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Assessment of Fish Biodiversity and Fishing Practices of the Old Brahmaputra River, Bangladesh

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Abstract: The present study deals with the status of fish biodiversity undertaken during period January 2012 to September 2012 to assess the fish biodiversity and understand the existing fishing practices of the Old Brahmaputra River, Bangladesh. The study was based on primary observations, questionnaire interviews with fishers, focus group discussions with river bank community members and cross-check interviews with key informants. A total of 39 species of fish belonging to 17 common groups were identified in the catches of the Old Brahmaputra River. Survey with fishers shows that among these varieties of fish, the highest amount of fish caught by the fishers was catfishes at about 16.62%. However, the lowest amount catch constituted the minor carp of about 1.29%. After the catfish, the second highest catch was 12.9% of small prawn. Another dominant group major carps contained 11.26% and barbs remained at 11%. Snakeheads constituted 9.61% of the catch and the loaches constituted 1.3% of the total catch. In addition other groups like molacarplet, mullet, gourami, spiny eels, climbing perch, tank goby, minnows, spiny eels, freshwater garfish, perchlet and river shad were found in the Old Brahmaputra River. The threats to the fisheries biodiversity in the study area also reported in this study. Results of the study also revealed that three kinds of fishers were engaged in the Old Brahmaputra River, namely professional fishers, seasonal fishers and subsistence fishers. Seven types of fishing gears like seine net, gill net, cast net, push net, lift net, trap and hook and line were used to fish by the fishers during the survey period. This study indicates a need to identify areas of high fish biodiversity and to select nature reserves to mitigate the loss of fish biodiversity in the Old Brahmaputra River basin.

Key words: Fish Biodiversity · Old Brahmaputra · River Fishing Practices

INTRODUCTION

The effects of changes in biodiversity on ecosystem functioning are becoming evident, although there is uncertainty, many fishery-induced changes in species and size composition of fish communities are now well documented [1]. What has recently become clearer is that these changes affect the structure and functioning of marine as well as riverine ecosystems, including the biomass of species at lower tropic levels [2].

Moreover, stresses due to other factors such as climate change, habitat loss, invasive species, eutrophication and pollution can accentuate fishing-induced declines and inhibit or prevent recoveries [3]. Fisheries managers and policy makers must, therefore, take a precautionary approach in their management of fish diversity.

Biodiversity is the quantity, variety and distribution across biological scales ranging through genetics and life forms of populations, species, communities and ecosystems [4]. It affects the capacity of living systems to respond to changes in the environment, underpins ecosystem function and provides the ecosystem goods and services that support human well-being [5, 6]. Moreover, biodiversity is important for the future sustainability of marine natural resources that include commercial fisheries. While it is axiomatic that biodiversity is essential for sustainable productive fisheries there is surprisingly little supporting evidence.

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The Brahmaputra River is one of the great rivers of Asia and one of the most important rivers of Bangladesh. The about 3,000 km long Brahmaputra, streaming through India enters into Bangladesh from the western side of the Garo Hills through Dewanganj Nalitaban, Jamalpur and Mymensingh [7]. The Brahmaputra River, with more than 1,300 species of plants and animals is one of the richest freshwater ecosystems in the earth. More than 600 of these species are uniquely endemic to the Brahmaputra River basin and in many cases these taxa also represent endemic genera and sometimes endemic families [8]. The river once the blessings for the Bangladesh providing fishing, communication and irrigation facilities but is now drying up. The fishers who have been living beside the river are facing difficulties and hardship due to lack of fish in the river. Now it is, therefore, very important to assess the fish biodiversity along with conservation of the Old Brahmaputra River.

Kabir *et al*. [8] mainly stressed on the assessment of the livelihood status and constraint faced by the fishermen and stated that the Old Brahmaputra River, adjacent to the Mymensingh town, is one of the most important ecosystems with much aquaculture potential. This flood fishery plays a very important role in the alleviation of rural poverty and supplying food to the poor fishing community. Considering the above fact, the present study was carried out to assess fish biodiversity and conservation in the area.

MATERIALS AND METHODS

A survey for a period of six months from January to December 2012 was conducted on the Old Brahmaputra River adjacent to Bangladesh Agricultural University, Mymensingh. The study was based on field survey where primary data were collected from the respondents in the field. The method of collecting data depends on the nature, aim and objectives of the study.

