



International Journal of Fisheries and Aquatic Studies

E-ISSN: 2347-5129

P-ISSN: 2394-0506

(ICV-Poland) Impact Value: 5.62

(GIF) Impact Factor: 0.549

IJFAS 2018; 6(4): 399-407

© 2018 IJFAS

www.fisheriesjournal.com

Received: 08-05-2018

Accepted: 09-06-2018

Md. Rasel Mia

Department of Aquaculture,
Sylhet Agricultural University,
Sylhet, Bangladesh

Abu Saleh Md. Arif

Department of Aquaculture,
Sylhet Agricultural University,
Sylhet, Bangladesh

Poly Rani Das

Department of Aquaculture,
Sylhet Agricultural University,
Sylhet, Bangladesh

Rafiul Islam

Fisheries Biology and Genetics,
Bangladesh Agricultural
University, Mymensingh,
Bangladesh

Md. Alal Hossen

Department of Fish Biology and
Genetics, Sylhet Agricultural
University, Sylhet, Bangladesh

Correspondence

Md. Rasel Mia

Department of Aquaculture,
Sylhet Agricultural University,
Sylhet, Bangladesh

Fishing gears and crafts of the Surma River in Sylhet district, Bangladesh

Md. Rasel Mia, Abu Saleh Md Arif, Poly Rani Das, Rafiul Islam and Md. Alal Hossen

Abstract

The present study was conducted to identify the types of fishing gears, crafts and their mode of operation in the Surma River of Sylhet district for a period of six months from March 2017 to August 2017. Questionnaire Interview (QI) and Key Informant Interview (KII), Direct Catch Assessment Survey (CAS) and Focus Group Discussions (FGDs) were conducted to gather information about fishing gears and crafts. The survey was designed to know the main habitat type, people need for operation, length, width, volume, diameter, mesh size, durability of gears, construction cost, target species, period of operation. A total of 16 different types of fishing gears were identified. All fishing nets were categorized into 6 grouped based on their mode of operation or action and catching of fish viz., lift net, dip net, gill net, seine net, cast net, and push net. Among them 7(seven) lift net, 1(one) dip net, 2(two) gill net, 2 (two) sine net, 1(one) push net , 1(one) cast net and 1(one) type of hook and 1(one) type of line was recognized. Two (2) types of fishing crafts were documented from the present study viz. Dinghi nouka and Trawler. Among these gears some were selective for a particular species like Chelapata jal, Boaler jal etc., whereas others account for a number of species caught during operation giving multispecies nature of the fishing. On the other hand, a number of the fishing gears such as Ber jal, Fash jal, and Current jal were found to catch fish irrespective of their size or species and destroys the habitat of the wild species thus causing multiple harms to the fisheries resources of the Surma River. Public awareness and training program should be conducted to the fishermen for sustainable exploitation of fishery resources of Surma River.

Keywords: Fishing gear, fishing net, gill net, fishing craft, Surma River

1. Introduction

Fish and fisheries items have been providing food or animal protein for millions of poor people in Bangladesh^[3]. The Surma River is one of the most important river in Bangladesh. It is located in Sylhet Division and a part of the Surma- Meghna River system. Surma River rises as the Barak from Northeast^[7]. This river system support large amount or diverse group of fishes. They play an important part in the water cycle, acting as drainage channels for surface water. Bangladesh was the fifth in world aquaculture production, which accounted for half of the country's total fish production (55.15%)^[12]. The fisheries sector plays a very important role in the national economy, contributing 3.69% to the Gross Domestic Product (GDP) of the country and 22.60% to the agricultural GDP^[14]. Fish only supply about 60% of animal protein. About 1.4 million people are directly employed by the fisheries sector. On the other hand, about 11 million people indirectly earn their livelihood out of activities related to fisheries sector^[5]. A fishery is the business or industry of catching fish or tapping other marine or freshwater resources. Fishing gear is any form of equipment, implement, tool or mechanical device used to catch, collect or harvest fish^[6]. The principal categories of fishing gears that are traditionally used in Bangladesh can be enumerated as the following: fishing nets, fishing traps, hooks and lines, wounding gears and fish aggregation device^[9]. Various types of materials are used to make these fishing gears include netting, twine, plastic structural and fasteners, clips and swivels, ropes, steel wire ropes, combination wire ropes, purse rings, polyester, polyethylene, nylon, cotton, polypropylene, mixed fibers, floats and sinkers, bamboo, wood etc.^[16]. The shape and size of the gear depends on the use of gears and the environmental condition of the water body^[25]. The description, mode of operation and classification of fishing gears and crafts of the Surma River is very scanty. So this information

is very much essential for developing a sound management practice for the commercial fishery in the Surma River. This is why the study was conducted to know the different types of gears and crafts in the Surma River with their detailed information. Considering the above circumstances, the present study was carried out. The objectives of the study was to identify the different types of fishing gears, crafts and their mode of operation with detailed description.

