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Research article

Market demand of conventional and non-conventional fish species and price comparison between BFDC landing center and two popular fish markets, the Baharchora and Borobazar, in Cox's Bazar, Bangladesh

Tabassom Rehnuma Raisa[1], Tahsin Sultana[1*], Subrata Kumar Ghosh[1], Nafisa Nawar Tamzi[1], Rifah Tamanna Shuchi[2] and Md. Faisal[1]

[1]Department of Fishing and Post-Harvest Technology, Chattogram Veterinary and Animal Sciences University, Chattogram-4225, Bangladesh.
[2]Department of Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University, Chattogram-4225, Bangladesh.

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*Corresponding author:
Cell: +88-01851367123

E-mail: tahsin@cvasu.ac.bd

A B S T R A C T

The study of conventional (common commercial fish species which is consumed by people in Bangladesh like Seabass, Ribbon fish, Hilsha, Bombay duck etc.) and non-conventional (fish species which is consumed by people in Bangladesh like Milk shark, Stingray etc.) fish species at BFDC landing center was conducted to know the current condition of fish, their market demand, prices and price difference between BFDC landing center and two popular fish market Baharchora and Borobazar. There were about 32 varieties of conventional fish species and most common were Seabass, Ribbon fish, Hilsha, Bombay duck, Mackerel, Silver pomfret, Red snapper, etc. The average price for most demandable fish were Hilsha (TK. 600-1000 kg), Silver pomfret (TK. 550-900 kg), Seabass (TK. 500-650 kg), Bombay duck (TK. 100 kg), Ribbon fish (TK. 300 kg) which varied with size and season. There were about 20 species of non - conventional fish including Milk shark, Stingray, Long Tung Sole, Mud spiny lobster, Mud crab etc. observed. Milk shark and Dog shark was common at the landing center. Their average size and weight were 1-2 feet and 1-3 kg which were sold for TK. 120-140 kg. The regular price of Stingray was TK.180-220 kg at the landing center with average weight of 2-8 kg. Normally marketing channel of both fish was maintained by middle men. A large number of fish from the landing center was sold to them by auction. The landing center is the common place from where local fish seller collects fish and sell by for around 15-25% of the profit. Usually, unsold raw fishes were preserved in the freezer and rests were sold to dry fish processors mainly in Nazirartek. The study shows a variation of conventional and non-conventional fish species, their price, and market demand in Cox's Bazar region.

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1. INTRODUCTION

"Mache Bhate Bangali," or "Fish and rice make a Bengali" is a famous proverb for Bangladeshi people. Fish, the second most valuable agricultural commodity in Bangladesh, plays a crucial role in the livelihoods and employment of millions of people (Ghose, 2014). The culture and consumption of fish, therefore, have

important implications for national income and food security. Fish is one of the major sources of animal protein which contributes about 60% of total animal protein (BBS, 2020). With a total fish production of 46.21 lakh metric tons (MT) in the financial year 2020-21, Bangladesh is one of the top fish- producing nations in the world which is lucky to have potential water resources (DoF, 2022). Fisheries resources are plentiful in Bangladesh. The country's vast and diverse fisheries resources can be roughly classified into two categories: inland fisheries and marine fisheries. Marine fisheries in Bangladesh are extremely important for supplying food, creating jobs, and earning money from international trade. In Bangladesh, the coastline is 480 kilometers long and the size of the continental shelf is around 66,400 km^2 (BFRI, 2007). About 14.74% of the 6.81 lakh MT of fish production in the country came from the marine sector in 2020-21 (DoF, 2022). Fish landing centers are the locations where various kinds of fresh fishes and fishery products are stocked from various sources such as rivers, beel, gher, ponds, estuaries and the sea. Various distribution systems are used to move the harvested fish from landing centers to consumer markets (Ali et al., 2004). The marine fish-catching regions and landing centers in Bangladesh are located at the south and south-eastern parts of Bangladesh (Mansur, 2005). Seabass, Ribbon fish, Hilsha shad, Bombay duck, Silver pomfret, Red snapper, etc. are some common fish consumed by the people in Bangladesh; these are considered conventional fish species. Non-conventional fish species are those that are not accepted by social norms and standards. Milk shark, Stingray, Long tongue sole, Mud spiny lobster, Mud crab etc. are some non-conventional fish species in Bangladesh. The concepts of conventional and non-conventional vary from area to area and country to country. A large amount of marine conventional and non-conventional fish species are caught from Cox's Bazar region and then distributes throughout the world. Bangladesh Fisheries Development Corporation (BFDC) fish landing center is one of the most well-known landing centers in Cox's Bazar. The marine fishing industry is divided into two categories: industrial and artisanal. There are more than 234 industrial trawlers and more than 67,000 artisanal vessels involved. Of the overall marine production, artisanal small-scale fisheries account for 82.52%, or 5.62 lakh MT, and large industrial fisheries for 17.49%, or 1.65 lakh MT (DoF, 2022). Bangladesh is one of the innovative nations because to its huge marine aquatic biodiversity. There are around 1093 marine aquatic creatures, of which finfish make up 44.35%, shellfish make up 32.23%, seaweed make up 15.10%, and other organisms, including shrimp, make up only 8.32% (Kabir, 2006). The present study has been carried out to know the present status of conventional and non-conventional fish species at BFDC landing center, and to know the market demand and price of these marine fishes.

