Environment and Ecology 41 (4): 2257—2265, October—December 2023
Article DOI: https://doi.org/10.60151/envec/CWTT8110
ISSN 0970-0420

Ichthyofaunal Diversity of Tipkai River in Assam, India

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Received 16 March 2023, Accepted 4 August 2023, Published on 12 October 2023

ABSTRACT

Assam is endowed with dynamic rivers and lakes which in turn facilitates a rich diversity of fish species. The western Assam geographically blessed with such a river named Tipkai. Tipkai River is a Himalayan tributary of the Brahmaputra River in the Indian state of Assam which raises in the Bhutan hills flows through the Kokrajhar (BTR) and through Dhubri district of Assam and joins the Brahmaputra River at Chatakurachar of Dhubri district. The present study deals with the extensive Ichthyological fields survey conducted over a period of oneyear from January 2021 to December 2022 based on the data collected from six locations of the river from the Mahamaya (Bagribari) to Chatakurachar. The survey revealed the occurrence of great range of diversity of fishes representing 106 species distributed under 10 orders and 31 families. Among the recorded fish species 4 species are Vulnerable (VU), 2 species are Near Threatened (NT), 3 species are Endangered (EN),86 species are least concern (LC) while 3 species are Not Evaluated (NE), 2 species are Data Deficient (DD) with 65 genus, 10 order and 30 families. The highest order Cypriniformes with 49 species, Siluriformes 27 species Perciformes 17 species. The site Khoraghat represents the lowest fish diversity among the six sites during the study period might be due to sand mining and other anthropogenic reasons which needs further analysis of water quality. Thus, this beautiful river, a small tributary from Bhutan serves the land cover and maintains its beautiful biodiversity and also the lifeline for mankind.

Keywords Ichthyofauna, Fish diversity, Cypriniformes, Tipkai River, Assam.

INTRODUCTION

Biodiversity is an important stabilization of ecosystems, production of overall environmental quality, for understanding intrinsic worth of all species on the earth (Ehrlich and Wilson 1991). India is on of the mega biodiversity countries in the world and occupies the ninth position in relation with fresh water biodiversity (Mittermeier *et al.* 1997). The rivers in India harbor one of the richest fish genetic resources in the

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world (Vas *et al*. 2009). As per estimation the global diversity of freshwater fishes is approximately 15000 species (Nelson 2006). Of these 868 were found in India, accounting for 5.75% of the global fresh water fish diversity. This includes 192 endemic species and 327 species listed as threatened in India by the International Union for Conservation of Nature (IUCN) (Lakra *et al.* 2010). The Northeast India is rich with varied type of water resources in the form of Beels, Lakes and swamps (143,740 ha), ponds (40,808ha), reservoirs (23,792 ha) rivers (19,150 km) and law laying wetland, paddy cum fish culture systems (2,780 ha), (Mahanta *et al.* 2003). The Northeastern region is rich in aquatic bio-resources and among them it is dominated by varied type of fish species. A number of endemic fish species have been recorded from this region, therefore recognized as the hotspot of freshwater fish diversity in the world (Kottelat and Whitten 1996). There are 288 freshwater fish species 115 genera under 37 families and 10 orders have been reported from Northeast region where maximum 111 number of species are from family Cyprinidae (Goswami *et al.* 2007). In Assam, from Brahmaputra valley and Barak valley zone. There are two main river system Brahmaputra and Barak with lots of flood plain wetlands exhibiting huge number of fish fauna supported by the subtropical climatic favorable geographical and ecological condition with rich aquatic biodiversity having the largest number of fish species (217), followed by Arunachal Pradesh (167), Meghalaya (165), Tripura (134), Manipur (121), Nagaland (68), Sikkim (52) and Mizoram (48), (Mahanta *et al*. 2003). The fish communities and species can also be excellent indicators of water as their continuous exposure to changing water conditions, fish are also suitable as early warning signals of anthropogenic stern on natural ecosystem dynamics. For these purpose, fish should be key elements of ecosystem monitoring programs. The fishes provide nutrition, generate economy and livelihood for the rural people of the globe. Although the investigation on ichthyofaunal diversity of these region has been carried out by various workers, but in Dhubri district yet there is few records of proper scientific information regarding the fish diversity, riverine capture fishery potentiality, abundances of food as well as their conservation measures from river Tipkai. In the present study an attempt has been made to record the fish diversity and their ICUN status from the Tipkai river of Dhubri district Assam.