2. Materials and Methods

2.1 Description of the study area

Sylhet Sadar is an Upazila of Sylhet District in the Division of Sylhet, Bangladesh. Sylhet Sadar is located in between 24°52' and 25°02' north latitudes and in between 91°01'and 91°40' east longitudes. Sylhet Sadar Upazila area 323.17 sq. km. The city of Sylhet is located within central of Sylhet Sadar. It is bounded by Companiganj, Gowainghat and Jaintiapur Upazilas on the north, Dakshin Surma Upazila on the south, Jaintiapur and Golapganj upazilas on the east, Chhatak and Bishwanath Upazilas on the west.

2.2 Period of the Study

The study was conducted for a period of 6 (six) months from March to August, 2017. The study was conducted based on both primary and secondary data.

2.3 Data Collection

The primary data were collected from fishermen, direct observation of fishing gears at the time of operation and from the local fishing gear market. Data about gear size, mesh size, mode of operation, period of operation, building materials, fish species caught, etc. were collected by Questionnaire interviews and personal communication from the River area. Cross-check interviews were conducted with key informants such as Upazila Fisheries Officer (UFO), District Fisheries Officers (DFO) and other fishing related person which helps to solve the contradictory of data or information. Focus Group Discussion (FGD) was conducted to get summary of issues such as fishing gear, fishing crafts.

2.4 Data Processing

At first the raw data is bring together and then gathered in a master sheet. The collected data were tested to eliminate all possible errors and contradictions, coded, summarized and processed for analysis. For data processing purpose MS Word and MS Excel was used.

2.5 Statistical Analysis

During the survey, the length, width, height and mesh size of the net was collected by meter scale and hand measurement. At first, fishermen buys net from market then make the gear of their own desire shape and size. As a result the size of the gears is different from one another. Average value was taken for various value of nets. Then the value was calculated by the following equations.

Volume/ area of rectangle shape net=Length (m) x Width (m)..... (1)

Area of square shape net=a² (Length=width=a) (2)

Volume of cone shape net=1/3xπr² (3)

Where, r=radius, π=3.1416

Volume of cylinder shape net=πr²h (4)

Where, h =height

Circumference=2πr (5)

Diameter=Radius/2 (6)

3. Results and Discussion

3.1 Fishing Gears

A total of 16 different types of fishing gears were identified from this present study. All fishing nets were categorized into 6 grouped based on their mode of operation or action and catching of fish viz., lift net, dip net, gill net, seine net, cast net, and push net (Table 1). Among them 7(seven) lift net, 1(one) dip net, 2(two) gill net,2(two) sine net, 1(one) push net , 1(one) cast net and 1(one) type of hook and 1(one) type of line was recognized. Sultana *et al.*,^[26] reported a total 18 types of fishing gears from Payra River which have been categorized under nine major groups described as Gill nets (5), Seine net (1), Fixed purse net(2) , Lift nets(1), Push net(2), Cast net(1) , traps (2), Hook and line (2) and wounding gears (2). Rahman *et al.*,^[22] found a total of 17 different types of fishing gears under 8 major groups such as gill nets (6), seine net (1), fixed purse nets (2), cast nets (1), trawl net (1), lift nets (3), push nets (2) and hook and line (1) from Santahar, Bogra. Hasan *et al.*,^[17] recorded a total 15 types of gears among them 11 types of fish net, 2 types of fish trap and 2 types of hook line are identified with their characteristics during the study period from the Meghna River. Rubel *et al.*,^[24] found a total of 8 types of nets and 2 types of traps from Lohalia river of Bangladesh. Siddique *et al.*,^[25] studied a total, 5 gill, 2 seine, 1 fixed purse, 1 cast, 1 dip, 1 lift and 2 drag nets, 6 traps, 7 hooks and lines and 3 wounding gears from the Meghna River Estuary of Chandpur Region, Bangladesh. Flowra *et al.*,^[13] total of 16 types of fishing gears were observed to harvest fish in the Baral River, Natore, Bangladesh. Galib *et al.*,^[15] recorded a total of 27 fishing gears from Chalan Beel. Fishing gears were categorized as nets (12), traps (5), hooks and lines (6) and wounding gears (4). Azadi and Arshad-Ul-Alam^[4] recorded a total of 28 types of fishing gears belonging to 13 categories in the Halda River. Jewel^[19] identified 6 types of net, 4 types of traps and 1 type of wounding gear in Padma River adjacent to Boalia Thana under the district of Rajshahi, Bangladesh. Ahmed^[1] found a total of 35 different kinds of fishing gears from Titas Floodplain in Brahmanbaria, Bangladesh and these were categorized into 7 types. Rahman *et al.*,^[23] recorded a total of 23 types of the fishing gear from BSKB beel, Khulna, Bangladesh of which 7, 8, 4 and 4 are nets, traps, hooks and lines, and hand harpoon respectively. Chakraborty *et al.*,^[9] described the structural designs of various fishing gears used in inland water of Bangladesh which have been classified into 9 major categories. These are (1) Draggged nets, (2) Seine net, (3) Bag nets or scoop nets, (4) Falling gear, (5) Lift nets or dip nets, (6) Drift or gill nets, (7) Hook for line fishing, (8) Wounding gear, and (9) Fish traps. Chong^[10] studied the fishing gears in Chandpur, Muhuri, Halda and Ichamati project area and recorded 21 different types of gears within the area. BCAS^[8] recorded 13 types of fishing gears used in 4 beels of Netrokona and Sunamganj districts. The findings of above researchers are very much similar or less similar to the findings of the present study.

