PROSPECTS AND CHALLENGES OF DEEP SEA FISHING IN THE BAY OF BENGAL - OPTIONS FOR BANGLADESH

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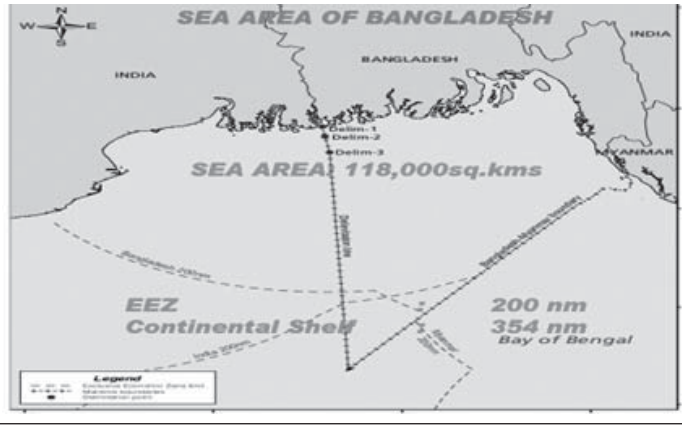
Introduction

The ocean covers about 72% of the earth surface. Fish from the ocean is a major source of protein and essential nutrients for a large part of the world's population. According to FAO Project Document -2017, fish accounts for about 17 percent of the global population's intake of animal protein, and 6 percent of all proteins consumed. (FAO-2017).

Bangladesh is one of the marginal coastal country of the Bay of Bengal (BoB) with a long coastline of 710 km. After the recent settlement of maritime dispute with India and Myanmar, Bangladesh has acquired sea area of about 1, 18,813 sq.km which is about 81% of Bangladesh total land area."We have huge untapped resources in the sea," said M Khurshed Alam, Secretary of Maritime Affairs Unit of Ministry of Foreign Affairs.

Figure 1: Approximate Sea Area of Bangladesh



Marine fisheries contributes about 16% of total fish production of the country (DOF, 2016-17). According to Ministry of Fisheries and Livestock (MFL) Annual Report 2016-17, Bangladesh harvested 63,476 MT Marine fish in 2016-17 (DOF-2016-17) and exported fishes and fish products valued BDT 4287.64 crore (MFL Report-2016-17). This sector also enables to earn about 5% of total foreign currency and contributes 3.61% to GDP engaging about 0.5 million coastal population (MFLReport-2016-17). Generally, beyond 200 meter is considered as deep sea fishing zone. Bangladesh still does not have any specific survey in this area nor any deep sea fishing vessel to explore it. However, most of our fishing community usually catches fish within 40-50 meter designated areas and within a distance of 50-60 km from the coast line. It is difficult to explore deep sea fishing areas due to lack of capacity, knowledge, technology, survey, appropriate policy, investment and resources etc.In Bangladesh there are three types of platforms used for sea fishing; mechanized boat, non-mechanized boat and industrial trawlers. There are about 248 industrial trawlers and 67,669 mechanized and non-mechanized boats engaged in fishing (DOF-2016-17). In a survey of marine fisheries it was found that, about 66% of demersal and 57 % of pelagic species are concentrated in the depth range of 0-50 meter (Khurshed 2004). Due to over fishing or exploitation within these zones, the area is facing gradual decrease of marine reserves. This is also a growing concern for Bangladesh (BD). After 1980, there is no authentic survey regarding current fishing reserve. However, Govt has recently undertaken some good initiatives to carry out some survey at BoB. The survey carried out by neighboring countries also indicates the considerable fishing reserve in BD part of BoB. If this could be determined more accurately then, huge economic activities could be generated which in turn would contribute to national economy.

Marine Fisheries Environment

Geomorphological Structure of the BoB

Bangladesh coastal zone includes coastal plains island, tidal flat, estuaries, and offshore waters. The coastal zone is intersected by a vast river network, a dynamic estuarine system and a drainage basin covering also parts of India, Nepal, Bhutan and China draining in to BoB. The land area of the coastal zone is about 42,154 sq. km. The coast of Bangladesh is broadly divided into three distinct geo-morphological regions (National Report on Sustainable Management of the BoB Large Marine Ecosystem {BOBLME}, 2003).

Hydrometeorology of the Marine Environment

The geo-climate environment of the BoB dominated by three main factors (i.) Wind direction, (ii) Precipitation and (iii). River discharge. These factors have a very strong influence on the marine environment, as they affect the water circulation, salinity, productivity and bottom topography, which in turn influence fish distribution and abundance (BOBLME, 2003).