2. MATERIALS AND METHODS

Site of the study

The study was conducted in BFDC landing center and two famous fish markets, the Borobazar and Baharchara bazar at Cox's Bazar district of Bangladesh. This study was mainly a survey-based study. Primary data was collected by field survey where BFDC landing center, Borobazar and Baharchara areas were covered.

Data collection

Different data collection methods were used to conduct the study such as focus group discussion, personal interview, observational study and cross-check interview, which covered 100 people. Data were collected from the landing center, fish market and BFDC office.

Focus group discussion

Focus group discussion was conducted to collect information on a participatory basis from fishermen communities and sellers of landing center. The advantage of this method over other methods is that it allows a wider participation of the community and the information collected is likely to be more accurate. Information of 25 people was collected through 5 focus group discussions.

Personal interview

A major part of empirical data was collected from in-depth interviews. Around 25 people were covered to gather information through personal interview and questionnaire.

Observational study

The natural environment of the study area was observed without manipulation or intervention. We visited our study area for fifteen times, and each time we observed species variation, price differences, and fish demand at the fish markets and landing center.

Cross-check interview

BFDC officers verified the primary data, collected from the field survey, by comparing our information to their recorded data. Some information, which includes daily catch composition at the BFDC landing center, were also collected from the senior officer and marketing officer.

Data analysis

The collected data and information were accumulated and entered into MS-excel and then presented in textual, tabular and graphical forms.

3. RESULTS AND DISCUSSION

Conventional fish species

The study documented 32 conventional fish species and their prices at the BFDC landing center, Borobazar and Baharchara Bazar. Table 1 shows the fishes which were available during that season and the average price of each individual fish. We collected data on fish variation and price difference from three specific areas (BFDC landing center, Borobazar and Baharchara Bazar) and calculated the average value that was used in our study. Most common species were Seabass, Ribbon fish, Hilsha, Bombay duck, Silver pomfret, Mackerel, Red snapper that were noted as most demandable fish in Cox's bazar region. Islam et al. (2001) noted that coastal and marine fish contribute about 22% of total fish production in Bangladesh. The most common species of fish harvested and consumed are Hilsha, Catfish, Pomfret, Ribbon and Jew fish according to his study, which is similar to our study. According to Ghosh et al. (2016), 56 main species of fish are used for commercial purposes including Hair tails, Catfish, White grunters, Ribbon fish, Pomfret, Hilsha and Silver jew fish. Islam et al. (2006) conducted a study in the Cox's Bazar region, which concluded that the most frequently caught and eaten fish included Jew fish, Ribbon fish, Hilsha, Catfish, Pomfret and Shrimp. The findings of aforementioned previous studies were almost similar to our present study.

Hilsha and Pomfret

The only species that has been discovered to be sold and consumed throughout the Bangladesh is Hilsha. Hilsha alone accounts for more than 40% of all marine fishes marketed of this group. In an over view of Table 2 and Table 3, we can understand the market demand. Table 2 represents the amount of Hilsha fish landed in BFDC landing center during our study period, while Table 3 presents previous data collected from BFDC office. According to Ahsan et al. (2016), in the case of pomfret and Hilsha, the marketing margins were 21% and 27% of consumer's purchase price, respectively. Islam et al. (2006) reported that the marketing margins for pomfret and Hilsha were 20% and 30%, respectively. Faruq (2009) reported that marketing margin for Hilsha was 33% of consumer's purchase price. In our study marketing margin were 10% and 19% for silver pomfret and Hilsha, mentioned in Table 1, which differed to some extent from those of Islam et al. (2006) and Faruq (2009). This variation may occur due to the peak season of these fishes during our study. Table 1 presents the recorded conventional fish species along with their prices in Barabazar and Baharchara bazar.

