



Biodiversity, threats and recommendation for conservation of fishes in the Old Brahmaputra River

MAHMUDUL HASAN* AND SYEDA MARZIA ISLAM TRIPTI

Department of Fisheries,

Bangamata Sheikh Fojilatunnesa Mujib Science and Technology University, Jamalpur-2012, Bangladesh

*Corresponding Author's Email: mhasan@bsfmstu.ac.bd

Abstract. The information of fish biodiversity, possible risks and associated threats which are liable for declining the indigenous fish species in our water bodies, particularly in the Old Brahmaputra River (Fulchhari, Gaibandha to Melandah, Jamalpur) is lacking compared to other rivers and/or other portion of the same river channel in Bangladesh. How many fish species exist in this river is also an arguable open question to local ichthyologists. To minimize this deficiency, our collected fishes were labeled with a proper voucher number and kept their good illustration. Further, we aimed to quantify the biodiversity, identify the threats and suggest the possible conservation policy for sustainable management of indigenous freshwater species of this river starting from Fulchhari Upazila of Gaibandha district towards Melandah Upazila, Jamalpur district from January to December 2021. The present study showed that Cypriniformes (43%) is the most dominating group followed by Siluriformes (33%), Perciformes (19%) and so on which belong to four orders and 10 families. In summary, it is generalized that fish biodiversity of this river has significantly declined in the last decade due to anthropological and natural effects which urge the design of a new conservation policy for the sustainable management of our tasty, valuable indigenous fish species.

Keywords: Biodiversity, Threat, Fish, Conservation, Old Brahmaputra River

Introduction

Bangladesh is situated in the northeastern part of South Asia and lies between 20° 34' and 26° 38' North latitudes and 88° 01' and 92° 41' East longitudes. The country is bordered by India on the West, North and North-East and Myanmar on the Southeastern tip. Formed by a deltaic plain, Bangladesh is virtually the only drainage outlet for a vast complex river basin made up of the Ganges (Padma), the Brahmaputra and the Meghna rivers and their network of tributaries. The Brahmaputra drainage system is originated from the Manasarovar Lake region, near mount Kailash, located on the Northern side of the Himalayas in Tibet, China. Later it enters into Arunachal Pradesh, India and flows Southwest through the Assam Valley as Brahmaputra. Then, it enters into Bangladesh through Kurigram district and is divided into two parts near to Dewanganj (northern part of Jamalpur district): 1) the Brahmaputra River (also known as Old Brahmaputra River [OBR]) and the Jamuna River. The OBR (around 200 km) passes through Jamalpur, Mymensingh, and Kishoreganj districts and meets with the Meghna river at Bhairab Bazar while the Jamuna river flows south (western part of Jamalpur) and joins the Padma river near Goalundo Ghat before meeting the Meghna river near Chandpur.

Warm water temperatures, sufficient rainfall, and nutritive silty clay-loam soil make the Brahmaputra River system a substantial resource for ichthyofauna in Bangladesh. But many species are now under threat due to unsustainable fishing practices, invasive species, habitat alteration and loss. In addition, anthropological activities pose a threat to the entire ecosystem in Bangladesh. Therefore, sustainable management of the aquatic resources of the region is urgently needed to conserve the ichthyofauna. A prerequisite for this is a careful and accurate assessment of fish species to plan a suitable conservation policy for the targeted species.

Study of the freshwater fish fauna of Bangladesh was started by Hamilton (1822) in the British period and after a subsequent review, comments and edition by many authors, later Ahmed (1953) revealed 106 freshwater fishes in East Pakistan (now Bangladesh). At the lapse of time, Rahman (2005) provided a comprehensive checklist including updated description, keys and illustrations which include 265 freshwater species. Most recently, Hossain *et al.* (2012) argued that the number of freshwater species in Bangladesh is 293 (including few fishes from coastal regions that migrate to rivers and do not change their body physiology). Although our ecosystem and biodiversity have lost their heritage (Hossain 2014), the number of species in Bangladesh is increasing year by year (Habib *et al.* 2018). In connecting this, it is believed that many species are morphologically similar but genetically distinct like frogs (Hasan *et al.* 2012) which need to explore in each and every rivers, canals, haors, boars etc. Most importantly, a few works of biodiversity study of fishes of the river Halda (Kabir *et al.* 2015), Padma (Joadder *et al.* 2015), Rupsha (Hossain *et al.* 2016) and OBR in Mymensingh district (Raushon *et al.* 2017, Bashar *et al.* 2020, Galib 2015) has been done. However, no attempt was made to assess the biodiversity, threats and conservation policy of the mouth part of OBR (Fulchhari, Gaibandha to Melandah, Jamalpur). Therefore, in our study, we attempted to evaluate the biodiversity, identify the threats and to suggest a conservation policy for the wellbeing of the large fisheries community who completely depend on the resources of OBR.

