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Meiofauna Distribution from Arukkattuthurai to Aiyyampattinam, South East Coast of India

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Abstract

The study of meiofauna is important as it could be an indicator of overall aquatic productivity. In the present study a survey of meiobenthic fauna was carried out in five different coastal areas. The results indicate that nematodes are dominant followed by foraminiferans, harpacticoids, ostrocodes, cumacea, cnidarians and turbellarians. The maximum species diversity was recorded at station 3 and minimum species recorded at station 1. In the present study confirming that anthropogenic disturbance in the intertidal coastal area and also pollution affect the species diversity.

Keywords: Nematodes; Foraminiferans; Harpacticoids; Ostrocodes; Cumacea; Cnidarians

Introduction

Benthos harbours a community of organisms including micro-organisms, animals and plants. The term meiobenthos fauna relate usually to multicellular animals with a size between 50 and 500 mm [1]. The meiobenthos has so far mainly been studied in the context of the formation of sediments and ecotoxicology in marine environments and freshwater lakes [2-4]. However, it should also be an interesting subject for food web studies. The whole phylum currently contains some 20,000 species, of which about 4,000 species are free living marine forms. Meiofauna occupies about 80% of the total marine biomass and its of great importance in the marine ecology and the marine mineralogy [2]. Some of the meiofauna groups form a direct food for Macrobenthos, juveniles of demersal fishes and also of shrimps [5]. The meiofauna are primary consumers and found to feed on organic matter. Meiofauna are also known to be sensitive indicators of environmental disturbances and have great potential as pollution indicators. It is shown to have advantages that include their sessile habitat, high abundance, high species diversity, short generation time, direct benthic development and ubiquitous distributions of marine sediments. Very little work was done especially on the benthic species diversity. So the present study was attempted to investigate the benthic biodiversity in five coastal environments of south east coast of India.

Materials and Methods

The field survey was conducted from September-2007 to August-2008 in five different stations. Station-1 Arukkattuthurai (10'23'30.51" N; 79'52'07'.14" L), Station-2 Pointcalimere or Kodiakkarai (10° 18' N; 79° 51' E), - Station-3 Mallipattinam (100 16' 35" N; 790 19' 12" E), Station-4 Manalmelkudi (10° 25' 13" N, 79° 18' 51"E) and Station-5 Aiyyampattinam (09° 57' 27" N, 79° 11' 02"E). The sample collection was made monthly five times for one year in all the stations. The samples collected on shore with the shallow region at the depth of 0 to >10m. Peterson grabs were used to collect sediment, after collection the sediments stored in polyethylene cover and preserved in 5% formalin. Then after five hours the species were sieved to get individual species, on direct observations to help of light microscope at a magnification of 10x10, then number of individuals (N) per unit area (10 cm^2) was estimated. The water quality parameters were also estimated by following standard methods.

	Stations				
Meiobenthos	**1**	**2**	**3**	**4**	**5**
Cnidarians	2	2	**2**	**2**	2
Turbellarians	2	2	**2**	**2**	2
Nematodes	27	37	**41**	**39**	30
Foraminiferans	28	32	**36**	**34**	31
Cumacea	4	4	**4**	**4**	4
Harpacticoids	15	17	**19**	**18**	16
Ostrocodes	12	16	**18**	**17**	13
Total	90	110	**122**	**116**	98

Table 1: Total species recorded in all five stations.

Results and Discussion

Nematode was a dominant species in the present study. They

S:No	Meiobenthos	ST-1	ST-2	ST-3	ST-4	ST-5
	Cnidarians					
1	*Halammohydra sp*	*	*	*	*	*
2	*Psammohydra sp*	*	*	*	*	*
	Turbellarians					
1	*Macrostomum sp*	*	*	*	*	*
2	*Otoplana sp*	*	*	*	*	*
	Nematodes					
1	*Astomonema sp*	*	*	*	*	*
2	*Chromadora sp*		*	*	*	*
3	*Comesomoides sp*		*	*	*	
4	*Daaptonema oxycerea*	*	*	*	*	*
5	*D. conicum*	*	*	*	*	*
6	*Daaptonema sp*	*	*	*	*	*
7	*Desmodora falcatus*	*	*	*	*	
8	*D. pontica*	*	*	*	*	*

