Diversity of fish fauna and fishing gears used in the River Banar, Mymensingh, Bangladesh

MST. ARMINA SULTANA, SABUJ KANTI MAZUMDER*
AND MRITYUNJOY KUNDA
Department of Aquatic Resource Management,
Sylhet Agricultural University, Sylhet 3100, Bangladesh
*E-mail: skmazumder.arm@sau.ac.bd

Abstract. The study was conducted during February 2017- January 2018. Data were collected by Questionnaire Interview (QI), Focus Group Discussion (FGD) and cross-check Interview of fishermen and resource persons from 8 villages by the river Banar under 4 Unions of Fulbaria Upazila, under Mymensingh District. A total of 62 species of fish and shellfish under 10 Orders and 24 Families were recorded from the Banar river. Among the Orders recorded from the studied river, Cypriniformes (30.65%) was the most dominant Order followed by Siluriformes (29.04%), Perciformes (22.58%), Synbranchiformes (6.45%), and Decapoda (3.23%). Cyprinidae was the most dominant family contributing 17 species. The availability status of identified species were common (40.32%), seasonal (20.97%), rare (17.74%) and very rare (20.97%). Seventeen threatened fish species were recorded from the river in which 8 species were endangered, 7 were vulnerable and 2 were critically endangered. Among the threatened fish species, endangered (47.06%) was found to be most abundant followed by vulnerable (41.18%) and critically endangered (11.76%). Fishermen were found to use 10 types of the fishing gears. Use of illegal fishing gears, overfishing, decreasing depth of river and katha fishing were observed as major threats for fish diversity in the river.

Keywords: Fish fauna, Fishing gear, Conservation, Banar river.

Introduction

Riverine capture fisheries in the form of common property and open access resources constitute a vital component of the agro-ecosystem of rural Bangladesh (Blaikie and Sadeque 2000). About 11% of the total population are directly or indirectly depend on fisheries (DoF 2014). For fishing, different types of crafts, gears and traps are used. Different types of fishing methods had been used from prehistoric times and now fishing methods have been modified. The fishermen select 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. Throughout the last century, riverine ecosystems have suffered from intense human intervention resulting in habitat loss and degradation and as a consequence, many fish species have become highly endangered, particularly in rivers where heavy demand is placed on freshwaters (Rahman *et al.* 2012). A total of 64 fish species of Bangladesh have been declared threatened by IUCN (IUCN 2016). The threat for the terrestrial and freshwater species is the destruction of

their habitats, overfishing, rapid extraction of fish seed and broodstock, destructive and unregulated fishing practices, pollution, introduction of exotic species, loss of aquatic habitat due to siltation, dam construction, and other anthropogenic activities (Allan and Flecker 1993).

The Banar river is the major river of Fulbaria Upazila which plays a significant role in supplying fish and prawn as a source of protein and providing livelihood to the local people. To date, no previous study on fish fauna and fishing gears in the river Banar was carried out. The biodiversity and its conservation are regarded as one of the major issues of enabling sustainable use of natural resources and are essential for the Banar river. The objectives of the present study were to identify the fish biodiversity, fishing gears and existing threats to the fish diversity and to suggest proper management strategies for the conservation of fish biodiversity of the Banar river.

