"Assessment of Ichthyofaunal Diversity of Bhima River near Gopalpur Village, Tal- Pandharpur, Dist. Solapur (M.S)"

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Abstract- *A total 10 species of fish was belonging to 8 genera and 4 during the study period. The Oreochromis mossambicus species composition was high in the study area. The Shannon diversity index value ranged in 2-2.59 therefore the pollution status was moderate. It is also suggested that proper conservation plan to be implemented to provide suitable habitat for aquatic flora and fauna. It indicates that there is lot of scope for fishery development in Bhima River.*

Keywords- Bhima river, composition, Fish, Pollution Status, Fauna.

I. INTRODUCTION

Among vertebrate animals which totaled approximately 54,711 recognized species, by far, fishes form the major category. Their numbers are probable to reach more than 32,500 valid marine and freshwater species within 515 families (Nelson, 2006). In general, roughly 11,952 species, or about 40% of fish species, occur exclusively in or most often in freshwater (Helfman *et al*., 2009). Freshwater species is a classic term used to describe fishes that are found in inland streams, rivers, lakes and regions of weak brackish water. The term may also encompass diadromous species such as sturgeons which often spend their lifecycle between inland freshwater and the ocean. Among them, some can be classified as anadromous (e.g. salmon, herrings), which means they usually migrate at incredible distances to the rivers and spawn in freshwater although they spend most of their adulthood at sea. In contrast, there are some 225 species which are catadromous (e.g. Anguilla eels) (Nelson, 2006) and they spawn in the ocean but live in freshwater.

Fishes are very significant from the biodiversity point of view and are the best bio-indicators of the known ecosystem over the last century. Riverine ecosystems have suffered most due to intense human intervention resulting in habitat loss and degradation. Moreover water bodies are used as dumping ground for garbage, sewage, industrial effluents etc. leading to pollution of the water.

Today the fish diversity and associated habitats management is a great challenge and the ability to evaluate the effects of habitat change and other impacts on the fish population required extensive surveying of the fish population before and after the change occur (Dudgeon *et al*., 2006). Therefore there was need of proper study and documentation of the fish diversity indices and monthly variation. The present investigation deals with the study of following aspects:

II. OBJECTIVES

- To study present status of fish fauna
- To study monthly variation of fish
- To analysis of Shannon diversity indices
- To study fish taxonomy
- To study the composition of fish fauna

III. MATERIAL AND METHODS

Study area

The Bhima River originates from Bhimashankar hills near Karjat of western ghat in Maharashtra, India. The length of Bhima River is 289 km in Solapur district. The Bhima River flows nearby this village in Pandharpur, taluka Water is used for irrigation and drinking purpose. The sugar factory is present near the river which adds pollutants in the river affecting the fish diversity. The Bhima river lies in Latitude 17^0 43' 50.2'' North and Longitude 75^0 18' 36.4'' East (www.google earth 2014) .Solapur has dry and hot climates, except in monsoon, with very low average rainfall 545mm and temperature ranging from 30^0 to 40 ^{0}C.

Sample collection:

Water samples were collected from monthly during Sep 2017 to Dec 2017 The fishes were monthly collected from sites by Gill nets, cast nets, trap nets, long line and hooks with the help of local fisherman.

Biological analysis:

a) Fish :

The fishes were collected by different types of nets and photography was taken immediately with the help of digital camera. The total number of fish species was counted and recorded immediately. Mostly the fishes were captured by gill nets. Fishes were brought to the laboratory and preserved in 10% formalin in separate specimen jars according to size of fish. Identification of fish was done up to species level with the help of standard key, (Hamilton, 1822, Day 1958, Jayaram 1999, Jhingran 1974). The identification of fishes up to species level is also confirmed by ZSI, Pune.

Statistical analysis of diversity indices:

a) **Shannon-Wiener Diversity Index (H)**

Diversity index is calculated by using the following formula given by Shannon-Wiener Index (1963).

$H = \sum [ni/N] \ln, [ni/N]$ or $\sum [Pi] \ln [Pi]$

Where, H = Shannon – Weiner index

Pi = ni / N

Σ = Sum

ni = Number of individuals of each species in the sample.