The amount of fish being caught after the completion of 22 days ban period is estimated lower than the earlier value. According to fishermen, all boats and vessels had not completed their fishing and had not returned from sea, so the estimate was lower than previously. Relevant data are given in Table 2. Rahman et al. (2017) also found that, because of the 22-day fishing prohibition, Jatka juveniles were discovered to be in great abundance which is similar to the present study. The fisherman also mentioned that, during ban period large numbers of Indian fishing boats invaded the Bangladeshi territory and caught all fishes without obeying the ban period. According to Shamsuzzaman et al. (2020), the amount of fish produced in Bangladesh during the past 20 years

has doubled from 17.81 lakh MT in 2000-01 to 41.34 lakh MT in 2016-17. Due to the gradual decline in capture fishery, a significant percentage of total production comes from aquaculture. The largest single-species fishery and largest contributor to Bangladesh's overall fish production is the Hilsha. This previous study is quite similar with present data showed in Table 3.

Status of non-conventional fish, crustacean and Mollusca

In BFDC fisheries landing center total 15 species of non-conventional fishes including Milk shark, Stingray, Long tongue sole, Dog sharks; Crustacean like crab, Lobster, Shrimp, Mollusca like octopus and Sepia was recorded that are shown in Table 4,5,6. Price of crustacean and some non-conventional fishes were higher than conventional fishes. Maximum buyers were from local restaurants. Some fishes such as Shark, Stingray etc. were consumed by the tribal people.

Shark

Five species of shark was identified at Cox's Bazar landing center. Milk shark and Dog shark were common at the landing center. Average size and weight were 1-2 feet and 1-3 kg, respectively. Main customers were tribal people and some processing industries. Eleven species of sharks from four families and 16 species of rays from 9 families were found according to Jit et al. (2014). Roy et al. (2007) mentioned the number of sharks as 22. Haldar (2010) showed that the average weight of sharks in Bangladesh ranged from 0.11 to 9.02 kg following the data of Roy et al. (2007) and commented that comparatively smaller sizes of sharks are caught here. Results from the present study are similar with previous study.

Stingray

According to the current study, the price of stingray was 180-220 BDT./kg at BFDC landing center and 250-300 TK./kg at fish markets, the Barabazar and Baharchara Bazar. Average weight was 2-8 kg. According to Uddin et al. (2018), the market value of stingray varied where fishermen sold at 90-140 TK./kg that passed through different marketing channels and at last consumers got it at 140-250 TK/kg. According to this study, stingray was caught by long line and gill net within 30-40 m depth. Stingray's tail was collected by other party for export. Stingray is mainly caught by artisanal fishery with gill net, set bag net and long line within 40-50 m depth ranges. During winter season huge amount of stingray is harvested by fishermen according to Bahadur (2011). Roy, (2011) stated that stingray's fresh meat is sold at 50-80 TK/kg in local market and sun-dried ray's skins (dorsal part) and tails are exported abroad. The present result was similar with Bahadur (2011) but less similar in price with Uddin et al. (2018) and Roy (2011). Price is increasing because demand is also increasing. Highest amount of stingray found in winter season, therefore, the price also decreased. For those reasons result could be vary from previous study. Dried stingray fish also most demandable product to the tribal people.

Crab

In BFDC fish landing center mud crab and swimming crab were the common species. Mud crab and swimming crab are consumed in Bangladesh according to Islam Roy et al. (2012). The study was similar with previous studies. Around 2 MT crab in BFDC ghat was recorded in present study and maximum were swimming crab. Roy (2011) found that maximum and minimum landing were 6.00 MT in May and 2.20 MT in August, at BFDC landing center. The present study was conducted during the months of September to November, which are typically not peak seasons for crab harvesting. As a result, it is possible that the production levels observed in this study were lower than those of previous studies. From present study it is also recorded that crabs were exported to other countries. According to FAO (2008), total commercial crab production was 1,319,953 metric tons (MT) in the world in 2008. In the year 2009-2010, the total crab production of Bangladesh was 7707.70 MT which is less than 1.0% of the world crab production. Total exported quantity was 6347.70 MT from which the total earning of foreign currency was 3758.8 million taka and exporting countries were China, Japan, Korea and Taiwan (Anon, 2011). There is a significant degree of similarity with the findings of the present study.

