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Zooplankton abundance in the Mangroves of Muthupet, South East coast of Tamil Nadu, India

Saravanan Marimuthu, Maharajan Athisuyambulingam*
PG & Research Department of Zoology, Khadir Mohideen College, Adirampattinam, Thanjavur, Tamil Nadu. (Affiliated to Bharathidasan University, Tiruchirappalli).
***Corresponding Author:** drathimaha@gmail.com

Abstract
Zooplankton abundance at three locations along the South east coast of Tamil Nadu near the Muthupet mangroves were investigated from July 2021 to June 2022. There were 72 zooplankton species found. Copepods, Foraminifera, Ciliata, Polychaetes, Chaetognatha, Cyclopoida, Rotifera, Cladoceran, Decapoda, Larva, Cumacea, and Tentaculata were the main zooplankton taxa found. The highest percentage was seen in Copepoda. It is clear from the biodiversity analysis that the Muthupet mangroves serve as a home for a diverse and rich zooplankton composition. This research may provide essential details for managing mangroves and protecting inshore habitats.

Keywords: mangrove, zooplankton, abundance

Introduction
In aquatic food webs, zooplankton is crucial as both a supply of organic material for the biological pump and a pathway for consumers on higher trophic levels, such as fish. For accurately forecasting the productivity of the region and its potential for fisheries, studies on the species composition of zooplankton and seasonal fluctuations in an estuarine environment are absolutely essential. Understanding patterns of species variety and abundance in communities and ecosystems is a key objective of ecology. The patterns of biodiversity and productivity in mangrove environments have been extensively studied.

One of the most productive and physiologically varied ecosystems on earth is the mangrove. They are believed to preserve the habitat for fish at various phases of their life cycles as well as the water quality, nutrient balances, hydrodynamic properties, and water quality (Nickerson, 1999) [11]. The zooplankton of mangroves are an important part of the trophic structure and should be equally regarded within the research, even if the relevance of mangroves as a nursery location for fish and prawn species has been a focus for research (Beck *et al*, 2001) [3]. Despite playing a crucial trophic role as a bridge between lower consumers like fish and alternative carbon sources (detritus), zooplankton's function in mangroves is little unclear (McKinnon & Klumpp, 1998) [12]. Mangrove river ways may have up to a one order of magnitude higher abundance than the nearby coastal seas. The trophic relationships seen in mangrove systems, particularly those that are home to young fish, are still poorly understood. This is a challenge for those trying to manage mangrove ecosystems effectively since, due to ignorance, seemingly insignificant inputs may have significant effects.

Copepods made up up to 95% of the zooplankton in Indian mangroves during various seasons (Kathiresan, 2000) [8]. In an estuary setting, zooplankton serves as both a primary consumer and a biological indicator of the water quality. It also maintains biological balance. The study and observation of plankton is very beneficial for controlling the physio-chemical and biological conditions of the water in aquatic ecosystems. To determine a region's exploitable fish resource, one might assess the rate of zooplankton production. Zooplankton production is highest in tropical aquatic habitats. The inflow of energy and organic matter from coastal waters may be associated to high zooplankton biomass productivity. The purpose of this study is to identify the seasonal quantity and distribution of zooplankton that live in the Muthupet mangroves' river runoff areas.

Materials and Methods
Study area
Three stations, Pettai (Station 1), Puthankottakam (Station 2), and Thottam (Station 3), make up the study area Muthupet Mangrove (Plate 1 & 2).

Fig 1: Study area at various locations near the Muthupet mangroves

Plate 2: Muthupet Mangroves

Fig 3: Plankton collection in Mangroves

Collection of Zooplanktons

Zooplankton was collected using plankton nets (Plate 3). The employed plankton nets come in a variety of shapes and sizes, but they can be essentially divided into two categories: open nets, which are mostly used for horizontal and oblique hauls, and closed nets with messengers, which are used to collect vertical samples from desired depths. The plankton net typically consists of a ring, a filtering cone, and a collecting bucket and is composed of nylon, bolting silk, or another synthetic material. The collection container needs to be sturdy and detachable from the net. This technology filters more water, and the equipment can be used for both qualitative and quantitative research. The sort of zooplankton that is caught will depend on the netting material's mesh size. There are several mesh sizes available, ranging from the smallest to the largest pore sizes. Zooplankton is typically collected using monofilament nylon with a mesh size of 0.2 mm for taxonomic and productivity research. The kind, length, mouth area, towing speed, period of collection, and type of haul, in addition to mesh size, will impact the quality and quantity of zooplankton gathered. Zooplankton that will be used for taxonomic research can be treated and kept right away to avoid bacterial action, cannibalism, or chemical deterioration. Fixation kills the organism while preserving its morphological traits, while preservation keeps the fixed state for an extended length of time. Using a compound microscope and a light microscope, the samples were qualitatively inspected to look at different zooplankton species (Goswami & Mankodi, 2012) [6]. Formaldehyde, which is used for fixing and preservation most frequently (4-5%). It is possible to separate the zooplankton sample from larger zooplankters (macro zooplankters), including medusae, ctenophores, fish larvae, slaps, and siphonophores. Several zooplankton identification manuals were used to identify the zooplankton (Thorp & Covich, 2009; Phan *et al*., 2015; Khan, 2003) [19,15, 9]

