European Journal of Applied Sciences 2 (1): 1-5, 2010
ISSN 2079-2077

Seasonal Abundance of Macro Benthic Composition and Diversity along the South East Coast of India

D. Varadharajan, P. Soundarapandian, B. Gunalan and R. Babu

Faculty of Marine Science, Centre of Advanced Study in Marine Biology,
Annamalai University, Parangiettai-608 502 Tamil Nadu, India

Abstract: Benthic communities are important to marine ecosystem and form important food source for most of the marine organisms especially fishes. The estimation of benthic production would serve as a useful index for assessing the fishery potentials, interaction, pollution and intertidal ecology. In the present study a survey on macrobenthic fauna was carried out in five different coastal areas. The results indicate that polychaetes are dominated followed by decapods, bivalves, gastropods, amphipods and Isopods. The maximum species diversity recorded in station 3. In station 2 minimum species recorded due to abundance of salt ponds and also salt refinery industries wastes that drained in the shore environment. So the present study conforming that pollution in the intertidal coastal area directly affecting the species diversity as well as indirectly the fishery potential.

Key words: Macrobenthos · Species diversity · Inter tidal coastal area · Polycheates · Decapods

INTRODUCTION

Macrobenthos in marine sediment plays an important role in ecosystem processes such as nutrient cycling, pollutant metabolism, dispersion and in secondary production [1]. Any fluctuation in their quality and quantity will directly affect the abundance of demersal fishes that are important fishery resources in the sea. Therefore, a benthic study may be used as baseline information to evaluate the existing demersal stocks and may serve as a baseline study of future investigations on environmental changes in this area [2]. The objective of the present study is to determine the seasonal abundance of macro benthic composition and diversity in relation to environmental factors.

MATERIALS AND METHODS

The present study was carried out for one year from September 2007 to August 2008 from Arukkattuthurai to Aiyyampattinam, south east coast of India. Five different stations were selected for the present study, (Station1)-Arukkattuthurai (10°23′30.51N″_79°52′07.14 L), (Station 2) -Point calimer (Kodikkarai) (10° 18' N; 79° 51' E), (Station 3) -Mallipattinam (10° 16’ 35N”; 79° 19’ 12” E), (Station 4)- Manalmelkudi (10° 25’ 13” N, 79° 18’ 51’’E) and (Station 5) -Aiyammpattinam (09° 57’ 27” N, 79° 11’ 02’’E). The water and sediment samples were collected in two times for every month at all stations. A hand corer with 4.3 cm inner diameter was used to collect samples at all stations, sieved and retained through 0.5mm screen and preserved in 5% formalin. The animals were separated, counted, identified up to species level using standard references and expressed in No/m^2. The salinity, temperature, P^H and dissolved oxygen of the water were estimated by following the method of APHA [3].

RESULTS AND DISCUSSION

The physico chemical parameters recorded in this study are temperature, salinity, dissolved oxygen and pH (Table 1). The maximum and minimum salinity recorded in all stations were 35 to 24 ppt respectively.

The water temperature varied between 23 to 35°C, at all the stations. The water pH was recorded maximum 8.4 and minimum was 7.2. The dissolved oxygen content was ranged from 3.0ppm to 4.6ppm in all stations.

Benthic macrofauna at all stations were represented by six groups viz., Polychaetes, Bivalves, Gastropods, Amphipods, Isopods and Decapods. Totally 112, 97,117,109 and 106 were reported from stations 1,2,3,4 and 5 respectively (Tables 2 and3).

Corresponding Author: D.Varadharajan, Faculty of Marine Science, Center of Advanced Study in Marine Biology, Annamalai University, Parangipettai-608 502, Tamil Nadu, India Tel: +04144-243223 Fax: +04144-243553

Table 1: Water quality parameters in all the stations

parameters	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG
Salinity (ppt)	26	25	25	24	27	28	29	30	32	34	35	35
Temp (°C)	30	28	27	23	28	30	34	33	34.5	34	33	35
pH	7.6	7.2	7.5	7.8	7.7	8.0	8.2	8.1	8.3	8.3	8.4	8.4
Do(ppm)	3.2	3.0	3.5	3.4	4	4.2	4.5	4.3	4.5	4.4	4.3	4.6

