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## **Diversity of Fish Fauna in the Chitra River of Southwestern Bangladesh: Present Status, Threats and Recommendations for Conservation**

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### **ABSTRACT**

Chitra river is an important water body in Southwestern Bangladesh in terms of fish production. Fisheries resources in this river are on the decline due to over exploitation, manmade pollution and inadequate management of inland waters. The present study was conducted to explore the diversity and to check the conservation status of fish fauna in the Chitra river. Fish samples were collected fortnightly from seven sampling stations of the Chitra River at Jessore district in Southwestern Bangladesh during August 2011 to July 2012. A total of 53 species of fish under 10 orders and 23 families were recorded. Cypriniformes were most leading order constituting 33.96% of the total fish population followed by Siluriformes (22.64%), Perciformes (24.53%), Clupeiformes (1.89%), Synbranchiformes (5.66%), Osteoglossiformes (1.89%), Beloniformes (1.89%), Mugiliformes (3.77%), Anguilliformes (1.89%) and Tetraodontiformes (1.89%). Fishes in this river is seriously affected by the various kinds of human development interventions and activities, especially in the areas of agriculture, forestry, fisheries, urbanization, industries, chemicals, minerals, transport and tourism. Estimates from these indices were indication of low fish species composition and richness and unevenness in the population of fish in river Chitra. For sustainability of fishery resources, an adequate knowledge of species composition, diversity and relative abundance of water bodies must be understood and vigorously pursued. Therefore, there is a need for the conservation and sustainable management of the fisheries resources of Chitra water body by relevant agencies.

**Key words:** Fish fauna, conservation, protection, Chitra river, Bangladesh

### **INTRODUCTION**

Fishes are one of the major important elements in the aquatic habitat and play a key role in economy of many nations (Okyere and Denis, 2011), as they have been a staple item in the diet of many people. Nearly one billion people worldwide consume animal proteins (Marichamy *et al.*, 2011). Of all the animals in aquatic environment fish is the most important source of human food. They are the main source of protein for many people, particularly in developing country people. Nonetheless, fish and fisheries are not only providing a significant portion of protein available for human consumption, but they are also contributing significantly in economy by providing jobs and

trade. In Bangladesh fisheries are the second largest employing and export sector involving about 8% of total labor force (Habib *et al.*, 2014). The role of fisheries sector to national economy of Bangladesh is always significant and main source of animal protein, employment opportunities, food security, foreign incomes and socio-economic improvement (Ali *et al.*, 2014; Siddiq *et al.*, 2013). This sector contributes 4.39% to GDP and 22.76% to agricultural GDP. Fish supplements contribute about 60% of daily animal protein intake. About 10% of the population is dependent directly and indirectly on the fisheries for their living (DoF, 2013). It is renowned as a vital income and employment-generating sector in Bangladesh, cheap sources of healthy food for the population of the country (Ali *et al.*, 2014). Total fish production in Bangladesh during the 2011-2012 was about 3.26 million metric tons of which 2.68 million metric tons were produced from freshwater including culture fisheries and 0.05 million metric tons from marine water including shrimp (DoF, 2013).

Bangladesh is known as the riverine country because of having large number of rivers distributed all around it (Banglapedia, 2012). It is blessed with various inland water bodies, which are very rich in diversity of fish species. About 800 rivers counting tributaries flow through the country constituting a waterway of total length around 24, 140 km where it bears a huge potential for fisheries sector (Banglapedia, 2012; DoF, 2013). Bangladesh is the third biggest aquatic fish bio-diversity in Asia, after China and India, with about 800 species in fresh, brackish and marine waters (Hussain and Mazid, 2001). Bangladesh contains large aquatic fish biodiversity with 260 freshwater fish species where minnows, catfish, eels, perch, gobies, clupeids and prawns constituted the major portion (DOF, 2009).