Materials and Methods

Study area: The study was conducted in the OBR starting from Fulchhari Upazila of Gaibandha district towards Islampur Upazila of Jamalpur district. We have selected this region, because no survey was undertaken for this area previously (Fig. 1).

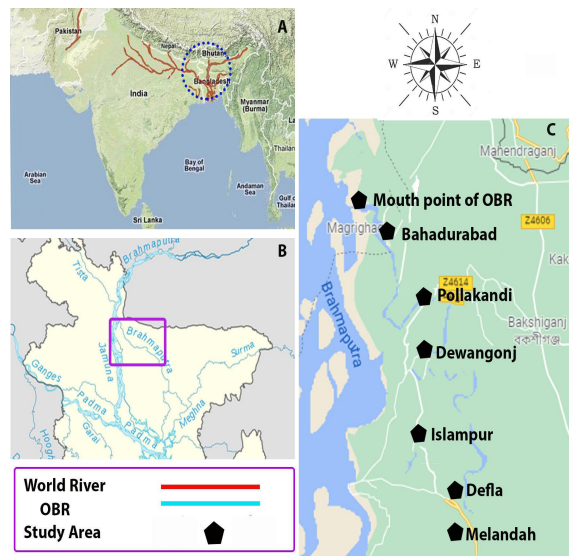


Fig. 1. A) World river map, B) Bangladesh river map and C) Study area map of Old Brahmaputra River.

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Collection and identification of samples: We collected 21 species with the help of local fishermen. We gave the voucher number of each specimen. Simultaneously, each specimen was preserved in 5% ethanol for further morphological and genetic study and/or to check the identity of the specimen. Identification of the collected species were based on the literature of fisheries science and taxonomy keys, online portal FishBase and Catalog of Fishes. We found out the conservation status of these species based on the database of IUCN Bangladesh (2015) and IUCN (2021).

Results

We have collected 21 species of freshwater fishes (Table I and Fig. 2) belonging to 10 families and four orders. Nine, seven, four and one species belong to order Cypriniformes, Siluriformes, Perciformes and Synbranchiformes, respectively.

Table I. Species list and conservation status of freshwater fishes of the OBR.

Order	Family	Species	Local name	National status	Global status	Species ID	
Cypriniformes	Cyprinidae	<i>Aspidoparia jaya</i>	Jaya/piyali/ boirel	LC	NE	MHBSFMSTU-5760 Fish4	
		<i>Salmostoma acinaces</i>	Chela	LC	LC	MHBSFMSTU-5760 Fish7	
		<i>Puntius sophore</i>	Jati punti	LC	LC	MHBSFMSTU-5760 Fish10	
		<i>Osteobrama cotio</i>	Dhela	NT	LC	MHBSFMSTU-5760 Fish11	
		<i>Chela cachius</i>	Chep chela	VU	LC	MHBSFMSTU-2020 Fish17	
		<i>Puntius terio</i>	Teri punti	LC	LC	MHBSFMSTU-2020 Fish21	
		Balitoridae	<i>Paracanthocobitis zonalternan</i>	Pahari Puiya	LC	LC	MHBSFMSTU-5760 Fish9
			<i>Schistura beavani</i>	Balikhora	DD	LC	MHBSFMSTU2030 Fish15
			<i>Acanthocobitis botia</i>	Puiya	LC	LC	MHBSFMSTU-2020 Fish18
		Siluriformes	Erethistidae	<i>Erethistes pusillus</i>	Kutakanti	LC	NE
Schilbeidae	<i>Clupisoma garua</i>		Ghaira	EN	NE	MHBSFMSTU-5760 Fish2	
	<i>Ailia coila</i>		Bashpata	LC	NT	MHBSFMSTU-5760 Fish3	
	<i>Pachypterus atherinoides</i>		Batai	LC	LC	MHBSFMSTU-2020 Fish19	
Bagridae	<i>Olyra kempfi</i>		Shing	EN	LC	MHBSFMSTU-5760 Fish5	
	<i>Sperata aor</i>	Air	VU	LC	MHBSFMSTU-2030 Fish14		
Perciformes	Sisoridae	<i>Gagata cenia</i>	Kaiyekata	LC	LC	MHBSFMSTU-5760 Fish6	
		<i>Glossogobius giuris</i>	Bele	LC	LC	MHBSFMSTU-5760 Fish8	
		<i>Awaous guamensis</i>	Bele	VU	LC	MHBSFMSTU-2030 Fish13	
	Ambassidae	<i>Chanda nama</i>	Chanda	LC	LC	MHBSFMSTU-2030 Fish12	
	Channidae	<i>Channa punctata</i>	Taki	LC	LC	MHBSFMSTU-2020 Fish20	
Synbranchiformes	Mastacembelidae	<i>Macrognathus pancalus</i>	Guchi baim	LC	LC	MHBSFMSTU-5760 Fish16	
Total 4 orders	10 families	21 Fish Species					

