EFFECT OF POLLUTION ON ROTIFER DIVERSITY IN RIVER GADHI AND DEHARANG RESERVOIR

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ABSTRACT : The rotifer diversity and density was studied for a period of 16 months at various sites of river Gadhi and Deharang reservoir. The diversity and density was found to be abundant at downstream sites, especially at the sites which receive domestic sewage. 27 different genera of rotifers comprising 58 species were ecoutered. The *Brachionus calyciflorus* contributed more in the total density of rotifers. Most of the species of *Brachionus* were confined to the downstream. The restriction of *B. patulus* and *B. paracollurella* at upstream may suggest their preference to the clean water.

Key words: Rotifers, pollution indicator, *B. calyciflorus, B. paracollurella*

INTRODUCTION:

Rotifers are smallest multicellular, 'wheel bearing' organisms found in all aquatic and semi aquatic habitat, but are predominantly freshwater inhabitants. Because of their high feeding and assimilation efficiencies, they play important role in energy flow and nutrient cycling, accounting for more than 50% of the zooplankton production in some freshwater systems (Saler and Sen, 2002). The cosmopolitan distribution and occurrence in relation to water quality have been the attention of many planktologists (Cajander, 1983; Edmondson, 1959; Pennack, 1953; sladecek, 1983).

Rotifers are sensitive indicators of water quality (Sheeba and Ramanujan, 2005). Schindler and Noven (1971) reported enormous growth of rotifers in lakes and reservoirs indicating eutrophic conditions. Presence of rotifers is also described as indicator of eutrophy by Saksena and Sharma (1981) as he observed it in Gandhi Sagar, Chhattri tank, Sawarkar sarovar and Matsya Sarovar in Gwalior.

During the present study, the samples were collected from river Gadhi and Dehrang reservoir which runs outskirts of Panvel town. The river originates from Dehrang reservoir which is at the bottom of mountains and collects water from streams that run down the mountains. As the river flow downwards, it approaches town and collects various wastes, especially sewage. To study the effect of pollution on rotifer diversity, seven sites were selected. The first site, S1, was reservoir and remaining six sites were down stream to it. S2 and S3 are indicated as upstream sites and were far away from the town. These sites have comparatively less human hindrance. S4, S5, S6 and S7 are in the vicinity of the town and the impact of anthropogenic activities increases in these areas. These are referred as downstream sites. As mentioned earlier the rotifers are indicators of trophic status and pollution, the density and diversity of roifers was studied for a period of 16 months to see the changes that encounter as the river approaches the town so as to see the impact of pollution on rotifers.

MATERIALS AND METHODS :

The samples were collected monthly for a period of 16 months from seven different sites (Fig. 1) located on river Gadhi and its Reservoir. With the help of wide mouthed containers 40 ltrs surface water was filtered by using net of mesh size 45 µm. The filtered samples were preserved separately for each site with 4% Lugol's Iodine made in formalin in a separate container.

Identification of rotifers was done with the help of standard keys (Ward and Whipple, 1958; Battish, 1992; Pennak, 1995; and Dhanapathi, 2000).

The density count of zooplankton was done by observing subsamples under compound microscope.

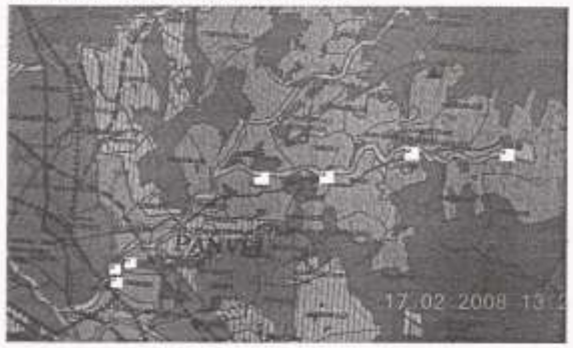

Fig. 2.2 Location of study sites

RESULTS AND DISCUSSIONS:

During the present study, the total density of rotifer was 34,79,919 ind/l. In all 27 different genera of rotifers comprising 58 species were encountered (Table 1). More abundance and diversity was seen in summer season which could be due to the absence of inflow of the water which brings stability to the water body. Stagnancy and availability of food due to production of organic matter and decomposition in summer season may have contributed for high species diversity in that season (Kiran *et al.* 2007).

