

Changes in Diversity Patterns of Fish after Construction of Sardar Sarovar Dam-A case Study of Barwani District M.P. India

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ABSTRACT

Present study was conducted to study the changes in fish diversity of Narmada River at Barwani district M.P. after construction of Sardar sarovar dam, from July 2016 to June 2017. Total seven sampling stations were selected such as Site-1 Khalghat, Site-2 Rajghat, Site-3-Chikhhalda, Site-4-Bhilkheda, Site-5-Pichodi, Site-6-Bijasan and Site-7-Morkatta. In total 26 species of fishes were recorded, among which order *Cypriniformes* dominated with 16 species, and family wise family *Cyprinidae* was dominant with 16 species followed by family *Bagridae* with 5 five species. Siluridae with 2 species, and Ambasiidae 1 species. Channidae 1species. Notopteridae 1species. Among the sampling station Khalghat showed a maximum number of fish species recorded 25 during the study, while as at Bhilkheda, Pichodi sites minimum number of fish species were recorded as 10. It was found that the number of species reported during the present study showed a declining trend which is mainly due to the habitat destruction, introduction of exotic species and overfishing.

Keywords: dominance of species, overfishing, Habitat destruction and exotic species.

INTRODUCTION

Narmada is a fifth longest river in central India. It flows through the states of Madhya Pradesh (1077km), Maharashtra (74 km)-(35km) then along the border between Madhya Pradesh and Maharashtra (39 km) and the border between Madhya Pradesh and Gujarat (161km) over a length of 1,312km before draining through the gulf of cambay into the Arabian Sea. Fish live in almost every possible aquatic habitat and constitute half of the total number of vertebrate in the world. India is one of the mammoth biodiversity countries in the world and occupies the ninth position in term of freshwater mega biodiversity (Mittermeier *et al.*, 1997). In India there are about 2500 species of fishes of which 930 lives in freshwater and 1570 are Marine (Kar *et al.*, 2003). Jayram (1981) listed 742 freshwater species of fishes coming under 233 genera, 64 families, and 16 orders from the Indian region. Talwar (1991) estimated 2546 species of fish belonging to 969 genera, 254 families and 40 orders from Indian region. Recently, Jay

ram (1999) grouped and estimated 852 species of fish belonging to 71 families and 16 orders from the Indian region. The Narmada is the fifth major river system in India and longest west flowing river in peninsular Indian. It is the most important ecological hub for biodiversity in central India and has therefore been the epicenter of biodiversity studies. There has been lot of work done on the biodiversity of the river, some of the notable contributions are from the authors Hora and Nair (1941); Karamchandani (1967); Rao *et al.*, (1991); Nath and Shrivastava (1999); Dubey (2006). Vyas *et al.*, (2006) have reported 47 fish species from river Narmada. Most recently Bakawale and Kanhere (2013) have studied the fish diversity of river Narmada in western zone during September 2006 to August 2007 and have reported 51 species of fishes in this zone of the river, among which maximum 37 species belonging to the order *Cypriniformes*. They also reported that some species of fishes like *Cirrihinus cirrihosa*, *Aspidoparia jaya*, *Colisa fasciatus*, *Labeo bata*, *Oreochthys cosuatis*, *Osteobrama cotio* etc. showed a declining trend in this stretch. Most recently it has been found that the fish fauna of the river system has been declining due to the construction of various dams and other anthropogenic activities, so the present piece of work was conducted to study the effect of construction of Sardar Sarovar dam on the fish diversity of river Narmada.

MATERIAL AND METHOD

For the present study from (July 2016 to June 2017) seven sampling stations (Ghats) were selected at the bank of river Narmada Khalghat, Rajghat, Chikhaldha, Bhilkheda, Pichodi, Bijasanan and Morkatta which are located at a distance of total 100 km from the Barwani district. Fish species were collected with the help of local fishermen and the tribal people at various locations. The collected specimens were preserved in 5% formalin and identification was done with the help of literature Day (1878) and Jayaram (1981) and the aquatic parameters was also collected by the advance instruments.

