A Preliminary Study on Spatio-Temporal Variation of Freshwater Fish Assemblage in Khudia Dam, Bilaspur Chhattisgarh

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ABSTRACT

The variety of the ichthyofauna of the Khudia Dam in Bilaspur, Chattisgarh, was investigated. Fish from the dam were sampled using gill nets, hook and lines, and cast nets for a full year (2019–2020). The fishes were recognised by looking at the morphological information. In Khudia dam a total of 13 orders, 28 genera and 45 species belonging to 13 families were reported during 2019 to 2020. The family Cyprinidae contributed the most, with a maximum share of 48.90%, followed by the ambassidae (11.20%), anabantidae (6.80%), Mastacembelede (6.75%), and bagridae with 6.67% of fish species. 19.68% of the species in Khudia Dam are contributed by the remaining 9 families. The dominance of some families may be due to their high levels of environmental adaption and prodigious ability to reproduce. According to reports, the fish species in Khudia Dam fall under various IUCN conservation categories. According to our research, 56.0% of fish species are considered to be of least concern, 13.0% are considered to be near-endangered, 13.0% are considered to be threatened, and 18.0% are considered to be vulnerable. In the dam, the condition of the fish assemblage is rapidly declining. To corroborate the physical and chemical habitat disturbances in these freshwater bodies in Bilaspur, Chhattisgarh, more study along separate disturbance

Keywords: Khudia Dam, Fish diversity, Conservation status.

INTRODUCTION

Aquatic ecosystems are the foundation for life on Earth and continue to be necessary for it now (Arthington, et.al., 2010). Water makes up the majority of all species, and aquatic ecosystems' ability to control air temperature, produce oxygen, and support a variety of other vital ecosystem processes determines how well those ecosystems work (Dalsgaard, et.al., 2013). Aquatic ecosystems are made up of both biotic and abiotic elements. Rivers, seas, lakes, ponds, dams, streams, swamps, bays, marshes, lagoons, and other associated areas are all considered to be part of an aquatic ecosystem. There are about 22-30000 species of fishes identified in the world, out of which 11% are reported from Indian water (Venketraman and Raghunathan, 2015; McDermot, 2021). However, given the dearth of knowledge regarding the diversity and distribution of fish species worldwide, this data is still less. Therefore, thorough research on diversity and distribution could be useful in developing elite conservation efforts.

Fish are the first known vertebrates, and they can only be found in water (Powrie, 1870). There's a chance that little fish served as the ancestor of several modern vertebrates (Lingham-Soliar, 2014). Some of these changed into amphibians that spend some of the day on land and some of it in the water. Before becoming seals, dolphins, or whales, other fish changed into land mammals. According to research, out of the 54000 vertebrate species that exist worldwide, over 30000 are fish species that are found in various aquatic habitats. There are over 450 families of freshwater fish worldwide. Due to its abundance in biodiversity, India is recognised as a mega diversity country. India, one of the countries with high levels of biodiversity, is ranked tenth in the world for freshwater megabiodiversity (Mittermeier , et.al., 1998).

The diversity of fish species in India is mostly a result of the changing aquatic environment (Ghosh and Roy, 2022). Since the dams, reservoirs, lakes, and ponds in various rural and urban locations serve as spawning grounds for inland fresh water fish (Abbasov, et.al., 2022). There have been numerous reports of fishing in India's rural dams, reservoirs, lakes, and ponds. These villages overuse these resources at an alarming pace because they are ignorant of the need to conserve, maintain, and manage fish species. Thus, research into the variety and conservation status of various fish assemblages is essential for the scientific community nationwide. The goal of the current study was to identify the ichthyological biodiversity of Khudia dam of Bilaspur Chhattisgarh. The study will aid in categorising fresh water fish conservation efforts in Bilaspur, Chhattisgarh, and determining their level of threat.

MATERIAL AND METHODS

Khudia Dam is located in Bilaspur, CG. The dam is located between $22^0$24’ 17’’ N Latitude and 81^0 35’ 40’’ E Longitude. The dam has been as important source of drinking, cooking, bathing and irrigation of the local people. The fishes of the dam were sampled for 12 months (2019-2020) using gill net, hook and line and cast net. To assess the fish diversity across different seasons of the Kori dam of Bilaspur Chhattisgarh A boat was hired and the sampled dams were visited and the fish samples were collected carefully throughout the study period.

After the arrival at the sampling sites, a careful observation was made from the bank of the water bodies and visual counts from an approximate 2mx2m area was carried out in clear water. All the fish specimens were identified based on morphometric and meristic characters following Rahman (2005,2007) and Talwar and Jhingran(1991). Identified species were classified based on the classification system of Nelson (2006). Scientific names and authorities follow those of Froese and Pauly, (2015). The conservation status categories (Near Threatened, Least Concern, Vulnerable etc.) are based on the online classification database developed by the International Union for the Conservation of Nature and Natural Resources (IUCN, 2015).