Selection of the Study Area: Selecting of the study area for the research is an important step. The purpose would, therefore, be better served in an area where there is a good source of recreational fisheries. With this view, the Old Brahmaputra River of Mymensingh region was selected for the present study area. The primary area for the study was in the Old Brahmaputra River adjacent to the Bangladesh Agricultural University, Mymensingh, from Railway Bridge (Kalibari Ghat-Latitude 24.754239° N and Longitude 90.417747° E) to the end of the university campus (Latitude 24.719159° N and Longitude 90.447431° E). The Old Brahmaputra River is famous for its rich reserve of aquatic life. A large number of rural people live in the east of the riverbank, whose livelihoods culture and daily activities are related and adapted to its aquatic environment.

Target Groups Fishers: For data collection, the target groups were fishers and fishing community members of the Old Brahmaputra River. A large number of fishers are known to be engaged in fish catching in the Old Brahmaputra River. Fishing is the main activity of the people. The total samples were collected from 120 fishers with the help of questionnaire interviews. Sample target people were selected randomly from the study area. Most of the fishers in the study area were very much cooperative for field survey.

Data Collection Methods: The credibility of the results of a scientific research depends largely on the appropriate methodology used in research. Data were collected from target groups by questionnaire interviews, Participatory Rapid Appraisal (PRA) tool such as Focus Group Discussion (FGD) and cross-check interviews with key informants. The sample size was taken about 30% of individual interview, 50% of FGD and 20% of the cross-check interviews with the key informants of the study area. Samples were selected randomly.

RESULTS AND DISCUSSION

Fishing Practices: Fishers are depending on fishing for their food and income. Villagers are fishing their catch with different abilities and motivations. According to questionnaire interview, about 75% of the families living besides the river are primarily dependent on the fishing from the Old Brahmaputra River. According to focus group discussion, it was found that around 85% are male and 15% are female; 83% are Muslim and remaining 17% are Hindus are involved in fishing in the study area. As per standard practice fishers are categorized into three groups as following:

- Professional fishers, who depend on fishing almost year round for their livelihood;
- Seasonal fishers, who fish only during a part of the year as income earning; and
- Subsistence fishers, who mostly fish for their own consumption.

Fishing season is the time when fishes can be caught legally from waterbodies. Seasons affect the availability of fishes, water quality of water bodies, abundance of food for the fishes and also the using of gears.

Table 1: Types of fishing gears

Group name	Name of gears: Local name	English name	Description of the gears
Nets	Ber jal	Seine net	▪ Rectangular in shape has two border lines. Upper one contains float and lower one contains sinkers. ▪ Sometimes it is as long as 250m.
	Current jal	Gill net	▪ Bag like net and fastened at the corner of four diagonal H poles. ▪ Lift pole is tied at the center and act as like as liver.
	Thela jal	Push net	▪ Rectangular net ▪ Upper border contains float and lower border usually contains sinker. ▪ Mesh size varies from 2.5 cm to 10.0 cm and even 20.0 cm for larger fishes. ▪ Free moving or fixed.
	Jhaki jal	Cast net	▪ Conical shaped and the hauling string of the net is fixed at the narrow apical end of the cone. ▪ The lower end is folded and attached to the net.
	Dharma jal	Lift net	▪ Triangular in outline. ▪ Two bamboo poles, one longer than the other, are fixed at an angle of about 30 degrees.
Wounding gear	Borshi	Hook and line	▪ Made of iron or brass. ▪ The manner of capture fish is to offer real or artificial bait on a single hook or tri hook to allure them to eat.
Traps	Bair/ Borong	--	▪ Made of split bamboo and cane materials. ▪ Tubular shaped basket like a trap. Set against water current. ▪ Set against the water current.

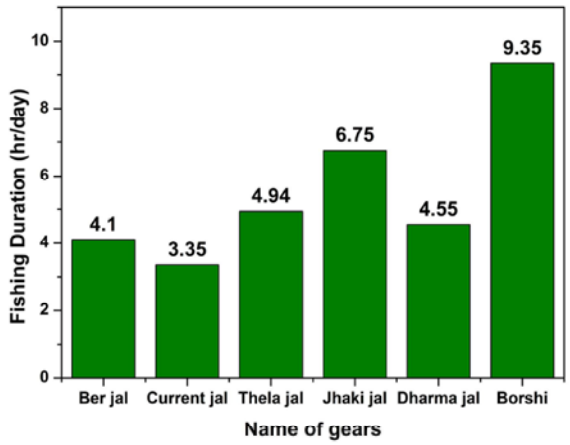

Fig. 1: The average fishing hours of different gears in the Old Brahmaputra River

Fishing Gears and Catch Composition: Various types of fishing gears were found to operate in the study area, they were mostly of the traditional type and some of them were unique for the particular locality. From the survey, it was found that only 7 types of fishing gear were operated by the fishers in the study area (Table 1). These gears are classified into three groups, such as; 1) net, 2) wounding gear and 3) trap. Besides, de-watering and hand picking were also done by the fishers. The water level of the Old Brahmaputra River is usually very low from January to April. During this period the use of any type of gear was very much limited. As soon as the monsoon rain comes down and water level increased the use of all types of gear also increased simultaneously.

