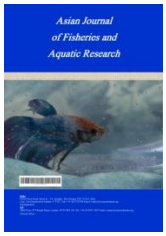

Asian Journal of Fisheries and Aquatic Research

18(1): 16-22, 2022; Article no.AJFAR.88717
ISSN: 2582-3760

Ichthyofaunal Diversity of Downstream Dikhu River and its Tributaries in Mon District of Nagaland, India

Shanglow Ln Konyak [a*] and Limatemjen [a]

[a] Department of Zoology, Kohima Science College, Jotsoma-797002, India.

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJFAR/2022/v18i130427

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/88717

Original Research Article

Received 12 April 2022
Accepted 24 June 2022
Published 29 June 2022

ABSTRACT

This study has been undertaken to investigate the Ichthyofaunal diversity, their present IUCN conservation status and economic value within the downstream Dikhu river and its tributaries in Mon district of Nagaland between 2019 to 2020. During the survey a total number of 22 fish species belonging to 4 orders, 8 families, 6 sub-families 17 genera were recorded. The catch lists composition showed the predominance of cyprinidae with 50%, Balitoridae 14%, Bagridae and Sisoridae 9%,Amblycipitidae and Channidae 5% whereas Psilorhynchynchidae and Belonidae represented by 4% each.The most significant of the investigation was the finding of endangered (EN) species *Tor putitora*, near threatened (NT) *Nimacheilus manipurenis and* four species Nemacheilus sikmaeinsis, Barilius barana, Garra lissorhynchus and *Bagarius yarrelli* as a vulnerable (VU) species of IUCN Red list.

Keywords: Ichthyofaunal diversity; Downstream Dikhu River; Fishes; species; conservation.

1. INTRODUCTION

Ichthyofaunal diversity refers to array of fish species; counting on context and scale, it may be alleles or genotype among the fish population within the aqua regimes [1]. Fish represent almost half the overall vertebrates described in the world. They will be found in almost all the conceivable aquatic environments. Fish exhibit enormous diversity of shape, size and biology, and within the habitats they occupy Nelson [2]. But rapid growing population and concomitant

**Corresponding author: Email: shanglowlowming@gmail.com;*

increases, in contrast of natural resources are the supreme challenge for the aquatic resource management [3, 4, 5, and 6]. With the use of increasingly sophisticated fishing gear, fish are being overfished throughout the world, and the expansion of fisheries has been linked to a decline in many fish stocks [7,8]. There is an increasing concern worldwide for the loss of aquatic ecosystems and associated biodiversity particularly for riverine landscapes [9]. Therefore, there is an urgent need for both conservation efforts and fish resource exploration at the study location.

Nagaland is a mountainous state of the north eastern part of India. Natural fish stock populations in the state are largely supported by its distinctive terrain, variety of physiographic features, and watershed pattern. Different fish species have been identified from the diverse aquatic resources by individuals such as [10-13]. It appears that no detailed survey was conducted to document the existence of diversified fish fauna in the various drainage systems of Nagaland, even though, there is possibility of more species unexplored in the river/hill streams. Hence, the current survey was carried out in order to ascertain the fish diversity, IUCN status of conservation, and economic significance of the downstream Dikhu river system in Mon district, Nagaland.

2. MATERIAL AND METHODS

2.1 Study Site

The Dikhu river has a latitude of 26.5364356, longitude of 94.709655, Elevation of 486m/1594 feet and has a total length of 160 km (Fig. 1). It is one of the most prominent rivers of Nagaland which originate from Nuroto Hill area of Zunheboto and passes through Tuensang, Longleng, Mokokchung and Mon districts of the state Nagaland. The Dikhu river is one of the principle tributary of Brahmaputra and the river offered rich fish fauna which include food fishes, ornamental fishes, game fishes, etc. The rich fauna is attributed to many reasons, *viz*., the geomorphology, consisting of hills, plateaus and valleys, resulting in the occurrence of a variety of torrential hill streams, rivers, lakes and swamps [13].

2.2 Collection and Identification

The documentation of present study was carried out with the help of local fishermen having experienced the art of fishing in fishing technologies over a decades. Fish samples were collected through experimental fishing technique with different locally adopted technique, and cast nets, gill nets of various shape and sizes.