Throughout the world, rivers are the most modified and threatened in environments. Scientific interest is increasingly focusing on the effects of major natural or human perturbations on riverine ecosystems. Riverine fish communities show seasonal changes in the composition and relative abundance of species, which may be influenced by constant fluctuations in environmental factors (Thiel *et al.*, 1995). It is widely accepted that the aquatic biodiversity of Bangladesh including Chitra river was not described statistically (Chowdhury *et al.*, 2011). Loss of aquatic habitats happened for installing various physical infrastructures such as dam. Many inland water bodies are dried up. As a consequence, fish production has declined. In addition, farmers use chemical fertilizers and pesticides, which devastated fish culture in a wider scale. According to IUCN Bangladesh (2000) report, out of 266 inland fish species 12 are critically endangered, 28 are endangered, 14 are vulnerable. Over exploitation, degradation of fish habitats and subsequent declining fish production from natural aquatic resources, inland capture fisheries contribution were declined from 50-35% of total fish production and marine capture fisheries production was remained static over the last ten years (Mazid, 2002).

During the last century, associated habitats are a great challenge. In addition, riverine ecosystems suffered from intense human activities, the conservation of aquatic biodiversity gained great intervention resulting in habitat loss and degradation and ecological importance over recent years. As a consequence, many fish species have become extremely endangered, particularly in rivers. The degradation of natural water bodies resulting from human interferences due to construction of roads, embankments, deforestation, encroachment for agricultural production, indiscriminate use of pesticides and natural causes (siltation, drought, cyclone and intrusion of saline water) has negative impacts on fish diversity in Bangladesh. On the other hand, the indiscriminant use of different fishing gears, harmful techniques of fishing threaten the biodiversity of the seasonal floodplains also has negative impacts on fish diversity. For the implementation of National Biodiversity Strategy and Action Plan, it is essential to manage some of the distinct features of which biodiversity are composed (Chowdhury *et al.*, 2011). Therefore, objective of this study was to provide an account of the fish diversity and species composition in the

Chitra river. The information from this investigation might serve as a baseline data for carrying out further study on ecology, conservation and sustainability management of fishery resources of this water body.

## MATERIALS AND METHODS

**Study area:** Chitra river is situated in the Jessore district, Southwestern Bangladesh (Fig. 1). Seven landing centers were selected for this study. The sites were selected on the basis of the possibility of getting more specimens.



Fig. 1: Map of the study area

**Sampling:** The fish samples were periodically collected from Chitra river during August 2011 to July 2012. Fish samples were collected from the catch of fishermen. Fish were usually caught by means of the traditional fishing gears such as seine net (Sutar jal), cast net (jhaki jal), square lift net (tar jal), conical trap (dughair), fish angles (Borsi), monofilament fixed gill net (Current jal) and fish barrier (Thaga). Samples were also collected from fish-landing centers and fish markets. The specimens were identified primarily during the sampling. Those, which appeared difficult to identify, were marked properly. All the identified and unidentified fish samples were preserved with 10% formalin in the plastic jars. Samplings were conducted fortnightly from commercial catches landed at different fish landing centers. Fishermen generally go for fishing during night and back next day morning and sell captured fish at nearby landing center.

Primary data on the concerned species was collected from the fishermen, fish traders and local people. Relevant data such as local name of the collected fish samples, source, distribution and availability of the species were collected from the study sites. Secondary data was also collected from the District Fisheries Offices, Department of Fisheries (DoF) and Statistical Yearbook of Bangladesh. Along with these data, published relevant documents were also collected from various government agencies, autonomous bodies and NGOs. Research papers on the freshwater fish fauna of Bangladesh were also consulted towards compiling the past data of abundance and availability for assessing biodiversity status.

**Taxonomic study:** Morphometric and meristic characters of the collected species were studied. Measurements of total length, standard length, height of body, snout length, eye diameter, depth of caudal peduncle were taken for each species. The counts of meristic characters such as number of scales, number of fin rays (branched or un-branched) was also taken.

**Identification of the collected samples:** The collected fish samples were identified by evaluating their morphometric and meristic characteristics as well as the color of the specimens referring the books and data base ([www.fishbase.org](http://www.fishbase.org)). The taxonomic analysis by Rahman (2005) and Inland Fishes of India and neighboring countries by Talwar and Jhingran (1991), Fischer (1974) and De Bruin *et al.* (1995) were also used for identification.