Table 1: List of different types of nets used in the Surma River

Category	Types of gears	Name of gears	Main habitat type	People Operate	Length (m)	width (m)	Volume	Dm	Mesh size (mm)	Durability of gears (Years)	Construction Cost (BDT)	Target species	Period
Fish nets	Lift net	Afa/Molli jal	R	2	8.23	6.86	56.43	—	50.8-254	5-10	1500-3000	Boal, Khalibaus, Ilish, Gania, Mirka, Ayre, Bighead, Carpio	April-Nov.
		Basta/ Dora jal	R	3	6.86	4.57	112.57	4.57	12.7	4-7	10,000-15,000	Bele, Baim, Punt, Tengra	Nov-April
		Jimti Jal		1-2	5.47	5.47	58.39	—	5-10	1-2	10,00-2500	SIS	March-Nov
		Chitka / chit jal /Dharma jal	RC	1	4.57	4.57	20.90	—	12.7-101.6	3-8	3,500-5000	Boal, Khalibaus, Gania, Mirka and SIS	June-Sept.
		Golfa Jal	R	1	91.44-274.32	5.47	1002.2	—	25.4-101.5	5-7	5,000-8,000	Ayre/Aor, Rita, Baghair, Khalibaus, Gagla	Nov-April
		Jam jal	R	8	45.72	45.72	2090.32	—	25.4-101.6	4-8	15,000-20,000	Punti, Tengra, Baim, Pabda, Gagla, Ayre,	Nov-April
		Goaler/ boaler jal	R	1	4.572	3.6576	16.7	—	50.8-101.6	2-5	1,000-2,000	Boal, Sarpunti, Khalibaus, Ilish, Gania	March-April
	Dip net	Bal/Khora Jal	RC	1	14.63	14.63	214.05	—	6.35-12.7	5-7	6,000-10,000	Tengra,Punti,Kakila, Gutum,Icha,Rita, Boal, Pabda, Kalibaus, Lasu, Chapila, Chela, Rani Chingri	May-Sept.
	Gill net	Current Jal/ Moka/ Fash jal	RBHBaC	1	27.43	0.92	25.08	—	6.35-12.7	1-2	1,000-15000	Chela, Chapila, Mola, Punt, Tengra	Throughout the year
		Rock /sotar/ Faia jal/ Chelapata jal	RBHBa	1	137.16-274.32	1.37	282.2	—	50.8-254	5-8	6,000-10G,000	Tengra, Punt, Baim, Poa, Gagla, Ayre, Kalibaus	Nov-April
	Seine net	Ber jal	RBHPBa	≥ 6	200-250	10-15	2000-3750	—	0-0.25	5-6	80,000-150,000	All	October-March
		Uttar Jal	R	2	7.11	9.144	1625.26	10.92	25.4-38.1	3-7	15,000-20,000	Tengra, Punt, Baim, Kalibaus, Mirka, Boal,	April - May
	Cast net	Jhaki jal	RP	1	6.86	4.57	860.59	10.78	≤12.7	5-10	2,500-5,000	Tengra,Chingri, Icha,Koi, Poa, Bata, Baim, Bele, Punt, Gutum,Mola, Bacha, Khalisa,Chapila,Chela, Taki, Shing, Darkina, Catla, Sarpunt, Dela	Throughout the year
Push net	Ponar jal/Thela Jal	RBH	1	1.83	1.37	2.51	—	0.00	3-5	250-400	Tengra, Koi, Icha, chingri, Punt, Taki, Kachki, Guchi baim, Meni, Chanda, Mola, Dela,	Throughout the year	

R=river; B=beel; H=haor; P=pond; Ba=baor; C=canal; Dm= diameter.



Fig 1: Afa Jal/ Molli Jal;



Fig 6: Gimti Jal



Fig 2: Basta/ Dora jal



Fig 7: Golfajal



Fig 3: Ber Jal



Fig 8: Fash Jal



Fig 4: Boaler Jal



Fig 9: Jhaki jal



Fig 5: Dharma Jal



Fig 10: Khora jal



Fig 11: Rock Jal/Chelapata Jal



Fig 12: Thela Jal



Fig 13: Uttar Jal



Fig 14: Barshi



Fig 15: Tana kachi Barshi.