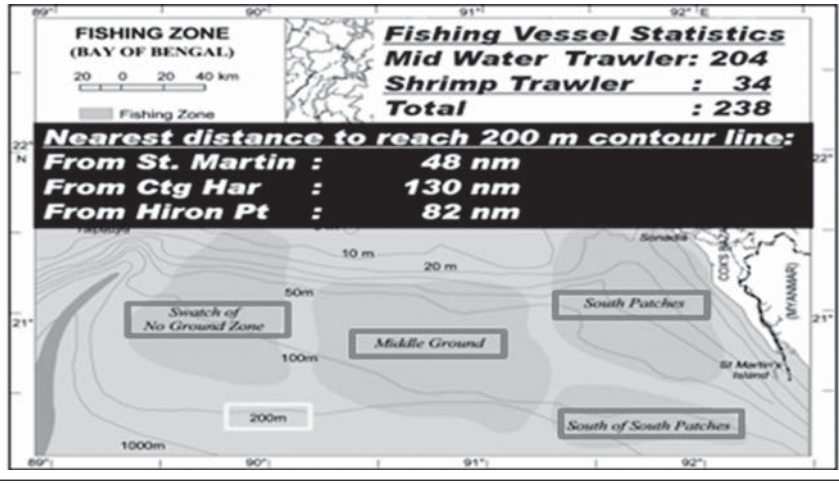
Physical Environment-Bottom Conditions

The area of the shelf zone from 10 m depth to the shelf edge or to the 200 m depth contour is about 40 000 sq.km . There is an area of about 24 000 sq.km which is shallower than 10 m. The traditional fishery is mostly carriedout at depths less than 20 m. The shelf area down to about 150 m appeared to be very even. The continental edgeis found at depths between 150-180 m. The slope is very precipitous and it seems impossible to carry out bottom trawling in waters deeper than 180 m. (RV Fridtjof Nansen, 1979-80). Besides a conspicuous feature of the western part of the area is the submarine canyon, Swatch of No Ground, reaching depths of more than 800 m. The continental edge is usually found at depths between 160 and 180 m (RVFridtjof Nansen, 1979-80).

Fishing Grounds and Establishing of Fish Sanctuaries

There are four major fishing grounds in the marine waters of Bangladesh. South Patches area about 3,400 sq. km and South of South Patches covering an area about 2,800 sq. km, Middle fishing ground covering 4,600 sq. km area and Swatch of no ground covering 3,800 sq. km (Karim 2018). Four different areas in Middle ground and South patches have been declared as'fish sanctuaries' in the BoB (BOBLME, 2003). The distance from St Martin, Chattogram Harbour and Hiron Point to 200 m contour line are 48 nm, 130 nm and 82 nm respectively. This long distance is also big challenge for deep sea fishing for going to the area also for carrying back fishes in to the shore. In Figure-02, 238 industrial trawlers are considered to be operational among total 248 trawlers.

Figure 2: Fishing Zones



Source: Karim, 2018

Table 1: Commercial Fishing Grounds			
Ser No	Name	Location	Major Commercial Species
1.	South Patches	20°10' - 21°40'N 090°10' - 090'50'E	Indian salmon, Hilsa, Pomfret, Ribbon fish, Bombay duck, Eel, Croaker, Catfish, etc.
2.	South-west of South Patches	20°45' - 21°10'N 090°30'- 090°40'E	Pomfret, Red snapper, Croaker, Carangids, Grunter, Ribbon fish, Shrimp, etc.
3.	East of Swatch of No Ground (Middling Ground)	21°00' - 21°25'N 090°00'- 090°40'E	Snapper, Grouper, Croaker, Shrimp, etc.
4	Swatch of No Ground	21°00' - 21°40'N 089°00'- 089°50'E	Hilsa, Pomfret, Ribbon fish, Bombay duck, Croaker, Shrimp, etc.
Source: Arif, 2015			

Marine Fisheries Reserves

A total of 475 fish species have been recorded from the marine waters of Bangladesh. The fish species are demersal fishes, shallow water estuarine species and some mid-water species. These include about 100 commercial species of which 20 fish families are highly commercial, contributing about 82-87% of the total demersal exploitation. The three most important families are Ariidae (catfishes) contributes 11.99%, Siaenidae (jewfishes) 1.37% and Nemipteridae (threadfin breams) 9% respectively (BOBLME, 2003).

Table 2: Stock and MSY of Resources		
Resource	Stock (MT)	MSY (MT)
Shrimp	2,000 – 4,000	7,000 – 8,000
Demarsal Fish and Pelagic accessible to demarsal trawl in 10-200m depth (Lamboeuf 1987)	188,000	47,500 – 88,500
Pelagic	90,000- 160,000	Not Determined
Source: Arif, 2015		

Figure 3: Tuna and Tuna-like Fishes in BoB

Source: Karim-2018

Demersal Fish

According to BIMSTEC survey the highest densities of demersal fishare observed off Cox's Bazar at 20-30 m depths and along the north-eastern edge of Swatch of No-Ground between 60 and 100 m depths. The dominant species in the area off Cox's Bazar are Catfish and Bombay duck, Harpodonnehereus. Catfish and Croakers are also among the important species at the 25-49 m depth zone. At 50-74 m depth, Catfish contributed about 75% of the catch. At 75-99 m depths the contribution of Catfish to the catches decreased sharply. At depths deeper than 100 m these species also dominated the catches. (RV Fridtjof Nansen, 1979-80).

Pelagic Fish

The high concentration of pelagic fish in approximate position N 2 0 ~ 1 5 'E~ 9 1°20' probably consisted of Indian mackerel, Rastrelliger kanagurta, settled on the bottom at about 80m. From the Carangidae family Carangoides malabaricus is the most abundahtspecies down to 75 m depth,while round Scad, Decapterus maruadsi, are dominant at 75-100 m. (RV Fridtjof Nansen, 1979-80). Skipjack tuna isthe dominant species not only in number and weight but also be the most important for DGN fishery in the BoB. Most of the capturing fishes were economic species. Bangladesh area seemed to be the richest area with the highest degree of species diversity (BIMSTEC, 2008).

Methods of Fishing, Marine Catches and Infrastructure

Exploitation of Marine Fishery Resources

There is a great potential for marine fisheries in BoB. Due to lack of conservation efforts, the production remained almost static. Only the coastal aquaculture shows an increasing trend. Of the two sub-sectors of marine fishery (industrial and artisanal), the industrial fishery is based on trawl fishery (shrimp trawl and fish trawl).