The use of fishing gears and operation time depends mainly on habitat type, water depth, type of fishers and abundance of fish. Fishing duration is essential to estimate the fish yields and to keep track of the Catch Per Unit Effort (CPUE). It is revealed that the fishers usually increase their operational hours to maintain a satisfactory catch if the fish availability less. The average fishing hours of commonly used gears are shown in Figure 1.

In the study area, the highest and the lowest fishing duration were recorded in borshi (hook and line) and current jal (gill net) which were 9.35 hours and 3.35 hours per day respectively. The jhaki jal (cast net) is the most common gear used in all area of the Old Brahmaputra River compared to other gears. Fishing duration of other gears recorded was ber jal (seine net) at 4.10 hours, thela jal (push net) at 4.94 hours, dharma jal (lift net) at 4.55 hours, shown in Figure 1.

The Old Brahmaputra River is known to very rich in fish. There are so many fishes are found in this river. In the Old Brahmaputra River, fishes under 17 groups have been found from the Questionnaire interviews. These groups contain 39 species of fishes which comprise 100% catch by weight. Here total weight of catch was about 620 kg. The catch composition of the study area is presented in Table 2 and the percentage of the different fish group shown in Figure 2.

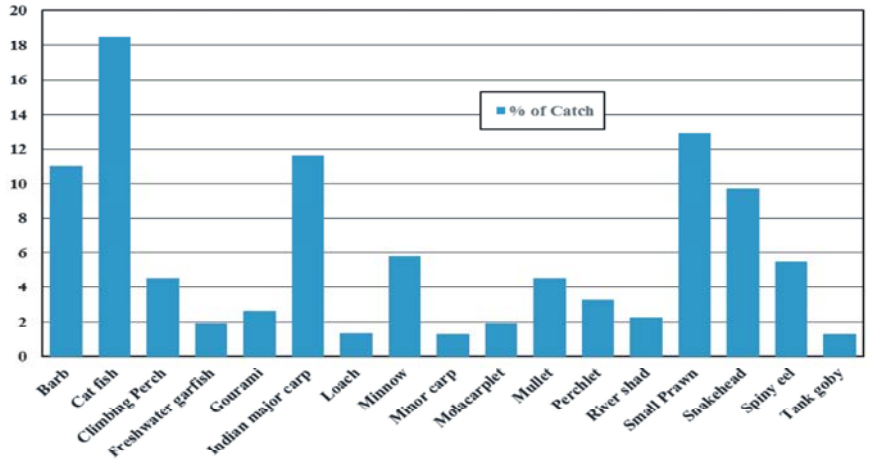

Fig. 2: Percentage of different fish group

Table 2: Catch composition

	Species		
Group name	Local Name	Scientific Name	% of Catch
Indian major carp	Rui	*Labeo rohita*	2.60
	Catla	*Catla catla*	1.94
	Mrigal	*Cirrhinus cirrhosus*	3.88
	Kalibaush	*Labeo calbasu*	3.24
Minor carp	Bata	*Labeo bata*	1.29
Barb	Jat punti	*Puntius sophore*	4.53
	Tit punti	*Puntius ticto*	3.24
	Kanchan punti	*Puntius conchonius*	1.29
	Shar punti	*Puntius sarana*	1.29
	Darkina	*Esomus danricus*	0.65
Snakehead	Taki/ Lata	*Channa punctatus*	6.15
	Shol	*Channa striata*	2.27
	Pipla shol	*Channa barca*	1.29
Loach	Bourani	*Botia dario*	0.65
	Kajuli	*Ailia coila*	0.65
Molacarplet	Mola	*Amblypharyngodon mola*	1.94
Cat fish	Tengra	*Mystus vittatus*	4.53
	Gulsa	*Mystus cavasius*	3.24
	Buzuri tengra	*Mystus bleekeri*	2.6
	Rita	*Rita rita*	3.24
	Boal	*Wallago attu*	4.2
	Kutakanti	*Hara hara*	0.33
	Cheka	*Chaca chaca*	0.33
Mullet	Kachki	*Sicamugil cascasia*	4.53
Gourami	Kholisa	*Colisa fasciata*	2.6
Spiny eel	Guchi baim	*Mastacembelus pancalus*	4.53
	Tara baim	*Macrognathus aculeatus*	0.97
Climbing Perch	Koi	*Anabus testudineus*	3.24
	Napit koi	*Badis badis*	1.29
Tank goby	Bele	*Glossogobius giuris*	1.29
Minnow	Chap chela	*Chela cachius*	0.97
	Chela	*Chela laubuca*	3.88
	Ful chela	*Salmostoma phulo*	0.97
Small Prawn	Icha	*Macrobrachium lamrrei*	7.1
	Kuchi chingri	*Machrobrachium rude*	5.8
Freshwater garfish	Kakila	*Xenentodon cancila*	1.94
Perchlet	Lal chanda	*Parambassis ranga*	0.65
	Nama chanda	*Chanda nama*	2.6
River shad	Chapila	*Gudusia chapra*	2.27