The specimens and the sites of the area were photographed and all the essential data like place of collection, number of fish caught, body color, body marking etc were recorded in the field itself. The specimens collected in the Field were kept in 5% formaldehyde as described by Joshi and Sreekumar [14] and the collected specimens were deposited in the laboratory of department of Zoology, Kohima Science College, Jotsoma for identification using a standard taxonomic reference [15,12,16].

Fig. 1. Map showing selected stations in downstream Dikhu river system
(Image © 2022 CNES / Airbus: © 2022 Maxar Technologies)

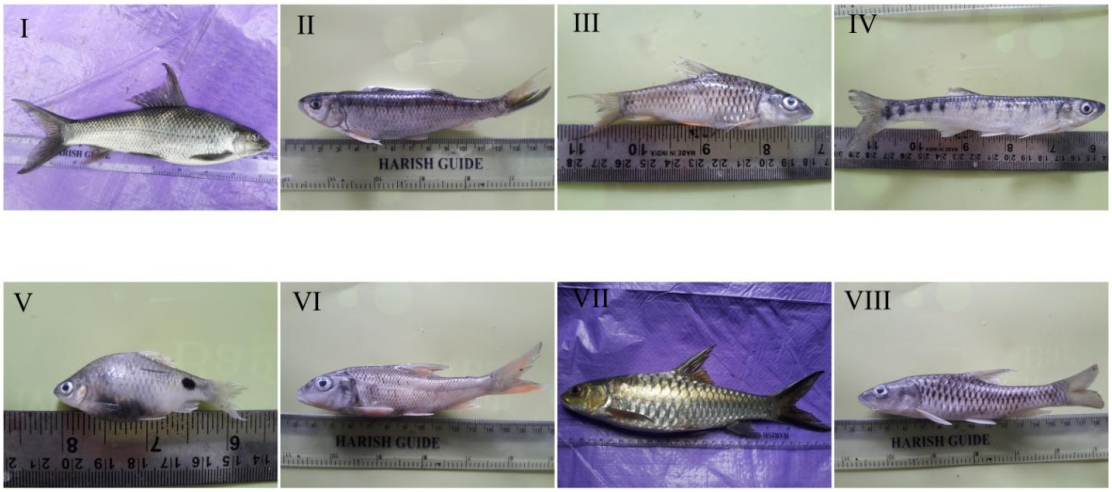

Fig. 2. I*. Labeo calbasu* II*. Barilius barna* III*. Chagunius chagunio* IV*. Barilius vagra* V*. Cyprinius conchonius* VI*. Barilius bendelisis* VII*. Neolissocheilus hexagonolepis* VIII*. Tor putitora*

3. RESULTS AND DISCUSSION

In the present study, a total of 22 species of fishes belonging to 4 orders, 8 families, 6 sub-families and 17 genera (Table 1) were identified from the downstream Dikhu river system. The family Cyprinidae dominated the catch lists with 50%, Balitoridae 14%, Bagridae and Sisoridae 9% ,Amblycipitidae and Channidae 5% whereas Psilorhynchynchidae and Belonidae represented by 4% each (Fig. 3). During the survey, presence of 13 least concern (LC) species , 3 lower risk-near threatened (LR-nt) species, *4* vulnerable (VU) species viz *Bagarius yarrelli, Barilius barana Garra lissorhynchus*, *Nemacheilus sikmaeinsis, 1* Near threatened (NT) species viz *Nimacheilus manipurenis and* 1 endangered (EN) species viz *Tor putitora* were recorded (Table 1). One of the major discoveries is the report of *Tor putitora*, this record is remarkable yet needed conservation strategies been listed under endangered on the IUCN (3.1) Red List.

Though the state of Nagaland lies within one of the biologically hot spot region of the world [17], The region is not spared from the worrying repercussions of so-called civilization. The aquatic environment of the current study location is severely threatened by widespread habitat damage, overfishing, and other illegal activities including the use of electrofishing and dynamite bombing, among other things. Another significant element that contributes to the loss of biodiversity in the state is the presence of indigenous people, who have long practices of fishing and hunting. The state adheres to the general belief of the people of north-eastern India that "all fishes are designed to be eaten," with the exception that some fish species are preferred to others [18].