Materials and Methods

Study area and periods: The primary criterion for the selection of the study area was a suitable geographical coverage for wider variety of fish biodiversity and good numbers of fishermen. The Banar river of Fulbaria upazila under Mymensingh District was selected for the present study. Banar river is an important river of Fulabria Upazila which provides fish to the local people and livelihood to many fishermen (Fig. 1) surrounding the river. The length of the river is 50-60 km and average width is 15.25 m. The main source of water is rainfall and the depth of Banar river is around 3 to 4.5 m in rainy season and around 1 to 1.5 m in winter season. The study periods were from February 2017 to January 2018.
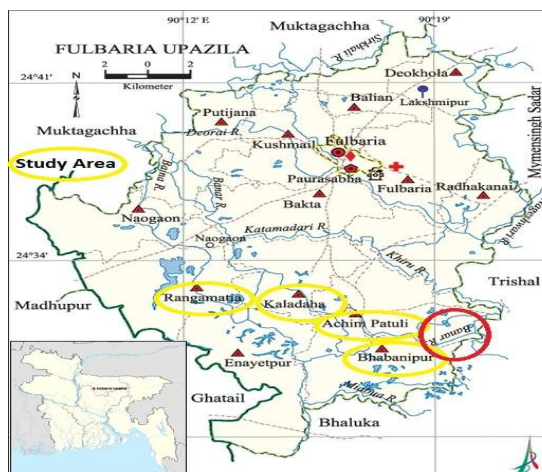

Fig. 1. Map depicting Banar river (red circle) and study area (Yellow circles).

Data collection methods: 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 primary areas of questionnaire interview (QI) and Focus Group Discussion (FGD) were 8 villages named Anuhati and Babuganj of Rangamatia Union, Kaladoho and Shibrampur of Kaladoho Union, Gopalpur, Titarchala and Bashdi of Asim Union and Kandania of Bhobanipur Union. A total of 80 fishermen were selected randomly for questionnaire interview

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about the fish biodiversity and fishing gears used in the Banar river. The number of fishermen participated in each Focus Group Discussion (FGD) were 12 to 15. QI and FDGs were conducted in fish markets, fish landing centers and fishing spot. Cross-check interviews were conducted with key persons such as Upazila Fisheries Officer (UFO), school teachers, local leaders, and Government and NGO workers. Furthermore, necessary data and information for threats to biodiversity and its conservation were collected from experienced persons related to fisheries sectors and available literatures. Present status of the collected species were assessed in four categories on the basis of availability of fishes of the Banar river as: common (C)-species found throughout the year, seasonal (S)-species found seasonally, rare (R)-species found sporadically and very rare (VR)- species almost not found in the study area.

Data processing and analysis: Data were summarized and scrutinized carefully before the actual tabulation and scrutinized carefully and analyzed by MS Excel 2010.

Results

Status of fish fauna: The Banar river provides habitat for many economically important fishes and serves as breeding, nursing and feeding ground of many wild fish species. From the present study a total of 62 species of fish and prawn species comprising 10 Orders and 24 Families were identified (Table I). The order based percentage analysis of the recorded species of fish and shellfish showed highest percentage under the Order Cypriniformes (30.65%) followed by Siluriformes (29.04%), Perciformes (22.58%), Synbranchiformes (6.45%) and Decapoda (3.23%). The percentage was found to be the same (1.61%) for the orders *viz.* Beloniformes, Clupeiformes, Cyprinodontiformes, Osteoglossiformes and Tetraodontiformes (Fig. 2).

