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# TO STUDY THE ICHTHYOFAUNAL DIVERSITY WITHIN SELECTED WATER BODIES OF BHOPAL, MADHYA PRADESH, INDIA.

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**ABSTRACT**

This research scrutinizes the ichthyofaunal diversity across various aquatic habitats in Bhopal, Madhya Pradesh, with a focus on establishing a correlation between species variation. The study encompasses a systematic survey of fish populations, employing both quantitative and qualitative methodologies to evaluate species richness, distribution patterns, and community structure. The findings aim to provide insights into the ecological status of the regions water bodies and propose conservation strategies to safeguard the aquatic biodiversity therein. This investigation not only contributes to the understanding of freshwater ecosystems in urban landscapes but also underscores the significance of maintaining ecological balance amidst anthropogenic pressures. There are 38 fish species total, divided into 25 genera, 12 families, and 9 orders. The most prevalent family of fish was determined to be the Cyprinidae, followed by the Siluriformes (7 species), Perciformes (5 species), Anabantiformes (1 species), Tetraodontiformes, Beloniformes, Osteoglossiformes, and Synbranchiformes.

**Keywords: Ichthyofaunal, Least Concern, Near Threatened, Vulnerable**

**INTRODUCTION**

It is believed that life began in water and developed into an enchanted realm with a remarkably varied and abundant array of flora and fauna (Kar, 2013). There are 2500 fish species in India; 930 of them are freshwater species, and 1570 are marine (Kar et al., 2003). For humans, rivers were the most significant source of freshwater. In the past, the distribution and availability of freshwater riverine systems had a major impact on sociopolitical development (Chapman, 1996). A river is one of the planet's most productive and valuable ecosystems because it is made up of a complex mixture of unique habitats (Das and Sharma, 2012 a). A river and its tributaries make up a special kind of ecosystem that typically spans a variety of climatic zones, topographies, and biogeographical areas. A river is the earth's naturally occurring drainage system that flows constantly. A river typically flows very quickly and straight upstream, but as it moves downstream and toward the plains, it starts to meander and loses speed. The load carried by the water current is deposited as slits, sand, and mud when its velocity decreases (Datta Munshi and Datta Munshi, 1995; Kar, 2007). Fish held significant cultural and psychological significance for humans. Fish that spend all or a significant portion of their life cycle in freshwaters are classified as freshwater fish. 2546 species of fish from the Indian region are estimated by Talwar (1991) to belong to 969 genera, 254 families, and 40 orders. The fish survey of the fish fauna of the central river marked the beginning of the work on the fish fauna of Madhya Pradesh. Among the twelve nations with the highest levels of mega-biodiversity worldwide, India ranks ninth for freshwater mega-biodiversity (Mittermeier and Mittermeier, 1997). India's freshwaters had only ever been seen from the standpoint of economic output. These were regarded as the sources of hydroelectric power, urban industrial water supply, and irrigation receptacles for sewage and industrial wastes inputs. Above all, they were the hub of biodiversity resources harbouring a bewildering diversity of piscine resources, which were the prolific sources and nutrition and avocation. There was no room for the sustainable use of fish as a source of consumer protein or for preserving the rich legacy of freshwater fish diversity in the nation within this purely utilitarian framework. Fish are mainly cold-blooded (ectotherms or poikilotherms) aquatic vertebrates that use their fins to propel and balance themselves while breathing through their pharyngeal gills. In terms of both the total number of species and individuals, they comprise the majority of the abundant class of vertebrates. Fishes had great significance in the life of mankind. They were the staple food item in the diet of many consumers throughout the world. They form an important economy of many nations and give incalculable recreational worth to home aquarists, sports fans, and naturalists. They have a significant impact on human legacy, either directly or indirectly. Simultaneously, the rapid growth of the human population and the heightened need for water and its associated bioresources have led to a further loss of stream habitat, which has decreased the abundance of aquatic organisms, especially fisheries resources. To prevent further deterioration of these delicate ecosystems, integrated and expedited efforts were necessary for environmental preservation and restoration (Kar et al., 2003 b; Kar, 2007; Kar, 2013).

