Original Article

Study of Fish Diversity and Livelihood Status of Fishermen in Karatoya River, Panchagarh Region

Md. Abdur Razzaq Joadder[1], Sushen Roy[2], Dil Afroza Khanom[3], Syeda Nusrat Jahan[4], Md. Al-Amin Sarker[5]

Abstract

Background: Fisheries are indispensable part in the livelihoods of the people of Bangladesh. **Objective:** The study was conducted to investigate the fish diversity and socio-economic profiles of the fishermen of Karatoya River in Panchagarh district in the Northern part of Bangladesh. **Methodology:** Pertinent information was collected from forty randomly selected fishermen from the study area who were directly involved in fishing in the rivers during the period of twelve months from July 2017 to June 2018. The data interpretations showed that 50 fish species under 8 orders and 17 families were recorded from the Karatoya River during the study period. Cypriniformes was found as the most dominant order constituting 48% of the total fish populationfollowed by Channiformes (6%), Sliuriformes(18%), Clupiformes (6%), Mastacembeliformes (6%), Perciformes (12%), Beloniformes (2%), Tenaodontifomres (2%). Fishes in this river are seriously affected by the various kinds of natural and manmade causes. Under this circumstance, a better understanding of the diversity and distribution of fishes in the Karatoya River is urgently needed. **Result:** In the study area the fishermen age range from 16 to 65 years. It was found that most of the fishermen (35%) illiterate though a small proportion completed primary level of education. 75% percent of the fishermen used their own tube-well, while 20% and 5% used government and neighbors' tube-well, respectively. In the study area, 55% of the fishermen were far from power plants and the rest of them had (45%) access to electricity. Majority (45%) of the fishermen was 1-10 decimal land, while 17.5% had 11-20 decimal lands and 15% had above 40 decimal lands and significant proportion of fishermen depend upon village doctors (62.5%) for their health facilities. Forty five percent of fishermen were engaged in fishing as their main occupation, 40% in agriculture and 15% in daily labor. **Conclusion:** Fishermen of Karatoya River were mostly illiterate, poor income, lack of training exposure and lack of awareness about their health facilities and sanitation. *[Journal of Science Foundation, July 2019;17(2):54-66]*

Keywords: Fish diversity, Karatoya River, Livelihood Status, Fishermen

*[**Reviewed:** 3 April 2019; **Accepted on:** 1 June 2019; **Published on:** 1 July 2019]*

[1]Professor, Department of Fisheries, Faculty of Agriculture, Rajshahi University, Rajshahi, Bangladesh
[2]MS Management, Department of Fisheries, Faculty of Agriculture, Rajshahi University, Rajshahi, Bangladesh
[3]Associate Professor, Department of Fisheries, Faculty of Agriculture, Rajshahi University, Rajshahi, Bangladesh
[4]Associate Professor, Department of Fisheries, Faculty of Agriculture, Rajshahi University, Rajshahi, Bangladesh
[5]Associate Professor, Department of Fisheries, Faculty of Agriculture, Rajshahi University, Rajshahi, Bangladesh

Correspondence: Md. Abdur Razzaq Joadder, Professor, Department of Fisheries, Faculty of Agriculture, Rajshahi University, Rajshahi, Bangladesh; Cell no.: +8801716535379; Email: raz2006_ru@yahoo.com

Introduction

Bangladesh is enriched with a plentiful of river. It is called a land of rivers as it has about 700 rivers including tributaries flow through the country constituting a waterway of total length around 24,140 kilometres (15,000 mi) (Banglapedia, 2012). Bangladesh is gifted with vast fisheries resources. The land, water and climate are very much suitable for fish production and fisheries resources management. Although aquaculture has been developed in Bangladesh last two decades, but its development is not enough and equal all over the country, especially most of the districts of the northern part of Bangladesh.

The rivers are offering immense scope and potentiality for augmenting fish production and socio-economic security of the people living around. Fisheries sector plays an important role contributing 3.61% of total GDP and 24.41% of total agriculture production (DoF 2018). It's also plays an important role in the national economy of Bangladesh through employment generation, poverty alleviation, supply of animal protein and foreign exchange earnings. About more than 11.0% of the total population of Bangladesh depends on fishing for their livelihood directly or indirectly (DoF 2018). This sector also contributes about 60.0% of the national animal protein in-take and 19% percent of the total protein in-take in the average Bangladeshi diet (DoF 2014). According to nutrition scientist an adult people should consume about 60g fish daily. But people in our country consume about 54g fish daily (DoF 2016). For subsistence fishermen and their families, the fish they catch is often their only source of protein and essential minerals. So, it is needed to increase fish production to fulfill the demand.

