

## Check list of fish species availability in Rupsha River, Bangladesh: Threat identification and recommendation for sustainable management

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Present study was conducted to assess fish species availability in the Rupsha River during February 2012 to January 2013. A total of 64 species of fish under 11 orders and 30 families were documented during the study period. Perciformes was the most dominant order constituting 34.38% of the total fish population followed by the Cypriniformes (25%), Siluriformes (18.75%), Clupeiformes (4.69%), Synbranchiformes (4.69%), Mugiliformes (3.13%) and Tetraodontiformes (3.13%). Osteoglossiformes, Beloniformes, Anguilliformes, and Aulopiformes were the least numerous orders constituting only 1.56% each of the total fish population. Among them, 5 species were vulnerable, 8 species were endangered and only 1 species were critically endangered. In addition, 48.43% of the available fishes are categorized as rare or very rare in the present study while only 23.44% species were available in large quantities throughout the year.

[**Keywords:** Conservation policy, Fish availability, Rupsha River, Threat]

### Introduction

Rupsha River runs by the side of Khulna city and connects to Poshur River at Mongla channel before finally falls into the Bay of Bengal. Many factories including fisheries, dockyard, shipyard factories are situated on the bank of this river. This river also supports livelihood and nutritional security of the people living alongside through different fisheries activities. Rupsha River acts as a breeding ground for various freshwater and marine water species.

The management and conservation of aquatic biodiversity have gained great ecological importance over recent years<sup>1,2</sup>. For sustainable exploitation and proper management of resources it is important to know the variety of the resources types and their availability. This sense is more significant when we know that the freshwater fisheries resources are in threat all over Bangladesh where 12 fish species are critically endangered, 28 are endangered, 14 are vulnerable<sup>3,4</sup>. It is also pointed out that because of over-exploitation accelerated by different ecological changes and natural habitats' deterioration, most of the wild populations have severely reduced in

Bangladeshi rivers and streams<sup>5,6</sup>. This status also resembles in the overall fish production of the country where the contribution of inland capture fisheries has significantly declined from 50% to 35% in recent years<sup>7</sup>.

To the best of the authors' knowledge, there are no previous studies regarding fish species availability in the Rupsha River, which is a barrier to the implementation of National Biodiversity Strategy and Action Plan<sup>8</sup>. In addition, to manage fisheries resources of Rupsha River effectively, it is necessary to find out the threats to the resources. This study aims to provide information on fish species availability, threats to the fisheries resources and to provide recommendations for sustainable fisheries management in Rupsha River, Bangladesh.

### Materials and Methods

The present study was conducted in the Rupsha River, southwestern Bangladesh from February 2012 to January 2013. Samples were collected fortnightly from pre-selected fishermen's catch from the Rupsha River landed at different fish landing centers (Custom

ghat, Rupsha ghat, Shipyard and Labanchara) (Figure 1).



Fig. 1— Map showing location of the Rupsha River, southwestern Bangladesh (Main source: Google map; Accessed on: 20 February 2014).

Fish were usually caught by means of the traditional fishing gears such as cast net (*jhaki jal*), square lift net (*tar jal*), conical trap (*dughair*), fish angles (*Borsi*), and fish barrier (*Thaga*). Fresh samples were immediately chilled in ice on site and fixed with 10% buffered formalin upon arrival at the laboratory. The collected fish samples were identified by evaluating their morphometric and meristic characteristics<sup>9,10,11</sup>.

Availability of fish species were determined on the basis of their abundance during sampling and survey through interviewing of 50 fishermen and fish traders following the questionnaire pattern<sup>4</sup>. In addition, necessary data and information on threats to biodiversity and its conservation were collected through the survey on the fishers, fish farmers, fish traders, teachers, students, researchers, Government and NGO personnel and experienced persons related to fisheries sectors, and available literatures<sup>4</sup>.

Data analyses were performed using GraphPad Prism 5 software, while figures were made by Microsoft® Excel 2007.