RESULTS AND DISCUSSION

During the present study from (July 2016 to June 2017) a total number of 26 species of fishes belonging

to 4 orders were recorded. *Cypriniformes* was observed to be the most dominating order with 16 species (Table 1), while as 7 species each of *Perciformes*, 2 species of *Siluriformes*, and 1 from *Osteoglossiformes* was found. Similar finding was observed by Bakawale and Kanhere (2013) who recorded 51 species of fishes belonging to 7 orders and 15 families; with higher diversity level in winter and lower in summer season. Dominance of *Cypriniformes* in Narmada River was also recorded by Vyas *et al.*, (2013). From all the sampling stations family *Cyprinidae* was most dominant with 16 species (61%), co-dominated by family *Bagridae* with 5 species (19%), followed by family *Siluridae* with 2 species (8%) and 1 species (4%) each from family *Ambassidae*, *Channidae* and *Notopteridae* (Fig.2).

During present study most dominant species of the fishes were *Cirrihinus mrigala*, *Lebeo rohita*, *Mystus Seenghala*, *Puntius sarana*, *P. ticto* and *Rita rita* which were reported from all the sampling stations throughout the study, followed by *Labeo calbasu* which was also present throughout the study present except at sampling station (VII) in the Month of May 2017 it was absent. Among all the sampling station it was found that sampling station KH. SI had a maximum number of fish species reported as 25 followed by MS VII with 19 species while as sampling stations BHS IV and PS V reported only 10 species of fishes (Table 2) and Fig1. Low diversity in summer months is due to extreme reduction of depth which ultimately results in boost of salinity, free CO₂ and hardness of water, decrease of dissolve oxygen, transparency and pH of water leading to the reduction in fish diversity whereas its vice versa in winters. Due to this, large scale degradation of physico – chemical parameters and very poor catchment of fishes is recorded in summers thus reflecting low diversity level. Some external factors also adds up to this state of affairs such as preamble of exotic species, simple habitat devastation resulting from human withdrawals for human acts like agriculture, irrigation etc and direct exploitation such as impoundments, migration of species etc. (Vyas *et al.*, 2006). By comparing the data with the literature of Rao *et al.*, (1991) it is quite clear that around 31 species were at the threat of decline and can be considered as rare species. The threatened Ichthyofauna of river Narmada in western zone was studied by Verma and Kanhere (2007).

Table 1: List of Fishes Recorded in Narmada River During July 2016 to June 2017

S.NO	ORDER	FAMILY	GENERA
1	Cypriniformes	Cyprinidae	<i>Catla catla</i> (Hamilton, 1822)
2			<i>Cirrihinus mrigala</i> (Bloch, 1793)
3	;		<i>Cirrhinus reba</i> (Hamilton, 1822)
4			<i>Lebeo rohita</i> (Hamilton, 1822)
5			<i>Lebeo calbasu</i> (Hamilton, 1822)
6			<i>Lebeo bata</i> (Hamilton, 1822)
7			<i>Lebeo fimbritus</i> (Bloch 1795)
8			<i>Lebeo gonius</i> (Hamilton, 1822)
9			<i>Puntius sophare</i> (Hamilton, 1822)
10			<i>Ctenopharydon idella</i> (Valenciennes, 1844)
11			<i>Puntius ticto</i> (Hamilton, 1822)
12			<i>Puntius sarana</i> (Hamilton, 1822)
13			<i>Tor tor</i> (Hamilton, 1822)
14			<i>Cyprinus carpio</i> (Linnaeus, 1758)
15			<i>Hypthalmichthys moltrix</i> (Valenciennes, 1844)
16			<i>Salmostoma bachaila</i> (Hamilton, 1822)
17	Perciformes	Ambassidae	<i>Chanda nama</i> (Hamilton, 1822)
18		Channidae	<i>Channa marulius</i> (Hamilton, 1822)
19		Bagridae	<i>Mystus karba</i> (Hamilton, 1822)
20			<i>Mystus singhala</i> (Sykes, 1839)
21			<i>Rita gegra</i> (valenciennes 1840)
22			<i>Rita rita</i> (Hamilton 1822)
23			<i>Mystus cavasius</i> (Hamilton, 1822)
24	Siluriformes	Siluridae	<i>Ompok Papda</i> (Hamilton, 1822)
25			<i>Ompok bimaculatus</i> (Bloch, 1794)
26	Osteoglossiformes	Notopteridae	<i>Notopterus notopterus</i> (Pallas 1769)

