Academic Journal of Life Sciences
ISSN(e): 2415-2137, ISSN(p): 2415-5217
Vol. 3, No. 4, pp: 18-23, 2017
URL: http://arpgweb.com/?ic=journal&journal=18&info=aims

An Introductory Study of Fish Biodiversity and Fishing Practices in the Betna River of Southwestern Bangladesh

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Abstract: The present research was conducted as a preliminary study to assess the status of fish biodiversity and the existing fishing practices of the Betna River of Satkhira district in southwestern Bangladesh. The study was carried out for a period of twelve months from January to December 2014 on the basis of primary observations, questionnaire interviews with fishers, focus group discussions (FGD) with river bank community members and cross-check interviews with key informants. The study revealed that a total of forty-six (46) species of fish and shell fish belonging to twenty one (21) common groups were identified in the catches of the Betna River. The highest and lowest fisheries species were recorded as shrimp (17.05%) and mullet (1.77%), respectively. The other dominant species were snakehead fish (13.27%), Indian major carps (10.94%), small prawn (9.85%), spiny eel (5.50%), and catfish (5.9%). In addition, the fishers of the Betna River were categorized into three groups namely professional, seasonal, and subsistence fisherman and they used seven (7) types of fishing gears for catching fish. The resources of the river are facing emerging threats due to pollution, hay siltation and over exploitation. So, proper management is urgently needed to conserve the ichthyofaunal diversity of the river.

Keywords: Fish diversity; Fishing gears; Betna River; Satkhira; Bangladesh.

1. Introduction

The inland open water bodies have a great importance for the people of Bangladesh because it contributes in food security, livelihood and income by its rich and diversified fisheries resources [1, 2]. The most critically and sensitive areas for open water aquaculture in Bangladesh is south western coastal area which supplies both fresh water and salt water indigenous fishes [3]. The Betna River is one of the largest river systems in Bangladesh and mother fishery for the south western district Satkhira [2].

In Bangladesh, the Betna River originates from northeastern part of Jessore district and enters through the southern part of Kalaroa Upazila in Satkhira district. In the Sundarban the Betna River changes its name as Arpangachhia and before flowing into Bay of Bengal it changes its name as Malancha River [4]. The Betna River is influenced by the tidal action and it is one of the important aquatic habitats in south western region as it serves as shelter (e.g. feeding, nursing, breeding grounds) of many fisheries species. However, the aquatic resources especially fish in water bodies of Bangladesh are under excess fishing pressure, Betna River is not beyond them.

Nowadays, the demand for fish have increased in line with population growth resides along the coast of the River and nearby village. As a result, the number of fishermen fishing both for subsistence and for employment has increased in figures. This, together with the introduction of more efficient fishing gears, caused the size of the catch to dwindle as wild fish stocks of the River became threatened by over-fishing. So, scientific management based studies on fishing gears and fish fauna and avoidance of various restricted fishing gears are the most important conservation and sustainable fisheries resource management issues of many rivers. There are some evidences of previous studies on the fishing gear selectivity and ichthyofaunal diversity of Paira and Andharmanik Rivers in southern Bangladesh [5]. Moreover, Ullah, *et al.* [6] studied on the fish diversity status of mid-coastal region of Bangladesh. However, at present sufficient information is not available on fish biodiversity and fishing practices in the Betna River. No attempt has been initiated so far to study fishing gears specificity to species and fish diversity of Betna River due to its geographical remoteness and distance from fisheries research centers and universities of the country. Therefore, this study was designed to know the fisheries status quo and types of fishing gears operation in the Betna River of south western Bangladesh.

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2. Materials and Methods

2.1. Experimental Site

A survey was conducted for one year from January to December 2014 on the Betna River in Satkhira district, Bangladesh. The main reason behind the study area selection to know the fisheries resources and fishing practices in the coastal area as the Betna River is in the coastal district Satkhira. A group of people live on the bank of the Betna River whose livelihood directly or indirectly depend on the Betna River. The GPS position of the study area is latitude 23°17'11.62" and longitude 88°54'54.22" (Figure 1). The total length of the river is about 192 km and the average width is 125m.

