



## Seasonal Variations And Zooplankton Diversity From Mangroves Area, Kakinada District, Andhra Pradesh

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### ABSTRACT

In the present study, the zooplankton diversity and distribution was studied in relation to seasonal variation in the mangrove area, Kakinada District, Andhra Pradesh. Samples were seasonally collected (i.e., monsoon: July-2013 and monsoon: June-2014). A total of 8 groups zooplankton were recorded during this study period. A total of 8 groups of zooplankton belonging to different species were identified. Copepod was found to be the most dominant group and it contributed more than 85% of the total zooplankton collected in this study. Second abundant group Molluscan veligers followed by Chaetognathes, Adult crustaceans, Decapods larvae, Polychaete larvae, Fish eggs and larvae and Cirripede nauplii. The results of present study help to develop an understanding on the zooplankton distribution in mangrove areas, which will form a reliable tool in bio-monitoring studies.

**Keywords:** Zooplankton, Mangroves, Kakinada coast, Seasonal variations

### INTRODUCTION

Zooplankton constitutes a diverse assemblage of microscopic organisms that occupy a crucial intermediate position in the food webs of freshwater, estuarine, and marine ecosystems. In transferring energy from primary producers (photosynthetic protists, bacteria, and single-celled plants) to macroscopic invertebrates and fishes, zooplankton has the capacity to shape the dynamics of entire ecosystems. Zooplankton is one of the four selected bio-indicators (benthic diatom, zooplankton, littoral macro-invertebrate, and benthic macro-invertebrate), used for assessment in ecological health monitoring. They serve as a good indicator of changes in water quality because it is strongly affected by the environment quality [Kumar et. al., 2011 and Sharif, et. al., 2017]. The relationship between phytoplankton and higher trophic levels is not straightforward, as zooplankton is the main energy pathway from phytoplankton to fish [Mitra and Davis and Everett et. al., 2010-7]. The rate of zooplankton production can be used as a tool to estimate the exploitation of fish stocks of an area [Tiwari and Nair 1991]. Studies on estuarine zooplankton population have been made extensively by various researchers from both east and west coast of India [Mathivanan et. al., 2007, Shanthi and Ramanibai 2011, Prabhakar et. al., 2012 and Santhanam et. al., 2012]. However, an understanding and interpretation of zooplankton diversity in mangrove ecosystem in relation to environmental variables (using univariate and multivariate indices) is still scanty and consequently such studies are warranted. Based on the above facts, the present study was undertaken to study the seasonal variation in species composition, diversity and distribution of zooplankton from various zones in Pichavaram mangrove forest, Tamil Nadu, southeast coast of India.