Table 2: Total species recorded in all five stations

	Stations				
Macrobenthos	1	2	3	4	5
Polycheates	53	45	56	53	48
Bivalves	19	16	21	18	19
Gastropods	08	08	09	08	08
Amphipods	08	09	09	09	07
Isopods	03	03	03	03	03
Decapods	21	16	19	18	21
Total	112	97	117	109	106

Table 3: Macrobenthos (No/m^2) species identified from all five stations

Macro benthos		STA-1	STA-2	STA-3	STA-4	STA-5
S. No.	Polychaetes					
1	*Ancistrosyllis constricta*	*	*	*	*	*
2	*Armandia longicaudata*	*	*	*	*	*
3	*A. intermedia*	*		*	*	*
4	*Brachiocapitta singularis*	*	*	*	*	
5	*Capitella capitata*	*	*	*	*	*
6	*Ceratonereis costae*	*		*	*	*
7	*Chone collaris*	*	*		*	*
8	*C. filicaudata*		*	*	*	*
9	*C. concinnus*	*	*	*		*
10	*Cirratulus chrysoderma*	*	*	*	*	
11	*Cirriformia sp*	*	*	*	*	*
12	*Cossura delta*	*	*	*	*	*
13	*Cossura coasta*	*	*	*	*	*
14	*Dendronereis aestuarina*	*		*	*	
15	*Diopatra neapolitana*	*		*	*	*
16	*Dorvillea gardineri*	*	*	*		*
17	*Drilonereis monroi*	*	*	*	*	*
18	*Eunice tubifex*	*	*	*	*	*
19	*Eunice indica*	*		*	*	*
20	*Eurythoe complanata*		*	*	*	
21	*Exogone clavator*	*	*	*		*
22	*Fabricia filamentosa*	*	*	*	*	*
23	*Glycera alba*	*	*	*	*	*
24	*G.longipinnis*	*	*	*	*	*
25	*Glycinnde capensis*	*		*	*	*
26	*Goniada emerita*		*	*	*	
27	*Hesione sp*	*	*	*	*	*
28	*Heteromastus similis*	*	*		*	*
29	*Heteromastus sp*	*		*	*	*
30	*Laonome indica*		*	*	*	*
31	*Lumbriconereis polydesma*	*	*	*	*	
32	*Lumbriconereis simplix*	*	*	*		*
33	*Malacoceros indicus*			*	*	
34	*Magalona sp*	*	*	*	*	*
35	*Nephtys dibranchis*	*	*	*	*	*

Table 3: Continued

36	*N. sphrocirrata*		*	*	*	*
37	*N. polybranchia*	*	*	*	*	*
38	*Nephtys sp*	*	*	*	*	*
39	*Nereis capensis*	*	*	*	*	
40	*Notomastus aberans*	*		*	*	*
41	*Onuphis sp*	*	*	*		*
42	*Ophelia sp*	*	*	*	*	*
43	*Perinereis cultrifera*	*	*	*	*	*
44	*Phalacrophorus pictus*	*				*
45	*Phyllodoce sp*	*		*	*	
46	*Pisione africana*	*	*	*	*	*
47	*Pisionidens indica*			*	*	*
48	*Pisione sp*	*	*	*	*	*
49	*Pista sp*	*		*		*
50	*Platy nereis sp*	*	*	*	*	*
51	*Polydora ciliata*	*	*	*	*	*
52	*Prionospio capensis*		*	*	*	*
53	*P. cirrobranchiatta*	*		*	*	
54	*P.cirrifera*	*	*		*	*
55	*P.pinnata*	*	*	*	*	*
56	*Protodorvillea biarticulata*	*	*		*	*
57	*Scololepsis squamata*	*	*	*	*	
58	*Syllis cornuta*	*	*	*		*
59	*S.longocirrata*	*		*	*	
60	*Terebella ehrenbergi*	*		*	*	*
61	*Tylonereis fauveli*	*	*	*	*	
Bivalves						
1	*Arca sp*	*		*	*	*
2	*Anadara granosa*	*	*	*	*	*
3	*A. veligers*	*	*	*	*	*
4	*Cardium setosum*	*	*	*	*	*
5	*C. veligers*	*	*	*	*	*
6	*Crassostrea madrasensis*	*	*	*	*	*
7	*Donax cuneatus*	*	*	*	*	*
8	*D. scortum*	*		*	*	*
9	*D. veligers*	*	*	*	*	*
10	*Gafrarium sp.*	*		*	*	
11	*Katalysia opmia*	*	*	*	*	*
12	*Lucina ovum*		*	*		*
13	*Mactra cuneata*	*		*		*
14	*Meretrix casta*	*	*	*	*	*
15	*M. meretrix*	*	*	*	*	*
16	*M. veligers*	*	*	*	*	*
17	*Paphia textile*	*	*	*	*	*
18	*Pecten sp*	*	*	*	*	*
19	*Placenta placenta*	*	*	*	*	*
20	*Solen sp*		*	*	*	
21	*Tellina sp*	*		*		*
Gastropods						
1	*Bullia vitata*	*	*	*	*	*
2	*Cerethedia cingulata*	*	*	*	*	*
3	*Cerithium sp*	*	*	*	*	*
4	*Littorina scarba*	*		*	*	*
5	*Natica sp*	*	*	*	*	*
6	*Oliva nebulosa*		*	*	*	
7	*Turritella attenuata*	*	*	*		*
8	*Umbonium vestiarium*	*	*	*	*	*
9	*Xancus sp*	*	*	*	*	*

