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Chemical Properties with Relation to Distribution of Meiobenthic Diversity in the Near Shore Waters off Gulf of Kutch, Gujarat, India

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

Department of Marine Biology,
Karnataka University, P.G. Centre, Karwar,
Kodibag, Karwar, Karnataka, India
**Sanagoudra23@gmail.com*

Abstract: *The present study was undertaken to know the distribution of meiobenthos of Gulf of Kutch during December(2010-May-2012).The macro benthos Gulf of Kutch were collected by using van veen grab having a mouth opening of 0.04 m^2 from 6 different stations. In total 17 taxa were recorded in this monthly study in the meobenthos faunal assemblage. Selected physico- chemical parameters shows positive correlation with numerical abundance of meiobenthos, Nematodes was highest percentage followed by Foraminifera and others Isopoda Amphipoda more significant with chemical properties, in the study area and also other groups is diversified with physic chemical properties. The chemical properties in relation to environmental properties showing study which is included here can be used to measure the impact of near shore marine environment.*

Keywords: *Meiobenthos, Nearshore water, chemical properties, Gulf of Kutch, India*

1. INTRODUCTION

Studying the benthos of Gulf of Kutch nearshore is also useful in understanding changes in biological diversity of Gujarat coast. The use of benthos in aquatic ecological research, and particularly in evaluating marine pollution, is especially effective in assessing long term changes and detecting input from diffuse sources. The benthos reflects the effects of pollutants or organic enrichment by responding through detectable changes in population dynamics on a time scale of weeks to years. This is in contrast to plankton which shows a more immediate change to point sources with no long term consequences to the populations [16, 18]. The highly variable physicochemical environment caused by the mixing of marine and fresh water stresses most animals in the coastal waters.Nearshore organisms have different tolerance and response to different physicochemical parameters. A comprehensive knowledge of venous physicochemical parameters is imperative to document the community structure of benthos. This chapter describes the important physico- chemical features that shape the character of the study area. The Nearshore is subjected to distinct seasonality in the physicochemical parameters due to strong southwest monsoon. The monthly data were pooled together for seasons to the analysis. Monthly fluctuations of various physicochemical parameters are documented in respective tables and figures.

Benthic monitoring is also a relatively sensitive, effective and reliable technique that can detect subtle changes that serve as an early indicator before more drastic environmental changes occur[1, 2]. Seasonal comparisons have become an interesting and popular approach in ecology, in the past a number of studies have been conducted on the ecology of macro benthic populations of Gulf of Kutch near shore. Gulf of Kutch off of the west coast of India has become an important economic asset of the country serving commercial navigation and the fishing sector. An important feature of Gulf of Kutch water is the presence of dense mangroves and extensive mud flats.

Meiofauna, the term is derived from the Greek word "*meio*" means "smaller". The size of the meiofauna ranges in between 63µm and 500 µm. The size ranges is arbitrary, smaller mesh size sieves are used in fine sediment. Meiofauna, a homogeneous ecological group, live in a wide

variety of habitats like freshwater, estuarine and marine ecosystems [1-5]. They were present in all the sediment types, softest of muds to the coarsest gravels. Meiofauna also occupy several "above sediment" habitats including rooted vegetation, moss, macroalgae fronds, sea ice and various animal structures like coral crevices, worm tubes, echinoderm spines etc **[6-9].** Meiofauna are more phyletically diverse than any other component of the marine biota.

Meiofauna offer high quality food sources for fish, shrimp and mollusc larvae and important components in benthic food chains **[10, 11].** Hence, they play an important role in trophic transfer in the marine ecosystem **[12, 18, and 19]**. They also make use of organic detritus in sediments and are grazers of benthic bacteria and microalgae. As meiofauna are the food sources of higher trophic organisms, their community structure, diversity pattern and biomass changes can influence the recruitment of juveniles of macrofauna.There was no attempt to study the distribution in meiofauna of the Gulf of Kutch nerashore water. Keeping this in view, the present work has been carried out which would contribute to the knowledge of benthic ecology of Gulf of Kutch.

2. MARTIAL AND METHODS

2.1. Study Area

The selected nearshore 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. Six sampling stations (Fig 1.1) having 3 equidistance substations were selected for the present investigation extending over a distance of 38 km. Sampling of water quality and biological parameters were done year round chiefly covering four seasons.

The research Vessel 'Khwaja Maharaja was used as conveyance for the sample collection. The Collection of samples in nearshore water from Gulf of Kutch environment is made from a research vessel of 45 feet and above. There is a basic facility like echo sounder for sounding depth and mechanical winches with sufficient length of wire rope of 0.6mm or more thickness. The study period consisted of two phases. During the first phase (December 2010-November 2011) monthly collection of samples was done. In the second phase (December 2011-May 2012) monthly sampling was carried out. Altogether 18 month collections were done.

Station-1:Okha:(22°29'32.86"N,69°3'55.53"E).

Station 2:Vadinar:(22°29'49.46"N,69°41'7.60"E)

Station- 3:Bedi:(22°35'16.52"N,70°3'22.02"E).

Station-4:Navlakhi:(22°50'40.53"N,70°18'7.08"E).

Station-5:Kandla:(22°53'18.71"N, 70° 8'11.96"E).

Station-6: Mundra (22°45'14.65"N, 69°45'19.07"E)

2.2. Collection, Extraction, Enumeration and Demarcation of Meiofauna

15cm long graduated glass corer with an inner diameter of 2.5cm was used to sub sample meiofauna from 0.04m^2 van Veen Grab grab hauls. Duplicate core samples were taken at each station from separate grab hauls the corer was inserted into the undisturbed sediment, to a depth of 8cm. Each slice was transferred into separately labeled plastic containers containing 4% neutral formalin and transported to the laboratory. The sediment containing the meiofauna was stained with Rose Bengal biological stain (0.1g in 100 ml of distilled water). Later the sediment were salved through a set of two sieves, the top one with a mesh size of 0.500 mm and the bottom one with 0.063 mm mesh size. The filtrate retained by the fine screen was transferred into pertridishes containing water. The organisms were separated and enumerated using a binocular microscope and preserved in 4% neutral formalin. The numerical abundance of organisms was extrapolated in to no/l0cm^2. The Polycheates were identified upto genus level; however a few were attempted up to species level. The rest of the organisms were examined upto major taxa. The organisms appearing in small numbers were pooled and categorized as others.