Table I. Status of fish fauna recorded from the Banar river

Order	Family	Local name	English name	Scientific name	Present status	IUCN status
Beloniformes	Beloniidae	Kakila	Freshwater gar fish	*Xenentodon cancila*	S	LC
Clupeiformes	Clupeidae	Chapila	Indian river shad	*Gudusia chapra*	R	VU
Cypriniformes		Gutum	Guntea loach	*Lepidocephalichthys guntea*	C	LC
	Cobitidae	Rani	Bengal loach	*Botio dario*	VR	EN
	Cyprinidae	Catla	Indian major carp	*Catla catla*	S	LC
		Rohu	Indian major carp	*Labeo rohita*	S	LC
		Mrigal	Indian major carp	*Cirrhinus mrigala*	S	NT
		Common carp	Common carp	*Cyprinus carpio*	S	EX
		Gonia	Kurialabeo	*Labeo gonius*	R	NT
		Grass carp	Grass carp	*Ctenopharyngodon idella*	S	EX
		Kalibaush	Black rohu	*Labeo calbasu*	R	LC
		Silver carp	Silver carp	*Hypophthalmicthys molitrix*	R	EX
		Bata	Bata	*Labeo bata*	S	LC
		Chela	Fine scale razor belly minnow	*Chela cachius*	S	VU
		Mola	Mola carplet	*Amblypharyngodon mola*	C	LC
		Darkina	Flaying barb	*Esomus danricus*	C	LC
		Dhela	Cotio	*Osteobrama cotio*	VR	NT
		Titpunti	Ticto barb	*Puntius ticto*	C	VU
		Jatpunti	Spot fin swamp barb	*Puntius sophore*	C	LC
		Sharpunti	Olive barb	*Puntius sarana*	S	LC
		Raj punti	Java barb	*Puntius gonoinotus*	R	EX
Cyprinodontiformes	Aplocheilidae	Kanpona	Blue panchax	*Aplocheilus panchax*	C	LC
Osteoglossiformes	Notopteriidae	Foli	Bronze Featherback	*Notopterus notopterus*	R	VU
Perciformes	Ambassidae	Lamba chanda	Elongated glass perchlet	*Chanda nama*	C	LC
		Kata chanda	Round glass perchlet	*Chanda baculis*	C	LC
		Gol chanda	Indian glass fish	*Parambassis ranga*	R	LC
	Anabantidae	Koi	Climbing perch	*Anabas testudineus*	C	LC
	Cichlidae	Tilapia	Mozambique tilapia	*Oreochromis mossambicus*	C	EX
	Channidae	Taki	Spotted snakehead	*Channa punctatus*	C	LC

		Cheng	Asiatic snakehead	*Channa orientalis*	C	LC
		Shol	Snakehead murrel	*Channa striatus*	C	LC
		Gozar	Giant snakehead	*Channa marulius*	VR	EN
	Gobiidae	Bele	Tank goby	*Glossogobius giuris*	S	LC
	Nandidae	Meni	Gangetic leaffish	*Nandus nandus*	R	NT
	Osphronemi-dae	Boro khalisha	Striped gourami	*Colisa fasciatus*	C	NO
		Choto khalisha	Honey gourami	*Colisa chuna*	C	NO
		Lal khalisha	Dwarf gourami	*Colisa lalia*	VR	NO
Siluriformes	Bagridae	Gulsha	Long whiskered catfish	*Mystus cavasius*	S	NT
		Bujuri	Long bled catfish	*Mystus tengara*	VR	LC
		Tengra	Striped dwarf catfish	*Mystus vittatus*	C	LC
		Ayre	Long whiskered catfish	*Sperata aor*	VR	VU
		Rita	Whale catfish	*Rita rita*	VR	EN
	Clariidae	Magur	Walking catfish	*Clarias batrachus*	C	LC
	Heteropneus-tidae	Shing	Stinging catfish	*Heteropneustes fossilis*	C	LC
	Pangasiidae	Pangus	Yellowtail catfish	*Pangasiuspangasius*	VR	EN
	Schilbeidae	Batasi	Indian potasi	*Pseudeutropiusather inoides*	R	NT
		Garua	Garua vachcha	*Clupisoma garua*	VR	EN
		Bacha	Batchwa vacha	*Eutropiichthys vacha*	VR	LC
		Kajuli	Gangetic ailia	*Ailia coila*	R	LC
		Shillong	Silond catfish	*Silonia silondia*	VR	LC
	Sisoridae	Baghair	Dwarf goonch	*Bagarius bagarius*	VR	CR
		Boal	Freshwater shark	*Wallago attu*	S	VU
	Siluridae	Pabda	Pabo catfish	*Ompok pabo*	C	CR
		Kani pabda	Butter catfish	*Ompok bimaculatus*	R	EN
		Madhu pabda	Pabdah catfish	*Ompok pabda*	VR	EN
Synbranchiformes	Mastacembeli-dae	Boro baim	Zig-zag eel	*Mastacembelus armatus*	S	EN
		Guchi	Barred spiny eel	*Macrognathu pancalus*	C	LC