The total conservation of the species diversity among the abundance of the two main samples i.e. dominant number of species and the recessive number of species. Which we found in our most of all the sampling sites of the western zone of the River Narmada.

The various abundance was also calculated so that the species richness will be get known by the researcher of that our own experimental sites. The total abundance was calculated by the formula from where we get the

total species richness which is based upon the individual fish species among all the sites.

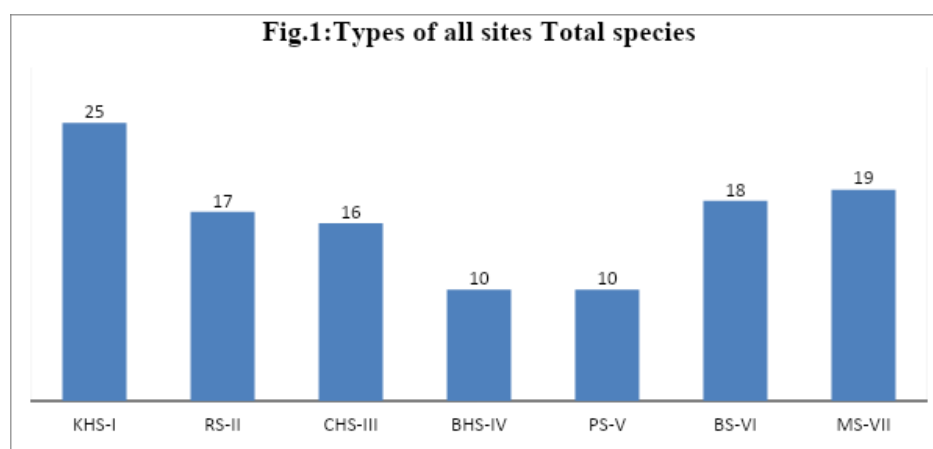
$$\text{Abundance (A)} = \frac{\text{No. of Species found}}{\text{Total Number of Species}} \times 100$$

Then the relative abundance was also calculated by the researcher of fish among all the sites was carried out by using the formula: -

$$\text{Relative Abundance (RA)} = \frac{\text{number of fishes of particular species} \times 100}{\text{total number of fish individual among all the sites}}$$

Table 2: Showing Fishes Recorded in Narmada River During July 2016 to June 2017

S.No.	Name of the fishes	KHS. I	RS. II	CHS. III	BHS. IV	PS. V	BS. VI	MS.VII
1	<i>Catla catla</i>	+	+	+	-	-	+	+
2	<i>Chanda nama</i>	+	+	-	+	-	+	+
3	<i>Channa marulius</i>	+	-	-	-	-	+	+
4	<i>Cirrhinus reba</i>	+	-	-	-	-	+	+
5	<i>Cirrihinus mrigala</i>	+	+	+	+	+	+	+
6	<i>Ctenopharydon idella</i>	+	+	+	-	-	+	+
7	<i>Cyprinus carpio</i>	+	+	+	-	+	-	-
8	<i>Hypothalmichthys moltix</i>	+	+	+	+	-	+	+
9	<i>Lebeo bata</i>	+	+	+	-	+	-	+
10	<i>Lebeo calbasu</i>	+	+	+	+	+	+	+
11	<i>Lebeo fimbrius</i>	+	-	-	+	-	+	-
12	<i>Lebeo gonius</i>	+	-	-	-	-	-	-
13	<i>Lebeo rohita</i>	+	+	+	+	+	+	+
14	<i>Mystus cavasius</i>	+	+	+	-	-	+	+
15	<i>Mystus karba</i>	+	-	-	-	-	-	-
16	<i>Mystus singhala</i>	+	+	+	+	+	+	+
17	<i>Notopterus notopterus</i>	+	-	-	-	-	-	-
18	<i>Ompok bimaculatus</i>	+	+	+	-	-	+	+
19	<i>Ompok Papda</i>	+	+	+	-	-	+	+
20	<i>Puntius sarana</i>	+	+	+	+	+	+	+
21	<i>Puntius sophare</i>	-	-	-	-	+	-	+
22	<i>Puntius ticto</i>	+	+	+	+	+	+	+
23	<i>Rita gegra</i>	+	+	+	-	-	+	+
24	<i>Rita rita</i>	+	+	+	+	+	+	+
25	<i>Salmostoma bachaila</i>	+	-	-	-	-	-	-
26	<i>Tor tor</i>	+	-	-	-	-	-	-
		25	17	16	10	10	18	19



