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ASSEMBLAGES AND DIVERSITY OF PELAGIC LARVAL FORMS OF BENTHIC FAUNA ALONG KOLLAM COAST, KERALA

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Abstract: Intertidal benthic fauna are excellent indicators of environmental stress. Due to differential tolerance and very restricted movements, they are among the most common organisms used to assess anthropogenic impacts. The present study was undertaken to create a baseline dataset of the composition and diversity of pelagic larval forms of benthic fauna along the coast of Kollam. The major physio-chemical parameters influencing the pelagic larval forms of benthic faunal assemblage was also evaluated. The site chosen for the study was Kollam beach (8° 52' 18. 84" N latitude and 76° 35' 40. 54" E longitude). Sampling was carried out during the months of March- June, 2012 between 6.00 am to 9.30am in the morning.A plankton net of mesh size 50µ was used for the collection. The collected samples were carefully transferred to a 5L capacity fish packing cover filled with sea water and transported to the laboratory. Surface water was also collected in plastic bottles and preserved for chemical analysis. The fauna obtained consisted of 48 species, which were Polychaetes, Molluscans, Crustaceans echinoderms, Nemerteans and Vertebrates. Polychaetes were dominant. There is no significant variation in the dissolved oxygen, pH and nutrients (NO_2,NO_3,$PO_4$and SiO_4) of the water samples during the period of study . This may be due to the fact that the collected water samples near shore region where fluctuations in chemical parameters is minimum. There was no correlation between the faunal assemblages and environmental parameters of the water. Season fluctuation of larva was observed with minimum density being recorded in the monsoon season (June). The study highlighted the possibility of environmental pollution along the coast of Kollam. It is high time that the Govt. trained rules and enforced responsible tourism.

Key Words: Benthic fauna, Pelagic larve, Environmental parameters, Pollution

INTRODUCTION

With increasing realization of the economic value and the ecosystem services that are derived from coastal areas, and owing to increasing, humanpopulation,urbanization and accelerated developmental activities, coastal areas are receiving, moreattention and importance in recent years. The intertidal sandy shore is characterized by an unstable substratum namely the sand. The wave action and tides determine the rate of submergence and emergence of the tidal zone and also the degree of exposure of the organisms to desiccation and other conditions of the beaches.

Intertidal benthic fauna are excellent indicators of environmental stress. Due to differential tolerance and very restricted movements, they are among the most common organisms used to assess anthropogenic impacts. Benthic communities are important to marine ecosystem and form important food source for most of the marine organisms especially fishes.

Most marine larvae being capable of dispersing long distances from their actual dispersal distance is a significant challenge due to their microscopic size and the lack of an appropriate larval tracking method. Understanding dispersal distance, however, is important for a variety of reasons, including fisheries management, effective marine reserve design, and control of invasive species.Considerable work on benthic larval ecology has been carried out abroad while in India there is a dearth of literature regarding marine benthic larva (Pechenick, 2011; Tarkowska–kukuryk, 2010; McEdward and Janies, 1997; Giangrande, 1997). The coast of Kollam is a high risk anthropogenic area due to the densely populated coastal hamlets. Investigating the diaspora of marine benthic larva in the intertidal waters would be ecologically productive. The present study is an attempt to map the assemblage and diversity of pelagic larval form of benthic fauna along the coast of Kollam in Kerala.

MATERIALS AND METHODS

Study Site

Kollam Beach: (8° 52' 18. 84" N latitude and 76° 35' 40. 54" E longitude)

Sampling protocol

Sampling was carried out during the months of from March - June, 2012 between 6.00 am to 9.30 am in the morning. A conical shaped plankton net of mesh size 50µ was used for the collection of zooplankton. The net was operated along the intertidal area of Kollam coast. The net was operatedby hauling it fromtheopen sea to the beach using a rope tied to the mouth portion. The collected samples were carefully transferred to a 5L capacity fish packing cover filled with sea water and transported to the laboratory. Aeration was provided using battery operated aerator. Surface water was also collected in plastic bottles and preserved at 4°C for subsequent chemical analysis.

Laboratory Analysis

The collected samples were sieved using a 50µ sieve. The residues retained on the sieve were transferred to a petridish and the zooplankton movement was arrested by adding chilled water for the purpose of live identification. After this, samples were fixed in Rose Bengal solution (1g in 1000ml 4% formaldehyde) and placed in polythene vials for later sorting and identification using standard keys (Shank, 2012).