Bangladesh has the third biggest aquatic fish bio-diversity in Asia, after China and India, with about 800 species in fresh, brackish and marine waters (Hussain and Mazid, 2001). It contains huge aquatic fish biodiversity with 260 freshwater fish species where minnows, catfish, eels, perch, gobies, clupeids and prawns constituted the major portion (DoF 2009).According to IUCN 2000 report, out of 266 inland fish species 12 are critically endangered, 28 are endangered, 14 are vulnerable. Over exploitation, degradation of fish habitats, and subsequent declining fish production from natural aquatic resources, inland capture fisheries contribution has declined from 50.0% to 35.0% of total fish production and marine capture fisheries production has remained static over the last ten years (Mazid 2010).

Fish and fisheries are indispensable part in the livelihoods of the people of Bangladesh since time immemorial and it is the part of our cultural heritage (Ali et al., 2008). Fishing is the main source of income of the river adjacent fishermen household. But the fishermen cannot catch fish properly due to economic, social and technical constraints. Thus, the socio-economic conditions of the fishermen are not so good. They are not capable to earn sufficient amount of money to meet basic needs (Alam, 2005). Fishermen community is deemed to be one of the most vulnerable communities in terms of their livelihood opportunities in Bangladesh (Farhana and Naser, 2006). In Bangladesh, fishermen are very important communities, they lives hand to mouth and considered as the poorest among the poor (Kabir et al., 2013). Most of the fishermen are deprived of many amenities. All the times they have to struggle to survive, so, livelihood status of fishing community is not satisfactory at all.

However, now-a-days fish production in open water bodies decreasing due to many causes. These are conservation of fisheries resources, various natural calamities and man-made problems, lack of proper management and technically skilled manpower and lack of funds. But the rivers, numerous beels and floodplains, are gradually declining because of flood control, drainage and irrigation project. The rapid population growth in Bangladesh and the faster rate of expansion of agricultural, domestic, irrigation and industrial activities for which water is essential, frequently shifting priorities from inland fisheries development to other uses.

Besides these, lack of a national fish policy is one of the important causes for slow development rate of this sector. Indiscriminate and destructive fishing practices cause havoc to the aquatic biodiversity (Hussain and Hossain, 1999). Tsai and Ali (1986) noted that construction of Farakka dam and over embankments, sedimentation of river and above all overfishing are the major factors for the decline of major carps in the existing open inland waters in the river system of Bangladesh. To get rid of this, the National Fish Policy has been formulated, but the proper implementation of this policy is still in process.

The Karatoya River system is one of the major river systems of Panchagarh district. It has great influence on fish biodiversity and socio-economic status of fishermen. Many families are directly involved in fishing and earning to maintain their livelihood by fishing throughout the year. For proper development of fishing community, it is essential to understand the baseline information to initiate proper developmental steps and improve the livelihood of fishermen. But, there is no sufficient information about livelihood of fishermen community in Northern part of Bangladesh. However, few studies on assessment of fish diversity and socio-economic conditions of fishermen were carried out but all these efforts lack specific information of livelihood.

Methodology

Study Area: The proposed study was conducted in Karatoya River, Panchagarh district under Rangpur division, northern Bangladesh. The study was conducted from two main points Telipara to Goalborgighat in Karatoya River including area of 6 kilometer. The study area located at 26°07′07″N 88°45′33″E.

Figure I: Showing the study area (🟥) (Source: Google)

Study Period: This study was conducted over a period of 12 months from July 2017 to June 2018.

Target group: Fishermen: In the study area, a large number of fishermen earn their livelihood by catching fish and its associated activities. Forty fishermen were selected for data collection. It is reported that maximum number of the fishermen are poor and few are solvent. All the fishermen live in adjacent of the river in Debiganj upazila and capture fish in order to supplement their family income.

Data Collection Methods: For data collection, a set of interview schedule designed for this study. The questionnaire was designed both close and open from of questions. However, some descriptive types of questions are also necessary to know the fact. That is why both close and open questions were used in the questionnaire. The draft questionnaire was tested with 10 fishermen in the study area. In the pilot survey, much attention was given to any new information, which was not designed to be asked, but was important and informative towards the objective. The information needed for this study was collected from multiple sources. Firstly, an extensive secondary data (literature review) were made in the area of fisheries resources. Secondly, the primary data for the study were collected through questionnaire interviews, Participatory Rural Appraisal (PRA) tool such as Focus Group Discussion (FGD) and crosscheck interview with key informants, and direct observation. Fishermen's data were collected using direct observation.