Industrial Fishery

Bangladesh Fishery Development Corporation (BFDC) took the lead to introduce trawler fleet in the BoB and acted as a pioneer and pathfinder for the private sector and contributed to the scientific exploitation of sea fish/shrimp resources. About 4000 tons of shrimp is caught and exported. Besides, about 20,000 tons fish is marketed locally every year. The industrial fishing is carried out by about 248 trawlers (Department of Fishery (DOF), 2017). These vessels usually operates between 40 m to 200 m depth. But, currently there is no vessel which can operate beyond 200 m, which is actual deep sea fishing area. However, in 2018 Govt has approved

16 licenses (09 Long Liner and 07 Purse seiner vessel). Bangladesh Navy Welfare Trust i.e Nou Kollayan Foundation (NKF), one of its commercial entity obtained approval for 02 Long Liner and 02 Purse Seiner vessel in 2018. Others are private entity.

Artisanal Fishery

Artisanal fisheries consist of about 20,359 mechanised and 16,831 non-mechanized boats operating in coastal waters (Year Book, Statistic, Ministry of Fishery and Live Stock, 2016-17). These vessels usually fish up to 40 m depth. However, both the fisheries (industrial and artisanal) try to exploit coastal and offshore marine fisheries resources without any appropriate management plan. It is mainly due to the non-availability of scientific information and difficulties in enforcement of management strategies.

Mariculture

Mariculture is a branch of aquaculture in which aquatic species are raised within the marine environment, i.e in sea water. The country has great potential for the development of fish and other shellfish culture in sea area. Transfer of such technologies available in other countries will greatly assist to develop mariculture for valuable species like sea bass, mullet and non-traditional items like different species of crab, mollusk and seaweed. (W H Kutubuddin, National Blue Economy Cell on 12 May 2018) Countries like China, Japan, and Vietnam have great success in this sector.

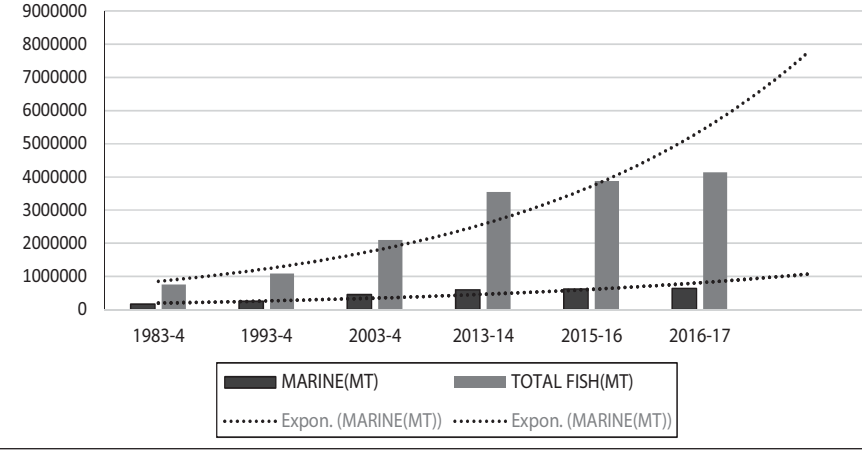
Fishing Gears Used

Bangladesh uses different innumerable fishing gears to exploit marine fishes. The major fishing gears in operation in the coastal and offshore waters of the BoB are gill nets (drift and fixed). Set bag nets (estuarine and marine), Trawl net (Shrimp and fish), Seine net, Push net, Trammel net, Hook and Line, Traps, etc. Drift Gill Nets (DGN) are dominated in inshore areas and specially for fish Hilsha species.

Marine Catches

The marine fishing catches are increasing gradually. According to the Fishery Statistics Year Book 2016-17, in 2005-6, Marine Industrial (MI) and Marine Artisanal (MA) had been 34,084 MT and 4,45,726 MT respectively. Whereas in 2016-17, MI and MA were 1, 08,479 and 5,28,997 MT total marine catches 6,37,476 MT. Total fish catches i.e capture, culture and marine was 41, 34,434 MT. So, marine fishes contributed 15.41% and fresh water fishes 84.59% (Year Book, 2016-7). Among total marine catches Industrial Sector contributes 17% and Artisanal contributes 83%. So, there is huge opportunity for Industrial sector. The Figure below shows the fish production trends. Since 1983 the production is growing exponentially but the marine fish catches are not increasing in the same paces. Therefore, more attention is required in to this sector.

Figure 4: Fish Production Trends



Source: Fishery Year Book 2016-17

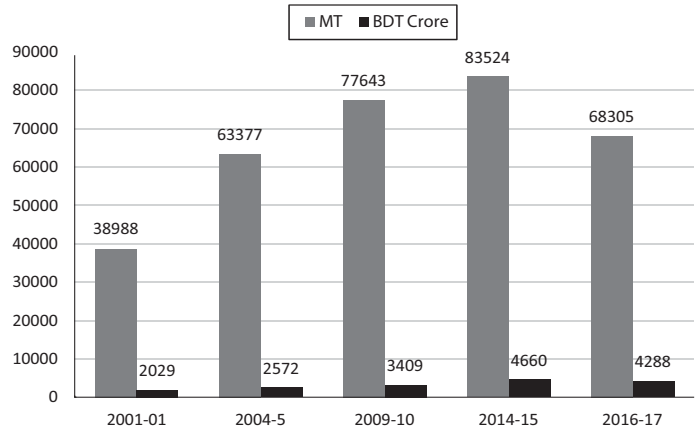
Table 3: Types Fishing and Gears				
SL No	Type of Fishing	No of Trawler/Boat	Unit (Gear/ Net)	Catches(MT)
1.	Industrial	248	744	1,08,479
2.	Artisanal: MB NMB	37,190 20,359 16,831	1,18,353 77,768 40,585	3,56,100 3,14,100 42,000
3.	Set Bag Net Fishing	-	-	1,46,097
4.	Long line Fishing	-	-	16,050
	TOTAL	37,438	1,19,097	6,37,476
Source: Fishery Statistical Year Book 2016-17				

