

## Distribution and abundance of zooplankton in Muttukadu backwater, Chennai.

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Documents/RA0157.pdf](http://jresearchbiology.com/Documents/RA0157.pdf)**ABSTRACT:**

The present work aims to study the zooplankton distribution and abundance in Muttukadu backwater, Chennai, East coast of India from December 2008 to May 2010. We have recorded 46 species of which, 31 species belongs to copepoda, 9 species belongs to Rotifera, 2 species belongs to Ostracoda, four species of Cladocera. Among zooplankton, particularly Rotifera was the dominant group throughout the study period and highest count was recorded in the month of January, 2008. Percentage composition and Shannon diversity index is also presented for zooplankton community.

**Keywords:**

Zooplankton, Distribution, Muttukadu backwater, Shannon wiener index, Percentage composition.

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## INTRODUCTION

Tropical aquatic ecosystems are more productive areas with rich zooplankton population. Information on species diversity, richness, evenness and dominance evaluation on the biological components of the ecosystem is essential to understand detrimental changes in environs (Perumal et al, 2009). The study of estuarine fauna especially zooplankton, constitutes a sensitive tool for monitoring environmental changes in coastal lagoons. It plays a major role in the functioning and the productivity of aquatic ecosystems through its impact on the nutrient dynamics and its key position in the food webs. They also constitute a food source for organisms of the upper trophic levels such as planktivorous fish and carnivorous invertebrates (Pinel-Alloul, 1995). The examination of variation in zooplankton assemblage composition according to environmental gradients may help to clarify the role of biotic and abiotic factors for community organization a major issue in aquatic ecology. Indeed, zooplankton generation times may be short enough to respond quickly to acute stress but long enough to integrate the effects of chronic problems. These are favorable attributes for a community indicator of ecosystem health (Cairns et al, 1993). Zooplankton can also be used as biological indicators for pollution, water quality, and eutrophication (Webber et al, 2005; Landa et al, 2007).

Species composition and seasonal variation of zooplankton abundance has been studied by many authors in different regions of Indian coastal waters (Achuthankutty et al, 1980; Nair et al, 1981; Godhantaraman, 2001; Eswari and Ramanibai, 2004; Ashok Prabu et al, 2005; Rakhesh et al, 2006; Elayaraja and Ramanibai, 2006) but there are few works has been carried out in Muttukadu backwater related to zooplankton abundance in relation with water quality and other aspects (Prema and Subramanian, 2003; Chitra 2006, 2008,2008 & 2009; Elayaraja, 2008; Bharathi Devi, 2010). The present study deals with the species distribution and abundance of zooplankton from Muttukadu backwater. This information would be helpful in the ecological monitoring of this ecosystem in future.

## MATERIALS AND METHODS

Muttukadu (Kovalam) backwater (lat.12° 46'N and long. 80° 18'E) is located at 36 km south of the Chennai city and runs parallel to the east coast, the Bay of Bengal. It is also called as estuary, creek or lagoon. Muttukadu backwater form a

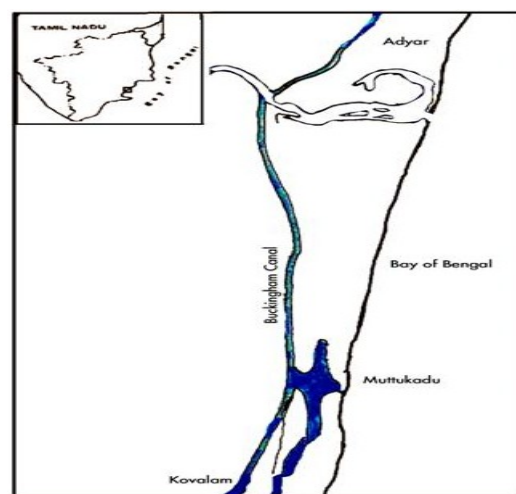
complex system of shallow estuarine network spread over an area of 215.36 acres (87.190 hectares) meant for fishing and boating activities. The backwater extended to north and southwards for about 15 Km and opens into the Bay of Bengal at its eastern end. The bar mouth acts as a barrier and the sea water infiltrates into the land which is the main source for the prawn hatcheries mostly situated in this area.