Table 1. Comparison of the prices of conventional fish species at BFDC landing center with those at and Baharchara and Borobazar

SL. No.	Available Fish (Local Name)	Scientific name	Common name	Price of fish (BDT. per kg)			Profit percentage (%)	
				Landing centre	Baharchora	Borobazar	Baharchara	Borobazar
1.	Ayre	*Sperata aor*	Long-whiskered catfish	465	550	500	18	8
2.	Baila fish	*Awaous guamensis*	Scribbled gobi	580	600	600	3.5	3.5
3.	Bata fish	*Labeo bata*	Bata labeo	425	550	530	29	24
4.	Bele/ bailla	*Glossogobius giuris*	Tank goby	270	320	300	18.5	11
5.	Bichatara	*Scatophagus argus*	Spotted scat	400	500	500	25	25
6.	Churi	*Trichiurus haumela*	Ribbon fish	300	320	320	6	6
7.	Daatpoa	*Otolithes ruber*	Tigertooth croaker	250	300	300	20	20
8.	Datina	*Acanthophagrus datnia*	Bengal yellowfin seabream	240	260	280	14	16
9.	Ekthuitta	*Hyporhamphus limbatus*	Congaturi halfbeak	410	430	450	5	10
10.	Faissa	*Setipinna phasa*	Gangetic hairfin anchovy	200	220	225	10	12.5
11.	Ful poa/rupalipoa	*Johnius belangerii*	Belanger's croaker	380	400	400	5	5
12.	Horul fish	*Mugil cephalus*	Flathead grey mullet	475	550	525	16	10.5
13.	Hundrabaila	*Sillaginopsis panijus*	Flathead sillago	190	210	220	10.5	16
14.	Ilish	*Tenualosa ilisha*	Hilsha shad	900	1100	1050	22	17
15.	Kachki	*Corica sp.*	Ganges river sprat	120	150	140	20	24
16.	Kalo chanda	*Parastromateus niger*	Black pomfret	650	750	730	15	12
17.	Kamila	*Congresox talabonoides*	Indian pike conger	160	170	180	6.25	12.5
18.	Kankila	*Xenentodon cancila*	Silver needlefish	250	280	300	12	20
19.	Koi koral	*Lobotes surinamensis*	Black perch	450	500	550	11	22
20.	Koral	*Lates calcarifer*	Seabass	650	800	750	23	15
21.	Loijja poa	*Otothoides pama*	Long-finned croaker	230	250	250	8	8
22.	Loitta	*Harpadon nehereus*	Bombay duck	100	100	120	0	20
23.	Olua fish	*Coilia sp.*	Pointed tail anchovy	120	140	150	16	25
24.	Red snapper	*Lutjanus campechanus*	Red snapper	630	650	675	3	7
25.	Rita	*Rita rita*	Rita	300	350	360	16	17
26.	Shamudrik mola	*Stolephorus commersonii*	Commerson’s anchovy	120	150	150	25	25
27.	Silver rupchanda	*Pampus argenteus*	Silver pomfret	750	850	800	13	7
28.	Surma	*Scomberomorus commerson*	Narrow-barred spanish mackerel	450	500	500	11	11
29.	Tailla fish	*Eleutheronema tetradactylum*	Fourfinger threadfin	400	520	500	30	25
30.	Theripoa	*Pennahia argentata*	Silver white croker	180	200	200	11	11
31.	Lal poa	*Johnius argentatus*	Houttuyn	180	250	230	39	28
32.	Tuna	*Euthynus affinis*	Mackerel tuna	180	200	200	11	11

