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Fish Diversity of Topchanchi Lake (IBA), and Conservation Threats, District Dhanbad, Jharkhand, India

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Abstract: ***The study was conducted at Topchanchi Lake, located in the Dhanbad district of Jharkhand state. The present study recorded 36 fish species belonging to 7 orders, 16 families, and 24 genera. Among the 36 recorded species, 17 species (47.22%) belong to the order Cypriniformes, making it the most dominant and diversified group. This was followed by the order Perciformes, which had 8 species (22.22%); Siluriformes with 6 species (16.67%); Osteoglossiformes with 2 species (5.56%); and Cyprinodontiformes, Synbranchiformes, and Cichliformes, each with 1 species (2.78%). In terms of family composition, the Cyprinidae family was the most dominant, with 11 species (30.56%). This was followed by 4 species (11.11%) each from the families Channidae and Danionidae; 3 species (8.33%) from Bagaridae; and 2 species (5.56%) each from Notopteridae and Ambassidae. The remaining species comprised 1 species (2.78%) each from other families. Among the recorded species, 2 were classified as globally threatened: Chitala chitala is listed as Near Threatened (NT), and Oreochromis mossambicus is listed as Vulnerable (Vu) according to the IUCN Red List (2025). None of the fish species recorded are listed in Schedule I or II under The Wildlife (Protection) Act, 1972 (amended, 2022). This study also highlighted the presence of various indigenous, ornamental, aquaculture, and commercially important fish species in the Lake. This work is likely the first scientific documentation of fish diversity in the area and will provide a baseline for understanding the fish diversity in Topchanchi Lake. Additionally, the findings will open up opportunities for further research and management efforts aimed at conserving fish, birds, and other wildlife.***

Keywords: Fish, Diversity, Topchanchi Lake, Conservation, Dhanbad, IBA

1. Introduction

Fish are an important group of vertebrates, comprising approximately half of all vertebrate species found worldwide and exhibiting the most remarkable diversity among vertebrate groups. Fish, also known as “Pisces,” are a vital part of the aquatic environment, playing a crucial role in energy transfer, nitrogen cycle, and maintaining ecological balance (Rao *et al.,* 2014). They serve as an important source of essential amino acids, proteins, healthy fats, minerals (calcium, magnesium, phosphorus, sodium, iron, copper, zinc, and iodine), and vitamins (A, C, and D) (Bera *et al.,* 2014; Selamoglu & Naeem, 2023). Additionally, their economic significance is evident through the employment opportunities and revenue they generate (Bera *et al.,* 2014). Their impacts on human lives and wildlife, including bird species, are diverse and significant. Many bird species rely on fish as a food source, including the Osprey, Brown Fish Owl, Grey Heron, Duck, Grebe, Stork, Heron, and various species of kingfishers. For instance, Ospreys have a diet that is 99% fish (Evans, 1982). According to Gohil and Mankodi (2013), many fish species act as bio - indicators for wetland ecosystems. Additionally, fish farming not only contributes to the local economy but also provides significant employment opportunities for local and tribal communities in Jharkhand, thereby playing a crucial role in their livelihood and economic sustainability.

Freshwater fish species are extensively studied and well - documented throughout the country (Jayaram, 2010; Lakra *et al.,* 2010). According to Nelson (2006), there are an estimated 27, 977 valid species of fish worldwide, with approximately 11, 952 species typically found in freshwater lakes and rivers. The Indian subcontinent is rich in fish diversity, with approximately 2, 500 species recorded, comprising 930 freshwater species and 1, 570 marine species (Kar *et al.,* 2003). A checklist published by Devi and Indra (2008) identifies 667 freshwater fish species in India. A recent checklist provides documentation of 2, 546 fish species (about 11% of the world's total), around 197 species of amphibians (4.4% of the world's total), and about 408 reptile species (6% of the world's total) found in India (Fauna of India, 2022).

