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Full Length Research Paper

Status of Fish Diversity of Mansarovar Talab of Jeerapura, Dhar (M.P) India

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ABSTRACT

Indian fisheries constitute an important sector of our national economy for various reasons. India has vast potential for development of inland fisheries. The fish population of our aquatic system plays a significant role in the human economy. Fishes of the inland waters of the Indian sub-continent have been a subject of study since a century (Hamilton-Buchanan, 1822; Day, 1878; Jayaram, 1981; Talwar and Jhingran, 1991). The biotic and abiotic factors and types of the Ecosystem (lentic & lotic habitat) play main role in fish diversity, Age of the water body, mean depth, water level fluctuation, dam design and morphometric feature have great ecological implications. Mansarovar Talab Of Jeerapura, Dhar (M.P.) is an important and well-known talab in Nemad region of Madhya Pradesh in terms of fish production, source of food and income for many people living beside where this study has been conducted during 2014 – 2015. This study revealed the existing fish species and their composition along with diversity, indices. Sampling of fishes was made by using Caste and Gill net under the guidance of local fishermen. The individuals were counted, preserved and identified up to the possible level as per the recommended standards. Diversity was measured by using Shannon wiener and Simpson diversity index. Quality of water was made by using NSF WQI. A total of 23 species of fishes were recorded which belong to 7 orders, 13 families and 2 divisions. Cypriniformes was recorded as the most diversified fish group in terms of both number of species (9) and percentage of occurrence (39.13%). Highest Simpson's diversity was (17.04) and that of Shannon was (2.81) and the lowest was 4.96 and 1.80 respectively. The NSF WQI indicated the quality of water was not up to the mark and needs various efforts to prevent its quality as it directly impacts the ecology. Hence a quick response is required to preserve the quality of water which will then conserve its ecology by its own.

Introduction

Fresh water is one of the most vital resources of Madhya Pradesh. It provides many suitable habitats of native fishes of high economic and academic value (Kumar et al 2005). Human activities like removal of sand, industrial and municipal waste discharge, destructive fishing, deforestation and hydraulic engineering structures are common threats to fish habitats. These activities, along with many others, cause spoiling damage to habitat, to fishes and to the people who, economically and socially, depend on fish. Ramesh R., Ramachandran S. (1999). Fish is only acceptable food to all non-vegetarians in this country. Despite its prominent contribution to animal protein supplies, the consumption of fish is rather low. Though science has brought about a

revolution in human life, the foremost basic need of life, the nutritious and balanced food is still far away from the reach of the common people, particularly in under-developed and developing countries (James & Allan 2001). To overcome this problem scientists have tried their best to evolve other natural resources among which aquaculture, specially the fish culture on large scale, may help to some extent as fishes constitute the major part of the aquatic world. For this, scientific management and proper monitoring of water bodies is required.

Fishes are treasured resource both in terms of utility as food and as material for Scientific Study. India has vast Potential for development of inland fisheries. Approximately 25000

fishes species have been reported from India living in fresh water, that too majority of them in tropics. Potential of inland resources of India are the entire world away richest in the world. Fishes of inland water of the Indian subcontinent have been studied since a century Day (1878), Hora (1920-59), Jhingran (1982) Nanda and Tiwari (2001)

Though several studies on the biodiversity of fishes have been conducted throughout the world (Goswami et al., 2012; Shinde et al., 2009a, b; Raghavan et al., 2008) but the study in the central India mostly of local and rural talabs is limited. Therefore In our present study an attempt has been made to document the fish fauna in the Mansarovar Talab along with physico-chemical parameters with an aim to find the current status of the talab and its ecology, the impact of human intervention, over utilization etc. from the study it has been observed the talab is in a polluted state which is mostly due to the human activity. Hence effective measures have to be taken to conserve the talab, which is not only the source of water but also as a source of food and economy for the local and rural people.

Materials and methods

Description of study Area

Mansarovar Talab is situated in the Jeerapura, on Dhar-Mandav road 23km away from Dhar in Madhya Pradesh. The talab is very old and made by parrars. The talab are basically used for irrigation, fish culture, drinking etc. It is situated between latitude 22.598°N and longitude is 75.304°E.