**MHBSFMSTU-0000 Fish represent Bangamata Sheikh Fojilatunnesa Mujib Science and Technology University
 **5760, 2030 and 2020 indicate the postal codes of Fulchhari, Dewanganj and Islampur, respectively. EN=Endangered;
 VU= Vulnerable; NT=Near Threatened; LC= Least Concern; DD= Data Deficient; NE= Not Evaluated.

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The available fishes which we found in the OBR are *Aspidoparia jaya* (Local name: piyali/boirel); *Paracanthocobitis zonalternan* (Local name: Puiya); *Erethistes pusillus* (Local name: Kutakanti); *Puntius sophore* (Local name: Jati punti); *Glossogobius giuris* (Local name: Bele); *Channa punctata* (Local name: Taki); *Ailia coila* (Local name: Bashpata) etc. The most dominated species are cyprinidae followed by siluridae, percidae and synbranchidae. Among them, *Clupisoma garua* (Local name: Ghaura); *Olyra kempfi* (Local name: Shing) are categorized as endangered. Once *Clupisoma garua* were available but now the availability of this species has been contracted. Based on IUCN Bangladesh (2015), 14 species are least concern (LC); 2 species are endangered (EN); 3 species are vulnerable (VU); 1 is Near threatened (NT) and 1 is data deficient (DD) (Table I). On the contrary, according to IUCN (2021), 17 species are least concern (LC); 3 species are not evaluated (NE) and 1 species is near threatened (NT). There is no species recorded as critically endangered (CR) among our collected species.



MHBSFMSTU-5760 Fish1 (*Erethistes pusillus*)



MHBSFMSTU-5760 Fish2 (*Clupisoma garua*)



MHBSFMSTU-5760 Fish5 (*Olyra kempfi*)



MHBSFMSTU-5760 Fish3 (*Ailia coila*)



MHBSFMSTU-5760 Fish4 (*Aspidoparia jaya*)



MHBSFMSTU-5760 Fish6 (*Gagata cenia*)



MHBSFMSTU-5760 Fish7 (*Salmostoma acinaces*)



MHBSFMSTU-5760 Fish8 (*Glossogobius giuris*)



MHBSFMSTU-5760 Fish9 (*Paracanthocobitis zonalternan*)



MHBSFMSTU-5760 Fish10 (*Puntius sophore*)

