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Research Article

Present Status of Fish Diversity of the Kaptai Lake, Bangladesh

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ABSTRACT

Kaptai Lake (KL) is the biggest manmade lake in Bangladesh and plays a significant role for local fisheries by creating an excellent environment for various indigenous species. This study pursues to enhance the understanding on fish diversity in Kaptai Lake by attempting to explore the present status of fish populations within the reservoir taking into specific focus on evaluation of conservation management priorities and additional conservation needs. The study was conducted during January–December 2023 at five different sites of the Rangamati district, namely Banarupa Bazar, BFDC Ghat (Rangamati), BFDC Ghat (Kaptai), Reserve Bazar and Tabalchari Bazar. We identified 80 fish species representing the 11 orders and 28 families where Cypriniformes had the highest percentage (38.75%), and ranged from 1.25% to 22.50% for the other orders. The diversity indices, Shannon-Wiener (H'), Pielou's evenness index (J') and species richness (SR) were found to be low and uneven in KL based on different seasons. The maximum fish catch was recorded in September (1,855.55 metric tons), and the minimum fish catch ever caught by April (112.24 metric tons). The diversity of Kaptai Lake fish stock is alarmingly threatened due to sustainable human and natural adversities. These results contribute valuable data for conservation purposes and management of Kaptai Lake for biodiversity protection in the years to come.

Introduction

Kaptai Lake (KL) in Bangladesh, is one of the largest artificial freshwater lakes in Southeast Asia (Hussain, 2020). It was formed in the year 1961 by constructing a dam on the Karnaphuli River at Kaptai. The lake falls within Latitude: 22°20'–23°18'N, Longitude: 92°00'–92°26'E. Dams were constructed for the initial time with a view to generating electricity hydropower and other purposes as fisheries, flood control, drainage and irrigation and navigation were regarded as additional benefits. However, from the year 1965 onwards, the lake has also been supporting the fish production activity to a greater extent (Galib et al., 2010). Today, it remains one of the key fisheries in the Chittagong Hill Tracts (Halder et al., 1991). The lake has a depth ranging from 9 to 35 meters (Kabir et al., 2019) and features a rocky shoreline with an uneven bottom, mainly composed of clay only in the submerged riverbeds (Rahman and Akther, 2015). The lake primarily supports artisanal to medium-scale commercial fishing and is controlled by the Bangladesh Fisheries Development Corporation (Suman et al., 2021).

Covering 68,800 hectares area, KL is a major inland water resource making up 46.8% of Bangladesh's total pond area (Ahmed, 1999). It harbors a diverse array of small freshwater fish species, contributing significantly to small-scale fisheries (FRSS, 2020). The lake currently produces 17,937 metric tons (MT) of fish annually which accounts for 0.38% of the nation's total fish production (DoF, 2023). Despite being a significant potential source for fish production, an essential component of the Bangladeshi diet, and a vital livelihood for local people, the performance of this reservoir is hindered by various environmental,

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socioeconomic, and management challenges that affect its potential (Ahmed et al., 2006).

Although KL is one of Bangladesh's most biodiverse reservoirs (Rahman, 2005) and serves as a key breeding ground for important carp species, the production of carp fish and high-value fish has steadily declined over time (DoF, 2020; Hussain, 2020). Over the years, due to various anthropogenic and environmental factors, the population of IMCs has decreased and several native species are nearing extinction in the lake (Lima et al., 2023). According to Mohsin et al., (2014), however, more recent studies have indicated that this trend will weaken with declines in both the number of species and the original fish population.

According to Patwary et al., (2014) observation, in (IMCs) some of the factors such as overfishing, water logging, and wind patterns adversely affect the hatching success of the fry, leading to negative consequences. Furthermore, the use of mosquito nets (Kechki jal) does more harm than good to ichthyoplankton, particularly IMC fry, thus, degrading IMC production.

Despite the lake's ecological and economic significance, limited research has been conducted on the current status of its fish diversity. Freshwater ecosystems are considered some of the most endangered in the world, with biodiversity declines being more severe in freshwaters than in even the most affected terrestrial ecosystems (Sala et al., 2000). With the above in mind, we performed a thorough evaluation to revise the status of the fishes of KL, their potential as a freshwater fishery, and the challenges that prevent its further development. The results of the present study may be of great importance to the proper utilization of KL and other aquatic ecosystems in Bangladesh.

