



## CAPTURE FISHERIES SCENARIO OF THE BAY OF BENGAL, BANGLADESH IN LAST TWO DECADES THROUGH INDUSTRIAL FREEZER TRAWLER

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### ARTICLE INFO

### ABSTRACT

**Received**  
06.04.2016

**Accepted**  
25.04.2016

**Online**  
30 April 2016

**Key words**  
Freezer trawler,  
Capture  
fisheries,  
Bay of Bengal

Industrial fishing in Bangladesh is operated by wooden trawler (ice trawler) and steel made trawler known as freezer trawler. There is significant lack of valuable information on freezer trawler fishing data though it contributes a remarkable portion in national marine capture fisheries which is not negligible. This study aims to investigate the historical trends in freezer trawler fishing of Bay of Bengal. Data from different sources were compiled and analyzed to complete this study. A total of 91 industrial freezer trawlers were recorded from the deep-sea fishing industry in Bangladesh. 72 of them are fish trawlers and 19 are shrimp trawlers. In 1990, there were only 5 freezer trawlers with a total capacity of 490 ton which increased up to 21,737 ton in 2014 by 91 trawlers. The calculated production of marine capture fisheries by freezer trawlers increased from 2940 ton (1990) to 150113 ton (2014) that is about 1 to 21 % of the FAO landings and 0.5 to 12 % of the reconstructed total national production of marine capture fisheries respectively. A total of 1.83 million ton of fisheries products were captured from the Bay of Bengal in last two decades (1990-2014). This study output will be helpful as a baseline database of freezer trawler for marine capture fisheries in Bangladesh.

**To cite this article:** Kumar U, MS Parvez, J Das, CM Nizamuddowla and SR Tarafdar, 2016. Capture Fisheries Scenario of the Bay of Bengal, Bangladesh in last two decades through Industrial Freezer Trawler. Res. Agric. Livest. Fish. 3 (1): 217-226.



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## INTRODUCTION

Fishing is recognized as the most widespread human activity in the marine environment (Benn *et al.* 2010). Bangladesh has a vast fishing ground and after the maritime border settlement with Myanmar and India-Bangladesh covers about 1, 18,813 sq. km. of sea area Exclusive Economic Zone (EEZ) in Bay of Bengal (MoFA, 2014) which stands as 121,110 sq. km. total marine waters of Bangladesh taking into account major river inlets and estuaries (Chowdhury, S.R. 2014, Figure-3) that remained at the forefront and high potential area for growing Blue economy activities (World Oceans Day Abstracts, 2015). Besides this new owned vast area could not be managed to fishing due to lack of vessel capacity and proper fishing technology (Hossain, *et al.* 2014). The Bay of Bengal (BoB) is one of the world's 64 Large Marine Ecosystems (BOBLME, 2011) and defined as a moderately productive ecosystem (Madhupratap *et al.*, 2003) with great potential for fisheries because of the huge nutrient input from the rivers of the Ganges, Brahmaputra (ESCAP, 1988). Deep sea fishing (Figure-4 & 5) is an important sector in Bangladesh, shared 22% of the total reported fishery landings by volume in 2001-2002 (Ullah *et al.*, 2014) contributing a good share in roughly 5% of the GDP and 9% of the country's export earnings (Nishida, 1988). There were about 415 million tons of fisheries production in Bangladesh came from marine capture fisheries in 2002 (Flewelling and Hosch, 2003). This huge catch is done by 2 ways called Artisanal and Industrial. Artisanal fishing is done in near shore areas within 100 nautical miles at 10 meters to 25 meters depth by small wooden boat with a mechanical engine (no navigation device) and gear includes purse seine net, set bag net, gill net etc. The industrial catch is done beyond 100 nautical at 30 to 70 meters depth by medium and large trawler which storing capacity range from 70 ton to 450 ton. Two types of trawler are operated fishing in BoB, Bangladesh. One type is wooden or light steel body trawler where fish preservation is done by ice (ice trawler). Another type of craft is a steel body trawler which preserves fish through the air blast freezer (freezer trawler).