Published literature indicates that various studies have been conducted on the diversity of fish in Jharkhand (Menon, 1950; Ganguly and Dutta, 1973, 1975; Bose *et al.,* 1974 - 75; Singh & Singh, 1988; Mishra, 1992; Srivastava, 2003; Verma *et al.,* 2008; Verma & Murmu, 2010; Saba & Sadhu, 2017; Srivastava, 2018; Ranjan, 2022). Karmakar *et al.* (2008) documented 66 fish species in the Subarnarekha River, which flows from Jharkhand to West Bengal. Verma and Murmu (2010) reported 40 fish species from Dimna Lake in Jamshedpur. Sanyal *et al.* (2014) identified 59 species belonging to 33 genera, 17 families, and 6 orders in the coalfield areas of Jharkhand. Prakash and Raziuddin

(2015) reported 80 species classified under 54 genera, 26 families, and 11 orders in the state. Ranjan and Verma (2017) observed 31 fish species at Tenughat Dam in Bokaro. Shrivastava (2018) documented 57 fish species from the North Chotanagpur region of Jharkhand. Additionally, a study by Ranjan (2022) identified a total of 55 fish species in the Damodar River, located in the Bokaro district of Jharkhand, India. The Topchanchi Lake, located in the Jharkhand region, remains largely unexplored in terms of its fish diversity. The existing literature suggests that the fish diversity in Topchanchi Lake has yet to be thoroughly investigated. The Topchanchi Lake is recognized as an Important Bird and Biodiversity Area (IBA) (Rahmani *et al.,* 2016) and is an important component of the Topchanchi Wildlife Sanctuary. This Sanctuary is home to a rich avian diversity, with numerous bird species relying on fish as a food source. The present study aims not only to explore the diversity of fish species in Topchanchi Lake but also to provide an exciting opportunity for future research. The present study documents the fish species found in Topchanchi Lake, providing a promising foundation for further research into their relationship with avian diversity, particularly regarding their role as a food resource for birds in the area.

2. Study Area

The study was conducted at Topchanchi Lake, located within the Topchanchi Wildlife Sanctuary (TWLS) in the Dhanbad district of Jharkhand state (Fig.1, 2, and 3). It is about 40 km from the city of Dhanbad. The Sanctuary is located between 23°50' and 23°56' N, 86°06' and 86°15' E. Topchanchi Lake (23°55'27.31" N; 86°11'01.75 E), also called "Rajdaha Reservoir", is an important wetland located in the heart of the Sanctuary (Fig.3). The fairly dense forest of TWLS surrounds the Lake with hills give it beauty with aesthetic appeal, creating an ideal place for tourist distinction. Furthermore, the Parasnath Hills, a holy place for Jains, being located nearby, attracts tourists to visit the Lake at the same time. The Lake also serves as a lifeline for the Dhanbad, Jharia, and Katrasgarh townships, providing drinking water. It is approximately 1.25 km from the National Grand Trunk Road (Highway No.2). The Topchanchi Lake contributes to the richness of the habitat for many bird species, as well as other fauna (Rahmani *et al.,* 2016).

A road approximately 6 km long surrounds the Lake. The total area of the Lake is 214 acres (http: //dhanbad. nic. in/tourist - place/topchanchi - lake/). Furthermore, the Lake is not part of the Topchanchi Wildlife Sanctuary. It is under the control of the MADA (Mineral Area Development Authority) and the Irrigation Department, District Dhanbad, although it is centrally located within the Sanctuary.