RESULTS

In Khudia dam a total of 13 orders, 28 genera and 45 species belonging to 13 families were reported during 2019 to 2020 (Table-1). The combined morphometric and meristic approach enabled accurate identification of the fishes at species-level. The different species identified in Kori dam during the study were; *Amblypharyngodon microlepis, Amblypharayngdon mola, Amphipnous cuchia, Anabas cobojius, Anabas testudinus, Anabas cobojius, Aspidoparia mora, Barilius barila,Chanda nama, Chanda ranga, Channa gachu, Channa punctatus, Channa striatus, Chela laubuca, Catla catla, Cirrhinus mrigala, Colisa fasciata, Crossocheilus latius, Cyprinus capio, Ctenopharyngodon idela, Esomus danricus, Glossogobius giuris, Heteropneustus fossilis, Labeo gonius, Labeo rohita, Lepidocephalichthys guntea, L. thermalis, Macrognathus aculeatus, M.armatus, M.guntheri, Mystus bleekeri, M.oar, M. tengara, Notopterus notopterus, Osteobrama cotio, Puntius chola, P.sophor, P.conchonius, P. sarana, P.punctatus, Penaeus indicus, Qxygaster bacaila, Rasbora elanga, Rasbora elanga,and Telapia mossambica.* The differences in dam morphometry, moderate exploitation, food supplies, photoperiod, dam size, and seasonal physico-chemistry may be regarded as the major factors of high diversity of fish species in Khudia dam. It has also been observed that local people use this water body for the drinking and other domestic purposes. The fishes of the dam are been continuously used by the local people as food and they exploit this ichthyofaunal diversity of the dam.

TABLE-1. Spatio-temporal variation of fish assemblages in the **KHUDIA** dam, Bilaspur 0f Chhattisgarh during July 2019 to June 2021

S.No	Fish Species	Family	SEASON			Conservation Status
			Monsoon	Winter	Summer	
01	***Amblypharyngodon microlepis***	Cyprinidae	+	+	+	VU
02	***Amblypharayngdon mola***	Cyprinidae	+	+	+	VU
03	***Amphipnous cuchia***	Synbranchidae	-	+	+	NE
04	***Anabas cobojius***	Anabantidae	-	+	+	VU

05	***Anabas testudinus***	Anabantidae	+	+	-	LC
06	***Anabas cobojius***	Anabantidae	+	+	-	VU
07	***Aspidoparia morar***	Cyprinidae	+	-	+	LC
08	***Barilius barila***	Cyprinidae	+	+	-	LC
09	***Chanda nama***	Ambassidae	+	+	-	NT
10	***Chanda ranga***	Ambassidae	-	+	-	NT
11	***Channa gachua***	Ambassidae	-	+	+	LC
12	***Channa punctatus***	Ambassidae	+	-	+	LC
13	***Channa striatus***	Ambassidae	-	+	-	VU
14	***Chela laubuca***	Cyprinidae	-	+	-	LC
15	***Catla catla***	Cyprinidae	-	+	-	NT
16	***Cirrhinus mrigala***	Cyprinidae				LC
17	***Colisa fasciata***	Osphronemidae	+	+	+	NT
18	***Crossocheilus latius***	Cyprinidae	-	+	+	LC
19	***Cyprinus capio***	Cyprinidae	-	+	-	VU
20	***Ctenopharyngodon idela***	Cyprinidae	-	+	-	VU
21	***Esomus danricus***	Cyprinidae	+	+	+	NE
22	***Glossogobius giuris***	Gobiidae	+	+	-	NE
23	***Heteropneustus fossilis***	Saccobranchidae	+	+	-	VU
24	***Labeo gonius***	Cyprinidae	+	+	+	LC
25	***Labeo rohita***	Cyprinidae	-	+	-	LC
26	***Lepidocephalichthys guntea***	Cobitidae	+	+	-	VU
27	***L. thermalis***	Cobitidae				VU
28	***Macrognathus aculeatus***	Mastacembelede	-	-	+	NE
29	***M.armatus***	Mastacembelede	+	+	-	VU
30	***M.guntheri***	Mastacembelede	+	+	-	VU
31	***Mystus bleekeri***	Bagridae	+	+	+	NT

