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MACROBENTHOS OF THE BUCKINGHAM CANAL BACKWATERS OF COLEROON ESTUARY

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ABSTRACT

The macrobenthos of the Buckingham Canal one of the backwaters of Coleroon Estuary in relation to sediment, organic carbon and environmental variables such as temperature, salinity and dissolved oxygen were studied for a period of one year at two stations. A rich population was found to occur at moderate salinity (14‰ to 17‰) in postmonsoon when the sediment composiions was silty-sand (53-43%) in nature. The abundance of macrobenthos was directly correlated with salinity, silt, clay and organic carbon. A poor macrobenthic population was recorded during monsoon and summer periods.

INTRODUCTION

THE MACROBENTHOS of the Vellar Estuary and adjacent waters were studied by Chandran (1982); Sivakumar (1982) and Thangaraj (1984) in relation to the hydrographic parameters and the nature of the sediment. So far, no attempt has been made to study the macrobenthos in relation to environmental factors on an annual basis with the seasonal variations in their abundance, composition and distribution from Coleroon estuarine complex of the southeast coast of India and hence the present investigation is undertaken.

MATERIAL AND METHODS

The River Coleroon which is a branch of River Cauvery, mixes with the Bay of Bengal at Pazhayaru (11° 29' N ; 79° 50' E). The Buckingham Canal Backwater (present study area) is situated near the Coleroon mouth on the southern bank extending about 2 km and connected to drainage channels of paddy fields. The aim of the present investigation is to explore the major constituents of the macrobenthic community, their pattern of distribution and seasonal abundance at two stations chosen based on the influence of tidal waters, exposure and depth. The Buckingham Canal is very shallow (2 m depth) and it is being filled up with sea water at hightides and at lowtides by freshwater drained from the surrounding paddy fields. Station I is fixed at the mouth and Station II is about 1 km away from Station I in the upstreams of the backwater.

The present study was carried out for one year from January to December 1983. All observations were made at hightide when the canal is at the maximum influence of seawater. The sediment sample was collected in duplicate by using 0.08 m Peterson grab. A portion of the sediment after ascertaining that there was no macrobenthos was air dried at room temperature for particle size analysis. The rest of the sediment was seived through 0.5 mm mesh size sieve to separate the macrofauna and preserved in 5% neutral formalin and rose Bengal. The macrobenthos were then sorted, indentified, counted and the standing crop estimated. The temperature of the surface water was measured by using a centigrade thermometer (± 0.5°C). The bottom water was collected by Meyer's water sampler and the temperature was measured immediately after draining the water into the bucket. The salinity was determined by silver nitrate method (Mohr's method) and dissolved oxygen by Winkler's method as described in Strickland and Parsons (1972). The particle size analysis was done by 'pipette out' method described by Krumbein and Pettijohn (1938) and organic carbon was estimated by Elwakeel and Riley (1956) wet oxidation method.

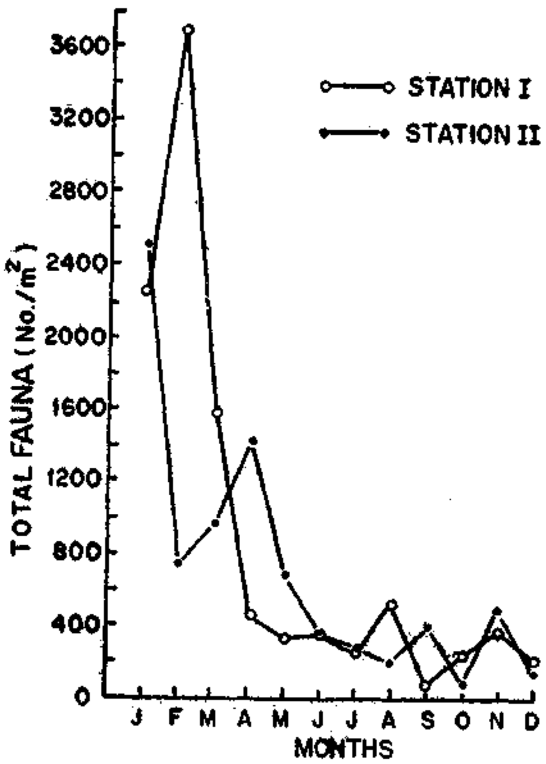

FIG. 1. The variations in population density of benthic fauna at Stations I and II.