Figure 1: Jharkhand Map

Figure 2: Map of District Dhanbad

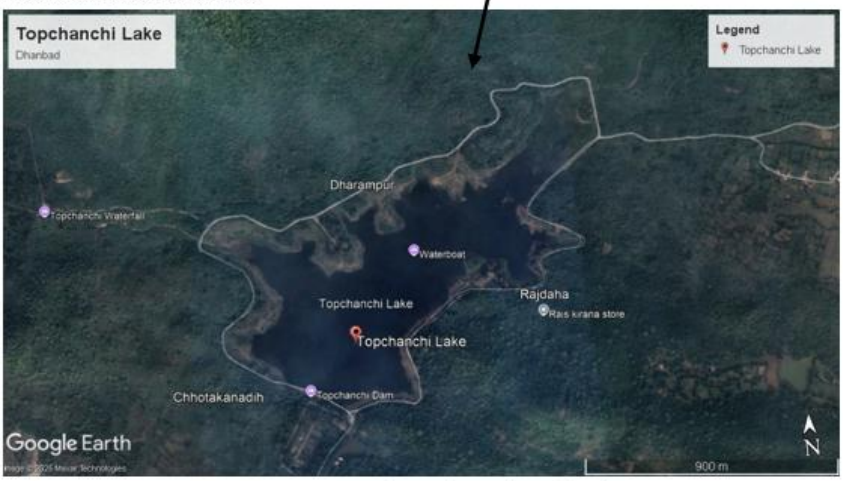

Figure 3: Location of Topchanchi Lake

The sanctuary area falls under the broad category of northern tropical dry deciduous forest. The forest has been sub - classified as Dry Peninsular Sal, Northern Dry Mixed Deciduous Forest, and Dry Bamboo Brake. Northern dry mixed deciduous forest is found in almost the entire area. Dry peninsular sal forest is found in Ganeshpur and Bhawardaha. The forest consists of almost pure sal (*Shorea robusta*) with Asan (*Terminalia tomentosa*), Bija Sal (*Pterocarpus marsupium*), Dhow (*Anogeissus latifolia*), and other species. It has tremendous potential to support ecotourism. The scheduled tribes inhabiting these forests include Santhals, Kherwars, Munda, and Birhors.

3. Materials and Methodology

Fish were collected in three seasons (pre - monsoon, from February to May; monsoon, from June to September; and post - monsoon, from October to January) over two years, from October 2021 to October 2023. The fish were collected with the support of local fishermen using various types of nets, including hand nets, cast nets, gill nets, and drag nets. Visual observations were conducted to locate the fish in the clear water.

After the collection, the fish were photographed immediately before preservation, as formalin decolorizes the fish's colour during preservation. Then, fish of major sizes were identified in the field, and small species were immediately preserved in a 10% formalin solution. The preserved fish specimens were brought to the laboratory for identification and analysis. Morphometric and meristic characters were measured, and the fish were identified up to the species level. The fish were identified using standard keys, as described by Day (1889), Talwar and Jhingran (1991), Jayaram (1999), and Shrivastava (2018). The IUCN Red List of Threatened Species and The Wildlife (Protection) Act, 1972, as amended in 2022 (GOI, 2022), were followed to assign the conservation status.

The photographs were taken in the field using a DSLR Camera, a Sony Cybershot 14x camera, and a GPS device for proper identification and record - keeping.

4. Results and Discussion

A total of 36 fish species, belonging to 7 orders, 16 families, and 24 genera, were recorded during the 2 - year study period at Topchanchi Lake, District Dhanbad in Jharkhand (Table 1). Among recorded 36 species of fishes, 17 species (47.22%) were under order Cypriniformes, was the most dominant and diversified group of fish species followed by Perciformes with 8 species (22.22%); Siluriformes with 6 species (16.67%); Osteoglossiformes with 2 (5.56%); and Cyprinodontiformes, Synbranchiformes, Cichliformes, with 1 species (2.78%) each. Order - wise percent composition of fish diversity is shown in Fig.4. Studies conducted by Ranjan and Verma (2017) and Ranjan (2022) reveal a similar observation of dominance in the orders Cypriniformes, Perciformes, and Siluriformes in the Tenughat Reservoir and Damodar River in Bokaro District, Jharkhand, respectively. Shinde *et al.* (2009) and Verma & Murmu (2010) also reported a similar dominance pattern in order from Harsool Savangi Dam, District Aurangabad, (M. S.), and Dimna Lake, Jharkhand, respectively.

Furthermore, family - wise fish distribution shows that under Cyprinidae, 11 species (30.56%) were the most dominant and diversified group of fish species, followed by 4 species (11.11%) each under Channidae and Danionidae; 3 species (8.33%) under Bagaridae; 2 species (5.56%) each under Notopteridae and Ambassidae; and 1 species each (2.78%) under Cobitidae, Xenocyprididae, Poeciliidae, Anabantidae, Osphronemidae, Cichlidae, Clariidae, Heteropneustidae, Pangasidae, and Mastacembelidae. Family - wise percent composition of fish diversity is shown in Fig.5. The results of dominance by the family Cyprinidae, Channidae, and Bagaridae were observed to be similar to those of Ranjan (2022) and Ranjan & Verma (2017), as reported in a study conducted at the Tenughat Reservoir and Damodar River in Bokaro District, Jharkhand. Further, Shinde *et al. (*2009) and Verma & Murmu (2010) also reported dominance of family in a similar pattern from Harsool Savangi Dam, District Aurangabad, (M. S.) and Dimna Lake, Jharkhand, respectively.