Questionnaire interview: The questionnaire interviews were conducted at the point sites in the selected study area and other different suitable places. Before going to make an actual interview, a brief introduction about the objective of the study was given to each of the fishermen and assured them that all information would be kept confidential. Each question was explained clearly and asked systematically as for their sound understanding. Time required for each interview was about 30 minutes to an hour.

Focus Group Discussion: PRA is a group of methods to collect information from target group in a participatory way. For this research PRA tool such as Focus Group Discussion (FGD) was conducted with fishermen. FGD is a group meeting where farmers from the target communities discuss selected topics. In this research, FGD was used to get an overview of particular issues such as existing fish production systems, constraints of fish production, socio-economic condition etc. A total of 6 FGD sessions was conducted, where each group size of FGD was 6 to10 fishermen. FGD session was held in front of village shops, under big trees, fishermen houses and bankside of the river wherever there were spontaneous gathering. The primary data about fish availability, fishing gear and crafts for the study were collected from the fishermen, fish farmers, and experienced persons.

Crosscheck Interviews: After collecting the data through questionnaire interviews and FGD, it was necessary to check the information for justification of collected data. If there were such items, which had been contradictory, then information's were collected from key informants. Crosscheck interviews were conducted with key informants such as Upazila Fisheries Officer, local experienced fishermen etc. Key informants were interviewed at their office and/ or houses.

Direct observation: Direct observation was followed to collect data from the study area. The observation made for this study as follows: fish species captured, different types of gears and crafts as well as different types of net and other fishing components.

Data Processing and Analysis: The collecting data were analyzed mainly based on tabular descriptive statistical techniques. Tabular technique was applied for the analysis of data by using simple statistical tools like total, average and percentages. Microsoft® Excel was used for analyzing collected data.

Result

Fish Diversity: A total of 50 fish species under 8 orders and 17 families were recorded from the Karatoya River during the study period. Among those Cypriniformes was found as the most dominant order constituting 48% of the total fish population considering species variety and abundance, and Siluriformes constituting 18% and Perciformes constituting 12% occupied second and third position in abundance, respectively. The lowest number of species constituting 2% was counted for the order Beloniformes and Tetraodontifomres. Only one species was obtained for each during the period of investigation. Those fish species were *Xenentodoncancila* and *Tetraodoncutcutio* belong to the family Belonidae and Tetraodontidae, respectively (Table 1).

Table1: Fish species found in Karatoya River during the study period

Order	Family	Sl. No.	Local name	Scientific name	Availability
		1.	Rui	*Labeorohita* (Hamilton, 1822)	Rainy season
		2.	Bata	*Labeobata* (Hamilton)	Rainy season
		3.	Katla	*Catlacatla* (Hamilton &Buch, 1822)	Rainy season
		4.	Mrigel	*Cirrhinusmrigala* (Hamilton & Bloch, 1822)	Rainy season
		5.	Kalibau	*Labeocalbasu* (Hamilton &Buch, 1822)	Rainy season
		6.	Raikhor	*Cirrhinusreba*	Rainy season
		7.	Grass carp	*Hypophthalmichthys molitrix* (Valenciennes)	Rainy season
		8.	Bighead carp	*Aristichthysnobilis*	Rainy season
		9.	Silver carp	*Ctenopharyngodonidella* (Valenciennes)	Rainy season
		10.	Punti	*Puntiusgonionotus*	Rainy season

1.Order: Cypriniformes	Family: Cyprinidae	11.	Sarpunti	*Puntiussarana* (Hamilton, 1822)	Round the year
		12.	Punti	*Puntiussophore* (Hamilton, 1822)	Round the year
		13.	Common carp	*Cyprinuscarpio*var.*communis*(Linnaeus)	Rainy season
		14.	Miror carp	*Cyprinuscarpio*var. *specularis* (Linnaeus)	Rainy season
		15.	Chela	*Salmostomaphula* (Hamilton & Bloch, 1822)	Round the year
		16.	Mola	*Amblypharyngodonmola* (Hamilton, 1822)	Round the year
		17.	Darkina	*Esomusdanricus* (Hamilton, 1822)	Rainy season
		18.	Tilapia	*Oreochromismossambicus*	Rainy season
		19.	Boirali	*Bariliusbarila*	Round the year
		20.	Dhela	*Rohteecotio*	Rainy season
		21.	Nilotica	*Oreochromisniloticus*	Rainy season
	Family: Cobitidae	22.	Poya	*Lepidocephalusguntea*(Hora)	Round the year
		23.	Puiya	*Lepidocephalichthysberdmorei*	Round the year
		24.	Rani	*Botiadario*	Round the year
2.Order: Channiformes	Family: Channidae	25.	Shol	*Channastriatus* (Bloch, 1801)	Round the year
		26.	Taki	*Channapunctatus* (Bloch & Schneider, 1801)	Round the year
		27.	Chang	*Channaorientalies*	Round the
3.Order: Sliuriformes	Family: Heteropneustidae	28.	Shing	*Heteropneustesfossilis* (Bloch,1792)	Rainy season
	Family: Claridae	29.	Magur	*Clariusbatrachus*	Autum to winter
	Family: Schilbeidae	30.	Batasi	*Pseudeutropius atherinaides*	Rainy season
		31.	Baspata	*Ailia coila* (Hamilton)	Round the year
	Family: Siluridae	32.	Boal	*Wallagoattu*	Round the year
	Family: Bagridae	33.	Gulsha	*Mystuscavasius*	Round the year
		34.	Tengra	*Mystustengara*	Round the year
		35.	Ayre	*Mystusaor* (Hamilton)	Round the year
	Family: Pangasiida	36.	Pangus	*Pangasiussutchi*	Rainy season
4.Order:	Family:Notopteridae	37.	Foli	*Notopterusnotopterus* (Pallas, Autumn 1810)	Autum

