Research Paper

Volume : 4 | Issue : 8 | Aug 2015 • ISSN No 2277 - 8179

Exploitation of Zooplanktons as Pollution Indicators of Water Quality at Nagapur Dam Near Parli. V. Town Dist. Beed Maharashtra, India

Zoology

KEYWORDS : Wan [Nagapur] Dam, Pollution indicator Zooplankton species, water quality.

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ABSTRACT

The present study deals with assessment of important Physico-chemical parameters and Zooplankton diversity correlated with the pollution status of Wan Prakalpa at Nagapur near Parli .v. town Dist. Beed resided between 180 – 53'-0" North latitude and 760 –27'-0" East longitude in Marathwada region [M.S] India [Asian continent]. The work was undertaken to investigate the important water body for this the vital parameters were studied and analysed every month during June 2011– May 2012. For this three different sampling stations were selected on Wan prakalpa as NG1,NG2,NG3 . The results construed that the different months showed fluctuations in physicochemical parameters imitate accordingly to the seasons, climate and the pollution load over the investigated water body. The present work was correlated with the zooplankton diversity and pollution indicator species which were used as bio-indicators to assess the water quality of the dam. The pollution indicator zoplankton species from three (3) stations of the dam were recorded, this was done with the pollution indicator index species listed by IAAB , Bilgami K. S. and Sládecek pollution indicator species of Zooplankton. A total of 20 genera were recorded out of 07 were Rotifers and 5 were pollution indicaor, from 05 Cladocera 4 were pollution indicator, out of 6 Copepods 4 were pollution indicator, and 2 Ostracodas 2 being the pollution indicator. For knowing the quality of water samples the total score of stations were recorded 15 pollution indicator species were found which helped to know the high degree of organic pollution of dam. The species given by IAAB , Bilgami K. S. and Sládecek pollution indicator index. observed at different stations of the dam, It clearly highlights the polluted condition of Nagapur Dam.

1] Introduction:-

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 Ogbuagu DH *et al* .(2012). 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 (Kulkarni and Tapase, 2011). Water pollution is a phenomenon that is characterized by the deterioration of its quality as a result of various human activities. Rapid industrialization and indiscriminate use of chemical fertilizers and pesticides in agriculture are causing heavy and varied pollution in aquatic environment leading to deterioration of water quality and hence depletion of aquatic biota (Khan et al., 2012). Surface water quality depends not only on natural processes like precipitation inputs, erosion, and weathering of crustal material, etc., but also on anthropogenic influences like urban, industrial, and agricultural activities (Ravikumar et al.,2013). Therefore, scientific study needs to review strategies for Conservation and better utilization of lakes (Nikitaraj, 2012). Zooplankton assume a great ecological significance in ecosystem as they play vital role in food Web of the food chain, nutrient recycling, and in transfer of organic matter from primary Producers to secondary consumers like fishes (Krishnamurthy et al., 1979) . 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 (Saler,2009).

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 (Partensky et al., 1999). 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.

The biological methods of water pollution are comparatively of recent origin and have the advantage giving the past history of water sources. These require less time because the single series of samples reveals the complete picture of the animal and plant communities which themselves represent the state of prevailing conditions. Bick (1963) have reviewed in great detail the various methods of biological assessment. 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 (Altaff, 2004). Zooplanktons can also be used as "bioindicators" for water pollution studies, because their occurrence, vitality and responses, change under adverse environmental conditions (Oliver, 1996).

In Marathwada region there are many dams on different rivers, but very less attention has been Compensated to presence of Zooplankton indicator species in water and water pollution. In the present investigation the pollution status of Nagapur Dam near Parli Vaijnath in Beed district of Marathwada region in Maharashtra State were checked with the help of Standard list of Zooplankton pollution indicator species.

1.1] keystone of the present exploration.

Biomonitoring was applied to survey to various zooplankton species occurring in Wan Dam water body to evaluate the biological health, or biological integrity and pollution status , of the resource surveyed with the help of pollution indicator species. Comprehensive pollution assessment requires various types of data biomonitoring which

method is best used for detecting aquatic life impairments and assessing their relative severity. 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 (Trivedi, 2000); Reddy (2002); (Altaf and Muthupriya,

2002); (Hiware and Ugale, 2003);(Sharma, 2004); (Raut et al., 2006); (Pandit et al.,2007); (Bhagat and Meshram, 2007); (Patil et al.,2008); (Mulani et al., 2009); (Rajgopal et al., 2010); (Verma et al., 2011) (Rankhamb and Raut,2012); (Sivalingam et al., 2013).