3.1.1 Cast Net

Jhaki jal

The net is conical in shape with variable size. This net is locally known as Jhaki jal, Kheo jal, Ural jal in Sylhet region (Fig. 9). The length and width of the net is 6.858 and 4.572m (Table 1). The mesh size of the net is ≤ 12.7 mm. One person can operate this net as the weight of the net is 3 to 8 kg and the construction cost is 2,500 to 5,000 BDT. The net can be operated in tide, ebb-tide and in the freshwater also at both day and night. A long tail like rope about 5 to 10 m long attached to the apex of the conical shape net. The longer edge of the net bear pockets and iron weight. Iron weight connected with the edge of the net as ring like structure. This iron weight support the net to allow quickly reaches the bottom and settle down in circular form. After sometime when the net is lifted by the help of rope it comes out in conical form. This nets are mainly used to catch SIS species but all types of fish are caught by this gear. The net is found in all over the Bangladesh, known as 'Khapla' in Dhaka, Mymensingh, Rajshahi, Jessor, Bogra, Pabna, Rangpur and Dinajpur, 'Jhanki' in Rangpur, 'Chlatki' in Chitagong, 'Dhundi and Kheo' in Sylhet, 'Teora' in Jessor and 'Pheka' in Dinajpur [2].

3.1.2 Push Net

Thela Jal

The net is triangular in shape. It is also locally known as Thela jal, Ponar Jal. This net is made by bamboo pole (Fig. 12). Normally three pieces of bamboo poles is needed to make this net. One of the bamboo poles is longer than other that facilitates the operation of net and act as handle. The net look like as conical shape when it is tied with the frame. One person can operate this net. Mainly it is operated in shallow water area of the water body. During the operation of this net the operator walking in shallow water area and pushing the net along the shore. Construction cost is 250 to 400 BDT. All types of fish are caught by this gear but mainly used for caught the SIS. In this study, the fish species caught by the net are Tengra, Koi, Icha, Chingri, Punt, Taki, Kachki, Guchi baim, Meni, Chanda, Mola and Dela (Table 1).

3.1.3 Dip Net

Khora jal

The net is triangular in shape. It is locally known as Khora jal, Bal jal. This gear is divided into two parts. One part is bamboo frame and another one is net part. When the two bamboo poles connected with other it appear as V shaped and the net is attached to the bamboo frame (Fig. 10). The net is 14.63 m long and 14.63 m width. The mesh size of the net is 6.35 to 12.7mm. The triangular portion of the net is lowered to the shallow water areas, the lower portion of the net block total passes way of fish and the fishes are trapped. All caught fish are kept in boat that is attached to a bamboo poles by a rope. The net is made by polyamide monofilaments, polypropylene or nylon rope but in traditional practice the net is made up of mosquito net available in the market. The construction cost of the net is 6000 to 10000 BDT (Table 1). All small size fish are caught by the net but the main species are Tengra, Punt, Kakila, Gutum, Icha, Rita, Boal, Pabda, Kalibaus, Lasu, Chapila, Chela, Rani and Chingri. The net is operated by one person and generally used in May to September.

3.1.4 Seine Net

Ber Jal

The net is known as seine net. It is locally known as Ber jal. It is rectangular in shape. It is large in size, usually 200 to 250 m (Fig. 3). The width of the net is 10 to 15 m. The mesh size of the net varies from 0 to 2.5 mm (Table 1). According to the size of the water body the length, width and mesh size of the net differs. Floats are attached to the upper or head portion rope of the net and weight on the lower or ground portion of the rope. The ground rope and the head rope are made of synthetic nylon fiber. After surrounding the part of a water body with this net, the two ends of the net are drawn together and the ground rope is hauled up from the center of the water body to catch the fish. The net is used in water body where the water flow is minimal. Generally Dingi nauka are used to operate this net. More than 6 person are needed to operate the net. Whereas the mesh size of the net is very fine, so it catches almost all sizes of fishes. Therefore it is great concern due to catches of early age of fish like as fry, fingerling, juvenile and totally damage the natural production of the river. Also, there is a great chance of abolishing the rare species due to bulk catches. Therefore, this gear has great negative effect on the fish diversity of the Surma river and also responsible for destruction of indigenous fish species from the Surma river. So, the use of this gear must be banned in the river in spawning season.

Uttar Jal

The net is conical in shape. This net is locally known as "Uttar jal". The length and width of the net is 7.11m and 9.144. The mesh size of the net is 25-38mm (Fig. 13). This net is operated from a boat then is allowed to spread in water and also hauled on the same boat. Generally two person can operate this net. The longer edge of the net bear many pockets and sinkers attached to them. The length of the pockets varies from 1-1.5 m (Table 1). Construction cost is 15,000 to 20,000 BDT. All types of fish are caught by this gear. The net is usually used in April to May.

