



†Distribution of zooplankton in selected centres of Cochin backwaters, Kerala

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Abstract

Seventeen groups of zooplankton were recorded from nine stations located in the Cochin backwaters during the period from August 2000 to July 2002. Quantitative and qualitative distributions of these groups in the nine stations are presented. Out of the 17 zooplankton groups, 16 groups were recorded from station I (Vypeen) as well as from station VI (Cochin Fisheries Harbour) and the number of groups were minimum (9) at station V (Eloor). The density of zooplankton was maximum at station II (Puthuvypu) followed by station III (Narakkal) with 42% and 39% respectively and the zooplankton density was minimum at station V (Eloor), with 0.66% of the total. Among the different groups of zooplankton available in this area, a maximum of 52% composed of rotifers, followed by copepods which formed 40%. Stationwise studies indicated the dominance of rotifers at stations II, III and VIII while copepods contributed to the maximum in all the other six stations. The results of ANOVA indicated that the variations in zooplankton between stations were highly significant.

Keywords: Zooplankton, distribution, Cochin backwaters

Introduction

Zooplankton community is a heterogeneous assemblage of animals covering many taxonomic groups. They play a vital role in the marine food chain and their abundance/biodiversity is considered as an index of fertility as the fishery resources of any aquatic system mainly depend on the magnitude of phytoplankton and zooplankton production. The distribution of zooplankton in Indian estuaries has been extensively studied by several researchers (Nagarajaiah and Gupta, 1985; Srinivasan and Santhanam, 1991; Nandan and Azis, 1994; Karuppasamy and Perumal, 2000; Patil *et al.*, 2002; Qasim, 2005). In Cochin backwaters, the seasonal changes in the zooplankton population was studied by Wellershaus (1974); tidal influence on the diel variations of zooplankton by Pillai and Pillai (1973); fluctuation of zooplankton during May-September, 1991 by Antony and Selvaraj (1993); effect of coconut husk retting on the faunal composition by Ambikadevi and Pillai (1990); monsoonal impact

on planktonic standing stock and abundance by Madhu *et al.* (2007); diversity and abundance of microzooplankton during April-July, 2003 by Jyothibabu *et al.* (2006) and the seasonal variation of zooplankton in the Panangad region of Vembanad lake by Haridevi *et al.* (2004). All these studies concentrated on either seasonal or short period patterns. An attempt is made here to study the distribution of zooplankton and their different groups in nine stations exposed to different ecological conditions in the Cochin backwaters.

Material and Methods

The Cochin backwaters and canals adjoining the system extending to about 50 km were selected for the study. Fortnightly collections of zooplankton were made from nine stations *viz.*, Vypeen, Puthuvypu, Narakkal, Cherai, Eloor, Cochin Fisheries Harbour, Ernakulam Market canal, Mangalavanam and Poothotta during the period from August 2000 to July 2002. The map showing the collection sites is given in Fig.1.

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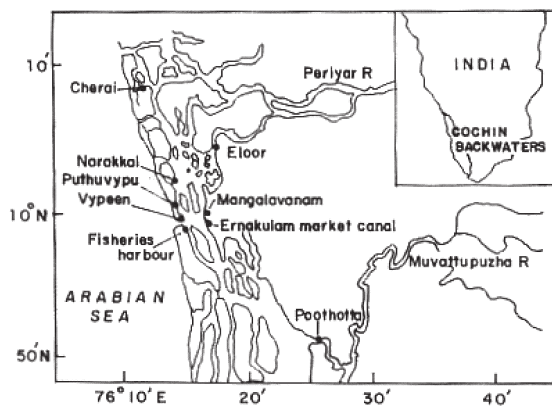


Fig.1. Map showing the location of stations

These stations were so selected that each of them showed a unique and different environment. The first station, Vypeen is located near Cochin barmouth, a very dynamic environment with maximum influence of tide and wind. The second station, Puthuvypu is considered as a good nursery area with plenty of finfish and shellfish seeds. The third station, Narakkal is a well known site for aquaculture where the traditional aquaculture methods are being practiced and the collection site gets a good inflow of water from culture ponds. The fourth station, Cherai is located about 5 km away from the sea, where Chinese dipnets are operated and wastes from fish and shellfish processing plants are discharged. The fifth station, Eloor is a hot spot of industrial pollution with near-freshwater environment. The sixth station Cochin Fisheries Harbour is a major fish landing centre, a busy water way with a deep shipping channel and the added oil pollution. The seventh station, Ernakulam Market canal is near to the Ernakulam market and all the wastes from the market are being discharged to the canal. The eighth station, Mangalavanam is a small mangrove forest which is a bird sanctuary also. The ninth station, Poothotta is about 25 km away from Ernakulam and is a near-freshwater ecosystem.

