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ROTIFER DIVERSITY IN LAKE MASUNDA,THANE (MAHARASHTRA)

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Abstract :

Rotifer diversity from Masunda lake, Thane (Maharashtra) was studied from April 1999 to June 2000. Rotifers constituted 34.67% of total zooplankton and their density ranged from 300 to 2000 ind/100l. The peak density was recorded in winter (November) while minima was observed in summer (May).

Dominance of family Brachionidae was observed all over the Study period. *Brachionus* was the dominant genera qualitatively as well as quantitatively. Dominance of this tolerant genera indicates onset of eutrophication in the ecosystern.

Introduction :

Rotifera comprises an integrai pail in the aquatic food chain. Their role as link between the nanoplankton and carnivorous zooplankton is well established (Ruttner-Kolisko, 1974). They play a key role in cycling of organic material (Mishra and Saksena, 1998). Rotifers exhibit remarkable ability to colonize diversified freshwater biotopes and these are apparently the most sensitive indicators of water properties (Ruttner-Kolisko, 1971). Due to their short developmental period and fast reproductive rate characterized by parthenogenetic production (Herzig, 1983), rotifers can populate vacant niches with extreme rapidity and convert primary production into a form usable for secondary consumers, producing up to 50% of the total plankton biomass (Nogrady *el. al.*, 1993). They are very common in Indian waters and their occurrence in eutrophic water bodies is also well noted.

Rotifer population from different regions has been extensively studied by many scientists (George, 1961; Arora, 1966a; Michael, 1968; Sharma, 1992, Dhanapathi, 2000). However references on rotifer diversity from fresh waters of Maharashtra, especially in Thane-Mumbai region are scarce. Hence the study on rotifer diversity was undertaken.

Materials and Methods :

The zooplankton samples were collected monthly from April 1999 to June 2000 by towing 41 µm mesh net through a boat and the samples were preserved in 4 % formalin for identification and counting. The rotifers were identified using Battish (1992) and Dhanapathi (2000).

Results and Discussion :

During the present study, total rotifer density in Masunda varied from 300 to 2000 ind/ 100 L. with minima in May 1999 and maxima during November 1999.This was comparable with total rotifer density ranging from 187.65 to 2562.8 ind / 100 L recorded by Nene (1985) in the same lake. Nene (1985) had reported rotifers as the most dominant zooplankton component of Masunda. However, in the present study, rotifers were observed to be subdominant to Copepods.

Average contribution of rotifers in total zooplankton in Masunda was (34.67%), Relatively high population densities were noticed during late monsoon and early winter (September-November 1999) as supported by Sharma (1992). However summer maxima as reported by Khan *el. al.* (1986) and Sharma (1992) could not be observed. Mukhopadyay *et. al.* (1981) and Jayadevi (1994) have reported higher rotifer densities in winter, which support rotifer peak observed in November 1999 in present study. Notable difference in quantitative abundance was seen in total rotifer population but only a single distinct peak was recorded.

Rotifera is quite a diverse group of organisms and large generic variety is observed in various lentic

Table 2. Monthly variations in rotifer abundance (ind/L) in lake Masunda, Thane, Maharashtra.

1999	Feb	Mar	April	May	June	Jul	Aug	Sept	Oct	Nov
B. calyciflorus	0	0	62	0	90	0	1216	0	806	45o
B. caudatus	0	0	108	0	90	0	152	93	124	150
B. diversicornis	0	0	98	121	0	34	304	651	248	150
B. falcatus	0	0	0	312	1350	0	0	0	434	150
B. forficula	0	0	20	0	0	0	0	0	0	200
B. angularis	0	0	0	0	0	0	0	0	0	100
B. plicatalis	0	0	0	0	0	0 1	0	0	0	010
keratella	0	0	30	0	90	34	76	186	62	8co
Testidunella	0	0	0	0	0	67	76	0	0	0
Hoarella	0	0	0	0	0	0	0	0	0	0
Anuropsis	0	0	15	0	0	0	0	0	62	0
Aspliunchana	0	0	0	0	0	201	0	0	0	0
Rotatoria	0	0	0	0	0	0		0	0	0
Epiphanes	0	0	0	o	0	0	0	0	0	0
Brachionus total	0	0	288	433	1530	34	1672	744	1612	1200
Rotifer total	0	0	333	433	1620	336	1824	930	1736	2000