Despite the pressure that anthropogenic activities place on the fish fauna, the state's abundant biodiversity resources are reflected in the rapid discovery of several fish species that are new to science. Thus, evaluation and documentation of the available fish species become essential for proper implementation and conservation measures. The presence of 1 endangered fish species, 4 vulnerable species, and 1 near threatened species from the current survey is extremely concerning. For that reason, there is a critical need for both fish resource exploration and conservation at the study location. Since habitat destruction is one of the primary mechanisms affecting biodiversity loss, most biologists are concerned about its importance for habitat conservation measure. Biodiversity conservation is one of the major issues and aquatic environments are in serious threats therefore, it is necessary to protect and develop research and systematic conservation planning to protect freshwater biodiversity. Cooperative efforts across the entire landscape are necessary for the long-term maintenance of species and their management. Instead of dealing with biodiversity on a species level, it should be done at the habitat or ecosystem level. Local media, by utilising a variety of communication channels may address the issue

Table 1. Systematic list of Ichthyofauna of Dikhu River System

Sl.no	Systematic position	Common name	Fins Formula	Economic value	Conservation status (IUCN)
1	**A.ORDER:CYPRINIFORMES**				
	1.Family: Balitoridae				
	I Sub Family: Nemacheilinae				
	1.Nemacheilus manipurenis (Chaudhuri ,1912)	Mainpur loach	Di6;Pi5;VI6;Ai 5 C18.	Or	NT
	2. *Nemacheilus sikmaeinsis* [10]	Sikmai loach	Dii7;Pi9-10;Vi9;Aii 5.	Fd, Or	VU
	3. *Nemacheilus scaturgina* (McClelleand,1839)	McClelland loach	D iii 7;Pi9;Vi9;Ai5.	Or	LR-nt
	2**.Family: cyprinidae**				
	I.Sub family: Rasborinae				
	1.*Barilius barna* (Hamilton-Buchanan,1822)	Barna baril	Diii6; Pii 12;VI9;Aiii11-12;C18.	Fd, Or	VU
	2. *Barilius vagra* (Hamliton-Buchanan,1822)	Vagra baril	Dii-iii7;P i14-15;Vi7;Aii12;C19.	Fd, Or	LC
	3. *Barilius bendelisis* (Hamilton-Buchanan,1822)	Hamliton's barila	D iii 8; P i 14; V ii 9; A ii 8; C19.	Or	LC
	II.Sub family: Danioninae				
	1.Danio aequipinnatus (McCleland,1839)	Giant danio	Dii7-8;P ii12; Vi9;Aii-iii 13-14;C21.	Or	LR-nt
	2.Danio dangila (Hamilton,1822) McClelland,1843)	Dangila danio	D ii 7; P i 12;Vii 9;Aii 5;C19.	Fd, Or	LC
	III.Sub family: Garrinae				
	1. *Garra lissorhynchus* (McClelland,1843)	Khasi garra	D iii 6; Pi12; Vii8;A ii6;C19.	Fd	VU
	IV.Sub family: Barbinae				
	1.Cyprinius conchonius (Hamilton-Buchanan,1822)	Rosy bard	Diii7-8;Aii-iii 5;Pi18;Vi8;C19.	Fd, Or	LC
	V.**Sub family: Cyprininae**				
	1. Cyprinius chagunio (Hamilton-Buchanan,1822)	Lalputi	Dv8;Pi15;Vi 8; Aiii5; C19.	Fd	LC
	2. *Tor putitora*	Putitor mahseer	D iii8-9;Pi18;Vi8;A ii 5;C19.	Fd, S	EN

Sl.no	Systematic position	Common name	Fins Formula	Economic value	Conservation status (IUCN)
	(HamiltonBuchanan,1822)				
	3.*Labeo calbasu* (Hamilton-Buchanan,1822)	Kalbasu	Diii15; Pi16;V i8;A ii5;C19.	Fd, S	LC
	4. *Neolissocheilus hexagonolepis* (McClelland)	Chocolate mahseer	D iv 9;Pi16;Vi8;A iii5;C19.	Fd,S	LC
	3.Family: Psilorhynchynchinae				
	1.Psilorhynchynchus homaloptera [3]	Homaloptera minnow	Diii 9;P vii-viii 10; Vii 8; A ii 5; C18.	Fd	LC
2	**B.Order:Siluriformes**				
	I.Family : Amblycipitidae				
	1.Amblyceps mangois (Hamilton-Buchanan,1822)	Indian torrents catfish	Di5-6;P i 6;V i 4;A i 8;C 19.	Or	LR-nt
	II.Family: Bagridae				
	1.Olyra longicaudatus (McClelland,1842)	Himalayan olyra	Dii7;Pi 5;V ii4;Aii16-20;C19.	Or	LC
	2. *Aorichthys aor* (Hamilton-Buchanan,1822)	Long whiskered catfish	Di7-8;Pi18;V i 5;A iii 8;C17.	Fd	LC
	III.Family: Sisoridae				
	1.Bagarius yarrelli (Sykes,1841)	Goonch	Di7;Pi11-14;Vi5;Aii9-12;C19	Fd	VU
	2. Glyptothorax trilineatus (Blyth,1860)	Blyth's glyptothorax	Di6-7;Pi 10; V i 5; A i 10.	Fd, Or	LC
3	**C.Order: Perciformes**				
	I.Family: Channidae				
	1. *Channa stewartii* (playfair,1867)	Assamese snakehead	Di 38-39;Pi 19;Vi 5;A i28;C17.	Fd, Or	LC
4	**D.Order: Beloniformes**				
	I.Family: Belonidae				
	1.Xenentodon cancila (Hamilton-Buchanan,1822)	Freshwater garfish	Di17-19;Pi10 ;V i7;Ai16-18;C15.	Or	LC

