



Study of Abundance and Distribution of Sub tidal Macrobenthic Diversity in near Shore waters off Gulf of Kutch, Gujarat, India

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Abstract

The present study was undertaken to know the distribution of subtidal macrobenthos of Gulf of Kutch during September 2011-August 2012. In total 34 taxa were recorded in this seasonal study in the benthic (subtidal) faunal assemblage. Faunal community was mainly represented by five groups namely, polychaetes, crustaceans, gastropods, bivalves and nematodes. Benthic faunal assemblages showed almost similar pattern of distribution with Gastropods, Crustacean and Polychaetes whereas Bivalves and Nematodes showed very rare occurrence. In overall observation in four stations, Polychaetes dominated in abundance with 32.29% followed by Gastropods (27.75%) and Polychaetes (32.29%). Numerical abundance of Bivalves and Nematodes was less with 7.89% and 1.60% in the study area. The study which is included here can be used to measure the impact of marine environment.

Keywords: Subtidal, abundance, macrobenthos, gulf of Kutch, India.

Introduction

Benthic organisms living in the subtidal habitats are sensitive to environmental changes and thus serve as indicators of changes occurring in their habitats¹. Community structure of benthic organisms is largely determined by the energy equilibrium and nutrient input. There is a strong physical, chemical and biological relationship between benthic communities and the prevailing environment². In an industrial environment dredging, continuous movement of vessels and human presence in large numbers produces major impact at the marine/coastal environment in its vicinity³. Assessment of the effects of this activity has usually targeted bottom substrata and the associated benthic fauna. Hence benthic communities living in intertidal and subtidal habitats are logical subject of study in any environmental monitoring programs⁴. The present study was carried out on benthic (sub tidal) samples were collected from four sites. The sites are Station 1, station 2, station 3, and Station 4. The selected locations are situated at Gulf of Kutch coastline off Arabian Sea, which are significantly rocky with irregular patches of sand or mud. The rocky portion is generally formed of rocks of miliolite and laterite stone. Extensive limestone deposits are seen to occur in the coastal areas of Gujarat. The intertidal rocks of Gulf of Kutch shoreline are calcareous sand stone. The selected shoreline of Okha and Vadinar experiences wave actions to a heavy extent. The intertidal zone of Gulf of Kutch coasts is not very wide, generally dynamic wave action due to this reason.

Material and Methods

Study area: The present study was carried out for one year from all the stations. September 2011 to August 2012 from

Okha to Kandla, North West Coast of India. Four stations were selected for Present study. (Station1)- Okha -22°30.37.31'N; 69°03 58.19''E, (Station 2) - Salaya -22° 30'10.42' N; 69° 34 12.33''E, (Station 3) -Vadinar -22° 29' 20.34 N''; 69° 40.00.32'' E, (Station 4) - Kandla -22° 48' 05.72'' N; 70° 09.28''E.

Sampling and Analytical Procedure: Benthic (subtidal) fauna were collected by using the Vanveen Grab covering an area of 0.04 m² at each station the grab was placed randomly at a minimum of 3 and maximum of 4 locations. The sediment samples were sieved through 0.5 mm mesh and the organisms retained were preserved in 5% formalin and stained with Rose Bengal in order to facilitate further sorting and identification in the laboratory. Shannon index for species diversity, evenness and richness were computed using standard formulae for all the stations¹. The study of the seawater quality was conducted during September 2011 to August 2012.

Results and Discussion

Faunal composition: In total 34 taxa were recorded in this seasonal study in the benthic (subtidal) faunal assemblage^{5,6}. Faunal community was mainly represented by five groups namely, polychaetes, crustaceans, gastropods, bivalves and nematodes⁷⁻¹⁰. Hence, the poor tropic conversion efficiency and a poor standing stock of fish eggs and larvae¹¹. Indicate unsuitability of the Gulf of Kutch Creek/Bay system for the coastal aquaculture. List of species collected in the grab samples is given table-1¹²⁻¹⁵. During the present study Polychaetes were dominant with 10 species followed by Gastropods (8 species), Crustaceans and Bivalves (4 species) and Nematodes (one species). The faunal population of Polychaetes consists of *Sabellids*, *Amphitrite* sp., *Glycera* and *Nereis* sp. Among

gastropods *Cerithidea cingulata*, *Nassarius pullus*, *N. dorsatus*, *Umbonium* sp, *Cirratulidae* and *Dentalium* sp were comparatively more abundant. Bivalves were represented by *Solen lamarcki*, *Epitonium scalare*, *Cucullea cucullata* and *Donax cuneatus*. Crustaceans were represented by Amphipods, Isopods, Tanaids, Shrimp larvae and Nematodes (*Monia brachiata*).

