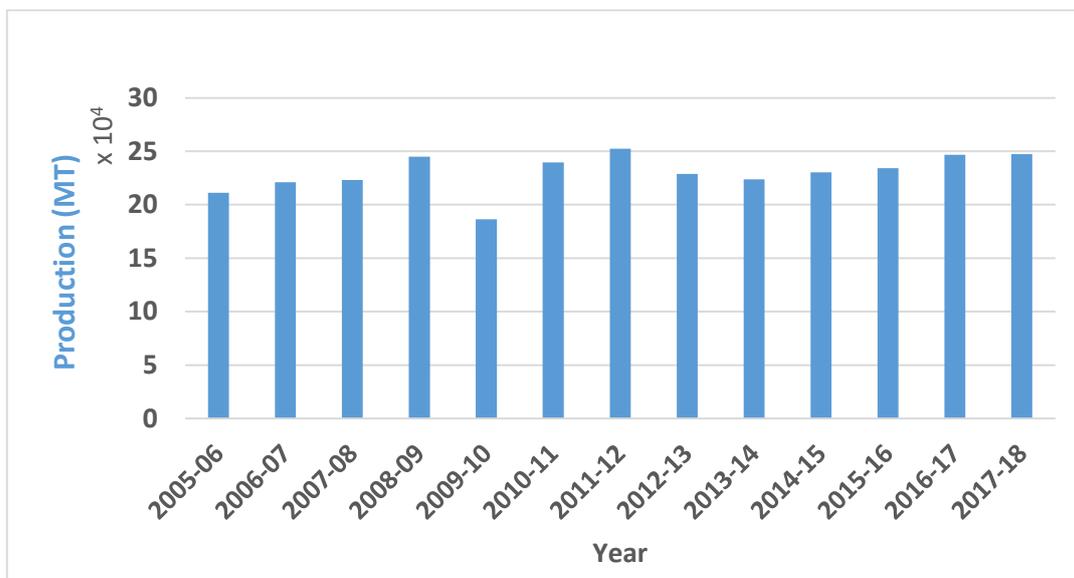
Hilsha (Ilish), Sardine, Bombay Duck, Salmon, Pomfret, Jew Fish, Sharks and Rays are the dominant species among others captured from marine and coastal water area (Figure 6) (DoF, 2018). Ilish alone contributes to around 12% of the country's total fish production. The economic value of the contribution is around 1% of country's GDP. According to the Fisheries Statistical Report of Bangladesh 2017-18, the country's total Hilsha production is 5,17,198 MT of which 2,32,698 MT from inland source and 2,84,500 MT from marine catches (DoF, 2018).



**Figure 6:** Species-wise annual production in marine fisheries, 2017-18 (Adapted from DoF, 2018).

### 3.3.4.2. Shrimp/Prawn

Shrimps and prawns are mainly produced in coastal Districts such as Khulna, Satkhira, Barisal, Patuakhali, Bagerhat, Vola, Chittagong, and Cox’s Bazar. The production costs are very low and ecology of coastal areas and the climatic condition of Bangladesh is extremely suitable for shrimp culture. As a result of increasing demand and price, shrimp culture started to expand in 1970s aiming mainly the export markets (Mazid and Gupta, 1997). Shrimp culture area has expanded from 217,177 ha in 2005-06 to over 272,717 ha in 2016-17 and production has increased form 85,510 MT to 130,296 MT respectively (Figure 7) (DoF, 2018). In Khulna region, shrimp is cultured in a modified rice field called ‘gher’. In Cox’s Bazar, shrimp and salt are produced alternately. In Bangladesh, the shrimp culture technology has been intensified over the last few years, but the production level has not increased satisfactorily. One of the main reason of that is availability of good quality PL and feed. The average production in the shrimp farms is about 904kg/ha (DoF, 2018).



