

## Status of Biodiversity and Conservation of Freshwater Barbs in Bangladesh

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**Abstract:** A study was conducted to know the biodiversity status of freshwater barbs. The study covered the key water bodies-river, floodplains, haors and beels along with fish markets and landing centers under ten districts namely Kishoreganj, Mymensingh, Netrokona, Sylhet and Sunamganj, Chandpur, Comilla, Satkhira, Chapainawabganj and Dinajpur. Eleven species under the family of Cyprinidae were recorded. Among the observed species two were found to be threatened (1 critically endangered and 1 vulnerable) according to IUCN red list. The single critically endangered species observed was a barb, *Puntius sarana*. Variations were found in the availability, distribution and richness of the species among the areas. Species diversity of barbs was found to be higher in river and streams compared to other water bodies. *Puntius sophore*, *Puntius chola* were the most common. *Puntius sarana* and *Puntius terio* were the rarest and also in small numbers. The present paper highlights the present situation of barbs so that proper conservation measures could be taken; otherwise the valuable species of the species will soon be disappeared from the water bodies of Bangladesh.

**Key words:** Biodiversity Status • Freshwater • Barbs • Distribution and Bangladesh

### INTRODUCTION

Barb (*puntimachh* in Bengali) name for some freshwater fish species of the family Cyprinidae, order Cypriniformes. Ten species of barbs under two genera *Puntius* (9 species) and *Oreochthys* (1 species) are found in Bangladesh (Table 1). The genus *Puntius* and *Oreochthys* have the species. The moderate to deeply compressed body of this fish is silvery to greenish silvery or reddish brown in colour. Spots, blotches, bands on the body and 4, 2 or no barbels are important identifying characters. Body length varies from 5 cm to about 20 cm. [1]. These barb species are the important small indigenous species of fish in Bangladesh.

(a) Rosy Barb (*P. conchoni*)-body silvery, dark along the back; scales with dark bases; body deeper and flatter than other barbs; attains a length of about 10 cm; barbels absent. There is a large black spot on the side above the posterior portion of the anal fin. In the breeding season some male individual exhibits red and purple

colour on the sides. Lateral line is incomplete. (b) Chola Barb (*P. chola*)-Silvery body, attains a length of about 12 cm. Dorsal part more convex than that of abdomen; maxillary barbels one pair. There is a dark blotch on the side of the tail, a black blotch at the base of the 2<sup>nd</sup> to 5<sup>th</sup> ray of the dorsal and one to two rows of dark spots along its centre. In the breeding season males develop a red band along the side from the end of the opercle to the forked end of the caudal fin. Lateral line is complete. (c) Golden Barb (*P. gelius*)-Reddish brown body moderately compressed, attains a length of about 13 cm. Barbels absent; lateral line incomplete; a black band over the tail and a deep black spot at the root of the anterior dorsal rays. In the breeding season dorsal and caudal fins and the posterior region turn red and orange. (d) Glass Barb (*P. guganio*)-Brownish silvery body, attains a length of about 11 cm. Lateral line incomplete; barbels usually absent. (e) Dwarf Barb (*P. phutunio*)-Greenish silvery body attains a length of about 12 cm. Barbels absent; lateral line incomplete; two vertically elongated broad

Table 1: Number of barb under different categories [10]

Sl. No.	Scientific Name	Local Name	IUCN biodiversity status	Fish Value
1.	<i>Puntius chola</i>	Chola punti	NO	Food fish
2.	<i>Puntius conchoni</i>	Kanchan punti	NO	Food fish, ornamental
3.	<i>Puntius gelius</i>	Jhili punti	DD	Ornamental
4.	<i>Puntius guganio</i>	Mola punti	NO	Food fish, Ornamental
5.	<i>Puntius phutunio</i>	Phutani punti	NO	Ornamental
6.	<i>Puntius puntio</i>	Punti barb	-	Ornamental
7.	<i>Puntius sarana</i>	Sarpunti	CR	Food fish
8.	<i>Puntius sophore</i>	Jatipunti	NO	Food fish
9.	<i>Puntius terio</i>	Teri punti	NO	Food fish
10.	<i>Puntius ticto</i>	Tit punti	VU	Food fish, Ornamental
11.	<i>Oreochthys cosuatis</i>	Kosuati	-	Ornamental

