

Biodiversity status of the Monoi River and Choilchakra *Beel*, Sunamganj district, Bangladesh

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ABSTRACT

A study on the checklist of the native fishes of the Monoi River and adjacent waters was carried out to obtain details on present status and trend of finfish diversity. Data were collected monthly by field survey, focus group discussions, and personal interviews using a semi-structured questionnaire during November 2019 to March 2020. A total of 57 indigenous fish species belonging to 22 families under 10 distinct taxonomic orders were documented where Cypriniformes (31.58%) contributes the highest and Tetraodontiformes (1.75%) contribute the lowest. Among the 22 recorded families Cyprinidae occupies highest 18 fish species. In the IUCN Bangladesh (2015) report, approximately 71.92%, were classified as having the least concern (LC), near threatened 8.77%, 12.28% of the total, had not undergone evaluation (NE) and 7.01% were vulnerable (VU). The leading threats to fish diversity were indiscriminate overfishing, followed by fishing by dewatering wetlands, the *katha* fishing method, the use of deprecated fishing gear, etc. The study suggests that minimising anthropogenic impacts, enacting fishing laws, installing and managing fish sanctuaries, and raising public awareness can be effective for the conservation of existing fisheries resources.

INTRODUCTION

Bangladesh is a land of enriched assets. Among them rivers is the major one. It is called the floodplain delta of the Brahmaputra, Ganges, and Meghna rivers that possess a vast, extensive inland water bodies in various forms (Ali et al., 2017; Mia et al., 2017; Haque et al., 2015) which are enriched with a wide variety of fish species and abundant water resources (Islam et al., 2015). Fresh water run-off receiver's rivers are the principal perennial freshwater sources of Bangladesh (Haque et al., 2015). The country stands as one of the leading global producers of fish, with its fish production totaling a substantial amount in the 2019–20 period (DoF, 2022). Covering a total inland water area of 6.7 million hectares, the nation's aquatic landscape comprises 94% open-water capture fisheries and 6% closed-water

aquaculture (Hossain, 2014). Recognized by the Food and Agriculture Organization (FAO), Bangladesh achieved the impressive rank of third place in terms of inland open-water capture fisheries production (FAO, 2022). This is very remarkable achievement of Bangladesh as in inland capture fisheries no feed is used while feed is the highest cost oriented input in aquaculture (Begum et al., 2017). The heart of fish production in Bangladesh resides in its inland fisheries, spanning rivers, estuaries, the Sundarbans' forest water resources, *beels*, Kaptai Lake, floodplains, and haors, fostering the growth of approximately 260 native freshwater fish species (DoF, 2022).

Bangladesh possesses more than two hundred rivers that meander into the Bay of Bengal, forming an intricate network totaling around 24,000 kilometres of riverine pathways (Islam,

2018). Among them, Monoi River is one, which boasts a diverse array of fish species. A significant population of fishermen relies on this river for their livelihoods, engaging in fish harvesting activities. These fishermen employ various types of fishing equipment to catch a wide variety of fish species within the river on a daily basis, except during specific fibre-mandated periods.

In recent times, the diversity of fish species has encountered a range of difficulties due to a variety of reasons (Pramanik et al., 2017). The existing condition of fish biodiversity exhibits a mixture of favourable and unfavourable patterns. On a positive note, endeavors focused on the preservation and rehabilitation of habitats has led to the revival of certain fish populations and the safeguarding of crucial environments (Rahman et al., 2019). Nevertheless, despite these encouraging initiatives, the conservation of fish biodiversity continues to confront notable perils and obstacles. Several fish populations are dwindling owing to a blend of factors such as the degradation of habitats, pollution, and shifts in climate, excessive fishing, and the proliferation of non-native species. The contemporary state of fish biodiversity displays variations across distinct regions, with certain areas encountering more severe declines than others (Rahman et al., 2015).