2.3. Biomass Estimation of Meiofauna

The wet weight of 50-100 representative of each group of organisms was estimated using high sensitive Sartorius electronic balance. From this the average wet weight of single organism and the biomass of entire community can be calculated. The biomass was expressed in mg/10 cm^2.

2.4. Physico -Chemical Parameters

Surface water samples was collected using clean plastic bucket and bottom water samples using a Niskin water sampler of 5 litre capacity. Analysis of different physico - chemical parameters were carried out following standard methods of Carlberg [20, 21, 22&23]. All colourimetric estimation for Physico - Chemical parameters were done on a spectronic - 21 Bausch and Lomb Spectrophometer.

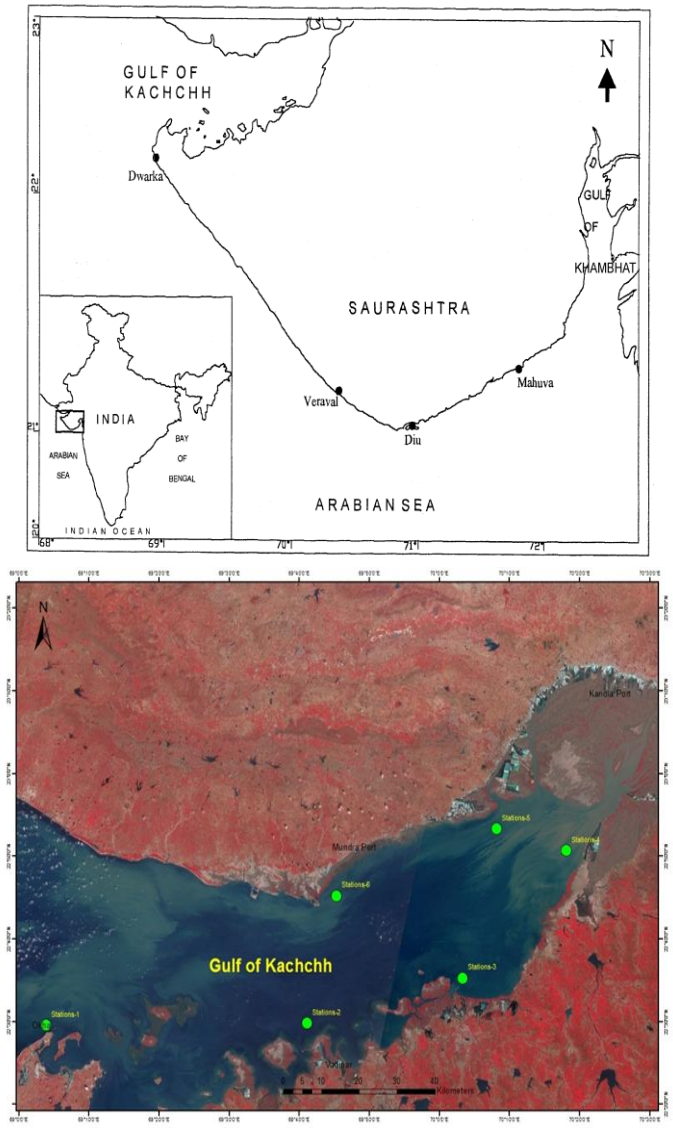

Fig. *Map Showing Study stations in the Gulf of Kutch Gujarat*

3. RESULTS AND DISCUSSION

3.1. Meiofauna Density at Study Stations

The meiobenthos at six study Stations, belonged to 17 groups, namely Foraminifera, Nematoda, Turbellaria, Coelenterata ,Diatom, Gastrotricha, Polychaeta, Bivalvia, Kinorhyncha, Crustacean larvae, Ostracods, Harpacticoida, Isopoda, Ampipoda, Tanidacea, Nemerteans and Nauplius.

At station 1, Out of 17 groups14 taxa was present namely Foraminifera, Nematoda, Polychaeta, Oligocheta Turbellaria, Kinorhyncha, and Copepoda were numerically major groups at station 1 during study period. Nematodes ranked first followed by Foraminifera, Polychaeta and Isopoda are found in less number at Station 1 during study period.. Month wise distribution of the meiofauna showed that, the organisms found more during August 2011, October and March 2012; Nematodes contribute 1128.0/10cm^2. Monthly variations of Meiofauna at study Station-1 are given in the (Table 1, and Figure 1) respectively. In station 2, Among 17 groups 12 groups namely, Foraminifera and Nematoda, Polychaeta, Kinorhyncha, Turbellaria, were recorded maximum at Station 2 during study period. Density of nematodes found maximum at station 2 and the density of Ampipoda Tanidacea, Nemerteans and Nauplius found less in Station 2 (Table 2, figure 2). Month wise distribution of the meiofauna at Station 2 showed that, the organisms found more during October and Copepods contribute 867 /10cm^2 . Monthly variation of Meiofauna at study Station-2 is given in the Table (2 and Fig. 2) respectively. At station 3 during study period the organism recorded more were Nematoda, Foraminifera, Polychaeta, Oligocheta Turbellaria, Kinorhyncha, (Table 2, figure 2) among which Nematoda, 1087 /10cm^2, population dominated followed by Foraminifera, Polychaeta, Coelenterata and. Numerically Ampipoda Tanidacea, Nemerteans and Nauplius groups found less in numbers. During October maximum number of meiofauna was found. Monthly variation of Meiofauna at study Station-3 is given in the (Table 31 and Fig. 21) respectively. At Station 4 the Meio benthos were dominated by Nematoda, Foraminifera, Polychaeta, Oligocheta Turbellaria (Table 4 figure 4).Nemotoda density is Numerically 794/10cm2.Tardigrada, Isopoda Ampipoda Tanidacea, Nemerteans and Nauplius groups s found less in numbers. During October maximum number of meiofauna was found. Monthly variation of Meiofauna at study Station-4 is given in the (Table 32 and Fig. 22) respectively. At Station 5 the meiobenthos were dominated by Nemotoda followed by Foraminifera, Turbellaria, Polychaeta (Table 5, figure 5) Numerically density is 539/10cm^2 Harpacticoida,Isopoda,Ampipoda,Tanidacea,Memerteans,Nauplius groups found less in numbers. During October maximum number of meiofauna was found. Monthly variations of meiofauna at study Station-6 are given in the (Table 33 and Fig.23) respectively.At Station 6 the meio benthos were dominated by copepods followed by Turbellaria, Polychaeta (Table 4 figure 4) Numerically 136, Isopoda,Amphipoda,Nauplius weere groups found less in numbers. During October maximum number of meiofauna was found. Monthly variation of Meiofauna at study Station-6 is given in the (Table 32 and Fig. 22) respectively. At station 1, Out of 17 groups11 taxa were April 2011 and Max April 2011 was present namely Foraminifera, Nematoda, Polychaeta, Oligocheta Turbellaria, Kinorhyncha, and Foraminifera were numerically major groups at station 6 during study period. Foraminifera ranked first followed 553, 10/cm^2 by, Nematode Polychaeta and Nauplius are found in less number at Station 1 during study period. (Table, fig)

