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AVAILABILITY AND DIVERSITY OF FISH FAUNA IN THE GURUKCHI RIVER OF SYLHET DISTRICT IN BANGLADESH

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Abstract

Degradation of fish diversity in the freshwater habitats, especially the rivers of Bangladesh, has become a major concern in recent years. Therefore, this study was conducted in the Gurukchi River of Gowainghat sub-district in the Sylhet district of Bangladesh between March 2018 and February 2019 to assess the availability and biodiversity of fish species with conservation status, and population trends, and threats. Data were collected on a monthly basis by direct catch observation and field surveys as focus group discussions and personal interviews of different types of stakeholders. A total of 55 indigenous and two exotic fish species belonging to 9 orders, 22 families, and 42 genera were identified. Cypriniformes was the dominant order, comprising 40.35% of the total documented fish species, whereas Cyprinidae was found as the richest family (33.33%). A total of 10 threatened fish species (18.18%) were found in the study area where 5 species (9.09%) were endangered and five species (9.09%) were vulnerable. Notably, four globally threatened fish species such as *Cirrhinus cirrhosus, Channa orientalis, Cyprinus carpio, and Wallago attu* were available in the river. Among the identified native fish species, 52.73% of species showed decreasing population trends at the national level. Considering availability, the maximum fish species was rarely available (29.82%), followed by commonly available (28.07%), moderately available (22.81%), and abundantly available (19.30%). The main drivers affecting the river's fish diversity were identified as indiscriminately overfishing, followed by dewatering fishing, dewatering for irrigation purposes, natural drought in the winter season, use of banned fishing gears, and *katha* fishing method. However, measures like the establishment and management of fish sanctuaries, creating alternate livelihood options for fishers, and building public awareness about fishing laws and regulations could be helpful in conserving the fish biodiversity of the Gurukchi River.

Keywords: Fish biodiversity, Availability status, Drivers, IUCN, Conservation.

Introduction

Bangladesh has a wide-ranging freshwater habitat with a number of ecologically and geographically distinct waters, including rivers, *beels, haors, baors*, and floodplains (IUCN Bangladesh, 2015). These wetlands have an irreversible role in the national economy as well as the food habits of the citizens of Bangladeshi (Kibria & Ahmed, 2005; Hossain *et al.,* 2006). The number of species in wetlands differs because of the distinction of the ecology of the wetlands (Rahman, 2005). Rahman (2005) recorded 265 indigenous freshwater fish species of Bangladesh belonging to 55 families and 154 genera. In a recent assessment by IUCN Bangladesh (2015), 253 indigenous fish species have been assessed, including 104 riverine, 36 migratory (travelling among rivers and floodplains), and 113 floodplain species. Loss of fish diversity and their availability due to degradation of the inland open water fisheries resources is adversely impacting the people's livelihoods that traditionally depend on it (Sufian *et al.*, 2017; Shumi *et al.*, 2019). However, 64 and 27 native fish species have been found as threatened and near-threatened categories, respectively. Moreover, 122 species were documented as least concern, and the remaining 40 species were categorized as data deficient (IUCN Bangladesh, 2015). Bangladesh is a riverine country where about 700 rivers and their tributaries are distributed all over the country, covering about 24,140 km in length (Rashid, 1991; Banglapedia, 2012; IUCN Bangladesh, 2015; Arefin *et al.,* 2018). These rivers are the principal perennial freshwater sources of Bangladesh, providing habitat for fish and other aquatic living beings for feeding, spawning, and dry-season shelter (Hossain *et al.,* 2016). The Gurukchi River is a tributary of the Shari-Goyain River, covering a length of around 10 km and is located in the Gowainghat Upazila

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(sub-district) of Sylhet district. It is fully navigable during the wet season (April-October), and flows to the Shari-Goyain River from the Gurukchi and other villages under the Lengura union. The river's lower section is known as Mohali Canal, which connects to the Shari-Goyain River at Shiyala Point in Jalurmukh near Ratargul Swamp Forest. The water of the Gurukchi River is used for agricultural and household purposes. The river is also affluent with diversified fisheries resources and supports the habitat for fishes and other aquatic fauna and flora. From this river, fishers capture several fish species every day by using different fishing gear. Thus, this river plays an essential role in the overall economy of this region.

Biodiversity conservation is considered one of the main concerns for the sustainable utilization of natural resources (Ahamed *et al.,* 2012; Arefin *et al.,* 2018). Conservation of the whole biodiversity is very essential because it is difficult to identify which individual species is critical to the sustainability of aquatic ecosystems. Various fish species may deliver genetic material and work as ecological indicators. Aquatic biodiversity conservation measures protect biological resources while promoting the long-term development of water bodies by guarding biological resources in a way that must preserve their ecosystems and surrounding habitats (Jenkins & Williamson, 2003; Arefin *et al.,* 2018). Wild fish populations are slowly dwindling in Bangladesh's rivers, *haors*, *beels*, floodplains, and other wetlands owing to degradation and loss of natural habitat, overfishing, climate change, water pollution, and other anthropogenic and natural drivers (Galib *et al.,* 2013; IUCN Bangladesh, 2015; Pandit *et al.,* 2015a, 2015b; Sufian *et al.,* 2017; Islam *et al.,* 2019; Akter *et al.,* 2020). Many fish species of the Gurukchi River may have been under threatened categories, which is unknown due to a lack of research work. Therefore, research is very crucial to evaluate the present status of this river in order to take proper management steps for the future. Before applying any fisheries management tool to any wetland, the current status of fish biodiversity in the water body must be identified (Huda *et al.,* 2009; Pandit *et al.,* 2015a). Notably, no research work on the fish biodiversity of the Gurukchi River has yet been conducted. Therefore, such research work is obligatory to understand the current status of fish biodiversity and take necessary management initiatives to conserve the biodiversity of fish in that river. However, the primary goal of this research is to compile a list of fish species as well as their current availability status, conservation status, and threats to support further management strategies.

Materials and Methods

Study area and period

The present study was conducted in the Gurukchi River of Gowainghat Upazila in the Sylhet District of Bangladesh. Data were collected from March 2018 to February 2019 from the three riverine sampling sites and one local fish market site (Fig. 1).