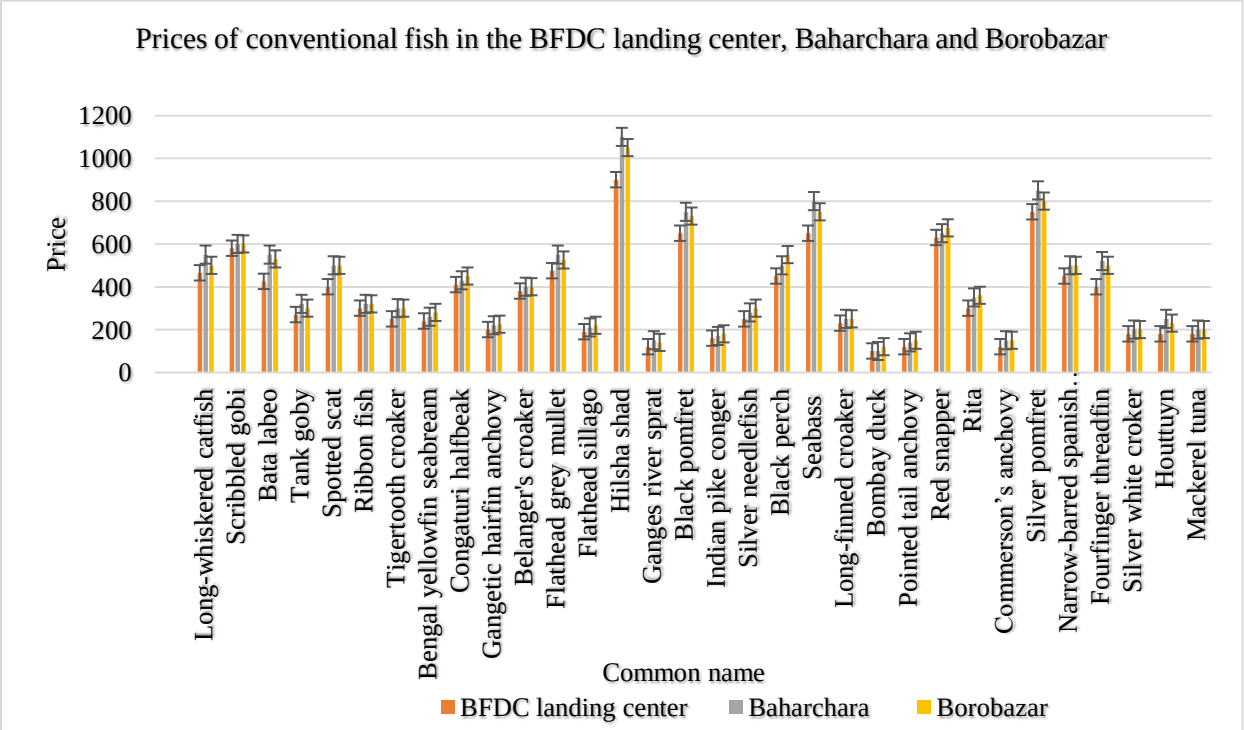

Figure 1. Comparison of prices of fish among landing center, Borobazar and Baharchara

Table 2. Catch composition at BFDC Ghat from 18th September, 2021 to 3rd November 2021

Fish Date	**Hilsha (kg)**	**Chanda (kg)**	**Rita (kg)**	**Mackerel (kg)**	**Mixed (kg)**
18.09.21	234,400	420	2567	1125	1346
19.09.21	7260	120	3100	340	10,512
20.09.21	5780	240	1102	360	16,884
21.09.21	7764	680	1062	400	10338
22.09.21	13277	120	460	470	15115
23.09.21	22240	360	1385	3430	13868
24.09.21	18567	300	1687	660	16905
25.09.21	8540	1080	1032	692	21618
26.09.21	34310	1075	1140	620	16351
27.09.21	9250	465	360	500	21250
28.09.21	16850	300	770	340	6451
29.09.21	26245	300	700	540	10624
2.10.21	38612	1025	2587	882	11964
3.10.21	23089	240	2127	720	17227
Ban period					
29.10.21	2600	60	2220	407	13904
30.10.21	1050	1602	1285	400	15634
31.10.21	2500	1202	1064	630	13783
1.11.21	1600	420	1012	900	16455
2.11.21	7200	120	740	3050	18095
3.11.21	7150	240	1430	400	20347

Table 3. Species wise catch composition in BFDC landing center from 2015-2021

Year	**2015-16 (MT)**	**2016-17 (MT)**	**2017-18 (MT)**	**2018-19 (MT)**	**2019-20 (MT)**	**2020-21 (MT)**
Species						
Hilsha	836	1297	3697	3635	4326	2989
Chanda	79	105	154	124	154	183
Mackerel	115	157	126	166	116	168
Rita	143	54	99	83	55	380
Mixed	4269	4666	5222	5597	6366	3491
Total	**5442**	**6279**	**9298**	**9606**	**11017**	**7211**

