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Present Status of Fish, Fishers and Fisheries of Dogger Beel in Hajigonj Upazila, Chandpur, Bangladesh

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Abstract The present investigation was carried out to determine existing fish species status, fish catch composition, fishing seasons, fishing gears, fishers socio-economic welfare and the fisheries management practices of Dogger *beel* in Hajigonj Upazilla of Bangladesh. The study revealed that a total of 58 fish species belong to 21 families under 9 orders were identified in the *beel*. Among them 44 species were small indigenous species (SIS) and the rest 14 species were large where 6 of them were exotic species. The maximum fish species (16) were under Cyprinidae family. Four families (Ambassidae, Channidae, Anabantidae and Palaeomonidae) represented 4 species each and another four families (Clupedaei, Schilbeidae, Bagridae and Mastacembelidae) represented 3 species each, and rest thirteen families represented 1 to 2 species each. Thirteen different kinds of fishing gears were identified under 5 major groups including 5 nets (current jal, ber jal, thela jal, jakhi jal and dharma jal), 3 traps (*unta chai, bitte chai and icha chai*), 2 hooks (*chip borshi* and *chara borshi*), 2 spears (*teta* without hooks and *teta* with hooks) and *khata/zag* in the *beel*. Three types of fishers were engaged in fishing in the Dogger *beel*. The highest catch was recorded in October (402 kg/month) and the lowest catch was recorded in June (213 kg/month). The highest number of fishers (85) observed in the monsoon period and the lowest number of fishers (33) observed in the dry season involved in fishing. Most of the fishers used current jal and spears where few of them were used dharma jal for fishing. The maximum 45% of the fishermen had medium size family, 32.5% had large size family and the rest 22.5% had small size family. Among the total fishermen 45% had primary or higher level education and 32.5% can sign their name while about 22.5% of them were illiterate. The average annual income of the professional fishers was BDT 61,375 only.

Keywords: *present status, fish, fishers, fisheries and Dogger beel*

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1. Introduction

The contribution of fisheries sector to national economy has always been important and main source of animal protein, employment opportunities, food and nutritional security, foreign earnings, aquatic biodiversity conservation and socio-economic development. Fisheries sector contributes 4.39% to GDP and 22.76% to agricultural GDP. Fish supplements to about 60% of our daily animal protein intake. About 10% of the population is dependent directly and indirectly on the fisheries for their livelihood [1]. There are 40.24 lakh ha open water bodies in our country. Among them 8.5 lakh ha are rivers and estuaries, 1.8 lakh ha sundarbans, 1.1 lakh ha *beel*, 28.32 lakh ha floodplains and 68,800 ha Kaptai [1]. *Beel* is one of the best natural habitats for the indigenous fishes of different food habits of Bangladesh. Most of the aquatic species specially the fish and prawn enter in the inundated areas of the *beel* from the adjoining rivers and canals to feed and grow during the monsoon months [2]. The '*beel*' a Bengali term is used for large surface water body that accumulates surface runoff water through internal drainage channel [3]. Bangladesh has thousands of *beels*, with the most common names being Chalan *Beel*, Gopalganj-Khulna *Beel*, Meda *Beel*, Aila *Beel*, Dekhar *beel*, Kuri *Beel*, Erali *beel* and Arial *Beel*. The average rate of production from *beel* is 714 kg/ha which can be increased manifold [1]. *Beel* nursery has been proved to be a significant tool for increased production of natural water bodies and to increase fish production. Department of Fisheries has continued the program in various dead rivers, *beels*, haor and government/non D government water bodies from 2009-10 fiscal years. During last year 80 *beel* nurseries were successfully established only the cost of BDT 34.5 lakh which produce 247.43 lakh fingerlings [1]. Chandpur is endowed with vast estuarine and inland waters having great fisheries potential. The average depth of the *beel* is 5-6 ft. during rainy season. In the Dogger *beel* fish culture is being practiced irregular basis by stocking the *beel* with fish fingerlings composed of rui, catla, mrigal, silver carp, grass carp, sarputi, and other species. Some research works would necessary for the management of the Dogger *beel* which would be greatly helpful in planning and setting up of strategies for future

development. The present study was undertaken to find out the fish species composition and fishers activity of Dogger Beel.