The zooplankton samples were taken from inshore areas of each station by filtering 500 litres of water through conical plankton net made of bolting silk having a mesh size of $40\ \mu$, and preserved using 4% formaldehyde. The sample was made upto 100 ml, an aliquot of 10 ml was taken in a counting chamber, observed under a binocular microscope

and different groups of zooplankton were identified using many publications by various authors, especially Newell and Newell (1973), Wickstead (1965) and Raymont (1983). The count of organisms present in 1000 litres (m^3) of water was calculated. The monthwise data estimated for 24 months were pooled together and the resulted average data of 12 months were considered for further analysis and interpretation. For seasonal studies, February-May was treated as premonsoon, June-September as monsoon and October-January as postmonsoon. ANOVA tests were carried out to understand the variations of zooplankton between stations.

Results and Discussion

Quantitative distribution: An average density of 4,95,156 nos per m^3 of zooplankton was noticed from this area.

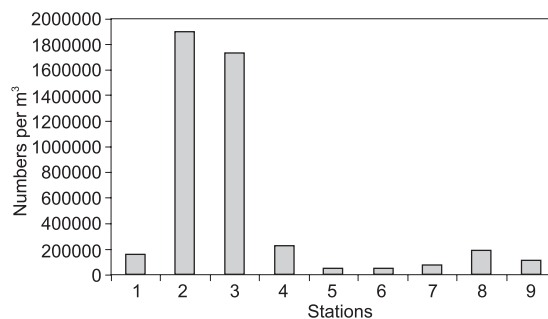


Fig. 2. Stationwise distribution of zooplankton during 2000-02

The density of zooplankton ranged from 29,195 nos per m^3 at Station 5 (Eloor) to 18,87,866 nos per m^3 at station 2 (Puthuvypu) (Fig. 2.). Srinivasan and Santhanam (1991) noticed 10,36,500 individuals/ m^3 from Pullavazhi backwaters in the southeast coast of India. The maximum density recorded during the present study is more than that noticed from Pullavazhi backwaters, indicating the more congenial environment for these organisms at Puthuvypu in Cochin backwaters when compared to Pullavazhi backwaters.

In the majority of stations, the density was high during premonsoon season (Fig. 3). Except at stations III, V and IX, the maximum density of zooplankton was recorded during premonsoon period. The abundance of zooplankton during the

premonsoon/summer season was also reported by Madhu *et al.* (2007) in Cochin backwaters, Haridevi *et al.* (2004) in the Panangad region of Vembanad lake, Karuppasamy and Perumal (2000) in the Pichavaram mangroves and by Srinivasan and Santhanam (1991) in the Pullavazhi backwaters.

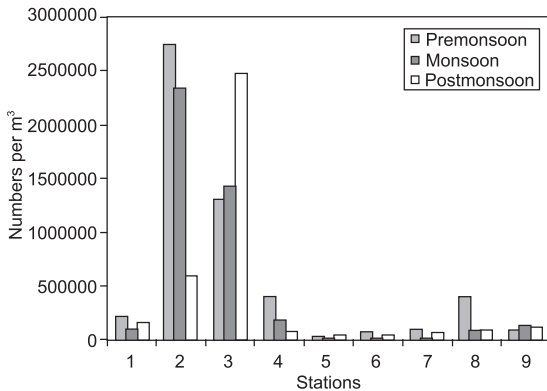


Fig. 3. Seasonal density of zooplankton in the area

Qualitative distribution: During the present study, 17 groups of zooplankton were recorded from nine stations. They were rotifers, copepods, tintinnids, medusae, nematodes, polychaetes, cladocera, ostracods, *Balanus* nauplii, mysids, amphipods, crab larvae, prawn larvae, gastropods, bivalves, tunicates and fish larvae. The distribution

of these zooplankton in different stations is given in Table 1.

Out of the 17 zooplankton groups, 16 were recorded from station 1 (Vypeen) as well as from station 6 (Cochin Fisheries Harbour). The lowest number of groups, 9 was observed from station 5 (Eloor). Vypeen and Fisheries Harbour are located nearer to the sea when compared to other stations whereas Eloor is situated in the upstream end of the stretch where almost riverine conditions persist. Hence, there is an indication of positive correlation of zooplankton diversity with salinity. This agrees with Wellershaus (1974) who observed a positive correlation between micro-zooplankton diversity and salinity in Cochin backwaters. Nagarajaiah and Gupta (1985) also noticed high correlation between salinity and zooplankton in brackishwater ponds of Nethravati estuary. Among the 17 groups, copepods, rotifers, tintinnids, nematodes, polychaetes, gastropods and fish larvae were recorded from all the nine stations.

In this area, 52% of zooplankton was composed of rotifers, followed by copepods which formed 40% and other groups contributed in minor proportions. The percentage composition of different groups of zooplankton in the different stations is given in Table 2.

