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Socio-economic condition of the indigenous fishermen in and around an artificial lake for Bangladesh

Abstract

The present study assessed the socio-economic circumstances of the fishermen of Kaptai lake, situated beside the Rangamati Sadar in the Rangamati district. The present study found that 4 categories of cast fishermen are engaged in fishing or fisheries-related activities. Moderate literacy rates were found among the tribal fishermen as only 15% of people were entirely illiterate, and 6% were above higher secondary education. The tribal fishermen in the surveyed area were mainly poor; their annual income ranged closely between Tk. 24000 and Tk 38400. Around 49% of houses were made of bamboo fences, whereas 27% were found to be made of mud, and only 6% of brick was built. 51.5% of the fishers' families had no adequate sanitation system, whereas earthen and sanitation latrines were found at 40% and 8%, respectively. About 45.5% of the tribal fishermen had little access to pure drinking water. The tribal fishing community suffers from various problems such as extortion, lack of fishing gear, inadequate credit facilities, ineffective marketing system, etc. Finally, it may be concluded that the socio-economic condition of the tribal fishermen is not indifferent to other traditional fishermen of Bangladesh.

Keywords: Kaptai lake, traditional fishermen, Rangamati district, marketing system

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Introduction

The fishing enterprise of Bangladesh is one of the most effective and colorful sectors. It performs a key position in assuaging protein deficiency, imparting employment for unemployed teens, foreign-income exchange, and enhancing socio-financial fame—the world debts for 5.00% of national G.D.P. and 25.81% of general agricultural G.D.P. Fish and fish products were the second ones of the top exporters in 2020–2021, accounting for 2.56% of the total earning rate.[1,2] However, inland fisheries have declined substantially over time, declining and deteriorating wetlands. Bangladesh's fisheries are at risk from overfishing and environmental degradation caused by population oppression.[3,4] From 1983-to 1984, inland fishing and traditional fishing contributed 62.59 % and 15.53 % of total fish production, whereas, in 2020-21, inland fishing only contributed 30.50 % while traditional fishing contributed 60.00 % of total fish production.[5] The authorities are currently focusing on progressing organic control in public water structures to diminish the loss of resources and increase production. There are both opportunities and challenges in Bangladesh's fishery. Land seizes, inland tradition, and maritime captivity make up the country's fishing sources. The fishery of inland cover five categories of habitats include river and estuary (853,863 ha), bells (1,14,161 ha), Kaptai Lake (68,800 ha), Sundarbans mangrove rainforests (1,77,000 ha), floods (2,695,529 ha); and an inland fishing endeavor such as six forms, principally lake (three,71,309 ha), regular waterfront (1,30,488), baor (5,488 ha), shrimp/prawn farm (2,75,274 ha), pen culture (6.78 ha), and cage culture (7 ha) (MoFL, 2021).

The rivers and estuaries, *beels*, Kaptai Lake, flood lands (annually flooded, low-lying areas associated with rivers), and polder/enclosures are among the inland open water bodies where capture fishing is primarily practiced (regulated floodplains created mainly for irrigation purposes). 4.92 million ha are designated as inland open water bodies, including 1.03 million ha of rivers and estuaries, 2.83 million ha of floodplains (which account for 53.63 percent of all inland water), 0.83 million ha of polder and enclosures (which account for 16.5 percent of all inland water), small areas of *beels,* and Kaptai Lake.[5]

Kaptai Lake is one of the essential freshwater bodies, the largest artificial freshwater resource in South-East Asia and Bangladesh, spreading over 680 sq. km. of crystal-clean water flanked by hills and evergreen forests lie in the Rangamati Hill District. The LakeLake was formed when the Karnaphuli river dam (153 feet high, 1800 feet long crest) was built for a hydroelectric power project at Kaptai in 1961. Seventy-two freshwater fish and shrimps are available in this LakeLake; 36 are commercially important harvested fishes. Total annual fisheries production in Kaptai lake during 1965-66 was 450 MT which increased to 4306 MT from 1994-95, and now it was 7110 MT (0.25 % of annual fish production) in 2020-2021 and now the fish production increased 12345 MT during 2021.[6] The local fisherman mainly collects these enormous amounts of fishing products in Kaptai Lake.

This lake is also one of the major sources of fishes for the people in southeast Bangladesh. However, the lake is receiving multiple treats resulting in an adverse impact on lake fisheries especially those are of high-value fish species. Despite an important aquatic habitat study on fish fauna of this lake, based on a reliable sampling method, is not available which is considered a prerequisite for the sustainable fisheries management.[7,8] The inhabitants of the region of Kaptai Lake are primarily tribal. The life of the tribal people is fascinating. Most of them are Buddhists (Tanchinga, Marma), and the rest are Hindus (Chakma), Christians, and Animists. Despite religion's bondage, primitiveness elements are powerfully displayed in their rites, rituals, and everyday life. The women and man folk are hard-working, and both are also productive forces. The tribal people are incredibly self-reliant; they grow their food, their girls weave their clothes, and generally live simple life. Each tribe has its dialect, distinctive dress, and rites and rituals. Tribal women are very skillful in making beautiful handicrafts.