The Monoi River and Choilchakra *Beel* play a crucial role in fish production within the Sunamganj district. Despite their importance, a notable absence of published articles addressing the fish biodiversity of these water bodies has been observed. To bridge this knowledge gap, a comprehensive study was undertaken to assess the current fish diversity in the Monoi River and Choilchakra *Beel*. This initiative aims to not only shed light on the existing status of aquatic fauna but also pinpoint potential threats. The findings of this research endeavor will serve as a valuable resource for future investigations into these aquatic ecosystems, inviting enthusiastic researchers to delve deeper into understanding and conserving the diverse fish species inhabiting these waters.

MATERIALS AND METHODS

Study area

The current study was conducted in the Monoi River and Choilchakra *Beel* of Dharmapasha Upazila (sub-district) under the Sunamganj district of Bangladesh. Monoi River and Choilchakra *Beel* are just 25km from Mohonganj Upazila. A total of sixty fishermen have taken this *beel*, paying 23 lacs BDT through tender. It is just 15 km from Mohonganj Upazila, and it covers 150 acres in total.

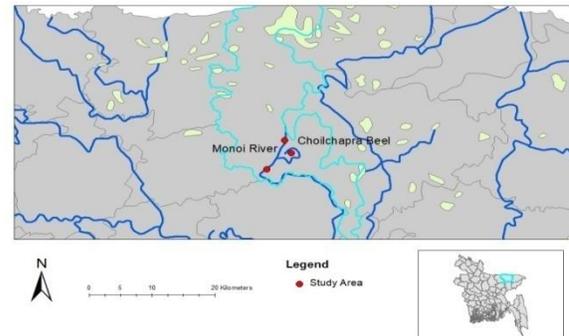


Figure 1: Monoi River and Choilchakra *Beel*

Data collection method

Primary data was collected monthly from November 2019 to March 2020, through questionnaire interviews. In this study, a large sample of 70 fishermen from six designated villages, along with 15 boatmen (Aratdars), and 14 fish retail vendors, participated in questionnaire interviews (QIs). Additionally, four distinct focus group discussions (FGDs) were organized within these villages, incorporating participants spanning various age brackets among the fishing community. Following the acquisition of data through both FGDs and QIs, in-depth key informant interviews (KIIs) were carried out. These interviews involved informed and experienced fishermen, as well as officials from the upazila and district fisheries offices (UFOs and DFOs, respectively), local leaders, and personnel affiliated with non-governmental organizations such as the Centre for Natural Resource Study (CNRS). To supplement primary data, governmental authorities, scholarly literature, periodicals, and diverse online sources were consulted and utilized.

Collection and identification of fish samples

Fish samples were procured during the fishing haul from previously identified fishermen and local fish landing points. The fishermen within the study region employ a variety of fishing equipment, including seine nets, gill nets, cast nets, hooks, and traps, each designed for distinct species and sizes with varying levels of efficiency. The collected fish, distinguished by their unique morphological characteristics, were categorized accordingly. During the fieldwork, any species that was hard to identify was put in a 10% buffered formalin solution and sent to the Fisheries Biology and Genetics Laboratory at Sylhet Agricultural University for further study. The identification procedure encompassed the assessment of the specimens' morphometric and meristic attributes, as well as their coloration. Taxonomic evaluation adhered to the protocols delineated by Rahman (2005) and IUCN

Bangladesh (2015), while the categorization of fish species followed Nelson's (2006) framework.

Statistical analysis

The gathered information was entered, prepared, and examined. The empirical data recorded from this study were computed in MS Excel after necessary error checking and corrections. Primary analysis for producing graphs and tables was accomplished in MS Excel.

RESULTS AND DISCUSSION

In the Monoi River and Choilchapra *Beel*, a total of 57 animal species, comprising 55 types of finfish and 2 prawn species under 10 distinct taxonomic orders and 22 families (Table 1) were recorded.