## RESULTS AND DISCUSSION

During the study period different fish varieties were observed in the Chitra river. A total of 53 species of fish under 10 orders and 23 families were recorded. Cypriniformes were most leading order constituting 33.96% of the total fish population followed by Siluriformes (22.64%), Perciformes (24.53%), Clupeiformes (1.89%), Synbranchiformes (5.66%), Osteoglossiformes (1.89%), Beloniformes (1.89%), Mugiliformes (3.77%), Anguiliformes (1.89%) and Tetraodontiformes (1.89%). Fish orders, families, species, english name, local name(s), their availability and status in Bangladesh were presented in Table 1.

There has been no previous information of fish fauna in the river Chitra and thus comparison of the present findings with previous one was not possible. The recorded fish species was much lower than some other rivers of Bangladesh (Bhuiyan *et al.*, 2008; Rahman *et al.*, 2012) but presence of similar number of fish species was also reported in Mahananda river (Mohsin and Haque, 2009).

However, all these researchers concluded with gradual loss of biodiversity in their considered rivers. In that sense, this is also true for river Chitra. Order Cypriniformes was found to be the most

Table 1: Fish diversity in the Chitra river, southwestern Bangladesh

Order	Family	Scientific name	Common name	Local name	Availability	Status
Osteoglossiformes	Notopteridae	<i>Notopterus notopterus</i>	Bronze featherback	Chital	VR	VU
Belontiiformes	Belontiidae	<i>Xenotodon cancula</i>	Freshwater garfish	Kakila	VR	
Synbranchiiformes	Mastacembelidae	<i>Macrogonathus aculeatus</i>	Lesser spiny eel	Tara baim	VR	
Synbranchiiformes	Mastacembelidae	<i>Mastacembelus armatus</i>	Zig-zag eel	Baim	VR	EN
Synbranchiiformes	Synbranchiidae	<i>Monopterus albus</i>	Cuchia	Kuchia	VR	VU
Mugiliformes	Mugilidae	<i>Rhinomugil corsula</i>	Corsula	Khorsula	R	
Mugiliformes	Mugilidae	<i>Sicamugil cascasia</i>	Yellowtail mullet	Kachki	TYS	
Clupeiformes	Engraulidae	<i>Setipinna phasa</i>	Gangetic hairfin anchovy	Phasa	TY	
Perciformes	Badidae	<i>Badis badis</i>	Badis	Napte koi	VR	EN
Perciformes	Channidae	<i>Channa orientalis</i>	Walking snakehead	Gachua	VR	VU
Perciformes	Channidae	<i>Channa marulius</i>	Great snakehead	Gozar	R	EN
Perciformes	Channidae	<i>Channa punctata</i>	Spotted snakehead	Taki	TY	
Perciformes	Channidae	<i>Channa striata</i>	Snakehead murrel	Shol	TY	
Perciformes	Eleotridae	<i>Eleotris fusca</i>	Dusky sleeper	Bhut bele	VR	
Perciformes	Gobiidae	<i>Acentrogobius caninus</i>	Tropical sand goby	Nuna baila	TYS	
Perciformes	Gobiidae	<i>Awaous guamensis</i>	Tank goby	Baila	TYS	
Perciformes	Gobiidae	<i>Glossogobius giuris</i>	Gangetic leaffish	Bele	TY	
Perciformes	Nandidae	<i>Nandus nandus</i>	Banded gourami	Nodoi/Meni/Bheda	R	VU
Perciformes	Osphronemidae	<i>Colisa fasciata</i>	Dwarf gourami	Khalisha	TY	
Perciformes	Osphronemidae	<i>Colisa lalia</i>	Spiketail paradisefish	Lal kholisha	TYS	
Perciformes	Osphronemidae	<i>Pseudosphromenus cupanus</i>	Longfin snake-eel	Koi	TYL	
Anguilliformes	Ophichthidae	<i>Pisodonophis cancrivorus</i>	Long whiskers catfish	Snake eel	VR	
Siluriformes	Bagridae	<i>Mystus gulio</i>	Striped dwarf catfish	Nuna-tengra	R	
Siluriformes	Bagridae	<i>Mystus vittatus</i>	Giant river-catfish	Tengra	TYL	
Siluriformes	Bagridae	<i>Sperata seenghala</i>	Painted catfish	Air	TY	
Siluriformes	Erethistidae	<i>Pseudolaguvia ribeiroi</i>	Stinging catfish	Kani tengra	TYS	
Siluriformes	Heteropneustidae	<i>Heteropneustes fossilis</i>	Yellowtail catfish	Shingi	TY	
Siluriformes	Pangasiidae	<i>Pangasius pangasius</i>	Gangetic ailia	Pangas	TY	
Siluriformes	Schulbeidae	<i>Ailia coila</i>	Jamuna ailia	Kajuli	VR	
Siluriformes	Schulbeidae	<i>Ailichthys punctata</i>	Butter catfish	Kajuli	R	
Siluriformes	Siluridae	<i>Ompok bimaculatus</i>	Pabda catfish	Kani pabda	VR	EN
Siluriformes	Siluridae	<i>Ompok pabda</i>	Pabo catfish	Madhu pabda	R	EN
Siluriformes	Siluridae	<i>Ompok pabo</i>	Wallago	Pabda catfish	VR	EN
Siluriformes	Siluridae	<i>Wallago attu</i>		Boal	TY	