2. Materials and Methods

2.1. Location and Description of the Dogger *beel*

Dogger *beel* is a small *beel* which is 17 km east from the Chandpur town and occupied an area of 120 ha spreading over two villages of Hajigonj Upazilla (Figure 1). It is a semi-closed and more or less rectangular shaped inland water body. Rainfall is the main source of water in this *beel*, whereas, during monsoon period the *beel* is connected through several channels to the river Dhakatia. During rainy season the entire *beel* inundate with water average depth become 5-6 ft.

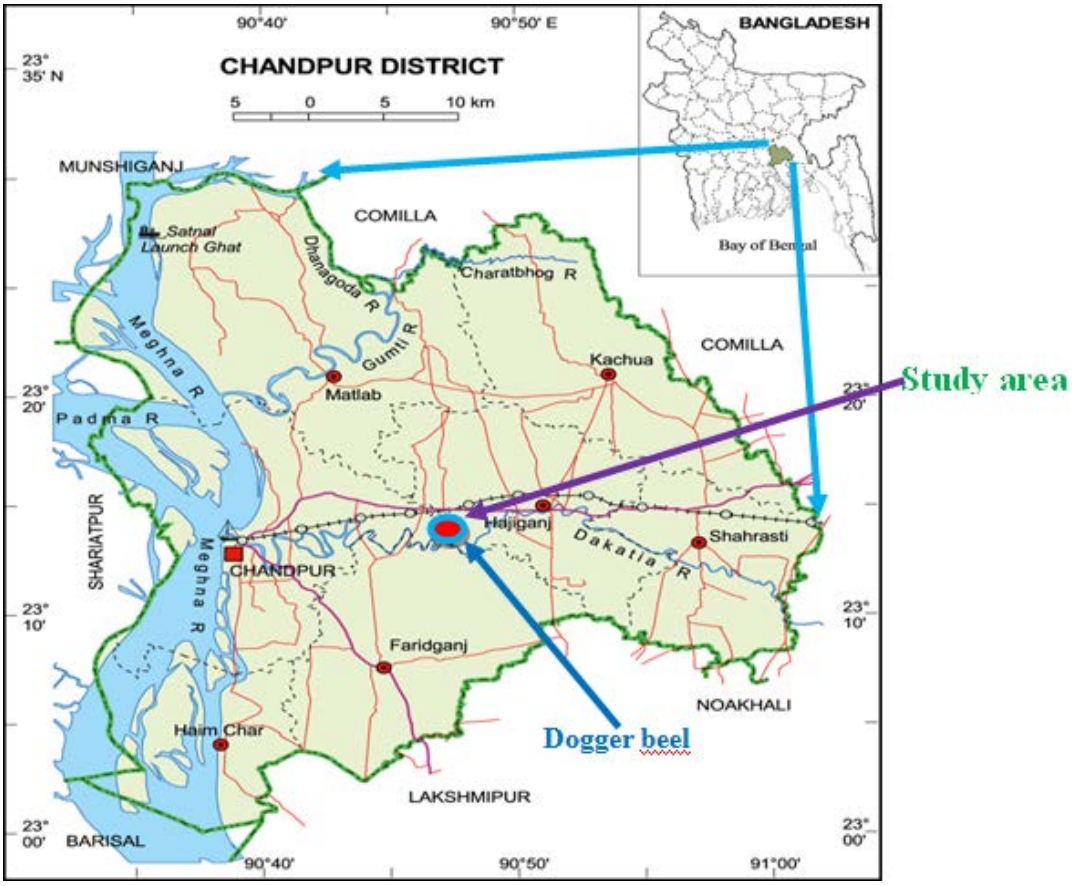

Figure 1. Location of the study is shown in Map with the red mark indicates

The data were collected in respect of the fishery of the *beel*, fishing activities and socio-economic condition for nine months from March 2 to November 2, 2012 every 15 days interval.

2.2. Prepared the Questionnaires & Data Collection

The questionnaire was developed in a logical sequence of that the target group could answer chronologically. For this study a combination of questionnaire interview, Participatory Rural Appraisal (PRA) tool such as Focus Group Discussion (FGD) and cross-check interviews with key informants were used for fishermen (Figure 2).

