

Fishing Gears and Crafts Used in Payra River, Bangladesh

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Abstract: Payra River is one of the most renowned rivers in the coastal region of Bangladesh and a perfect expanse for breeding, feeding and nursery grounds of many fish species specially *Tenuulosa ilisha*. The aim of the present study was to identify the traditional fishing gears and crafts used by the fishermen of Payra River at Amtali upazila under Barguna district for a period of 12 months from September 2015 to October 2016. Questionnaire Interview (QI) and Key Informant Interview (KII) were done to obtain information about fishing gear and craft. The investigation showed that a wide variety of fishing gears and crafts were operated throughout the year in the study area for commercial fishing. Fishermen were found to follow 4 fishing techniques i.e. netting, angling, trapping and spearing. Among them 18 types of the fishing gear was recorded to be used by the fishermen of which 5 gill, 1 seine, 2 fixed purse, 1 lift, 1 cast, 2 push/drag nets, 2 traps, 2 hooks and lines and 2 wounding gears were recorded. Three (03) types of fishing crafts were recorded from the present study viz. Kosha, Dinghi and Trawler. Traditionally woods and bamboos were used in boat making which found locally. But the fishing boat had no license which reflects lack of awareness and weak control of the regulatory agency. Some of the gears were selective for a particular species like chandi jal, poa jal, ramsos jal, ayre and coral jal. But ber jal, behundi jal and chargora jal were found to catch fish irrespective of their size or species and destroy the habitat of the wild species thus causing multiple harms to the biodiversity of the river. Awareness creating training program should be conducted to the fishermen for sustainable exploitation of fishery resources of Payra River. Sustainable exploitation is not only about restriction on fishing for economic purposes, but also has a great concern to save fish diversity.

Key words: Fishing Gear • Fishing Net • Fish Trap • Fishing Craft • Payra River

INTRODUCTION

Bangladesh is an agro-based riverine country with a huge delta of water resources. The country act as a drainage outlet for a vast river basin complex made up of the Ganges-Brahmaputra-Meghna river system and rich in various fisheries resources [1, 2]. Fisheries sector plays a significant role and main source of animal protein, employment opportunities, food security, foreign incomes and socio-economic improvement [3-6]. This sector contributes 3.69% to GDP and 23.12% to agricultural GDP. Fish supplements to about 60% of our daily animal protein intake. About 11% of the population is dependent directly and indirectly on the fisheries for their living [7].

Fishing gear is any form of equipment, implement, tool or mechanical device used to catch, collect or harvest fish. The major categories of fishing gears that are regularly used in Bangladesh can be counted as the following: fishing nets, fishing traps, hooks and lines, wounding gears and fish aggregation device [8]. 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. [9]. Different types of fishing method used from primitive times and now fishing methods had been modified. The fishermen selected their fishing gears depending on types of water body, different operation

area, depth of water and availability of target species to the caught. In Bangladesh fish and fisheries items of inland water still are caught by using traditional crafts and gears [10]. Fishing craft are the device have different shape and size and used to transport the captured fishes. In some mechanized fishing crafts they have the facility of processing, preservation, storing capacity so that they can catch fish with a long duration. Different types of crafts are in operation in the marine artisanal and small scale-fisheries are used in Bangladesh [11].

Payra River has rich fishing resources which are the essential part not only for fishermen but also for the people living surrounding this River. It provides natural spawning grounds and nursery grounds for many commercially important species of aquatic biota and a significant portion of the country's fisheries production is dependent on this coastal river [12]. These provide direct and indirect jobs and economic benefits relation to population. After meeting domestic demand fish are transported to various districts to contribute in the economy of Bangladesh.

Thus studies in fishing gears and crafts provide the essential basis for the proper exploitation of fishery resources. Hence, forth no literature has been found that are cited the available gear and craft used in Payra River. Rahman *et al.* [13] studied on observation on selectivity

of fishing gears and ichthyofaunal diversity in the Paia river of Southern Bangladesh. So the present study was conducted to find out the different fishing gears and crafts used in Payra River with their detailed description. Such information is very much essential for developing a sound management practice for the commercial fishery in the river.

MATERIALS AND METHODS

Study Area: The present study site is Payra River, located at Amtali upazila under Barguna district in Bangladesh (Fig. 1). Amtali upazila having area of 720.76 sq km, located in between 21°51' and 22°18' north latitudes and in between 90°00' and 90°23' east longitudes. It is bounded by Patuakhali Sadar upazila on the north, bay of bengal on the south, Galachipa and Kalapara upazilas on the east, Barguna Sadar and Mirzaganj upazilas (Patuakhali) on the west. Water bodies are Burishwar and Andarmanick rivers and Rabnabad channel. The upper portion of Burishwar river is known as Payra river. Main occupations are agriculture 56.79%, fishing 3.41%, agricultural labourer 17.21%, wage labourer 3.09%, commerce 7.14%, service 2.81% and others 9.55% [14]. In this area fishing is the main way of livelihood for the fisher folk.

