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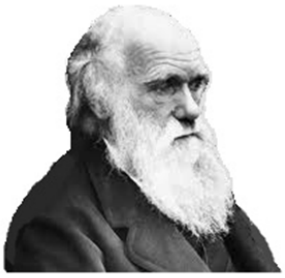

World News of Natural Sciences

An International Scientific Journal

WNOFNS 56 (2024) 84-93 EISSN 2543-5426

Freshwater fish biodiversity in Dikhu River below Longleng District, Northeast India

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ABSTRACT

The present study was conducted on August 2020 to study the diversity of fishes in Dikhu River under Longleng District, Nagaland. The fish species were collected and for identification systematic list and while nomenclature was after FishBase (http//www.fishbase.org). A total of 11 species of fishes, representing 5 orders (Cypriniformes, Siluriformes, Perciformes, Synbranchiformes and Anguilliformes), 9 families (Cyprinidae, Balitoridae, Sisoridae, Siluridae, Heteopneustidae, Bagridae , Mastacembelidae, Anguillidae, Channidae) and 11 genera were collected from the Dikhu River, Longleng District. Among the fish species collected from the river, the order Cypriniformes composed of 37% was the most dominant, followed by Siluriformes composed of 27%, Perciformes composed of 18% and the remaining order Synbranchiformes, Anguilliformes composed of 9% and the number of individual species was highest from the order Cyprinformes (*Devio aequipnatus* sp.). The short term study does not cover up all the fish species that are found in the river .Therefore, the further study on the diversity of fish can be done.

***Keywords*:** Diversity of fishes, Dikhu River, Nagaland

(Received 11 July 2024; Accepted 13 August 2024; Date of Publication 15 August 2024)

1. INTRODUCTION

Fish are vertebrate that live in water. They breathe using special organs called gills. Fish signifies an enormous as well as a diverse resource of the aquatic systems of the world related to their food chain that have been unique bequest to the humankind and other fish eating creatures. Fishing for food is an important human activity globally, with many societal benefits, including food security, providing important micronutrients. Globally, fish provides 6.7 percent of all protein consumed by humans, as well as offering a rich source of long chain omega 3 fatty acid, vitamins, calcium, zinc and iron. More than 250 million people depend directly on fisheries and aquaculture for their livelihoods. Apart from providing cheap nutritious components to the human dietary system, fish has great roles in ecosystem service like the aquatic food chain and sustaining the livelihood of millions of people around the world. Fish provide important nutritional benefits to the poor [1].

India is the second largest fish producer in the world with a total production of 13.7 million metric tonnes in 2018-2019 of which 65 percent was from inland sector. They are important components of most freshwater ecosystem and contribute to biodiversity and ecological functions by their uptake, storage and transport nutrients. The fish taxonomy is also one of the important parameters for assessment of fishery in a river, fishes are important from the biodiversity point of view and are the best bio-indicators of the ecosystem [2].

India is one of the recognized megadiverse countries of the world and bestowed with a large inland fish habitat comprising a numbers of major and minor rivers with their innumerable tributaries, streams and the floodplain wetlands. There are 2,500 species of fishes found in India, of it 930 species are freshwater belonging to 326 genera, 99 families and 20 orders [3]. India is one of the major fish producing countries in the world employing over seven million person in fishing and allied industries and contributing 60 crores annually to national income [4]. The three Indian major carps, catla (*Catla catla*), rohu (*Labeo rohita*) and (*Cirrhinus mrigala*) are main components in composite fish farming in India [5]. Marine and coastal biodiversity benefits all of humanity [6]. Fish can also assists in controlling diseases like malaria, yellow fever and other dreadful diseases that are spread through mosquito. Indian fish such as Macropodus and Aplochielus are effective in mosquito control [7]. The composition and distribution of fish species have a strong association with the kind of terrestrial landscape elements and the importance of landscape approach to conservation and management of aquatic ecosystem [8].

The North Eastern India being considered as one of the global ‘hot spots’ of freshwater fish diversity in the world [9]. The Northeast region of india comprising the seven sister states of Assam, Meghalaya, Manipur, Arunachal Pradesh, Mizoram, Tripura, Nagaland and Sikkim possess a unique potential of fishery resources. Northeast India has rich freshwater fish diversity which attributed to past geological history and the Himalayan orogeny which played an important role in the speciation and evolution of groups inhabiting mountain streams [10]. The North East region is known for Indo gangetic fish fauna and to a small extent the Burmese and South China fish fauna. There is a record of 213 fish species in the states of Arunchal Pradesh, India [11]. The total of 15 fish species were identified as commercially important and fetch good market price [12]. The northeast region is blessed with rich biodiversity and fisheries resources, with more than 90% of population being fish eaters [13]. A large number of 204 fish species from a single river have recorded in the states [14].

