Species Availability and Marketing System in Two Fish Markets of Coastal Region in Bangladesh

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Abstract: An investigation was carried out on the availability of fish species and marketing system in Indrerhat and Banaripara fish markets of Bangladesh over 12-months between January and December, 2013. Combinations of the participatory qualitative and quantitative methods were used for questionnaire interviews during data collection and species identification has been done based on morphometric and meristic characteristics. A total 140 species of fresh water, brackish and marine water fish and crustacean species were recorded during the observation period. The number of fresh water species was 89 including 15 fresh water culture species, 18 SIS and 10 crustaceans (fresh water prawn) whereas the recorded brackish and marine water species was 51 including 7 crustaceans (6 marine and brackish water shrimp and 1 crab). Among the total species of which 12 species as endangered, 9 species as vulnerable and 1 species as critically endangered were identified. The availability of fish species in two markets was varied between 38 and 83 in different months while the highest 83 species was recorded in October and lowest 38 species in January. The highest 37.77% was recorded as marine and brackish water fish, 34.34% as freshwater capture fish and 30.83% as freshwater culture fish which contributed mainly Indian major carps, hilsa, catfish, snakehead, shrimp, prawn, SIS (Small Indigenous Species) and others. The marketing channel from fishermen/fish farmers to consumers passed through a number of intermediaries such as wholesaler/aratder, local agent/foria and retailer. About 95% fish was transported by mechanized boats and trawlers in Indrerhat fish market while that was 60% for Banaripara fish market. Fish transportation cost by mechanized boasts was 80% lower than road communication system. There were some common constraints of fish marketing system observed in both markets such as lack of capital, storage facilities, ice supply, sufficient space, clean water supply and proper communication facilities. Exploitation by middlemen acts as a common fence for the improvement of socioeconomic condition of fishermen/fish farmers.

Keywords: Species Availability; Fish Marketing; Constraints.

1. Introduction

Bangladesh remains one of the most compactly populated countries in the world covering an area of 147500 square kilometer with a population of 164 million (Ahmed *et al*., 2012). It is blessed with rich extensive inland and marine fisheries potential resources with a wide variety of indigenous and exotic fish fauna (Hasan *et al.*, 2014). Fisheries sector signifies one of the most productive and dynamic sectors in Bangladesh. In the economy of Bangladesh, this sector contributes about 60% animal protein to the daily diets of the population, about 3.65% to the GDP and 23.81% to the agriculture while 18.2 million people directly and indirectly involved in this sector which is about 11% of total population in Bangladesh (DOF, 2016). Bangladesh is measured one of the most apposite countries in the world for freshwater aquaculture, because of its favorable resources and agro-climatic conditions. A sub-tropical climate and vast areas of shallow water make ideal conditions for fish production. The total fish production was estimated at 36.84 lack metric tons of which 83.72% came from inland water and 16.28% from marine water in 2014-2015 (DOF, 2016). The fisheries sector is crucial for socio-economic development, nutrition supplementation, employment creation, poverty alleviation and foreign exchange earning of Bangladesh (Hasan *et al.,* 2011). The Indrerhat and Banaripara fish markets are situated on the bank of Sandha River which has connection a network of riverine system internally in the southern part of Bangladesh that ultimately flows down to the Bay of Bengal through the Pirojpur district. The noted river in this region are Lower Meghna, Arial khan, Kalabadar, Kirtankhola, Tetulia, Paira, Baleshar and many other local rivers and canals that linked many upazilas under five districts namely Pirojpur, Jhalokati, Barisal, Gopalganj and Madaripur through river

communication. Most of the agricultural lands of Barisal, Pirojpur and Gopalganj districts and some parts of Jhalokati, Faridpur, Shariatpur and Madaripur districts are inundated for 6-8 months (Rasid, 1981; BARCIR, 2004) from April to November, contain 5-7 feet water and make huge area of water resources when growth rate of native species of fishes are very high and make available in the markets in large amount especially puti, shing, magur, koi, taki, shol, tengra, prawn, baim, baila and SIS (Small Indigenous Species). Moreover, coastal rivers and estuaries provide huge amount of fishes are namely ilish, shrimp, poa, baila, koral, chewa, pangus, ramsosh, tulardati, air, rita, bata, boal etc. to the markets. Fish production is an essential part of the marketing process as fish and fishery products are extremely traded commodities. Approximately 97% of the production of fish is marketed internally for domestic consumption while remaining 3% is processing for export (Rahman *et al.,* 2009). Domestic markets are enormous, varied and complex in terms of volume and as compared to export market domestic market is unlimited. Fish collectors, commonly known as Mahajan or Aratder procure fish from the catchers with the help of local agents (paiker/foria) who get a profit margin or commission from the Mahajan/Aratder. However, the most serious marketing complications seem to happen in the remote communities which with poor communication facilities and where the farmers are in weak position in relation to intermediaries (Rahman, 1997). Several studies have already been done to explore the marketing system, species availability, marketing constraints and the socio-economic condition of the poor retailers in different parts of Bangladesh (Ahmed *et al.,* 1993; Khan, 1995; Rokeya *et al.,* 1997; Afroz, 2007; Sen, 2008; Goon *et al.,* 2012; Hossain and Ali*,* 2014; Islam *et al.*, 2015), but have no or limited information is documented about the fish markets in coastal region of Bangladesh. The main aim of this study is to evaluate the existing marketing system, fish species availability and to identify the constraints for fish marketing in this region.