3.1.5 Current Jal /Gill Net

Fash Jal

Fash Jal is a rectangular shaped monofilament gill net. It is known as Gill net. It is locally known as Current jal, Fash jal, Moka jal in the study area. The length of the net is 27.432 to 091.44 m and the width is 25.08 m. The mesh size of the net is 6.35 to 12.7mm (Table 1). Floats are used at the head portion or line of the net, whereas ground or lower line is provided with earthen weights (Fig. 8). This net is operating in a relatively low current and standing water area of the Surma River. The net is fixed in the water with two bamboo poles. Generally it is set on the river side or in shallow water of the river. Generally it is set in the evening and lifted in the morning or set in the morning and lifted in the evening. One man can operate the net from the Dingi nauka. Fash jal is used by fisherman to catches the Cat fishes, carp fishes and other fishes (SIS) because of its different mesh size. Different mesh size net is used in the Surma River depending on the water level. This net is considered as destructive fishing gear because it catches all type of fishes. The use of Fash jal in Surma River is banned by the government authority but some fisherman used it adversely. This net generally used in river throughout the year. The construction cost of the net is 1000 to 15,000 BDT.

Rock Jal/Chelapata Jal

It is a long rectangular shaped mono filament synthetic nylon fiber. It is known as Gill Net. Locally it is called Rock Jal, Chelapata Jal. The length of the net varies from 137.16 to 274.32m and width of the net is 1.37 to 1.5m (Table 1). Mesh size of the net is 50.8 to 254 mm. During the operation of this net, at first a bamboo poles is fixed in the ground of the river. One side of the net is tied with the poles, another end of the net is joint with the large foam, Cork sheet, or plastic bottle which indicates another part of net and also allow the net to drift the desired water level. The net is drive from a boat. In this net, floats (Sponge, Cock Sheet and Foam) are used in the upper line of the net and sinkers (Lead or Sisa) connected with the lower line of the net (Fig. 11). The net is checked about 2 to 3 times in a day because it is fixed in a bamboo poles. One person is needed to operate this net. Fish species caught by this gear are Tengra, Punt, Baim, Poa, Gagla, Ayre, Kalibus, Illish, and Chela. The construction cost of the net is 6,000 to 10,000. The net is used from November to April in the study area.

3.1.6 Lift Net

Afa Jal/ Molli Jal

The net is known as Lift net. It is locally known as Afa jal, Molli jal. Local fisherman called its various name such as cairon (mesh size 4 inch), pasoon (mesh size 5 inch), chairon (mesh size 6 inch) jal due to their different mesh size. The shape of the net is Square. The length and width of the net is respectively 8.2296, 6.858. Mesh size of the net is ranges between 50.8-254 mm (Table 1). The net is consists of two bamboo poles and net (Fig. 1). The net is made by nylon and Japanese cord sota. Between two bamboo poles, one is longer than other one. The extended handle of the bamboo poles help the fisherman to operate or drifting the net and hauled the net easily. This net mainly operated from a boat. The net is operated by two persons. During the operation, one person drift the net favors the current of the river and another person smoothly operates the boat. The net is raised or hauled by the fisherman 5 to 10 minutes later. Main fish species caught by these types of gear are Boal, Khalibus, Illish, Gonia. Mirka or Mrigal, Ayre or Gagot, Bighead, Carpio. Generally the net is used from April to November. The construction cost of the net is 1500 to 3,000 BDT.

Boaler Jal

The net is known as Lift net. It is locally known as Goaler jal, Boaler Jal. It is a square shaped net made by nylon or Japanese cord sota. The length of the net is 4.572 m and the width is 3.6576 m (Table 1). The mesh size of the net is 50.8 to 101.6mm. The net of this gear joined with two bamboo poles like Afa jal (Fig. 4). These types of gear mainly used in the river mouth where it is connected with the canal. The net is used in March to April due to heavy rainfall. Heavy water flow comes to the river at this time. The net is mainly used to catch Boal fish but other fish species caught by this gear such as Boal, Sarpunti, Khalibus, Illish, Gonia during the study period. One person can operate this net. The net is raised or hauled by the fisherman 2 to 3 minutes later. About 1000 to 2,000 BDT in needed to manufacture this gear.

Dharma Jal

Dharma jal is a square shape net. This net is locally known as Dharma Jal, Sit jal, Sitka jal in sylhet region. It is attached to two bamboo strips arranged in cross-bars and the four corners

of the net is connected with two bamboo strips (Fig. 5). The arranged crossbars of the net are then connected with another lever bamboo poles for lifting the net from of the water. A rope is attached to lever bamboo poles that is used to facilitate the operation of the net. The mesh size of the net is 12.7-101.6mm. The length and width of the net is 4.572 and 4.572. Generally the net is used in the rainy season and the construction cost is 3,500 to 5,000 BDT (Table 1). It is operated in shallow water area of river in low current. One person can operate this net. Different type of fish species are caught by this net due to their different mesh size. The fish species caught by the net are Tengra, Gulsha Tengra, Chingri, Icha, Koi, Bele, Punt, Gutum, Mola, Bacha, Khalisa, Chapila, Chela, Taki, Shing, Darkina, Dhela, Boal, Bata, Catla, Khalibus, Gannia, Mirka etc. The net is also used in Potuakhali, Barishal, Comilla, Dhaka, Khulna and Chittagong district of Bangladesh^[11].