Table 1: Recorded fish species from the Monoi River and Choilchapra *Beel*

Order	Family	Scientific Name	English Name	Common Name	Conservation Status	
					BD	Global
		<i>Labeo rohita</i>	Rohu	Rui	LC	LC
		<i>Cirrhinus cirrhosus</i>	Mrigal carp	Mrigel	NT	VU
		<i>Cirrhinus reba</i>	Reba carp	Lachu	NT	LC
		<i>Labeo calbasu</i>	Orange Fin Labeo	Kalibus	LC	LC
		<i>Cyprinus carpio</i>	Common carp	Carpio	NT	VU
		<i>Hypophthalmichthys molitrix</i>	Freshwater cyprinid fish	Silver carp	LC	NT
		<i>Ctenopharyngo donidella</i>	Ray-finned fishes	Grass carp	NT	NE
		<i>Pethia ticto</i>	Ticto barb	Tit punti	VU	LC
		<i>Puntius sophore</i>	Spotfin swamp barb	Jatpunti	LC	LC
		<i>Pethia conchonius</i>	Rosy barb	Kanchonpunti	LC	LC
		<i>Pethia guganio</i>	Glass barb	Molapunti	LC	LC
		<i>Pethia phutunio</i>	Spottedsail barb	Phutaniopunti	LC	LC
		<i>Puntius chola</i>	Chola barb	Cholapunti	LC	LC
		<i>Systomus sarana</i>	Olive barb	Shorputi	NT	LC
		<i>Amblypharyngo donmola</i>	Molacarpulet	Mola	LC	LC
		<i>Osteobrama cotio</i>	Cotio	Dhela	NT	LC
		<i>Securicula gora</i>	Chela gora	Ghora chela	NT	LC
		<i>Salmostoma acinaces</i>	Silver razorbelly minnow	Chela	DD	LC
		<i>Lepidocephalichthys guntea</i>	Guntea loach	Gutum	LC	LC
		<i>Botia dario</i>	Bengal Loach	Bou rani	EN	LC

	Clupeidae	<i>Gudusia chapra</i>	Indian river shad	Chapila	VU	LC
		<i>Corica soborna</i>	The Ganges river sprat	Kachki	LC	LC
Perciformes	Channidae	<i>Channa marulius</i>	Giant snakehead	Gozar	EN	LC
		<i>Channa striata</i>	Snakehead murrel	Shol	LC	LC
		<i>Channa punctata</i>	Spotted snakehead	Taki	LC	LC
		<i>Channa orientalis</i>	Asiatic snakehead	Cheng	LC	LC
		Nandidae	<i>Nandus nandus</i>	Gangetic leaffish	Meni	NT
Perciformes	Gobiidae	<i>Glossogobius giuris</i>	Bareye goby	Bele	LC	LC
	Ambassidae	<i>Pseudam bassislala</i>	Highfin glassy perchlet	Lal chanda	LC	NE
	Ambassidae	<i>Chandanama</i>	Elongate glass-perchlet	Chanda	EN	NE
Anabanti-formes	Anabantidae	<i>Anabas testudineus</i>	Climbing perch	Koi	LC	LC
	Osphronemidae	<i>Trichogaster fasciata</i>	Banded gourami	Barokholisha	LC	LC
		<i>Trichogaster lalius</i>	Red gourami	Lal kholisha	LC	LC
Beloniformes	Belonidae	<i>Xenentodon cancila</i>	Freshwater garfish	Kankila	LC	LC
	Hemiramphidae	<i>Hyporhamphus limbatus</i>	Congaturi halfbeak	Ekthutia	LC	LC
Siluriformes	Siluridae	<i>Wallago attu</i>	Freshwater shark	Boal	VU	VU
		<i>Ompok pabo</i>	Pabo catfish	Pabda	CR	NT
	Clariidae	<i>Clarias batrachus</i>	Walking catfish	Magur	LC	LC
	Heteropneustidae	<i>Heteropneustes fossilis</i>	Asian stinging catfish	Shing	LC	LC
	Schilbeidae	<i>Pachypterus atherinoides</i>	Indian potashi	Batashi	LC	NE
		<i>Eutropiichthys vacha</i>	BatchwaVacha	Bacha	LC	LC
		<i>Ailia coila</i>	Gangetic Ailia	Kajuli	LC	NT
		<i>Clupisoma garua</i>	Garua Bacha	Gaura	EN	NE
		<i>Sperata seenghala</i>	Giant river-catfish	Guizza air	LC	LC
	Bagridae	<i>Sperata aor</i>	Long-whiskered catfish	Air	VU	LC
<i>Speratas eenghala</i>		Gangetic Goonch	Baga air	CR	NT	
<i>Mystus bleekeri</i>		Bleeker'smystus	Gulsha tengra	LC	LC	
<i>Mystus vittatus</i>		Asian striped catfish	Tengra	LC	LC	
Synbranchi-formes	Mastacembelidae	<i>Macrognathusaral</i>	One-stripe spiny eel	Tara baim	DD	LC
		<i>Mastacembelus pancalus</i>	Striped spiny eel	Guchi baim	LC	LC
		<i>Mastacembelus armatus</i>	Tire-track Spinyeel	Baim	EN	NE
	Synbranchidae	<i>Monopterus cuchia</i>	Gangetic mudde	Kuchia	VU	VU
Osteoglossi-formes	Notopteridae	<i>Notopterus notopterus</i>	Bronze featherback	Foli	VU	LC
		<i>Chitala chitala</i>	Humped Featherback	Chitol	EN	NT
Tetraodonti-formes	Tetraodontidae	<i>Leiodon cutcutia</i>	Ocellated puffer fish	Potka	LC	LC
Decapoda	Soleniceridae	<i>Solenocera crassicornis</i>	Red prawn	Gurachingri	LC	NE
	Palaemonidae	<i>Macrobrachium rosenbergii</i>	Giant Freshwater Shrimp	Golda	LC	LC

