

## **ICHTHYODIVERSITY OF THE FIVE LINKED RIVERS OF CHATTOGRAM BANGLADESH**

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**Abstract:** Faunal records are essential to understand, manage and conserve any ecosystem if altered due to anthropogenic or natural causes. In the south eastern Bangladesh five linked rivers, Karnaphuli, Halda, Sikalbaha, Chandkhali and Sangu play a significant role in the country's fisheries sector. In this study ichthyofauna of the three linked rivers, Karnaphuli, Shikalbaha and Chandkhali are presented. From these three important linked rivers a total of 130 ichthyofaunal species, of which 112 finfish and 18 shellfish species were recorded during May 2010 to February 2020. Out of 130 species of finfish and shellfish, 128 species (110 fin and 18 shell fish) from the River Karnaphuli, 85 species (74 fin and 11 shell fish) from the River Shikalbaha and 83 species (72 fin and 11 shell fish) from the River Chandkhali were recorded. A total of 112 finfish species including four exotics belonged to 20 orders, 47 families, and 90 genera and 18 shellfish species were under one order, 3 families and 7 genera. Maximum finfish and shellfish species were under the families Cyprinidae (22 species) and Palaemonidae (9). Amongst the 112 finfish, one was critically endangered, six endangered and eleven was vulnerable. Systematic list of the ichthyofauna with local names is given. Status of local availability of species along with those reported as data deficient and not reported by IUCN (2015) are also provided. This study will help the fishery scientists, policy makers and planners to manage and conserve the fish faunal diversity in the three important linked rivers of Chattogram.

**Key words:** Ichthyofauna, Karnaphuli River, Sikalbaha River, Chandkhali River, finfish, shellfish, Chattogram.

### **INTRODUCTION**

The trans boundary River Karnaphuli (22°12'60.00" N, 91°47'59.99" E, 270 km long) is known as the gate way of hill tracts of South Eastern Bangladesh (Fig.1). It supports the biggest sea port of the country, the

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Chattogram port, contributes a lion share in the national economy every year (Tk.2717.18 crore, plus 650 crore Taka FDR during 2016-17, personal communication). The Karnaphuli or Kaptai reservoir (68,800 ha) was created in 1961 by damming the River Karnaphuli at Kaptai point, to produce only hydropower (242 MW in 2016-17) of the country. Besides hydroelectricity, the reservoir also contributes a remarkable amount of freshwater fish yearly (13751 MT during 2018-19 year, BFDC 2019). There are five big tributaries of the River Karnaphuli, namely Myani, Chengi, Rainkhiang, Ichamati and Halda.

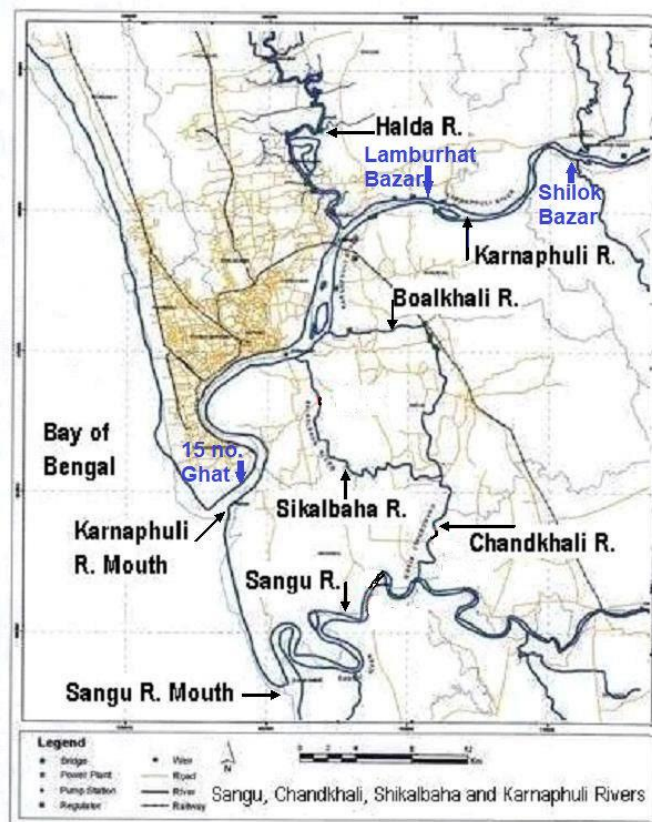


Fig. 1. Map showing the study area in the three linked rivers (Karnaphuli, Sikalbaha, & Chandkhali) along with five interconnected rivers (Halda, Karnaphuli, Sikalbaha, Chandkhali and Sangu) of Chattogram river system.