Gimti Jal

Gimti Jal is a triangular shaped net. The net is known as Lift net. Two bamboo poles and plastic made net is needed to construct this net (Fig. 6). Between two bamboo poles, one is longer than other one. The extended handle of the bamboo poles help the fisherman to operate or drifting the net and hauled the net easily. The length of the net is 5.47 m and the width of the net is 5.47 m. Mesh size of the net is 5 to 10 mm (Table 1). Gimti Jal is operated from the side of the river. At first the net is keep against the current then drive the net to favor the current of the river. The net is hauled 2 to 3 minutes later and one person can operate this net. It is mainly used to catch the SIS species but sometime fry of large fishes are caught. Generally the net is used from March to November. Construction cost of this net is ranges from 800 to 1,500 BDT.

Golfa Jal

Golfa is a rectangular shaped net. It is made by parasut sota (Fig. 7). The length of the net is 91.44 to 274.32m. The width of the net is 5.47m (Table 1). Mesh size of the net is differs from 25.4-101.5mm. The operation procedure of this net is similar to Rock Jal or Chelapata Jal. But it has some different. It has floats but no sinker is connected with the lower portion of the net. Instead of sinker, a thick Jute Yarn is joint to the lower portion of the net. It has no destructive effect considered to Rock Jal or Chelapata Jal. The net is mainly used to catch the Ayre/Aor, Rita, Baghair, Khalibus, Gagla fish. Construction cost of the net is 5,000 to 8,000 BDT. The net is used from November to April in the study area.

Basta/ Dora jal

Basta or Dora Jal is a slender shaped net. It is called Basta jal because their shape is similar to basta (Fig. 2). The length of the net is 6.858 m. The width of the net is 4.572 m. Mesh size of the net is 12.7 mm and diameter of the net is 4.572 m (Table 1). Three person is needed to operate this net and middle man spread the net into the water favor to current of the river, rest of the person catch the thick rope of the net which is connected with the net. A Jute Yarn roundly joint with the mouth of the net. Floats and sinkers are attached to the net. This net is only used in river. Main species caught by this gear are Bele, Baim, Punt, Tengra. Construction cost of the net is 10,000 to 15,000 BDT and it is used during November to April.

Jam Jal

Jam jal is a square shaped net made by nylon and cord. The length and width of the net is 45.72 and 45.72 respectively. Mesh size of the net is varies from 25.4 to 101.6mm (Table 1). During the operation of the net eight persons and four boats is needed. Four thick ropes connected with the four end of the net and four heavy rocks in the lower portion of the net. At first four boat congregate and drive the net with one accord. The net is raised or hauled by the fisherman 15 to 20 minutes later. This net is only used in river. It is used to catch Punt, Tengra, Baim, Pabda, Gagla, Ayre. Construction cost of the net is 15,000 to 20,000 BDT. The net is commonly used in November to April.

4. Hook and Line

Hook and Line is one of the most common and useful fishing gear all over the world. It has a recreational and commercial importance. Hooks and lines is largely used in Surma River. Hook and line fishing has many distinctions in terms of design, manufacture and techniques of operation. Every region has its specific method of application but depends generally on the behavior and habitat of the target species. Current fish hooks come in a diversity of sizes, shapes, and materials. There are two main types of hooks: J-hooks and circle hooks. J-hooks are constructed with the point of the hook parallel to the shank of the hook creating a J-shape. Circle hooks are manufactured with the point of the hook turned perpendicularly to the shank forming a circular shape. Traditionally J-hooks have been used in most fisheries. In this study only J-shape hooks are found. Earthworm and fish flesh are mainly used in hook and line as bait. Mainly two types of hooks and lines were found in the study area.

Table 2: List of different types of hook and line used in the Surma River

Category	Types of gear	Name of gear	Main habitat type	People Operate	Length (m)	width (m)	Mesh size (mm)	Durability of gears (Years)	Construction Cost (BDT)	Target species	Period
Hook and line		Borshi	RBHPBaC	1	1.372-13.72		—	1-2	50-150	Baim, Punt, Tengra, Buguri Tengra, Gulsa Tengra	Throughout the year
		Tana kachi Borshi	R	1-2	40-200 m long line	1-1.5 (Length of Borshi rope)	—	2-4	3,000-4,000	Baim, Boal, Rita, Gagla, Baghair, Bacha, Laria or Gaura	June-Oct.

R=river; B=beel; H=haor; P=pond; Ba=baor; C=canal

Barshi

Barshi is one of the most common fishing gear in our country. It is locally known as Hat barshi, Sip barshi. Barshi is a very simple barbed hook tied with one end of a line and the other end with a bamboo stick (Fig. 14). A piece of bearable porous substances (sponge, foam, shola) is attached to the rope which

allows the hook to drift desired water level. Its acts as a float. It also indicates that if the fish is baited or not. One person can operate this gear. One person can operate several barshi at a time. During operation, a person take a seat on the embankment or a boat and set the sip in water throwing the baited hook with the sinker. Earthworm, Ant egg, Flour and

fish flesh is used as bait in this barshi. It is operated by the people throughout the year. Main fish species caught by this type of gear are Boro Baim, Tara baim, Punti, Tengra, Buguri Tengra, Gulsa Tengra (Table 1).