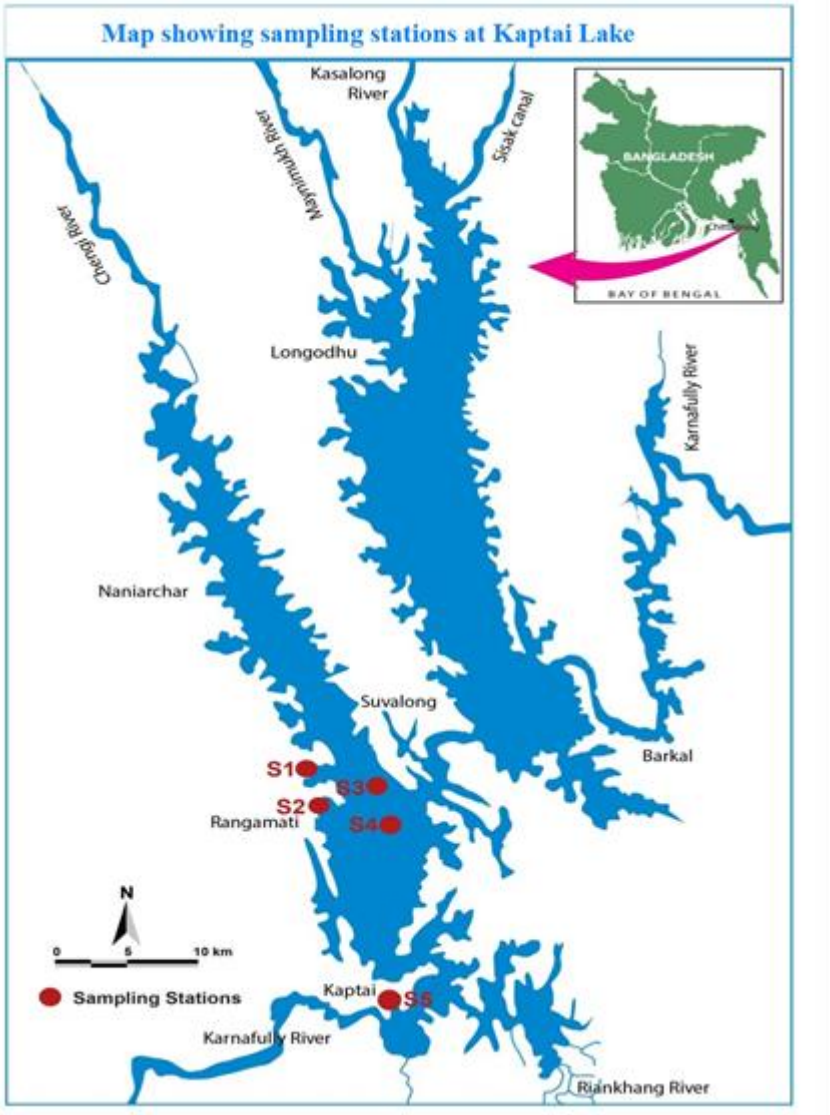

Figure 1. Map showing sampling stations at Kaptai Lake

Materials and Methods

Study area

The study was conducted in KL located in the Rangamati and Khagrachari districts of south eastern Bangladesh. Sampling was done at five different stations (Figure 1 and Table 1), these were Banarupa Bazar, Rangamati (S1); BFDC Ghat, Rangamati (S2); BFDC Ghat, Kaptai (S3); Reserve Bazar, Rangamati (S4); Tabalchari Bazar, Rangamati (S5).

Table 1. Sampling stations

Sampling Station No.	Latitude	Longitude
S1	22°39'14"N	92°10'43"E
S2	22°38'53"N	92°11'05"E
S3	22°39'10"N	92°11'48"E
S4	22°38'21"N	92°11'10"E
S5	22°29'42"N	92°13'14"E

Study period

Data on fish biodiversity, fishing practices, fishing gear, and catch assessments were collected during the period between January 1, 2023 and December 31, 2023. Sampling was conducted once a month (first week of each month) at each of the five stations. As fishing is banned from May to July by the government, no data were available in those months.

Sample collection and identification

Initially, primary information on the fisheries resources of KL was collected from the Bangladesh Fisheries Development Corporation (BFDC), Rangamati, and local fishermen, focusing on key fishing activity areas. Using this information, a preliminary survey was conducted through semi-structured questionnaire interviews with 112 respondents (fishermen and fish traders), along with three focus group discussions (FGDs) involving local community members at fish markets, landing centers, and fishing sites.

Primary data and information were gathered directly through field visits and observations at these five sampling locations. During the monthly sampling periods, samples were taken from the catches of locally selected fishermen while they were fishing or selling at the designated sampling sites. To determine the sample size, we employed constant weight sampling, where a constant sample weight (e.g., 1 kg) was decided based on the study's objectives and practicality. The sample size was chosen to ensure adequate representation of all species in the catch. Multiple samples of the same weight were taken to account for variability and ensure statistical reliability. To draw samples from a large fish catch, we collected random portions of the catch to avoid bias. This was done by dividing the catch into sections and randomly selecting a portion for sampling. In order to obtain a representative sample, the whole catch was homogenized. The assembled sample was sieved and then, its components were listed and quantified for assessment of their populations. Samples were photographed and their pattern coloration was noted while still the samples were fresh. The identification of the fish species was done basing on the morphometric and meristic characters of the body of the fish as described by Rahman (2005). The recorded fish species were classified the Fish Base database (Froese and Pauly, 2019). Fish from different levels of water were sampled using various fishing gears such as kechki jal (seine), fas jal (gill net), dharma jal (lift net), thela jal (push net) and hook and chai (trap) which are efficient for the sampling process (Galib et al., 2018a). The data was obtained from BFDC and additional information was gathered from the District Fisheries Officer (DFO), the Upazila Fisheries Officer (UFO) and other governmental and non- governmental bodies. The BFDC and Bangladesh Fisheries Research Institute (BFRI), Rangamati provided correspondence data on the total volume of fish production. The collected data was then analyzed and reviewed thereby enabling a thorough understanding of the fish species diversity present in KL.