VU-Vulnerable; NO-Not Threatened; CR-Critically Endangered; EN-Endangered and DD-Data Deficient

bands, one from the back to the middle of the pectoral and another from the back to the posterior end of the anal base; during breeding season the dorsal and pectoral fins appear light yellow, pelvics and anal orange. (f) Olive Barb (*P. sarana*)-Moderately compressed silvery body, attains a length of about 10 cm. Barbels two pairs, lateral line complete; opercle shot with gold; sometimes a small dot behind gill opening. (g) Spotfin Swamp Barb (*P. sophore*)-Moderately compressed, silvery body, attains a length of about 13 cm. Barbels absent; lateral line complete; during the breeding season a scarlet red band develops along the middle of either side in males, which is not distinct in the female. (h) Ones pot Barb (*P. terio*)-Silvery; dorsal part of the body more convex than that of abdomen; attains a length of about 10 cm. Barbels are absent and the lateral line is incomplete. (i) Firefin Barb (*P. ticto*)-Body compressed, silvery, attains a length of about 12 cm. Barbels absent; lateral line incomplete; two black spots, the smaller one near the commencement of the lateral line, the large one behind the base of the anal fin. During the breeding season flanks turn red. (j) Cosuatis Barb (*Oreochthys cosuatis*)-Body moderately compressed; reddish brown; attains a length of about 12 cm. Barbels are absent; and lateral line is interrupted [2].

The inland open waters of Bangladesh are rich in faunal diversity containing at least 265 species of finfish [3, 4], of which 143 species have been classified as small indigenous species of fish (SIS) [5]. The fish which grow to a maximum length of about 25 cm or 9 inches at maturity are generally considered to be the SIS [6-8]. The small indigenous species (SIS) of Bangladesh includes barb and minnows with several other groups of fishes [9]. The barb belong to genus *Puntius* under the Order Cypriniformes and most abundant as to individuals in the fish fauna widely distributed in South Asia [4]. Cyprinidae

is the largest Family among the freshwater fishes which includes the carps (*Labeo rohita*, *Catla catla*, *Cirrhinus cirrhosus*, *Labeo calbasu* etc.), the barb (*Puntius* sp.) and a large variety of minnows (*Esomus danricus*, *Amblypharyngodon mola* etc.) The name 'Punti' is extensively used in Bangladesh to denote at least 9 species of barb [4].

Biodiversity and its conservation are regarded as one of the major issues for sustainable development. Biodiversity provides incalculable benefit to humanity, most directly; it comprises a vast genetic storehouse of medicines and foods [11]. Small indigenous species of fish contributes to feeding of millions of rural poor people and those are usually caught by subsistence fishing that provides a cushioning effect on rural poverty in Bangladesh [12]. These fishes did not get high attention in culture systems in large scale. Some species of barb and minnows are also being used as attractive aquarium fishes [13].

The primary threat for most terrestrial and freshwater species is the destruction of their habitats [14]. Environmental degradation and human interventions reduce the habitat available of the species, resulting in a reduction in their numbers. As a consequence, many fish are under different levels of threat, such as, vulnerable (VU), endangered (EN) and critically endangered (CR), which category was provided by IUCN [10]. Such categories of threat levels provide an assessment of the likelihood of extinction under the current circumstances. Both natural and manmade catastrophes, degradation of aquatic environments and reduction of many wetlands and water areas of Bangladesh have resulted in the disappearance of many suitable habitats for floodplain, riverine and brackish water small indigenous fish species. Many of these valuable small indigenous fish species

have been threatened or endangered and some are already on the verge of extinction [15]. Freshwater barbs and minnows were once abundant in nature and now disappearing from all kinds of water bodies. In the past, these fishes were considered as weed fishes and totally neglected in the culture system.

In spite of tremendous significance of barbs, not many studies have been done in Bangladesh on the distribution, biology and the status of biodiversity. Therefore, the present study was carried out to assemble adequate information on the diversity of the species through collecting barbs from different parts of Bangladesh and to identify the species by studying morphometric and mesuric characteristics and to know their availability, natural abundance and distribution. Current work is important because it provides information of local declines and extinctions that will require action from conservationists.