1999 - 2000	Dec	Jan	Feb	Mar	Apr	May	Jun	Total	Avg	SD	%
B. calyciflotis	84	420	42	60	72	33	0	3335	222.3	358.2	14.04
B. caudatus	210	126	84	96	108	198	216	1755	117	64.27	8.069
B. diversicornis	42	252	210	240	288	66	72	2776	185.1	162.9	4.246
B. falcatus	0	42	0	96	144	0	0	2528	168.5	352.2	6.716
B. forficula	0	28	84	0	0	0	72	404	26.93	55.13	6.116
B. angularis	0	0	0	0	0	0	72	172	11.47	30.72	0.977
B. plicatalis	0	56	84	40	0	33	0	213	14.2	26.53	0.416
kerate#a	126	476	252	126	108	66	0	2432	162.1	213.5	0.515
Testidunella	0	0	42	0	0	0	0	185	12.33	26.39	5.884
Hoarella	0	0	0	0	0	33	0	33	2.2	8.521	0.448
Anuropsis	0	0	42	15	0	33	0	167	11.13	19.43	0.08
Asplanchana	0	14	42	0	0	0	0	257	17.13	52.07	0.404
Rotatoria	0	0	42	0	0	0	0	42	2.8	10.84	0.622
Epiphanes	0	0	0	0	0	33	0	33	2.2	6.521	0.102
Brachionus total	336	924	504	532	612	330	432	11183	745.5	1050	0.08
Rotifer total	462	1414	924	673	720	495	432	14332	955.5	1389	34.67

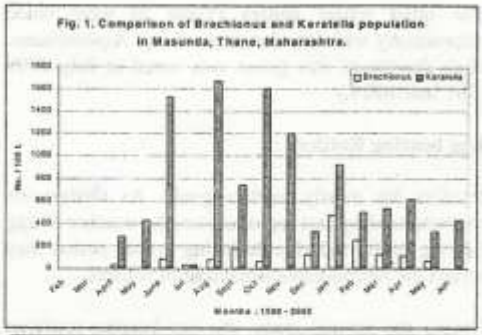
environments all over India. However *Brachionus* and *Keratella* are the most commonly recorded rotifer genera in Indian lakes.

During the present study, occasional presence of *Epiphanes, Testidunella, Hoarella, Anuropsis, Asplanchana* and *Rotaria* was observed (Table 1). However, quantitatively *Brachionus* was the main and significantly abundant genera which was followed by *Keratella in* terms of abundance and periodicity (Fig. 1). This was in accordance with observations of George (1966), Jayadevi (1994) and Hiware and Jadhav (1998). *Keratella* followed this in terms of abundance and regular periodicity. Predominance of one or two genera is characteristic of rotifer population (George, 1961).

Brachionus :

Brachionous is cosmopolitan in distribution and by far the best-known genus from India. It shows large species variation and embraces 19 species with more than 14 subspecies in this country (Battish, 1992). During the present study, *Brachionus* was represented by 7 species as *B. calyciflorus, B. caudatus, B. divescicornis, B. falcatus, B. forficula, B.angularis* and *B. plicatalis,* thus making it significant genera.. Pejaler (1977) and Fernando (1980) mentioned *Brachionus* as important genera in tropical rotifer community.

