

8. Study of Zooplankton Diversity for Pollution Bio-marker Species and Status of Kasarwadi /Borna Dam Parli V. Dist. Beed Marathwada Region (M.S) India

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Abstract

The plankton constitutes the basic food source of aquatic ecosystem, which supports fish and other animals. Phytoplankton is the Producer and zooplanktons are the primary consumers and so on. Plankton feeder fishes feed upon Planktons. Apart from this Zooplanktons can be the indicators of the changes in water quality as are very sensitive to polluted conditions and thus reflect suddenly to the changes in the nature of medium. This is useful in knowing the healthy condition of water body. Due to this Zooplanktons can be used as the monitors of polluted condition of any aquatic ecosystem.

Key words: Zooplanktons, Bio-marker, Water Quality , Kasarwadi/Borna Dam.

Introduction

Fresh water zooplankton is an important biological component in aquatic ecosystems, whose main function is to act as a primary and secondary links in the food chain and they play a vital role in energy transfer of aquatic ecosystems .[27]

Plankton as bio-indicators has been extensively used in the establishment of water quality status.

Their suitability for theoretical and experimental population ecology studies is conferred by their small sizes, short generation time and relatively homogenous habitats [1].

In the biotic assemblage planktons are small plants or animals that float, drift, or weakly swim in the water column. Phytoplankton comprises photosynthetic Prokaryotes, which are major contributors of biomass and primary productivity in oligotrophic ecosystems [23]

Phytoplanktons are the plant constituent and zooplanktons are the animal constituent of plankton. They play an important role in energy transfer between the phytoplankton and the economically important fish populations in water bodies. Pollution is essentially a biological phenomenon and its primary effect is on living things. Simple, rapid and reliable methods are needed for the evaluation of degree of pollution.[6]

Physico-chemical analysis is the prime consideration to assess the quality of water for its utilization like drinking, irrigation, domestic and helpful in understanding the complex interaction between the climatic and biological process in the water[2]

The Zooplankton constitutes food source of Organisms. It plays an important role in Aquaculture, being an indicator of water quality, pollution, and the state of eutrophication [22]

The aquatic animal's life directly or indirectly depends on water quality status [24, 25, 26]. The Zooplankton and fish production depend to large degree on the phytoplankton [3].Zooplankton is a good indicator of changes in water quality because it is strongly affected by environmental conditions and responds quickly to changes in environmental quality. The major zooplankton groups vary in their relative abundance and they belong to these groups Rotifera, Cladocera, Copepoda, and Ostracoda.[4] -Table no.1 and Zooplankton Pollution marker Species-Table no.2.

In ecologically, zooplankton are one of the most important biotic components influencing all the functional aspects of an aquatic ecosystem, such as food chains, food webs, energy flow and cycling of matter [5] If water quality is good and then quantity of plankton will more , thus more food will be available to fishes and more will be the fish production. Which will operate the commerce of a fish farm. This will positively govern the socio economic up gradation of the fish farmers. Thus inspection of a water body with the help of Zooplankton is important which plays an important role in Aquaculture by signaling water quality, pollution status and the eutrophication. [22].

Material and Methods

The present work was undertaken in July 2011- June 2012 to know the zooplankton diversity and pollution indicator species at Kasarwadi Dam. This was done for knowing the pollution status of Kasarwadi [Borna] dam, which is located on Parli Dharmapuri Pangaon Road [SH-233] on Borna river near village Kasarwadi and Nandnaji which is 12 kms from Parli in west direction it Coordinate: 18° 85 '2" N 76° 59'16 " E. This dam is Earthfill dam on

river Borna it was constructed in year 1983 its height is 22.3m[73 ft], with length 866 m [2841 ft], volume content 460 km³[110 cu mi] , with total storage capacity 9060 km³ /2170 cu mi] and was basically constructed for irrigation purpose. Reservoir area is 2191 km³. / [846 sq. mi]

The influence of pollution on the abundance of major zooplanktons like Rotifera, Cladocera and Copepoda were investigated at polluted and non polluted regions at kasarwadi near Parli v. The water samples were collected for physicochemical analysis from 4 stations A, B, C and D of Kasarwadi dam; for one year (July 2011 to June 2012). The water samples were collected in the acid washed five-liter plastic containers, at early Morning 9.00 to 11.00 is in the first week of every month. Separate samples were collected for DO in 250 ml. BOD bottles.

The Physicochemical variations of dam water like DO, Temperature, pH were recorded. DO was fixed at the stations itself and further analyzed in the Laboratory, Dept.of Zoology at Late Laxmibai Deshmukh Mahila College Parli. V.Dist Beed. The standard methods for water analysis were followed according to APHA (1998). The subsurface water was sieved through plankton net of 25 micron and was transferred to 200 ml plastic containers for preservation in 4% formalin solution. The formalin fixed plankton samples were centrifuged at 1500 to 2000 rpm for 6-10 min. The zooplankton were settled at bottom., diluted to concentration in such a way that they could be easily counted individually under compound binocular microscope and zooplanktons were measured and multiplied with dilution factors using Sedgwick rafter cell [7] APHA (2005). Species diversity index was obtained by following standard method.

Result and Discussion

The present work was undertaken to study the pollution status of the Kasarwadi Dam with zooplankton diversity. This dam water is used for drinking purpose of 12 nearby village residents and water is also used irrigation and domestic and industrial purpose. This dam is one of the important water bodies in Parli (V). So to know the pollution status this water body study was undertaken during the July 2011- June 2012. For this study the pollution indicator species of Zooplanktons are used as Biomonitors.