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9	*D. sanguinea*		*	*	*	*
10	*D. tenuispiculum*		*	*	*	*
11	*Desmodora sp*	*	*	*	*	*
12	*Draconema sp*	*	*	*	*	*
13	*Enoploides sp*	*	*	*	*	*
14	*Gomphionema sp*		*	*	*	*
15	*Gonionchus sp*	*	*	*		
16	*Greeffiella sp*			*	*	*
17	*Halalaimus filum*	*	*	*	*	*
18	*H.setosus*		*	*	*	
19	*Metapselionema sp*	*	*	*	*	*
20	*Oncholaimus sp*	*	*	*	*	
21	*Oxystomina sp*	*	*	*	*	*
22	*Pandolaimus sp*	*	*	*	*	
23	*Paralinhomoeus sp*		*	*	*	*
24	*Polygastrophora sp*	*	*	*	*	*
25	*Prochaetosoma sp*	*	*	*	*	*
26	*Pselionema sp*	*	*	*	*	*
27	*Pseudolella sp*	*	*	*	*	*
28	*Quadricoma sp*	*	*	*	*	*
29	*Rhynchonema sp*	*	*	*	*	
30	*Sabatieria sp*		*	*	*	*
31	*Steineria sp*	*	*	*	*	
32	*Syringolaimus sp*		*	*	*	*
33	*Theristus partenuis*	*	*	*	*	*
34	*T. clax*	*	*	*	*	*
35	*Theristus sp*	*	*	*	*	*
36	*Trichotheristus sp*	*	*	*	*	*
37	*Tricoma sp*	*	*	*	*	*
38	*Vasostoma sp*		*	*	*	
39	*Viscosia viscosa*	*	*	*	*	
40	*V. macramphida*		*	*	*	*
41	*V. carnleyensis*	*	*	*	*	*
42	*Viscosia sp*	*	*	*	*	*
	Foraminiferans					
1	*Ammobaculities exigus*			*	*	*
2	*Ammonia beccari*	*	*	*	*	*
3	*Ammonia sp*					
4	*Amphisorus hemprichii*			*	*	*
5	*Asterorotalia inflata*	*	*	*	*	*
6	*Bolivina sp*					
7	*Cibicides lobatulus*	*	*	*	*	*
8	*Cyclammina sp*	*	*	*	*	*
9	*Cymbaloporetta bradyi*	*	*	*		
10	*Diffusilina sp*		*	*	*	*
11	*Discorbis sp*	*	*	*	*	*
12	*Elphidium advenum*	*	*	*	*	*
13	*Eliphidium sp*	*	*	*	*	*
14	*Ephonides repandus*	*	*	*	*	*
15	*Globigerina ruber*		*	*	*	*
16	*Globigerina sp*					
17	*Hanzawaia sp*	*	*	*	*	*
18	*Hauerina sp*	*	*	*	*	*
19	*Lagena semistriata*	*	*	*	*	*
20	*Lagena sp*	*	*	*	*	*
21	*Nonion depressulum*	*	*	*	*	*
22	*Nonionoidds boveanum*	*	*	*		
23	*Osangularia venusta*		*	*	*	*
24	*Operculina sp*	*	*	*	*	*
25	*Oridosalis umbonatus*		*	*	*	*
26	*Planorbulinella larvata*	*	*	*	*	*
27	*Quinoqueloculina sp*	*	*	*	*	*
28	*Rosalina globularis*	*	*	*	*	*
29	*Rotalia pulchella*	*	*	*	*	*
30	*Rotalia sp*	*	*	*	*	*
31	*Spirillina limbata*		*	*	*	
32	*Spirolina sp*	*	*	*	*	*
33	*Spiroloculina sp*	*	*	*	*	*
34	*Textularia agglutinans*	*	*	*	*	*
35	*Textularia sp*		*	*	*	*
36	*Trochammina sp*	*	*	*	*	*
37	*Triloculina sp*			*	*	*
	Cumacea					
1	*Campylaspis sp*	*	*	*	*	*
2	*Gynodiasytlis sp*	*	*	*	*	*
3	*Nannastacus sp*	*	*	*	*	*
4	*Picrocuma sp*	*	*	*	*	*
	Harpacticoids					
1	*Acuticaudatus*		*	*	*	*
2	*Arenosetella indica*	*	*	*	*	*
3	*Asellopsis sp*	*	*	*	*	*
4	*Canuella sp*	*	*	*	*	*
5	*Cervinia sp*	*	*	*	*	*
6	*Cylindropsyllus sp*	*	*	*		
7	*Diarthrodes sp*			*	*	*
8	*Emertonia minuta*		*	*	*	
9	*Eutrpina acutiferans*	*	*	*	*	*
10	*Laophonte sp*	*	*	*	*	*
11	*Leptastocus euryhalinus*	*	*	*	*	*
12	*Laptascus sp*	*	*	*	*	*
13	*Macrosetella sp*	*	*	*	*	*
14	*Metis*	*	*	*	*	*
15	*Microsetella sp*	*	*	*	*	*
16	*Phyllopodosylliis sp*	*	*	*	*	*
17	*Psammastacus*			*	*	*
18	*Sewellina reductus*	*	*	*	*	*
19	*Stenhelia sp*	*	*	*	*	*
	Ostrocodes					
1	*Actinocythereis scutigera*			*	*	
2	*Basslerites liebaui*		*	*	*	*
3	*Conchoecia sp*	*	*	*	*	*
4	*Cyprideis sp*	*	*	*	*	*
5	*Cypridina sp*	*	*	*	*	*
6	*Keijella reticulata*			*	*	*
7	*Leptocythere sp*	*	*	*	*	*
8	*Loxoconcha lillijeborgii*		*	*	*	*
9	*Neocytheretta sp*	*	*	*	*	*
10	*Neocytheretta murilineatta*		*	*	*	
11	*Neomonoceratina iniqua*	*	*	*	*	*
12	*Mutilus pentoekensis*	*	*	*		
13	*Polycope sp*			*	*	*
14	*Tanella gracilis*	*	*	*	*	*
15	*T. indica*	*	*	*	*	*
16	*T. kingmaii*	*	*	*	*	
17	*Tanella sp*	*	*	*	*	*
18	*Xestoleberis variegata*			*	*	*

* - Species recorded in different stations
(Station 1– Arukkattuthurai, Station 2- Pointcalimere, Station 3– Mallipattinam, Station 4– Manamelkudi, Station 5- Aiyyampattinam).