Among the 7 species of this genera, *Brachionus calyciflorus* was the most dominant, which is



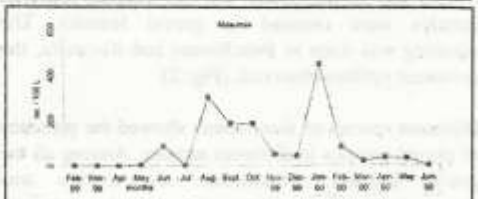


Fig 2: Monthly variation of gravid rotifer population in Masunda

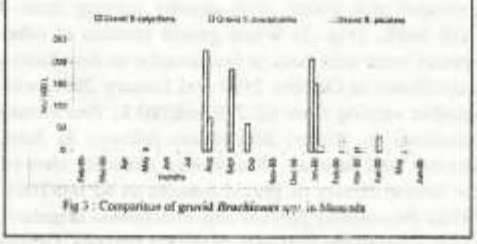


Fig 3 : Comparison of gravid *Brachionus* spp. in Masunda

Table 1: Rotifers of Masunda lake.

Order	Family	Genus and species
Ploimida	Brachionidae	*Brachionus calyciflorus*
		B. diversicornis
		B. caudatus
		B. falcatuts
		B. forficula
		B. angularis
		B. plicatalis
	Brachionidae	*Keratella spp.*
	Brachionidae	*Anuropsis spp.*
	Testudinellidae	*Testudinella spp.*
	Trochosphaeridae	*Hoarella spp.*
	Asplanchanidae	*Asplancha spp.*
	Epiphanidae	*Apiphanes spp.*
Bdelloida	Philodinidae	*Rotarja spp.*

supported by the observations of Patil (1978), Isairasu. (1997) and Malathi (1999). It was also reported as dominant species from lake Masunda in earlier studies (Nene, 1985).

During this study, in Masunda, the density peak of *Brachionus catyciflorus* was recorded in August 1999 (1216 ind/100 L). According to Nene (1985), the spp. flourished well in the month of December and June with density of 1300.51 and 1115.13 ind/ 100 L respectively. Exact seasonal pattern could not be observed in abundance of *Brachionus. calyciflous* as commented by Reid and Wood (1976).

Brachionus diversicornis was 2nd in dominance, next to *Brachionus calycifloris*.. Though Green (1960) regarded it as mostly a summer species, Battish (1992) has reported its occurrence in monsoon (July), in northern Indian States. During the present study, this species was recorded in almost all the months of the study period and peak density was attained in the month of September 1999 in Masunda. Earlier Nene (1985) recorded highest abundance of the species In November from the same lake.

Brachionus falcatus occupies 3 rd position, in order of abundance in Masunda lake. The species is considered as cosmopolitan in distribution. Dhanapathi (2000) designated it as warm water species and observed it to be less variable when compared to *Brachionus calyciflorus* and *Brachionus quadridentatus.* During the present study, density of *Brachionus falcatus* varied between 0 to 1350 ind/100 L in Masunda with peak observed in June 1999. Its presence was of discontinuous nature. Malathi (1999) in Hussain sagar lake, Hyderabad, recorded this species occasionally, with quite low density (20 ind/ 100 L) only in September.

Brachionus caudatus enjoyed 4th position, with average density of 117 ind/100 L. It exhibited two peaks, in December 1999 and June 2000 whereas the density was zero in May 1999 and July 1999. Nene (1985) observed its highest abundance in January 1983 in Masunda lake. The peak value reported by Nene (1985)- 13016.4 Ind/100 L, was more than 10 times higher as compared to peak density of this species recorded in present study. Pathak and Mudgal (2002) recorded this spp. as one of the dominant rotifer member in Virla reservoir (M. P.).

Brachionus forficula showed lower densities in Masunda. Durve (1992) and Salaskar (1996) recorded the species, as most dominant rotifer species in Udaipur lakes and Powai lake respectively. Nene (1985) however did not report its presence in the study of Masunda lake. During the present study April 1999, January, February and June 2000 were characterized by low density of this species, whereas

November 1999 exhibited peak values- 200 ind/100 I in Masunda.