| Clupiformes		38.	Chital	Notopteruschitala	Round the year
	Family: Clupeidae	39.	Kaski	*Coricasoborna*	Round the year
5.Order: Mastacembeliformes	Family: Mastacembelidae	40.	Tara baim	*Macrognathusaculeatus*(Bloch, 1810)	Round the year
		41.	Guchi, baim	*Mastacembeluspancalus*	Round the year
		42.	Guchi	*Maslacembelusarmatus*	Round the year
6. Order: Perciformes	Family: Anabantidae	43.	Koi	*Anabas testudineus* (Bloch, 1795)	Round the year
		44.	Khalisha	*Colisafasciatus* (Bloch, 1795)	Round the year
		45.	Lalkhalisha	*Colisa lalius*	Round the year
	Family: Gobiidae	46.	Bele	*Glossogobiusgiuris* (Ham Buch., 1822)	Round the year
	Family: Centropomidae	47.	Chanda	*Chandanama* (Hamilton, 1822)	Round the year
		48.	Lalchanda	*Chandaranga* (Hamiltion, 1822)	Round the year
7. Order: Beloniformes	Family: Belonidae	49.	Kakila	*Xenentodoncancila*	Round the year
8.Order: Tenaodontifomres	Family: Tetraodontidae	50.	Tepa, Potka	*Tetraodoncutcutio* (Hamilton &Buch., 1822)	Rainy season
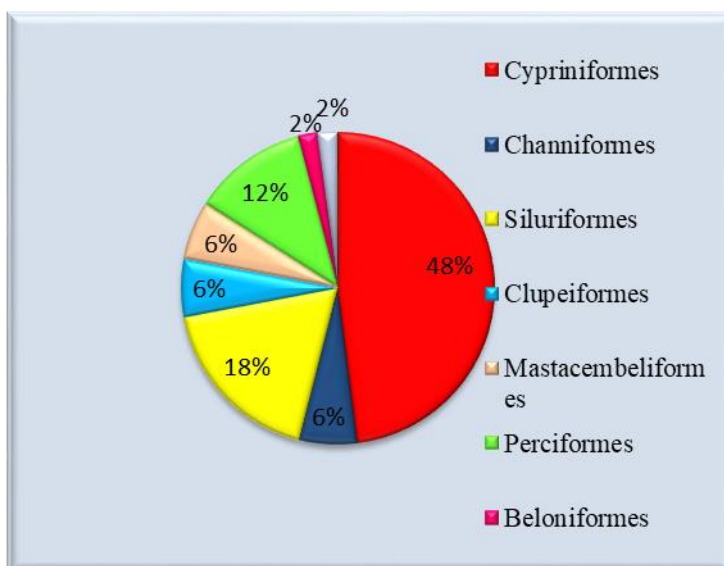
Figure II: Order wise fish diversity in the study area

Livelihood conception

Age Structure: In the study area the age of the fishermen ranged from 16 to 65 years. The fishermen were classified into the following four categories according to their age (Figure III).
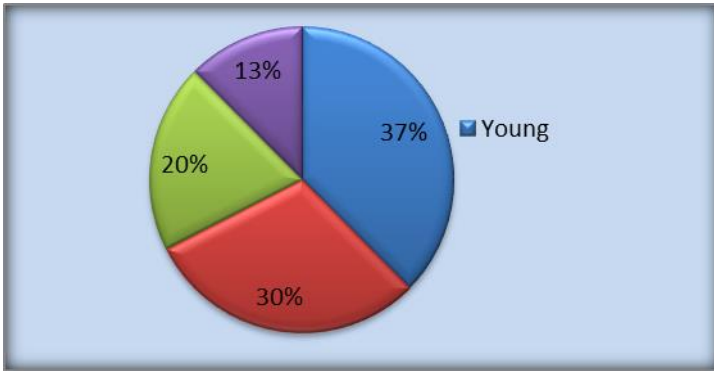
Figure III: Distribution of fishermen according to their age