Table 1: Continue

Order	Family	Scientific name	Common name	Local name	Availability	Status
Cypriniformes	Cobitidae	<i>Botia dario</i>	Bengal loach	Bou mach	R	
Cypriniformes	Cobitidae	<i>Lepidocephalichthys annandalei</i>	Annandale loach	Gutum	VR	
Cypriniformes	Cyprinidae	<i>Cirrhinus cirrhosus</i>	Mrigal	Mrigal	TY	
Cypriniformes	Cyprinidae	<i>Devario devario</i>	Sind damio	Banspata	TYS	EN
Cypriniformes	Cyprinidae	<i>Labeo bata</i>	Bata	Bata	TYS	CR
Cypriniformes	Cyprinidae	<i>Labeo boga</i>	Boggut labeo	Bhangan	VR	
Cypriniformes	Cyprinidae	<i>Labeo boggut</i>	Boggut labeo	Ghonia	R	
Cypriniformes	Cyprinidae	<i>Labeo calbasu</i>	Orange-fin labeo	Kalibaus	TYS	EN
Cypriniformes	Cyprinidae	<i>Labeo rohita</i>	Rohu	Rui	TYL	
Cypriniformes	Cyprinidae	<i>Puntius chola</i>	Swamp barb	Punti	TYL	
Cypriniformes	Cyprinidae	<i>Puntius conchomius</i>	Rosy barb	Kanchan punti	TYS	
Cypriniformes	Cyprinidae	<i>Puntius getius</i>	Golden barb	Gilipunti	TYS	
Cypriniformes	Cyprinidae	<i>Puntius guganio</i>	Glass-barb	Mola punti	TYL	
Cypriniformes	Cyprinidae	<i>Puntius puntio</i>	Puntio barb	Punti	TYL	
Cypriniformes	Cyprinidae	<i>Puntius terio</i>	Onespot barb	Teri punti	TYL	
Cypriniformes	Cyprinidae	<i>Puntius ticto</i>	Ticto barb	Tit punti	TYS	VU
Cypriniformes	Cyprinidae	<i>Rasbora daniconius</i>	Slender rasbora	Darkina	VR	
Cypriniformes	Cyprinidae	<i>Securicula gora</i>	Ghore chela	Ghora chela	TYS	
Tetraodontiformes	Tetraodontidae	<i>Tetraodon cutcutia</i>	Ocellated pufferfish	Tepa	VR	

TY: Throughout the year, TYS: Throughout the year in small amount, TYL: Throughout the year in large amount, R: Rare, VR: Very rare, Status in the IUCN red list according to IUCN Bangladesh (2000), EN: Endangered, VU: Vulnerable, CR: Critically endangered

diversified fish group in terms of both number of species and individuals followed by Perciformes and Siluriformes. Similar findings were also reported by Galib *et al.* (2009), Mohsin and Haque (2009), Mohsin *et al.* (2009) and Imteazzaman and Galib (2013). This is because these three groups are the most dominant groups in freshwater bodies of Bangladesh (Rahman, 1989, 2005). The Chitra river is hugely tormented by bank erosion every year with a wide range of water fluctuation every year. Gradual reduction of fish species was also associated with the siltation of the river, irrigation and over fishing. In this circumstance, it is essential to take immediate action for habitat improvement of Chitra river to save the fish biodiversity. At present, loss of biodiversity is an alarming threat but the earliest effective management is essential to deal with the issue. According to Lakra (2010), conservation of fish diversity is essential to maintain ecological, nutritional and socio-economic equilibrium. Due to abundance of threatened fish species among the total catch, strongly reflecting its potentiality to be an excellent site for natural conservation (IUCN Bangladesh, 2000).

