

PRELIMINARY SURVEY ON MACROBENTHOS OF
PRENTICE ISLAND, SUNDARBANS,
WEST BENGAL.

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(With 3 Text-figures and 1 Table)

INTRODUCTION

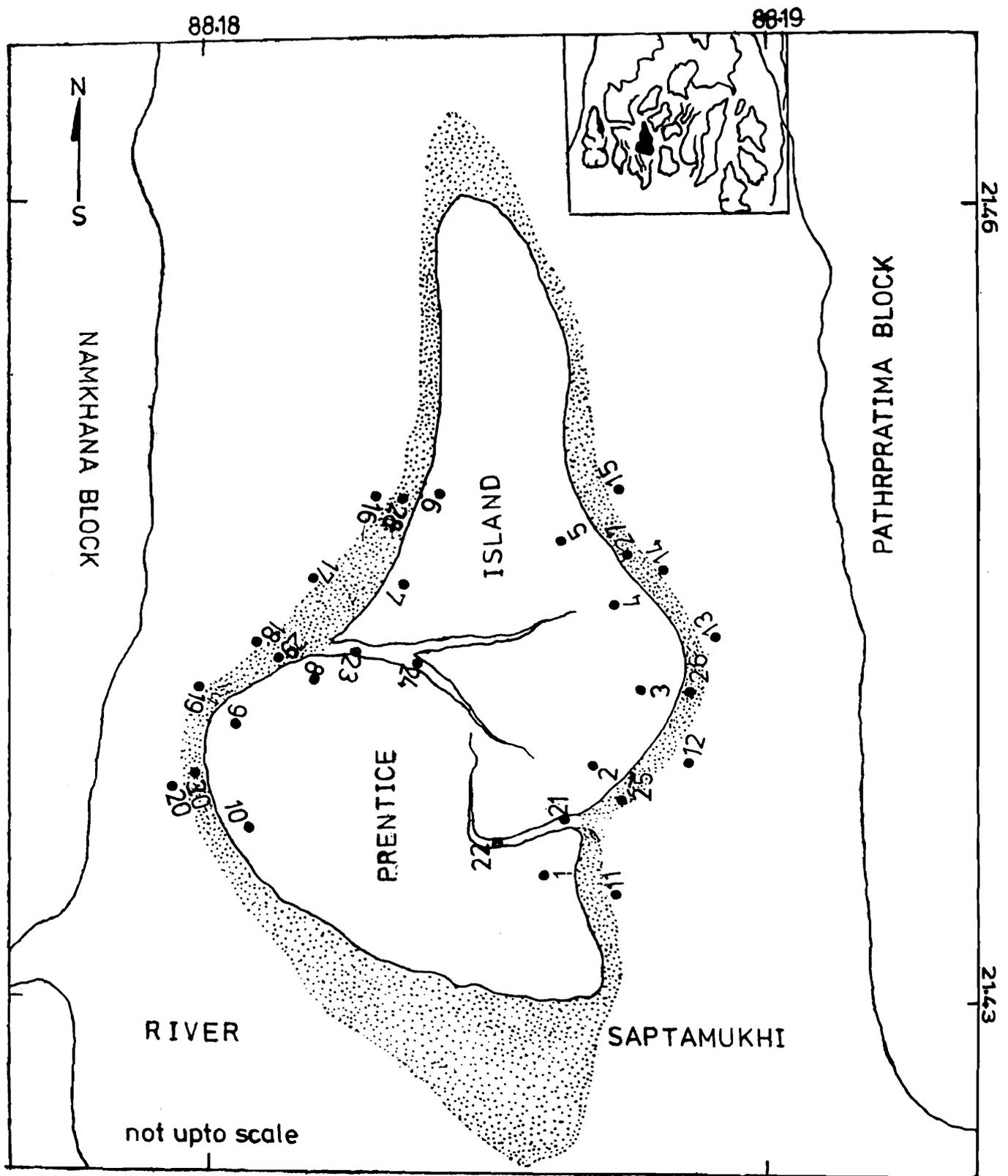
Mangrove ecosystem, a very specialised environment in the natural transition zone between the land and the sea, have gained momentum recently as it plays important role in protecting and extending coastline by trapping sediments, supporting fishery by developing detritus-based food chain and also controlling the regional climatic condition. Studies on the floristic structure of Indian mangrove forest have well been documented by Blatter (1905), Banerjee (1964), Ahmad (1972), Blasco (1975, 1977), Berry (1963, 1972), Sidhu (1963), Sasekumar (1974), Dwivedi *et al.* (1974), Joshi and Shinde (1979), Mukherjee and Mukherjee (1978), Choudhury (1979), Untawale *et al.* (1973) and Untawale (1980). After the works of Roonwal (1954a, b) a number of studies have been carried out on the faunal community of this ecosystem by Subbarao and Mukherjee (1975), Murty and Rao (1977), Radhakrishna and Janakiram (1975), Choudhury *et al.* (1980) and Bhunia and Choudhury (1981).