LC – Least concern, NT – Near threatened, NE – Not evaluated, DD – Data deficient, VU – Vulnerable, EN – Endangered, and CR – Critically endangered (IUCN Bangladesh, 2015); AA – Abundantly available, CA – Commonly available, MA – Moderately available, RA – Rarely available.

The Monoi River and Choilchapra *Beel* fish populations present a dynamic distribution across various orders, each accounting for a distinct percentage of the ecosystem. Notably, Cypriniformes dominate with 31.58%, reflecting their remarkable adaptability and diverse ecological roles. Siluriformes, representing 22.81% of the fish diversity, contribute significantly to nutrient cycling and organic matter regulation. Perciformes, comprising 14.04%; Synbranchiformes and Clupeiformes at 7.02%; and Anabantiformes, making up 5.26%. The remaining orders Beloniformes, Osteoglossiformes, Tetraodontiformes, and Decapoda, collectively contribute with smaller percentages 3.51%, forming a cohesive and diverse aquatic community within the Monoi River (Figure 2).

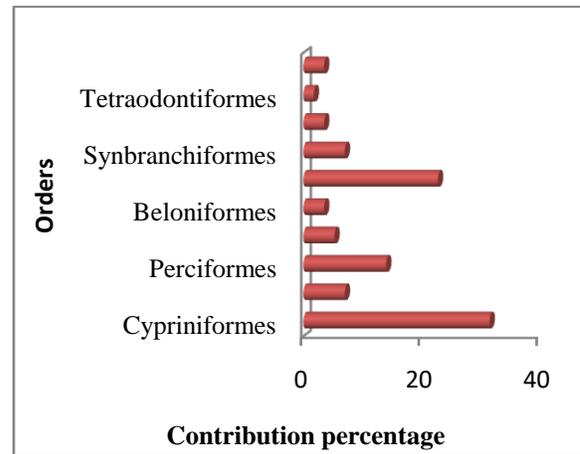


Figure 2: Fish species distribution by order in Monoi River and Choilchapra *Beel*