Data collection framework

Data on the present status of fish availability and diversity were collected on a monthly basis by direct catch observation and field survey where focus group discussion (FGD) and personal interviews (PI) with 50 fishers, 15 fish traders, and 20 riverside residents were performed at the sampling sites and market. To identify possible threats to fish diversity, 10 FGDs and 85 PIs were also performed at the riverbank, fish markets, and fishers' villages near the sampling sites using a pretested questionnaire.

Fish specimen collection and identification

During direct catch observation, fish samples were collected from the fishers in the course of fishing. The collected samples were finally identified to the species level by analyzing their morphometric and meristic characteristics according to some previously published documents (Talwar & Jhingran, 1991; Rahman, 2005; Siddiqui *et al.,* 2007). Additionally, a high-resolution digital camera (Canon DS126491, Canon INC., made in Taiwan) was used to capture the photos of fish samples for recording purposes. Using the outcomes of interview and the catch records of fishers, the identified fish species were categorized into four groups based on their availability. The groups are abundantly available (AA): species abundantly observed throughout the year; commonly available (CA): species frequently observed throughout the year, but in small numbers; moderately available (MA): species observed infrequently in the study area in small numbers; and rarely available (RA): species observed occasionally in minimal numbers. The valid scientific names of the identified fish species were ensured by checking with IUCN red list (IUCN Bangladesh, 2015)

and internet source (http://www.fishbase.org). The IUCN conservation status and population trends of each species were documented by comparing with IUCN Bangladesh (2015) and IUCN Global (2019).

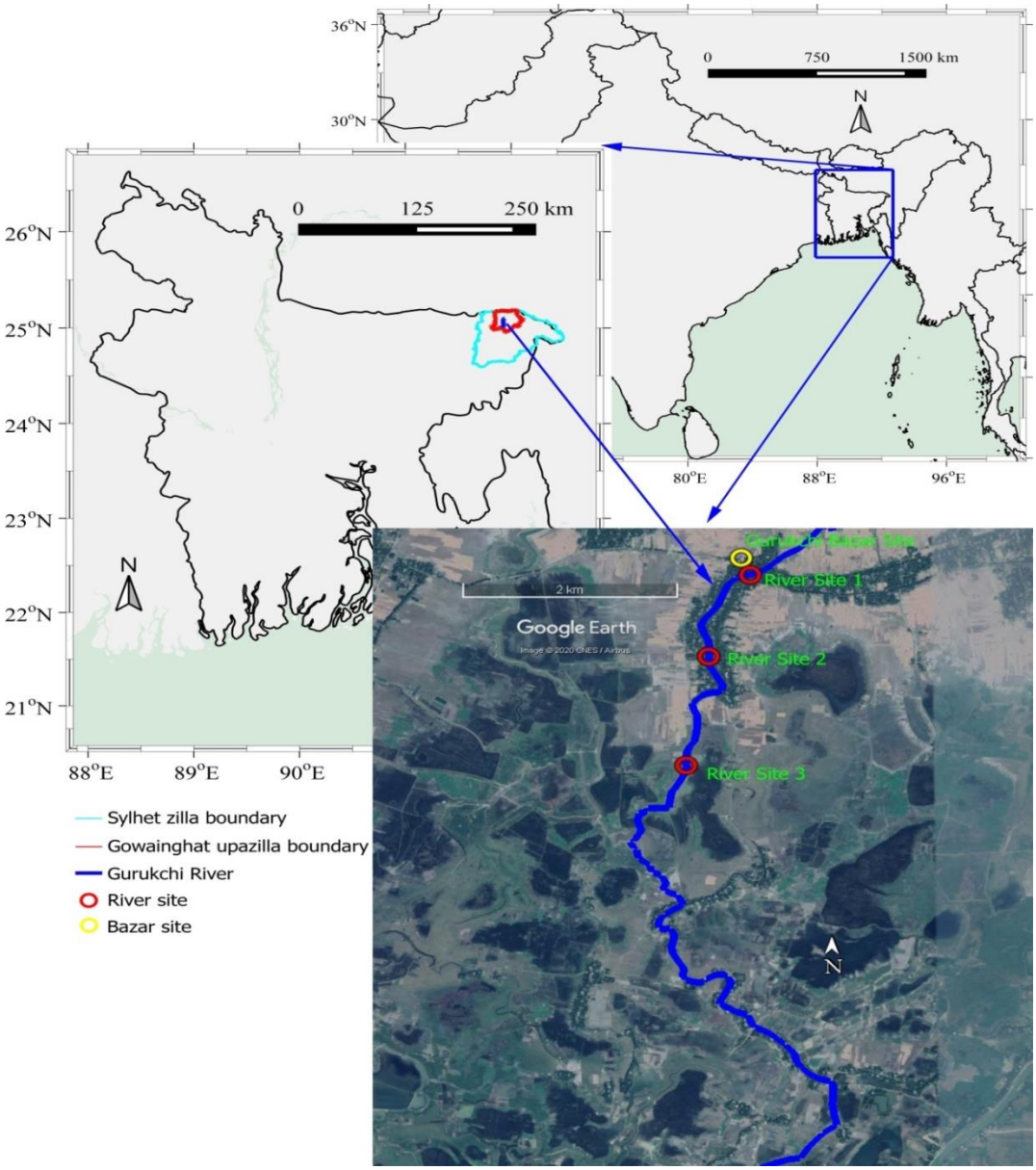

Fig. 1. Study area showing four study sites

Data analysis

After collection, all data was inputted into a computer, where it was subjected to a simple descriptive statistical analysis and graphical display using Microsoft Office Excel 2010.

Results and Discussion

Diversity of fish species

The present study recorded a total of 57 species of fish (55 indigenous and two exotic) belonging to 42 genera, 22 families, and nine orders in the Gurukchi River. A list of available fish species with their taxonomic position (order and family name), scientific name, English name, local name, present status, conservation status, and population trends in Bangladesh and global aspects are accumulated in Table 1.

