

Benthos Off Cochin, Southwest Coast of India

S N HARKANTRA & A H PARULEKAR

National Institute of Oceanography, Dona Paula, Goa 403 004, India

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Macro-invertebrate benthic fauna off Cochin mainly composed of polychaeta (82.45%), crustacea (7.62%), mollusca (5.92%), sipuncula (2.25%), nemertinea (0.96%) and echinodermata (0.80%). The maximum population density and biomass values were $304 \pm 25 \text{ m}^{-2}$ and $2.37 \pm 0.32 \text{ g} \cdot \text{m}^{-2}$ respectively. The fauna were relatively rich in medium size particles than the finer particles. The population density and biomass decreased with increase in depth. It seems that depth, sediment characteristics, dissolved oxygen and availability of food are important factors in the distribution and abundance of sediment dwelling macro-fauna in the sub-littoral region off Cochin.

Earlier studies¹⁻³ on sub-littoral benthos of southwest coast of India were primarily based on widely spaced sampling (30 to 60 nautical mile apart) and could not reflect spatial variations in the faunal distribution. Hence, an extensive sampling programme was carried out to study the quantitative aspect of benthic distribution in relation to the type of bottom deposits, depth and other environmental parameters.

Materials and Methods

Sampling was carried out in March 1980 during cruise 71 of *R V Gaveshani*. The sampling grid with median interval of 5 km apart, extended between 40 and 1500 m depth along 9 transects running perpendicular to the coast (Fig. 1). The total number of stations sampled was 72. Analyses of benthic fauna and sediment were done by standard procedure⁴. Biomass was expressed on wet basis excluding hard parts.

Results and Discussion

Sediment analysis showed 5 types of substrata (Fig. 2) having varied percentage of shell fragments, sand, silt and clay. Clay was observed only in offshore transects of E, F and G whereas silty-clay was found at the outer stations of transect D, H and inner section of transect E. Largely, substrate were sandy with varied proportion of silt and clay (Fig. 2).

The fauna was mainly composed of polychaeta (82.45%), crustacea (7.62%), mollusca (5.92%), sipuncula (2.25%), nemertinea (0.96%) and echinodermata (0.80%). Polychaeta were mainly represented by—*Nephtys*, *Aphrodita*, *Glycera*, *Nereis*, *Owenia*, *Onupis*, *Diapatra* and *Pectinaria*. Crustacea included amphipods (*Ampelisca* sp. and *Macra* sp.), isopods, brachyuran crab (*Leucosia* sp. and *Lepidopas* sp.), anomuran crab (*Albunea* sp.), cumaceans (*Bodotrica*

sp. and *Diastylis* sp.), stomatopods (*Squilla* sp.), and juvenile prawn (*Metapenaeus* sp.). Mollusca were mainly represented by *Cardium* sp. and elephant tusk shell *Dentalium* sp. Echinodermata composed of brittle star (*Opiothrix* sp.), sand dollar (*Ophiocnemis* sp.) and sea urchin *Echinus* sp.).

Among the sediment dwelling macro-benthic invertebrates polychaeta showed wide distribution with a high percentage of occurrence (82.45%) followed by bivalvia (27.40%) and crustacea (22.88%). The faunal taxa present at only one station were nem-

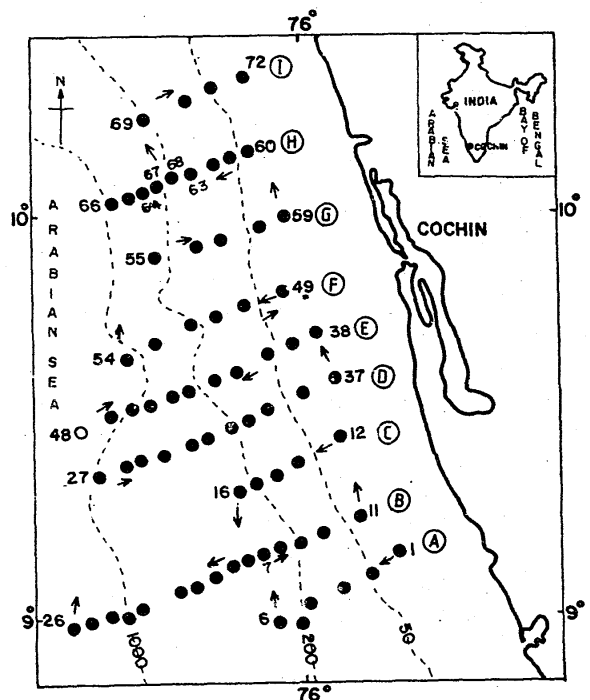


Fig. 1—Station position and cruise track (arrow mark) [A-I are transects]