RESULTS

Temperature

The surface temperature varied between 24.5°C and 33.5°C at Station I and 25.5°C and 33.0°C at Station II (Fig. 2). The maximum temperature was observed in summer (May) at Station I and (June) at Station II and the minimum temperature was found to occur in NE monsoon (November and December) at Stations I and II. The bottom water temperature ranged between 24.0°C and 32.5°C at Station I and 25.5°C and 32.5°C at Station II.

Salinity

The salinity of the surface water ranged from 5.15‰ (November) to 28.71‰ (May) at Station I and from 0.7‰ (November) to 28.65‰ (June) at Station II (Fig. 3).

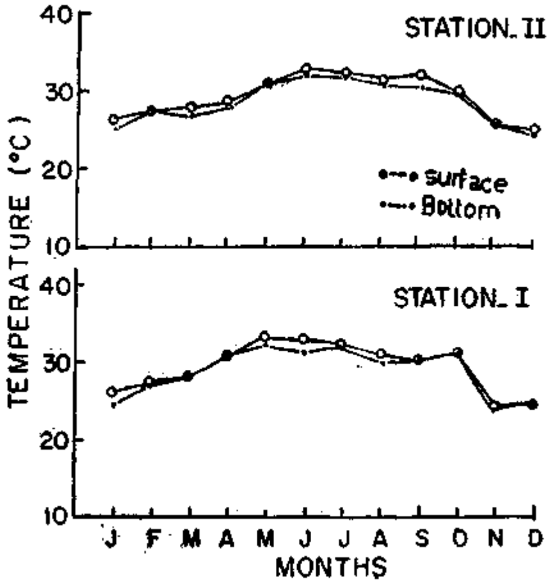

FIG. 2. The fluctuations in temperature at Stations I and II.

In bottom water the salinity varied between 5.15‰ and 29.65‰ at Station I and 2.71‰ and 29,5‰ at Station II. A high value of 29.65‰ and 29.5‰ were recorded in summer (May and June) respectively. Low values of 5.15‰ and 2.71‰ were noticed in NE monsoon (November and December) at Stations I and II respectively.

Dissolved oxygen

The surface water dissolved oxygen content was ranging from 4.2 O_2 ml/l to 5.8 O_2 ml/l at Station I and 4.46 O_2 ml/l to 6.56 O_2 ml/l

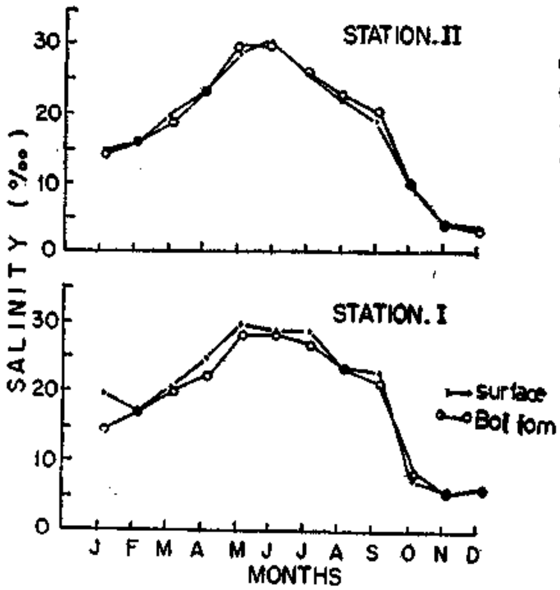

FIG. 3. The fluctuations in salinity at Stations I and II.

at Station II (Fig. 4). The maximum values of dissolved oxygen content 5.8 O_2 ml/l and 6.56 O_2 ml/l were recorded in monsoon (November) at Stations I and II and minimum was 4.2 O_2 ml/l in summer (May) at Station I and 4.4 O_2 ml/l in September at Station II.

