

# Environmental Variations in Marine *Benthic Fauna* over Coral-Reef Kutch, India

Shivanagouda .N. Sanagoudra\*, and U. G. Bhat

**Abstract---** To understand the precise coral-reef Benthos ecology on a diurnal basis, benthic abundance, biomass and size composition from a shallow waters coral-reef of Gulf of Kutch marine protected area of Gulf of Kutch Gujarat India, were investigated at four-hour intervals for a 48 hour period. Diurnal variation of the benthos showed that the catches at night were always higher than those in the daytime and the nocturnal increase occurred most strongly in the large fraction (340mm). Benthos abundance steeply increased just after sunset, showed an abrupt increase 2.5 hour later and declined sharply thereafter. Observation of diurnal variation in coral-reef Benthos from four -hour intervals revealed that the temporal variation was large in this research paper.

**Keywords---** Benthic, Coral-reef, diurnal, Gulf of Kutch, India.

## I. INTRODUCTION

**B**ENTHIC animals are the aquatic fauna that spending all or most of their life on the bottom of a water body. They usually have a long, regional life span but weak migration ability and play an irreplaceable role in the material cycling and energy flow of aquatic ecosystems. Because they vary in their adaptation to environmental conditions and their tolerance of or sensitivity to pollution, the parameters of benthic animals (such as their community structures, dominant species, diversity and abundance) can be used to reflect environmental quality. Larvae and their biochemical composition in the coastal waters from Okha to Jamnagar, west coast of India.



Fig. 1 Gulf of Kutch India

Shivanagouda . N. Sanagoudra\* is with the Department of Studies and Research in Marine Biology, Karnataka University, P.G. Centre, Karwar, Kodibag, Karwar 581 303, Karnataka, India.(Corresponding author\* e-mail: sanagoudra23@gmail.com, Phone: + (91) 8141150995, Fax :+( 91)-02838-66629

## STUDY MAP

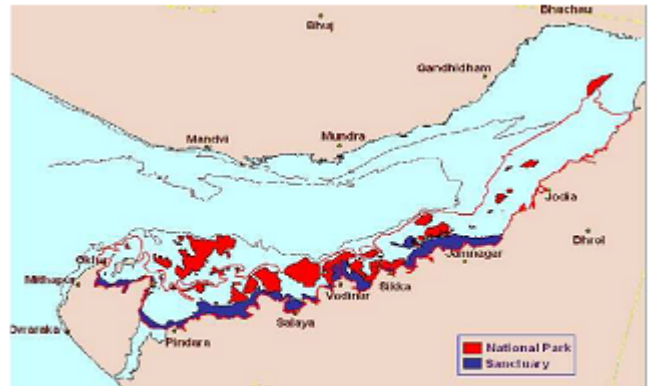


Fig. 2 Gulf Of Kutch India, Map Showing the Study Area

## II. MATERIALS AND METHODS

Benthic samples were collected from 4 stations (Fig. 2) during ORV Sagar Poorvi cruise using The macro benthos Gulf of Kutch were collected by using van veen grab having a mouth opening of 0.04 m<sup>2</sup> from four different stations.. At each station the net was towed for 10 mins. at every 3 hr interval covering the entire diel cycle. Benthos samples were preserved in 5% formaldehyde and rose Bengal. The samples were analyzed for estimation of biomass and occurrence of major groups/species. A separate set of Benthos sample was taken simultaneously for estimation of biochemical components. The samples were cleared of debris, washed with distilled water and dried at 60°C till constant weight. Proteins<sup>8</sup>, carbohydrates<sup>9</sup> and lipids<sup>10</sup> were estimated in triplicate. For diel variation study, the Benthos samples collected during 0700 to 1900 hrs and 1800 to 0600 hrs were considered arbitrarily as day and night samples respectively. The values were averaged for day and night collections at each station. Benthos biomass (ml/100m<sup>3</sup>) values (Table 1) varied from 16 to 139 ml /100 (3 av.=72ml / 100 m<sup>3</sup>). Higher values were obtained during night (av.=80ml /100 m<sup>3</sup>) compared to day time (av.= 65ml /100 m<sup>3</sup>). Such nocturnal abundance of Benthos in surface layers in the estuaries along east and west coasts of India have been reported earlier".Twenty five Benthos groups were identified in the samples collected over the diel cycle at different stations (Table 2). The Copepods were the dominant group (59.89%) followed by chaetognaths (9.99%), siphonophores (7%), decapods (4.1%), amphipods (3.29%), bivalve (2.79%), appendicularians (1.93%), fish eggs and larvae (1.79%),

