

ORIGINAL ARTICLE

ZOOPLANKTON DIVERSITY WITH REFERENCE TO THE SEASONAL VARIATION OF
COCHIN BACKWATERS, KERALA

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ABSTRACT

Zooplankton community is cosmopolitan in nature and they inhabit all freshwater and backwater habitats of the world. The Cochin backwaters and canals adjoining the system extending to about 30 km were selected for the study. Fortnightly collections of zooplankton were made from four stations *viz.*, Fort Cochin, Vypeen, W.Island, Ernakulam Market canal during the period from February 2011 to January 2012. Fifteen groups of zooplankton were recorded from four stations. Quantitative and qualitative distributions of these groups in the four stations are presented. Out of the 15 zooplankton groups, 13 groups were recorded from station 1 (Fort Cochin) as well as from station 2 (Vypeen) and the number of groups were minimum (7) at station 3 (W.Island). The density of zooplankton was maximum at station 2 (Vypeen) followed by station 1 (Fort Cochin) with 42% and 34% respectively and the zooplankton density was minimum at station 4 (Ernakulam Market canal), with 0.56% of the total. Among the different groups of zooplankton available in this area, a maximum of 65% composed of rotifers, followed by copepods which formed 36%. Station wise studies indicated the dominance of rotifers at stations 2 and 3 while copepods contributed to the maximum in all the other two stations. The results of ANOVA indicated that the variations in zooplankton between stations were highly significant.

Keywords: Zooplankton diversity, Seasonal variations

1. INTRODUCTION

The backwaters of Kerala along with its net work of canals spread and extend almost throughout the coastline and form important areas of fisheries and other human use. It opens into the Arabian Sea at Cochin and this facilitates free mixing of sea water with the fresh water which originates from the rivers that empty into the backwaters. The regular tidal rhythm influences the mixing and flow patterns giving it the features of an estuary. Apart from the tides, the seasonal outbursts of the monsoons have great bearing in controlling the environmental factors and thereby the distribution of the organisms of the estuary. The zooplankton of the estuary has been studied earlier by several authors. George (1958) has given an account of the general composition of the zooplankton.

Cochin backwaters (CBW), a tropical estuarine system located along the southwest coast of India, is influenced by heavy rain and fresh water influx during monsoon periods (June to September – summer monsoon, November to February - winter monsoon) in which most of the rain occurs

during summer monsoon period. During the peak of summer monsoon (July – August) surface salinity reaches near zero values over most of the region (Madhupratap 1987). The present investigation was made to assess the abundance and diversity of Zooplankton. An attempt has also been made to infer the influence of exceptionally low saline waters on zooplankton community during summer monsoon period and its implications on the food web.

2. MATERIAL AND METHODS

The Cochin backwaters and canals adjoining the system extending to about 30 km were selected for the study. Fortnightly collections of zooplankton were made from four stations *viz.*, Fort Cochin, Vypeen, W.Island, Ernakulam Market canal during the period from February 2011 to January 2012. These stations were so selected that each of them showed a unique and different environment. The first station, Fort Cochin is located near Cochin barmouth, a very dynamic environment with maximum influence of tide and wind. The second station Vypeen also located near the bar mouth. The third station, w.island is near to harbour. The fourth station, Ernakulam Market canal is near to the

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Ernakulam market and all the wastes from the market are being discharged to the canal. 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 μ , and preserved using 4% formaldehyde.

The sample was made upto 100ml, 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 (m³) of water was calculated. The month wise data estimated for 12 months were pooled together and the resulted average data of 6 months were considered for further analysis and interpretation. For seasonal studies, January- February 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.