Table 3: Continued

Amphipods						
1	*Ampithoe*	*	*	*	*	*
2	*Corophium triaenonyx*		*	*	*	
3	*Cheriphotes sp*	*	*	*	*	*
4	*Eripisella sp.*	*	*	*	*	
5	*Gammarus sp*	*	*	*	*	*
6	*Grandidierella sp*	*	*	*	*	*
7	*Pontharpinia sp*	*	*	*	*	*
8	*Urothoe sp*	*	*	*	*	*
9	*Vibilia sp*	*	*	*	*	*
Sipunculida						
Isopods						
1	*Angliera sp*	*	*	*	*	*
2	*Eisiothistos sp*	*	*	*	*	*
3	*Sphaeroma sp*	*	*	*	*	*
Decapods Crustaceans						
1	*Calappa lophas*	*	*	*	*	*
2	*Clibanarius longitarsus*	*		*	*	*
3	*C. olivaceus*	*				*
4	*Eriopsia sp*	*		*		*
5	*Eurydice sp*	*			*	*
6	*Idunella sp*	*	*	*	*	*
7	*Metapenaeus dobsoni*	*	*	*	*	*
8	*Peneaid shrimp larvae*	*	*	*	*	*
9	*Penaeus indicus*	*	*	*	*	*
10	*P. monodon*	*	*	*	*	*
11	*P. semisulcatus*	*	*	*	*	*
12	*Portunus pelagicus*	*	*	*	*	*
13	*P. sanguinolentus*	*	*	*	*	*
14	*P. trituberculatus*	*		*		*
15	*Scylla tranquebarica*	*	*	*	*	*
16	*S. serrata*	*	*	*	*	*
17	*Charybdis feriata*	*	*	*	*	*
18	*Charybdis sp*	*	*	*	*	*
19	*Podophthalmus sp*	*	*	*	*	*
20	*Mututa victor*	*	*	*		*
21	*M. lunaris*	*	*	*		*

* - Species recorded in different stations

(Station 1 -Arukkattuthurai, Station 2- Pointcalimer or Kodiakkarai, Station 3-Mallipattinam, Station 4-Manamelkudi, Station 5-Aiyyampattinam).

In general the distribution of Macrobenthos are influenced by physicochemical, biological characteristics prevailing in the environment. In the present study polychaetes are dominated followed by decapods, bivalves, gastropods, amphipods and Isopods the similar species were reported by Sunilkumar [4] in Cochin backwater and Prabha Devi [5] by Coleroon estuary. Totally 61 species of polycheates was recorded in the present study. Out of this 20 species were recorded in all the five stations (*Ancistrosyllis constricta, Armandia longicaudata, Capitella capitata, Cirriformia sp, Cossura delta, Cossura coasta, Drilonereis monroi,Eunice tubifex, Fabricia filamentosa, Glycera alba, Glycera longipinnis, Magalona sp, Nephtys polybranchia,Nephtys sp, Ophelia sp, Perinereis cultrifera, Pisione sp, Platy nereis sp, Polydora ciliate, Prionospio pinnata)*. Most of the benthic studies explored that *Glycera* is the dominant species in polychaetes might be due to firm substrate provided by seaweed deposition. Polychaetes have a mucus secreting device, which is used to protect themselves in adverse conditions in estuarine habitat [6].

