

Subtidal benthic macrofauna of the Mangalore coast, west coast of India

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Subtidal macrobenthic fauna from the Mangalore coast was studied from the shelf areas between the old Mangalore Port and Suratkal, covering an area of approximately 40 km². Benthic bivalves were the most abundant group, (36160/m²) in December. During the same period, gastropods which also co-existed, showed their highest density (6400/m²), followed by a lean period up to April. Peak abundance of polychaetes was during May (3380/m²) with consequent reduction during the time of bivalve dominance and vice versa. Other groups recorded occasionally were amphipods, heteropods, holothurians, juvenile star fishes, stomatopods, cephalochordates, sipunculids, oligochaetes, cumaceans and decapods. The area between the old Mangalore Port and New Mangalore Port appeared to be more productive compared to the suratkal area in the north. The striking difference noticed was the shift in the benthic production from the 5 m contour. In all the earlier works 5 m contour line was found to be most productive, with a decrease in biomass with depth. In the present observations 5m contour line was least productive with an increasing trend up to 20 m, both in biomass and numerical density.

Though the coastal areas are extensively explored for marine resources, some areas are also being used for dumping industrial and domestic wastes, causing environmental problems. Effluents from a fertilizer factory and iron ore exporting company are discharged into the nearshore waters of Mangalore, central west coast of India. As a part of the detailed oceanographic observations, to assess the impact on the environment by the proposed Mangalore Refineries and Petrochemical Complex, the quantitative distribution of the macrobenthic fauna of this region was studied in 1988, over a period of one year and the results are discussed. The data was compared with earlier studies from this region¹⁻⁵ to assess long term variations in the macrobenthic fauna.

Materials and Methods

Four transects between the old Mangalore Port and Suratkal, at equidistant points (Fig.1) were selected for the study. Transect I was at Suratkal, transect II in line with new Mangalore Port, transect IV close to the old Mangalore Port and transect III in between. The proposed outfall point is between Chitrapur and Suratkal area. At each transect, four stations were fixed at 5,10,15 and 20 m depths. A total marine area between old

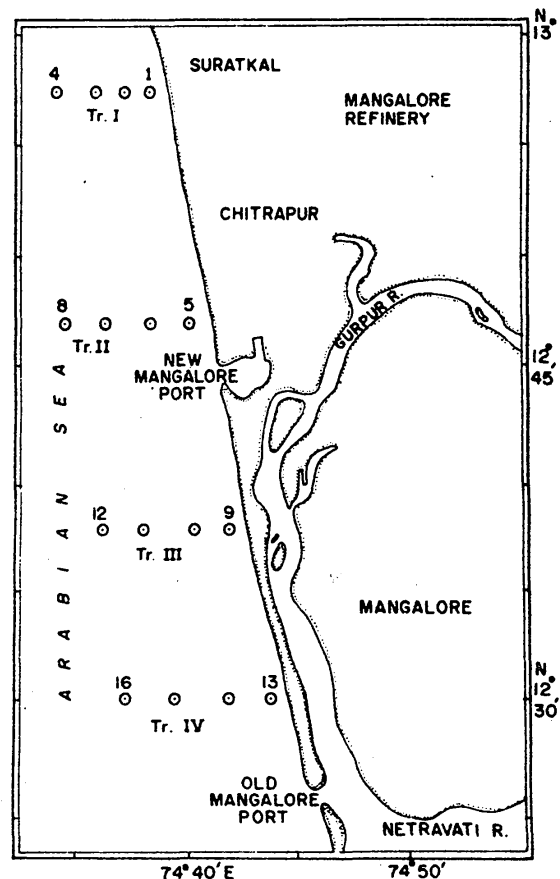


Fig. 1—Stations position

Mangalore Port and Suratkal, covering a distance of about 20 km, extending approximately 2 km seaward was surveyed. Samples were collected in January, March, May, September and December 1988. Benthos samples were collected using Van Veen grab (mouth area 0.048 m²), filtered through a 0.5 mm sieve, stained using Rose Bengal and the organisms were sorted out and counted. Benthic biomass, is expressed in g/m² (shell on wet weight) and numerical abundance in no./m².

Results

Benthic biomass—Biomass values varied from 1 to 1100 g/m². Highest biomass of 1100 g/m² was noticed at st. 8 during December, in the New Mangalore port area, mainly constituted by bivalves. Suratkal area (Tr. I) had lesser biomass compared to other stations. Mangalore Port to old Mangalore Port areas (Tr. II, III and IV). In general 5 m contour stations yielded lesser biomass and May and December were productive months (Fig. 2).