Table 1. List of available fish species in the Gurukchi River

Sl. no.	Taxonomic position (order and family name)	English name	Local name	Present status	Conservation status		Population trend	
					BD	Global	BD	Global
	Beloniformes							
	Belonidae							
1	*Xenentodon cancila*	Freshwater garfish	Kakila	CA	LC	LC	UN	UN
	Clupeiformes							
	Clupeidae							
2	*Gudusia chapra*	Indian river shad	Chapila	CA	VU	LC	DE	DE
	Cypriniformes							
	Cyprinidae							
3	*Amblypharyngodon mola*	Mola carplet	Mola	RA	LC	LC	DE	ST
4	*Esomus danricus*	Flying barb	Darkina	AA	LC	LC	DE	ST
5	*Osteobrama cotio*	Cotio	Dhela	RA	NT	LC	DE	UN
6	*Salmophasia bacaila*	Large razorbelly minnow	Katari chela	RA	LC	LC	DE	ST
7	Salmophasia phulo	Finescale razorbelly minnow	Fulchela	CA	NT	LC	DE	UN
8	*Gibelion catla*	Catla	Catla	RA	LC	LC	DE	UN
9	*Cirrhinus cirrhosus*	Mrigal carp	Mrigal	RA	NT	VU	DE	DE
10	*Devario devario*	Sind danio	Chapchela	CA	LC	LC	DE	UN
11	*Labeo calbasu*	Black rohu	Kalibaosh	RA	LC	LC	IN	UN
12	*Labeo gonius*	Kuria labeo	Gonia	RA	NT	LC	DE	UN
13	*Labeo rohita*	Rohu	Rui	RA	LC	LC	DE	UN
14	*Oreichthys cosuatis*	Cosuatis barb	Titla	RA	EN	LC	UN	UN
15	*Pethia conchonius*	Rosy barb	Kanchan punti	MA	LC	LC	UN	UN
16	*Pethia guganio*	Glass barb	Mola punti	RA	LC	LC	UN	UN
17	*Pethia phutunio*	Spottedsail barb	Phutani punti	MA	LC	LC	UN	UN
18	*Systomus sarana*	Olive barb	Sarpunti	CA	NT	LC	DE	UN
19	*Puntius sophore*	Spotfin swamp barb	Jat punti	AA	LC	LC	UN	UN
20	*Pethia ticto*	Ticto barb	Tit punti	MA	VU	LC	DE	UN
21	*Cyprinus carpio*	Common carp	Carfu	MA	-	VU	-	UN
	Balitoridae							
22	*Acanthocobitis botia*	Mottled loach	Balichata gutum	CA	LC	LC	UN	DE
	Cobitidae							
23	*Botia dario*	Queen loach	Rani mach	CA	EN	LC	UN	UN
24	*Lepidocephalichthys guntea*	Guntea loach	Gutum	AA	LC	LC	DE	ST
25	*Canthophrys gongota*	Gongota loach	Bag gutum	MA	NT	LC	DE	UN
	Cyprinodontiformes							
	Aplocheilidae							
26	*Aplocheilus panchax*	Blue panchax	Kanpona	AA	LC	LC	UN	UN
	Osteoglossiformes							
	Notopteridae							
27	*Notopterus notopterus*	Grey featherback	Kanla	CA	VU	LC	DE	ST

	Perciformes							
	Gobiidae							
28	*Glossogobius giuris*	Bareye goby	Baila	AA	LC	LC	UN	UN
	Channidae							
29	*Channa orientalis*	Smooth-breasted snakehead	Raga	MA	LC	VU	DE	DE
30	*Channa punctata*	Spotted snakehead	Lati	AA	LC	LC	DE	ST
31	*Channa striata*	snakehead murrel	Shol	CA	LC	LC	DE	ST
	Ambassidae							
32	*Chanda nama*	Elongate glass perchlet	Lomba chanda	AA	LC	LC	UN	DE
33	*Parambassis lala*	Highfin glassy perchlet	Ranga chanda	AA	LC	NE	UN	DE
34	*Pseudambassis ranga*	Indian glassy fish	Gol chanda	AA	LC	LC	UN	ST
	Nandidae							
35	*Nandus nandus*	Mud perch	Bheda, meni	RA	NT	LC	UN	UN
	Anabantidae							
36	*Anabas testudineus*	Climbing perch	Koi	RA	LC	LC	UN	ST
	Osphronemidae							
37	*Trichogaster fasciata*	Banded gourami	Bara khailsha	RA	LC	LC	UN	UN
38	*Trichogaster chuna*	Dwarf gourami	Boicha	MA	LC	LC	UN	UN
	Cichlidae							
39	*Oreochromis niloticus*	Nile tilapia	Tilapia	RA	-	LC	-	ST
	Siluriformes							
	Schilbeidae							
40	*Neotropius atherinoides*	Indian potasi	Batasi	CA	LC	LC	UN	UN
	Bagridae							
41	*Batasio batasio*	Titsta batasio	Jalu tengra	CA	NT	LC	DE	UN
42	*Hemibagrus menoda*	Menoda catfish	Ghagla	MA	NT	LC	DE	UN
43	*Mystus bleekeri*	Bleeker's mystus	Gulsha tengra	AA	LC	LC	UN	UN
44	*Mystus cavasius*	Gangetic mystus	Gulsha	AA	NT	LC	DE	DE
45	*Mystus tengara*	Tengara mystus	Bujuri tengra	CA	LC	LC	UN	UN
46	*Mystus vittatus*	Asian striped catfish	Tengra	CA	LC	LC	UN	DE
	Siluridae							
47	*Ompok bimaculatus*	Butter catfish	Kani pabda	MA	EN	NT	DE	UN
48	*Ompok pabda*	Two stripe gulper catfish	Pabda	CA	EN	NT	DE	DE
49	*Wallago attu*	Freshwater shark	Boal	CA	VU	VU	DE	DE
	Clariidae							
50	*Clarias batrachus*	Walking catfish	Magur	RA	LC	LC	DE	ST
	Heteropneustidae							
51	*Heteropneustes fossilis*	Stinging catfish	Shing	RA	LC	LC	UN	ST
	Synbranchiformes							
	Synbranchidae							
52	*Monopterus cuchia*	Gangetic mudeel	Kuchia	RA	VU	LC	DE	UN
	Mastacembelidae							
53	*Macrognathus aral*	One-stripe spiny eel	Tara baim	MA	DD	LC	UN	ST

