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BENTHIC COMMUNITY SURVEY OF GWADAR (EAST BAY) BALOCHISTAN, PAKISTAN

Mohammed Atiq ullah Khan, Monawwar Saleem, Shahid Amjad and Fasih Uddin Ansari

Marine Reference Collection and Resource Centre, University of Karachi, Karachi. (MAK); National Institute of Oceanography, ST-47, Block-1, Clifton, Karachi-75600, (MS, SA); Department of Micro biology, University of Karachi, Karachi, Pakistan.

ABSTRACT: Benthic communities of the Gwadar east bay (Balochistan) was surveyed during the onset of S.W. monsoon. A total 1030 specimens were collected which represented Phyla of Arthropoda, Mollusca, Annelida, Echinodermata. The most abundant class observed was that of Bivalvia. Seawater parameters such as dissolved oxygen, temperature, pH, salinity together with sediment characteristics were measured. Analysis of variance between observed stations and fauna do not show any significant difference ($P<0.05$). The present observation forms a baseline study in the area.

KEY WORDS: Benthic communities Gwadar east bay, Baluchistan, Pakistan.

INTRODUCTION

Benthic animals are considered as good indicator of pollution. The subtidal macrofauna which is abundant in the coastal marine environment, forms a good tool for monitoring the interaction and hypothesis relevant to ecology, (Varshney *et al.*, 1984). Several works on benthic communities are Lee, (1973) Eliot, (1981) Chi *et al.*, (1988) Chou and Khoo, (1990). The fauna is subjected to environmental factors that fluctuate in an unpredictable manner, and as many species are not able to tolerate unpredictable fluctuations, the species composition is low. Generally the euphotic coastal marine environment are less stable and have low diversity when compared to oligotrophic deep sea environment. Medium and fine sands usually have an abundant macrofauna. But because fine compact sediment have more organic matter per unit area faunal densities are therefore frequently higher (Gray 1981). Pollution induced changes in the community structure of benthic fauna can be studied, certain species respond to pollution stresses and become less dominant while become more adaptive and respond favorably. The present examines the effects of coastal marine macrofauna and its response to domestic coastal effluents at Gwadar east bay.

MATERIAL AND METHODS

Ten stations were sampled in the Gwadar east bay area between 25th and 26th May 1996 during the onset of South West monsoon period. The stations were randomly selected in the coastal marine subtidal area at regular intervals moving away from the influence of urban center (Fig. 1). The observed station depths ranged from 1.75m - 10.5m in depth. The sediment fauna samples were collected using Peterson grab. Other observation recorded for surface water and sediments at each station were water temperature, salinity, dissolved oxygen, and pH (table 1). The sediments obtained from

the grab samples were sorted through 1mm mesh size sieves. The specimens collected were preserved in 7% formaline. Specimen were identified up to the family level from the available macrofauna literature, Abbot and Dance (1982), Trimizi and Itrat (1984). Barnes, (1987) and Dance (1992).

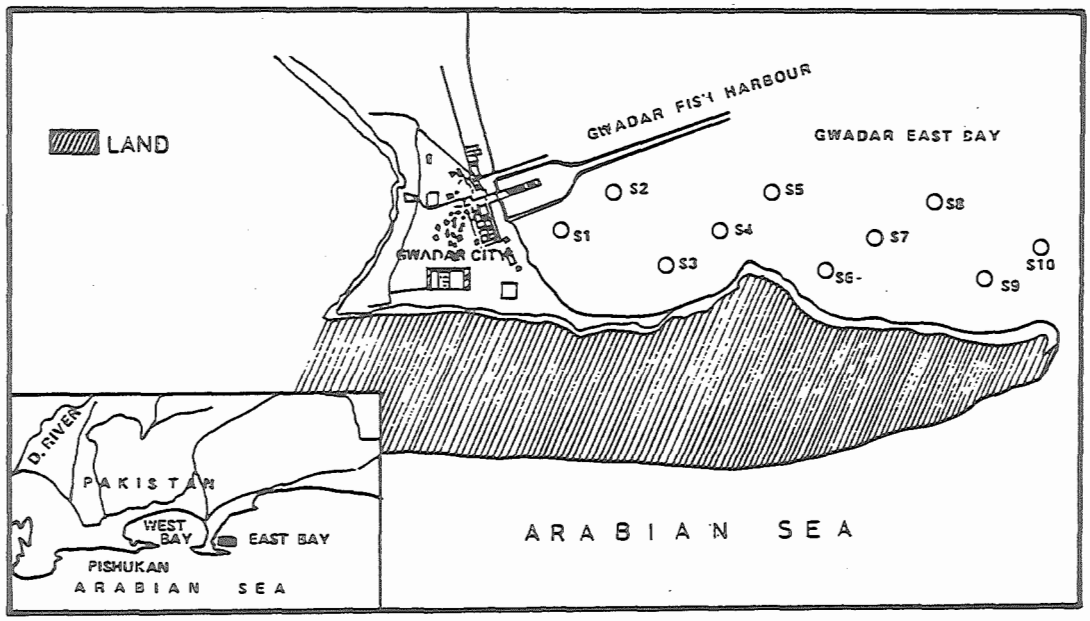

Fig. 1. Map showing sampling site.