32	***M.oar***	Bagridae	-	-	+	NT
33	***M. tengara***	Bagridae	+	+	-	LC
34	***Notopterus notopterus***	Notopteridae	-	+	+	NT
35	***Osteobrama cotio***	Cyprinidae	+	-	+	VU
36	***Puntius chola***	Cyprinidae	-	+	+	NT
37	***P.sophor***	Cyprinidae	+	+	-	NT
38	***P.conchonius***	Cyprinidae	+	+	-	NT
39	***P. sarana***	Cyprinidae	+	+	-	NT
40	***P.punctatus***	Cyprinidae	+	+	-	VU
41	***Penaeus indicus***	Penaeidae	+	+	+	LC
42	***Qxygaster bacaila***	Cyprinidae	-	+	-	VU
43	***Rasbora elanga***	Cyprinidae	-	+	+	NE
44	***Rasbora elanga***	Cyprinidae	+	+	+	LC
45	***Telapia mossambica***	Cichidae	+	+	+	VU

*(Note: **LC**=Least concern, **NE**= Not Evaluated, **VU**= Vulnerable, **NT**=Not Threatened)

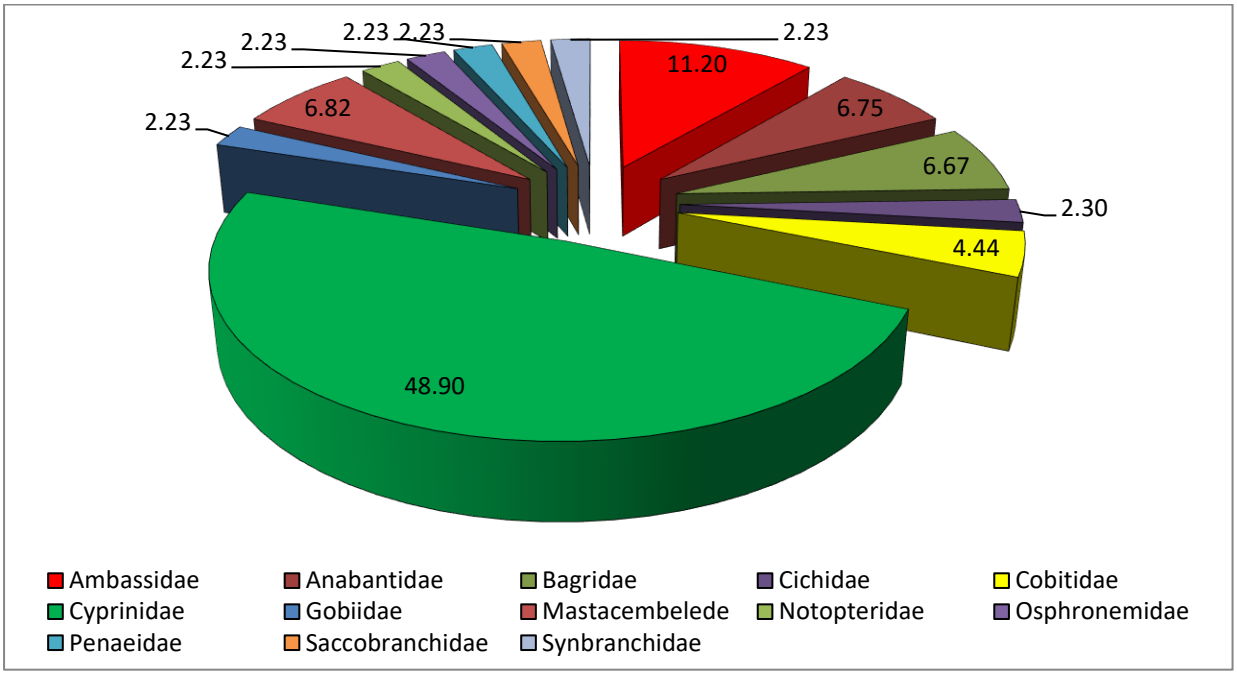
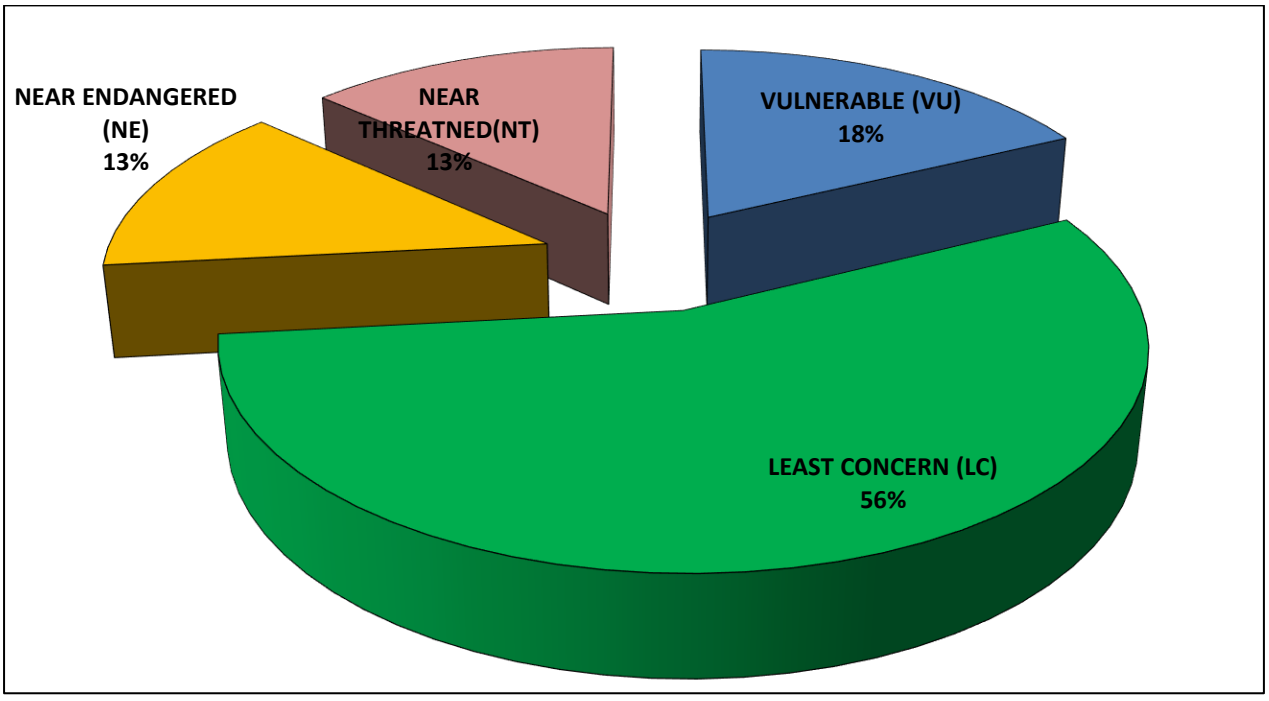