54	*Macrognathus aculeatus*	One-stripe spiny eel	Tara baim	MA	NT	NE	UN	UN
55	*Mastacembelus armatus*	Spiny eel	Sal baim	MA	EN	LC	DE	ST
56	*Macrognathus pancalus*	Stripped spiny eel	Chikra baim	CA	LC	LC	DE	UN
	Tetraodontiformes							
	Tetraodontidae							
57	*Tetraodon cutcutia*	Ocellated puffer fish	Potka	MA	LC	LC	UN	UN

BD = Bangladesh, VU = Vulnerable, EN = Endangered, NT = Near threatened, LC = Least concern, DD = Data deficient, NE = Not evaluated, DE = Decreasing, ST = Stable, IN = Increasing, UN = Unknown

There is no related study showing fish diversity of the Gurukchi River, and therefore it was not possible to co-relate the current results with earlier findings. This type of situation was also faced by several other scientists when they were working to assess fish diversity in some other rivers of Bangladesh (Galib *et al.*, 2013; Mohsin *et al.*, 2013, Mohsin *et al.* 2014; Galib, 2015). A total of 126 fish species covering 39 families were recorded from the Sunamganj district, which is very higher fish diversity compared with the present study (Mahalder & Mustafa, 2013). However, this study covers 36.77% of the fish species living in the *haor* basin (155) of Bangladesh (BHWDB, 2012). Chowdhury *et al.* (2019) reported 51 indigenous fish species under 16 families from the Surma River, which is lower than the present study. Hossain *et al.* (2017) and Islam *et al.* (2019) enlisted 74 fish species of 22 families and 75 fish species of 25 families in the Kushiyara and Juri Rivers, respectively, located in the north-eastern part of Bangladesh. These studies found much higher numbers of fish species than the present study. The probable reasons behind the lower number of fish species in the river are the geographical location and the short length and width of the river.

In this study, Cypriniformes was found as the most dominant order consisting of 23 species i.e., 40.35% of the total fish species, followed by 12 species of Siluriformes (21.05%), 12 species of Perciformes (21.05%), and five species of Synbranchiformes (8.77%) whereas Beloniformes, Clupeiformes, Cyprinodontiformes, Osteoglossiformes, and Tetraodontiformes have contributed one species individually (1.75% each) (Fig. 2). Galib (2015) documented similar outcomes from the Brahmaputra River, where Cypriniformes were the dominant order (21 species) followed by Siluriformes (19 species) and Perciformes (15 species).