Table 1. Physico-chemical characteristic of sea water of Gwadar east bay.

Station	pH	Temperature of Water(C)	Temperature of Air(C)	Dissolved Oxygen(mg/1)	Salinity (PPT)
1	8.01	29.2	28.3	6.83	36.984
2	8.02	29.5	28.2	6.92	36.960
3	8.08	29.5	28.2	7.21	36.870
4	8.09	29.8	28.1	7.64	36.893
5	8.18	29.8	28.1	7.55	36.871
6	8.17	29.8	28.0	7.65	36.916
7	8.25	30.0	27.8	7.73	36.910
8	8.25	30.0	27.9	7.68	36.736
9	8.24	30.1	28.0	7.72	36.871
10	8.21	30.4	28.2	7.70	36.803

RESULT

The variation in the physical parameter of salinity, temperature, dissolved oxygen, pH are given in figure 2. The seawater salinity varied between 36.736 to 36.984 ppt.

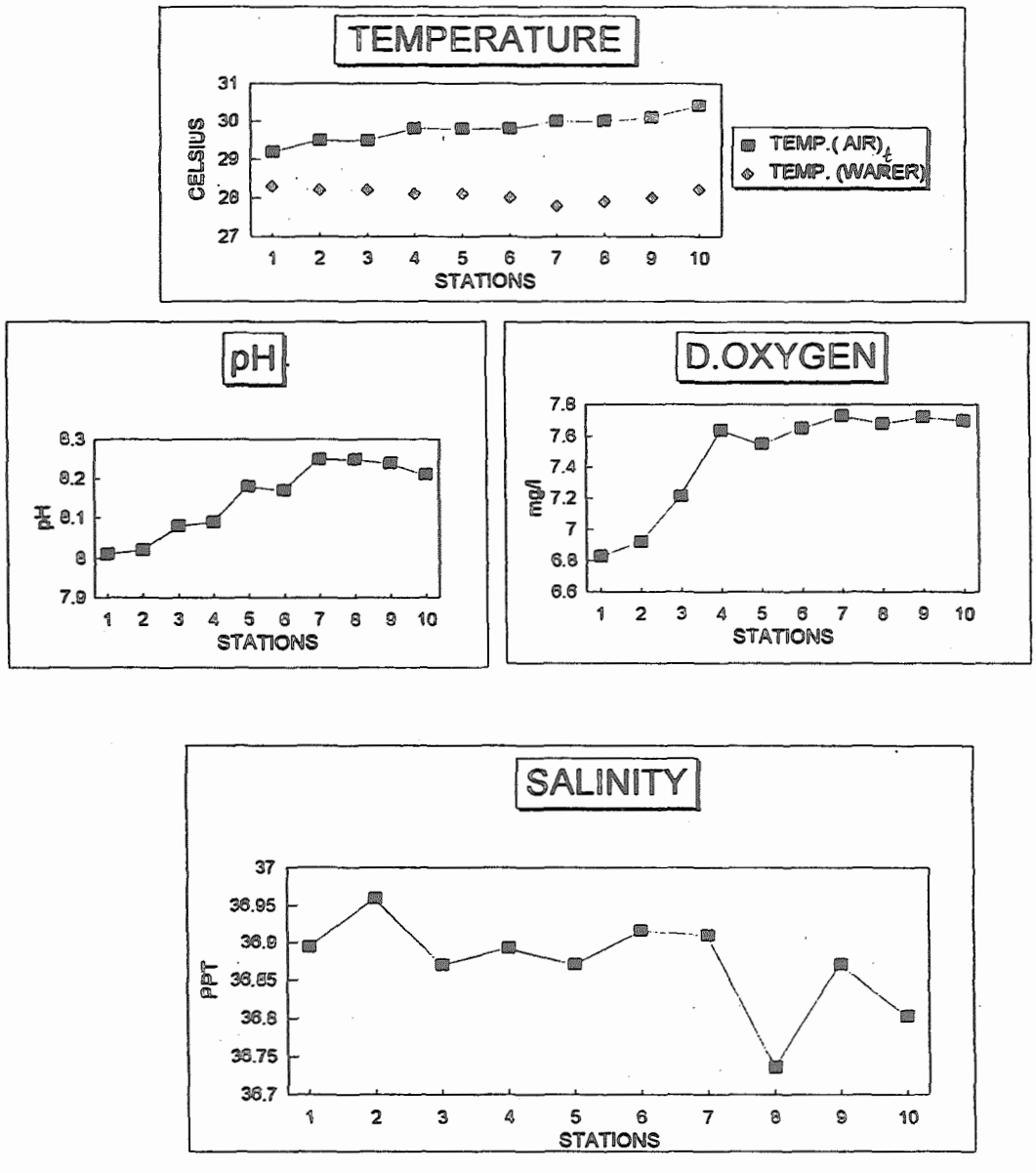

Fig. 2. Distribution of Air and Water temperature, pH, dissolved Oxygen and salinity at different stations in the Gawadar east bay.

