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# Diversity and conservation status of fishes in the lower reach of Manu River of Tripura

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## Abstract

A study was carried out from lower reach of Manu river of Tripura, North-East India during May, 2020 to June 2023 to investigate the diversity of fishes and their conservation status. During the study period a total of 50 fish species belonging to 10 orders, 21 families and 35 genera were identified. The Cypriniformes was the most dominate order with 20 species (40%) followed by Siluriformes 14 species (28%) and Perciformes 5 species (10%).According to the IUCN, 5 species of the total fish recorded during the present study are placed near threatened (NT) category in the IUCN (2023) check list. The present study showed that the lower reach of Manu river possesses rich fish diversity but some malpractices were noticed during study period which is likely to be forced on decreasing trend in both diversity and abundance of fish in the study area in near future. Therefore, it is to be expected that the outcomes of the present study will certainly help chalking out proper strategies for conserving of fish biodiversity as well as for sustainable utilization of this important resource for human benefit in this region.

## Keywords

Fish diversity; Cypriniformes; Conservation; IUCN; Manu River; Tripura

## 1. Introduction

Fishes are the important aquatic organism among different kinds of living being. Basically fishes live in three different types of aquatic ecosystems viz. freshwater, estuarine and marine ecosystems[11].Each ecosystem having characteristics feature of biotic components as well as abiotic components. On the basis of water velocity nature of the ecosystem freshwater ecosystem

can be divided into lotic and lentic ecosystem[12].The lotic ecosystem further can be classified into different zones such as littoral zone, limnetic zone and profundal zone and these three zone also having unique characteristic features at the micro-habitat level[6].On the basis of feeding habit fish can be divided into herbivorous, carnivorous and omnivorous and also categories as surface feeder, column feeder and bottom feeder and food preference are based on availability of food in different time of seasons[1].

Fish growth and development are directly related to its habitat where it is occupied and its physico- chemicals parameters of the water body. The biotic and abiotic parameters are poses several impacts on different aspects of fish biology such as feeding biology, reproductive behavior etc[4]. Freshwater culture and capture fisheries play a vital role for economic development of the country. Tripura is a third smallest state in the country and it has numerous perennial and short term water bodies like river, lake, stream, spring etc. North East India is very potent in fisheries in terms of rivers, streams, floodplain wetlands, lakes, ponds. As a result, plenty of fish species are available in this region and considered as one of the global hotspots of freshwater fish biodiversity [23, 14, 21, 24, 8].

It has been considered that the fish species drastically reduced in the lotic and lentic ecosystems of Tripura in the last two decades at a greater scale because of various anthropogenic threats in its habitat [15, 2, 13, 20]. For example, slow and gradual siltation in river due to soil erosion, sand mining, damage of limnological niche of feeding and breeding ground with the use of umwanted various pesticides in agricultural field, unscientific collection of brood stock by the fisherman, gradual reduction of water level in the river ecosystem are the major features behind declining the species in its density [5]. It is a great challenge to fish biologist and conservation scientist for conserving the species for future. As a result it is necessary to know the present distribution status of this fish species in the state of Tripura.

## 2. Materials and Methods

### Study area

Manu river is an important river of north part of Tripura and originates from Shakhatang mountains of Tripura and it is a Indo-Bangladesh transboundary river which flow north-east direction through Manu, Kumarghat, Kailashahar locality and enters into Bangladesh where it meet with Kushiara river. The total length of the river from origin to Indo-Bangladesh border is 167 km and therefore it is recognized as longest river in Tripura. The river flows throughout the year and is flooded up to half of the hydrological annual cycle**.** The study area is located in and around latitudes $24^0 31'$ N and longitudes $91^0 99'$ E [Figure-1]. The climate of the study area is ranging from 3.8 to 8.2 $^0$C during winter period and 30.0 to 36.0$^0$C in the summer months.