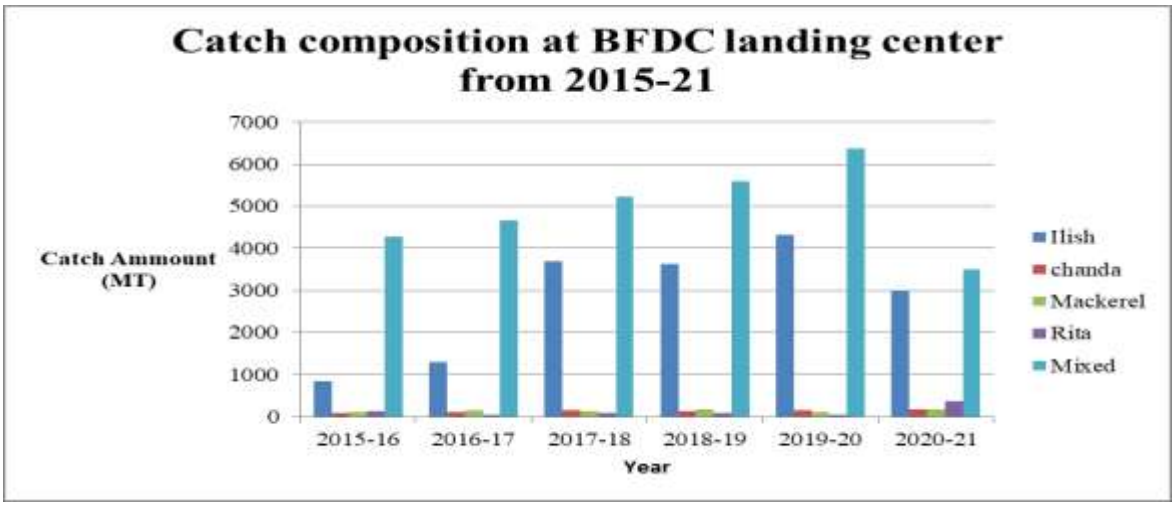

Figure 2. Catch composition at BFDC landing center from 2015-21

Marketing channel of conventional and non-conventional fish

According to the present study all types of fish species were supplied throughout the country and the world. Fishermen used dingi nouka at low tide to transport fish from commercial boats. After catching fish, it was distributed equally in two parts: one part went to the boat owner and another part went to the fishermen. There were two types of selling practices: in the first type, the boat owner directly sold the fish species in landing center and in case of second type, buyer bough the fish directly from the boat in a wholesale system. According to Islam et al. (2001) most of the marine fishermen are engaged in artisanal fishing and usually they receive wages and salaries as they can sell their catch in landing centre. In each trip, catch revenue is distributed between boat owners and fishermen through prevailing sharing arrangement (Islam et al., 2001). Results from the present study were similar with previous study. From the present study it is also recorded that fish from BFDC fisheries ghat supplied to the local markets (In Chattogram District: Amirabad, Dohazari, Satkaniya and Chakaria; In Dhaka District: Jatrabari, Karwan bazar and Savar), processing industry and export to other countries. Normally, marketing channels are maintained by middlemen. A large amount of fish was sold to the middle man by auction at the landing center. The middle man also collected fish directly from the boat. Islam, (2000) conducted a study and concluded that 60-80% of the money that the fishermen earn by selling their fishes go to the middlemen. The result was more similar with previous studies. In present study mahajans or aratdars (Middle mans are commonly known as so in Cox's Bazar) procured fish from the catchers with the help of local brokers (called dalal), who get a profit margin or commission from the mahajans. The mahajan sold the fish to distributors known as beparies, generally with the help of aratdars or commission agents. The beparies transported the fish to the nearest city or town markets by road or boat. These were the main distributing markets, and beparies sold fish to another set of distributors known as wholesalers. Wholesales

sold the fish to the retailers, who brought them to the final consumer market. Ahmed et al. (2007) noted that generally the supply chain of marine dried fish was comprised of several stakeholders like producers, wholesalers, aratdars, middlemen, retailers and finally at the top, the consumers. Alam (2012) observed the supply chain of fish comprises of six intermediaries namely farmer, aratdar, paiker, trader, retailer and consumer for the distant domestic market. So the results from the present study were more or less similar with previous study. Unsold fish species was kept in freezer and some unsold fish in boat sold to dry fish producer.

Sometimes bad-quality or poor-quality fish is also sold in dry fish production areas like Najirattek. From the landing center, fish is also collected for export business. The processing industry collects fish from landing centers and processes them to meet the needs of foreigners or countries. Styrofoam boxes and drams were normally used to transfer the fish species. For local supply, bamboo basket was used. Toll had to pay during transportation of fish according to weight of Styrofoam box and dram. The silver pomfret toll rate was higher than other fish species.