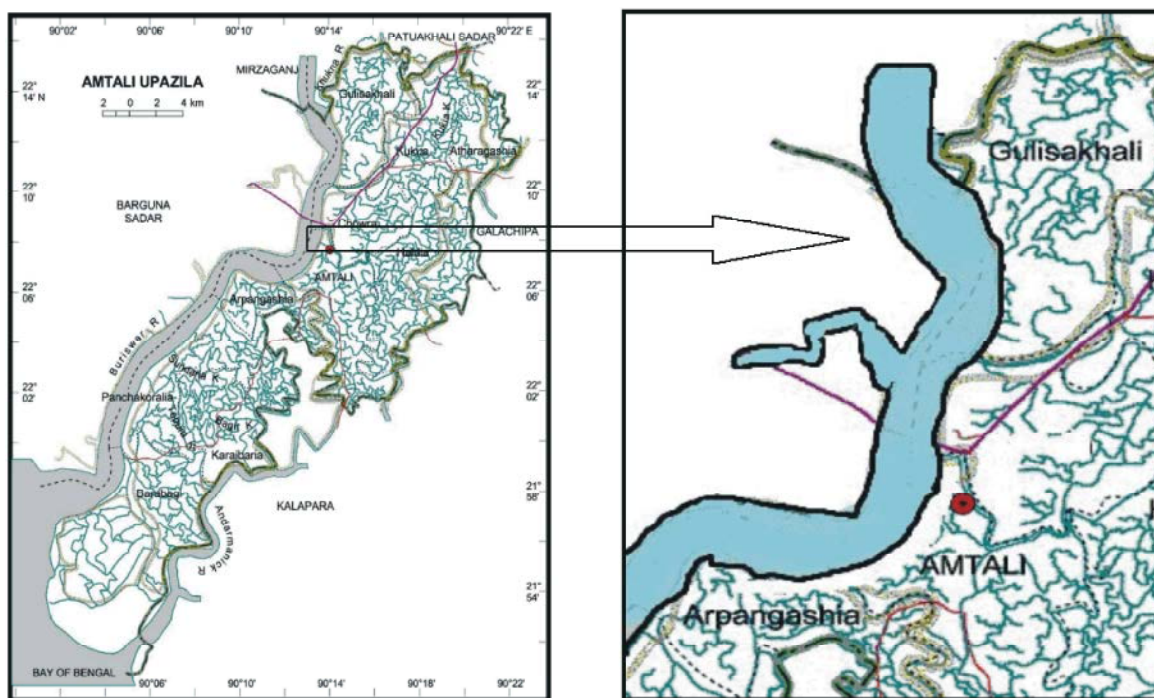


Fig. 1: Map depicting location of the study area

Payra is one of the famous coastal rivers of Bangladesh and sustains country's important multi-species commercial fishery. The river originated from the Tetulia River via the Karkhana River and finally falls into the Bay of Bengal by the name of Burishwar River. Its center lies between 22°35'N latitude and 90°26'E longitude. The river also known as the Rajganj River. Total length of the river is approximately 45 kilometer and width is 1-1.5 kilometer [15].

Data Collection: The present study was conducted to assess fishing gears and crafts used in Payra River during the period of 12 months from September 2015 to October 2016. The primary data were collected from six villages surrounding Payra River at Amtali upazila named Locha, Gulishakhali, Angulkata, Arpangasia, Tarikata and Baliatoli. Data were collected from fishermen, aratdar, fish landing center labour and direct observation of fishing gears at the time of operation and from the local fishing gear market. Data about fishing gear with their mesh size, operation mode, building materials, fish species caught, season etc. and data about operation of fishing craft with their size, shape etc. were collected by Questionnaire interviews (QI). Interviews were conducted through face to face interview method by using semi- structured open ended questions. Cross-check Interviews (CI) were conducted with key informants such as Upazila Fisheries Officer (UFO), District Fisheries Officers (DFO) and relevant GO and NGO officers and staffs.

Data Processing and Analysis: For the analysis of data tabular technique was applied by using simple statistical tools. Processed data were transferred to a master sheet from which classified tables were prepared revealing the finding of the present study. For processing and analysis purpose computer software MS Excel was used.

RESULT AND DISCUSSION

The study showed that a wide variety of fishing gears and crafts were operated throughout the year in the Payra River for commercial fishing.