Fig-1: Family wise species composition (%) in **KHUDIA** Dam, Bilaspur District, Chhattisgarh

A significant variation of fish diversity was observed across different seasons of the year. The presence of different families across different seasons represents the sustainable distribution of fish species across the year in Chhattisgarh. Fig-1 represents the composition of different families in Khudia Dam. The family Cyprinidae contributed the most, with a maximum share of 48.90%, followed by the ambassidae (11.20%), anabantidae (6.80%), mastacembelede (6.75%), and bagridae with 6.67% of fish species. 19.68% of the species in Khudia Dam are contributed by the remaining 9 families (Fig-1). The dominance of some families may be due to their high levels of environmental adaption and prodigious ability to reproduce (Russel, et.al., 2012;Bouma-Gregson, et.al., 2022). The dominance of family cyprinidae is due to a number of factors, including high proliferation, good parental care, high rates of juveniles and adult survival, diverse feeding protocols, high population in response to predation and other forces of population decay, while productivity and changes to hydrological regimes (Lazem and Attee, 2016; Kim, et.al., 2017; Malik, et.al., 2022). Also we observed that some fish species show higher abundance than other across the year. Their flexibility to various feeding strategies, moderate body size in relation to development rate, moderate degree of fertility, and accessibility of macrophytes and debris as food sources are all credited with their exceptional abundance (Kennard, et.al., 2005; Iber and Ojutiku, 2018; Soo, et.al., 2021;Andrabi, et.al., 2022).

Fig-2: Percentage of fish species under different conservation categories as per IUCN at **KHUDIA** Dam, Bilaspur Chhattisgarh**.**



According to reports, the fish species in Khudia Dam fall under various IUCN conservation categories. According to our research, 56.0% of fish species are considered to be of least concern, 13.0% are considered to be near-endangered, 13.0% are considered to be threatened, and 18.0% are considered to be vulnerable (Fig-2).

Conclusion

Preliminary investigation on fish diversity was carried out in Khudia dam of Bilaspur Chhattisgarh. Any quantitative studies on fish species diversity and distribution of Khudia dam were not conducted till today. The combined morphometric and meristic approach enabled accurate identification of the fishes at species-level. The results of the present study depicted that in Khudia dam a total of 13 orders, 28 genera and 45 species belonging to 13 families were reported during 2019 to 2020. The family Cyprinidae has in maximum contribution in building up the overall fish diversity in Khudia dam. Also it was observed that maximum fish species fall under least concern category of IUCN. Some fish species have been brought under threatened and vulnerable category due to overexploitation and climate change, respectively. The findings of the present study will be helpful for the management of ichthyofaunal diversity of Khudia dam of Bilaspur Chhattisgarh. In addition the study will provide a baseline data for the prior conservation of fish biodiversity in central India.

CONFLICT OF INTEREST

The authors declare that they do not have any conflict of interest

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