Brachionus angularis is one of the important rotifer species with respect to indication of eutrophic state. In Masunda it was recorded only twice with maximum density as 100 ind/100 L. Datta *et al.* (1987) noted this species in Calcutta pond and its abundance was exceptionally high, making it dominant throughout the study period. While Mudgal *et. al.* (1990) also observed it forming sporadic blooms, Patil (1978) recorded its important contribution in winter rotifer pulse. Subbamma (1993) observed dominance of *Brachionus angularis* in temple pond study.

Brachionus plicatalis was present only for last 4 months of study period, with highest density in February 2000- 84 ind/100 L. Thus this species was of low density status as among other *Brachionus* species of lake Masunda. Thus genus *Brachionus* showed dominance of different species in different months, however *Brachionus calyciflorls* dominated in most of the months based on average density. Similarly the dominance of a particular spp. is not in the same every year, as dominant species in April, May and June 1999 are different from April, May and June 2000.

Keratella spp. :

Keralella was the 2"d dominant rotifer genera. This genus is also considered as cosmopolitan in distribution and according to Battish (1992) and it is probably the most common rotifer genera, as it is reported in different ecosystems all over India.

During the present study, highest density of this genus in Masunda was noted in November, in fact it was the largest contributor of total rotifer peak of this month. Jayadevi (1994) and Malathi (1999) recorded *Keratella tropica* as common eurytopic perennial form in lakes of Hyderabad. In Dhom reservoir, Maharashtra (Trivedi, 1993) *Keralella* was recorded as most dominant rotifer genera. However, it was recorded only occasionally in Salim Ali lake, Aurangabad (Hiware and Jadhav, 1998).

Anuropsis, the important indicator species (Gannon and Stemberger, 1978) was represented in 5 months in Masunda with low densities.

Other rotifers :

The other rotifer genera (Table 2) were noted occasionally with low densities, except *Asplanchana.* High density of this genus was noted in July 1999 (201 Ind/ 100 L).

Egg bearing Rotifers :

Rotifers are mostly parthenogenic. As rotifers are characterized by fast reproduction, the number of egg bearing rotifer individuals during certain period may reflect the reproductive behaviour of rotifers.

During the present study, the egg bearing rotiferan females were counted as gravid females. The counting was done in *Brachionus* and *Keratella,* the dominant rotifers observed. (Fig. 2)

Different species of *Brachionus* showed the presence of gravid females in different months. Among all the gravid females, *Brachionus diversicornis* was observed more frequently in all seasons *i. e.* summer, monsoon and winter, with density varying from 4 -186 Ind/L. (Fig. 3) While gravid females of other species were seen only in few months as *Brachionus calyciflorus* in October 1999 and January 2000, with number varying from 62-228 ind/100 L. *Brachionits caudatus* in winter, *Brachionus falcatus* in June, October and January, *Brachionus plicatilis* showed the lowest density of gravid females as 42 ind/1001. While *Brachionus fuficula* and *Brachionus angularis* never showed the presence of gravid females. Gravid females of *Keratella spp.* in Masunda were specific to winter. Nene (1985) noted, total rotifer maxima in the same month as well as total berried rotifer maxima (April), which was not observed during the present study.

Brachionus calycifloris and *Brachianus diversicornis* the dominant species in the lake, showed more number of their gravid individuals. Winter 2000 was characterized by presence of gravid females of 6 rotiferan types, *Brachiontis calyciflorus, B. caudatus, B. diversicornis, B. falcatus, B. plicatalis* and *Keratella spp.* Similarly the peak density of rotifers was also noted in winter. Hence winter seems to be favorable for reproduction of rotifers in Masunda.

The present study also suggests that genus *Brachionus* is a continuous breeder and hence one or the other species of *Brachionus* breeds in every month resulting in the dominance of this genera.

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