Physiography of study area :

Prentice island, a fractional component of virgin mangrove forest area of Sundarbans, lies between the latitude 21°43 and 21°46 N and longitude 88°18 and 88°19 E. The waterways bordering the island is formed by the river Saptamukhi (Fig. 1). It is traversed by a number of creeks of which two are well contoured with repeated ramification retaining considerable tidal water even during the lowest low tide.

Tidal variation :

The island is situated in a very close proximity to the sea and thus receives intensive tidal flux twice daily. The highest amplitude recorded



Text-fig. 1.

so far is 5 m, generally varies from 2 to 4.5 m in an average in a total lunar cycle.

MATERIALS AND METHODS

All together 30 sampling spots distributed over the two faces (eastern and western) of the island have been selected for the quantita-

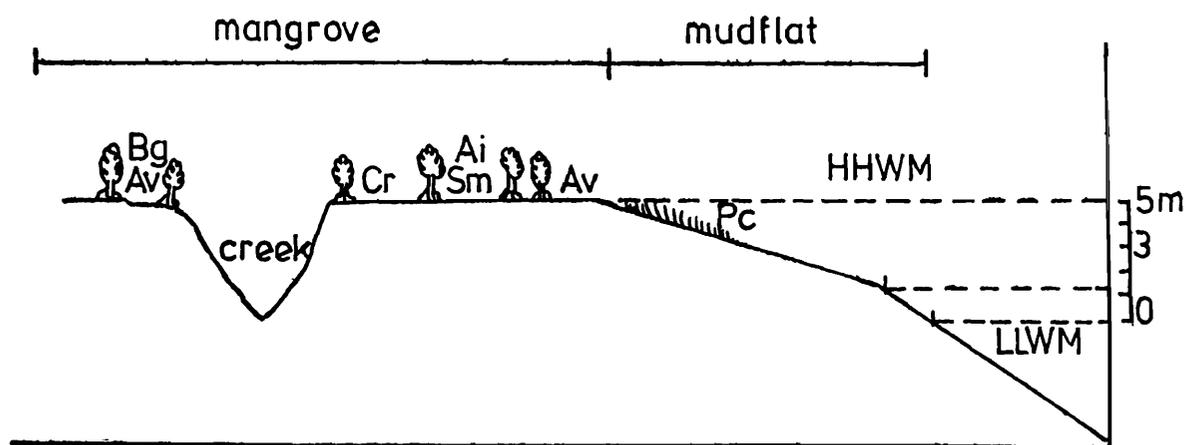
tive study of macrobenthos. The samplings were made from November 1981 to June 1982. Studies were conducted in a transect on either side of the island covering three biotopes, mangrove substratum, creeks and mudflats. Out of the 30 sampling spots 10 from mangrove biotope, 4 from the creeks and 16 from the mudflats were made (Fig. 1). A meter square quadrat was used for the sampling. Macrobenthos occupying the quadrat mud were sorted out and preserved in alcohol, sometimes buffered formaldehyde was used in the field.