Data analysis

Identifying a fish serves as the initial step in conducting any research. The identification was confirmed by analyzing the morphological characteristics (external features) of the specimens, and regional threats were evaluated based on the IUCN (2015a) guidelines. The availability of species was assessed by analyzing catch data and the classification system primarily followed the framework proposed by Nelson et al., 2016. In accordance with the guidelines and standards outlined by the International Code of Zoological Nomenclature (ICZN), the scientific names of all genera and species were documented along with their recognized vernacular names. The local conservation status was assessed based on IUCN Bangladesh (2015a and 2015b), while the global conservation status was evaluated based on the IUCN database from 2020.

Species assemblage and fish diversity analysis

In this study, the Shannon-Wiener diversity index (H'), Pielou's species evenness index (J') and species richness index (SR) were calculated to evaluate the status of fish diversity using the following formulae:

Shanon-Wiener diversity index (H')- a method used to measure the diversity of species of community.
Denoted as H', this index calculated using formula as follows:

$$H' = -\Sigma Pi \ln Pi$$

Here, Σ: A Greek symbol that means "sum", H' is the diversity index and Pi is the relative abundance (s/N)

Pielou's Species Evenness index (J')- a method to measure how numerically equal a community is an

environment. Denoted as J', the species evenness is calculated using formula as follows:

$J' = H'/ H_{max}$

Here, H' is Shannon-Wiener Diversity Index; and H_{max} is the maximum possible diversity (Baliton et al., 2017). The value of J' is a dimensionless ratio ranging from 0 to 1. The lower the value of J', the lower the complete evenness of species distribution. A value of J' (≤0.5) indicates an unbalanced distribution of species (Hussain et al., 2012). Species richness (S) is the number of species within a defined region. The species richness of a region is obtained through sampling or via a census.

Results

During the twelve-month study period, which ran from January 2023 to December 2023, 80 fish species altogether, representing 11 orders and 28 families, were found in the KL in Rangamati, Bangladesh (Table 2).

Table 2 List of fish biodiversity of the Kaptai Lake and current status

S. N.	Order	Family	Scientific Name	Local Name	Status in Bangladesh	Global Status
1	Cypriniformes	Cyprinidae	*Amblypharyngodon mola*	Mola	LC	LC
2			*Rasbora rasbora*	Darkina	NT	LC
3			*R. daniconius*	Darkina	LC	LC
4			*Osteobrama cotio*	Dhela	NT	LC
5			*Salmostoma argentea*	Chela	DD	LC
6			*S. phulo*	Fulchela	NT	DD
7			*Securicula*	Ghora chela	NT	LC
8			*Salmophasia bacaila*	Katari	LC	LC
9			*Catla catla*	Catla	LC	LC
10			*Hypophthalmichthys nobilis*	Bighead Carp	LC	LC
11			*H. molitrix*	Silver carp	LC	LC
12			*Ctenopharyngodon idella*	Grass carp	LC	LC
13			*Cirrhinus cirrhosus*	Mrigal	NT	VU
14			*Labeo boga*	Bhanghan bata	CR	LC
15			*Puntius conchonius*	Kanchon puti	NT	LC
16			*P. chola*	Puti	LC	LC
17			*P. sophore*	Jat puti	LC	LC
18			*Aspidoparia jaya*	Jaya	LC	LC
19			*Tor tor*	Mohashoal	CR	NT
20			*Cirrhinus reba*	Lasso	NT	LC
21			*Labeo gonius*	Goinnya	NT	LC
22			*Gymnostomus ariza*	Bangna	VU	LC
23			*L. bata*	Bata	LC	LC
24			*L. calbasu*	Kalibaos	LC	LC
25			*Cyprinus carpio*	Common carp	LC	LC
26			*L. rohita*	Rui	LC	LC
27			*Systomus sarana*	Sarputi	NT	LC
28			*P. brevis*	Punti	DD	NE
29			*P. ticto*	Tit punti	VU	LC
30		Cobitidae	*Lepidocephalichthys berdmorei*	Puiya	LC	LC
31			*L. guntea*	Gutum	VU	LC
32		Gobiidae	*Glossogobius giuris*	Bailya	LC	LC
33			*Channa marulius*	Gajar	EN	LC
34		Channidae	*C. punctata*	Taki	LC	LC
35			*C. striata*	Shol	LC	LC
36			*C. orientalis*	Cheng	VU	VU
37	Perciformes		*Parambassis ranga*	Gol chanda	LC	LC
38			*P. lala*	Lal chanda	LC	NE
39		Ambassidae	*Chanda nama*	Lamba chanda	LC	LC
40			*P. baculis*	Kata chanda	NT	LC
41		Nandidae	*Nandus nandus*	Meni	NT	LC
42			*Badis badis*	Napit koi	LC	NE
43		Anabantidae	*Anabas testudineus*	Koi	LC	DD
44		Osphronemidae	*Trichogaster labiosa*	Khalisha	LC	LC