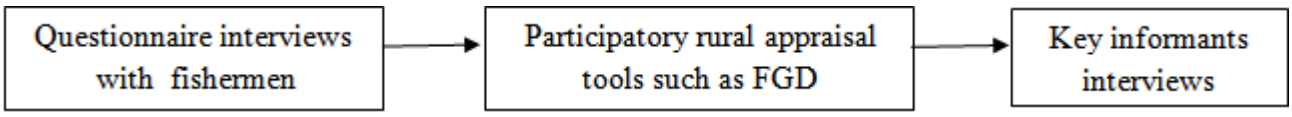

Figure 2. Data collection methods from fishermen

2.3. Questionnaire Interview

To collects data with questionnaire interviews, simple random sampling method was followed in 40 fishermen in the Dogger *beel*. The interview of fishermen was made at home or *beel* sites during fishing.

2.4. Questionnaire Survey and Focus Group Discussion (FGD)

For the present study, the PRA tool such as Focus Group Discussion (FGD) was conducted with fishermen. In the study , FGD was used to get an overview of particular issues such as existing fish composition, fishing systems, management of the *beel* and also improving the production of the Dogger *beel* an as well as its fish biodiversity, socio-economic conditions of fishermen etc. A total of three FGD sessions were conducted in the *beel* area where each group size of FGD was 10 to15 fishermen.

2.5. Cross-check Interview

Cross-check interviews were conducted with key person such as, Upazila Fisheries Officer (UFO), and District Fisheries Officer (DFO), Scientific Officers of BFRI, School teachers, local leaders, NGO workers where information was contradictory or requested for further assessment.

2.6. Data Processing and Analysis

The collected data were coded, summarized and processed for analysis. Tabular technique was applied for the analysis of data by using simple statistical tools like averages and percentages. Collected data has been analyzed by Microsoft Excel.