Religious status: It was found that Muslims were featuring as the absolute majority (75.0%) followed by Hindus (25%) with no Buddhists or Christians (Figure IV).
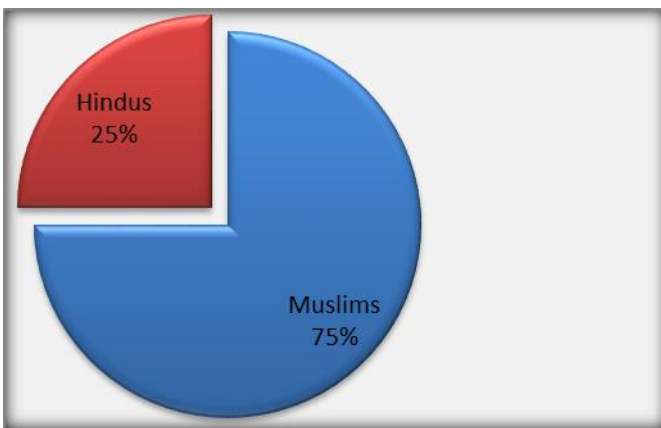

Figure IV: Distribution of Fishermen According to Religious Status

Family Type and Family Size: In this study, it found that 35% families were nuclear family and 65% was joint family (Figure V).
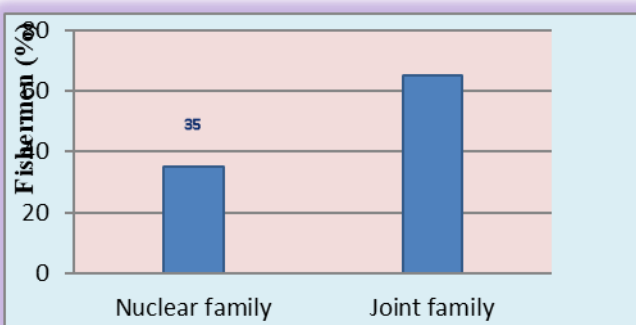

Figure V: Distribution of Fishermen According To Family Type

Family size is defined as the number of persons, either working or not, belonging to the same family. Family size was categorized as small family (member 2 to 4), medium family (member 5 to 7) and large family (member above 7). During the period of the investigation, small family constituted 20%, medium family constituted 50% and large family constituted 30% of the total surveyed fishermen (Figure VI).
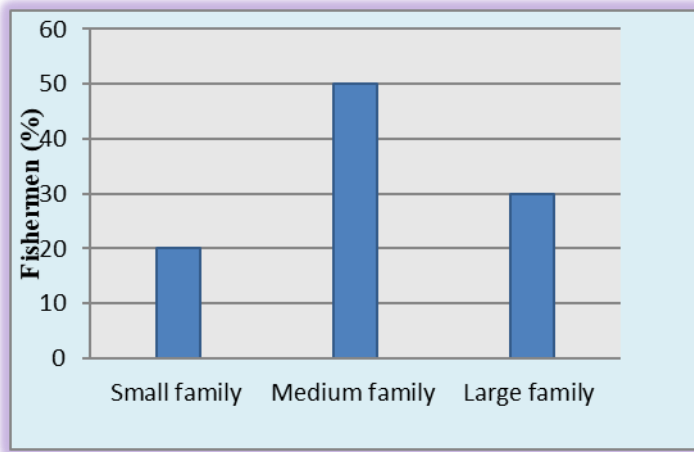
Figure VI: Distribution of Fishermen According To Their Family Size

Educational Status: The fishermen in the locality had varying level of educational background. Most of the fishermen were illiterate (35%), small portion of them can sign only (25%). Some had primary and SSC level of education (20%) and (12.5%), respectively but very few numbers of fishermen (7.5%) had HSC level of education (Table 2).

