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Fish fauna of the Dibru River- a tributary of the Brahmaputra River, Dibrugarh District, Assam, Northeastern India, with a new range extension record of *Pseudolaguvia vespa*

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Abstract

This study is an attempt to explore the fish diversity of the Dibru River, a vital waterway that supports both the local economy and the ecological integrity of the Dibru-Saikhowa National Park (India), conducted during October 2023 to May 2024. A total of 414 specimens were collected and, there are 20 species in Cypriniformes, 8 in Siluriformes, 5 in Perciformes, 2 in Synbranchiformes and 1 species each in the other 5 orders in the study. Of these, 37 photographs of different fish species, mostly of ornamental value, are presented to emphasize the potential of the fish resources of this river. Notably, the study records a new range extension for *Pseudolaguvia vespa*, documenting its presence in the Dibru River within the Brahmaputra Basin.

Keywords: fish fauna, ornamental fish, Dibru river, Cyprinidae, Brahmaputra River system

1. Introduction

The northeastern region of India, recognized globally as a biodiversity hotspot for freshwater fish [1], plays a pivotal role in sustaining ecological balance. Freshwater fish are not only crucial components of aquatic ecosystems but also serve as significant protein sources for local communities and also as bioindicators, which can reflect the health and quality of water bodies. However, the rich biodiversity of freshwater fish in India has been declining steadily, primarily due to various anthropogenic pressures and environmental changes. Habitat modification, pollution, overfishing, and unsustainable development have accelerated this trend, while climate change further exacerbates the challenges, posing severe threats to aquatic species and the ecosystems they inhabit. Predictions suggest that, in the future, the impacts of biodiversity loss may be more pronounced in aquatic ecosystems than in terrestrial ones [2]. The potential loss of fish species risks disrupting food webs, altering nutrient cycles, and diminishing ecosystem resilience of the system. Thus, conservation of fish fauna in this region is essential not only for ecological stability but also for the well-being of local communities that rely on these resources for their livelihoods. The Brahmaputra and Barak River systems in Assam, India, are home to 216 documented fish species spanning 36 families, with the Cyprinidae family exhibiting the greatest species diversity [3]. In contrast, neighboring Bangladesh, endowed with extensive and productive freshwater ecosystems rich in diverse aquatic flora and fauna, supports a higher count of 260 freshwater fish species [4]. Considering the challenges facing aquatic biodiversity in the modern era, assessing fish diversity in the Dibru River, Assam, is critically important for maintaining and evaluating ecological balance and supporting the livelihoods of local communities through fishing and related activities. Although numerous studies have explored fish diversity in Assam [5], [6], [7], [8] [9], [10], [11], and assessed protected areas [12], [13] [14], [15], [16], the fish fauna of the Dibru River itself remains under-researched. Therefore, this study aims to assess the diversity of fish and the status of fish species in the Dibru River. The findings could provide valuable insights into the biodiversity of the river, supporting conservation efforts and sustainable management practices.

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2. Materials and methods

Study Area: The Dibru River originates in the low hills near Bordumsa village in Arunachal Pradesh, flows down into the plains, meets with the Doomdooma River, and continues westward. The river forms the Maguri Beel wetland in the Tinsukia district of Assam, then debouches into the Lohit River at the south of Dibru-Saikhowa National Park, and eventually merges with the Brahmaputra River. The study was conducted at four sampling stations covering a distance of approximately 8.0 km starting from near the small township of Dinjan to the vicinity of Bogoritolia village in Dibrugarh District (Figure 1).

The sampling of fish was carried out using a cast net of 3.0 m diameter and 9.50 mm meshes in the study site (Dibru River) covering a distance of approximately 8.0 km. Fish specimens were collected from four sampling stations i.e., Station-1 (27°55'80.36"N; 95°26'73.01"E), Station-2 (27°55'12.31"N; 95°18'54.11"E), Station-3 (27°55'18.30"N; 95°16'64.70"E) and Station-4 (27°55'18.89"N; 95°14'75.46"E). The fish samples that were collected were taken to the laboratory of Zoological Survey of India (ZSI), Arunachal Pradesh Regional Centre (APRC), Itanagar for identification and stored in 70% alcohol. The standard literature that was available in the ZSI library, viz., [17] [18] [19], [20], were consulted and identified the fish specimens except for two that belong to the genera *Amblyceps* and *Paracanthocobitis*. The percentage of relative abundance of the fish was calculated dividing the total number of each species by total number of all species multiplied by 100 and categorized into four categories, viz., abundant (15.1-20.0%), common (10.1-15.0%), moderate (5.1-10.0 %) and rare (0.1-5.0 %). The IUCN conservation status was confirmed following the IUCN Red List of Threatened species version 2024-1 [21]. All the fish species are registered with the registration number at the Department of Zoology, Patkai Christian College (Autonomous), Nagaland.

