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Ichthyofaunal Diversity of a Coastal River in Bangladesh: Status and Conservation Measures

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Abstract: Bangladesh's coastal riverine ecosystem is assorted with a large amount of aquatic species. Ichthyofaunal diversity of the Kirtankhola River was studied to understand fish fauna and their conservation status for a period of 1 year from January to December 2015. The study revealed total of 86 fish species belonging to 61 genera and 31 families of which Cyprinidae (25.58%) was found as dominant family followed by 9.30%, 5.81% and 4.65% for Bagridae, Clupeidae and Schilbeidae, Channidae and Gobiidae respectively. In addition, 3 families viz., Cobitidae, Mastacembelidae and Siluridae were comprisied 3.49% individually and another 7 family's viz., Ambasside, Cynoglossidae, Mugilidae, Nandidae, Notopteridae Sisoridae and Sciaenidae were contributing 2.33% individually. Least 15 families were comprised 1.16% respectively. Out of 86 species 31 were red listed considering 8 Critical Endangered, 13 Endangered and 10 Vulnerable. Within all recorded species 44.19% was common where 22.09% was Not very common, 20.93% Rare and rest 12.79% was Very rare. Calculated value of Shannon Weiner index, Gibson's Evenness, Simpson's dominance index, Simpson's index of diversity and Margalef's index was ranges between 2.18 to 2.44, 0.12 to 0.15, 0.15 to 0.24, 0.76 to 0.85 and 6.80 to 7.57 respectively. To sustain the expectancy fish diversity, conservation strategies and active management like as banning destructive fishing gears and indiscriminate fishing, establishing and maintaining fish sanctuaries, identification and safeguard the breeding and nursery grounds should be taken into consideration with crucial precedency.

Key words: Fish · Biodiversity · Diversity Index · IUCN · Conservation · Kirtankhola River

INTRODUCTION

Bangladesh is endowed with vast inland water resources covering 4699387 ha. area and 710 km long coastline that consists of a vast network of river system [1-3]. The country is enriched with the pompous diversity of aquatic biological resources due to its unique geographical location [4-10]. It has third biggest aquatic fish biodiversity in Asia which contribute approximately 800 species in fresh, brackish and marine waters [11-14]. The fishes are the most enormous and diverse living components of water bodies [15-17] throughout the world and about 40% of them live in the fresh water body [18, 19]. There are 289 native fresh water species, 475 fish species of marine water, 24 freshwater prawn, 36 shrimp species and 12 exotic fish species, enhance our fisheries resource [20-24]. Freshwater fish diversity is regarded as one of the most threatened taxonomic groups because of

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their high sensitivity to the quantitative and qualitative alteration of aquatic habits [25-28]. At present time, retrenchment in the abundance of fish species from the inland waters is envisaged as an ardent issue in Bangladesh [29-32].

However, IUCN-Bangladesh revealed 54 threatened freshwater fish species in Bangladesh, of which 12 are critically endangered, 28 are endangered and 14 are vulnerable [33]. The main causes of biodiversity abatement are over exploitation [34-36] habitat destruction and defragmentation, water abstraction, industries and private use [37-44] exotic species introduction [45], pollution [46-49] and global climate change impacts [50, 51]. The River Kirtankhola is situated in the interior coastal region of Southern Bangladesh. It has enriched fish diversity with different categories which considered as the most resourceful and Potential river for fisheries sector. This condition clearly denotes the requirement of detailed biodiversity study is imperative to assess the present status and sustainable management of water resources in southern Bangladesh [52-54].

To conserve biodiversity, fish abundance along with their natural distribution scientific understanding of different management strategies is essential to back up their optimum exploitation [55-60]. Diversity index act as tool for providing more accurate information rather than simply counting of species within a community. No notable researches have been done yet regarding fish diversity in this river. In this study, we attempt to gather information on fish biodiversity of Kirtankhola River. The purposes of the present study were to assess the fish biodiversity, investigate the main threats of fish biodiversity and providing suggestions for conservation of fish biodiversity of Kirtankhola River.

