

OBSERVATIONS OF BENTHIC FAUNA OF THE SOUTH YEMENI COASTAL WATERS

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ABSTRACT

Analyses of the benthic samples collected from the coastal waters between Ras Al Ara and Ras Fartak and around Socotra showed that numerically Polychaeta was the most abundant group (54.6%) in the benthic fauna with 3553 n/m², followed by Crustacea (36.2%) with predominance of amphipods, isopods, decapods, cumaceans and tanaidaceans. Echinoderms contributed to 7.2%, though absent at several stations. Other benthic communities recorded were molluscs (0.5%), nematodes and nemeritines (1%). About 50% of the benthic fauna collected were from Ras Al Ara and Aden, the minimum being from Al Kalb (4.4%). While Polychaeta exhibited a direct correlation with the mud content of the sediment, the relationship of Crustacea was negative.

INTRODUCTION

THE COASTAL waters of ROY are well known for its crustacean, molluscan and other demersal fisheries. The muddy, sandy and rocky coasts of this region support a high density of macro and meiofauna. But very little is known about the benthic communities of this area. There have been no direct detailed studies on the distribution of benthic fauna of the coastal shallow waters of this region. However information available on the northern Indian Ocean (Beljaev and Vinogradova, 1961), Indian Ocean (Neyman *et al.*, 1973) and the west coast of India (Trevellin *et al.*, 1970; Ansari *et al.*, 1977; Harkantra *et al.*, 1980) should be comparable with the present study. Saad and Abdulhakim (1986) have provided some preliminary information on the sediment characteristics, infauna biomass and taxonomical composition at 2 localities in the Gulf of Aden.

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MATERIAL AND METHODS

Benthic samples collected from the coastal waters between Ras Al Ara and Ras Fartak and around Socotra by R. V. Dimitri Stifanov during January 1989 using Okean-50 grab (mouth area 0.25 m²) was used for this study. A total of 21 samples were collected from 8 transects, Ras Al Ara, Aden, Maqatin, Irca, Al Kalb, Qusayir, Ras Fartak and Socotra (Fig. 1). The mud, sand and coarse fraction of each sediment sample and the percentage of organic matter in mud at different class intervals were estimated (Table 1). All samples were sieved through 0.1 mm mesh screen. Animals retained on the sieve were identified wherever possible upto species, counted and their density per metre square calculated. The correlation coefficient of organic matter with mud, as well as polychaetes and crustaceans

with mud were determined (Fig. 3, 4, 5) by applying suitable regression equations $Y = 1.73 + 0.1x$ and $15.82 + 16.06 \ln x$ respectively. For Crustacea the regression equation applied was $Y = 60.46 \cdot e^{-0.008x}$

species of Gnathostomata and *Tripneustes* were represented in small numbers. But the high density of this group (7.2%) was mainly due to the ophiuroids collected from one station at Ras Al Ara transect. Molluscs were represen-

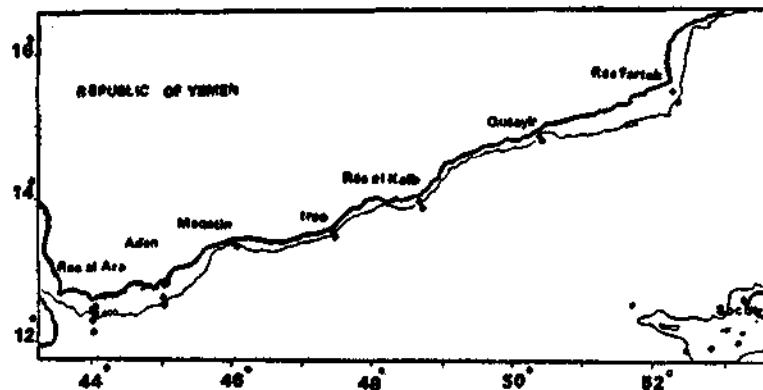


FIG. 1. Location of sampling stations.