S. N.	Order	Family	Scientific Name	Local Name	Status in Bangladesh	Global Status
45			*T. fasciata*	Khoila	LC	LC
46	Siluriformes	Schilbeidae	*Eutropiichthys vacha*	Bacha	LC	LC
47			*Clupisoma garua*	Shishu Bacha	EN	NE
48			*Ailia coilia*	Kajali	LC	NT
49			*E. murius*	Muribacha	LC	LC
50			*Pachypterus artherinoides*	Batashi	NT	LC
51			*Mystus gulio*	Guillya	NT	LC
52		Bagridae	*M. cavasius*	Golsha	NT	LC
53			*M. tengara*	Tengra	LC	LC
54			*M. bleekeri*	Golshatengra	LC	LC
55			*Sperata aor*	Air	VU	LC
56		Siluridae	*Ompok pabda*	Pabda	EN	NT
57			*Wallago attu*	Boal	VU	NT
58		Sisoridae	*Bagarius bagarius*	Bagha ayer	CR	NT
59		Clariidae	*Clarias batrachus*	Magur	LC	LC
60		Heteropneustidae	*Heteropneustes fossilis*	Shing	LC	LC
61		Pangasiidae	*Pangasius pangasius*	Pungas	EN	LC
62		Loricariidae	*pterygoplichthys pardalis*	Suckerfish	LC	LC
63		Aillidae	*Ailiichthys punctata*	Baspata	LC	LC
64	Clupeiformes	Clupeidae	*Corica soborna*	Kachki	LC	LC
65			*Gudusia chapra*	Chapila	VU	LC
66			*Gonialosa manmina*	Goni Chapila	LC	LC
67		Engraulidae	*Setipinna phasa*	Phaisha	LC	LC
68	Synbranciformes	Synbranchidae	*Monopterus cuchia*	kuiccha	VU	VU
69		Mastacembelidae	*Macrognathus aculeatus*	Tara baim	NT	LC
70			*M. pancalus*	Guchibaim	LC	LC
71	Beloniformes	Adrianichthyidae	*Oryzias melastigmus*	Kanpona	LC	LC
72		Belonidae	*Xenentodon cancila*	Kakila	LC	NE
73		Hemiramphidae	*Dermogenys pusilla*	Ekthuttya	LC	DD
74	Osteoglossifo rmes	Notopteridae	*Chitala chitala*	Chitol	EN	NT
75			*Notopterus notopterus*	Pholi	VU	LC
76	Cichliformes	Cichlidae	*Oreochromis mossambicus*	Tilapia	VU	NE
77			*Oreochromis niloticus*	Nilotica	LC	LC
78	Anguilliformes	Anguillidae	*Anguilla bengalensis*	Boa Baim	VU	NT
79	Acanthuriformes	Sciaenidae	*Johnius coitor*	Poa	LC	LC
80	Tetraodontiformes		*Leiodon cutcutia*	Ocellated Pufferfish	LC	LC

Conservation status: CR (critically endangered), DD (data deficient), EN (endangered), LC (least concern), NE (not evaluated), NT (near threatened), VU (vulnerable)

Of the 80 fish species documented in the study area, 3 species (3.75%) are classified as Critically Endangered, 5 species (6.25%) as Endangered, 11 species (13.75%) as Vulnerable, 15 species (18.75%) as Near Threatened, 44 species (55%) as Least Concern, and 02 species as Data Deficient (2.5%) (Figure 2).

In the present study, the highest dominant order was Cypriniformes which covered 38.75% of the total, followed by Siluriformes at 22.50%, Perciformes at 17.50%, Clupeiformes at 5%, Synbranciformes at 3.75%, Beloniformes at 3.75%, Osteoglossiformes at 2.5%, Cichliformes at 2.5%, Anguilliformes at 1.25%, Acanthuriformes at 1.25% and Tetradontiformes at 1.25% (Figure 3).

According to the family, Cyprinidae has the highest 29 species (36.25%), followed by Schilbeidae (6.25%), Bagridae (6.25%), Channidae (5%), Ambassidae (5%), Clupeidae (3.75%), Cobitidae (2.5%), Nandidae (2.5%), Osphronemidae (2.5%), Siluridae (2.5%), Mastacembelidae (2.5%), Notopteridae (2.5%), Cichlidae (2.5%) each. The rest of the families contain (1.25%) fish species.