MATERIALS AND METHODS

Study Area: The present investigations were assigned in the Kirtankhola river of Barisal district (Fig. 1), Bangladesh during the period of January 2015 to December 2015. Four sampling stations such as Lamchori (S_1), Bukhainogor (S_2), Beltola (S_3) and Char Kawa (S_4) area of Kirtankhola River were selected for data collection. Geographical location of the sampling stations:

Table 1: Latitude and longitude of the study site-

Study Area	Latitude	Longitude
Bukhainogor	22°71 "N	90°38"E
Beltola	22°72"N	90°38"E
Chair cowa	22°67"N	90°36"E
Lamchori	22°41"N	90°22"E

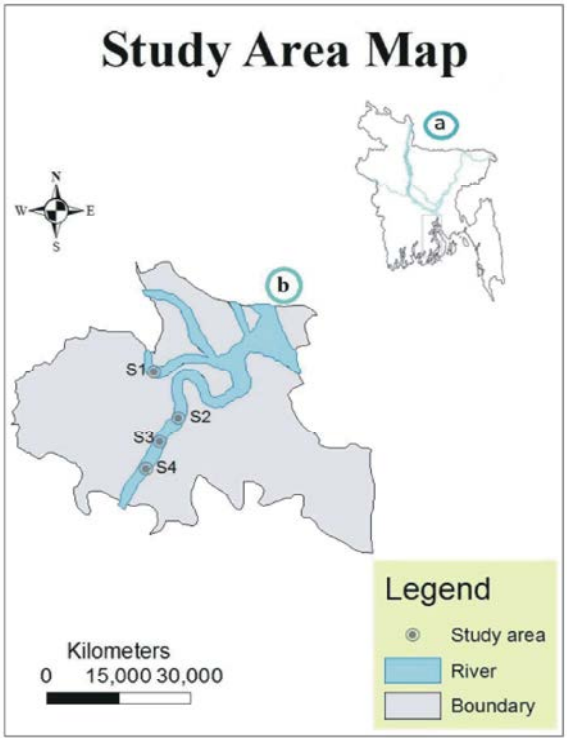

Fig. 1: Geographical locations of the studied areas; Map of Bangladesh (a) and enlarged study site (b)

Data Collection: Data were collected from various sites especially from fishermen with questionnaire interview, fish sellers in fish markets and fishing spots. 20 seine net fishermen were selected for data collection from the spots. However, which species was seemed difficult to identify at a fishing spots those species was preserved with 10% buffered formalin solution for identification in the laboratory. During sampling, *in situ* water quality parameters were measured at each sampling site. The salinity, pH, temperature and dissolved oxygen were determined by using a refractometer (REF 201/211/201bt), a pen pH meter (HI 96107), a thermometer in centigrade and a DO meter (DO- 5509), respectively. Meteorological data were collected from meteorological department.

Identification of Fish Species: Collected fish species were identified based on their meristic and morphometric characters following Eschmeyer [61] and Rahman [62]. Fish species were classified systematically followed by Nelson [63].

Data Analysis: For attain the study of species diversity, quantify the diversity and statistical comparison of diversity at four different position was analyzed by Paleontological Statistics (PAST) Version 3.13 software.

Table 2: Biodiversity and conservation status of fish fauna recorded from four studied areas for January to December 2015