Except Ichamati major carps breed and spawn during monsoon in other four tributaries of the river Karnaphuli (Azadi 2019, 1985). Egg collection and fry production of major carps is regularly practiced in Halda River. Amongst the other four tributaries, only from Myani River BFDC collects the major carp's eggs during monsoon and hatches the same in artificial hatching tank. Hatched

fries are reared to fingerlings in the reservoir creeks and later released in the Kaptai lake. Most of the ethnic communities of Chittagong hill tracts are dependent on this river for their livelihood from very beginning of their settlement and make this river as a common cultural heritage. Sikalbaha and Chandkhali are the two important linked rivers which are also linked with the Sangu and Halda rivers via the River Karnaphuli, which facilitate the migration of major carps from the River Sangu to the River Halda during breeding season and also movement of other migratory fresh and estuarine fishes in these five interconnected rivers (Fig. 1). Isolated by physical barrier of land and sea from the Ganges-Brahmaputra river system the freshwater riverine and estuarine fish stock of the Karnaphuli-Sangu river system needed a distinctive attention for detailed taxonomic study.

During 2007 an amendment was made on “The Protection and Conservation of Fish Rules, 1985” for the protection and conservation of fish spawning in Halda River, as per regulations suggested by Khan and Azadi (2006). According to this regulation about 40 km waterways of the River Halda (Kalurghat Bridge to Nazirthat Bridge) was declared as fish sanctuary where fishing is prohibited throughout the year. Halda adjacent canals and rivers including the rivers Karnaphuli, Sangu, Sikalbaha and Chandkhali were declared as seasonal sanctuary where fishing is closed from February to July, and in the 16 tributaries of the River Halda from March to July. Operation of engine and mechanized boats are also prohibited in Halda Rver during pre-spawning, spawning and post spawning time (March to July) for facilitating migration of brood carps (Bangladesh Gazette 2007, 2010). If the regulations in the Bangladesh Gazette (2007 and 2010) are fully implemented, the disappeared fish species might be restored in those rivers.

Some works on freshwater ichthyofauna of different rivers and water bodies including Karnaphuli River estuary, Halda, and Sangu rivers of Chittagong were done by Ahmed and Hasan (1981), Tsai *et al.* (1981), Gafur and Bhuiyan (1983), Hafizuddin *et al.* (1989), Haroon *et al.* (1989), Alamgir *et al.* (1990), Halder *et al.* (1991), Hossain *et al.* (2007), Rashed-Un-Nabi *et al.* (2011), Azadi and Arshad-ul-Alam (2011, 2013, 2014), Arshad-Ul-Alam and Azadi (2017). Although ichthyofauna of Halda and Sangu rivers have been done (Azadi and Arshad-ul-Alam 2011, 2013, 2014) but no detailed works were found on Ichthyofauna of the three linked tidal rivers of Halda i.e. Karnaphuli, Chandkhali and Sikalbaha. The present investigation was carried out to find out the ichthyofauna of these three linked rivers along with their status. This work might be useful to protect and conserve the fish fauna of the three important rivers which connect the River Sangu with the River Halda.

