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# A SEASONAL ANALYSIS OF MICROZOOPLANKTON IN THE BACKWATERS OF KOTTAIPATTINAM, TAMIL NADU, INDIA

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## ABSTRACT

*The species composition and diversity of various microzooplankton in the backwaters of Kottaipattinam, Pudukkottai, Tamil Nadu, India were assessed for three seasons of the year. Pre-summer season recorded 23 species while pre-summer, 38 species and summer 24 species. Thus, highest diversity was recorded in the pre-summer season. Among the various groups, tintinnids represented 27 species out the total of 38 species and dominated all the three seasons.*

## KEY WORDS

*Microzooplankton, backwater, Tintinnopsis, seasons*

## INTRODUCTION

Microzooplankton (20-200 µm) form a considerable portion of the zooplankton biomss in marine and estuarine environments (Porter *et al*., 1985; Pierce and Turner, 1992). Due to their sheer abundance, small size and higher weight specific metabolic rates (Fenchel, 1987; Verity, 1985) microzooplankton play an active role in the transfer of energy to higher trophic levels (Gifford, 1991) from nanoplankton to secondary and tertiary consumers like copepods and fishes (Robertson, 1983; Stoecker and Egloff, 1987). Unlike the meso and macrozooplankton, the microzooplankton are efficient in consuming pico and nanoplankton (Nival and Nival, 1976; Johnson *et al.,* 1979; Godhantaraman, 2001) and hence act as a trophic intermediate between pico / nanoplankton and large zooplankton. Further studies show that microzooplankton can be the dominant consumers of phytoplankton production in both oligo and eutrophic regions of the coast and are capable of consuming > 100% of primary production (Elangovan *et al*., 2012). Hence the present study was aimed at identifying the commonly occurring microzooplankton in Kottaipattinam backwaters in Tamil Nadu situated in the south-east coast of India.

## MATERIALS AND METHODS

### Study Area

The present investigation was carried in the backwaters of Kottaipattinam area, Pudukkottai District, Tamil Nadu during the three seasons of the year (Rainy season: October-November 2015; Pre-summer season: January-March, 2016; Summer season: April-June, 2016). Kottaipattinam is situated in Pudukkottai District, Tamil Nadu, with 10.16 Latitude and 78.99 Longitude.

### Sample Collection and Analysis

Microzooplankton samples were collected from the surface water by horizontal tow of conical net (0.35 m mouth diameter) made up of bolen silk (mesh size is 54 µm) for twenty minutes. The samples were preserved in 5% neutralized formalein and were used for qualitative analysis. To collect a good number of species and to estimate the abundance of microzooplankton, 100 litre of surface water was filtered with the help of a 10 litre bucket (10 times). As the microzooplankton size is smaller, there are considerable chances of missing few

smaller sized forms through the net. Hence, to obtain a reasonable value in the tintinnid abundance, the sedimentation technique was used following the method of Sikhanova (1978). Various biodiversity indices were calculated using the formula of Pielou (1966, 1975 and Gleason (1922).

## RESULTS AND DISCUSSION

The various microzooplankton of this region belonged to six groups (Tintinnids, Rotifers, Foraminifers, Radiolarians, Ciliates and Copepods) representing a total of 38 species. Among the 38 species, the tintinnids were represented by 27 species while the rotifers were represented by 5 species, foraminiferans and ciliates by two species each and radiolarians and copepods by one species each (Table-1).

A seasonwise comparison reveals that a total of 23 species of microzooplankton were recorded during the rainy season. Of these, 14 species belonged to Tintinnids, 4 to rotifers, 2 to foraminiferans and one each to radiolarians, ciliates and copepods. Thus, during this season tintinnids formed 60.8% of the microzooplankton while rotifers formed 17.3% and foraminiferans formed 8.6% of the total microzooplankton. On the other hand ciliates, radiolarians and copepods represented only 4.3% each of the microzooplankton.

During the pre-summer season, a total of 38 species of microzooplankton were recorded of which 27 species belonged to tintinnids, 5 species to rotifers, 2 each to foraminiferans and ciliates and one species each to radiolarians and copepods. In terms of percentage, 71% was represented by tintinnids, 13.1% by rotifers, 5.2% each by foraminifers and ciliates and 2.6% each by radiolarians and copepods.

With regard to the summer season, a total of 24 species were recorded of which 19 species belonged to tintinnids, 2 to rotifers and one species each to radiolarians, ciliates and copepods. Surprisingly, foraminifers were absent in this season. In terms of percentage, tintinnids formed 79.1% of microzooplankton followed by rotifers which formed 8.3% and 4.1% each to radiolarians, ciliates and copepods.

An overall percentage composition reveals that tintinnids represented 71% of the total microzooplankton followed by rotifers forming 13.2%. The foraminiferans and ciliate represented 5.2% each followed by radiolarians and copepods forming 2.6% each. Thus, tintinnids were the most dominating group for all the three seasons. Further, among the three seasons, the most preferred season for microzooplankton appears to be the pre-summer season as the maximum species of microzooplankton were recorded in this season followed by the summer and the rainy season.