		Tara baim	Lesser spiny eel	*Macrognathus aculeatus*	C	NT
	Synbranchi-dae	Kuchia	Mud eel	*Monopterus cuchia*	C	VU
Tetraodontiformes	Tetraodonti-dae	Potka	Ocellated pufferfish	*Tetraodon cutcutia*	C	LC
Decapoda	Palaemonidae	Chatka icha	Monsoon river prawn	*Macrobrachium malcolmsonii*	C	NO
		Gura icha	Monsoon river prawn	*Macrobrachium lamarre*	C	NO

C: common, S: seasonal, R: rare, VR: very rare, CR: critically endangered, EN: endangered, VU: vulnerable, NT: near threatened, NO: not threatened, LC: least concern and EX: exotic species.
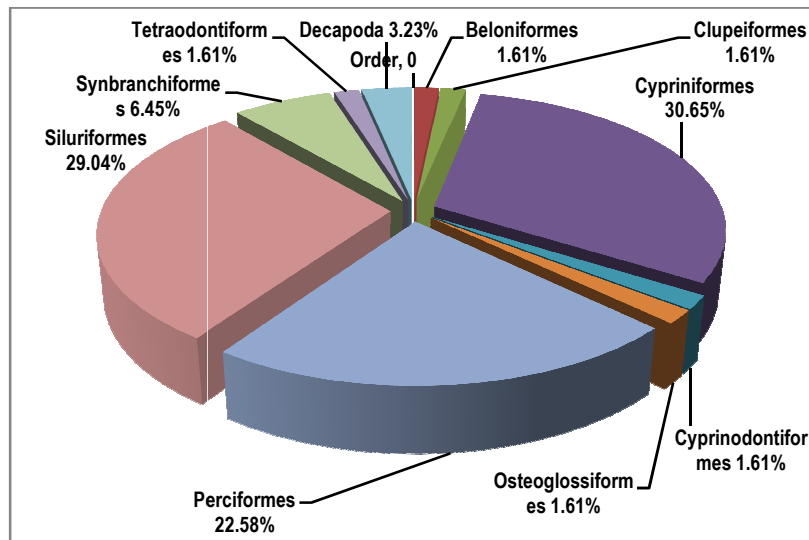
Fig. 2. Order based percentage of recorded species.

Among 24 Families recorded, Cyprinidae was the most dominant family contributing 17 species followed by Schilbeidae (5 species), Bagridae (5 species), Channidae (4 species), Siluridae (4 species), Synbranchiformes (4 species), Osphronemidae (3 species), Decapoda (2 species) (Table I). The recorded species were categorized into four statuses based on their availability and found as common (40.32%), seasonal (20.97%), rare (17.74%) and very rare (20.97%) (Fig. 3).
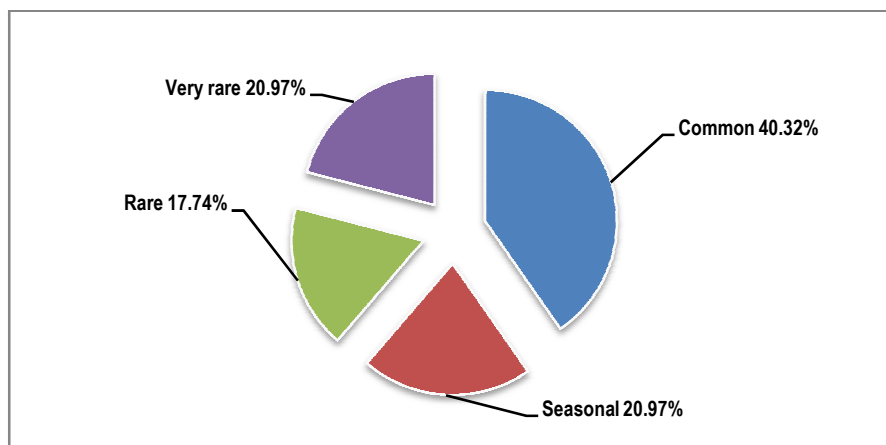
**Fig. 3.** Availability status of recorded species.