The highest density 15,18,994 ind/l was recorded at site S6 which receives sewage and the minima 12,107 ind/l was at site S1 which is reservoir and lies upstream far away from the town. The sites near the town having various anthropogenic activities showed more densities of zooplankton than the sites away from the town having less or no human hindrance.

Among the various species encountered during the present study, the maximum diversity and density was seen in the *Brachionus* spp. It was represented by 19 different species and contributed

82% of the total rotifer density. The numerical superiority of *Brachionus* is also observed by Tasveska *et al.* (2010), Dutta (2011). Their dominance and diversity was seen at the down stream sites, except S7 which had only 6 species of the *Brachionus*. Nutrient enrichment due to inlet of sewage and availability of food due to heavy growth of phytoplankton could be the possible reasons for increased downstream density.

B. calyciflorus was the dominant in the genus *Brachionus* which was found to be maximum again at down stream sites. According to Stevenson *et al.* (1998) and Mukhopadhyay *et al.* (2007) the density of *B. calyciflorus* increases with increasing concentration of waste water. Sampaio *et al.* (2002) are of opinion that *B. calyciflorus* is a good indicator of eutrophication. The higher densities at down stream sites may indicate that *B. calyciflorus* is a pollution tolerant genera. The other species of *Brachionus* found at down stream sites fed with waste water are *B. angularis, B. bidentata, B. budapestenensis, B. caudatus, B. diversicornis, B. plicatilis, B. quadricornis and B. quadridentatus.*

The species *B. patulus* was found abundant at S2 indicating its preference to the clear water as this site is clean comparative to the other sites and does not have considerable impact of anthropogenic activities. According to Onwudinjo and Egbore (1994) the species tolerate low salinity which could be applicable during the present study as the site S2 having clean and less saline water showed maximum density. *B. paracollurella* also showed its presence at upstream indicating it as pollution sensitive ad its preference to clear water.

Keratella was next dominant genus. It has contributed 7% of the total rotifer density. It was represented by five different species namely *K. choclearis, K. grilenta, K. procurva, K. quadranta and K. tropica.* Among the various species *K. tropica* was dominant. More diversity and richness was seen in summer season especially at down stream sites. However, the density at S5 was very less, which was equally polluted to that of S4 and S6 which had very high densities of *K. tropica*. The other species of *Keratella* encountered rarely.
The species like *Mon*

CONCLUSION:

From the present study, it is concluded that the density and diversity of rotifers increases with pollution. The genera like *Bruchionus, Keratella, Filinia, Monostyla and Asplanchna* are pollution tolerant as their densities were observed to be very high at the downstream sites which had more anthropogenic impact. The *Lecane* spp. and *Brachionus patulas* are pollution sensitive genera and were confined to upstream sites where the water was clear.

ACKNOWLEDGEMENTS:

The authors are thankful to Vidya Prasarak Mandal and Janardan Bhagat Shikshan Prasarak Sanstha for providing us necessary support to carry out the research. We would also like to thank Department of Zoology, B.N. Bandodkar College, Thane for providing timely help.

