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Fish Diversity in Bichnaiyya Lake (Wetland) of District Basti, Uttar Pradesh, India

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Abstract: With increase of the human population, India will have to utilize all its approaches to increase its food production. Fishes are staple food item in the diet of many people and are important component in the economy of many nations. Most of the lakes which form sustentation of many organisms are facing decadence today due to unsustainable development. Fishes constitute almost half of the total number of vertebrates so it is important to preserve fish diversity. Hence, the present study was conducted to study the fish diversity in Bichnaiyya lake (wetland) in Basti, uttar Pradesh, India. A total of 29 species belonging to 6 orders and 11 families were identified. Among various families Cyprinidae was recorded the highest species richness followed by Ophiocephalidae (4 species), Clupeidae and Bagridae (3 species). Notoperidae, Siluridae (2 species) and other families were represented by one species only.

Keywords: Fish diversity, Bichnaiyya lake, Cyprinidae, Ophiocephalidae, Clupeidae, Bagridae

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Introduction

Fish diversity is an important part of an aquatic ecosystem. The Fish are jawed, aquatic, poikilotherm (cold blooded), oviparous, streamlined vertebrates having gill for respiration and fins for locomotion. Fishes contributes half of the total number of vertebrates (Amphibia, Reptile, Bird and Mammals) (Froese and Pault, 2014). They show huge diversity as far as their number, size, morphology, habitats, biology, behavior etc. are concerned (Gupta and Gupta, 2006). The distribution of fish in a particular region or habitat is affected by the ecological conditions prevalent there e.g., the fishes living in total darkness, in the fast torrential streams, in the swampy conditions, in the slow running shallow or deep rivers; in deep, cold, oligotrophic lakes; in shallower, warmer eutrophic lakes; in the different depths of oceans etc., are

characteristically variable in their number, size, morphology and biology (Gupta and Gupta, 2006). Among vertebrates fishes are fifth largest aquaculture resources and are the primary source of protein to over 1.4 billion peoples (Singh *et al.*, 1994). It has been estimated that the global diversity of all the fishes is about 33,059 species. Fishes are important component in the economy of many nations as are staple items in the food of many people (Shukla and Singh, 2013). Most of the higher vertebrates inhabiting in an aquatic environment are dependent on fishes for their food (Groombridge, 1992). Few studies suggested that aquatic ecosystems are concerned with loss of biodiversity which is due to human activities (Abell, 2002). Freshwater fishes exist at or near top of the food chain and serve as indicator of a balanced aquatic ecosystem (Dutta Munshi and Srivastava, 1988) and are one of the most threatened group due to their high sensitivity to changes of aquatic habitats and the limitations in morphology, physiology and their life history of species associated with environment changes.

Conservation of biodiversity is important in developing countries where people directly depend on natural resources for their live hood. Wetlands are socio-culturally associated with the native people therefore efforts should be made to conserve the aquatic ecosystem. The species diversity is at peak in post-monsoon, coinciding with favorable conditions such as sufficient water and ample food resources. The diversity was low in pre-monsoon probably due to the shrinkage of the water spread of the lake. Fish diversity has declined faster over past 30 years (Jenkins, 2003). Fish diversity is likely to be reduced due to reduced precipitation, temperature variation, withdrawal of water for agricultural and other uses (Vorosmarty *et al.*, 2000; Alcamo *et al.*, 2003). The water bodies continuously receive sedimentation, pollution and water abrasion which leads to decline of aquatic fauna diversity. To save this diversity and to develop a sustainable fishery practices and proper documentation leading to diversity, information system is an urgent need. The objective of the present study was to know and conserve the fish diversity of Bichnaiyya Lake (wetland) Basti, Uttar Pradesh, India.

Materials and Methods

Study Area:

The fishes were collected from Bichnaiyya Lake seasonally from February 2021 to January 2023. The Bichnaiyya Lake (Fig. 1) is located near Bichnaiyya Pandey village, under tehsil Harraiya, District Basti (U.P.). This lake is situated at 26º55'15.7" N latitude and 82º25'29.9" E longitude. The total area of this lake is 279,855.00 m^2 (3,012,334.12 ft^2) with peripheral total distance of 1.94 km (1.21 m).