N = Total number of individuals of all species in the sample

IV. RESULTS

1.1) Fish taxonomy:

The present investigation revealed total 10 species of fish belonging to 8 genera and 4 families namely *Cyprinidae, Channidae, Gobiidae, and Cichlidae* from Bhima river during the study period. The taxonomic studies of fishes were studies as given bellow.

1) ***Catla catla*** :(Hamilton 1882)

English Name: Indian major carp. **Local name**: Katla

Morphology: Catla has large head, broad snout bluntly rounded. Body is short, deep and abdomen rounded. The lateral lines are present on the body surface. The colour of fish is grayish above becoming silvery on the side and beneath. Fins are dark black. Catla is surface feeder fish. Adults feed on the zooplankton and phytoplankton.

Fin formula: D. 18, P.19; V.9; A.8; C.19; L.I.41.

2) ***Labeo calbasu*****:** (Hamilton 1882)

English Name: Orange Fin Labeo **Local name:** Kanoshi

Morphology: Body is dorsally and ventrally profile about equally convex. Body is moderately elongated and abdomen rounded. Head is large, snout with pores but devoid of lateral lobes, Mouth is narrow lips thick and fringed each with distinct inner fold. The colour of fish is blackish with scarlet in the center of the scale. Adults feed on zooplanktons and phytoplankton.

Fin formula: D. 16; P.18: V.9; A.7; C.19; L.I.4

3) ***Labeo boggut*** (Sykes, 1839).

English Name: Minor carp. **Local name:** Sandshi

Morphology: Body colour is dark grey and silvery grey on the sides. The fins are tinged orange colour. Mouth is terminal and upper jaw longer. Upper lip is thick with an overhanging flap from the snout. The lateral lines are complete on the body surface. It is bottom feeder and omnivorous fish.

Fin formula: D. 12; P.17; V.9; A.7; C.19; L.I.60, L. tr. 11

4) ***Puntius sophore*** (Hamilton 1882)

English Name: Pool Barb. **Local Name:** Khavli

Morphology: Body is moderately elongated structure. The abdomen is round and also dorsal side more compressed than the ventral side. Lateral lines are present and complete. Fresh species colour is silvery with dorsum darker.

Fin formula: D. 11; P.15; V.9; A.8; C.19; L.I.23

5) ***Garra mullya*** (Sykes 1839):

English Name: Mullya Garra. **Local Name:** Mullya

Morphology: Body is elongated and sub cylindrical. Mouth is semicircular and inferior, snout projects beyond the mouth. There are no lateral lobes to the snout. Upper and lower lips are continuous. Lateral lines are complete.

Fin formula: D.11; P. 15; V.9; A.7; C.17; L.I.32

6) Amblypharyngodon mola (Hamilton, 1882)

English Name: Molacarplet. **Local Name:** Mola

Morphology: Body is compressed structure. The abdomen is rounded shape. Mouth is anterio lateral cleft rather wide lower

jaw prominent and directed upwards. Body colour is bright silvery. A silvery band is present on either side from above the operculum up to base of caudal fin where it takes an upward turn. It is omnivorous fish

Fin formula: D. 9; P.15; V.9; A.7; C.19; L.r.67, L.tr. 12

7) ***Oreochromis mossambicus*** (Peters, 1852)

English Name: Common tilapia. **Local Name:** Chilapia

Morphology: Body is elongated, short and compressed structure. The abdomen is rounded shape. The upper side of the body is concave structure. Mouth is terminal and very wide position. The snout is rounded in shape. The jaws are equal in size.

Fin formula: D.15; P. 14; A.10.

8) Labeo rohita (Hamilton 1882)

English Name: Indian major carp. **Local name:** rohu

Morphology: Body is moderately elongated and abdomen rounded shape. Dorsal side is more convex than that of the abdomen. Head is fairly large snout depressed and project beyond the jaws. Lateral lines are complete the body surface. Adult feeds on zooplanktons and phytoplankton

Fin formula: D. 16; P.17; V.9; A.7; C.19; L.I.40.