Sl. No.	Species	English Name	Family	Species abundance S_1	S_2	S_3	S_4	Present Status	Red list status BD*	Global
F1	*Chanda baculis*	Himalayan glassy perchlet	Ambasside	55	80	20	34	C	NO	LC
F2	*Chanda nama*	Elongate glass perch		97	176	00	00	NVC	VU	LC
F3	*Anabas testudineus*	Climbing perch	Anabantidae	34	67	31	43	C	DD	DD
F4	*Aplocheilus panchax*	Blue panchax	Aplocheilidae	290	432	80	320	C	NO	LC
F5	*Hemibagrus menoda*	Menoda catfish	Bagridae	532	690	430	652	C	NO	LC
F6	*Mystus aor*	Long- catfish		42	32	24	36	NVC	VU	LC
F7	*Mystus bleekeri*	Day's mystus		382	460	290	312	C	NO	LC
F8	*Mystus cavasius*	Gangetic mystus		6	12	3	32	NVC	VU	LC
F9	*Mystus seenghala*	Giant river catfish		00	4	2	2	R	EN	LC
F10	*Mystus tengara*	Tengara catfish		12	9	6	45	R	NO	LC
F11	*Mystus vittatus*	Striped dwarf catfish		135	196	220	220	C	NO	LC
F12	*Rita rita*	Rita		29	32	10	10	NVC	CR	LC
F13	*Xenentodon cancila*	Needle fish	Belonidae	34	64	22	28	C	NA	LC
F14	*Amblypharyngodon mola*	Mola carplet	Cyprinidae	2342	2560	1200	980	C	NO	LC
F15	*Aspidoparia morar*	Aspidoparia		37	48	16	18	C	NO	LC
F16	*Cirrhinus cirrhosis*	Mrigal carp		4	8	4	6	R	NO	LC
F17	*Esomus danricus*	Flying barb		570	680	220	256	C	DD	LC
F18	*Gebalion Catla*	Catla		4	6	180	2	NVC	NO	LC
F19	*Labeo bata*	Bata		40	12	14	6	NVC	EN	LC
F20	*Labeo boga*	Boga labeo		3	18	00	00	VR	CR	LC
F21	*Labeo calbasu*	Orange fin labeo		12	32	2	15	R	EN	LC
F22	*Labeo gonius*	Kuria labeo		8	6	3	17	R	EN	LC
F23	*Labeo nandina*	Nandi labeo		2	16	00	00	VR	CR	LC
F24	*Labeo rohita*	Roho labeo		16	30	12	9	R	NO	LC
F25	*Osteobrama cotio*	Cunma osteobrama		65	120	354	260	C	NO	LC
F26	*Puntius chola*	Swamp barb		110	96	97	299	C	NO	LC
F27	*Puntius chonchonius*	Rosy barb		12	32	3	00	VR	NO	LC
F28	*Puntius conchonius*	Rosy barb		86	176	98	132	C	NO	LC
F29	*Puntius sarana*	Olive barb		690	420	354	698	C	CR	LC
F30	*Puntius sophore*	Pool barb		221	256	87	149	C	NO	LC
F31	*Puntius terio*	One spot barb		198	290	187	254	C	NO	LC
F32	*Puntius ticto*	Ticto barb		263	312	226	486	C	VU	LC
F33	*Rasbora rasbora*	Gangetic scissortail rasbora		00	6	00	00	VR	NO	LC
F34	*Salmostoma phulo*	Finescale razorbelly minnow		578	1276	769	682	C	NO	LC
F35	*Trygon sp*	Stingray		9	8	4	15	R	NO	LC
F36	*Channa marulius*	Giant snakehaed	Channidae	8	12	5	9	R	EN	LC
F37	*Channa orientalis*	Asiatic snakehead		81	54	90	84	NVC	VU	NA
F38	*Channa punctatus*	Spotted snakehead		177	123	168	123	C	NO	LC
F39	*Channa striatus*	Snakehead murrel		120	82	48	53	NVC	NO	LC
F40	*Corica soborna*	Ganges river sprat	Clupeidae	16730	18470	16096	15600	C	NO	LC
F41	*Gonialosa manmina*	Ganges river gizzard shad		540	122	72	130	C	NO	NA
F42	*Gudusia chapra*	Indian river shad		1439	1520	1300	1254	C	DD	LC
F43	*Tenualosa ilisha*	Hilsa shad		6870	7133	10200	9067	C	NA	NA
F44	*Tenualosa toil*	Toli Hilsha		86	98	130	231	NVC	NA	NA
F45	*Clarious batrachus*	Walking catfish	Claridae	25	54	21	67	NVC	NO	LC
F46	*Botia Dario*	Necktic Loach	Cobitidae	3	5	00	00	R	EN	LC
F47	*Lepidocephalichthys guntea*	Guntea loach		65	96	69	29	C	NO	NT
F53	*Eleotris fusca*	Dusky sleeper		16754	7854	1190	10542	C	NA	LC
F54	*Glossogobius giuris*	Tank goby		679	352	430	659	C	NO	LC
F55	*Odontamblyopus rubicundus*	Eel goby		4320	15432	654	1754	C	NO	NA
F56	*Heteropneustes fossilis*	Stinging catfish	Heteropneustidae	173	120	112	213	C	NO	LC
F57	*Lates calcarifer*	Sea bass	Latidae	43	112	23	22	NVC	NA	NA
F58	*Macrognathus aral*	One-spine spiny eel	Mastacembelidae	432	640	170	321	C	VU	NA
F59	*Mastacembelus armatus*	Zig-zag eel		9	16	7	19	R	EN	LC
F60	*Mastacembelus puncalus*	Barred spiny eel		10	22	13	73	NVC	NO	LC
F61	*Moringua raitaborua*	Purple spaghetti eel	Moringuidae	15	16	123	00	NVC	NO	LC
F62	*Liza parsia*	Gold spot mullet	Mugilidae	54	9	00	17	R	NA	LC
F63	*Rhinomugil corsula*	Corsula mullet		15	24	00	9	VR	NO	LC
F64	*Badis badis*	Badis		2	10	2	2	VR	EN	LC
F65	*Nandus nandus*	Mud perch	Nandidae	111	144	64	87	C	VU	LC
F66	*Notopterus chitala*	Humped featherback	Notopteridae	6	16	00	00	R	EN	NT
F67	*Notopterus notopterus*	Grey featherback		13	24	13	14	R	VU	LC
F68	*Pisodonophis boro*	Rice-paddy eel	Ophichthidae	13	24	12	8	R	NO	LC
F69	*Colisa fasciatus*	Banded gourami	Osphronemidae	26	42	24	56	NVC	NO	LC
F70	*Pangasius pangasius*	Pangus	Pangasidae	00	34	320	00	NVC	CR	LC
F71	*Polynemus paradiseus*	Paradise threadfin	Polynemidae	47	156	48	30	C	NO	NA
F72	*Ailia punctata*	Jamuna ailia	Schilbeidae	320	340	430	1560	C	VU	LC
F73	*Clupisoma garua*	Garua bacha		34	90	14	70	NVC	CR	LC
F74	*Eutropiichyhys vacha*	River catfish		16	26	18	18	R	CR	LC
F75	*Pseudeutropius atherinoides*	Potasi		1487	420	98	322	C	NO	LC
F76	*Silonia Silondia*	Silondia vacha		45	92	98	65	C	EN	LC
F77	*Ompok bimaculatus*	Indian butter	Siluridae	7	00	4	12	VR	EN	NT
F78	*Ompok pabda*	Pabdha catfish		31	46	32	53	R	EN	NT
F79	*Wallago attu*	Freshwater shark		28	48	11	18	NVC	NO	NT
F80	*Bagarius bagarius*	Gangetic goonch	Sisoridae	2	8	3	2	VR	CR	NT
F81	*Gangata gangata*	Gangetic gangata		11	16	20	16	NVC	NO	LC
F82	*Monopterus cuchia*	Gangetic mud eel	Synbranchidae	3	12	2	4	VR	VU	LC
F83	*Pama pama*	Croakers pama	Sciaenidae	697	470	350	797	C	NA	NA
F84	*Panna microdon*	Panna croaker		89	48	00	00	R	NO	NA
F85	*Sillaginopsis panijus*	Lady fish	Sillaginidae	123	256	167	104	C	NA	NA
F86	*Tetraodon cutcutia*	Ocellated pufferfish	Tetraodontidae	9	22	16	8	R	NO	LC

