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Research article

COMPOSITION AND DYNAMICS OF ROTIFERA FAUNA FROM UPPER BASIN (BHOJ WETLAND) AS PARAMETER OF WATER QUALITY

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ABSTRACT: Rotifers are usually considered to be useful indicators of water quality. Due to high population turnover rates, rotifers are particularly sensitive to changes in water quality. Their community structure not only allows estimates of the level of pollution, but also can indicate the trend of general conditions over time. This study was conducted by investigating rotifer species composition and dynamics, as indicators of lake trophic status. The qualitative and quantitative analysis of the rotifers of Lake, are based on materials collected monthly between February 2008- January 2009. Thirty-five species were recorded indicating a fairly rich quality. When the annual abundance of species was taken into consideration Brachionus and Keratella species were determined as dominant species. Dominance of these species indicates onset of eutrophication in the ecosystem. These species were observed in most months of the year and are well observed in their annual abundance.
Keywords: Rotifer dynamics, density, trophic status

INTRODUCTION

Zooplankton constitute the food source of organisms at higher trophic levels. Rotifers are microscopic fauna characteristically prevalent in fresh waters. Due to their short development period and fast reproductive rate characterized by parthenogenetic production (Herzig, 1983), rotifers can populate vacant niches with extreme rapidly and convert primary production into a form usable for secondary consumers, producing up to 50% of the total plankton biomass (Nogrady *et al.,* 1993; Mishra and Saksena, 1998).

A few rotifers are cosmopolitan, while majority of these animals are highly adapted to a wide range of freshwater conditions (Hutchinson, 1967, Brummett, 2000). As water quality is an index of water pollution, assessing water quality parameters is a baseline for monitoring freshwater environments (Pontin, 1978; Sladecek, 1983; Berzins and Pejler, 1989; Matveeva, 1991; Dugan *et al.,* 2001).

The changes in species diversity and population abundances result from either direct or indirect environmental stressors, hence changes in biota may be used to elucidate changes in the environment (Ruttner-Kolisko, 1974). Thus, the present study was done to assess the impact of different environmental and lake degrading hazards affecting the respective rotifer population.

MATERIALS AND METHODS

Upper lake, the backbone of Bhopal has profound economic and irrigational importance and hence this water body was selected for the present research work. Earlier studies by Bajpai *et al.,* (1993), Wanganeo *et al.,* (1997), Wanganeo (1998), Pani and Mishra (2000) and Vyas *et al.,* (2006) established the importance of upper lake in terms of socioeconomic and natural integration of different organisms and the impact and assessment of different quality deteriorating activities on the health of respective water treasure.

The study area selected was Upper Lake located in the Bhopal city, the state capital of Madhya Pradesh, India (latitude 23 0 12'-23 0 16'N and longitude 77 0 18'–77 0 23'E). The Upper Lake has an area of 31 km^2 and a catchment area of 361 km^2. Rotifer samples were collected monthly with plankton net and water bottle. Plankton samples were used for identification of the rotifer species and the samples were preserved in 5% formaline solution. The various limnological methods for physical measurements and chemical analysis of water have been described as per methods given by APHA (1995). Identification of the plankton samples was performed according to Edmondson (1959) and Adoni (1985) method.

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RESULTS

During the present investigation of water sample of lake was done for a period of one year from February 2008 to January 2009 in order to study the physicochemical parameters and density and diversity of rotifers (Table 1). Shows the seasonal variations of various physico-chemical parameters of Upper Lake during the study period. Parameters like water temperature (24.60 °C), pH (8.31 units), total dissolved solids (205.4 mg/l), conductivity (237.75 µS), dissolved oxygen (7.18 mg/l), total alkalinity (96.25 mg/l), total hardness (111.06 mg/l), calcium hardness (79.88 mg/l), chloride (45.71 mg/l), phosphate (0.288mg/l), and nitrate (0.452 mg/l).