Most reliable data say commercial exploration of deep sea fishing trawlers started in 1972 when Bangladesh Fisheries Development Corporation (BFDC) introduced 11 modern fishing trawlers and 3 more trawlers were added in 1974 (Islam, 2003). There are about 70 large trawlers engaged in offshore fishing for shrimp and fin fishes between 30-meter to 80-meter depth (Mustafa, 2003). In another report it says about 138 different types of commercial fish trawlers are harvesting beyond 40-meter depth zones to offshore water of Bangladesh marine territory (Roy, *et al.* 2014). According to (Khan, M.G., 2010) about 22500 non-mechanized and 21400 mechanized fishing boats and a significant number of industrial trawler fleets targeting shrimp and fin fish on the continental shelf. About 27000 mechanized and 25000 non-mechanized boats are exploiting in the inshore waters area up to 40- meter depth zone (Roy, *et al.* 2014). But (DoF, 2014) reported there are 158 Trawlers, 45377 boats (mechanized and non-mechanized) engaged in fishing at BoB. According to (DoF, 2008) there are 127 trawlers, 45 of them are shrimp and the remaining are fin fish trawlers. However, FRSS (2014) reported a total of 32 shrimp trawlers and 152 fin fish trawlers are exploring in the water of Bangladesh.

The BoB and its coastal areas are one of the most poorly studied areas, although it possesses a high potential for increasing marine fish production (Islam, 2003). The lack of accurate and valuable information on the number of freezer trawlers or ice trawlers as well as their fishing capacity is a major concern for sustainable deep sea fisheries. Moreover, there is no such information about how many of them is functioning properly since most of the trawlers were imported years ago. The objective of this study is to investigate the number of freezer trawlers are being engaged in deep-sea fishing in the BoB, to calculate approximate fisheries yield by those trawlers and compare the production data with the FAO capture production statistics and reconstructed total national marine catches.

## MATERIALS AND METHODS

A survey was conducted on the freezer trawlers those engaged in fishing at different fishing grounds of Bangladesh since 1990 to 2014. Data were collected from Government offices (BFDC, DG Shipping, Marine Fisheries Academy, Marine Fisheries Office), Trawler Captains, sailors who had been working in various trawlers since the 1980s in BOB and industrial fishing companies of Bangladesh (Table 1). Total yearly production was deliberated based on trawler capacity. The calculation of yearly production totaled through multiplying production per voyage with voyage frequency (7 for fish trawlers, 6 for shrimp trawlers/year). Calculated yearly catch data were assembled to FAO reports (FIGIS, 2015) on marine capture fisheries of Bangladesh and to reconstructed data of Bangladesh marine fisheries catches since 1950 - 2010 (Ullah *et al.*, 2014) (Table 2).

**Table 1.** Chronological introduction of new trawlers by companies in Bangladesh offshore fishing industry. (Source: Primary survey records from various Fishing companies and Govt. organization)