From the study, total eighteen types of fishing gears were identified under nine major categorizes described as Gill nets (Chandi jal, Poa jal, Ramsos jal, Ayre jal, Coral jal), Seine net (Ber jal), Fixed purse net (Benti jal and Chargora jal), Lift nets (Dharma jal), Push net (Thela jal and Moiya jal), Cast net (Jhaki jal), Hook and line

(Chip barshi and Chara barshi), Fish trap (Polo and Chai) and Wounding gear (Konch and Teta). Details of these gears are described in the followings:

Fishing Nets: Fishing net is a net used for fishing usually formed by knotting a relatively thin thread. Nets are devices made from fibers woven in a grid- like structure. Early nets were woven from grasses, flaxes and other fibrous plant material. Later cotton was used. Modern nets are usually made of artificial polyamides like nylon, although nets of organic polyamides such as wool or silk thread were common until recently and are still used. Fishing nets were grouped into 6 categories according to the mode of operation and catching of fish viz., gill net, seine net, fixed purse net, cast net, lift net and drag/push net (Table 1).

Gill Netting: Gill netting is a common fishing method used by commercial and artisanal fishermen of all the rivers and in some freshwater and estuary areas. Gill nets were the principal and common type of net used in the region. A gill net is an upright wall of fiber netting. The local name is Fansh Jal. A fish swims into a net and passes only part way through the mesh. When it struggles to free itself, the twine slips behind the gill cover and prevents escape. This is a passive gear, but fish can also be driven into the gill nets. The nets were used singly or in series. They are vertical walls of netting normally set out in a straight line. Floats and sinkers are attached plastic ropes are used as head ropes and foot ropes. By altering the ratio of floats to weights, buoyancy changes and the net can therefore be set to fish at any depth in the water column. Gillnets have a high degree of size selectivity. In commercial fisheries, the meshes of a gill net are uniform in size and shape. This gives gillnets the ability to target a specific size of fish. Five types of gill nets were widely operated in the study area viz., chandi jal, poa jal, ramsos jal, ayre jal and coral jal.

Chandi Jal: Chandi jal is also known as Ilish jal and one of the common gill net operated in the Payra River. Mesh size of this net is 2.75 to 4.5 cm. The length of the net is 600 to 800 m and width is 10 to 14 m. The net is constructed by polyamide monofilaments, polypropylene or nylon rope. Both floats and sinkers are attached to the net. The net is rectangular in shape and 3 to 6 persons are needed to operate this net. The net is drifted with water current and the gill of fish is trapped in

Table 1: Different types of net used for fishing in the Payra River

Gear type	Local name	Construction cost (BDT/net)	Mesh size (cm**)	CPUE*** (Kg/effort)	Major species caught	Fisherman needed for operation	Fishing effort/day	Season	Durability (years)
Gill net	Chandi jal *	30000-50000	2.75-4.5	5-15	Hilsha, Poa, Taposhi	3-6	2	All	1-2
	Poa jal	20000-30000	1.75-3.5	5-10	Poa, Taposhi, Hilsha, Faisha	3-5	4	September-February	1-3
	Ramsos jal	20000-30000	1.75-3.5	6-15	Taposhi, Poa, Cheua	3-5	2	December-May	1-3
	Ayre jal	40000-50000	6-8	2-5	Ayre	3-4	4	September-February	2-4
	Coral jal	50000-100000	5-7	4-7	Coral, Ayre, Pangus	4-8	4-5	February-May	3-5
Seine net	Ber jal	40000-60000	0.0	10-20	All	7-10	2	All	1-2
Fixed purse net	Behundi jal	40000-50000	0.0-0.5	8-15	All	3-5	2	All	1-2
	Chargora jal	20000-30000	0.0-0.5	6-12	All	3-5	2	All	1-2
Lift net	Dharma jal	4000-5000	0.5-1	0.5-1	Taki, shol, Tengra, Prawn, Baila, Baim	1	4	May-September	1
Cast net	Jhaki/jhai jal	3000-4000	0.5-1	1-2	Prawn, Koi, Poa, Boal, Taposhi, Bata, Baim, Baila	1	10-15	All	3-4
Drag/ Push net	Moia jal	1000-1500	0.25-0.75	1-2	Prawn	2-3	7-8	All	1-2
	Thela jal	400-500	0.25-1	0.5-1.5	Prawn, Poa, Chewa, Koi, Gulsha	1	5-6	All	2-4

*Jal= Fishing net, **Cm= Centimeter, ***CPUE= Catch per Unit Effort

the mesh of the net. Construction cost of this net is 300000 to 500000 BDT having a life span of 1 to 2 years and has a catch per unit effort of 5 to 15 kg. The net is operated from the boat and generally used in the whole year except the fish banning period. This net is also used in Rajshahi, Khulna, Chittagong, Noakhali etc [15]. Mainly Hilsa (*Tenualosa ilisha*) and Poa (*Otolithoides pama*), Taposhi (*Polynemus paradiseus*) are caught by the net (Table 1).