1.2] Need behind the goal

To provide the data of qualitative, quantitative abundance of zooplankton highlighting pollution indicator species as the base for further research and rehabilitation.

• This work is one step in the direction to minimize the Problem of water pollution due to domestic, industrial and agricultural activity from end to end with Gram Panchyat Nagapur Municipal Corporation, Pollution control board, Govt. officials and NGO's etc.

1.3] intention of research

The different objectives of the investigation were as:-

_ To study the zooplankton diversity of the Wan Dam body.
_ To find out the monthly and seasonal quantitative and qualitative data of the zoooplankton abundance.
_ To investigate the abundance of species from different groups of zoooplankton and correlate them with pollution indicator species of IAAB, pollution tolerant zooplankton index by Bilgami K.S., Sládecek pollution indicator index.

_ To enlist the final pollution indicator zooplankton species and correlate it with polluted status of the present water body.

1.4]Necessitate behind this work.

_ The present water body is important in parli region but no attention has been given to it.

_ The main cause behind this work is to focus on pollution status and inhibit the all domestic activities to reinstate the usual status of this lake.

_ This work may be a little effort to solve the water scarcity in this region and to minimize the Pollution stress on this Dam.

2] Materials and Methods

The influence of pollution on the abundance of major zooplanktons like Rotifera, Cladocera and Copepoda were investigated at polluted and non polluted regions at Nagapur near Parli v. The water samples were collected for physicochemical analysis from 3 stations NG1, NG2, NG3 of Nagapur dam; for one year (Jun 2011 to May 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 and conductivity wererecorded. 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 water and air temperatures were recorded with thermometer; pH was examined with the help of universal indicator and checked by using digital pH meter in laboratory. The conductivity was recorded

with the help of digital conductivity meter. 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 10-12 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 Edmonson, (1963) ,Battish (1992) and APHA (2005).

Species diversity index was obtained by following Shannon Weaver methodology (Nath, 1997).

After further taxonomic investigations' the pollution tolerant genera and species were recorded from three (3), stations of one dam. The assessment of each station of dam was done with the help of by IAAB , Bilgami K. S. and Sládecek pollution indicator index.

The Zooplankton samples were collected every month at the present dam from 3 different sampling stations. For one year from June 2011 to May 2012. Zooplankton samples were collected with the help of plankton net No.25. The analysis was done with the help of Sedgwick's rafter cell.

The supernant water was siphoned out and the settled planktons were enumerated by 'Sedgwick-Rafter Cell' method. Identification of zooplanktons species was performed under microscope by using keys and monographs of IAAB , Bilgami K. S. and Sládecek pollution indicator index.standard References; Pennak (1978) and Adoni *et al.* (1985).]

The pollution indicator species were identified standard list of pollution tolerant zooplankton index by IAAB , Bilgami K. S. and Sládecek pollution indicator index.

Table no.1:- Details of Wan [Nagapur] Prakalpa near Parli v.Town .

Name of Prakalpa	Wan Prakalpa /Nagapur Dam
Geographical coordination	**18^0 _53'-0"** North latitude and **76^0 _27'-0"** East longitude.
River impounded.	Wan
Type of Dam	Earthen type
Year of Construction.	1963
Catchment area	371.92 sq.kms
Submergence area	547 hector.
Length of dam [Length of earthern wall] .	2188 meters
Height of Dam[Height of earthern wall]	19.81 meters.
Reservoir irrigated area	7122 hectors
Gross storage capacity	25.181 million Cubic meters.
The average rain fall	676 mm
Distance from Parli v. Town	14 kms away in west direction
Water supplied for Drinking to	Parli v Town and 23 nearby villages.

1Result and Discussion

Zooplankton constitutes the food source of organisms. It plays an important role in aquaculture, including being an indicator that determines water quality, pollution, and the state of eutrophication (SALER, 2009).

Zooplankton communities of fresh water bodies constitute extremely diverse assemblage,

represented by different phyla of invertebrates. These are minute, microscopic organisms, \present in water their size ranges from 0.2 to 5 mm. The abundance of zooplankton in lagoon depends on a great variety of abiotic and biotic factors, which collectively affect individual species of the zooplankton community.