3.2. Meiofauna Species Diversity at Study Stations

Station 1**.** Monthly variation in total species(S) were recorded minimum during June-2011 (3 no.) and maximum during (13no) Jan2011. Number of individuals (N) recorded maximum during March-2011(587 no) and minimum during May-2011(65). Species richness (d) found normal and it ranged between 0.713-0.1825, High range in Pielou's evenness (J) recorded during study period (0.891-0-0.291). Shannon's index found in normal range (2.237-0.1.699).whereas Simpsons index. Showing higher values between 0.8128 to 0.2871. Species dominance maximum during Jan-2011 (0713) and minimum 0.1825 in March-2011.

At station-2,14numbers of species (S) were recorded during study period. Maximum Number of individuals (N) recorded during March-2011 (871no.) and minimum during may-2012 (215). Species richness (d) found normal and it ranged between 0.935(March-2011)-0.263 (Dec-2010), Species distributed eventually (J) and recorded between 0.608-0.2491. Shannon's index was recorded between 1.533-0.18 and Simpson's index showing higher values 0.737-0.0651. Species dominance recorded 0.9254-0.263. Monthly variations in various species diversity are seen respectively(Figure-2-6). Station 3**.** Monthly variation in total species(S) were recorded minimum Dec-2010 (11 no) during July-11, (16 no) and maximum during post monsoon period. Number of individuals (N) recorded maximum during October-11 (338 no.) and minimum during Jun-2011(117). Species richness (d) found maximum during August-2011(0.2858) and minimum in January (0.0997). Pielou's evenness (J) recorded maximum during August-2011 (0.7879) minimum on Jan-2012(0.4272) whereas Simpsons index showing higher values between 0.9003

to 0.7142. Species dominance maximum during August-2011 (0.2858) and Jan-2012(0.0997) in January. Monthly variation in various species diversity values at study Station-III are given in the (Figure-2-6) respectively**.** In station 4**,** out of 17 species the maximum individuals were found during October-2011 (302) and minimum on Feb-2012 (216). It is found that February month more richness than other. Species evenness (J) recorded maximum during August-2011 (0.8009) and minimum during December-2011 (0.3736). Shannon's index found in normal range (2.551-2.0.1413) whereas Simpsons index showing higher values 0.9046 to 0.5969. Species dominance maximum during December-2011 (0.4031) and minimum 0.0.954 in August-2011. Monthly variation in various species diversity values at study Station-4 are given in the (Figure-2-6) respectively. At Sation5**,** 17 numbers of species (S) were recorded during study period. Maximum Number of individuals (N) recorded during April-2012 (206 no.) and minimum during March-2012 (86). Species richness (d) found normal and it ranged between 0.356(Dec-2011)-0.0729 (Feb-2012), Species distributed eventually (J) and recorded between 0.92-0.3826. Shannon's index was recorded between 2.689-1.672 and Simpson's index showing higher values 0.9271-0.644. Monthly variation in various species diversity values at study Station-6 are given in the (Figure-2-6) respectively. Stations 6, 17 numbers of species (S) were recorded during study period. Maximum Number of individuals (N) recorded during October-2011 (163 no.) and minimum during May-2011 (106). Species richness (d) found normal and it ranged between 0.2176(Dec-2011)-0.07329 (Feb-2012), Species distributed eventually (J) and recorded between 0.8975-0.4494. Shannon's index was recorded between 0.9267-0.7824 and Simpson's index showing higher values 0.9267-0.7824. Species dominance recorded 0.2723-1.904. Monthly variation in various species diversity values at study Station-6 are given in the (Figure-2-6) respectively. In order to determine the correlation between different chemical properties and environmental parameters correlation (Table-13). Strong positive correlations were obtained for attenuation coefficient water, water temperature and sediment temperature Temperature is one of the most common ecological factors influencing all the activities of an organism. It acts as the limiting factor for growth and distribution of animals. It interacts with many other ecological factors and results in many climatic changes 24, 25. The temperature in estuarine environment is largely influenced by changes in air temperature, intensity of solar radiation, evaporation, and freshwater ingression in the present study, the water temperature showed monsoonal minimum and pre monsoonal maximum. The higher temperature during the pre-monsoon period is due to intense solar radiation. The fall in water temperature noticed during the monsoon season is due to the cold weather and rainfall. The water was nearly vertically isothermal with in the nearshore[3, 13, and 17]. The northern study stations were recorded a slight increase in the temperature when compared to the southern stations; this may be due to its proximity to industrial discharge. The observed changes in salinity were primarily due to various causes like annual variation in precipitation, temperature, evaporation, wind, increase of fresh water and tidal action. The present findings are in affirmative with Chandramohan (1990) and Saravanan (1999). The nutrient rhythm in backwater followed marked seasonal pattern. Among various nutrients studied, silicate showed more pronounced spatial and temporal variability. The increase in silicate concentration on the onset of rainy seasons is mainly due to the intrusion of fresh water containing relatively more silicate in to the system. There exhibited an inverse relationship between silicate concentration and salinity. Other nutrients generally established high concentration during monsoon season. Still, occasionally higher values were also obtained during Feb-May months-October and September-October also. The surface-bottom differences arising out of either surface excess over bottom or vice versa were inconsistent. These fluctuations that were seen in the present study may be due to local effect. It was understood that the large input from industrial units, sewage works and agricultural runoffs determine the nutrient concentration in the water column (0.889), salinity and pH (0.996), DO, BOD(0.650) and NO_2-N (0.390), NO_2-N and NO_3-N(.807), NO_2-N and PO_4-P (0.40), PO_4-P and sediment temperature (0.957) Species Dominance (D),Meio-Margalef(0.980) and Meio-Margalef with Meioeveness(0.780). Chemical quality is a vital aspect for the survival and well-being of near shore organisms. Chemical properties conditions in the nearshore system mainly depend on the interaction of the seawater, freshwater, wind, rainfall, water current and tidal forces since the seawater is dominating during the summer and the fresh water during the monsoon months there is a seasonal pattern in the variations of different parameters.