Study area

The study was conducted Tipkai river and in the fish market available in and around Dhubri district, Latitude 26.0207° N and Longitude 89.9743°E the western most part of the lower Brahmaputra valley of Assam. The Geographical Area of the district is 2838 sq km. Tipkai river is a North Himalayan Tributary of River Brahmaputra flows from downstream of Bhutan Hills by touching the two district Kokrajhar district and Dhubri district of Assam and Joined in Brahmaputra River at Chatakurachar of Dhubri district. In the Eastern part of Tipkai is Gaurang and Sonkosh river and Chakrashila Hills, Gadadhar river in the western part, Bhutan hills is in the Sothern part and Brahmaputra River is in the Northern part. The survey area was conducted in the selected catchment areas having approachable roads to river sides. These are Mahamaya, Sapatgram, Gutipara, Bagribari, Atani, Kawunbari, Khoraghat river site markets and main river.

MATERIALS AND METHODS

To collect the data the study was conducted by direct and indirect methods. Investigation was conducted twice in a month from January 2021 to December 2022 in the selected catchment areas with the help of fisherman during the time of fishing. Fishes were observed from the group of the people who catches fish for their own daily consumption, Fishing community who engaged in fishing as their livelihood and from leaseholder. Besides the market, survey was conducted in the fish markets to observed the local fish species caught by the fisherman in the morning hrs 7 to 10 AM and evening 3 to 6 PM at the river site market of the study area (Fig. 1). For Identification and Classification, Talwar and Jhingran (1991), Jayaram(1999), Vishwanath (2002), Nath and Dey (2000) were followed, Nomenclature is based on fish base (www.fishbase.se). The conservation status of recorded species was based on IUCN (www.iucnredlist.org). Statistical analyses were done by using MS Excel 2003.

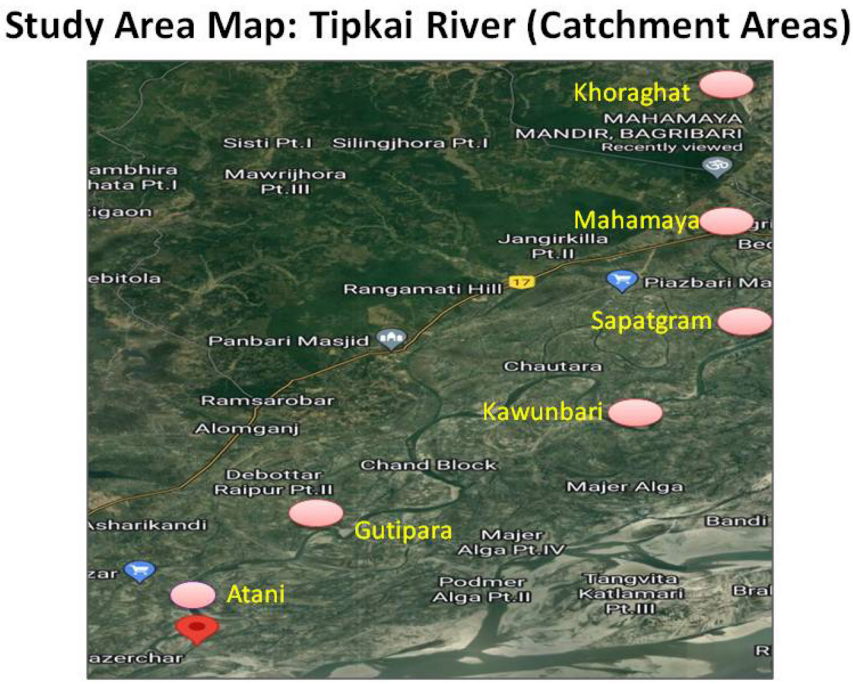

Fig. 1. Study area map of Tipkai river (source-google earth).