2. Materials and Methods
Study area
The study was conducted in two important fish markets in coastal districts namely Indrerhat fish market at Swarupkati (Nesarabath) upazila in Pirojpur district and Banaripara fish market at Banaripara upazila in Barisal district of Bangladesh. These two fish markets are very old, large and familiar which have high availability of freshwater, marine and brackish water fish species. These two fish markets were selected for the study after discussion with the fishermen, fish traders, District Fisheries Officer,

Upazila Fisheries Officers and NGO workers who are working with fisheries sectors, based on market history, number of fish traders, duration of marketing time, season etc. The study was carried out for a period of one year from January to December, 2013.
Methodology
For this study, a combination of questionnaire interview, Focus Group Discussions (FGD) and crosscheck interviews were accompanied with key informants such as Upazila Fisheries Officer, Local leaders, NGOs workers and teachers according to Ahmed *et al.* (2010) and Ahmed *et al.* (2012). A total of 50 fish retailers were randomly selected for questionnaire interviews from two markets i.e. 25 in Indrerhat fish market and 25 in Banaripara fish market while 50 consumers (25 in each market) were also selected for interview at fish market, home and office with questionnaires. In addition, a total of 10 aratders (5 in each market) were interviewed in their office with questionnaires for data collection. Fish samples were identified up to the species level based on morphometric and meristic characteristics. Data from questionnaires and species identification sheets were coded and entered into Microsoft Excel for analyses.

3. Results
3.1 Species composition
A total of 140 species of fresh water, brackish and marine water fish and crustacean species were identified during the observation period in two fish markets (Table 1). The availability of different fish species in two fish markets were varied between 38 and 83 in different months and the highest number (83 species) was recorded in the month of October in Indrerhat fish market and lowest (38 species) was found in January in Banaripara fish market (Fig. 1). The number of fresh water species was 89 including 15 fresh water culture species, 18 SIS (Small Indigenous Species) and 10 crustaceans (fresh water prawn); while brackish and marine water species was 51 including 7 crustaceans (6 species of marine and brackish water shrimp and 1 species of crab). Some species of fresh water and brackish water fish (according to IUCN-Bangladesh, 2000) were found as threatened i.e. endangered (12 species): chital, bata, dhela, bhol, rani, silong, bishtara, gajar, madhupabda, neftani, salbain and pabda; vulnerable (9 species): foli, teriputi, gulshatengra, kajuli, tarabaim, kuchia, bheda, namachanda, cheng; and critically endangered (single species): bacha. There are about 20 exotic fish species have been introduced to Bangladesh for aquaculture (increasing fish production) and about 25 species for ornamental purpose in different time. During the observation period, it was found that 4 Indian major carps and 11exotic fish were the most dominant species in two markets. A total of 17 crustacean

species was also recorded during the study period of which 10 freshwater prawns, 6 marine and brackish water shrimp and 1 crab (Table 1). In case of economic importance, *Penaeus monodon* (Asian tiger shrimp) and *Macrobrachium rosenbargii* (giant freshwater prawn) were the remarkable species available in both two markets during the study period.

Table 1. List of fish species available in Indrerhat and Banaripara fish markets

Sl.	Family name	Local name	English name	Scientific name
Fresh water capture fish species				
1	Schilbeidae	Bacha	Schilbid catfish	*Eutropiichthys bacha*
2	,,	Silong	Silong catfish	*Silonia silondia*
3	,,	Batasi	Indian potasi	*Neotropius atherinoides*
4	,,	Kajuli/Baspata	Gangetic ailia	*Ailia coila*
5	Cyprinidae	Chinese puti	Silver barb	*Barbonymus gonionotus*
6	,,	Jatputi	Pool barb	*Puntius sophore*
7	,,	Sarputi	Olive barb	*Puntious sarana*
8	,,	Bata	Bata	*Labeo bata*
9	,,	Dorgi	Gobi	*Apocryptes bato*
10	,,	Chewa	Bearded eel goby	*Teanioides anguillaris*
11	,,	Rui	Rohu labeo	*Labeo rohita*
12	,,	Catla	Katol	*Catla catla*
13	,,	Gonia	Kuria labeo	*Labeo gonius*
14	Gobiidae	Bele	Scribbled goby	*Awaous grammepomus*
15	Belonidae	Kakila	Asian needlefish	*Xenentodon cancila*
16	Notopteridae	Foli	Bronze featherback	*Notopterus notopterus*
17	,,	Chital	Clown knifefish	*Chitala chitala*
18	Bagridae	Gura tengra	Hummingbard catfish	*Rama chandramara*
19	,,	Nuna tengra	Long whiskers catfish	*Mystus gulio*
20	,,	Tengra	Striped dwarf catfish	*Mystus vittatus*
21	,,	Tengra	Striped dwarf catfish	*Mystus tengara*
22	,,	Gulsa tengra	Gangetic tengra	*Mystus cavasius*
23	,,	Air	Giant river catfish	*Sperata seenghala*
24	,,	Rita	Whale catfish	*Rita rita*
25	Mastacembelidae	Baim/salbaim	Zig-zag eel	*Mastacembelus armatus*
26	,,	Tara baim	One-stripe spiny eel	*Macrognathus aral*
27	,,	Tara baim	Lesser spiny eel	*Macrognathus aculeatus*
28	,,	Gusi baim	Barred spiny eel	*Macrognathus pancalus*
29	Osphronemidae	Khalisha	Banded gourami	*Trichogaster fasciata*
30	Tetraodontidae	Patka	Green pufferfish	*Tetraodon fluviatilis*
31	Nandidae	Bheda/mini	Gangetic leaffish	*Nandus nandus*
32	Pangasiidae	Pangas	Pangas catfish	*Pangasius pangasius*
33	Siluridae	Madhu pabda	Pabdah catfish	*Ompok pabda*
34	,,	Pabda	Pabo catfish	*Ompok pabo*
35	,,	Boal	Fresh water shark	*Wallago attu*
36	Anabantidae	Koi	Climbing perch	*Anabus testudineus*
37	,,	Koi	Gangetic koi	*Anabus cobojius*
38	Heteropneustidae	Shing	Stinging catfish	*Heteropneustes fossilis*
39	Clariidae	Magur	Walking catfish	*Clarias batrachus*
40	Channidae	Shol	Snakehead murrel	*Channa striata*
41	,,	Gajar/Gajal	Giant snakehead	*Channa marulius*
42	,,	Taki	Spotted snakehead	*Channa punctata*
43	,,	Cheng	Walking snakehead	*Channa orientalis*
44	,,	Gachua	-	*Channa gachua*
45	Synbranchidae	Kuchia	Cuchia	*Monopterus cuchia*
46	Eleotridae	Kaldi/Nundi	Bhutbele	*Eleotris fusca*
SIS (Small Indigenous Species)				
1	Cyprinidae	Chela	Large razor belly minnow	*Salmophasia bacaila*
2	,,	Chela	Fine scale razor belly minnow	*Salmophasia phulo*
3	,,	Ghora chela	-	*Securicula gora*
4	,,	Mola	Mola carplet	*Amblypharyngodon mola*