4. CONCLUSION

Generally, when population density is higher corresponding increase in the number of taxa can be predicted. However the total number of taxa recorded in the present study is comparatively less and the population density was significantly higher when compared to the earlier reports [16, 15]. In the present study H' ranged from Shannon's index was recorded between 0.9267-0.7824 and Simpson's index showing higher values 0.9267-0.7824. Species Foraminifera, Nematota, Turbellaria, Coelenterata ,Diatom, Gastrotricha, Polychaeta, Bivalvia, Kinorhyncha, Crustacean larvae, Ostracods, Harpacticoida, Isopoda, Ampipoda, Tanidacea, Nemerteans and Nauplius dominance recorded 0.2723-1.904.in the present study is attributed to the notmuch reduction in number of species, due to the chemical properties and environmental stress. Benthic infaunal communities in high quality condition will be diverse and dominated with monthly fluctuating chemical properties of nearshore environment in Gulf of Kutch.

Table1.1. *Distribution of meiofauna (no/10 sq.cm) at station 1 during the period December 2010 -May 2012*

	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11
Foraminifera	56	45	16	15	8	12	26	18	13
Nematota	114	78	76	56	2	4	14	11	9
Turbellaria	0	0	9	8	5	6	0	9	5
Coelenterata	2	12	19	6	7	9	10	12	4
Diatom	5	8	0	7	0	11	5	4	10
Gastrotricha	0	11	5	12	7	1	8	32	34
Polychaeta	26	39	44	87	65	45	16	12	8
Bivalvia	0	2	0	0	4	0	1	2	3
Kinorhyncha	0	5	0	2	2	1	0	2	3
Crustacean larvae	0	2	0	0	0	0	0	0	2
Ostracods	0	0	5	0	0	4	2	0	0
Harpacticoida	12	8	9	15	5	2	5	2	2
Isopoda	10	15	14	15	10	8	9	16	12
Ampipoda	2	1	6	4	0	0	4	2	10
Tanidacea	0	0	4	0	2	0	0	0	0
Nemerteans	0	0	0	0	0	0	0	0	2
Nauplius	2	0	0	0	2	0	0	2	0
Total	229	226	207	227	119	103	100	124	117

Table1.2. *Distribution of meiofauna (no/10 sq.cm) at station 1 during the period December 2010 -May 2012*

	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12
Foraminifera	11	32	25	42	35	25	25	0	11
Nematota	85	44	55	135	145	95	53	95	57
Turbellaria	10	5	5	6	30	6	5	0	2
Coelenterata	8	12	13	11	12	13	0	0	3
Diatom	0	11	2	5	6	2	5	1	5
Gastrotricha	23	24	2	12	12	5	2	0	0
Polychaeta	25	24	33	11	18	25	56	14	15
Bivalvia	2	0	0	0	2	2	3	2	2
Kinorhyncha	2	4	2	4	0	2	2	0	2
Crustacean larvae	1	2	2	0	1	0	3	2	0
Ostracods	0	0	0	0	0	0	0	0	0
Harpacticoida	8	2	1	2	5	8	12	8	10
Isopoda	10	15	15	12	2	0	5	2	3
Ampipoda	10	12	13	10	10	10	10	5	5
Tanidacea	0	2	2	5	2	5	2	0	0
Nemerteans	2	0	0	0	4	0	0	0	0
Nauplius	0	2	0	1	0	0	2	2	0
Total	197	191	170	256	284	198	185	131	115

Table-2.1. *Distribution of meiofauna (no/10 sq.cm) at station 2 during the period December 2010 -May 2012*

	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11
Foraminifera	88	55	33	13	36	32	44	18	8
Nematota	55	44	77	12	13	10	15	25	18
Turbellaria	2	0	10	12	5	8	0	10	7
Coelenterata	15	20	33	11	4	4	5	7	9
Diatom	10	6	4	2	6	12	5	0	16
Gastrotricha	11	5	4	4	14	5	10	15	42
Polychaeta	40	40	12	100	56	51	10	10	14
Bivalvia	10	12	11	10	9	8	3	8	8
Kinorhyncha	12	2	4	0	4	10	0	5	7
Crustacean larvae	5	3	12	1	5	2	12	45	10
Ostracods	3	4	14	1	4	0	4	0	14
Harpacticoida	4	5	11	4	4	8	16	6	13
Isopoda	10	10	13	9	6	2	8	8	16
Ampipoda	5	5	4	4	2	0	3	6	15
Tanidacea	3	3	4	5	4	0	1	8	0
Nemerteans	1	1	5	5	12	0	0	1	7
Nauplius	2	1	2	1	3	0	0	0	2
Total	276	216	253	194	187	152	136	172	206