2.2. Target Group Fisherman

The study was performed on the basis of field survey where primary data was collected from the fisherman. For data collection, the target group was the fisherman community of the Betan River. Fishing is the main activity of this community and a group of people are known to engage in fish catching of the Betna River. The data was collected from 150 fishermen with the help of questionnaire interview. In the study area, the target group for data collection was selected randomly. The fishermen community was very cooperative during data collection.

3. Methods of Data Collection

The data were collected by participatory Rural Appraisal (PRA), Focus Group Discussion (FGD), questionnaire interview, and cross check interview with key informants. The sample size was taken by 40% individual interview and 35% of FGD and 25% of the cross check interviews with the key informants of the study area. Selections of the samples were done randomly.

4. Results and Discussion

4.1. Fishing Practices

Fisherman depends on fishing activities for their daily food and income. Village people are catching fish by their different abilities and motivations. On the basis of questionnaire interview it was found that 80% of the family livings beside the river are primarily dependent of fishing for their livelihood and income. According to FGD it was showed that 70% of people are male and 30% of people are female; 73% of people are Muslim and remaining 27% of people Hindu are involved in the fishing activities in the river.

In the study area various types of fishing gears are operated through the whole year. The fisherman mostly uses traditionally fishing gears which are locally made. From the survey it was showed that they use generally seven (7) types of fishing gears (Table1). The fishing gears are also categorized into three major groups such as i) Fishing nets ii) Wounding gears iii) Traps. On the other hand, some fishermen catch the fish by de-watering and hand picking process. Gear operation is limited from January to April when the water level of the Betna River is low. The gear operation significantly increases when the monsoon comes and the water level is high. Habitats types, water depth, fishing abundance indicate what types of fishing gear have to operate and in which time it has to operate. The availability of fish depends on fishing season, water quality, food abundance and also the type fishing gear.

When studied on Haltibeel 30 different types of fishing gears were recorded and gears are classified in five major groups [7]. The same number of fishing gears recorded in Tista and Megna River [8]. Therefore, the fishing gears recorded in the Betna River agreed the above study.

According to the fishing practicing the fishers are categorized in three groups:

1) Professional fishers: the fishers catch the fish all the year round for their income and livelihood. They mainly sell the fish in the market for their own income.
2) Seasonal fishers: the fishers who catch the fish only a part of the year. e.g. especially rainy season.
3) Subsistence fishers: The fisherman only catches the fish for their own consumption.

To estimate the fish yield fishing duration is essential. It is showed that fishers increase gear operation time to catch more fish species. The average fishing hours by commonly used fishing gears is shown Figure 2. In the Betna River, it was found that the highest and lowest fishing hours by Borshi and Thelajal (Push net) 9.75hrs and 3.8 hrs, respectively. The Jakhijal (cast net) is mostly used in the Betna River which is operated for 4.5 hrs. Besides the fishing duration of other types of gear was recorded respectively for Dharma jal (lift net) 6.75 hrs, Berjal (Seine net) 4.25 hrs, Current jal 5.76 hrs and Aton 8.75 hrs (Figure 2).

4.2. Fishing Gears and Catch Composition

The Betna River is full of a large number of fish species. From the questionnaire interview it found that there are 46 common fish and shell fish species of 21 groups. 260 fish species recorded by Rahman, *et al.* [9] similar study with inland open water researchers found 130 native fish species [10] whereas a total 19 species of fish other than shrimp and small size fishes in *chandabeel*, [7].When study conducted in Hakalukihaor reported that 107 fish species during October 2001 to May 2002. Likewise, during fisheries biodiversity assessment in Brahmaputra river basin, Assam Biswas and Sugunan [11] reported 152 fish species. The fish species found in the present study more or less similar to the above fish species found.