Figure 1: A view of study area (Lower reach of Manu River, Tripura)

With the help of conventional drag net cast net along with other camouflaging technique the fish sample was collected from river Manu during morning period and brought to the laboratory for taxonomic study. The specimens were preserved following the standard protocol[11] and deposited at museum of Zoology department, Ramkrishna Mahavidyalaya, Kailashahar, Tripura. The fish specimens were identified following the identification key and diagnosis [6, 10, 26].The photography of the specimen was taken with smart mobile camera and digital camera NIKKON COOPIX P610[ Photo plate 1, 2, 3 and 4]. The conservation status was ascertained with the help of IUCN (2023).

## 3. Results and discussion

A total of 50 fish species were reported that belong to 10 orders, 21 families and 35 genera. Cypriniformes was the most dominate among the 10 orders of fish recorded with 20 species followed by Siluriformes with14 species, Peciformes with 5 species and Synbranchiformes with 3 species. Anabantiformes and Osteoglossiformes were represented 2 species respectively. The orders Cichliformes, Beloniformes, Clupeiformes and Gobiiformes represented single species each[Figure-2]. The order Cypriniformes had 20 species belonging to two families viz. Cyprinidae (18 species) and Cobitidae (2 species); order Siluriformes had 14 species belonging to different families viz. Bagridae (6 species), Siluridae (3 species), Clariidae (1 species), Heteropneustidae (1 species), Ailiidae (1 species) , Sisoridae(1 species)and Schilbeidae (1 species); order Perciformes had 5 species under different families viz. Channidae (1 species), Centropomidae (1 species), Anabantidae (1 species), Nandidae (1 species), Osphronemidae (1 species); order Synbranchiformes contributed 3 species with two families viz. Synbranchidae (1 species) and Mastacembelidae (2 species); order Anabantiformes contributed 2 fish species under family Channidae; order Osteoglossiformes had 2 species under Notopteridae and order Cichliformes, Beloniformes, Clupeiformes, Gobiiformes had single species each under the

family Cichlidae, Belonidae, Clupeidae, Gobiidae respectively. It is observed that the family Cyprinidae dominated with 18 species [Table-1and Figure-3].

**Table 1:** List of fish species observed in lower reach of Manu River with their IUCN status

| Order | Family | Sl No. | Fish species | Local name | IUCN Status (2023) |
|---|---|---|---|---|---|
| Cypriniformes | Cyprinidae | 1 | *Labeo rohita*(Hamilton, 1822) | Rui | LC |
| Cypriniformes | Cyprinidae | 2 | *Labeo bata*(Hamilton, 1822) | Bata | LC |
| Cypriniformes | Cyprinidae | 3 | *Labeo calbasu*(Hamilton, 1822) | Kalibahus | LC |
| Cypriniformes | Cyprinidae | 4 | *Catla catla*(Hamilton, 1822) | Katla | LC |
| Cypriniformes | Cyprinidae | 5 | *Cirrhinus mrigala*(Hamilton, 1822) | Mirka | LC |
| Cypriniformes | Cyprinidae | 6 | *Ctenopharyngodon idella*(Steindachner,1866) | Gras carp | LC |
| Cypriniformes | Cyprinidae | 7 | *Cyprinus carpio*(Linnaeus, 1758) | Carpio | VU |
| Cypriniformes | Cyprinidae | 8 | *Puntius javanicus*(Bleeker, 1855) | Japani puti | LC |
| Cypriniformes | Cyprinidae | 9 | *Puntius sophore*(Hamilton, 1822) | Puti | LC |
| Cypriniformes | Cyprinidae | 10 | *Puntius ticto*(Hamilton, 1822) | Tit puti | LC |
| Cypriniformes | Cyprinidae | 11 | *Puntius chola*(Hamilton, 1822) | Puti | LC |
| Cypriniformes | Cobitidae | 12 | *Botia dario*(Hamilton,1822) | Ranimach | LC |
| Cypriniformes | Cyprinidae | 13 | *Labeo gonius*(Hamilton,1822) | Goinna | LC |
| Cypriniformes | Cyprinidae | 14 | *Hypophthalmichthys molitrix*(Valenciennes, 1844) | Silver mach | NT |
| Cypriniformes | Cyprinidae | 15 | *Hypophthalmichthys nobilis*(Richardson, 1845) | Bighead mach | DD |
| Cypriniformes | Cyprinidae | 16 | *Cyprinus cachius*(Hamilton, 1822) | Chela | LC |
| Cypriniformes | Cyprinidae | 17 | *Amblypharyngodon mola*(Hamilton, 1822) | Malaiya | LC |