Results

All three of the stations in the study region, the Muthupet mangroves, are rich in copepods, foraminiferans, ciliates, rotifers, cladocerans, decapod larvae, etc (Table.1) There were 72 zooplankton species found. Copepods, Foraminifera, Ciliata, Polychaetes, Chaetognatha, Cyclopoida, Rotifera, Cladoceran, Decapoda, Larva, Cumacea, and Tentaculata were the main zooplankton taxa found. A total of 28 species from different genera were found. Ten species of Rotifera, four species of Cladocera, one species of Tentaculata, one species of Cumacea, one species of Decapoda, and seven species of crustacean larvae were identified. There were also four species of ciliates, two species of polychaete larvae, three species of chaetognatha, three species of cyclopoida, and four species of ciliates. It was discovered that the zooplankton composition varied among the several locations in the mangrove area.

Discussion

Zooplankton abundance was employed by Paul *et al*., (2016) [14] to assess a biotic stressor in a temperate estuary habitat. The absence of some species or a drop in population density of species that are already present may be caused by the presence of inorganic or organic contaminants (Mahdy, 2005) [10]. In the mangrove and salt marsh habitats in the estuary area of Bakkhali, Cox's Bazar, Bangladesh, twelve taxonomic categories of zooplankton were discovered (Abuhena *et al*., 2016) [1]. This figure was greater than the six zooplankton taxa that Ali *et al*. (1985) had noted. The tidal current, food availability, wind direction, and river discharge, which control the variety of zooplankton in the estuarine environment, may be responsible for this (Osore *et al*., 2004) [13].

According to Ali *et al*., (1985) [2], zooplankton was most abundant during the monsoon and least abundant in the fall and winter. The density of zooplankton and copepods in Indian estuaries, including those in the Porto Novo waters (Subbaraj & Krishnamurthy, 1972; Thangaraj, 1984) [17, 18] and the Agniar estuary, is the subject of extensive research (Habib Mohamed & Abdul Rahaman, 1987) [7]. In Muthupet Estuary, there were noticeable seasonal variations in the zooplankton. The research of various writers has shown that the plankton varies greatly in both quality and quantity from location to location and throughout time

Copepods made up a large portion of the zooplankton population in the current study, and similar observations were made in the Vellar estuary (Chandran, 1982) [4], the Ashtamudi estuary (Divakaran *et al*., 1982) [5], and the Agni estuary (Santhanam *et al*., 1975) [16]. The zooplankton distribution in Muthupet estuary was similar to that (Habib Mohamed & Abdul Rahaman, 1987) [7]. The zooplankton play a significant ecological role in mangrove ecosystems because these ecosystems serve as the feeding, breeding, and nursery grounds for numerous fin and shellfish species. Young fin fish and shellfish species (meroplankton/larvae) spend the majority of their lives in brackish waters before migrating to the sea as adults. Zooplankton thus control the quantity of fish stock.

Table 1: Check list for Zooplankton groups in Muthupet mangrove water

Zooplankton species	Station 1	Station 2	Station 3
Copepoda			
Acaritia danae	-	-	+
A.spinicadua	+	+	+
A. erythraea	-	-	+
Acrocalauus gibber	+	+	+
Centropages furcatus	-	+	+
C. orsinii	-	-	+
Eucalanus crassus	+	+	+
E. elongates	+	+	+
E.marina	+	+	+
E. monachus	+	+	+
Paracalanus parvus	-	-	+
Pontella brevicornis	+	-	+
Temora discaudata	+	+	+
T. turbinate	+	+	+