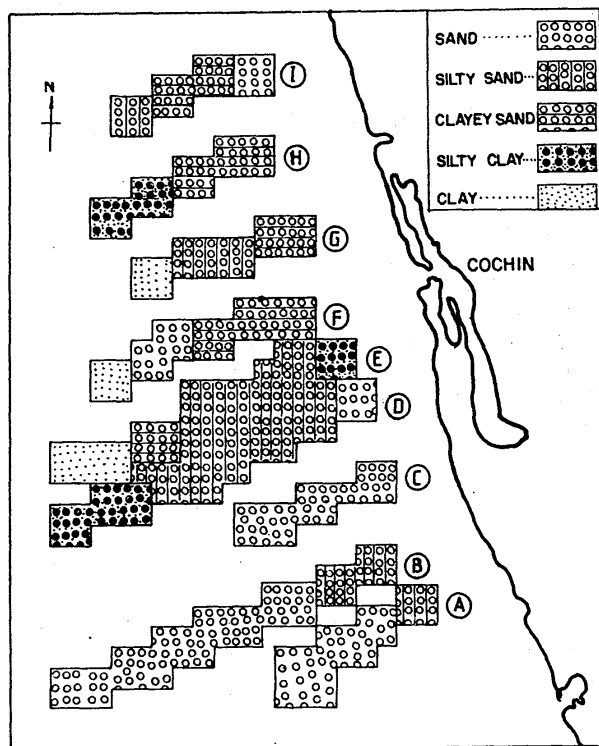


Fig. 2—Sediment distribution

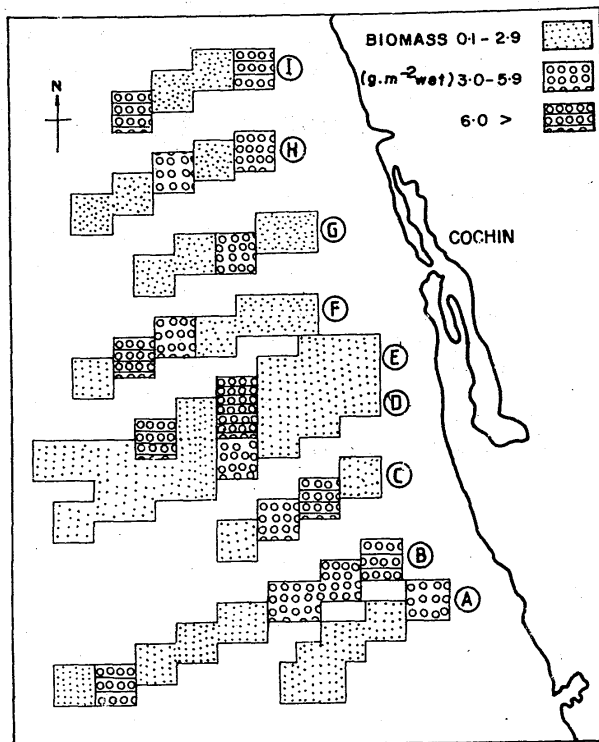


Fig. 3—Biomass distribution

ertinea (st 56), sea urchin and sand dollar (st 72), brittle star (st 35), stomatopods (st 62), mole crab (st 35) and elephant tusk shell (st 40). Cumacea occurred at 2 stations (49 and 53) while sipuncula occurred at 4 stations (11, 62, 68 and 72). Other fauna were present at 5 or more stations.