Tamilnadu Tourism Development Corporation (TTDC) initiated boating activities and declared it as a tourist spot. Several salt pans are also located along the backwaters. The average depth of the water found to be 1.16 m extends to a distance of about 20 Km. Depth varied throughout the year depending on rainfall and outflow of water from the sea during high tide period. It receives considerable amount of sewage, industrial effluents, hazardous wastes, human influences and urban runoff (**Fig.1**).

Bimonthly sampling was carried out in Muttukadu estuary from December 2008 to May 2010. Three locations were selected at the interval of 100 m between each location from the mouth of the estuary extends up to the boat house. The period of sampling covered six seasons namely two Post-monsoons (Jan – Mar, 09 & 10), two Summer (Apr – Jun, 09 & 10), one Pre-monsoon (Jul – Sep, 09) and 2 Monsoon ( Dec 08 & Oct - Dec 09).

For qualitative and quantitative analysis of zooplankton, circular metallic frame of 0.0176 m<sup>2</sup> area was employed for the collection. The filtering cone was made up of nylon bolting silk plankton net with a mesh size 120 µm was used for the collection of zooplankton by hauling each time for five to ten minutes. The collected samples were preserved in 5%

**Fig.1 Study area**





buffered formalin for further analysis. Zooplankton was identified using the standard keys given by Edmondson (1959); Kasturirangan (1963); Newell and Newell (1977); Victor and Fernando (1979); Sharma and Michael (1980); Battish (1992). For quantitative analysis, zooplankton samples were used after sedimentation and counted under binocular microscope using Sedgewick Rafter Cell counter. The values were expressed as individuals/ m<sup>3</sup> (ind./ m<sup>3</sup>) using the formula given by Santhanam et al (1989).

Shannon wiener diversity index and percentage composition were calculated for zooplankton abundance using SPSS v10.

## RESULTS AND DISCUSSION

The zooplankton of Muttukadu estuary was clumped into four major groups Copepods, Cladocera, Ostracods and Rotifers, the total of 46

zooplankton species, comprising of Copepods (31 species), Rotifers (9 species), Ostracods (2 species), Cladocerans (4 species) were recorded in the backwater (**Table.1**). Among the rotifers *Brachionus plicatilis*, *B. rubens*, *B.angularis*, *B.bidentata* along with their egg sacs were frequently recorded as dominant. The percentage composition of rotifers accounted from 12% (Summer, 2010) to 43% (Post- monsoon, 2009) and it forms the most abundant group in Muttukadu estuary by representing an average value of 7, 17, 000 ind. /m<sup>3</sup> in post monsoon, 10 (**Fig.2D**).

Among copepods *Oithona brevicornis*, *O. rigida*, nauplii and copepodites of cyclopoida, *Paracalanus parvus*, copepodites of calanoida, and *Onychocamptus bengalensis* along with nauplii and copepodites of harpacticoida were recorded frequently. The average copepod abundance was also high (1,80,700 ind. /m<sup>3</sup>). The composition of

**Table 1. List if Zooplankotons identified in the surface water samples of Muttukadu backwater**

<i>Calanoida</i>	<i>Cladoceran</i>
<i>Acartia discaudata</i>	<i>Ceriodaphnia Cornuta</i>
<i>Acrocalanus Gibber</i>	<i>Diaphanosoma sp</i>
<i>Acrocalanus gracilis</i>	<i>Moina micrura</i>
<i>Diaptomus sp</i>	<i>Podon sp</i>
<i>Metacalanus aurivili</i>	
<i>Nannocalanus minor</i>	<i>Rotifera</i>
<i>Paracalanus parvus</i>	<i>Branchionus angularis</i>
<i>Pseudodiaptomus annandalei</i>	<i>Branchionus bidentata</i>
<i>Pseudodiaptomus aurivili</i>	<i>Branchionus calyciflorus</i>
<i>Pseudodiaptomus serricadatus</i>	<i>Branchionus forficula</i>
<i>Scolecithnx danae</i>	<i>Brachionus falcatus</i>
	<i>Branchionus plicatilis</i>
<i>Cyclopoida</i>	<i>Brachionus quadridentatus</i>
<i>Cyclopoida copepodite</i>	<i>Branchionus rubens</i>
<i>Halicyclops sp</i>	<i>Cephalodella forficula</i>
<i>Mesocyclops aspericornis</i>	
<i>Mesocyclops hyalinus</i>	<i>Ostracoda</i>
<i>Mesocyclops leuckartii</i>	<i>Cypris subglobosa</i>
<i>Microcyclops minutes</i>	<i>Stenocypris major</i>
<i>Microcyclops varicans</i>	
<i>Oithona brevicornis</i>	<i>Harpacticoida</i>
<i>Oithona linearis</i>	<i>Euterpina acutifrons</i>
<i>Oithona rigida</i>	<i>Longipedia weberi</i>
<i>Oithona similis</i>	<i>Onychocamptus bengalensis</i>
<i>Oithona spinorostris</i>	
<i>Oncaea venusta</i>	
<i>Thermocyclops decipiens</i>	
<i>Thermocyclops sp</i>	