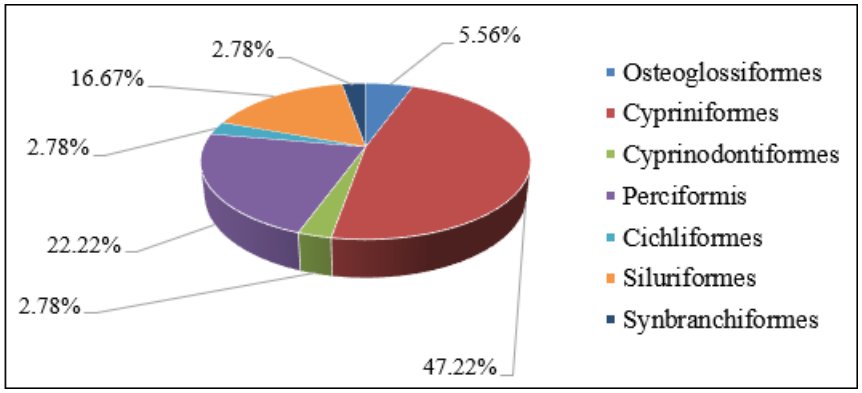

Figure 4: Order-wise percent composition of fish diversity

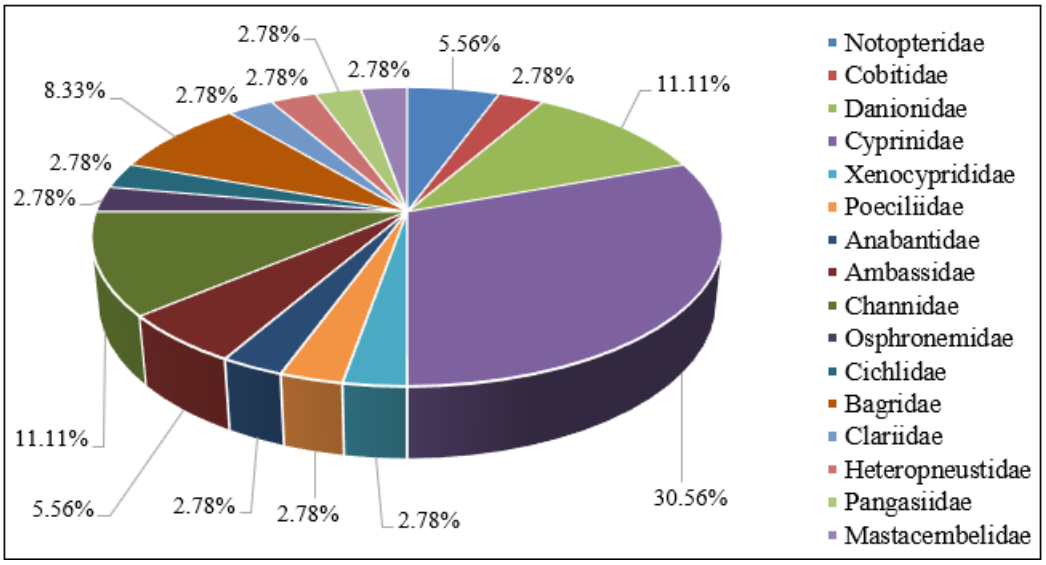

Figure 5: Family-wise percent composition of fish diversity

Table 1: Fish diversity of Topchanchi Lake with local name, human use, feeding habit, and conservation status