## MATERIALS AND METHODS

A field survey was conducted to know the biodiversity status of freshwater barbs in some selected areas of Bangladesh. The study was designed to cover five districts of Sylhet-Mymensingh basin namely Kishoreganj, Mymensingh, Netrokona, Sylhet and Sunamganj and five other districts Chandpur, Comilla, Satkhira, Chapainawabganj and Dinajpur (Fig. 1) were also arbitrarily selected. Different markets, landing centers, direct catch composition of the fishers of the above mentioned sites were covered during the study period. Frequent visits (Table 2) were made to the selected areas and fish samples were collected mainly from fish landing centers, fish markets and also from the fishermen fishing in the rivers and other natural water bodies. A total of 20 fish markets of the study sites were visited, each for two to three times throughout the study period (Table 2).

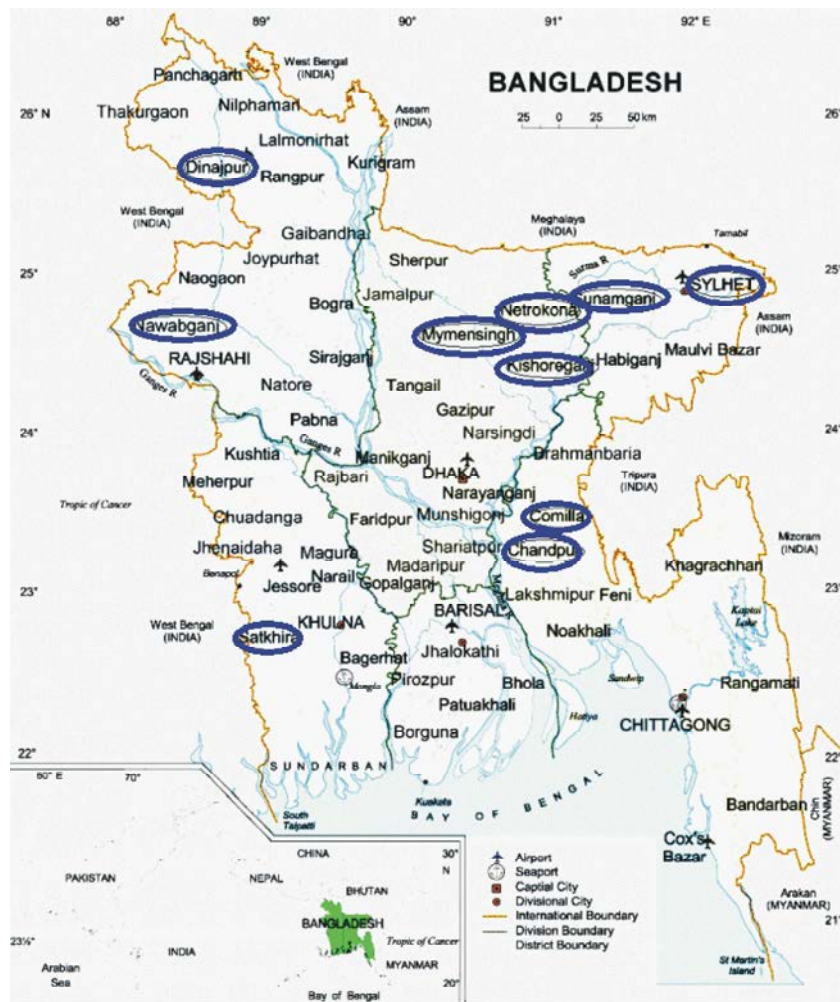


Fig. 1: Map showing study sites

Table 2: Number and frequencies of visits and other details of surveyed areas under each district

