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ZOOPLANKTON ANALYSIS OF WELL WATER OF CERTAIN ZONES OF NAGPUR (M.S.), INDIA

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Abstract:

Composition and diversity of zooplankton provide information on the characteristics and quality of the water body. Biomonitoring (biological surveillance) is the systematic use of living organisms or their responses to determine the quality of the environment. Therefore the present study was carried out in terms of zooplankton analysis in summer and rainy seasons i.e. March-August-2018 in four zones of Nagpur (M.S.) India. Water samples were collected from one sampling station in every month from each zone of Nagpur city. Zooplanktons were sampled using plankton net. By qualitative and quantitative analysis of the zooplankton community, bio indicator species were selected for evaluation of water quality. The results revealed that zooplanktons are present in all wells of the selected zones. The identified zooplankton population in the present study were under 5 groups includes Protozoa, Ostracoda, Copepoda, Cladocera and Rotifera. Total 24 Zooplankton genera under 5 groups were recorded from the study area. Among the identified zooplankton the gp. Rotifera was dominant with 12 genus followed by Protozoa (8genus), Copepoda (3 genus), Ostracoda (1genus), along with larvae of Copepods, like *nauplius, nematode* worms and some undesirable mosquito larvae and small fishes also were found in well waters of one zone in the month of May 2018. The findings of the present study will be helpful to improve management plans for well water quality control authorities of the city.

Key words: Zones of Nagpur City, Bioindicators, Zooplankton, Water Quality.

Introduction:

Zooplanktons are microscopic organisms that are suspended in water. These include many kinds of Protozoans, micro crustaceans and other micro invertebrates that are planktonic in water

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bodies (omudu & odeh, 2006). They are globally recognized as pollution indicators organisms in the aquatic environment (yakubu et al., 2000). Water of good drinking quality is of basic importance to human physiology and man's continued existence depends very much on its availability (Lamikarna, 1999: FAO, 1997). The provision of potable water to the population is necessary to prevent health hazards (Nikoladze and Akastal, 1989; Lemo 2002). A good knowledge of the qualities of raw water is necessary so as to guide its suitability for use (omezuruike et al. 2008).

A change in the physico-chemical aspect of a water body brings about a corresponding change in the relative composition and abundance of the organisms in that water. The abundance and diversity of zooplanktons vary according to immunological features and the trophic state of fresh water bodies. Composition and diversity of zooplankton provide information on the characteristics and quality of the water body. Biomonitoring (biological surveillance) is the systematic use of living organisms or their responses to determine the quality of the environment.

Before 1936, dugwells, rivers and ponds were the main source of drinking water to the city population. Water works department, Nagpur Municipal Corporation, Nagpur, besides the surface water sources, they have constructed open wells in various localities. Field investigations revealed that many public wells are deliberately misused for dumping garbage. Consequently these dependable sources get polluted. These pollutants may be biological or physicochemical.

Material & Methods:

Study area:

Nagpur District is one of the nine districts of Vidarbha Region of Maharashtra. It is situated on the eastern part of the state abutting Chindwada District of Madhya Pradesh in North, It is surrounded by Wardha and Amravati District in the West, Bhandara in East and Chandrapur District in South lies between North latitudes $20^0$35' and $21^0$44' and East latitudes $78^0$15' and $79^0$40' and falls in survey on India to toposheets 55k. The District has a geographical area of 9892 sq km (Murthy and Sahoo, 1999).

Water supply service area is statutory limit of Nagpur Municipal Corporation. The total service area within the city is 217sq.km of which about 7sq. km area is under catchment of lakes at periphery of city. The city is divided in to ten administrative zone-Laxminagar, Dharampeth, Hanuman Nagar, Dhantoli, Neharu Nagar, Gandhibagh, Satranjipura, Lakadganj, Ashinagar, Mangalwari. (Source : Water audit and leak detection report March 2004).(Fig.1)