Tribal people are generally peace-loving, honest, and hospitable. Many acute problems of the tribal Fisherman in Kaptai need

immediate attention and early solution. The problems relate to various aspects of tribal peoples, viz. social, economic, educational, health, religion, land, law and order situation, self-centered tendency, and so on. Many of these problems cannot be well understood due to a lack of necessary and adequate information.[9]

The present study attempts to collect factual information about the lifestyle of the tribal fishermen community in Kaptai Lake, Rangamati. It was evident that such information is essential before we can discover the needs of the tribal peoples and suggest means of providing a practical solution to their problems.

Materials and methods

Study area

In Bangladesh, inland open water fisheries resources play a significant role in the people's economy, culture, tradition, and food habits. Inland capture fisheries are potentially one of the wealthiest fisheries resources. Kaptai Lake, situated in the southern part of Bangladesh, with an average surface area of 58300 ha (68800 ha in total) and a water reserve of 525×10^6 m^3, is the largest in South Asia.[10] Kaptai Lake has an 'H' shaped structure, and two arms of this LakeLake are joined near Shuvalong, a part of the Karnaphuli River. Like most reservoirs in South Asia, it was created (in 1961) primarily for hydroelectric power generation, with fisheries, navigation, flood control, and irrigation as secondary uses. The maximum and mean depth of the reservoir are 35m and 9 m, respectively, with a mean annual water level fluctuation of 8.14 m. shoreline of the reservoir is rocky and strewn with remnants of submerged wooden logs and rocks that hinder fishing activities (Figure 1). Despite this, the reservoir contributes substantially to the national fish product.[11]

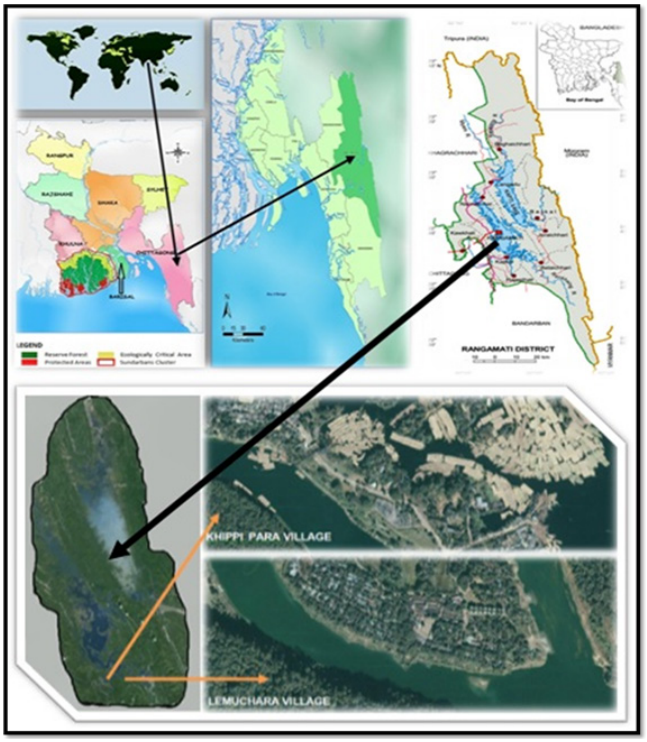

Figure 1 Geographical location and map of the study area.

Many people live in the Kaptai Lake area whose livelihoods, culture, and daily activities are related and adapted to its aquatic environment. The earthen and excavation work was done in Kaptai Lake in 1961 with the financial assessment of A.D.B. The Kaptai Lake has been used as an irrigation canal to supply water for crop culture cultivation and fish growing. There are approximately 7453 no. of households around the side of Kaptai Lake.

Target group: fishermen

Many fishermen are known to be engaged in fish catching in the Kaptai Lake. The number of fishermen varies in different seasons. May to June is when fishing in Kaptai Lake is temporally blocked cause of the breeding period of the brood. During this time, fishermen engage in secondary occupations such as agriculture, small business, net making, daily labor, shopkeeping, etc.

Sample size and sample methods

The sample size of fishermen depends on several factors, such as financial constraints—the importance of the study, its methods of data collection, etc. For the present study, data were collected from 33 randomly selected fishermen of the two villages, namely the shipping para and Lemuchara.

Data collection methods

For data collection from fishermen, a questionnaire was prepared by the objective set for the study. Before preparing questionnaires, a draft questionnaire was developed and then pre-tested in the study area. The questionnaire was then changed, modified, and rearranged according to the experience gathered in the pre-tested. The final questionnaire was then developed logically so that the fishermen could answer chronologically. Questions related to the socio-demographic condition, fishermen's income, family members, and other relevant aspects of Lake fishing were included in the questionnaire. The questionnaire was constructed in English and translated into Bengali during face-to-face interviews. For questionnaire interviews, simple random sampling methods were followed for 33 tribal fishermen in the Kaptai Lake area, Chittagong. Fishermen were interviewed at the Lakeside during fish catching and their homes. Interview of each fisherman required about an hour.