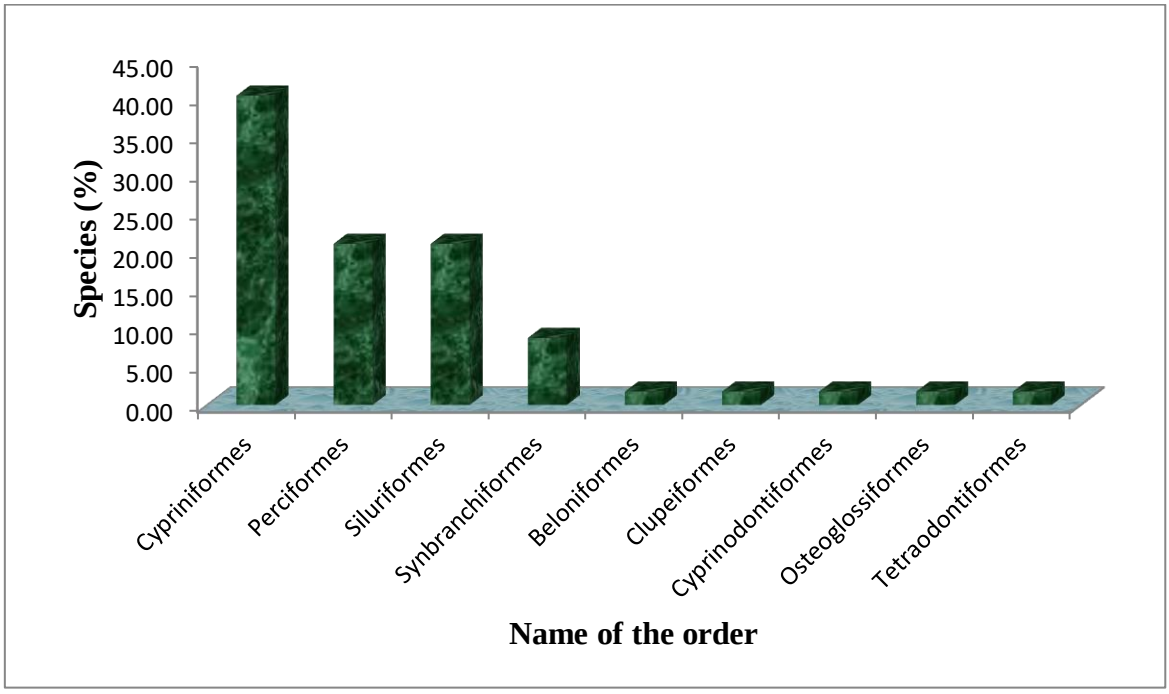

Fig. 2. Order-wise percentage of fish species in the Gurukchi River

In this study, Cyprinidae was the most dominant family providing 19 species (33.33%) followed by six species of Bagridae (10.53%), 4 species of Mastacembelidae (7.02%), and three species each from Ambassidae, Channidae, Cobitidae, and Siluridae (5.26%), two species of Osphronemidae (3.5%), whereas Anabantidae, Aplocheilidae, Balitoridae, Belonidae, Cichlidae, Clariidae, Clupeidae, Gobiidae, Heteropneustidae, Nandidae, Notopteridae, Schilbeidae, Synbranchidae and Tetraodontidae contributed one species each (1.75%) (Fig. 3). Chowdhury *et al.* (2019) reported Cyprinidae as the most diversified family with 36% species in the Surma River followed by Bagridae (9%), Cobitidae (7%), Siliuridae (7%), Channidae (6%), Clupidae (6%), Anabantidae (6%), Mastecembalidae (5%), etc. Cyprinidae was the most abundant family in the Kushiyara River, covering 38% of species followed by Siliuridae (15%), Cobitidae (7%), belonidae (4%), etc. (Hossain *et al.*, 2017). Cyprinidae was the most leading family in the Juri River, comprising 27% of the total fish species, followed by Bagridae (11%), Schilbeidae (7%), Gobiidae (7%), Channidae (6%), Cobitidae (6%), and others (Islam *et al.*, 2019). Similar findings of the dominance of Cyprinidae family were also reported for many other rivers of Bangladesh (Mohsin *et al.*, 2013, Chaki *et al.*, 2014). Rahman (2005) showed that this family is dominant in the freshwater fishes of Bangladesh. However, there are differences in species dominance within the Cyprinidae family in different Bangladeshi rivers, attributable to geographical and environmental variables.

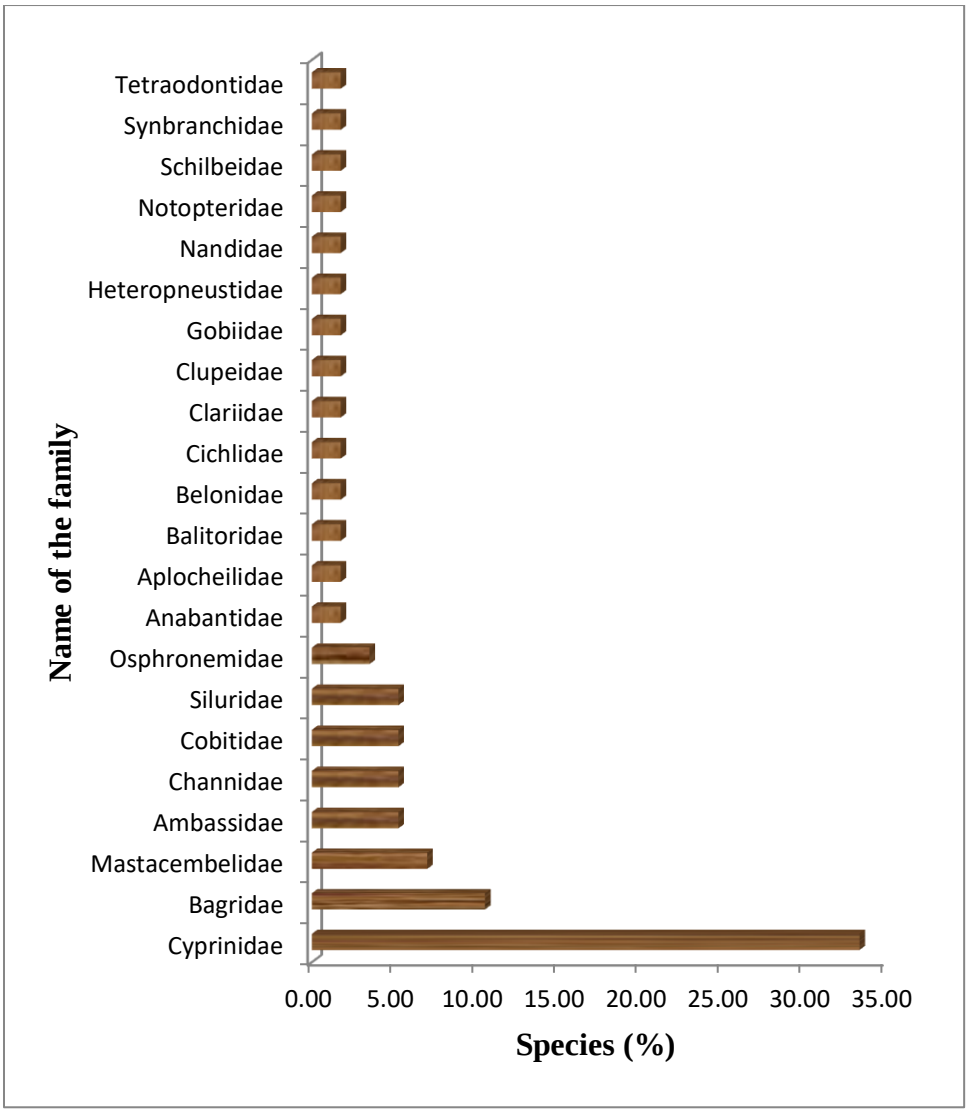

Fig. 3. Family-wise percentage of fish species in the Gurukchi River

Global conservation status of fish species

In comparison with the IUCN Global (2019), the least concern category filled the greatest number of fish species in this river (85.96%), followed by near threatened (3.51%), vulnerable (7.02%), and not evaluated (3.51%). Notably, four globally threatened fish species such as *Cirrhinus cirrhosus, Channa orientalis, Cyprinus carpio,* and *Wallago attu* were recorded as RA, MA, MA, and CA, respectively in this river (Fig. 4). Galib (2015) observed almost similar findings for the Brahmaputra River, where the majority of native fish species (82%) were the least concern category, followed by the near-threatened (9%), not evaluated (5%), threatened (2%), and data deficient (2%).