## Results

The present study reveals 64 species of fish under 11 orders and 30 families in the Rupsha River, Bangladesh (Table 1). Perciformes was the most dominant order constituting 34.38% of the total fish population followed by the Cypriniformes (25%),

Siluriformes (18.75%), Clupeiformes (4.69%), Synbranchiformes (4.69%), Mugiliformes (3.13%) and Tetraodontiformes (3.13%). Osteoglossiformes, Beloniformes, Anguiliformes, and Aulopiformes were the least numerous orders constituting only 1.56% each of the total fish population (Figure 2). In our study, 14 species were identified as threatened, among them 5 (35.71 %) species as vulnerable, 8 (57.14 %) species as endangered and 1 (7.14 %) species as critically endangered were categorized<sup>3</sup> and presented in figure 3. However, alarmingly 31.25% of the fish species found during the study are categorized as very rare while 17.18% species were grouped as rare due to low catch amount. On the other hand, 28.13% species were found in small quantities while only 23.44% species were available in large quantities throughout the year (Figure 4).

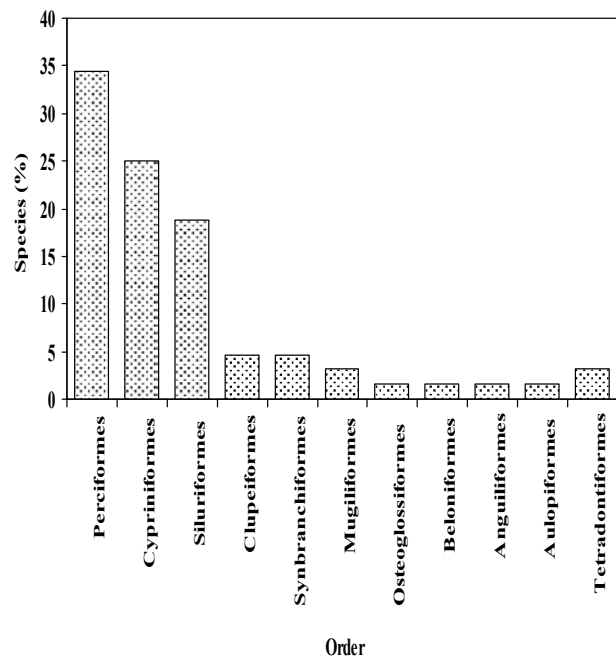


Fig. 2— Fish species composition under different order found in the Rupsha River, southwestern Bangladesh

Major threats to the fisheries resources in the Rupsha River include destructive fishing methods applied by different fishermen, indiscriminate fishing of fry-fingerlings and gravid females, habitat modification, water diversion, siltation, low water velocity. In addition, a series of barrages and dams have been constructed in the upper segment of Rupsha and adjacent linking rivers from Jessore to Bagerhat district. Also, the construction of Khan

Jahan Ali Bridge over the river Rupsha disrupts the water flow and by that may have a detrimental effect on feeding and spawning ground for fishes and may also interrupt the migratory routes. Additionally, the waste products of a number of factories that are located on the bank of Rupsha River pollute its water. Also, agrochemicals including fertilizers and pesticides washed out with the rain water and drained into the river also pollute the water. These pollutants could negatively affect the spawning and feeding behavior of fishes.

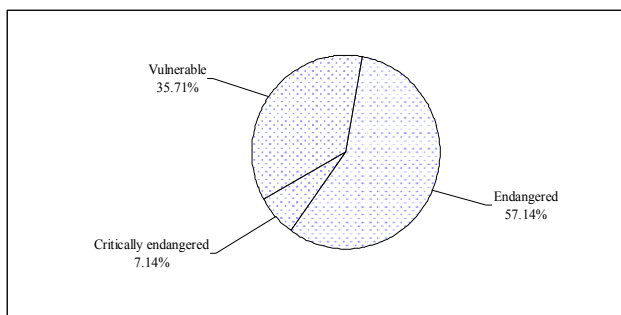


Fig. 3— Percentage of threatened fish in the Rupsha River, southwestern Bangladesh