Poa Jal: Poa jal is a gill net made of polyamide monofilaments and nylon rope. The length of the net varies from 600 to 700 m and the width is 3.5 to 4.5 m. The net is rectangular in shape and the mesh size of the net is 1.75 to 3.5 cm. The net is operated by 3 to 5 persons from the boat in both day and night (Table 1). Both floats and sinkers are attached to the net and the net is drifted with water current and the gill of fish is trapped in the mesh of the net. Construction cost of this net is 20000 to 30000 BDT having a life span of 1 to 3 years. Poa (*Otolithoides pama*), Taposhi (*Polynemus paradiseus*), Hilsa (*Tenualosa ilisha*), Faisha (*Setipinna phasa*) are the main species caught by net. This net is also used in the river of Dhaka, Noakhali etc. [15].

Ramsos Jal: Ramsos jal is a gill net made of polyamide monofilaments and nylon rope. The length of the net varies from 500 to 700 m and the width is 3.5 to 4.6 m. The net is rectangular in shape and the mesh size of the net is 1.75 to 3.5 cm (Table 1). The net is operated by 3 to 5 persons from the boat in both day and night. Both floats and sinkers are attached to the net and the net is drifted with water current and the gill of fish is trapped in the mesh of the net. Construction cost of this net is 20000 to 30000 BDT having a life span of 1 to 3 years. Taposhi

(*Polynemus paradiseus*), Poa (*Otolithoides pama*) and Cheua (*Pseudapocryptes elongates*) are the main species caught by net.

Ayre Jal: Ayre jal is a gill net made of polyamide monofilaments and nylon rope. The length of the net varies from 150 to 200 m and the width is 10 to 15 m (Table 1). The net is rectangular in shape and the mesh size of the net is 5 to 7 cm. The net is operated by 4 to 6 persons from the boat in both day and night. Floats are attached to the net and the net is drifted with water current and the gill of fish is trapped in the mesh of the net. Construction cost of this net is 40000 to 50000 BDT having a life span of 2 to 4 years. Ayre (*Sperata aor*) is the main species caught by net.

Coral Jal: Coral jal is a gill net made of polyamide monofilaments and nylon rope. The length of the net varies from 150 to 200 m and the width is 10 to 15 m (Table 1). The net is rectangular in shape and the mesh size of the net is 5 to 8 cm. The net is operated by 4 to 7 persons from the boat in both day and night. Only floats are attached to the net and the net is drifted with water current and the gill of fish is trapped in the mesh of the net. Construction cost of this net is 50000 to 100000 BDT having a life span of 4 to 5 years. Coral (*Lates calcarifer*), Ayre (*Sperata aor*), Pangus (*Pangasius pangasius*) are the main species caught by net.

Seine Net: Seine net has very long wings and a towing rope. The nets are of various lengths and come with or without bags for catching and are locally called Bedh Jal. If the size is too big, it is called Jagot Bedh. Fish are captured by surrounding a certain area and towing the gear over the area with both ends to a

fixed point on the shore or on a fishing vessel. The size of the mesh depends upon the size of the fish to be caught.

Ber Jal: It is a fine mesh size seine net which is commonly used in the Payra River. It is large in size, usually 500 to 700 m long and 9 to 12 m wide with a mesh size ranges between 0.0 and 0.5 cm (Table 1). It is a rectangular net with floats on the head rope and weights on the ground rope. The ground rope and the head rope are made of synthetic nylon fibre. 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. As it has a very fine mesh size so during operation, this gear catch fish irrespective of their size or species and destroys the habitat of the wild species thus causing multiple harm to all the fish living on the river. Generally 7 to 10 people are needed to operate the net and the construction cost of this net is 40000 to 60000 BDT. The net is used in all seasons except ban period. Although it catches almost all types of fishes but it is mainly used to catch Juvenile Pangus (*Pangasius pangasius*), Poa (*Otolithoides pama*) and Juvenile Hilsa (*Tenualosa ilisha*). Length, width and mesh vary with the size of the water body. This gear can be operated in both day and night.

Fixed Purse Net: Fixed purse net is a common type of purse seine, named such because along the bottom are a number of rings. Locally known as Behundi jal, is used in the shallow region of the river to catch different types of fish.

Behundi Jal: The net is also locally known as 'Badhar Jal/Benti jal. Behundi jal is a purse or conical in shape net and has two extensions. The length of the net is 12 to 15 m and width of mouth of the net is 11 to 12 m. The mesh size at the mouth of the net is 5 to 6.25 cm and at the end of the pouch is 0.5 to 1.25 cm (Table 1). The net is constructed by polyamide monofilaments, polypropylene, polyvinyl chloride or nylon rope, in traditional practice the net is made up of nylon ropes and is knotted. Mouth of the net is spread and fixed on tide by bamboo, wood or iron. The net is set against the current during the low tide. The front side is wide and opened by using two bamboo poles. The net is usually set in the middle of the river by tying two wings of front side by two strong separate string attached with two strong anchors. Fishes are deposited at the back end of the net which is tied by a sting. Fish is trapped in the centre pouch of the net and

net is monitored carefully for 2 to 3 hours. After definite intervals the fishermen collect fish through this end. Two to four persons are required to operate the net where the catch per unit effort is 10 to 15 kg. The durability of the net is 1 to 2 years whereas the construction cost is 40000-50000 BDT. All types of small to large are caught by this net. This net is also found in Khulna and Chittagong locally known as behuti jal [15]. The net is operated in all season except ban period.