## MATERIAL AND METHODS

For this study fish samples were collected from the three linked tidal rivers namely Karnaphuli, Sikalbaha and Chandkhali (Fig.1) at monthly intervals in fresh condition during May 2010 to April 2012 from the catch of 38 kinds of active fishing gears immediately after emptying the gears. Regular monthly field trips were made during this period for catch assessment using mechanized boat. Fish samples were also collected through irregular field visit during May 2012 to February 2020 upto Shilok Bazar, Rangunia at Karnaphuli River (22.44, 92.08) (17 km upstream from Lambur Hat Bazar) (Fig.1). Structured questioners and data sheets were used for catch assessment and sampling survey in the regular sampling area from the 15 No. Ghat near Karnaphuli mouth (22.24, 91.82) to Lambur Hat Bazar, Raozan (35 km stretch of the Karnaphuli River) (22.42, 91.94) and entire Shikalbaha River (river mouth 22.32, 91.86 to Murali ghat 22.24, 91.96) and entire Chandkhali River (Murali Ghat 22.24, 91.96 to Keshua 22.18, 91.94), which connected the River Karnaphuli with the River Sangu (Fig 1). Photographs of fish samples were taken and colour pattern were noted in fresh condition. Specimens were preserved in 10% formaldehyde for detailed study later. Identification was made after reviewing external features and finer morphometric and meristic details with the help of works of Day (1889), Shafi and Quddus (1982), Rahman (2005) and IUCN (2000 and 2015). Regional threatened status was confirmed using IUCN (2015). Availability of the species was stated after analysis of catch assessment data. Classificatory scheme was mostly followed as proposed by Nelson *et al.* (2016). Accepted species name was confirmed from FishBase website.

## RESULTS AND DISCUSSION

A total of 112 finfish species under 20 orders, 47 families and 90 genera and a total of 18 shellfish (16 prawns and 2 crabs) under 1 order, 3 families and 7 genera were identified from the rivers Karnaphuli, Sikalbaha and Chandkhali during ten years study period from May 2010 to February 2020. A list of finfish and shellfish species recorded from the Karnaphuli, Sikalbaha and Chandkhali rivers is given below (Table 1). The taxonomic list and systematic index of ichthyofauna with scientific name, local name, common name, habitat, regional Red List Category, threatened status as per IUCN Bangladesh Red List (2000, 2015) and abundance are presented in the list.

Taxonomic List of the recorded finfish and shellfish from the three studied linked rivers along with fishes previously recorded from the Sangu and Halda rivers are given in Table 1.

Karnaphuli, Sikalbaha and Chandkhali are three linked rivers which are also linked with the Halda and Sangu rivers (Fig.1). In spite of being blocked by the Kaptai Dam, Karnaphuli River is still in touch with the Kaptai reservoir through the outlet (spill way) water, which is apparent during heavy monsoon shower when some fish species of Kaptai lake are seen in Halda and lower Karnaphuli rivers, which arrive through the discharged excess water of the lake through the spill ways. There is a variation of species and also in their number in different estuarine rivers. In advent of time due to over fishing, new techniques of fishing and fishing gears, climate change and human intervention, the number of species has not only varied in different rivers but also in the same river. Gafur and Bhuiyan (1983) documented 67 species of estuarine finfish from the Karnaphuli river estuary. Azadi and Arshad-Ul-Alam (2011) reported 83 species of finfish and 9 species of shellfish from Halda river. Azadi and Arshad-Ul-Alam (2014) reported 109 species of finfish and 18 species of shellfish from Sangu River (river mouth to Bandarban District Sadar). Arshad-Ul-Alam and Azadi (2017) first recorded a new carp species namely horned carp, *Schismatorynchos nukta* from hilly stream zone of upper Sangu River, Bangladesh. Ahmed and Hasan (1981), Hafizuddin *et al.* (1989) and Alamgir *et al.* (1990) reported 48, 58 and 72 species of finfish respectively from Kaptai lake. Halder *et al.* (1991) documented 64 finfish from the Feni River estuary, which included freshwater dependent 35, estuarine dependent freshwater 11, estuarine 7, estuarine dependent marine 9 and marine 2. Hossain *et al.* (2007) documented and illustrated 98 species of finfish, 23 species of prawn, 13 species of crab from the Naaf River. Rashed-Un-Nabi *et al.* (2011) recorded 45 estuarine species (35 finfish and 10 shrimps) from Bakhkhali River estuary. Pramanik *et al.* (2017) documented 107 finfish species from Meghna River. While Hossain *et al.* (2012) recorded 53 fin fish species from Meghna River estuary. Chowdhury *et al.* (2019) recorded 51 finfish species from Surma River, Sylhet Sadar, Bangladesh.