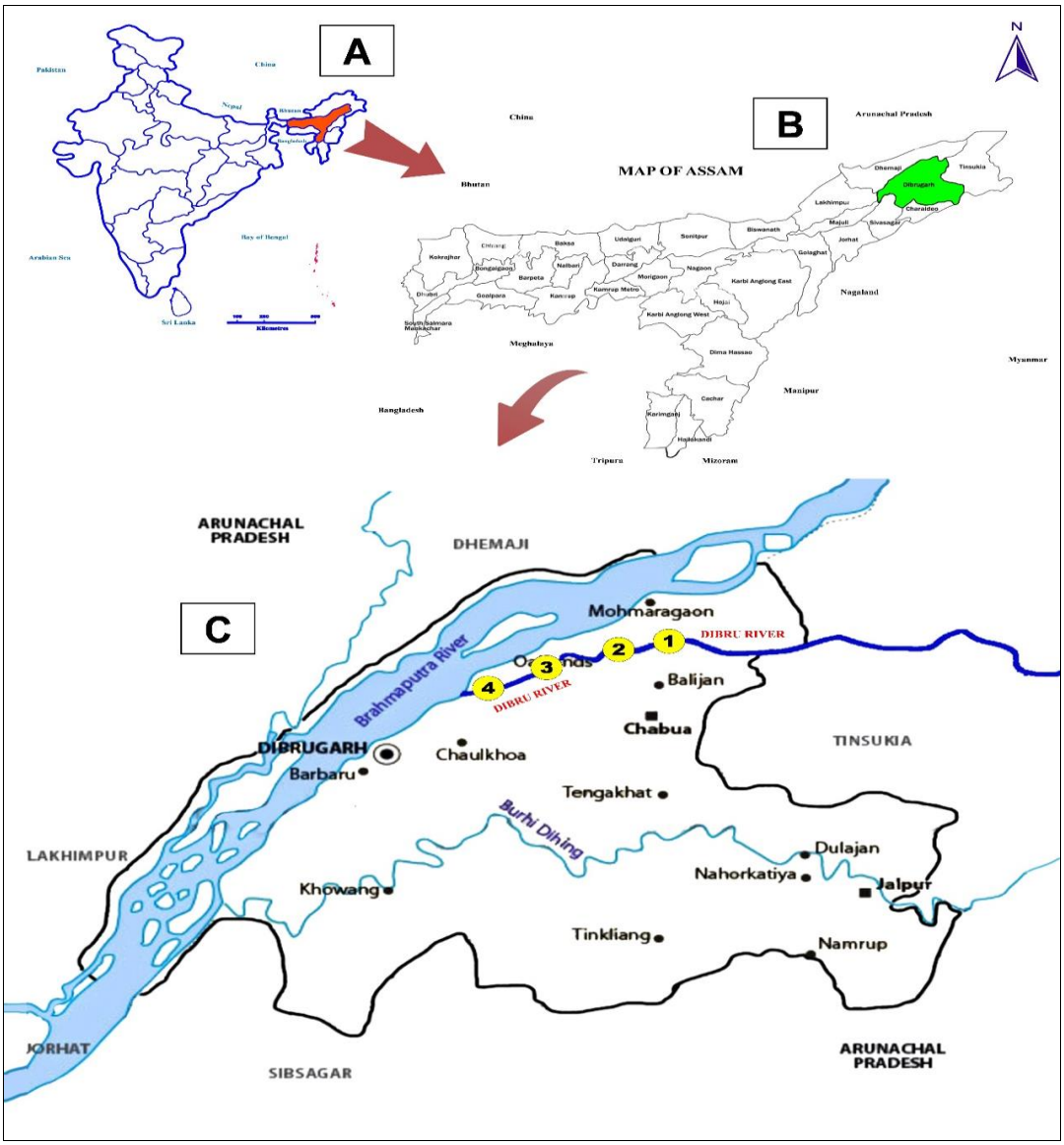


Figure 1. (A) Map of India indicating the State of Assam; (B) Map of Assam indicating Dibrugarh district; (C) Map of Dibrugarh District indicating the Dibru River and four sampling sites

3. Results

The study in the Dibru River documented a total of 414 specimens of fish fauna, comprising 40 species distributed across 34 genera, 18 families, and 9 orders (Table 1 and Figure 2). The fish species accessed primarily consisted of potential ornamental fish, as illustrated in Figure 4. During the survey the highest number of fish species (richness) were recorded during the third survey in March 2024 with 28 species, followed 20, 17, and 13 species in the fourth, first, and second survey respectively (Table 2). The peak in species richness in March may be attributed to reduced water volume during that period, which likely facilitated easier catches.