Macrobenthic population and faunal composition—Lowest and highest aggregate numerical abundance recorded were during September and December (20 and 45680/m²) at st. 1 (Tr.I) and st. 8 (Tr.II). Benthic population was generally rich

along 20 m contour and varied along at 5, 10 and 15 m. Suratkal area (Tr.I), was less productive compared to the other areas. Considering the overall faunal composition in the four transects together, bivalves were the most dominant group which constituted 59.1% followed by polychaetes (17.8%), gastropods (11.7%), scaphopods (7.8%) and echinoderms (2.3%). Other groups present in small numbers were holothurians, decapods, amphipods, cephalochordates, heteropods, sipunculids, oligochaetes, cumacea and stomatopods constituting 1.3% of the total population. Bivalves, gastropods, scaphopods and polychaetes were present during all the five observations (Table 1).

Bivalvia: Transectwise occurrence was 62.2, 70.1, 45.0 and 54% respectively. Peak abundance of 36160/m² was in December in Tr. II, followed by a second peak in May (6320/m² in Tr. IV).

Gastropoda: Transectwise contribution was 20.1, 12.1, 7.9 and 9.7% respectively. Gastropoda also had its highest density in December (6400/m²), followed by a lean period up to April. Peak abundance was in Tr. II.

Scaphopoda: Transectwise contribution was 7.8, 8.5, 6.5 and 8.1% respectively. Peak abundance was in December (3120/m²) in Tr. II.

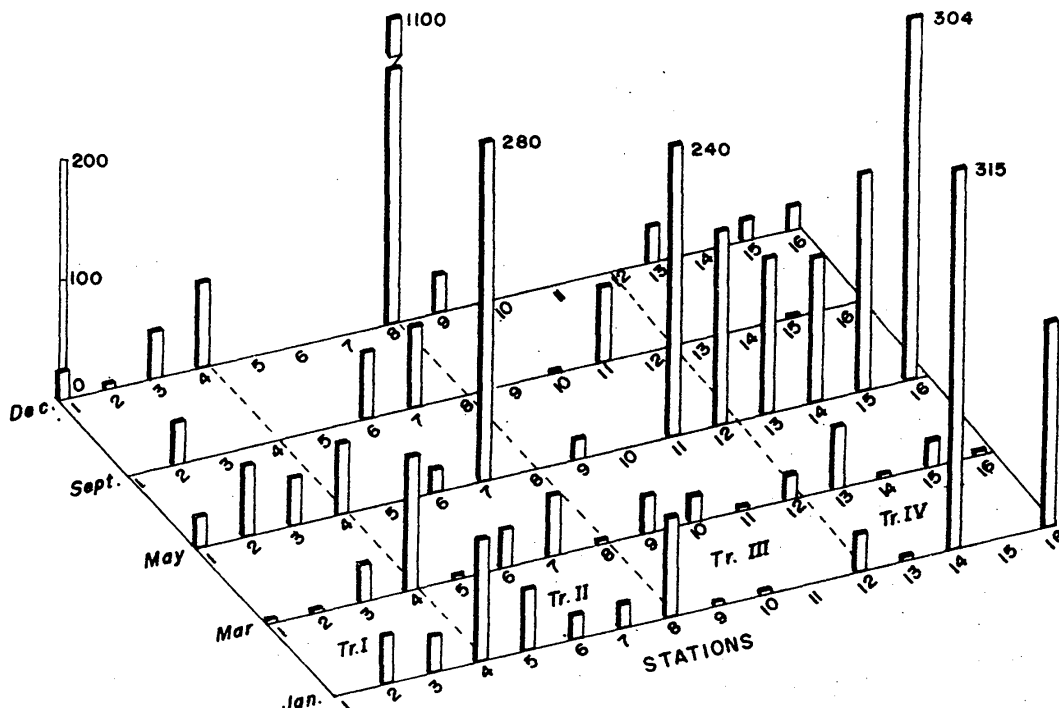


Fig. 2—Biomass (g/m²) of the macrobenthic organisms

Table 1—Numerical abundance of macrobenthic organisms (no./m²) of the Mangalore region