9) Channa punctata **(**Bloch 1785)

English Name: Spotted Snake head **Local Name:** Maral

Morphology: Body is elongated and abdomen round shaped. The colour is varies to environment, dorsum of the body mostly black or dark grey. Heads are depressed with plate like scales. The lower jaw is longer than upper jaw. Mouth is opening with wide may extend behind the orbit. Lateral lines are complete for the body surface. It is carnivorous fish.

Fin formula: D. 29; P.16; V.6; A.20; C.12; L.I. 3, L. tr. 4.

10) ***Glossogobius giuris*** (Hamilton 1882)

English Name: Thank goby. **Local Name:** Kharpya

Morphology: Head is flattened structure. The dorsal fins are small spots forming longitudinal stripes. The body is brownish yellow colour with 5 dark rounded spots on each side of the body. It is carnivorous animal. The cannibalism is relatively common for this species. Caudal fin is pointed and somewhat rounded.

Fin formula: D. 6; P.20; V.5; A.8; C.17; L.I. 33, L. tr. 9.

1.2) Monthly variation and Shannon diversity indices of fish in study area:

The month of October highest population was observed during study period and lowest population observed in December month. The *Oreochromis mossambicus* is most abundant species found in the study area. The *Glossogobius giuris* is lowest number observed in study area. The Cyprinidae family was high found in the study area. (Table. 1). The Shannon diversity index was high in September and low in December during study area. The water pollution status of Bhima River was moderate. (Table.no.4). The *Oreochromis mossambicus* was 19% followed by *Amblypharyngodon mola* (10%), *Labeo calbasu*, (9%) , *Labeo rohita, Catla catla* (8%) (Fig. no.2).

Table .No.1. Monthly Variation of fish in Bhīma River during Sep 2017 to Dec 2017

Sr.No	Fish Species	Sept	Oct	Nov	Dec	Total
	Cyprinidae family					
1	*Catla catla*	20	22	15	10	67
2	*Labeo calbasu*	25	20	26	25	91
3	*Labeo boggut*	20	26	24	20	90
4	*Labeo rohita*	23	23	25	14	85
5	*Puntius sophore*	25	28	24	21	98
6	*Garra mullya*	21	23	24	15	83
7	*Amblypharyngodon mola*	25	25	26	16	92
	Cichlidae family					
8	*Oreochromis mossambicus*	50	51	60	60	221
	Channidae family					
9	*Channa punctata*	23	23	23	23	92
	Gobiidae family					
10	*Glossogobius giuris*	24	21	13	23	81
	Total	256	262	260	227	1005

Table No.2. Shannon diversity index value of fish in study area during Sept 2017 to Dec 2017.

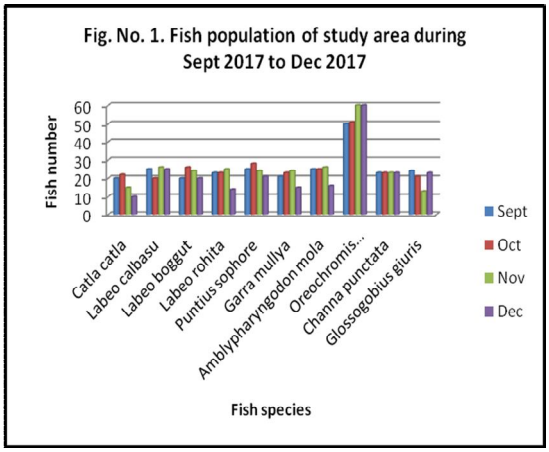
Sr.No	diversity indices	Sept	Oct	Nov	Dec
1	Shannon index	2.259	2.258	2.213	2.169

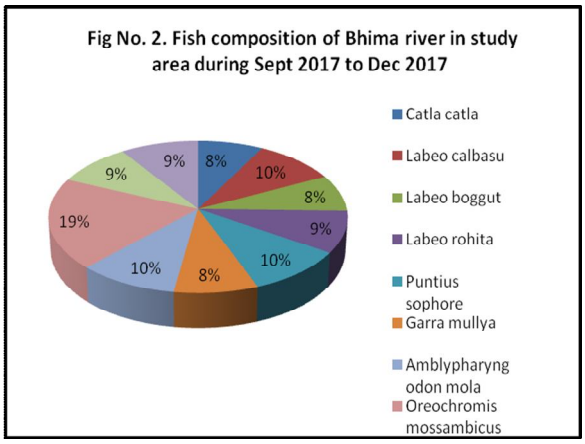
Table No.3. Comparison between standard value and calculated value of Shannon diversity index