District	Upazilla (sub-district)	Rivers	Fish market (No.)	Number of days in each visit	Frequency of Visits	Species found (No.)
Kishoreganj	Sadar, Bhairab, Tarail	Narsunda	4	Feb (2)June (4)Oct (3)	2-4	5
Mymensingh	Sadar, Muktagacha, Fulpur, Bhaluka	Old Brahmaputra	6	Jan (3)March (2)May (2)July (1)Sept (2)	5-6	7
Netrakona	Mohonganj, Barhatta	Kangsho, Dhala	4	Jan (2)April (2)July (3)Oct (2)	2-3	5
Sylhet	Sadar, Fenchuganj, Kanaighat, Golapgonj, Bianibazar	Surma, Kushiara, Saari, Piyang	6	March (2)June (2)Sept (2)Dec (2)	3-4	10
Sunamganj	Sadar, Dirai, Tahirpur	Surma, Kushiara, Jaduakata	3	March (2)June (2)Sept (2)Dec (2)	3-4	8
Chandpur	Sadar, Haimchar	Meghna	2	Jan (2)July (2)Oct (2)	1-2	3
Comilla	Sadar, Borura	Gomti	3	Jan (2)July (2)Oct (2)	1-2	5
C.nawabganj	Sadar	Padma, Mahananda	2	March (1)Sept (1)	1-2	5
Dinajpur	Sadar, Birgonj	Atrai, Punarbhaba	4	March (1)Sept (1)	2-3	6
Satkhira	Sadar, Tala	Kapotakho, Raimangol	2	Nov (2)Jan (1)	1-2	3

Table 3: Main morphometric and meristic characteristics of barbs species

Fish species	Total length (TL)	Lateral line and no. of scales	No. of barbel	Vertical colour bands on body	Dorsal spine and rays	Spots on body
<i>Puntius sophore</i>	10.5 cm	Complete 24-26	No barbel	Vertical colour bands present with one or two black blotches	Dorsal spine smooth	Two black blotches at base of dorsal rays and base of caudal fin
<i>Puntius conchoniis</i>	9.5 cm	Incomplete	No barbel	-	-	Black spot over posterior portion of anal fin
<i>Puntius ticto</i>	9.5 cm	Incomplete 23-26	No barbel	Vertical colour bands present with one or two black blotches	Dorsal spine serrated on its posterior edge	Two black blotches on anterior part of body either above pectoral fin or adjacent to dorsal fin and at sides of the tail above anal
<i>Puntius chola</i>	9.5 cm	Complete	2	-	Last unbranched dorsal ray osseus, strong and serrated	Two conspicuous dark blotches on behind operculum and near base of caudal fin
<i>Puntius phutunio</i>	9.4 cm	Incomplete	No barbel	Body with vertical colour bands	Last unbranched dorsal ray osseus, strong and serrated	Five steel-blue transverse bars which fade into three black blotches, 1st behind operculum, 2nd above anal fin and 3rd on caudal peduncle
<i>Puntius guganio</i>	9.0 cm	Incomplete	No barbel	-	Last unbranched dorsal ray osseus, strong and serrated	A light greenish silvery lateral band
<i>Puntius sarana</i>	16 cm	Incomplete	4	-	-	-
<i>Puntius terio</i>	10.2 cm	Incomplete 22-23	No barbel	-	-	A black blotch over anal fin, from which a fine dark line runs back to base of caudal fin; a reddish orange spot on operculum
<i>Puntius gelius</i>	4.0 cm	Incomplete	No barbel	Body with vertical colour bands	Last unbranched dorsal ray osseus, strong and serrated	A dark band over tail Anterior base of dorsal, pectoral, pelvic and anal with black mark

A questionnaire survey was also conducted to collect data on status of the species, their distribution, abundance, attitudes of human to those species and initiatives for conservation.

Fish samples were collected and preserved with 10% formalin and transported to the laboratory of Fish Biodiversity and Conservation, Department Fisheries Biology and Genetics, Bangladesh Agricultural University, Mymensingh for further study. Morphometric and meristic characteristics of the collected fish species were studied for the confirmation of their identification (Table 3). The barbs were identified up to species level following taxonomic keys of [4, 16-18] and Red Book [10]. Species were identified primarily by observation, then scales and fin rays count were made with naked eye and

by taking digital photographs (Sony Cyber shot 10.1 mega pixels). In some cases, fin rays were counted under a light microscope at  $\times 40$  magnifications (Novax, Holland) for confirmation. All the collected and identified barbs were preserved in glass jars with 70% ethanol and placed in the Fish Museum and Biodiversity Centre (FMBC), Bangladesh Agricultural University, Mymensingh.

Primary data were collected by field observation and interviewing the fishermen, fish traders, local people on the collection sites regarding the local names of the collected fish samples, distribution and availability of the species etc. Secondary data were also collected from the Bangladesh Fisheries Research Institute (BFRI), Department of Fisheries (DoF) and other government agencies, NGOs, websites and relevant books.