**Causes of degradation and recommendations for protection:** The agricultural activities become the unsafe practice, which causes harm not only to the fish fauna but also the entire community of the ecosystem. Farmers used artificial fertilizers, insecticides and pesticides for agriculture that causes water pollution. It is also causes loss of breeding ground, eutrophication, increased turbidity of the water, creation of algal blooms, which effect many species. The encroachment and siltation causes permanent closure of the outlet, which not only decreases the fish density but also greatly effects on the reproductive strategies of the fishes and their habit and habitats. There are various legislations on fishing regarding the use of fishing gear, regulation of mesh size of nets, time of fishing and size of the catch. But they are not implemented anywhere, which highly increases the depletion of fish fauna of the study area.

The freshwater resources of Chitra River are currently experiencing an alarming decline due to various anthropogenic activities. Destructive fishing methods, entry of exotic species, use of poison, habitat alteration and water diversion, poor vegetation cover in the river banks, siltation, water abstraction and low water velocity affected the overall fish diversity to large extent. A series of barrages and dams were commissioned in the upper segment of the Chitra river from Jessore to Magura district reduced considerably the water flow and shown detrimental effects on physical attributes and destruction of feeding, spawning and migration routes of fishes. Evidently, this will prove hazardous to the abundance and distribution of fish fauna in Chitra river. Water pollution became a great menace to the aquatic fish fauna almost in all the major rivers. However, it is important to make awareness among local people and their participation in conservation activities is must. Therefore, providing alternative livelihood to the local people in the study area is one of the prime factors, which can be done only by the help of eco-tourism. Conservation steps e.g., stopping illegal fishing, identifying and protecting crucial breeding habitats, creating mass awareness are needed to save the threatened fish fauna of this river. There should be a strong implementation of conservation laws and acts to make free from illegal catch and pollution in this river.

## CONCLUSION

The population of Bangladesh is growing day by day. There was a place of green peace with its flourishing agro-based economy and colorful socio-cultural enrichment in this country. But, unfortunately fish and fish species in the open water bodies have declined in the recent times. To



meet the growing demand of the animal protein, there is a need of more fish production and sustainable management of fishery resources. Thus, fish production through aquaculture should be increased and meet daily protein requirement.