The observed values of dissolved oxygen close to the urban centers that is at Stations 1 and 2 were comparatively low (6.83 mg/1 and 6.92 mg/1 respectively). Relatively higher dissolved oxygen values (7.65 mg/1 - 7.73 mg/1) were recorded from stations 6- 10. The pH values varied from 8.01-8.25, but they appear to be stable (8.17-8.25) between stations 5-10. Atmospheric temperature fluctuated between 27.8C°-28.3C°. The surface water temperature ranged between 29.2 to 30.4C° (Table 1). The textural characteristic of the sediment is shown in the table 2. Where stations 1 and 2 were predominately silt and sandy, and the rest of the stations were represented by clayey silt sediment. The colour of the sediment was mostly greenish gray except at Station 8 and 9 were it was olive gray. Very low concentration of organic carbon was found in all the stations. Its maximum concentration was found at station 10 (1.12%). Calcium carbonate varied from 13% to 22.5%. In these sediment pH was found in narrow range. Its value varied from 7.39-7.65.

Table 2. Physico-chemical characteristic of surface sediments of Gwadar east bay.

Station	Colour of Sediment	Depth (m)	pH	Texture	Organic Carbon %	Calcium Crbonate %
1	Greenish Gray	1.75	7.39	Silty Sand	0.51	20.0
2	Greenish Gray	2.1	7.65	Silty Sand	0.43	14.5
3	Greenish Gray	2.0	7.47	Clayey Silt	0.76	14.5
4	Greenish Gray	2.4	7.39	Clayey Silt	0.64	14.5
5	Greenish Gray	4.0	7.5	Clayey Silt	0.76	13.0
6	Greenish Gray	3.5	7.55	Clayey Silt	0.67	15.5
7	Greenish Gray	5.5	7.53	Silty Clay	0.65	19.0
8	Light Olive Gray	7.5	7.59	Silty Clay	0.59	22.5
9	Light Olive Gray	7.5	7.59	Silty Clay	0.83	22.0
10	Greenish Gray	10.5	7.64	Silty Clay	1.12	21.5

The distribution and composition of various benthic faunal class at the observed stations are given in table 3. The total 1030 specimens collected from the sampled area represented 40 families, 5 classes and 4 phyla. Bivalvia was the dominant class in terms of abundance with 595 individual specimen representing 16 families. Veneridae, the dominant family was represented by 371 specimens this accounted for 36% in the class bivalvia. This was followed by Gastropoda with 366 individuals representing 21 families, The largest dominant family of Turtillidae in Gastropoda class was represented by 129 individuals (12.5%).

However, statistical analysis using SPSS package of oneway ANOVA between recorded animals in the observed stations showed no significant difference. Further, Scheffe's multiple pairwise comparison difference between stations ($P<0.05$), (Table 4).

Table 3. Composition and distribution of specimens collected (USING THE GRABS) in Gwadar east bay.

