

# BENTHOS OF THE BAY OF BENGAL: A PRELIMINARY ACCOUNT

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## ABSTRACT

Quantitative distribution of benthos in the depth range 20-1700 m from the Bay of Bengal has been studied. Biomass and population density of benthos in the Bay of Bengal were not very different from those of the Arabian Sea. Macrofauna ranged between 58-1644 animals/m<sup>2</sup>. Polychaetes, pelecypods and crustaceans were the major taxonomic groups of macrobenthos. Foraminifera and nematodes followed by polychaetes and ostracods contributed to the meiobenthos. There was a clear relationship between the type of sediment and the density of animals. Macro and meiofauna were high in the shallower region and low in deeper parts.

## INTRODUCTION

The knowledge of benthic fauna of the Bay of Bengal is fragmentary, and the little information available only pertains to macrobenthos (Ganapati and Rao, 1959; Samuel, 1944 and Sokolova and Pasternak, 1964).

The results presented here, are based on the samples collected in 1976, during the 7th, 8th and 9th cruises of *R. V. Gaveshani*. The area surveyed was between latitude 10° to 21° and longitude 80° to 93° (Fig. 1). Quantitative distribution and faunal composition of macro and meiobenthos in relation to depth (20-1700 m) and sediment characteristics have been reported in this communication.

## MATERIALS AND METHODS

Fig. 1 shows the area and the sampling sites. Sampling was done using a La fond Dietz snapper (0.017 m<sup>2</sup>) and a van Veen grab (0.04 m<sup>2</sup>). Fifty-three stations, from Paradip in the north to Palk strait in the south, were covered. Analysis was carried out using the same procedure as reported earlier (Parulekar, Nair, Harkantra and Ansari, 1976). Biomass was

expressed as wet-weight excluding hard parts. Of the 53 samples, only 46 had any fauna. Textural characteristics of the sediments was determined by the method of Holme and McIntyre (1971).

## RESULTS AND DISCUSSION

*Sediments:* The results of the analysis are shown in Table I.—No regular features in the sediment distribution was observed. The bottom deposits varied from place to place. Coarsest sediments (shell fragments and coarse sand) were found up to 100 m, whereas muddy substrata with silt and clay were noticed in deeper parts. Off Visakhapatnam, fine sand was conspicuous but it progressively decreased to sandy mud and clay along the outer shelf. From Kakinada Bay up to Pulicat Lake, the shelf was muddy and it was dominated by clay fractions. Off Madras, sandy sediments on the inner shelf, and sandsilt along the outer shelf, were common. South of Madras, coarse to fine sand was dominant.

*Macrofauna:* Polychaetes were the most dominant group. These were followed by pelecypods and crustaceans (amphipods, decapods and stomatopods)