Fish Collection and Preservation Methods:

The selected sites were surveyed by walking and some guidelines were also taken by local fishermen. The fish samples were collected from Bichnaiyya Lake from different locations (3 sites) with the help of experienced local fisherman using various kinds of nets such as gill nets (32 mm, 38 mm, 64 mm, 78 mm, 110 mm), cast nets (16 mm, 18 mm, 22 mm), drag nets and scoop nets. The sampled fishes from different sampling sites were washed gently and photographs were taken quickly before preservation. After collection, the number of fish species was counted and recorded. Local names of the fishes were noted after asking from fisherman. For biometric studies (morphometric and meristic) and species identification, 3-5 specimens of each type were collected from each site. The collected fishes were preserved in 10% formalin solution and kept in airtight plastic bottles for further study. The small sized fishes were directly kept in the formalin solution while large sized fishes were eviscerated and preserved by injecting formalin in its visceral cavity. After preservation, the fishes were brought to the laboratory for further studies. The Identification of fish was done with the help of standard reference books of Day (1878), Qureshi and Qureshi (1983), Talwar and Jhingran (1991b), Pethiyagoda (1991), Dutta Munshi and

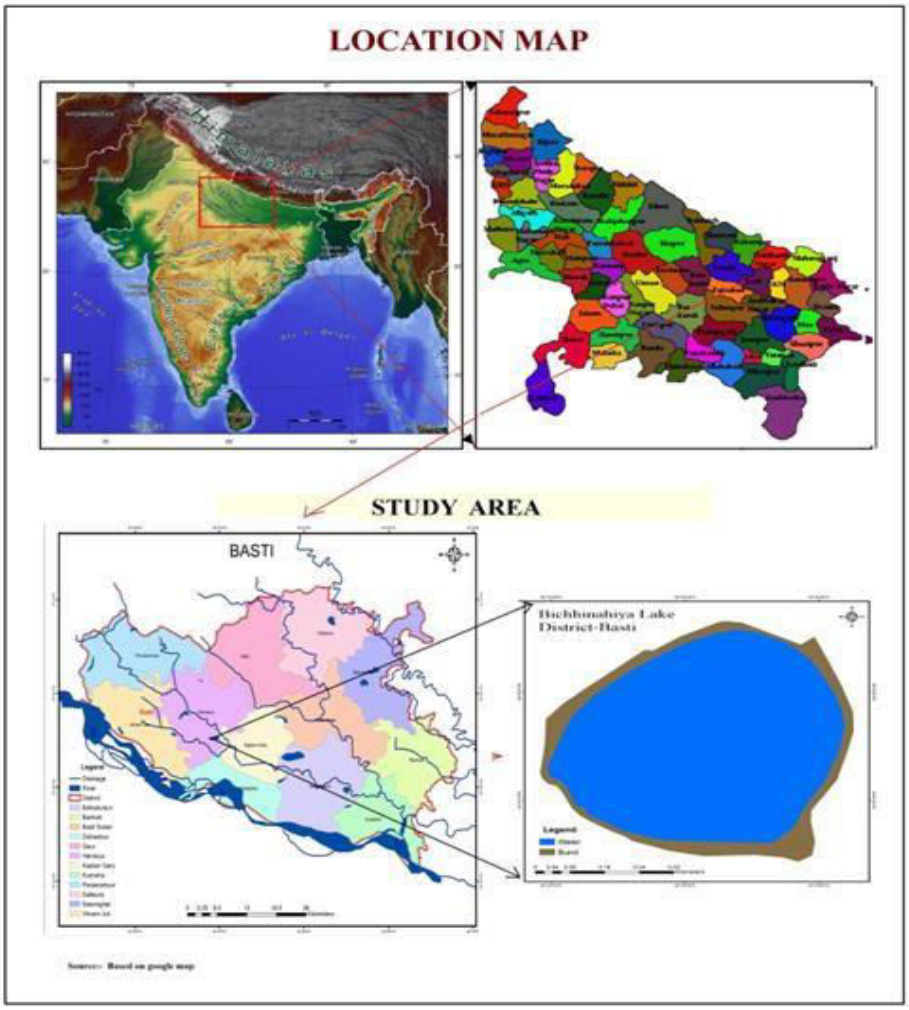

Fig. 1: Location of study area. (Source-Survey of India and Google earth)

Srivastava (1998), Jayaram (1981, 1999), and Srivastava (2022).