The 46 fish species comprises 100% catch by their weight. Here the total weight for fish catch is about 650 Kg. The catch composition of the Betna River is presented in Table 2 and the percentage of different fish group is shown Figure 3. From the survey it was found that the fisherman uses different types of fishing gears to catch different types of fish. Study conducted by Hossain [12] recoded 19 fish species in old Brahmaputra River, Bangladesh which are caught by different gears. Specific types of gear is use to catch specific types of fish such as Indian major carps, climbing perch Feather back, Tank goby, loach is mainly caught by cast net or berjal and river shad, sea bass is caught with the help of current jal. Besides, minor carp and perch, small prawn let is mainly caught by dharma jal and thelajal. Aton is mostly use to catch Shrimp and small prawn, crab and eel. Borshi is used to catch catfish, crab and eel.

The Betna is rich in fisheries biodiversity but nowadays the fish species is decreasing for different reasons. Natural and manmade factors are responsible for fish species reduction. From the study it was showed that five years ago there were 50-57 fish species but now the fish species is 46. Ali [13] studied on major carps of Bnagladesh and reported that Farakka dam, embankments and sedimentation, over fishing are the main factors which cause habitat destruction of major carps in most of the rivers. Likewise, Jhingran [14] reported that improper management policy, unplanned establishment of flood control and drainage system projects, over-exploitation are the main causes for the decreasing of fisheries resources in riverine system of Bangladesh. Besides, the rapid urbanization, population bloom and agricultural, irrigation, industrial activities have also a negative impact in riverine system. From the survey it was found the highest and lowest fish catch is shrimp and mulllet 17.05% and 1.77% respectively (Table 2).

Besides the Major carps (10.94%), snake head (13.27%), small prawn (9.85%) contribute to dominant fish catch. (Table 2) In adddition there also found minnor carps, molacarplet, tabkgobi, featherback,river shad, perchlet, spiny eel, crab, seabass fresh water gar fish which have also great contribution in fish catch. In an experiment with Chanda beel Rahrnan, *et al.* [15] found 20 fish species of which the major dominant fish species are punti, kholisha, baila,tengra, taki which also agreed the present study.

5. Conclusion

The study was conducted about the ecosystem based approach on fisheries management of the Betna River in Satkhira region, Bangladesh. The main purpose of the research is to understand the status of fish biodiversity and fishing practices of the Betna River. From the study it was revealed that the Betna River is full of fisheries resources and groups of fisherman community live on the bank of the Betna River who maintains their livelihood and income from the fishing activities of the River. In addition, it was showed that in present day the fish biodiversity of the Betna River is decreasing because of pollution, rapid urbanization, siltation, over exploitation etc. Besides, it was found that there are some parts of the Betna River is becoming dry due to hay siltation which is a great threat for fish biodiversity and its ecosystem. Some recommendations like banned illegal fishing gears, preventing water pollution, ensuring water flow, fishermen's awareness, implementation of fisheries laws and declaration of fish sanctuary have been coming out to save the fish fauna from extinction. Government and fisheries research institutions along with different agencies must take immediate action through public awareness and education to protect the ecosystem of these valuable fish species and to develop more feasible strategy as conservation measures. The findings of the study could be useful for the management of the Betna River by the policymaker of the country as well as it would be helpful for the researchers for their future study.

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Table-1. Types of fishing gears

Group name	**Name of the fishing gears**		
	Local name	English name	Description of the fishing gears
Net	JhatkaiJal	Cast net	Conical shaped net, nets are cast from the shore or from boat and fishes are caught by falling and closing in on them.
	Dharma Jal	Lift net	Triangular shaped net, the manner of capture with lift net or dip nets is to bring the fish on a flat or bag shaped netting. The nets are operated by hand from the shore or boat.
	Thelajal	Push net	Rectangular shaped net and has a rigid frame that is pushed along the bottom in shallow waters and is used to catch shrimps and small bottom-dwelling fishes.
	Berjal	Seine net	Seine is a fishing net that hangs vertically in the water with its bottom edge held down by weights and its top edge buoyed by float.
	Current jal	Gill net	Twines used for these nets are made of nylon which has a average life span of about 4 years. Large gill net mesh size 180-200 mm. Most boats use small mesh gill net
Traps	Bair/Aton	Trap	Traps are made by splitting bamboo or using can material and set against water current.
Wounding gear	Borshi	Hook and line	Hooks are made of iron and fishes are attracted by a natural or artificial bait(lures).

