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Fish Diversity and Hydrological Parameters of Indrasagar Reservoir (Khandwa District)

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Abstract:- The state of Madhya Pradesh is the central state of India & one of the important aquatic biodiversity hotspots of the country, having bestowed with a large number of water bodies both lotic and lentic, the state boasts of rich fish biodiversity. The aim of this study is collection and identification of finfish that found in Indira sagar reservoir and the water quality parameter of the reservoir in which the fishes thriving. Total 54 species of 9 order were found in the reservoir in Khandwa district including *labeo rohita,Catla catla, Cirrhinus mrigala, Ctenopharyngodon idella Labeo calbasu, Puntius sophore, Pethia ticto,Puntius chola, Cyprinus carpio, Pangasianodon hypophthalmus, Oreochromis mossambicus, Glossogobius giuris, Channa marulius, Channa gachua , Channa striata and Clarias magur* etc. The 03 species of transplanted Indian major carps *Catla catla, Cirrhinus mrigala* and *Labeo rohita* are dominating the fishermen catches The authors are of firm opinion that the exotic species are posing competition for food and space to the native species.. To certain extend even hybrid of catla and rohu are available in the fish catches The water quality parameters were significantly found suitable for freshwater cultivable species including the temperature, dissolved oxygen, Total hardness , dissolved oxygen and temperature are higher in summer season and lower in winter season. This may be due to higher photosynthetic rate in summer season. Whereas the pH value is higher in winter season and lower in summer season. It indicates reduction in photosynthetic activities in winter which reduces assimilation of carbon dioxide and bicarbonates.

I. INTRODUCTION

Every living thing on Earth has distinct traits that contribute to the ecological balance of ecosystems. Water bodies' ecological processes have a substantial impact on the structure and content of their biotic communities. Fish play an important function in aquatic systems and are economically valuable. Wetlands inland fisheries, and understanding the dynamics of their ecosystems is critical for efficient usage and protection. Madhya Pradesh is rich in aquatic environments, with a total water area of 3.0 lakh hectares that includes reservoirs and ponds. At present, the decline of fish biodiversity is considered a severe worldwide concern.

The sustainable management of fish stocks confronts substantial problems, including increased harvest pressure, damaging fishing techniques, and the introduction of non-native species. These barriers present significant obstacles for fisheries scientists working to protect local fish populations. (Sarkar and Lakra 2007). Multiple factors influence fish diversity within a given geographical area, with a focus on geographic location, diverse aquatic ecosystems, overall water body health, effective commercial fish species management, law and regulation enforcement, and initiatives aimed at restoring fish habitats. (Uchchariya *et al.*, 2012). To protect diversity, it is critical to regulate human activities and undertake more water quality evaluations in this dam. This will help in the implementation of suitable conservation measures to preserve the aquatic ecosystem's variety and vitality (Sharma *et al.*,2010)

The findings of Dibakar *et al.* (2012), emphasize the need of monitoring and treating water quality issues in the Kunda River in order to preserve its ecological health and biodiversity. fish diversity and limnological conditions compromised unfortunately, due to numerous human activities, the majority of these have been eutrophicated, resulting in poor water quality and a loss in native fish species in their natural habitats. (Tamot and Awasthi 2012). Fish biodiversity in reservoirs can vary significantly depending on factors such as location, size, depth, water quality, and surrounding habitat. Reservoirs are artificial bodies of water created by damming rivers or streams, primarily for purposes like water supply, irrigation, flood control, hydropower generation, and recreation.

II. MATERIALS AND METHOD

- *Study Area (Location)*

Indirasagar dam, also commonly referred as Punasa dam and it is one of the ambitious project in Madhya Pradesh region, was established with an aim of offering irrigation facilities to the villages of Khandwa districts.

- *Collection of Fishes*

Fishes were caught for the present study from Indirasagar dam, by local fisherman by operating cast net and during Government operation using drag nets and gill net for its harvesting. A period of one year from June 2010 to May 2011.Fishes were identified using the standard keys of Day, F. (1989), Mishra, K.S. (1959), Jhingran (1991) Jayaram (1999) and Shrivastava (1998).

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III. PHYSICO-CHEMICAL PARAMETERS

During the course of research of 5 months between November 2020 to Jaunary 2021, we analyzed water sample for various physical Chemical parameters followed by the methodology in APHA (1998) Physico-chemical parameter of water. The physico-chemical parameter was analyzed by following method for water chemistry as given in APHA (1998)

- *Temperature*

Atmospheric temperature and water temperature were recorded with the help of standard digital thermometer. The atmospheric temperature was recorded under shade and water temperature of sample was recorded at the sampling station by dipping the thermometer in the water for nearly 1 minute. The result has been recorded in degree Celsius (°C).

