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Original Research Paper

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BIODIVERSITY OF ZOOPLANKTON COMMUNITIES IN KASURA DAM PARTUR DIST-JALNA (MS) INDIA.

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ABSTRACT

The present study shows the Kasura dam Zooplankton diversity status during the Year July 2009 to June 2010. Zooplankton holds a key position in the food web as it was directly related to the consumption of organic energy produced by phytoplanktonic photosynthesis and then by transforming it to the higher tropical levels of heliotropes such as fish. Plankton diversity and physicochemical parameters of water are important criteria for evaluating the suitability of water for culture practices. Therefore, structure of different fish food organisms assumes greater significance to fisheries management. Indiscriminate exploitation of Kasura Dam has been evidently resulted in the depletion of fish fauna and it leading to folding and other negative consequences at surrounding area. In this study, we tried to assess zooplankton richness, evenness and diversity to observe the state of pond water in the study area. A total number 38 species recorded with Cladocera – 17, Copepoda – 05, Rotifera – 13, Ostracoda - 03. In the Rotifers the genus Brachionus is the dominant group.

KEYWORDS : Biodiversity, Zooplankton, Kasura dam, physicochemical parameters

Introduction

Plankton is the most important component of trophic structure which take parts in transfer of energy to higher trophic levels in the aquatic environment. In ecological point of view, zooplankton influences all the functional aspects of an aquatic ecosystem such as food chains, food webs, energy flow and cycling of matter (Sinha and Islam, 2007). In this connection it is to be mentioned that plankton population is very much sensitive to the environment in which they resides. Alternations among zooplankton population leads to change in the communities in terms of tolerance, abundance, diversity and dominance in their habitat. Several zooplankton species are served as bioindicators (Ahamad et al., 2011). Some of the noteworthy contributions on various aspects of zooplankton ecology in the reservoir have been made by Vijaykumar and Majagi, 2009; Chandan and Tiwari, 2011; Dutta, 2011; Mahor, 2011; Koli and Muley, 2012; Veerendra et al., 2012; Sitre, 2013; Shivashankar and Venkataramana, 2013. The main aim of present study was to determine the zooplankton diversity to delineate its richness, evenness, dominance, basic ecological condition during study period. Besides the present study is an effort to construct a pillar of knowledge on Kasura dam.

Materials and Methods:

Zooplankton sample were collected by sieving 50 liters of water through plankton hand net made of nylon bolting cloth of 68 m pore size for quantitative estimation. Sample was fixed in 4% formaldehyde. The zooplankton identified to the greatest possible taxonomic level (Genus/species) by using an optical microscope and referring to a specialized bibliography of Edmondson, (1959). Quantitative analysis of Zooplankton was performed in Sedgwick rafter cell using Welch (1952) formula and counts were expressed as Number of Organisms as follows:

$$n = \frac{(a \times 1000)C}{L}$$

N = (a 1000\L) C

Where, n = Number of animals per liter of original water body

A= Average number of organisms from all the counts.

C= Volume of concentration in ml

L= Volume of water sieved through the net in liters.

Collecting of sample, analysis of physic-chemical factors and fixation and identification of zooplankton counts were done by following the above said methods. The correlation analysis was carried out with data on the population of the zooplankton (Cladocera, Copepoda, Rotifera and Ostracoda) and environmental variables by using SPSS pc (Statistical Package for Social Sciences), Zooplankton community diversity was analyzed by following Shannon -Wiener Index H = - (pi In pi) (natural log) method. Zooplankton community evenness (Uniformity) was determined by using formula E= H/IN (s) (natural log) where H was the Index of diversity of Shannon- Wiener and In was natural long and S was species number.

The trophic status was analyzed using QB/T quotient. Because the genus Brachionus is connected with the eutrophic waters (except B. sericus which is typically acidophilic and B. plicatilis from brackish water) and the genus Trichocerca is nearly purely oligotrophic, we can establish a Brachionus: Trichocerca quotient (QB/T). (Sladecek.1983). This quotient can be established for individual water bodies of standing or slowly-flowing character or even for individual sample, if representatives of at least one of these genera are present.

Result and Discussion: Kasura dam is situated 19 km away from South side of Partur city. It lies between 190.30'0" North latitude, 760.15'50" East longitude and altitude. It was constructed as minor irrigation tank, soil has been used as bunding materials, the bund length is about 3172 meters, the width is 4.50 meters and the catchments area is about 73.64 Sq.km. top width is 4.50 meters. The water spread area is about 336.00 hectares; its command area for irrigation is about 2070 hectares, towards east. During monsoon tank gets enough water but in post monsoon period particularly March and April water level is very much reduced. The pond is surrounded by red Laterite soil and black cotton soil. The quotient QB\T values of Kasura dam varied from 1 to 6.5 during the year (2009-10) . It was mesotrophic in the month of June and July and rest of the ten months it was eutrophic and hypereutrophic. The quotient QB\T of the Kasura dam in the year of (2009-10) varied from 1 to 8. It is mesotrophic only in the month of June and rest of the eleven months, it was mesotrophic and mesopereutrophic.

MONTHLY VARIATION OF QUOTIENT Q/BT OF KASURA DAM DAM DURING 2009-10.