## MATERIALS AND METHODS

**Study area:** The Bhopal (Bhoj) wetland City, located in the central part of India, is a vital ecological zone that supports a rich biodiversity. This wetland is part of the Bhoj Wetland, which includes the two lakes, Upper and Lower. These lakes are essential for maintaining the ecological balance and offering a wide range of ecosystem services, such as flood control, water supply, and habitat for different species. Currently, the lake provides about 40% of the water used in the city.

**i. Site 1-** Van Vihar National Park geographically, the Upper Lake has a 31 $km^3$ area under its waters and a 361 $km^3$ catchment area. The coordinates of it are 23 15N 77 20'E. Van Vihar serves as a green lung and ecological buffer for the city of Bhopal because of its proximity to the lake.
**ii. Site 2-** Lower Lake Boat Club, also called Chotta Talab. It is a major component of the Bhoj Wetland and is located east of the Upper Lake. Geographically speaking, the lake is located between North Latitude 23 12' 0" and East Longitude 77 18' 0".
**iii. Site 3-** Shri Kalika Mandir near Lower Lake in Bhopal is located at coordinates 23 16'0" N 7725'0" E. Being a significant religious and cultural spot could be one such sampling station. Here the focus might be on understanding the impact of human activities, such as rituals and offerings on the water quality.


fig. 1: map showing sample site 1

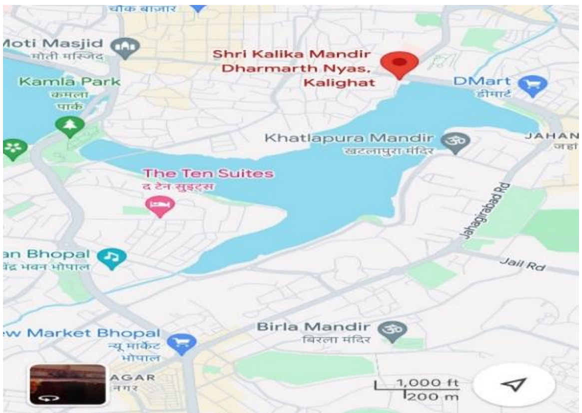


fig. 2: map showing sample site 2

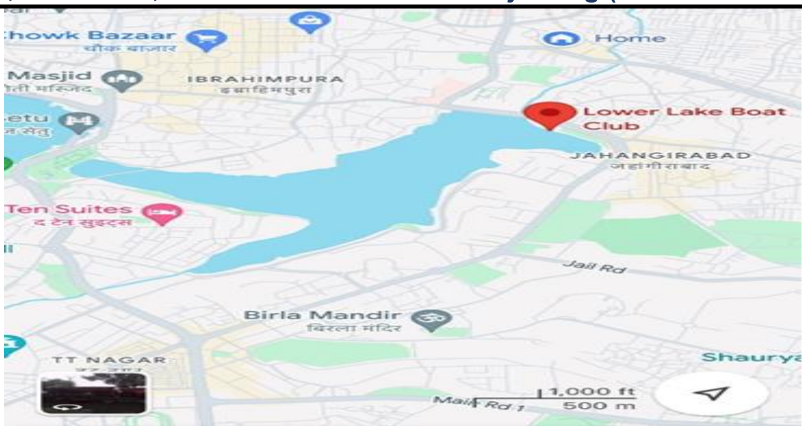


fig. 3: map showing sample site 3

**Materials: G**ill nets are commonly employed. Fishing lines with hooks, often baited with small fish. Cast net material made of monofilament or multifilament nylon and recreational cast nets ranging from 3 to 12 feet in radius. Drag net material usually made of nylon, polyethylene or polypropylene and legal lengths can be up to 40 meters, but regulations vary by location. Gill net material typically made of monofilament or multifilament nylon and sizes can vary widely, but are characterized by mesh size, which is regulated to target specific fish sizes.

**Identification of Fish:** The fish that were gathered were identified both on the spot and in the aquaculture lab at SAGE University Bhopal for additional identification. They were then preserved in 70% formalin using methods described by Shrestha (1981, 1994; Shrestha 2008; K.C. 2010 and Talwar et al. 1995). When possible, the caught fish were immediately photographed while they were still fresh.