The present work was undertaken to study the pollution status of the Nagapur Dam with zooplankton diversity. This dam wa-

ter is used for drinking purpose of Parli v Town and 23 nearby village residents. After recording the zooplanktons for one year pollution statuses during the present work total of 20 genera of zooplankton were recorded the groups with the genera composition are as Rotifera (7 genera- 5 pollution indicator) Cladocera (5genera -4poll.ind), Copepoda (6 genera- 4 poll.ind) and Ostracoda (2genera- 2 poll.ind).Out of 20 found genera 15 were pollution indicator .From this it becomes clear that Nagapur Dam is PollutedDue to different domestic, agricultural and industrial activities as the water of Wan river is Thwarted to construct the Dam for wellbeing of the people in this Parli v. Town of Beed District of Maharashtra India.

For understanding the health of water bodies, zooplanktons are useful as these are very sensitiveto pollutants and as they act as bio indicator of water bodies. The utility of zooplankton inaccessing 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 (Trivedi, 2000);

Reddy (2002); (Altaf and Muthupriya, 2002); (Hiware and Ugale, 2003); (Sharma, 2004); (Raut et al., 2006); (Pandit et al., 2007); (Bhagat and Meshram, 2007); (Patil et al., 2008); (Mulani et al., 2009); (Rajgopal et al., 2010); (Verma et al., 2011) (Rankhamb and Raut, 2012); (Sivalingam et al., 2013).

In the present investigation in biotic assemblages in the bulk of rotifers was recorded, bioindicators from Cladocera, Copepoda and Ostracoda were recorded as in table no. 2 and 3 which indicates that the Wan Dam At Nagapur is moderately polluted with 15 pollution indicator species from standard pollution indicator index. After outcome the results of the polluted status of the present Lake Municipal Corporation, Maharashtra Pollution Control board, and NGO's can use them. This research work may be useful for the future generations if utilizedin proper manner to minimize the pollution stress on this water body.

Table no.2 Zooplankton groups with their respective generas at Wan [Nagapur] Reservoir During June 2011 to May 2012.

1)Rotifera(5 enera)	**Frequency**	**2)Cladocera (5 genera)**	**Frequency**
i) *Brachionus sp.* ii) *Cephalodella sp.*	+++++	i) *Bosmania sp.*	00
iii) *Trichocerca sp.*	xxxx	ii) *cerodaphnia sp.*	+++++
iv) *Keratella sp.*	_ _ _	iii) *Daphnia sp.*	xxxx
v) *Filina sp.*	+++++	iv) *Chydorous sp*	_ _ _
vi) Notommatid	---	v)*Moina Sp.,*	
vii) Pliomate	---		
	----		
3) Copepoda (6 gener)	**Frequency**	**4) Ostracoda (2 genera)**	**Frequency**
i) *Cyclops sp.*	+++++	*i) Cypris sp.*	xxxx
ii) *Diaptomous sp.*	_ _ _	*ii) Stenocypris*	_ _ _
iii) *Eucyclops sp.*	xxxx		
iv) Mesocyclops sp.	xxxx		
v) *Microcyclops sp*	xxxx		
vi) Macrocyclops sp.	00		
	+++++		

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

Table no. 3:- Pollution indicator Zooplanktons species from different groups at Wan [Nagapur] Reservoir During June 2011 to May 2012.

Sr. No/ Group	**Rotifera**	Strength of pollution	**Cladocera**	Strength of pollution	**Copepoda**	Strength of pollution	**Ostracoda**	Strength of polution
1	*Brachinous calciflorus*	****$ b+xx	*Chydorous Species*	**#	*Diaptomus Sp*	***	Stenocypris	***
2	*Brachinous* quadridentata	***$	*Bosmina. Sp*	**a+	*Cyclops Sp.,*	*xx	cypris	***
3	*Brachinous angularis*	***$	*cerodaphnia sp.*	#	*Mesocyclops Sp.*	***	Cyprinotus nudus	*
4	*Kartella sp.*	**	*Daphnia sp.*	**	*Microcyclops Sp.*	***		
5	Brachionus havanaensis	***$			*Macrocyclops sp.*	*		
6	Trichocerca	**			*Eucyclops sp*	*		
7	Caphalodella	%						
8	Notommatid	*						
9	Pliomate	*						

Pollution frequency :- 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 $ 8] Heavy metal stress indicator ^{xx} 9] Alkaline stress indicator b+ 10] Sludge and Detrioration indicator % Different types of Zooplanktons which were found in Wan Reservoir showed the following seasonal variations during the study period was as .,

June 2011to December 2012.
Summer: Cladocera >Rotifera > Copepoda>Ostracoda.
Mansoon: Rotifera> Copepoda> Cladocera> Ostracoda.
Winter: Rotifera>Copepoda>Cladocera> Ostracoda.