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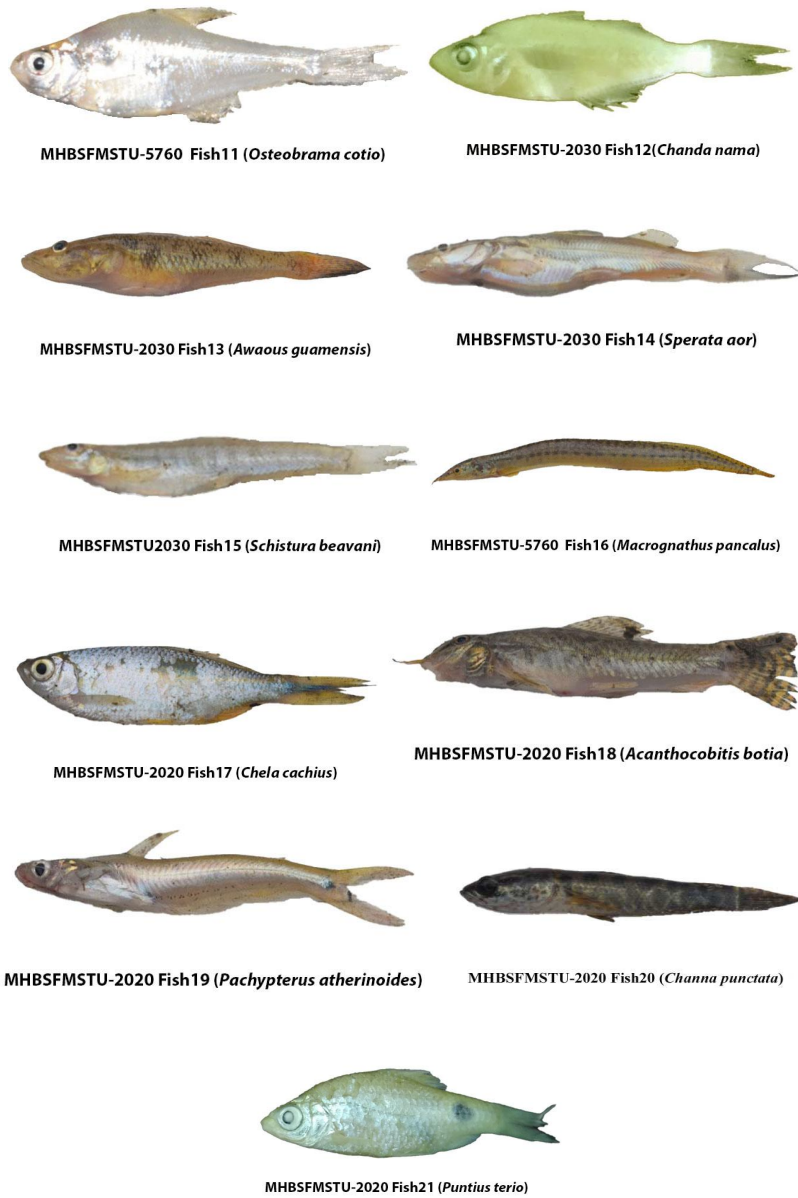


Fig. 2. Fish specimens collected from the Old Brahmaputra River (length not in scale).

Among the collected species, 43%, 33%, 19% and 5% belong to Cypriniformes, Siluriformes, Perciformes and Synbranchiformes orders, respectively (Fig. 3).

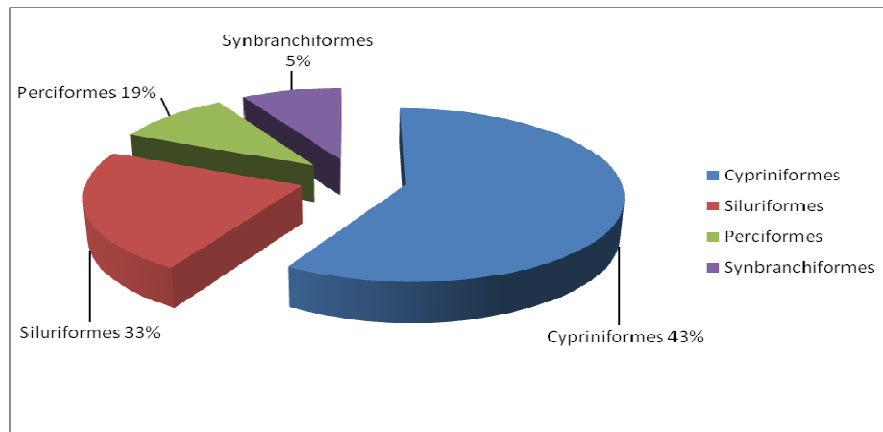


Fig. 3. Order wise fish composition percentage of collected species from OBR

Threats. In our restricted study site, we identified a few threats which have direct involvement to destroy the feeding and breeding ground of OBR. For example, siltation is one of the greatest problems. Because, just one decade ago, there was frequent flow of water in the Brahmaputra river channel, however, now-a-days, many areas of the river basin are filled by silt. Eventually, the depth of the river has declined. In the winter season, it is quite hard to run the boat. We observed that the people of the surrounding area are crossing the river (near Defla Bridge, Melandah Upazila) by walking where the water depth is knee level. Overfishing, use of current and China ring net (Jal) are abruptly used which kill the small indigenous fish species. Introduction of exotic (alien invasive) fish i.e. the sucker mouth catfish is also destroying the local aquatic ecosystem in the OBR. Dumping of garbage and use of pesticide on the paddy land which washed out and dropped into the river are frequently polluting the water. Erosion of embankments is also another prime threat for destroying the fishing grounds.