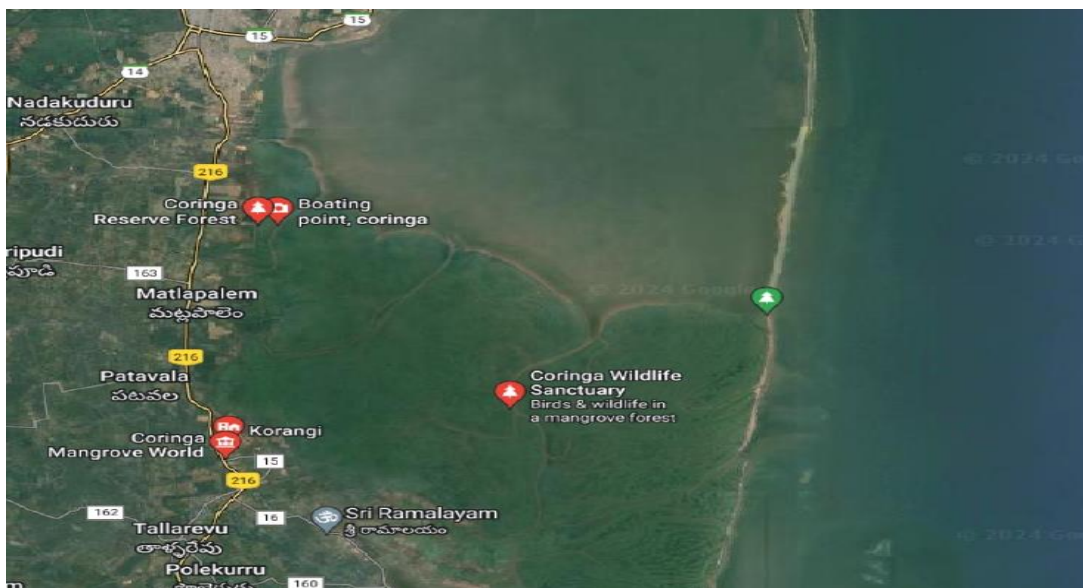
### GODAVARI MANGROVES

In Andhra Pradesh the Godavari wet lands of 33,263 ha are located in the coastal plains of deltaic regions. The river originates at an elevation of 1067m about 75km inland from the west coast of India and flows in a general eastwards direction across the country, over a length of 1465km before joining the Bay of Bengal (Nageswararao, et al, 2005). The Godavari has two active distributaries the Gautami and Vasishtha. The Gautami Godavari opens into the Bay, the largest and most important being Coringa (total length of 26 km) and Gaderu (total length 11 km). The area between the river and Bay is dominated by the extensive Mangrove forests and tidal mudflats. A major part of the Godavari Mangroves is separated from the Bay of Bengal by Kakinada Bay. The agriculture runoff through the creeks of Coringa and Gaderu canals brings dissolved nutrients to the Mangroves. Mangrove ecosystems support a variety of plant and animal species and are highly diverse. Moreover, they serve as nurseries for molluscs, crustaceans, and fishes. In mangrove waters, there are several faunal communities that depend in one way or another on the water element. In India, there are 105 different kinds of fish that live in mangroves.

### MATERIALS AND METHODS

This creek is situated about 4 km away from the Kakinada Bay at let N 16.810675" and long E 82.315781. The depth of the creek is about half meter during ebb period. Total length of the creek is about 6km and ends into mangrove mudflats. The banks are dominated with *Avicennia* and *Exocoecaria* mangrove vegetation. The sampling station is located 1 km

way from the Corangi canal. Agricultural runoff, domestic wastes from the surrounding areas and effluents from the being released into this canal Kakinada Bay waters influence the hydrographical conditions during the flood period and fresh water conditions during the ebb period (Fig. 1).



**Fig. 1: Google satellite map of the Corangi area representing study area and sampling location (Courtesy: Google Earth)**

### SAMPLE COLLECTION AND PRESERVATION

Monthly surface zooplankton samples were made out at the selected six stations in Kakinada Bay and Mangroves Areas. Surface zooplankton samples were collected by employing a 120 m mesh sized net of 40 cm diameter. As soon as the net was hauled the contents in the cod end collector of the net were gently transferred in to a clean polyethylene container and fixed with 5% formaldehyde solution. In the laboratory biomass was measured by the displacement method for the enumeration of Zooplankton aliquot method was employed where the total sampled was sub sampled and 10 ml. aliquot, was taken in to a Petridish provided with a grid, and the major groups of zooplankton were enumerated.

### RESULTS

During the survey, 8 groups of zooplankton belonging to different species were identified. Copepod was found to be the most dominant group and it contributed more than 85% of the total zooplankton collected in this study. Second abundant group Molluscan veligers followed by Chaetognathes, Adult crustaceans, Decapods larvae, Polychaete larvae, Fish eggs and larvae and Cirripede nauplii (Table. 1).