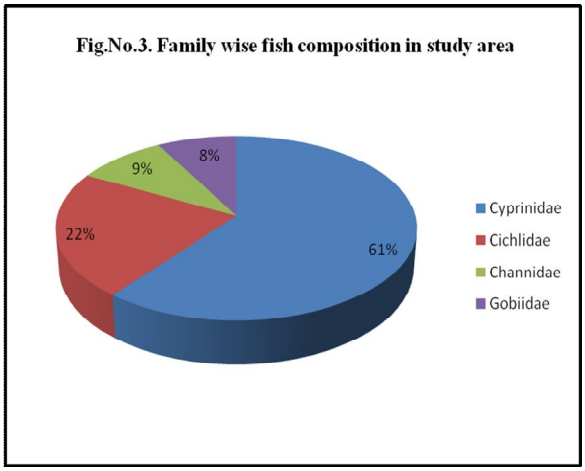
Diversity indices	Standard value	Calculated value
Shannon index	0-5	2.169- 2.259

Table No.4. The Shannon diversity index of fish show pollution status during September 2017 to December 2017

Shannon index	Calculated value	Status of pollution
1-3	2-2.59	Moderate pollution







V. DISCUSSION

In the present study total 10 species was observed in Bhima River belonging to 4 families. The cyprinidae family was dominated group of the study area. The second highest fish population was *Oreochromis mossambicus* species because this species grow fast according to other fish. Pathani and Upadhyay, (2006) recorded 18 fish species belonging four families in the Western Ramganga River; Negi and Negi, (2010) estimated 10 species in rivers of Kumaun Himalaya; Negi and Rajput, (2012) found only 9 fish species in Nainital Lake. Ubharhande and Sonawane (2012) observed fish fauna belong to 07 orders10 families, 19 genera and 21 species. Cyprinidae family is dominant with 10 (47.61%) species, Channidae and Mastacembelidae with 02 (9.52%) species, Balitoridae, Bagridae, Clariidae, Belonidae, Notopteridae, Cichlidae,and Poecilidae contribute 01 (4.76%) species each from Paintakli dam at Buldhana district.

In the present study, maximum collected fish species belong to Cyprinidae family. Similar results have been also reported by (Pathani and Upadhyay, 2006; Negi and Negi, 2010). Diversity indices are good indicators of pollution in aquatic ecosystems. Ramesha and Sophia, (2013) in their studies reported that a diversity index greater than 3 indicates clean water and between 1 to 3 indicates moderately polluted water while values less than 1 is characteristic of heavily polluted water. Data on diversity indices and the concentration of dominance of fish community are available for comparison. Negi and Rajput, (2012) found maximum fish diversity index (H') 2.359 in Bhimtal Lake similar results observed in present study period. The Cyprinidae family was dominated followed by Cichilidae and Channide in present study area similar finding also reported by (Galib *et al.*, 2009, Sakhare *et al.*, 2001, Shahanawaz *et al.*,2010, Atkore,2011).In the present study *Oreochromis mossambicus* species is also abundant in sites, because the environmental condition of water bodies suitable for survival of the fish. Ecologically these fishes have adverse effect on indigenous fish diversity of river similar result was observed by (Kumar, 2013, Mustapha, 2009 and Balogun, 1986).

VI. CONCLUSION

Present study made an attempt to make a biological database for the protection of endangered and threatened fish species from Bhima River. The study concluded that water of Bhima River is not well for drinking but can be used as irrigation, bathing, aquaculture etc. In order to improve the river health, it is suggested that proper conservation plan to be implemented to provide suitable habitat for aquatic flora and fauna. It indicates that there is lot of scope for fishery development in Bhima River.

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Plate 1
Fish species recorded from Bhima river near Gopalpur Village, Pandharpur

Amblypharyngodon mola

Catla catla

Garra mullya

Glossogobius giuris

Labeo boggut

Labeo rohita

Labeo calbasu

Channa punctata

Puntius sophore

Oreochromis mosambicus