Oithona rigida	-	+	+
Oithona simplex	-	+	+
O. plumifera	-	+	+
O. lineari	+	-	+
O. rigida	-	+	+
Eucyclops sp.	+	+	+
Microsetella rosea	+	+	+
Euchaeta marina	+	+	+
Calanoid sp.	+	-	-
Pseudodiaptomus Serricadatus	-	+	+
P. elongates	+	+	+
Labidocera acuta	-	-	+
Centropages furcatus	-	-	+
Foraminifera			
Globigerina bulloides	-	-	+
Globigerina opima	+	-	-
Tintinnopsis beroidea	-	+	+
Tintinnopsis butchi	+	-	+
Globigerima rubescens	+	+	-
Rhabdonella lohman	-	-	+
Codonellopsis ostenfeldi	+	-	+
Tintinnopsis minute	+	-	-
Ciliata			
Eutinitinnus tenuis	-	-	+
Favella brevis	-	+	+
Tintinnopsis brindle	+	-	+
T. minute	-	+	+
Polychate larvae			
Chaetopterus sp.	-	-	+
Ophiodromus sp.	+	-	+
Chaetognatha			
Sagitta serratodenta	-		+
S. enflata	-	+	-
Sagitta sp.	+	-	+
Cyclopoida			
Oncaea venusta	+	-	+
Oithona brevicornis	-	+	+
Coryeasus danae	-	-	+
Rotifers			
Europris fissa	-	-	+
Branchionus rubens	+	+	+
Keratella tropica	+	-	+
Branchionus calcifloris	-	+	-
Cupeopasis vorax	-	-	+
Filinia longiseta	+	-	-
Keratella cochlearis	-	+	+
Monostyla bulla	-	-	+
Keratella tropica	-	-	+
Cladocera			
Penilia sps.	-	+	+
Bosmina Longirostris	+	+	-
Moina brachiata	-	-	+
Daphnia carinata	+	+	-
Tentaculata			
Pleurobrachia globosa	+	+	+
Cumaceae			
Paradiastylis sp.	+	+	+
Decapoda			
Lucifer hansenii	+	+	+
Larvae			
Alma larvae	-	+	+
Megalopa larva	+	+	+
Crustacean naupli	+	-	+
Phyllosoama larvae	-	-	+
Euphausid larvae	+	+	+
Copepod larvae	-	+	+
Mysis larvae	+	+	+

+ = Present; - = Absent

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References

1. Abu Hena MK, Japar Sidik B, Idris MH, Johan I, Nesarul NH, Aysha A, Islam MS. Seasonal distribution of zooplankton composition and abundance in a sub-tropical mangrove and salt marsh estuary. *Malay.* Jour.of Scien.,2016:35(2):257-270.
2. Ali A, Sukanta S, Mahmood N. Seasonal abundance of plankton in Moheskhali channel, Bay of Bengal. *In Proceeding of SAARC Seminar on Protection of Environment from Degradation*, 1985, 128-140.
3. Beck MW, Heck KL, Able KW, Childers DL, Eggleston DB, Gillanders BM *et al.* The identification, conservation and management of estuarine and marine nurseries for fish and invertebrates. *Bioscience,*2001:51(8):633- 641.
4. Chandran R. Hydro biological studies in the gradient zone of the Vellar estuary. Ph.D., Thesis, Annamalai University, India, 1982, 1-158.
5. Divakaran O, Arunachalam M, Nair NB, Balasubramaniyan NK. Distribution and seasonal variation of the zooplankton of Ashtamudi lake, South West Coast of India. *Mahasagar. Bull. Natn. Inst. Oceanogr*, 1982, 15-43.
6. Goswami AP, Mankod PC. Study on Zooplankton of Fresh Water Reservoir Nyari – II Rajkot district, Gujarat, India. Journal of Biological Sciences,2012:1(1):30-34.
7. Habib Mohamed TAM, Abdul Rahman A. Seasonal distribution of plankton in Agniar estuary. *J. Mar. Biol. Ass. India*,1987:29(1-2):273-279.
8. Kathiresan K. A review of studies on Pichavaram mangrove, southeast India. *Hydrobiologia*,2000:430:185-205.
9. Khan RA. Faunal Diversity of Zooplankton in freshwater wetlands of South-eastern West Bengal. (Published by the Director, Zool. Survey of India, Kolkata) *Rec. zool. Surv. India*, 2003:204:1-107.
10. Mahdy AA. Taxonomical and Ecological studies on Marine Zooplankton of the Red Sea, Egypt. Msc. Thesis, Al Azhar University, Assiut, Egypt, 2005, 1-208.
11. Nickerson DJ. Trade-offs of mangrove area development in the Philippines. *Ecological Economics*,1999:28:279-298.
12. McKinnon AD, Klumpp DW. Mangrove zooplankton of North Queensland, Australia I. Plankton community structure and environment. *Hydrobiologia*,1998:362:127-143.
13. Osore MKW, Mwaluma JM, Fierset F, Daro MH. Zooplankton composition and abundance in Mida Creek, Kenya. Zoological Studies,2004:43(2):415-424.
14. Paul S, Wooldridge T, Perissinotto R. Evaluation of abiotic stresses of temperate estuaries by using resident zooplankton: A community vs. population approach. Estuarine, Coastal and Shelf Science,2016:170:102-111.
15. Phan DD, Nguyen VK, Le TNN, Dang NT, Ho TH. Identification handbook of freshwater zooplankton of the Mekong River and its tributaries. Mekong River Commission, Vientiane, 2015, 207.
16. Santhanam R, Krishnamurthy K, Raju RCS. Zooplankton of Portonovo, South India. *Bull. Department Mar. Sci*.,1975:7:899- 911.
17. Subbaraju RC, Krishnamurthy K. Ecological aspects of plankton production. *Mar. Biol.*,1972:14:25-31.
18. Thangaraj GS. Ecobiology of the marine zone of the Vellar estuary. Ph.D. Thesis, Annamalai University,1984, 192.
19. Thorp JH, Covich AP. (Eds.) Ecology and classification of North American freshwater invertebrates. Academic press. (Second edition), 2009.