Launching Year	Name of the Company	Type	Number of added freezer Trawler	Average Capacity (Ton)	Production per voyage by each company
1990	Bengal Fisheries	Shrimp	3	90	270
	Sea Fishers	Shrimp	2	110	220
1993	Sea Resource Ltd	Fish	3	227	681
	Bengal Fisheries	Shrimp	1	110	110
1994	Continental Group	Fish	3	280	840
	Shimizu Group	Shrimp	2	110	220
1996	Sea Fishers	Shrimp	2	120	240
	Continental Group	Fish	1	280	280
1997	Crystal Group	Fish	2	200	400
	Fish Mark	Fish	2	290	580
	Sea Resource Ltd	Fish	1	227	227
	Shimizu Group	Fish	2	280	560
1998	Sea Heart Group	Fish	3	280	840
	Sea Fishers	Shrimp	1	120	120
	Continental Group	Fish	3	300	900
	Paradise Group	Fish	2	250	500
1999	Continental Group	Fish	1	300	300
	Sea Resource Ltd	Fish	2	220	440
	Fish Mark	Fish	1	280	280
	Single Trawler*	Shrimp	1	90	90
2000	Shimizu Group	Fish	1	280	280
	Crystal Group	Fish	1	180	180
	Single Trawler	Fish	3	200	600
	Barracuda	Fish	1	325	325
	Paradise Group	Fish	1	250	250
2002	Sea Fishers	Shrimp	2	128	256
	Sea Heart Group	Fish	2	300	600
	Single Trawler	Fish	3	200	600
2003	Crystal Group	Fish	1	200	200
	Continental Group	Fish	2	250	500
	Ishak Group(Long fin)	Fish	2	220	440
2004	Barracuda	Fish	1	330	330
	Sea Resource Ltd	Fish	1	228	228
	Single Trawler	Fish	3	250	750
2005	Eden Group(Peninsula)	Fish	3	280	840
	Sea Fishers	Shrimp	1	150	150
	Shimizu Group	Fish	2	280	560
	High Speed Company	Shrimp	2	120	240
2007	Sea Heart Group	Fish	2	300	600
	Eden Group(Peninsula)	Fish	1	280	280
	Paradise Group	Fish	2	300	600
2010	Single Trawler	Fish	1	250	250
	High Speed Company	Shrimp	2	200	400
	Eden Group(Peninsula)	Fish	2	300	600
2011	FMC Group	Fish	2	280	560
	Paradise Group	Fish	1	250	250
2012	FMC Group	Fish	3	300	900
	Single Trawler	Fish	1	250	250
2013	Agro Food**	Fish	2	450	900
2014	Agro Food	Fish	1	400	400
	FMC Group	Fish	1	320	320
<b>Total</b>			<b>91</b>	<b>12215</b>	<b>21737</b>

\*Company with only one single trawler; \*\* Agro Food, Sea Fishers & Sea Resource is under same group of Company

**Table 2.** Data compilation among different capture production in BoB from 1990-2014

Year	Total Yearly production by the freezers trawlers (Calculated as capacity)	FAO Capture production Statistics FIGIS,2 015	Reconstructed total national catch (Ullah et al.,2014)
1990	2940	253,453	617,000
1991	2940	258,884	625,000
1992	2940	280,127	653,000
1993	8367	312,715	693,000
1994	15567	253,044	624,000
1995	15567	264,650	639,000
1996	18967	279,170	658,000
1997	31336	295,141	675,000
1998	44356	300,452	685,000
1999	55536	309,797	693,000
2000	62956	333,799	718,000
2001	62956	379,497	771,000
2002	76917	415,420	812,000
2003	81817	431,908	826,000
2004	94053	455,207	850,000
2005	104903	474,597	870,000
2006	104903	479,810	879,000
2007	118453	487,438	885,000
2008	118453	497,573	894,000
2009	118453	602,642	1,020,000
2010	125053	607,492	1,016,000
2011	128973	546,333	
2012	138773	578,620	
2013	145073	588,988	
2014	150113		
<b>Total</b>	<b>1830365</b>	<b>9,686,724</b>	<b>16,103,000</b>

### Calculation

No fishing company lets its trawlers anchored idly at the shore unless there is any sea roughness or low pressure or got any emergency signal by the Sea Transport Authority. So a fishing vessel must complete its full voyage until filled up fish storage capacity. The government took some efficient management measures for the marine capture fisheries in Bangladesh. One of these is the limitation of the fishing days for industrial trawlers as the freezer trawlers are permitted to fish not more than 30 days while non-freezer trawlers are permitted to sail for up to 15 days in a single voyage and to limit the discard of by-catch the shrimp trawlers must have at least 30 % fish in the total catch (GoB, 1993). After returning to shore, it takes 5 to 7 days of a trawler for unloading and trawl net or light body repairing and oil bunkering purposes and another 2 days gone in the way of shore to the fishing grounds of each voyage. For those activities a vessel could operate maximum 20 to 22 days of fishing in a month to fulfill its storage capacity. So, each trawler has a chance to explore the BOB for about 9 months. Again, from those 9 months due to continuous low pressure and heavy intolerable rolling on the month of June- July, the bay force to keep trawlers stay inshore around 40 days. If that is the case – it is almost accurate except some exception that in every year a trawler could complete 7 full voyages, including short voyages and can return to shore having full of its storage capacity. A shrimp trawler needs more days than a fin fish trawler and it could complete 6 full voyages including other short voyages. If there were no new trawler launched in a year, the yield is considered same as the previous year in this calculation.