RESULTS

The major faunistic composition was of similar nature at the areas sampled, but differed in their percentage of occurrences (Table 1, Fig. 2). Echinodermata was totally absent in the collections from Aden, Maqatin, Irca, Qusayir and Ras Fartak transects. Aden transect recorded the highest density of 25.3% of the organisms collected, followed by Ras Al Ara (20.2%) and Socotra (18.3%). These high values suddenly dropped from 9.15% at Irca to 8.9% at Maqatin and Qusayir. Ras Al Kalb and Ras Fartak recorded the least values of about 4.5%. Groupwise, the highest contribution was of Polychaeta (54.9%). Crustacea, the next dominant group (36.2%) was comprised of amphipods, Tanaidaceans, decapods, stomatopods, isopods, copepods, and mysids. Decapods were comprised of brachyurans like Portunidae (*Goniosoma* sp., *Thalamita admete*, Xanthidae, Dromiidae, Majidae, Calappidae, Ocypodidae and anomurans such as Galathidae and Paguridae. Among Echinodermata *Lovenia elongata* and

ted by 0.54%, the major share being that of bivalve larvae belonging to the families Tellinidae (*Tellina inflata*), Cardiidae, Mytilidae, Ostreidae, Solenidae and Veneridae. Gastropods were represented by Cymatiidae, Cerithidae, Fasciariidae Nassariidae (*Nassarius albescens*, *Bullia* sp.) and Turridae (*Gemmula unedo*). The meiofauna consisted of nemertines and turbellarians.

Ras Al Ara: The percentage of mud fraction in the sediment varied from 35 to 65% at this region, the maximum being at the station of depth 475 m. The average faunal density was 2825 n/m². Polychaeta was the most abundant group (61.78%) in the samples, followed by crustaceans (20.9%), which was dominated by amphipods (16.2%). Other groups were decapods, isopods, tanaidaceans and cumaceans. Molluscs were represented by gastropods and juvenile bivalves. Nemertines and nematods were also recorded from this region.

Aden: The mud fraction in the sediment was between 15 and 38% and the depth of stations varied from 48 to 35 m. The density of benthic population at this sector was 3252 n/m², slightly higher than Ras Al Ara. Here also the dominant group was Polychaeta, contributing to 63.58%. Among crustaceans

Irca: The depth range of this area was between 60 and 400 m. The percentage of mud fraction was only 9.15%. The faunal density was 1281 n/m², the dominant group being Polychaeta with 73.3% followed by Crustacea (24.8%) of which about 50% was amphipods. Gastropods and bivalves together

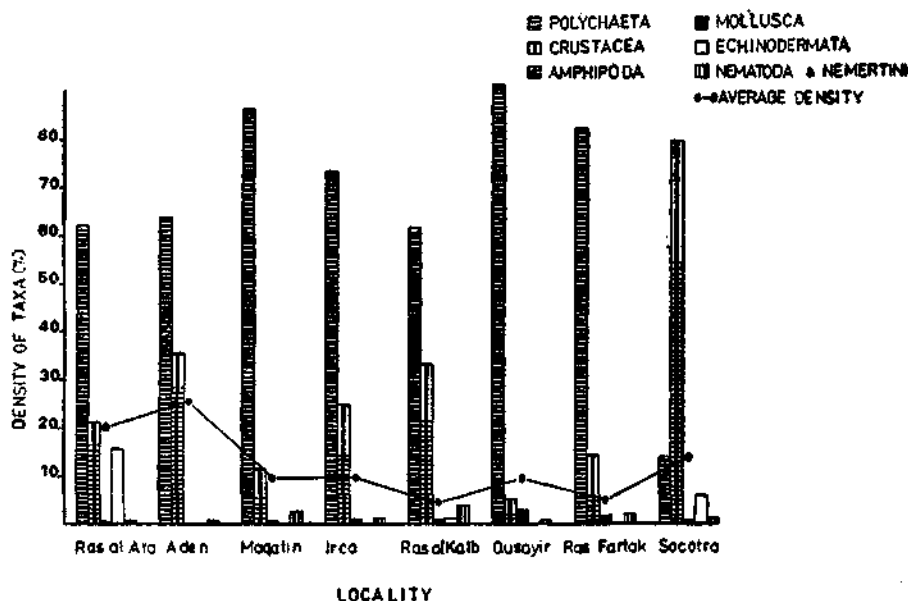


FIG. 2. Composition of major taxa at different transects.

amphipods recorded 28.2%, others being Anomura, Brachyura and Cumacea. Molluscs were very poorly represented. No echinoderms were recorded in the collection. The meiofauna was represented by nemertines and nematodes.