Abbreviations used in the table: C= Common, NVC= Not very common, R= Rare, VR= Very rare; LC = Least Concern, NT = Near Threatened, CR= Critically Endangered, EN= Endangered, VU= Vulnerable, DD= Data Deficient, NO= Not threatened, NA= Not Assessed; *BD= Bangladesh

Species diversity was conducted using different indices viz., Shannon–Wiener diversity, Simpson's dominance index Simpson's index of diversity, Evenness, Margalef's index, Berger-Parker Dominance and Fisher's alpha.

Shannon Weiner diversity index [63-66] deliberated both the number of species and the distribution of individuals among species. The Shannon Weiner diversity was calculated by using the following formula:

$$H = - \Sigma P_i \times \ln P_i$$

where, $P_i = n_i/N$; n_i= number of individuals of each species in the sample; N= total number of individuals of all species in the sample.

Evenness is a measure of the relative abundance of the different species making up the richness of an area [67] which was measured by using the following formula:

$$E = e^H/S$$

Simpson's dominance index [67] is often used to quantify the biodiversity of habitat which takes into account the number of species, as well as the abundance of each species [68]. Formula was used for calculating Simpson's dominance index is: $D = \Sigma n_i (n_i-1)/N (N-1)$.

where,
n_i= number of individuals of each species in the sample;
N= total number of individuals of all species in the sample.