Further analysis showed that 40% of the species were recorded only once across the surveys, 30% of the species were recorded in at least two surveys, and 25% were observed in three surveys. Only two species (5%), *Paracanthocobitis botia* and *Pethia ticto*, were recorded at all sampling stations throughout the four-month temporal variation period, as presented in Table 2, which also includes catch frequencies for other species. The highest abundance was observed in *Trichogaster fasciata*, accounting for 16.9% of the total specimens, classified as abundant. This was followed by *Xenentodon cancila* at 9.7% (moderate), *Devario devario* at 7.2% (moderate), and *Acanthocobitis pavonacea* at 6.3% (moderate). Other species exhibited lower abundances ranging from 0.5% to 4.3%, categorizing them as rare. No fish species was found under “common" category, which would fall between the abundant and moderate categories. This absence may be attributed to the limited duration of the sampling period.

The family Cyprinidae was the most dominant, comprising 26.3% of the fish species, followed by Bagridae and Nemacheilidae with 10.5% each, Cobitidae and Danionidae with 7.9% each (Figure 3). According to the IUCN Red List of Threatened Species [9], the majority of species (92.1%) are categorized as Least Concern (LC), indicating that most of the fish species collected in the present study in Dibru River is not currently at-risk category. Among the 40 species recorded, two- *Acanthocobitis pavonacea* and *Pseudolaguvia vespa*- are listed as Not Evaluated (NE), while *Badis assamensis* is classified as Data Deficient (DD) on the IUCN Red List. Insufficient data or rarity in field observations may contribute to the "Not Evaluated" status of *Acanthocobitis pavonacea*, while *Pseudolaguvia vespa*, only recently described in 2021, has not yet been assessed by the IUCN. *Badis assamensis* has a limited geographic distribution within the Brahmaputra basin, but information on its population, range, and structure remains minimal; hence, it is placed under the Data Deficient category due to the scarcity of data.

4. Conclusions and discussion

A longer study period, extending up to one year with increased sampling efforts, is expected to reveal a greater diversity of fish species in the Dibru River. Such an extended study would likely provide a more comprehensive understanding of fish fauna of this river, potentially uncovering additional species and their population dynamics. The current collection includes not only food fishes but also several ornamental species, such as *Trichogaster fasciata*, *Parambassis ranga*, *Badis assamensis*, *Acanthocobitis pavonacea*, *Paracanthocobitis botia*, and *Leiodon cutcutia etc*. This diversity highlights the significant potential of fish resources for the economic upliftment of the local population. The study highlighted that many fisher folks residing nearby villages depend heavily on the fish resources of the Dibru River for their livelihoods. This dependence indicates the importance of fishery not only for biodiversity but also for the economic upliftment of local communities. However, dependency on wild collection only is not a permanent solution for sustainability. So, it is necessary to adopt sustainable approaches to fishery management and sustainable utilization such as preventing overfishing, promoting community-based management strategies that minimize habitat degradation and ensure the long-term fish production as well as the health of fish.

Detailed examinations of morphological and meristic data of the specimens (no. of specimens) confirm the presence of *Pseudolaguvia vespa* in the Dibru River of Assam. *Pseudolaguvia vespa*, originally known from its type locality in the Tsücha River (26°27.59′N; 94°29.63′E) in Mokokchung District, Nagaland, India [22]. This range extension reveals the ecological connectivity of northeastern river systems and warrants further ichthyological surveys in these areas.

The study emphasizes the need for a long-term management strategy and technological interventions to promote entrepreneurship in the aquarium trade, particularly for minnows and loaches. To address the challenges posed by anthropogenic pressures and declining health of the river systems, captive breeding, propagation, and seed production are essential. Hence, the government, ichthyologists, NGOs, local communities, and the public should work together to protect illegal trading and promote awareness among fishermen to protect both food and ornamental fish species through innovative and sustainable approaches.

Table 1. Fish species collected from the Dibru River, Assam, according to percentage Abundance [Abundant (15.1-20.0%)- (A), Common (10.1-15.0%) –(C), Moderate (5.1-10.0 %) (M) and Rare (0.1-5.0 %)-(R)]