cyclopoid ranged from 28% (Post monsoon 09) to 49% (Summer 2010). Calanoid were accounted from 10 % (Summer and Premonsoon 09) to 33% (Monsoon 08) and Harpacticoids were 11% (Summer 2010) to 7% (Premonsoon,09 and Post monsoon ,09 &10) (Fig. 2A-C ). The copepods and rotifers were more in abundance during the post monsoon compared to the other seasons. The quantitative analysis of changes in zooplankton abundance and community structure in the Bornholm bay, over a full seasonal cycle of cyclopoid copepod *Oithona similis* in the spatio temporal pattern and suggested a possible decade-scale shift in zooplankton community was investigated by Hansen *et al.* (2004).

Ostracoda occupied third position of zooplankton and represented 2% (Pre monsoon, 09 and Summer 10) and to 5% (Monsoon 08). The average abundance of the Ostracoda group was 29,400 ind. /m<sup>3</sup> in all the seasons (Fig. 2E & 3F). The distribution of ostracods was related to the

depth of water, sedimentological aspects, organic matter and carbonate distribution. His observations revealed that the linear and multiple correlations resulted in depth favored the increased population of ostracods was reported by Reghunath *et al.* (1999). Only *Cypris subglobosa* and *Stenocypris major* are contributed from ostracods during the study period.

The composition of cladocera was ranged from 0% (Monsoon 08) to 7 % (Summer 2009) and it was completely absent in Dec 08, Jan, June, Oct, Dec of 2009 and Jan, April, May of 2010. *Moina micrura*, *Diaphanosoma sp.*, *ceriodaphnia cornuta* were recorded frequently during the study. The average number of cladocerans were recorded as 33,200 ind. /m<sup>3</sup> (Summer 09) to 7,600 ind. /m<sup>3</sup> (Post monsoon 09) (Fig. 2F & 3E). The zooplankton of temperate bay and estuaries were typically high in abundance and low in diversity than zooplankton of adjacent neritic waters was suggested by Chandramohan *et al.* (1999). They