5	,,	Dhela	-	*Osteobrama cotio*
6	,,	Teri puti	One spot barb	*Puntius terio*
7	,,	Tit puti	Ticto barb	*Puntius ticto*
8	,,	Gili puti	Golden barb	*Puntius gelius*
9	,,	Phutani puti	Spotted sail barb	*Puntius phutunio*
10	,,	Chebli	Giant danio	*Devario aequipinnatus*
11	,,	Darkina	Flying barb	*Esomus danricus*
12	Ambassidae	Lomba chanda	Elongate glass-perch let	*Chanda nama*
13	,,	Ranga chanda	Indian glassy fish	*Parambassis ranga*
14	Cobitidae	Rani/boumach	Bengal loach	*Botia dario*
15	,,	Gutum	Guntea loach	*Lepidocephalichthys guntea*
16	Osphronemidae	Chuna khailsha	Honey gourami	*Trichogaster chuna*
17	,,	Neftani	Frail gourami	*Ctenops nobilis*
18	Tetraodontidae	Tepa	Oscillated puffer fish	*Tetradon cutcutia*
Fresh water culture species				
1	Cyprinidae	Rui	Indian major carp	*Labeo rohita*
2	,,	Catla	Katol	*Catla catla*
3	,,	Mrigal	Mrigal carp	*Cirrhinus cirrhosus*
4	,,	Silver carp	Silver carp	*Hypophthalmichthys molitrix*
5	,,	Grass carp	Grass carp	*Ctenopharyngodon idella*
6	,,	Bighead carp	-	*Aristicthys nobilis*
7	,,	Kalibaus	Orange-fin labeo	*Labeo calbasu*
8	,,	Common carp	Common carp	*Cyprinus carpio*
9	,,	Minar carp	Mirror carp	*Cyprinus carpio var. specularis*
10	,,	Black carp	-	*Mylopharyngodon pisceus*
11	Pangasiidae	Thai pangas	Striped catfish	*Pangasianodon hypophthalmus*
12	Clariidae	African magur	African catfish	*Clarias garipinus*
13	Cichlidae	Nile tilapia	Nile tilapia	*Oreochromis niloticus*
14	,,	Tilapia	Mozambique tilapia	*Oreochromis mossambicus*
15	Anabantidae	Thai koi	Thai koi	*Anabus testudineus*
Brackish and marine water species				
1	Scatophagidae	Bishtara	Spotted scat	*Scatophagus argus*
2	Latidae	Bhetki/coral	Barramundi	*Lates calcarifer*
3	Scombridae	Bommaitta	Tuna	*Euthynnus affinis*
4	,,	Rupsha	Skipjack tuna	*Katsuwonus pelamis*
5	Synbranchidae	Bamosh	Bengal eel	*Ophisternon bengalense*
6	Terapontidae	Borguni	Jarbua terapon	*Terapon jarbua*
7	Cyprinidae	Bhol	Trout barb	*Raiamas bola*
8	,,	Utii	Chaguni	*Chagunius chagunio*
9	Synodontidae	Lattia	Bombay duck	*Harpadon nehereus*
10	Schilbeidae	Muri bacha	Garuabachcha	*Clupisoma garua*
11	Gobiidae	Chewa	Torpedo trevally	*Taenoides anguillaris*
12	Trichiuridae	Churi	Small head hair tail	*Eupleurogrammus muticus*
13	,,	Churi	Savalani hair tail	*Lepturacanthus savala*
14	,,	Churi	Ribbon fish	*Trichiurus haumela*
15	Pristigasteridae	Dhela	Coromondel ilisha	*Ilisha filigera*
16	,,	Dhela	Big eye ilisha	*Ilisha megaloptera*
17	Clupeidae	Ilish	Hilsa shad	*Tenuolosa ilisha*
18	,,	Chapila	Indian river shad	*Gudusia chapra*
19	,,	Chandan ilish	Toli shad	*Tenualosa toli*
20	,,	Collombo	Indian sardine	*Sardinella longiceps*
21	Belonidae	Kakila	Needlefish	*Xenentodon cancila*
22	Mugilidae	Khorsula	Corsula	*Rhinomugil corsula*
23	,,	Mullet	Flathead grey mullet	*Mugil cephalus*
24	Sciaenidae	Koitor	Coitor croaker	*Johnius coitor*
25	,,	Lamba poa	Long jewfish	*Sciaenoides brunneus*
26	,,	Lalpoa	Silver jew	*Johnius argentatus*
27	,,	Poa	Pama croaker	*Otolithoides pama*
28	Ariidae	Ghagra	Ghagra catfish	*Arius gagora*

