

ECOLOGY OF COLEROON ESTUARY : STUDIES ON BENTHIC FAUNA

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ABSTRACT

The qualitative and quantitative analysis of the macrobenthic fauna of the tidal zone of Coleroon Estuary revealed an irregular pattern in the distribution and abundance. The polychaetes formed the predominant group among the fauna showed significant positive correlations with percentage composition of silt in the sediment. Gastropods and bivalves are the molluscs available along with the crustaceans, isopods and amphipods. No significant correlations were noticed between the number of the total fauna and the seasonal fluctuation in the environmental parameters.

INTRODUCTION

THE STRUCTURE of the shallow water benthic fauna and their role as the principal food source for the demersal fishes and other predators, as well as the processors of organic productivity of the superficial waters through nutrient regeneration were well documented by earlier workers (Steel, 1974; Hale, 1976; Gray, 1981; Nixon, 1981; Hylleberg and Vestergaard, 1984). The estuarine and coastal water benthic communities on the west and east coasts of India were also studied in relation to the environmental parameters and the nature of the bottom sediment (Damodaran, 1973; Harkantra *et al.*, 1980; Divakaran *et al.*, 1981; Chandran *et al.*, 1982; Nair *et al.*, 1984). The present study deals with the seasonal distribution and abundance of benthic fauna of the tidal zone of Coleroon Estuary, in relation to the sediment composition and the other environmental parameters.

MATERIALS AND METHODS

The temperature, salinity, dissolved oxygen of the bottom water were measured as described by Strickland and Parsons (1972). Sediment

samples were collected by using Peterson's grab 0.08 m diameter and sieved through 0.5 mm sieve and the animals retained were preserved in 5% neutral formalin. The animals were separated, counted and expressed in No/m². The sediment composition was estimated by the method described by Krumbein and Pettijohn (1938). The organic carbon content was measured by Elwakeel and Riley (1956) wet oxidation method.

RESULTS

Physico-chemical parameters

Marked seasonal changes in the hydrographic factors of this estuary (Fig. 1) was observed during NE monsoon months. These changes in the environment have direct access on the biotic components of this estuarine ecosystem, particularly the plankton and bottom fauna. The highest rainfall was recorded in December 1983 (736.5 mm) and the lowest 14.0 mm in January 1984. The banks of the estuary were eroded during rainy season and the heavy siltation resulted was one of the major factors influencing the existence of the bottom fauna.

The temperature of the bottom water varied between 20°C and 33°C and the seasonal fluctuation was not very prominent. The tidal and seasonal variation of the bottom water showed irregular pattern throughout the period of study. The maximum salinity (33.33‰) during summer and the estuary was completely filled with fresh water during rainy season where no stratification was found in the study

gastropods, bivalves, isopods, amphipods and 'others'. The group 'others' was constituted by various animals encountered at times in small numbers.

Population density and percentage composition

The actual number of animals collected and the groups of benthic fauna occurred at this zone is shown in Fig. 4. The highest