The hydrological samples were collected from September 1981 to August 1982. The temperature was recorded in degree centigrade ; the salinity of the sample was estimated by 'Mohr-Knudsen' method. Winkler's method was followed to estimate the dissolved oxygen content of the sample and for pH colour comparator disc was used.

The texural analysis of soil was done following the procedure of Buchanon and Kain (1971). The organic carbon content of the soil was estimated following the method outlined by El. Wakeel and Riley (1956).

RESULTS

The structure of floristic community of the island though represented by a limited number of species, is more or less compact. The succession pattern of different species is steadily recognised throughout the island (Fig. 2). The forest edge is embodied with *Porteresia coarctata*. Among



HHWM. Highest High Water Mark
 LLWM. Lowest Low Water Mark

Pc. <i>Porteresia coarctata</i>	Cr. <i>Ceriops roxburghiana</i>
Av. <i>Avicennia officinalis</i>	Sm. <i>Suaeda maritima</i>
A. <i>A. alba</i>	Bg. <i>Bruguiera gymnorhiza</i>
Ai. <i>Acanthus ilicifolius</i>	

Text-fig. 2.

the established floral components, the dominant community is represented by *Avicennia* spp. and is followed by *Acanthus ilicifolius* and *Suaeda* sp. and then by *Ceriops* sp. in order of succession. *Bruguiera gymnorhyza* is scarcely represented particularly at the creek bank. Various taxa comprising the forest community are given below :

Sl. No.	Family	Flora
1.	Gramineae	<i>Porteresia coarctata</i>
2.	Chenopodiaceae	<i>Suaeda maritima</i>
3.	Verbenaceae	<i>Avicennia officinalis</i>
4.	Rhizophoraceae	<i>Ceriops roxburghiana</i> <i>Bruguiera gymnorhyza</i>
5.	Acanthaceae	<i>Acanthus ilicifolius</i>

Hydrology :

The hydrological parameters of water temperature, salinity, dissolved oxygen and pH in particular did not show any significant variation. The temperature varied from 23.5 to 32.0°C as compared to salinity 6.2–26.8‰. The pH (8.1–8.3) was almost constant. The concentration of dissolved oxygen ranged from 2.5–4.6 ml/l. The data on hydrological parameters and the corresponding monthly values of humidity and rainfall are plotted in Text-fig. 3.