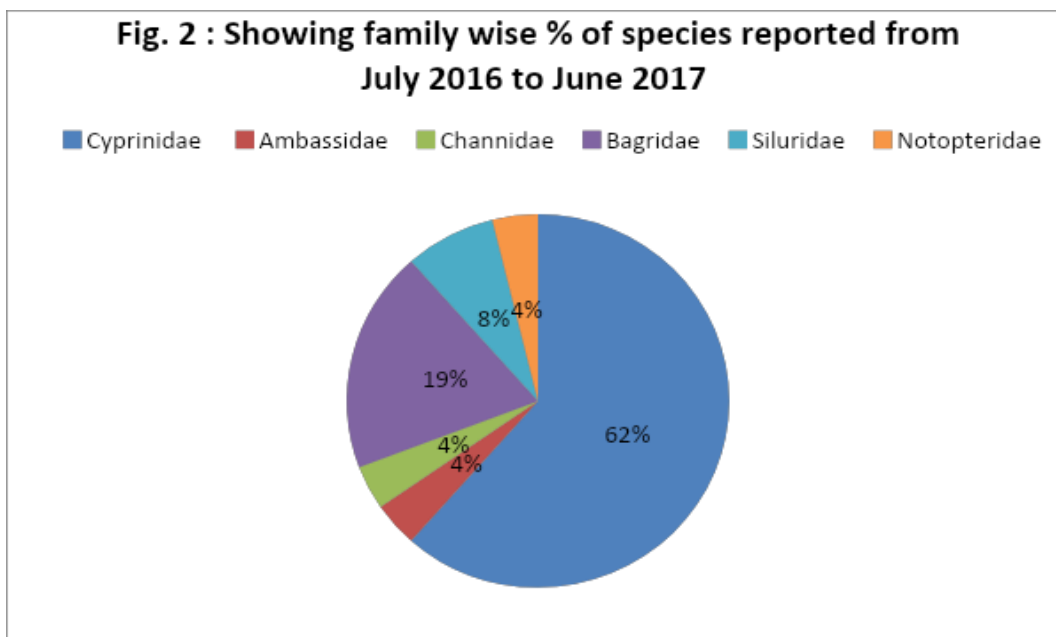
KHS-I Khalghat site, **RS-II** Rajghat site, **CHS-III** Chikhalda site, **BHS-IV** Bhilkheda site, **PS-V** Pichodi site, **BS-VI** Bijasan site, **MS-VII** Morkatta site.