| 29	''	Med	Giant sea catfish	*Arius gigus*
30	Carangidae	kawa	Hardtail	*Megalapsis cordyla*
31	''	Rupchanda	Black pomfret	*Parastromateus niger*
32	''	Maitya	Jack and pompanos	*Cybium guttatum*
33	Engraulidae	Phasa	Gangetic hair fin anchovy	*Setipinna phasa*
34	''	Samudra chela	-	*Thryssa purava*
35	Stromateidae	Rup chanda	Chinese pomfret	*Pampus chinensis*
36	''	Fali chanda	Silver pomfret	*Pampus argenteus*
37	Nemipteridae	Ruppan	Japanese threadfin bream	*Nemipterus japonicus*
38	Tetraodontidae	Potka	Green puffer fish	*Tetraodon flaviatilis*
39	Lobotidae	Samudra koi	Atlantic tripletail	*Lobotes surinamensis*
40	-	Sagorrita	-	*Rita rita*
41	Dasyatidae	Saplapata	Pale-edged stingray	*Dasyatis zugei*
42	Sillaginidae	Tulardadi	Lady fish	*Sillaginopsis panijus*
43	Polynemidae	Tapasi	Paradise threadfin	*Polynemus paradiseus*
44	''	Lakhua	Indian salmon	*Polynemus indicus*
Crustacean species				
1	Palaemonidae	Golda chingri	Giant fresh water prawn	*Macrobrachium rosenbargii*
2	''	Goda chingri	Goda river prawn	*Macrobrachium scabriculum*
3	''	Dimua chingri	Dimua river prawn	*Macrobrachium villosimanus*
4	''	Kunchu/gura chingri	Kuncho river prawn	*Macrobrachium lamaerrei*
5	''	Goda chingri	Orana river prawn	*Macrobrachium idea*
6	''	Chikon chingri	Slender river prawn	*Macrobrachium idella*
7	''	Choprai chingri	Ganges river prawn	*Macrobrachium choprai*
8	''	Lothia ischa	Short leg river prawn	*Macrobrachium mirabile*
9	''	Dhanua chingri	Rice land prawn	*Macrobrachium lanchesteri*
10	''	Chatka chingri	Monsoon river prawn	*Macrobrachium malcolmsonii*
11	Penaeidae	Bagda chingri	Giant tiger shrimp	*Penaeus monodon*
12	''	Sada/Bagtara chingri	Green tiger shrimp	*Penaeus semisulcatus*
13	''	Chapta chingri	White shrimp	*Penaeus indicus*
14	''	Harina chingri	Brown shrimp	*Metapenaeus monoceros*
15	''	Harina chingri	Yellow shrimp	*Metapenaeus brevicornis*
16	''	Chamua chingri	Brown shrimp	*Metapenaeus pinulatus*
17	Portunidae	Shela kakra	Mud crab	*Scylla serrata*
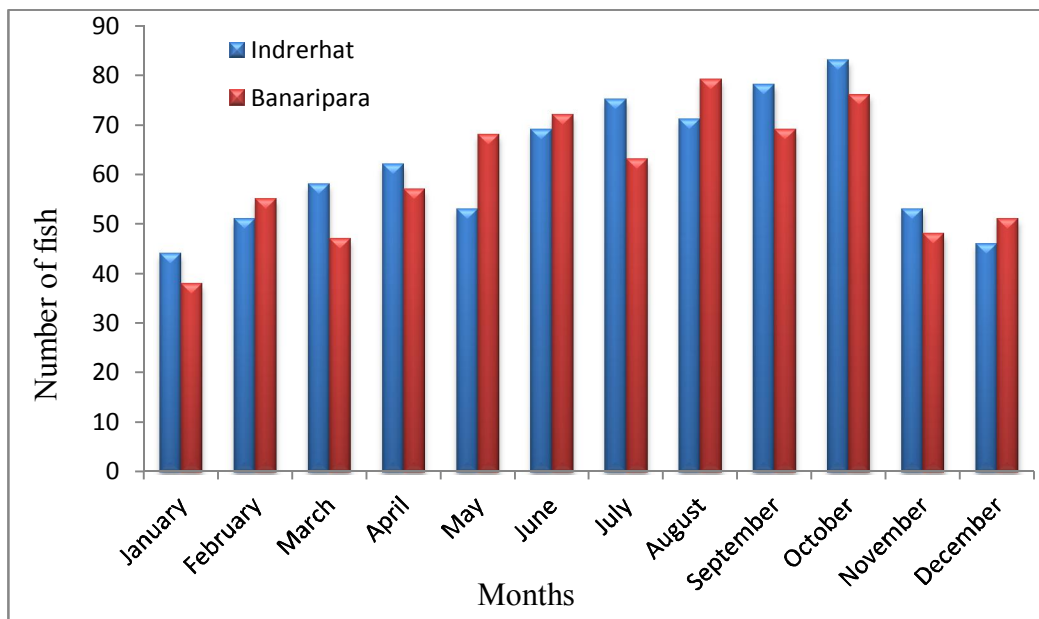
Figure 1. Variation of species availability in different months in two fish markets