| | | | | | |
|---|---|---|---|---|---|
| Cypriniformes | Cyprinidae | 18 | *Esomus danricus*(Hamilton, 1822) | Darkina | LC |
| Cypriniformes | Cobitidae | 19 | *Lepidocephalichthys guntea*(Hamilton,1822) | Gutum | LC |
| Cypriniformes | Cyprinidae | 20 | *Cirrhinus reba*(Hamilton, 1822) | Bangla | LC |
| Siluriformes | Siluridae | 21 | *Wallago attu*(Bloch and Schneider, 1801) | Bowal | VU |
| Siluriformes | Bagridae | 22 | *Sperata seenghala*(Syles, 1839) | Aor | LC |
| Siluriformes | Bagridae | 23 | *Sperata aor*(Hamilton, 1822) | Aor | LC |
| Siluriformes | Clariidae | 24 | *Clarias batrachus*(Linnaeus, 1758) | Magur | LC |
| Siluriformes | Heteropneustidae | 25 | *Heteropneustes fossilis*(Bloch,1794) | Shing | LC |
| Siluriformes | Siluridae | 26 | *Ompok bimaculatus*(Bloch, 1794) | Papda | NT |
| Siluriformes | Siluridae | 27 | *Ompok pabda*(Hamilton-Buchanan, 1822) | Pabda | NT |
| Siluriformes | Bagridae | 28 | *Mystus bleekeri*(Day, 1877) | Tengra | LC |
| Siluriformes | Bagridae | 29 | *Mystus vittatus*(Block, 1794) | Tengra | LC |
| Siluriformes | Bagridae | 30 | *Mystus cavasius*(Hamilton,1822) | Tengra | LC |
| Siluriformes | Ailiidae | 31 | *Ailia coila*(Hamilton, 1822) | Kajoli | NT |
| Siluriformes | Bagridae | 32 | *Rita rita*(Hamilton, 1822) | Rida | LC |
| Siluriformes | Sisoridae | 33 | *Bagarius bagarius*(Hamilton, 1822) | Bagair | VU |
| Siluriformes | Schilbeidae | 34 | *Clupisoma garua*(Hamilton, 1822) | Bacha | LC |
| Synbranchiformes | Synbranchidae | 35 | *Monopterus cuchia*(Hamilton,1822) | Kuichha | LC |
| Synbranchiformes | Mastacembelidae | 36 | *Macrognathus aculeatus*(Bloch, 1786) | Chuta baim | LC |
| Synbranchiformes | Mastacembelidae | 37 | *Mastacembelus armatus*(Lacepede, 1800) | Dora baim | LC |
| Perciformes | Channidae | 38 | *Channa orientalis*(Bloch and Schneider, 1801) | Upal | VU |
| Perciformes | Centropomidae | 39 | *Chanda nama*(Hamilton, | Chanda | LC |

| | | | | | |
|---|---|---|---|---|---|
| | | | 1822) | | |
| Perciformes | Anabantidae | 40 | *Anabas testudineus*(Bloch, 1792) | Koi | LC |
| Perciformes | Nandidae | 41 | *Nandus nandus*(Hamilton, 1822) | Meni | LC |
| Perciformes | Osphronemidae | 42 | *Trichogaster lalius*(Hamilton, 1822) | Baicha | LC |
| Cichliformes | Cichlidae | 43 | *Oreochromis niloticus(*Linnaeus, 1758) | Telapia | LC |
| Beloniformes | Belonidae | 44 | *Xenentodon cancila*(Hamilton,1822) | Kaikka | LC |
| Anabantiformes | Channidae | 45 | *Channa punctata*(Bloch, 1793) | Taki | LC |
| Anabantiformes | Channidae | 46 | *Channa striata*(Block, 1793) | Shol | LC |
| Osteoglossiformes | Notopteridae | 47 | *Notopterus notopterus*(Pallas, 1769) | Kanla | LC |
| Osteoglossiformes | Notopteridae | 48 | *Chitala chitala*(Hamilton,1822) | Chital | NT |
| Clupeiformes | Clupeidae | 49 | *Gudusia chapra*(Hamilton, 1822) | Chapila | LC |
| Gobiiformes | Gobiidae | 50 | *Glossogobius giuris*(Hamilton, 1822) | Bailla | LC |