- *Dissolved Oxygen*

Dissolved oxygen was determined by modified Winkler's Methods. The sample was collected 125 ml oxygen bottles and 1 ml of manganous sulphate and l m alkaline iodide azide solution were added to fix the dissolved oxygen. It was shaken sufficiently and the brown precipitate which appeared was allowed to settle. 2ml of Conc. Sulphuric acid was added to it through the sides of the bottle and shaken well to dissolve the precipitate. 50 ml of this solution was taken in a conical flask and titrated with 0.025 N Sodium thiosulphate Solution using starch as an indicator to colour less. The Dissolved Oxygen was calculated as follows:

Dissolved Oxygen in (mg/l) = (8 ×1000 ×N)/V

The result is expressed in D.O. (mg/l)

where,

V= Volume of the sample (ml) v = Volume of titrate used (ml)

N = Normality of titrate (0.025N) 8 = Molecular weight of Oxygen.

- *pH*

We analysis pH with pH paper. Dip the end of pH strip into the sample water. After a couple of seconds, remove the paper and compare the color of the pH strip to the color chartprovided with the pH paper.

- *Total Hardness*

The hardness of sample was calculated by titrating it against 0.01M EDTA titrate in presence of 1 ml Ammonia Buffer solution and 5 drops Eriochrome Black- T Indicator. Titration was continued till the colour Changed from Wine red to clear blue. Total hardness was calculated by using following formula:

Total Hardness= (Volume of titrant used × 1000)/(ml of sample used)The result was expressed in (mg/l).

Table 1. Fish Diversity Found During the Study

Particulars	Remark
A. Osteoglossiformes	
I. Notopteridae	
Notopterus notopterus (Pallas, 1769)	**LC**
B. Anguilliformes	
I. Anguillidae	
Anguilla bengalensis (Gray, 1831)	**NT**
C. Cypriniformes	
I. Cyprinidae	
Catla catla (Hamilton, 1822)	**T**
Cirrhinus mrigala (Hamilton, 1822)	**T**
Ctenopharyngodon idella (Valenciennes, 1844)	Exotic / I
Cyprinus carpio Linnaeus, 1758	Exotic / I
Hypophthalmichthys nobilis (Richardson, 1845)	Exotic / I
Hypophthalmichthys molitrix (Valenciennes, 1844)	Exotic / I
Hypselobarbus kolus (Sykes, 1839)	**VU**
Labeo boggut (Sykes, 1839)	**LC**
Labeo calbasu (Hamilton, 1822)	**LC**
Labeo fimbriatus (Bloch, 1795)	**LC**
Labeo rohita (Hamilton, 1822)	**T**
Osteobrama peninsularis Silas, 1952	**DD**
Osteobrama vigorsii (Sykes, 1839)	**LC**
Puntius chola (Hamilton, 1822)	**LC**
Systomus sarana (Hamilton, 1822)	**LC**
Puntius sophore (Hamilton, 1822)	**LC**

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Pethia ticto (Hamilton, 1822)	**LC**
Tor tor (Hamilton, 1822)	**DD**
Salmophasia balookee (Sykes, 1839)	**LC**
Salmophasia boopis (Day, 1874)	**LC**
Amblypharyngodon mola (Hamilton, 1822)	**LC**
Brachydanio rerio (Hamilton, 1822)	**LC**
Rasbora daniconius (Hamilton, 1822)	**LC**
Garra mullya (Sykes, 1839)	**LC**
I. Bagridae	
Mystus cavasius (Hamilton, 1822)	**LC**
Mystus vittatus (Bloch, 1794)	**LC**
Rita gogra (Sykes, 1839)	**LC**
Sperata seenghala (Sykes, 1839)	**LC**
II. Siluridae	
Ompok bimaculatus (Bloch, 1794)	**NT**
Wallago attu (Bloch and Schneider)	**NT**
III. Schilbeidae	
Eutropiichthys cf. goongwaree (Sykes, 1839)	**DD**
Clupisoma bastari Datta & Karmakar, 1980	**DD**
IV. Pangasiidae	
Pangasianodon hypophthalmus (Sauvage, 1878)	**Exotic / I**
V. Sisoridae	
Bagarius yarrelli (Sykes, 1839)	**NT**
VI. Clariidae	
Clarias magur (Hamilton, 1822)	**EN**
VII. Heteropnustidae	
Heteropneustes fossilis (Bloch, 1794)	**LC**
E. Beloniformes	
I. Belonidae	
Xenentodon cancila (Hamilton, 1822)	**LC**
F. Perciformes	
I. Ambassidae	
Parambassis ranga (Hamilton, 1822)	**LC**
Chanda nama Hamilton, 1822	**LC**
J. Cichliformes	
I. Cichliadae	
Oreochromis niloticus (Linnaeus, 1758)	**Exotic / I**
Oreochromis mossambicus (Peters, 1852)	**Exotic / I**
H. Gobiiformes	
I. Gobiidae	
Glossogobius giuris (Hamilton, 1822)	**LC**
H. Anabantiformes	
I. Nandidae	
Nandus nandus (Hamilton, 1822)	**LC**