Table 1: Different species of Rotifers encountered during the study

Sr. No	Species of Rotifers	S1	S2	S3	S4	S5	S6	S7	Total
1	*Anuraeopsis spp.*	0	550	1085	3517	2530	3977	130	11789
2	*Asplanchana spp.*	420	1730	1529	8807	18615	29260	2420	62781
3	*Brachionus spp.*	0	0	0	120	460	0	0	580
4	*B. angularis*	375	2125	2900	7210	2454	15175	2800	33039
5	*B. bidentata*	0	255	250	262	6710	310	3531	11318
7	*B. budapestenensis*	0	0	800	0	750	480	2140	4170
8	*B. Calyciflorus*	2600	12985	4513	153999	304418	1501550	88929	2068994
9	*B. Caudatus*	1452	1180	0	155141	530017	34625	6530	728945
10	*B. dimidiatus*	0	0	0	525	0	0	0	525
11	*B. diversicornis*	350	140	0	9443	700	15980	200	26813
12	*B. falcatus*	200	0	401	5143	280	1540	0	7564
13	*B. forficula*	0	0	100	5464	19780	620	316	26280
14	*B. havanensis*	0	0	0	2131	0	0	0	2131
15	*B. paracollurella*	775	115	0	0	0	0	0	890
16	*B. patulus*	0	53695	730	7338	140	0	103	62006
17	*B. plicatilis*	710	1275	930	8432	16681	5180	11465	44673
18	*B. quadricornis*	100	0	0	11052	1520	5025	538	18235
19	*B. quadridentatus*	100	0	0	262	410	1755	4380	6907
20	*B. rubens*	100	75	845	722	5786	2900	0	10428
21	*B. vulgatus*	0	0	0	0	1080	0	0	1080
22	*Collurella obtusa*	0	140	0	0	140	0	0	280
23	*Cyrtonia tuba*	0	0	0	460	0	0	0	460
24	*Diplois daviesiae*	0	0	0	0	180	0	0	180
25	*Durella sulcata*	0	0	0	108	0	375	0	483
26	*Elosa worralli*	0	0	0	0	3150	0	0	3150
27	*Euchlainis spp.*	0	0	0	2000	910	1095	0	4005
28	*F. longiseta*	0	0	1850	106637	88230	36347	2185	235249
29	*Gastropus spp.*	0	0	0	0	0	750	0	750
30	*K. chochlearis*	0	300	0	0	0	720	1780	2800
31	*K. grilenta*	0	0	0	0	0	800		800
32	*K. tropica*	0	1145	2858	214418	1870	16950	2565	239806
33	*K. procurva*	0	0	0	131	0	0	0	131
34	*K. quadrata*	0	0	500	0	0	0	0	500
35	*Keratella spp.*	0	0	140	0	0	2460	130	2730
36	*L. ionopinata*	0	440	280	0	540	2200	400	3860
37	*Lecane luna*	0	610	0	0	0	0	2875	3485
38	*Lecane polonensis*	0	690	317	727	900	0	530	3164
39	*Lepadella bicornis*	0	0	0	108	0	0	0	108
40	*Lepadella cresta*	0	0	0	131	0	0	0	131
41	*Lepadella ovalis*	0	0	0	0	0	620	0	620
42	*Lepadella patella*	0	0	345	0	0	320	0	665
43	*Lepadella spp.*	0	0	635	120	420	0	0	1175
44	*Microcodides robustus*	0	0	0	0	140	0	0	140

45	*M.bula*	200	543	811	4313	9990	2633	0	18490
46	*M. closterocerca*	0	0	0	1858	0	310	0	2168
47	*M.decipens*	0	510	805	112	180		0	1607
48	*Monostyla spp.*	0	220	80	8345	0	931	0	9576
49	*Megalotrocha spp.*	0	0	0	108	0	0	0	108
50	*Notholca spp.*	0	200	175	8000	650	0	0	9025
51	*Notommata spp.*	0	900	1237	2240	260	0	0	4637
52	*Philodina spp.*	0	140	115	0	500	100	0	855
53	*Ploima spp.*	0	0	0	0	280	0	0	280
54	*Pompholyx complanata*	0	0	0	108	0	0	0	108
55	*Polyathra spp.*	0	0	250	0	0	375	0	625
56	*Rattulus spp.*	0	450	100	456	0	995	0	2001
57	*Testudinella spp.*	0	9930	950	2348	740	0	2970	16938
58	*Trichocerca spp.*	0	0	0	0	0	80	0	80
Total		7382	90343	25531	732296	1021411	1686458	136917	3700338

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