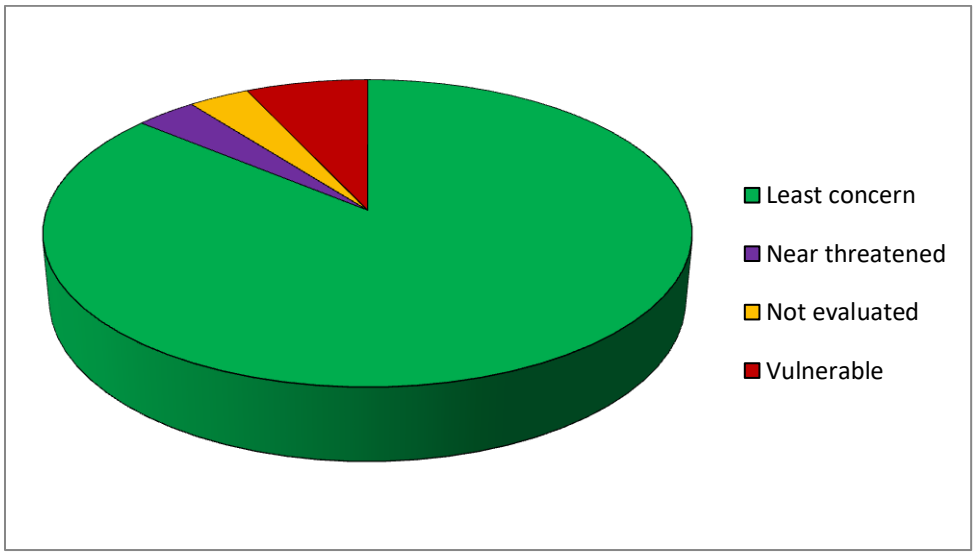

Fig. 4. Distribution of different categories of fishes in global assessment

Local conservation status of fish species

Out of the recorded 55 indigenous fish species, the highest number of fish species (33) was recorded as least concern (60.00%) followed by 11 species as near threatened (20.00%), 5 species as endangered (9.09%), five species as vulnerable (9.09%), and one species as data deficient (1.82%) (Table 2). However, 18.18% of fish species in the current study was under the threatened group in comparison to those of IUCN Bangladesh (2015). In the Meghna River, about 20% of the identified species (21 species) were in threatened condition, where two species (2%) were found as critically endangered, eight species (7.48%) as endangered, and 11 species (10.28%) as vulnerable (Pramanik *et al.*, 2017). The total identified native fish species (55) from the study sites are 21.74% of the total indigenous freshwater fish species (253) of Bangladesh recorded by IUCN Bangladesh (2015).

Table 2. Local conservation status of fish species

Status	IUCN status of fish in BD	Conservation of status of fish species comparing IUCN Bangladesh (2015)	
		No. of species	Percentage (%)
*CR	9	0	0.00
EN	30	5	9.09
VU	25	5	9.09
NT	27	11	20.00
LC	122	33	60.00
DD	40	1	1.82
Total	253	55	100

*CR = Critically endangered

Global population trends

According to the global population trend (IUCN Global, 2019), the highest percentage of the fish species in the river was fallen under the category unknown (57.89%), followed by decreasing (17.54%) and stable (24.56%) (Fig. 5). Galib (2015) discovered a similar population trend in the Brahmaputra River, where the unknown category accounted for the highest percentage of fish species (57%), followed by decreasing (25%), stable (13%), and not evaluated (5%). According to Joadder *et al.* (2015), the population trend of 51% of fish species of the Padma River was unknown, and about 24% population was in decreasing trend.

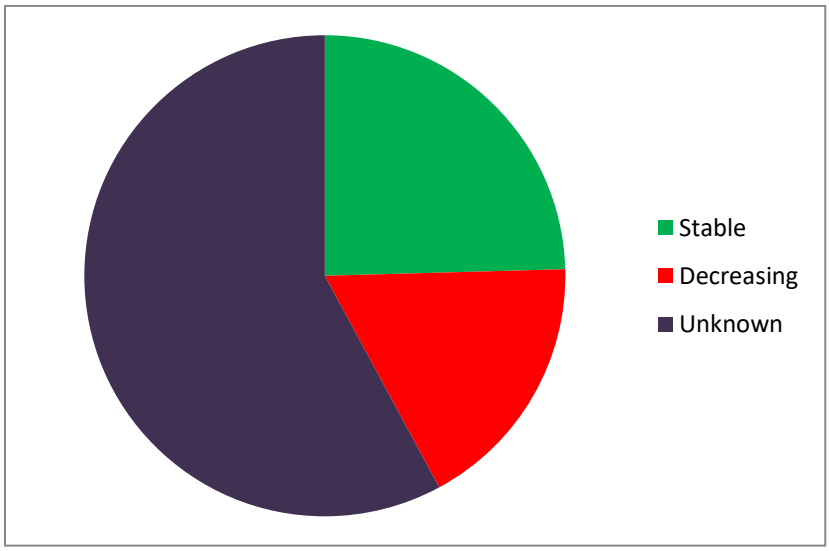

Fig. 5. Global population trends of fish species

National population trends

According to IUCN Bangladesh (2015) assessment, the population trend of more than half (52.73%) of the identified indigenous fish species was in the decreasing trend at national level and only 1.82% was found to increase. However, the population trend of a huge portion of fish species (45.45%) was unknown (Fig. 6). Galib (2015) found the population trend of over two-thirds of the total native fish species in the Brahmaputra River was in decreasing category. Fish species in the Padma River have similarly shown a decreasing population trend (Mohsin *et al.*, 2013).