RESULTS AND DISCUSSION

The survey revealed the occurrence of inexplicable diversity of fishes representing 106 species distributed under 10 orders and 30 families. Among the recorded fish species 4 species are Vulnerable (VU), 2 species are Near Threatened (NT), 3 species are Endangered (EN), 86 species are Least Concern (LC), while 3 species are Not Evaluated (NE), 2 species are Data Deficient (DD), With 65 genus, 10 order, 30 families. Highest order Cypriniformes with 49 species, Siluriformes 27 species, Perciformes 17 species. The presence of 15 numbers of rare fish species belonging to Vulnerable, Near threatened, Endangered IUCN status indicates the value and important of the present study sites (Table 1). But their sustainability is now becoming threatened in the Tipkai river. The major threats to the rare fishes might be due to over fishing; high food value (Table 1), habitat loss and illegal fishing practices. According to IUCN 2013 out of 49 species of Cypriniformes collected, 41 species falls under least concerned (LC) category (Table 1). Six sampling sites of the Tipkai river were selected in this study namely Mahamaya, Sapatgram, Khoraghat, Kawunbari, Gutipara and Atani (Fig. 1). Order Cypriniformes constituted 46% of the total fish composition followed by 25% (Fig. 2). Family Cyprinidae comprised of 41% during of the total family shows relevant similarity with the composition of other studies (Fig. 3). Ambassidae, Badidae, Channidae, Cyprinidae, Osphronemidae, Sisoridae, Siluridae, Heteropneustidae, Anabantidae present throughout the 12 months where as Engraulidae, Belonidae and Clupeidae presents 3-4 month throughout the year (Table 2). Study reveals that 106 number of species, 10 orders and 30 families have been recorded from six sites during the study period out of which Cypriniformes dominates the catch list with 49 followed Siluriformes with 27 species (Table 3). The month-wise availability of fish order presents among Perciformes, Anabantiformes, Cypriniformes and Gobiiformes presences throughout the 12 months where as Tetraodontiformes, Beloniformes and Clupeiformes presences only 5 month throughout the year during the study period (Table 3). Scanning of the literature shows that 132 fish species with reference

Table 1. List of fish diversity of Tipkai river with IUCN status.

Sl. No.	Order	Family	Genus	Species	Food fish	IUCN status
1	Perciformes	Ambassidae	Chanda	*C. nama*	Yes	LC
				C. ranga	Yes	LC
			Parambasis	*P. lala*	Yes	LC
		Badidae	Badis	*B. badis*	Yes	LC
		Channidae	Channa	*C. orentalis*	Yes	VU
				C. gachua	Yes	LC
				C. punctatus	Yes	LC
				C. straitus	Yes	LC
				C. marulius	Yes	LC
		Cichlidae	Oreochromis	*O. niloticus*	Yes	LC
		Nandidae	Nandas	*N. nandas*	Yes	LC
		Osphronemidae	Trichogaster	*T. faciata*	Yes	LC
				T. lalius	Yes	LC
				T. chuna	Yes	LC
				T. laila	Yes	LC
		Bagaridae	Sperata	*S. aor*	Yes	LC
				S. seenghala	Yes	LC
			Mystus	*M. Vitratus*	Yes	LC
				M. tengara	Yes	LC
				M. cavasius	Yes	LC
				M. bleekeri	Yes	LC
				M. gulio	Yes	LC
			Rita	*R. rita*	Yes	LC
		Clariidae	Clarius	*C. bactrachus*	Yes	LC
2	Siluriformes					
				C. gariepinus	Yes	LC
		Sisoridae	Gagata	*G. cenia*	Yes	LC
			Bagarius	*B. bagarius*	Yes	NT
		Siluridae	Ompok	*O. pabo*	Yes	NT
				O. pabda	Yes	NT
			Wallago	*W. attu*	Yes	NT
		Erithistidae	*Erithistes*	*E. punsillus*	Yes	LC
		Pangacidae	Pangacius	*P. pangasius*	Yes	LC
				P. bocourti	Yes	LC
		Schilbeidae	*Eutropiichthys*	*E. vasha*	Yes	EN
				E. murius	Yes	NT
			Pseudeutropius	*P. atherinoides*	Yes	LC
			Clupisoma	*C. garua*	Yes	VU
			Pachypterus	*P. atherinoides*	Yes	NE
			Ailia	*A. coila*	Yes	NT
		Loricariidae	*Hypostomini*	*Hypostomini* sp.	Yes	LC
		Heteropneus-pidae	*Heteropreustes*	*H. fossilis*	Yes	LC
		Chacidae	*Chaca*	*C. chaca*	No	LC
3	Anabantifor-mes	Anabantidae	Anabus	*A. testudineus*	Yes	LC
		Botidae	Botia	*B. birdi*	Yes	NE
				B.dario	Yes	LC
			Labeo	*L.rohita*	Yes	LC
				L.calbasu	Yes	LC
				L.bata	Yes	LC
				L.ariza	Yes	LC
				L.gonius	Yes	LC
				L.dero	Yes	LC
				L.bogs	Yes	LC
			Salmostoma	*S. boopis*	Yes	LC

Table 1. Continued.