Value of this index ranges between 0 to 1 and the greater value indicates the greater sample diversity. This can be measured by using following formula:

$$1-D = 1-\Sigma n_i (n_i-1)/N (N-1)$$

Margalef's index (*d*) [69] was used to measure species richness by the following formula: d=(S-1/LnN).

Berger-Parker Dominance is simple measure of the numerical importance of the most abundant species. Formula was used for calculating Berger-Parker Dominance [70] index is:

$$d = N_{max} / N$$

where,
N_{max} = Number of individuals in the most abundant species;
N =Total number of individuals in the sample.

Fisher's logarithmic series model [43] was used to describe mathematically the relationship between the number of species and the number of individuals by using following formula:

$$S = a \times \ln (1+n/a)$$

where, S = number of species; n = number of individuals; a = Fisher's alpha

RESULTS

Fish Diversity: The river acts as harbor of immense aquatic organisms especially fish. Present investigations represented 86 fresh water fish species belonging to 61 genera and 31 families from the four-study site which presented in the Table 1 with their scientific name, common English and local name and IUCN red list status of Bangladesh including global. Out of 31 families Cyprinidae (25.58%) was found as dominant family followed by 9.30%, 5.81% and 4.65% for Bagridae, Clupeidae and Schilbeidae, Channidae and Gobiidae respectively. In addition, 3 families viz., Cobitidae, Mastacembelidae and Siluridae were comprisied 3.49% individually and another 7 family's viz., Ambasside, Cynoglossidae, Mugilidae, Nandidae, Notopteridae Sisoridae and Sciaenidae were contributing 2.33% individually. Least 15 families were comprised 1.16% respectively (Figure 2).

Present Status: Within the collected fish sample all species were not equally distributed through this river. Out of 86 fish species 38 species were common where 19 species were Not very common, 18 were Rare and 11 were Very rare species. Percent value of Present fish status is shown by the Figure 3.

Conservation Status: Among the 86 species 31 threatened species were found from the studied area considering Critically Endangered 9.30% Endangered 15.12% and Vulnerable 11.62% whereas in the globe total 6 species identified as near threatened (Figure 4). Most of threatened species were recorded at sampling site S_2 followed by S_1, S_3 and S_4 as shown in Figure 5.

Biodiversity Index: The values of Shannon–Wiener index (H), Simpson's dominance index (D), Simpson's index of diversity (1-D), Gibson's evenness (E) and Margalef's index (*d*), Berger-Parker Dominance and Fisher's alpha of selected areas are given in Table 3. Diversity index values of all stations are shown in Figure 6.

Table 3: Biodiversity index of fishes in study areas

Study area	Total number of species	Total number of individuals	(H)	(E)	(D)	(1-D)	(*d*)	(d)	(a)
Lamchori (S_1)	83	66074	2.39	0.13	0.16	0.84	7.39	0.25	9.36
Bukhainogor (S_2)	85	65962	2.41	0.13	0.16	0.84	7.57	0.28	9.62
Beltola (S_3)	76	39991	2.20	0.12	0.23	0.77	7.09	0.40	9.06
Chair kowa (S_4)	75	53275	2.44	0.15	0.16	0.84	6.80	0.29	8.59

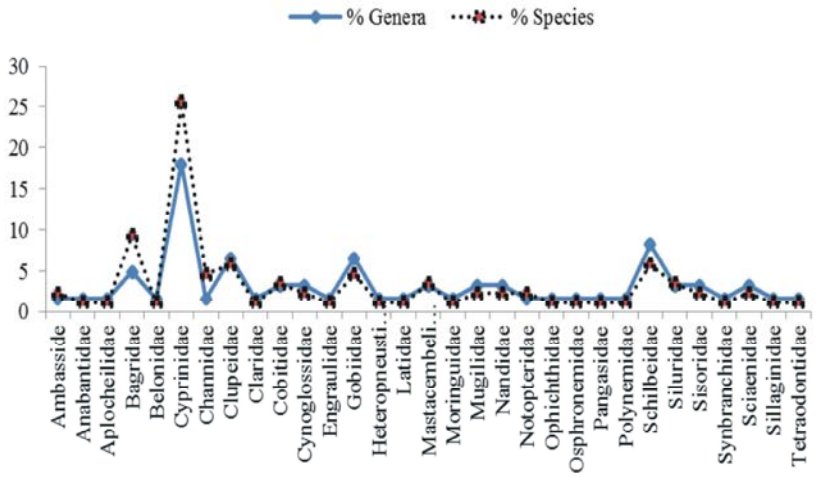

Fig. 2: Percent contribution of genera and species of different families of Kirtankhola River's fishes

