

LIMNOLOGICAL STUDIES OF A FRESHWATER FISH TANK BIBINAGAR, HYDERABAD (PART II)-ROTIFERA

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INTRODUCTION

Seasonal variations in Freshwater rotifers population have been studied by many workers (George, 1966; Nayar, 1970; Pennak, 1949, 1955; Green 1972 and Patil, 1976). However studies of ecology of Indian rotifers is still inadequate. Hence to enhance our knowledge in this field the present investigation was undertaken (January, 1985 to December, 1985) on a freshwater tank at Bibinagar.

MATERIALS AND METHODS

Description of Bibinagar tank is given somewhere else in part I of this study Patil and Panda (1997). Plankton samples were collected with the help of Nylon satin Plankton net (200 mesh/cm). In all 40 litres of water was filtered through the net from different sampling stations for quantitative study. For qualitative analysis samples were collected by towing a net through the surface of water. The plankton concentrate was preserved in 4% formalin. The quantitative enumeration of rotifers were made with the help of "Sedgwick Rafter cell" under 100^x magnification.

RESULTS AND DISCUSSION

During the one year study, 18 species of rotifers were recorded (Table 1). The occurrence of all the species of rotifers was irregular and two major peaks were observed in the month of January and December. George (1966) attributed summer periodicity for rotifers in Delhi water. In the present study, the rotifers showed two pulses, one in January and the other in December. Probably the summer periodicity cannot be attributed to the total number of rotifers as stated by Nayar (1970), Patil (1976). Pennak (1949, 1955) also could not observe any seasonal periodicity.

It is well known that the rotifers are cosmopolitan and this view is supported by many workers like Amren (1964), Green (1967) and Patil (1976). Green (1972) has pointed out that cosmopolitanism is observed common in a number of rotifers but there are many differences in the species list of tropical and temperate or cold temperate region plankton fauna. In all 18 species of Rotifers were recorded with a majority of cosmopolitan species. Some of the species appeared

Table 1. Showing list of Rotifers species.

1. <i>Philodina</i> sp.	10. <i>B. calyciflorus</i> Pallas
2. <i>Polyarthra vulgaris</i> Carlin	11. <i>B. caudatus</i> Borrois & Daday
3. <i>Filinia longiseta</i> Ehrenberg	12. <i>B. rubens</i> Rubans
4. <i>Keratella cochlearis</i> Gosse	13. <i>B. forficula</i> Ehrenberg
5. <i>K. valga</i> Ehrenberg	14. <i>B. quadridentatus</i> Hermann
6. <i>Asplanchna intermedia</i> Hudson	15. <i>B. falcatus</i> Zacharias
7. <i>Anuraeopsis fissa</i> Gose	16. <i>Lecane (M) bulla</i> Gosse
8. <i>Trichocerca cylindrica</i> Imhoff	17. <i>Epiphanes macrourus</i> Borrois & Dady
9. <i>Brachionus angularis</i> Gosse	18. <i>Euchlanis dilatata</i> Gosse

Table 2. Average annual range of various physico-chemical parameters.

Transparency cm.	..	..	30 — 90
Temp. of water °C	..	..	19 — 28
Temp. of air °C	..	..	27 — 43
pH	..	..	8.2 — 9.7
CO ₂ mg/L.	..	..	0 — 35
CO ₃ mg/L.	..	..	34 — 80
HCO ₃ mg/L.	..	..	170 — 370
D.O. mg/L.	..	..	5.1 — 6.9
Total hardness mg/L.	..	..	190 — 220
Ca mg/L.	..	..	65 — 120
Mg mg/L.	..	..	40 — 50
Chloride mg/L.	..	..	64 — 130
Total PO ₄ mg/L.	..	..	0.32 — 0.40
Nitrate-Nitrogen mg/L.	..	..	0.58 — 0.65
Sulphate mg/L.	..	..	8 — 10
Sp. conductivity ug ohm/Cm.	..	..	486 — 600

only in summer. Green (1972) in his study of latitudinal variation of planktonic rotifera indicates that *Brachionus* is important in tropic than in temperate and northern area. The present study corroborate the view of Green. Lair (1980) noticed that Genera *Brachnionus* and *Keratella* were very sensitive to increase in temperature on the contrary this does not seems to be so in the present investigation in this region.