Hydrological Parameters

The water samples were analyzed for the following physicochemical parameters.

- pH and Salinity were measured in the field itself using a digital p^{H}pen and a mobile water analyzer (Systronics).
- Dissolved oxygen (DO) was estimated by modified Winkler's Iodo metric method (Strickland and Parson, 1972).
- Nutrients (nitrate, nitrite, phosphate, &silicate): The water samples were filtered using 0.45m cellulose nitrate filter paper and used for nutrient analysis.(APHA, 1985)

RESULTS

Analysis of larval forms

The monthly variations of percentage composition is represented in Fig. 2 to 5. The fauna was mainly composed of Polychaetes, molluscs, Crustaceans, Nemertines and Echinoderms . The dominant group comprised the Polychaeta (Plate 1-2).

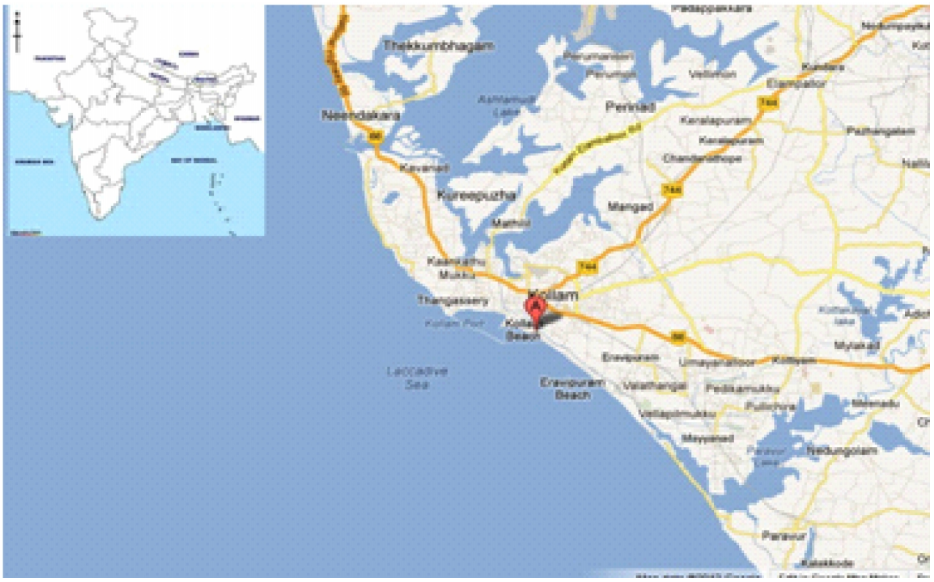


Fig. 1. Study area

Totally 48 species were found during the study period. The abundance and species composition washighest in the month of May and lowest in the month of March. Polychaetes, crustaceans and molluscs were the three major groups present throughout theperiod of study (March – June). Thepremonsoonperiod(April - May) recorded the highest composition of benthic fauna while the monsoon period (June) recorded the lowest.

Analysis of water samples

The physico-chemical parameters of the water samples during the period of study is given in Figs 6 to 12. There is no significant variation in the dissolved oxygen, pH, salinity and nutrients (NO_2, NO_3, PO_4 and SiO_4) of the water samples during the four months of study (P>0.05). This may be due to the fact that the collected water samples are from the near shore region where fluctuations in chemical parameters is minimum.