For the present study, Participatory rural appraisal (P.R.A.) tools such as focus group discussion (F.G.D.) were conducted with fishermen. F.G.D. was used to get an overview of particular issues such as the existing fishing system, the socio-economic condition of fishermen, etc. F.G.D. sessions were held at fishermen's riverside, under the trees where there was spontaneous gathering and their home.

After collecting the data through questionnaire interviews and F.G.D., it was necessary to check the information to justify data collection. If there were such items that had been contradictory, then the information was collected from crucial information. Cross-check interviews were conducted with the key person, such as the Upazilla Fisheries Officer, A.F.O., and relevant N.G.O. workers, to confirm the relevant information.

Data processing and analysis

After the collection of data, there were edited and coded. All the collected data were summarized and scrutinized and recorded. Finally, relevant tables and graphs were prepared following the study's objectives. Data is presented mainly in tabular form because it is simple in calculation, widely used, and easy to understand.

Results

Fishermen types

In the Kaptai lake area, fish were caught throughout the year (without 3 months of temporary fishing ban time) by many fishermen residing around the Kaptai Lake. The fishermen depend on fishing for

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their income and nutrition. Their income varied with their capability and quantity of catching fish. Fishermen were categorized into three groups based on standard practice. They were:

1) Professional fishermen, who depend on fishing almost year-round for their livelihood,
2) Occasional fishermen, who used to catch fish during a part of the year as income earning; and
3) Subsistence fishermen, who used to catch fish for their consumption only. As observed in the study area, the distributions of fishermen by category over the season are shown in Figure 2.

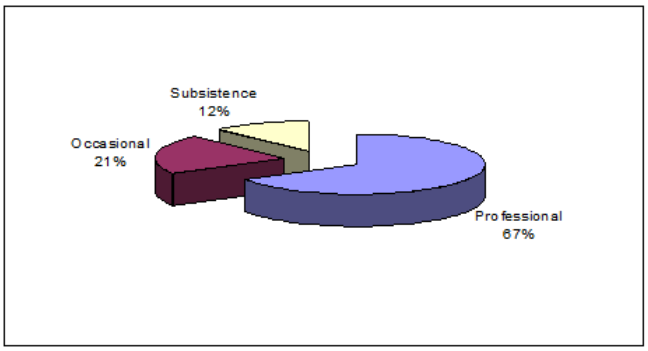

Figure 2 Types of fishermen in the Kaptai Lake jolkor.

Fishing gears

The survey found that 11 types of gears were operated by the fishermen of Kaptai Lake (Figure 3). These gears were mainly of the traditional type, and some of them were unique for the particular locality and may be classified into three groups: net, trap, and wounding.

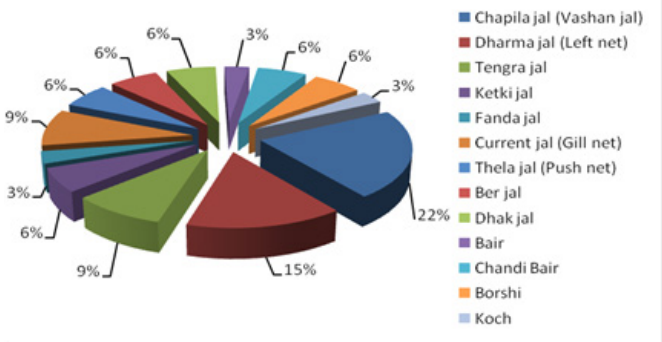

Figure 3 Kind of fishing gears used in Kaptai Lake jolkor.

Caste and age of the fishermen

In a tribal socio-economic study, caste can play a very impotent role in the socio-cultural environmental life of people. The present study found that Marma 61%, Chakma 27%, Tanchanga 9%, and Tripura 3%. . Knowing the age structure of fishermen was necessary for estimating potential productive human resources. In this study, it was found that 18% of fishermen were 21 to 30 years of age, 49% of fishermen were 31 to 40 years of age, 21% were 41 to 50 years of age, and 12% were 51 to 60 years of age (Figure 4).

Education and marital status

There was a strong relationship between society and education. Human resource development was primarily a function of education. The level of education of the Lake fishermen reveals that 15 % were illiterate, 46% were primary educated, 33% were secondary educated, 6% were up to H.S.C. level, and there was no graduate or above level education. In the surveyed area from the questionnaire interviews, the result comes out that 87% of tribal fishermen were married, and the rest, 12.1% of tribal fishermen, were unmarried.

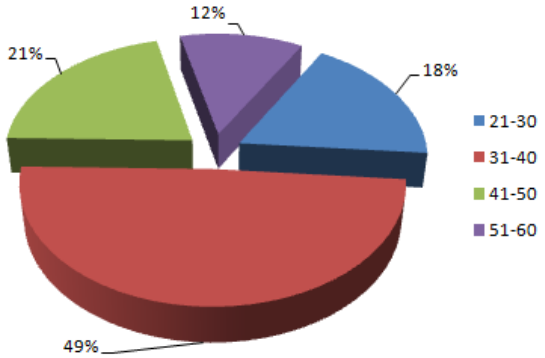

Figure 4 Age Structure of the surveyed area.