Table no. 4 Physicochemical parameters of Wan Reservoir at Nagapur June 2011 to May 2012 .

Months/ Parameters	Jan 2012	Feb 2012	March 2012	April 2012	May 2012	June 2011	July 2011	Aug 2011	Sept 2011	Oct 2011	Nov 2011	Dec 2011
Taste	Unob	Unob	Unob	Unob	Unob	Unob	Unob	Unob	Unob	Unob	Unob	Unob
Atm. Temp.	22	24	27	33	36	33	29	27	24	25.5	23	17
Water temp.	19	21	23.5	29	32	29.5	26	24	20	21.5	19	13.5
P^H	7.8	8.0	8.25	8.35	8.44	8.1	7.76	7.70	7.50	7.39	7.53	7.7
Conductivity	742	1\\Md3-pc\d\Research Paper\IJSR August 2015\For Approval\1-71				1980	2007	2057	1052	1003	995	818
D. Oxygen	8.9	8.3	7.5	6.7	6.0	6.3	7.3	7.5	7.6	7.8	8.2	8.7

Physicochemical parameters
The study of different water parameters is very important for understanding the metabolicevents in aquatic ecosystem. The parameters influence each other and also the sediment as well as they governs the abundance and distribution of the flora and fauna. Therefore, it has become obligatory to analyze at least the important water parameters when ecological studies are carried out. Such studies when done from time to time can indicate the favorable or unfavorable changes occurring in the ecosystem (Shinde et al., 2010).

The quality of surface water of lakes and rivers depends on their physical, chemical and biological prosperities. Reservoirs ,lakes, rivers are visible tools for managing fresh water resources, contributing to socioeconomic development and drinking water supply.

The results obtained from analysis of water samples are discussed below and shown in table no. 1

1] P^H pH refers to the negative logarithm of hydrogen ion activity in water. PH =- lgH +. The quantity of hydrogen ions (H+) in water will determine if it is acidic or basic. The scale for measuring the degree of acidity is called the pH scale, which ranges from 1 to 14. A value of 7 is considered neutral, neither acidic or basic; values below 7 are considered acidic; above 7, basic. The acceptable range for fish culture is normally between pH 6.5-9.0.

In the present investigation maximum pH value recorded in Summer was 8.44 and minimum pH value recorded in winter in October was 7.39.Similar types results were attributed by Mahajan C.L.,Singh J.J.,(1973). Trivedi, (2000); Reddy (2002); Altaf and Muthupriya, (2002); Hiware and Ugale, (2003); Sharma, (2004); Raut et al., (2006); Pandit et al., (2007); Bhagat and Meshram, (2007); Patil et al., (2008); Mulani et al., (2009); Rajgopal et al., (2010); (Verma et al., 2011)., Rankhamb and Raut, (2012); Sivalingam et al., (2013).2]Temperature Water temperature: physical and chemical properties of water and water temperature are closely linked. The solubility of water soluble gases (such as oxygen, carbon dioxide, etc.), biological and microbial activity in water, non-ionic ammonia, salinity and pH, and other solutes are subject to water temperature changes.

Atmospheric water temperature is an important parameter role which plays in determine the growth of organisms ultimately the water quality. Excess amount of nutrients, high temperature cause to the eutrophication. In the present investigation the maximum air temperature was 36ºC and maximum water temperature was32ºC in the month of May while minimum air temperature was 17ºC and minimum water temperature was 13.5ºC recorded in the month of December.

Similar types of results were recorded by few workers at different water bodies are as .,Mahajan C.L.,Singh J.J.,(1973). Trivedi, (2000); Reddy (2002); (Altaf and Muthupriya, 2002); Hiware and Ugale, (2003); Sharma, (2004); Pawar S, (2005) ., (Raut et al., 2006); Salve (2006)., Pandit et al., (2007); Bhagat and Meshram, (2007); Patil et al., (2008); Mulani et al., (2009); Dirican., (2009). Rajgopal et al., (2010); Sanyogita (2011) ., Verma et al., (2011) ., Shinde (2011)., Rankhamb and Raut, (2012); Sivalingam et al., (2013)..3]Conductivity Conductivity is a numerical solution of conduction current capabilities. The conductivity of pure water is very low, but when the water contains inorganic acid, alkali or salt, the conductivity can increase. Conductivity is often used in the indirect speculation of the total concentration of ions in water. The conductivity of aqueous solution depends on the nature and concentration of ions and the temperature and viscosity of the solution. Conductivity varies with temperature. Every increase of 1 in the temperature shall cause an increase of the conductivity by 2% or so. The standard temperature for determination of the conductivity is set at 25 .