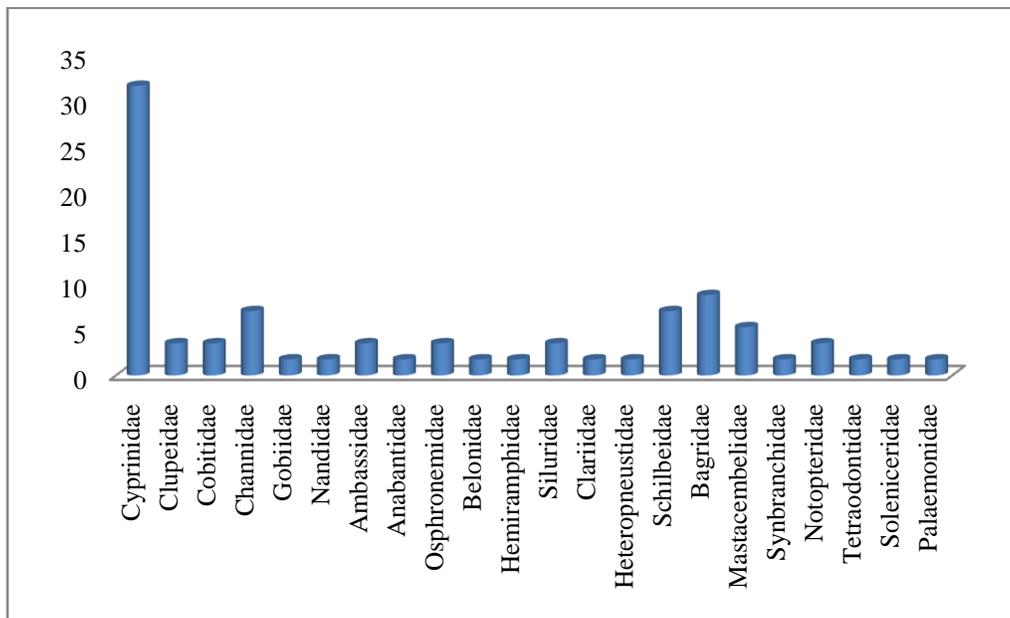


Figure 3: Fish species composition in Monoi River and Choilchapra *Beel* under different families.

The Monoi River and Choilchapra *Beel* are a captivating mosaic of diverse fish families, each contributing to the river's enchanting biodiversity. Dominating this ecosystem is the Cyprinidae family, with an astonishing representation of 31.58%. Bagridae family, constituting a notable 8.77%. This family's significant presence demonstrates their prowess in thriving within the river's waters. The Schilbeidae and Channidae

families each contribute a substantial 7.01%. Mastacembellidae contributes 5.26%. The Clupeidae, Cobitidae, Ambassidae, Osphronemidae and Siluridae, and Notopteridae families each account for 3.51%. Families such as Gobiidae, Nandidae, Anabantidae, Belonidae, Hemiramphidae, Clariidae, Heteropneustidae, Synbranchidae, Tetraodontidae, Soleniceridae and Palaemonidae make up 1.75%, exemplifying the

interconnectedness of various aquatic life forms (Figure 3).

A total of 57 fish species covering 22 families were recorded from the Monoi River and Choilchapra *Beel*. There is no related study showing fish diversity of the Monoi River and Choilchapra *Beel*. While no prior investigations had been conducted to compare fish diversity in this specific research area, this study establishes a foundational reference for forthcoming evaluations of fish populations. The results of this study align with earlier research on fish diversity and abundance in the neighboring regions. 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; Pandit et al., 2020). A total of 55 indigenous and two exotic fish species belonging to 9 orders, 22 families were documented from Gurukuchi River which is near of fish diversity compared with the present study (Pandit et al., 2020). 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 and Suravi et al., 2017 enlisted a total of 51 fish species belonging to 34 genera along with two prawn species under 19 families from Dekar *haor* 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. Das et al, 2023 recorded a total of 36 species under 8 orders belonging to 19 families from Roktodaho *Beel*. 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 18 species i.e., 31.58% of the total fish species, followed by 13 species of Siluriformes (22.81%), 8 species of Perciformes (14.04%), four species of Synbranchiformes and Clupiformes (7.02%), three species from Anabantiformes and Beloniformes, Osteoglossiformes, and Decapoda have

contributed two species individually (3.51% each), only one species (1.75%) recorded from Tetraodontiformes (Figure 2). Pandit et al. (2020) documented the more or less similar findings from Gurukuchi River of Sunamganj where Cypriniformes (18 species) and Siluriformes (13 species) were the most dominant orders. 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).