Family types and sizes

The family functions as a unit of income generation, consumption, reproduction, and social interaction. In rural Bangladesh, families were classified into two types:

1) Single-family
2) Joint families

The statistical analysis of the family type from the surveyed area showed that 21% of tribal fishermen were single-family and 79% were joint-family. Family size was defined as the number of persons, either working or not, belonging to the same family. The family size and composition were related to occupation and income and likely influenced fishing practices. The family member includes the husband, wife, son, daughter, brother, sister, parents, and servants. Data on the family members of fishermen in the Kaptai Lake reveals that one and two family members were there in 3% of tribal fishermen, 27% of tribal fishermen had five family members, 34% of tribal fishermen had six family members, and 33% of tribal fishermen had above six family members (Figure 5).

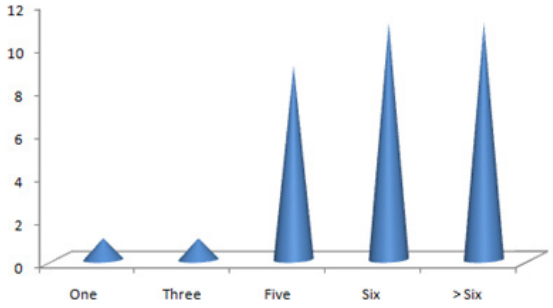

Figure 5 Total number of family sizes in the surveyed area.

Status of children

The result reveals from the investigation that 9%, 18%, 28%, and 21% of fishers had Zero, one, two, and three children. On the other hand, 15% and 9% of tribal fishermen had four and five children,

respectively. Education is the main criterion for developing a person or a community, and this process should be arranged from the preliminary stage. However, the tribal fishermen of Kaptai Lake are not interested in children's education. As a result, only 44% of total children go to school, and the rest, 56%, are not interested in going to school.

Secondary occupation

From the 33 interviewers, the present study found that 4 people were involved in net making, 1 person was involved in shopkeeping, 16 people involved in agriculture, 3 people involved in small business, and 9 people involved in daily labor (Figure 6).

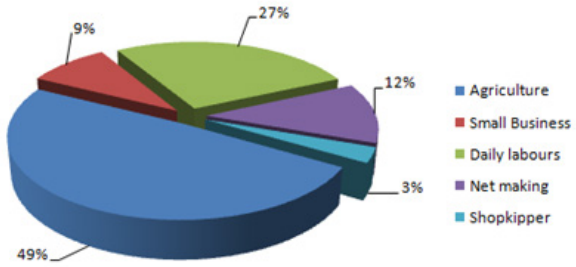

Figure 6 Secondary occupation of the surveyed area.

Participation in a cultural festival

Cultural festival varies from region to region and caste to caste. Deferent scarce celebrates several festivals. This festival bears their meticulous lifestyle, feeding habits, traditions, cultural approaches, behavior, etc. Like other areas in Bangladesh, the study area is also affected by political influence. However, the amount of influence is not as hazardous like other areas. The study reveals that only 24% of tribal fishermen are involved in political activities in those communities.

Others lifestyle of the fishermen

In the modern world, it is established that where money is spread, there must be an extra hand from the elite class will spread. Kaptai Lake is a superior unit of achieving money. So one kind of group wants to take some facilities from illiterate and weak ancestral fishermen. However, this amount was found low amount. From the questionnaire surveyed, it was found that only 33% of women were engaged in fishing activities.

The study area house of fishermen was of five main types,

1) **Tin and Bamboo made houses:** the walls of these houses made of bamboo are made its roof is of tin. 18 % of people make this type of house,
2) **Mud made:** these houses are made of mud using some splits of wood (e.g., palm tree), 27% of people use these type materials to make their houses
3) **Bamboo fence:** 49% people use this type of house and
4) **Semi pacca:** these houses are brick built, and tin or bamboo are made in its roof. Only 6% of people can make this type of house because the price is so high to build a semi-pacca or building (Figure 7).

The lake engulfed 40% of the precious plow lands in the C.H.T., old Rangamati town (the region's central town), and 17.5% of jum lands and reserve forest. It displaced about 60% of the C.H.T. population, mostly Chakma indigenous people. The displacement is known to the Chakmas as the '*bara parang*,' meaning the 'great exodus.' This land mainly goes into production once a year when the water of the LakeLake lows in the dry season. On the other, the beautiful hilly area also is under Jum cultivation. In the study area, 76% of people had some cultivated land.

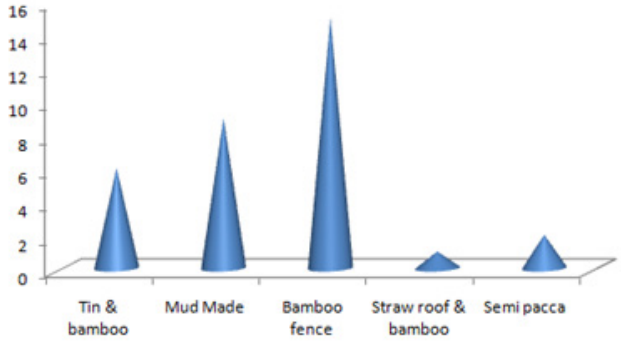

Figure 7 House Structure of the surveyed area.