Sl. No.	Order	Family	Species	Local Name	IUCN Red List	Human Use	Feeding Habit
1	Osteoglossi-formes	Notopteridae	*Notopterus notopterus* (Pallas, 1769)	Falat, Patra	LC	Ornamental, Aquaculture	Carnivore
2			*Chitala chitala* (Hamilton, 1822)	Falat/Chital/ Moya	**NT**	Ornamental, Aquaculture	Carnivore
3	Cypriniformes	Cobitidae	*Lepidocephalichthys guntea* (Hamilton, 1822)	Guntea	LC	Ornamental, Commercial	Carnivore
4		Danionidae	*Aspidoparia morar* (Hamilton, 1822)	Chelwa	LC	Ornamental, Commercial	Omnivore
5			*Danio rerio* (Hamilton, 1822)	Zebra fish/Anju	LC	Ornamental, Aquaculture	Omnivore
6			*Salmostoma bacaila* (Hamilton, 1822)	Chela	LC	Commercial	Omnivore
7			*Amblypharyngodon mola* (Hamilton, 1822)	Dhawai	LC	Ornamental, Commercial	Herbivore
8		Cyprinidae	*Catla catla* (Hamilton, 1822)	Catla	LC	Aquaculture, Commercial	Herbivore
9			*Cirrhinus reba* (Hamilton, 1822)	Reba, Sunhi	LC	Aquaculture, Commercial	Omnivore
10			*Cirrhinus mrigala* (Hamilton, 1822)	Mrigal	LC	Aquaculture, Commercial	Omnivore
11			*Labeo bata* (Hamilton, 1822)	Bata	LC	Aquaculture, Commercial	Herbivore
12			*Labeo calbasu* (Hamilton, 1822)	Kalbagus	LC	Aquaculture, Commercial	Herbivore
13			*Labeo rohita* (Hamilton, 1822)	Rahu & Ruhi	LC	Aquaculture, Commercial	Omnivore
14			*Puntius sarana* (Hamilton, 1822)	Puthi	LC	Ornamental, Commercial	Omnivore
15			*Puntius conchonius* (Hamilton, 1822)	Puthi	LC	Ornamental, Commercial	Omnivore
16			*Puntius sophore* (Hamilton, 1822)	Puthi	LC	Ornamental, Commercial	Omnivore
17			*Puntius ticto* (Hamilton, 1822)	Puthi	LC	Ornamental Commercial	Omnivore
18			*Puntius chola* (Hamilton, 1822)	Sidhari, Pothi	LC	Ornamental, Commercial	Omnivore
19		Xenocyprididae	*Ctenopharyngodon idella* (Valenciennes, 1844)	Grass carp	LC	Aquaculture, Commercial	Herbivore
20	Cyprinod-ontiformes	Poeciliidae	*Gambusia affinis* (Baird & Girard, 1853)	Puthi	LC	Ornamental, Aquaculture	Carnivore
21	Perciformis	Anabantidae	*Anabas testudineus* (Bloch, 1792)	Koi/Kaji	LC	Aquaculture, Commercial	Omnivore
22		Ambassidae	*Chanda nama* (Hamilton, 1822)	Chanda	LC	Ornamental, Commercial	Omnivore
23			*Parambassis ranga* (Hamilton, 1822)	Ranga	LC	Ornamental, Commercial	Omnivore
24		Channidae	*Channa marulius* (Hamilton, 1822)	Garai	LC	Ornamental, Aquaculture	Carnivore
25			*Channa punctatus* (Bloch, 1793)	Garai	LC	Ornamental, Aquaculture	Carnivore
26			*Channa striatus* (Bloch, 1793)	Shol	LC	Aquaculture, Commercial	Carnivore
27			*Channa gachua* (Hamilton, 1822)	Garai	LC	Ornamental, Commercial	Carnivore
28		Osphronemidae	*Trichogaster fasciata* (Schneider & Bloch 1801)	Khosti	LC	Ornamental, Commercial	Omnivore
29	Cichliformes	Cichlidae	*Oreochromis mossambicus* (Peters, 1852)	Tilapia	**Vu**	Aquaculture, Ornamental	Carnivore
30	Siluriformes	Bagridae	*Mystus vittatus* (Bloch, 1794)	Tengra	LC	Ornamental, Commercial	Carnivore
31			*Mystus tengara* (Hamilton, 1822)	Tengra	LC	Ornamental, Aquaculture	Carnivore
32			*Mystus cavasius* (Hamilton, 1822)	Tengra	LC	Ornamental, Commercial	Omnivore
33		Clariidae	*Clarias batrachus* (Linnaeus, 1754)	Magur	LC	Ornamental, Commercial	Carnivore

34		Heteropneustidae	*Heteropneustes fossilis* (Bloch, 1794)	Singhi	LC	Ornamental, Commercial	Omnivore
35		Pangasiidae	*Pangasius pangasius* (Hamilton - Buchanan)	Basa Machli	LC	Aquaculture, Commercial	Omnivore
36	Synbranchi-formes	Mastacembelidae	*Macrognathus aculeatus* (Bloch, 1786)	Bami/Baim	LC	Ornamental, Commercial	Omnivore