Table 3: Total Number Showing Fishes Recorded in Narmada River During July 2016 to June 2017

Sl. No	Species	Site I	Site II	Site III	Site IV	Site V	Site IV	Site VII	Total No. of Species (site wise) all seasons
1	Catla catla	203	143	140	0	0	146	146	778
2	Chanda nama	91	66	0	55	0	54	48	314
3	Channa marulius	61	0	0	0	0	51	47	159
4	Cirrhinus reba	16	19	0	0	0	0	10	45
5	Cirrihinus mrigala	187	133	142	127	133	134	142	998
6	Ctenopharydon idella	115	94	87	0	0	86	81	463
7	Cyprinus carpio	132	94	92	0	70	0	0	388
8	Hypothalmictmys moltix	76	51	53	46	0	44	40	310
9	Lebeo bata	68	44	43	0	37	0	36	228
10	Lebeo calbasu	180	140	133	115	112	137	136	953
11	Lebeo fimbritus	65	0	0	40	0	49	0	154
12	Lebeo gonius	55	0	0	0	0	0	0	55
13	Lebeo rohita	149	116	109	91	86	122	126	799
14	Mystus cavasius	50	32	20	0	0	38	38	178
15	Mystus karba	40	0	0	0	0	0	0	40
16	Mystus singhala	132	94	87	72	66	66	84	601
17	Notopterus notopterus	5	0	0	0	0	0	0	5
18	Ompok bimaculatus	54	18	16	0	0	19	22	129
19	Ompok Papda	73	60	55	0	0	55	57	300
20	Puntius sarana	69	46	43	35	30	45	46	314
21	Puntius sophare	0	0	0	0	0	0	17	17
22	Puntius ticto	150	144	105	78	76	93	102	748
23	Rita gegra	107	76	82	0	0	75	79	419
24	Rita rita	114	95	89	68	70	82	86	604
25	Salmostoma bachaila	29	0	0	0	0	0	0	29
26	Tor tor	99	0	0	0	0	0	0	99

Table 4:- Depicting the total number of diversity collected by the researcher.

S.NO.	ORDER		FAMILY		GENERA
1	Cypriniformes	16	Cyprinidae	16	26
2	Perciformes	7	Ambassidae	1	
3	Siluriformes	2	Channidae	1	
4	Osteoglossiformes	1	Bagridae	5	
5			Siluridae	2	
6			Notopteridae	1	



Both the abundance and relative abundance was calculated by using the above formulae these parameters of fish species was calculated individually among all seasons (moonson, summer and winter) of the one year i.e. 2016-2017 the species richness of site khalghat is 24.33% and the abundance and relative abundance of site pichodi is 8.87% they will find the diversity by using the standard method Shannon and Weaver, 1963 index and simpson index i.e. on all the sites of the river narmada but the researcher found the diversity is very less from the other rest of the sites of my experiments due to the construction of the Sardar Sarovar Dam. Here the formula used:

$$H = \sum_{i=1}^n \left\{ \frac{n_i}{N} \log_2 \left(\frac{N}{n_i} \right) \right\}$$

Where:

H = Shannon -wiener index of diversity

n_i = Total No. of individual of a species

N = Total No. of species of individuals of all species.

Here we find, the site -1 khalghat found more number of species among all the fish species.

KHS-I Khalghat site, RS-II Rajghat site, CHS-III Chikhaldia site, BHS-IV Bhilkheda site, PS-V Pichodi site, BS-VI Bijasan site, MS-VII Morkatta site. In this sites the researcher finds the highest number of species viz. *Cirrihinus mrigala* 998 while the lowest found number of species are *Notopterus notopterus* i.e. 05 (In table 3) while in (Table 4) depicting the

total number of species were collected from the different sites familywise description also given total number of genera 26 was collected in the perspective year i.e. 2016-2017.

CONCLUSION

The results point out to take a rain check in the overall cornucopia of fish fauna in river Narmada as compared to references is a complete indication of habitat devastation, which seems to be caused by nearby Gelatin factory, ritual performances by nearby villagers and by poisoning of the fish fauna using plant herbs mining and pesticides in the nearby fields too. Keeping in view the above concerns and factors that cause multiplicity loss to a greater extent, that there is a vital need to cram the life history traits and demography of the most important scarce species of this Holy River. Lack of studies in this field may lead to the threat of certain edible fishes and may reduce the quality level of fish fauna of river Narmada.

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