**Figure 7:** Production of shrimp/prawn from 2005-06 to 2016-17 (Adapted from DoF, 2018).

### 3.3.4.3. Crab

Among the available species, mud crab *Scylla serrate* is the only species that is cultured on a small scale. Mud crabs are also collected from natural sources like mangrove areas and shrimp gher (Istiaque, 2018). According to Joarder (2014), 60% of mud crabs are landed from Khulna, 30% from Satkhira and 10% from Bagerhat. In Bangladesh, about 19,408-hectare water bodies were used to produce crab. In 2015-16 fiscal year, the total production of mud crab was 13,160

MT, which has reached at 14,421 MT in 2016-17 (DoF, 2018). Crabs are mainly exported in live and frozen form.

#### **3.3.4.4. Mollusc**

Very little is known about production and management of clams. Intertidal and mangrove areas up to a depth of 10m in the sea is the suitable area for clams (Pagcatipunam, 1982). For lime production, animal feed industries and shell handicrafts blood clams are utilized. Recently, the blood clams are exported from Bangladesh (Alam and Sarker, 1986). There is no published information about the amount of catch is available on clam, but the annual production is roughly estimated to be 80–100 t (Kamal, 2000). Pagcatipunan (1982) reported that the highest natural abundance of edible oyster occurs in Cox’s Bazar and Teknaf area. Sarker and Alam (1988) reported an annual production of shell weight of 50–70 MT in 1984. There is no report available on production and stock size of cuttle fish and squid also in Bangladesh.

#### **3.3.4.5. Seaweed**

Very little is known about utilization of the seaweeds in Bangladesh. Kamal (2000) reported that *Hypnea spp.* mainly collected during February–April for commercial purpose. The fishermen, women and their children collecting seaweeds from the St. Martin Island for their livelihood. The collected weeds are sun dried in the open beach. Till now, Bangladesh is unable to establish industrial set up for seaweed processing and utilization, therefore, Bangladesh disposed about 200 ton (t) of dried seaweeds to Myanmar through various marketing intermediaries (Kamal, 2000).

#### **3.3.5. Fishing gears and fishing vessels**

Marine capture fisheries is further subdivided into artisanal and industrial fisheries. Artisanal fisheries contribute about 95% of the total marine production. Artisanal fisheries include a number of different types of fishing gears and crafts, which are mainly traditional. Only a few of the gears are operated by mechanized boats, but mostly with country boats, some are even operated without any boat. The catches of the Estuarine set bag net (ESBN) are mainly juvenile fish and other aquatic animals. There are two types of set bag nets, the larger one is operated in the deeper areas with an average depth of 10 to 30 meters. The smaller one is operated in the estuarine areas as well as in the river, where the tidal effect is high. Hook and line fishing is a seasonal practice and limited to mainly in the winter season when the sea becomes calm. The

seine nets are operated at the very near shore and used for catching small fishes (Shamsuzzaman *et al.*, 2017).

**Table 9:** Fishing gear used in the coastal/marine water in Bangladesh with target species and depth of operation (Source: Khan *et al.*, 1997)

<b>Gear</b>	<b>Target species</b>	<b>Depth (m)</b>
<b>A. Industrial</b>		
✓ Shrimp Trawler	Penaeid shrimp	40-100
✓ Fishing Trawler	Pomfret, Grunter, Croaker, Catfish, Salmon, Jewfish, Ribbon fish etc.	40-100
<b>B. Artisanal</b>		
✓ Gillnet (Drift gillnet, Fixed Gillnet , Large mesh Driftnet, Bottom set net, Mullet gillnet)	Hilsa Shad, Sharks, Indian Salmon, Grey Mullet,	5-30
✓ Set bag net (Estuarine set bag net, Marine set bag net, Large mesh set bag net)	Shrimp, croaker, Ribbonfish, Bombay duck, Clupeids, Anchovies, etc.	5-10
✓ Trammel net	Seabass	10-30
✓ Bottom long line	Shrimp, Croaker, Catfish	10-30
✓ Beach seine	Croaker	10-30
✓ Char pata net	Clupeids	8-10
✓ Cast net	Anchovies, Ribbonfish	> 10
✓ Push net	Shrimp	> 10
✓ Fixed bag net	Shrimp	> 10
✓ Dagnet	Shrimp	> 5

### 3.3.6 Export of fish and fishery products

The Fisheries sector of Bangladesh have emerged as the second most important contributors to the export earnings (Ghose, 2014). Ten categories of fishery products (Frozen freshwater fish, frozen marine water fish, frozen shrimp, chilled fish, live fish, dry fish, salted dehydrate, live kusia, live crab, and fish scale/shrimp scull) are exported from Bangladesh to more than 55 countries. The shrimp export for Bangladesh is primarily in the EU. More than 45% of fishery exports (by quantity) were exported to European Union (EU) in 2015. Remaining 55% were

exported to USA, Japan, Russia, China, Thailand, Vietnam, India, Malaysia, Philippines, Saudi Arabia.