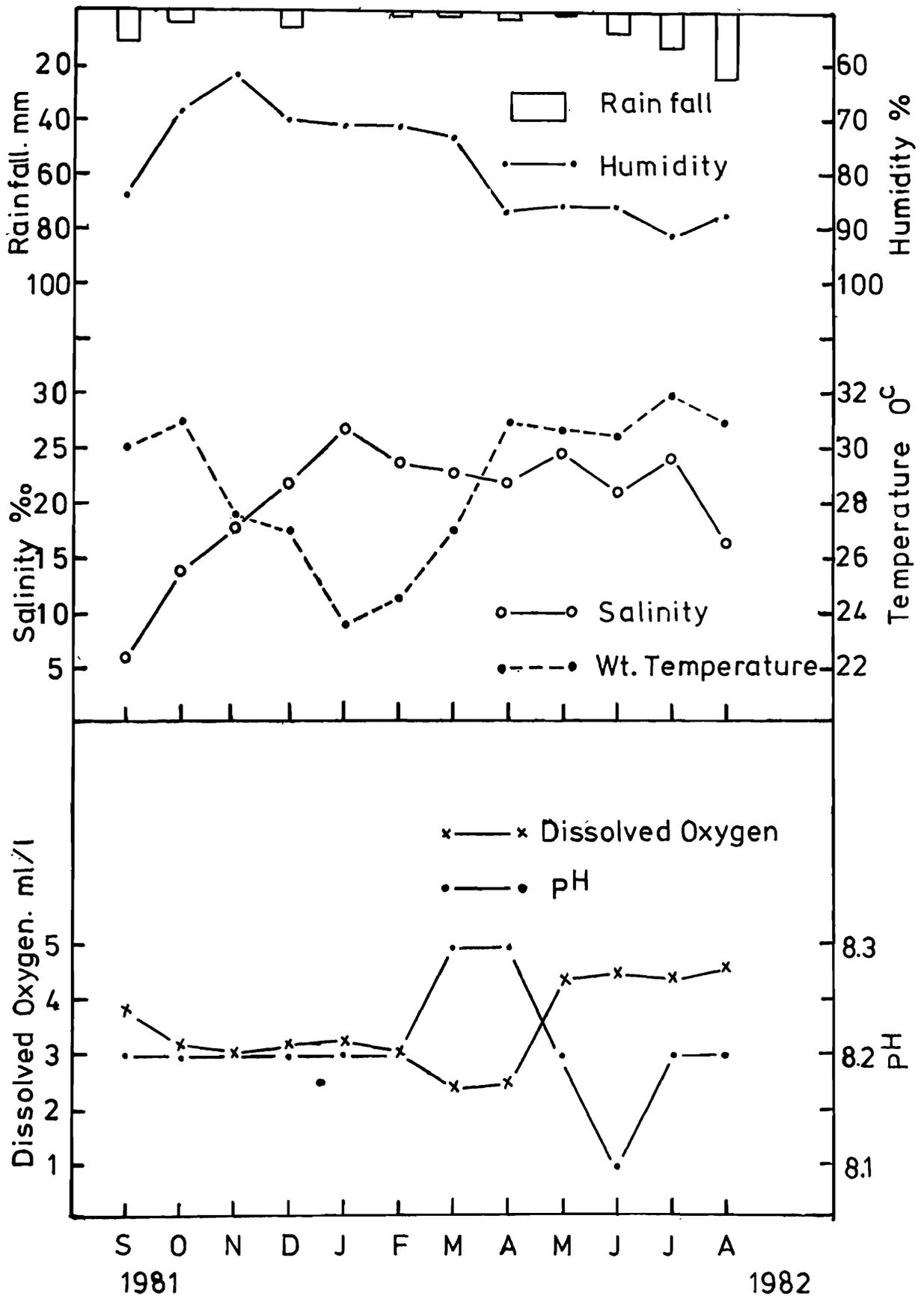
Soil :

The percentage variation of sand, silt, clay and organic carbon in three different biotopes is as follows :

	Sand	Silt	Clay	Organic carbon
Forest	40.0	30.1	29.9	0.84
Creek	48.3	28.0	28.7	0.83
Mudflat	44.4	24.4	31.2	0.82

MACROBENTHOS

Qualitative analyses of benthos through seasons presented a composite structure of faunal community of the island. Generally, the species composition varied according to the influence of prevailing hydrological conditions. The population size increased from November till March/April, with the increasing gradient of salinity but temperature played less significant role (Bhunja and Choudhury, 1981 ; Choudhury *et al.*, 1980). The purpose of the present study is to report a preli-



Text-fig. 3.

minary information on the benthic production potential of this virgin mangrove forest habitat. All together 35 species representing the different taxonomic groups have been encountered during the present study. A composite picture of the faunal community is given in Table 1.

The benthic macrofauna inhabiting the island environment predominantly are the molluscs, crustaceans, actinarians, polychaetes, nemertines among the invertebrates ; and gobiids represented the only vertebrate in the benthic community. The percentage composition of different faunal groups in three biotopes is presented below :

	Mangrove substratum	Creeks	Mudflats
Mollusc	72.10	46.2	19.9
Crustacea	10.00	18.7	4.1
Actinarian	8.01	1.2	65.1
Polychaete	4.30	7.5	5.4
Nemertine	1.70	6.2	2.4
Echiurid	0.08	11.2	1.4
Echinoderm	—	—	0.3
Gobiids	3.40	8.7	1.1

Mangrove substratum biotope :

The fauna inhabiting the mangrove substratum are well represented by various taxa of the community. Almost all the groups have been quantified from this biotope. The molluscs (Total No. 354) representing 12 species appear as the dominant group in the forest floor habitat. The second flourishing group is established by crustacean component (Total No. 49) of which 7 species have been encountered. Actinarians (Total No. 40) with 3 species and polychaetes (Total No. 20) having 4 species share the faunal association of the ecosystem as the third and fourth community members (Table 1).