Fd: Food; O: Ornamental, S: Sport, EN-Endangered; NT- Near Threatened; VU-Vulnerable; LC;Least Concern; LR-nt: Lower Risk (near threatened),D-Dorsal; V-Pelvic; P-Pectoral; A-Anal

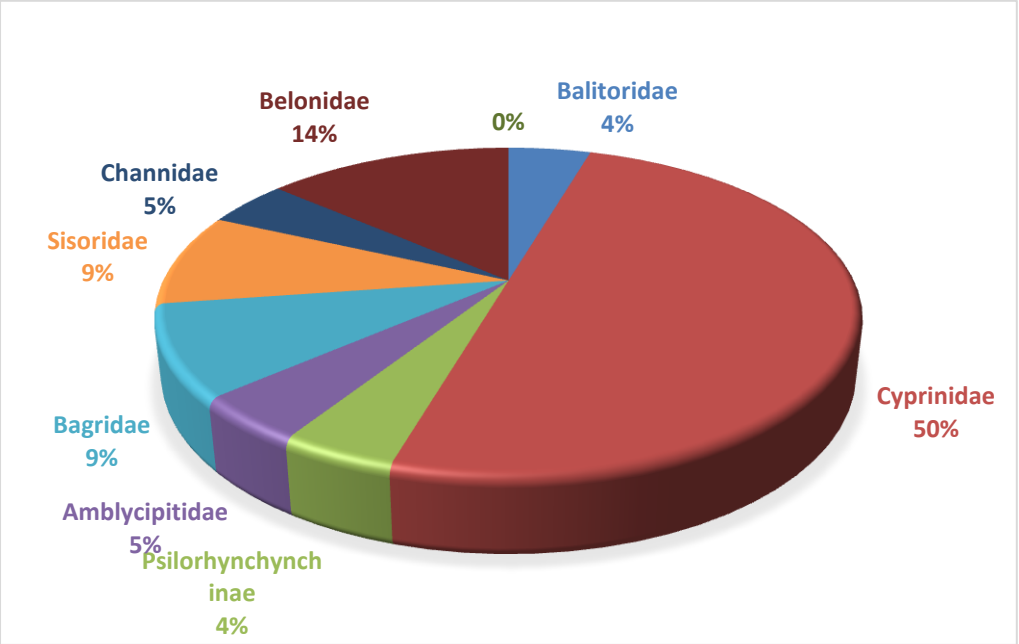

Fig. 3. Percentage composition of fish families from downstream of Dikhu river system

of biodiversity to educate and to raise the awareness among the public about it. Environmental actions at the national and international levels need to be strengthened to safeguard the biodiversity otherwise no immune to further change of existing threat intensity or the new threat arises [19,20].

4. CONCLUSION

The present work of Ichthyofaunal diversity of the downstream Dikhu river and its tributaries shows that this particular river system is endowed with a variable type of fishes. From the investigation a total of 22 species of fishes belonging to 4 orders, 8 families, 6 sub- families, 17 genera (Table 1) were identified from the downstream Dikhu river system. The family Cyprinidae dominated the catch lists with 50%, Balitoridae 14%, Bagridae and Sisoridae 9% ,Amblycipitidae and Channidae 5% whereas Psilorhynchynchidae and Belonidae represented by 4% each (Fig. 3). Present surveys recorded the presence of 13 least concern (LC) species , 3 lower risk-near threatened (LR-nt) species, *4* vulnerable (VU) species, one species each under near threatened (NT) and endangered (EN) species categories of IUCN (3.1) Red list.