**Table 10:** Year-wise annual export of fish and fish product (Source: DoF, 2018)

Year	Value in Core Taka
2010-11	4603.83
2011-12	4703.94
2012-13	4158.97
2013-14	4776.92
2014-15	4660.60
2015-16	4282.82
2016-17	4287.64
2017-18	4309.94

### 3.7. Prospects of fisheries resources in Bangladesh

#### 3.7.1. Prospects of Inland Closed water

56% fish production comes from inland closed water. Inland closed water fish production almost saturated in condition. Aquaculture industry has the responsibility. A 5-fold increase in production needed within the next 5 decades to maintain current aquatic food consumption levels. For this reason, we need new technology. Biofloc technology has self-nitrification process within culture ponds with zero water exchange. Biofloc technology is cost effective, control water pollution, eco-friendly, prevent diseases, gives higher productivity and consequently a sustainable production. Nitrate, Nitrite, Ammonia can be converted to useful product, *ie.*, proteinaceous feed through this technology. It is the technology used in aquaculture system with limited or zero water exchange under high stocking density, strong aeration and biota formed by biofloc. The culture of biofloc will be productive in the case of culture tanks exposed to sun. Probiotics can improve the digestibility of nutrients, increase tolerance to stress, and encourage reproduction.

#### 3.7.2. Prospects of Inland Open water

Only 28% fish production comes from inland closed water. But we have huge open water resources. The productivity in the beel and River and Estuary is 859 and 318 kg/ha, respectively. If we want to increase this value either 1000 kg/ha or 1200 kg/ha we should increase the water area under pen and cage culture system. Only 1.29 lakh cubic meter and 5294 ha area are under cage and pen culture system, respectively. If we increase the area under

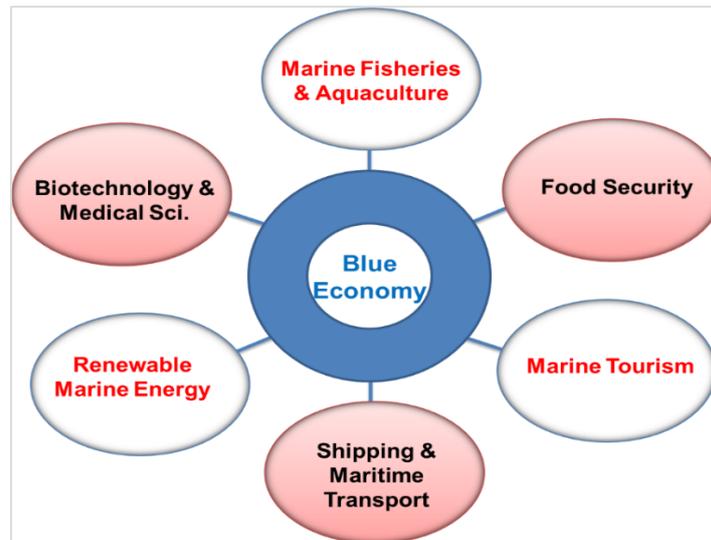
pen and cage culture, then the fish production will be increased rapidly. The Daudkandi model of community floodplain aquaculture is the another opportunity. It is one kind of community-based fisheries management. CBFM was expected to improve fisher access, livelihoods, and the sustainability of fisheries. CBFM promote an equitable distribution of benefits from fisheries to community people The project started with around 115 ha (285 acres) of floodplain that turns into a water-body in the monsoon (June–September). Eighty percent of shares were distributed to landowners and villagers, and 20% were bought by the initiator NGO, SHISUK. 70% of the net profit is distributed as dividends to shareholders regardless whether landowners or not, and 3% is kept for development of local areas. We can apply this approach in the different open water bodies in the country such as chalan beel, arial beel etc.