Ten out of 62 stations sampled had no fauna (sts 19-26, 43 and 49). The biomass varied from 0.11 (st 28) to 8.57 (st 69) with a mean value of $2.37 \pm 0.32 \text{ g.m}^{-2}$. Similarly, population density varied from 30 (st 28) to 1200 (st 80) with mean density of $304 \pm 25 \text{ .m}^{-2}$. Relatively, high biomass values were observed at sts 11, 23, 40, 45, 53, 69 and 72 mainly due to the presence of bivalvia *Cardium* sp. (Fig. 3). This bivalvia occurred densely (180 .m^{-2}) at st 22 on a 355 m terrace⁵.

Distribution of different taxa in relation to depth showed decrease of fauna as well as biomass values with increasing depth (Table 1). Echinodermata and sipuncula were found only up to 100 m depth whereas polychaeta, bivalvia and crustacea were found in all depth zones, however the composition of taxa differed, in different depth zones. Amphipoda (crustacea) were abundant in 100-200 m depth zone.

Faunal abundance in relation to substrate showed rich fauna in clayey sand and sandy substrate whereas clay had very poor fauna. Echinodermata were found only in clayey sand whereas sipuncula were absent in silty sand and clay. Other groups were present in all

types of substrata except clay where only polychaeta were found (Table 1)

Spatial variations, in the distribution and abundance of benthic fauna, are attributed to the impact of localized environmental and biotic factors, which are site specific⁶. Highest population density and biomass values, observed in the present study, are much lower than reported for the shelf and the slope region along the Indian coast^{1-3,7,8}.

One of the important factor regulating the distribution of benthos is the availability of food⁹. The vertical food web, from phytoplankton to benthos, produces a concentration of benthos higher near the coasts than in the open ocean¹⁰. Along the Indian coast, the maximum primary productivity is observed, during post-monsoon season (October-January) and medium to low during premonsoon (February-May) and monsoon (June-September), respectively¹¹. The present set of observations were recorded during March, the organic input from surface productivity, was minimal¹¹ and hence, it supported a low level of benthic fauna and consequent low standing crop.

However, the data on organic carbon in the sediment, from the present area of study¹² indicate that the shelf and slope off Cochin, are variedly enriched. While the level of organic carbon in the shelf sediment ($> 1-4\%$) associated with well oxygenated waters¹³ was conducive for the healthy growth of benthic fau-

Table 1—Faunal Abundance in Relation to Depths and Sediments

No. obs	Total		Polychaeta	Bivalvia	Crustacea	Echinoder- mata	Sipuncula	
	Population (n.m ⁻²)	Biomass (g.m ⁻²)						
Depth-wise								
Depth (m)								
> 40	20	486	2.94	329	19	30	—	8
50-100	22	349	2.92	298	20	20	2	9
100-200	5	323	2.58	253	18	42	—	—
200-1500	25	58	1.04	38	17	3	—	—
Sediment-wise								
Sediment fraction								
Sand	30	439	3.55	318	36	34	—	21
Silty sand	18	402	2.00	311	22	36	—	—
Clay sand	12	475	2.61	407	29	27	6	6
Silty clay	6	148	1.90	106	8	16	—	18
Clay	6	56	0.78	56	—	—	—	—

na¹⁴, the analogous values of 4 to 8% associated with low oxygen values of 0.5 ml.l⁻¹, caused stressful environment for the settlement, growth and propagation of benthic fauna in the slope region off Cochin. This explains the poor faunation of benthos in slope as compared to the shelf.

Decrease in faunal abundance with increase in depth is a common feature of the distribution of marine benthos and is ascribed to a variety of parameters revolving around hydrostatic pressure, sedimentary regime and upwelling¹⁵. As seen from present data, distribution and abundance of benthic fauna was higher in sand dominated substratum along the shelf than in clay dominated bottom deposits of the slope (Table 1), as observed earlier for the shelf and slope along the Indian coastline³. Similarly, the relationship between benthic standing crop and exploited demersal catch was evidently positive for the shelf than the slope¹⁶.

In a short term study as the present one, arriving at long ranging inferences may be far from realistic. However, it appears that the distribution and abundance of benthic fauna off Cochin is influenced by dominance of sandy bottom deposits, oxygenation of bottom waters and optimal levels of organic carbon in the sediments.

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