SN	O	F	NoS	%	R	IS	Reg. No.
1.	Anabantiformes	Osphronemidae	*Trichogaster fasciata*	16.9	A	LC	PCC/ZOO/FISH/00001
2.	Beloniformes	Belonidae	*Xenentodon cancila*	9.7	M	LC	PCC/ZOO/FISH/00002
3.	Cypriniformes	Danionidae	*Devario devario*	7.2	M	LC	PCC/ZOO/FISH/00016
4.	Cypriniformes	Nemacheilidae	*Acanthocobitis pavonacea*	6.3	M	NA	PCC/ZOO/FISH/00019
5.	Cypriniformes	Cyprinidae	*Amblypharyngodon mola*	4.3	R	LC	PCC/ZOO/FISH/00006
6.	Cypriniformes	Cyprinidae	*Bangana dero*	3.9	R	LC	PCC/ZOO/FISH/00007
7.	Cypriniformes	Danionidae	*Barilius barila*	3.9	R	LC	PCC/ZOO/FISH/00017
8.	Cypriniformes	Cyprinidae	*Cabdio morar*	3.4	R	LC	PCC/ZOO/FISH/00008
9.	Cypriniformes	Cobitidae	*Lepidocephalichthys annandalei*	2.9	R	LC	PCC/ZOO/FISH/00003
10.	Cypriniformes	Cobitidae	*Lepidocephalichthys goalparensis*	2.9	R	LC	PCC/ZOO/FISH/00004
11.	Cypriniformes	Cobitidae	*Lepidocephalichthys guntea*	2.4	R	LC	PCC/ZOO/FISH/00005
12.	Cypriniformes	Cyprinidae	*Oreichthys cosuatis*	2.4	R	LC	PCC/ZOO/FISH/00009
13.	Cypriniformes	Cyprinidae	*Osteobrama cotio*	2.4	R	LC	PCC/ZOO/FISH/00010
14.	Cypriniformes	Nemacheilidae	*Paracanthocobitis* sp.	0.5	R	-	PCC/ZOO/FISH/00039
15.	Cypriniformes	Cyprinidae	*Pethia gelius*	2.4	R	LC	PCC/ZOO/FISH/00011
16.	Cypriniformes	Danionidae	*Opsarius bendelisis*	2.4	R	LC	PCC/ZOO/FISH/00018
17.	Cypriniformes	Nemacheilidae	*Paracanthocobitis botia*	2.4	R	LC	PCC/ZOO/FISH/00020
18.	Cypriniformes	Cyprinidae	*Pethia ticto*	1.9	R	LC	PCC/ZOO/FISH/00012
19.	Cypriniformes	Cyprinidae	*Puntius sophore*	1.9	R	LC	PCC/ZOO/FISH/00013
20.	Cypriniformes	Cyprinidae	*Tariqilabeo latius*	1.4	R	LC	PCC/ZOO/FISH/00014
21.	Gobiiformes	Gobiidae	*Glossogobius giuris*	1.4	R	LC	PCC/ZOO/FISH/00021
22.	Perciformes	Ambassidae	*Chanda nama*	1.4	R	LC	PCC/ZOO/FISH/00022
23.	Perciformes	Badidae	*Badis assamensis*	1.4	R	DD	PCC/ZOO/FISH/00024
24.	Perciformes	Badidae	*Badis badis*	1.4	R	LC	PCC/ZOO/FISH/00025
25.	Perciformes	Ambassidae	*Parambassis ranga*	1.0	R	LC	PCC/ZOO/FISH/00023
26.	Perciformes	Channidae	*Channa punctata*	1.0	R	LC	PCC/ZOO/FISH/00026
27.	Siluriformes	Amblycipitidae	*Amblyceps* sp.	1.0	R	-	PCC/ZOO/FISH/00027
28.	Siluriformes	Sisoridae	*Gagata cenia*	1.0	R	LC	PCC/ZOO/FISH/00028
29.	Siluriformes	Heteropneustidae	*Heteropneustes fossilis*	1.0	R	LC	PCC/ZOO/FISH/00029
30.	Siluriformes	Bagridae	*Mystus cavasius*	1.0	R	LC	PCC/ZOO/FISH/00030
31.	Siluriformes	Bagridae	*Mystus dibrugarensis*	1.0	R	LC	PCC/ZOO/FISH/00031
32.	Siluriformes	Bagridae	*Olyra longicaudata*	1.0	R	LC	PCC/ZOO/FISH/00032
33.	Siluriformes	Sisoridae	*Pseudolaguvia vespa*	1.0	R	NA	PCC/ZOO/FISH/00033
34.	Cypriniformes	Nemacheilidae	*Schistura scaturigina*	0.5	R	LC	PCC/ZOO/FISH/00040
35.	Cypriniformes	Cyprinidae	*Labeo gonius*	0.5	R	LC	PCC/ZOO/FISH/00015
36.	Siluriformes	Bagridae	*Rama chandramara*	0.5	R	LC	PCC/ZOO/FISH/00034
37.	Synbranchiformes	Mastacembelidae	*Macrognathus pancalus*	0.5	R	LC	PCC/ZOO/FISH/00035
38.	Synbranchiformes	Synbranchidae	*Ophichthys cuchia*	0.5	R	LC	PCC/ZOO/FISH/00036
39.	Tetraodontiformes	Tetraodontidae	*Leiodon cutcutia*	0.5	R	LC	PCC/ZOO/FISH/00037
40.	Osteoglossiformes	Notopteridae	*Notopterus notopterus*	0.5	R	LC	PCC/ZOO/FISH/00038

SN- Serial No.; **O-** Order; **F-** Family; **NoS-** Name of species; **%-** Percentage; **R-** Remarks; **IS-** IUCN Status; **Reg. No-** Registration No.