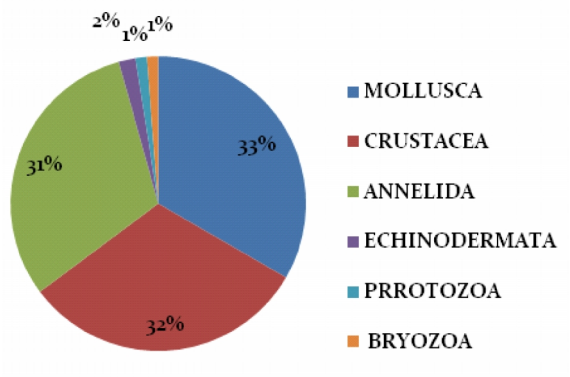


Fig. 2. Variation in the density of larvae in march

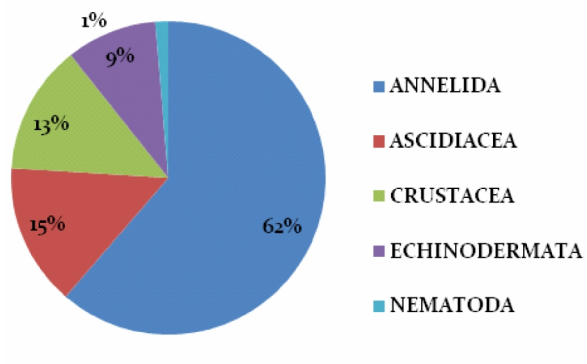


Fig. 3. Variation in the density of larvae

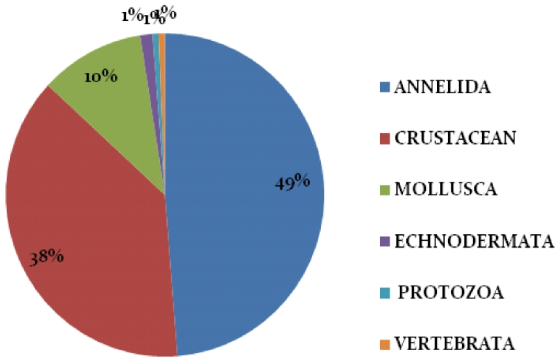


Fig. 4. Variation in the density of larvae in may

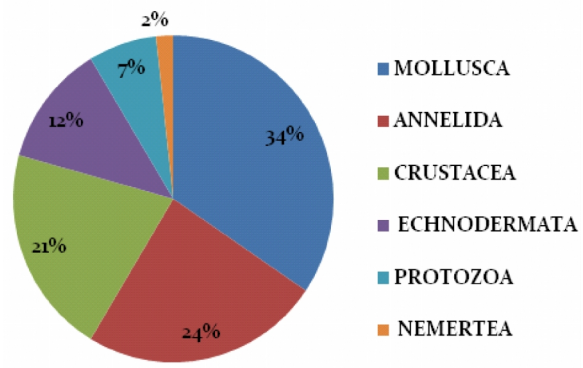


Fig. 5. Variation in the density of larvae in April

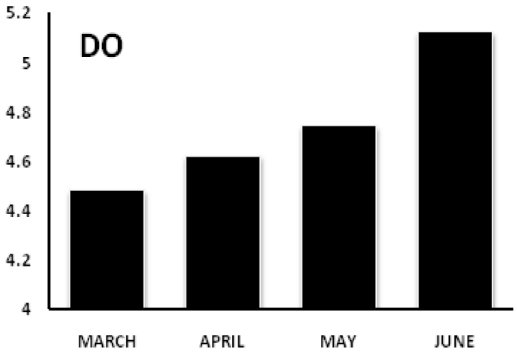


Fig. 6. Variation of Dissolved oxygen

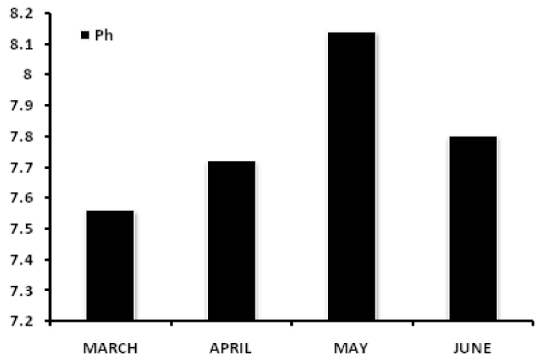


Fig. 7. Variation of pH

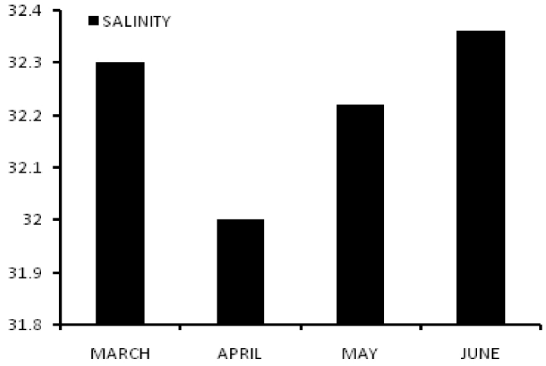


Fig. 8. Variation of salinity

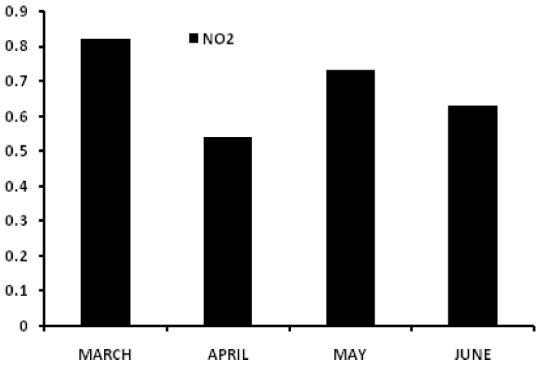


Fig. 9. Variation of NO_2