Decapods and bivalves are the second dominant group observed in the present study. Among the bivalve species *Anadara granosa, A. veligers,Cardium setosum,C. veligers,Crassostrea madrasensis,Donax cuneatus,D.veligers,Katalysia opmia,Meretrix casta,M. merretrix,M. veligers,Paphia textile,Pecten sp and Placenta placenta* are commonly available in the present

study. The same species were observed in Coleroon estuary and Vellar estuary by Prabha Devi and Ayyakannu [7] and Chandran *et al*. [8]. Totally 21 species of Decapods were recorded in the present study. Out of this 12 species were recorded in all the five stations (*Scylla tranqubarica, S. serrata, Portunus pelagicus, P. sanguinolentus, Charybdis feriata, C.sp, Penaeus semisulcatus, P.monodon, P. indicus, Idunella sp, Metapenaeus dopsoni, Peneaid shrimp larvae).* Amphipods, gastropods and isopods were contributed minimum percentage.

Temperature is an important ecological factor, which influence the distribution of benthic organisms. High temperature 35 (°C), recorded in premonsoon season influence the distribution of macrobenthic organisms. Low temperature recorded in December and that influence higher faunal density. Low density recorded in November due to heavy downpour, which caused drastic fluctuations in the sampling stations. Positive relationship between the abundance of benthic fauna and concentration of organic carbon in sediments had been documented by many workers [9, 10]. The salinity also considered to be a dominant limiting factor, in the distribution of benthic fauna of the present study. The salinity determines the distribution of benthic fauna in Damman cornice and half moon Bay of Arabian Gulf by Anvar Batcha [11]. pH and DO didn't play any considerable role in benthic faunal assemblage of present study. Similar finding's was also projected by Prabha Devi and Ayyakannu [5].

In the present study station 2 (Pointcalimer) have less species when compared to other four stations. This is due to abundance of salt ponds and also salt refinery industries wastes that drained in the shore environment. Because of this pollution the benthic biodiversity is disturbed. Comparatively station 3 (Mallipattinam) had maximum number of species. This is due to abundance of sea weeds and sea grass distribution in that area which creates conducive environment for the macrobenthos.

REFERENCES

1. Snelgrove, P.V.R., 1998. The biodiversity of macrofaunal organisms in marine sediments. Biodiv. Conserv., 7: 1123-1132.
2. Giere, O., 1993. Meiobenthology, Springer-Verlag, Berlin Heidelberg, pp: 328.
3. APHA, 1985. Standard methods for the examination of water and waste water. 15th Edn, APHA, AWWA, WPCF. Washington D.C. pp: 327-354.
4. Sunilkumar, R., 1995. Macrobenthos in the mangrove ecosystem of Cochin backwaters, Kerala (south west coast of India). Ind. J. mar. Sci., 24: 56-61. WPCF. Washington D.C. pp: 327-354.
5. Prabha Devi, L., 1994. Ecology of Coleroon estuary. Studies on benthic fauna. J. mar. biol. Ass. India, 36(1 and 2): 260-266.
6. Sadhana, 1993. Ecology of macrobenthos in lower region of river reaches of Kaveri, south east coast of India. Ph. D. Thesis, Annamalai Univ. India.
7. Prabha Devi, L. and K. Ayyakannu, 1989. Macrobenthos of the Buckingham canal and backwaters of Coleroon estuary. J. mar. bio. Ass. India, 31(2and3): 80-85.
8. Chandran, R., G.S. Thangaraj, V. Sivakumar, B. Srikrishnadhas and K. Ramamoorthy, 1982. Ecology of macrobenthos in Vellar estuary. Ind. J. Mar. Sci., 11: 1122-127.
9. Parulekar, A.H., G.V. Rajammanickam and S.N. Dwivedi, 1975. Bemthic studies in Goa estuaries. Biomass and faunal compositionin the zuari estuary. Ind. J. Mar. Sci., 4: 202-204.
10. Damodaran, R., 1973. Studies on the benthos of the mud banks of the Kerala coast. Bulletin of theDepartment of the Marine Sciences, University of Cochin, pp: 1-126.
11. Anvar Batcha, S.M., 1997. Studies on intertidal and benthic macrofauna of Damman cornice and Half APHA, 1985. Standard methods for the examination of water and waste water. 15 Edn, APHA, AWWA.