Table 2. Temporal variation of fish species in the Dibru River, Assam, (Surveys I – October 2023, II – January 2024, III – March 2024, IV – May 2024)

Sl. No.	Order	Family	Name of species	I	II	III	IV
1.	Anabantiformes	Osphronemidae	*Trichogaster fasciata*				+
2.	Beloniformes	Belonidae	*Xenentodon cancila*	+		+	
3.	Cypriniformes	Danionidae	*Devario devario*	+	+	+	
4.	Cypriniformes	Nemacheilidae	*Acanthocobitis pavonacea*				+
5.	Cypriniformes	Cyprinidae	*Amblypharyngodon mola*			+	+
6.	Cypriniformes	Cyprinidae	*Bangana dero*	+		+	
7.	Cypriniformes	Danionidae	*Barilius barila*	+	+		
8.	Cypriniformes	Cyprinidae	*Cabdio morar*			+	
9.	Cypriniformes	Cobitidae	*Lepidocephalichthys annandalei*			+	
10.	Cypriniformes	Cobitidae	*Lepidocephalichthys goalparensis*			+	+
11.	Cypriniformes	Cobitidae	*Lepidocephalichthys guntea*			+	+
12.	Cypriniformes	Cyprinidae	*Oreichthys cosuatis*			+	
13.	Cypriniformes	Cyprinidae	*Osteobrama cotio*	+	+	+	
14.	Cypriniformes	Cyprinidae	*Pethia gelius*			+	+
15.	Cypriniformes	Danionidae	*Opsarius bendelisis*	+			+
16.	Cypriniformes	Nemacheilidae	*Paracanthocobitis botia*	+	+	+	+
17.	Cypriniformes	Cyprinidae	*Pethia ticto*	+	+	+	+
18.	Cypriniformes	Cyprinidae	*Puntius sophore*			+	
19.	Cypriniformes	Cyprinidae	*Tariqilabeo latius*	+			
20.	Gobiiformes	Gobiidae	*Glossogobius giuris*	+	+	+	
21.	Perciformes	Ambassidae	*Chanda nama*		+	+	+
22.	Perciformes	Badidae	*Badis assamensis*			+	
23.	Perciformes	Badidae	*Badis badis*		+	+	+
24.	Perciformes	Ambassidae	*Parambassis ranga*	+	+	+	
25.	Perciformes	Channidae	*Channa punctata*		+	+	+
26.	Cypriniformes	Nemacheilidae	*Paracanthocobitis* sp.	+	+		
27.	Siluriformes	Amblycipitidae	*Amblyceps* sp.			+	
28.	Siluriformes	Sisoridae	*Gagata cenia*	+			
29.	Siluriformes	Heteropneustidae	*Heteropneustes fossilis*			+	+
30.	Siluriformes	Bagridae	*Mystus cavasius*	+	+		+
31.	Siluriformes	Bagridae	*Mystus dibrugarensis*			+	+
32.	Siluriformes	Bagridae	*Olyra longicaudata*			+	
33.	Siluriformes	Sisoridae	*Pseudolaguvia vespa*			+	
34.	Cypriniformes	Nemacheilidae	*Schistura scaturigina*			+	
35.	Cypriniformes	Cyprinidae	*Labeo gonius*	+	+		+
36.	Siluriformes	Bagridae	*Rama chandramara*	+		+	+
37.	Synbranchiformes	Mastacembelidae	*Macrognathus pancalus*				+
38.	Synbranchiformes	Synbranchidae	*Ophichthys cuchia*			+	
39.	Tetraodontiformes	Tetraodontidae	*Leiodon cutcutia*	+			+
40.	Osteoglossiformes	Notopteridae	*Notopterus notopterus*				+