Table 1. Distribution of zooplankton groups in different stations

| Zooplankton | Station 1 | Station 2 | Station 3 | Station 4 | Station 5 | Station 6 | Station 7 | Station 8 | Station 9 |
|------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Rotifers | + | + | + | + | + | + | + | + | + |
| Tintinnids | + | + | + | + | + | + | + | + | + |
| Medusae | + | - | + | - | - | + | - | - | - |
| Nematodes | + | + | + | + | + | + | + | + | + |
| Polychaetes | + | + | + | + | + | + | + | + | + |
| Cladocera | + | - | + | + | + | + | + | - | + |
| Ostracods | + | + | + | + | - | - | - | - | - |
| <i>Balanus</i> nauplii | + | + | + | + | - | + | + | + | - |
| Copepods | + | + | + | + | + | + | + | + | + |
| Mysids | - | + | + | + | - | + | + | - | + |
| Amphipods | + | + | + | + | - | + | - | - | + |
| Crab larvae | + | - | - | - | + | + | - | - | + |
| Prawn larvae | + | + | + | + | - | + | + | + | + |
| Gastropods | + | + | + | + | + | + | + | + | + |
| Bivalves | + | - | - | + | - | + | + | + | - |
| Tunicates | + | - | - | - | - | + | - | + | + |
| Fish larvae | + | + | + | + | + | + | + | + | + |

+ indicates presence

- indicates absence

Table 2. Composition (%) of zooplankton groups in different stations

| Zooplankton | Station 1 | Station 2 | Station 3 | Station 4 | Station 5 | Station 6 | Station 7 | Station 8 | Station 9 |
|------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Rotifers | 15.12 | 66.50 | 48.22 | 32.08 | 32.37 | 6.65 | 15.88 | 45.17 | 31.81 |
| Tintinnids | 18.96 | 5.62 | 5.52 | 16.72 | 0.49 | 29.52 | 17.08 | 6.89 | 0.12 |
| Medusae | 0.09 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Nematodes | 0.16 | 0.03 | 0.13 | 0.23 | 0.64 | 0.18 | 2.62 | 1.41 | 0.30 |
| Polychaetes | 0.04 | 0.02 | 0.01 | 0.06 | 0.33 | 0.14 | 0.33 | 0.08 | 0.06 |
| Cladocera | 0.00 | 0.00 | 0.00 | 0.00 | 3.33 | 0.04 | 0.15 | 0.00 | 0.65 |
| Ostracods | 0.02 | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| <i>Balanus nauplii</i> | 0.46 | 0.02 | 0.03 | 0.38 | 0.00 | 2.33 | 0.26 | 0.09 | 0.00 |
| Copepods | 63.78 | 27.45 | 45.71 | 50.35 | 62.63 | 59.70 | 62.69 | 41.85 | 64.04 |
| Mysids | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 |
| Amphipods | 0.04 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 |
| Crab larvae | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 |
| Prawn larvae | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.01 |
| Gastropods | 0.13 | 0.29 | 0.21 | 0.09 | 0.20 | 0.96 | 0.95 | 4.13 | 2.89 |
| Bivalves | 0.11 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.03 | 0.00 |
| Tunicates | 0.23 | 0.00 | 0.00 | 0.00 | 0.00 | 0.36 | 0.00 | 0.31 | 0.03 |
| Fish larvae | 0.85 | 0.01 | 0.13 | 0.05 | 0.02 | 0.10 | 0.00 | 0.03 | 0.00 |

Among the 17 groups of organisms in the zooplankton observed during the present study, rotifers and copepods dominated. The share of rotifers in total zooplankton varied from 6.65% to 66.50% while copepods showed variations from 27.45% to 64.04% in different stations. Thus the variation is more in the case of rotifers than in the copepods. This may be due to the ability of rotifers to multiply fast as a result of parthenogenesis. Stationwise studies indicated the dominance of rotifers at stations 2, 3 and 8 while copepods formed the major component in the other 6 stations. The dominance of copepods among the zooplankton groups was reported by several researchers earlier (Wellershaus, 1974; Sarkar *et al.*, 1984; Nagarajaiah and Gupta, 1985; Nair and Azis, 1987; Padmavati and Goswami, 1996; Mishra and Panigraphy, 1999; Karuppasamy and Perumal, 2000; Madhu *et al.*, 2007). Qasim (2005) stated that "in the zooplankton community, copepods constitute the dominant group in all the Indian estuaries". But, Nandan and Azis (1994) observed rotifers and copepods as the major groups, while studying the zooplankton of the retting zones in the Kadinamkulam estuary. Patil *et al.* (2002) noticed that rotifers, nauplii, copepods and eggs were the dominant types in Ulhas river estuary. Thus, the dominance of a particular group among the zooplankton can be due to the type of the

ecosystem under study or may be due to the mesh size of the net used for collecting zooplankton.

The ANOVA test showed that the zooplankton abundance varied significantly between stations. This indicates that the abundance of zooplankton is related to the nature of ecosystem. Also, in the present study, different groups of zooplankton were found to prefer specific environments. Since some zooplankton are considered to be excellent live feed organism in aquaculture practices, detailed studies on species abundance and their relationships with the environmental characteristics are necessary.

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