In the above-mentioned rivers maximum number of finfish species (110) was found in the river Meghna (Pramanik *et al.* 2017) and maximum number of shell fish (23) and crab species (13) in the River Naaf (Hossain *et al.* 2007), whereas minimum number of fin fish species (45) and shell fish species (10) were found in the estuarine River Bakhkhali (Rashed-Un-Nabi *et al.* 2011). In







Order	Family	Species	Common name, Local name	Habitat	Karnaph # River	Sakhab # River	Chandkh # River	Haida River	Sangu River	ICCN 2000 Status	ICCN 2015 Status
9	Cichlidae	88. <i>Scorpaeniscopus</i> (Hamilton, 1822)	Yellow tail mullet; Buda	River	F	F	F	F	F	F	VU
10	Balitoridae	89. <i>Oreochromis niloticus</i> (Linnaeus, 1758)	Blue tilapia; Mubaha	Estuary	C	C	C	C	C	S	NE
		90. <i>Oreochromis mossambicus</i> (Peters, 1822)	Common tilapia	River	C	C	C	C	C	S	DD
		91. <i>Cyprichromis labialis</i> (Linnaeus, 1847)	Wesafira labiale; Thulita	Wide freshwater	VF	VF	VF	VF	VF	NE	EN
		92. <i>Demipogonias kaluh</i> and <i>van Hasselti</i> , 1823	Wesafira labiale; Thulita	Wide freshwater	NF	NF	NF	NF	NF	EN	LC
		93. <i>Verreuterosoma</i> (Hamilton, 1822)	Freshwater garfish; Galika	Wide freshwater	VF	VF	VF	VF	VF	VF	NO
11	Cyprinodontiformes	94. <i>Aplocheilichthys</i> (Hamilton, 1822)	Blue pondich; Chukuni	Wide freshwater	VF	VF	VF	VF	VF	VF	NO
12	Synbranchiiformes	95. <i>Mozambiqueus</i> (Lacépède, 1800)	Zig-zag eel; Kata bain	Wide freshwater	VF	VF	VF	VF	VF	VF	EN
		96. <i>Micropterus salmoides</i> (Bloch, 1786)	Lesser spiny eel; Tara bain	Wide freshwater	VF	VF	VF	VF	VF	VF	EN
		97. <i>Micropterus</i> (Hamilton, 1822)	Banded spiny eel; Guchibain	Wide freshwater	F	F	F	F	F	F	NO
13	Anabantidae	98. <i>Archibuteo</i> (Bloch, 1792)	Climbing perch; Koi	Pond, lake, beel and floodplain	VF	VF	VF	VF	VF	VF	NO
		99. <i>Trichopodus</i> (Cuvier, 1831) [Fig. 2]	Croaking gourami; Kholsia	River; Estuarine	S	S	S	S	S	S	NO
		100. <i>Trichopodus</i> (Bloch and Schneider, 1801)	Banded gourami; Kholsia	Wide freshwater	S	S	S	S	S	S	NO
		101. <i>Trichopodus</i> (Hamilton, 1822)	Honey gourami; Chokholola	Wide freshwater	S	S	S	S	S	S	NO
		102. <i>Chromis</i> (Bloch and Schneider, 1801)	Walking snailhead; Ching mach	Pond, lake, beel and floodplain	S	S	S	S	S	S	NO
		103. <i>Chromis</i> (Bloch, 1793)	Spotted snailhead; Ching mach	Pond, lake, beel and floodplain	S	S	S	S	S	S	NO
		104. <i>Chromis</i> (Bloch, 1793)	Spotted snailhead; Ching mach	Pond, lake, beel and floodplain	S	S	S	S	S	S	NO
14	Pleuronectiformes	105. <i>Brevicephala</i> (Bloch and Schneider, 1801)	Oriental sole; Kular jib	River and estuary	F	F	F	F	F	F	NO
		106. <i>Brevicephala</i> (Bloch and Schneider, 1801)	Bengal tongue sole; Kular jib	River and estuary	C	C	C	C	C	C	NO
		107. <i>Macropodus</i> (Hamilton, 1822)	Crocodile-tooth pipefish; Kumerkhil	River and estuary	F	NF	NF	NF	NF	F	NO