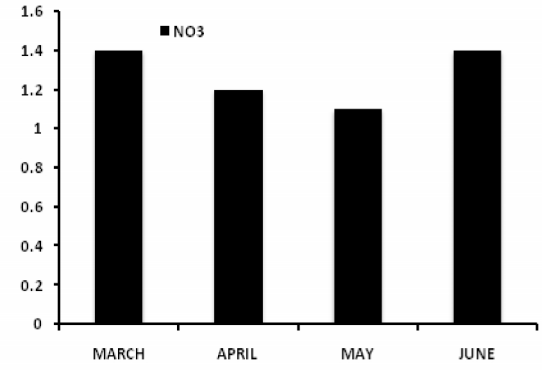


Fig. 10. Variation of NO_3

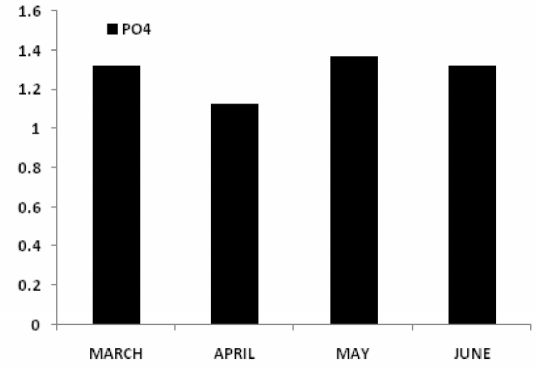


Fig. 11. Variatin of PO_4

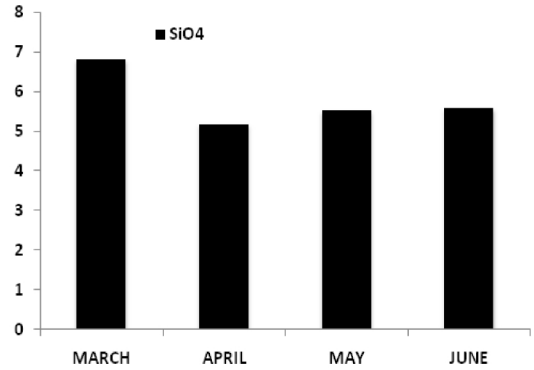


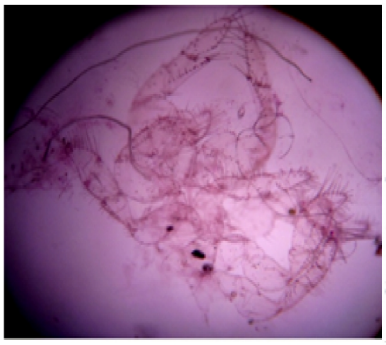
Fig. 12. Variation of SiO_4

DISCUSSION

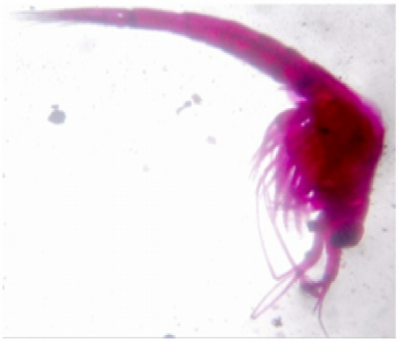
Marine benthic communities are frequently characterized by their number of species, abundance and biomass (SAB). Pearson and Rosenberg (1978) showed that these parameters change in a predictable way along a gradient of disturbance, both in time and space Under low food conditions, SAB is also low and when food is abundant the values of SAB are significantly higher.