In the prsent study total 35 species of rotifera were recorded belonging to 25 different genera. The most quantitatively genera Brachionus was the main and significantly abundant genera, represented by 8 species, which was followed by Keratella interms of abundance represented by 3 species, while by 2 species of trichocerca. The least dominant genera which were represented by a single species are *Ascomorpha, Asplanchna, Asplanchnopsis, Cephalodella, Colurella, Conochilus, Filinia, Gastropus, Harringia, Hexarthra, Lecane, Lepadella, Monostyla, Mytilina, Philodina, Platyias, Ploesoma, Polyarthra, Rotaria, Scardium and Synchaeta* (Table 3).

During the study period total population of rotifera was estimated as 956.62 indi/l. Monthly population density of rotifera showed its peak during January as 216.66 indi/l, while least in October as 18.88 ind/l (Table 2). Rotifera was represented by all 35 species during summer (23 species), monsoon (18 species) and winter (26 species) seasons.

Table 1. Seasonal variation of physico-chemical parameters during 2008-2009

Parameters	Summer	Monsoon	Winter
Water Temperature (°C)	23.97	24.60	19.33
pH units	8.37	7.77	8.02
Total Dissolved Solids mg/l	169.17	179.72	205.4
Electrical Conductivity (mg/l)	255.3	267.2	319.22
Dissolved Oxygen (mg/l)	7.17	6.825	5.59
Total Alkalinity (mg/l)	81.46	79.13	96.25
Total Hardness (mg/l)	91.16	87.55	111.06
Calcium Hardness (mg/l)	71.2	64.20	79.88
Chloride (mg/l)	31.37	32.53	45.70
Phosphate (mg/l)	0.16	0.288	0.252
Nitrate (mg/l)	0.35	0.452	0.302

Table 2. Monthly population density of Rotifers in Upper basin (Bhoj Wetland)

Months	**Population mean density (Ind/l)**
February 2008	43.33±50.99
March	45.55±30.45
April	90±120.51
May	73.33±88.74
June	72.22±83.78
July	130±124.49
August	21.11±20.88
September	26.66±14.14
October	18.88±13.64
November	77.77±102.44
December	141.11±209.13
January 2009	216.66±270
Total	956.62

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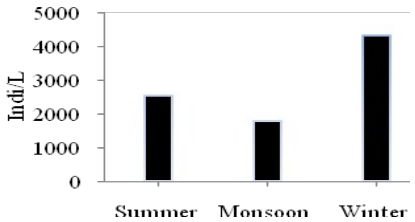