Table 2: Distribution of the Fishermen According To Their Educational Status

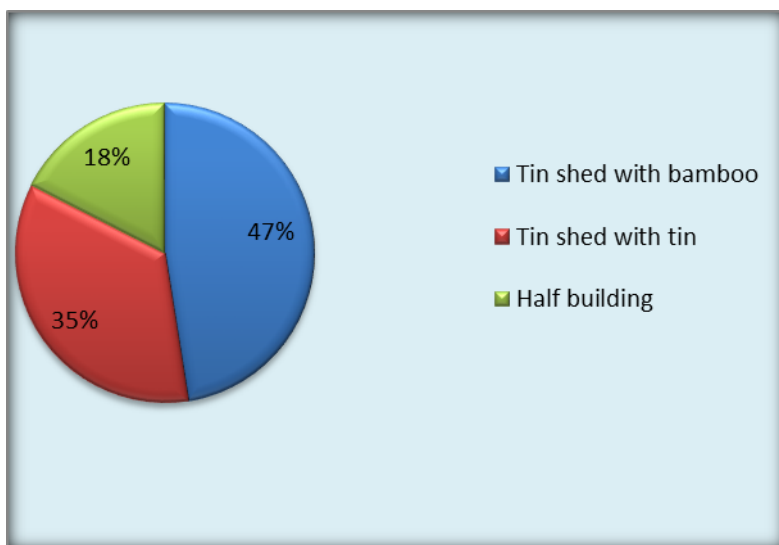| Categories	Frequency	Percent
Illiterate	14	35
Sign only	10	25
Primary	8	20
SSC	5	12.5
HSC	3	7.5
Total	**40**	**100**

Status of Physical Properties

Figure VII: Distribution of Fishermen According To Housing Condition

Housing Condition: Housing condition of the fishermen were dominated by Tin shed with bamboo (47%), followed by Tin shed with tin (35%) and half building (18%). No fisherman was found to have pakka house (Figure VII).

Drinking Water Facilities: The study showed that 100.0% of the fishermen households used tube-well water for drinking purposes and among them 75.0% fishermen used their own tube-well, 20.0% used government tube-well and remaining 5.0% used neighbors tube-well as a source of water for drinking (Figure VIII).
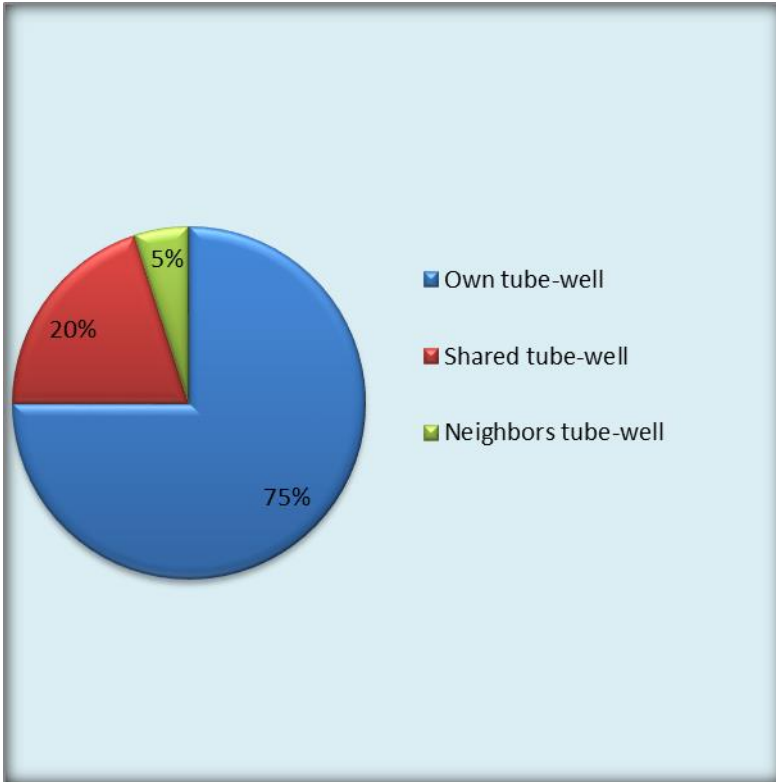

Figure VIII: Distribution of Fishermen According To Drinking Water Sources

Sanitary Facilities: In the study, it revealed that 62% of the toilets were kacha, 23% toilets were semi pakka and 15% of the fishermen had no sanitary facilities (Figure 8). There was no pakka sanitation system used by the sampled fishermen (Figure IX).
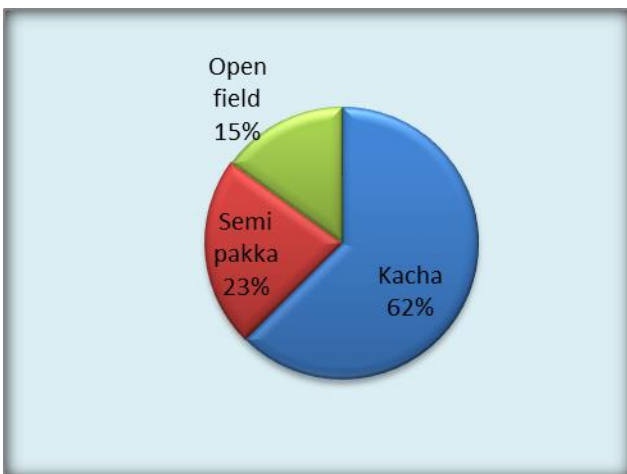