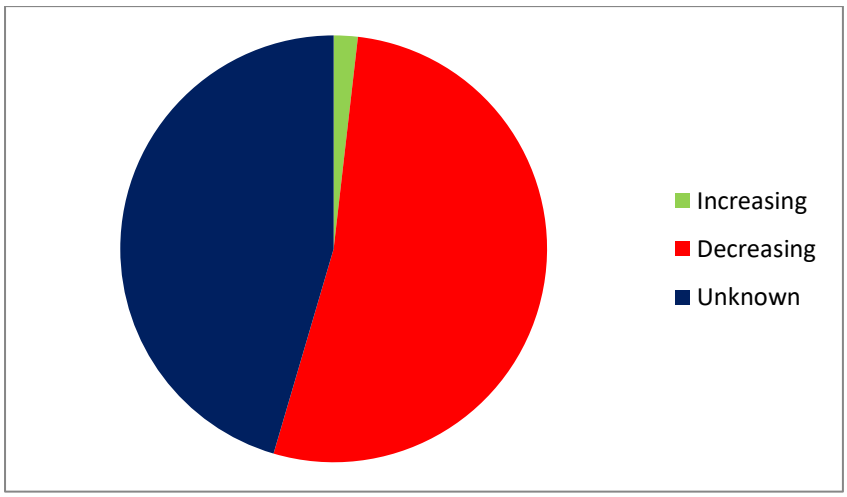

Fig. 6. National population trends of fish species

Present availability status of fish fauna

From the present survey, it was found that 11 species were abundantly available (19.30%), 16 species were commonly available (28.07%), 13 species were moderately available (22.81%), and 17 species were rarely available (29.82%) (Fig. 7). During the study, more than one-quarter part of the fish species was rarely available, which were found only once or twice in the study area over the study period. The local fishermen opined that these species will disappear very soon if proper steps are not taken to conserve them. From the wetlands of Sylhet Islam *et al.* (2015) found 24 commonly available, 16 moderately available, and 18 rarely available fish species. According to Arefin *et al.* (2018), 14 species are commonly available, 28 species are moderately available, and rest 20 species are rarely available. Many fish species in different water bodies were found as rarely available due to the variations in geographical position, effects of natural drivers, and anthropogenic hazards on fish biodiversity.

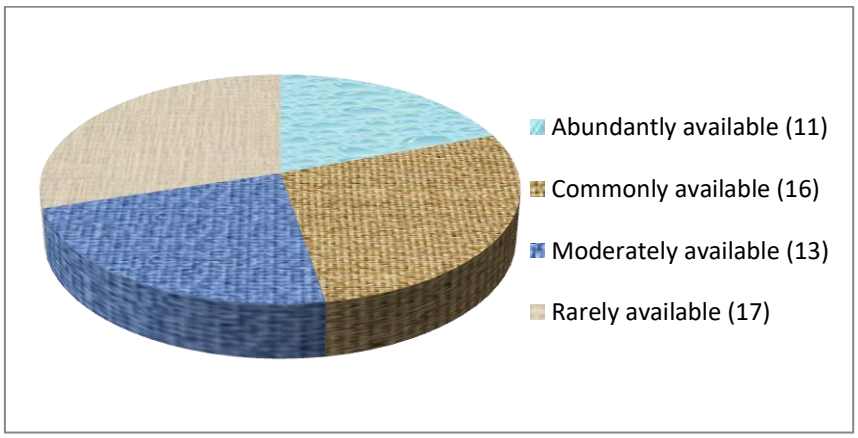

Fig. 7. Present availability status of fish species in the study area

Drivers affecting the fish availability and diversity of the Gurukchi River

According to the total of 85 respondents, many manmade and natural driving factors are responsible for destroying the fish biodiversity of the Gurukchi River. The main drivers affecting the fish diversity of this river are indiscriminately overfishing, followed by dewatering fishing, dewatering the river for irrigation purposes, natural drought in the winter season, use of banned fishing gears, *katha* fishing method, siltation and sedimentation, construction of communication infrastructures, aquatic pollution, and intensification of agricultural farming (Table 3). Islam *et al.* (2015), Pandit *et al.* (2015a), Sultana *et al.* (2017), Arefin *et al.* (2018), and Islam *et al.* (2019) found that similar categories of drivers accountable for species diversity decreased in the inland natural open waters of Bangladesh.

Table 3. Drivers responsible for declining the fish diversity of the Gurukchi River

Sl. no.	Drivers affecting fish diversity	Perception of the respondents (N = 85)	
		Numbers	Percentage (%)
1	Indiscriminately overfishing	77	90.59
2	Dewatering fishing	74	87.06
3	Dewatering the river for irrigation purpose	72	84.71
4	Natural drought in winter season	67	78.82
5	Use of banned fishing gears	64	75.29
6	*Katha* fishing method	61	71.76
7	Siltation and sedimentation	57	67.06
8	Construction of communication infrastructures	54	63.53
9	Aquatic pollution	49	57.65
10	Intensification of agricultural farming	42	49.41

Conclusion

The study is the preliminary attempt to enlist the fish biodiversity of the Gurukchi River in Gowainghat Upazila of Sylhet District. It mainly focuses on the documentation of available fishes with their decline causes in the Gurukchi River. The total numbers of fish species recorded during the study period is a good indicator of rich fish diversity in this small river but the availability status of 29.82% of fish species of them was rarely available, which may disappear soon. Some anthropogenic and natural drivers are found to be responsible for decreasing fish availability of the river. However, some management measures such as the establishment and management of fish sanctuaries, creating alternate livelihood options for fishers, and creating public awareness about fishing laws and regulations may be helpful to save the fisheries resources of this river.

Acknowledgements

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References

Ahamed F, Hossain MY, Fulanda B, Ahmed ZF and Ohtomi J. 2012. Indiscriminate exploitation of wild prawn postlarvae in the coastal region of Bangladesh: A threat to the fisheries resources, community livelihoods and biodiversity. Ocean Coast. Manag. 66:56-62.

Akter N, Kunda M, Rashid AHA, Mazumder SK, Sultana MA and Pandit D. 2020. Fish biodiversity in the Khiru River of Bangladesh: Present status and threats. Int. J. Nat. Soc. Sci. 7(4):30-39.

Arefin S, Kunda M, Islam MJ, Pandit D and Haque ATU. 2018. Status of fish and shellfish diversity and their decline factors in the Rupsa River of Khulna in Bangladesh. Arch. Agric. Environ. Sci. 3(3):232-239.

Banglapedia. 2012. River and drainage system. Banglapedia: National Encyclopedia of Bangladesh, Asiatic Society of Bangladesh. Retrieved August 13, 2018 from http://en. banglapedia.org/ index. php? title =River_and_ Drainage_System.

BHWDB (Bangladesh Haor and Wetland Development Board). 2012. Master Plan of Haor Area: Volume 1, Summary Report. Ministry of Water Resources, Government of the People's Republic of Bangladesh. 18p.

Chaki N, Jahan S, Fahad MFH, Galib SM and Mohsin ABM. 2014. Environment and fish fauna of the Atrai River: Global and local conservation perspective. J. Fish. 2(3):163-172.