More recently [15] provides the detailed taxonomic description of 296 freshwater fish species of North East India representing 112 genera and 36 families.

Nagaland is a hilly mountainous state in Northeast India, bordering Myanmar. The states is located between 25.6 and 27.4 N degrees latitudes and between 93.20 and 95.13 E degrees longitudes. It encompasses a geographic area of 16,579 sq. km. Nagaland has a well fisheries potential, it is endowed with rich and unique natural resources which provide immense potential for aquaculture development.

The major rivers of Nagaland are Dikhu, Zungki, Doyang, Dhansiri, Tsurong, Nanung, Disai, Tsumok, Menung, Dzu, Langlong, Zunki, Likimro, Lanye, Dzuza, Manglu and Tizu. All these river are dendritic in nature. Fishery play an integral part which has tremendous potential of becoming a major contributor towards the improvement of states economy providing livelihood and employment to the local populace [16].

A great number of fish species have been reported from the varied aquatic resources. The total of 197 valid of fish species has been reported from Nagaland [17]. According to the study [18] carps dominated the reservoir fishery followed by catfishes, loaches, mahseers, snakeheads and spiny eels and majority of fishe species found have high ornamental and food values. The study on Ichthyofaunal recorded a total of 46 species belonging to 30 different genera under 14 families and 5 orders [19].

The total recorded from Doyang river, 64 numbers of freshwater fishes, 6 order, and 16 families [20]. Dikhu river is one of the tributaries of (flows into) Brahmaputra river. The river is one of the most prominent rivers of Nagaland that flows across Mokochung and Longleng districts. The Dikhu river is located between 26° N of latitude and 94° E of longitude. It encompasses geographical area of 16,579 km^3. It has a total length of about 160 km, originates from Nuroto Hill area in Zunheboto district. The measurement point of Dikhu River in Nagaland is from Surumi area to Naginimora.

The river flows further and finally mereges with the Brahmaputra river in the plains of Assam. Dikhu river is a major source of water for the people and provides food in the form of fishes all year long. The Dikhu River was principally focused to find out the freshwater fish diversity. In Nagaland, the study on the diversity of fishes in Dikhu river is not yet documented. So, the fundamental aim of the present study is to make a record to the fish diversity and studies on fishes present in the river.

Objectives

The major objective of the research works include:

1) To study the diversity of fishes in Dikhu River, under Longleng District.
2) To identify their taxa and study their classification.

2. MATERIALS AND METHODS

2. 1. Study area

The present study was conducted on August 2020 in Dikhu River of Longleng District. The Dikhu River is one of the most prominent river of Nagaland. The river flows across Mokochung and Longleng districts, The sampling area Dikhu River is a major source of water for the people and provides food in the form of fishes all year long.

2. 2. Collection of fishes

Study has been conducted in Dikhu River of Longleng District on August 2020. Fish were collected by some indigenous methods such as bait, hook, fishing net and hand picking, etc.

The fishes were photographed and were preserved, in concentrated formaldehyde in the field itself and then in 10% formalin.

2. 3. Identification of Samples

For identification, systematic list and classification, Jayaram (1999) was followed, while nomenclature was after FishBase (http//www.fishbase.org).

(A) **(B)**

(C)

Fig. 1(A-C). Study Area of Dikhu River.

3. RESULTS

The present study recorded 11 species of fishes, representing 5 orders (Cypriniformes, Siluriformes, Perciformes, Synbranchiformes and Anguilliformes), 9 families (Cyprinidae, Balitoridae of the order Cypriniformes, Sisoridae, Siluridae, Heteopneustidae, Bagridae of the order Siluiformes, Mastacembelidae of the order Synbranchiformes, Anguillidae of the order Anguilliformes, Channidae of the order Perciformes), 11 genera. They were represented by 4 species of Cypriniformes, 3 species of Siluriformes, 2 species of Perciformes, 1 species of Synbranchiformes and 1 species of Anguilliformes.It was found that the number of order Cypriniformes recorded higest (4) followed by order Siluriformes (3), order Perciformes (2), and order Sybranchiformes, Anguilliformes (1). The number of recorded species in the present study signifies the rich diversity of fishes in Dikhu River.