A perusal of literature reveals that Prabhu *et al.* (2005) while analysing the microzooplankton and Senthilkumar *et al.* (2002) from Vellar estuary in Parangipettai coastal waters also recorded maximum diversity during the pre-summer season. They attributed this to the higher productivity of phytoplankton during this season. Even though productivity was not analysed in this study, the same reason can be attributed to the maxima obtained as environmental conditions that prevailed would have been more stable when compared to rainy and summer seasons. Literature also reveals that several workers (Mangesh *et al*., 1996; Krishnamurthy and Naidu, 1977; Qasim and Sengupta, 1981; Prabhu *et al*., 2005) have also reported lowest diversity of microzooplankton to occur during the rainy season. This may be attributed to the heavy influx of water from the land into the system as already suggested by a number of workers. In addition, it can also be due to the dispersion of these organisms further away into the sea due to the increased speed of water current as well as winds that are normally associated with this season.

The microzooplankton diversity (H) index (Table 2) in general was found to vary between 2.1 to 3.62 during the three seasons while the evenness (j) ranged from 0.56 to 0.87 and richness from 0.94 to 2.2. While the minimum diversity index was recorded in the rainy season, the maximum was recorded in the pre-summer season.

Among the various groups, tintinnids were found to dominate. Within this group, the species belonging to the genus tintinnids was found to dominate as it was represented by 13 of the 27 tintinnid species. Literature reveals that similar reports were also recorded by Krishnamurthy and Santhanam (1975) and Prabu *et al*. (2005).

**Table-1 shows the Microzooplankton collected from backwaters**

| S. No. | Species | Rainy Season | Pre-summer Season | Summer Season |
|---|---|---|---|---|
| | | **Tintinnids** | | |
| 1. | *Tintinnidium primitivum* | + | + | + |
| 2. | *T. incertum* | + | + | + |
| 3. | *Tintinnopsis amphora* | – | + | – |
| 4. | *T. beroider* | + | + | + |
| 5. | *T. dinecta* | – | + | + |
| 6. | *T. glans* | + | + | – |
| 7. | *T. glacilis* | – | + | + |
| 8. | *T. minuta* | + | + | – |
| 9. | *T. nucula* | + | + | + |
| 10. | *T. radix* | + | + | + |
| 11. | *T. tubulosa* | – | + | + |
| 12. | *T. butschlii* | + | + | + |
| 13. | *T. kifoidi* | – | + | + |
| 14. | *T. nane* | + | + | + |
| 15. | *T. lohmanni* | – | + | + |
| 16. | *Codonellopsis orthoceras* | + | + | + |
| 17. | *C. schabi* | – | – | + |
| 18. | *Dictyocysta sehaiyai* | + | + | + |
| 19. | *Stenosemella stenei* | + | + | – |
| 20. | *Amphorellopsis acuta* | – | + | – |
| 21. | *Coxliella annulata* | + | + | – |
| 22. | *Eutintinnus tenuis* | – | + | – |
| 23. | *Dadayiella bulbosa* | + | + | + |
| 24. | *Favella brevis* | – | + | + |
| 25. | *Favella philippinensis* | – | + | – |
| 26. | *Helicostomella longa* | + | + | + |
| 27. | *Rhabdonella spiralis* | + | + | + |
| | | **Rotifera** | | |
| 28. | *Brachionus plicatilis* | + | + | + |
| 29. | *B. argularis* | + | + | + |
| 30. | *B. urceolaris* | + | + | – |
| 31. | *Cephalodella gibba* | + | + | – |
| 32. | *Manostyla bulla* | – | + | – |
| | | **Foraminifera** | | |
| 33. | *Globigerina rubescens* | + | + | – |
| 34. | *G. plicatilis* | + | + | – |
| | | **Radiolaria** | | |
| 35. | *Acantaria* sps. | + | + | + |
| | | **Ciliata** | | |
| 36. | *Halteria chlorelligera* | + | + | + |
| 37. | *Lohmaniella spiralis* | – | + | – |

| S. No. | Species | Rainy Season | Pre-summer Season | Summer Season |
|---|---|---|---|---|
| | **Copepod nauplius** | | | |
| 38. | *Copepod nauplius* | + | + | + |

***Note*: '+' represents Presence; '–' represents Absence**

**Table-2 shows the average diversity index of microzooplankton**

| S. No. | Details | Rainy Season | Pre-summer Season | Summer Season |
|---|---|---|---|---|
| 1. | Diversity index (H) | 2.10 | 3.62 | 3.00 |
| 2. | Species Evenness (j) | 0.56 | 0.87 | 0.68 |
| 3. | Species Richness (S) | 0.94 | 2.20 | 1.20 |

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