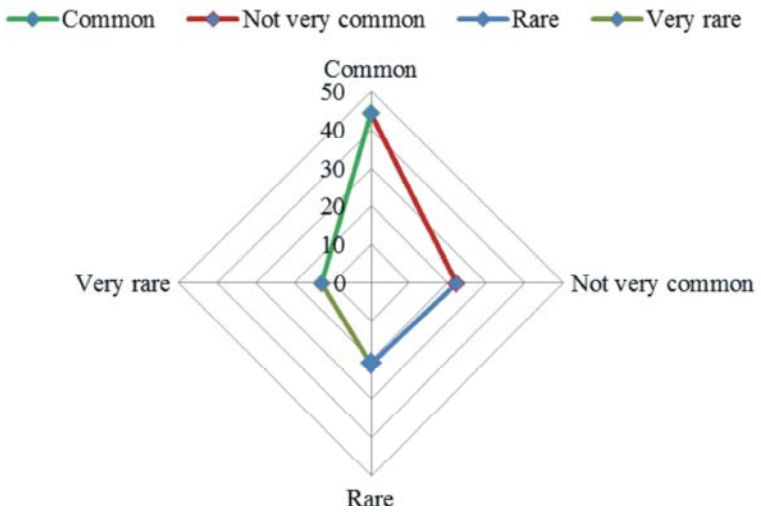

Fig. 3: Percent value of different categories fish in the study areas

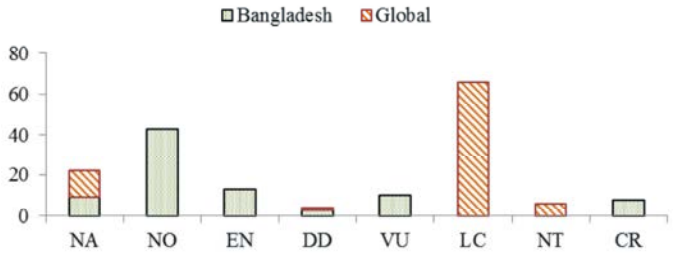

Fig. 4: Conservation status of available fish

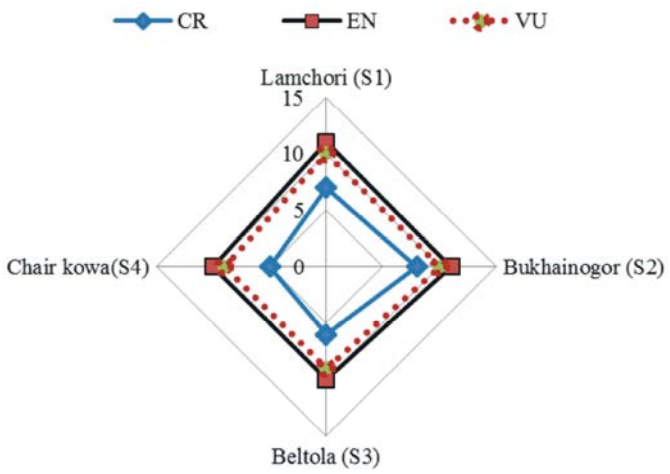

Fig. 5: Number of species under different categories of threat as per IUCN 2013 in the studied areas

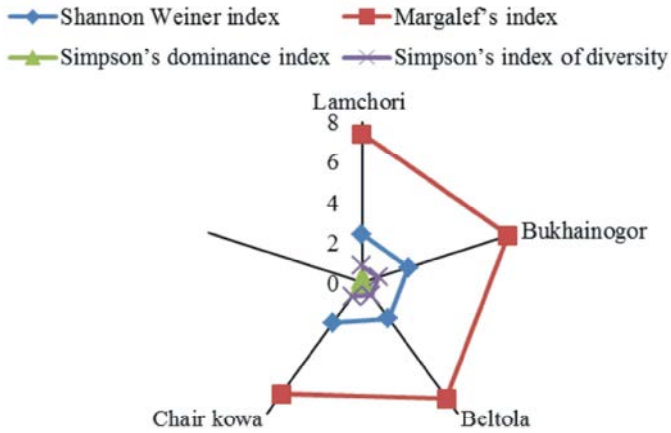

Fig. 6: Different fisheries diversity index at sampling site of Kirtankhola River