### ***3.7.3. Prospects of marine fisheries resources***

Bangladesh is rich in coastal and marine resources. Utilization of the marine resources by implementing proper management strategies will develop an economic zone in the southern part of Bangladesh. It will create employment opportunities and other income-generating activities.

#### ***3.7.3.1. Blue economy***

Blue economy is a quite new and emerging concept in Bangladesh, which refers to all economic activities related to ocean, sea and coast (Hasan *et al.*, 2018). Blue economy means extraction of the resources from the sea for the growth of an economy. Ocean resources can be utilized for increasing food security, improving nutrition and health, alleviating poverty, creating jobs, generating alternative energy, lifting seaborne trade and industrial profiles, while protecting ecosystem health and biodiversity (Hussain *et al.*, 2017; MoFA, 2019). The major sectors related to blue economy is shown in Figure 8. By recent settlement of maritime boundary with Myanmar and India, Bangladesh has acquired 118,813 square kilometers of the Bay of Bengal. According to expert opinion, Bangladesh would be able to extract about 1.2 billion dollar from its huge marine resources. Bangladesh could be a developed country by 2041, if the resources are properly extracted and adequately used. It is possible to acquire 5 percent of the country's GDP by 2030 from the resources of the sea. Development of blue economy will open a new window for development of Bangladesh.



**Figure 8:** Different sectors related to blue economy in Bangladesh (Adapted from Hussain *et al.*, 2017).

### ***3.7.3.2. Biotechnology and marine genetic resource***

Marine bio-tech has the potential to address a suite of global challenges such as sustainable food supplies, human health, energy security and environmental remediation. Marine genetic resources like bacteria are a rich source of potential drugs. In 2017, there were over 36 marine derived drugs in clinical development, including 15 for the treatment of cancer (MoFA, 2019). One area in which marine bio-tech can make a critical contribution is the development of new antibiotic for medical science (Hunt and Vincent, 2006).

### ***3.7.3.3. Research***

Freshwater fish production is higher with compared that in marine fish production in Bangladesh (DoF, 2018). Research works related marine fisheries resources and their production performance are very limited in the country. Recent settlement of maritime area with India and Myanmar provides the country a huge marine water area, which has a diversified fisheries resources. Therefore, appropriate research works on the marine fisheries are absolutely required. A number of marine fisheries academy and institutes are available in Bangladesh, which can play significant role for increasing marine fisheries production.

## **3.8. Challenges of fisheries resources management in Bangladesh**

### ***3.8.1. Climate change***

Bangladesh is most at risk from climate change. The country will face the greatest danger from global warming in the next 3 decades. Poverty and large low-lying coastal regions prone to

annual floods and cyclones were among factors making Bangladesh the number 1 exposed country to climate change (Hossain, 2014). Climate change have devastating impacts on fishery-based livelihoods and on domestic food supply. World's biggest mangrove can be smeared out by a one- meter rise in sea level (World Bank, 2000). The mangrove similarly supports offshore and deep sea fisheries by playing a noteworthy part as nursery ground for many deep sea fishes and shrimps including the *P. monodon*. Thus, sea level rise due to climate change may abolish the marine fish nursery ground in the Sundarban (Chowdhury *et al.*, 2010). Climate change effect may reduce pH and increase CO<sub>2</sub> level in the sea, which can affect survival of marine fishes, eggs and larvae.

### ***3.8.2. Reduced fish diversity***

Total number of freshwater fish species in Bangladesh ranges from 250 to 260 (Rahman, 2005, Siddiqui *et al.*, 2007), but IUCN assessed 253 fish species of which 64 species are under threatened category. 9 species are critically endangered, 30 species are endangered and 25 species are vulnerable (IUCN Bangladesh, 2015). The production of eggs and carp fry has been declined in Halda river (Haque, 2016).

### ***3.8.3. Water quality and productivity***

Changes in temperature and dissolved oxygen affect plankton productivity in the water bodies (FAO, 2018). The deteriorated water quality is tended to escalate disease outbreaks and reduce fish growth and production (Hossain, 2013).