After recording the zooplanktons for one year pollution statuses during the present work total of 18 genera of zooplankton were recorded the groups with the genera composition are as Rotifera (6 genera- 5 pollution indicator) Cladocera (4genera -3poll.ind), Copepoda (5 genera- 3 poll.ind) and Ostracoda (3genera- 1 poll.ind).Out of 18 found genera 12were pollution indicator this indicates that Kasarwadi dam is Polluted due to different domestic, agricultural and industrial activities. There is a need to minimize the pollution load for good health of all living beings directly or indirectly dependent.

For understanding the health of water bodies, zooplanktons are useful as these are very sensitive to pollutants and as they act as bio indicator of water bodies. The utility of zooplankton in accessing the water quality at population level was done by several workers. The role of Zooplankton in assessing water quality at population level had been reported, [21, 9, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22].

During July 2011 to June 2012.

Table No. 1 [Zooplankton groups with genera]

Sr.No	Zooplankton Genera	Frequency of Pollution
1	1) Rotifera (6 genera) i) <i>Brachionus</i> sp. ii) ii) <i>Trichocerca</i> sp. iii) <i>Keratella</i> sp. iv) <i>Filina</i> sp. v) Notommatid vi) Pliomate	Frequency +++++++ xxxxxxx ***** +++++ 000 ---
2	2) Cladocera (4 genera) i) <i>Bosmania</i> sp. ii) <i>cerodaphnia</i> sp. iii) <i>Daphnia</i> sp. iv) <i>Chydorous</i> sp	Frequency 00 +++++ xxxx ---
3	3) Copepoda (5 genera) i) <i>Cyclops</i> sp. ii) <i>Diaptomous</i> sp. iii) <i>Eucyclops</i> sp. iv) <i>Mesocyclops</i> sp. vi) <i>Macrocylops</i> sp	Frequency +++++ -- xxxx xxxx xxxx
4	4) Ostracoda (2 genera) i) <i>Cypris</i> sp. ii) <i>Stenocypris</i>	Frequency xxxx ---

Symbols for frequency 1] Abundant= +++++ 2] Moderate= xxxx 3] Frequent= 00 4] Rare= ---

Table no. 2:- Pollution marker Zooplanktons species from different groups at Kasarwadi /Borna Dam During July 2011 to June 2012.

Sr.no	Zooplankton Type	Genus found	Pollution Status	Frequency of Pollution and indication
1	Rotifera [Total Genera= 6]	<i>Brachinous calciflorus</i>	***T b+xx	High pollution status Heavy metal stress indicator and Alkaline and Thermal Stress .
		<i>Brachinous quadridentata</i>	*** T	Moderate Pollution status Thermal Stress
		<i>Brachinous</i>	*** T	Moderate Pollution status

		<i>angularis</i>		Thermal Stress
		<i>Kartella sp.</i>	**	Mild Pollution Stress
		<i>Brachionus havanaensis</i>	***T	Moderate Pollution status Thermal Stress
		<i>Trichocerca</i>	**	Mild Pollution Stress
		<i>Notommatid</i>	*	Nil pollution
		<i>Pliomate</i>	*	Nil pollution
		<i>Filina</i>	*	
2	Cladocera[Total Genera= 4]	<i>Chydorous Species</i>	**#	Mild Pollution stress, Euthrophication indicator
		<i>Bosmina. Sp</i>	**a+	Acid stress and mild Pollution Stress
		<i>cerodaphnia sp.</i>	#	Euthrophication indicator
		<i>Daphnia sp.</i>	**	Mild Pollution stress
3	Copepoda Total Genera= 5]	<i>Diaptomus Sp</i>	***	Moderate Pollution status
		<i>Cyclops Sp.,</i>	*xx	Heavy metal stress indicato
		<i>Mesocyclops Sp.</i>	***	Moderate Pollution status
		<i>Macrocyclus sp.</i>	*	Nil pollution
		<i>Eucyclops sp</i>	*	Nil pollution
4	Ostracoda[Total genera=2]	<i>Stenocypris</i>	***	Moderate Pollution status
		<i>cypris</i>	***	Moderate Pollution status

Bio-marker Strength :- 1] Nil pollution status * 2] Mild pollution status ** 3] Moderate Pollution status *** 4] High Pollution status **** 5] Acid stress indicator a+ 6] Euthrophication indicator # 7] Thermal stress indicator T 8] Heavy metal stress indicator xx 9] Alkaline stress indicator b+

Seasonal variations during the study period was as.,

July 2011 to June 2012.

Summer: Cladocera > Rotifera > Copepoda > Ostracoda.

Monsoon: Rotifera > Copepoda > Cladocera > Ostracoda.

Winter: Rotifera > Copepoda > Cladocera > Ostracoda.

Conclusion

After the present investigation it is very clear that

1. The present water body is polluted as from the zooplankton analysis out of 18 recorded species 12 are pollution indicator.
2. Diverse zooplankton pollution indicator genera from Rotifera, Cladocera, copepod and Ostracoda were found as shown in table no 2 it points to polluted condition of Kasarwadi/Borna Dam

3. The domination of rotifers indicates towards moderate polluted condition.
4. The zooplankton found in, high pollution stress, acid stress, heavy metal stress, eutrophication stress, thermal stress, alkaline stress conditions, etc. clearly indicates that water body shows moderate polluted condition.

Recommendations

1. The domestic activities around the reservoir must be prohibited to minimize the pollution load.
2. Municipal corporation can have facilities there Creation Park with Ornamental plants, Fish Aquarium house, boating facility, swimming pool etc.
3. Pollution stress must be banned and domestic activities in the catchment area of dam must be inhibited.

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