Table 3. Percentage composition of zooplankton.

	Jan, 85	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec, 85	Average Annual % Composition of zooplankton
Rotifera	48.98	10.39	36.12	29.65	33.47	39.86	36.73	34.70	22.91	39.84	6.70	48.07	32.30
Cladocera	29.78	62.31	33.13	42.15	29.29	33.78	36.73	36.87	24.30	33.83	66.49	37.08	38.81
Copepoda	18.29	19.95	18.07	10.75	27.19	20.27	15.92	24.94	45.83	26.31	20.72	8.24	21.37
Copepodid	0	3.12	12.65	8.72	4.18	2.70	4.08	2.60	0	0	5.87	12.09	3.75
Nauplii	2.97	4.16	0	8.72	5.86	3.38	6.53	0.86	6.94	0	0	5.49	3.74

In the present investigation species composition and abundance of Rotifers population in Bibinagar tank has been given. Campbell (1941) has pointed out that D.O., CO₂ and pH seems to be closely related to the abundance of the Rotifer in freshwater. Davis (1955) has shown that pH to be an important factor, while Yousuf and Quadri (1981) have pointed out that temperature is the main factor for the appearance and abundance of Rotifers in freshwater. Balkhi *et al.* (1984) stated that temperature and also D.O. have their influence on the abundance of specific composition of the Rotifera in Anchor lake. In the present study well marked relationship could not be established. Since the peaks of rotifers varies and no specific pattern was observed throughout the one year study.

The rotifer population in the tank was less than cladoceran population Patil & Panda (in press), the reason might be due to forage activities of these large crustaceans, the rotifer population depleted in samples in the presence of predator. This is supported by an excellent work of Pennington (1941) details rapid replacement of rotifers by *Daphnia* in tube culture of micro-algae showing that in the presence of cladocera (large crustaceans) the rotifers population was reduced. Michael (1964) attributed that loricate rotifers showed their maximum intensity in the summer months with a peak in April or May, when the temperature and alkalinity of the water were high. This was also observed by Gray (1953) and Byars (1960). In the present study loricate forms were found without any prominent peak and their occurrence was irregular. The dominance of zooplankton organisms over phytoplankton were observed. Similar relationship has been noticed by Jayangouder (1980) in Ajwa reservoir. This can be explained on the basis of Harvey *et al.* (1935) hypothesis that the grazing effect of herbivore zooplankton is sufficient to limit the phytoplankton population in time and quantity.

Ruttner (1980) concluded that in warm climate *Filinta longiseta* may occur in epilimnion and also stated that in warm monomictic lake there is no room for *Filinia terminalis* but *F. longiseta* may be present. In the present study only *Filinia longiseta* was observed in the routine collection in this tropical reservoir and *Keratella valga* as this species appears to be indicative of mesotrophic environment (Leentvaar, 1980). Pajler (1977) states that this species is distributed in the northern regions may be related to low temperature but Leentvaar (1980) concluded that the distribution of this species is also controlled by water quality. The present investigation corroborate the view of Leentvaar (1981). As per saprobic system *B. calyciflorus*, *B. urceolaris* are indicators of polluted water. Green (1972) and Chengalath *et al.* (1974) have shown the common occurrence of genus *Brachionus* and the absence of or near absence of the boreal genus *Notholca* to be characteristic of many tropical waters. The same holds good in the present study.

As such rotifer group is quite rich in Indian Sub-continent. The present studies on the ecology of Rotifers, indicate certain lacunae, therefore for further study there is ample scope for detailed work on the ecology of Rotifers from other region of India.

SUMMARY

Seasonal variation in Rotifera population was studied for a period of one year. In all 18 species of rotifers were recorded, but their distribution in the population was not very much prominent whereas, their occurrence was also very much irregular. The major peaks were observed in the month of January and December. *Brachnionus falcatus* and *B. quadridentatus* were absent in the samples of summer months in both the years. The population of rotifera was less than cladocera.