Status of threatened species: According to IUCN (2016), 64 native freshwater fish species of Bangladesh have been declared as threatened of which 25 species were vulnerable, 30 species were endangered and 9 species were critically endangered. Among them 17 fish species were recorded from the river Banar, which is 26.56% of total threatened fishes of Bangladesh (Fig. 4). The threatened species of the river was 27.42% of the total identified species. Out of the 17 fish species, 8 species (12.94%) were found as endangered (*Channa marulius*, *Botio dario*, *Rita rita*, *Mastacembelus armatus*, *Ompok bimaculatus*, *O. pabda*, *Clupisoma garua* and *Pangasius pangasius*), 7 species (11.34%) as vulnerable (*Monopterus cuchia*, *Gudusia chapra, Wallago attu*, *Notopterus notopterus*, *Puntius ticto, Sperata aor* and *Chela cachius*), and 2 species (3.14%) as critically endangered (*O. pabo* and *Bagarius bagarius*). Among the threatened fish species, endangered (47.06%) was found to be most abundant followed by vulnerable (41.18%) and critically endangered (11.76%) (Fig. 5).

Out of the 17 threatened species, 3 species were found as common (17.65%), 3 species as seasonal (17.65%), 3 species as rare (17.65%) and 8 species as very rare (47.05%) in the Banar river (Fig. 6).
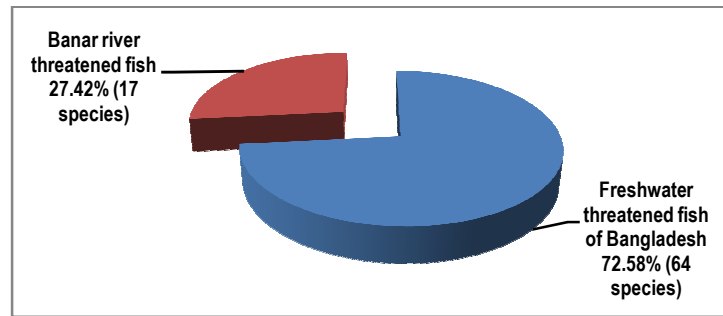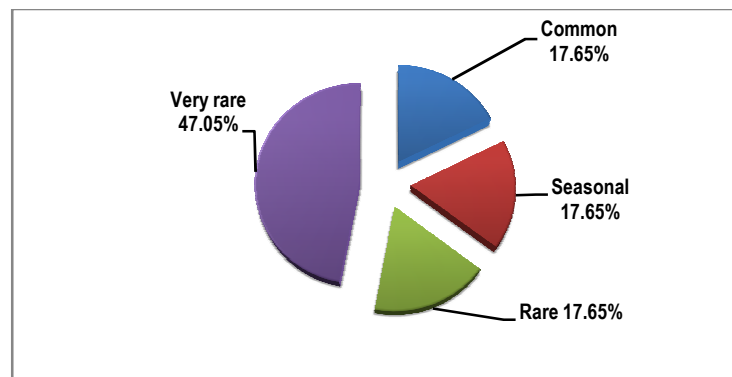
Fig. 4. Percentage of Banar river threatened species among total freshwater threatened fish species of Bangladesh.
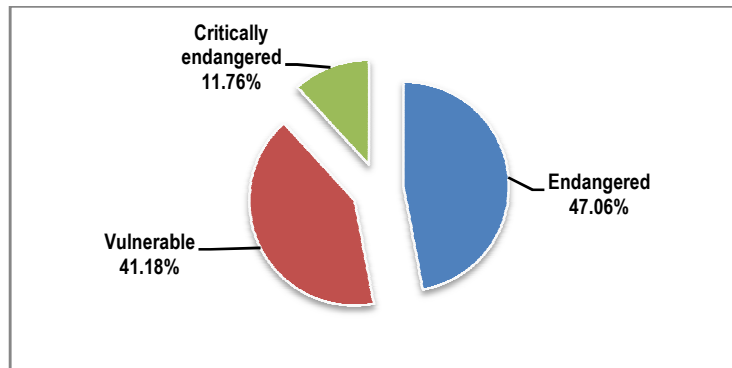
Fig. 5. Percentage of threatened species (IUCN status).