## RESULTS AND DISCUSSION

### Fish community composition

**table 1: check list of fish species of bhoj wetland during july 2023- january 2024**

| Sl. No. | Scientific name | Common name | Local name | IUCN cons. Status |
|---|---|---|---|---|
| 1 | *Parambasis ranga* | Indian glassfish | Kakhai | LC |
| 2 | *Trichogaster fasciata* | Banded gourami | Kavai | LC |
| 3 | *Parambasis* | Indian glassfish | Kachua | LC |
| 4 | *Puntius sophore* | Pool barb | Karawa | LC |
| 5 | *Mystus bleekeri* | Bleekeri catfish | Ghoni | LC |
| 6 | *Cirrhinus reba* | Reba carp | Rewah | LC |
| 7 | *Ompak bimaculatus* | Butter catfish | Pabda | NT |
| 8 | *Salmostoma boopis* | Boopis razorbelly | Botia | LC |
| 9 | *Puntis sarana* | Olive barb | Kharpata | LC |
| 10 | *Labeo rohita* | Rohita | Roho | LC |
| 11 | *Rasbora daniconius* | Slender rasbora | Dhera | LC |
| 12 | *Puntis ticto* | Ticto barb | Barber | LC |
| 13 | *Osteobrama cotia* | Cotio | Bhoiya | LC |
| 14 | *Nematolosa erebi* | Siamese hematode | Ghoni | LC |
| 15 | *Gadusa chapra* | Gangetic whiting | Doodia | LC |
| 16 | *Nandus nandus* | Gangetic leaffish | Bongal | LC |
| 17 | *Macronagthus aral* | Giant danio | Barli | LC |
| 18 | *Rasbora argyrotaenia* | Silver rasbora | Tada | LC |
| 19 | *Parambasis siamensis* | Indian glassy fish | Chahal | LC |
| 20 | *Cirrhinus mrigala* | Mrigal | Mrigal | LC |
| 21 | *Labeo calbasu* | Orangefin labeo | Kalosh | LC |
| 22 | *Channa marulius* | Great snakehead | Kharra | LC |

| | | | | |
|---|---|---|---|---|
| 23 | *Mystus seenghala* | Seenghala | Singara | LC |
| 24 | *Xenentodon cancila* | Freshwater garfish | Suja | LC |
| 25 | *Cyprinus carpio* | Common carp | Common carp | VU |
| 26 | *Labeo bata* | Bata | Bhana | LC |
| 27 | *Mystus aor* | Ornate bagrid | Singara | LC |
| 28 | *Mystus vittatus* | Striped catfish | Singharh | LC |
| 29 | *Pangasius pangasius* | Pangus catfish | Pangus | LC |
| 30 | *Notopterus notopterus* | Bronze featherback | Chitol | LC |
| 31 | *Mastacembelus armatus* | Indian spiny eel | Baam | LC |
| 32 | *Ctenopharyngodon idella* | Grass carp | Dariba | NE |
| 33 | *Catla catla* | Catla | Katla | LC |
| 34 | *Labeo gonius* | Kuria labeo | Kusra | LC |
| 35 | *Labeo dussumeri* | Kalabans | Kalabans | LC |
| 36 | *Garra gotyla* | Sucker head | Pathar chata | NE |
| 37 | *Clarius batrachus* | Walking catfish | Magur machli | LC |
| 38 | *Channa stratus* | Snakehead murrel | Sambal | LC |

IUCN conservation categories (LC-Least Concern, NT- Near Threatened, VU- Vulnerable and NE- Not Evaluated)

