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Fishing gears and crafts used in Chalan beel, Bangladesh

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Abstract
The present study was an effort to provide an overview of present status of fishing practices, gears and crafts used in fishing, common species caught by gear of the 5 upzillas of four districts of Chalan beel. The study describes the available fishing gears and crafts used in Chalan beel, Bangladesh. The study was carried out in 7 spots under 5 upazilas of 4 districts such as Atrai upazila (Nawgaon), Singra upazila, Gurudaspur upazila (Natore), Chatmohor upazila (Pabna) and Tarash upazila (Sirajganj), respectively. Eye observation and interview method were applied for the data collection. During the study period, 20 different types of fishing gears were observed. Fishing gears including 9 types of net (Ber jal, Khepla jal, Puti jal, Thela jal, Current jal, Moi jal, Veshal jal, Suti jal and Dharma jal); 4 types of trap (Kholson, Doair, Polo and Vair); 3 types of wounding gears (Koach, Ek kata and Angta) and 4 types of hooks and lines (Chip borsi, Nolborsi, Daun borsi and Jiala) were found. Another 2 types of fishing method were also recorded. Among the available nets in the study area it was recorded that maximum length was 363.33±109.70 fit (Ber jal) and minimum length was 15±5 fit (Dharma Jal). It was also recorded that the maximum and minimum breath were 106.67±15.27 fit (Suti jal) and 2.5±0.5 fit (Puti jal), respectively. Mesh size of net varied from 3±0.5cm (Suti jal) to 0.83±0.52cm (Thela jal). Among the traps maximum length was 2.5±0.5 fit (Kholsun) and minimum length was 1.83±0.28 fit (Vair). Small Indigenous Species (SIS) was mostly caught by the trap with few exception and carnivorous fishes are mainly caught by the fishing hooks and lines. When water level becomes low, wounding gears were used for fishing large size fishes during heavy flood. In Chalan beel 5 crafts (Kosa nauka, Bhot nauka, Jaila nauka, Konai dingi and Vela) were observed. Cost benefit ratio of studied fishing crafts was also calculated. The highest Cost Benefit Ratio (CBR) is 1:0.92 (for Vela). Several problems were found which are responsible for the loss of fish diversity of Chalan beel. Among them, over fishing and use of illegal (Current jal), destruction fishing gears, fishing by blocking (Bana) the migration paths of fishes, excess katha fishing and fishermen caught brood and fry fishes indiscriminately.

Keywords: Chalan beel, fishing gears, Gurudaspur upazila

1. Introduction
Fishing is major source of food for the humanity and provides employment and economic benefits to large sections of the society. As a source of food it contributes about 20 percent of animal protein supply. It is an ancient occupation. About fifty million people are involved with this occupation and contributes significantly to foreign exchange earnings of many developing countries. A wide array of fishing gears and practices ranging from small-scale artisanal to large scale industrial systems are used for fish capture. Over the years, traditional fishing gears have been upgraded and newer more efficient fishing systems have been introduced. A diverse range of fishing gears and methods have been evolved to capture a wide range of species constituting the fisheries in different parts of the world. Most important among these fishing gears are traws, purseseines, lines, gillnets and entangling nets and traps (Hameed M. S. and Boopendranath M. R. 2015) [11]. In Bangladesh, fishermen use over 100 types of fishing gears of 9 categories (Alam *et al*. 1997) [5]. Fishing method actually means the way in which fish can be captured. Gears are the instrument used for fish catching and crafts provide platform for the fishing operation carrying the fishing gear. Gear and crafts used in the different parts of the country are mostly indigenous, non-mechanized and locally built. Different kinds of gears are used for fishing in the Chalan beel. Various types of nets used in different grounds for fishing purpose (Ahmed, 1954) [1]. Loss of fish diversity and abundance is a burning issue in recent

times, specially in open waters. One of the major causes of this loss is indiscriminate harvesting of fishes using illegal fishing gears and methods (Galib *et al.* 2009) [21]. There is no or little research such as Ahmed (1954) [1], Khaleque and Islam (1985) [14], Dewan and Mazid (1994) [7], Chakrabarti *et al.* (1995) [6] and Galib *et al*. (2009) [21] efforts in this respect have been found in Bangladesh but proper information about fishing gears are very rare. Proper knowledge of fishing gear, craft and method is essential to take decision which one to be controlled or allowed. The present study is aimed to find out the present status of fishing gears and crafts in the study area to know the operational process of fishing gears and crafts and to know the common fishes which are caught by the gears.