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#### **REFERENCES**

- Ali, M.M., M.B. Hossain, M.H. Minar, S. Rahman and M.S. Islam, 2014. Socio-economic aspects of the fishermen of Lohalia River, Bangladesh. *Middle-East J. Sci. Res.*, 19: 191-195.
- Banglapedia, 2012. Asiatic society of Bangladesh. 1st Edn., National Encyclopedia of Bangladesh, February 2012, Dhaka, Bangladesh.
- Bhuiyan, S.S., M.A.R. Joadder and A.S. Bhuiyan, 2008. Occurrence of fishes and non-fin fishes of the River Padma near Rajshahi, Bangladesh. *Univ. J. Zool. Rajshahi Univ.*, 27: 99-100.
- Chowdhury, M.S.N., M.S. Hossain, N.G. Das and P. Barua, 2011. Environmental variables and fisheries diversity of the Naaf River Estuary, Bangladesh. *J. Coastal Conserv.*, 15: 163-180.
- DOF, 2009. Fishery statistical yearbook of Bangladesh 2007-2008. Fisheries Resources Survey System, Department of Fisheries, Dhaka, Bangladesh.
- De Bruin, G.H.P., B.C. Russel and A. Bogusch, 1995. FAO Species Identification Field Guide for Fishery Purposes. The Marine Fishery Resources of Sri Lanka. FAO, Rome, Pages: 400.
- DoF, 2013. National fish week 2013 compendium. Department of Fisheries, Ministry of Fisheries and Livestock, Government of the People's Republic of Bangladesh, Dhaka, pp: 1-144 (In Bengali).
- Fischer, W., 1974. FAO Species Identification Sheets for Fishery Purposes: Eastern Indian Ocean (Fishing Area 57) and Western Central Pacific (Fishing Area 71). FAO/UN, Rome, Italy.
- Galib, S.M., M.A. Samad, A.B.M. Mohsin, F.A. Flowra and M.T. Alam, 2009. Present status of fishes in the chalan beel-the largest beel (wetland) of Bangladesh. *Int. J. Ani. Fish. Sci.*, 2: 214-218.
- Habib, A., M.H. Ullah and N.N. Duy, 2014. Bioeconomics of commercial marine fisheries of bay of bengal: Status and direction. *Econ. Res. Int.* 10.1155/2014/538074
- Hussain, M.G. and M.A. Mazid, 2001. Genetic improvement and conservation of carp species in Bangladesh. Bangladesh Fisheries Research Institute and International Center for Living Aquatic Resources Management, Penang, Malaysia, pp: 1-74.
- IUCN Bangladesh, 2000. Red Book of Threatened Fishes of Bangladesh. IUCN-The World Conservation Union, Bangladesh, Pages: 116.
- Imteazzaman, A.M. and S.M. Galib, 2013. Fish fauna of halti beel, Bangladesh. *Int. J. Curr. Res.*, 5: 187-190.
- Lakra, W.S., 2010. Fish biodiversity of Uttar Pradesh: Issues of livelihood security, threats and conservation. Proceedings of the National Conference on Biodiversity, Development and Poverty Alleviation, May 22, 2010, Uttar Pradesh State Biodiversity Board, India, pp: 40-45.
- Marichamy, G., S. Shanker, A. Saradha, A.R. Nazar and M.A. Badhul Haq, 2011. Proximate composition and bioaccumulation of metals in some finfishes and shellfishes of Vellar Estuary (South East Coast of India). *Eur. J. Exp. Biol.*, 1: 47-55.

- Mazid, M.A., 2002. Development of fisheries in Bangladesh, plan and strategies for income generation and poverty alleviation. Nasima Mazid, 176, 74 A/2, Kallyanpur Main Road, Dhaka.
- Mohsin, A.B.M. and E. Haque, 2009. Diversity of fishes of Mahananda River at Chapai Nawabgonj district. *Res. J. Biol. Sci.*, 4: 828-831.
- Mohsin, A.B.M., M.M. Hasan and S.M. Galib, 2009. Fish diversity of community based fisheries managed oxbow lake (Bookbhara baor) in Jessore, Bangladesh. *J. Sci. Found.*, 7: 121-125.
- Okyere, I. and W. Denis, 2011. Aheto and Joseph aggrey-fynn. *Eur. J. Exp. Biol.*, 1: 178-188.
- Rahman, A.K.A., 1989. *Freshwater Fishes of Bangladesh*. 1st Edn, Zoological Society of Bangladesh, Dhaka, Bangladesh, Pages: 364.
- Rahman, A.K.A., 2005. *Freshwater Fishes of Bangladesh*. 2nd Edn., Zoological Society of Bangladesh, Dhaka, Bangladesh, Pages: 263.
- Rahman, M., Y. Hossain, F. Ahamed, Fatematuzzhura, B.R. Subba, E.M. Abdallah and J. Ohtomi, 2012. Biodiversity in the Padma Distributary of the Ganges River, Northwestern Bangladesh: Recommendations for conservation. *World J. Zool.*, 7: 328-337.
- Siddiq, M.A., M.I. Miah, Z.F. Ahmed and M. Asadujjaman, 2013. Present status of fish, fishers and fisheries of Dogger Beel in Hajigonj Upazila, Chandpur, Bangladesh. *J. Aquatic Sci.*, 1: 39-45.
- Talwar, P.K. and A.G. Jhingran, 1991. *Inland Fishes of India and Adjacent Countries*. Vol. 12, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, Calcutta, India, Pages: 1158.
- Thiel, R., A. Sepulveda, R. Kafemann and W. Nellen, 1995. Environmental factors as forces structuring the fish community of the Elbe estuary. *J. Fish Biol.*, 46: 47-69.