The availability of fish species in markets depend on the demand and supply of fish, transportation and communication facilities and season of capture and culture fisheries. The percent compositions of different fishes were varied in different months in two fish markets during the observation period is shown in Table 2. The amounts 37.77% and 34.83% were recorded as marine and brackish water fish following to freshwater capture fish 32.63% and 34.34% and freshwater culture fish 29.60% and 30.83% in Indrerhat and Banaripara markets respectively during the study period (Fig. 2). It was estimated that a major portion of fishes in two markets was ilish (16.17% in Indrerhat and 15.08% in Banaripara); moreover, Indian major carps, catfish, snakehead, shrimp, prawn and SIS (Small Indigenous Species) were also remarkable amounts in percent composition of two markets during the study period (fig. 3).

Table 2. Percent composition of major groups of fish in different months in two fish markets

Name of month		Ilish	Carps*	Catfish**	Tilapia	Snakehead	Baim	Shing & Magur	Koi & Thai Koi	Punti	Shrimp & Prawn	SIS	Marine fish	Others
January	Indrerhat	10	12	5	6	15	4	10	5	3	5	5	15	5
	Banaripara	7	13	6	7	14	3	11	4	4	4	6	13	8
February	Indrerhat	8	10	7	7	17	5	9	6	2	4	5	13	7
	Banaripara	7	11	7	8	15	4	8	5	3	5	7	14	6
March	Indrerhat	10	10	8	6	15	4	8	6	3	4	4	15	7
	Banaripara	9	12	10	8	10	2	7	5	3	5	7	14	8
April	Indrerhat	10	13	10	7	12	2	7	5	2	5	5	16	6
	Banaripara	11	11	11	9	10	4	5	4	3	4	6	15	7
May	Indrerhat	12	13	8	10	8	1	5	4	3	6	5	20	5
	Banaripara	14	12	10	7	9	3	3	2	1	5	7	19	8
June	Indrerhat	15	12	7	8	7	3	5	6	2	6	4	20	5
	Banaripara	13	11	12	9	6	3	3	3	1	4	6	22	7
July	Indrerhat	15	13	8	7	8	2	4	4	3	7	4	20	5
	Banaripara	14	10	9	8	6	3	3	2	1	8	8	21	7
August	Indrerhat	20	10	7	6	7	2	3	5	3	7	5	20	5
	Banaripara	19	11	10	4	6	3	2	1	1	6	7	22	8
September	Indrerhat	30	10	5	5	5	5	1	3	3	8	5	16	4
	Banaripara	31	9	8	5	8	3	2	1	1	7	4	15	6
October	Indrerhat	32	12	3	4	4	5	2	2	4	7	3	17	5
	Banaripara	30	8	9	7	5	2	4	1	1	6	5	15	7
November	Indrerhat	20	12	8	6	7	4	4	2	2	8	6	15	6
	Banaripara	18	9	9	7	9	3	6	4	2	6	8	13	6
December	Indrerhat	12	10	10	8	10	5	8	5	3	7	7	10	5
	Banaripara	8	9	14	9	12	4	7	4	2	6	9	12	4

*Indian major carps and exotic carps;   **Thai pangas, Gulsha tengra, Tengra, African magur, Air and Boal.
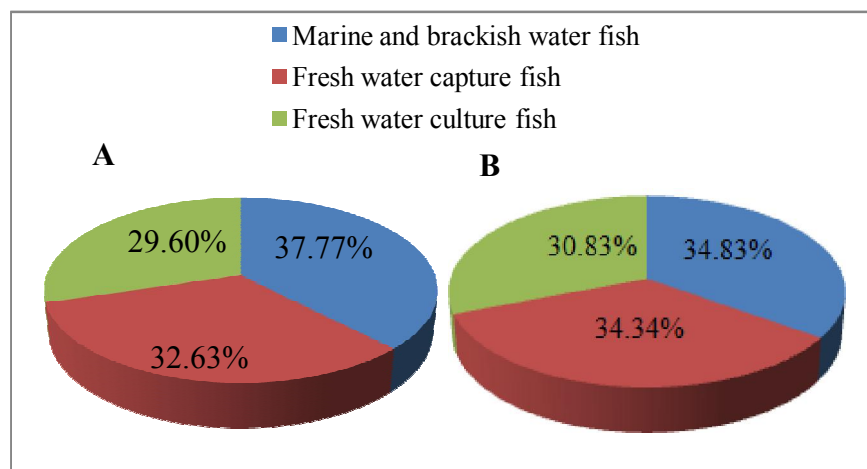

Figure 2. Percent composition of fresh water capture and culture fish and marine and brackish water capture fish in Indrerhat (A) and Banaripara (B) fish markets.