Materials and Methods

Location of the study area and duration

Chalan beel is a vast water body of northern area of Bangladesh and a great source of indigenous fish species. Every year a huge amount of fish are caught in Chalan beel area. The study was conducted in 5 upazilas (Singra, Atrai, Gurudaspur, Chatmohor, Tarash) of 4 districts (Natore, Nawgaon, Pabna and Sirajganj). Data were collected fortnightly for a period of one year from July-2018 to June-2019.

Data collection method

Survey method

Eye observation and interview method were used for the preliminary data collection. Interview method was applied and a prepared questionnaire was used which was pre-tested in field situation and updated before final use.

Photography

Photographs were taken with digital camera (camera model: Nikon 14x wide optical zoom EDVR).

Cross-check Interview

Interviews were carried out of upazila fisheries Officers (UFOs) and other stakeholders including fishers about the use, pattern and intensity of different gears in the water body to know the real situation as well as cross-checking the collected data. Data was also reviewed with the secondary data sources mainly research reports of the Department of Fisheries (DoF), case studies, books, journal, Govt. and non Govt. organization.

Data Processing and Analysis

The information thus collected, were analyzed of bring it to bear on the hypothesis, simple tabulation and statistical calculation like average, standard deviation etc. All the collected data were summarized carefully and recorded. All the collected information were accumulated and analyzed by MS-Excel and then presented in textual and tabular forms to understand the present status of the fishing gears and crafts in the concerned area. The results was expressed as mean ± standard deviation.

Results and discussions

Fishing seasons

In the present study it was observed that fishing seasons were divided into 3 categories (pre-monsoon, monsoon and post monsoon). Duration of the each season was 1. Pre-monsoon (May-June), 2. Monsoon (July-October) and 3. Post monsoon (November-February), respectively (Table -01).

Table 1: Fishing seasons and fish availability in the study area

SL No.	Seasons	Duration of the Seasons	Comparison of fish availability and fishing among the seasons
1	Pre-monsoon	May-June	Low
2	Monsoon	July- October	High
3	Post monsoon	November-February	Moderate to low

Fishing gears available in the Chalan beel

In the present study it was observed that a total of 20 types of fishing gears were found in Chalan beel which were classified into 6 major groups such as- nets, traps, wounding gears, hooks and lines, another 2 methods such as FAD (Fish Aggregating Devices) and others way (Dewatering, Hand fishing) of fishing were also observed (Fig.1). A wide variety of materials ranging from natural fibres, wood and metal to synthetics are used in the construction of different fishing gears.

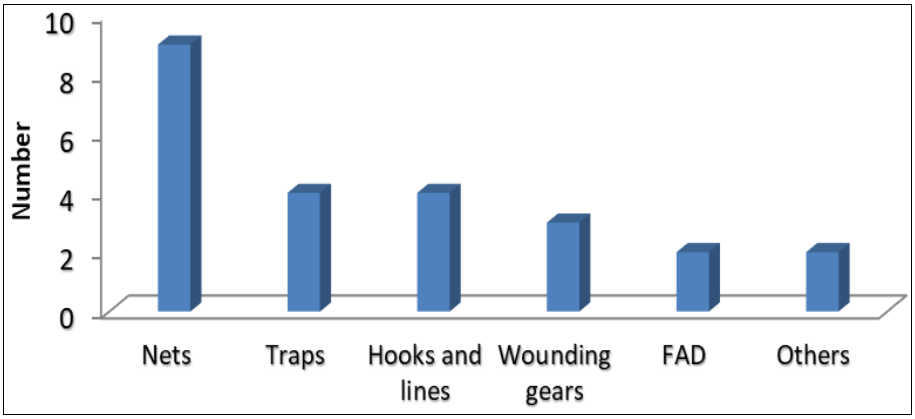

Fig 1: Fishing gears used in Chalan beel area

This observations of the study are more or less similar with the observations of Galib *et al.* (2009) [21] who observed a total of 27 fishing gears and 2 FADs at Chalan Beel. There are 7 types of nets, 2 types of traps, 5 types of hooks and lines and 4 types of wounding gears are recorded in the river Atrai (Hussain, 1999) [13]. So, it was observed that availability of

fishing gears are higher followed by other beels and rivers. In another study, it was observed 7 different types of fishing gears (3 categories such as 1. nets, 2. traps and 3. wounding gears) used by 2 categorized fishers in the Gawha Beel in Nawabganj (Saha *et al*., 2005) [18]. So, availability of fishing gears are higher in Chalan beel than other beels and rivers.