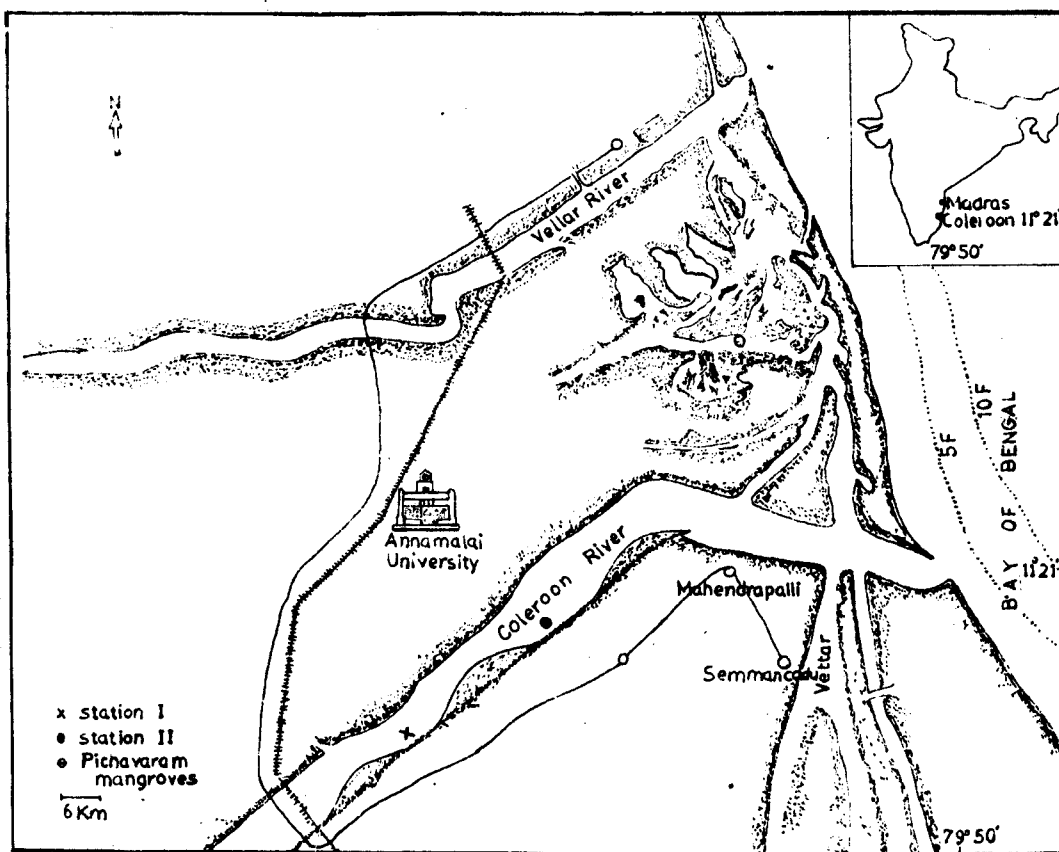


Fig. 1. The sampling stations in the Coleroon River.

area (Fig. 2). The dissolved oxygen in the bottom water was found to be lower than that of the surface water in general and at no time it was observed below 2.8 ml/l (Fig. 3).

Benthic fauna

The macrobenthic animals recorded mainly fall under six major groups viz. polychaetes,

number of macrobenthos (1557/m²) and the lowest number (19/m²) were observed during monsoon in 1983 and 1984 respectively, clearly showed an irregular pattern in the population abundance and distribution.

The polychaetes ranked first among the total faunal groups in species composition as well as in abundance and represented at all

seasons except on certain months. The polychaete population was maximum during

during monsoon periods, and the percentage composition varied between 1.1% and 93.38%

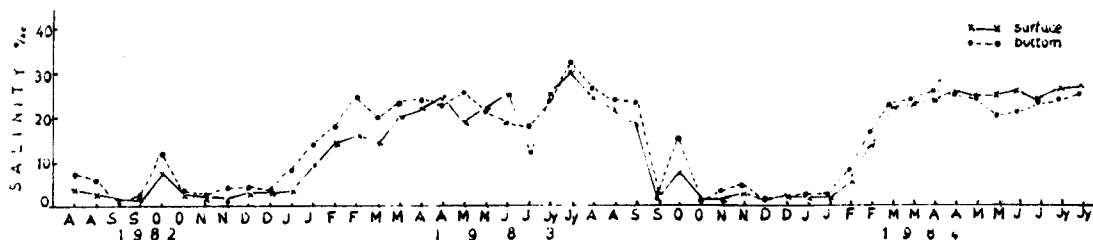


Fig. 2. Salinity variations of the surface and bottom water.

NE monsoon period ($350/m^2$) formed about 67.02% of the total fauna. The minimum number ($13/m^2$) was also noticed during the same season and it was 1.6% of the benthic fauna. Among polychaetes *Ceratonereis costae*, *Nephtys polybranchia*, *Ancistrosyllis constricta*, *Heteromastus similis*, *Goniada incerta*, *Glycera alba*, *Glycinidae* sp. and *Capitella* sp. were recorded in this zone. During premonsoon *Ceratonereis costae*, *Capitella* sp. and *Nephtys polybranchia* were recorded. Whereas in monsoon *Goniada incerta*, *Glycinidae* sp. and *Ceratonereis costae* were observed. During postmonsoon and summer periods *Nephtys polybranchia*, *Ancistrosyllis constricta* and *Heteromastus similis* were also encountered in large numbers along with *Ceratonereis costae* and *Glycera alba*.

in postmonsoon and monsoon months respectively.

Bivalves were very low in population density and the two species *Katylisia opima* and *Solen kempii* were found occasionally in the samples. The maximum number obtained was $125/m^2$ and the minimum was $7/m^2$. The percentage composition of bivalves was also very less and it varied from 1.01% in January and 45.8% in August.