Sl. No.	Order	Family	Genus	Species	Food fish	IUCN status
			Hypophthalmicsthys	*H. molitrix*	Yes	LC
				L.nandina	Yes	LC
			Puntius	P.sophore	Yes	LC
				P. chola	Yes	LC
				P.javanicus	Yes	LC
				P.sarana	Yes	LC
				P.terio	Yes	LC
4	Cypriniformes	Cyprinidae	Pethia	*P. phutonio*	Yes	LC
				P. ticto	Yes	LC
				P. conchonius	Yes	LC
				P. guganio	Yes	LC
			Barilius	*B. barna*	Yes	LC
				B. bendelisis	Yes	LC
				B. vagra	Yes	LC
				B. shacra	Yes	LC
			Salmostoma	*S. bacaila*	Yes	LC
			Amblypheryn-godon	*A. mola*	Yes	LC
			Hypophthalmicsthys	*H. nobilis*	Yes	DD
			Ctenopharyngodon	*C. idella*	Yes	NE
			Chirrhenus	*C. mrigala*	Yes	LC
				C. reba	Yes	LC
			Cyprinus	*C. carpio*	Yes	VU
				C. nudus	Yes	LC
			Tor	*T. tor*	Yes	DD
				T. putitora	Yes	EN
			Cabdio	*C. morar*	Yes	LC
			Laubuca	*L. laubuca*	Yes	LC
			Rasbora	*R. daniconius*	Yes	LC
			Salmostoma	*S. bacila*	Yes	LC
			Esomus	*E. danricus*	Yes	LC
			Rasbora	*R. daniconius*	Yes	LC
			Danio	*D. derari*	Yes	LC
			Oxygaster	*O. gora*	Yes	LC
			Aspidoporia	*A. jaya*	Yes	LC
	Cypriniformes	Cobitidae	Lepidocepha-lichthys	*L. guntea*	Yes	LC
			Canthophrus	*C. gongata*	Yes	LC
			Somileptis	*S. gongata*	Yes	LC
		Nemaceilidae	Acanthocobitis	*A. botia*	Yes	LC
		Psilorhynchidae	Psilorhynchus	*P. balitora*	Yes	LC
5	Tertaodonti-formes	Tetradontidae	Tetradon	*T. cutcutia*	No	NE
6	Osteoglossi-formes	Notopteridae	Notopterus	*N. notopterus*	Yes	NT
			Chitala	*C. chitala*	Yes	LC
7	Synbranchi-formes	Mastacembelidae	Macrognathus	*M. siamensis*	Yes	LC
				M. guentheri	Yes	LC
				M. aral	Yes	LC
				M. puculas	Yes	LC
			Mastacembelus	*M. armatus*	Yes	LC
		Synbrachidae	Monopterus	*M. cuchia*	Yes	LC
8	Beloniformes	Belonidae	Xenentodon	*X. cancila*	Yes	LC
9	Clupeiformes	Clupeidae	Gudusia	*G. chapra*	Yes	LC
			Hilsa	*H. ilsha*	Yes	NT

Table 1. Continued.

Sl. No.	Order	Family	Genus	Species	Food fish	IUCN status
		Engraulidae	Setipinna	*S. phasa*	Yes	LC
10	Gobiiformes	Gobiidae	Glossogobius	*G. giuris*	Yes	LC
	Cypriniformes	Cobitidae	Lepidocepha-lichthys	*L. guntea*	Yes	LC

Table 2. Showing the Family of fish month wise availability in the area.