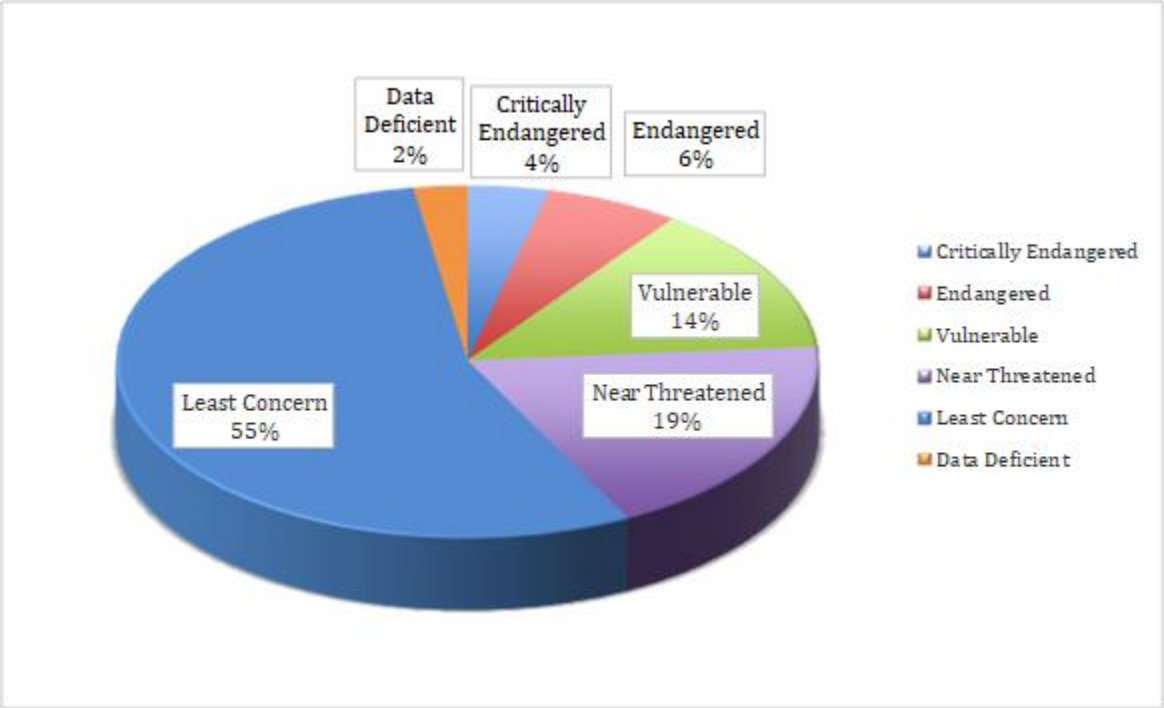

Figure 2. Status of reported fish species according to IUCN Red List (2015)