Figure IX: Distribution of Fishermen According To the Sources of Sanitary Facilities

Health Facilities: A significant proportion of fishermen depend upon village doctors (62.5%) who actually posses no knowledge on medical science. About 25% respondent got health service from village kabiraj and 7.5% from upazila health complex and only 5% take health service from MBBS doctor outdoor chamber (Figure X).
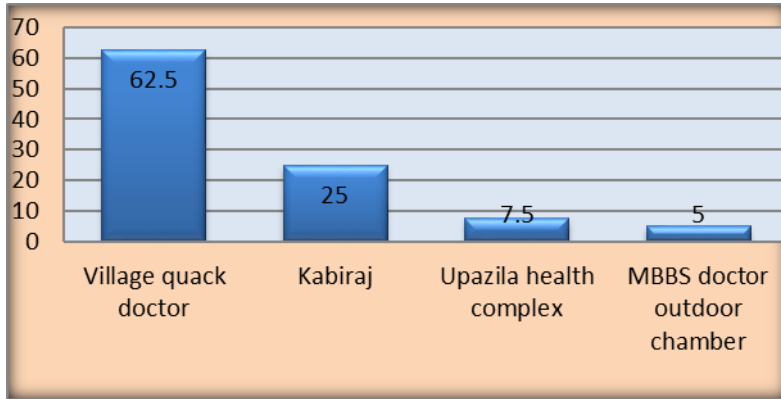

Figure X: Distribution of Fishermen According To the Sources of Health Facilities

Electricity Facilities: In the study area, of the total (40) interviewed, 55% fishermen were far from power plants and the rest (45%) had access to electricity.
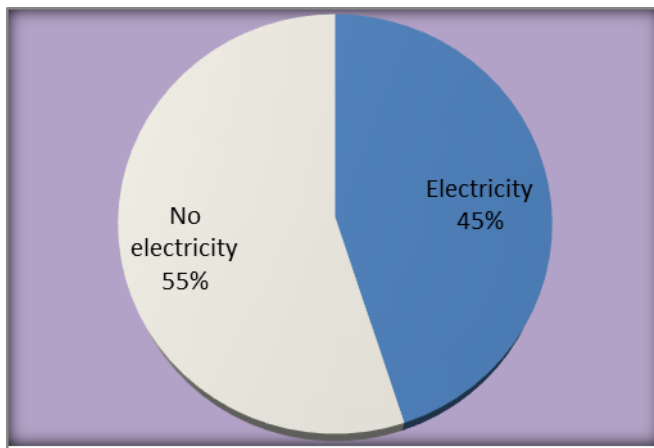

Figure X: Distribution of fishermen according to electricity facilities

Financial Status

Land Properties: In the study area, the land ownership of fishermen was grouped into several categories. Majority of the fishermen them had 1-10 decimal lands (45%), while 5% were landless, 17.5% had 11-20 decimal, 12.5% had 21-30 decimal, 5% had 31-40 decimal and only 15% had above 40 decimal lands. Usually the landless fishermen live in Government land (khas land) and they were unable to buy land due to very low income (Table 3).

Table 3: Land properties of fishermen in the surveyed areas

Categories	Frequency	Percent
Landless	2	5
1-10 decimal	18	45
11-20 decimal	7	17.5

21-30 decimal	5	12.5
31-40 decimal	2	5
Above 40 decimal	6	15
Total	**40**	**100.00**

Occupational Status

The study revealed that 45% of fishermen were engaged in fishing, 40% in agriculture and 15% in daily labor in sand business (Figure XII).
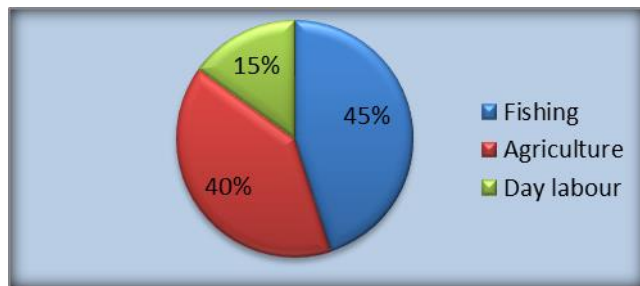

Figure XII: Distribution of fishermen according to occupational status

Annual Income of Fisherman: The fishermen were grouped into four categories based on their annual income and found that 50% fishermen annual income between 20000 to 30000 BDT (Bangladeshi Taka) and 20% fishermen income of 30001 to 40000 BDT and only 12.5% fishermen annual income above 50000 BDT (Table 4).