Table 4: Marine Fish Production Trend (1983-2017)				
SL No	Type of Boat	1983-84 (MT)	2016-17(MT)	Growth
1.	Marine Industrial(MI)	14,500	1,08,479	2.97%
2.	Marine Artisanal(MA)	1,50,582	5,28,997	1.50%
	Total	1,64,882	6,37,476	1.75%
Source: Fishery Statistical Year Book 2016-17				

Fish Exports Trends (2001-2017)

According to the Statistical Year Book 2016-17, total fish exports were 68,305 MT in value BDT 4287 crore which is about 1.51% of total export. Among this export, shrimp was 39,705 MT and BDT 3,682 crore. (Year Book, 2016-7). It appears that, shrimp export is about 58% of total fish export which contributes to 85% in terms of export value. However, in 2000-1, total export were 38,988, BDT 2032 crore. So, during the last 15 years there was growth 1.75% and in terms of value it was 1.81% which is insignificant. On the other hand, in 2000-1, fish export was 5.77% of total export

Figure 5: Fish Export



Source: Fishery Year Book 2016-17

But in 2016-17 it was reduced to 1.51%. So the export pie for fishes is reducing (Year Book, 2016-17). Since there is a growing demand abroad, therefore, BD should put special focus on sea fish and processed sea food products export.

Infrastructures

Fishery Administration and Institutions

Fishery Administration. The Government administers both marine and inland fisheries by Ministry of Fisheries and Livestock (MoFL). The main public sector agencies are the Directorate of Fisheries (DoF) and the BFDC.

Fishery and Human Resource Development

Research: Fisheries research are undertaken independently by the Marine Biological Laboratory, Chattogram, Fisheries Technological Research Station, Chandpur; Freshwater Fisheries Research Station, Chandpur; and Aquaculture Experiment Station, Mymensing.

Universities: Currently there are number of Universities which are providing academic education on oceanography and marine resources. Bangabandhu Sheikh Mujibur Rahman Maritime University (BSMMRU), Bangladesh Agricultural University at Mymensing, Universities of Chattogram, Dhaka and Rajshahi have their own academic program in the fisheries field.

Marine Fisheries Academy

For developing marine fishery human resources Marine Fisheries Academy (MFA) was established on 1st September 1973 as sister concern of BFDC. So far about 1500 cadets in different trades (up to 34th batch) have successfully passed out from MFA since inception. Among those about 850 cadets are now serving in international maritime sector earning huge foreign currencies (Capt M H Ahmed, Commandant, MFA).

Fisheries Corporations

BFDC was established in 1964 for purposes of strategy development of the fishing industry of Bangladesh. "Fishing industry" includes also fish processing and marketing. The Corporation has the power to establish units for fishing, preservation, processing, distribution and marketing of fish and fish products (Razib, 2007).

Deep Sea Fishing Industry

Industrial trawlers are main platforms for fishing up to 200 m area. For importing deep sea fishing trawlers, foreign investment etc are regulated by Bangladesh Investment and Development Authority (BIDA). At this moment, there is no authorized vessel which can go beyond 200 m for deep sea fishing.

Platforms and Technology

Types of Fishing Trawlers in Bangladesh

There are different types of fishing trawlers currently used in Bangladesh; Industrial and Artisanal; Mechanized and non mechanized (MFA, 2018)

Table 5: Present Size of lndustrial Trawlers			
Type	No.	Mesh size	Engine power
Shrimp	37	45-300mm	50-500
Bottom	60	60-300mm	250-900
Mid-water	103	60-1600mm	600-1850
Trial Trip	4860	300mm	250-500
Source: Mr Humayun, 2016			

Total 248 industrial trawlers are permitted to fish in the area between 40m to 200m depth. Currently, there is no deep sea fishing activity in the BoB which is beyond 200m depth. Govt has recently sanctioned 16 long liners and purse seiner for deep sea fishing.

Deep Sea Fishing

For deep sea fishing, there are two types of fishing vessels .i.e Long Liner and Purse Seine vessel around the world.

Long Lining Fishing

Longline fishing, or long lining, is a commercial fishing technique. It uses a long line, called the main line, with baited hooks attached at intervals by means of branch lines called snoods. Long lines are classified mainly by where they are placed in the water column. This can be at the surface or at the bottom (Wikipedia). Longlines can be set to hang near the surface (Pelagic longline) to catch fish such as tuna and swordfish or along the sea floor (Demersal longline) for ground fish such as halibut or cod.

Figure 6: Pelagic Longline (Karim, 2018)

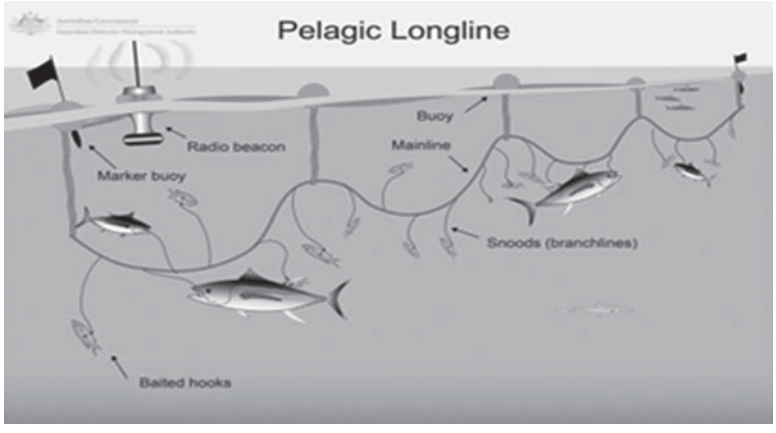
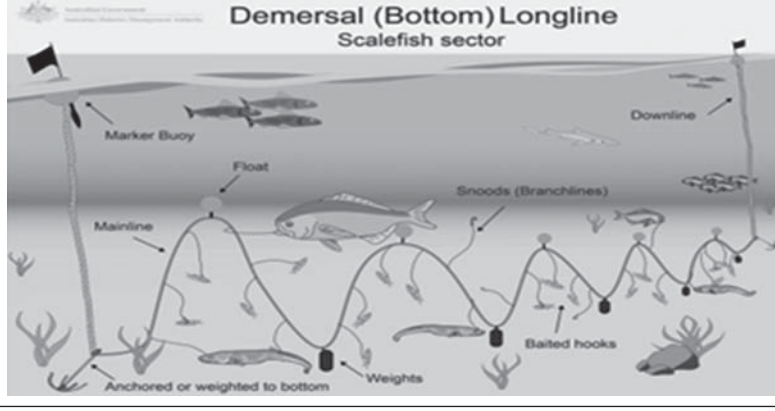