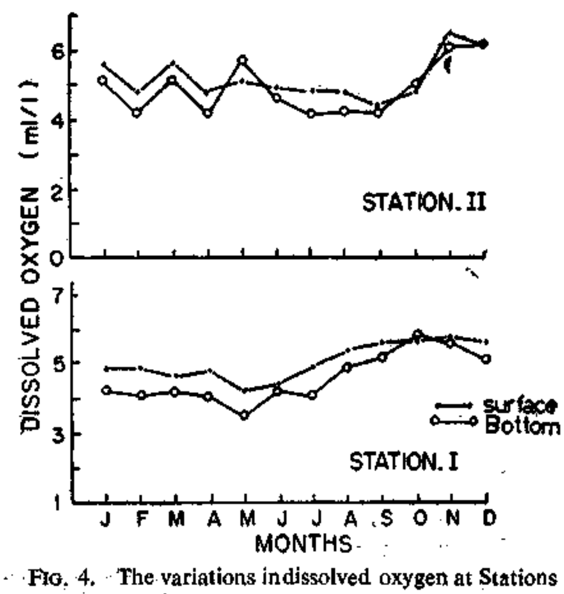

FIG. 4. The variations in dissolved oxygen at Stations I and II.

In bottom water the dissolved oxygen concentration varied between 3.5 O_2 ml/l and 5.85 O_2 ml/l at Station I and 4.0 O_2 ml/l to 6.36 O_2 ml/l at Station II. The high values of dissolved oxygen content were noticed during monsoon (October and December) and the low values were noticed in May and April at Station I and II respectively.

Sediment composition

In the Coleroon Estuary (Station I) the sediment was silty-sand (Silt 52.12%, sand 38.0% and clay 9.8%) and at Buckingham Canal (Station II) the sediment was fine and also dominated by silty-sand except in summer when substratum was sandy-silt in nature (sand 51%, silt 34% and Clay 15% (Fig. 6).

Organic carbon

The percentage composition of organic carbon in the sediment varied between 6.1 mgC/g and 9.5 mgC/g at Station I. Higher values (10.6 mgC/g) were obtained during postmonsoon and lower values (7.6 mgC/g, 7.3 mgC/g and 6.6 mgC/g) were found in summer, premonsoon and monsoon periods respectively (Fig. 5). At Station II, sediment organic carbon ranged from 10.1 mgC/g to 5.5 mgC/g. A maximum of 10.1 mgC/g was recorded in postmonsoon and minimum values 7.0 mgC/g in summer and 5.5 mgC/g in premonsoon 6.2 mgC/g in monsoon were noticed. In general, the organic carbon was found to be related to the texture of the sediment.

Macrobenthos

The macrobenthos displayed a well pronounced seasonal variation in their abundance and composition (Fig. 1). The numerically abundant macrobenthos was represented in order by polychaetes, tanaids, gastropods, hermitcrabs, amphipods, bivalves and others. The other groups were mainly consisting juveniles of prawns and crab, gobid fishes and *Squilla* sp. The polychaetes which were recorded in the presnt study included *Hetero-*

mastus similis, Ceratonereis costae, Nephtys polybranchia, Ancistrosyllis constricta, Glycinidae oligodon, Glycera sp., *Nereis unifaciata, Goniada* sp. and *Capitella* sp.