Chargora Jal: Chargora jal is funnel shaped net. The net is constructed by polyamide monofilaments, polypropylene, polyvinyl chloride or nylon rope, in traditional practice the net is made up of nylon ropes and is knotted. It has no float and sinker. This net is set before high tide and hauled in low tide. The length of the net is 150 to 200 m and width is 5 to 6 m. The mesh size at the mouth of the net is 0.6 to 1.27 cm. 3 to 4 persons are required to operate the net where the catch per unit effort is 5 to 15 kg. The durability of the net is 1 to 2 years whereas the construction cost is 20000 to 30000 BDT (Table 1). All types of fish are caught by this type of net.

Lift Net: Lift net is a hand operated and portable net generally used in the shallow region of the river to catch small fish. A lift net has an opening which faces upwards. The net is first submerged to a desired depth and then lifted or hauled from the water. It can be lifted either manually (hand lift net) or mechanically (shore-operated lift net) and can be operated on a boat (boat-operated lift net). This net is locally named as dharma jal.

Dharma Jal: The common shape of the net is square. The length of the net is 10 to 15 m and width is 5 to 8 m. The net is fitted with two bamboo strips arranged in cross-bars and connected at the four corners of the net (Table 1). The arranged crossbars with the net are then attached with another lever for lifting the net from of the water. A fisherman dips the net in water and pushes it forward and then abruptly lifts it up. Occasionally, a rope is used to facilitate the manipulation of the net. The mesh size of the net is 0.5 to 1 cm. Sometimes the size could be made bigger and fixed at some strategic water areas e.g. Khoda Jal and Konaghar Jal. The net is generally used in the rainy season and the construction cost is 4000 to 5000 BDT. The main species caught by the net are Baila (*Glossogobius giuris*), Taki (*Channa punctatus*), Shol (*Channa striatus*), Koi (*Anabas testudineus*), Gulsha (*Mystus cavasius*), Tengra (*Mystatus vittatus*), Prawn and Baim (*Mastacembelus armatus*). The net is also used in

Potuakhali, Barishal, Comilla, Dhaka and Chittagong district of Bangladesh [16]. Dharma jal was used only in daytime throughout the year in shallow water areas in river where river current is gentle.

Cast Net: It is a common net in Bangladesh and used in Payra River. Cast nets are conical-circular nets, the edge of which is weighted with lead while the conical end is tied to a throwing/hauling rope. The throwing rope also serves as hauling rope. It is operated manually and used mainly in the shallows of ponds, beels, estuaries and in the coast. Cast net, locally known as Jhaki jal/Khapla jal, is used in the shallow region of the river to catch different types of fish. The net is of various sizes, depending on individual's preference and fisher's ability to manipulate the net.

Jhaki Jal: The net is conical shaped where it is 4 to 8 m long from anterior part to the posterior end with 6 to 10 m in diameter of the mouth. A rope of about 5-7 m length is connected to the apex of the conical net. The mesh size of the net varies with the types of the target fishes. Normally, it varies from 0.5-1.5 cm. One person can operate this net as the weight of the net is 3 to 6 kg. The net can be operated in tide, ebb-tide and in the freshwater also at both day and night. When the net is casted it spreads out over the water surface circularly and when lifted it comes out in conical form. Construction cost of the net is 5000 to 10000 BDT having a catch per unit effort of 1 to 5 kg. The main species caught by the net are Bata (*Labeo bata*), Taposhi (*Polynemus paradiseus*), Baim (*Mastacembelus armatus*), Koi (*Anabas testudineus*), Poa (*Otolithoides pama*) and Prawn (Table 1). 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 [15]. This net is operated by fishermen from the boat or from the shore of the water body. To operate the net from the boat it needs 1-2 fishermen depending upon the size of the nets and water bodies. The net is usually used in April to September.

Drag nets/push nets: This is a general term which can be applied to any net which is dragged or hauled across a river or along the bottom of a lake or sea. Push net is a small triangular fishing net with a rigid frame that is pushed along the bottom in shallow waters. Drag nets/push nets are held apart with triangular bamboo frame and pushed manually to fish in the traditional waters of river, beels and floodplains.