From the present study maximum of 49% of fishermen were found to have two crafts, 30% of fishermen have one craft, 12% of fishermen have three crafts, and 9% of fishermen have four crafts. In the tribal fishermen society, most of the fishermen had no personal tub-well, but their drinking water collection rate was not so poor. They made a group and contributed to the tube well by shearing. Also, some N.G.O.'s set up some tube wells. Of the 33 fishermen interviewed, 45% of the fishermen's households used tube-well for drinking water, and 55% of tribal fishermen had no scope to collect drinking water from tube-well and relied on the LakeLake for drinking water everyday household and small-scale commercial use.

In a surveyed area, only 36% of tribal fishermen use a sanitary latrine, and the rest of the 64% of fishermen do not have the proper sanitation system. The main occupation of the tribal fishermen is fishing or related activities. Three types of tribal fishermen were observed in the Kaptai lake area. The average annual income of professional tribal fishermen was found to be Tk 4000 (per month 4500 tk or 50 US$ where US$ 1= about Tk. 85), Occasional tribal fishermen earn annually Tk 35000 (per month 3500 tk or 40 US$), and the annual income of Subsistence fishermen was Tk. 36000 (per month 3000 or 35 US$). It also fluctuates with their catching capability, several crafts and fish production in the LakeLake, etc.

Secondary occupation means those activities which they do during the non-fishing season. The average annual income from the secondary occupation of professional tribal fishermen was found to be Tk.9600, Occasional tribal fishermen earn an annually Tk 15600, and an annual income of Subsistence fishermen was Tk. 17000.

Loan and saving of the fishermen

There are many sources to get loan facilities in the tribal fishermen community, such as Money Lander, N.G.O.'s (BRAC. Proshika, Grameen bank, etc.), G.O.'s, and others. However, this loan facility is mainly enjoyed by those fishermen whose economic condition is comparatively better. Because most of the poor fishermen cannot return the loan. Of the 33 fishermen interested, 49% took loans from Money Lander, 3% took loans from both N.G.O.'s and G.O.'s, 12% took loans from others, and 33% took no loan from anywhere (Figure 8).

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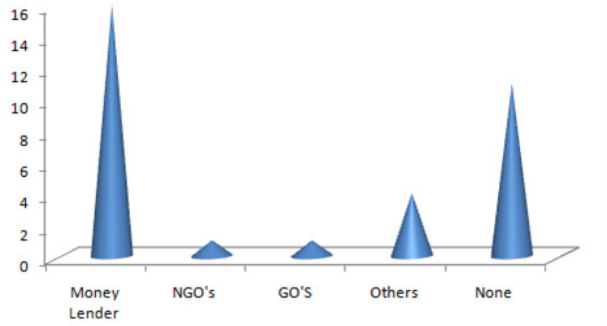

Figure 8 Source of the loan in tribal fishermen community.

People save exchangeable assets, like money, jewelry, tree, etc., for unwanted hazards, which help them during specific problems. However, the saving tendency in the tribal fishermen community is near about absent. In particular problem, they mortgage their boat or land. Otherwise, they agree with the money lender to trade their fish catch at a cheaper rate.

In the study area, the habit of saving is practiced at a low scale by the tribal fishermen because they can not meet their daily needs with little income. As a result, the number of fishermen and their savings are inferior. Only 30% of the interviewees have a habit of saving, and the rest, 70%, are not interested.

Abundance of fish resources

In this regard, the fish landing centers in Rangamati town may be the point of observation to evaluate the state of fish, source of fish, and dry fish availability. Fish landing centers play a significant role in the quick and easy disposal of fresh fish. Fish of 84 different species were discovered. A significant number (62) of marine and freshwater fish species (13) were delivered to Rangamati town from Kaptai Lake and other locations across the nation. During the study period, 54 species of freshwater fish, 10 foreign, 13 marine, 7 prawn/shrimp, 1 crab, and 1 pond tortoise species were discovered. The wider Rangamati district's rivers, lakes, creeks, and other waterbodies, however, were where most freshwater fish were found. Chapila (Gonialosa manmina), Bata (L. bata), Kachki (C. soborna), Air (Mystus aor), Kuncho chingri (Machrobrachium lamarrei), Kajoli (Ailia coila), Mola (Amblypharyngodon mola), and Tilapia were the major dominant species (Oreochromis mossambicus).

Thirty of the 74 species of fin fish were abundant in the winter (WN), 19 in the summer (SM), and the remaining 26 were available all year round (TY) (Table 1). Freshwater fish of all the foreign species were year-round residents since they are raised by industrial fish farmers. The majority of landing areas and seafood markets contained nine (9) shellfish species. Table 1 offer many species of freshwater fish, marine fish, crustaceans, and exotic fish along with their scientific names, families, common names, and local names.