**table 2: fish distribution in order and family**

| Sl.No. | ORDER | FAMILY | SCIENTIFIC NAME | S1 | S2 | S3 |
|---|---|---|---|---|---|---|
| 1 | Cypriniformes | Cyprinidae | *Puntius sophore* | ++ | + | - |
| | | | *Cirrhinus reba* | + | - | - |
| | | | *Salmostoma boopis* | + | - | - |
| | | | *Puntius sarana* | ++ | ++ | + |
| | | | *Labeo rohita* | + | + | - |
| | | | *Rasbora daniconius* | + | + | + |
| | | | *Puntius ticto* | ++ | ++ | + |
| | | | *Osteobrama cotia* | + | + | + |
| | | | *Macronagthus aral* | + | ++ | ++ |
| | | | *Rasbora argyrotaenia* | ++ | - | - |
| | | | *Cirrhinus mrigala* | ++ | + | + |
| | | | *Labeo calbasu* | + | + | + |
| | | | *Cyprinus carpio* | + | + | - |
| | | | *Labeo bata* | ++ | + | + |
| | | | *Ctenopharyngodon Idella* | ++ | ++ | + |
| | | | *Catla catla* | ++ | ++ | + |
| | | | *Labeo gonius* | ++ | + | + |
| | | | *Labeo dussumeri* | + | + | + |
| | | | *Garra gotyla* | + | + | + |
| 2 | Siluriformes | Bagridae | *Mystus seenghala* | ++ | ++ | + |
| | | | *Mystus aor* | + | - | - |
| | | | *Mystus vittatus* | + | ++ | - |
| | | | *Ompak bimaculatus* | + | - | - |
| | | | *Mystus bleekeri* | + | ++ | ++ |
| | | Pangasidae | *Pangasius pangasius* | ++ | + | + |
| | | Clariidae | *Clarius batrachus* | - | + | + |
| 3 | Perciformes | Ambassidae | *Parambasis ranga* | ++ | ++ | - |
| | | | *Parambasis siamensis* | + | + | + |
| | | | *Parambasis* | + | + | + |
| | | Channidae | *Channa straita* | _+ | ++ | + |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | *Channa marulius* | + | + | - |
| 4 | Clupeiformes | Clupeidae | *Nematolosa erebi* | + | - | - |
| | | | *Gadusia chapra* | ++ | - | - |
| 5 | Anabantiformes | Osphronemidae | *Trichogaster fasciata* | + | + | - |
| 6 | Tetraodontiformes | Tetraodontidae | *Nandus nandus* | ++ | + | + |
| 7 | Beloniformes | Belonidae | *Xenentodon cancila* | + | - | - |
| 8 | Osteoglossiformes | Notopteridae | *Notopterus notopterus* | ++ | - | - |
| 9 | Synbranchiformes | Mastacembelidae | *Mastacembelus armatus* | + | - | - |

Statistical representation showing (+ as less, ++ as average and +++ abundant)

Based on current research and studies done on Bhopal's fish diversity. The Bhopal Upper and Lower Lakes, commonly referred to as Bhojtal, are home to a diverse array of fish. The current investigation has found 38 distinct fish species belonging to different families. On the other hand, environmental changes affecting fish diversity have occurred in the lower lake, especially in the vicinity of the boat club areas and Kalika Mandir. Since the aquatic population is struggling as a result of outside influences, the lower lake's waters are primarily polluted. This leads to a decrease in fish species, as shown by the +mark in table 2 above. Additionally, the Upper Lake is home to a far higher variety of fish species than the Lower Lake's Boat Club.

38 fish species classified under 25 genera, 12 families, and 9 orders were found in the current study. The fish diversity analysis of the survey data, which highlights the noteworthy trends seen during the study period, is provided in (Tables 1 and 2) above. In the Jamalai Wetland in Assam, **Goswami and Goswami (2006)** found 54 fish species that are divided into 36 genera and 22 families. According to **Sharma et al. (2007),** 29 species of fish from 6 orders were found in Krishnapura Lake in Indore. Of these, 15 species belonged to the dominant order, Cypriniformes, followed by 6 species by Siluriformes. The order Cypriniformes was dominant based on species richness and percentage composition (Graph 1). Of the 19 species that made up the dominant family Cyprinidae, 7 represented 50% of the total, the order Ophiocephaliformes (5 species), Perciformes (4 species), and other order were the dominant taxa in the lake. In the Kondakarla freshwater lake ecosystem in Visakhapatnam, Andhra Pradesh, India, **Jagatheswari et al. (2016)** also investigated the diversity of fish population and their conservation aspects, reporting 26 species of fish. Certain extremely rare species, like Rasbora daniconius, Mastacembelus armatus, and Xenentodon cancila, are in danger of going extinct from Bhoj Wetland.

## CONCLUSIONS

The topic of discussion was the fish of Bhoj Wetland. The wetland's ecological significance has led to conservation efforts and studies. A wide variety of fish species can be found in Bhoj Wetland, and these species also help to sustain local livelihoods. The upper lake and lower lake are parts of the wetlands. The fish species Oreochromis niloticus was found to be abundant primarily in the Lower Lake, while the family Cyprinidae was found to be abundant in the Upper Lake. The current research and preservation efforts are essential to ensure the viability of this vital aquatic habitat.

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