Thela Jal: It is also known as Push net. Thela jal is a triangular shaped push net constructed by polyamide mono-filament nylon rope with an extended handle of two bamboo poles, one is longer than other, are fixed at an angle of 30°. Its' two arms are 2 to 3 m long and front side is 1 to 1.5 m long having a mesh size of 0.25 to 1.0 cm (Table 1). The net has four corners but two adjacent corners are unified by sewing and this takes conical shape when tied with the frame. The triangular portion of the net is lowered and pushed forward along the bed of the shallow water areas. The net is used at all time of the year and one person can operate this net. Construction cost of this net is very low ranges from 400 to 500 BDT. All small size fish is caught by the net but the main species are Gulsha (*Mystus cavasius*), Koi (*Anabas testudineus*), Chewa (*Odontamboopus rubicundus*), Poa (*Otolithoides pama*) and Prawn. It is operated all over the year. It is mainly operated in shallow water. Push net is used by subsistent fishermen. One man can operate walking in shallow water and pushing the net along the shore, particularly in the area infested by Water hyacinth or rooted vegetation. If a fisherman continues fishing in a day, he can catch 1-3 kg fish in that day.

Moia Jal: This is a rectangular net, upper side is attached with a horizontal bamboo pole and lower side has many pockets. The lower portion is sunk under the water by the support of iron attached to each pocket. Moia jal is a small fishing gear having a length of 2 to 3 m, width 1 to 2 m and mesh size 0.5 to 1 cm. It is operated in the bottom of the river from a boat by using a long thread. The construction cost of the net is 1000 to 1500 BDT (Table 1) which is relatively cheaper than other nets. Small to medium sized fishes are caught by this net. But the net is mainly used to catch prawn and can be used in the whole year having a catch per unit effort of 1 to 5 kg. It is used in all seasons and 2 to 3 fishermen are needed to operate the net.

Hooks and line: A fish hook is a device for catching fish either by impaling them in the mouth or, more rarely, by snagging the body of the fish. Fish hooks have been employed for centuries by fishermen to catch fresh and saltwater fish. Fish hooks are normally attached to some form of line or lure device which connects the caught fish to the fisherman. There is an enormous variety of fish hooks in the world of fishing. Sizes, designs, shapes and materials are all variable depending on the intended purpose of the fish hook. The most familiar type of manufactured steel hook is "J" shaped, which is mostly used for hook and line fishing. Two types of hooks and lines were found in the study area.

Table 2: Different types of hooks and line used for fishing in the Payra River

Types of Gear	Name of gear	No. of hooks	Bait used	Person needed	Boat Needed	Species Caught	Season	Durability (year)	Fishing effort per day
Hooks and line	Sip barshi	1	Yes	1	No	Shol, Taki, Shing, Tengra	September- November	-	-
	Chara barshi	800-1200	Yes	3 to 5	Yes	Pangus, Ayre, Boal, Tengra, Taposhi, Poa	All	1 to 2	2

Sip Barshi: It is one of the most common fishing gears throughout the country. A cleaned, upper part of a bamboo or its branch of suitable length called chip that gradually tapers at one end. A long and thin synthetic rope of desired length is tied to the tapering end and a barbed hook, which is locally called barshi is tied to the other end of the rope. A piece of light wood or shola is attached to the rope in a manner that it can be moved along the rope. It is called as a float. A piece of lead or iron is also tied with the rope near the hook as sinker. A man sits on the embankment or a boat and set the sip in the water throwing the baited hook with the sinker. The position of hook within the water is maintained at desired depth by moving and fixing the float at a definite position in the rope. Earth worm and small prawn is used as bait. Main fish species caught by this type of gear are Shol (*Channa striatus*), Taki (*Channa punctatus*), Koi (*Anabas testudineus*), Shing (*Heteropneustes fossilis*) and Tengra (*Mystus vittatus*) (Table 2). It was found to be operated throughout the year.

Chara Barshi: Chara barshi is a long line measuring from 400 to 600 m, which is set into shallow water with bamboo poles 4 to 6 cm above water. A small line of 0.45 to 1 m with barbed hooks is lowered into water with bait. The baits include earthworm, prawn and punti. One daun may contain even more than 500 hooks. The lines are shot at night and hauled in the morning. The small barshi is 1-2.0 cm, medium barshi is 4-5 cm and large barshi can be 6-8 cm in size. The construction cost is 10000-15000 BDT with a life span of 1 to 2 years. Normally 3 to 5 fishermen are needed to operate it (Table 2) with a CPUE of 4 to 6 kg. Different types of fish are caught by this gear but the main species are Ayre (*Sperata aor*), Pangus (*Pangasius pangasius*) and Taposhi (*Polynemus paradiseus*), Poa (*Otolithoides pama*), Boal (*Wallago attu*) and Tengra (*Mystus vittatus*).

Wounding Gears: Spearfishing is an ancient method of fishing. Spears are the fishing devices which are used to catch fish by throwing or wounding fishes. Spearfishing conducted with an ordinary spear or a specialized variant such as a harpoon, trident, arrow or eel spear. Two types of spears were mainly used in the Payra River.