Table 4. Comparison of price of non-conventional fish among BFDC landing center, Baharchara and Borobazar

Local name	**Scientific name**	**English name**	**Price (TK./kg)**			**Profit percentage (%)**	
			Landing Centre	**Baharchora**	**Borobazar**	**Baharchora**	**Borobazar**
Hangor	*Rhizoprionodon acutus*	Shark	130	150	150	15	15
Shaplapata fish	*Himantura uarnak*	Stingray	200	275	250	40	38
Shaplapata	*Pteroplatytrygon violacea*	Pelagic skate	220	280	250	21	10
Tobol fish	*Caranax ignobilis*	Lowly trevally	250	300	300	20	20
Kukurjib	*Cynoglossus lingua*	Long tongue sole	150	180	160	20	10
Haturi hangor	*Scoliodon sorrakowa*	Dog sharks	130	140	130	7	0

Table 5. Comparison of price of crustacean between landing center and two local markets

Local name	**Scientific name**	**English name**	**Price (TK./kg)**			**Profit percentage (%)**	
			Landing Centre	**Baharchora**	**Borobazar**	**Baharchora**	**Borobazar**
Chaga chingri	*Penaeus indicus*	Indian white shrimp	750	800	850	6	13
Golda	*Macrobrachium sp.*	Giant river prawn	900	1000	1000	11	11
Lobster	*Panulirus polyphagus*	Mud spiny lobster	1300	1500	1600	15	23
Sila kakra	*Scylla serrate*	Mud crab	180	215	200	17	11
Tin fota kakra	*Portunus sanguinolentus*	Three spotted crab	280	300	310	7	10
Bagda	*Penaeus sp.*	Giant tiger shrimp	600	700	700	17	17

Table 6. Comparison of price of mollusks between landing center and two local markets

Local name	**Species name**	**Common name**	**Price (TK./kg)**			**Profit percentage (%)**	
			Landing center	**Baharchora**	**Borobazar**	**Baharchara**	**Boro Bazar**
Octopus	*Octopus rugosus*	Octopus	350	450	425	28	21
Sepia	*Sepia aculeate*	Sepia	20 TK./ piece	32 TK./ piece	30 TK./ piece	60	50
Squid	*Loligo edulis*	Squid	350	450	450	28	28

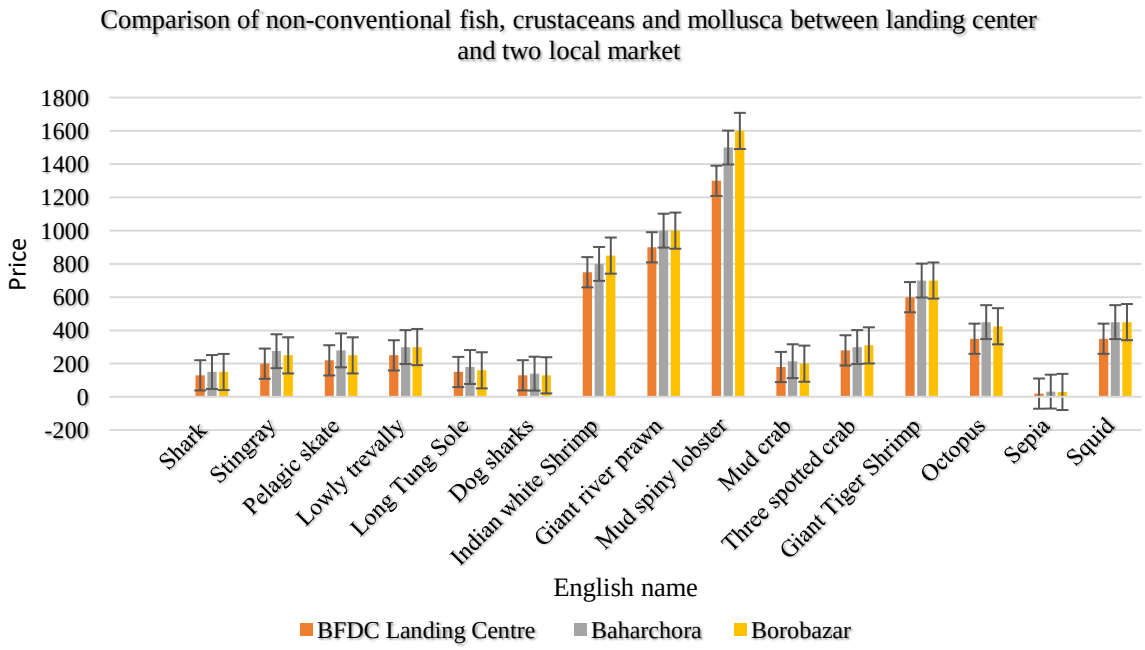

Figure 3. Comparison of price of non-conventional fish, crustacean and mollusca between landing center and two local markets