Abbreviation: - IUCN: International Union for Conservation of Nature and Natural Resources; **NT**: Near Threatened; **Vu**: Vulnerable; **LC:** Least Concern

PHOTO PLATE

Photographs of some common fishes of Topchanchi Lake

Fig. 1. *Notopterus notopterus*

Fig. 2. *Danio rerio*

Fig. 3. *Oreochromis mossambicus*

Fig. 4. *Clarias batrachus*

Fig. 5. *Pangasius pangasius*

Fig. 6. *Amblypharyngodon mola*

Fig. 7. *Puntius sophore*

Fig. 8. *Cirrhinus mrigala*

Fig. 9. *Labeo rohita*

Fig. 10. *Catla catla*

Among the recorded species of fish, two species were found to be globally threatened: *Chitala chitala* was listed as Near Threatened (NT), and *Oreochromis mossambicus* was listed as Vulnerable (Vu), according to the IUCN Red List (2025). The rest of the species were listed as Least Concern (LC). None of the species recorded were listed in Schedule I or Schedule II of The Wildlife (Protection) Act, 1972, as amended in 2022 (GOI, 2022). The present study revealed that various indigenous, ornamental, aquaculture, and commercially important fish species were found in the Lake. A detailed checklist of fish recorded at Topchanchi Lake with local name, scientific name, human use (ornamental, aquaculture, and commercial), IUCN Red List status (IUCN, 2025), and feeding habits is given in Table 1.

Furthermore survey of literature revealed that, study conducted in different Lake, reservoir, river, and dam in Jharkhand reported, 40 fish species from Dimna Lake in Jamshedpur (Verma & Murmu, 2010); Sanyal *et al.* (2014) reported 59 species in the coalfield areas of Jharkhand; Ranjan and Verma (2017) observed 31 fish species at Tenughat Dam in Bokaro. Shrivastava (2018) documented 57 fish species from the North Chotanagpur region, while Ranjan (2022) identified a total of 55 fish species in the Damodar River, located in Bokaro District. Saba & Sadhu (2017) reported 25 species of fish from the Garga Reservoir in Bokaro district. From another state, Shinde *et al.* (2009) reported 15 species from Harsool Savangi Dam, District Aurangabad, (M. S.) India. Jagatheeswari (2016) reported 26 species of fish from Kondakarla freshwater lake. Visakhapatnam, Andhra Pradesh, India. These observations suggest that the presence of 36 species of fish indicates a rich fish diversity at Topchanchi Lake. Nikolosky (1978) reported positive correlations between biomass production and species abundance. Shinde *et al.* (2009) reported that species diversity is often related to the amount of living, non - living, and organic matter present in an ecosystem.

The present research conducted at Topchanchi Lake marks the first scientific documentation of fish diversity in the area. The findings will serve as a baseline for the fish species present in Topchanchi Lake and will provide opportunities for further research. Additionally, this work can contribute to the development of policy - making strategies for the conservation and management of both Topchanchi Lake and the Topchanchi Wildlife Sanctuary (IBA), particularly regarding fish and avifauna diversity, as well as other wildlife. According to recently published work on the avifauna of Topchanchi Lake (Prakash *et al.,* 2025), bird diversity in Topchanchi Lake is vibrant; therefore, further research can be undertaken to explore the relationship between the feeding habits of piscivorous birds and the fish resources available in the Lake.

5. Conservation Threats

Conservation of fish diversity is crucial for maintaining ecological, nutritional, and socio - economic balance. Species diversity and genetic variability are essential for the long - term maintenance of stable, complex ecosystems and their constituent species. Fish assemblages are a crucial element in aquatic bodies because these animals play a vital role in maintaining the balance of the aquatic habitat (Quin Gno *et al.,* 2018). Fish respond to changes in their environment, whether these changes are human - induced or natural (Han, 2007). Over the past few decades, the number of fish species has decreased at an alarming rate, and endemic species are facing continuous threats globally due to the construction of dams, overfishing, pollution, deforestation, land erosion, and other anthropogenic activities; therefore, it is essential to conserve the fish diversity for the good health of the aquatic body as well as for the long sustainability of the ecosystem (Fu *et al.,* 2003; Arthington *et al.,* 2016).