4. DISCUSSIONS

The Present study in Dikhu River revealed the total of 11 (Table 1) species representing 5 different orders *viz* Cypriniformes, Siluriformes, Perciformes, Synbranchiformes and Anguilliformes. A study on the diversity of fish species help us to understand the structural component of fishes and the value of fishes to the people for variety of purposes. A total of 4 genera *Barilius bendelisis* sp. (Cyprinidae), *Balitora brucei* sp. (Balitoridae), *Devario aequipinnatus* sp. (Cyprinidae), *Garra annandalei* sp. (Cyprinindae) of order Cypriniformes; 3 genera Glyptothorax indicus sp. (Sisoridae), *Silurus afghan* sp. (Siluridae), *Heteropneustes fossilis* sp. (Heteopneustidae) of order Siluriformes; 2 genera *Channa orientalis* sp. (Channidae), *Channa punctata* sp. (Channidae) of order Perciformes; 1 genera *Mastacembelidae armatus* sp. (Mastacembelidae) of order Synbranchiformes; 1 genera *Anguilla bengalensis* sp. (Anguillidae) of order Anguilliformes have been recorded (Table 2).

The order basis percentage analysis of the recorded fish species on the basis of availability showed that the highest occurrence from the order Cypriniformes composed of 37%, followed by Siluriformes composed of 27%, Perciformes composed of 18% and the remaining order Synbranchiformes, Anguilliformes composed of 9%.

The number of individual species was highest from the order Cyprinformes (*Devio aequipnatus* sp.). The order Cyriniformes was the highest in the study period. The result was similar to the study recorded in the wetlands of Chhatak, Bangladesh (Armina Sultana, *et al* 2017) [21-34]. Where the order Cypriniformes was found to be dominant constituting 35% of the total fish population. The short term study does not cover up all the fish species that are found in the river. Therefore, further study can be done (Figs 2-12).

Fig. 2. *Mastacembelus armatus*

Fig. 3. *Barilius bendelisis*

Fig. 4. *Balitora brucei*

Fig. 5. *Glyptothorax indicus*

Fig. 6. *Channa punctata*

Fig. 7. *Anguilla bengalensis*

Fig. 8. *Channa orientalis*

Fig. 9. *Danio aequipinnatus*

Fig. 10. *Silurus afghana*

Fig. 11. *Heteropneustes fossilis*

Fig. 12. *Garra annandalei*

Table 1. List of fishes recorded from the study.

Order	Family	Species
Cypriniformes	Cyprinidae	*Barilius bendelisis*
	Balitoridae	*Balitora brucei*
	Cyprinidae	*Devario aequipinnatus*
	Cyprinidae	*Garra annandalei*
Siluriformes	Sisoridae	*Glyptothorax indicus*
	Siluridae	*Silurus afghan*
	Heteopneustidae	*Heteropneustes fossilis*
Perciformes	Channidae	*Channa orientalis*
	Channidae	*Channa punctata*
Synbranchiformes	Mastacembelidae	*Mastacembelidae armatus*
Anguilliformes	Anguillidae	*Anguilla bengalensis*

Table 2. Total number of species recorded from the study.

Order	Species	No. of species
Cypriniformes	*Barilius bendelisis*	52
	Balitora brucei	31
	Devario aequipinnatus	56
	Garra annandalei	23
Siluriformes	*Glyptothorax indicus*	1
	Silurus afghan	2
	Heteropneustes fossilis	17
Perciformes	*Channa orientalis*	6
	Channa punctata	8
Synbranchiformes	*Mastacembelidae armatus*	13
Anguilliformes	*Anguilla bengalensis*	4

5. CONCLUSION

Dikhu River is one of the most prominent river of Nagaland. The present study is the first study on the diversity of fishes in Dikhu River, Longleng Nagaland. The study revealed that the fish species collected from the Dikhu River are represented by 11 species individuals, belonging to 5 orders, 9 families and 11 genera. Among them order Cypriniformes was found to be the most dominant one and the number of individual species was highest from the order Cyprinformes (*Devio aequipnatus* sp.). The fishes are the most diverse vertebrate taxa, yet the least studied group because of their complex life history patterns. However, the fishes are also the most threatened group after amphipians becausse of constant pressure on their habitats by human activities. Therefore it would be important to inventory and to ascertain status of fish species for conservation efforts.

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