sFishing nets

In the present study 9 types of nets (Ber Jal, Khepla Jal, Puti Jal, Thela Jal, Current Jal, Moi Jal, Veshal Jal, Suti Jal and Dharma Jal) were used in the study area. The most commonly used net were Berjal, Current jal, Khepla jal and Khorajal. 30 types of seine net were reported in our country (Ghosh, 2001) [22]. Nine types of fishing nets were recorded in Chalan beel area (Table-2). In the Chalan beel area among the different nets, maximum length was 363.33±109.70 fit (Ber Jal) and minimum length was 15±5fit (Dharma Jal) (Table-2). Sultana and Islam (2016) [19] found maximum length was 332.20±202.77fit which was recorded for Ber Jal and minimum length 15.00±0.37fit was for Khepla Jal whereas the maximum and minimum breadth were recorded 106.67±15.27 fit and 2.5±0.5 fit for Suti Jal and Punti Jal, respectively (Table-2). Maximum and minimum mesh size recorded 3±0.5 cm in Suti Jal and 0.83±0.52 cm in Thela Jal, respectively (Table-02). Sultana and Islam (2016) [19] found maximum mesh size 2.97±3.58 cm was recorded for Suti Jal and minimum mesh size 0.94±0.42 cm was for Ber Jal. Galib *et al*. (2009) [21] found maximum and minimum mesh size recorded 3.88 ±0.79 cm and 0.30 ±0.32 cm in Chabi Jal and Thela Jal, respectively.

Table 2: Some related information about the different nets used in the study area of the Chalan beel (Average ±SD)

Name of the nets	Measurements (fit)		Mesh size (cm)	Amount/day/gear of fish caught (kg)	Total cost (BDT)
	Length	Breadth			
Berjal	363.33±109.70	50±10	1.16±0.38	20±10	16333.33±5131.60
Kheplajal	28.33±2.88	17.67±2.51	1.25±0.25	1.83±0.76	1833.33±288.67
Puntijal	60±36.05	2.5±0.5	1.41±0.52	1±0.5	366.67±125.83
Thelajal	23.33±2.88	12.33±2.51	0.83±0.52	0.91±0.52	366.67±76.37
Current jal	73.33±25.16	4.5±1.32	1.16±0.28	1.33±1.04	433.33±76.37
Moijal	95±18.02	4.5±2.17	1.5±0.5	1±0.5	583.33±189.29
Veshaljal	25±5	25±5	1.33±0.76	1.83±1.25	4666.67±1527.52
Sutijal	1.83±0.28	106.67±15.27	3±0.5	18.33±12.58	19000±3605.56
Dharma Jal	15±5	15±5	1±0.5	1.83±0.76	1033.33±152.75

Most of the widely used fishing gears such as trawls, purse seines and gillnets make extensive use of netting in the process of capture and for restraining the catch. It was proved that fishing nets were the dominating fishing gear followed by traps and wounding gears and the uses and amount of different types of fishing gears varies with the seasonal variation of water level in the beel. Ber Jal used in the beel and also used in ponds. Lift nets such as triangular Veshal Jal and rectangular Dharma Jal are used in Chalan beel area. Jhaki Jal was also used in chalan beel area which is less destructive to the fisheries. Moi Jal and Thela Jal were also found to be used widely in chalan beel for household consumption. Netting twine is manufactured by one single twisting operation of two or more single netting yarns or monofilaments. Netting yarns can be twisted or braided. The findings were supported by Dutta (1983) [9]. Among different wounding gears, Angta, Koach and Ek-kata were found in Chalan beel during the study. Both small and large fishes were caught by these gears. Different wounding gears are operated in the Chalan beel to catch fish. This finding was agreed with Ahmed (2008) [3] and Hussain (1999) [13].