15	Syngnathiformes	108. <i>Chondromys</i> (Hamilton, 1822)	Elongate glass-perchlet; Lomkhanda	Wide freshwater	F	F	F	F	F	F	VU
16	Perciformes	109. <i>Paramisgurnus</i> (Hamilton, 1822)	Himalayan glassy perchlet; Kata chanda	Wide freshwater	A	A	A	A	A	A	DD
		110. <i>Paramisgurnus</i> (Hamilton, 1822)	Indian glassy fish; Lakhanda	Wide freshwater	F	F	F	F	F	F	VU
		111. <i>Danio</i> (Hamilton, 1822)	Four banded silver tiger fish; Dora koi	Lower estuary	VF	NF	NF	NF	NF	NF	DD
38	Demniidae	112. <i>Genesio</i> (Hamilton, 1822)	Deep-bodied mojarra; Chunda	Lower estuary and sea coast	VF	NF	NF	NF	NF	NF	NR
39	Gerridae	113. <i>Leuciscus</i> (Bloch, 1791)	Berrimud; Korai	Lower estuary and sea coast	F	NF	NF	NF	NF	NF	NO
40	Lutidae	114. <i>Scopelogadus</i> (Linnaeus, 1766)	Spotted cat; Sishara	Lower estuary and sea	VF	NF	NF	NF	NF	NF	NE
41	Scorpaenidae	115. <i>Scorpaenopsis</i> (Linnaeus, 1758)	Red scorpionfish; Barga	Lower estuary and sea	VF	NF	NF	NF	NF	NF	NE
42	Trachinotidae	116. <i>Trachinotus</i> (Linnaeus, 1758)	Red drum; Barga	Lower estuary and sea	VF	NF	NF	NF	NF	NF	NE
43	Trachinotidae	117. <i>Trachinotus</i> (Linnaeus, 1758)	Bridled jaw fish; Barga	Sea	S	NF	NF	NF	NF	S	NR
44	Polycentridae	118. <i>Polycentrus</i> (Linnaeus, 1758)	Barial; Baribad; Dombila	River and estuary	F	F	F	F	F	F	DD
17	Scorpaeniformes	119. <i>Polycentrus</i> (Linnaeus, 1758)	Parasitic threadfin; Thopole	Estuary	VF	VF	VF	VF	VF	VF	NO
18	Polycentridae	120. <i>Microgobius</i> (Hamilton, 1822)	Color croaker; Poo; Euarine	Estuary	VF	NF	NF	NF	NF	NF	NO
19	Acanthuriformes	121. <i>Acanthurus</i> (Hamilton, 1822)	Cup bob; Kalpa	Estuary and sea, Migrants	VF	NF	NF	NF	NF	NF	NO
		122. <i>Osteichthys</i> (Hamilton, 1822)	Pama croaker; Poo	Lower estuary and sea	F	NF	NF	NF	NF	NF	NO
20	Spariformes	123. <i>Siganus</i> (Hamilton, 1822)	Flathead sillago; Sunda	Lower estuary and sea	VF	S	S	S	S	S	NO
		124. <i>Siganus</i> (Forsskal, 1775)	Silver sillago; Sunda	Lower estuary and sea	VF	NF	NF	NF	NF	NF	NE
		125. <i>Siganus</i> (Hamilton, 1822)	Silver sillago; Sunda	Lower estuary and sea	VF	NF	NF	NF	NF	NF	NE
1	Deepsea	126. <i>Macropodus</i> (Hamilton, 1822)	Giant river prawn; Gola ching	Freshwater	110	74	72	43	111		
		127. <i>Macrobrachium</i> (Linnaeus, 1758)	Dima river prawn; Dima ching	River and estuary	A	A	A	A	A	A	NE
		128. <i>Macrobrachium</i> (Linnaeus, 1758)	Monsoon river prawn; Chakchaka	River	A	A	A	A	A	A	NE
		129. <i>Macrobrachium</i> (Linnaeus, 1758)	River prawn; Godalcha	Wide freshwater	C	C	C	C	C	C	NE
		130. <i>Macrobrachium</i> (Linnaeus, 1758)	Kara river prawn; Karalcha	River	F	F	F	F	F	F	NE
		131. <i>Macrobrachium</i> (Linnaeus, 1758)	Hary river prawn; Godalcha	River and estuary	F	F	F	F	F	F	NE
		132. <i>Macrobrachium</i> (Linnaeus, 1758)	Pattacha	River and estuary	F	F	F	F	F	F	NE
		133. <i>Macrobrachium</i> (Linnaeus, 1758)	Birma river prawn; Shilcha	Wide freshwater	F	NF	NF	NF	NF	F	NE