LC- Least Concern, NT- Near Threatened, VU- Vulnerable, DD- Data Deficient

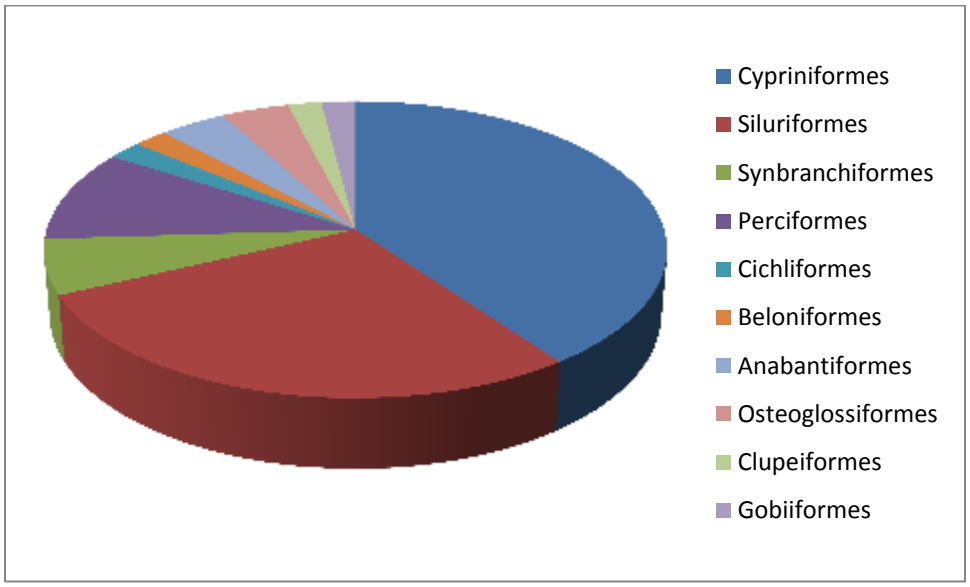


Figure 2: Diagrammatic representation of order – wise species recorded in the study area