The crustaceans were largely consisting of Tanaids *Apseudes chilkensis, A. gymnophobia,*

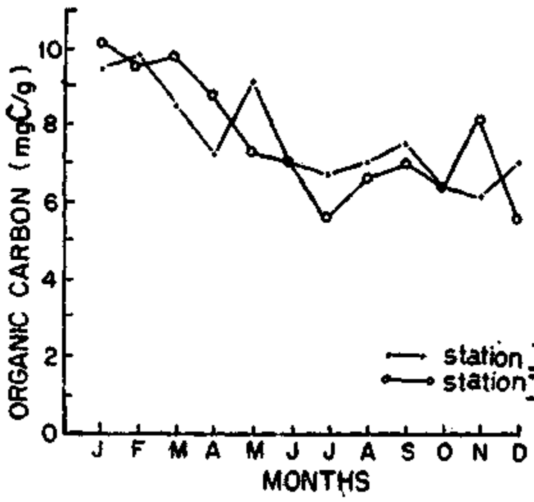

FIG. 5. The variations in organic carbon in the sediment at Stations I and II.

the Amphipod *Grandierella* sp. and the hermit-crab *Diagene* sp. The gastropods were represented by *Nassa jacksoniana, Neritina* sp., *Umbonium* sp., *Cerithedia fluviatilis, Kateylsia opima, Meretrix casta, Solen kempi, Donax* sp., *Tellina* sp. and *Anadara granosa* were among the bivalves. In terms of quantitative faunal components, polychaetes ranked first (73.25%) among the total fauna in NE Postmonsoon at Station I. Likewise gastropods (63.77%) in monsoon, *Apseudes* (47.87%) in Postmonsoon, Hermitcrabs (69.0%), bivalves (54.35%) and amphipods (9.42%) in summer and others (3.03%) in monsoon were also represented among the total fauna observed at station I.

At Station II *Apseudes chilkensis* ranked first (66.66%) among the total faunal composition in numbers while polychaetes (66.49%), gastropods (63.42%) in premonsoon, Hermitcrabs (80.92%) and amphipods (17.33%) bivalves (33.3%) in summer and others (3.6%) in postmonsoon periods.

The population density was ranging between 88 and 3788 No/m² at Station I and 88 and

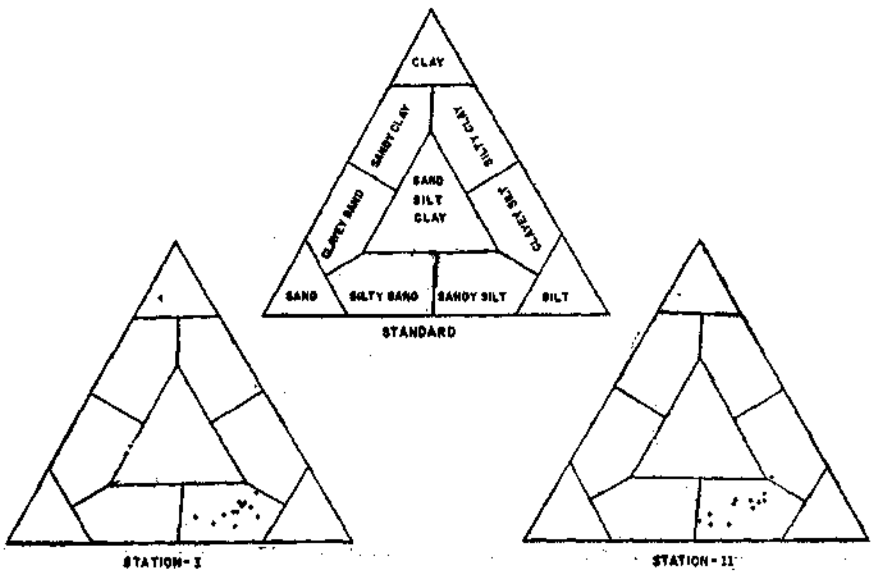

FIG. 6. Sediment texture at Stations I and II.

2525 No/m² at station II (Fig. 1). A high population was found to occur in postmonsoon and low population was prevailed in premonsoon and monsoon at Stations I and II.