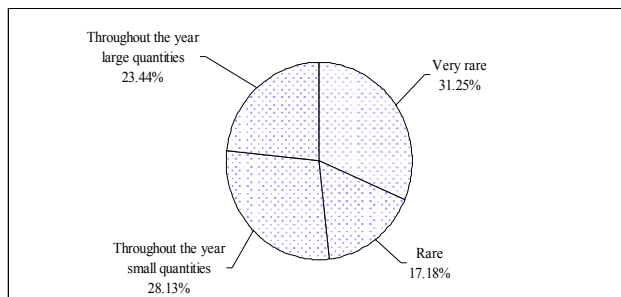


Fig. 4— Percentage of fish on the basis of availability in the Rupsha River, southwestern Bangladesh

## Discussion

The number and composition of species recorded in this study are the first documentation in the Rupsha River. However, the documentation of the species found here as well as their availability is critical; this together with the identification of the threats will help formulating the needed conservation measures. Because of no previous information on the fish availability or biodiversity of this river, it was not possible to compare the present findings. Perciformes was the most diversified fish group considering both the number of species and individuals followed by

Siluriformes and Cypriniformes. These results are reasonable because these three groups are the most dominant in freshwaters of Bangladesh<sup>12,10,4</sup>. In our present investigation, 21.88% of the total fish species from the Rupsha River is recorded as threatened<sup>3</sup>. As well, 48.43% of the available fishes are categorized as rare or very rare in the present study. All these findings are indicating the need for urgent management and conservation measures. It is important to address all the threats and to act accordingly in order to avoid worsening of the situation and to start improving the overall condition. Threats mentioned earlier figured out during the present study are all common threats to freshwater fisheries resources all over the world<sup>13,14,15,16,17,18,19,4</sup>. Same reasons for declining the species have also found in the lower part of Ganges River, Bangladesh<sup>20, 21, 22,23</sup>.

Detail information on the life history traits including reproductive biology, growth, distribution, abundance of fishes are prerequisite for any effective management strategies planned for sustainable fisheries management and conservation. In addition, for better management of the fisheries resources in the Rupsha River the following measurements could be taken: establishing and maintaining available fish sanctuaries, banning indiscriminate fishing especially during spawning season, identification and protection of the breeding and nursery grounds, encouraging the farmers to introduce integrated pest management (IPM), reducing the use of chemical fertilizers and pesticides, introduction of fish bypasses to facilitate fish migration, restocking economically important fish species, training of the fishermen, encourage community-based organizations for fisheries management at community level, establishment of waste treatment plants in the factories, formulating new legislation concerning the current situation, and finally strict implementation of existing conservation regulations and ensuring proper punishment of the culprits. Furthermore, financial assistance from government and non-government organizations is indispensable with the intension of initiating further surveys, research, monitoring and raising awareness among the people for better management and conservation of fisheries resources in the Rupsha River, Bangladesh.