The Lake is also facing many conservation issues. Hundreds of villagers, in small groups, come from remote areas to collect various species of molluscs. The anthropogenic activities associated with mollusc collection disturb the ecosystem in several ways. During this process, they also catch fish, disturbing their habitat and leading to food shortages for bird species (Prakash *et al.,* 2025). The problem of soil erosion in the catchment areas of the Sanctuary is a threat to the habitat of the fish fauna. Large parts of this Lake are silted up during the rainy season and are being subjected to the spread of terrestrial weeds, such as *Ipomoea* and *Lantana camara.* The felling of trees can also be observed regularly around the Lake, posing a threat to the habitat and leading to soil erosion.

Topchanchi Lake is leased for fishing by the MADA (Mineral Area Development Authority), and fishing activities continue throughout the year. Maximum fishing is done in August and September; various types of craft and gear are frequently used for fishing, including different types of boats, hand nets, hook and line, cast nets, gill nets, and drag nets. The lease given for fishing and local fishing activity deters the birds due to a shortage of food. According to Jagatheeswari (2016), uncontrolled fishing depletes the food source of wetland birds. All such activities severely upset the natural biological balance of the Lake, which in turn deters many visiting birds from coming to the Sanctuary and Lake for nesting, roosting, and breeding purposes. These activities disturb the Lake's ecosystem, causing an imbalance. The people residing in the surrounding villages are entirely dependent on this Lake for various purposes, such as bathing, washing, and cleaning vehicles, which leads to water pollution.

Furthermore, Topchanchi Lake is a significant tourist destination; several people visit this place for picnics and recreational activities, which disturbs the Lake's biodiversity. Encouraging ecotourism can play a vital role in conserving Topchanchi Lake, helping to protect its natural beauty and biodiversity while fostering sustainable development in the surrounding community. The conservation policy should promote sustainable management practices that maintain the integrity of the aquatic ecosystem, maintaining ecological balance.

6. Conclusion

During the two - year study period at Topchanchi Lake in district Dhanbad, Jharkhand, a total of 36 fish species were recorded, belonging to 7 orders, 16 families, and 24 genera. Among these species, 47.22% belonged to the order Cypriniformes, making it the most dominant and diverse group of fish, followed by Perciformes (22.22%), Siluriformes (16.67%), Osteoglossiformes (5.56%), and Cyprinodontiformes, Synbranchiformes, and Cichliformes, each with 2.78%. In terms of family distribution, the Cyprinidae family was the most dominant, with 30.56%, followed by Channidae and Danionidae, each with 11.11%; Bagaridae (8.33%); and Notopteridae and Ambassidae, each with 5.56%. The remaining species comprised 2.78% each from other families.

Two species were identified as globally threatened: *Chitala chitala*, and *Oreochromis mossambicus*, listed as Near Threatened (NT), and Vulnerable (Vu) respectively according to the IUCN Red List. None of the fish species

recorded are listed as Schedule I or II under The Wildlife (Protection) Act, 1972, as amended in 2022. This study revealed a variety of indigenous, ornamental, aquaculture, and commercially important fish species present in the Lake. It is likely the first scientific documentation of the fish diversity in this area. The findings from this research will establish a baseline for the fish species in Topchanchi Lake, opening up opportunities for further studies. Moreover, this work can contribute to policy making for conservation and management strategies for both Topchanchi Lake and the Topchanchi Wildlife Sanctuary, particularly in terms of fish and avifauna diversity, as well as other wildlife species. The bird diversity at Topchanchi Lake is vibrant, suggesting that further research could investigate the relationship between the feeding habits of piscivorous birds and the available fish resources in the Lake.

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We would like to express our heartfelt gratitude to the Forest Department officials for their invaluable support. We are especially indebted to our mentor, the late Dr. M. Raziuddin, for his unwavering encouragement of research in pure zoology. We also wish to acknowledge the significant contributions of the local fishermen, personnel, whose assistance in collecting fish was crucial to our research. Our thanks extend to Amit Jain, Murari Singh and Sunil Kumar Mahato for their excellent photography of the fish, which greatly aided in their proper identification. Additionally, we are grateful to Parikshit Kumar Mahato and Chanchala Kumari for their unconditional support throughout the study. Furthermore, we appreciate the efforts of the members of BNHS/IBCN and NHF/AFNC, as well as the volunteers, forest staff, and local personnel whose names are not listed here, for their invaluable support in various capacities.

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