3. Results

The Dogger *beel* is a *beel* adjacent to the Dakatia River. Water depth of the *beel* fluctuated in different months and ranged from 0 to 8 ft. The highest water depth was recorded in October and the *beel* remains dry in Febuary and March. The highest value of water depth was recorded in the canal of the *beel* was 14 ft. According to the statement of the fishermen and the people from surrounding area of the *beel*, 10 years ago the *beel* was rich with different fish species. These are *Gudasia chapra, Corica soborna, Pelloua ditchela, Notopterus notopterus, Cyprinus carpio, Labeo rohita, Labeo calbasu, Labeo gonius, Cirrhinus cirrhosus, Catla catla, Amblypharyngodon mola, Hypophthalmichthys molitrix, Ctenopharyngodon idella, Puntius sarana, P. stigma, P. sophore, P. ticto, Esomus danricus, Rohtee cotio, Chela laubuca, Botia Dario, Lepidocephalus guntea, Sperata aor,Mystus vittatus, Mystus bleekeri, Mystus tengara, Wallago attu, Ompok pabda, Neotropius atherinoides, Pseudeutropius atherinoides, Ailia coila, Pangasius pangasius, Clarias batrachus, Heteropneustes fossilis, Chaca chaca, Xenentodon cancila, Pseudambassis beculis, Pseudambassis lala, Chanda nama, Pseudambassis ranga, Nandus nandus, Badis badis,Tilapia mussanbicus, Oreochromis niloticus, Glossogobius giuris,Channa striatus, Channa marulius, Channa punctatus, Channa orientalis, Anabas testudinus, Colisa fasciatus, Colisa lalius, Colisa sota, Tetraodon cutcutia, Mastacembelus armatus, Mastacembelus pancalus, Macrognathus aculeatus, Monopterus cuchia, Macrobracium rosenbergii, Macrobracium malcomsonii, Macrobrachium lammarrei, Macrobracium villosimanus.* At that time the fishermen were very much satisfied about their everyday catch from the *beel*. At the present time, *beel* water bodies have been changed with their normal characteristics. For the various modifications of the Dogger *beel* is in critical condition now. The species compositions of fishes caught by different types of gears have been given. These are *Gudasia chapra, Corica soborna, Pelloua ditchela, Notopterus notopterus,Cyprinus carpio, Labeo rohita, Labeo calbasu, Labeo gonius,Cirrhinus cirrhosus,Catla catla, Amblypharyngodon mola, Hypophthalmichthys molitrix,Ctenopharyngodon idella, Puntius sarana, P. stigma, P. sophore, P. ticto, Esomus danricus, Rohtee cotio, Chela laubuca, Lepidocephalus guntea, Mystus vittatus, Mystus bleekeri, Mystus tengara, Wallago attu, Ompok pabda, Neotropius atherinoides ,Pseudeutropius atherinoides, Ailia coila, Pangasius pangasius, Clarias batrachus, Heteropneustes fossilis, Xenentodon cancila ,Pseudambassis beculis, Pseudambassis lala, Chanda nama, Pseudambassis ranga, Nandus nandus, Badis badis, Tilapia mussanbicus, Oreochromis niloticus, Glossogobius giuris, Channa striatus, Channa marulius, Channa punctatus, Channa orientalis, Anabas testudinus, Colisa fasciatus, Colisa lalius, Colisa sota, Tetraodon cutcutia, Mastacembelus armatus, Mastacembelus pancalus, Macrognathus aculeatus ,Macrobracium rosenbergii, Macrobracium malcomsonii, Macrobrachium lammarrei, Macrobracium villosimanus.* In the *beel*, 58 species belong to 21family under 9 order were found in different seasons. All the species are not found equal amount. Among them 16 species belong to the family Cyprinidae; within 58 recorded, 44 fished were SIS (Small Indigenous Species) and the rest 14 species were large fish. There were 6 exotic species recorded in the *beel*. Among 58 species the maximum fish species (16) were under Cyprinidae family. Four families (Ambassidae, Channidae, Anabantidae and Palaeomonidae) represented 4 species each and another four families (Clupedaei, Schilbeidae, Bagridae and Mastacembelidae) represented 3 species each, and the rest thirteen families represented 1 to 2 species each. The following number of fish found in Dogge *beel* (Figure 3) and 10 dominant fishes (kg/day) also found in Dogger *beel* at present investigation which are shown in Figure 4.

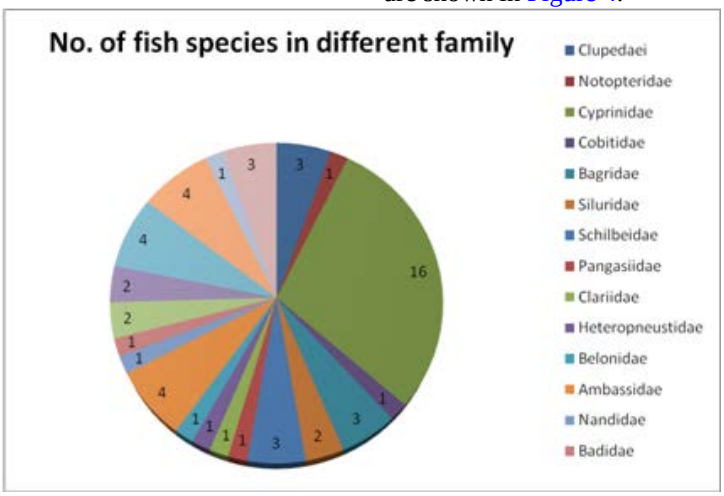

Figure 3. Total number of fish species found under different families in Dogge *beel*