\* Fishes recorded only from Sangu and not found in Kamrup, Shillong, Chitlang or Haila.



Order	Family	Species	Common name, Local name	Habitat	Status in this study					IUCN 2000 Status	IUCN 2015 Status		
					Karnaphuli River	Sakabaha River	Chandkhali River	Hala River	Sangu River				
2	Penaeidae	<p>8. <i>Macrobrachium</i> (Kemp, 1917)</p> <p>9. <i>Exopalaemon</i> (Fabricius, 1798)</p> <p>10. <i>Metapenaeus</i> (Fabricius, 1798)</p> <p>11. <i>Metapenaeus</i> (Fabricius, 1798)</p> <p>12. <i>Metapenaeus</i> (Fabricius, 1798)</p> <p>13. <i>Metapenaeus</i> (Fabricius, 1798)</p> <p>14. <i>Parapenaeopsis</i> (Heller, 1862)</p> <p>15. <i>Penaeus</i> (Fabricius, 1798)</p> <p>16. <i>Penaeus</i> (Fabricius, 1798)</p> <p>17. <i>Acinipenaeus</i> (Wood Mason)</p> <p>18. <i>Scylla serrata</i> (Forster, 1775)</p>	Thangulcha	River and estuary	A	A	A	C	A	NE	LC		
			Short-leg river prawn; Lohitacha	Wide freshwater and estuary	F	NF	NF	NF	F	F	NE	LC	
			Roehma prawn; Gurachingri	Estuary and sea	C	C	C	F	C	F	C	NE	LC
			Speckled shrimp; Hairnachingri	Estuary and sea	F	F	F	NF	NF	NF	F	NE	LC
			Yellow shrimp; Lallichingri	Estuary and sea	VF	NF	NF	NF	NF	NF	VF	NE	DD
			Kadial shrimp; Gosachingri	Sea	VF	NF	NF	NF	NF	NF	VF	NE	LC
			Bird shrimp; Kuchochingri	Sea	F	NF	NF	NF	NF	NF	F	NE	LC
			Rainbow shrimp; Rodachingri	Sea	F	NF	NF	NF	NF	NF	F	NE	LC
			Bhagarachingri	Sea	F	NF	NF	NF	NF	NF	F	NE	LC
			Banya shrimp; Baghachamashingri	Estuary and sea	VF	NF	NF	NF	NF	NF	VF	NE	LC
			Black tiger shrimp; Bagachingri	Estuary and sea	S	NF	NF	NF	NF	NF	S	NE	LC
			Spiny crab; Cimelakira	Wide freshwater	C	C	C	C	C	C	C	NE	LC
			Giant mud crab; Shilakira	Estuary and sea	F	S	S	S	S	S	F	NE	LC
				Shallfish richness	18	11	11	10	18	10	18		
				Total Species richness	128	85	83	93	129	93	129		