ACKNOWLEDGMENT

The first author SLK would like to give special thanks to local fishers especially Mr. Takyong, Mr. Taiwang and Mr. Phongwing for their valuable help during my field trip and Mr. Zenwang Konyak for his valuable suggestions while writing this paper. Word are short to express my deep sense of gratitude towards Dr. Methlow and YM Yollow for their unconditional financial support and for always being there as a source of encouragement. The authors would like to thank HOD, Dept. of Zoology Kohima Science College, Jotsoma for allowing to use laboratory facilities and also every individual who has immensely contributed to this work.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Burton PJ, Balisky AC, Coward LP, Kneeshaw DD. and Cumming SG. The value of managing for biodiversity. The forestry chronicle. 1992;68(2):225-237.
2. Nelson JS. Fishes of the world, Johm Wiley and Sons, New York.1984 523.
3. Noss RF and Peters RL. Endangered ecosystems: a status report on America's vanishing habitat and wildlife. Defenders of Wildlife, Washington, DC; 1995.
4. Folkerts GW. State and fate of the world's aquatic fauna;1997.

5. Cordell HK, Bliss CY, Johnson and Fly M. Voices from the southern forests. Trans. N. Am. Wildl. Nat. Resour. Conf. 1998;63:332-347.
6. Melvin L. Warren Jr, Brooks MB, Stephen JW, Henry LB, Robert CC et al., Diversity,Distribution, and Conservation Status of the Native Freshwater Fishes of the Southern United States, Fisheries. 2000;25:10, 7-31.
DOI: 10.1577/1548 8446(2000)025<0007:DDACSO>2.0.CO;2 (Accessed on 07 May 2022)
7. Allan JD, Abell R, Hogan Z, Revenga C, Taylor BW. Overfishing of inland waters. Bioscience. 2005;55:1041-1051.
8. Priyanka M, Dwivedi AC. Biology of Cirrhinus mrigala and Oreochromis niloticus. LAP LAMBERT Academic Publishing, Germany; 2015.
9. Dunn H. Can conservation assessment criteria developed for terrestrial systems be applied to river systems. Aquatic Ecosystem Health and Management. 2004;6:81-95.
10. Hora SL. On a further collection of fish from the Naga Hills. Records of the Zoological Survey of India.1936;38(3):317-331.
11. Kosygin L, Vishwanath W. A report on fish diversity of Tizu River, Nagaland with some new records. Ecology environment and conservation. 1998;4:243-247.
12. Ao S, Dey SC, Sarmah SK. Fish and fisheries of Nagaland. Inland Fisheries Society of India. 2008;26:1-19.
13. Goswami UC, Basistha SK, Bora D, Shyamkumar K, Saikia B, Changsan K. Fish diversity of North East India, inclusive of the Himalayan and Indo Burma biodiversity hotspots zones: A checklist on their taxonomic status, economic importance, geographical distribution, present status and prevailing threats. International Journal of Biodiversity and Conservation. 2012;4(15): 592-613.
14. Joshi KK, Sreekumar KM. Basics of sample collection, preservation and species identification of finfish; 2015
15. Talwar PK and Jhingran AG. Inland Fishes of India and Adjacent Countries. Oxford-IBH Publishing Co.Pvt. Ltd., New Delhi.1991;1158 .
16. Jayaram KC. The Freshwater Fishes of the Indian Region (Revised second edition); 2010
17. Myers N, Mittermeier RA, Mittermeier CG, da Fonseca GAB, Kent J. Biodiversity hotspots for conservation priorities. Nature. 2000;403:853-858.
18. Gurumayum S, Kosygin L and Tamang L. Ichthyofaunal diversity of Arunachal Pradesh, India: A part of Himalaya biodiversity hotspot. International Journal of Fisheries and Aquatic Studies. 2016;4(2):337-346.
19. Benz GW and Collins DE. Aquatic fauna in peril: the Southeastern perspective. Special Pub.1, Southeast Aquatic Research Institute, Lenz Design and Communications, Decatur 1999;1-16
20. Maitland PS. The conservation of freshwater fish: past and present experience. Biological Conservation. 1995; 72(2):259-270.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/88717