Chowdhury MA, Karim MA, Rahman MT, Talukder SH, Shefat AR and Hossain MA. 2019. Biodiversity assessment of indigenous fish species in the Surma River of Sylhet Sadar, Bangladesh. Punjab Univ. J. Zool. 34(1):73-77.

Galib S M. 2015. Fish fauna of the Brahmaputra River, Bangladesh: richness, threats and conservation needs. J. Fish. 3(3):285-292.

Galib SM, Naser SMA, Mohsin ABM, Chaki N and Fahad FH. 2013. Fish diversity of the River Choto Jamuna, Bangladesh. Int. J. Biodivers. Conserv. 5(6):389-395.

Hossain MY, Ahmed ZF, Leunda PM, Islam AKMR, Jasmine S, Oscoz J, Miranda R and Ohtomi J. 2006. Length-weight and length-length relationships of some small indigenous fish species from the Mathabhanga River, south-western Bangladesh. J. Appl. Ichthyol. 22(4):301-303.

Hossain MA, Akter M and Iqbal MM. 2017. Diversity of fish fauna in Kusiara River (Fenchungonj Upazilla), Northeast Bangladesh. J. Aqu. Tro. 32(1-2):1-13.

Hossain M, Rahman M, Ali MM, Hossen M, Nawer F, Bahkali AH, El-Shikah MS, Islam M, Elgorban AM and Ahmed ZF. 2016. Check list of fish species availability in Rupsha River, Bangladesh: Threat identification and recommendation for sustainable management. Indian J. Geo-Mari. Sci. 45(10):1292-1298.

Huda A T M N, Shah M S, Hasanuzzaman A F M and Azam M R. 2009. An Investigation on the Ichthyofauna of the Gorai-Modhumati River System. Bangladesh J. Zool. 37(1):11-24.

Islam MA, Islam MZ, Barman SK, Morshed F and Marine SS. 2015. Study on present status of fish biodiversity in wetlands of Sylhet District, Bangladesh. Agric. For. Fish. 4(6):296-299.

Islam MR, Kunda M, Pandit D and Rashid AHA. 2019. Assessment of the ichthyofaunal diversity in the Juri River of Sylhet district, Bangladesh. Arch. of Agric. Environ. Sci. 4(4):488-496.

IUCN Global. 2019. The IUCN Red List of Threatened Species. Version 2019-3 (1). Retrieved May 30, 2019 from www.iucnredlist.org.

IUCN Bangladesh. 2015. Red List of Bangladesh, Volume 5: Freshwater Fishes. IUCN, International Union for Conservation of Nature, Bangladesh Country Office, Dhaka, Bangladesh. xvi+360p.

Jenkins MD and Williamson. 2003. Biodiversity and the ecosystem approach in agriculture, forestry and fisheries proceedings. Food and Agriculture Organization of the United Nations. Rome, Italy. pp. 100-116.

Joadder MAR, Galib SM, Haque SMM and Chaki N. 2015. Fishes of the river Padma, Bangladesh: Current trend and conservation status. J. Fish. 3(2):259-266.

Kibria MG and Ahmed KKU. 2005. Diversity of selective and nonselective fishing gear and their impact on inland fisheries in Bangladesh. NAGA 28:43-48.

Mahalder B and Mustafa MG. 2013. Introduction to fish species diversity: Sunamganj *Haor* Region within CBRMP's working area. Community Based Resource Management Project-LGED, Worldfish, Dhaka, Bangladesh. 75p.

Mohsin ABM, Haque SMM, Galib SM, Fahad MFH, Chaki N and Islam MN. 2013. Seasonal availability of fin fishes in the Padma River at Rajshahi district, Bangladesh. World J. Fish Mar. Sci. 5(6):680-685.

Mohsin ABM, Yeasmin F, Galib SM, Alam B and Haque SMM. 2014. Fish fauna of the Andharmanik River in Patuakhali, Bangladesh. Middle-East J. Sci. Res. 21(5):802-807.

Pandit D, Kunda M, Islam MJ, Islam MA and Barman PP. 2015a. Assessment of present status of fish diversity in Soma Nadi *Jalmohal* of Sunamganj in Bangladesh. J. Sylhet Agril. Univ. 2(1):127-135.

Pandit D, Kunda M, Rashid A H A, Sufian M A and Mazumder S K. 2015b. Present status of fish biodiversity in Dekhar *Haor*, Bangladesh: A case study. World J. Fish Marine Sci. 7(4):278-287.

Pramanik MMH, Hasan MM, Bisshas S, Hossain ABMA and Biswas TK. 2017. Fish biodiversity and their present conservation status in the Meghna River of Bangladesh. Int. J. Fish. Aquat. Stud. 5(1):446-455.

Rahman A K A. 2005. Freshwater fishes of Bangladesh (2nd eds.). The Zoological Society of Bangladesh, Dhaka. 394p.

Rashid HE. 1991. Geography of Bangladesh, University Press Ltd., Dhaka.

Shumi L, Kunda M, Rashid AHA, Sultana MA and Pandit D. 2019. Socio-demographic observation of fishing community of the Shari-Goyain River, Bangladesh. Bangladesh J. Fish. 31(2):345-352.

Siddiqui KU, Islam MA, Kabir SMH, Ahmad M, Ahmed ATA, Rahman AKA, Haque EU, Ahmed ZU, Begum ZNT, Hasan MA, Khondker M and Rahman MM. 2007. Encyclopedia of flora and fauna of Bangladesh. Vol. 23. Freshwater fishes. Asiatic Society of Bangladesh, Dhaka. 300p.

Sufian MA, Kunda M, Islam MJ, Haque ATU and Pandit D. 2017. Socioeconomic conditions of fishermen of Dekar *Haor* in Sunamganj. J. Sylhet Agril. Univ. 4(1):99-107.

Sultana A, Sarker AC, Kunda M and Mazumder SK. 2017. Present status and threats to fish diversity of wetlands of Chhatak, Bangladesh. Int. J. Fish. Aquat. Stud. 5(5):43-48.

Talwar PK and Jhingran AG. 1991. Inland fishes of India and adjacent countries. Oxford & IBH Publishing Company Pvt. Ltd, New Delhi. 1158p.