#### Percentage contribution

The study of zooplankton was conducted in the Corangi area and the data was recorded during the period of July 2013-June 2014 (Table 1 and Fig. 2). In the current study, copepods were found most abundant species ranging from 31.2-95.4 percent of total zooplankton species of study area, in which highest percentage was recorded in the month of July (monsoon season) and lowest in February (winter season). Molluscan veligers were the second higher abundant species ranged from 2.4-66.4 percentage with highest value recorded in the month of February (winter season) and lowest in July (monsoon season). Chaetognathes ranges from 0.0-1.5 percentage with highest value recorded in the month of April (pre-monsoon) and lowest in July and February (monsoon and winter). Adult crustaceans ranges from 0.3-5 percentage with highest value recorded in the month of August (monsoon) and lowest in February (winter). Decapods larvae ranges from 0.6-16.4 percentage with highest value recorded in the month of December (winter) and lowest in July (monsoon). Polychaete larvae ranges from 0.1-2.5 percentage with highest value recorded in the month of October (post-monsoon) and lowest in April (pre-monsoon). Fish eggs and larvae ranges from 0.0-0.6 percentage with highest value recorded in the month of August (monsoon) and lowest in April (pre-monsoon). Cirripede nauplii ranges from 0.0-1.2 percentage with highest value recorded in the month of February (winter) and lowest in July (monsoon).