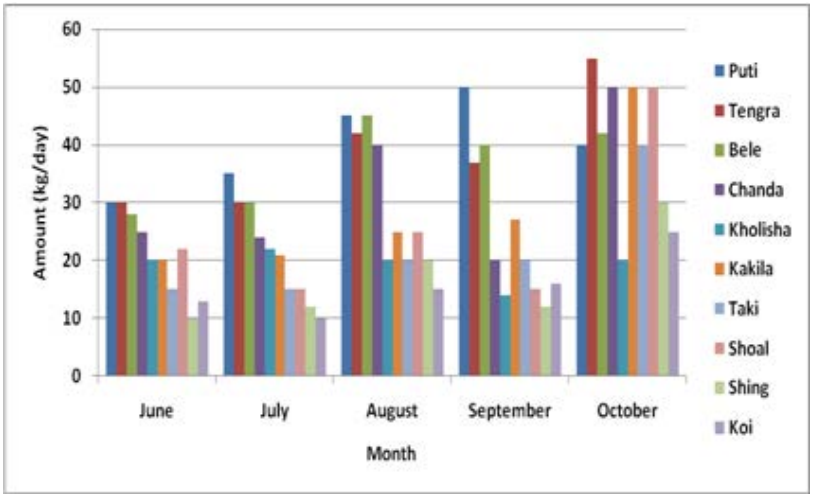

Figure 4. Ten dominant fish species (kg/day) found in the study area

Fisher Types

The fishermen who catch fish in Dogger *beel* were categorized into three groups.

Professional fishermen: the fishermen who depends on fishing almost year round for their livelihoods.

Seasonal professional fishermen: the fishermen who catch fish during a particular time of the year for income source.

Subsistence fishermen: the fishermen who catch fish for their own consumption.

Socio-economic condition and the distribution of fishermen

In the present survey, it was found that Muslims were featuring as the absolute majority of the fishermen. In the study area, 84% of the fishers were Muslims and the rest16% was Hindus.

Distribution according to season

The distribution of the fishermen varies with the seasons (Figure 6). Fishermen were distributed by the category over the season observed in the study area: "Pre-monsoon" (April-June), "Monsoon" (July-September), "Post-monsoon" (October-December) and "Dry season" (January-March).

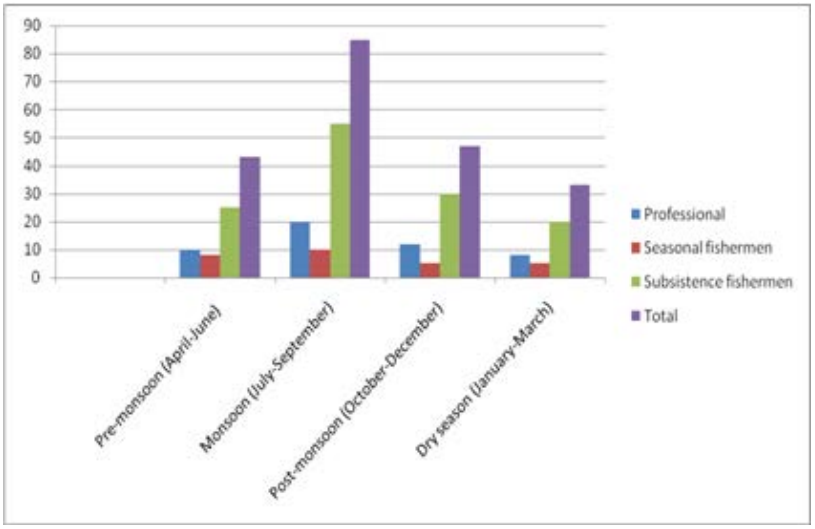

Figure 5. Distribution of fishermen by season in the Dogger beel

Distribution according to family size

On the basis of family size the fishermen were classified into three categories: Small family (1-4), Medium family (5-6) and large family (above 6). The maximum percentage (45%) of the fishermen had medium family which is nearly fifty percent of total fishermen. The lowest percentage (22.5%) of the fishermen had small family. The larger family represents the 32.5% of total fishermen. The mean family size of the study area is almost similar to that national average.

Distribution according to age structure

The distribution of fishers of the Dogger *beel* according to age structure ranged from 18 years to 60 years. On the basis of age structure the fishers were classified into three categories: "Yong" (18-35years), "Middle aged" (36-50 years) and "Old" (above 50 years). The maximum 42.5% of fishermen were Middle aged while the proportion of Old and the Young aged fishers were respectively 32.5% and 25% of the total fishers.

