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Ichthyo-faunal Diversity of Alwara Lake: Threats and Conservation Status

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Abstract: Fishes are very important aquatic components and play a vital role in food web. An attempt has been made to study the fish fauna naturally occurring in Alwara Lake of district Kaushambi, Uttar Pradesh, India. The survey was focussed mainly on fish biodiversity and undertaken during July, 2020 to June, 2021. The results of the present study reveal occurrence of 45 species belonging to 9 orders, 18 families and 29 genera. The members of family Cyprinidae were dominated by 13 species followed by Bagridae (6 species); Ophiocephalidae (4 species); Siluridae (3 species); Schilbeidae, Clariidae, Gobiidae, Notopteridae and Mastacembelidae each with two species; Saccobranchidae, Ophiocephalidae, Gobiidae, Anabantidae, Nandidae, Osphronemidae, Ambassidae, Clupeidae, Eugraulidae, Belonidae and Tetraodontidae each with one species. It is concluded that the fish in this wetland is under threat due to anthropogenic activities such as overfishing and pollution. Therefore, conservation action plan is strongly needed for conservation of rare and threatened fish in this natural lake.

Keywords: Fish diversity, Fish fauna, Sarus crane, Conservation, Alwara lake

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Introduction

Fishes (Chondrichthyes and Osteichthyes) are exclusively aquatic animals with streamlined body (Verma and Prakash, 2020). They constitute almost half of the total number of vertebrates in the world and live in almost all conceivable aquatic habitats. Out of 30,900 species of vertebrate, about 22,000 living fish species have been recorded (Jayaram, 2010). India is one of the mega biodiversity hot spot contributing 11.72% of globe fish biodiversity. Fisheries sector in India has shown outstanding growth and ranks third in the world in total fish production and contributes around 1.07 % of the Gross Domestic Products (GDP) and 5.34% of the agricultural GDP. The

fishes are used not only as food, medicine but also as bio-indicators, research models and active links between ecosystems, entertainment and to mitigate vector borne diseases.

Fish is one of the most important components of food for human beings, because it provides protein, lipids, vitamins, minerals, essential amino acids and fatty acids for the growth, development and maintenance of a healthy human body and prevents several nutritional deficiency diseases (Kumar *et al.*, 2020). Fishes are also richest sources of ω 3-polyunsaturated fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (Prakash, 2020a). So, it is essential to study

the distribution and availability of fish from freshwater rivers, lakes, reservoirs, ponds and wetlands. Wetlands are areas where water is the primary factor controlling the environment and the associated plants and animal life. The climatic change influences to its vast openness, landscape ecology and biodiversity of wetlands (Ashok, 2017; Prakash, 2020b; Arya, 2021).

The fish diversity is subjected to the changes in land and water resulting into substantial losses of fishes and remaining species may be at a risk. Fish species inhabiting in lentic fresh water bodies have to live under harsher and more variable conditions and they may put to extraordinary stress because of human interventions. Natural water has more stable conditions under which the fish evolve, hence enlisting biodiversity and its distribution over time and space becomes important. Until one knows the diversity and variations over time and space, it is difficult to plan conservation and the developmental projects related to water resources (Prakash and Yadav, 2020).

Due to irrational fishing practices, environmental aberrations like reduction in water volume, increased sedimentation, water abstraction, and pollution over the years, fish diversity is declining and even few species have been lost from the freshwater ecosystem of India and some are under endemic, endangered and threatened category (Prakash *et al.* 2020; Sanjay and Prakash, 2020).

Several studies have been done by different researchers on different aspects of fish diversity from various fresh water bodies in India during the last few decades such as Jayaram (2010), Jhingran (1991), Bhat (2003) and Gowda *et al.* (2015). Fish diversity of Alwara lake has been studied by Verma and Prakash (2016a). In this study, an attempt has been made to provide diversity, threats and current conservation status of fishes naturally occurring in Alwara lake of district Kaushambi, Uttar Pradesh, India.