invertebrate eggs (1.75%) and Polychaetes (1.7%). The remaining groups constituted < 1% of the total counts. Copepods were represented by 42 species belonging to 17 families. Of the 42 species 31 belong to calanoids, 9 to cyclopoids and 2 to harpacticoids. Nine species belonging to 3 genera represented the chaetognaths. *Sagitta enflata* was more common (84.38%) followed by *S.bedoti* (12.21%) and *S.robusta* (2.08%). The cladocerans were represented by 2 species viz. *Evadne tergestina* and *Penilia avirostris*. *Lucifer hanseni*, *Acetes* sp., larval stages of *Metapenaeus dobsoni*, *M.monoceros*, *Penaeus merguensis*, *Parapeneopsis stylifera*, and brachyuran larvae were the common decapods in the samples. The other groups were represented only by larval forms.

## II. RESULTS AND DISCUSSION

An average value (%) for proteins, carbohydrates and lipid for day and night samples are given as follows. Protein ranged from 14.82 to 45.55% at Station 1, 13.44 to 40.29% at st.2,

22.26 to 31.17% at Station 3 and 22.81 to 41.13% at Station 4. Protein was high in samples collected during night at Station 1 and 2 as compared to those obtained for day samples from the respective stations. However, such a difference was not noticed at Station 3 and Station 4. The values recorded in the present study are comparable to the values reported for the northern part of central Arabian Sea [11] and lower than those reported earlier for Andaman Sea [7] northwest bay of Bengal [7] north eastern Arabian Sea [12] Arabian Sea of the south central west coast of India and east coast of India. Greater occurrence of certain groups such as Copepods, decapods, euphausiid and fish eggs polychaetes, salps and doliolids might have probably influenced the high protein content in Benthos during the night collections at Station 1 and Station 2. However, noticeable difference in protein content was not observed between day and night samples at Station 3 and Station 4.

TABLE I  
DIEL VARIATIONS IN BENTHIC BENTHOS BIOMASS (ML/100 M<sup>3</sup>) AT 4 STATIONS FROM OKHA TO JAMNAGAR.

No	Day				Night			
	0700	1000	1300	1600	1900	2200	0100	0400
1	43	22	22	16	36	42	54	47
2	60	72	54	60	72	78	68	62
3	89	99	99	89	104	94	139	94
4	93	64	58	94	97	98	105	88

TABLE II  
DISTRIBUTION AND ABUNDANCE (NO/100 M<sup>3</sup>) OF COMMON GROUPS AT 4-STATIONS FROM OKHA TO JAMNAGAR-WEST COAST OF INDIA.

Day	1		2		3		4	
	Day	Night	Day	Night	Day	Night	Day	Night
Bivalve	51	430	3597	3752	1492	1233	20	126
Siphonophora	2689	1578	2894	2315	5651	8538	1853	2784
Ctenophora	54	86	72	144	259	239	186	326
Polychaetalarva	23	454	527	1760	1214	2344	140	349
Molluscan larvae	13	216	216	192	597	398	419	325
Brachipodlarvae	43	43	191	96	00	80	209	93
Pteropoda	65	97	383	142	1042	1050	512	139
Heteropoda	65	173	216	132	301	2867	93	70
Cladocera	43	54	96	00	2603	1154	00	00
Ostracoda	22	162	96	72	159	00	70	46
Copepoda	31685	16489	24598	34326	32303	35870	37858	28818
Mysidacea	00	1230	05	01	03	02	83	02
Cumacea	00	00	96	96	00	00	00	00
Amphipoda	108	1093	719	1353	1254	7144	791	1163
Euphausiacea	00	43	96	120	00	00	00	93
Decapoda+larvae	108	357	503	2850	4686	7144	849	488
Stomatopoda	00	43	96	00	00	00	00	00
Chaetognatha	5010	3137	6683	6509	5114	6054	4360	4534
Appendicularia	2315	400	695	778	637	701	1744	674
Invertebrateegg	789	573	216	299	1174	915	1410	1884
Cyphonaute larv	259	260	16	144	239	80	163	325
Fish eggs+Larva	2795	260	288	264	1157	2309	93	232
Others	00	00	96	96	100	80	93	232

