RESEARCH ARTICLE

ICHTHYOFAUNAL DIVERSITY, HABITAT ECOLOGY AND THEIR CONSERVATION ISSUES OF RIVER NARMADA IN JABALPUR REGION (M.P)

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ABSTRACT

Fish diversity of River Narmada was studied during June 2015 to December 2015. Total 23 species are discussed here in Altogether, 23 fish species belonging to 16 genera and 10 families less than 6 orders were collected from four sampling stations spread along the river Narmada which revealed Cyprinidae was the most diverse family among all. The present study attempted to reveal the study and status of fish diversity for better conservation action plans and their modern management.

INTRODUCTION

India is one of the mega biodiversity hot spots contributing to the World's biological resources from the long stretches of Eastern Ghat, the grater Himalaya range on the northern plains, Western Ghat on west and central plateau region. Fish exhibits enormous diversity in size, shape, biology and habitat they occur. Fish is one of the most important aquatic vertebrate which provided itself as a rich protein source in human diet as an important culturable animal in the economy of majority of countries.

Fish continues to be among the most traded food commodities worldwide, accounting for about 10% of total agricultural exports and 1% of world merchandise trade in value terms. Fish diversity has enormous economic and aesthetic value and is largely responsible for maintaining and supporting overall environmental health. Ichthyofaunal diversity refers to the variety of fish species or allele or genotype within species of life form within a community or in Piscean population (Burton *et al.*, 1992). The Indian fish fauna comprise of 2662 native fin fishes species belonging to 1019 genera, 246 families under 42 orders and 291 exotic fishes.

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The species diversity of an ecosystem is more or less depends on the amount of living and non-living organic matter present in it. However species diversity depends less on the characteristics of a single ecosystem than on the interaction between ecosystems. The genetic imprinting of various populations of lentic fish species is essential since the freshwater ecosystems constitute crucial parts of their life-support systems by providing nursing grounds and feeding areas (Hammer *et al.*, 1993). Further, species diversity is a property at the population level while the functional diversity concept is more strongly related to ecosystem stability and stress, physical and chemical factors for determining population dynamics in the lentic ecosystem (Kar and Barbhuiya, 2004). Narmada River is a mighty westward flowing and overall fifth largest river of India and largest of Central-western India (Amritage, 2012).

Due to habitat alteration or modification, climatic change, pollution, disturbed rainfall the life cycle of these fish species appears to be disrupted. Moreover introduced exotic species like, the Grass Carp and the Silver Carp proved catastrophic for native species due to competition for territory and tropic demands. The main causes are habitat destruction and defragmentation, water abstraction, industries and private use (Szollosi and Nagy, 2004; Richard and Rasmussen, 1999; Gibbs, 2000; Dawson *et al.*, 2003) exotic species introduction

(Copp *et al.*, 2005), pollution (Lima-Junior *et al.*, 2006) and global climate change impacts (Leveque *et al.*, 2005; Mas-Marti *et al.*, 2010). Freshwater fish are one of the most threatened taxonomic groups (Darwall and Vie, 2005) because of their high sensitivity to the quantitative and qualitative alteration of aquatic habits (Laffaille *et al.*, 2005; Kang *et al.*, 2009; Sarkar *et al.*, 2008). The present analysis is an attempt to enlighten the current status of Ichthyofaunal community structure, abundance, diversity, distribution, richness, trophic ecology of the fishes, threats and to recommend conservation management measures for studied area.

MATERIALS AND METHODS

The Narmada basin lie in the central India between 70° 20" E to 81°45" E longitude and 21°20" N to 23°45" N latitude with a drainage area of 98,796 sq. km and mean elevation of 760 meters. The present study was carried out during the year June 2015 to December 2015. Four study sites namely Bargi Dam, Gwarighat, Tilwaraghat and Bhedaghat of Jabalpur were selected for the sampling which was done at 15 days interval by using standard methods which includes gill nets, cast nets, hooks and line and some other local nets. The fishes were collected using mono filaments gill nets of 10-50 mm mesh sizes. We also used cast nets of 10-25 mm mesh sizes for collecting fish in shallow areas. The collected fish samples were subsequently fixed in 5-10% formaldehyde depending upon the size of sample. All fishes were identified with the help of available taxonomy based literature mainly including Qureshi and Qureshi (1983), Talwar and Jhingran (1991) and Jayaram (1991).

RESULTS

After careful sampling using standardised field collection methods, species identification and enumeration in laboratory, evaluation of structural and functional attributes of the assemblage are used to evaluate biological condition.

The identified species are listed against the assigned families and orders followed by Diet habit, habitat and their economic importance. A total of 23 species belonging to 10 families of 6 orders were found in river Narmada at Jabalpur region. The dominant order was *Cypriniformes* (minnows and carps) comprising 48% of all the number of species recorded. Next to *Cypriniformes,* other dominant orders were *Siluriformes* comprising of 22% of species.