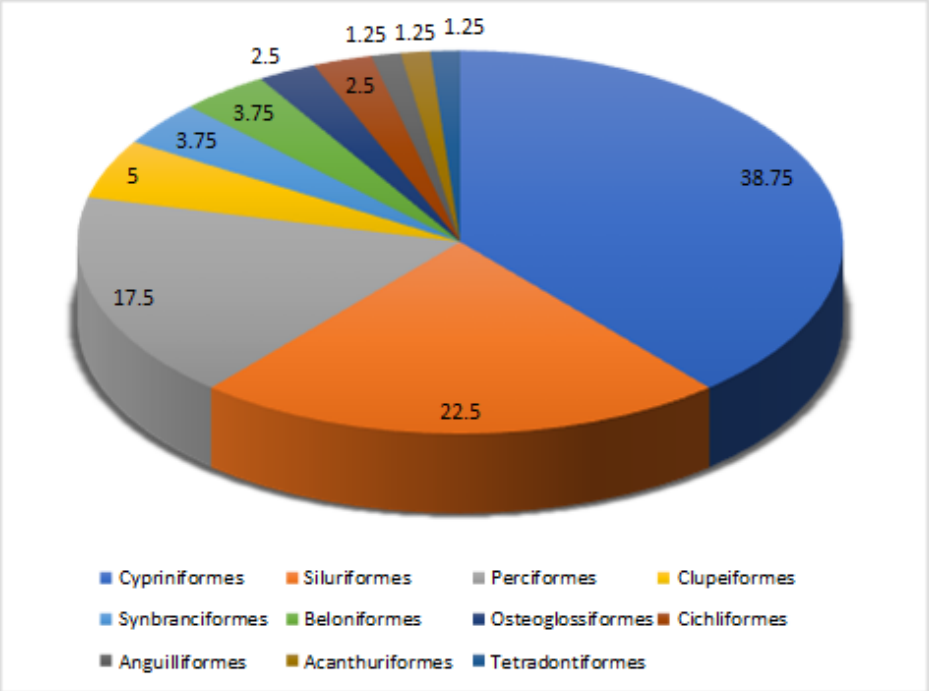

Figure 3. Percentage (%) of Fish Species according to Fish Orders in Kaptai Lake

Table 3. Biodiversity indices of Kaptai Lake

Collection period	Species richness index (SR)	Total Number of Individuals (N)	DIVERSITY (H')	EVENNESS (J')
January, 2023	35	241493.6	1.292052726	0.2521923387
February, 2023	36	263222.3	1.485936374	0.2874193289
March, 2023	42	293035.75	1.573114877	0.2917326176
April, 2023	44	112242.1	1.777803788	0.3256389881
May, 2023	0	0	0	0
June, 2023	0	0	0	0
July, 2023	0	0	0	0
August, 2023	55	1845636.1	1.026068287	0.177478714
September, 2023	50	1855553.85	1.136208078	0.2013176877
October, 2023	51	1543487.5	0.965668029	0.170239002
November, 2023	38	1013107.8	1.032605411	0.1967644196
December, 2023	37	602436.25	1.136833115	0.2182250296

The Shannon- Wiener diversity index (H') exhibited a range of 0.96 to 1.77, reaching its peak (1.77) in the month of April, 2023 and its lowest point (0.96) in the month of October, 2023. The range of Pielou's evenness (J') index is between 0.170 to 0.325. The peak value 0.325 was documented in April, 2023 and its lowest point 0.170 was in October, 2023 (Table 3 and Figure 4).

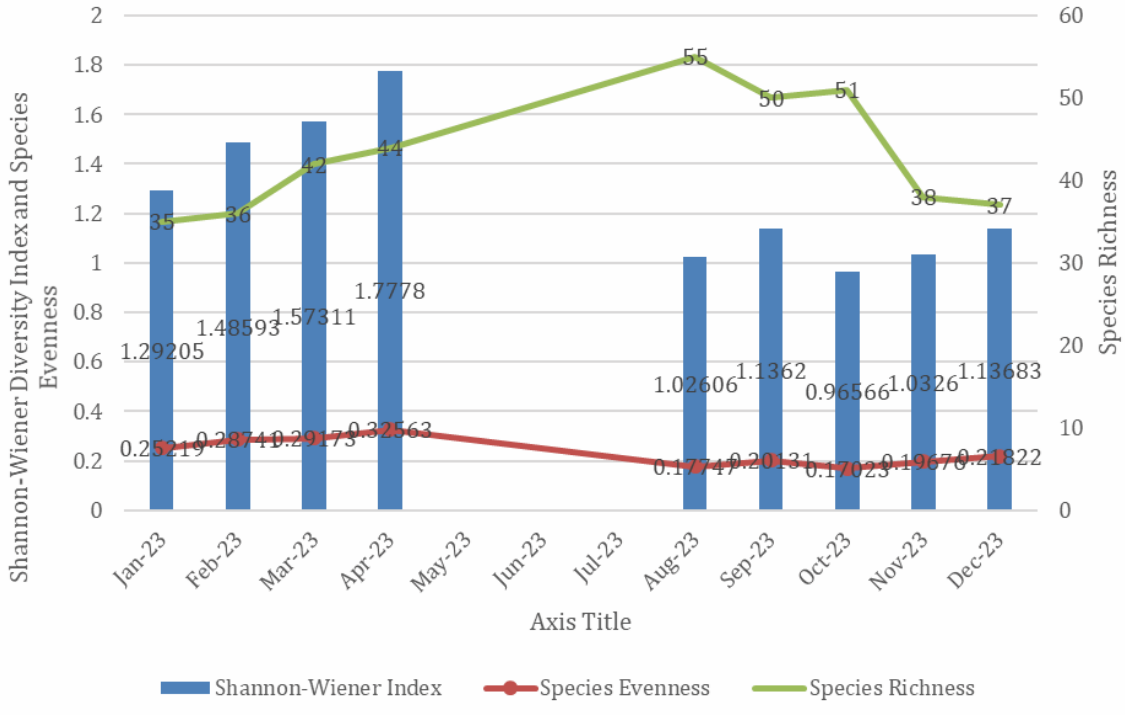

Figure 4. Graph representing the Shannon-Wiener diversity index and species Evenness in different months

The species richness index ranged from 35 to 55. According to the dominance plots, the curve for August 2023 had the greatest diversity with 55 species, while the curve for January 2023 had the lowest diversity with 35 species found in this study (Table 3 and Figure 4).

Over the course of several months, there was a notable fluctuation in the fish catch assessment, including in January with a count of 241493.6 kg, February with a count of 263222.3 kg, March with a count of 293035.75 kg, April with a count of 112242.1 kg, August with a count of 1845636.1 kg, September with a count of 1855553.85 kg, October with a count of 1543487.5 kg, November with a count of 1013107.8 kg, and December with a count of 602436.25 kg individuals of different species in kg. In September 2023, the highest recorded catch was 1,855,553.85 kg, while April 2023 had the lowest at 112,242.1 kg (Figure 5).