Sl. No.	Family	January	Febru-ary	March	April	May	June	July	August	Septem-ber	Octo-ber	Novem-ber	Decem-ber
1	Ambassidae	+	+	+	+	+	+	+	+	+	+	+	+
2	Badidae	+	+	+	+	+	+	+	+	+	+	+	+
3	Channidae	+	+	+	+	+	+	+	+	+	+	+	+
4	Cichidae	-	+	-	+	+	+	+	+	+	+	+	-
5	Osphronemidae	+	+	+	+	+	+	+	+	+	+	+	+
6	Bagaridae	-	-	-	+	+	+	+	+	+	+	+	+
7	Clariidae	+	-	-	+	+	+	+	+	+	+	+	+
8	Nandidae	-	-	+	+	+	+	+	+	-	-	-	-
9	Sisoridae	+	+	+	+	+	+	+	+	+	+	+	+
10	Siluridae	+	+	+	+	+	+	+	+	+	+	+	+
11	Erithistidae	-	-	-	-	+	+	+	-	-	-	-	-
12	Pangacidae	-	-	-	-	+	+	+	+	+	+	+	+
13	Loricariidae	-	-	+	+	+	+	+	+	+	+	+	+
14	Schilbeidae	-	-	+	+	+	+	+	+	+	+	+	+
15	Heteropneuspidae	+	+	+	+	+	+	+	+	+	+	+	+
16	Chacidae	-	-	-	+	+	+	+	+	+	+	+	-
17	Anabantidae	+	+	+	+	+	+	+	+	+	+	+	+
18	Botidae	+	+	-	-	-	-	+	+	+	+	+	+
19	Cyprinidae	+	+	+	+	+	+	+	+	+	+	+	+
20	Cobitidae	+	+	+	+	+	-	+	+	+	+	+	-
21	Nemaceilidae	+	+	+	+	-	-	+	+	+	+	+	-

Table 2. Continued.

Sl. No.	Family	Janu-ary	Febru-ary	March	April	May	June	July	August	Septem-ber	Octo-ber	Novem-ber	Decem-ber
22	Psilorhynchidae	+	+	-	-	+	-	-	+	+	+	+	+
23	Tetradontidae	-	-	-	+	-	+	+	+	-	-	+	-
24	Notopteridae	+	-	-	-	-	-	-	+	+	+	+	+
25	Mastacembelidae	-	-	+	-	-	+	+	+	+	+	+	+
26	Synbrachidae	-	-	+	-	-	+	+	+	+	+	+	+
27	Belonidae	-	-	-	-	-	-	-	+	+	+	+	-
28	Clupeidae	-	-	-	-	-	-	-	+	+	+	+	-
29	Engraulidae	-	-	+	-	-	+	+	-	-	-	-	-
30	Gobiidae	+	-	-	-	+	+	+	+	+	-	-	+

their economic importance was recorded by Ghosh and Lipton (1982) while Sen (1985) and Mahanta (1998) recorded altogether 183 fish species from Assam and the neighboring North Eastern State of India. Nath and Dey (1997) recorded a total of 131 species from the drainages of Arunachal Pradesh. Sen (2000) has indicated that a greater number of species (267) has been reported from North East India. Nelson (1994) also reported that the greatest fish diversity represents from Cypriniformes and Siluriformes

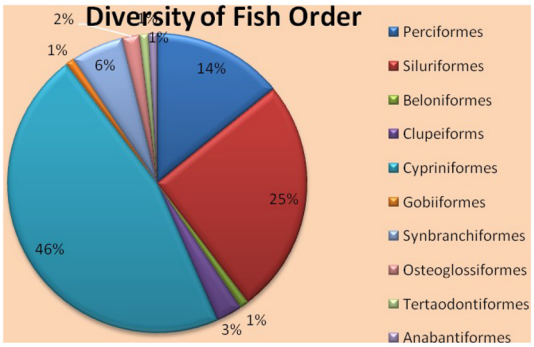

Fig. 2. Fish groups diversity of Tipkai river.