**RESULTS AND DISCUSSION**

**Taxonomy and Identification of the Barbs:** All the fishes found to show visual distinguishing characteristics and were easily identified with the help of available resources. Detailed taxonomic and identifying characteristics of the species were as follows:

**Species Diversity:** A total of 11 species of freshwater barbs belonging Cyprinidae family under the order Cypriniformes were recorded, identified and preserved during the study period (Table 4). Rahman [4] described 9 species of barbs under the family Cyprinidae. Shafi and Quddus [16] described 10 species of barbs under genera *Puntius*. Hoq [13] mentioned 7 different species of *Puntius* available in Bangladesh. Sylhet-Mymensingh basin fish stock assessment [19] recorded a total of 92 species of fish and prawns from the Sylhet-Mymensingh basin and of which barbs (*Puntius* sp.) was the most dominant group comprising 19% of the total catch. The report highlighted some barbs among them *Puntius sophore*, *Puntius sarana*, *Puntius ticto*, *Puntius conchoni*, *Puntius gelius*, *Puntius chola* etc. were dominant. Bhuiya [20] reported 9 barbs from Kishoreganj district of Bangladesh.

**Availability and Distribution:** The present study revealed that most of the barbs were available in ditches, rivers, streams, *haors* and also in floodplains (Table 5). Most of the species were abundant in the streams and rivers. Some of the barbs were very common in most of the study sites. *Puntius sophore*, *Puntius chola*, *Puntius conchoni* were almost common in all types of water bodies. There is hardly found in any rivers, canals, lakes, *beels* or *haors* and ponds in Bangladesh where the family Cyprinidae is not represented [4] but variations were also found in the availability and distribution of barbs of this family. *Puntius sarana* was rare and only reported from river and *beels* of Kishoreganj and ponds of different polyculture system of Mymensingh. *Puntius sarana* was declared as a critically endangered barb in 2000 by IUCN [10] in Bangladesh. This fish may be restricted to some of the major floodplains and the rivers in Bangladesh. Hossain *et al.* [9] reviewed the availability of small fish resources like *Puntius* sp. and others in the rivers, floodplains and upland areas of Bangladesh which is more similar to this study. Bhuiya [20] found in the *Haors* of Itna upazilla (sub-district) under Kishoreganj district three species of *Puntius* but previously available *Puntius ticto* and *Puntius sarana* became less common. On the other hand, Hossain *et al.* [21] reported that *Puntius sarana*,

Table 4: List of freshwater barbs found during the study period

Sl. No.	Family	Scientific names	Local name	Fish Value
1	Cyprinidae	<i>Puntius chola</i>	Chola punti	Food fish
2	Cyprinidae	<i>Puntius conchoni</i>	Kanchan punti	Food fish, ornamental
3	Cyprinidae	<i>Puntius gelius</i>	Jeli punti	Ornamental
4	Cyprinidae	<i>Puntius guganio</i>	Mola punti	Food fish, Ornamental
5	Cyprinidae	<i>Puntius phutunio</i>	Phutani punti	Ornamental
6	Cyprinidae	<i>Puntius sophore</i>	Jati punti	Food fish
7	Cyprinidae	<i>Puntius sarana</i>	Sarpunti	Food fish
8	Cyprinidae	<i>Puntius terio</i>	Teri punti	Food fish
9	Cyprinidae	<i>Puntius ticto</i>	Tit punti	Food fish
10	Cyprinidae	<i>Oreochthys cosuatis</i>	Kosuati	Food fish, Ornamental

Table 5: Distribution of the collected barbs in different water bodies according to the sources of collection during the entire study period

Sl. No.	Scientific names	Local names	Types of water bodies			
			River Streams	Floodplains	Beels, haors and baors	Ponds
1	<i>Puntius sophore</i>	Jat punti	v	v	v	v
2	<i>Puntius ticto</i>	Tit punti	v	v	v	v
3	<i>Puntius conchoni</i>	Kanchan punti	v	v	v	v
4	<i>Puntius chola</i>	Chala punti	v	v	v	v
5	<i>Puntius phutunio</i>	Phutani punti	v	-	v	v
6	<i>Puntius guganio</i>	Mola punti	-	-	v	v
7	<i>Puntius terio</i>	Teri punti	v	-	v	-
8	<i>Puntius sarana</i>	Sar punti	v	-	v	v
9	<i>Puntius gelius</i>	Jeli punti	v	v	v	