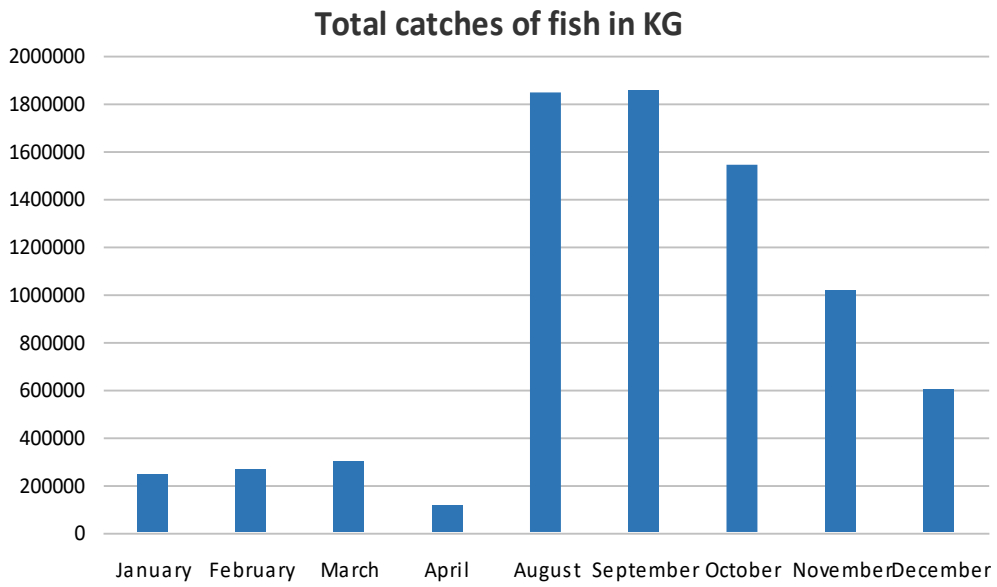

Figure 5. Bar diagram representing the total catches of fish in (kg) different months

By evaluating the anthropogenic and natural factors in their interaction with aquatic ecosystems, we were able to identify the primary challenges, opportunities, and management measures. The present challenges are associated with people's behaviour- illegal fishing when ban is in place, fishing with destructive instruments such as Jak and Gara nets, and Chaina duari, excessive fishing, and introduction of exotic fishes that are detrimental to the natural balance. Materials that do not decompose as a result of tourism activities also lead to the pollution of the water, whereas the presence of silt in the water body leads to the destruction of the dwelling places of fish. Seasonal changes, such as low water levels in the rivers during the dry season and other climatic restrictions, also disturb the life patterns of the fishes, their migration and breeding over generations.

Discussion

Ichthyofaunal Composition in Kaptai Lake

This study on fish diversity in KL revealed a rich ichthyofaunal composition, with 80 fish species identified from 11 orders and 28 families during the year-long study in 2023. Previous studies have reported varying numbers of species, such as similarly a total of 75 fish species (2014-2015) were recorded by Basak et al., 2016; 44 species by Patwary et al., 2016; 67 species (2018-2019) by Suman et al., 2021; 49 species by Hussain, 2020; 66 species by BFDC, 2020; and 60 species by Shalehin et al., 2020. These studies indicate that fish diversity in KL fluctuates over time, likely due to the complex interplay of limnological factors such as water depth, temperature, and nutrient availability. The order Cypriniformes was the most dominant, comprising 38.75% of the species, while the orders Anguilliformes, Acanthuriformes, and Tetraodontiformes were the least dominant, each representing 1.25%. The predominance of Cypriniformes (38.75%), particularly the family Cyprinidae (36.25%), is consistent with other freshwater systems in South Asia, where Cyprinidae species dominate commercial fisheries in this region (Basak et al., 2016; Shalehin et al., 2020).

Though the dominance of Cyprinidae suggests that the lake offers suitable habitats for a variety of benthic and pelagic species, the temporal variation in fish catches which ranged from 112,242 kg in April 2023 to 1,855,553 kg in September 2023 raises a big concern about the IUCN Red List species in KL. Species such as *Bagarius bagarius*, *Labeo boga*, *Tor tor*, *Channa marulius*, *Clupisoma garua*, Chitala *chitala*, Pangasius *pangasius*, and *Ompok pabda* in KL might be classified as critical endangered (CR) or endangered (EN) due to the slow rate of reproduction or overfishing for high demand in the market. With all entities combined, catches peaked in a few months suggesting that threatened species could be overexploited during this period, whereas low catches would indicate the depletion of some species due to intense fishing activities.

Above mentioned Shannon-Wiener diversity index (H') 0.96-1.77 indicate very low fish diversity in KL (Fernando et al., 1998). The Pielou's evenness index (J') was recorded between the values of 0.170 and 0.325 which shows an iniquitous distribution of individuals among species and fewer species are more abundant

than others (Hussain et al., 2012). A similar imbalance is observed for the monthly distribution of species richness (SR), with 55 species in August and only 35 species in January. These diversity indices highlight fluctuations in species distribution and a significant reduction in fish diversity which may be attributed to environmental factors and human activities such as seasonal changes in water levels and oxygen concentration, sedimentation, habitat fragmentation, overfishing, pollution, shoreline erosion, competition from invasive species, and breeding cycles.