Methodology

Sampling of fish has been done for every fortnight days throughout the study period. Collection of fish was made by using the Caste net and gill net under the supervision of fishermen. The fish were counted on the spot and two to three individuals of each type were selected, preserved in the 5% formalin solution and brought to the laboratory for morphometric and meristic study. Further identification of the fishes was done with the help of standard keys and books (Jayaram 1996, Shrivastava 1968, Day 1958).

Data analysis

$$\text{NSFWQI} = \sum W_i Q_i$$

Percentage of occurrence was calculated by using the following formula:

$$P\% = \frac{\text{no. of individuals belonging to the } i\text{th family}}{\text{total number of individuals}}$$

Where P% is the percentage of occurrence.

Diversity was measured by using the following indices

- Shannon-Weaver diversity index, $H = - \sum P_i \ln P_i$ (Shannon and Weaver, 1949)
- Simpson's index $D = 1/\sum P_i^2$

Result and Discussion

Fish production in lake, talab & reservoir is directly or indirectly dependent on the abundance of plankton and bottom fauna (Das and chand, 2003). The physico-chemical properties of water determine the quality and quantity of the fauna (Srivastava, 1980). A total of twenty three species of fish

belonging to seventeen genera, under thirteen families and seven orders were recorded from Mansarovar talab. (Table-1) the most dominant family was cyprinidae 39.13% followed by Bargridae and Mastacembelidae 8.70% each. This is because these three groups are dominant in lentic water reservoirs of India and Bangladesh and are more tolerant towards pollution (Pathak, S. K. and Mudgal L.K., 2005). (Rahman, 1989, 2005). The family cyprinidae represents the bulk of fish species, which includes nine species. The important fish species recorded from this family are *Rasbora daniconius*, *Puntius sarana* *Puntius ticto ticto*, Family Bargridae represents second dominant family 8.70% comprised of two species namely *Mystus bleekeri* and *Mystus seenghala*. The family Siluridae represented by *Wallago attu* whereas Heteropneustidae represented by *Heteropneustes fossilise*. Family Clariidae is represented by a single species *Clarias batrachus*, family Belontiidae also recorded by single species *Colisa fasciatus*. The species recorded is *Chanda nama* and Channidae *Channa punctatus*, Family Notopteridae is also recorded by single species. The Mastacembelidae family recorded two species *Mastacembelus armatus* & *Mastacembelus pancalus*. Family Clupeidae is also recorded by single species *Hilsa hilsa* and family Nemacheilidae represented by *Noemacheilus botia*. The Change in the composition of a fish assemblage often indicate a variation in the water quality parameters. Such as pH, Temp., D.O. and Nutrient (Jhingran, 1982). Due to more fecundity of major carp and suitable environmental condition these exists a relatively higher number of cypriniformes. Such type of observation was reported by Talwar and Jhingran (1991) and Das and Chand (2003) Patnak and Mudgal (2005) Indian fishes.

National Sanitation Foundation water quality index (NSFWQI) a commonly-used water quality index (WQI) was developed by the National Sanitation Foundation (NSF) in 1970 (Brown and others, 1970). The NSF WQI was developed to provide a standardized method for comparing the water quality of various bodies of water. In the current study the same was used to check the status of water as per the standards. From the study it was observed that the value lies in the bad zone that is less than 50 but at some sites the value was just par i.e. just above the 50. The values of NSF WQI for different months of the two years are shown in the given (Graph 2 & 3). the lowest value was observed 39.41 in the month of June at S4 in the year 2014 -2015 and 41.68 at the same site in year 2015 -2016 this is mainly due to high temperature, high influence of humans as the site is mostly invaded by locals, high metabolic activities of living organisms due to the suitable temperature which results in the high accumulation of excretion.

The site receives the waste water drain which also increases its pollution level. The highest value was observed in the month of November (55.089) at S1 in 2014 – 2015 and in the same month (52.077) at the site in the following year. This result is mostly due to low temperature, high water level as the talab was filled due to monsoon rains. The month of September, October also provides ample time for sedimentation and utilization of nutrients by living organisms inhibiting the talab.