Local conservation status of fish species

According to the 2015 IUCN report for Bangladesh, a significant portion, roughly 57.89%, of the observed fish species in the region were classified as having low conservation concerns. Furthermore, approximately 14.03% of the overall fish population was categorized as near threatened (NT), with additional species falling into the vulnerable (VU), endangered (EN), critically endangered (CR), and data-deficient (DD) groups. These results underscore the assessment of fish species distribution and conservation status in Bangladesh (Figure 4).

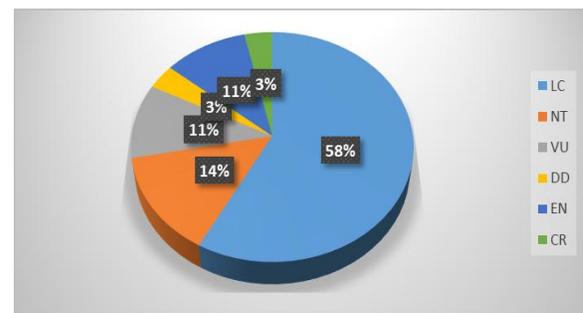


Figure 4: Conservation status of Bangladesh of the identified fish species in Monoi River and Choilchapra *Beel*

Pandit et al., 2020 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%). In the Meghna River, Pramanik et al., 2017 outlined 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.

Global population trends

In the IUCN Bangladesh (2015) report, the assessment of the global conservation status for fish species in the Monoi River and Choilchakra revealed that a substantial portion of the listed species, approximately 71.92%, were classified as having the least concern (LC). The subsequent noteworthy category was near threatened (NT), encompassing 8.77% of the species. Moreover, a portion of the fish species, equivalent to 12.28% of the total, had not undergone evaluation (NE). A smaller fraction of species, specifically 7.01%, were categorized as vulnerable (VU) (Figure 5).

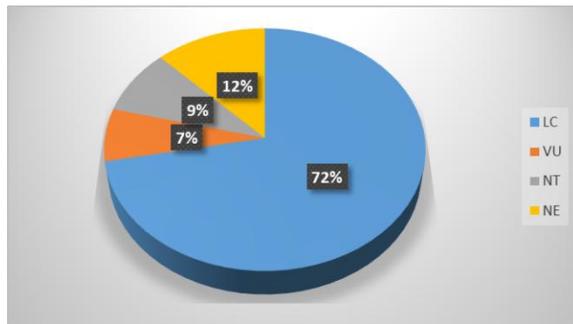


Figure 5: Global conservation status of the identified fish species in Monoi River and Choilchakra *Beel*

Drivers affecting the fish availability and diversity of the Gurukchi River

According to the respondents, many manmade and natural driving factors are responsible for destroying the fish biodiversity of the Monoi River and Choilchakra *Beel*. 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, macrozooplankton damage, siltation and sedimentation, construction of communication infrastructures, aquatic pollution, discarding of fin fish larvae and intensification of agricultural farming. Islam et al. (2015); Haque et al, 2015; Das et al., 2022; Das et al., 2023a, Das et al.,

2023b; Haque et al., 2023; Pandit et al. 2020, Sultana et al. (2017), Ferdousy 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.

RECOMMENDATIONS

- Dredging of the River Bed
- Alternative earning sources for the people of these areas should be provided during the banded season of fishing.
- The use of insecticides should be controlled.
- The leasing system should be easy and cheaper for poor fishermen.
- Increasing awareness among the people of surrounding wetland areas

CONCLUSION

This is the first attempt at looking into the fish species diversity of the Monoi River, and Choilchakra *Beel*, the study focused primarily on documenting the available native (and implicitly to non-native) fish species of the river and adjacent *beels*. Fish species richness is a good allusion of healthy fish diversity in the waters, which could be conserved. On the contrary, the poor availability status and decreasing trend of many fish species intimates the alarming present situation of the fisheries resources. Furthermore, the current study also observed that freshwater fish species are affected by a range of anthropogenic and natural threats, and it suggested a number of conservation solutions. Moreover, ecosystem-based fisheries management with local community participation is highly recommended for these water bodies to conserve fish diversity and to prevent any kind of catastrophes in the future.

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