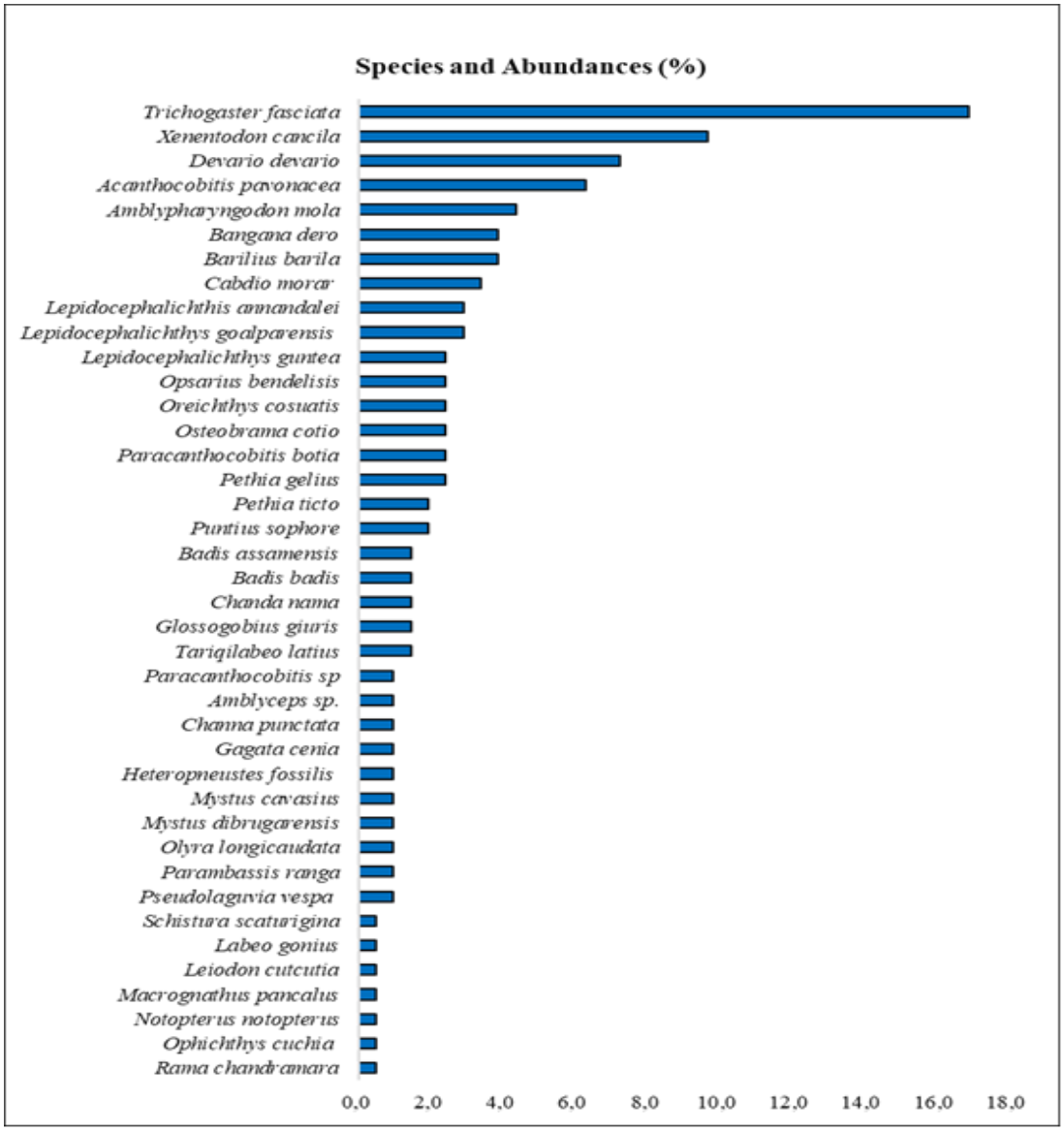


Figure 2. Number of species with percentage of abundances