Maqatin: The composition of mud in the sediment varies from 34 to 86% and the depth of the region being between 60 and 500 m. The average faunal abundance recorded was 1247 n/m², polychaetes contributed to 85.9%. The total crustaceans were only 11.2% of which 5.13% were amphipods, the rest being cumaceans, tanaideans, decapods and other crustaceans. Mollusca was represented by gastropods. Echinoderms were not recorded from here.

contributed to 0.9%. This sector also not recorded any echinoderms. Nemertines and nematods were also present in small numbers (1%).

Ras Al Kalb: The percentage of mud in sediment ranged from 29 to 76 at the depths between 100 and 430 m. The density of population was 618 n/m², with polychaetes and crustaceans representing 61.7% and 33.3% respectively. Amphipods and tanaidaceans together contributed to 25.5% (21.3% and 4.2%). The contribution of molluscs was only 0.6% whereas nemertines and nematods recorded 3.5%. Echinodermata was represented by ophiuroids only (0.9%).

TABLE 1. *Distribution of major benthic communities (%) in relation*

Class interval of mud %	Organic matter %	Polychaeta	Mollusca	Amphipoda			Anomura		Brachyura	
0—1	2.7	20.8	0.4	13.4	0.2	0				
1—5	3.75	10.4	0.2	72.3	0.2	0.2				
5—10	3.33	50.2	1.9	12.4	0.8	0.6				
10—15*										
15—20	3.0	51.4	0	41.5	0.2	0				
20—25*										
25—30	2.8	55.5	0.4	28.8	0	0				
30—35	4.58	53.1	0.3	20.4	0	0				
35—40	4.4	84.5	0.2	5.7	0.5	0.2				
40—45	5.4	88.2	0.1	7.9	0.3	0.1				
45—50	5.2	94.8	0.2	0.6	0	0				
50—55	7.3	94.1	0.8	2.7	0	0				
55—60*										
60—65	8.0	84.7	1.1	5.0	0	0				
65—70	8.6	79.0	0.2	3.4	0	0				
70—75*										
75—80	10.5	77.9	8.6	3.8	0	0.5				
80—85	11.5	93.3	1.1	1.2	0	0				

* No sample.

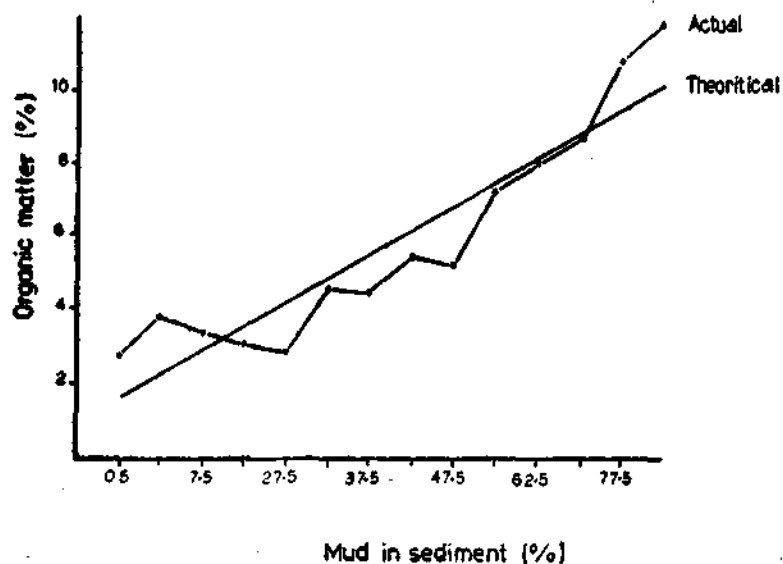


FIG. 3. Relationship between organic matter and mud in the sediments.