Tana kachi Barshi

Tana kachi Barshi is a 40 to 200 m long line baited hook. It contains 300 to 400 hundred baited hooks. The length of the hook rope is 1 to 1.5 meter (Fig. 15). This types of gear mainly operated in an area of river where 30 to 50 m water depth. Floats are not attached to the long line but rock or concrete connected with the long line at 10 hooks interval. It is usually used to catch bottom water fish. It is capable to running in current water area of river. Earthworm is used as

bait in this barshi One end of the line is tied with a fixed pole on the ground of the riverbank and heavy rock is attached another end of the line. Main fish species caught by this type of gear are Boro Baim, Boal, Rita, Gagla, Baghair, Bacha, Laria or Gaura fish (Table 2). This gear generally used in June to October in the study area.

5. Fishing crafts

Fisherman use different types of fishing craft having different length, width, height, shape and size in the Surma River. Traditionally woods and bamboos were used in boat making which found locally. In the study area two types of fishing crafts were used for fishing in the Surma River viz. Dinghi nouka and Trawler.

Table 3: Different types of crafts used for fishing in the Surma River.

Name of Crafts	Length (m)	Width (m)	Height (m)	Construction cost(BDT)	Bottom shape	Boat type	Person need to operate	Fishing time	Duration (year)
Dinghi	5-10	2-2.5	1-2	50000-80000	Flat	NM	2-5	Year round	3-8
Trawler	6-10	2.5-4	2-3	150000-250000	Flat/Rounded	M	5-7	Nov-Feb	4-10

M=Mechanized; NM=Non-mechanized

Dinghi Nouka

Traditionally, wood is mainly used to make the Dinghi nouka. These boats are made by local carpenters. It is a non-mechanized boat. The length and width of the Dinghi nouka is varying. It is 5 to 10 m in length, 2 to 2.5 m in width (Table 3). The bottom of this boat is flat. The posterior and the anterior part of the boat are high above the water level which capable the boat to move efficiently. The deck of this boat is usually covered by bamboo poles. Fisherman normally keep their fish below the deck for retain alive condition. The construction cost of this boat is 50000-80000 BDT TK.

Trawler

Trawler is a one kind of mechanized boat. The length, width and height of this boat are 6-10m, 2.5-4 and 2-3m respectively (Table 3). The shape of bottom is either flat or rounded. This type of boat mainly operated by 5-7 person. It is used for effective fishing by long time and long distance fishing. It is operated when fish is available in the Surma River. The construction cost of this boat is 100000-250000 BDT.

6. Conclusion

Surma River is rich with valuable fisheries resources. Its carry vast water and nutrients to areas all around the earth. As a result, different types of fishing gears and crafts are used to conduct fishing activities in the Surma River. During field survey, the respondents said that the pollution, Siltation, use of destructive fishing gears, dumping of waste materials, Inadequate depth of river, use of fish killing poison, fishing during breeding season, Drought in summer etc. are responsible for loss of fisheries resources within the Surma River. In this study, a total of 16 different types of fishing gears were recorded which has been categorized into 6 grouped viz., lift net, dip net, gill net, seine net, cast net, and push net. Among them 14 fishing nets, 2 hook and line and 2 types of fishing crafts were documented. Regarding to the information gathered so far in this study, it may be concluded that to maintain the sustainable fisheries resources of the Surma River embankment erosion control, stop of indiscriminant gears used and proper management policy for the Surma River is necessary. So, an awareness or training program should be conducted to the fishermen to create

awareness of the long-term effects of different fishing gears and to impart knowledge of fishing laws under the supervision of the government as well as non-government organizations.

7. Acknowledgements

Authors would like express their sincere thanks to the Upazilla Fisheries Officer and the fishermen in the Surma River for providing valuable information to accomplish this paper successfully.

8. References

- Ahmed MS. Assessment of Fishing Practices on the Exploitation of the Titas Floodplain in Brahmanbaria, Bangladesh. Turkish Journal of Fisheries and Aquatic Sciences. 2008; 8:329-334.
- Ahmed N. Government of East Pakistan Directories of Fisheries: Fishing Gear of East Pakistan. East Pakistan Fishery Department, East Pakistan, 1971.
- Akter H, Islam MR, Hossain MB. Fecundity and Gonadosomatic Index (GSI) of *Corsula*, *Rhinomugil corsula* Hamilton, 1822 (Family: Mugilidae) from the Lower Meghna River Estuary, Bangladesh. Global Veterinaria. 2012; 9(2):129-132.
- Azadi MA, Arshad-Ul-Alam M. Fishing Gears of the Halda River, Chittagong, Bangladesh, Book of Abstract, 3rd Fisheries Conference and Research Fair 2008 16-17 January 2008, Bangladesh Fisheries Research Forum (BFRF), River, Chittagong, Bangladesh, 2008, 89.
- Banglapedia. Fisheries, National Encyclopedia of Bangladesh. Asiatic Society of Bangladesh, Dhaka, Bangladesh, 2005.
- Banglapedia. Fishing Gear, National Encyclopedia of Bangladesh. Asiatic Society of Bangladesh, Dhaka, Bangladesh, 2006.
- Banglapedia. National Encyclopedia of Bangladesh. Asiatic Society of Bangladesh, Dhaka, Bangladesh, 2015. [http://en.banglapedia.org/index.php/title=Surma River](http://en.banglapedia.org/index.php/title=Surma%20River).
- BCAS (Bangladesh Center for Advanced Studies). Final report, ENIMOF project, Department of Fisheries, Ministry of Fisheries and Livestock, Govt. of Bangladesh, 1989, 228.