The overall value fluctuates above and below the value of 48 and does not shown any high difference at different sites.

The Season-wise values of Shannon-Weaver diversity (H), and Simpson diversity (D) indices are shown in Table2 & 3. The Shannon highest value being observed in Monsoon 2.804 and that of Simpson is 17.04 which is due the reproductive

cycle and sufficient supply of nutrients. The lowest value of Shannon and Simpson was 4.96 and 1.80 respectively in the summer season of 2015 respectively. This unexpected resulted was mostly due to the over utilization of fish, less amount of nutrient supply and low water level which allows fishermen to use their gears effectively. The similar statement was made by (Galib et al, 2013).

Table 1: Seasonal Variations in Fishes of Mansarovar Talab , Jeerapura (Dhar)(July, 2014 to Jun 2016).

S.no	Name of fish	2014-15								2015-16							
		Monsoon	Post Monsoon	Winter	Summer	Monsoon	Post Monsoon	Winter	Summer	Monsoon	Post Monsoon	Winter	Summer	Monsoon	Post Monsoon	Winter	Summer
1	Labeo rohita	+	+	+++	+	+	+	+++	+	+	+	+++	++	+	+	++	+
2	Labeo calbasu	+	-	+++	-	+	+	+++	+	+	-	+++	+	+	+	++	-
3.	Labeo bata	-	+	-	++	-	+	++	-	-	-	++	+	-	+	+	-
4.	Notopterus notopterus	-	+	-	++	-	+	++	-	-	-	++	+	-	+	+	-
5.	Catla catla	+	++	+++	++	+	+	+++	+	+	+	+++	+	+	+	++	+
6	Rasbora daniconius	+	+	++	+	+	+	+++	-	-	-	++	-	-	-	-	-
7	Puntius sarana	-	+	++	-	-	+	++	-	+	+	+++	-	-	+	++	-
8	Puntius ticto	+	-	+++	++	-	-	++	-	+	-	++	-	-	-	++	-
9	Cirrhinus mrigale	-	+	+++	++	+	+	+++	+	+	+	+++	+	+	+	++	+
10	Mastacembalus armatus	+	++	++	-	+	+	+++	+	+	-	+++	+	+	-	++	-
11	Mastacembelus pancalus	+	+++	++	+++	+	+	++	+	+	+	+	++	+	+	++	++
12	Cyprinus carpio	-	-	-	+	-	+	-	-	-	-	-	+	+	-	-	-
13	Wallago attu	+	+	++	++	+	+	+	+	+	+	++	++	+	+	++	+
14	Mystus seenghala	+	+	+++	-	+	-	+++	+	+	-	+++	-	+	-	++	-
15	Mystus bleekari	+	++	+++	+	+	+	+++	+	+	+	+++	++	+	+	++	+
16	Heteropneustes fossilis	+	+++	++	+++	+	+	++	+	+	+	+	++	+	+	++	++
17	Clarias batrachus	-	+	++	-	-	+	++	+	-	-	+++	++	-	+	++	++
18	Chanda nama	+	+	++	+	+	+	+	+	-	-	++	+	-	-	-	-
19	Colisa fasciatus	+	+	+	-	-	-	+	-	-	-	-	-	-	-	-	-
20	Nandus nandus	0	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-
21	Channa punctatus	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-
22	Mystus bleekari	+	+++	++	+	+	+	++	+	-	+	++	++	-	+	++	++
23	Hilsa hilsa	+	+	-	+	-	-	-	+	+	+	-	-	-	+	+	-
24	Noemacheilus botia	+	+	+++	++	-	+	++	+	-	-	-	-	-	-	-	-

Index: +++ Abundant 10-20, ++ Less Abundant 05-10, Always Visible + Rare 1-2, Sometime Visible, - Absent