Table 1 Fish species composition with their relative abundance and IUCN conservation status (Bangladesh and global perspective) recorded in the Kaptai Lake, Bangladesh

No.	Common name	Scientific name	IUCN conservation status		[3]Relative abundance
			[1]Bangladesh	[2]Global	
	Order: Cypriniformes				
1	Roho labeo	Labeo rohita (Hamilton,1822)	LC	LC	VC
2	Catla	Gibelion catla (Hamilton, 1822)	LC	LC	VC
3	Mrigal carp	Cirrhinus cirrhosus (Bloch, 1795)	NT	VU	VC
4	Finescale razorbelly minnow	Salmostoma phulo (Hamilton, 1822)	NT	DD	R
5	Cotio	Osteobrama cotio (Hamilton, 1822)	NT	LC	R
6	Silver carp	Hypophthalmichthys molitrix (Valenciennes, 1844)	*EX	NT	C
7	Grass carp	Ctenopharyngodon idella (Valenciennes, 1844)	*EX	DD	VC
8	Bata	Labeo bata (Hamilton, 1822)	LC	LC	VC
9	Reba carp	Cirrhinus reba (Hamilton, 1822)	NT	LC	VR
10	Indian flying barb	Esomus danrica (Hamilton, 1822)	DD	LC	R
11	Olive danio	Danio dangila (Hamilton, 1822)	VU	LC	VR
12	Stone roller	Crossocheilus latius (Hamilton, 1822)	EN	LC	R
13	Morari	Cabdio morar (Hamilton, 1822)	VU	LC	VR
14	Tor mahseer	Tor tor (Hamilton, 1822)	CR	DD	VR
15	Olive barb	Systomus sarana (Hamilton, 1822)	NT	LC	VR
16	Pool barb	Puntius sophore (Hamilton, 1822)	LC	LC	VR
17	Common carp	Cyprinus carpio Linnaeus, 1758	*EX	VU	R
18	Kuria labeo	Labeo gonius (Hamilton, 1822)	NT	LC	F
19	Ticto barb	Pethia ticto (Hamilton, 1822)	VU	LC	F
20	Onespot barb	Puntius terio (Hamilton, 1822)	LC	LC	F
21	Bighead carp	Hypophthalmichthys nobilis (Richardson, 1845)	*EX	DD	F
22	Carplet (Indian carplet)	Amblypharyngodon microlepis (Bleeker, 1853)	LC	LC	VC
23	Carplet (Mola carplet)	Amblypharyngodon mola (Hamilton, 1822)	LC	LC	VC
24	Bengal loach	Botia dario (Hamilton, 1822)	EN	LC	R
25	Orangefin labeo	Labeo calbasu (Hamilton, 1822)	LC	LC	VC
26	Annaldale loach	Lepidocephalichthys annandalei Chaudhuri, 1912	VU	LC	R
	Order: Clupiformes				

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Table Continued...