Table 2: Meiobenthos (No/10cm^2) species recorded in all five stations.

parameters	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG
Salinity(‰)	28.5	27.5	28.0	26.5	28.5	33.5	28.0	35.0	34.5	34.0	34.0	34.5
Temp (°C)	30.5	29.0	28.5	25.5	29.5	31.5	33.0	35.5	34.5	33.5	32.0	33.5
pH	7.8	7.5	7.8	7.9	7.8	8.0	8.1	8.2	8.0	8.1	8.2	8.3
Do (ml/l)	3.4	3.3	4.4	4.2	4.0	4.3	4.2	4.1	3.0	4.0	4.2	3.7

Table 3: Water quality parameters in all the station.

normally occur in any environment that provides a source of organic carbon. In every soil type, under all climatic conditions and habitats that vary from pristine to extremely polite. They do not rapidly migrate stressful conditions and many species survive dehydration, freezing or oxygen stress. Nematodes occupy on key position particularly in soil food webs. Nematodes were the most dominant at all stations in the present study that was followed by foraminifera's, Harpacticoid, Ostrocodes, Cumacea, Cnidarians and Turbellarians. Totally 42 species of nematodes were recorded in the present study. Mallipattinam had maximum number of nematodes rather than other stations (Tables 1 and 2). Out of this, 21species are present in all five stations, (*Astomonema sp, Daaptonema oxycerea, Daaptonema conicum, Daaptonema sp, Desmodora pontica, Desmodora sp, Draconema sp, Enoploides sp, Halalaimus filum, Metapselionema s, Oxystomina sp, Polygastrophora sp, Prochaetosoma sp, Pselionema sp, Pseudolella sp, Quadricoma sp, Steineria sp, Theristus sp, Trichotheristus sp, Tricoma sp, Viscosia sp*). Observations in the nematodes from other parts of the world have related their occurrence to the type of sediments in which they occur [7,8]. The Mallipattinam is highly productive and mud flat areas are abundant in the top few centimeters of sediments where they are easily accessible to predators including fishes.

The second dominant species in the present study are foraminifera which are good indicators for paleoenvironmental studies (Tables 1 and 2). Some species are commonly present in all the five stations (*Ammonia beccarii, Rosalina bradyi, Rosalina globularis, Rotalia pulchella, Asterorotalia inflate, Triloculina austriaca, Quinqueloculina lamarckiana*) either alive or dead in the environment. Foraminiferas are small level of dead species but they are active in bottom currents. Some species viz., *Nonion elongatum and Asterorotalia inflate*, were absent in the study of [6] from (Stations 3 & 4). The *Ammonia beccarii* is considered to be highly tolerant to different ecosystems. So the present study supports the survival species having high order of tolerance in turbulent conditions. Harpacticoid copepods are widely disburse and seasonally high in almost all the five stations. Copepods are very sensitive to oxygen depletion and the presence of sulfide [5]. Harpacticoid copepods are the general feature of meiofauna reported from different geographical regions [7-9]. The meiofauna higher density in pre and post-monsoon followed by low density in monsoon was the feature of this study.

Temperature is an important ecological factor, which influence the distribution of benthic organisms. High temperature 35.5°C, recorded in summer season influence the distribution of meiobenthic organisms. Low temperature 25.5°C, recorded in December and that influence higher faunal density.pH value was minimum in the month of October 7.5 and maximum in the month of August 8.3, Salinity was minimum 26.5‰ in the month of December and maximum 35.0‰ in the month of April. The pH, salinity and available nitrogen that may affect meiofauna diversity [10]. The dissolved oxygen content varied from 3.0 to 4.4 ml/l. The oxygen content was highest during the monsoon period.

The meiofauna is considered as the best indicators of environmental stress because of their smaller size and short generation time. These benthic organisms form an important component of the detritus food chain of nutrient generators [11]. In coastal areas, the density of meiobenthos also decreases away from coral and sea grass area. Because of the fishing activities, anthropogenic disturbance and the environmental pollution. Benthic communities are widely used in monitoring the effect of marine pollution as the organisms are mostly sessile and readily integrate the effects of pollutants. It has been suggested that benthic fauna might be used as an integrating indicator of water quality within an area [1] (Table 3). Any fluctuation in their quality and quantity will directly affect the abundance of demersal fishes that are important fishery resources in the sea. In the present study free-living marine nematodes are the most dominant group among the meiofauna of marine environments. Their great abundance, adaptation to a wide range of habitats and diverse morphology suggest that nematodes play a major role in the benthic ecosystem.

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