## RESULTS

Ninety one industrial freezer trawlers were found engaged in exploring the fishing grounds of the BoB, Bangladesh. Among those, 72 vessels were fish trawler and 19 were shrimp trawler (Figure 1). About 21,737 ton of fish were captured by these vessels in a single voyage (Table1). The results revealed that there were 5 freezer trawlers in 1990 and the capacity of those was 490 ton. In 2014 the total number of trawlers was found 91 and capacity increased to 21,737 ton (Table 1). At the beginning, the calculated production of marine capture by freezer trawlers was 2940 ton which increased up to 150,113 ton in 2014. Comparing this to the FAO landings data and reconstructed total national marine production, it was observed that freezer trawlers contributes about 1 to 21 % and 0.5 to 12% of the total marine capture fisheries, respectively. A total of 1.83 million ton of fisheries products were captured from the Bay of Bengal from 1990 to 2014 (Table 2).

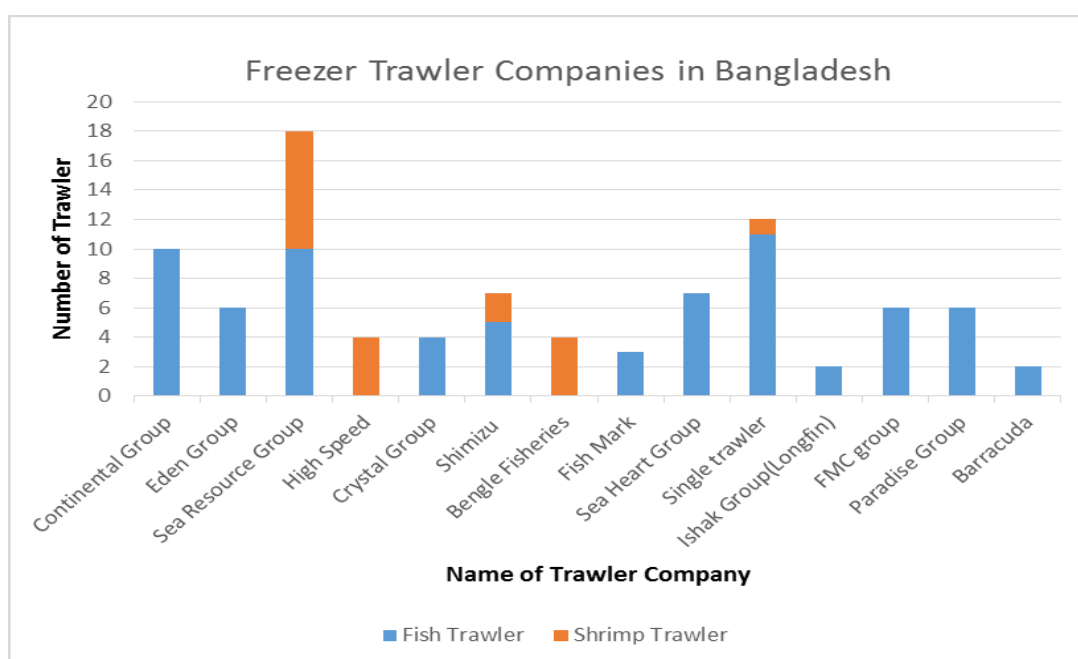
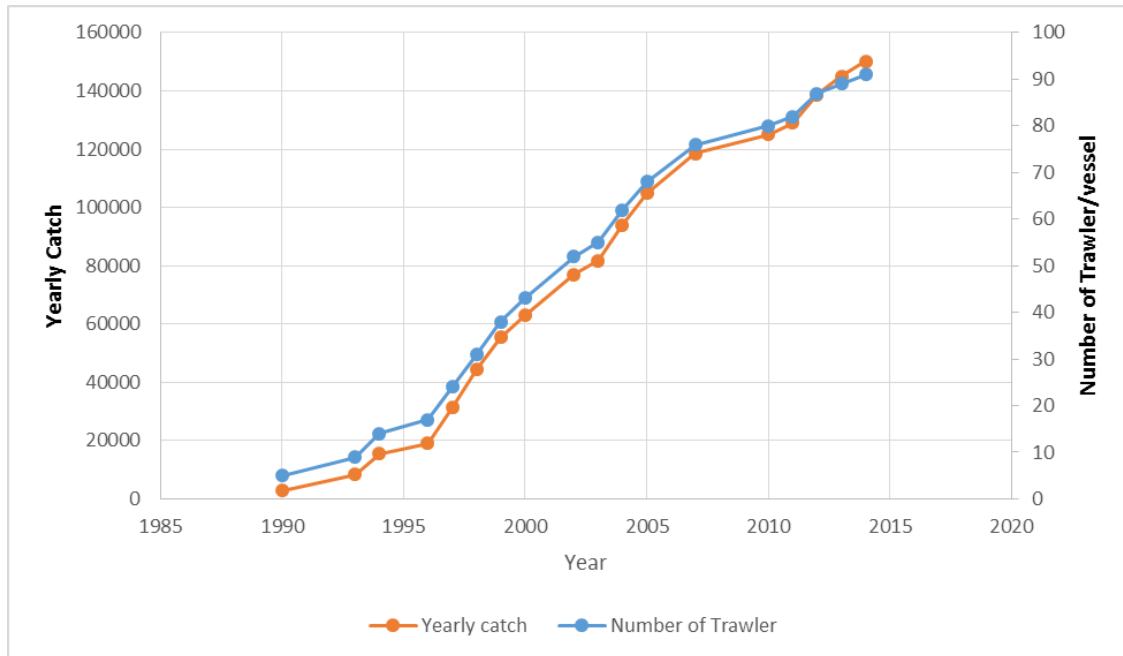