Distribution according to income level

Annual income of fishers varied from BDT 30,000 to 96,000 with a mean income of the professional fishermen was BDT 61,375 only. On the basis of their annual income the fishers were classified into three categories: "Low income" (up to BDT 48,000), "Medium income" (BDT 48,000 to 72,000) and "High income" (above BDT 72,000) shown in Figure 6. The half 52.5% fishers had low income while the proportion of medium income and

high income earning fishers were respectively 37.5% and 10% of the total fishers.

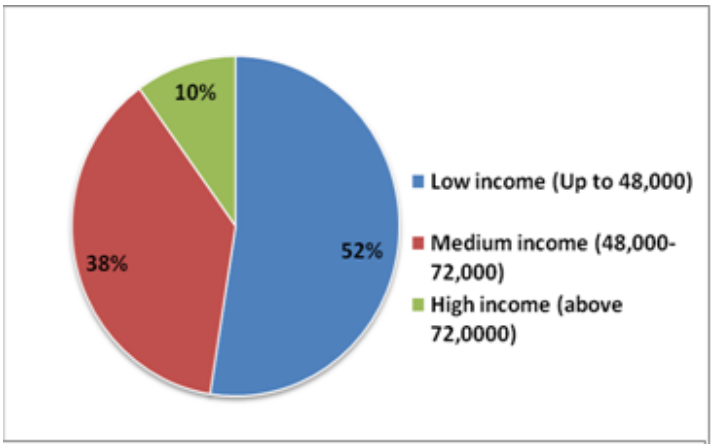

Figure 6. Distribution of fishers according to their annual income

Distribution according to education level

On the basis of education score of the fishermen, they were classified into five categories (Figure 7): "Illiterate" (0), "Can sign only" (0.5), "Primary level" (1-5), "Secondary level" (6-10) and "Higher secondary and above" (above 10).One third 32.5% of the fisher can sign their name while about 22.5% of them were illiterate. Among them 25% of the fisher had primary level education, 12.5% of the fisher had secondary level education and the rest of 7.5% of had higher secondary and above level education. Although 35.5% can sign only but they are not considered as effective education, so the proportion of no education were about 55%. Thus the effective literacy percentage of the fishers of the study area was 45% which were much lower than the national average 56.8%.

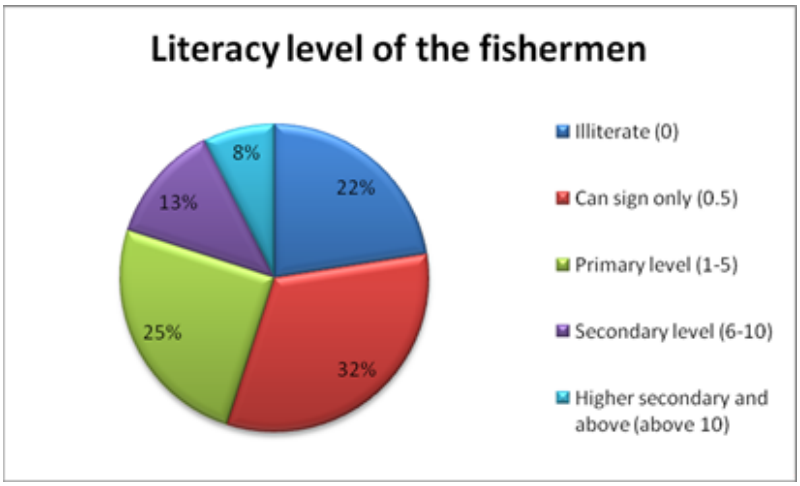

Figure 7. Distribution of fishers according to their education level

Socio-economic constrains of the fishers

The fishers of the Dogger *beel* have faced various types of problems. The main problem was identified as inadequate credit facility, other problems were lack of skill fishers, lack of appropriate gears, presence of aquatic vegetation and extension by the local extortionist. Most of the fishermen were poor and illiterate and live from hand to mouth. As a result, generation after generation they remain itinerate and not being able to contribute for betterment of their family and community. Another socio-economic constraint is the onset of flood that has to be faced by the fishers almost every year.