Table 4: Annual Incomes of the Fishermen in the Study Areas

Categories (BDT)	Frequency	Percent
20000-30000	20	50
30001-40000	8	20
40001-50000	7	17.5
Above 50000	5	12.5
Total	**40**	**100**

Current Fishing Practices and Implications for Biodiversity

Major gear used in Karatoya River: Various types of fishing gear are used in the Karatoya River. The type of gear used differs according to the target species, type of water body, labor intensity, cost, materials available, and profit. Cast nets, spears, lift nets, and gill nets are operated both day and night. However, the trap units are used only at night, while push nets and seine nets are used only during the daytime. Furthermore, the use of spears and lift nets is seasonal, limited to the wet season.

Description of nets: Different types of nets are used in the Karatoya River. The fishermen and non-professional fishermen use nets to catch fishes in different fishing ground. The fiber use and the mesh size are very important for nets. The thickness of the fiber used mesh size floats and sinkers used in the nets differ in quality, quantity and design depending on the size of fish catch and depth of water.

Table 5: Different types of nets used for fishing in the Karatoya River

Name of gear	Local Bengali name	Main use of the gear types	Impact on biodiversity
Gill net	Patajal, Fashjal, Current jal.	Mono-filament gill net (current jal); the most effective for catching small fish	High: The most commonly used and most destructive for fish biodiversity
Seine net	Berjal, Jagatberjal, Katha berjal.	More fish are caught by seine nets than any other basic method. Can have large, medium or very small mesh.	Medium/High: Impact depends on mesh size; small-mesh seine net is much more destructive than small-mesh gill nets
Cast net	Kheplajal, Toirajal, Jhakijal.	Common and primitive nets used all over the country, operated by a single person on the bank, in shallow water, or from a boat in open areas	Low: Generally not harmful for fish biodiversity
Push net	Thelajal, Dhormojal.	Small net mounted on a triangular bamboo frame. Used in late monsoon and dry seasons.	Medium: Harmful during post breeding season

Description of Traps

In our country, there are many types of traps are used for fishing. These traps are used to catch fish which are allowed to get in but prevented escaping. The professional as well as non-professional fishermen catch fish by using traps. The traps are usually made of split bamboo tied with rope. From the present study many kinds of traps are found in the study area of the Karatoya River.

Hooks and line

For line fishing the basic need is hook and bait. The principle of line fishing is to offer a real or artificial bait to entice the fish, which is then unable to release the bait and it lifted form water. Metallic hooks of various shape and size are used for this purpose. During the study period 4 types of hook and line were found to use by the fishermen in Karatoya River. The particulars of different hooks and lines are discussed below:

Table 4: Different types of hook and line used for fishing in the Karatoya River

Type of gear	Name of gear	No. of hooks	Using season	Common caught species
	Daunbarshi	5-50	August- December	Bele, Boal, Shol, Gojar, Taki etc.
	Chip barshi	1-2	Round the year	Rui, Catla, Tilapia, PutiTengra etc.,
	Wheel barsi	1-2	August- October	Boal, Foli, Chital, Pabda
Hook and line	Patabarsi	1-2	July-November	Magur, Boal

Conclusion

River is the main source of fish production in the inland open water bodies in northern Bangladesh especially in Karatoya River. At present, loss of biodiversity is an alarming in Karatoya River due to several reasonsand the 1ast few years, the production of fish from this source has gradually been declining. This is because of natural and man-made factors. These are; flood control, water drainage and construction of dam and barrage in the irrigation projects, exploitation of matured brood fish and their juveniles, removal of excess water for crop cultivation, release of hazardous chemicals and poisonous substances from the run-off

into the river and other water bodies, pollution of water using chemical insecticides and fertilizers in the agricultural fields, reduction of water holding capacity of river due to siltation, and harvesting of excessive amounts of fish to meet the demand of growing populations. The present study will provide an important baseline for sustainable management of fisheries resources, fish production, fish diversity, fishing gear and craft, manpower and infrastructure, training activities, credit facilities and extension activities. It is therefore essential to provide the necessary institutional and organizational supports and extension services for increasing fish diversity as well as sustainable livelihood status of fishermen in Karatoya River.

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