

Distribution of Meiobenthos & Macrobenthos at the Mouth of Some Rivers of the East Coast of India

Z A ANSARI, C L RODRIGUES, A CHATTERJI & A H PARULEKAR

National Institute of Oceanography, Dona Paula, Goa 403 004

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Distribution of meio- and macrobenthos of muddy bottom deposits at the mouth of Krishna, Godavari, Mahanadi and Hooghly rivers was studied from replicate sampling. Total meiofauna ranged from 226 animals/4.5 cm² to 967 animals/4.5 cm² in the top 10 cm layer of the bottom deposits. Macrofaunal density varied from 90/m² to 4785/m². Nematodes, harpacticoids and polychaetes were the important faunal taxa. Meiobenthic population was contagiously distributed.

Replicate sampling programme has been undertaken to study the distribution and abundance of muddy bottom meiofauna and macrofauna from the mouth region of Krishna, Godavari, Mahanadi and Hooghly rivers of the East coast of India. The results in the context of some of the abiotic factors are discussed in the present communication.

During the 94 cruise of *R V Gaveshani* (June 1981) benthic samples were collected in the vicinity of the mouth region of Krishna (K), Godavari (G), Mahanadi (M) and Hooghly (H) rivers (Fig. 1). A 0.1 m² Petersen type grab (penetration 25 cm) was used for collecting 5 replicate meiobenthic samples at each of the station. Meiofauna subsamples were drawn from the undisturbed bottom deposits using a plexiglass core tube (10 cm length & 4.5 cm diam.). The core was divided into 0-5 and 5-10 cm sections and preserved separately in 1:500 Rose Bengal buffered seawater formalin¹.

Macrofauna subsampling was done by a 170 cm² plexiglass quadrant and the sediments were sieved through a 500 µm mesh screen. Laboratory methods for the analysis were same as reported elsewhere^{2,3}. Medium diameter for the sediments particle size was calculated by the method of Folk⁴.

Dispersion patterns of meiofauna were estimated using the Morisita's Index

$$I\sigma = n[\Sigma(x^2) - \Sigma x/(\Sigma x)^2 - \Sigma x]$$

where n is the number of samples and x is the number of individuals in the sample⁵.

Physical environment—Temperature, salinity and dissolved oxygen in the surface and the bottom waters (Table 1) showed fairly uniform trend of variations. Similarly, suspended load also did not show significant differences within the study area. The sediment was fine silty clay at all stations. Sand particles (> 62 µm diam.) were present in negligible proportion, except at st H.

Meiofauna—In terms of overall number, st G was the richest area ($\bar{x} = 715$) followed by st M ($\bar{x} = 705$). As seen from Table 2; st K ($\bar{x} = 314$) and st H ($\bar{x} = 431$) were relatively impoverished. Fauna was mainly localized in the top 5 cm depth of the sediments. Population density in the total 10 cm layer varied from 226 animals per core at st K to 967 animals per core at st M.

Nematodes were the most important taxa followed by harpacticoids and polychaetes (Table 2). Turbellarians, ostracods, lamellibranchs and kinorhynchans were present in lesser numbers and with patchy distribution. Other taxa including gastrotrichs, tardigrades, rotifers and crustacean nauplii, were inconspicuous.

Analysis of count data using Morisita's Index of dispersion for total meiofauna count revealed significant departures from randomness (χ^2 , $P < 0.55$) in many cases. Major faunal taxa (Nematoda, Harpacticoida, Polychaeta) showed contagious distribution except in one case, where at st K polychaetes showed random distribution.