Figure 1. Number of Trawlers owned by different company

## DISCUSSION

According to fishing professionals, before 1990, there were deep-sea fishing activities operated by most of the companies who are operating now a days, but at that time, all those companies had ice trawlers. Since then, every year anew fishing company with new freezer trawler had been added to the fishing industry. Global marine fisheries catches were stagnated at about 90 million ton since late 1990 (Norse *et al.* 2012). Landings from the waters of Bangladesh was estimated to be 9.5 million ton over the 1950-2006 time period (BOBLME 2011). Since 2000 Bangladesh produced 424000 ton of capture fisheries per year (Funge-Smith *et al.* 2012). Fish production in BoB increased far more than early years of introducing mechanized trawlers. In the present study, the production of marine capture fisheries by freezer trawlers increased from 2,940 ton in 1990 to 1,50,113 ton in 2014. Another report (Kamal, 2000) stated that the increase of marine catch as 95,000 ton in 1975-76 to 2,50,480 ton in 1992-93. A separate report stated the capture increased from 2,45,474 ton in 1991-92 to 3,33,799 ton in 1999, 92,000, 4,74,597 ton in 2004-05 and 5,14,644 ton in 2008-09 (Funge-Smith *et al.* 2012). According to the studied survey, the highest number of trawler included to the fishing industry in 1998 and 2002. This contributed to enhance the capture production which was almost double within few years.



**Figure 2.** Catch graph by Freezer trawler from 1990 to 2014

From previous studies it was found that industrial trawl fishing contributed only 6% of the total marine capture (MoF, 2001). According to FAO (2007) it contributed upto 7.1% of the total catch from the BoB. For instance, in 2010-11, 546333 ton fish was captured from BoB (FRSS, 2012) but the study calculated about 1,25,053 ton by freezer trawlers that were about 22% of the total marine landed catches by all types of crafts in the same year.