They also mentioned that they use different gears to catch those fish. Each fish tend to be dominant to get caught by specific gear, like Macrobrachium lamrrei, Puntius sophore, Chanda ranga, Puntius ticto, Esomus danricus, Chanda nama and Glossogobius giuris were dominant species to catch with the help of seine net. Puntius sophore, Mystus vittatus, Labeo raita, Cirrhinus cirrhosus were tended to be dominant by the current net. Puntius sophore, Mystus vittatus, Chanda nama, Chanda rangea, Macrobrachium lamrrei, Channa punctatus, Puntius ticto, Esomus danricus, Amblypharyngodon mola were dominant to catch by push net, cast net, lift net, hook and trap.

The Old Brahmaputra River was very rich in biodiversity and the availability of the fish in this river was always remarkable. But now the condition is at stake due to so many natural and manmade reasons. A Survey with the fishermen shows even five years ago about 60 to 65 species were found in the Old Brahmaputra River and now the number has been declined at 39 species. A Survey with fishermen also indicates, illustrated in Figure 2 that among these varieties of fish, the highest amount of fish caught by the fishers was catfishes at about 18.47%. However, the lowest amount catch constituted the minor carp of about 1.29%. After the catfish, the second highest catch was 12.9% of small prawn. Another dominant group major carps contained 11.66% and barbs remained at 11%. Snakeheads constituted 9.61% of the catch and the loaches constituted 1.3% of the total catch.In addition, other groups like molacarplet, mullet, gourami, spiny eels, climbing perch, tank goby, minnows, spiny eels, freshwater garfish, perchlets and river shad were found in the Old Brahmaputra River.

CONCLUSION

The study was conducted about the ecosystem-based approach on fisheries management of the Old Brahmaputra River in Mymensingh region. The study was based on field survey where primary data were collected from the respondents in the field. For data collection, the target groups were fishers and fishing community members of the Old Brahmaputra River. The total samples were 120 for questionnaire interviews. The main objectives of this study were to understand the existing status of fish biodiversity and the fishing practice of the Old Brahmaputra River.

In the present study, it revealed that the Old Brahmaputra River is famous for its rich reserve of aquatic life. A large number of rural people live in the east of the riverbank, whose livelihoods culture and daily activities are related and adapted to its aquatic environment but nowadays the biodiversity of the Old Brahmaputra River is under great threat due to fishing pressure, overfishing, pollution, siltation, urbanization and human encroachment. These have been created a great impact on river ecology. As a result, the water quality is deteriorating day by day and the availability of fish species and another aquatic biodiversity is decreasing gradually. The complete drying up in many parts of the river Brahmaputra is a common scenario during lean season, which is detrimental to fish populations and ecosystem.

The fishers were found to follow three (3) fishing techniques viz., netting, trapping and angling. Within these fishing techniques, seven (7) types of fishing gears recorded to be used by the fishers for fishing. Among them, five were fishing nets, one fishing trap and one wounding gear. A total of 39 species of fish were identified in the catches of the Old Brahmaputra River.

The fishing effort and fishing duration were found to vary with the type of gear. The highest fishing effort and fishing duration were recorded in cast net and hook and lines which were 25.34 gears/day and 9.35 hours/day respectively. The cast net was the most common gear used at all over the study area compared to other gears and catches most of the fish species in all sizes. The findings of the study will, in particular, be applicable to the management of the Old Brahmaputra River in Mymensingh. Moreover, the findings are expected to be useful to students, researchers and policy makers.

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