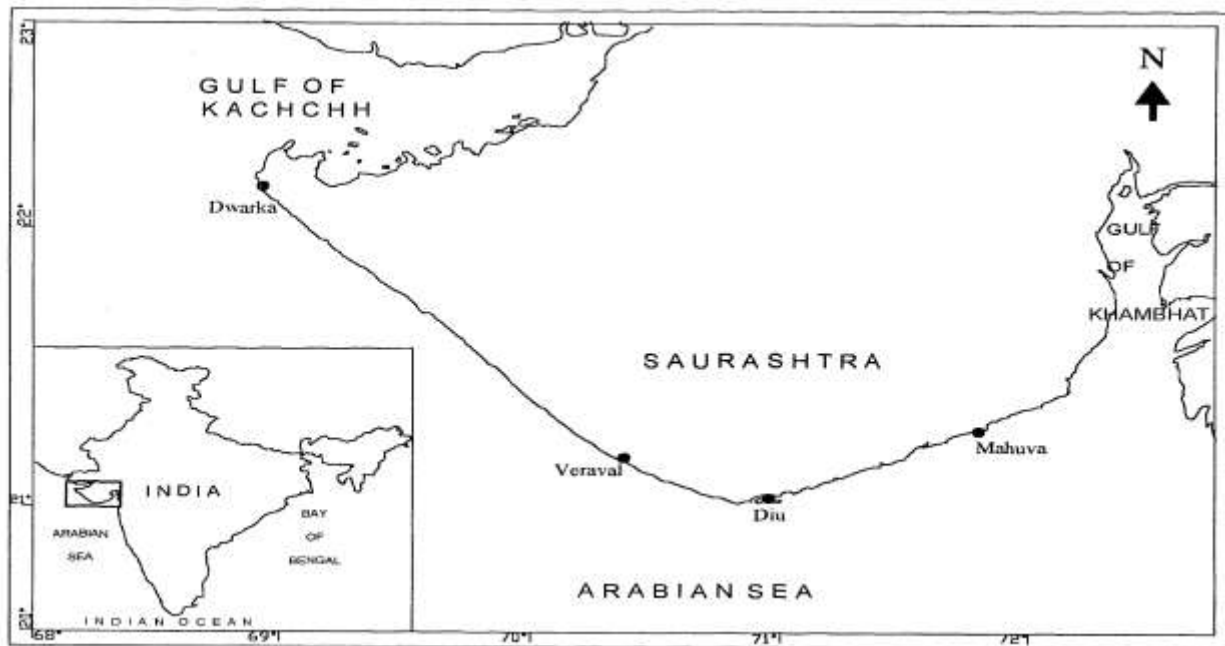


Figure-1
Map of Gulf of Kutch with sampling locations.

Percentage composition of macrofauna: Benthic faunal assemblages showed almost similar pattern of distribution with Gastropods, Crustacean and Polychaetes whereas Bivalves and Echinoderm showed very rare occurrence¹⁶. In overall observation in four Stations, Gastropods dominated in abundance with 32.29% followed by Crustaceans (30.67%) and Polychaetes (27.75%). Numerical abundance of Bivalves and Nematodes was less with 7.89% and 1.40% in the study area. In Station 1, Gastropods were found to be the dominant representing 62% of the total benthic organisms recorded. Crustaceans formed the second dominant group with a Percentage occurrence of 23.63%. Polychaetes and Bivalves contribute to the lowest of 7.63% and 8.45% followed by the group “Nematodes” with a meagre percentage of 4.27% respectively. With respect to station 2, crustaceans dominated with a percentage of 50.70%. The polychaetes were found to be the next best with a percentage contribution of 22.61%. Gastropods and bivalves constituted 28.67% and 8.66% to the total benthic organisms collected. The contribution of group Nematodes was 1.64%. As in station Station 1, station 2 was dominated by Gastropods with a percentage incidence of 28.75% of the total benthic organisms enumerated. Polychaetes ranked highest with a percentage of 32.29%. Crustaceans and bivalves contributed 17.22% and 6.66% to the total benthic organisms collected. The contribution of group Nematodes was nil. In station station 4, Gastropods and Crustaceans dominated with a percentage contribution of 32.25% followed by Polychaetes, Bivalves and Nematodes with a percentage occurrence of 22.58%, 10.97%, and 1.93% respectively. Density of groups ranged from station 3/m² of Nematodes at station 2 to a maximum of 99/m² by Gastropods at ‘Station 1, station 3. Sub tidal faunal abundance was found to be more in inshore stations than offshore stations. A total of 936 specimens were recorded representing 34 species in 5 major groups (table 1).