Table 2 presented a significant similarity in the growth of capture except few that shows a decreasing trend. A sudden decline was observed in both FAO capture production statistics and reconstructed national catch production which was around 60,000 ton in 1994. The same was observed in 2010 for reconstructed national catch. The very next year FAO reported collapse again by 60,000 ton. This might be because both of the FAO and Reconstructed catch data comprised of all kinds of fishing technique including traditional, commercial or artisanal fishing which was likely to be affected and influenced by various climatic disasters like cyclones. This caused huge loss of artisanal fishermen's resources (eg. fishing gear) and takes a reasonable time to recover. One of the other major causes of the marine catch depletion was coastal and offshore pirate attack. Unavailability of proper loan for the fishermen also might be a remarkable reason. But following the study, those causes generally do not effect on freezer trawlers. So, marine captured productions in Bangladesh by freezer trawlers were gradually increasing year after year along with increasing number of trawlers ( Figure 2). It was clear from Table-2 that the total marine capture increased only by 4,00,000 tons (65%) and 3,40,000 tons (134%) in reconstructed catch data and FAO data respectively whereas marine capture increased far more by freezer trawlers which is about 147000 tons (5000%).

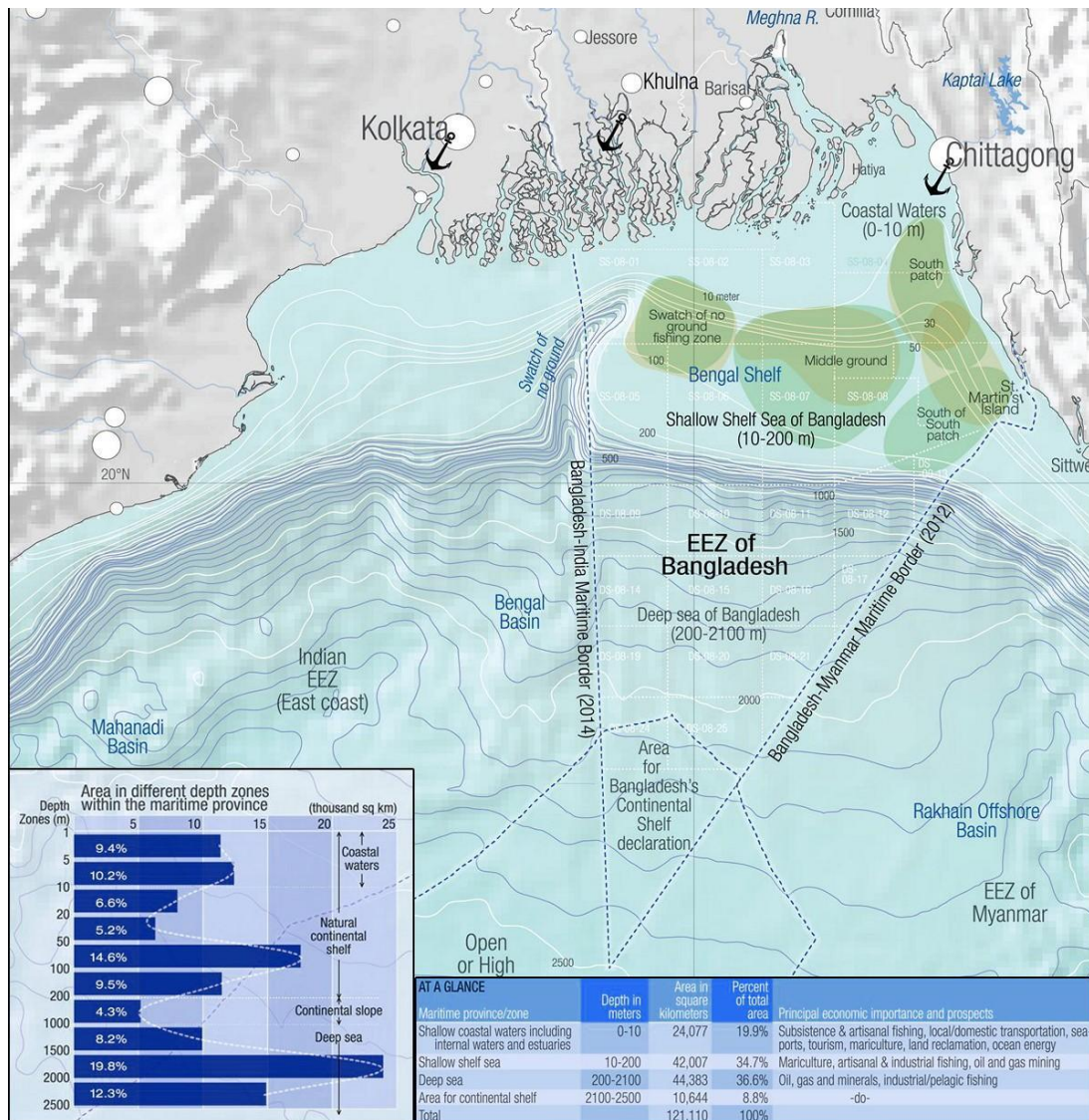


Figure 3. Fishing zones in the coastal and marine area of Bangladesh. (Chowdhury, 2014)



Figure 4 and 5. Deep-sea trawl catch (Image credit- Co-author; Chowdhury Mohammad Nizamuddowla)

### Conflicts of the literature

Except mechanical errors and the capability of storage in some cases, Trawler launching from later 1990's every vessel is working properly, but those trawlers launched the early 1990s need to reconstruct more than once. So it is not possible for those trawlers to complete 7 voyages all the time. Another conflicting thing is in the early 1990's all fishing trawlers were bottom trawling but now except 2 or 3 trawlers all are converted into mid-water or fly fishing. The other problem is due to overfishing voyage period (days) is longing day after day. In some cases, a voyage completed within 15 days while sometimes it goes over the month. Moreover for much frequency sometimes trawlers under same company share its catch which saves fishing time but could not possible quoting in this experiment. The vast difference of capture statistics of DoF or another source with this study is because government publishes in their gazette what fishing company provides them in letter information. For legislative and economic reason fishing companies tend to give less capture information to