Table-2..2. *Distribution of meiofauna (no/10 sq.cm) at station 2 during the period December 2010 -May 2012*

	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12
Foraminifera	28	11	0	56	55	30	12	15	18
Nematota	86	10	44	123	125	75	33	46	56
Turbellaria	9	6	4	0	52	45	5	4	4
Coelenterata	5	14	44	8	2	12	9	55	51
Diatom	1	9	5	8	5	4	4	4	4
Gastrotricha	28	9	8	9	14	10	5	0	4
Polychaeta	53	18	9	5	13	12	22	14	10
Bivalvia	9	7	7	11	5	0	5	7	9
Kinorhyncha	3	0	4	9	2	3	11	4	2
Crustacean larvae	5	14	14	4	10	0	7	8	8
Ostracods	8	9	15	17	2	0	2	4	9
Harpacticoida	14	8	20	18	6	2	4	4	5
Isopoda	7	4	16	2	4	2	6	5	4
Ampipoda	0	0	4	0	6	5	4	5	3
Tanidacea	7	2	5	4	4	3	3	1	11
Nemerteans	8	2	0	0	5	1	1	1	12
Nauplius	1	1	2	0	1	1	2	2	1
Total	272	124	201	274	311	205	135	179	211

Table-3.1. *Distribution of meiofauna (no/10 sq.cm) at station 3 during the period December 2010 -May 2012*

	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11
Foraminifera	34	34	22	28	56	55	44	25	33
Nematota	75	58	62	60	10	5	15	15	10
Turbellaria	0	0	9	8	5	4	0	9	5
Coelenterata	59	22	20	10	0	0	5	9	8
Diatom	5	8	0	7	0	10	5	4	10
Gastrotricha	0	9	10	8	14	12	5	6	14
Polychaeta	33	45	34	93	70	42	10	18	7
Bivalvia	2	4	10	15	10	0	3	6	7
Kinorhyncha	0	5	0	2	2	0	0	2	3
Crustacean larvae	5	2	10	5	5	0	12	15	14
Ostracods	0	2	2	3	1	4	4	2	5
Harpacticoida	8	6	10	9	3	5	2	3	12
Isopoda	8	11	10	11	9	6	8	8	10
Ampipoda	0	3	2	1	1	4	3	4	5
Tanidacea	2	2	3	3	6	7	1	2	3
Nemerteans	0	0	0	0	0	2	0	0	2
Nauplius	2	0	0	0	2	0	0	2	0
Total	233	211	204	263	194	156	117	130	148

Table-3.2. *Distribution of meiofauna (no/10 sq.cm) at station 3 during the period December 2010 -May 2012*

	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12
Foraminifera	31	51	38	32	33	20	22	14	34
Nematota	90	50	88	120	143	77	66	88	55
Turbellaria	10	5	5	6	30	6	5	0	2
Coelenterata	10	98	50	10	9	10	12	52	44
Diatom	0	11	2	5	6	2	5	1	5
Gastrotricha	20	18	10	11	10	15	10	12	10
Polychaeta	25	30	10	15	23	14	10	15	21
Bivalvia	14	18	10	10	2	3	4	0	0
Kinorhyncha	2	4	2	4	0	2	2	0	2
Crustacean larvae	5	10	20	5	2	2	10	4	2
Ostracods	11	10	11	19	0	0	0	0	0
Harpacticoida	9	10	2	9	4	5	8	9	10
Isopoda	6	12	11	8	5	11	8	3	4
Ampipoda	6	7	8	9	10	11	5	6	7
Tanidacea	0	2	7	6	5	4	3	0	0
Nemerteans	2	0	0	0	4	0	0	0	0
Nauplius	0	2	0	1	0	0	2	2	0
Total	241	338	274	270	286	182	172	206	196

Table-4.1. *Distribution of meiofauna (no/10 sq.cm) at station 4 during the period December 2010 -May 2012*

	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11
Foraminifera	23	44	10	85	44	18	32	45	33
Nematota	45	56	52	56	8	10	12	12	10
Turbellaria	4	2	4	6	6	6	5	4	5
Coelenterata	53	10	15	11	5	0	10	10	8
Diatom	0	4	4	4	1	11	41	6	10
Gastrotricha	2	10	8	4	56	2	0	15	14
Polychaeta	28	55	25	58	60	45	5	10	10
Bivalvia	3	20	8	10	11	8	12	15	14
Kinorhyncha	1	12	2	12	3	1	10	6	3
Crustacean larvae	4	5	9	4	5	10	12	10	14
Ostracods	1	2	4	2	2	2	14	12	5
Harpacticoida	5	0	5	12	4	3	0	0	12
Isopoda	4	10	6	6	10	7	0	3	10
Ampipoda	6	4	3	5	12	2	0	2	5
Tanidacea	4	4	4	4	4	5	2	0	3
Nemerteans	2	2	3	2	2	0	0	2	2
Nauplius	0	2	1	1	6	0	3	5	0
Total	185	242	163	282	239	130	158	157	158

Table-4.2. *Distribution of meiofauna (no/10 sq.cm) at station 4 during the period December 2010 -May 2012*

	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12
Foraminifera	51	22	33	10	10	26	32	18	5
Nematota	70	45	57	110	66	25	56	59	45
Turbellaria	15	0	5	0	25	2	5	5	0
Coelenterata	23	78	44	5	10	16	6	44	34
Diatom	0	15	0	0	4	2	10	4	0
Gastrotricha	12	20	11	4	42	4	5	10	8
Polychaeta	12	25	10	2	30	15	8	6	21
Bivalvia	10	13	14	12	23	12	11	4	4
Kinorhyncha	0	5	0	0	5	5	12	5	2
Crustacean larvae	3	14	10	0	10	1	5	12	0
Ostracods	2	11	12	25	5	0	5	11	1
Harpacticoida	4	15	3	1	10	0	0	2	4
Isopoda	5	10	8	0	2	5	0	10	0
Ampipoda	4	8	92	5	23	2	0	15	8
Tanidacea	0	8	0	0	2	0	0	11	1
Nemerteans	0	4	2	4	5	0	0	0	1
Nauplius	0	9	1	2	1	1	0	0	1
Total	211	302	302	180	273	116	155	216	135

