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# SEASONAL FLUCTUATIONS IN THE ROTIFER COMMUNITY OF SOMESHWAR TEMPLE TANK OF PANHALGARH HILLFORT, KOLHAPUR DISTRICT, MAHARASHTRA

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**Though studies on zooplankton in general and rotifers in particular are not rare, studies on seasonal fluctuations in rotifer community existing in an isolated freshwater body at high altitude. Hence, a study of rotifers and their seasonal variations in a freshwater body at Panhalgarh hillfort (958 MSL), Kolhapur, Maharashtra was investigated. The study reveals existence of 12 species of rotifers with highest density during December, which declined to a minimum during the month of October. Making use of SPSS-10 software the correlation between fluctuations of rotifer community and that of physico-chemical parameters of freshwater body were drawn. Biomass reveals regular pattern and shows very low profile throughout the study period.**

Key words: ***Rotifer, freshwater, zooplankton, seasonal variation, diversity, biomass.***

## INTRODUCTION

The study of zooplankton communities is important because it provides ways of predicting and increasing the productivity of lakes (Fernando, 1980; 1984). The rotifers being a prime constituent of the zooplankton community form a major trophic link in food chain. They play a role in cycling organic matter and are therefore taken as pollution indicators (Saksena, 1987; Saksena and Mishra, 1990).

Panhalgarh hillfort is situated between 16°50' N and 75°10' E and about 22 Kms west of Kolhapur. It is at 950 to 1000 MSL and receives an average annual rainfall of about 100 inches. Someshwar temple tank is one of the perennial water bodies found in the hillfort. The water-spread area during post-monsoon is 2.5 hectare and the average depth is 3.5 M. The tank is enclosed on three sides by concrete walls and with a huge rock on fourth side. The surrounding land is non-agricultural in nature. This tank is used for bathing, washing clothes and cattle, but not for fishing, though quite a number of fish are present in the tank. An attempt has been made to describe the rotifer fauna of Someshwar temple tank in relation to seasonal fluctuations. Studies on seasonal variations in planktonic fauna have been reported by Kadar *et.al.* (1978), Ayyappan and Gupta (1980), Kohli, *et.al.* (1982), Yousuf and Qadri (1985), Pushpendra and Madhyastha (1994), Pulle and Khan (2003) *etc.*

## MATERIALS AND METHODS

Sampling was carried out between February 2000 to December 2001 at monthly intervals. Three stations were chosen and samples taken using tow nets. The water samples for rotifers were collected by filtering 40 L of water through plankton net of 45-µm-mesh size. The samples were immediately preserved

in 4 % formalin. The samples were tagged for biomass, taxonomical and numerical studies. The individual species of zooplankton were sorted out; their whole mounts were stained with borax carmine or Lugol's iodine, according to the requirement. Then mounted in glycerol jelly and oven dried. Identifications were made with the help of standard literature (Battish, 1992; Dhanapathi and Ramasarma, 2000; Dumont & Tundisi, 1984; Edmondson, 1992; Pennak, 1953).

Rotifers were counted for quantitative analyses using Sedgwick-Rafter cells under an inverted microscope and recorded as individuals per liter. The biomass of zooplankton was determined by displacement method (APHA, 1989) and results are expressed in terms of ml of biomass per 100 ml of water filtered.

The correlation of physico-chemical parameters with zooplankton abundance, in general as well as individual species, in particular, was carried out by subjecting data to Pearson's bivariate correlation using SPSS-10 software. Average values of physico-chemical parameters was considered and only significant zooplankton groups have been mentioned in the results.

## RESULTS AND DISCUSSION

This area was studied for the first time for its zooplankton abundance. The density and diversity of zooplankton in general and rotifers in particular, was lowest as the water body was closed from all sides and there was no input of nutrients from surrounding land washoff, except during monsoon. Planktivorous fish dominates the tank and there is no much fishing activity. As a result of size selective and species selective predation by fish, zooplankton density was low throughout the year.

Twelve rotifera species were identified from Someshwar temple tank namely, *Brachionus bidentata, B. calyciflorus, B. caudatus f. vulgatus, B. diversicornis, B. patulus, B. plicatilis, B. quadricornis, Filinia longiseta, F. opoloensis, Keratella tropica, Monostylla bulla, Polyarthra* species.

The seasonal fluctuations in the total counts of rotifers are depicted in Fig. 1. It was observed that annually rotifer population showed peaks in August and December, with a smaller peak in February. The cyclic pattern showed a fall in counts during May-June and October. In the year 2000, rotifers were found in the range of 72 (October) to 630 (August) individuals/ L. The highest count being in August. During 2001, rotifers were found in the range of 169 (April) to 743 (December) individuals/ L. Except in May '01, rotifera were present throughout the year. Four peaks were observed for during biomass estimation of Someshwar temple tank in March, August, September and December '00. The biomass was in the range of 0.05 to 0.1 ml/ 100 ml with the dominant zooplankton being rotifers. Biomass concentration in 2001 was high during April and August - September. Same pattern was observed during previous year, which include rise in biomass during December too.

The fall in count during summer may be due to rise in temperature. During monsoons and post monsoon, there is availability of nutrients and abundant food in the form of bacteria, nanoplankton and detritus. Low counts at the beginning of monsoon (June - July) may be due to dilution and / or washout. While in winter, the temperature is favourable and food is available. These factors might be contributing to the high rotifer population during this season (Baker, 1979). Pulle and Khan (2003) reported maximum

rotifer numbers in summer and minimum in winter. Nasar (1977) reported periodicity of rotifers in winter while Pandey *et.al.* (1994) have observed peak of rotifers in rainy season.