DAMS/ MONTHS	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
KASURA DAM	2.5	5.5	6	5	5.5	4	4.5	6	5	5	8	1.5

SPECIES DIVERSITY (H) AND UNIFORMITY (E) OF

CLADOCERA, COPEPODA, ROTTIFERA AND OSTRACODA IN KASURA DAM DURING 2009-10

Groups/Months	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE
CLADOCERA												
Shannon-wiener index (H)	1.377	1.903	1.896	1.692	1.602	1.967	1.707	2.682	2.091	1.199	1.848	1.101
Evenness (E)	0.67	0.785	0.772	0.64	0.702	0.897	0.781	1.147	0.874	0.852	0.758	0.777
Total No. of Species	2	6	7	5	7	5	5	8	7	5	9	1
CPEPODA												
Shannon-wiener index (H)	1.779	1.872	1.801	1.717	1.674	1.213	1.801	1.688	1.812	1.01	1.690	1.044
Evenness (E)	0.879	0.901	0.800	0.874	0.905	0.712	0.824	0.801	0.864	0.897	0.916	0.913
Total No. of Species	4	5	5	4	4	4	5	4	5	5	4	5
ROTIFERA												
Shannon-wiener index (H)	1.440	1.844	2.100	1.913	1.900	1.09	1.899	2.00	1.391	2.299	3.300	1.01
Evenness (E)	0.797	0.842	0.861	0.824	0.800	0.772	0.777	0.812	0.683	0.867	1.402	0.842
Total No. of Species	5	9	8	8	6	7	6	9	8	8	7	4
OSTRACODA												
Shannon-wiener index (H)	0.600	1.00	0.44	0.545	1.04	0.00	1.01	0.864	1.42	0.810	0.700	1.14
Evenness (E)	0.900	0.712	0.555	0.888	0.645	0.000	0.54	0.900	0.788	0.777	0.674	0.529
Total No. of Species	2	3	3	1	1	0	2	2	3	2	3	1

CORRELATION OF ZOOPLANKTON GROUPS WITH PHYSICO-CHEMICAL VARIABLES AND OTHER ZOOPLANKTON GROUPS DURING 2009-10.

Parameters	Air Temp	Water Temp	pH	TDS (mg/l)	DO (mg/l)	Free CO2 (mg/l)	Ca+ (mg/l)	Mg + (mg/l)	TH (mg/l)	Chloride (mg/l)	PO4 (mg/l)	SO4 (mg/l)	Cladocers	Copepods	Rotifers	Ostracodes
Cladocera	.476	.346	-188	.010	-054	.334	.009	-167	.005	-176	-163	-288	.923	.676	.856	.745
Copepoda	.656	.774	-200	.027	-022	.356	.267	-489	.401	.303	.025	-589	.665	.889	.677	.565
Rotifera	.478	.301	-199	.056	-076	.378	.060	-269	.099	-184	-245	-265	.884	.664	.889	.690
Ostracoda	.287	.267	.134	.056	.202	.043	.054	-089	-100	-067	-101	-078	.767	.545	.666	.878

KASURA DAM

Cladocera : In the present, study a total of seventeen species (32.72%) of Cladocera are reported from Kasura and Dahiphal dams in and around Partur taluka. Wisniewski (2002) reported that among the organisms inhibiting the littoral region the members of the family Chydoridae, belonging to the cladocera group were present. Similar observation was also made by Serafim et al, (2003). The higher Cladoceran species in Kasura dam is due to the presence of extensive banks of macrophytes as observed by Pinto Coelho et al, (2005), Sharma and Sharma, (2001); Serapfim et al, (2003), Lack of such macrophytes banks in Kasura dam might be the reason for lowest number of cladoceran species.

Among the Cladocera group three species were dominant namely ceriodaphina cornuta, Diaphanosoma excisum and Alona pulchella. These three species found in Kasura

Copepoda : In the present study, five species of Copepods documented in Kasura dam namely, Heliodiaptomus viduus, Paracyclops fimbriatus, Mesocyclops Leukarti, Mesocyclops hyalinus,Neodiaptomus Strigilepous. In Kasura dam year (2009-10) it showed positive correlation with atmospheric temperature (r=0.656, P<0.01), water temperature (r=0.774, P<0.01), negative correlation was observed with sulphate (r= -0.589, P<0.05).

Rotifera: In the present study, thirteen species of Rotifers were documented from Kasura dam. In the year (2009-10) it showed positive correlation with Cladocera (r=0.884, P<0.01), Copepoda (r=0.664, P<0.01), Ostracoda (r=0.690, P<0.01), and negative correlation observed with Chloride (r= -0.184, P<0.01), DO (r= -0.076, P<0.01).

Ostracoda: In the present study, only three species of ostracodes were documented from Kasura dam. In the year (2009-10) these were positively correlated with Cladocera (r=0.767, P<0.01), Copepod (r=0.545, P<0.05) and Rotifers (r=0.666, P<0.01) negative correlation with Chloride (r= -0.067, P<0.01), Sulphate (r= -0.078, P<0.01).

In the present investigation, zooplankton groups have been used as an index to classify water bodies. Although most zooplankton species survive under a wide range of environmental conditions, their growth and intensity depend on a number of physical, chemical and biological factors Hutchinson (1967). The number of studies which indicated that temperature regulated the birth rate, longevity and other population characteristic of zooplankton. Zooplankton growth is an indicative of the fertility of the aquatic body and has a key role not only converting plant food to animal food but also they themselves serve as a source of food for higher organisms including fish. Among several factors temperature appears to exert greater effect on the productivity of zooplankton (Battish and Kumari, 1986). Based on the quotient (Q/BT) values it was observed that in monsoon all the two water dams were mesotrophic and rest of the time they were eutrophic or hypereutrophic. This variation may be attributed to more water influx to the dams during monsoon season which dilutes the concentration of nutrients and planktons. It was also observed by Bohra and Kumar, (2004); Hegde and Huddar, (1995); Kudari (2005). Hypereutrophic condition was noticed in summer due to drastic reduction of water level in the two dams which increased the organic matter and growth of bacteria population and in turn increased the zooplankton population as explained by Bohra and Kumar (2004).

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