The tanaids *Apeudes chilkensis* and *A. gymnophobia* were the only two species of isopods occurred in the sediment throughout the year. The largest population recorded was $1369/m^2$ in November and the density was

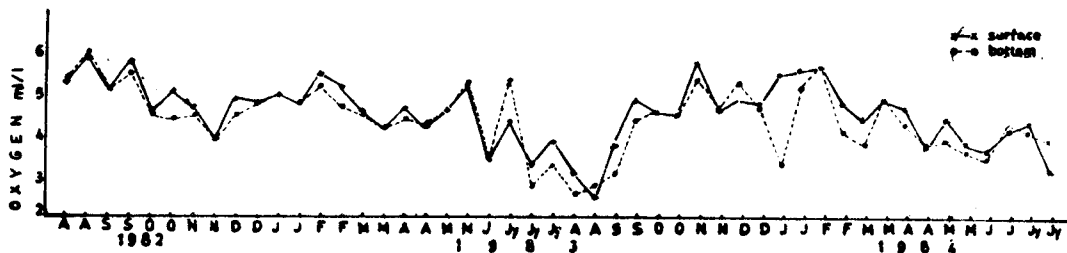


Fig. 3. The variations in dissolved oxygen of the surface and bottom water.

The common gastropods were *Neritina* sp., *Nassa jaksoniana*, *Cerithedia fluviatilis* and *Natica lineata*. The highest population density ($794/m^2$) and the lowest ($7/m^2$) were observed

$7/m^2$ during October in the same year. The percentage composition was also found to be high (87.9%) and low (1.68%) during the above months respectively.

The amphipods *Grandierella gilesi* and *Corophium triaenonyx* were the two common species of this area. The population was found to be very high 500/m² during postmonsoon and the number decreased to 13 m² in summer. The percentage composition was maximum (75%) noticed in summer and minimum 6.5% in premonsoon period.

of the sediment and the sedimentation process in an area and particularly in estuaries are governed by many factors such as topography, water transport, physical and chemical properties of water and the effects of tides and currents operating in the area. The animal communities associated with the sediment were studied in relation to the seasonal variation in the texture

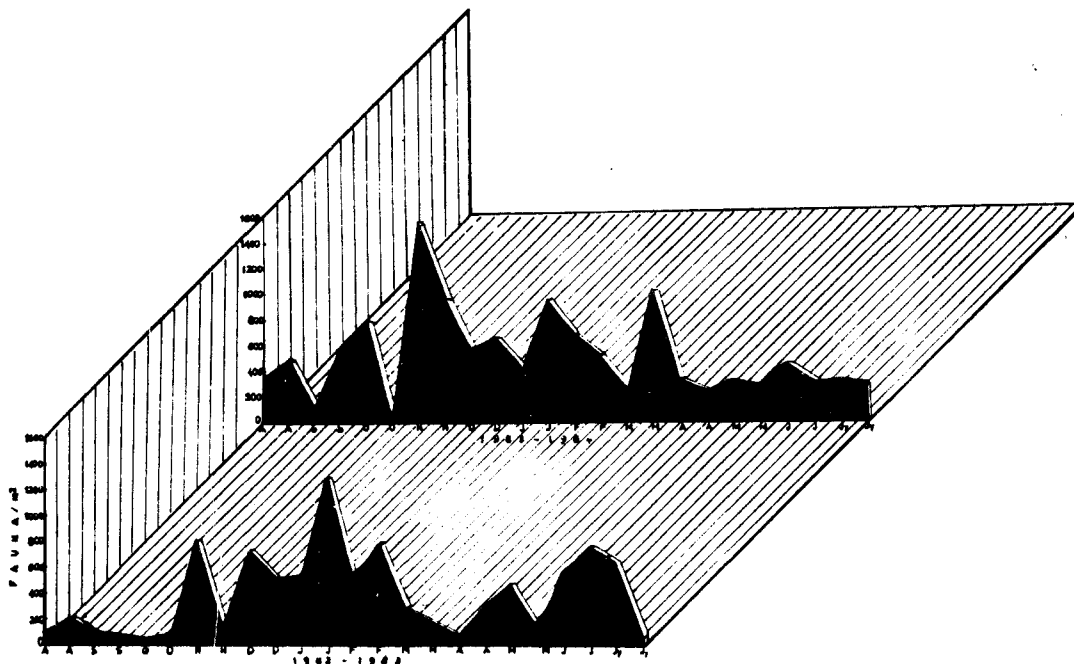


Fig. 4. Population density of the benthic macrofauna.