Table 1 — List of fish species in the Rupsha River, southwestern Bangladesh

Order	Family	Scientific name	Habit-at	Common name	Local name	Availability	Status*	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>
Anguilliformes	Ophichthidae	<i>Pisodonophis cancrivorus</i>	MW, FW, BW	Longfin snake-eel	Snake eel	VR		√	√		
Aulopiformes	Synodontidae	<i>Harpadon nehereus</i>	MW, BW	Bombay-duck	Loitta	TYL		√	√		
Beloniformes	Belonidae	<i>Xenentodon cancila</i>	MW, BW	Freshwater garfish	Kakila	VR		√	√		√
Clupeiformes	Clupeidae	<i>Gonialosa manmina</i>	FW, BW	Ganges river gizzard shad	Chapila	R		√	√	√	√
		<i>Gudusia chapra</i>	FW, BW	Indian river shad	Chapila	R		√	√		√
	Engraulidae	<i>Setipinna phasa</i>	FW, BW, EW	Gangetic hairfin anchovy	Phasa	TYL		√			√
Cypriniformes	Cobitidae	<i>Lepidocephalichthys annandalei</i>	FW	Annandale loach	Gutum	VR		√			√
	Cyprinidae	<i>Cirrhinus cirrhosus</i>	FW, BW	Mrigal	Mrigal	TYS			√	√	√
		<i>Devario devario</i>	FW	Sind danio	Banspata	TYS		√	√	√	√
		<i>Labeo bata</i>	FW	Bata	Bata	TYS	EN		√	√	√
		<i>Labeo boga</i>	FW	Bhangan	Bhangan	VR	CE		√	√	√
		<i>Labeo boggut</i>	FW	Boggut labeo	Ghonia	R				√	√
		<i>Labeo calbasus</i>	FW	Orange-fin labeo	Kalibaus	TYS	EN		√	√	√
		<i>Labeo rohita</i>	FW	Rohu	Rui	TYL		√		√	
		<i>Puntius chola</i>	FW	Swamp barb	Punti	TYL		√		√	
		<i>Pethia conchonius</i>	FW	Rosy barb	Kanchanpunti	TYS		√	√		√
		<i>Puntius gelius</i>	FW	Golden barb	Gilipunti	TYS		√	√		√
		<i>Puntius guganio</i>	FW	Glass-barb	Molapunti	TYL		√	√	√	√
		<i>Puntius sophore</i>	FW, BW	Puntio barb	Punti	TYL					
		<i>Puntius terio</i>	FW	Onespot barb	Teripunti	TYL		√	√		
		<i>Pethia ticto</i>	FW, BW	Ticto barb	Titpunti	TYS	VU	√		√	
		<i>Securicula gora</i>	FW	Ghora chela	Ghora chela	TYS		√	√	√	√
Mugiliformes	Mugilidae	<i>Rhinomugil corsula</i>	FW, BW, EW	Corsula	Khorsula	R		√	√	√	√
		<i>Sicamugil cascasia</i>	FW	Yellowtail mullet	Kachki	TYS		√		√	√
Osteoglossiformes	Notopteridae	<i>Notopterus notopterus</i>	FW, BW	Bronze featherback	Chital	VR	VU		√	√	√

Perciformes	Badidae	<i>Badis badis</i>	FW	Badis	Napte koi	VR	EN	√	√	√	
	Channidae	<i>Channa orientalis</i>	FW, BW, EW	Walking snakehead	Gachua	VR	VU	√		√	√
		<i>Channa marulius</i>	FW	Great snakehead	Gozar	R	EN	√			√
		<i>Channa punctata</i>	FW, BW	Spotted snakehead	Taki	TYL		√	√		√
		<i>Channa striata</i>	FW	Snakehead murrel	Shol	TYS		√	√		
		Eleotridae	<i>Eleotris fusca</i>	MW, FW, BW	Dusky sleeper	Bhut bele	VR		√		√
	Gobiidae	<i>Acentrogobius caninus</i>	MW, FW, BW	Tropical sand goby	Nuna baila	TYS				√	√
		<i>Awaous guamensis</i>	MW, FW, BW	Bailla	Bailla	TYS		√		√	√
		<i>Glossogobius giuris</i>	MW, FW, BW	Tank goby	Bele	TYL		√	√	√	
		<i>Pseudapocryptes elongatus</i>	FW, BW		Chewa	R		√	√		√
		<i>Taenioides buchanani</i>	MW, FW, BW	Burmese gobyeel	Raja chewa	VR		√	√		
	Latidae	<i>Lates calcarifer</i>	MW, FW, BW	Barramundi	Bhetki	R		√		√	√
	Leiognathidae	<i>Leiognathus equulus</i>	MW, FW, BW	Common ponyfish	Tak chanda	VR		√	√	√	√
	Nandidae	<i>Nandus nandus</i>	FW, BW	Gangetic leaffish	Nodoi / Meni/ Bheda	R	VU		√		√
	Osphronemidae	<i>Trichogaster fasciata</i>	FW	Banded gourami	Khailsha	TYL			√	√	√
		<i>Trichogaster laliusa</i>	FW	Dwarf gourami	Lal kholish a	TYS		√			
		<i>Pseudosphromenus cupanus</i>	FW, BW	Spiketail paradisefish	Koi	TYL		√		√	
	Polynemidae	<i>Polynemus paradiseus</i>	MW, FW, BW	Paradise threadfin	Taposi	TYL		√		√	
	Sciaenidae	<i>Otolithoides pama</i>	MW, FW, BW	Pama croaker	Poa	TYL		√	√	√	√
	Sillaginidae	<i>Sillaginopsis panijus</i>	MW, FW, BW	Flathead sillago	Tular danti	TYS			√		√
Toxotidae	<i>Toxotes chatareus</i>	FW, BW	Largescale archerfish	Goti poa	VR		√	√		√	
Trichiuridae	<i>Lepturacanthus savala</i>	MW, FW	Savalai hairtail	Churi	VR		√	√			
Siluriformes	Bagridae	<i>Mystus gulio</i>	FW, BW	Long whiskers catfish	Nuna-tengra	R		√	√	√	