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Crustacea					Echino- dermata	Nematods & Nemertines
Cumacea	Isopoda	Tanaidacea	Other Crustacea	Crustacea Total		
0	1.2	26.0	35.5	76.3	2.3	0.2
0.7	11.6	1.4	2.0	88.4	0.9	0.1
0.9	0.5	4.2	9.7	29.1	15.1	3.7
0.3	0.1	0	5.7	47.7	0	0.9
0.9	1.7	5.7	3.5	40.6	1.3	2.2
0.3	0.1	0	2.1	23.0	22.1	1.5
0.7	0	0	7.3	14.4	0	0.9
1.1	0.2	0.3	0.9	10.8	0	0.9
0	0.6	0.2	2.5	4.0	0	1.0
0	0	1.0	1.6	4.3	0	0.8
0	0.4	0.8	6.1	12.3	0.4	1.5
0	0.2	0.6	16.4	10.6	0	0.2
0	0.5	0	5.2	10.0	0	3.5
0	0	0	3.5	4.7	0	0.9

Qusaytr: The mud in the sample was estimated to be 49 to 78% where the depth of bottom ranged between 115 and 360 m. The density of animals was 1250 n/m² from this area, of which polychaetes alone constituted to 91.6%. Except echinoderms all other groups recorded from other regions were present here, but in very few numbers. Mollusca was represented by juveniles of bivalves contributing to about 2%.

Ras Fartak: The area sampled between depth 117 and 460 m had the mud composition ranging from 10 to 64%. This region recorded a lower density of 646 n/m² for polychaetes amounting to 82% of the total fauna. Other groups were crustaceans (14.3%), bivalves and

gastropods (1.9%), nemertines and nematod (1.8%).

Socotra: The stations covered only shallow regions of depth ranging from 20 to 65 m, having samples with very low percentage of mud (0.5 to 5). The average numerical abundance of 2570 n/m² was recorded from here, with lesser percentage of polychaetes (13.5) unlike other regions. Here the dominant group was crustaceans (79.4%) comprising of amphipods (5.4%), isopods (8.4), decapods (0.35%) and cumaceans (0.5%). Mollusca was represented by bivalves of about 0.6% of the total fauna. Echinoderms present at this area were echinoids (0.23%), ophiuroids (5.3%) and holothurians (0.03%). The meiofauna was contributed mainly by 0.87% of nematods and 0.07% of nemertines.

DISCUSSION

The qualitative and quantitative distribution on benthic fauna was found to have a direct relationship with the type of bottom and its physical nature. Among the 8 sections studied the composition of mud fraction and its organic content varied from place to place. Higher densities of the benthic fauna were observed at Aden and Ras Al Ara section, 25.3% and

the proportion of crustaceans was much reduced with the dominance of tanaidaceans (2.1%) and isopods (1.2%). The occurrence of molluscs mainly contributed by gastropods, bivalves and nudibranchs were very insignificant (0.54%). The meiofauna (1%) comprised of nematods and nemertines at these stations.

The percentage of mud grouped at different class intervals (from 0-1% to 80-85%)

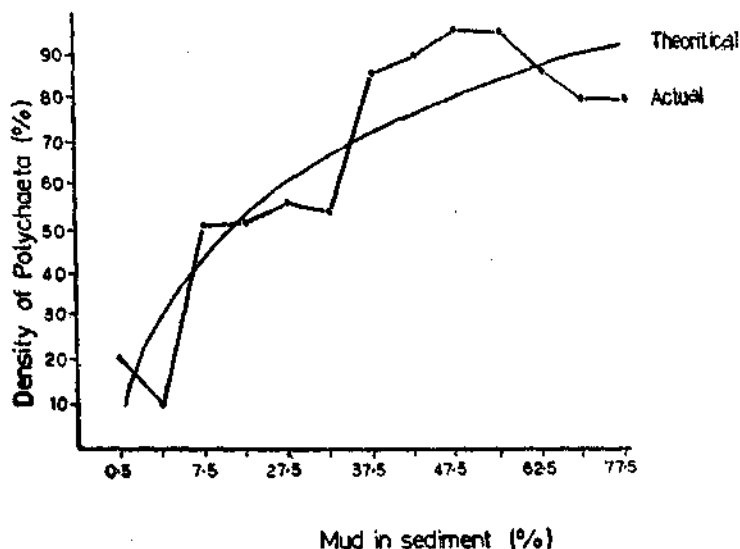


FIG. 4. Relationship between Polychaeta and mud in the sediments.