Fig. 6. Percentage of threatened species availability status.

Fishing gears used in the Banar river: Fishers of the study area were observed to use different types of fishing gear. Those fishing gears were operated in different seasons for fishing in the Banar river. Modes of operations of gears were dependent on various

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factors such as water level and rainfall. Some of the gears were selective for a particular species, whereas other account for a number of species caught during operation giving multi-species nature of the fishing. Most of the areas of the river remained dry from January to April. In the monsoon water level is increased and the use of all types of gear also increased simultaneously. During the study period ten (10) types of fishing gear were found to operate in the study area which classified into four (4) groups such as nets, traps, hook and line and wounding gears (Table II). Besides these, fishermen were also found to catch fish by dewatering the water body (katha fishing). Katha fishing was done during dry season. The capture fishery in Banar river is decreasing day by day due to indiscriminate harvesting of brood fishes and small fishes in the early stage by various illegal fishing gears. Different fishing gears (net jal) was found to catch fish irrespective of their size or species and destroys the habitat of the wild species thus causing numerous problems to the biodiversity of the river. In the Banar river the highest fishing hours by bair (Fish trap) 7.0 hrs and lowest fishing hours by Thela jal (Push net) 4.0 hrs (Table II).

Table II. Fishing gears used in the Banar river

Category	Type of gear	Name of gear	Mesh size	Target species	Period (month)	Fishing duration (hour/day)
Fish net	Gill net	Current jal	0.5-2.5	All	Year round	6.0
	Seine net	Berjal	0.25-1.0	All	Year round	6.0
		Morsharijal	Fine meshed	All	June-September	6.5
	Lift net	Dharma jal	0.5-1.0	All	June-Sep.	4.5
	Cast net	Jhakijal	>1.0	All	Year round	4.5
	Drag net/	Thelajal	0.25-1.0	All	Year round	4.0
	push net	Moiajal	0.25-0.75	All	Year round	5.5
Hook and line	-	Chip borshi	-	Sharpunti, Taki, Shol, Kalibaush	August-December	6.0
Wounding gear	-	Koach	-	Any kind of fishes	Year round	4.5
Fish trap	-	Bair	-	Baim, Baila, Gutum, Sharpunti, Tengra	July-September	7.0

Discussion

There is no previous information on the study of fish diversity of the Banar river. So, it was not possible to compare the present findings with previous one to assess the trend in biodiversity in the river. However, the fish species richness in the Banar river was quite similar to several rivers and wetlands. The number of fish and shellfish species