Table-5.1. *Distribution of meiofauna (no/10 sq.cm) at station 5 during the period December 2010 -May 2012*

	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11
Foraminifera	52	10	22	36	33	13	44	32	33
Nematota	35	35	27	55	12	12	7	23	10
Turbellaria	0	0	2	5	2	0	6	8	5
Coelenterata	2	1	8	10	8	1	11	9	8
Diatom	0	2	5	4	1	5	34	10	10
Gastrotricha	6	8	12	10	34	4	5	5	14
Polychaeta	23	6	14	23	52	7	7	12	10
Bivalvia	0	2	5	12	4	2	4	14	7
Kinorhyncha	0	5	6	15	2	7	8	5	3
Crustacean larvae	0	2	8	0	0	11	1	12	14
Ostracods	0	2	10	0	0	8	12	14	5
Harpacticoida	15	1	0	6	2	1	1	5	12
Isopoda	0	11	7	0	4	7	1	12	10
Ampipoda	2	2	9	3	7	11	5	8	5
Tanidacea	10	5	10	0	0	2	2	10	3
Nemerteans	0	0	0	4	0	1	0	8	2
Nauplius	0	0	0	0	2	0	1	6	0
Total	145	92	145	183	163	92	149	193	151

Table-5.2. *Distribution of meiofauna (no/10 sq.cm) at station 5 during the period December 2010 -May 2012*

	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12
Foraminifera	44	20	23	5	5	12	20	17	4
Nematota	23	55	45	68	45	12	5	45	25
Turbellaria	5	2	0	4	5	5	1	6	5
Coelenterata	15	65	32	5	45	14	3	8	22
Diatom	2	15	0	1	0	0	4	7	4
Gastrotricha	8	12	1	5	0	4	5	12	5
Polychaeta	42	20	2	9	5	8	3	8	11
Bivalvia	5	0	5	5	14	11	11	15	8
Kinorhyncha	2	0	0	4	5	7	2	9	8
Crustacean larvae	4	0	2	1	11	4	4	14	4
Ostracods	2	0	5	5	8	6	11	9	6
Harpacticoida	0	5	1	1	11	8	2	8	5
Isopoda	0	0	5	0	3	11	1	14	5
Ampipoda	0	0	4	0	12	6	5	9	5
Tanidacea	0	0	0	0	0	11	4	12	2
Nemerteans	0	0	5	2	0	5	5	8	4
Nauplius	0	9	1	2	1	4	0	5	0
Total	152	203	131	117	170	128	86	206	123

Table-6.1. *Distribution of meiofauna (no/10 sq.cm) at station 6 during the period December 2010 -May 2012*

	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11
Foraminifera	29	23	32	45	28	23	38	31	44
Nematota	33	40	45	41	23	10	4	22	6
Turbellaria	0	5	0	0	7	0	2	5	9
Coelenterata	21	4	2	4	8	1	4	4	10
Diatom	5	5	6	7	0	5	33	4	11
Gastrotricha	1	2	5	6	8	12	2	6	12
Polychaeta	25	5	12	8	41	5	1	12	7
Bivalvia	2	2	4	0	0	4	4	4	8
Kinorhyncha	1	12	4	8	0	2	5	5	5
Crustacean larvae	1	0	4	4	0	8	1	12	12
Ostracods	1	4	5	1	4	2	2	10	13
Harpacticoida	10	1	4	4	1	5	3	4	8
Isopoda	10	5	2	5	1	10	4	5	7
Ampipoda	5	0	4	0	1	12	5	4	5
Tanidacea	11	4	8	1	10	2	1	8	0
Nemerteans	2	2	1	1	0	5	2	0	0
Nauplius	2	0	1	1	0	0	1	3	0
Total	159	114	139	136	132	106	112	139	157

Table-6.2. *Distribution of meiofauna (no/10 sq.cm) at station 6 during the period December 2010 -May 2012*

	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12
Foraminifera	34	39	31	51	33	21	17	23	11
Nematota	8	28	28	5	21	9	5	4	8
Turbellaria	9	0	2	4	5	8	4	15	5
Coelenterata	6	43	31	9	24	4	9	9	6
Diatom	8	8	2	12	0	10	6	8	14
Gastrotricha	4	5	5	8	0	6	7	9	11
Polychaeta	18	4	8	5	4	5	8	12	9
Bivalvia	0	6	8	10	8	12	9	5	5
Kinorhyncha	8	5	4	0	4	8	4	8	7
Crustacean larvae	6	5	5	1	9	7	12	10	11
Ostracods	9	4	0	1	1	10	11	13	0
Harpacticoida	1	2	3	0	12	3	5	0	3
Isopoda	1	5	1	0	0	8	4	8	4
Ampipoda	1	3	2	2	8	11	6	0	6
Tanidacea	1	2	0	2	4	10	7	4	4
Nemerteans	0	4	0	8	2	21	3	9	0
Nauplius	0	0	1	2	0	0	4	0	2
Total	114	163	131	120	135	153	121	137	106

Table-7.1. *Chemical Properties of near shore water at Gulf of Kutch at station 1*