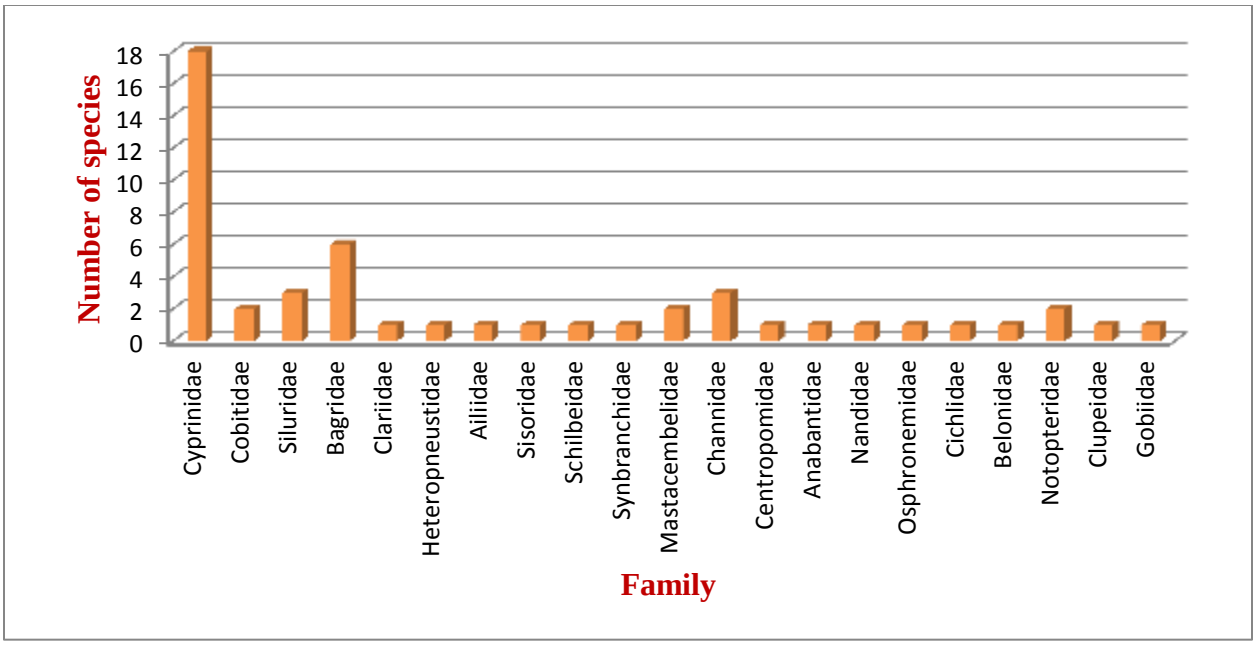


Figure 3: Diagrammatic representation of family – wise species recorded in the study area

Table 2: percentage of threat categories of fish species from lower reach of Manu river

| IUCN STATUS | Number | Percentage |
|---|---|---|
| LC | 40 | 80 |
| VU | 4 | 8 |
| NT | 5 | 10 |
| DD | 1 | 2 |

Photo plate 1: Fish species images Sl.No. 1-12 recorded in table1


Photo plate 2: Fish species images Sl.No. 13-24 recorded in table1


Photo plate 3: Fish species images Sl.No. 25-36 recorded in table1

Photo plate 4: Fish species images Sl.No.37-50 recorded in table1

Present finding complies with the results of previous works from the same geographic region where also Cypriniformes was found to be most dominating species [18, 16, 22, 25, 3, 19]. One very important finding of the present study was that among the 50 species recorded in this study 5 species of fish viz. *Hypophthalmichthys molitrix, Ompok bimaculatus, Ompok pabda, Ailia coila and Chitala chitala* [Table-2] *were* placed under near threatened category in IUCN [9, 17]. Some of the ornamental fishes like *Puntius sophore, Amblypharyngodon mola, Channa punctata* etc. were identified during the study period. It is to be noted that the species *Labeo rohita, Labeo bata, Catla catla, Cirrhinus mrigala, Ctenopharyngodon idella, Cyprinus carpio and Labeo gonius* are main cultured fish species in the study area. The catfish species like *Wallago attu, Heteropneustes fossilis, Clarias batrachus, Mystus bleekeri, Ompok pabda, Rita rita* etc, have high market demand due to their taste and nutritive value in the local market. Finding of the present study revealed that the fish species like *Chitala chitala, Bagarius bagarius* were seldom found during the study that draws serious conservation measures. Some of the fish species like *Heteropneustes fossilis, Monopterus cuchia, Channa punctata, Notopterus notopterus* have ethnomedicinal value in the study area.

During the survey local fishermen stated that both diversity and abundance of fish in the Manu river has decreased significantly during the last few decades. Over the year, malpractices like uncontrolled sand mining, application of pesticides in the nearby agricultural field, use of electric fishing net and frequent use of poisoning particularly during winter season when water level

became low etc. are the main identified reason for reduction of fish availability in the river under study. Similar kind of anthropogenic threats are also identified by other study report in recent times in different fishery resources in Tripura[3, 16] .

## 4. Conclusion

From the present study it has been clear that the study area lower reach of Manu river of Tripura having potent in terms of fish diversity richness. But at the same time it is also true that the impact of anthropogenic stress reducing the fish feeding as well as breeding ground day by day at alarming rate. Therefore, utmost care is needed to conserve the freshwater characteristic features of the habitat and plan for a sustainable utilization of the fishery resources by taking appropriate conservation measures involving all the stockholders in this study area.

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**Conflict of interest**

The author declares no conflict of interest.

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