No.	Common name	Scientific name	IUCN conservation status		[3]Relative abundance
			[1]Bangladesh	[2]Global	
27	Ganges river gizzard shad	Gonialosa manmina (Hamilton, 1822)	LC	LC	VC
28	Indian river shad	Gudusia chapra (Hamilton, 1822)	VU	LC	VC
29	Ganges river sprat	Corica soborna Hamilton, 1822	LC	LC	VC
30	Gangetic hairfin anchovy	Setipinna phasa (Hamilton, 1822)	LC	LC	VR
Order: Siluriformes					
31	Long- whiskered catfish	Sperata aor (Hamilton, 1822)	VU	LC	VC
32	Pabdah catfish	Ompok pabda (Hamilton, 1822)	EN	NT	C
33	Butter catfish	Ompok bimaculatus (Bloch, 1794)	EN	NT	C
34	Indian patasi	Pachypterus atherinoides (Bloch, 1794)	LC	LC	R
35	Wallago	Wallago attu (Bloch & Schneider, 1801)	VU	VU	VC
36	Gangetic ailia	Ailia coila (Hamilton, 1822)	LC	NT	VC
37	Striped dwarf catfish	Mystus vittatus (Bloch, 1794)	LC	LC	F
38	Tengara catfish	Mystus tengara (Hamilton, 1822)	LC	LC	VC
39	Goonch	Bagarius bagarius (Hamilton, 1822)	CR	NT	VR
40	Day's mystus	Mystus bleekeri (Day, 1877)	LC	LC	F
41	Pangas catfish	Pangasius pangasius (Hamilton, 1822)	EN	LC	R
42	Batchwa vacha	Eutropiichthys vacha (Hamilton, 1822)	LC	LC	C
43	Stinging catfish	Heteropneustes fossilis (Bloch, 1794)	LC	LC	VC
44	North African catfish	Clarias gariepinus (Burchell, 1822)	*EX	LC	R
45	Philippine catfish	Clarias batrachus (Linnaeus, 1758)	LC	LC	R
Order: Perciformes					
46	Mozambique tilapia	Oreochromis mossambicus (Peters, 1852)	*EX	VU	F
47	Nile tilapia	Oreochromis niloticus (Linnaeus, 1758)	*EX	LC	C
48	Tank goby	Glossogobius giuris (Hamilton, 1822)	LC	LC	VR
49	Gangetic leaffish	Nandus nandus (Hamilton, 1822)	NT	LC	R
50	Badis	Badis badis (Hamilton, 1822)	NT	LC	R
51	Scribbled goby	Awaous personatus (Bleeker, 1849)	VU	LC	VR
52	Dwarf gourami	Trichogaster lalius (Hamilton, 1822)	LC	LC	F
53	Banded gourami	Trichogaster fasciata Bloch & Schneider, 1801	LC	LC	F
54	Climbing perch	Anabas testudineus (Bloch, 1792)	LC	LC	F
55	Elongate glass-perchlet	Chanda nama Hamilton, 1822	LC	LC	R
56	Striped snakehead	Channa striatus (Bloch, 1793)	LC	LC	F
57	Great snakehead	Channa marulius (Hamilton, 1822)	EN	LC	F
58	Spotted snakehead	Channa punctatus (Bloch, 1793)	LC	LC	VC
59	Walking snakehead	Channa orientalis Bloch & Schneider, 1801	LC	VU	VR
Order: Mugiliformes					
60	Yellowtail mullet	Minimugil cascasia (Hamilton, 1822)	VU	LC	VR
Order: Beloniformes					
61	Freshwater garfish	Xenentodon cancila (Hamilton, 1822)	LC	LC	R
Order: Synbranchiformes					
62	Cuchia	Monopterus cuchia (Hamilton, 1822)	VU	LC	F
63	Zig-zag eel	Mastacembelus armatus (Lacepède, 1800)	EN	LC	C
64	Barred spiny eel	Macrognathus pancalus Hamilton, 1822	LC	LC	F
Order: Tetraodontiformes					
65	Ocellated pufferfish	Leiodon cutcutia (Hamilton, 1822)	LC	LC	VR
Order: Osteoglossiformes					
66	Clown knifefish	Chitala chitala (Hamilton, 1822)	EN	NT	C
67	Bronze featherback	Notopterus notopterus (Pallas, 1769)	VU	LC	VC
Order: Decapoda					
68	Giant freshwater prawn	Macrobrachium rosenbergii (de Man, 1879)	LC	LC	C
69	Monsoon river prawn	Macrobrachium malcolmsonii (H. Milne Edwards, 1844)	LC	LC	C
70	Short-leg river prawn	Arachnochium mirabile (Kemp, 1917)	LC	LC	VC
71	Birma river prawn	Macrobrachium birmanicum Schenkel, 1902	LC	LC	VC

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Table Continued...

No.	Common name	Scientific name	IUCN conservation status		[3]Relative abundance
			[1]Bangladesh	[2]Global	
72	Karnafuli shrimp	Nematopalaemon karnafuliensis (Ali Azam Khan, Fincham & Mahmood, 1980)	LC	LC	VC
73	Giant tiger shrimp	Penaeus monodon Fabricius, 1798	LC	NE	R
74	Indian white shrimp	Penaeus indicus H. Milne Edwards, 1837	LC	NE	R
75	Giant mud crab	Scylla serrata (Forskål, 1775)	LC	NE	C
76	Orange mud crab	Scylla olivacea (Herbst, 1796)	LC	NE	C

[1]IUCN Bangladesh (2015a, b)

[2]IUCN Global 2020

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

[3]Relative abundance:VR (very rare), R (rare), F (few), C (common),VC (very common)

Discussion

In the present study, 80% of the tribal fishermen were involved in daily fishing activities. With the onset of the monsoon, fishing activities increased due to the availability of an increased number of fish. Participation of an increased number of fishermen in the monsoon period coincides nicely with the findings of Alam (2015) and Hossain (2017).[12]

Several fishing gears were found to be operated in the Kaptai lake area. These gears were classified into three groups: such as nets, traps, and wounding gears. In this present study, it was found that Ber Jal Thela Jal (Push net), Current Jal (Gill net), Fanda Jal, Ketki Jal, Tengra Jal, Dharma Jal (Left net), Chapala Jal (Bashan Jal), Boris and Koch were operated in the Kaptai Lake. The fishing gears currently used by the fishermen of Kaptai Lake were similar to those reported by Dewan and Mazid,[13] who counted about 90 gears under different categories, Rahman et al.[14] reported that fishing gears operated by the fishermen in three floodplains (Chanda, BSKB and Halti beel) comprised of four groups: fishnet (7 types, 20 subtypes), fish trap (5 types, 14 subtypes), hook and line (5 types) and spear/harpoon (4 types).

In the present study, 40 species of fish were recorded in the catches of nets, traps, and wounding gears used by the fishermen in the Kaptai Lake. Rahman et al.[15] recorded 60 species of fish in Chanda, BSKB, and Halti beels. Another study by Rahman[14] indicated the presence of 47 species of fish in BSKB beel. The results of the present study agree well with the findings of Hossain,[12] who recorded 36 species of fish in Mikesh beel in Kaliakoir under the Gazipur district.