Figure 7: Demarsal Longline (Karim, 2018)



Per Seine Fishing

Seines have been used widely in the past, including by stone age societies. Seine fishing (or seine-haul fishing) is a method of fishing that employs a fishing net called a seine. Seine nets can be deployed from the shore as a beach seine, or from a boat.Boats deploying seine nets are known as seiners. Purse seine fishing can result in smaller amounts of by-catch (unintentionally caught fish)(Greenpeace, 21 May 2010). Use of purse seines is regulated by many countries. In Sri Lanka, using this type of net

within 7 kilometers of the shore is illegal (Colombo Page, 21 October 2013). Purse seine fishing can have negative impacts on fish stocks because it can involve the by catch of non-target species and it can put too much pressure on fish stocks.

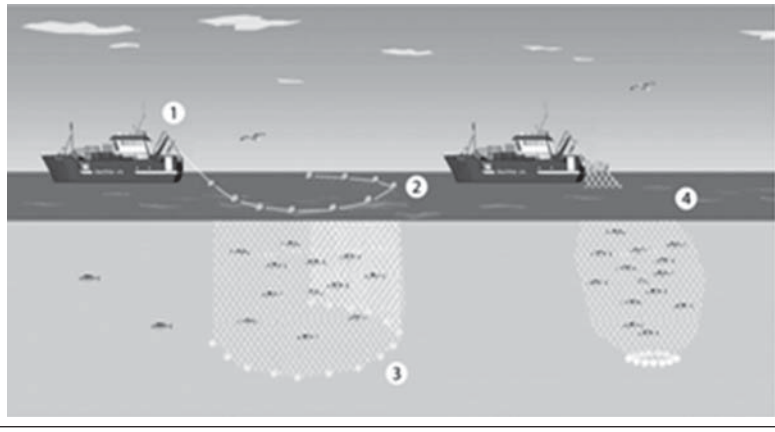
Types of Seiner

Two types of seine net deployed from seiners:

- Purse seines
- Danish seinesseiners

Purse Seine

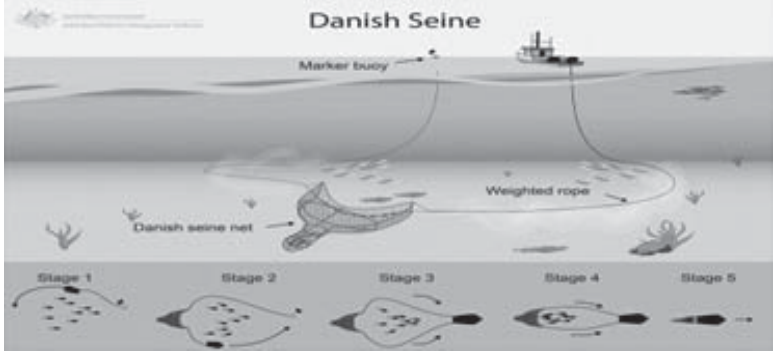
Figure 8: Purse Seine (Karim, 2018)



A common type of seine is a purse seine, named such because along the bottom are a number of rings. This operation is similar to a traditional style purse, which has a drawstring. The purse seine is a preferred technique for capturing fish species close to the surface: sardines, mackerel, anchovies, herring, and certain species of tuna and salmon .

Danish Seine

Figure 9: Danish Seine (Karim, 2018)



A Danish seine is similar to a small trawl net, but the wire warps are much longer and there are no otter boards. The seine boat drags the warps and the net in a circle around the fish. The motion of the warps herds the fish into the central net.

Rules, Regulations and Policies

International Legal Frame Work for Maritime Sectors

The World Summit on Sustainable Development (WSSD) (UN, 2002) set clear and time-bound targets for member countries to implement sustainable fisheries and sustainability targets. Target 6 specifically addresses fisheries. Several SDGs also address sustainability challenges relevant to fisheries. These are particularly prominent in the ten targets of Goal 14 (FAO, 2017).

Government Existing Rules, Regulations

Existing Rules and Regulations for Marine Fisheries Resources: The parent law is the Marine Fisheries Ordinance of 1983 and supplemented by Marine Fisheries Rules. However, Rules, Regulations and ordinance related to marine fisheries are given below:

- Marine Fisheries Ordinance, 1983
- Marine Fisheries Rules, 1983
- Shrimp Culture Users Tax Ordinance, 1992
- Protection and Conservation of Fish Rules, 1985
- Ordinance to provide for the establishment of a Fisheries Research Institute, 1984
- Protection and Conservation (Amendment) Ordinance 1982
- Territorial Waters and Maritime Zones Rules, 1977
- Allocation of functions to the Ministry of Fisheries and Livestock
- Bangladesh Fisheries Development Corporation Act, 1973
- Government Fisheries (Protection) Ordinance, 1959
- Protection and Conservation of Fish Act, 1950.