Results and Discussion

During the present study, a total of 29 species belonging to 6 orders, 11 families and 17 genera were recorded at various sites of the lake. The species found in the lake, their taxonomic distribution and relative abundance are given in Table 1 and Figure 2, respectively. The most abundant family of fishes was Cyprinidae represented by 9 species contributing about 31% of fish diversity in the lake. The percentage of contribution of other families is given in Table 2. The presence/absence of fish species at selected sites are illustrated in Table 3.

The fish diversity of the collected and identified fish species from different sites of Bichnaiyya lake of Basti district are shown in Table1. In present study total 29 fish species were collected from the lake belonging to17 genera, 11 families and 6 orders (Table 1). Among the various families Cyprinidae was recorded the highest species richness (9 species) followed by Ophicephalidae (4 species), Bagridae, Clupeidae, Mastacembelidae (3 species) and Notopteridae and Siluridae (2 species). All the other families Claridae, Anabantidae and Saccobranchidae were represented by one fish species. Highest number of the species were observed at site II (27 species) followed by site III (23 species) and site I (21 species). Among all the species some species such as *Xenentodon cancila*, *Gudusia chapra*, *Catla catla*, *Cirrihinus mrigala*, *Labeo rohita*, *Puntius ticto*,

Table 1: Fish diversity at study site

S. No.	Scientific name of fish	Comon/Local Name	Family
		Order -Beloniformes	
1	*Xenentodon cancilla*	Kauwa	Belonidae
		Order- Clupeiformes	
2	*Notopterus chitala*	Patra	Notopteridae
3	*Notopterusnotopterus*	Moya	Notopteridae
4	*Gudusia chapra*	Suhia	Clupeidae
5	*Gudusia godanahiai*	Godanahiya suhia	Clupeidae
6	*Gonialosa manmina*	Majhali suhiya	Clupeidae
		Order- Cypriniformes	
7	*Catla catla*	Bhakur	Cyprinidae
8	*Cirrihinus mrigala*	Nain	Cyprinidae
9	*Cirrihinus reba*	Raia	Cyprinidae
10	*Labeo rohita*	Rohu	Cyprinidae
11	*Labeo gonius*	Kursi	Cyprinidae
12	*Labeo calbasu*	Karauchar	Cyprinidae
13	*Puntius ticto*	Sidhari	Cyprinidae
14	*Puntius sarana*	Sidhari	Cyprinidae
15	*Puntius chola*	Sidhar	Cyprinidae
16	*Wallago attu*	Padhani	Siluridae
17	*Ompak bimaculatus*	Jalkapoor	Siluridae
18	*Mystus tengara*	Tengana	Bagridae
19	*Mystus cavasius*	Sutahawa tengana	Bagridae
20	*Mystus vittatus*	Tengara	Bagridae
21	*Heteropneustus fosslis*	Singhi	Saccobranchidae
22	*Clarias batrachus*	Mangur	Claridae
		Order-Mastacembeleformes	
23	*Macrognathus aculeatus*	Malga	Mastacembelidae
24	*Mastacembeleus armatus*	Baam	Mastacembelidae
		Order-Perciformes	
25	*Anabas testudineus*	Sumha	Anabantidae
		Order-Ophiocephaliformes	
26	*Channa marulius*	Saur	Ohiocephalidae
27	*Channa punctatus*	Girai	Ohiocephalidae
29	*Channa gachua*	Changa	Ohiocephalidae
29	*Channa straitatus*	Sauri	Ohiocephalidae

Wallago attu, *Ompok bimaculatus*, *Mystus tengra*, *Mystus vittatus*, *Heteropneustes fossilis*, *Clarias batrachus*, *Mastacembelus armatus*, *Anabas testudineus*, *Channa punctatus*, and *Channa gachua* were found at all the sites. *Notopterus notopterus*, *Gonialosa manmina*, *Cirrihinus reba*, *Puntius sarana*, and *Mystus cavassius* were found atSite II and Site III and *Notopterus chitala*, *Labeo gonius*, *Puntius chola*, *Macrognathus aculeatus*, and *Channa marulius* were found at Site I and Site III.