Table-2. Species composition

Group Name	Species		
	Local name	Scientific name	% of catch
Indian major carps	Rui	*Labeorohita*	3.62
	Catla	*Catlacatla*	2.53
	Mrigal	*Cirrhinuscirrhosus*	1.22
	Kalibaush	*Labeocalbasu*	1.05
	Bata	*labeobata*	2.52
Minor carps/Barb	Sarpunti	*Puntiussarana*	1.52
	Tit punti	*Puntiusticto*	1.01
	Jatpunti	*Puntiussophore*	1.23
	Darkina	*Esomusdanricus*	1.80
Molacarplet	Mola	*Amblypharyngodonmola*	1.90
Mullet	Kachki	*Sicamugilcascasia*	1.77
Gourami	Kholisa	*Colisafasciata*	1.98
Loach	Bourani	*Botiadario*	0.90
	Kajuli	*Ailiacoila*	0.70
Snakehead	Taki/ Lata	*Channapunctatus*	4.56
	Shol	*Channastriata*	3.26
	Gozar	*Channamarulius*	2.20
	cheng	*Channaorientalis*	1.50
	Shing	*Heeropneusfossilis*	1.75
Catfish	Ayre	*Mystusayre*	1.65
	Tengra	*MystusVitatus*	4.25
Seabass/ barramundi	Bhetki	*Latescalcarifer*	4.46
Climbing Perch	Koi	*Anabustestudineus*	2.20
	Napit koi	*Badisbadis*	1.70
Freshwater garfish	Kakila	*Xenentodoncancila*	1.50
Tank goby	Bele	*Glossogobiusgiuris*	2.50
Minnow	Chela	*Chela cachius*	1.50
	Chap chela	*Chela laubuca*	0.70
Feather back	Chitol	*Notopteruschitla*	1.90
	Foli	*Notopterusnototerus*	1.50
Perchlet	Lalchanda	*Parambassisranga*	1.08
	Namachanda	*Chandanama*	1.50
Spiny eel	Guchibaim	*Mastacembeluspancalus*	3.30
	Tara baim	*Macrognathusaculeatus*	2.20
River shad	Chapila	*Gudusiachapra*	2.30
	Ilish	*Hilshailisha*	1.75
Small Prawn	LotiaIcha	*Macrobrachiummirable*	1.50
	Paittaicha	*Machrobrachium rude*	2.20
	Golda chingri	*Macrobrachiumrosenbergii*	3.95
	Chatkaicha	*Macrobrachiummalcolmsonii*	2.20
Srimp	Bagdachingri	*Penaeusmondon*	5.75
	Horinachingri	*Penaeusmonoceros*	3.35
	Chapdachingri	*Penaeusindicus*	3.20
	Bagtarachingri	*Penaeussemisulcatus*	4.75
Crab	Mud Crab	*Scylla serrata*	4.80
Eel	Kuuchia	*Monopteruscuchia*	3.75

Figure-1. The location of the Betna River in Satkhira district of Bangladesh.

