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Zooplankton characteristics in the Coringa Wild Life Sanctuary of Kakinada Bay

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ABSTRACT

Zooplankton is an important biological component of any aquatic ecosystem. Its high rate of production influences enrichment of organic matter and it plays a vital role in secondary and tertiary productions. Zooplankton in the Indian estuaries had been widely studied. Though extensive studies were made on the distribution of zooplankton of estuarine and coastal waters, studies related to mangrove regions were meager. The mangrove ecosystem in the vicinity of Kakinada Bay is a complex environment since this happens to be a transition zone between limnetic and marine regions of the diverse aquatic regimes. Zooplankton form Gaderu and Coringa rivers of the mangrove area of the Kakinada were collected. The results reveal that during the months of November and December coinciding with the post monsoon period peak abundance of zooplankton was noticed. The post monsoons period is the period of re-colonisation. The meroplankton abundance varied between 25.04 % to 32.35 % in the Gaderu River and the similar observation was noticed in the Coringa River also. Since the mangrove habitat provides the natural nutrients through leaching activity, it supports higher percentages of meroplankton.

Introduction:

The study area is the fertile estuarine ecosystem on the east coast of India, the Godavari estuarine ecosystem, consisting of Kakinada Bay and the surrounding mangrove vegetation. The river Godavari is the second largest river in India (1530 Km). The drainage area is about 2,90,400 km^2. The normal run off from the Godavari is estimated at 4,60,316 million cusec. Meters (Govt. of India Report, 1987). The Kakinada Bay lies between $82^0$14' E and $82^0$22'E longitudes and 16^0.5' N and 17^0 N latitudes has an area of 132 km^2. (Fig1) (Rama Sarma, 1965). The Kakinada Bay acts as the main reservoir for the riverine discharge from Godavari's distributaries. Annual flooding of the rivers during monsoon period is a characteristic feature of many tropical rivers. On account of this the estuaries near the river mouths experience extreme variations in physcio – chemical parameters and biological aspects. All along the east coast of India in Bay of Bengal including the Kakinada region we have two prominent coastal currents during the period of a year . One being southerly current during July-December and the other northerly current during January-June (La Fond, 1954). During the south west Monsoon period (July- September) the waters move in clock wise direction within the Bay. During north east monsoon (December –January) period when the coast has northerly current, with in the Bay the water movement will be counter clock wise in direction. Thus the water movements in Kakinada Bay are influenced by the discharge of water from the rivers and also on the prevailing coastal currents in the environments (Rama Sarma, 1968). Altogether 4 stations were selected for the monthly zooplankton collection two stations each in river Gaderu and Coringa (Fig.2). The station location was precisely determined with the help of a GPS.

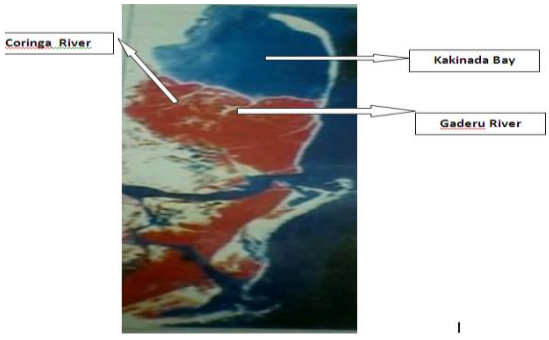

Fig.1: Satellite image showing the study area

Gaderu River:

Station 1 (G1) Lat. $16^0$46 .977 '. Long E $82^0$18.176'

Station 2 (G2) Lat. $16^0$43.774'. Long E $82^0$19.450'

Coringa River:

Station 1 (C1) Lat. $16^0$53.68'. Long E $82^0$21.450'

Station 2 (C2) Lat. $16^0$50.160'. Long E $82^0$04.55'

The stations were selected in such a way that each one represents a unique characteristic with regard to physico-chemical and biological features. The Station I in the river Gaderu and Coringa represents the mangrove habitat. Station II in the Gaderu River is at the confluence of the river Gautami with the Bay of Bengal represents fluctuating hydrographical features on account of the prevailing complex current patterns and tides. The station II in Coringa River represents the fresh water dominant conditions during most part of the year.

Material and Methods:

Monthly surface zooplankton collections were made at the selected stations Gaderu and Coringa Rivers. Surface zooplankton samples were collected by employing a 120ч m mesh sized net of 40 cm diameter net in the Gaderu and Coringa rivers. A TSK flow meter (Model No 411740) was fitted at the opening of the net for the quantification of amount of water filtered through the net. The net was hauled for considerable period i.e., 5-8 minutes, during which period the boat speed was kept constant (3-5 nautical miles/hr). A beach landing craft BLC Sagarika and a fiber glass boat without board motor of 8 HP were employed for the collection of zooplankton samples in different regions.

As soon as the net was hauled the contents in the cod end collector of the net were gently transferred into a clean polythene container and fixed with 5% formaldehyde solution. In the Laboratory biomass was measured by displacement method (UNESCO, 1968, Wickstead, 1965) and expressed as $ml.m^{-3}$. For enumeration of Zooplankton aliquot method was employed (Wickstead,1965), where the total sample was sub sampled and 10 ml aliquot was taken into a petridish provided with a grid, and the major groups of zooplankton was enumerated according to the illustrations given by Wickstead (1965).