3.2 Source of fish

Most of the fishes (above 90%) in two fish markets were brought from different parts of Barisal region such as Paisarhat, Shatla, Bagda, Nazirpur, Agouljara, Uzirpur, Mohipur, Bhola, Bakergonj, Borguna, Bandaria and Pirojpur whereas small parts (below 10%) from outside of Barisal region like Jessore, Bagerhat, Fakirhat, Satkhira, Kotalipara (Gopangonj) and Khulna (especially Thai pangus, tilapia, shing, Thai koi, rui and shrimp) and Indian major carp from India and Myanmar (Table 3). According to the informants, 95% fishes were transported by mechanized boasts and trawlers through rivers and canals in the Indrerhat fish market while in Banaripara fish market, 60% fishes were transported by mechanized boats and trawlers; transportation cost by

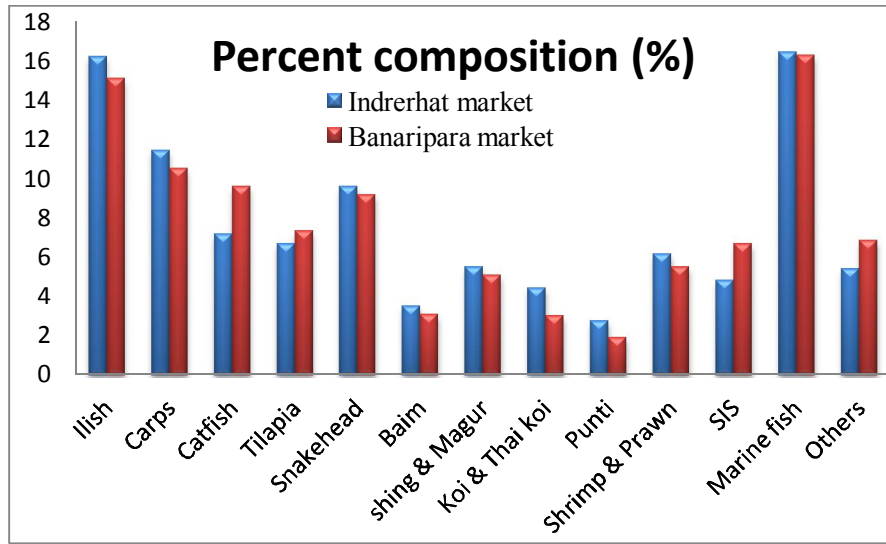mechanized   boasts   is   80%   lower   than   road   communication system.

Figure 3. Percent composition of major fish groups in Indrerhat and Banaripara fish markets

Table 3. Source of fish in Indrerhat and Banaripara fish markets

Fish	Source of fish		Amount of fish
	Greater Barisal region	Outside of Barisal region	
Ilish	Mohipur, Barguna, Bandaria, Bhola, Pirojpur and coastal rivers (100%)	-	100%
Carps	Local ponds, Shatla, Bagda, Paisarhat, Uzirpur, Agouljara and Bakergonj (80%)	Shatkhira, Jessore, Bagerhat, Fakirhat, Kotalipara, India and Myanmar (20%)	
Catfish	Local rivers, canals, ponds, inundated agriculture lands, Bakergonj, Pirojpur, Nazirpur, Uzirpur and Agouljara (90%)	Shatkhira, Jessore, Bagerhat, Fakirhat and Kotalipara (10%)	
Tilapia	Local ponds, Shatla, Bagda, Paisarhat, Bakergonj, Uzirpur, Agouljara, Nazirpur and Pirojpur (90%)	Jessore, Khulna, Bagerhat and Fakirhat (10%)	
Snakehead	Local canals, inundated agriculture lands, Shatla, Bagda, Paisarhat, Nazirpur and Agouljara (98%)	Kotalipara (2%)	
Baim	Local rivers, canals and inundated agriculture lands, Nazirpur, Shatla, Bagda, Paisarhat, Uzirpur and Agouljara (100%)	-	
Shing&Magur	Small canals and inundated agriculture lands, Nazirpur, Paisarhat, Shatla and Bagda (90%)	Jessore, Khulna, Fakirhat and Kotalipara (10%)	
Koi & Thai Koi	Inundated agriculture lands, Nazirpur, Paisarhat, Agouljara, Uzirpur and Bakergonj (95%)	Jessore, Fakirhat and Kotalipara (5%)	
Puti	Local ponds, Paisarhat, Shatla, Bagda, Nazirpur, Pirojpur and Uzirpur (90%)	Bagerhat, Fakirhat, Jessore and Kotalipara (10%)	
Shrimp & Prawn	Local rivers, canals and inundated agriculture lands, Nazirpur, Uzirpur, Agouljara, Shatla, Bagda and Paisarhat (90%)	Shatkhira, Bagerhat, Fakirhat and Kotalipara (10%)	
SIS	Local rivers, canals, ponds and inundated agriculture lands (100%)	-	
Marine fish	Mohipur, Borguna, Bhola, Bandaria, Bagerhat and Pirojpur (95%)	Shatkhira and Bagerhat (5%)	
Others	Local rivers, canals, ponds, inundated agriculture lands, Mohipur, Borguna, Bhola, Bandaria, Bagerhat and Pirojpur (90%)	Shatkhira, Jessore, Khulna, Bagerhat and Kotalipara (10%)	