Konch: Konch having more than 10 pieces of bamboo splits are firmly fixed in a bunch. The pointed ends of the bamboo splits are covered with sharp and pointed iron caps to increase the efficiency. The konch is thrown at the fish with great force so that the prongs pierce the fish. It is normally operated by the fishermen from a boat or embankment. It was operated in shallow water to catch bottom and pelagic fishes. The sharp end of the prong wounds the fish. It was found to operate during high flooding period when large fishes moved close to water surface near the land. During fishing, operator aims the target fish and throws the gear towards the fish. Iron sticks of the gear penetrate the fish muscle and the fisherman then collects wounded fish. Fish caught by this gear are Boal (*Wallago attu*), Shol (*Channa striatus*), Gozar (*Channa marulius*), Taki (*Channa punctatus*) (Table 3).

Teta: Teta is a wounding gear made of a long bamboo handle about 2 to 3 m long and several iron hooks with iron rod at the base. The length of iron rod is about 60 to 65 cm with hooks at the apex. The iron rod with hooks is tightly tied with the bamboo handle by coconut thread or iron wire. The fisherman throws the gear to target species like Boal (*Wallago attu*), Shol (*Channa striatus*), Taki (*Channa punctatus*), Pangus (*Pangasius pangasius*) and others fish species (Table 3).

Fishing Traps: A fish trap is a trap used for fishing. Fishing traps are mostly bamboo and wooden made mechanical devices used in shallow water by both professional and non-professional fishermen. Traps are culturally almost universal and seem to have been independently invented many times. There are essentially two types of trap, a permanent or semi-permanent structure placed in a river or tidal area and pot-traps that are baited to attract prey and periodically lifted. Two types of fishing traps were identified in the study area viz., chai and polo.

Polo: Fishing made by polo is usually done for fisherman's household consumption. Polo is a bell shaped fishing trap made of bamboo splits, lower part of this gear is cylindrical and upper portion is conical which is tied

Table 3: Different types of wounding gears used for fishing in the Payra River

Types of gear		Length of handle (m)	Person needed	Boat needed	Species caught	Season
Wounding gear	Konch	2-3	1	No	Boal,Shol, Gozar	All
	Teta	2-3	1	No	Boal,Shol, Taki, Pangus	All

Table 4: Different types of trap used for fishing in the Payra River

Name of traps	Construction cost (BDT/Trap)	Materials	Person and boat needed	Species caught	Season	Fishing effort per day
Polo	200-300	Bamboo splits	1 and no	Shing, Magur, Taki, Cheng, Puti, Baim	November-December	10-20
Chai	150-250	Bamboo sticks	1 and no	Prawn, Shol, Baila, Veda, Taki, Pabda, Tengra, Koi, Shing, Magur.	June to October	5-15

with bamboo rings. During fishing, fisherman passes this trap to the mud bottom in shallow water and put his hand through the top opening to search fish in the trap and if any fish is entangled, the operator can know by its movement. The trapped fish is taken out through the upper opening. This procedure is repeated till sufficient fish of different varieties are collected. The height is 0.6 to 0.9 m. The diameter of broad opening was 0.4 to 0.5 m and narrow opening was 0.15 to 0.18 m. Catch composition by Polo depends on place of operation, abundance of fish, fishing season and time. The major fish species caught were Taki (*Channa punctatus*), Shing (*Heteropneustes fossilis*), Magur (*Clarias gariepinus*), Baim (*Mastacembelus armatus*) etc (Table 4). Fishing duration is 0.5 to 2 min/haul.

Chai: It is a tubular shaped basket like trap. The bamboo sticks are arranged in parallel one after another and tied them with cane materials to make the structure of this gear. There is a unidirectional valve at the mouth and single opening at the upper side. Fish once entered through the valve cannot escape. Trapped fish are gathered at the back side. After certain period of time fish are collected through the opening. These gears are used to catch smaller to medium types of fishes. It is mainly operated in shallow running water and set against the water current. These gears are used to catch smaller to medium types of fishes. Chai was used in the river side and adjacent shallow water and set against the water current. From June to October, trap (chai) was widely used in the riverside and adjacent shallow water bodies. Major species caught by this trap were Prawn, Shol (*Channa striatus*), Taki (*Channa punctatus*), Veda (*Nandus nandus*), Pabda (*Ompok pabda*), Tengra (*Mystus vittatus*), Koi (*Anabas testudineus*), Shing (*Heteropneustes fossilis*), Magur (*Clarias gariepinus*), Baila (*Glossogobius giurus*) (Table 4).

In addition to the use of gears for fishing, other devices viz. hand catch, fishing by katha fishing (spots where bushes/branches of plants are accumulated to gather fishes) are also practiced in all the study area.