Fishing traps

Traps are passive fishing gears with enclosures to which the fish are lured or guided and from which escape is made difficult by means of labyrinths or retarding devices like funnels or constrictions. A wide range of traditional fishing gears are grouped here. There are 4 types (Kholsun, Doair, Polo and Vair) of fishing traps observed in Chalan beel. In Chalan beel, maximum length was 2.5±0.5 fit (Kholsun) and minimum was 1.83±0.28fit (Vair) among the available traps used (Table 03). The maximum and minimum breadths were recorded as 1.17±0.37 (Vair) and 0.67±0.28fit (Doair). Maximum and minimum height was 3.11±0.34 fit (Doair) and1.75±0.25 fit (Kholsun), respectively. Highest (1.5±0.86kg) catch fish per day was found in Vair whereas the lowest (0.58±0.38 kg) was recorded in Polo. Vair was especially designed to trap large size fish like boal, shol, Ayre etc. among the available traps used. Main fishing period of different fishing traps are also recorded (Table 03).

In the present study, it was observed that several types of fishing traps used in the Chalan beel such as Kholsun, Vair, Dohair, Polo. More or less similar type of traps was found by Galib *et al*. (2009) [21] at Chalan beel. Among the available traps used in Chalan beel, maximum length 2.5±0.5 fit was recorded for Kholsun and minimum length1.83±0.28fit was for Vair (Table 03). This finding is agreed with Sultana and Islam (2016) [19]. They found maximum length of Kholsun was 2.50±0.43 fit and minimum length was 1.78±0.22 fit (Vair).

Table 3: Some related information about the traps used for fishing in the Chalanbeel.

Name of trap	Measurements (fit)			Mean Total cost (BDT)	Amount /day/gear (kg)	Using season	Major species caught
	Length	Breadth	Height				
Kholsun	2.5±0.5	0.75±0.25	1.75±0.25	316.67±76.37	1±0.5	Aug-Nov	All types of SIS
Doair	1.91±0.38	0.67±0.28	3.11±0.34	333.33±104.08	1.16±0.76	Jul-Oct	Baim,shol,guchi,bele,koi and tara baim
Polo	2.33±0.28	-	-	216.67±76.37	0.58±0.38	Dec-Jan	Shing,magur, rui, taki, punti, guchi
Vair	1.83±0.28	1.17±0.37	2.5±0.5	176.67±25.16	1.5±0.86	Aug-Oct	ayre, kalibaus, koi, Boal, shol

Hooks and lines of fishing

Four types of hooks and lines (Chip borsi, Nolborsi, Daunborsi and Jiala) were identified in Chalan beel area. Mainly Rui, punti, Mrigel, Kalibaus, Bele, Taki, Tengra, Magur and Shol were caught by this gear using baits (Small live fish, bread earthworm, small frog). Fish are enticed by edible or artificial bait or lure which stimulates the appearance and movement at the natural prey and are finally held by the hook concealed in the bait or lure. These gears are neither destructive nor detrimental gear. Rahman *et al.* (1999) [17]; Ahmed *et al.* (2003) [4] and Hussain (1999) [13] also observed these types of findings except slight variations. It can be due to variations of season, area, location and other environmental factors affecting them.

Table 4: Some related information about the hooks and lines fishing

Number of Spears and harpoons	Period of operation	Target Species	Mean Total Cost (BDT)	No. of hooks	Bait used
Chip barshi	July-Dec	Puti, Rui, Kalbaus, Mrigel, Bele, Taki, Shol	30±10	1	Small live fish, bread earthworm, small frog
Nolborshi	July-Nov	Puti, Taki, Shol, Magur, Tengra	16.67±2.88	1	Small live fish, earthworm
Daunbarshi	July-Dec	Shol, Taki, Gazar, Magur, Bele	100±50	10-20	Small indigenous fish, earthworm, small frog
Jiala	Aug-Oct	Shol, Taki, Boal, Gazar	70±26.45	1	Earthworm, frog, cockroach

Wounding gears

Sharp implements such as clamps, tongs, lances, bow and arrow, harpoons and rifles are used for catching fish by wounding, grapping and killing. These types of fishing gears were made up of bamboo, wood shifts with forks or group of iron points. These devices were used in shallow water and surface water. In Chalan beel area 3 types (Koach, Ek kata and Angta) of wounding gears were observed. Anta was found as more common than other wounding gears. The highest length was observed 2.67±1.52 m (Koach) and lowest was 1.67±0.76 m (Ek kata). Baim, kuchia, guchi, tarabaim fishes were caught by angta and boal, ayre, shol, pholi, gazar, chital, rui, catla, mrigel etc. fishes were caught by koach. Khan *et al*. (2005) [15] identified various types of nets and wounding gears used i in the Kaptai Reservoir.