Table 4. Price list of important species in Indrerhat and Banaripara fish markets

Most available fish	Price: US$/kg(1US$=80BDT)	
	Indrerhat fish market	Banaripara fish market
Ilish- *Tenualosa ilisha* (Large size-above 1kg)	8.75-9.36	8.75-10.00
Ilish (below 1kg)	5.63-6.88	6.25-6.88
Jatkailish (Less than 23 centimeter)	2.5-3.13	2.50-3.13
Carps (large size-above 2kg)	3.13-3.75	2.50-3.13
Carps (small size-1kg)	1.88-2.25	1.75-2.13
Pangas-*Pangasius hypophthalmus*	1.25-1.63	1.13-1.25
Air-*Sperata seenghala*	4.36-5.63	4.36-6.25
Boal-*Wallago attu*	3.13-3.75	3.13-3.75
Tilapia- *Oreochromis niloticus* (large size)	1.25-1.50	1.50-1.75
Tilapia (small size)	1.0-1.13	1.0-1.25
Taki-*Channa punctata*	0.88-1.13	1.0-1.25
Shol-*Channa striata*	2.13-3.13	2.5-3.13
Gajar-*Channa marulius*	1.88-2.25	2.25-2.75
Baim-*Macrognathus aral*	2.50-2.75	3.13-3.75
Salbaim-*Mastacembelus armatus*	3.13-3.75	3.75-4.36
Shing- *Heteropneustes fossilis*	5.0-6.25	5.0-5.63
Magur-*Clarias batrachus*	5.63-6.88	5.0-6.25
Koi-*Anabas testudineus* (native)	3.75-4.36	3.75-5.0
Thai Koi-*Anabas testudineus* (exotic)	2.5-3.13	2.5-3.75
Puti- (average)	1.25-1.50	1.63-1.88
Shrimp (large size –Bagda)	5.0-6.25	5.0-7.50
Shrimp (small size)	2.50-3.13	3.13-3.75
Prawn- *Macrobrachium* sp. (large size)	5.0-6.88	6.25-8.75
Prawn (small size)	3.13-4.36	4.36-5.0
SIS (Small Indigenous Species)	1.88-2.5	2.38-2.75
Koral-*Lates calcarifer* (average)	3.13-4.0	2.75-3.75
Foli-*Notopterus notopterus*	2.5-3.13	3.13-3.75
Chital-*Chitala chitala*	3.13-3.75	3.75-5.0
Bele-*Awaous grammepomus*	1.88-3.13	2.5-3.13
Ramsosh-*Thryssa hamiltonii*	1.88-2.50	2.13-2.50
Rupchanda-*Pampus chinensis*	3.13-3.75	3.13-3.75
Poa-*Otolithoides pama*	1.75-2.25	1.88-2.5
Silong-*Silonia silondia*	2.5-3.13	2.75-3.13
Rita- *Rita rita*	5.0-5.63	5.0-6.25
Pabda catfish-*Ompok pabo*	5.0-6.25	3.75-6.25

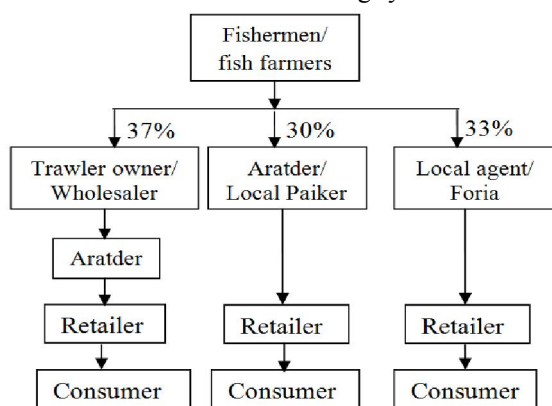3.3 Distribution and marketing system

Figure 4. Fish marketing channels in Indrerhat and Banaripara fish markets.

Almost similar market chains were observed in two fish markets during the study period. A number of middlemen were found to be involved between fishermen/fish farmers and consumers in fish marketing system. The market chain from producers (fishermen/fish farmers) to consumers passes through a number of intermediaries, such as local fish traders (paikers/foria), wholesalers, aratders and retailers whereas found similar three types of marketing channels in two fish markets during the study period (Fig. 4).

3.4 Daily fish trading

Daily fish trading time in Indrerhat and Banaripara fish markets was a little bit different. It was found that in Indrerhat fish market fish trading occurs very early in the morning from 6am to 3pm and 5pm to 10pm whereas in Banaripara fish market it

starts at 7 am in the morning to 2pm at noon and 5 pm to 9 pm daily.

3.5 Price of important species

The price of fish varied with season, size, quality and availability of fish in the markets. It is also varied with live or death condition especially in case of shing, magur, koi, shol, taki, pangus etc. Banaripara fish market showed the higher prices for most of fishes either native or exotic and captured or cultured fishes compared to Indrerhat fish market during the observation period (Table 4).

3.6 Constraints of marketing

A number of constraints for fish marketing were reported by the respondents (aratders and retailers) of Indrerhat and Banaripara fish markets. The highest proportion of respondents (25.71%) reported lack of transportation and communication facilities in Indrerhat fish market while uppermost 20% informed lack of ice/poor ice supply in Banaripara fish market as the main constraint of fish marketing. Moreover, lack of money, lack of storage facilities, lack of sufficient space, lack of clean water supply and exploitation by middlemen were identified as the major constraints (Table 5).