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REFERENCES

- Ameren, H. 1964. Ecological and taxonomical studies on Zooplankton from Spitzbergen. *Zool. Bidr. Upps.*, **36** : 209-276.
- Balkhi, M. H. Yousuf, A. R. & Quadri. 1984. Rotifera of Anchor lake during summer and winter. *Geobios new reports*. **3** : 163-165.
- Byars, J. A. 1960. A freshwater pond in Newzealand. *Aust. J. Mar. Freshw. Res.*, **ii** 222-240.
- Campbell, R. S. 1941. Vertical distribution of the plankton Rotifera in Douglas lake, Michigan, with special reference to depression individuality, *Ecol. Monogr.*, **11** : 1-19.
- Chengalath, R., Fernando, C. H. & Kostelw. 1974. Rotifera from Sri Lanka (Ceylon) 3. New species and records with a list of Rotifera recorded and their distribution in different habitats from Sri Lanka. *Bull. Fish. Res. Stn., Srilanka, Ceylon*, **25** : 83-96.
- Davis, C. C. 1955. *The Marine and Freshwater plankton* Michigan State University Press, 562 pp.
- George, M. G. 1966. Comparative plankton ecology of five fish ponds in Delhi, India, *Hydrobiologia*, **27** : 81-108.
- Gray, E. A. 1953. The ecology of rotifers in Cambridge shire. *J. Anim. Ecol.*, **22** : 208-216.
- Green, J. 1967. Association of Rotifera in the Zooplankton of the lake sources of White Nile, *J. Zool. Lond.*, **151** : 343-378.
- Green, J. 1972. Ecological studies on crater lakes in West Cameroon, Lake Kotto and lake Soden. *J. Zool. Lond.*, **166** : 283-301.
- Green, J. 1972. Latitudinal variations in association of planktonic Rotifera, *J. Zool. Lond.*, **167** 31-39.

- Harvey, H. W., Cooper, L. H. N., Llebour, M. V & Rusell, F. S. 1935. Planktonic production and its control. *J. Marine Biol. Ass. U.K.*, **20** : 407-441.
- Jayagauder, I. 1980. Hydrobiological studies on the Ajwa reservoir, the source of raw water supply to Baroda Water Works. *Hydrobiologia.*, **72** : 113-123.
- Lair, N. 1980. The rotifer fauna of the river Loire (France), at the level of the Nuclear Power Plants. *Hydrobiologia*, **73** : 153-160.
- Leentvaar, 1980. Note on some Brachionidae (Rotifers) from the Netherlands. *Hydrobiologia*, **73** 259-262.
- Michael, P. G. 1964. Limnological investigations on Pond Plankton, macrofauna and chemical constituents of water and their bearing on fish population. Ph.D. Thesis, Calcutta University.
- Nayar, C. K. G. 1970. Studies on the rotifer population of two ponds at Pilani, Rajasthan. *J. Zool. Soc. India.*, **22**(1 & 2) : 21-34.
- Patil, S. G. 1976. Plankton ecology of few waterbodies of Nagpur area, Ph.D. thesis submitted to Nagpur University, Nagpur.
- Patil, S. G. & Panda, P. 1997. Limnological studies of a tropical freshwater fish tank Bibinagar, Andhra Pradesh : Abiotic factors. *Rec. zool. Surv. India*, No. **96**(1-4) : 173-178.
- Patil, S. G. (In Press). Population dynamics of some planktonic Cladocera and copepods of a freshwater fish tank Bibinagar, Hyderabad, Andhra Pradesh, Part III. *Rec. zool. Surv. India*.
- Pejler, B. 1957. Taxonomical and ecological studies on planktonic Rotatoria from Northern Swedish Lapland. *K. Svenska vetensk Akad. Mandi.* (4) **6**(5) : 1-69.
- Pennak, R. W. 1949. Annual limnological cycles in some Colorado reservoir lakes. *Ecol. Monogr.* **19** : 233-267.
- Pennak, R. W. 1955. Comparative limnology of eight Colorado mountain lakes, *Uni. Colo. Stud. Biol.*, **2** : 1-75.
- Pennington, W. 1961. Detail rapid replacement of Rotifers by *Daphnia* in tube culture of Microalgae. *J. Ecol.* **5** : 29.
- Ruttner, F. 1980. The abundance and distribution of *Filinia terminalis* in various types of lake and related to temperature and food, *Hydrobiologia.*, **73** 169-175.