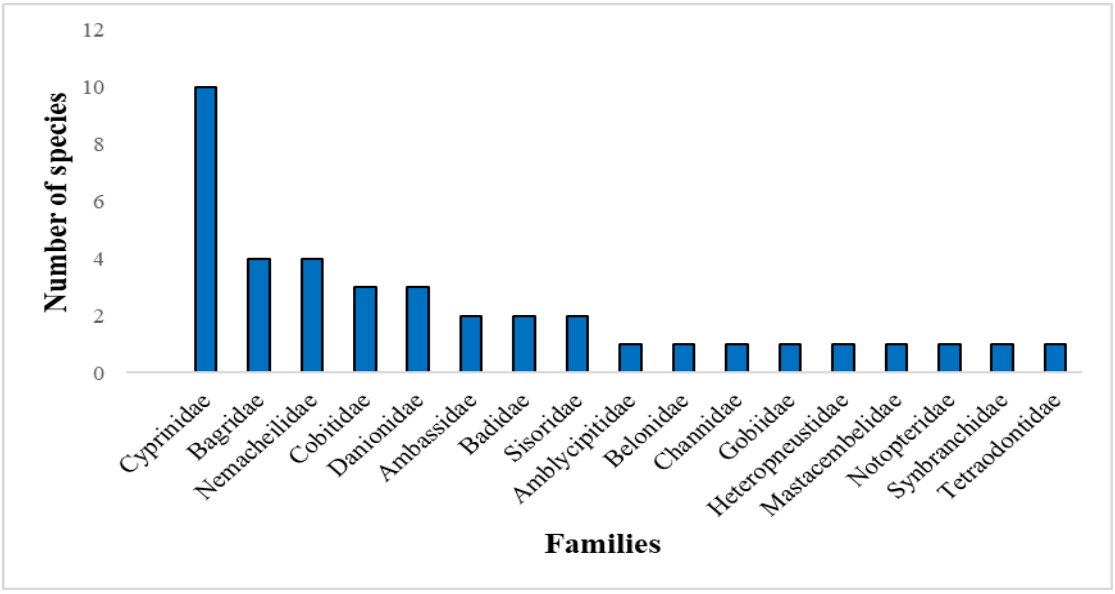
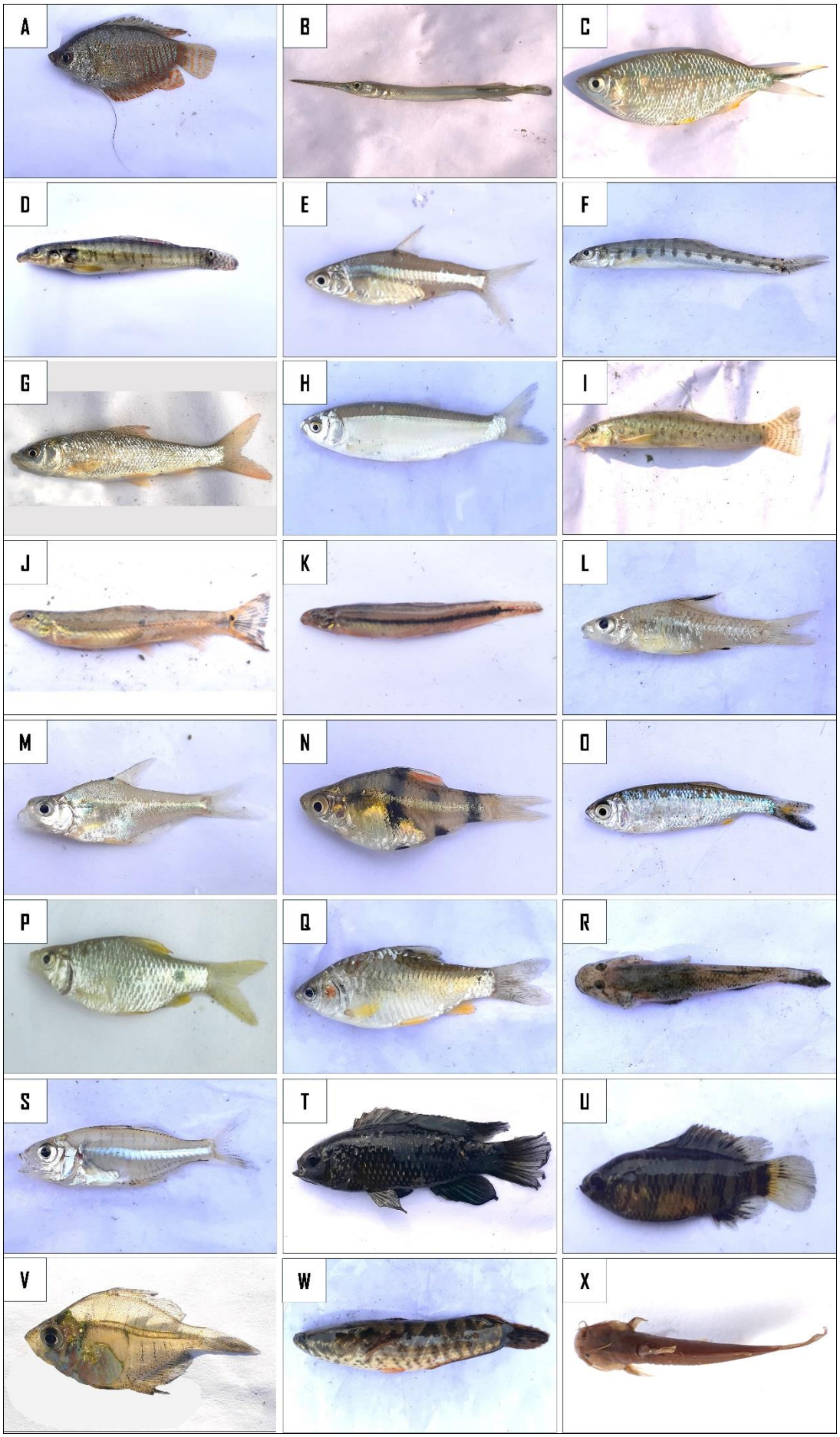