Creeks :

In response to the production of benthos, creeks of this island play a secondary but no less an important role. Accumulated data (Table 1) reveal that almost all the principal groups though less in number do occur in this biotope. A certain exception is noticed for the members of the genera *Littorina*, *Nerita*, *Cerithidea* and most of the actinarians which are totally absent. Molluscs comprising 5 species have been recorded as the dominant group from this zone.

Mudflat :

The species composition as well as the number of fauna of the mudflat biotope are to some extent different from the adjacent forest habitat. The dominant group is represented by actinarians (Total No. 679) with only 4 species and the molluscs (Total No. 208) compri-

TABLE 1. Average density (No/m²) of species in different biotopes.

	Mangrove	Creek	Mudflat
Number of sample	10	4	16
Solenidae			
<i>Neosolen aquedalcioris</i>	2	1.8	1.6
<i>Macoma</i> (<i>Psammacoma</i>) <i>birmanica</i>	—	—	3.3
Arcidae			
<i>Anadara</i> (<i>Anadara</i>) <i>granosa</i>	1	0.8	0.4
Littorinidae			
<i>Littorina</i> (<i>littorinopsis</i>) <i>melanostoma</i>	3.9	—	—
<i>L. carinifera</i>	1.1	—	—
<i>L. undulata</i>	4.6	—	—
Onchidiidae			
<i>Onchidium tigrinum</i>	0.4	—	—
Assimineidae			
<i>Assimnia brevicula</i>	12.1	6.2	5.5
Nassaridae			
<i>Nassarius foveolatus</i>	1.3	—	—
<i>Cymia carinifera</i>	0.5	0.3	0.3
Potamididae			
<i>Cerithidea cingulata</i>	4.7	—	2.6
<i>Telescopium telescopium</i>	1.3	0.2	—
Ocypodidae			
<i>Uca dussumieri</i>	0.4	0.7	0.3
<i>Dotilla brevetarsis</i>	0.3	0.2	0.8
Grapsidae			
<i>Metaplex intermedia</i>	0.2	0.5	0.2
<i>Sesarma</i> sp.	2.5	0.5	0.2
Portunidae			
<i>Scylla serrata</i>	2.2	0.7	0.8
Synalpheidae			
<i>Alpheus crassimanus</i>	0.3	0.7	0.3
Stomatopoda			
<i>Squilla</i> (unidentified)	0.1	0.2	0.3
Glyceridae fam.	0.1	0.7	1
Nereidae fam.	0.4	0.7	1.3
Capitellidae fam.	0.7	0.2	0.8
<i>Polynoe</i> sp.	—	—	0.4

TABLE 1. (Concluded)

	Mangrove	Creek	Mudflat
Eunicidae			
<i>Lumbrineris</i> sp.	0.8	—	0.4
Actiniarians			
<i>Phytocoetiopsis rammuni</i>	2.5	—	37.1
<i>Pelocoetes exul</i>	1.3	0.2	1.6
<i>Edwardsia zonesi</i>	0.2	—	—
Anemone A (unidentified)	—	—	3.5
Nemertinea A (unidentified)	0.6	0.7	0.3
Nemertinea B (unidentified)	0.2	0.5	1.3
Echiurid worm (unidentified)	0.2	2.2	1
Holothuroides (unidentified)	—	—	0.2
Gobidae			
<i>Boleophthalmus bodderti</i>			
<i>Boleophthalmus viridis</i>			
<i>Scartelaos histophorus</i>	0.1	—	—
Gobid (unidentified)	0.3	0.2	0.1

sing 6 species stand as the second master component. The third and fourth grade of responsibility in the production potential of the community are shared by polychaetes (Total No. 57) with 5 species and crustaceans (Total No. 45) with 7 species respectively (Table 1).