Marine Fisheries Ordinance (1983) is implemented by the DoF. This is supported by a series of rules (Marine Fisheries Rules, 1983) and supplemented periodically by Bangladesh Gazettes. The MFO (1983) is applied between the baseline (10 fathoms or 18.29 m) and 40 m (for the artisanal fishery) and beyond the 40 m depth contour (industrial fisheries) (Arif, 2015) Industrial trawlers often violets it.

Regulations and Enforcement

MFO and its Legal Implication in the Marine Fisheries Management

The MFO makes provisions for management, conservation and development of marine fisheries which is applicable to waters deeper than 40 meters. However, proper survey is yet to be made for effective exploitation of pelagic resources in EEZ (Razib, 2007). It is difficult to formulate effective policy and strategy without adequate information about standing stock of fish and fish habitats.

Legal Enforcement

The local administration enforce of laws, rules and policies. The Upazila administration might undertake shore-based enforcement program and data on movement of vessels and use of gears by non-mechanized artisanal sector. These are to be collected and monitored (Razib, 2007). Sea based enforcement are the responsibility of Coast Guard (CG) and Bangladesh Navy (BN) with the support of the DOF.

Ensuring Safety at Sea

Major provisions of regulating the fishing fleet must promote "Safety at Sea". The DOF prior issuing license required special awareness about lifesaving equipment. In line with this all registered and certified boats must carry lifesaving equipment for each crew member. All vessels falling under the mechanized commercial boats should be equipped with radios and transponders.

Policy Framework

In 1998, a National Fishery Policy was drafted and approved by the Government. Detailed deep sea fishing policy is yet be formulated and implemented. Since this type of fishing needs huge investment, local investors may face difficulties. Therefore, conducive policy for foreign investment in terms of joint venture needs to be formulated earliest.Above all, enforcement of policy remains to ever challenging task in this sector.

Enforcement Relating to Marine Fisheries

With limited resources, Coast Guard could employ 3,339 personnel to safe guard the coastal population and fishery communities. This population is safeguarded by 12 ships/crafts in 34,000 sq. km area. It appears that, one CG person takes care of 7500 fishermen and 15000 coastal people, which is very limited (Ministry of Planning, 2016).

Besides, Govt can take support of BN to facilitate the enforcement with the followings: (Mahbub, 2017)

- BN ships may actively take part in regular scientific data collection on various aspects of the Blue Economy activity.
- BN Hydrography may develop resources map of the BoB from real-time scientific information.
- BN may facilitate training activities on deep-sea living resources harnessing to expedite sea resources.
- BN may consider for facilitating commercial deep sea tuna fishing from the continental shelf of the BoB.

Socio-Economic Overview –Prospects and Challenges

Socio-Economy

BD coastal area lies in 19 districts covering 47,201 sq. km which is 32% of the land area. Out of 19 districts, 12 districts (48 Upazila) are directly engaged with the sea related businesses. Density of population is 482 person/sq. km. Out of 30 million population in coastal area, only 15 million are engaged with sea related activities for their livelihood (Ministry of Planning, Maritime Resources Documents 2016).

Prospects of Deep Sea Fishing

There are enormous living and non-living resources in the BoB. Among the living resources; 475 species of fishes, 36 types of shrimps, 5 types of lobsters, 15 types of crabs, 351 types of snails and mollusks, 33 types of sponges, 56 types of algae and corals, etc are there. Due to the permanent settlement of maritime boundary disputes, the opportunity also largely increased (MoFL).

BD traditional fisherman currently explores fishing up to 40m depth. Industrial trawlers (i.e 248) fishes 40 to 200m but beyond that the area, is yet to be explored. BD has about 35,000 sq. km up to 40m depth. But beyond this zone upto continental shelf, huge area is yet to be explored .

Surveys by R.V. Fishery Research No-2 (1979) and R.V Dr. Fridtj Nansen (1979-1980) indicate presence of some species of tunas and tuna like fishes in the EEZ of BD. Most abundant species as' per R. V. Fishery Research No 2 occurring mostly more in the 28-31m in depth area (N 21 -15.00, long E 90-22.00) (Fridtjof Nansen, 1979-80):

- Spanish Mackerel (S. commerson)
- Frigate tuna (A. thazard)
- Long tail tuna (I. tonggol)

The other survey indicates that, the feasibility of catching tuna near the EEZ of BD (latitude 16°N -19°N, longitude 88°E -91 °E) particularly skipjacks with DGN (BIMSTEC 2008). Besides, major catches of BD trawlers are white fishes which are as follows (Humayun-2016):

- Sardines/Rainbow sardines : 30%
- Breams/red fish : 10%
- Mackerels : 9%

BD can catch fish from up to 660 km from the BoB but its trawlers catch fishes mainly from 60 km owing to lack of capacity. For instance, in 2016 the country caught only 95,000 tons of fish in contrast to 8 million tons by India, Myanmar, Sri Lanka and Thailand from the BoB. Bangladeshi trawlers accounted for 11 percent of the total catch last year (Daily Star 2017).

"We have huge untapped resources in the sea," said M Khurshed Alam, Secretary of Maritime Affairs Unit of the Foreign Affairs Ministry. The average depth of the BoB is 2,500 meter. And yet, there is hardly any capability of catching demersal fishes beyond 50 meter depth of water. Long line fishing is totally absent in deep waters, he said (Daily Star 2017).

There is tremendous scope for increasing marine catch by introducing technology, long line and incentives for bigger ocean going trawler, (Alam, 2017). The global population will be 9 billion by 2050 and 100 million tons of additional fishes will be needed by that time. "It will be good if we can catch at least 5 million tons of fishes from the sea."(Daily Star 2017). Deep sea fishing can generate huge economic benefits to nation But it requires appropriate technology, knowledge, skilled man power, investment etc (Alam 2018).