Figure 3. Species abundances within each family



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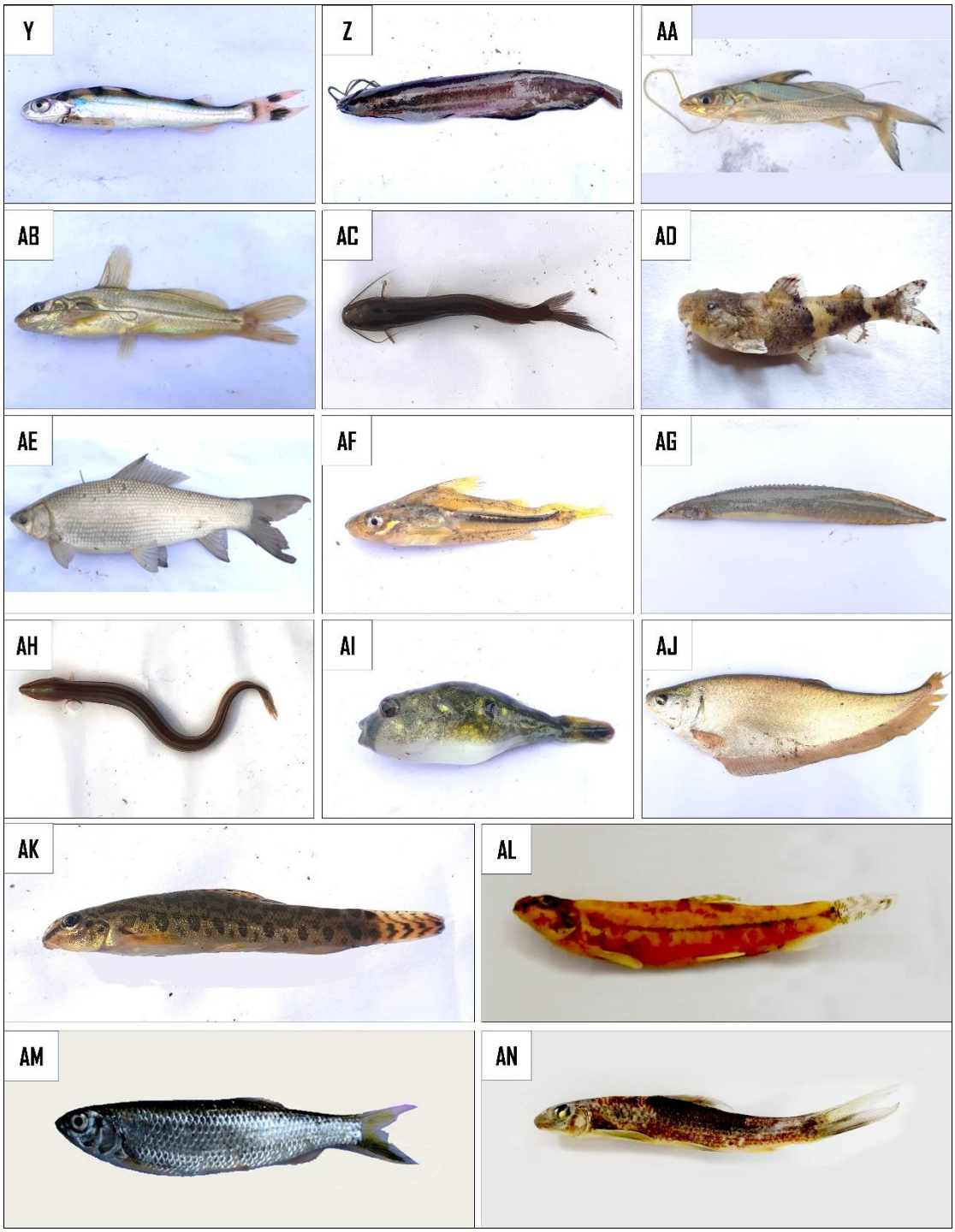

Figure 4. Fish species of Dibru River, Assam: (A) *Trichogaster fasciata*; (B) *Xenentodon cancila*; (C) *Devario devario*; (D) *Acanthocobitis pavonacea*; (E) *Amblypharyngodon mola*; (F) *Schistura scaturigina*; (G) *Bangana dero*; (H) *Cabdio morar*; (I) *Paracanthocobitis* sp.; (J) *Lepidocephalichthys goalparensis*; (K) *Lepidocephalichthys guntea*; (L) *Oreichthys cosuatis*; (M) *Osteobrama cotio*; (N) *Pethia gelius*; (O) *Opsarius bendelisis*; (P) *Pethia ticto*; (Q) *Puntius sophore*; (R) *Glossogobius giuris*; (S) *Chanda nama*; (T) *Badis assamensis*; (U) *Badis badis*; (V) *Parambassis ranga*; (W) *Channa punctata*; (X) *Amblyceps* sp.; (Y) *Gagata cenia*; (Z) *Heteropneustes fossilis*; (AA) *Mystus cavasius*; (AB) *Mystus dibrugarensis*; (AC) *Olyra longicaudata*; (AD) *Pseudolaguvia vespa*; (AE) *Labeo gonius*; (AF) *Rama chandramara*; (AG) *Macrognathus pancalus*; (AH) *Ophichthys cuchia*; (AI) *Leiodon cutcutia*; (AJ) *Notopterus notopterus*; and (AK) *Paracanthocobitis botia;* (AL) *Lepidocephalichthys annandalei*; (AM) *Barilius barila*; (AN) *Tariqilabeo latius.*

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