### ***3.8.4. Installation of Rampal power station and Matarbari coal power plant***

Bangladesh government has decided to establish 1320 MW coal-fired power plant at the mouth of the Sundarban under Rampal upazila of Bagerhat district beside the Poshur river. This, coal-based power plant would affect the ecosystem of Sundarbans and surrounding areas permanently (Chowdhury *et al.*, 2017) and thereby affect the marine fish nursery ground in the Sundarban. Furthermore, Matarbari Coal Power Plant in Moheshkhali upazila of Cox's Bazar would be another threat for marine ecosystem, which in turn may affect the marine organisms including fishes and turtles (Chowdhury, 2018).

### ***3.8.5. Other challenges:***

The following challenges need to be addressed to increase the marine production in a sustainable manner, which will have tremendous and long-term impact on livelihoods of the coastal people (Mazid, 2002; Shamsuzzaman *et al.*, 2017). Such as Lack of awareness about

modern aquaculture techniques like cage culture, Lack of appropriate technology for marine and coastal aquaculture, inadequate facilities in relation to information, communication, transportation and market, lack of skilled manpower in this field, the areas for Mariculture not yet demarcated by the government, lack of financial support and loan facilities to the sector.

### **3.9. Possible solutions against challenges of fisheries resources management in Bangladesh**

The government of the Bangladesh should develop appropriate policy and take proper initiatives for protection and conservation of marine fisheries resources. The government should not consider for installing any harmful power plant nearby or in the sea, which may disturb the ocean ecosystem. Others recommended that the following initiatives need to be taken by the government and private sector in collaboration with the regional and international networks (Mazid, 2002; Shamsuzzaman *et al.*, 2017). These are:

#### **A. Capacity building relating to the Marine aquaculture, in terms of-**

Develop appropriate technologies for coastal and marine aquaculture, which will be best fit for Bangladesh considering its climatic, market and social conditions. Develop knowledge and management skills of the human resources who will be involved in coastal and marine sector. Plan for the demarcation of coastal areas using GIS.

#### **B. Development of infrastructures**

Road for transportation of both inputs and outputs. Developing the educational or training facilities. Develop communication system to rapid access to information.

#### **C. Development of networks**

Develop organizations and networks for information, better management, and access to finance. Develop and coordinate with the regional and international networks for update technological, markets and other relevant information and support.

## **CHAPTER IV**

### **CONCLUSION**

This review paper provides information about the present scenario of fisheries resources in Bangladesh.

Inland open water and inland closed water covers 39,27,142 and 7,97,851 ha respectively. There are 260 fresh water, 475 marine water fish species, 56 species of shrimps and prawn, 16 species of crabs, 301 species of molluscs and 133 species of seaweeds available in Bangladesh. Fisheries resources have great potentialities and huge prospects for economic development of the country. The inland and marine fisheries properties of Bangladesh contributed about 84% and 16% of the total fisheries production, respectively. Biofloc technology, pen and cage culture is the new approach to increase the fish production in inland closed and open water bodies, respectively.

The newly settled maritime boundary with Myanmar and India, up to 200 nautical miles from the coastline comprise of 118,813 sq. km of maritime water. Thus, the country has huge potential for marine fisheries in artisanal, industrial and coastal sub-sectors. Additionally, the concept of Blue economy has recently increased the prospects of marine resources in various ways, such as marine aquaculture, nutritional security, biotechnology, marine tourism and transport etc. Despite the huge prospects and potentialities, a number of reasons (climate change, installation of coal-based power plant nearby the sea, lack of scientific information and skilled manpower, and poor implementation of acts and rules related to marine fisheries etc.) limit the fisheries resources with their production performance. Supply of seed, feed in any time and extension services will increase the fisheries production in inland water bodies. Develop appropriate technologies for coastal and marine aquaculture, develop communication system to rapid access to information, develop and coordinate with the regional and international networks for update technological, markets and other relevant information and support. Proper utilization of the marine resources can boost up the total fisheries production of Bangladesh.

## **CHAPTER V**

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