The simple correlation coefficient was performed on the environmental parameters and the total fauna observed at Stations I and II (Table 1). No significant correlation was obtained for the surface and bottom water temperature with total fauna. However, the total fauna had a significant positive correlation with the salinity and a significant negative correlation with the dissolved oxygen content was observed at Stations I and II.

TABLE 1. *Simple correlation coefficient 'r' between benthic fauna and other environmental parameters at Station I and II*

Parameters		'r' value	Significance level
Station I			
Temperature ..	S	—0.772	P 0.01
	B	—0.665	
Salinity ..	S	0.78	
..	B	0.79	P 0.01
Dissolved oxygen ..	S	—0.86	
	B	—0.93	P 0.1
Sand ..		—0.35	P 0.1
Silt ..		0.85	P 0.1
Clay ..		0.91	P 0.1
Organic carbon ..		0.96	P 0.1
Station II			
Temperature ..	S	—0.655	
	B	—0.544	P 0.1
Salinity ..	S	0.90	
	B	0.90	P 0.1
Dissolved oxygen ..	S	0.92	
	B	0.74	P 0.1
Sand ..		0.087	P 0.1
Silt ..		0.89	P 0.1
Clay ..		0.94	P 0.1
Organic carbon ..		0.97	P 0.1

DISCUSSION

Seasonal variation in water temperature was not found to have any influence on the abundance and distribution of the macrofauna observed in the present investigation. It may be explained that the depth is one of the major factors for fluctuations in temperature. The two Stations were very shallow especially Station II even the bottom can be visible at low tide. The present study is in agreement with the statement of Kurian (1972) who suggested that the temperature is not an important factor that affect the distribution of fauna in Cochin waters.

Among variables, the salinity is considered as one of the dominant limiting factors in the distribution of benthic fauna in estuaries (Desai and Krishnankutty, 1967; Parulekar and Dwivedi, 1974; Ansari, 1977). In this study the bottom water salinity at Stations I and II was always found to be high except during monsoon where there was almost no difference between the surface and bottom water. The correlation coefficient analysis showed that salinity (surface and bottom) and total fauna had significant positive correlations (Table 1). A sudden fall of total faunal numbers was noticed in monsoon which then gradually built-up in the subsequent months. The reduction in the number of animals was due to run off and reduced salinity during monsoon and such studies were reported earlier by Desai and Krishnankutty (1969) from Cochin Backwater and Ansari (1974) from Vembanad Lake.

The dissolved oxygen content of the surface and bottom water observed in the present study was significantly negatively correlated to the abundance of fauna. The dissolved oxygen content was high during monsoon while the macrobenthic animals were less in numbers. The river-run off resulting the sudden reduction in salinity and heavy turbulence of bottom sediment are the other important factors responsible for the reduction of benthic animals. The enrichment of dissolved oxygen does not found to have any effect on the fauna as reported from Vembanad Lake by Ansari (1974).

Seasonal fluctuations in the texture of the substratum was found to be very less. The substratum at Station I was comprised of fine silty-sand in almost all seasons except summer (sandy-silt). At Station II the fine nature of the silty-sand was found to exist at all seasons except during monsoon with large amount of detritus accumulated due to river run-off. The fine nature of the sediment with high salinity of the bottom water controls the stability of the fauna especially polychaetes and bivalves. The organic carbon content was relatively high at Station II due to the presence of large quantity of detritus the derivatives of the nearby paddy fields. The abundance of total fauna showed a high correlation with the organic carbon content of the sediment at the two stations studied. Variations in organic carbon content with seasons may be influenced by less water movements, slow dislocation of the sediment and turbulence of water column. The relationship between the organic carbon content and faunal composition was reported by Harkantra *et al.* (1980). The present study also revealed that the total fauna had a very high significant positive correlation with the organic carbon content of the sediment.

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