Table 6: Abundance and national biodiversity status of the collected freshwater barbs and minnows

Scientific name	Local name	Abundance (Present study)	IUCN biodiversity status
<i>Puntius sophore</i>	Jat punti	Very common	NO
<i>Puntius ticto</i>	Tit punti	Rare	VU
<i>Puntius conchoniis</i>	Kanchan punti	Common	NO
<i>Puntius chola</i>	Chala punti	Very common	NO
<i>Puntius phutunio</i>	Phutani punti	Common	NO
<i>Puntius guganio</i>	Mola punti	Less common	NO
<i>Puntius terio</i>	Teri punti	Very rare	NO
<i>Puntius sarana</i>	Sar punti	Rare	CR
<i>Puntius gelius</i>	Jeli punti	Wide	DD
<i>Puntius puntio</i>	Punti barb	Rare	-
<i>Oreichthyes cosuatis</i>	Cosuati	Very rare	-

CR: Critically endangered; EN: Endangered; VU: Vulnerable; NO: Not threatened and DD: Data deficient

*Puntius sophore* and *Puntius ticto* were found in the floodplains, ponds and rivers of Savar upazila (sub district) of Bangladesh.

There is no available data on the production of barbs and minnows in Bangladesh. Halls [22] reported a single species, *Puntius sophore* accounted for approximately 17% of total annual catch recorded at 1995-1996. *Puntius sophore* and *Puntius ticto* production comprise 14-16% and 1%, respectively in two floodplains of Bangladesh [23]. Recent findings of Mohsin *et al.* [24] suggested that *Puntius sarana*, *Puntius sophore* and *Puntius ticto* were found in Padma river consisted of about 1.24%, 1.16% and 0.78% respectively among 69 species of fish. However, some of the small indigenous fish species namely *Puntius sophore* and *Puntius sarana* have received attention for culture in ponds with carps and thus these species were found to be available in some areas of the study sites. That's why the IUCN biodiversity status may be reviewed for *Puntius sarana*.

**Abundance and Biodiversity Status:** Out of the collected 11 fish species, 6 species were ranked as not threatened (NO), 1 as vulnerable (VU), 1 as data deficient (DD) and 1 as critically endangered (CR) according to IUCN Red Book [10] (Table 6). The present study shows the alarming decline of the biodiversity of barbs in the surveyed area as well as in the country. Some of the *Puntius* species were most common while some were rare to very rare. Among all the *Puntius* species, *Puntius sophore*, *Puntius chola*, *Puntius conchoniis* and *Puntius gelius* were abundant in all types of water bodies. On the contrary, Hossain *et al.* [21] found that *Puntius sarana*, *Puntius sophore* and *Puntius ticto* were common. *Puntius sarana*, *Puntius terio*, *Puntius guganio* and *Puntius ticto*

were ranked as less common to rare. The only one critically endangered species *i.e.* *Puntius sarana* was rare and not found in all types of water bodies. This species was found in some polyculture system, nevertheless, the species was not abundant and only reported from Mymensingh and Kishoreganj. However, these species were not abundant in all the types of water bodies and were in less quantity.

Though the study was not conducted throughout the country but it indicates alarming decline of the barbs and minnows in the surveyed area. Some of them were found to be occasionally available as a rare fish species in the study area. If inclusion of these small fishes in the aquaculture systems and establishment of fish sanctuaries should not be taken into consideration for the conservation of these species; otherwise it is predictable that barbs will disappear from nature in near future. Breeding and nursing grounds of these small fishes should be protected through banning or restricting the use of agricultural pesticides. Drying of floodplains should also be discouraged for the conservation of broods of these small indigenous fish species. Public awareness on the conservation of aquatic biodiversity and sensible habitat management needs to be created through mass media. Finally, the present study gives the checklist of barbs species together with their availability and distribution in the surveyed area. Ghorbani *et al.* [25] emphasized and recommended on the knowledge of biology and management of aquatic organisms for further research and management. The present findings will enable the scientists, researchers, policy makers, officials and general mass to take necessary actions like further research on the culture, breeding, conservation and management strategies of these species.

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