St. No.	Bivalvia					Gastropoda					Scaphopoda					Polychaeta				
	Jan.	Mar.	May	Sept.	Dec.	Jan.	Mar.	May	Sept.	Dec.	Jan.	Mar.	May	Sept.	Dec.	Jan.	Mar.	May	Sept.	Dec.
Tr. I 1	-	60	5560	-	1080	100	-	3640	-	200	-	-	-	-	320	-	100	40	20	-
2	820	540	1200	300	540	-	20	40	500	40	-	-	-	200	40	-	60	420	-	-
3	100	260	1360	-	520	40	140	120	-	80	40	40	120	-	-	-	420	-	-	20
4	2940	140	1620	120	660	25	140	280	180	200	640	40	300	100	-	60	260	20	40	40
M. total	9560	1000	2435	420	2000	140	300	4080	680	520	1060	80	420	300	360	1500	840	480	60	60
Y. total & %	3258	1780	62%			5720			20.1%		2220			7.8%		1500			5.3%	
Tr. II 5	-	500	180	-	160	-	140	-	-	-	80	-	-	-	-	20	40	-	3100	20
6	60	460	1360	2240	660	-	140	20	800	20	20	-	40	700	80	-	620	-	550	-
7	200	140	1500	20	1400	-	20	80	520	100	240	-	420	260	560	40	120	20	280	20
8	340	640	120	2420	36160	-	-	20	120	6400	120	-	240	20	3120	-	-	60	80	-
M. total	600	1740	3160	4680	38380	-	300	120	1440	6520	460	-	700	980	3760	60	780	80	4010	100
Y. total & %	48560		70.1%			8380			12.1%		5900			8.5%		5030			7.3%	
Tr. III 9	-	280	1600	80	120	-	-	60	-	1380	-	-	-	-	40	120	3360	1200	80	220
10	-	40	440	700	180	-	-	20	480	160	-	-	-	360	-	180	940	300	1500	20
11	-	320	6160	1480	680	-	40	80	120	140	-	-	-	660	-	-	60	3380	1350	20
12	-	240	5520	-	780	80	20	320	200	180	260	80	-	1300	20	140	-	1760	1200	-
M. total	-	880	13720	2260	1760	80	60	480	800	1860	260	80	-	2320	60	440	4360	6640	4130	260
Y. total & %	18620		45.0%			3280			7.9%		2680			6.5%		15830			38.3%	
Tr. IV 13	280	420	1040	-	180	-	20	80	-	-	-	-	-	-	-	-	80	2800	-	-
14	2850	180	6320	20	220	420	-	320	-	-	280	20	-	-	-	-	-	1680	280	40
15	-	1800	6080	1120	-	-	80	160	40	480	-	-	-	100	340	-	-	4000	200	-
16	1950	700	1040	100	1020	100	-	2640	80	120	160	80	320	2360	100	-	-	1520	300	-
M. total	5080	3100	14480	1240	1420	520	100	3200	120	600	460	100	320	2460	440	-	80	10000	780	40
Y. total & %	25320		54.0%			4540		9.7%			3780		8.1%		10900				23.3%	
Grand total & %	110320					21920					14580					33260				17.8%
M. total=Monthly total, Y. total=Yearly total						11.7%					7.8%									

(Continued)

Table 1—Continued

St. No.	Holothuria			Other Echinodermata			Decapoda		Amphipoda		Cephalo-chordata		Hetero-poda		Sipunculida		Oligochaeta		Cumacea		Stomatopoda		Station wise total
	Jan.	Mar.	May	Sept.	Mar.	May	Sept.	Jan.	Mar.	Mar.	May	Sept.	Dec.	Mar.	May	May	May	May	Mar.	Mar.	Mar.	Mar.	
Tr. I 1	-	-	-	-	20	80	-	-	-	640	-	-	-	-	-	-	-	-	-	40	-	-	11900
2	40	-	-	60	-	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4840
3	-	-	-	-	540	160	-	20	-	80	-	-	-	-	-	-	-	-	-	-	-	-	4440
4	40	80	-	-	60	-	-	5	60	20	-	-	-	-	-	-	-	-	-	10	-	-	8040
M. total	80	80	-	60	620	240	20	20	60	740	-	-	-	-	-	-	-	-	-	40	-	-	29220
Y. total & %					880	3.0%																	
Tr. II 5	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4260
6	-	-	-	-	580	100	-	-	-	60	-	20	-	-	-	-	-	160	-	-	-	-	8690
7	-	-	20	-	-	40	-	-	-	-	-	20	-	-	-	-	-	360	-	-	-	-	6380
8	20	-	-	-	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	49900
M. total	40	-	20	-	580	160	-	-	-	60	-	40	-	-	-	-	-	520	-	-	-	-	69230
Y. total & %					740	1.1%																	
Tr. III 9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8560
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	-	-	5360
11	-	-	-	80	40	80	240	-	-	-	20	20	-	-	-	-	-	-	-	-	-	-	14970
12	20	-	80	-	-	80	-	-	-	-	-	-	-	20	-	160	-	-	-	-	-	-	12480
M. total	20	-	80	80	40	160	240	240	20	-	20	20	20	20	160	160	-	-	-	20	20	20	41370
Y. total & %					440		1.1%																
Tr. IV 13	-	-	-	-	-	880	-	-	-	-	-	-	-	60	-	-	-	-	-	-	-	-	5840
14	-	-	-	-	-	240	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12870
15	-	-	-	-	-	880	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15280
16	40	-	-	-	-	240	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12870
M. total	40	-	-	-	-	2240	-	-	-	-	-	-	-	60	-	-	-	-	-	-	-	-	46860
Y. total & %					4300	4.8%																	
Grand total & %	500				4300			100	820	80	160	520	60	20	160	20	20	60	20	20	20	20	186720