Months	Temp (S)	Temp (B)	pH (S)	pH (B)	Sal (S)	Sal (B)	DO (S)	DO (B)	BOD (S)	BOD (B)
Dec-10	19.5	19.8	7.8	7.9	37.0	37.5	4.7	4.1	4.0	3.7
Jan-11	19.2	19.7	7.7	7.8	37.6	37.2	4.5	4.3	2.5	2.2
Feb-11	24.4	19.5	7.9	7.9	37.2	36.2	4.4	4.8	3.0	3.0
Mar-11	24.8	24.2	8.2	8.3	37.5	37.2	3.8	2.8	2.9	2.8
Apr-11	26.5	24.2	8.1	8.0	38.7	37.5	3.7	3.6	2.9	2.4
May-11	27.5	26.1	8.5	8.3	38.4	38.1	3.8	3.4	1.5	1.6
Jun-11	24.5	27.2	8.3	8.4	36.2	37.9	4.9	4.4	2.9	2.4
Jul-11	25.0	24.0	7.2	7.3	34.5	35.9	4.8	4.2	2.5	2.6
Aug-11	26.1	25.3	7.7	7.6	34.9	34.4	4.2	4.5	0.8	0.9
Sep-11	27.1	25.8	7.8	7.9	36.8	35.9	4.5	4.5	1.8	1.9
Oct-11	26.5	26.8	7.6	7.8	37.4	36.8	4.8	4.4	1.5	1.6
Nov-11	19.0	26.1	7.4	8.2	37.2	37.4	4.3	4.2	3.0	3.0
Dec-11	18.9	19.0	8.1	7.9	37.8	37.2	4.5	4.1	2.8	2.9
Jan-12	22.1	18.5	8.2	7.9	38.1	37.8	3.5	3.3	4.0	3.4
Feb-12	28.9	22.6	8.1	8.1	38.1	38.1	4.4	2.8	3.9	3.8
Mar-12	30.2	28.4	8.2	8.1	38.4	38.1	4.9	4.1	4.0	3.8
Apr-12	30.2	30.2	8.3	7.9	38.9	38.4	5.5	5.9	4.2	3.7
May-12	30.1	30.1	7.9	8.0	39.5	38.9	5.3	5.3	3.9	3.4

Table-7.2. *Chemical Properties of near shore water at Gulf of Kutch at station 1*

Months	NO_2-N (S)	NO_2-N (B)	NO_3-N (S)	NO_3-N (B)	NH_4^+-N (S)	NH_4^+-N (B)	PO_4-P (S)	PO_4-P (B)	SiO_3-Si (B)	SiO_3-Si (B)
Dec-10	0.6	0.5	13.0	12.8	0.8	0.3	1.3	1.2	26.9	27.9
Jan-11	0.7	0.6	7.9	7.4	0.7	0.1	1.2	1.1	34.2	32.2
Feb-11	0.7	0.7	8.7	8.4	2.9	2.2	1.8	1.5	32.5	31.5
Mar-11	0.3	0.4	6.8	6.5	1.3	5.0	0.9	1.1	41.4	40.4
Apr-11	0.4	0.6	4.7	4.1	2.4	0.1	2.2	21.0	13.4	15.4
May-11	0.6	0.3	9.6	9.5	0.4	0.9	1.9	1.2	9.8	11.8
Jun-11	0.8	0.4	9.3	9.5	2.0	0.7	2.3	2.4	12.7	11.7
Jul-11	0.5	0.2	3.6	3.4	2.2	2.5	0.8	0.9	4.4	6.4
Aug-11	0.4	0.4	6.7	6.3	2.6	2.2	2.2	2.1	26.7	23.7
Sep-11	0.3	0.4	5.7	6.1	0.4	2.1	0.9	1.0	17.4	16.5
Oct-11	0.3	0.5	4.6	5.1	1.8	2.4	1.8	1.5	23.4	22.1
Nov-11	0.6	0.5	7.2	4.2	7.6	0.2	0.9	0.6	32.6	32.2
Dec-11	0.8	0.9	9.3	8.8	0.5	0.3	1.9	1.8	33.9	30.9
Jan-12	0.7	0.8	9.7	9.6	0.3	2.8	1.5	1.2	44.9	41.4
Feb-12	0.6	0.9	7.1	7.4	0.4	2.7	1.3	1.1	29.8	28.2
Mar-12	0.5	0.1	12.1	12.4	0.2	2.3	1.3	1.3	25.4	30.2
Apr-12	0.9	0.4	6.9	7.1	0.4	0.9	1.2	1.3	33.9	30.5
May-12	2.8	2.5	6.6	6.7	0.5	0.9	2.3	2.2	12.9	13.0

Table-8.1. *Chemical Properties of near shore water at Gulf of Kutch at station 2*

Months	Temp (S)	Temp (B)	pH (S)	pH (B)	Sal (S)	Sal (B)	DO (S)	DO (B)	BOD (S)	BOD (B)
Dec-10	21.5	20.9	7.9	7.6	37.1	36.8	4.9	5.2	3.6	3.3
Jan-11	19.5	21.8	7.9	7.7	37.6	37.3	4.7	4.2	2.9	2.8
Feb-11	24.2	19.7	7.8	7.6	38.5	37.4	5.4	5.3	3.1	3.0
Mar-11	24.9	24.5	8.4	8.1	38.4	37.9	5.5	5.9	1.2	1.2
Apr-11	25.8	24.3	8.3	8.1	36.9	36.6	4.8	4.1	2.5	2.4
May-11	27.8	25.3	8.3	8.4	37.9	37.4	4.5	3.5	4.8	4.3
Jun-11	25.1	27.3	8.1	8.0	36.4	38.1	4.9	3.7	2.4	2.0
Jul-11	26.4	25.0	7.4	7.5	34.5	36.1	5.7	5.9	2.2	2.0
Aug-11	26.3	26.2	7.9	7.7	34.7	34.2	5.3	3.5	3.6	3.5
Sep-11	27.5	26.0	7.7	7.6	35.4	36.7	4.9	3.1	2.6	2.8
Oct-11	25.4	26.8	7.8	7.7	36.4	35.4	2.9	2.9	2.2	2.1
Nov-11	20.5	25.8	7.5	8.4	36.8	36.4	3.5	3.9	1.8	1.7
Dec-11	19.2	20.2	8.3	8.1	37.4	36.8	4.7	4.7	2.5	2.6
Jan-12	21.5	19.0	8.1	7.8	37.2	37.4	5.5	5.8	2.9	2.9
Feb-12	29.1	21.9	8.4	8.4	37.2	37.2	5.6	5.7	2.6	2.1
Mar-12	31.5	29.1	8.1	8.2	38.1	37.2	4.9	5.1	3.9	3.5
Apr-12	29.9	31.5	8.4	8.1	37.2	38.1	3.9	3.1	3.1	3.1
May-12	30.7	30.2	7.7	7.9	37.3	37.2	3.8	3.2	3.4	3.1