3. RESULTS AND DISCUSSION

Quantitative distribution:

An average density of 3,97,156 nos per m³ of zooplankton was noticed from this area. The density of zooplankton observed 2,919,54 nos per m³ at Station 4 (Ernakulam Market canal), 3,87,866 nos per m³ at station 2 (Vypeen) 3,544,84 nos per m³ at station 1 (Fort Cochin) and 2,54,826 nos per m³ at W. Island. Srinivasan and Santhanam (1991) noticed 10,36,500 individuals/m³ from Pullavazhi backwaters in the south east coast of India. The maximum density recorded during the present study is Vypeen and Fort Cochin because these two stations are far from pollutant from harbour. The minimum density of zooplankton is noticed at W. Island and Ernakulam Market canal. W. Island is nearer to the Cochin Harbour and the water is polluted by ship operations. The Ernakulam Market canal is also polluted by market waste. In the majority of stations, the density was high during premonsoon season. The abundance of zooplankton during the premonsoon/summer season was also reported by Madhuet *al.* (2007) in Cochin backwaters, Harideviet *al.* (2004) in the Panangad region of Vembanad lake, Karuppasamy and Perumal (2000) in the Pichavaram mangroves (Chidambaram) and by Srinivasan and Santhanam (1991) in the Pullavazhi backwaters.

Qualitative distribution:

During the present study, 15 groups of zooplankton were recorded from four stations. They were rotifers, copepods, medusae, nematodes, polychaetes, cladocera, ostracods, *Balanus* nauplii, mysids, amphipods, crab larvae, prawn larvae, gastropods, bivalves and fish larvae. The distribution of these zooplankton in different stations is given in Table 1.

Zooplankton groups, maximum number of groups were recorded from station 1 (Fort Cochin) as well as from station 2 (Vypeen). The lowest number of groups were observed from station 4 (Ernakulam Market canal). Vypeen and Fort Cochin are located nearer to the sea when compared to other stations. 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 brackish water ponds of Nethravati estuary. Among the 15 groups, copepods, rotifers, nematodes, polychaetes, gastropods and fish larvae were recorded from all the four 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 given in Table 2.

Among the 15 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. The Present studies indicated the dominance of rotifers and copepods at all stations. The dominance of copepods among the zooplankton groups was reported by several researchers earlier (Wellershaus, 1974; Sarkaret *al.*, 1984; Nagarajaiah and Gupta, 1985; Nair and Azis, 1987; Padmavati and Goswami, 1996; Mishra and Panigraphy, 1999; Karuppasamy and Perumal, 2000; Madhuet *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.

Table 1 Distribution of Zooplanktons groups in different Stations

Zooplankton	Station 1	Station 2	Station 3	Station 4
Rotifers	+	+	+	+
Medusae	+	+	+	+
Nematodes	+	+	-	+
Polychaetes	-	+	+	-
Cladocera	+	-	+	-
Ostracodes	+	+	+	+
Balanusnauplii	-	+	+	+
Copepods	+	+	+	+
Mysids	+	-	-	+
Amphipods	+	-	-	+
Crab Larvae	+	+	+	+
Prawn Larvae	+	+	+	+
Gastropods	+	+	-	-
Bivalves	+	-	+	+
Tunicates	-	+	+	+
Fish Larvae	+	+	+	+

+ indicates presence of zooplanktons; - indicates absence of zooplanktons

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

Zooplankton	Station 1	Station 2	Station 3	Station 4
Rotifers	15.12	66.50	48.22	32.08
Medusae	18.96	5.62	5.52	16.72
Nematodes	0.09	0.00	0.01	0.00
Polychaetes	0.16	0.03	0.13	0.23
Cladocera	0.04	0.02	0.01	0.06
Ostracodes	0.00	0.00	0.00	0.00
Balanusnauplii	0.02	0.00	0.00	0.03
Copepods	0.46	0.02	0.03	0.38
Mysids	63.78	27.45	45.71	50.35
Amphipods	0.00	0.00	0.00	0.00
Crab Larvae	0.04	0.00	0.01	0.00
Prawn Larvae	0.02	0.00	0.00	0.00
Gastropods	0.00	0.05	0.00	0.00
Bivalves	0.13	0.29	0.21	0.09
Tunicates	0.11	0.00	0.00	0.01
Fish Larvae	0.85	0.01	0.13	0.05

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