M. total = Monthly total, Y. total = Yearly total

Polychaeta: Transectwise occurrence was 5.3, 7.3, 38.3 and 23.3% respectively. Peak numerical abundance of 4000/m² was in May at Tr. IV. High values were recorded in March and September also.

Echinodermata: Transectwise contribution was 3.3, 1.1, 1.1, and 4.8% respectively. Highest density of 880/m² was recorded in May in Tr. IV.

Discussion

A comparative study of the results from the present observations with the available data from Mangalore region and nearby areas¹⁻⁵ revealed that longterm changes, are not pronounced though seasonal abundances recorded were fluctuating. The biomass values reported¹ in 1973 from subtidal benthos from Vengurla to Malpe region are 0.2-32.0, 0.1-2.1 and 0.3-16.5 g/m² along the 5, 10 and 20m contours respectively. Biomass and corresponding numerical density reported in 1977, from Vengurla to Mangalore region² were 0.25-1109.7 g/m² and 251-15800/m² respectively, with mean values of 762.35 g/m² and 5518/m² for the Mangalore region. The estimated values during 1980 were 0.12-190.5 g/m² (av. 11.59 g/m²) and 50-3715/m² for the shelf region of the west coast of India³. In 1987 the values were 1.5-56.55 g/m² and 200-6535/m² for Mangalore region⁴. Contrary to the above, the averaged benthic biomass reported from the EEZ of the west coast of India during 1988 were only 0.1->20 g/m² with highest values along Kerala coast and the nearshore waters of Mangalore region had only 1.0-10.0 g/m² as per that report⁵.

A striking difference noticed in the benthic standing crop of the same area was the shift in the benthic production from the 5 m contour. In all the earlier observations¹⁻⁴, 5 m contour line was reported to be most productive and a decrease in biomass progressively with depth. In the present observations 5 m contour line appeared to be less productive compared to 10, 15 and 20 m with an increasing trend up to 20 m, both in biomass and numerical density. As against the polychaete dominance reported earlier^{1,3,4}, molluscan dominance was reported in the Mangalore area². The

present observations also showed molluscan dominance.

High benthic production during May and December is also comparable to the gradual increase in production from post to premonsoon months. The nature of the substratum at Mangalore region has been reported as sandy mud and silty clay or clayey silt^{1,3}. Five meter zone has been found dominated by sandy mud bottom and 10-20 m depth zone is silty clay or clayey silt^{1,3}. Polychaetes and gastropods showed preference to sandy mud. Scaphopods did not prefer sandy mud. Crustaceans did not show any preference to substratum¹. Abundance of benthos was found in sandy clay followed by silty sand. Clay supported poor benthic population³. In the present observations the peak occurrence of molluscs were in clayey silt substratum with sand, silt, clay percentage of 5.04, 50.00 and 44.96. Polychaetes and echinoderms had their peaks when the substratum was sandy clay (15.61% sand, 1.7% silt and 82.69% clay). The area between the new and old Mangalore port (Tr. II, III and IV) appeared to be more productive than the Kulai region (Tr.I) in the north. This may be attributed to the slightly rich organic carbon content in the former area (0.011 to 1.969%) compared to the latter (0.089 to 1.835%). Organic carbon of >4% only has been reported to cause a decrease in benthic fauna along the west coast of India³. Mangalore region is comparable to any other areas in the west coast and no major variation has taken place in this environment, from industrial effluents.

Acknowledgement

The authors are grateful to the Scientist-in-Charge NIO, RC, Cochin and to the Director NIO, Goa for providing all facilities.

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