FAD (Fish Aggregating Device)

Bana

Bana is rectangular shaped structure made of thin bamboo splits which placed across the areas with some intermediate space of floodplain to form barrier to the fish movement and thus force them to move through the intermediate empty space. Fishing traps like kholsun, vair etc. were placed these point and trapped the fishes when they try to cross the barrier made by bana.

Katha

In many areas of Chalan beel floodplain, floating aquatic vegetation like water hycinth, water velvet, were confined to a limited area with the help of bamboo frame. This technique was usually practiced where water depth was much deeper. This practice is locally known as ‘katha’. In many cases, external foods were supplied to the Katha. This system supports fishes for their shelter, food etc. and later caught by fishermen when water becomes almost dry or end of flooding season. Small and large all types of fish species are caught from katha which were catla, baim, magur, shing, punti, bele, pabda and taki etc.

Fishing crafts available in the Chalan beel

In the present study 5 types of craft (Jaila nauka, konai dingi, Bhot nauka, Kosha nauka and Vela) were identified in Chalan beel.

Table 5: Some related information about the different crafts of the Chalan beel (Average ±SD).

Name of the boat	Measurements (m)		Number of Person operating	Cost/gear (BDT)	Cost benefit ration	Loading capacity (Mon)	Using gears
	Length	Width					
Kosa	4±1	1.5±0.5	1-6	12333.33±2516.61	1:0.13	25±5	Khepla jal, Puti jal, Current jal
Bhot nauka	5.33±1.52	1.83±028	2-6	15333.33±577.35	1:0.01	6.67±1.52	Berjal, Veshal jal, Suti jal
Jaila nauka	8±3.60	1.16±0.28	5 - 8	17666.67±2516.61	1:06	29.33±10.06	Moi jal, Beshal jal, and Traps
Konai dingi	7.33±2.51	1.5±0.5	1-8	14000±1732.05	1:0.02	12.33±2.51	Khepla jal Konch, Dharma jal
vela	1.5±0.5	1±0.5	1-2	866.67±115.47	1:0.92	1.83±0.288	Kheplajal (Cast net) Dhorma jal (Lift net)

Among all the crafts maximum length 8±3.60m was recorded for Jaila nauka and minimum length 1.5±0.5m was for Vela where the maximum and minimum width was recorded1.83±028m and1±0.5m for Bhot nauka and Vela respectively (Table 5). Maximum and minimum loading capacity was recorded as 29.33±10.06mon in Jaila nauka and1.83±0.288 mon in Vela, respectively. Highest cost was BDT 17666.67±2516.61 in Jaila nauka and lowest cost BDT 866.67±115.47 in Vela. Ahmed (1954) [1] stated that the classification of crafts is impossible because some are employed for more than one types of net used. Ahmed (1977) interpreted about the inland fishing crafts which are absolutely man operated. Craft made of tree trunks (danga) and rafts (made from varies fibrous plants including parts of banana trees). According to Dutta (1980) [8] 13 types of crafts are found in different fishery resource of Bangladesh. Except boat nauka all of the naukas are eco-friendly. Boat nauka are harmful because fuel is used this type of nauka. This fuel creates an oily layer above the water surface which is harmful for the aquatic lives.

The Cost Benefit Ratio (CBR) was found higher (0.92) for the craft vela (Table 05). No previous study was conducted to calculate CBR of any fishing craft. So, it was not possible to compare the present finding with previous one. In Bangladesh, cost and benefit issues are calculated mostly for production oriented researchers, for example carp production status Mohsin *et al.* (2012) [16].

Conclusion

Among the fishing gears in Chalan beel, current jal is harmful for the aquatic biodiversity. Now it is banned by the government but some fishermen use it for fishing purpose secretly. Further, fishing by blocking (Bana) the migration paths of fishes makes narrow. The fishermen caught brood and fry fishes indiscriminately through katha fishing. In Chalan beel area, all of the naukas are eco-friendly except boat nauka due to use of fuel. This fuel creates an oily layer over the water surface which is harmful for the aquatic living animals. Chalan beel is a moderate productive water body with decreasing fish species diversity. Species selectivity of different gears differed considerably. If fish catches in Chalan beel legally and illegally continued without any control, then a valuable resource like Chalan beel would be empty of fish day by day. For that reason, it is very important to find out the harmful gears which are used for fishing. It is the duty of concerned GOs, NGOs and the local people of the Chalan beel area to stop the destructive gears, to control the gear efficiency and to provide alternative livelihood options to the poor fishermen along with other measures.

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