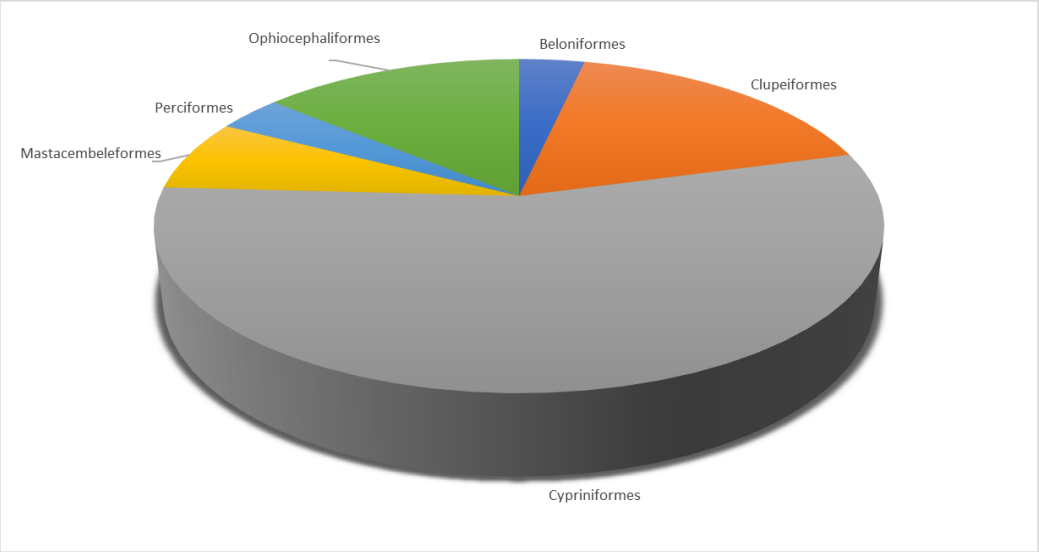

Fig. 2: Order-wise representation of fishes at study site.

Table 2: Family-wise representation of fishes at study site.

Order	Family	No. of fish species	% of fish species
Beloniformes	Belonidae	1	3.5
Clupeiformes	Notopteridae	2	6.9
	Clupeidae	3	10.3
Cypriniformes	Cyprinidae	9	31
	Siluridae	2	6.9
	Bagridae	3	10.3
	Saccobranchidae	1	3.5
	Claridae	1	3.5
Mastacembeleformes	Mastacembelidae	2	6.9
Perciformes	Anabantidae	1	3.5
Ophiocephaliformes	Ohiocephalidae	4	13.7

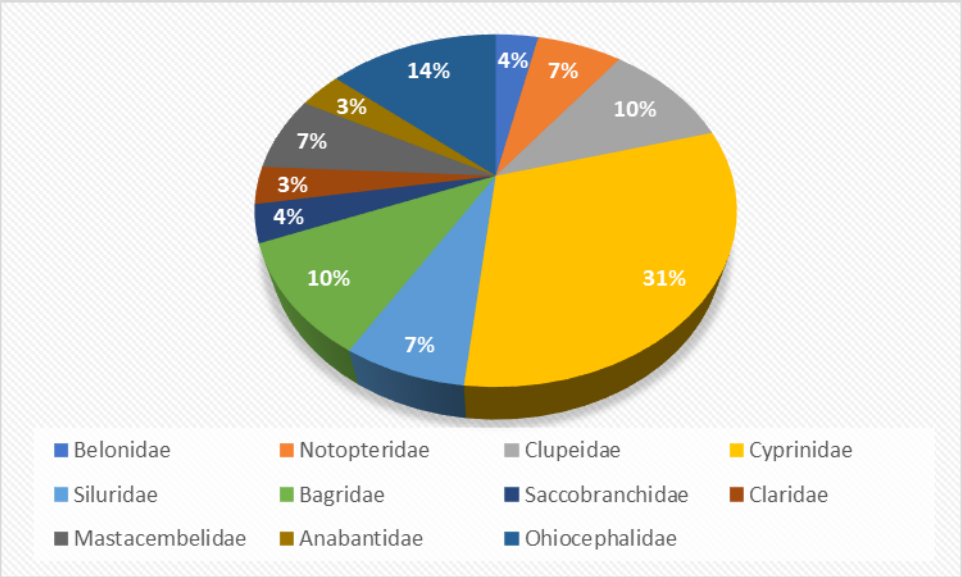

Fig. 3: Per cent Contribution of Families in Bichnaiyya Lake.