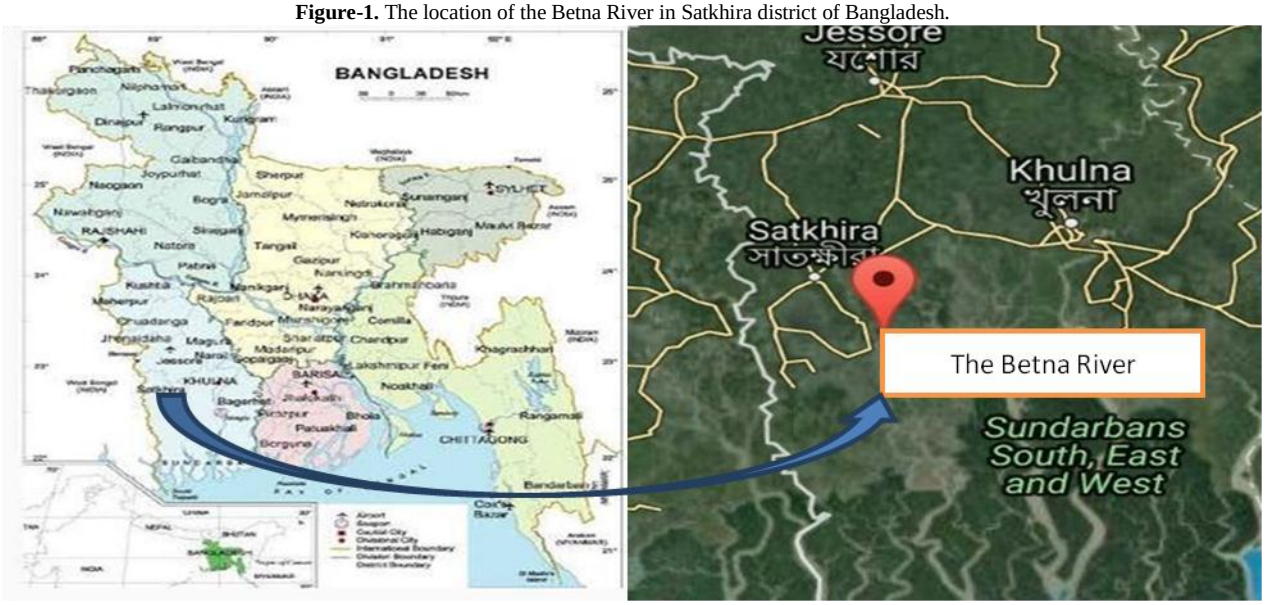

Figure-2. Fishing duration (hr./day) by different fishing gears.

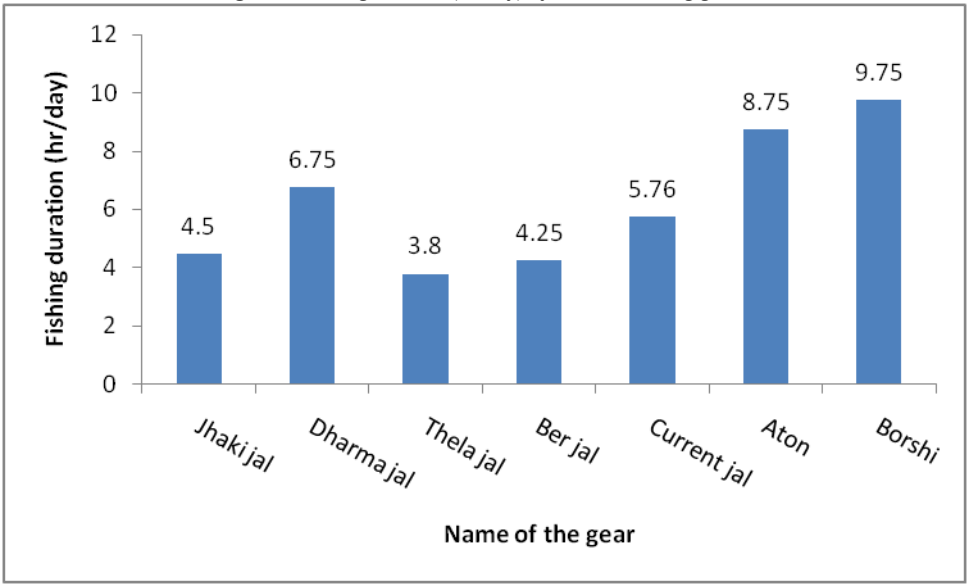

Figure-3. The percent difference of different species composition around the whole year.