The 'other' group was constituted by the hermit crab (*Diogene* sp.), juveniles of crabs, prawns and fishes. They were relatively few in number and 844/m² was the highest number recorded and the lowest number was 7/m². The maximum and minimum percentage composition varied between 83.3% and 0.9% respectively.

Sediment composition

The sediment composition is of utmost significance to biological cycles in the estuarine environment as well as the life of benthic fauna in it. Postma (1982) reported that the nature

and organic carbon content of the sediment. The texture of the sediment and the percentage composition of the sand, silt and clay fraction are given in Fig. 5.

The percentage composition of sand was the maximum 84.65% recorded in premonsoon and minimum 5.5% during monsoon. The percentage of silt in the sediment was found to be high during monsoon 74.5% and the lowest value of 8.25% during premonsoon period. The clay fraction was also found to be very high (32%) in monsoon months in most of the cases and the lowest value was (3.2%) noticed in premonsoon.

including the hydrographical features, rate of primary production, sediment composition, organic matter and also localised seasonal changes were considered to be prime factors for fluctuations in the benthic population. The reduction of fauna at this station during monsoon may be well related to the problem of heavy siltation where the banks on both sides of the estuary were completely eroded when it rains along with heavy flooding in the estuary. Mahoney and Livingston (1982) stated that the mechanisms behind the seasonal

Kali Estuary that polychaetes preferred sandy substratum. From Vellar Estuary, Sivakumar (1982) observed that polychaetes population was higher when the substratum was silty-clay in nature. However, the present observation is in confirmity with the statement of Anwarbatcha (1985) that the polychaetes found to prefer fine to medium type of sandy bottom with moderate amount of admixture of silt and clay. Further, there is a general tendency for deposit feeders to predominate in clayey-silt sediment and filter feeder to predominate in sandy sediments

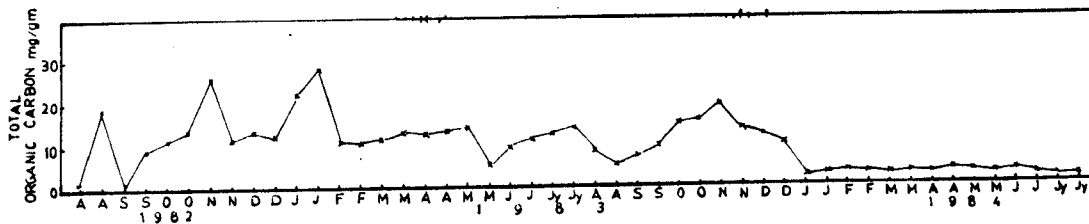


Fig. 6. Percentage content of organic carbon.

fluctuations of the benthic organisms revealed that more than one variable in the environment may be responsible for the observed changes in the abundance of fauna in monsoon. In the present study it was also controlled by the nature of the substratum composed of silt and detritus derived mainly from plants which harbours polychaetes, gastropods and browsers like amphipods.

Considering the species composition and population density of the benthic animals studied with texture of the sediment, in general at this station, the composition was found to be similar, but the relative abundance of the species varied considerably. This shows that substratum preference of individual groups are more effective than as total community in viewing the animal sediment relationship.

The polychaetes and gastropods exhibited negative correlation with the percentage of sand in the sediment. Harkantra (1975) reported from

(Mann, 1982). The significant negative correlation of polychaetes with sand may also be due to this reason and moreover the sand retains only a very low organic carbon which is the principal food for these bottom dwellers.

The gastropods exhibited negative correlation with the percentage of sand in the sediment, affirms the view of Parulekar and Dwivedi (1974) that gastropods prefer sandy silt substratum. It may also be explained that the direct correlation of gastropods with organic carbon content was due to the detritus feeding nature of gastropods.

Tanaids showed close association with the composition of silt content and showed significant negative correlation with sand and clay percentages. The amphipods collected in this study did not show any correlations with the nature of the sediment.

From this observation it is unable to pinpoint a single factor responsible for the

fluctuations in the population density and distribution of benthic fauna and also very difficult to determine which combinations of factors control the quantitative differences of macrobenthos in a very shallow water system such as the tidal zone of Coleroon Estuary which is reasonably exposed to many man made activities and natural catastrophies.

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