Marketing channel of conventional and non-conventional fish

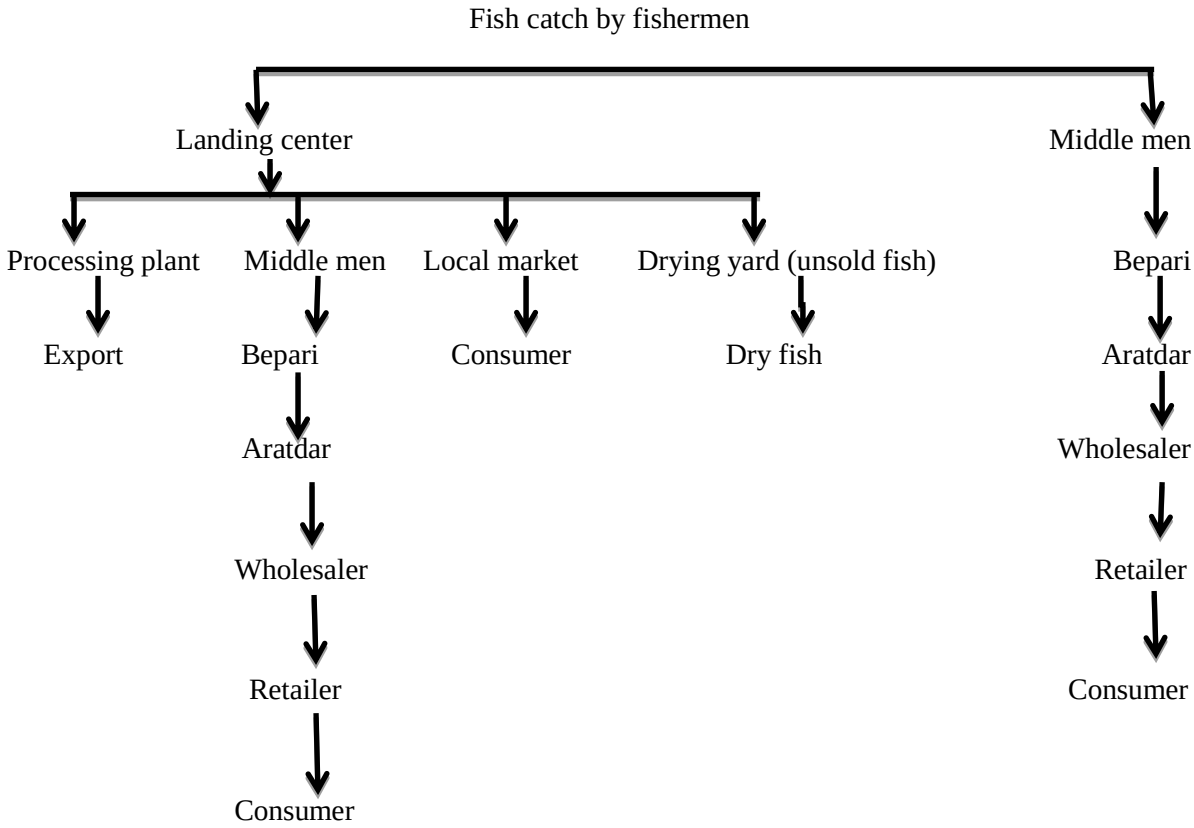

Figure 4. Marketing channel of conventional and non-conventional fish at BFDC landing center.

4. CONCLUSION

The landing center makes the market system simpler and ease the transportation process. From the Cox's Bazar region, a large number of marine fish species spread throughout the country and around the world. This study was about BFDC Fishery Ghat, which is one of the most common marine fish species landing centers at Cox's Bazaar. There were different types of conventional fish and also some non-conventional fish. Thirty-two (32) species of conventional fish and 15 species of non-conventional fish were found at this landing center. The most common and demandable conventional fish found at landing center were Hilsha (600-1000 TK./kg), Silver pomfret (550-900 TK./kg) and Croaker. Shark, stingray, and crab species were the most common non-conventional fishes at BFDC Ghat that includes 5 species of shark, 2 species of stingray and 3 species of crab. The marketing channels of this landing center were controlled by intermediaries such as fishermen, wholesalers, dealers, retailers and suppliers. The market value of fish species varied with the types of marketing channels. Local fish sellers sold those fish at the local fish market for about 20–25% profit. The value of fish is also varied with season to season and species to species. Stingray fish market prices decreased in the winter season. From the present findings, it can be concluded that conventional fish species variation was average but non-conventional species variation was not as abundant as before.

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