9. Chakraborty SC, Hossain MA, Hoq ME. Traditional Inland Fishing Methods in Bangladesh, J Asiat. Soc. Bangladesh Sci. 1995; 21(1):19-27.
10. Chong KC. An economic appraisal of the fisheries in the Chandpur, Muhuri, Halda and Ichamatic Project areas. Irrigation Fishery Development Project. Working Document No. 13, Directorate of Fisheries, Bangladesh and Snell Environmental Group, Inc., U.S.A, 1978.
11. Das B, Banerjee A. Matshya sangrah projukti (Fish Harvesting Technology), Bangla Academy, Dhaka 1000, Bangladesh. 2000, II.
12. DoF. National fish week, compendium (In Bengali). Dhaka: Department of Fisheries, Ministry of Fisheries and Livestock, Government of Bangladesh, 2016.
13. Flowra FA, Islam MA, Jahan SN, Samad MA, Alam MM. Status and Decline Causes of Fishing Activities of the Baral River, Natore, Bangladesh. J Sci. Foundation. 2011; 9(1, 2):115-124.
14. FRSS. Fisheries resources survey system (FRSS), fisheries statistical report of Bangladesh: Department of Fisheries. 2016; 32:1e57.
15. Galib SM, Samad MA, Kamal MM, Haque MA, Hasan MM. A Study on Fishing Gear and Methods in the Chalan Beel of North-West Bangladesh. Journal of Environmental Science & Natural Resources. 2009; 2(2):213-218.
16. Hameed MS, Boophendranath MR. Modern Fishing Gear Technology. Das Publishing House, Delhi, 2000, 3.
17. Hasan SJ, Haidar MJ, Rahman MA, Bosu A, Mahmud Y. Fishing Gears in Meghna River: Threatening or Sustainable for Fisheries. International Journal of Business, Social and Scientific Research. 2016; 4(4):303-306.
18. Islam MR, Sultana N, Hossain MB, Mondal S. Estimation of Fecundity and Gonadosomatic Index (GSI) of Gangetic Whiting, *Sillaginopsis panijus* (Hamilton, 1822) from the Meghna River Estuary, Bangladesh. World Appl. Sci. J. 2012; 17(10):1253-1260.
19. Jewel MAS. Study on Fishing Gears and Socioeconomic Conditions of Fishermen of the Padma River, Abstracts, 2nd Fisheries Conference and Research Fair 2006, Bangladesh Fisheries Forum (BFRF), 18-19 January Dhaka, Bangladesh, 2006, 61.
20. Mia MR. Fish Diversity and Gear Efficiency of the Surma River at Sadar Upazila Under Sylhet District, MS thesis, Department of Aquaculture, Sylhet Agricultural University, Sylhet-3100, 2017.
21. Rahman MM, Rahman MB, Okazaki E, Rithu MNA. Assessment of Species Specificity of Fishing Gears and Fish Diversity Status in the Andharmanik River of Coastal Bangladesh. Journal of Aquatic Science. 2016; 4:11-19.
22. Rahman S, Chakraborty B, Razzak A, Paul SK, Chu-ta. The Fishing Gear Selectivity Study, Preliminary Progress Report (May 1993), Fisheries Research Institute, TFP, Santahar, Bogra, 1993, 1-27.
23. Rahman S, Mazid MA, Kamal M, Hossain MA, Hossain MS. Study on fishing gears, species selectivity toward gears and catch composition of BSKB beel, Khulna, Bangladesh. Bangladesh J Fish. Res. 1999; 3(1):25-32.
24. Rubel MRI, Hashem S, Hasan SM, Rahmatullah SM, Ferdousi K, Bornali JJ. Catch composition of fishes by using different types of fishing gear in Lohalia river of Bangladesh. International Journal of Research in Fisheries and Aquaculture. 2014; 4(4):161-170.
25. Siddique AB, Saha D, Rahman M, Hossain MB. Fishing Gears of the Meghna River Estuary of Chandpur Region, Bangladesh. 2013; 2(1):2319-4758.
26. Sultana MA, Mazumder SK, Kunda M. Fishing Gears and Crafts Used in Payra River, Bangladesh. European Journal of Applied Sciences. 2016; 8(6):337-346.