		<i>Mystus vittatus</i>	FW, BW	Striped dwarf catfish	Tengra	TYL	√	√	
		<i>Sperata seenghala</i>	FW, BW	Giant river- catfish	Air	TYL	√		√ √
	Erethistidae	<i>Pseudolaguvia ribeiroi</i>	FW, BW	Painted catfish	Kani tengra	TYS		√	√
	Heteropneustidae	<i>Heteropneustes fossilis</i>	FW, BW	Stinging catfish	Shingi	TYS	√	√	√ √
	Pangasiidae	<i>Pangasius pangasius</i>	FW, BW	Yellowtail catfish	Pangas	TYS			√ √
	Schilbeidae	<i>Ailia coila</i>	FW, BW	Gangetic ailia	Kajuli	VR	√	√	√
		<i>Ailiichthys punctata</i>	FW	Jamuna ailia	Kajuli	R	√	√	√
	Siluridae	<i>Ompok bimaculatus</i>	FW, BW	Butter catfish	Kani pabda	VR	EN	√	
		<i>Ompok pabda</i>	FW	Pabdah catfish	Madhu pabda	R	EN	√	√
		<i>Ompok pabo</i>	FW	Pabo catfish	Pabda catfish	VR	EN	√	√ √ √
		<i>Wallago attu</i>	FW, BW	Wallago	Boal	TYS		√	√ √
Synbranchiforme	Mastacembelidae	<i>Macrognathus aculeatus</i>	FW, BW	Lesser spiny eel	Tara baim	VR		√	√ √
		<i>Mastacembelus armatus</i>	FW, BW	Zig-zag eel	Baim	VR	EN	√	√ √
	Synbranchidae	<i>Monopterus cuchia</i>	FW	Cuchia	Kuchia	VR	VU	√	√
Tetraodontiformes	Tetraodontidae	<i>Tetraodon cutcutia</i>	FW, BW	Ocellated pufferfish	Tepa	VR			√ √
		<i>Tetraodon fluviatilis</i>	FW, BW	Green pufferfish	Potka	VR			√ √

FW, Fresh water; MW, Marine water; BW, Brackish water, EW, Estuarine water; TYS, throughout the year in small amount; TYL, throughout the year in large amount; R, rare; VR, very rare; Status\*, IUCN Bangladesh (2000); EN, endangered; VU, vulnerable; CE, critically endangered; S<sub>1</sub>, Custom ghat; S<sub>2</sub>, Rupsha ghat; S<sub>3</sub>, Shipyard and S<sub>4</sub> Labanchara.

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