Fig. 2 (A-F) Percentage composition of Zooplankton

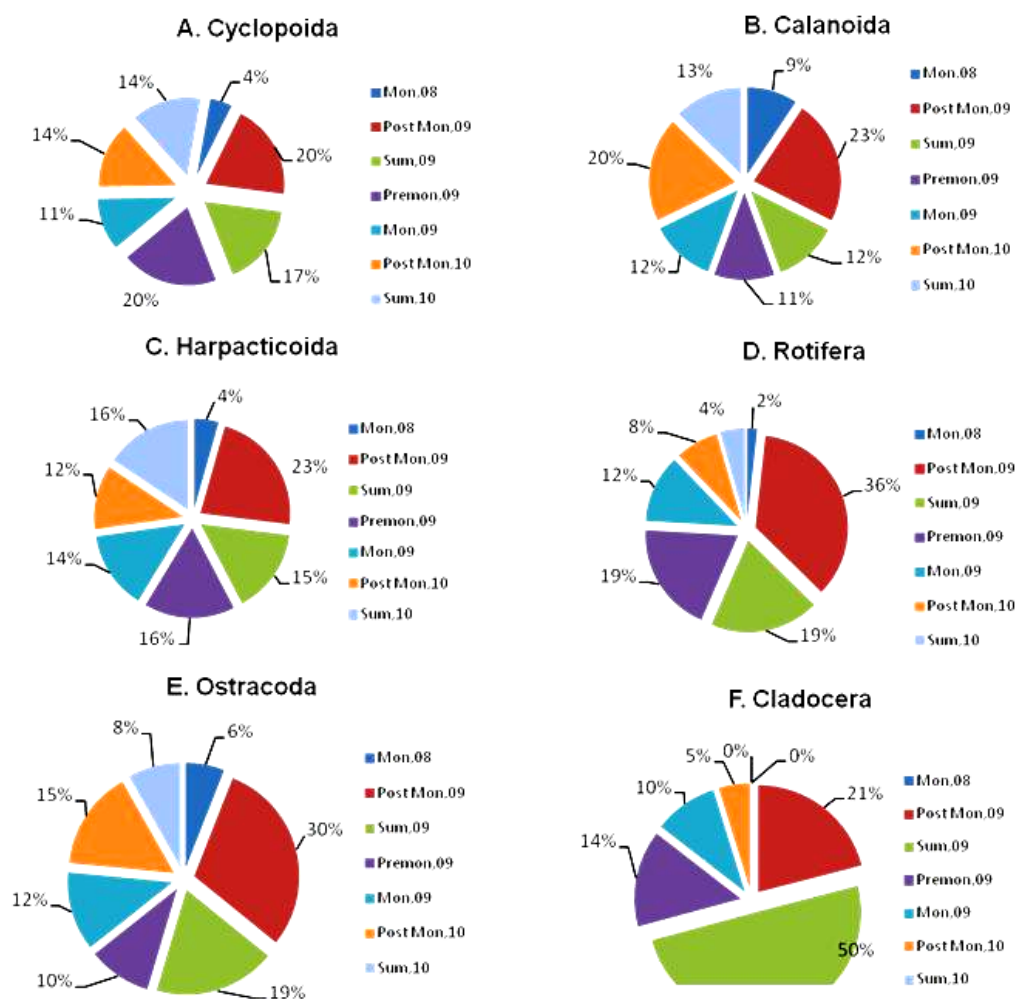
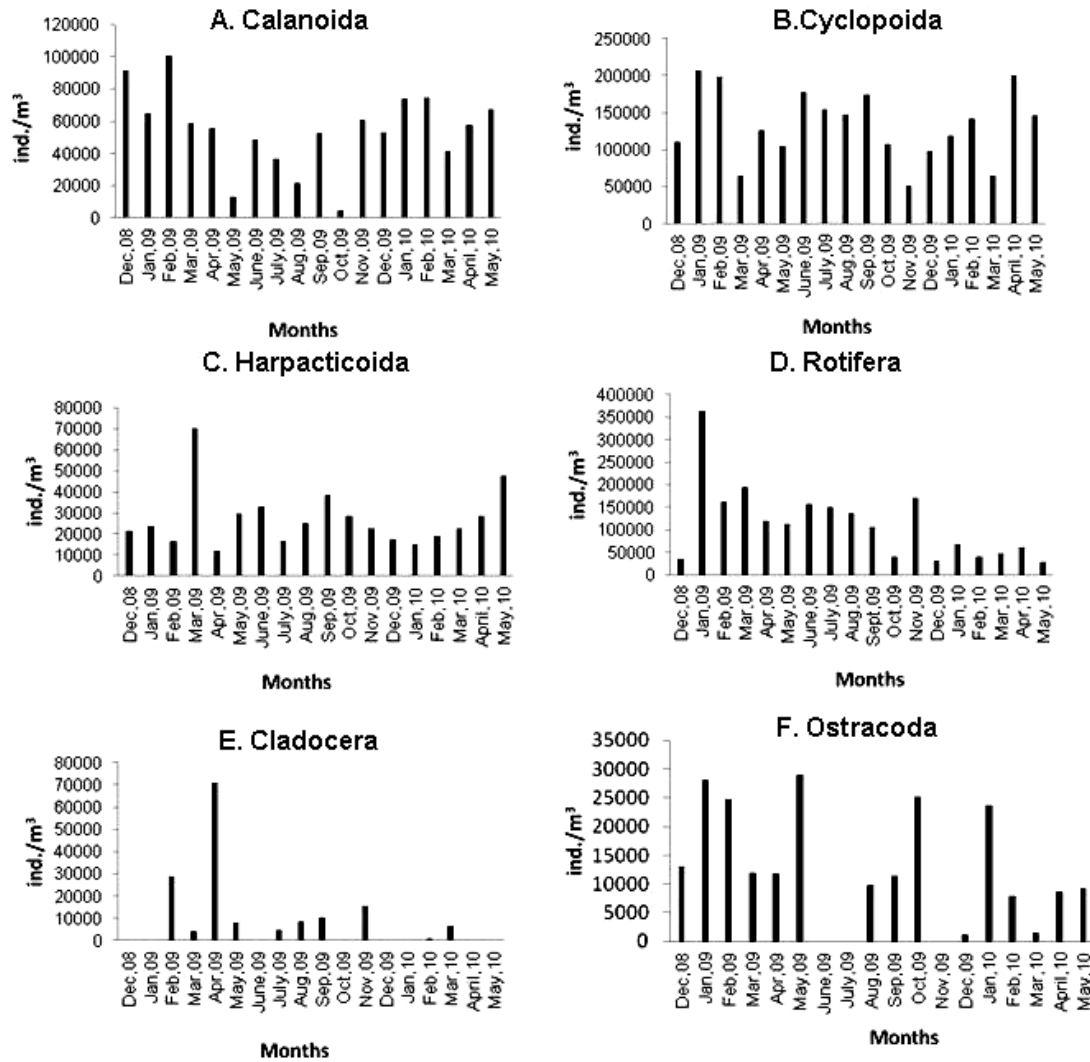