Global Fishing Scenario

According to FAO (2016), global fish production has been increasing over the years and has reported 167.2 million tonnes by end of 2015. Capture fish production has contributed 55% to the global fish production in the same year.

Marine Fishing- Japan

Japan is one of the world›s largest consumers of sea fishes, consuming 7.5 billion tons of fish a year which is about 10 percent of the world›s catch. Per person consumption is about 30 kg a year. Scandinavians consume only around 15 kg per person as the next highest consumer. The Japanese consume so much fish that Japan has traditionally controlled the world market for seafood.

Japan has about $14 billion commercial fishing industry. There are around 200,000 fishing vessels in Japan. (https://en.wikipedia.org/wiki/Agriculture,_forestry,_and_fishing_in_Japan).

Marine Fishery- Sri Lanka

Sri Lanka has exclusive fishing and economic rights for an ocean area of 500,000 sq. km and a coastal line of 1700 km in addition to inland water bodies, which makes fishery to be one of the promising industries in the

country. Fisheries industry of the country contributes 1.3 percent to the total Gross Domestic Production (GDP). The marine fisheries, Deep-sea and Coastal, contribute about 86% (456,990 MT) to the total fish production of the country in 2016 .The major export destinations for Sri Lankan fish and fishery products are Europe and America.

Challenges Faced in Exploring Deep Sea Fishing

There are various challenges for deep sea fishing in the BoB:

- **Overfishing and Biodiversity Decline:** There is over exploitation and indiscriminate fishing up to 40 m depth by artisanal and industrial trawlers. Due to the over fishing, fishing stock and biodiversity is declining at faster rate affecting future sustainable growth.
- **Inadequate Survey:** Lack of exploratory survey on stocks assessment in the deep sea beyond 200m is still a need of the time. Although there have been some limited scale survey like Norwegian Survey, BIMSTEC Survey, IOTC Survey etc within 200 m depthbut those data are yet to be utilized and disseminated to the stake holders and potential entrepreneurs for determining economic feasibility.
- **Feasibility on Economic Viability:** Entrepreneurs need to know economic viability, its future prospect for any types of investment. Proper economic feasibility study and access to those information to encourage potential entrepreneurs is essential.
- **Technology and Platforms:** There is a lack of proper technology to explore deep sea i.e beyond 200 m. There is no deep sea fishing platforms currently. There is hardly any modern technology for harvesting, storing, processing and marketing sea fishes.
- **Knowledge and Skilled Manpower:** Fishing community and stake holders lacks in appropriate knowledge and skill to explore and develop this sector. For deep sea fishing people needs special training, skilled manpower which should be started as soon as possible.

- **Policy Support and Enforcement of Laws:** For deep sea fishing, currently there is need for detailed policy for Govt. Conducive foreign investment support policy is essential to grow this sector. Liberal banking support is essential for this sector. There is lack of strict enforcement of law as per Marine Fisheries Ordinance. Besides, some specialterms and conditions for joint venture with foreign countries does not seem to adequately encourage entrepreneurs (Alam, 2018). Appropriate Govt policy support is a requirement for growth of this sector.

- **Lack of Awareness:** There is sea blindness among the general publics in BD. Sea being out of the tangible visibility, it creates a phobia in to mind set of the people (Alam 2018). It requires deliberate ways and means to create awareness primarily through the Government bodies followed by NGOs, medias and other stakeholders.

- **Research and Education:** Although Govt has limited facilities to carry out research but has limitations in modern technology. Different public universities have limited fishery faculty. Promoting such education and research may boost developing this sector.

- **Limited Infrastructures:** Govt has limited infrastructures in terms of supervision, monitoring, survey, dedicated department for marine fisheries, landing stations, storage and processing facility, research centre etc.

- **Illegal Fishing:** Entry of illegal fishing vessels and pouching in our EEZ has been a common phenomenon. However, it has been reducing due to effective surveillance by BN and CG round the year.

- **Marine Pollution:** Marine pollution is causing serious impact in the BoB and to human lives. Millions of tons of plastics, oil spill, industrial pollutants, and different wastes making the sea increasingly dangerous for the marine living resources specially fishes.

- **Poor Fishing Community:** Fishing community live a very modest life facing different challenges like; piracy, safety hazards, lack in storage facilities, in adequate access to fund, exploitation by middle man, price hikes of essential items like fuel etc. Restriction in fishing atsea every year for about two months make their life more difficult due to lack of day to day earnings.
- **Weather Condition and Climatic Changes at BoB:** Generally rough sea condition often prevails at BoB round the year specially from April to September. Besides, there are regular occurrence of cyclone, storm, depressions and many fisherman loss their lives. Due to climatic changes, temperature rising, changes in salinity at different depths and water nutrients contents, fishes are migrating to different places.
- **Long Distance for Deep Sea Fishing:** For deep sea fishing, 200 m contour line is far away from the shore which ranges from 48 to 130 nm. In many countries it is far closer to the shore like Sri Lanka. It reduces cost and effort. It is a significant challenge for reaching and bringing back fishes to the shore for further process in BD.
- **Access to Fund:** Existing banking system do not have easy options to offer that can facilitate to develop business for marine sectors in general. For deep sea fishing sector there is no bank in BD, which can offerattractive investment packages. A newly built deep sea fishing trawler may cost BDT 150 to 250 crore depending on the capacity and size. Therefore, it requires easy access to find. Govt may consider dedicated bank like Maritime Bank for such sector where Bangladesh Navy is trying to work. Bangladesh Bank may also consider some financial options to ease the investment for deep sea fishing.
- **Implementation:** There is limited holistic and effective approach to explore and exploit sea resources specially deep sea fishing. However, Govt has recently taken some good initiatives determining, short, medium and long term plan for exploring potentials of Blue Economy including deep sea fishing in brief. But it needs to be implemented within the stipulated time frame as planned.