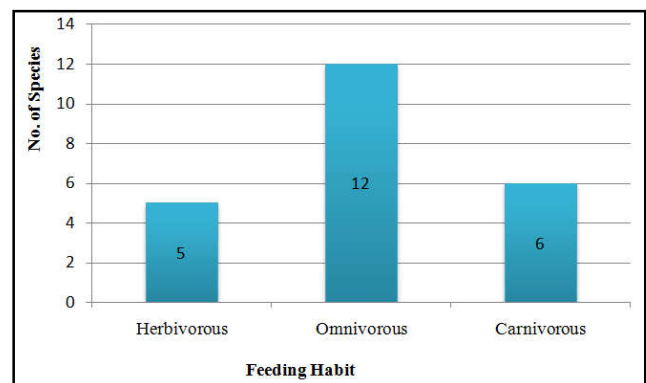**Fig 1. Order wise distribution of Picses species of River Narmada in Jabalpur region**

Fig. 2. Numbers of Fish Species along with their Feeding Habit

Table 1. List of fishes recorded in River Narmada

S.No.	Order	Family	Species	Diet; Habit; Habitat	Economic importance
1.	Cypriniformes	Cyprinidae	*Hypothalmicthys molitrix*	H; BP; R,L	E
2.			*Cirrihinus mrigala*	O; BP; R,P,WL	E
3.			*Cirrihinus reba*	O; BP; R,P,WL	E
4.			*Ctenopharyngodon idellus*	H; D; R,Str,L,WL	E
5.			*Cyprinus carpio*	O; BP; R,PL,WL	E
6.			*Catla catla*	O; BP; R,P,WL	E
7.			*Labeo rohita*	H; BP; R, L, P	E
8.			*Labeo calbasu*	H; D; R, L, WL	E
9.			*Labeo bata*	H; BP; R, L, P	E
10.			*Tor tor*	O; BP; R,Str	E
11.	Siluriformes		*Mystus seenghala*	C; D; R, L, WL	E
12.		Bagridae	*Mystus aor*	C; D; R, L, WL	E
13.			*Mystus cavasius*	C; D; R, Str, WL, L	E, Or
14.		Clariidae	*Clarius batrachus*	C; D; R, L, WL	E
15.		Siluridae	*Wallago attu*	C; D; R, L, WL	E
16.	Clupiformes	Notopteridae	*Notopterus notopterus*	O; D; R, WL	E
17.			*Notopterus chitala*	O; D; R,WL	E
18.	Beloniformes	Belonidae	*Xenthodon cancila*	O; (P-N); R, Str	Or
19.	Ophiocephaliformes	Ophiocephalidae	*Channa punctatus*	O; BP; R, L, WL	E
20.			*Channa striatus*	O; BP; R, L, WL	E
21.	Perciformes	Centropomidae	*Chanda nama*	O; BP; R, L, WL	E
22.		Gobioidae	*Glassogobius giuris*	O; BP; R, L, WL	E
23.		Nandidae	*Nandus nandus*	C; BP; R, Str	Or

Abbreviations used in above Table 1: E- Edible; Or- Ornamental fish; Str- Stream; P- Pond; R- River ; L- Lake; WL- Wetland; O-Omnivorous; C-Carnivorous; H- Herbivorous; BP- Bentho-pelagic, D- Demersal and (P-N)-Pelagic-Neritic.

The other diversified families were *Perciformes, Ophiocephaliformes, Clupiformes* and *Beloniformes* constitutes 13%, 9%, 9% and 4% respectively. Furthermore, order *Cypriniformes* was found as the most dominant fish group in terms of total number of individual observed (Fig. 1). The summarized list of the 23 species of fishes recorded from river Narmada with their families, diet, habit, habitat and economic importance presented in (Table 1).

DISCUSSION

The trophic structure of the fishes indicates dominancy of omnivorous fishes such as *Catla catla, Cirhhinus mrigala, Cyprinus carpio, Mystus cavasius and Tor tor* etc. Moreover, the distribution of carnivorous, herbivorous and planktivorous fishes depicted similar patterns as per Fu *et al*. (2003). Evaluation of the commercial utilization of fishes of River Narmada indicated that Narmada is rich in supporting many food fish (86.96%) and ornamental fish (13.04%) as shown in (Table 1). Among the fishes collected from entire stretch a uniform pattern of utilization of trophic ecology (feeding habit) was observed. Omnivorous fishes were dominated (52%), followed by carnivorous (26%) and herbivorous (22%) respectively shown in Fig 2. The dominancy of omnivorous fishes may be because of their tolerance to degradation or ecosystem dysfunction. Similar results were also found by Wichert and Rapport, (1998). A number of ichthyologists have made contribution on the diversity and systematic of Madhya Pradesh. Fisheries Department of Madhya Pradesh during 1967-1971 (Anon, 1971) and 46 species belonging to 14 families was recorded. Rao *et al*. (1991) had undertaken pre-impoundment survey and pertaining to the river and have enlisted 84 fish species belonging to 45 genera, 20 families and 6 order from Khandwa, Khargone and Barwani districts whiles Balapure (2001), reported 21 fish species belonging 16 genera, 6 families and 4 orders from the same sample area.

Conclusion

Our study shows that the River supports considerable diversity of the fishes and is important for conservation. It can be inferred from the present study that Narmada is very important river for fresh water fish diversity. Economically this is one of the most consumed sources of edible and ornamental fishes. With such vast and irreplaceable role of River Narmada, we should be given sensible attention to manage and conserve fish fauna. Sustainable consumption of edible fishes and application of legal protection in pollution and harvesting aspects will be key methods to ensure the healthy density of fishes for human and ecological use.

The conservation of aquatic germplasm resources is to be taken on priority basis in the present global scenario. The present analysis will provide a useful step for future studies in the same subject.

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