Challenges to Kaptai Lake's progress

Although KL provides numerous ecological benefits and supports a rich diversity of aquatic species, its biodiversity conservation faces significant challenges due to a combination of natural and human-induced stressors threatening the ecological and environmental sustainability of the wetland ecosystem (Rayhant et al., 2021). Global threats to freshwater biodiversity fall into five categories: overexploitation, water pollution, flow modification, habitat destruction or degradation, and the invasion of exotic species (Dudgeon et al., 2006). In KL, various traditional fishing methods, such as lift nets, mosquito seine nets, gill nets, current nets, push nets, and fishing traps are used to exploit the lake's multi-species fishery (Ahmed and Hambrey, 2005). According to DoF (2020), there are 22,323 licensed fishermen in the area, though many more people are directly or indirectly involved in fishing activities. Habitat degradation, driven by land use changes, urbanization, inland navigation, tourism, and major infrastructure projects like road and bridge construction, is also causing a decline in biodiversity (Basak et al., 2016; Ahmed and Hambrey, 2005). Rahman et al., (2017) revealed that human activities have increased the chemical properties of KL, further impacting its health.

The presence of non-native species≥, except for *Pterygoplichthys pardalis*, has both positive and negative implications for the lake. While non-native cyprinids were intentionally introduced to boost fish production, tilapia species (*O. niloticus* and *O. mossambicus*) were accidentally introduced in the 1980s (Haldar et al., 2002; Ahmed et al., 2006). More recently, suckermouth catfish (*Pterygoplichthys pardalis*) has been occasionally caught in the lake (Galib and Mohsin, 2010).

Opportunities for conservation enhancemen

We can see that there are low levels of biodiversity and many species are listed as threatened, suggesting that if these trends continue, the lake's ecological condition may be in jeopardy. The management of the lake's fisheries will not be straightforward and will necessitate a wide array of measures directed at minimizing threats to spawning stocks as well as achieving effective control over the lake's fishery assets. In order to protect the fish diversity in KL, the following measures are suggested:

Sustainable Fisheries Management

According to a study by Patwary et al., (2016), KL is facing a serious threat on its IMCs as a result of factors such as parasites, indiscriminate fishing and the use of different kinds of fishing gears. Therefore, to help sustain the fish populations, measures such as controlling the type of fishing gear used and the intensity of fishing will be necessary. Moreover, enhancing the management of brush shelter fisheries can be used as a measure to protect the native fish populations in the lakes without the need to fish for the juveniles and the breeding stock (Uddin, et al., 2015). Another significant method includes stocking native species which are threatened by extinction and facilitating the breeding of these species (Banglapedia, 2021).

Habitat Restoration

The decrease in larger fish species is also exacerbated by several factors such as siltation, unsatisfactory quality of water, unavailability of water during winter months, coupled with high influxes of people. Degeneration of critical habitats such as spawning and nursery grounds is reversible only through rehabilitation measures (Patwary et al., 2016). Primary activities for habitat restoration should include the mitigation of sedimentation, pollution abatement, and restoring vegetation.

Monitoring and Research

Despite the presence of various conservation rules and regulations for KL, the lack of a comprehensive scientific database hinders effective management and conservation strategies (Basak et al., 2016). Ongoing monitoring of fish diversity and population trends is necessary to evaluate the effectiveness of conservation initiatives and guide future management actions.

Enforcement of Fishing Regulations

Several socioeconomic and political factors influence fishers to violate the laws and boundaries imposed by the Protection and Conservation of Fish Act 1950. For example, all the proponents believe that articulating a sound legal policy and framework that is relevant to the local situation is very important in managing the resources of KL (Rayhan et al., 2021). The declaration of no-fishing zones or seasonal fishing bans, coupled with alternative livelihood options for fishers during breeding seasons can help improve fish recruitment and prevent the overexploitation of vulnerable species.

Conclusion

Kaptai Lake is Bangladesh's largest artificial freshwater lake, created in 1961 by damming the Karnaphuli River as part of a hydroelectric project. The lake is a vital resource for the local ecosystem and economy, supporting fisheries, agriculture, and tourism. Throughout the study period, a total of 80 species were identified from 11 orders and 28 families. The order Cypriniformes displayed the highest species count, comprising 38.75% of the species, while the orders Anguilliformes, Acanthuriformes, and Tetraodontiformes were the least dominant, each representing 1.25%. Great proportion of KL fish biodiversity is severely endangered by anthropogenic and environmental factors for a prolonged period. The extremely low diversity index figures, in addition to the presence of threatened species in the lake, call for the immediate implementation of conservation measures. This research will establish a foundation for adopting future conservation and management strategies aimed at preserving the fish diversity of the KL.

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