In the present investigation the maximum conductivity was recorded in summer season 2021 µm

in the month of May while minimum conductivity recorded in winter was 742 µm in the month of January Electric conductivity showed high significant positive relationship with water temperature. Similar types of results were recorded by few workers as., Pandit et al., (2007); Bhagat and Meshram, (2007); Patil et al., (2008); Mulani et al., (2009); Dirican., (2009). Rajgopal et al., (2010); Sanyogita (2011) ., Verma et al., (2011) ., Shinde (2011)., Sivalingam et al., (2013).

4]Dissolved oxygen:
The dissolved oxygen content in natural water depends on the

balance between water and atmospheric oxygen. Saturation of dissolved oxygen is closely related to the partial pressure of oxygen in the air, atmospheric pressure, water temperature. Dissolved oxygen in clean surface water is generally close to saturation. But because of the growth of algae, dissolved oxygen may be too saturated. The dissolved oxygen in the water bodies affected by organic and inorganic reduction substances would be lower. When the atmospheric oxygen is late in supplement, the dissolved oxygen in water would decrease gradually, even closer to zero. Thus, anaerobic bacteria would breed and water quality deteriorates, leading to fish mortality.

In the present investigation the maximum values of dissolved oxygen were recorded in the winter season in month of January 8.9 mg/l and minimum values of dissolved oxygen were recorded in the summer season in month of may 6.0 mg/l. Similar types of findings were recorded by some workers as Hiware and Ugale, (2003); Sharma, (2004); Pawar S, (2005) ., (Raut et al., 2006); Salve (2006)., Pandit et al., (2007); Bhagat and Meshram, (2007); Patil et al., (2008); Mulani et al., (2009); Dirican., (2009). Rajgopal et al., (2010); Sanyogita (2011) ., Verma et al., (2011) ., Shinde (2011)., Rankhamb and Raut, (2012); Khan (2012), Sivalingam et al., (2013).. Ravikumar **(2013).,**

Conclusion

After the present investigation it is very clear that

1] The present water body is polluted as from the zooplankton analysis out of 20 recorded species 15 are pollution indicator.
2] Different zooplankton pollution indicator species groups from Cladocera, copepod and Ostracoda were found as shown in table no 2 it points to polluted condition of Wan Reservoir .
3] This wan water body shows domination of rotifers which can be attributed with the degree of pollution.
4] The zooplankton found in, high pollution stress, acid stess ,heavy metal stress, euthrophication 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 pollutionload.
[2]. The different types other activities around the reservoir which are responsible to pollution must be stopped.
3] Municipal corporation can have facilities there Creation Park with Ornamental plants, Fish Aquarium house, boating facility, swimming pool etc.
[4] There must be separate system run by Municipal Corporation for the management of Wan reservoir as the water from wan is supplied to Parli City.

Acknowledgements

The author is thankful to Head, Dept. of Zoology, Dr. Babasaheb AmbedkarMarathwada University for providing the laboratory and library facilities.The author isthankful to Principal Dr. S.B. Jadhavsir, Rajarshi Shahu Mahavidyalaya, Latur andthePresident of Shiv Chatrapati Shikshan Sanstha Dr.Gopalraoji Patil Ex. M.P. Rajya Sabha, and VicePresident Dr. P.R Deshmukh Saheb, SecretaryNarayanraoji Patil (Joint Secretary) Dr. A.S. Jadhavsir and S.T. Manaleji, Dr. R.L. Kawale and all therespected management members. The authors are thankful to Dr. Baban Ingole Dy. Director NIO Goa, Head Dept. of Zoology, Rajarshi Shahu mahavidyalaya Latur, and Prof. Dr.V.S.Shembekar Sir. The Authors are also thankful to Principal, Dr. R.J. Paralikar madam L.L.D.M.M. Parli v.,Vice principal Dr..L.S.Munde, Vice principal Dr..V.D.Deshpande , President Anilrao Deshmukh, Secretary Ravindra Deshmukh andTreassure Sanjay Deshmukh sir and all the respected members of Late Laxmibai DeshmukhShikshan prasarakmanda Parli vaijnath. I am very much thankful to my friend Dr. B.S. Salve sir, Dr. D.H.Thorat sir Ex. BOS [Zooogy] Dr. B.A.M.University Aurangabad for the encouragement and V.B. Deshpande Ex. Head Dept. of ZoologyVaidyanath college Parli v. for moral support.

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