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POPULATION DYNAMICS OF PLANKTONIC CLADOCERA AND COPEPODA OF A FRESHWATER FISH TANK BIBINAGAR, HYDERABAD, A.P. (PART III)

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INTRODUCTION

The data on seasonal population dynamics of freshwater Cladocera and Copepoda of India is inadequate. The important work in this regard is of workers like Das and Srivastava (1956), Pahwa and Mehrotra (1966), Michael (1964), Sumitra (1970), Patil (1976) and others. This investigation describes annual changes in the population of Cladocera and Copepoda of subtropical freshwater fish tank of Hyderabad on the basis of one year study.

MATERIAL AND METHODS

Description of the present water body under study, Bibinagar, is given in the paper Part I of this series (Patil and Panda, 1997). During one year, (Jan, 1985 to Dec, 1985) collection of plankton were made with the help of a (Nylon satin) plankton net once in a month from five different sampling stations. Forty litres of water was filtered through the net and the plankton concentrate was preserved in 4% formalin. The quantitative estimation was made with the help of "Sedgwick Rafter cell" under compound binocular microscope. Three counts were made from each samples. Mean concentration was calculated from the mean value of the total count per litre.

RESULTS AND DISCUSSION

Twelve species of Cladocera were recorded in the present study (Table 1). As per anual percentage composition of zooplankton, Cladocera was the dominant group forming 38–81% of the average annual population (Table 2). The reason might be due to the reduced fish population. The annual fish production of the tank is only 500 kg/hec/year. This clearly shows that the fish production is very low and in the presence of reduced population of predator (fishes) the cladocera dominated in the tank. This is further supported by Harbacek *et al.* (1961) in Poultruba tank that when the fish stock was low, a large sized *Daphnia* comprised 80% of the population. *Moina micrura* was the only cladoceran observed almost throughout the year of investigation.

Table 1. 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

The occurrence of this species is "euryplastic" and can tolerate wide range of temperature. Similar observation was made by Nayar (1970) for one species of rotifer while working on the freshwater ponds at Pilani, Rajasthan.

Ceriodaphnia cornuta was observed for about 7 months from April to October, 1983. *Diaphanosoma sarsi, Simocephalus vetulus, Macrothrix spinosa, Chydorus sphaericus and Chydorus eurynotus reticulatus* were the species slightly better represented in the samples of the tank and their occurrence was about 5 to 7 months, whereas, *Scapholeberis kingi, Alona rectangula* and *Pleuroxus aduncus* were sparse in the samples and their occurrence was irregular. Thus, it can be concluded that the cladocera in the reservoir may not have any fixed seasonal pattern of abundance. Nordoli (1976) found that two types of zooplankton assemblages occurred in Florida lake, one type is poor in cladocera and rich in rotifers and the other type rich in cladocera with variable in numbers of rotifers. The second type of assemblage is found in the present reservoir with no oxygen stratification and chaoborus larvae are not present in the tank. The diversity of Cladocerans in reservoir might be related to vegetation like *Hydrilla, Ceretophyllum* etc. This is in conformity with the finndings of Shireman and Martin (1978), Quade (1969), as the abundance of cladoceran was noticed in the macrophytes. Two peaks of cladocera were observed in a one year study with a

Table 2. Percentage composition of zooplankton.

	Jan,85	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec,85	Average Annual % Composition 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

Table 3. List of species of Cladocera and Copepoda.

CLADOCERA
Diaphanosoma sarsi Richard
Ceriodaphnia cornuta Sars
Moina micrura (Jurine) Kurz
Simocephalus vetulus Schodler
Scapholeberis kingi Sars
Pleuroxus aduncus (Jurine)
Macrothrix spinosa king
Chydorus eurynotus reticulatus Sars
C. sphaericus O. F. Muller
C. denticulatus Sars
Alona intermedia Sars
Alona rectangula Sars
COPEPODS
Mesocylops hyalinus Rehberg
Cyclops sp.
Diaptomus spp.
Copepodids
Nauplii

minor peak in April. This is not true for copepods distribution. Twelve species of cladocerans were recorded, the most dominant tropical species were *Diaphanosoma sarsi, Ceriodaphnia cornuta, Moina micrura and Simocephalus vetulus.* Temperature of water was in the range of 19° C to 28° C. Swar & Fernando (1980) pointed out that different group of zooplankton have their major peaks in different months of the year. Further opines that these were not definitely related to temperature changes. Thus temperature does not play any role in the seasonal abundance of Crustacea population and in the present study also this was found true. Das & Srivastava (1956), Bayly (1963), Moitra & Bhattacharya (1965) and Jana (1973) have found that zooplankton vary inversely with pH. However, in the present study the pH was in the range 8.2 to 9.7 and there does not seem to be any significant variation in zooplankton with pH. This is in conformity with Swar & Fernando (1980). During the monsoon, the population was found to be low. It may be due to rain water bringing about changes in physical, chemical and biological factors.

After one year of study all species population size did not exhibit what it had been a year before when sampling was began, this is in contrary to the observations of Keen (1976) on chydorid Cladocera of southern Michigan Marl Lake.

Copepods were represented only by three genera *Cyclops, Mesocyclops* and *Diaptomus.* These copepods were present in the samples throughout the period of investigation. The maximum intensity shown by copepods was in the montgh of Sept. The annual percentage of the copepods was 21.37%. This shows that copepods population was better represented in the tank.

Das and Srivastava (1956) have shown peak period of copepods in the month of September and October. In the present study, the major peak was observed in September and two minor peaks were seen in the months of May and October.

Kow (1953) has observed that the peaks of phytoplankton and copepods coincided with each other showing direct relationship. But in the present investigation, the peaks of phytoplankton and copepods did not exactly coincide with each other but follow one another showing a definite relationship as shown by Patil (1976), and will be discussed elsewhere. The copepodid stages of the copepods were counted and their percentage was only 3.75%. The occurrence of these copepodids was irregular and appear in certain months of the year.

Nauplii were also present in the samples of the tank with definite peaks in the months of April, July and September. In a year round study Nauplius showed three peaks which perhaps indicate the active period of reproduction as stated by Patil (1976).

Vaas and Vanoven (1959) have stated that generally microcrustaceans feed on minute phytoplanktonic forms, epiphyton and detritus. Sumitra (1970) has also shown direct relation between the seasonal fluctuations in the density of cladocera with the fluctuations in the availability of food. The present data reveal a some what direct relationship between the crustaceans and phytoplankton. This is further supported by the study made by Pahwa and Mehrotra (1966). The tanks at Nagpur studied by Patil (1976) were very rich in phytoplankton as compared to the phytoplankton population of the present tank. The phytoplankton in the present tank was very poor and the annual average units/litres was only 6980.

SUMMARY

Seasonal population dynamics of 12 species of Cladocera and 3 species of Copepoda were studied. The Cladocera fauna of the tank was well represented in the absence of predators like fishes. *Moina micrura* the only cladoceran was found almost throughout the year except May, 1985. The peak of Cladocera and Copepoda were observed in the month of November and September respectively. Nauplii were poorly represented in the samples.

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