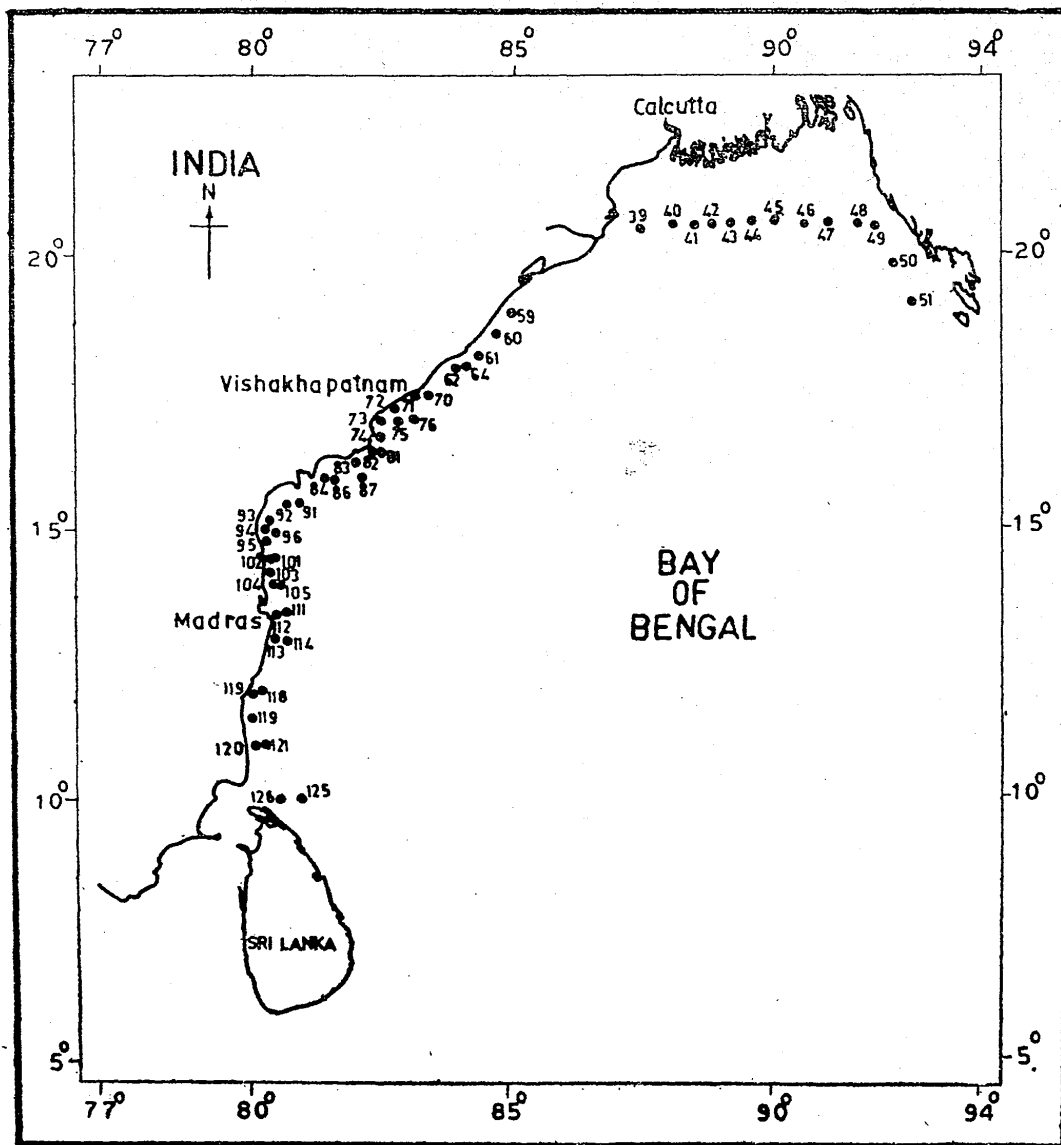


Fig. 1. Map of Bay of Bengal showing the station position.

Brittle stars and sea anemones were observed at stations 103, 112 and 120. Faunal density varied from 58 to 1644/m<sup>2</sup>, with an average count of 517/m<sup>2</sup>. The abundance of fauna decreased with increasing depths. However, there were some exceptions (Table I). The richness of fauna at the locations was probably due to favourable substratum.

Biomass (Table I) ranged from

0.058 to 36.514 g/m<sup>2</sup>, with a mean of 9.223 g/m<sup>2</sup>. Minimum and maximum biomass values were found in silty and muddy sand respectively. Polychaetes (63%), bivalves (16%) and crustaceans (16%) were the important components. The occurrence of large size organisms such as *Squilla* and sea anemones at some stations increased the mean values of the biomass substantially.

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*Table I.* Total number of animals and the biomass in relation to depth and sediment type.