Phylum	Class	Family	St-1	St-2	St-3	St-4	St-5	St-6	St-7	St-8	St-9	St-10	Total
Mollusca	Gastropoda	Turritellidae	10	-	2	20	10	20	20	29	9	9	129
		Architectonicidae	2	-	-	-	-	-	1	1	4	3	11
		Cerithidae	9	3	-	-	-	5	6	5	8	5	41
		Janthinidae	10	4	8	6	-	-	-	-	1	3	32
		Buccinidae	4	1	2	-	-	2	-	-	-	1	10
		Olividae	5	5	2	-	4	3	4	2	4	2	31
		Teredridae	-	10	-	5	-	-	-	-	-	-	15
		Dentilidae	-	6	4	5	5	1	1	1	2	3	28
		Naticidae	-	-	2	9	-	-	-	-	1	2	14
		Littorinidae	-	-	-	-	5	5	-	-	-	5	15
		Ceriothidae	-	-	-	-	6	-	-	-	-	-	6
		Potomididae	-	-	-	-	-	5	-	-	-	-	5
		Turridae	-	-	-	-	-	4	-	2	-	-	6
		Pyramidellidae	-	-	-	-	-	2	1	-	-	2	5
		Trichidae	-	-	-	-	-	2	1	-	-	2	5
		Conidae	-	-	-	-	-	1	-	-	-	-	1
		Narridae	-	-	-	-	-	-	1	-	-	3	4
		Nassaridae	-	-	-	-	-	-	-	7	-	-	7
		Fabciolaridae	-	-	-	-	-	-	-	1	-	-	1
		Lucinidae	-	-	-	-	-	-	-	1	-	-	1
		Cancillaridae	-	-	-	-	-	-	-	-	-	2	2
	Bivalvia	Mactridae	15	10	10	10	8	20	-	20	-	10	103
		Vmeridae	30	20	40	55	30	45	23	44	34	50	371
		Cardidae	2	-	-	-	-	-	3	1	2	-	8
		Mytilidae	3	5	5	-	-	-	-	5	4	3	25
		Tellinidae	1	1	-	4	5	-	-	5	4	3	23
		Donacidae	-	3	-	-	-	-	-	2	-	-	5
		Anomidae	-	1	1	-	-	-	-	-	-	-	2
		Lucinidae	-	3	-	11	3	-	6	-	4	2	29
		Cultillidae	-	-	2	-	-	-	-	-	-	2	4
		Nuculidae	-	-	2	-	-	-	-	-	-	-	2
		Thracidae	-	-	-	-	5	-	-	-	-	-	5
		Phorodidae	-	-	-	-	-	5	-	-	-	-	5
		Nautrillidae	-	-	-	-	-	-	3	-	-	-	3
		Pinnidae	-	-	-	-	-	-	-	2	-	-	2
		Pectinidae	-	-	-	-	-	-	-	1	2	-	3
Annelida	Polychaeta	Nerridae	5	5	2	4	5	4	5	8	8	2	48
Arthropoda	Crustacea	Mysidae	2	3	2	1	1	2	-	-	5	-	16
Echinodermata	Echinoidea	Echinoidae	1	-	2	-	-	1	-	-	1	-	5
4	5	40	99	80	86	130	87	127	79	137	93	112	1030
		% at each station	9.6	7.7	8.3	12.6	8.4	12.3	7.6	13.3	9.0	10.8	

Table 4. Analysis of variance between individual organisam and stations

Source	D.F	Sum of Squares	Mean Squares	F Ratio	F Probablity
Between Groups	9	431.3873	47.9319	.5090	0.8662
Within Groups	144	13560.6972	94.1715		
Total	153	13992.0844			

MULTIPLE RANGE TEST
Scheffe procedure
Range for the .050 level

5.92 5.92 5.92 5.92 5.92 5.92 5.92 5.92 5.92

The ranges above are table ranges
The value actually compared with mean (J)-Mean (I) is..
6.8619* Range* Sqrt (1/N(I) + 1/N (J))
No two groups are significantly different at The .050

TESTS FOR HOMOGENEITY OF VARIANCES

Cochrans C = Max. Variance/ Sum (Variances) = .24, P = .009 (Approx.)
Bartlett-Box F = 2.654, P = .005
Maximum Variance / Minimum Variance 10.238

DISCUSSION

Although the number of families identified in the present study were large, however, it is interesting to note that the number of specimens in each family were found to occur in a small numbers. The composition of benthic fauna as observed in the present study is comparable to the macro and meiofauna of other region of the Indian Ocean, (Parulekar 1976, 1981), this study is in conformity with the finding of Perikkar (1967), who refers that the fauna of Arabian Sea, Bay of Bengal, eastern central Indian Ocean and the smaller sea are associated with the eastern archipelago and the equatorial region is a distinct marine zoogeographical region dominated by Indo-Pacific species.

The number of species in any given intertidal area is dependent upon the nature of sediment type. In this study the sediment type was mostly silty sand to clayey silt and as such it is not unusual to find forty macrofauna species in the subtidal coastal marine

environment. Further fine sediments as found in the present study were tightly packed together, they have poor water circulation such sediment has more organic matter. Poorly sorted sediments such as those found in the Gwadar east bay during the onset of S.W. monsoon season is sheltered area and is characterized to be a low energy area, the sediments are heterogeneous, the observed sediment types are typical of low wave and current activity.

The pollution in the area is mostly domestic sewage, the organic matter is broken down by bacterial action. However, if the rate of domestic sewage exceeds the intake capacity of the system, eutrophication will occur this would change the faunal composition drastically to less diverse macrofauna having one or two dominant species with greater number of individuals that can be termed as opportunist species capable of adapting to domestic effluents and thus may be categorized as pollution indicator species.

Although the present results revealed a deteriorating condition at the bay, the organic pollution in near shore coastal water of Gwadar east bay has not yet reached an alarming level. Probably in due course of time the increase in the intensity and accumulation of pollution may lead to further deterioration in the macrofauna resulting in a state of ecological imbalance.

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