Sub tidal Faunal Diversity: The Shannon index was used to describe the faunal diversity and evenness. Diversity, richness and evenness values are presented in table 2. Subtidal diversity (H) values ranged between 2.80 and 2.65 at all the four stations. From overall Premonsoon seasonal¹⁷⁻¹⁹. Observation diversity was higher at Station 1 (2.86) followed by station 2(2.65), station 3 (2.42) and station 4 (2.65). The evenness (‘E’) values ranged between 0.8967 and 0.8697 at the stations Station 1 to station 4. The evenness was higher at Station 1 (0.867) than other stations. The richness (d) values ranged between 8.95 and 0.869 at all the four stations²⁰. From overall Premonsoon season observation richness was higher at Station 1 (0.8956) followed by station 2(0.7836), station 3 (0.7798) and station 4 (0.8697).

Conclusion

Among the four stations studied, macrofaunal composition and abundance varied among stations. In subtidal habitat, out of 34 species collected gastropods recorded highest percentage of

density whereas polychaete showed more diversity. Crustacean also showed second highest density but diversity was poor. Both bivalves and nematodes were more or less equal in their ecological density in the study area. In fact, the observed high benthic productivity of the creek/bay system is not adequately utilized at the tertiary level for the conversion of demersal fishery standing stock. However, the proposed marine reserve forest/ecological zone off Gulf of Kutch may improve the environmental conditions of the bay/creek system in the near future.

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Table-1
Subtidal Macrobenthic diversity at Gulf of Kutch

S.No	Group/Species	Stn1	Stn2	Stn3	Stn4	Total	%
I	Polychaetes						
1.	<i>Flabelligeridae</i>	10	5	4	2	21	
2.	<i>Magelonidae</i>	5	5	0	0	10	
3.	<i>Paraonidae</i>	1	4	1	1	7	
4.	<i>Phyllodocidae</i>	4	2	1	0	7	
5.	<i>Sabellidae</i>	2	2	1	0	7	
6.	<i>Syllidae</i>	2	0	1	0	3	
7.	<i>Ampharetidae</i>	12	14	2	22	50	
8.	<i>Capitellidae</i>	8	3	0	8	19	
9.	<i>Cirratulidae</i>	45	19	54	15	133	
10.	<i>Nephtys dibranthis</i>	12	21	14	2	49	
	Total	99	73	77	50	299	32.29
II	Gastropoda						
11.	<i>Naussarius pullus</i>	3	4	1	0	8	
12.	<i>Bursa granularis</i>	12	8	11	6	37	
13.	<i>Olive gibbosa</i>	1	0	8	3	12	
14.	<i>Bulla sp.</i>	12	4	4	5	25	
15.	<i>Umbonium sp</i>	0	2	0	1	3	
16.	<i>Tellina sp.</i>	5	2	2	1	10	
17.	<i>Maetra sp.</i>	5	0	5	1	11	
18.	<i>Dentalium sp</i>	5	45	12	2	64	
19.	<i>Cerithidea cingulata</i>	3	2	1	0	6	
	Total	41	121	60	35	257	27.75
III	Nematodes						
20.	<i>Monia brachiata</i>	5	5	0	3	13	
	Total	5	5	0	3	13	1.6
	Crustacean						
21.	<i>Ampipoda</i>	10	11	5	15	46	
22.	<i>Acetes</i>	05	10	3	10	28	
23.	<i>Melita Zeyanica</i>	5	3	8	3	19	
24.	<i>Anthuridae</i>	11	20	0	4	35	
25.	<i>Caridian Prawns</i>	10	5	0	2	17	
26.	<i>Grandidierella gilesi</i>	5	90	10	11	99	
27.	<i>Eriopisa chi/kensis</i>	6	12	5	5	45	
	Total	25	141	31	47	289	30.67
IV	Bivalves						
28.	<i>Prunum sp.</i>	3	4	5	4	16	
29.	<i>Donax cruneataus</i>	2	2	4	8		
30.	<i>Cucullea cucullata</i>	4	2	2	1	9	
31.	<i>Solen Lamarcki</i>	5	6	0	3	14	
32.	<i>Epitonium Scalare</i>	3	5	0	1		
33.	<i>Arlacama proboscidea</i>	5	2	1	0	8	
34.	<i>Sunetla scripta</i>	1	0	0	0	1	
	Total	23	21	12	17	73	7.89

Table-2
Ecological Indices of Sub tidal macro benthos at Gulf of Kutch

Stations	Station 1	Station 2	Station3	Station 4
Evenness	0.8956	0.7836	0.7798	0.8697
Richness	0.8967	0.7893	0.7729	0.8697
Diversity	2.8689	2.6589	2.423	2.6591

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