Lipid values were in the range of 12.02 to 33.81% at st 1, 14.06 to 20.66 % at Station 2, 9.92 to 26.68 % at st 3 and 13.58 to 35.67 % at Station 4. On an average the lipid content ranged from 15.93 to 22.47% in day samples and 17.5 to 20.94% in night samples. The values recorded in the present study agree with the earlier report but are lower than those reported for Benthos from the north eastern Arabian Sea [12]. The amount of lipid was more in Benthos collections made during the day at Station 1 and Station 4. The reverse was true for Station 2 and Station 3. Higher percentage of lipids during the day therefore due to greater occurrence of high lipid containing group like Copepods, chaetognaths, invertebrate eggs and fish eggs and larvae. Though there was difference in protein and lipid

content between day and night samples. Carbohydrate ranged from 1.38 to 8.42 % at st 1, 0.66 to 4.84 % at Station 2, 1.46 to 2.46 % at Station 3 and 1.13 to 1.74 % at Station 4. No appreciable difference was observed in carbohydrate content between day and night samples. On an average the night samples showed 2.06% while the day samples as 1.96%. The values recorded in the present study are comparable with the earlier reports [6], [7] and [12]. In general, carbohydrate content is very low in Benthos as compared to proteins and lipids as was observed in the present study [7], [12]. It may be said that the differences in the benthic faunal population and their biochemical components observed during the present study could be due to the changes in species composition as a result of the vertical migration of benthos.

#### REFERENCES

- [1] Chandramohan P & Rao T S S, Tidal cycle studies in relation to Benthos distribution in the Godavari estuary, *Proc Indian Acad Sci*, 75(1972) 23-31.
- [2] Duboiss M, Gillas K A, Hamilton J K, Rbus R A & Smith F, Calorimetric method for determination of sugars and related substances, *Anal Chem*, 28 (1956)350-356.
- [3] Folch J, Lees M & Solane-Stanley G H, A simple method for the isolation and purification of total lipid from animal tissues, *J Biol Chem*, 226 (1957)497-509.
- [4] Goswami S C, Rao T S S & Matondkar S G P, Biochemical studies on some Benthos off the west coast of India, *Mahasagar-Bull Natn Inst Oceanogr*, 14 (1981)313-316.
- [5] Goswami S C, Selvakumar R A & Goswami U, Diel and tidal variations in Benthosic populations in the Zuari estuary, Goa, *Mahasagar-Bull Natn Inst Oceanogr*, 12 (1979)247-258.
- [6] Goswami S C, Rao T S S & Matondkar S G P, Biochemical composition of Benthos from the Andaman Sea, *Indian J Mar Sci*, 10 (1981)296-300.
- [7] Kumari L K & Achuthankutty C T, Standing stock and biochemical composition of Benthos in the northeastern Arabian Sea, *Indian J Mar Sci*, 18 (L989) 103-105.
- [8] Kumari L K, Nair V R & Gajbhiye S N, Biochemical composition of Benthos from the offshore oil fields of Bombay, *Proc Nact Acad Sci India*, 63(B) II (1993)161-167.
- [9] Selvakumar R A, Goswami S C & Goswami U, Tidal and diel influence on Benthos occurrence in the Mandovi estuary, Goa, *Indian J Fish Ass Bombay*, 16 & 17 (1987) 34-49.
- [10] Pillai P P & Pillai A M, Tidal influence on the diel variations of Benthos with special reference to Copepods, *J Mar Biol Ass India*, 15 (1973) 411-417.
- [11] Nandakumar K, Bhat L K & Wagh A B, Biochemical composition and calorific value of Benthos from Northern part of Central Arabian Sea, *Indian J Mar Sci*, 17(1988)48-50.
- [12] L K Kumari & Achuthankutty C T, Standing stock and biochemical composition of Benthos in the northeastern Arabian Sea, *Indian J Mar Sci*, 18 (L989) 103-105.