Fig. 1.Seasonal variation of Rotifera

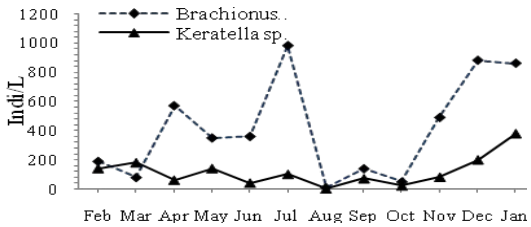

Fig. 2. Comparison of *Brachionus* and *Keratella* Population

Table 3. Seasonal biodiversity of Rotifera in Upper basin of Bhoj Wetland

Rotifera	Summer	Monsoon	Winter
Asplanchna sp.	--	--	++
Asplanchnopsis sp.	--	--	++
Ascomorpha sp.			++
Brachionus Angularis	++	--	++
Brachionus angulosum	++	--	++
Brachionus calciflorus	++	++	++
Brachionus calyciflorus	++	++	++
Brachionus caudatus	++	++	++
Brachionus Falcatus	++	++	++
Brachionus quadridentata	++	--	--
Brachionus Urceus	++	--	--
Cephalodella sp.	--	--	++
Colurella sp.	--	++	++
Conochilus sp.	++	++	--
Filinia sp.	++	++	++
Gastropus sp.	++	--	++
Harringia sp.	++	--	++
Hexarthra sp.	++	--	++
Keratella sp.	++	++	--
Keratella cochlearis	++	++	++
Keratella tropica	++	++	++
Lecane sp.	++	++	++
Lepodella sp.	++	--	++
Monostyla sp.	++	--	++
Mytilina sp.	++	++	--
Philodina sp.	--	++	--
Platyias sp.	--	--	++
Ploesoma sp.	--	++	--
Polyarthra sp.	++	++	++
Rotaria sp.	--	--	++
Scaridium sp.	--	++	++
Synchaeta sp.	--	--	++
Trichocerca sp.	++	++	++
Trichocerca longiseta	++	--	--
Trichotria sp.	--	++	--

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	Feb.	Mar.	Apr.	May.	Jun.	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Mean	SD
Site 1	70	40	320	200	80	290	20	40	40	170	70	160	**125**	102.20
Site 2	10	110	10	10	20	10	10	30	20	0	40	20	**24.16**	29.06
Site 3	30	60	20	10	70	160	0	30	40	20	20	20	**40**	42.64
Site 4	40	30	0	140	70	260	30	30	20	80	60	300	**88.33**	96.84
Site 5	20	30	80	40	80	160	20	20	10	310	300	100	**97.5**	106.26
Site 6	20	30	80	0	0	270	20	40	10	70	650	30	**101.66**	187.56
Site 7	10	0	10	0	10	10	0	0	0	0	30	0	**5.83**	9.00
Site 8	170	50	270	220	280	0	70	40	20	40	60	720	**161.66**	201.80
Site 9	20	60	20	40	40	10	20	10	10	10	40	600	**73.33**	166.64
Mean	**43.33**	**45.55**	**90**	**73.33**	**72.22**	**130**	**21.11**	**26.66**	**18.88**	**77.77**	**141.11**	**216.66**		
SD	50.99	30.45	120.52	88.74	83.78	124.49	20.88	14.14	13.64	102.44	209.13	270		**8610**

DISCUSSION

During the present study, total rotifer density in Upper lake varied from 170 ind./l to 1950 ind/l in the month of October 2008 and January 2009. Nene (1985) were reported similar findings of total rotifer density results ranging 187.65 to 2562.8 ind./l.

However, quantitatively *Brachionus* was the main and significantly abundant genera which were followed by *Keratella* in terms of Abundance and periodicity (Fig. 2). This was in accordance with observations of George (1961) and Hiware and Jadhav (1998). Predominance of one or two genera is characteristic of rotifer population (George, 1961). Sharma (1992) have also reported the same. Mukhopadyay *et al*., (1981) and Jayadevi (1994) have reported higher rotifer densities in winter, which support rotifer peak observed in the 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 environments all over India.

However *Brachionus* and *Keratella* are the most commonly recorded rotifer genera in indian lakes. During the present study, *Brachionus* was represented by 7 species as *B. angularis, B. angulosum, B. calciflorus, B. calyciflorus, B. caudatus, B.falcatus, B. quadridentata, B. urceus,* thus making it significant genera and are in full support of Pejaler (1977) and Fernando (1980) observations.

Keratella was the second dominant genera. *Keratella* genus is also considered as cosmopolitan in distribution and according to Battish (1992) 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 Upper lake was noted in March, infact it was the largest contributor of total rotifer peak of this month. recorded *Keratella tropica* as common eurytopic perennial form in lake sof Hyderabad. Similar conclusions by Jayadevi (1994) and Malathi (1999) and Trivedi, (1993) are in agreement with our present investigations.

During the investigated period 35 species were identified. The lake can also be termed to be eutrophic regarding the rotifera species identified. Upper lake is nutrient rich and contain diversified rotifer fauna. Rotifers are most abundant during summer season. In the study *Brachionus and Keratella species were* found the most important species in terms of frequency of occurrence.

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