Discussion

OBR has been considered a good shelter for native fish species from ancient times (Rahman 2005, Hossain 2014). However, the colossal siltation has threatened the continuation of this important river and it is constantly being shifted into a canal. The river, once the blessing for Bangladesh contributing fishing, communication and irrigation facilities, is now drying up. Our caught fish composition (21 species) which belongs to 4 orders and 10 families is less than the contemporary studies of OBR (Galib 2015, Afrose and Ahmed 2016, Raushon *et al.* 2017) in Mymensingh district. Although their studies had not covered the present study areas (Gaibandha and Jamalpur districts). In connecting this, it is argued that the constant destruction of the fishing and breeding ground of OBR is a major cause for the paucity of fishes from this river. In our very recent (December 29 & 30, 2021) further sampling in the OBR channel from Defla bridge, Melandah Upazilla to Jamalpur Sadar, Jamalpur district; we accounted additional 11 fish species (therefore, total number of our caught fish is 32): *Parambassis ranga*, *Corica soborna*, *Puntius guganio*, *Glyptothorax telchitta*, *Crossocheilus latius*, *Amblypharyngodon mola*, *Chandramara (Rama) chandramara*, *Gogangra (Gangra) viridescens*, *Xenontedon cancila*, *Trichogaster fasciata* and *Cirrhinus reba* (picture and voucher number were not included here). On the contrary, there is a possibility to increase the abundance of fishes of the same site by

sampling a longer duration rather than our stipulated time period (personal communication to R.B. Mamun).

Among the collected species, *Erethistes pusillus* could be used for ornamental purposes while the remaining fish plays an important role to meet the protein demand of the mass people of the country. Most importantly, two fishes *Clupisoma garua* and *Olyra kempfi* are endangered while the other fishes belong to various categories in the threatened group based on IUCN Bangladesh (2015). Our results showed that 24% (2 Endangered and 3 Vulnerable) species are under threatened categories. Similar results were also reported by the IUCN Bangladesh (2015). They assessed 253 fish species and among them 25.3% were threatened while endangered and vulnerable numbers were 30 and 25, respectively. This notion was also supported by other researchers (Rahman 2005, Hossain 2014 and 2015, Galib 2015, Raushon *et al.* 2027, Bashar *et al.* 2020).

Pressure of fishing stock (Galib 2015) and climate change (Hossain 2015), IUCN Bangladesh (2015) are responsible for these declining. Further, anthropological threats such as pollution, use of destructive fishing gear, construction of roads, bridges, and kiln are also hindering the total fish production in the OBR basin. Hossain (2014) reported that 30 fishes are already extinct from our water bodies. Excavation of river channels, establishment of fish sanctuary, and making a fish-pass for the migratory fishes might be a reasonable solution to conserve these valuable fishes. The release of the fish fry to the open water bodies in June-July by the Government (Go) and Non-Government organization (NGO) could be also another attempt to improve the current status of the indigenous fishes in the OBR. The biodiversity of freshwater fishes are deteriorating due to environmental degradation, aquatic pollution, natural disaster, destruction of fishing grounds, siltation, lack of proper management etc.

Our data, though small, carries the significance of how the freshwater fish species are vanishing in nature. Most importantly, our specimens have been labeled with voucher numbers including keeping the corresponding picture for further taxonomic and genetic study. Because, a high resolution image and proper voucher number could recover most of our conventional descriptions of characters without compromising the precision. Usually a high resolution image coupled to a DNA barcode is better explanatory than detritus of poorly preserved holotype (Vences 2020). Therefore, these data will be useful for conservation of our freshwater fish species in nature.

The abundance of freshwater fishes decreases gradually due to siltation, overfishing, construction of roads, and introduction of alien invasive species. Further natural fish breeding has been destroyed by the influential people who withdraw the sand through diesel machine from the river in an unplanned way. Although there is a serious lack of information on the impact of climate change on fish biodiversity in Bangladesh, however long drought, excessive rainfall and extreme unbearable heat pose another threat for the destruction of the aquatic ecosystem. Establishment of fish sanctuary and implementation of fisheries law is highly recommended for these water bodies to conserve our valuable and tasty fish species.

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