20.2% of the total population respectively, the next dense area being Socotra, with 18.3%. The first two areas are closely located and much similar in the case of sediment structure, percentage of mud, organic content and faunistic composition with very high density of polychaetes 3552 n/m² and 2825 n/m². Socotra region was very much different from these, with respect to the lesser depth, sandy nature of the sediment and low organic content which supported a very rich crustacean fauna 2570 n/m², dominated by amphipods. In other areas too, the most important bottom fauna was polychaetes (54.6%) followed by crustaceans with predominance of amphipods, decapods and cumaceans. In deeper waters

showed that the organic content varied from 2.7 to 11.8% (Table 1). This relation of high concentration of organic matter to sediments with high mud content, has been observed by Saad and Abdulhakim (1986) and several other workers (Fernando, 1987). On the west coast of India maximum organic content of 2100 µg/gm was recorded at Sancole Beach (Achuthankutty, 1976) and 1600 µg/gm at Baina Beach (Achuthankutty *et al.*, 1987).

The correlation coefficient of mud with organic matter ($r = 0.93$, $r^2 = 0.87$) and with polychaetes ($r = 0.941$, $r^2 = 0.89$) indicated a statistically significant correlation (Fig. 3, 4). But with crustaceans (Fig. 5) the relationship

was negative ($r = 0.93$, $r^2 = 0.87$). Increase in the mud value of bottom sediments was more suited for the high densities of polychaetes, molluscs and other direct deposit feeders, but not favourable for crustaceans, filter feeders, raptorial and other detritus feeders. Jones (1950) has observed that muddy sand fauna has relatively higher biomass than other sediments. Away from the coastline and with increasing depth, the distribution and abundance of

made in the present study also indicate that the Yemeni coastal waters support a very high density of benthic population despite the absence of any river discharges from land, only because of the high productivity of the region. The sediment distribution along the coast is apparently regulated by the prevailing surface currents which exhibit seasonal reversal. But the environmental disturbances caused by monsoon and other severe stress on the eco-

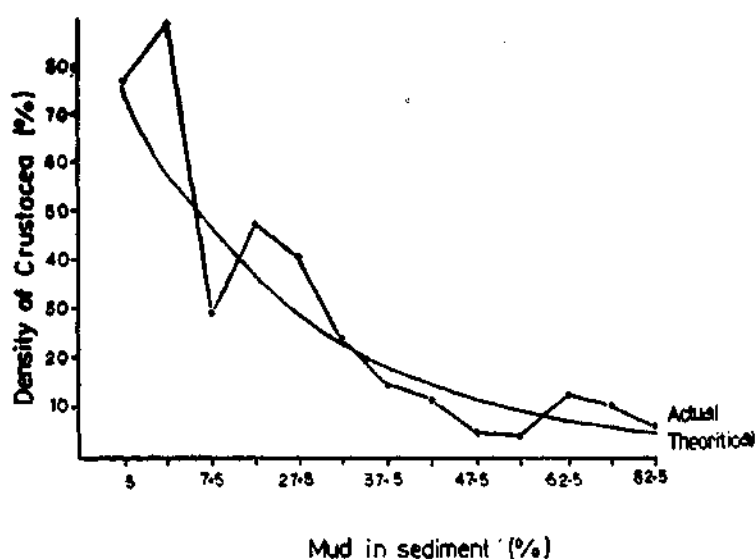


FIG. 5. Relationship between Crustacea and mud in the sediments.

fauna vary significantly. Rich benthic fauna and high biomass depend on the high organic production overlying the water column. In temperate zones especially near the coast, benthos is far richer than tropics and open part of the ocean (Neyman *et al.*, 1973). They observed that the intensity of coastal run off and the amount of organic matter brought into the ocean from land is not comparable with quantities produced by phytoplankton activity. Arabian Sea is characterised by rich bottom fauna (Sokolova and Pasternak, 1962) and according to Neyman *et al.* (1973) the general productivity is very high especially in the north western half. The observations

system adversely affect the density of the coastal fauna. Fluctuations in the population density is a common feature of the shallow epifaunal community. Frankenberg and Scott Leiper (1977) while comparing the benthic fauna of Georgia continental shelf for two different years study reported variation of one or more order of magnitude in population density and suggested that the density of benthic population may fluctuate from season to season, year to year and place to place. A similar study on the seasonal fluctuations of the fauna in relation to environmental parameters in the Yemeni coastal waters would help in the better understanding of this ecosystem.

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