Fishing gear used in the Dogger *beel*

Dogger *beel* is very rich in fisheries and so as fishing gears. The fishing gears found in the study area were classified into five types, namely fish net, fish trap, hook, FAD (Fish Aggregation Devices) and wounding gear/Spears. Each of these types had again been classified into a number of sub-types (Table 1). From the survey it was found those only 5 type nets, 3 types of traps, 2 types of hooks, 2 spears and various FAD. Most of the gears were traditional and some of them were unique of the particular locality. Almost 90% of the area of the *beel* remains dry from January to April.

Table 1. Fishing gears used in Dogger *beel*

Gear type		Gear name
Nets	Gill net	Current jal
	Seine net	Ber jal
	Cast net	Jhaki jal
	Lift net	Dharma jal
	Push net	Thela jal
Traps		Unta chai
		Bitte chai
		Icha chai
Hooks		Chip borshi
		Chara borshi
Wounding gear/Spears		Teta without hook
		Teta with hook
Zag/FAD (Fish Aggregation Devices)		Khata/Zag

Species availability in different fishing gears

The catch composition of different fish species varies with the seasonal variation of water level of the *beel* and also with the variation of gears used. It was observed that the ber jal and the current jal were used to catch almost all the major fish species in the *beel*. The major fish species caught by specific gears are presented in Table 2.

Table 2 Major fish species caught by different fishing gear in Dogger *beel*

Name of gear	Major species caught
Current jal	Puti, tengra, koi, bele, mani, baim
Ber jal	Rui, tengra, kakila, puti, kaski
Thela jal	Puti, chingri, chanda, bele
Dharma jal	Puti, tengra, koi, kaski, kakila, shoal, taki
Jaki jal	Koi, shingi, puti, chanda, bele, mani
Unta	Choto chingri, kholisa, puti, tenara
Borsi	Puti, Rui, kalbasu, mrigle
Teta	Koi, shingi, bele, mani, tengra, baim, kholisha, chingri, taki

Number of fishing gears observed in a day in operatio There are some specific gear for specific fish and some for common fish. During the study period in Dogger *beel*, six types of fishing gears were observed for fishing in a single day.

Fishing duration of every single gear observed in a day

It is very important to know the fishing duration to estimate the fish yields and to keep track of the catch per unit effort (CPUE). It was seen that most of the gears used both day and night basis. Current jal mostly uses at morning or at night; most of the traps operate through the whole night. In the study area the highest and the lowest fishing duration recorded in current jal and chip borshi. The gears which used longer time were current *jal*, ber *jal*, dharm jal, unta and icha chai. The fishing hours of used gears are presented in the Table 4.10.

Table 3. Fishing duration every single gear observed in a day

SL No.	Gear name	Fishing duration (hours)
1	Current jal	6-12
2	Ber jal	2-4
3	Dharma jal	2-6
4	Thela jal	0.5-2
5	Traps	3-8
6	Borsi	2-5

Fishing gear used by the different number fishers

During the survey period it was found that different types of fishing gear used by the several number of fishers in the Dogger *beel*. The maximum number of fishers were used spears (Teta) and the lowest number of fishers were used lift net (dharma jal). The second and third highest number of fishers used cast net (jhaki jal) and gill net (current jal) respectively.

4. Discussion

Among the various inland fisheries resources, *beel* play a major role in fish production from time immemorial. According to Upazilla Fisheries Offices ten years before, more than 61and present 58 species of fishes were found in Dogger *beel*. Sugnan and Bhattachariya [4] studied the fish population of Dighai *beel* and noted 56 species belonging to 18 families. The percent contribution of the major fished is reported to have declined from 50% to about 25% in most *beels* during recent years which is similar to the present study. Now the number of fish species depletion for various anthropogenic causes such as human intervention, habitat degradation, overfishing, pollution etc.