Species with free-living larvae would be at a disadvantage if larvae are more susceptible than encapsulated or brooded individuals to environmental stress. Major environmental stresses to which developn~entalstages are potentially exposed include bacterial andviral infection, thermal stress, salinity stress, low oxygen concentrations, chemical pollution, and ultraviolet (UV) irradiation (reviewed by Pechenik, 1987, Morgan, 1995a, Cohen and Strathmann, 1996, Rawlings, 1996). In the present study,a rich pelagic larval diversity of benthic fiuna was recorded. A total of 48 species was obtained during the limited period of study. This comprised Protozoans, Nemertines, Annelids , Urochordates, Crustaceans, Molluscs, Echinoderm and Vertebrates (fish larvae). Polychaetes recorded the highest density in all the four months with the maximum density (62%) during the month of April. Polychaetes are indicators of pollution and their abundance points to organic pollution along the Kollam Coast. The high incidence of Molluscs in March maybe attributed to the substrate texture during that mouth (more sand and less clay). A significant decrease of larval density was seen

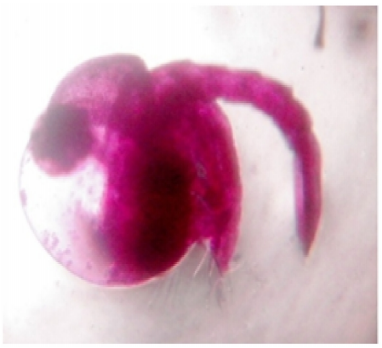
IDENTIFIED LARVAL FORMS



Crab -Megalopa

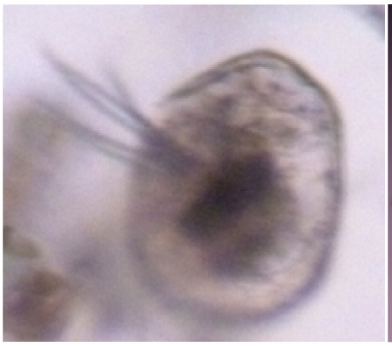


Shrimp mysis

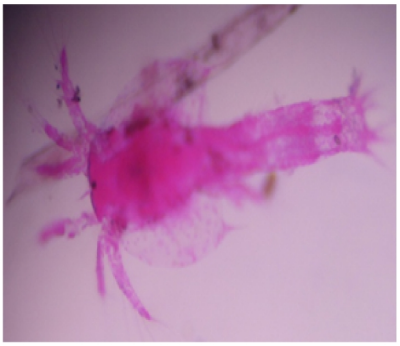


Crab Pre- Zoea

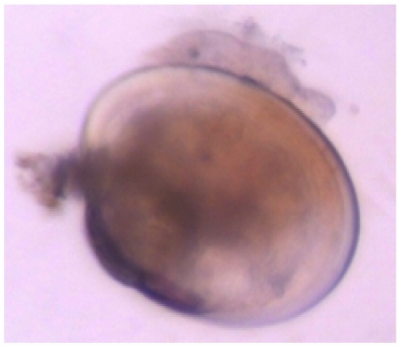
Crustacean Cypris Larvae

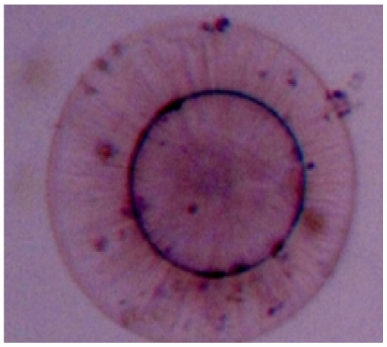


Polychaete Larvae



Shrimp Zoea



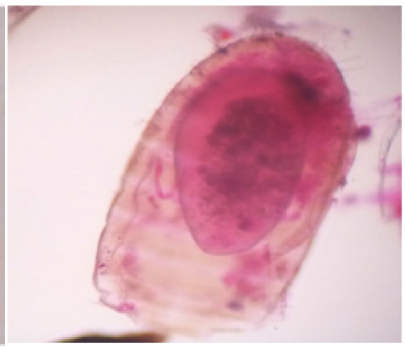


Lucina edentula

Amphipoda polychaete

Juvenile stage

Nematode worm
Sea anemone



Planula larvae

in June (monsoon period). These results are in conformity with those of Rosenberg (2001)

It has been reported that samples will vary greatly both in quality and quantity depending upon the time of day or night of the collection. The ideal time for collection is said to be in the early morning considerable seasonal variations in the occurrence and abundance of planktonic species as larval form are also reported (Smith, 1977) . Our study is in conformity with these observations. No correlation was observed between the physic chemical characteristics of the water and plankton assemblage density . This maybe due to the fact that there was no significant variation in the concentration of O_2 salinity and nutrients during the entire period of study. Since near shore waters are less prone to environmental fluctuations.

This study is the first of its kind to be carried out along the Kollam Coast. We hope that the study will pave the way for environmental risk assessment and it will help policy makers to develop a more comprehensive protocol to curb pollution along the coastal waters.

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