Fishing crafts: Fishing crafts are specialized boat, ship or other vessel used for fishing. Different types of fishing crafts like kosha boat, dinghi boat and trawler were dominantly used for fish capture (Table 5). Ahmed [17] and Hussain [18] described the utilization of traditional crafts. Fisherman use different types of fishing craft having different length, width, height, shape and size in the Payra River. The crafts are built traditionally by the rural carpenters according to their individual plan with planks. It is different to classify the crafts according to net used because fisherman used the same boat for operating different net. Most of the fishing boats are manually operated by using paddle and pole propulsion with or without sails. The size of the sail depends on the size and types of boat. The shape of the sail is rectangular, square or triangular. Fishermen use woods, bamboos and irons to make their boats which is furnished by coulter and burned oil [19]. In Bangladesh there are about 306642 fishing craft (including 141 trawler, 43960 traditional and 21433 mechanized boat) are engaged in fish transportation [20]. In the study area three types of fishing crafts were used for fishing in the Payra River viz. Kosha nouka, Dinghi nouka and Trawler.

Kosha Nauka: Anterior and posterior ends of kosha nouka are blunt. It is 6-7 m in length, 2 to 3 m in width and 1 to 2 m in height and has a flat bottom. Construction cost of this boat is 8000-12000 BDT (Table 5). Its oars are made of bamboo poles; the deck is made of whole or split bamboo pieces. A hood is never provided. A triangular sail, when present, is situated in the anterior half of the boat. The boat is used for fishing in shallow waters [21]. All types of net are used but chandi jal is used mainly.

Dinghi Nauka: This is small boats with round bottom. It is 5 to 8 m in length, 2 to 2.5 m in width and 1 to 2 m in height. The construction cost of this boat is 8000-10000 BDT (Table 5). The fore and the hind part of the boat are high above the water level. The stem and the bow are long and pointed. In smaller boats there are no deck but the bigger ones usually possess one. The hood is usually lacking, but when present, is located in the posterior part

Table 5: Different types of crafts used for fishing in the Payra River

Craft name	Construction					Boat type	Persons need to operate	Gear used in craft	Fishing duration (hour/day)	Life span (years)
	cost (BDT/ Boat)	Length (m)	Width (m)	Height (m)	Shape of bottom					
Kosha	8000-12000	6-7	2-3	1-2	Flat	Non-mechanized	3-5	All	10-12	3-5
Dinghi	8000-10000	5-8	2-2.5	1-2	Rounded	Non-mechanized	3-6	All	10-12	3-5
Trawler	24000-26000	8-10	2-4	2-3	Flat/Rounded	Mechanized	5-8	All	12-14	4-5

of the boat. The oars are long and paddle-like. The sail is not carried by most dinghis but if present it is made of comparatively thin cloth and is supported by bamboo poles attached diagonally. Fishing dingis are also called Jalia dingis. The dingis are named on the basis of the fishing nets operated by them; for instance, Bhesail Dinghi, Patam Dinghi, Shangla Dinghi and Talal Dinghi [21].

Trawler: It is one kind of mechanized boat which can be either kosha or dinghi nouka. The construction cost of this boat is 24000-26000 BDT. The length of this boat is 8 to 10 m, width is 2 to 4 m and height is 2 to 3 m (Table 5). The shape of bottom is either flat or rounded. Normally 5 to 8 fishermen are engaged for fishing by using this type of boat. It is used for long time and long distance fishing. All types of nets are used by this boat. Different types of crafts are also essential to assure a good and effective fishing. The fresh water fishing craft and gears are of traditional types, using from long times without any modifications. Same observation or results are found in the study area. Most of the fishing gears have to break off operations after a certain period of activity, for rest and repair [22].

CONCLUSION

Fishing gear and crafts are used to conduct fishing activities. Therefore, fishery management requires a good knowledge of fishing gear and fishing craft. The introduction of fishing gear and methods to an area whether these methods are technically new or simple are not without danger to both the community and the aquatic ecosystem. In this regards, the fishing arts developed within a region may usually be the best suited for the species and sizes desired, given the prevailing aquatic conditions, community and economic structure. The issue of gear regulation become appropriate considering the dangers of fishing out our aquatic ecosystem. The adaptation of new technologies could help small scale fisheries increase their catch, but the introduction of any new fishing technology always demands good rational management and regulation.

Vessels must also march with new fishing methods and gear. As gears become more complex, it may require updating of vessels in size, power and design. Currently, most of the rivers are over fished. Upgrading the gear and making it more efficient increases the risk of further depleting the fish stocks. As the operation of all types of gear cannot be banned immediately to allow the stocked fingerlings to grow out, it is important to identify the gear that can be operated without exploiting undersized fingerlings stocked under the government plan and the gear that should be regulated. At the same time, an awareness or training program should be conducted under the supervision of the government as well as non-government organizations to the fishermen to create awareness of the long-term effects of different fishing gears and to impart knowledge of fishing laws. Therefore, the introduction of new gear and fishing methods should be accompanied by proper monitoring and protection of the aquatic resources. In this regards, the establishment and funding of a functional monitoring/surveillance unit within the fisheries department is most appropriate.

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