Station	Depth (m)	Macrofauna		Meiofauna		Sediment Characteristics		
		Number/m <sup>2</sup>	Biomass/m <sup>2</sup>	Number m <sup>2</sup> (×10 <sup>4</sup> )	Biomass/m <sup>2</sup>	Sand %	Silt & Clay %	Texture
39	74	—	—	13	0.182	19.30	80.70	Sand, Silt & clay
40	107	1234	5.58	39	0.448	4.20	95.80	Silty sand
41	245	—	—	39	0.448	4.2	95.80	Silty clay
43	390	—	—	52	0.728	2.6	97.4	Silty clay
45	110	469	4.409	247	3.458	62.8	37.2	Clayey sand
46	91	587	1.352	127	1.776	59.16	40.84	"
47	87	—	—	26	0.364	4.9	95.1	Clay
49	52	294	17.462	—	—	18.45	81.55	Sandy silt
50	113	—	—	117	1.638	37.73	62.27	Sandy clay
51	1700	—	—	52	0.728	0.5	99.5	Clay
59	80	—	—	39	0.532	60.25	39.75	Silty sand
60	80	234	5.223	143	2.002	58.48	41.53	"
61	90	1116	3.527	104	1.456	65.30	34.70	"
63	45	234	4.233	104	1.285	18.52	81.48	Sandy silt
64	63	—	—	117	1.562	43.95	56.05	Sandy clay
70	63	295	10.995	169	2.366	54.22	45.78	Clayey sand
71	23	587	12.524	—	—	72.72	27.28	Silty sand
72	40	175	3.822	169	2.198	21.98	78.02	Sandy silt
73	22	1410	23.637	78	1.092	69.3	30.7	Silty sand
74	42	58	4.41	39	0.552	1.64	98.36	Clay
75	103	1587	29.038	321	4.494	60.82	39.18	Silty sand
76	277	—	—	104	1.565	9.6	90.4	Clay
81	710	176	1.117	775	10.878	3.84	96.16	"
83	35	176	1.999	130	1.82	4.25	95.75	"
84	35	—	—	269	3.746	5.76	94.24	"
86	540	58	0.764	323	4.522	3.94	96.06	Clayey silt
87	960	—	—	234	3.277	0.6	99.4	Silty clay
91a	240	—	—	169	2.366	0.2	99.8	Clay
94	33	292	2.107	65	0.912	36.36	63.64	Clayey sand
95	40	—	—	65	0.886	5.0	95.1	Clay
96	200	—	—	963	12.482	0.8	99.2	"
98	—	—	—	460	6.566	—	—	—
101	300	117	2.058	143	2.902	—	—	—
102	26	176	36.514	143	2.104	99.2	0.8	Sand
103	27	1644	25.871	282	3.848	2.82	97.18	Silty clay
104	50	1351	5.233	104	1.456	68.1	31.9	Silty sand
105	1000	—	—	276	3.864	2.0	98.0	Clay
111	440	234	1.351	456	6.384	4.62	95.38	Sandy silt
112	46	704	26.988	130	1.722	69.24	30.76	Silty sand
113	43	58	0.058	39	0.458	9.78	90.22	Sandy silt
114	210	58	0.529	26	0.388	48.13	51.87	Clayey sand
118	270	58	1.234	65	0.911	6.45	93.55	Clay
119	36	—	—	91	1.274	88.73	11.27	Sand
120	37	880	11.994	195	2.731	87.32	12.68	"
121	250	234	14.229	—	—	83.73	16.28	"
125	250	—	—	183	2.548	45.0	55.0	Sandy clay

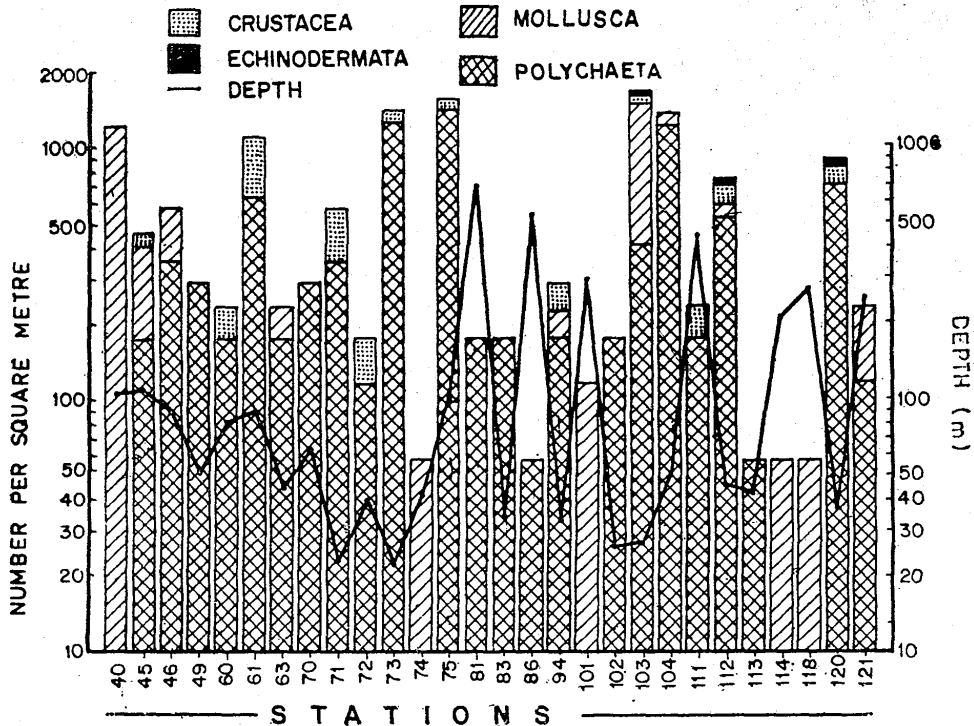


Fig. 2. Distribution of macrobenthos in relation to depth in the Bay of Bengal.