To find the influence exerted by abiotic factors on population of rotifers, data was analysed statistically. As seen in Table 1, rotifera in general, *Brachionus bidentata, Filinia longiseta* and *Keratella tropica* in particular, showed strong correlation with temperature, whilst a weak correlation was observed with *Brachionus plicatilis*. Weak correlation was also seen between pH and rotifera, *Brachionus diversicornis* and *K. tropica* while a strong correlation was exhibited by rotifera in general, for magnesium. These results indicate that abiotic factors i.e. temperature, pH and magnesium content, influenced the rotifer abundance. According to Chandrasekhar (1996), the diversity and density of rotifers during summer and monsoon was controlled by factors like water temperature, turbidity, transperancy and dissolved oxygen. Seasonal fluctuation in the species of rotifers reveals dominance and codominance of *Brachionus bidentata, B. caudatus B. diversicornis, B. plicatilis, B. quadricornis and Keratella tropica.* All these species are new records for western Maharashtra. It was observed that rotifers showed higher densities compared to other groups throughout the study period. This is an indication of the tank being in the process of eutrophication (Saksena and Mishra, 1990). Organisms of this group are considered opportunists reaching high or low densities according to environmental conditions (Allan, 1976). This fact is demonstrated by seasonal fluctuations of this group.

Table 1– Pearson's bivariate correlation for physico-chemical factors and rotifer abundance in Someshwar temple tank during 2000-2001

| | Temp. (°C) | pH | Alkalin-ity | Hardn-ess | $Ca^{+2}$ | $Cl^{-1}$ | $Fe^{+3}$ | $Mg^{+2}$ | $PO_4$ | $SO_4$ |
|---|---|---|---|---|---|---|---|---|---|---|
| Average values | 25.8 | 7.14 | 175.3 | 137.2 | 79.0 | 69.6 | 0.34 | 59.6 | 0.368 | 142 |
| Rotifera | -0.658** | -0.439* | -0.584** | -0.297 | -0.111 | -0.241 | -0.208 | -0.532** | -0.135 | -0.237 |
| *Brachionus bidentata* | -0.544** | -0.314 | -0.415 | -0.241 | -0.145 | -0.264 | -0.380 | -0.410 | -0.056 | -0.060 |
| *B. diversicornis* | -0.248 | -0.422* | -0.321 | -0.345 | -0.230 | -0.124 | -0.100 | -0.260 | -0.069 | -0.270 |
| *B. patulus* | -0.386 | -0.415 | -0.456* | -0.098 | -0.045 | 0.110 | -0.213 | -0.125 | -0.120 | -0.143 |
| *B. plicatilis* | -0.421* | -0.388 | -0.561** | 0.169 | 0.045 | -0.234 | -0.096 | -0.510* | -0.214 | -0.120 |
| *B. quadricornis* | -0.350 | -0.248 | -0.124 | -0.389 | -0.213 | -0.354 | -0.124 | -0.422* | -0.165 | -0.300 |
| *Filinia longiseta* | -0.569** | 0.210 | 0.045 | -0.122 | -0.065 | -0.168 | -0.170 | -0.460* | -0.412 | -0.215 |
| *Keratella tropica* | -0.742** | -0.495* | -0.652** | -0.376 | -0.121 | -0.356 | -0.021 | -0.486* | -0.145 | -0.122 |

Key: * $P < 0.05$, ** $P < 0.01$

Except for temperature and pH, all parameters are in ppm

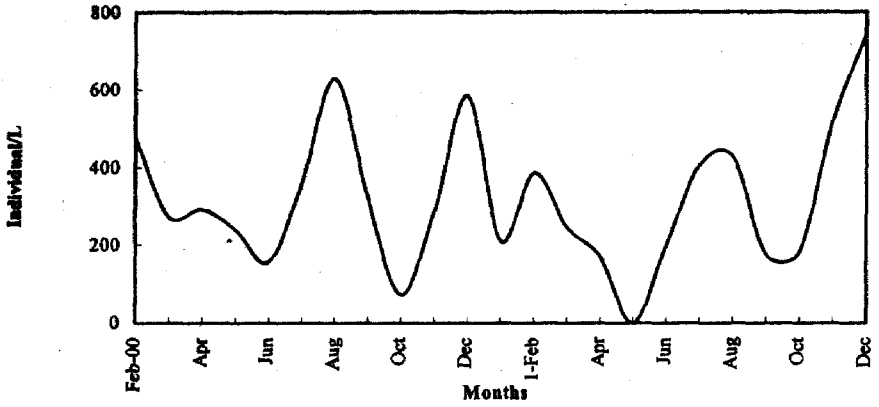


Fig. 1– Rotifera abundance in Someshwar temple tank during 2000-2001.

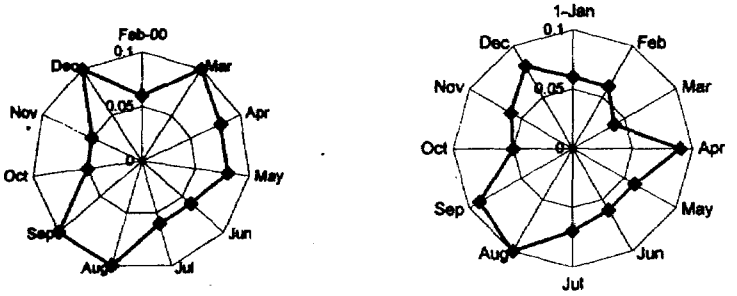


Fig. 2– Zooplankton biomass (ml/100ml of water filter) of Someshwar temple tank during 2000 - 2001.

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