Rahman [5] recorded and identified a total of 47 species of fish in the catches of different gears by the fishermen in BSKB *beel*. Chakraboty and Miraza [6] studied that a total number of 70 species of fishes were identified so far from the Gharia *beel* Ehshan et al [7] reported that a total of 40 species of fish including three exotic species was observed in Chanda *beel* studies. In the present study, a total of 58 species were found in the Dogger *beel* area out of total 260 freshwater fish species, this number suggests that the *beel* is rich with fish biodiversity comparing to above result. All the fish that were found in the study area were classified under 9 orders 21 families and this also showed a diversification of fishes at Order and Family level behalf of 260 species belonging to 57 families occurred in the inland open water of Bangladesh [8]. Family Cyprinidae comprise the largest family of freshwater fishes and contain 51 species [8]. In the present survey it revealed that among 58 species the highest number of fish (16) was found under the family Cyprinidae. The results suggest that this water body is very suitable for carp and minnows. Within 58 recorded, 44 fished were SIS (Small Indigenous Species) and the rest 14 species were large fish. There were 6 exotic species recorded in the *beel*. The species reportedly found extinct were rani (*Botia dario*), ayre (*Sperta aor*) and chaca (*Chaca chaca*). The seasonal variations of fish species in the *beel* were found to be significantly diverse.

The present study reveals that, different types of fishing gears were found to operate in the *beel*. The most used fishing gears were current jal, ber jal, jakhi jal dharma jal, borshi and teta. Dewan and Mazid [9], the fishing technique that are currently used by the fishermen of Bangladesh are netting, trapping, de-watering, spearing, angling and hand picking. Saha et al. [10] classified into 7 different types of gear of 3 categories (nets, traps and wounding gears) used by 2 categorized fishers in the *beel*. According to BCAS [11], approximately 30 different types of fishing gear have been identified to use in halti *beel*. Rahman *et at.* [12], reported that fishing gear operating in the floodplains (chanda, BSKV and halti *beel*) comprised four groups: fish net (7 types), fish trap (5 types), hooks and line (5 types) and spears/harpoon (4 types). Rahman [13] found a total of 38 fish were identified in the catches of different gears in the haor. Among the different types of nets the highest number of species (29) was recorded in the catch of seine net, which was followed by cast net (23) and relatively less number of species (9) were recorded in the catch of push net. In present investigation it was found that 13 different kinds of fishing gears under 5 major groups including 5 nets (current jal, ber jal, thela jal, jakhi jal and dharma jal), 3 types of trap (unta chai, bitte chai and icha chai), 2 types of hooks (chip borshi and chara borshi), 2 spears (teta without hooks and teta with hooks) and khata/zag (FAD) which is more or less similar to the previous finding. Nets were the dominating fishing gear in the *beel* followed by traps and wounding gears. The use of fishing gears and

operation time depends largely on the habitat type, water level, types of fishermen and species availability. In the present study, the maximum and the minimum fishing duration were observed in current jal and thela jal, which were 6-12 and 0.5-2 hr/day, respectively. Fishing duration of other gears were recorded in ber jal 2-4 hours, dharma jal 2-6 hours, traps 3-8 hours and borshi 2-5 hours per day. Baseline report of fisheries by MACH [14] recorded lower fishing duration than present findings.

In the present study, it was found that a total 24.04% fisherman was professional, 13.46% fishermen were seasonal and the rest 62.5% fishermen were subsistence fishermen. Ahmed [15] in the coastal area and Raju [16] in the Sailkupa upazilla obtained the literacy rate at 25% and 90.8% respectively. From the present study it was found that 32.5% of the fishermen can sign their name while about 22.5% of the fishermen were illiterate and the rest 40% had primary or higher education. The average annual income of the professional fishers was BDT 61,375 only. The half 52.5% fishermen had low income (up to BDT 48,000) while the proportion of medium income (BDT 48,000 to 72,000) and high income (above BDT 72,000) earning fishermen were respectively 37.5% and 10% of the total fishermen.

5. Conclusion

The present investigation revealed that the diversity of fishes in the Dogger *beel* had a variation at different seasons. There is no Governmental and non-governmental survey has been introduced about the estimation of fish biodiversity and fishing gears of Dogger *beel*. Long term studies on biodiversity, fishing gears and socio-economic condition are much essential to know the changes in the biodiversity and socio-economic development of the fisher community for better and sustainable *beel* fishery management. Some *beel* management policies should be adopted to protect the species which are at the degree of extinction and to recover sustainable production of the *beel*. For the protection of fish biodiversity of Dogger *Beel* the Community Based Fisheries Management (CBFM) system and sustainable fisheries management should be familiarized among the fishermen.

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