DISCUSSION

Mangrove ecosystem is qualified by the soil substratum and aquatic subsystem together with the specialised halophyte community and thus provides a unique habitat for a large variety of estuarine fauna. The growth and propagation of the inhabitants are subjected to the continuous stresses of hydrological conditions, varying degrees of tidal innudation and periodical desiccation. The present study represents a preliminary investigation of flora and quantitative assessment of benthos in relation to environmental factors in three biotopes, viz., mangroves, creeks and mudflats. In total, 35 species of macrobenthos have been recorded of which 31, 20 and 26 species occurred in the mangroves, creeks and mudflats respectively. From the overall data it is pertinent to mention that the number, composition and the percentage variation of different species varied considerably between the biotopes. The molluscs dominated the other groups with the composition of 72.2% and 46.2% in mangrove habitat and associated creeks respectively ; whereas in mudflat, actiniarians stand as the most abundant group with 65.1% of the population.

It is interesting to note that the fauna which were more common in one biotope appeared very poor in other closely associated biotopes. The reason for impoverishment of benthic population in a biotope or an uneven distribution of species in different biotopes may be attributed to the nature of substratum, tidal flux, period of desiccation and availability of food. A certain exception was noticed for the members of Nemertines and Polychaetes which were found in each biotope indicating their high degree of accommodation in a wide range of fluctuation of macro- and microclimatic conditions of the system.

In the available data there appears a unique pattern of distribution of few species of the genus *Littorina* and actinarians by which the biotopes may be steadily characterised in respect of habitat preference of organisms. The *Littorina* spp. recorded 9.6/m² in mangrove biotope were totally absent from creeks and mudflats. Similarly, in the mudflats actinarians composing the highest population density (42.2/m²) were very poorly represented (4/m²) in mangrove biotope.

Comparisons of data on macrobenthos reported from different mangrove ecosystems are of considerable interest. Works of Dawn (1977) on forest and adjacent biotopes at Surin Island and also the report on fauna of mangrove shore of Phuket Island by Dawn *et al.* (1976) revealed that the population in these two areas were dominated by Crustacean and Molluscs. Data presented by Anuwat and Pitiwong (1980) on macrobenthos of mangrove forest at KO Yao Yai, Southern Thailand, suggested almost similar assessment of population size with greater abundance of crustaceans and molluscs. During the present study the number of the crustacean population varied from 3.0 to 6.0/m², a little low value as compared to molluscs and actinarians components.

Our knowledge on the ecology of molluscan fauna in Indian Mangroves are available through the works of Radhakrishna and Janakiram (1975) in Godavari and Krishna estuary, Murty and Rao (1977) in South Indian mangrove swamps. From the data on molluscs only *Littorina melanostoma*, *Assimnia brevicula*, *Cerithidea cingulata*, *Telescopium telescopium* and *Onchidium* sp. are the common forms found in Macchilapatnam mangrove area in Krishna estuary and in the present study; while the *Littorina undulata* is the only species occurred in mangroves of Godavari and in the present study too.

The results of the present findings indicate that the faunal community comprising a variety of species, form an integral component of the mangrove ecosystem but the degree of association and adaptation to such an environment differed from species to species. This is

attributed to the varied pattern of feeding habits and competition. At the same time the distribution and abundance of fauna are influenced by various physical and biotic factors of this complex ecosystem.

SUMMARY

The paper deals with the hydrobiological findings in and around Prentice Island, a typical and virgin forest delta of Sundarbans mangrove ecosystem. The floral components documented are mostly represented by members of the genus *Avecinnia*, *Ceriops*, *Bruguiera* and *Acanthus*. The salinity varied from 22.0-26.2‰ as compared to the temperature 26.0-29.5°C. The most common groups of macrobenthos accounted are molluscs, crustaceans, actinarians, polychaetes, nemertines and gobiids. The diversity as well as the density of various species composition comprising the faunal community are discussed in response to various ecological stresses in different biotopes.

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