*Meiofauna*: Foraminiferans were the most abundant organisms (57.5%), followed by nematodes (22.4%) and polychaetes (8.17%). Gastropods, lamelibranchiata, ostracods, copepods and gastrotrichs were also observed. Faunal density ranged from  $13 \times 10^4/m^2$  to  $963 \times 10^4/m^2$ . Population was high where depth was about 800 m and low in shallow and deeper regions (Fig. 3). Biomass varied from 0.18 to  $12.482 g/m^2$  with a mean value of  $2.488 g/m^2$  (Table I) and was mainly contributed by foraminiferans, nematodes and polychaetes.

The Bay of Bengal, inspite of many unique meteorological and hydrobiological features (Ganapati, 1973), has been reported to be less productive than the Arabian Sea (Panikkar and Jayaraman, 1966). The bottom fauna of the Bay of Bengal was earlier reported to be 4-6

times poorer than that of the Arabian Sea (Sokolova and Pasternak, 1962). However, the results of the present investigation indicate that the quantitative distribution of benthos in the Bay of Bengal is of similar magnitude as the Arabian Sea (Neymann, 1971; Parulekar, Nair, Harkantra & Ansari, 1976).

Table II shows the distribution of fauna in relation to the type of sediments. Polychaetes, at various depths, showed preference to muddy sand and were totally absent in the clayey deposits. Pelecypods preferred fine sediments with a high percentage of silt and clay. Distribution of amphipods seem to be dependent on the availability of organic matter in the substratum rather than the type of sediment as has been reported by Savich (1972). In the meiofauna, foraminiferans and nematodes were abun-

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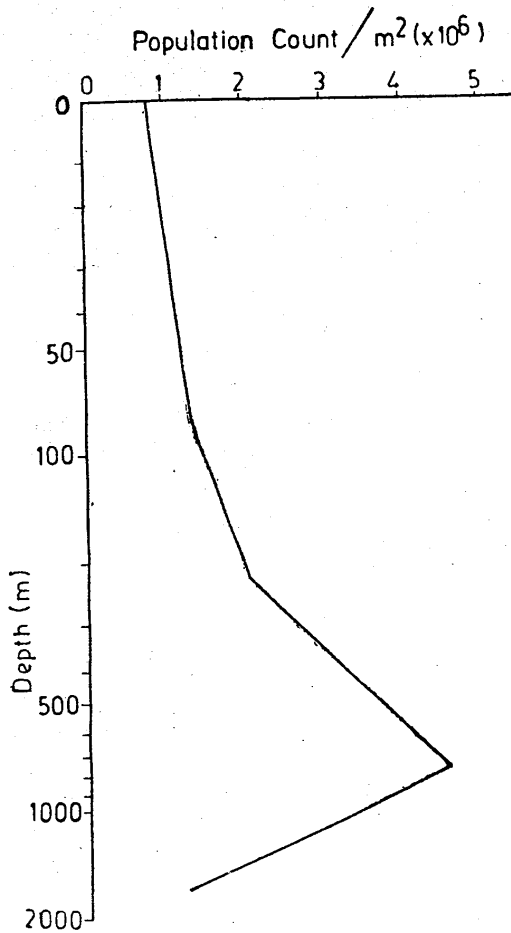


Fig. 3. Meibenthos distribution in relation to depth in the Bay of Bengal.

dant in fine sediments with silt and clay. At some stations (Table I), the population density was low inspite of a suitable substrata. Kurian (1967) also observed that sandy deposits have high values of benthos at some places, while at others, the production was low in

similar deposits. It suggests that the type of substratum cannot be considered independently as a master ecological factor determining the distribution and abundance of bottom fauna.

The quantitative abundance of bottom fauna generally decreases with depth and distance from the shore (Vinogradova, 1962). Polychaetes were observed at almost all the depths, whereas pelecypods and crustaceans were restricted to shallow waters (Fig. 2). From the meiofauna, foraminiferans and nematodes were recorded at all the depths, but ostracods, copepods, gastrotrichs, gastropods and lamellibranchs were confined mainly to shallow waters. Similar relationship between meiofauna and depth has been reported by Wigley and McIntyre (1964).