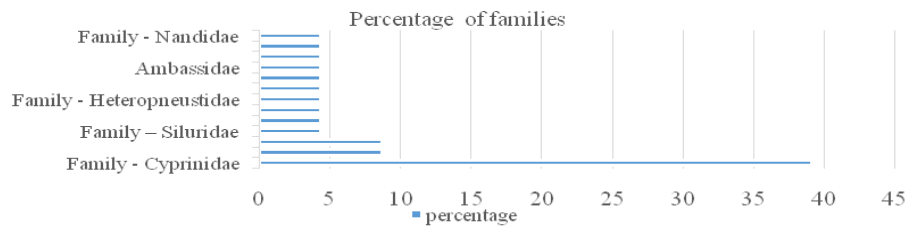


Figure 1: Percentage occurrence of fishes at family level

Table 2: Fish Diversity Index, Year 2014 – 2015

Shannon wiener index	Simpson index
2.3211	17.04347826
2.37163	9.859237537
2.36432	14.68615061
2.47766	10.24338624
2.55345	13.88888889
2.724737979	13.44537815
2.782	14.48161543
2.46424	9.382978723

Table 3: Fish Diversity Index, Year 2015 - 2016

Shannon wiener index	Simpson index
2.50666	11.64516129
2.38573739	6.428571429
2.810639379	15.2591133
2.324984996	9.485666105
2.35126	10.125
2.45376952	10.36490251
2.61783502	12.25930764
1.79824	4.964044944

Table 4: Physico Chemical parameters of Mansarovar Talab.

Temperature	27.5 ⁰ C
PH	7.8
Dissolved Oxygen demand	5.40 mg /l
Biochemical Oxygen demand	3.3 mg / l
Total hardness	145 mg / I
Total Calcium hardness	125 mg / I
Alkalinity	135 mg / I
Chloride	38 mg / I
Sulphate	1.60 mg / I
Nitrate	1.82 mg / I
Phosphate	0.90 mg / I

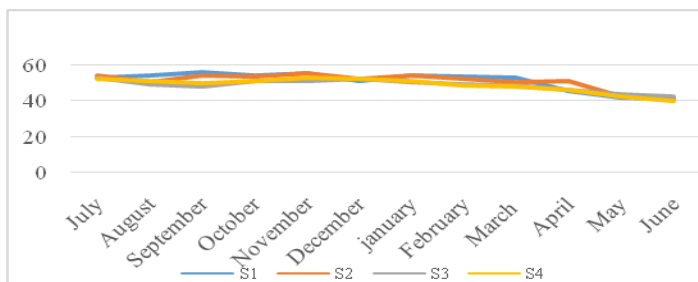


Figure 2: NSF WQI value 2014 – 2015

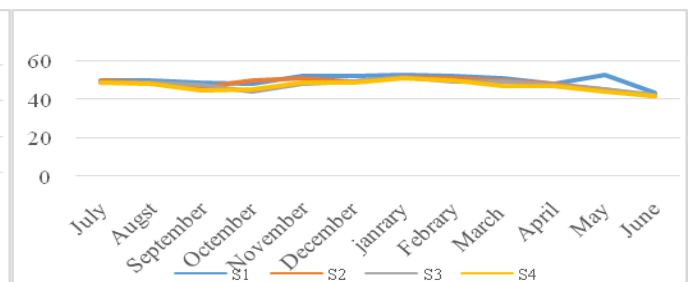


Figure 3: NSF WQI value 2015 - 2016

The WQI ranges have been defined as (Brown and others, 1970):

- 90-100: Excellent
- 70-90: Good
- 50-70: Medium
- 25-50: Bad
- 0-25: Very Bad

Conclusion

Fishes being nutrient rich is considered as an ultimate source of food. As the population is increasing rapidly so is the decline of agriculture land due to mass transformation into urbanization, building roads etc. It is quite evident that in the near future more than half of the population will face starvation due to increasing demand and shortage of agricultural food. The only solution to fix this problem is effective and planned utilization of aquatic resources mostly the fish resources. Hence important steps and measures has to be made to conserve these types of resources as these resources not only provide the food but are also the valuable source of economy mostly in India and other Asian countries.

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