Table 3: Presence (+)/ absence (-) of Fish species at the sampling sites

S. No.	Order	Family	Species	Site I	Site II	Site III
1	Beloniformes	Belonidae	*Xenentodon cancilla*	+	+	+
2	Clupeiformes	Notopteridae	*Notopterus notopterus*	_	+	+
3			*Notopterus chitala*	+	+	_
4			*Gudusia chapra*	+	+	+
5			*Gudusia godanahiai*	+	_	+
6			*Gonialosa manmina*	_	+	+
7	Cypriniformes	Cyprinidae	*Catla catla*	+	+	+
8		Cyprinidae	*Cirrihinus mrigala*	+	+	+
9		Cyprinidae	*Cirrihinus reba*	_	+	+
10		Cyprinidae	*Labeo rohita*	+	+	+

11		Cyprinidae	*Labeo gonius*	+	+	–
12		Cyprinidae	*Labeo calbasu*	–	+	+
13		Cyprinidae	*Puntius ticto*	+	+	+
14		Cyprinidae	*Puntius sarana*	–	+	+
15		Cyprinidae	*Puntius chola*	+	+	–
16		Siluridae	*Heteropneustus fosslis*	+	+	+
17		Siluridae	*Clarius batrachus*	+	+	+
18		Bagridae	*Mystus tengara*	+	+	+
19		Bagridae	*Mystus cavasius*	–	+	+
20		Bagridae	*Mystus vittatus*	+	+	+
21		Saccobranchidae	*Heteropneustus fosslis*	+	+	+
22		Claridae	*Clarias batrachus*	+	+	+
23	**Mastacembeleformes**	Mastacembelidae	*Macrognathus aculeatus*	+	+	–
24		Mastacembelidae	*Mastacembeleus armatus*	+	+	+
25	**Perciformes**	Anabantidae	*Anabas testudineus*	+	+	+
26	**Ophiocephaliformes**	Ohiocephalidae	*Channa marulius*	+	+	–
27		Ohiocephalidae	*Channa punctatus*	+	+	+
28		Ohiocephalidae	*Channa gachua*	+	+	+
29		Ohiocephalidae	*Channa striatus*	–	–	+

Channa striatus was only found at Site III (Table 3). The fishes collected from all the sites comprises 29 species, 17 genera. The dominating populations of the lake belong to genus *Channa* (13.7%) consisting of 4 species, *Mystus*, *Labeo*, *Gudusia*, *Puntius* consisting of 3 species (10.3%). The remaining populations are *Xenentodon*, *Heteropneustes*, *Clarias*, *Wallago*, *Ompok* (3.5%), and Notopterus (6.9%). Since there is no connectivity of other sources of water in the lake so the lake is poor in fish diversity. The fish diversity is threatened due to illegal and

destructive fishing methods pollution, eutrophication, siltation (Habit *et al*., 2006) which affect the fish diversity to a large extent (Jayaram, 1981). Destructive and illegal fishing methods like use of destructive gears, small mesh size net, catching all the life stages of fish is the main cause of loss of fish diversity (Basu *et al*., 2012). The use of long fine size mesh nylon net causes indiscriminate killing of brooders in breeding season (Habit *et al*., 2006). Practices for short term profit lead to consequent reduction in fish diversity (Allan *et al*., 2005). The best approach to conserve the fish species is to educate the fisherman about the danger of the species extinction and the need of conservation (Corbacho and Sanchez, 2011). Prevention of fish species is cheaper than recalling the lost species (Bhattacharya *et al*., 2018). Limnologist, aquatic ecologist, fish biologist play major role for awareness in public for conservation of fishes (Sarkar *et al*., 2008, 2010). This study recommends the public awareness for regular cleaning of lake, avoid illegal fishing, avoid using pesticides in nearby agricultural land and strict regulations for catching early stages of fish are major concern to loss of fish diversity.