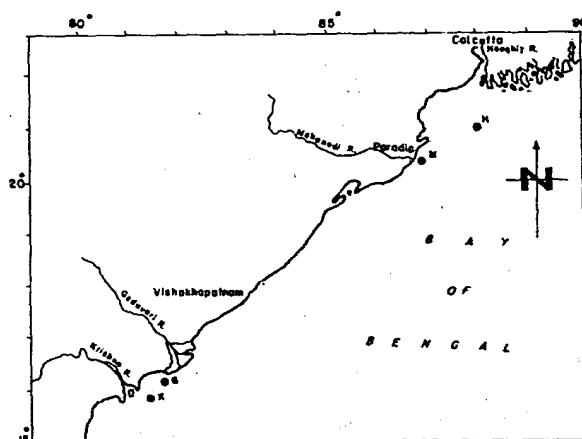


Fig. 1—Map showing location of station positions

Table 1—Physico-Chemical and Biological Parameters of the Study Area

St	Depth m	Temp. °C		Sal. ‰		Dissol. oxygen ml/l		Sand %	Silt-Clay %	Median grain size, mm	Suspended matter mg/l	Primary Productivity mg C/m ² /day
		S	B	S	B	S	B					
		K	50	28.8	27.6	33.9	34.1					
G	20	28.8	28.1	34.2	34.3	4.93	4.07	0.51	98.09	0.0029	3.6	288
M	15	30.2	30.3	31.9	31.9	4.68	4.56	0.55	98.65	0.0025	3.8	267
H	15	28.9	28.9	33.2	33.4	4.35	4.31	11.54	87.96	0.0012	4.7	211

S = surface; B = bottom

Table 2—Distribution of Meiofauna in Pentriplicate Core Samples

Faunal group	Core samples										Total	% Composition
	1		2		3		4		5			
	0-5	5-10	0-5	5-10	0-5	5-10	0-5	5-10	0-5	5-10		
St K												
Nematoda	176	83	196	34	144	42	204	72	92	52	1095	69.7
Polychaeta	25	9	20	6	18	0	28	9	26	2	143	9.1
Harpacticoida	25	6	14	0	31	2	39	0	25	5	147	9.3
Ostracoda	12	0	3	0	0	0	4	0	7	0	26	1.6
Turbellaria	13	0	19	0	12	0	22	0	8	2	76	4.8
Others	7	2	12	4	15	5	21	9	6	1	82	5.2
Total	258	100	264	44	220	49	318	90	164	62	1569	
St G												
Nematoda	584	76	381	52	560	125	506	218	414	163	3079	86
Polychaeta	25	7	18	2	30	12	39	1	17	0	151	4.2
Harpacticoida	51	3	16	0	32	10	26	0	22	0	160	4.5
Turbellaria	25	3	32	3	10	0	12	0	9	2	96	2.6
Lamellibranchiata	19	0	12	0	4	2	9	0	8	2	56	1.5
Others	4	3	6	2	3	1	9	2	3	3	36	1
Total	708	92	465	59	639	150	601	221	473	170	3578	
St M												
Nematoda	435	120	360	55	700	95	498	41	521	64	2889	81.7
Polychaeta	45	13	22	2	62	15	42	2	17	0	220	6.2
Harpacticoida	41	2	51	0	48	5	32	0	33	0	212	6
Turbellaria	22	8	19	0	42	4	9	0	14	2	120	3.4
Kinorhyncha	7	0	0	0	4	0	6	2	2	0	21	0.6
Lamellibranchiata	15	3	7	2	9	0	0	0	12	0	49	1.3
Others	2	0	6	2	3	0	0	2	4	4	23	0.6
Total	567	146	465	61	868	119	587	47	603	70	3533	
St H												
Nematoda	240	39	182	30	296	29	313	34	262	55	1480	68.7
Polychaeta	20	8	24	6	35	12	41	20	34	2	202	9.3
Harpacticoida	60	0	48	0	36	0	89	0	52	3	288	13.3
Ostracoda	19	0	9	0	13	0	18	0	8	0	67	3.1
Turbellaria	15	0	3	0	19	6	6	0	9	0	58	2.6
Others	14	11	7	3	2	3	16	4	6	3	69	3.2
Total	368	58	273	39	401	50	483	58	371	63	2154	