Materials and Methods

Study area:

The Alwara lake is a natural lake (Fig. 1), located in Sarsawan block of Manjhanpur tahsil of district Kaushambi of Uttar Pradesh, India. This is a part of perennial marshy wetland, situated between the latitude 25°24'05.84" S – 25°25'10.63" N and longitude 81°11'39.49" E-81°12'57.95" W with altitude MSL- 81.08 meter. It is surrounded by agricultural fields and is connected to the river Yamuna and Kishanpur lift canal and covers several hundred hectares. The lake is skirted by villages like- Koripur, Ranipur, Dundi, Hatwa and Bhawansuri in the east; PaurKashi Rampur, Alwara and Gaura in the north; Shahpur, Umrawan in the south and Mawai, Tikra and Dalelaganj in the west.

Fig. 1: Study area in Kaushambi district (U.P.)

The lake has derived its name from village Alwara. Locally it is called AlwaraTaal (Verma and Prakash, 2016b). The taal is a marshy riparian type perennial wetland, covering an area of several hundred hectares. The annual floods of adjacent river Yamuna bring about the vast openness of agricultural land after rainy season during winter and summer around the lake. It also turned out into an open land form and many irregular shapes of marshy wetland during non-flooding periods. The climatic change therefore influences to its vast openness, landscape ecology and biodiversity. In this lake, the water level falls during summer and winter but rises during rainy season.

Fishes were caught and collected for the present study from few sites of Alwara lake by

hand-nets, gill nets, cast nets, hooks and drag nets with the help of local people and fishermen mainly during the time of fishing. Investigations regarding fish capture and collection were conducted twice in a month for the period of one year from July, 2020 to June, 2021.

Preservation and Labeling of Fish specimens:

The collected fish specimens were preserved in 10% formaldehyde solution at the sampling site. Small fish specimens (less than 10 cm) were preserved directly in formaldehyde solution whereas larger specimens were preserved after incision in belly. The preserved specimens were stored in the plastic containers. Every sample was individually labeled and details of site, date and time of collection and other related information of specimen were recorded. Colour of the specimens was also recorded before preservation.

Identification of fish specimens:

Identification of fish specimens was done up to species level while identifying its natural colour, pattern of scales, fins, mouth pattern, identification marks like black or red spots, bloch on operculum, paired and unpaired fins and body parts according to the guidelines mentioned by earlier workers -- Mishra (1959), Datta Munshi and Srivastava (1988), Day (1989), Menon (1992), Srivastava (1998) and Jayaram (2010).

Results and Discussion

The ichthyofaunal diversity of collected fish species from Alwara lake are shown in Table1. In the present study total 45 fish species were collected from six sampling sites belonging to 9 orders, 18 families and 29 genera.

The Alwara lake, a wetland ecosystem supports diverse stock of carps, catfishes, perches, feather backs, gobies, eels, puffers etc. Status of fish species of the Alwara lake is given in Table 1. *Danio devario*, *Amblypharyngodon mola*, *Tetraodon cutcutia*, *Mastacembelus aculeatus* and *Bagarius bagarius* are very rare and occur on upper parts. The middle and lower parts are mainly inhabited

by mixed group of fishes like carps, catfishes, perches, snake heads, feather backs and eels. Out of 45 species, very rare (5), rare (18) moderate (9) and Common (13) were observed. Among these, *Cirrhinus reba*, *Labeo bata*, *Labeo dera*, *Puntius sarana*, *Mystus* spp., *Notopterus notopterus* and *Channa* spp. were frequently observed while some species of carps and catfishes were seen moderately and rare also.