II. Badidae	
Badis badis (Hamilton, 1822)	**LC**
III. Channidae	
Channa marulius (Hamilton, 1822)	**LC**

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Channa gachua Bloch & Schneider, 1801	**NE**
Channa punctata (Bloch, 1793)	**LC**
Channa striata (Bloch, 1793)	**LC**

Taxonomic status as per Eschemeyer *et al.* 2018, T = Transplanted; I = Invasive, IUCN (2018). EN = Endangered, NT = Near Threatened, VU = Vulnerable, LC = Least Concern, NE = Not Evaluated, DD = Data Deficient. Statuses for introduced/transplanted species are not provided.

Table 2. Water Quality Parameters Recorded During the Study Period

S. No.	Parameter	Range
1.	Water temperature	26.6 ±0.31^{0}c
2.	PH	7.6±0.12
3.	Dissolved oxygen	5.6±0.12 mg/l
4.	Ammonia	0.04 ±0.03mg/l
5.	Nitrite	0.0
6.	Nitrate	0.0
7.	Hardness	350±0.24 mg/l

Overall, the evaluation shows that a number of species documented in Indira Sagar reservoir were not detected by Garg *et al.* (2010) in the Ramsagar and Tighra reservoirs in this region. It claimed that the Indira Sagar reservoir provides an ideal home for the region's freshwater fish. As a result, it is critical to develop a conservation management plan for Indira Sagar reservoir, in which vulnerable texa stocks may be replenished with the assistance of the Madhya Pradesh Government's Fisheries and Irrigation Department. Local residents, fisherman, and fisheries groups will all play an important role in preserving the reservoir and its fish biodiversity. The Indira Sagar dam harbours a rich diversity of fishes including some of the threatened fish species. But, the fish fauna of the Indira Sagar dam is under threat due to several anthropogenic activities. The 03 species of transplanted Indian major carps *Catla catla*, *Cirrhinus mrigala* and *Labeo rohita* are dominating the fishermen catches The authors are of firm opinion that the exotic species are posing competition for food and space to the native species.. To certain extend even hybrid of catla and rohu are available in the fish catches.

On the other hand the water quality parameters observed during the study (Table.2) were found in the range as, the temperature of the water is recorded as 26.6 degrees Celsius with a precision of ±0.31 degrees Celsius.The pH level of the water is 7.6, indicating a slightly alkaline condition, with a precision of ±0.12. The amount of dissolved oxygen in the water is 5.6 milligrams per liter (mg/l), with a precision of ±0.12 mg/l. This is an important indicator of water quality as aquatic organisms rely on dissolved oxygen for survival. The concentration of ammonia in the water is 0.04 mg/l, with a precision of ±0.03 mg/l. Ammonia is a nitrogen compound and its presence in water, particularly at high levels, can be harmful to aquatic life. The concentration of nitrite is recorded as 0.0, indicating either a very low level or absence of nitrite in the water. Similar to nitrite, the concentration of nitrate is also recorded as 0.0, indicating a very low level or absence of nitrate in the water. The hardness of the water is measured at 350 mg/l, with a precision of ±0.24 mg/l. Hardness refers to the concentration of dissolved minerals, particularly calcium and magnesium ions, in the water. Higher hardness levels can affect water quality and aquatic life. Overall, this table provides a snapshot of various parameters that are crucial for assessing the health and quality of the water body in question. It allows for monitoring changes over time and implementing necessary interventions to maintain or improve water quality.

IV. CONCLUSION

It is to conclude that, the Indira Sagar dam is rich in fish biodiversity but, is facing anthropogenic pressure. It harbours a number of freshwater fish species as well as globally threatened fish species. However, the fish fauna in Indira Sagar dam is threatened due to several anthropogenic activities including introduced exotic fish species, growth overfishing, municipal sewage pollution, aquatic weed infestation. The native fish fauna which supports the livelihood of local fishing community has to be sustainably utilised by proper planning, conservation and local awareness on impacts of introduction of exotics, growth overfishing is necessary. At the same time juvenile fishing

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practice by using small mesh size fishing gears and and as a result of this the fish fauna of Indira Sagar dam is subjected to growth overfishing. During the monsoon season, reproductive overfishing is also evident below the dam walls of Indira Sagar dam.All along the reverse spawning migration the adult fishes get strangled at the dam wall and get easily captured.

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