Results:

Gaderu River:

Station: 1(G1): During the study period the zooplankton biomass varied between 0.28 $ml.m^{-3}$ and 3.64 $ml.m^{-3}$ with a mean of 0.93±10.82. The numerical abundance varied between 8508 $no.m^{-3}$ and 50341 $no.m^{-3}$ with an mean of 29390±14483. (Table 1)

Station 2 (G2): The biomass values varied between 0.21 $ml.m^{-3}$and 0.96 ml. m^{-3} with a mean of 0.58 ± 0.26. The numerical abundance of zooplankton varied between 6563 $no.m^{-3}$ and 28305 $no.m^{-3}$ with a mean of 16743 ± 8958. (Table 2)

Coringa River:

Station 1 (C1): The zooplankton biomass varied between 0.22 $ml.m^{-3}$ and 4.69 $ml.m^{-3}$with a mean of 1.31 ±1.45. The numerical abundance of zooplankton varied between 11543 $no.m^{-3}$ and 56341 $no.m^{-3}$ with a mean of 29769 ±15845 (Table 3).

Station 2 (C2): The zooplankton biomass varied between 0.44 $ml.m^{-3}$ and 1.36 $ml.m^{-3}$ with a mean of 0.8±0.31.The zooplankton numerical abundance during the study period varied between 11294 $no.m^{-3}$ and 35223 $no.m^{-3}$ with a mean of 23419 ± 8715 (Table 4).

Discussion:

Phytoplankton and Zooplankton play an important role in the biogeochemical cycle due to their accumulation and transfer mechanisms. (Sreenivas N & Anil Kumar P, 2013). With this special feature of Zooplankton studies were made in the mangrove habitat of Godavari estuary.

The extensive area that has been undertaken for study presents a complex environment and in spite of extreme variations in water quality the drifting planktonic organisms exhibit certain definite seasonal pattern and breeding periodicity. This particular feature is the result of their adaptive behavior for survival and maintenance of endemic populations.

The results reveal that the entire Kakinada Bay and mangrove area support high zooplankton populations. The zooplankton composition was mostly dominated by copepods, ranging between 53% to 83% of total population. Estuarine environments exhibited wide range of physical and chemical factors in both time and space, demanding considerable physiological and behavioral plasticity in the organisms which colonize them. Estuaries are among the most productive ecosystems, largely as a result of allochthonous organic matter inputs from surrounding marshes, swamps and inflowing of rivers as well as urban generated organic matter (Laybourn-Parry *et al.*,1992).

In mangrove dominant stations in Gaderu and Coringa Rivers meroplakton abundance was more. A peak in pre – monsoon period and another peak during the post monsoon periods was noticed. The physical factors salinity, temperature and turbidity are the prime influencing factors in limiting the abundance and biomass of zooplankton distribution. The plankton composition also varied spatially since the hydrographical features showed spatial variation and accordingly the zooplankton biomass and numerical abundance were influenced.

The meroplankton abundance was high in the present study; this reveals that the food available in the form of detritus is a favorable factor which attracts most of the decapods larvae to the mangrove region. Detritus

of vegetable origin is rich in the backwaters and creeks of Coringa Wild life sanctuary. In the present observation the meropalnktonic larval composition was dominated by zoeae of crustaceans. The seasonal distribution of larvae, shows the highest abundance coinciding with the reproductive period and the prevailing hydrographical conditions which are highly suitable during that seasons.

The mangrove habitat of Coringa and Gaderu rivers and their narrow creeks supporting mostly meroplankton populations. Here the salinity ranges from that of pure freshwater to that of brackish water conditions. The stagnant waters might represent hypersaline conditions. In the present study all the four stations in the Gaderu and Coring a rivers (Stations G1,G2, C1, and C2) the zooplankton population was mostly supported by the larval forms. The important observations made in this area were the sporadic occurrence of swarms of decapods larvae, gastropod veligers, bivalve veligers during pre monsoon and post monsoon periods. In general the hydrographical conditions prevailing in the mangrove areas and the nature of substratum are known to be suitable for the larvae to survive and grow. In particular the post larval stages of prawns prefer the mangrove areas because of the soft muddy substratum rich with organic matter. The presence of dense vegetation would provide necessary cover as well as support to cling (Rajyalakshmi, 1973). Sri Krishna Das *et.al*.,(1993) from the Porto Novo coastal zone reported that the invertebrate larval contribution to the zooplankton production reached a maximum of 79.59 % with an average of 23.84 %. In Vellar estuary the invertebrate larval contribution was higher than in the near shore waters. Parulekar (1986) while mentioning the characteristic properties of mangroves mentioned that, high organic inputs from decaying mangrove foliage and debris combined with circulation results in the formation of pools of high organic matter in the mangrove sediment. Macnae (1968) in the review on the flora and fauna of mangroves in the Indo west Pacific regions has commented that there exists on all shores of mud or mixed mud and sand, a biota which is not found elsewhere and of which certain elements demand the shelter of vegetation. The faunal and floral elements are always found to be associated with mangroves. Parulekar, (1984) while discussing about the influence of mangroves over the biota of mangroves over the biota dwelling in the area reported that essentially an intertidal littoral area, the mangrove ecosystem subjected to the lack of vigorous water motion, active sedimentation of fine particles and a relatively sheltered location with high detritus content is a stressful habitat which makes the biota either to adapt to the wide range of environmental variations of else evolve mode of life that will minimize the adverse effects. These studies adequately support the presence if meroplankton abundance near mangrove habitats.

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