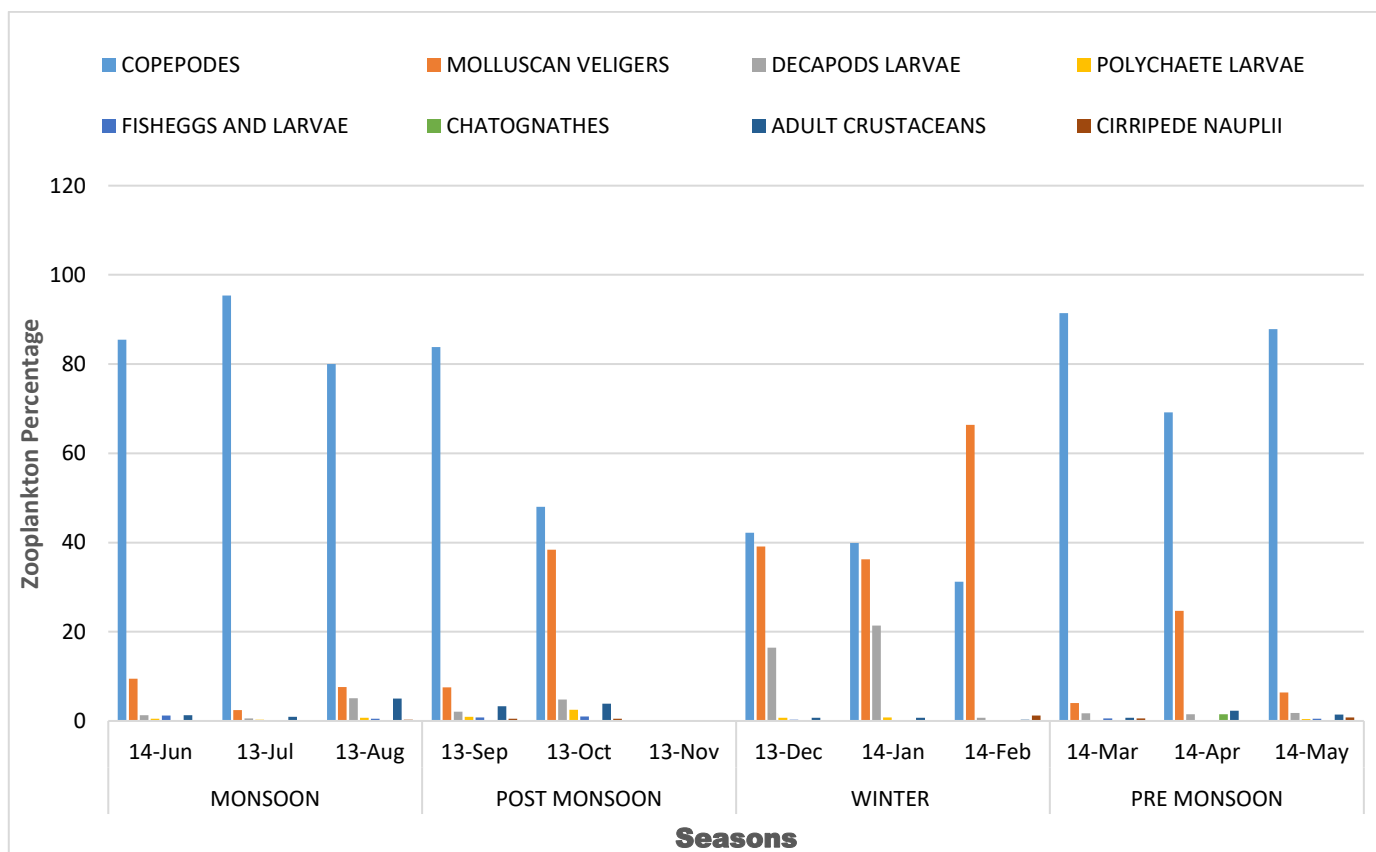
### DISCUSSION

In the present study, abundance and distribution zooplankton was found to be dependent on water quality and coexisting biotic communities at given point of time. The temperature and plankton productivity are positively correlated [Rajasegar et. al., 2000]. During the study period the zooplankton was predominantly by copepods (94.5%). [Ahmad and Siddiqui 1995] Reported copepoda as a dominant group in mangrove forests in Bangladesh. On the contrary, [Chowdhury et. al., 1989 and Mathias, P.M., 1991] found Rotifera as a dominant group of zooplankton in Sundarban mangroves in Bangladesh. A distinct seasonal fluctuation of zooplankton population was observed in this study, which could be due to

the seasonal variation in physico-chemical parameters. Similar observations were reported by [Islam et. al., 2000] from elsewhere. The high zooplankton population density during pre-monsoon and summer could be due to stable condition of hydro chemical parameters [Kumar 1991 and Rajasegar 1998]. The density and species composition of zooplankton showed gradual increase from post-monsoon to pre- monsoon implying that drop down in salinity reduce zooplankton composition and density [Eswari and Ramanibai 2004].

**Table 1:** Seasonal variations and percentage of zooplankton in Corangi area during July 2013- June 2014

	MONSOON			POST MONSOON			WINTER			PRE MONSOON		
	14-Jun	13-Jul	13-Aug	13-Sep	13-Oct	13-Nov	13-Dec	14-Jan	14-Feb	14-Mar	14-Apr	14-May
COPEPODES	85.5	95.4	80	83.8	48	N	42.2	39.9	31.2	91.4	69.2	87.8
MOLLUSCAN VELIGERS	9.5	2.4	7.6	7.5	38.4	O	39.1	36.2	66.4	4	24.7	6.4
DECAPODS LARVAE	1.3	0.6	5.1	2.1	4.8	S	16.4	21.4	0.7	1.7	1.5	1.8
POLYCHAETE LARVAE	0.5	0.3	0.7	0.9	2.5	A	0.7	0.8	0.2	0.2	0.1	0.4
FISHEGGS AND LARVAE	1.2	0.2	0.5	0.8	1	M	0.3	0.2	0.1	0.6	0.2	0.5
CHATOGNATHES	0.2	0	0.08	0.1	0.1	P	0.03	0.03	0	0.1	1.5	0.1
ADULT CRUSTACEANS	1.3	0.9	5	3.3	3.9	L	0.7	0.7	0.3	0.7	2.3	1.4
CIRRIPEDE NAUPLII	0.1	0	0.3	0.5	0.5	I	0.2	0.2	1.2	0.6	0.1	0.8



**Fig. 2:** Seasonal variations and population density of zooplankton in Corangi area during July 2013 to June 2014

**CONCLUSION**

In the present study, efforts were made to explore the zooplankton diversity as well as to determine current status of zooplankton composition in Mangrove area, Kakinada District and Andhra Pradesh. It was found that the faunal composition of zooplankton remained significantly diverse. Copepods emerged as the most dominant group contributing >95% of total population. Occurrence of freshwater zooplankton species signified estuarine influence on the distribution of zooplankton. The results of this study confirmed that the environmental parameters such as salinity, chlorophyll a and nutrients of the ambient medium regulate the zooplankton composition and abundance in this region. This study forms part of the larger exercise only on taxonomy, abundance and periodicity of zooplankton in tropical mangrove ecosystem. However, more such studies are required to make a complete list of zooplankton available in mangrove ecosystem and

also to understand the influence of water quality parameters on the distribution and assemblage of zooplankton in tropical mangrove environment.

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