Way Forward

To explore, conserve and manage the marine fisheries resources specially the deep sea fishing in the BOB, following may be considered as way forward:

Short Term Strategies

The short term strategies may be:

- Govt may take extensive awareness program and initiatives to promote potentials of sea resources especially deep sea fishing in the BoB to the public and specially focusing new entrepreneurs.
- Attractive financial incentives may be offered by the Govt and financial institutions to the entrepreneurs for investment in to this sector and for promoting exports. Easy access to fund and dedicated bank for maritime sector is essential to grow this sector.
- All out efforts may be made for promoting regional and global cooperation for maritime sector specially deep sea fishing. Joint venture investment from abroad should be encouraged with reasonable terms and conditions.
- Efforts may be made for detailed survey and stock assessment of BD EEZ to explore new fishing grounds and determine fishing stock with joint survey effort from abroad at the earliest.
- Strict enforcement of all relevant Acts, Rules and Regulations to be ensured by all agencies like DOF, BN, BCG etc.
- Impose restrictions during breeding period effectively.Fishing community should be taken under safety net to ensure their comfortable livelihood during that period.

Mid-Term Strategies

The mid-term strategies may be :

- Appropriate policies may be developed to formulate marine fisheries development strategies specially deep sea fishing and improve effective management system for the future.
- Govt research institutes including private think tanks may be engaged to carry out extensive research on sea resourcesspecially on deep sea fishing to reap economic benefits of Blue Economy includingissues like Biodiversity, Climate Changes etc.
- Monitoring, surveillance and evaluation system may be developed to track the performance of the marine fisheries sector such as, catch level, level of stock/reserve, illegal poaching etc.
- Rules, regulations and policy may be updated to create investment friendly environment through policy options, developing facilities, support and enforcement of law for deep sea fishing.
- Deep sea fishing beyond 200 m and across the EEZ maybe promoted to explore and exploit tuna, tuna like and other pelagic fishes by collaborative effort.
- Skilled human resources need to be developed on priority basis at all levels of this sector with the support of universities, MFA, DOF and from friendly countries.
- MoFL may actively consider to provide BN with oceanography platform with required manpower to carryout survey and research in the BoB. To ensure proper conservation, monitoring and safe guarding of fishery and fishing community, Coast Guard may be equipped accordingly.

Long -Term Strategies

The long term strategies may be following:

- National Marine Fisheries policy and National Ocean Policy may be formulated earliest.
- Steps may be taken to control marine pollution to restore and conserve bio-diversity.
- Introduce air surveillance effectively to control pouching, illegal entry of foreign fishing vessels in EEZ and deep sea fishing area.
- Develop appropriate research facilities to explore and exploit marine resources specially for deep sea fishingfor national economic benefit. Govt may take necessary steps to make the National Oceanography Research Institute functional.
- Marine Affair Division may be formed incorporating a Maritime Cadre Serviceto focus on Blue Economy and effectively expliot its potentials as new economic front contributing to national economy.
- Govt may consider to include blue economy/ocean issues in the Secondary School Curriculum to develop the mindset of future generation towards the enormous potentials of the sea and sea resources.

Conclusion

BD has been a sea faring nation since ancient time. The country has won 1, 18, 813 sq. km of area after delimitation maritime boundary with Myanmar and India in 2012 and 2014 respectively. The huge sea area is about 81% size of land area which is full of living and non-living resources. Among the living resources about 475 fishing species are there. But unfortunately BD is not in a position to extract these resources for economic benefit.

Currently, up to 40 m, artisanal boats do fishing their and 40m to 200m by industrial trawlers. However, beyond 200 m is deep sea fishing area. There is no deep sea fishing vessel currently operating in Bangladesh.Marine fishes contribute to 10 to 15 percent of total fish catches in BD.

There was survey by Norwegian team, back in 1979-80 and by BIMSTEC in 2000, which provides some information about marine environment and fishing species at various depths at BoB. However, for deep sea fishing survey beyond 200m depth is yet to be done properly. If the survey data and stock position are properly determined, then potential entrepreneurs will find more interest for investment in this sector.

BD seriously lacks in technology, skilled human resources at all levels, investment and efforts to grow new entrepreneurship. Beyond 200 m depth remains as potential sector for deep sea fishing. There are different many types of demarsal and pelagic fishes in BoB. Such as Tuna, Sardines/ Rainbow sardines, Breams/red fish, Mackerels and shrimps etcwhich has good commercial value in the international market. However, due to over fishing in 40m depth fishes with bottom trawling, all types fishes including fish fries are declining fast.

There is limitations in enforcement by different Govt agencies. Coast Guard and BN need to be well equipped to ensure safe fishing and prevent illegal fishing at BoB. Govt has recently formed a high powered committee under the leadership of Honorable PM to steer Blue Economy in right direction.

Govt needs to focus on immediate survey, encouraging entrepreneurs through different incentives, joint collaboration, technology transfer from countries like Japan, China, Thailand etc. BD may take support from FAO and IOTC as well. Govt needs to provide pragmatic policy support, invest in applied research, human resources, infrastructural development, easy access to finance, technology transfer, quality assurance and international compliances etc on priority basis for deep sea fishing. Besides, existing fishery sector should be brought to discipline and enforcement through the existing law by DOF, BN and BCG.

As a whole, the marine sector is a green field with huge potentials but the country needs a holistic approach from the top to create public awareness and facilitating in exploiting the sea resources especially for the deep sea fishing. Future of BD lies not only on land but more on the unexplored potentials of BOB.

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