Fish species composition when grouped into families reveal that Cyprinidae captures the major share (28.26%) followed by family Bagridae (13.04%), Ophiocephalidae (8.70%), Siluridae (6.52%), Schilbeidae (4.35%), Clariidae (4.35%), Gobiidae (4.35%), Notopteridae (4.35%), Mastacembeleidae (4.35%) and each of remaining 9 families comprises 2.17%. Besides native fishes, exotic fish, *Cyprinus carpio* was also present in this wetland. *Catla catla*, *Labeo rohita*, *Cyprinus carpio*, *Ompok pabda* are rare and have been recorded during rainy season. *Puntius ticto* has been recorded during spring season.

As per latest version of International Union for Conservation of Nature Red List (IUCN, 2021), out of 45 species of fishes identified, 2 species are under EN (Endangered), 5 under NT (Near Threatened), 37 under LC (Least Concern) and 1 species VU (Vulnerable). So far, considerable attention should be paid to conserve fish species which fall under EN, UV and NT categories.

Author noticed that this lake has good biodiversity as it is rich biota and supports vulnerable Indian Sarus crane because of its vast openness (Ashok, 2016; Verma and Prakash, 2017, 2018, 2021; Prakash and Verma, 2019). The occurrence of rich bio-diversity is an index of healthy, growing, dynamic and economically efficient water body.

Author strongly suggests that the fishery authorities should investigate and practice the proper exploitation and management of this fishery resource according to ecological principles. Fishing during breeding season is serious threat and should be banned. Illegal fishing methods and

Table 1: Ichthyo-fauna of Alwara lake, Kaushambi district of U.P., India

S.N.	Fish Species	Common Name/ Local Name	Availability in Alwara Lake	Conservation status
Order- Cypriniformes; Family- Cyprinidae (Minnows and Carps)				
1.	<i>Catla catla</i> (Hamilton)	Bhakur	Rare	LC
2.	<i>Labeo rohita</i> (Hamilton)	Rohita	Rare	LC
3.	<i>Labeo calbasu</i> (Hamilton)	Karaunchh	Rare	LC
4.	<i>Labeo bata</i> (Hamilton)	Bata	Common	LC
5.	<i>Labeo dero</i> (Hamilton)	Gargi	Common	LC
6.	<i>Labeo gonius</i> (Hamilton)	Kuria / Gonius	Rare	LC
7.	<i>Cirrhinus mrigala</i> (Hamilton)	Naini	Rare	LC
8.	<i>Cirrhinus reba</i> (Hamilton)	Reba	Common	LC
9.	<i>Cyprinus carpio</i> (Linnaeus)	Common carp	Rare	VU
10.	<i>Puntius sarana</i> (Hamilton)	Sarana	Common	LC
11.	<i>Puntius ticto</i> (Hamilton)	Two spot barb	Moderate	LC
12.	<i>Danio devario</i> (Hamilton)	Pataki	Very Rare	LC
13.	<i>Amblypharyngodon mola</i> (Hamilton)	Molacarplet	Very Rare	LC
Order- Siluriformes; Family- Bagridae				
14.	<i>Mystus seenghala</i> (Sykes)	Tengara	Rare	LC
15.	<i>Mystus cavasious</i> (Hamilton)	Tengara	Common	LC
16.	<i>Mystus vittatus</i> (Bloch)	Tengara	Common	LC
17.	<i>Mystus tengara</i> (Hamilton)	Tengara	Common	LC
18.	<i>Mystus aor</i> (Hamilton)	Tengara	Common	LC
19.	<i>Rita rita</i> (Hamilton)	Rita	Rare	LC
Order- Siluriformes; Family- Siluridae				
20.	<i>Wallago attu</i> (Schneider)	Pardni	Common	LC
21.	<i>Ompak pabda</i> (Hamilton)	Pabdah catfish	Common	NT
22.	<i>Ompak bimaculatus</i> (Bloch)	Butter catfish	Rare	NT
Order- Siluriformes; Family-Schilbeidae				
23.	<i>Pangasius pangasius</i> (Hamilton)	Pangas catfish	Rare	LC