Fig. 3 (A-F): Abundance of Zooplankton in Muttukadu Backwater



further stated that bay fauna was typically dominated by one or two ubiquitous species like *Acartia* sp., *Paracalanus* sp., *Oithona* sp. and *Centropages* sp.

From the study, the percentage composition and abundance of zooplankton group was classified in the order as follows: Rotifers < Copepods < Ostracods < Cladocerans. Shannon wiener index (H') was used to measure the zooplankton diversity. The Shannon diversity indices applied to zooplankton abundance data. The zooplankton diversity at Muttukadu backwater varied from 0.665 to 1.149. The minimum species diversity was observed at station two and maximum at station three. The monthly variation of zooplankton at Muttukadu backwater was recorded between 0.40 (May 2009) to 0.474 (September

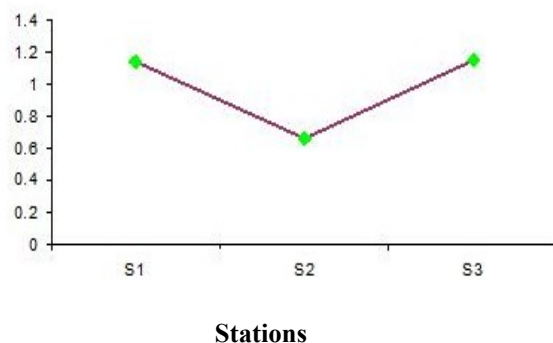
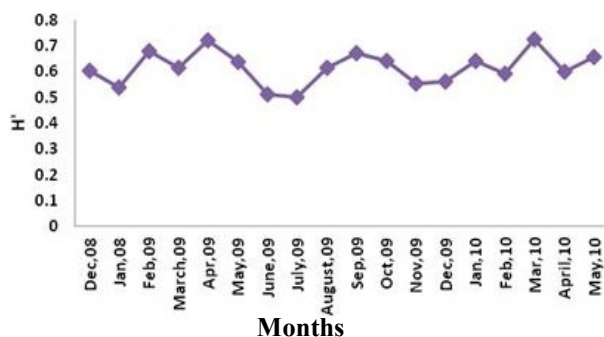
2009 and February 2010). The results indicate that the maximum number of species occurred at station 3 that other stations (Fig. 4a&b).

**CONCLUSION**

There is an increasing interest sparked in the commercial culture of various marine fish species that led to technological improvements in copepod culture aspects which leads to the thrust on the study of zooplankton diversity in the Muttukadu backwater. It is highly influenced by human activities and largely engaged with aquacultural farms.

The present study will provide the needed information on species composition, distribution and diversity of zooplankton. This information would be helpful in the ecological monitoring of

Fig. 4 (a&amp;b) Shannon Wiener Indices for Zooplankton



this ecosystem in future.

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