the present investigation a total of 130 species of ichthyofauna (112 finfish and 18 shellfish) were recorded from the three linked rivers i.e. Karnaphuli, Sikalbaha and Chandkhali. Among the three rivers highest number of finfish (110) and shellfish species (18) and altogether 128 ichthyofauna were recorded from the River Karnaphuli, while a total of 74 fin fish and 11 shellfish, altogether 85 ichthyofauna and 72 finfish and 11 shellfish, altogether 83 ichthyofauna species were recorded from Sikalbaha and Chandkhali rivers respectively. The variation in the recorded numbers of finfish and shellfish species in these three linked estuarine rivers was due to the variation in river size (length, width and depth) and total area of the rivers as well as habitat condition and also having chance of directly joining with the sea by the River Karnaphuli, which was also true for the above mentioned other rivers studied by different authors. In context of presence of finfish numbers, Karnaphuli (110) showed higher species density than lower Sangu (109) and Halda (83), but equals to the Meghna (110) while in context of shell fish numbers both rivers Karnaphuli (18) and Sangu (18) occupied the second position after the river Naff (23) but higher than the Halda (10), Sikalbaha (11) and Chandkhali (11). Number of Ichthyofauna in other two studied rivers (Sikalbaha and Chandkhali) was moderate but lower than the River Halda, Karnaphuli and Sangu.

In earlier edition of Threatened Animals of Bangladesh (IUCN Bangladesh 2000) ten fish species were evaluated as freshwater but in update edition of IUCN Bangladesh (2015) these fish species were considered as marine. These ten species are *Megalops cyprinoides*, *Moringua raitaborua*, *Gymnothorax tile*, *Lates calcarifer*, *Scatophagus argus*, *Terapon jarbua*, *Paraapocryptes serperaster*, *Oxyurichthys microlepis*, *Polynemus paradiseus* and *Brachirus orientalis*. Six species were not evaluated in either edition of IUCN Bangladesh 2000, or IUCN Bangladesh 2015, as they are marine exclusively. These are *Moringua macrocephalus*, *Hexanematichthys sagor*, *Giuris margaritacea*, *Sillago sihama*, *Gerri's erythrourus* and *Opistognathus nigromarginatus*, but they are occasional invaders in river. Four freshwater fish species not reported in IUCN Bangladesh 2000, but reported in IUCN Bangladesh 2015 are *Bangana ariza* (VU), *Oryzias dancena* (DD), *Pseudapocryptes elongates* (LC), and *Macrognaathus aculeatus* (NT).

Under the genus *Cirrhinus* only *Cirrhinus mrigala* was reported from the Halda River (Azadi and Arshad-Ul-Alam 2013). Karnaphuli is enriched with another congeneric species, *Cirrhinus reba*. No specimen of *Cirrhinus cirrhosus* was found in the three studied rivers, which was also not reported from Sangu and other rivers of Chattogram (Azadi and Arshad-Ul-Alam 2014, Personal communication). *Cirrhinus cirrhosus* is characterized by two pairs of well-

developed barbels, rostral pair is longer than maxillary barbel, *Cirrhinus mrigala* has rostral pairs only. It is noticeable that a single specimen of *Cirrhinus cirrhosus* (Fig.2) was collected by the present authors from Chowmuhani Arong (Arong is the local name of village market in Cumilla) of Devidwar Upazilla Sadar of Cumilla district. Although the seller primarily claimed it as Gomti river fish, but he did not ascertain whether it was collected from captured or cultured stock. In the present study, several attempts were taken to collect more *Cirrhinus cirrhosus* from different fish markets and fishermen of Chattogram and Devidwar and Muradnagar Upazilla but failed.

Rahman (2005) stated *Cirrhinus mrigala* as a synonym of *Cirrhinus cirrhosus* (p.140). Day (1878, 1889), Talwar and Jhingran (1991), Dahanukar (2010), (IUCN 2019), Rema Devi and Ali (2011), (IUCN 2019), Menon 2004 (IUCN 2019), Menon (1999) (Fishbase) and Roberts (1997) (Fishbase) described *Cirrhinus mrigala* and *Cirrhinus cirrhosus* as two distinct species with morphological differences and with different geographical distribution.

According to Day (1878, 1889), Talwar and Jhingran (1991), Goswami *et al.* (2012), FishBase and IUCN Red List (accessed on 24 March 2020) *Cirrhinus mrigala* is native of northern India, Pakistan and Bangladesh; however the native range of *Cirrhinus cirrhosus* is the Godavari, Krishna and Cauvery rivers of South India. Both the species have been introduced to other regions of India and many countries outside of India. In the present study the recorded *Cirrhinus cirrhosus* from Gomti river of Comilla may be introduced or invaded in Bangladesh river waters from Indian Tripura region or Barak river drainage.