Table 5. Key constraints of Indrerhat and Banaripara fish markets

Constraints	Indrerhat fish market (N=35)	Banaripara fish market (N=35)	Total (N=70)
Lack of money	4 (11.43%)	5 (14.29%)	9 (12.86%)
Lack of storage facilities	6 (17.14%)	5 (14.29%)	11 (15.71%)
Lack of ice/Poor ice supply	5 (14.29%)	7 (20.00%)	12 (17.14%)
Poor communication facilities	9 (25.71%)	5 (14.29%)	14 (20.00%)
Lack of sufficient space	5 (14.29%)	4 (11.42%)	9 (12.86%)
Exploitation by middlemen	3 (8.57%)	5 (14.29%)	8 (11.43%)
Lack of clean water supply	3 (8.57%)	4 (11.42%)	7 (10.00%)
Total (Retailers-50 and aratders-20)	35 (100%)	35 (100%)	70 (100%)

4. Discussion

The present investigation was conducted to know the fish availability and marketing system of two fish markets in Barisal and Pirojpur districts of Bangladesh. A total number of 140 fish species were recorded during the study period in two fish markets. An investigation was conducted by Hossain and Ali (2014) in Dhauladia fish market in Khulna and recorded a total 115 species while another study was carried out by Hasan *et al.* (2014) in three fish markets of Barisal town and recorded 64 species that were lower than the present study. One of the most important reasons here for recording higher species availability are the presence of plentiful rivers, canals and inundated agricultural lands in the coastal region which provide considerable amount of marine and brackish water fish, SIS and fresh water capture fish species to the markets. It was estimated that a major portion of fish (37.77% in Indrerhat and 34.83% in Banaripara) were marine and brackish water fish species because Barisal and Pirojpur are located in the coastal region of the country. Moreover, fresh water capture fish species was recorded in a significant amount (32.63% in Indrerhat and 34.34% in Banaripara) in the markets which contributed 9.58% snakehead, 5.5% shing-magur, 3.5% baim, 3.5% prawn, 2.75% puti, 4.83% SIS and 5.72% others species in Indrerhat fish market while in Banaripara fish market that were 9.17%, 5.08%, 3.08%, 3.5%, 1.92%, 6.67% and 6.83% respectively. Indigenous

species especially shing, magur, baim, snakehead, prawn, SIS and other native species were recorded significant amount in two markets which might be due to the availability of small canals and inundated agricultural lands. Moreover, supply of fish depends upon the demand of fish (Shrivastava and Ranadhir, 1995) also cause of variation in the supply of fish in different markets. Most of the fishes (above 90%) in the markets were brought from different parts of greater Barisal region including various kinds of rivers, canals and inundated agricultural lands and the remaining part (less that 10%) from outside of Barisal region like Satkhira, Jessore, Bagerhat, Fakirhat, Kotalipara and Khulna region and large sized Indian major carp from India and Myanmar. Similar information was quoted by Hasan *et al.* (2014) during their study on three fish markets in Barisal town. Afroz (2007) reported that about half of the fish (48%) supplied in the markets was Indian major carps, minor carps and exotic carps, whereas ilish was in small quantities (8%) in Mymensingh. Fish marketing system includes the involvement of some intermediaries or middlemen through which transformation of fish take place from producer to consumer and with a few exceptions, producers never directly communicate with the consumers. In the present study three types of marketing channels were experienced where wholesaler/aratder, locan agent/foria and retailer had involvement as intermediaries in both fish markets in Indrerhat and

Banaripara. Goon *et al.* (2012) reported that bepari, aratder, paiker and retailer have involvement as intermediaries in the fish marketing channels in Mymensingh; Rahman *et al.* (2009) indicated that local trader, agent/supplier, wholesaler and retailer have involvement as intermediaries in fish marketing system in Khulna; moreover Alam *et al.* (2010) mentioned that traders, broker, aratder, wholesaler, mahajan, dadondar and retailers have involvement as intermediaries in the fish marketing system in Swarighat, Dhaka. Similar types of marketing channels were observed in Netrokona, Mymensingh and Gazipur district (Mia, 1996). Presence of intermediaries in fish marketing channels has also been reported in other parts of Bangladesh and India (Ahmed, 1984; Khan, 1995). The fish market and marketing system of present study were found to be demonstrated with some common features that observed in most of the fish markets in Bangladesh. These were lack of money, lack of storage facilities, lack of ice supply, lack of sufficient space, lack of clean water supply, exploitation by middlemen and lack of proper communication facilities. Similar constraints regarding fish marketing system were also reported by a number of authors during their investigations (Quddus, 1991; Khan, 1995; Mia, 1996; Rokeya *et al.*, 1997; Ahmed *et al.,* 2012; Hasan *et al.,* 2014 and Hossain and Ali*,* 2014).

5. Conclusion

The common indicator of marketing competence is the size of marketing margin which makes a huge gap between the producers (fishermen/fish farmers) and consumers in case of price. Some management procedures for instance more new policies and strategies should be taken by the government and research organizations to reduce intermediaries. In order to adequate supply of fish in the market, it is advisable to increase transportation and communication facilities, sufficient icing facilities, improvement of preservation and storage facilities, ensure electricity and clean water supply, provide institutional and organizational supports, extension services, more research and public private partnership. It is imperative to increase public-private affiliation and public awareness that can improve the existing system of fish marketing.

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