References

Allan JD, Abell R, Hogan Z, Revenga C, Taylor BW, Welcomme RL and Winemiller K. (2005) Overfishing of inland waters. BioScience 55(12): 1041-1051.

Abell R. (2002) Conservation biology for biodiversity crisis: Freshwater follow up. Conserve Biol. 16: 1435-1437.

Alcamo J, Doll P and Henrichs T. (2003) Global estimates of water withdrawals and availability under current and future "business -as-usual" conditions. Hydrological Sci J. 48: 317-337.

Basu A, Dutta D and Banerjee S. (2012) Indigenous ornamental fishes of West Bengal. Recent Res Sci Technol. 4(11): 1-22.

Bhattacharya M, Chini DS, Patra BC, Malik RC and Das BK. (2018) Assessment and modeling of fish diversity related to water bodies of Bankura District, West Bengal, India for sustainable management of cultural practices. Environ Developm Suatainability 20: 1-14.

Corbacho C and Sanchez MJ. (2001) Pattern of species richness and introduced species in native fish faunas of a Mediterranean- type basin: the Guadiana River (South west Iberian Peninsula). Regul Rivers Res Manag. 17(6): 699-707.

Day F. (1878) The Fishes of India: being a natural history of fishes known to inhabit the Seas and Freshwaters of India, Burma and Ceylon, London. Williams Dowson Sons, pp. 778.

Dutta Munshi JS. and Srivastava MP. (1988) Natural history of fishes and systematics of freshwater fishes of India. Narendra Publications House, New Delhi, pp. 381.

Froese R and Pauly D. (2014) Fish Base World Wide Web electronic publication. www.fish.org,version (08/2014).

Gupta SK and Gupta PC. (2006) General and applied ichthyology (Fish and fisheries). S Chand Company, pp. 1156.

Groombridge B. (1992) Global biodiversity: Status of earths living resources. Chapman and Hall, London, pp. 585.

Habit E, Belk MC, Tuckfield RC and Parra O. (2006) Response of the fish community to human induced changes in the Biobio River in Chile. Freshw Biol. 51: 1-11.

Jayaram KC. (1981) Freshwater fishes of India-handbook. Zoological Survey of India, Calcutta.

Jayaram KC. (1999) The fresh water of India, region. Narendra Publication House, Delhi.

Jenkins M. (2003) Prospects for Biodiversity. Science 302: 1175-1177.

Jhingran VG. (1991) Fish and fisheries of India Hindustan Pub. Co., New Delhi, pp. 727.

Pethiyagoda R. (1991) Freshwater fishes of Sri Lanka. The wild life Heritage Trust of Sri-Lanka, Colombo, pp. 362.

Qureshi TA and Qureshi NA. (1983) Indian Fishes. Brij Brothers, Bhopal, pp. 209.

Sarkar UK, Gupta BK and Lakra WS. (2010) Biodiversity, ecohydrology, threat status and conservation priority of freshwater fishes of River Gomti, a tributary of Ganga (India). Environmentalist 30: 3-17.

Sarkar UK, Pathak AK and Lakra WS. (2008) Conservation of freshwater fish resources of India: New approaches, assessment and challenges. Biodivers Conserv. 17: 2495-2511.

Shukla P and Singh A. (2013) Distribution and diversity of freshwater fishes in Aami River, Gorakhpur, India. Adv Biol Res. 7: 26-31.

Singh VN, Kumar V and Singh GP. (1994) Qualitative and quantitative study of benthic fauna of Kararia Lake of Motihari, Bihar, India. J Freshwater Biol. 6: 21-25.

Srivastava GJ. (2022) Fishes of Uttar Pradesh and Bihar 22nd edn., Vishwavidyalaya Prakashan, Varanasi (India), pp. 208.

Talwar PK and Jhingran AG. (1991) Inland fishes of India and adjacent countries. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, pp 1-322.

Vorosmarty C, Green JP and Salisbury J. (2000) Water system group. A Global Hydrology Research Group. Science 289: 284-288.