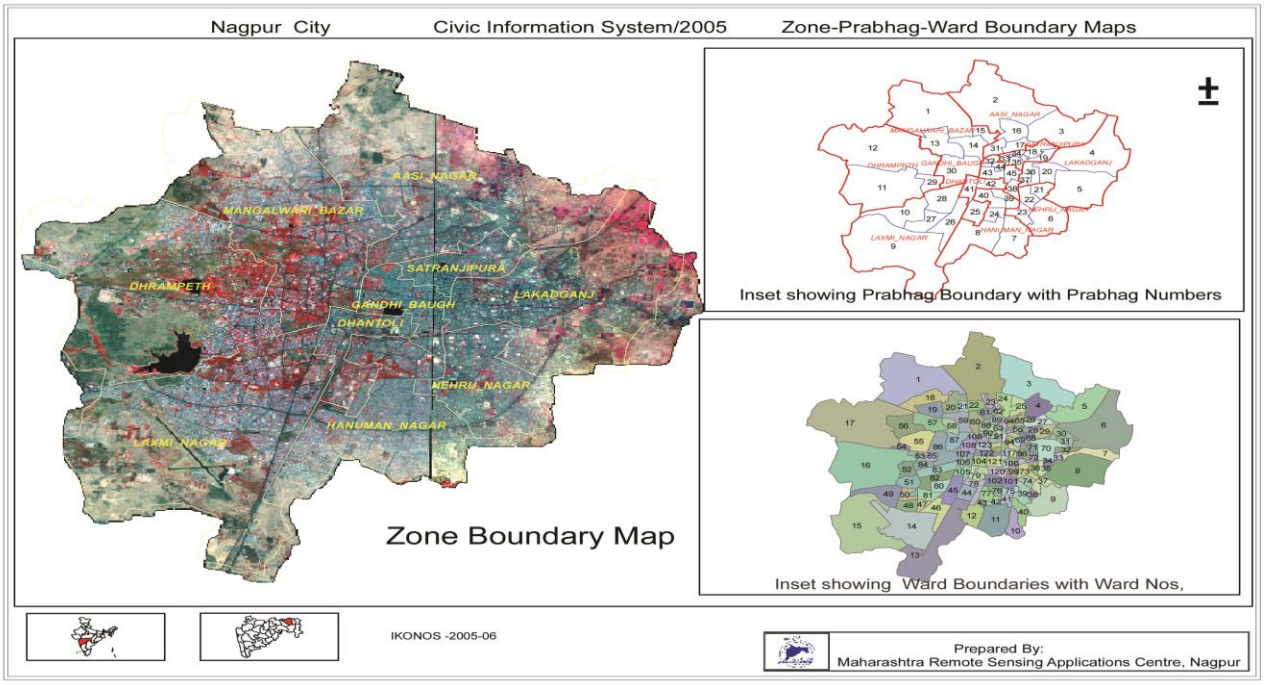

Fig 1- 10 Administrative zones of Nagpur city.

The population of the city increased by almost 1 to 2 lacs approximately up to 1971. However it is noticed that after 1971 absolute growth rate is more than 3 lacs and touches to four lacs in 2001. It is estimated that in 2011, the population of Nagpur City would be 27 lacs with a water deficiency of 200 MLD. With the rapid development due to its centralized location, the population of Nagpur is expected to be more than 50 Lacs by 2031 with a water demand of 1100 MLD (Pal, 2005, Girgaonkar, 2007).

3.2 Sampling:

The water samples were collected form one well from four zones (Dharampeth Zone, Hanuman Nagar Zone, Dhantoli Zone, Ashinagar Zone) of Nagpur City at monthly interval for the six months for the period from March-August in the year 2018. The selection of wells was made on the basis of population density and use of well water. The water samples were collected by using rope bucket method from the wells and stored in one liter plastic cans for physicochemical and bacterial analysis. No preservative were added before analysis.

3.3. Analysis:

Zooplankton analysis of the collected samples was done in a following manner-

Sample Analysis: Water samples were collected between 6.00 am to 8.00 am from March to August (Summer & Rainy Season) from all one well of the each study zone for the analysis of zooplankton.

Zooplankton Sampling: Zooplankton samples were collected by passing water through plankton net of mesh size 50µm 50 litres of water is passed through the plankton net and the final concentration of plankton sample is 25ml to this 5ml of 4% formalin is added which acts as fixative as well as preservative. Identification and counting of zooplankton : From the pressured sample 1 ml of the sample was taken on the slide with the help of dropper and observed under the microscope. The following are the specific volumes for identification of different groups of zooplankton - Protozoa, Ostracoda, Copepoda, Cladocera, Rotifera number of plankton in the S-R cell was derived from the following formula APHA (1976).

Number of Species/ Litre = CX 1000 mm3/ L X D X W X S

Where, C = Number of organisms counted
L = Length of each stripe (S-R cell length) in mm
D = Depth of each stripe in mm
W = Width of each stripe in mm
S = Number of stripe

Qualitative and quantitative analysis of Zooplankton done by Sedwick Rafter Cell Method. (APHA 1991, Kodarkar *et al*., 1998, Tonapi 1980, APHA, 1989, Battish 1992, Dhanpathi 2000).