DoF, BFDC specially species like Hilsha (*Tenulosailisha*), tiger shrimp etc. and at the same time companies keep hide original catch data on export items for ignoring government revenue. The government has poor monitoring system about actual marine capture scenario by the trawlers specially thousands of boat is engaged in offshore fishing without any proper permission and it is not even possible to get the real view with little manpower. Moreover, government data on trawler quantity is contradictory, in (FRSS, 2014) it says there are 184 trawlers where in the same year (DoF,2014) reported there are 158 trawlers in BoB. Operation cost of trawler including food and wages of sailors and officers, air blast freezing, fuel etc. cost every freezer trawler having 250 MT capacities is about 2.5 lac taka per day. So, because of profit, each freezer trawler has the target of catch at least 13 MT of fish every in a day. One of a backward phase of this study is launching time of each trawler. Trawler companies keep records of launching trawler of their first trial voyage (month) which is different from actual fishing voyage time. But the year of launching is same as they recorded.

### CONCLUSION

Considering the contribution of capture fisheries in Bangladesh it is to mention that the record-keeping and database management is not up-to the mark. The updated methods on data records and providing them to the government must be ensured for the sustainability of this sector. To fix Maximum Economic Yield (MEY), maximum sustainable yield (MSY), total allowable catch (TAC) and to ensure Bionomic Equilibrium (BE) in capture fisheries in Bangladesh, government must work to launch studies and research for data collection, recording and update. To ensure a sustainable capture fisheries management there might have a harmony between public and private initiatives. This study tried to delineate some of the fisheries vessel capacities in terms of fish catch through freezer trawlers and attempted to make a ground for deep sea industrial freezer trawlers information. Further investigation of the exploratory research is strongly recommended to ensure a capture fisheries management plan in terms of biological and economic point of view.

### ACKNOWLEDGEMENTS

The authors would like to show gratitude to Md. Monower Parvez, Manager-Operation, to Sea Resource Group, Chittagong Port Authority (CPA) Building, Sadar Ghat Road, Chittagong, Bangladesh. Authors specially like to give thanks to Mr. Biplob Dev, Senior Engineer to "Deep Sea-2" fishing trawler, Chittagong, Bangladesh for his valuable information and Cooperation. Authors also like to give their gratefulness to Mr. Sharif, Captain of the Agro Food-2 and Mr. Ashraf, Captain of the SRL-5.

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