Table 3—Macrofauna Density/m² and Biomass g/m² wet weight from Different Stations

Faunal group	Stations			
	K	G	M	H
Polychaeta	50	1189	708	59
Bivalvia	10	87	118	118
Scaphopoda	0	1480	0	0
Euphausiacea	10	0	0	0
Tannidacea	0	116	0	0
Gammaridea	0	1856	0	0
Penaeidea	0	58	0	0
Cumacea	0	0	59	0
Sipunculida	10	0	0	0
Hydrozoa	0	0	59	0
Ophiuroidea	10	0	118	0
Echiurida	0	29	0	0
Total population/m ²	90	4785	1062	177
Total biomass (g/m ²)	0.11	13.64	16.04	2.48

Macrofauna—Table 3 shows macrofauna density and biomass from different stations. Generally polychaetes and bivalves were the most dominant groups with polychaetes comprising 24.8 to 66.7% of the total macrofauna and bivalves contributing 1.8 to 66.7% of the total macrofauna. Other groups which were not found regularly at all stations include euphausiids, amphipods, decapods, cumaceans, sipunculids, hydrozoans, ophiuroids and echiuroids.

The importance of meiobenthos in the dynamics of the subtidal bottom fauna, in general, and in the marine trophic ecology in particular, is well recognized⁶. As observed in the present study, meiofauna was numerically 94 to 2193 times more than macrofauna (Table 4), with an overall contribution of 50% of the total benthic standing crop. Although meiofauna formed moderate to small share of benthic biomass, their short generation time and high metabolic rate are reported to contribute far more towards annual benthic production than their larger counterparts⁷.

Distribution and abundance of meiofaunal population are particle size dependent⁸. Richness of

Table 4—Comparison of Macrofauna and Meiofauna/m² Area

St	Biomass (macro:meio)	Density (macro:meio)
K	1:2.7	1:2193
G	2:1	1:94
M	3:1	1:417
H	1:1.7	1:1531

fauna in the substratum having median grain diameter of 0.0029 and 0.0025 mm suggests their preference for such substratum. Nematodes are most dominant (percentage wise) in soft muddy deposits and harpacticoids in sandy substratum. Vertically the bulk of the meiofauna (>70%) is concentrated in the top 5 cm layer of the substratum. Such high aggregations are attributed to the availability of food and oxygen in the top layer^{2,9}. Horizontally, meiofauna exhibits highly contagious distribution. Such variations in spatial distribution of meiofauna are controlled by variations in more localized physical, chemical and biological factors^{10,11}.

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References

- 1 Tjetjen J H, *Deep Sea Res*, **18** (1971) 941.
- 2 Parulekar A H, Nair S A, Harkantra S N & Ansari Z A, *Mahasagar—Bull natn Inst Oceanogr*, **9** (1976) 41.
- 3 Ansari Z A, *Mahasagar—Bull natn Inst Oceanogr*, **11** (1978) 163.
- 4 Folk R L, *Petrology of sedimentary rocks* (Hemphills, Austin, Texas) 1968, 170.
- 5 Elliot J M, *Some methods for the statistical analysis of samples of benthic invertebrates* (Freshwater Biological Publication No. 25) 1977, 76.
- 6 Gerlach S A, *Oecologia (Berl)*, **6** (1971) 176.
- 7 McIntyre A D, *Biol Rev*, **44** (1969) 245.
- 8 Wieser W, *Limnol Oceanogr*, **4** (1959) 181.
- 9 Ansari Z A, Parulekar A H & Jagtap T G, *Hydrobiologia*, **74** (1980) 209.
- 10 McIntyre A D, *Thal Jugoslavia*, **7** (1971) 209.
- 11 Coull B C & Bell S S, in *Ecological processes in Coastal and marine systems*, edited by R J Livingston (Plenum Publishing Co, New York) 1979, 189.