recorded in the present study (62 species) was found to be higher than the fish species recorded by Nabi *et al.* (2011) (35 species, from Bakkhali river), Rahman *et al.* (2017) (47 species, from Agunmukha river), Mohsin *et al.* (2014) (53 species from Andharmanik river) and Mohsin and Haque (2009) (56 species, from Mahananda river). Rahman *et al.* (2012), Azadi and Alam (2013), Chowdhury *et al.* (2010) recorded higher fish species as 80 species from Ganges river, 93 species from the river Halda and 98 species from Naaf river respectively. Quite similar number of fish species was reported (63 species) from the Choto Jamuna river by Galib *et al.* (2013) and Galib (2015) (67 finfish species) from Brahmaputra river. Order Cypriniformes was found to be the most diversified fish group in terms of both number of species and individuals followed by Siluriformes and Perciformes. Similar findings were also reported by Galib *et al.* (2009) and Imteazzaman and Galib (2013). The most dominant family found in the present study was Cyprinidae. Cyprinidae was found as a major contributing family in different open water bodies of Bangladesh (De *et al.* 2011). Availability status of the identified species were found as common (40.32%), seasonal (20.97%), rare (17.74%) and very rare (20.97%). Islam *et al.* (2015) categorized the recorded species as available (43.86%), less available (29.82%), rare (18.42%) and very rare (7.89%) from the Payra river. Sultana *et al.* (2017) categorized as available (40.85%), less available (29.58%), rare (14.08%) and very rare (15.49%) and Flowra *et al.* (2013) as available (45%), less available (33.33%), rare (13.33%) and very rare (8.33%) from wetlands of Chhatak and Baral river respectively which supports the present availability status of fishes. A total of 64 freshwater fish species have been declared threatened to extinct in the red book of threatened fishes, published by IUCN Bangladesh (2016). A large portion of fish species (27.42%) were belonging threatened categories indicates degradation in fish abundance and its diversity in the Banar river. Pramanik *et al.* (2017) listed 20% fish species as threatened from Meghna river which is less than the present result. Galib *et al.* (2013) reported 41.27% of fish species in the river Choto Jamuna as threatened. In another study, 42.5% fish species were recorded as threatened in the river Padma (Ramman *et al.* 2012). Rahman *et al.* (2015) revealed that 32.14% of fish species were threatened in Talma river which is higher than the present result. Seventeen (17) threatened fish species were recorded from the river in which 8 species (12.94%) were endangered, 7(11.34%) were vulnerable and 2(3.14%) were critically endangered. Only 10 species of threatened fishes were recorded by Mohsin *et al.* (2014) from Andharmanik river and 14 threatened species were identified by (Rahman *et al.* 2017) from Agunmukha river which are much lower than that of present findings. Pramanik *et al.* (2017) found 21 threatened fish species from the river Meghna in which 11 species (10.28%) were found as vulnerable, 8 species (7.48%) as endangered and 2 species as critically endangered which are much higher than that of present findings .Among the threatened fish species recorded from the present study, endangered (47.06%) was found to be most abundant followed by vulnerable (41.18%) and critically endangered (11.76%).

This maiden study on Banar river recorded a total of 10 types of the fishing gears among them 5 nets (1 each from Gill, Seine, Lift, Cast, Drag and push net categories), 1 trap, 1 hook and line, 1 wounding gear and 1 fish aggregating device (*katha* fishing. Among the 10 different groups of fishing gear, Gill net and lift net were larger in mesh size. The result suggested that Gill net/Drift net, Seine net are considered for commercial fishing and Cast net, Lift net, Drag/Push net, fish trap and Wounding gear are considered for economic/ subsistence fishing. Present study recorded the highest and the lowest fishing hours per day by Fish trap (Bair) and Push net (Thela jal) 7.0 hrs and 4.0 hrs, respectively. Chakroborty and Rahman (2017) recorded the highest and the lowest fishing hours per day by Borshi and Thela jal (Push net) 9.75 hrs and 3.8 hrs, respectively from the Betna river. Islam *et al.* (2017) found the highest and the lowest fishing duration in borshi (hook and line) and current jal (gill net) which were 9.33 hrs and 3.35 hrs per day respectively from Bhairab river. Fishing duration per hour in Betna river and Bhairab river are higher than the Banar river.

During the study period a 62 fish and shellfish species belonging to 24 Families and 10 Orders have been recorded from Banar river. The research revealed that 27.42% fish species were threatened in the study area among which 47.06% were endangered, 41.18% were vulnerable and 11.76% were critically endangered. This study provides the baseline information on fish diversity and fishing gears in the Banar river that would be beneficial for fishery biologists and conservationists to impose adequate regulations for sustainable fishery management and conservation of biodiversity for the river as well as for other rivers in Bangladesh.

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