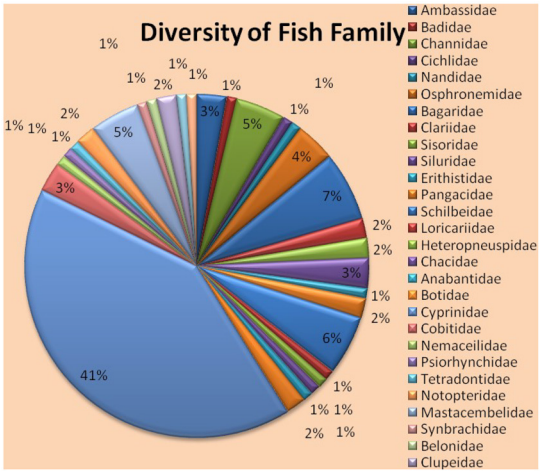

Fig. 3. Showing the family wise distribution of fish.

in waterbodies. Such observations were made by Goswami *et al.* (2012) from fish diversity of North East India, inclusive of the Himalayan biodiversity hotspots zones, Acharjee and Barat (2014) in the hill-stream rivers of Himalaya, Johal and Rawal (2005) in Western Himalayan hill stream and by Shrestha (1999) in the rivers of the Nepal in the Eastern Himalaya. Reports from other Asian rivers De Silva *et al*. (2007), Raghavan *et al.* (2008), Sarkar and Bain (2007) also found the maximum composition of Cyprinid species in rivers. It was evident from the present study that the ichthyofaunal composition of Tipkai river system was mostly cold water species in the borders of Bhutan and warm water species in down stream of the river stretches. Similar works was reported by Goswami *et al.* (2012) that all the water bodies of North East India i.e. Himalayan and Indo Burma biodiversity hotspots zones are blessed with warm and cold-water fish species and furnish a wider an geo habitat. Dominance of cold water hill stream species may be probably due to the nature of the stream with high water current and gradient, low water temperature. Water temperature falling within the tolerance limit of the *Schizothorax* spp. Habitat may be termed as cold (Jhingran and Sehgal 1978). Similar record has been made by Bagra and Das (2010) in Siyom River of Arunachal Pradesh. Distribution of species in all six sampling sites of river stretches show a trend of increment from upstream to downstream that is Khoraghat (45 sp)<Mahamaya (66 sp)<Sapatgram(84 sp)< Kawunbari (88 sp)< Gutipara (92 sp)< Atani (97 sp). It was in accordance with the studies of Welcomme (1985), Granado (2000) that fish communities in riverine system typically follow a pattern of increasing species richness, diversity and abundance from upstream to downstream. It

Table 3. Showing the order of fish month wise availability in the area.

Sl. No.	Family	January	Febru-ary	March	April	May	June	July	August	Septem-ber	Octo-ber	Novem-ber	Decem-ber
1	Perciformes	+	+	+	+	+	+	+	+	+	+	+	+
2	Siluriformes	+	+	-	-	+	+	-	+	+	+	+	+
3	Anabantiformes	+	+	+	+	+	+	+	+	+	+	+	+
4	Cypriniformes	+	+	+	+	+	+	+	+	+	+	+	+
5	Tetraodontiformes	-	-	-	+	-	+	+	+	-	-	+	-
6	Osteoglossiformes	-	-	-	+	+	+	+	-	+	-	-	+
7	Synbranchiformes	-	-	+	-	-	+	+	+	+	+	+	+
8	Beloniformes	-	-	-	-	-	-	-	+	+	+	+	-
9	Clupeiformes	+	-	+	-	-	-	-	+	+	+	-	-
10	Gobiformes	+	+	+	+	+	+	+	+	+	+	+	+

was more or less similar with the study reports of Raghavan *et al*. (2008) that higher species richness was observed in 0 to 200 m above sea level. The site Khoraghat showed lower number of species might be due to sand mining, soil erosion, construction of number of bridges, over-exploitation, operation of fishing gear, and the pesticides that are randomly used in the bank side paddy fields.

CONCLUSION

From the above preliminary investigation, it is observed that the fish diversity of River Tipkai is higher with respect to other rivers in the Dhubri district might be due to the connection with the mighty Brahmaputra river supporting various groups of fish for upstream and downstream movement from Bhutan. However, due to various anthropogenic reasons the fish population has been found to be low but species diversity is higher with 106 numbers of species. As far as the pollution of the study area is concerned, further study is required to analyze the level of physico-chemical characteristics of the river Tipkai in the future. The river exhibits a number of commercially important edible fish species. Further, the assessment of water quality needs to avoid further contamination of the river waterand to save the fish habitat from sand mining and other anthropogenic activities for the betterexistence of the fish fauna and supporting the human society for its survival.

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