Results & Discussion:

Table1: Zooplankton analysis of Dharampeth Zone of Nagpur City for the period March-August-2018

MONTH	**MARCH**	**APRIL**	**MAY**	**JUNE**	**JULY**	**AUGUST**
PROTOZOA	1	-	-	-	-	2
OSTRACODA	-	-	-	-	-	-
COPEPODA	2	5	3	2	2	-
CLADOCERA	-	-	-	-	-	-
ROTIFERA	1	1	1	-	1	1
Total No. of Zooplankton /ml	4	6	4	2	3	3
Total No. of Zooplankton /liter	1200	1800	1200	600	900	900

Table 2: Zooplankton analysis of Hanumannagar Zone of Nagpur City for the period March-August-2018

MONTH	**MARCH**	**APRIL**	**MAY**	**JUNE**	**JULY**	**AUGUST**
PROTOZOA	-	1	-	-	-	-
OSTRACODA	-	-	-	-	-	-
COPEPODA	2	1	-	1	4	6
CLADOCERA	-	-	-	-	-	-
ROTIFERA	2	1	4	4	2	2
Total No. of Zooplankton /ml	4	3	4	5	6	8
Total No. of Zooplankton /liter	1200	900	1200	1500	1800	2400

Table3: Zooplankton analysis of Dhantoli Zone of Nagpur City for the period March-August-2018

MONTH	MARCH	APRIL	MAY	JUNE	JULY	AUGUST
PROTOZOA	2	-	-	40	32	22
OSTRACODA	-	-	-	-	-	-
COPEPODA	1	1	-	-	-	-
CLADOCERA	-	-	-	-	-	-
ROTIFERA	1	1	1	2	-	3
Total No. of Zooplankton /ml	4	2	1	42	32	25
Total No. of Zooplankton /liter	1200	600	300	12600	9600	7500

Table4: Zooplankton analysis of Ashinagar Zone of Nagpur City for the period March-August-2018

MONTH	MARCH	APRIL	MAY	JUNE	JULY	AUGUST
PROTOZOA	-	-	-	-	-	-
OSTRACODA	1	-	-	-	2	2
COPEPODA	1	1	2	-	2	3
CLADOCERA	-	-	-	-	-	-
ROTIFERA	2	4	1	8	3	4
Total No. of Zooplankton /ml	4	5	3	8	7	9
Total No. of Zooplankton /liter	1200	1500	900	2400	2100	2700

The identified zooplankton population in the present study were under five groups including protozoa, ostracoda, copepoda, cladocera and rotifera. A total eleven zooplankton genera under five groups were recorded from the study area. Among the identified zooplankton the group rotifer was dominant with five genus followed by copepdoda (2 genus), protozoa (7 genus), ostracoda (1 genus) also found. The month wise quantitative composition of zooplankton in the month of March-August-2018 in all four zones are given in the table 1-4. The use of zooplankton community structure as an indicator of the wellbeing of well waters. The zooplankton community structure in four Zones of Nagpur city were Rotifera>copepoda> protozoa, except in Dharampeth zone where Copepoda dominates the zooplankton population. In the present study the greatest diversity was observed among rotifera with 14 species followed by protozoa and copepoda. Largely available zooplanktons were represented by the members of group rotifera in the month of June & July in the Dhantoli, Hanumannagar and Aashinagar zone.

The work on well water is very scanty and therefore these results are not comparable with other authors but, the present investigation can be compared with other fresh water reservoir studies. The other ecological factors and plankton communities together from a comprehensive ecosystem and as in any ecosystem, there are interactions between the other factors and the plankton. These interactions are directly or indirectly subjected to the complex influences some of

which results in quantitative changes i.e. increase or decrease of size of the population (Welch 1952). During this study a distinct fluctuation of zooplankton population in ten zones as well as four months was observed. This fluctuation is due to the impact of different ecological factors such as commencement of monsoon (June), moderate rain (July) and heavy rain (August). The present results are accordance with Zorka Dulic et al., (2006), md. Abdul Bashar et al., (2015) found nearly same results during the study on lake water. The present study partially agrees with the study of above lake water analysis. In present investigation copepoda found as a second dominant group among all the group of zooplankton. A study conducted by Islam et al., (2007) also found the similar findings. Similar result was observed by Ganpati (1943) and he found that copepoda was a dominant order among zooplankton in the garden pond. In the present investigation the maximum diversity was recorded during June and July i.e., commencement of monsoon. These results are comparable with George (1964) observed maximum population of zooplankton in November, January i.e. calm water conditions.

Conclusion:

Zooplanktons may exist in a wide range of environmental conditions. At the same time they are also a very good bioindicators to assess the pollution of any freshwater body. The presence of rotifers and copepodes reveals that the wells are being organically polluted. The all 4 zones out of 10 are badly affected due to various anthropogenic activities such as entry of domestic waste run offs, contamination of wells due to seepage from toilets which are adjustant to the open wells, dumping of garbage and ill maintenance. From the above study we can make the conclusion that a strict vigilance and general awareness is required so that proper maintenance of this essential reservoir can be done and further studies in this regard is essential to measuring the diversity of zooplanktons and other pollution indicators to maintain the water quality.

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