The feeding habits of demersal fish, both detritophages and carnivores will give an idea about the role of benthos in the food chain. The available information suggests that at least some of the meiofauna are actively eaten by the predators such as fish and prawns (Damodaran, 1973). Savich (1972) has also found a relationship between the amount of food available at the bottom and the catch size of most fishes feeding on benthos. It is also possible that a part of the meibenthos is utilised by selective deposit feeders of the macrobenthos community which share the same habitat (Thorson, 1966). The relative proportion of macro to meiofauna was of the

Table II. Animal density and sediment relationship.

Faunal group	Substratum type and faunal density/m <sup>2</sup>			
	Muddy sand	Sandy mud	Silty clay	Clay
Polychaeta	332	117	91	..
Pelecypoda	87	8	117	8
Amphipoda	40	16	13	..
Foraminifera	110 × 10 <sup>4</sup>	91 × 10 <sup>4</sup>	540 × 10 <sup>4</sup>	360 × 10 <sup>4</sup>
Nematoda	13 × 10 <sup>4</sup>	26 × 10 <sup>4</sup>	150 × 10 <sup>4</sup>	52 × 10 <sup>4</sup>

order of 1:3500, which indicates the important role meiofauna may have in the benthic community of Bay of Bengal.

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REFERENCES

- DAMODARAN, R., 1964. Studies on the benthos of the mud banks of the Kerala coast. *Bulletin of the Department of Marine Sciences, University of Cochin*, VI: 1-126.
- GANAPATHI, P. N. and M. V. L. RAO, 1959. Preliminary observations on the bottom fauna of the continental shelf of the north-east coast of India. *Proceedings of the 1st All India Congress of Zoology, Part III* : 8-13.
- GANAPATHI, P. N., 1973. Biological Oceanography of the Bay of Bengal. *Mahasagar—Bulletin of the National Institute of Oceanography*, 7(3 & 4): 177-182.
- HOLME, N. A. and A. D. MCINTYRE, 1971. *Methods for the Studies of Marine Benthos*. I. B. P. Handbook No. 16, Blackwell Scientific Publications, Oxford & Edinburgh: 1-334.
- KURIAN, C. V., 1967. Studies on the Benthos of the southwest coast of India. *Bulletin of the National Institute of Sciences of India*, 38: 649-656.
- NEYMANN, A. A., 1971. Shelf Benthos in the Northern Part of the Indian Ocean (52-61) in A. S. Bogdanov (Ed.), *Soviet Fisheries Investigations in the Indian Ocean*, Izdatelstvo Pisheyyava Promyshlennost, Moskva.
- PANIKKAR, N. K. and R. JAYARAMAN, 1966. Biological and Oceanographic differences between the Arabian Sea and the Bay of Bengal as observed from the Indian Region. *Proceedings of the Indian Academy of Sciences*, 64 B: 231-240.
- PARULEKAR, A. H., S. A. NAIR, S. N. HARKANTRA and Z. A. ANSARI, 1976. Some quantitative studies on the benthos off Bombay. *Mahasagar—Bulletin of the National Institute of Oceanography*, 9: 51-56.
- SAMUEL, M., 1944. Preliminary observations on the animal communities of the level sea bottom of the Madras coast. *Journal of Madras University*, 15(2): 45-71.
- SAVICH, M. S., 1972. Quantitative distribution and food value of benthos from the West Pakistan shelf. *Oceanology*, 12(1): 113-117.
- SOKOLOVA, M. N. and F. A. PASTERNAK, 1962. The quantitative distribution of the bottom fauna in the northern part of the Arabian Sea and Bengal Bay. *Doklady Akademi, Nauk SSSR*, 144 : 645-648.
- SOKOLOVA, M. N. and F. A. PASTERNAK, 1964. Quantitative distribution and trophic zonation of the bottom fauna in the Bay of Bengal and the Andaman Sea. *Trudy Instituta Okeanologii Akademii Nauk SSSR*, 64 : 271-296.
- THORSON, G., 1966. Some factors influencing the recruitment and establishment of marine benthic communities. *Netherland Journal of Sea Research*, 3: 267-293.
- VINOGRADOVA, N. G., 1962. Some problems of the study of deep sea bottom fauna. *Journal of the Oceanographical Society of Japan. 20th Anniversary Volume*: 724-741.
- WIGLEY, R. L. and A. D. MCINTYRE, 1964. Some quantitative comparisons of offshore meiobenthos and macrobenthos, South of Martha's Vineyard. *Limnology and Oceanography*, 9: 485-493.