Natural fish production and species diversity in the Kaptai Lake decline due to various ecological changes. Fish catch statistics showed that the abundance of fish has gradually decreased over the years. This decline in fish production seemed to be related to changes in habited resulting from various artificial hazards. Anon[16] reported that capture fisheries were seriously affected by the impact of the PIRDP embankment in Pabna, which has obstructed fish migration and reduced inland water habitats such as beel canals and floodplains.

The fishermen in the present study were primarily middle age (49%) and mature aged (21%) who could afford much energy and labor to catch fish. This agrees with the fishermen of the age structure reported by Alam (2014) and Hossain.[4] The family size of the fishermen varied from 1 to above 6, with an average of 5.48. The families were joint primarily, as reported by Alom (2014), Dasgupta,[17] and Hossain,[4] also showed similar types of families in Gazipur and Mymensingh districts.

Caste is an essential attribute in the cultural area of any society. Most of the fishers of the community in Kaptai Lake were Marma (60.6%) and Chakma (27.3%). The dominance of Marma in the fishing community, as observed in the present study, indicate that Marma was coming to this profession in increasing number through breaking the previous norms and value of the society, which were due to the economic hardship and LakeLake of employment scope in another sector.

Education is an essential prerequisite for human resource development and an indicator of social advancement. In the study area, the education level of tribal fishermen is comparatively higher than other traditional fishermen. The results of the present study agree with the result of Alam (2014) and Dasgupta.[17]

The income profile is a robust economic indicator of national development. The tribal fishermen in the surveyed area were mainly poor; their annual income ranged closely between Tk. 30000 and Tk. 50000. This annual income is coincidental with the average national income (US$ 456) in Bangladesh. Hossain[14] indicated that fishermen in Kaliakoir Upazila under Gazipur district had an annual income ranging from Tk.24000 to Tk 40000. On the other hand, Alam (2020) found a much higher income in the case of beel fishermen in Gazipur Sadar Upazila district.

Four types of housing conditions were observed with the fishermen in the case of Kaptai Lake. About 49% of the tribal fishermen had bamboo fences having poor sanitation, which reflects the deplorable and distressed condition of the tribal fishing community. Similar scenarios regarding housing conditions were also reported by Alom (2020) and Hossain[14] in Gazipur Sadar and Kaliakoir Upazilla under the Gazipur district.

Health facilities enjoyed by the tribal fishermen community were inferior and unsatisfactory. The tribal fishermen primarily depend on local quacks or village doctors who do not know modern medical science. The tendency of the fishermen to obtain improper poor medical service from the village doctor appeared to be due to the financial inability of the fishermen to bear the medical expenses. About 54.5 % of fishermen had no access to pure drinking water as they had no tube well for their own. However, 45.5% of fishermen had their tube-well and could drink pure water. The availability of health facilities and pure drinking water to the fishermen's community in the present study was more or less similar to those found elsewhere.[14]

Three marketing channels that are very common in Bangladesh were in operation in the Kaptai Lake color system, where the

mediators or intermediaries derive the maximum financial benefit. The shorter the marketing channel, the more benefits the tribal fishermen. Effective measures and initiatives from the Government and local N.G.O.'s are required to ensure that the fishing community gets a reasonable price for their fish.

The fishing community suffers from various problems such as extortion, LakeLake fishing gear, inadequate credit facilities, an ineffective marketing system, political influence, etc. These problems were also faced by fishermen elsewhere (Bhaumik and Pandey, 2020; Halder, 2022; Alam, 2014; Hossain, 2017). The problems faced by the fishing community in the case of Kaptai Lake need immediate attention and solution for the betterment of the fishing community.[18–23]

Conclusion and recommendations

Managing wastewater or sewage discharge, other point sources and non-point sources of pollution, development within the watershed (such as unforeseen irrigation channels, dam construction, and road construction), and illicit fishing are the key difficulties facing KL. Although KL's production capacity was just 181.42 kg.ha-1 in 2018-2019, it was still deemed to have medium productivity and the potential for increased fisheries. The peak breeding season is when annual fishing closures (90 days) take place to aid natural reproduction. Six crucial breeding and nursery grounds have been designated as sanctuaries, where fishing is prohibited. However, inaccessible portions of the lake are rife with illegal and unreported fishing.

The result of the present study indicated that natural fish production and species diversity in this LakeLake have declined due to the changed habited, over-exploitation, indiscriminate use of gears, and absence of a sound management policy. There was no management policy for this Kaptai lake fisherman. So, some Lake management policies should be adopted to protect the species from the degree of extinction and to recover sustainable fish production of the Kaptai Lake jolkor. Kaptai Reservoir fisheries management basically pertains to implementing closed seasons, issuing licenses, fish act implementation and stocking. To protect natural recruitment, fishing is prohibited from April to mid-August every year because June-July is the peak-breeding season. However, in distant places it is almost impossible to ban fishing completely during the breeding season. Subsistence fishermen and tribal people fished at that time for their own consumption and local marketing.

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Conflicts of interest

The authors declared that there is no conflict of interest.

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