*Oryzias dancena* was reported as data deficient (DD) in recent Redlist of Bangladesh (IUCN Bangladesh, 2015) although it might be considered as least concern (LC) as per guidelines for using the IUCN Red List categories and criteria (IUCN Standards Petitions Subcommittee 2014). In first edition of IUCN Bangladesh (2000) it was not reported and was first reported by Azadi and Arshad-Ul-Alam (2013) from the river Halda. This tiny fish was found common in the catch of enclosure net (locally called Ghera jal of 2 mm mesh) used in the Rivers Halda, Karnaphuli, Sangu and their tributaries (Azadi and Arshad-Ul-Alam 2014).

*Laubuka laubuca* was reported as endangered in IUCN Bangladesh (2000) and as least concern in IUCN Bangladesh (2015). This species was recorded as very rare in Halda and Sangu by the present authors (Azadi and Arshad-Ul-Alam 2013, 2014).

*Plotosus canius* locally known as 'Gang magur' is a euryhaline species found mostly in estuary and coastal area and in this study it was recorded from the lower Karnaphuli near to Karnaphuli mouth estuary. Recently, present

authors collected an individual of juvenile *Plotosus canius* from the electro-fishing catch in the Remakri river, a remote hilly upstream tributary of Sangu river.

*Trichopsis vittata* reported as an unintentionally invaded ornamental fish (Norén et al. 2017) was recorded from Turag, Dhaleshwari and Titas rivers. It was recorded as abundant in Turag river but not found in southeastern Bangladesh (Chittagong division) during 2015 and northeastern Bangladesh



Fig. 2. Photographs of some fishes found in studied rivers excluding *Cirrhinus cirrhosus*.

(Sylhet division) during 2016 (Norén et al. 2017). However, in recent survey during April 2018, considerable number of this species was found in Set-Bag net catch in Karnaphuli river, although no such specimen was found in previous

eight years extensive survey. This species was also reported during 2017 from the hilly up stream of Chittagong University Campus (Azadi and Mandol 2017).

Out of 112 finfish species, 76 species and out of 18 shell fish species, 11 species were common in three linked rivers. However, 40 species of finfish and 7 species of shellfish were only found in the river Karnaphuli. *Chela cachius* and *Dermogenys pussilus* were not found in Karnaphuli river. There was no example of the recorded species being found only in Chandkahlia or Sikalbaha rivers. It might be due to the quality of water, size of the rivers in respect of length, width, depth and total area of the studied rivers.

### **CONCLUSION**

Out of the five linked rivers of Chattogram River system, ichthyofaunal study of two linked Rivers, Halda and Sangu (lower Sangu) have been done earlier (Azadi and Arshad-Ul-Alam 2013, 2014). With the study of three more linked rivers, Karnaphuli, Sikalbaha and Chandkhalia, ichthyofaunal study of five linked rivers has been completed. In this study a total of 130 ichthyofaunal species have been recorded from the three rivers, out of which 128 species (110 fin and 18 shell fish) were from the River Karnaphuli, 85 species (74 fin and 11 shell fish) were from the River Shikalbaha and 83 species (72 fin and 11 shell fish) were from the River Chandkhalia. Ichthyofauna of other two linked rivers, Halda and Sangu were found to be 93 species (83 fin fish and 10 shell fish) and 127 species (109 fin fish and 18 shell fish) respectively (Azadi and Arshad-Ul-Alam 2013, 2014). Among the five linked rivers highest number of ichthyofaunal species were recorded from the River Karnaphuli (128) while second, third, fourth and fifth highest were recorded from the Rivers Sangu (127), Halda (93), Sikalbaha (85) and Chandkhalia (83). This variation was due to different river size, length, depth and absence or presence of diversified habitat in different rivers. This study will be helpful to the policy makers, planners and researchers to protect, manage, conserve and for further study of the important fin and shell fishes of the five linked rivers of Chattogram.

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