24.	<i>Ailia coila</i> (Hamilton)	Gangetic ailia	Rare	NT
Order- Siluriformes; Family- Clariidae				
25.	<i>Bagarius bagarius</i> (Linnaeus)	Goonch	Very Rare	NT
26.	<i>Clarias batrachus</i> (Linnaeus)	Mangur	Moderate	LC
Order- Siluriformes; Family- Saccobranchidae				
27.	<i>Heteropneustes fossilis</i> (Bloch)	Singhi	Moderate	LC
Order- Ophiocephaliformes; Family- Ophiocephalidae (Snake headed fish)				
28.	<i>Channa punctatus</i> (Bloch)	Saura	Common	NE
29.	<i>Channa marulius</i> (Hamilton)	Saura	Moderate	LC
30.	<i>Channa striatus</i> (Bloch)	Saura	Common	LC
31.	<i>Channa gachua</i> (Hamilton)	Saura	Rare	LC
Order-Perciformes; Family- Gobiidae (Gobies)				
32.	<i>Glossogobius giuris</i> (Hamilton)	Balia / Bhalia	Rare	LC
33.	<i>Badis badis</i> (Hamilton)	Blue Perch	Rare	LC
Order-Perciformes; Family- Anabantidae (Climbing Perch)				
34.	<i>Anabas testudeni</i> (Bloch)	Kawai	Moderate	LC
Order-Perciformes; Family- Nandidae (Leaf fish)				
35.	<i>Nandus nandus</i> (Hamilton)	Gangetic leaf fish	Rare	LC
Order-Perciformes; Family- Osphronemidae (Gourami fish)				
36.	<i>Colisa fasciatus</i> (Bloch)	Rainbow gourami	Moderate	NE
Order-Perciformes; Family- Ambassidae (Glassfishes)				
37.	<i>Chanda nama</i> (Hamilton)	Chanda	Moderate	NE
Order -Osteoglossiformes ; Family- Notopteridae (Featherbacks / Knifefishes)				
38.	<i>Notopterus notopterus</i> (Pallas)	Patara / Pholi	Common	LC
39.	<i>Notopterus chitala</i> (Hamilton)	Chitala	Moderate	NT
Order -Clupeiformes ; Family-Clupeidae (Herrings)				
40.	<i>Gudusia chapra</i> (Hamilton)	Suhia / Suiya	Rare	LC
Order -Clupeiformes ; Family-Engraulidae (Forage fish)				
41.	<i>Setipinna phasa</i> (Hamilton)	Phasia	Rare	LC
Order -Beloniformes; Family- Belonidae (Needle fish)				
42.	<i>Xenentodon cancila</i> (Hamilton)	Kauwa machhali	Moderate	LC

Order - <u>Synbranchiiformes</u> ; Family- Mastacembeleidae (Spiny eels)				
43.	<i>Mastacembelus armatus</i> (Lacepede)	Bam	Rare	LC
44.	<i>Mastacembelus aculeatus</i> (Bloch)	Bam	Very Rare	EN
Order -Tetraodontiformes; Family- Tetraodontidae (Puffer fish)				
45.	<i>Tetraodon cutcutia</i> (Hamilton)	Galfulni, Kutkutia	Very Rare	EN

fishing of small sized fishes should be monitored regularly. Thus, it should be the duty of each one to play an important role to conserve fish diversity as this plays and handover the valuable biodiversity in the healthy condition to the future generation. The work will be proved fruitful to conserve the other flora and fauna of Alwara lake.

Conclusion

Since the ecological condition of this lake not only supports the survival of a number of fish species and other endangered species like Indian sacred lotus and Indian Sarus crane, hence there is a compulsory need to understand the conservation priorities and to design and implement conservation action plan. It will save the genetic resources of fish as well as Sarus crane from the danger of extinction. Moreover, author recommends the declaration of the entire Alwara Lake as '*Fish and Sarus Sanctuary*' for the conservation of these threatened species. Huge exploitation of natural resources of the Alwara lake should be reduced.

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