DISCUSSION

Biodiversity study of fish generally indicates the variety of fish species found in certain area. In order to adjust with global changing situation, it is essential to make up documentation of present fish population including their ecosystem and biodiversity status. This study recorded 86 fish species from the Kirtankhola River. Present study represents 29.76% of the country's total fish species (Table 4). No previous statistics of fish fauna in the Kirtankhola river was found and thus comparison of the present findings with previous was not possible.

This problem seemed not new in Bangladesh while studied with fish diversity [32] and denotes the need for water-body specific fish diversity study in Bangladesh. Present study recorded much smaller number of fish species (86) than 135 [72], 110 [73]. On the other hand, present findings are quite larger than 80 [74], 74 [30], 73 [75]. The high percentage of fish species revealed by the order Cypriniformes might be due to the presence of an appropriate environment and river bottom that the member of this family prefers. Among those fish species Hilsa was recorded as the most dominant fish species from the study areas. Total 31 number of threatened fish species were founded from the present study, which was more than half of the total threatened fish species (54) of Bangladesh [76]. Mohsin *et al*. [18] estimated 26 threatened species which was quite fewer than present findings (31). Kachki (*Corica soborna*) fish is recorded as the most dominant species from this river.

Different environmental characteristics of the aquatic ecosystem were observed due to variation in species composition at different locations in the study area. Decrease of fish diversity is considered as alarming threat and its conservation is the only solution of this problem.

Table 4: The past 50 years Studies on freshwater fish species of Bangladesh

Study area	No. of species	No. of family	References
Barisal	86	31	Present study
Paira River; Patuakhali	57	28	[83]
Pirojpur, Bhola, Patuakhali and Barguna	98	48	[82]
Noakhali	128	34	[35]
Bangladesh	251	61	[84]
Bangladesh	265	55	[62]
Rajshahi	133	32	[85]
Mymensingh and Tangail	106	34	[86]
Dhaka	71	25	[87]

The same causes of decreasing biodiversity from the Padma River were reported by Hossain [77]. Although the river is gradually losses its biodiversity but also support a large number (31) of threatened fish in aspect of Bangladesh and wild also. Rahman *et al*. [74] represented similar result in case of threatened fish from the Padma River.

Human interaction is continuously decreasing the water body of the area. With increased fishing pressure, this human interaction is reducing fisheries diversity in Kirtankhola River. S_2 represented the highest number of individuals that is subject to relatively low human interference and thus is under-fished and retains an optimum environmental condition.

A biodiversity index described the diversity of a sample or community by a single number [78]. Species diversity of fishes involves with two components; the number of species or richness and the distribution of individuals among species [79]. Higher value of the evenness indicates the rich diversity. While evenness and dominance indices represent the number of species present in an ecosystem then Shannon-Wiener diversity index considers both the number of species and proportion of each species [35].

Highest Shannon wiener diversity index was found at S_1 and S_4 where lowest was observed at station S_3. The present study shows a significant lower in H' values due to a smaller number of species. Shannon–Wiener index (H) value usually ranges from 1.5 to 3.5 for ecological data and hardly exceeds 4.0; which is related with our calculated data. When the water body remains sustainable condition then H values could be found higher than 3.5. Alam *et al*. [80] was represented the Shannon-Wiener values as 3.29 to 3.49, which value was higher than present value in upper Halda River; which value was higher than present studied because of the Kirtankhola River is highly influenced by environmental factors rather than Halda river. Chowdhury *et al*. [79] found the Shannon-Wiener values as 1.63 to 3.41 in the the Naaf River Estuary. According to Shannon-Wiener diversity index data present study suggested that, the river kirtankhola was dominated by few types of species considering *Corica soborna, Apocryptes bato, Periophthalmus magnuspinnatus, Odontamblyopus rubicundus, Tenualosa ilisha* etc. Biodiversity index was conducted for the analysis of fish diversity by comparing the estimated values within four areas of Kirtankhola River. Simpson's dominance index (D) value usually ranges from 0 to 1, the higher ranges of value represent the smaller the biodiversity. Simpson's Dominance index was higher in the S_3 area and lowest value was observed in station S_1. According to D value S_1 is considered as the highest species diversity and S_3 is considered as the least diversity comparing both study area. The Simpson's index of diversity (1-D) value also ranges between 0 and 1; the peak value indicates the greater sample diversity. Dominant Simpson's index of diversity value was observed from the S_1, which area represented as the highest species diversity. Evenness value ranges from 1 and 0; lowest evenness value indicates the higher species diversity. Peak evenness value was observed in the S_4 where least was in the S_3. Considering evenness value S_3 was considered as the rich diversity zone. For feeding and breeding purpose different fish migrate to this river and sampling station S_2 is considered as the breeding zone of these species which may be the reason behind the highest and lowest even-ness value in S_4 and S_3. Margalef richness value which was used as indicator to compare the sites, generally it shows deviation depending on the species number [81]. With the highest species number, station S_2 shows the maximum Margalef richness value followed by S_1, S_3 and S_4. Vyas *et al*. [81] reported Margalef index value in the Betwa River of India ranging from 3.71 to 6.70, which value was least than present value. In the present study, The Margalef values S_2 were higher than these due to the presence of large number of individuals. Hanif *et al*. [82] recorded maximum Margalef's index (d) of 8.67 and lowest of 7.48 from the

Patuakhali area. Among the four different stations of study area, Bukhainogor (S_2) has highest number of species with maximum individuals compared to others and species richness also concentrated due to its unique geographical location, free from industrialization, low interaction between fish and fishermen etc. So, to maintain aquatic biodiversity in balance condition, scientific based sustainable exploitation should be allowed.

Reasons for Declining Fish Diversity: Declination of fish folk diversity is a hot cake issue for degradation of water resource. Over exploitation is considered as the main issue for Declination of biodiversity globally. Worldwide 40 species had gone extinct as a result of over exploitation. Besides that, various types of factor are responsible for declination of fish folk diversity, such as Climate change, habitat loss, invasive species, eutrophication and different types of pollution [37, 46]. Over exploitation is considered as the principle reasons of declining fish diversity. Use of harmful fertilizer, pesticide, insecticide in the river bank agricultural land, Use of destructive fishing gear and banded net (current jal), Dumping waste from cement factory, Waste and heavy metal from doc yard, Dumping of oil from lanch and cargo, Underestimation of the national band period, Making of bridge and barrier Those alarming issue react with the fish diversity and hamper the reproductive and physiological activities.

Conservation Recommendations: A large number of fish fauna in the southern coastal region of Bangladesh are out of assessment due to insufficient scientific study. As the consequence of this region, It should be require further study for identify specific problem from this river to keep sustainable condition of the fish diversity. Biodiversity of this river can be conserve by taking following steps like relief facilities for the fishermen in banning period, applied fishing rules strictly in the breeding season, monitoring diversity after certain interval, taking proper step to identify breeding ground, build up awareness among the people about negative impact of insecticide, pesticide, herbicide , protect destructive fishing gear, treat Industrial washed before dumping, create aware among owner of the doc yard and labor to prevent contamination of water by heave metal and establishment of sanctuary in the studied area. Establishment of “fish sanctuary” could be the effective step for conservation of threatened species. The most important conservational aspect of coastal resources is to create awareness in stake holders through proper communication, cooperation and education. Furthermore, financial support from government and donor agencies is crucial with the intention of commencing further research, monitoring and raising awareness among the fishermen for the conservation of fish diversity in the coastal area of Bangladesh.

CONCLUSION

The present study mainly focuses on fish diversity, threats and conservation aspects in the interior coastal River Kirtankhola. Variation of Species diversity was observed from different station due to specific factor. This river supports the aquatic ecosystems and a wide array of globally threatened species likes *Pangasius pangasius*. Fish abundance of Kirtankhola River is gradually decreasing due to mismanagement and indiscriminate fishing. Considering species abundance, Kirtankhola River can be considered as an ecological hotspot since it has a biodiversity close to or greater than that of many other rivers in Bangladesh. Sustainable management strategies are the basic required to save the fish population of this river system. It is essential to take immediate action for habitat enhancement of Kirtankhola River to save the fish biodiversity. Proper management strategies must be applied with an integrated approach of government, researchers, NGOs and donors can save the fisheries diversity of Kirtankhola River.

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