Table-8.2. *Chemical Properties of near shore water at Gulf of Kutch at station 2*

Months	NO_2-N (S)	NO_2-N (B)	NO_3-N (S)	NO_3-N (B)	NH_4^+-N (S)	NH_4^+-N (B)	PO_4-P (S)	PO_4-P (B)	SiO_3-Si (B)	SiO_3-Si (B)
Dec-10	0.4	0.4	7.9	8.1	10.2	5.4	2.2	2.1	36.5	33.5
Jan-11	1.1	1.5	10.6	10.4	5.2	2.6	2.4	2.3	12.9	14.9
Feb-11	0.8	0.5	6.8	6.1	5.0	2.8	1.3	1.4	12.5	13.5
Mar-11	1.1	1.1	6.9	6.4	5.4	3.4	1.0	1.1	40.0	36.0
Apr-11	1.5	1.4	7.5	7.5	2.3	1.0	0.6	0.3	13.1	18.1
May-11	0.3	0.5	7.7	7.2	0.1	4.9	1.7	1.4	8.4	16.4
Jun-11	0.9	0.5	8.7	8.4	0.3	0.5	1.8	1.9	9.8	10.8
Jul-11	0.6	0.4	8.2	8.1	0.4	0.6	1.2	1.5	3.2	7.2
Aug-11	0.8	0.6	3.3	3.1	0.3	0.7	1.2	1.1	8.9	11.4
Sep-11	0.3	0.5	2.8	2.5	0.4	0.7	0.5	0.9	11.7	12.4
Oct-11	0.3	0.4	3.1	3.1	0.5	1.3	1.1	1.4	25.4	23.2
Nov-11	0.4	0.5	2.1	2.0	0.3	0.4	0.7	0.9	19.8	19.1
Dec-11	0.2	0.6	3.3	3.5	0.4	0.9	4.0	3.5	28.7	26.5
Jan-12	0.3	0.4	5.5	5.0	0.2	0.3	2.8	2.8	41.1	39.3
Feb-12	1.1	1.4	3.1	3.4	0.1	0.2	1.4	1.5	35.4	32.8
Mar-12	0.6	0.5	10.8	10.4	0.3	0.4	0.9	1.0	35.9	30.4
Apr-12	0.4	0.4	8.9	6.8	0.2	0.2	1.8	1.5	38.4	36.2
May-12	0.2	0.3	9.1	10.1	0.3	0.4	1.1	1.6	15.9	16.4

Table-9.1. *Chemical Properties of near shore water at Gulf of Kutch at station 3*

Months	Temp (S)	Temp (B)	pH (S)	pH (B)	Sal (S)	Sal (B)	DO (S)	DO (B)	BOD (S)	BOD (B)
Dec-10	19.8	20.1	7.8	7.9	38.4	38.4	4.9	5.4	1.2	1.1
Jan-11	20.5	20.0	7.8	7.4	37.5	37.4	4.3	4.1	1.8	1.3
Feb-11	24.8	20.9	7.9	8.0	37.3	37.1	3.7	3.1	0.8	0.8
Mar-11	25.4	24.5	8.2	8.3	38.6	36.9	3.0	2.5	0.7	0.7
Apr-11	26.8	25.8	8.4	8.5	38.1	37.7	5.1	5.9	1.9	1.1
May-11	27.1	26.2	8.1	8.3	37.6	37.5	4.8	4.4	1.3	1.5
Jun-11	25.5	27.0	8.4	8.1	36.3	38.6	4.0	4.3	2.7	2.6
Jul-11	26.5	25.1	7.3	7.1	35.4	35.5	3.9	3.1	3.5	3.5
Aug-11	26.4	26.2	7.6	7.9	35.2	35.4	3.6	3.9	4.4	4.5
Sep-11	27.6	26.8	8.2	8.3	34.5	35.2	3.7	3.8	3.4	3.4
Oct-11	27.5	26.9	7.9	7.4	35.3	34.5	4.8	4.7	3.2	3.3
Nov-11	20.8	27.8	7.8	8.2	37.5	35.3	4.8	4.4	2.7	2.5
Dec-11	19.0	20.9	8.5	7.9	36.8	37.5	4.6	4.1	4.4	4.3
Jan-12	22.0	19.2	7.9	7.9	37.1	37.2	7.6	7.4	2.3	2.1
Feb-12	28.7	22.8	8.5	8.5	37.5	37.1	7.8	7.5	3.8	3.4
Mar-12	29.8	28.3	7.9	8.1	38.1	37.5	6.9	7.1	3.5	3.5
Apr-12	29.4	29.8	8.4	8.2	38.7	38.1	5.1	5.2	4.4	3.8
May-12	30.8	30.9	7.8	7.9	38.6	38.7	4.3	4.0	2.6	2.1

Table-9.2. *Chemical Properties of near shore water at Gulf of Kutch at station 3*

Months	NO_2-N (S)	NO_2-N (B)	NO_3-N (S)	NO_3-N (B)	NH_4^+-N (S)	NH_4^+-N (B)	PO_4-P (S)	PO_4-P (B)	SiO_3-Si (B)	SiO_3-Si (B)
Dec-10	0.6	0.5	15.1	15.4	1.2	0.8	0.6	0.8	39.0	35.0
Jan-11	0.4	0.6	12.8	12.2	0.6	0.9	1.6	1.2	9.5	10.5
Feb-11	0.5	0.6	14.3	14.2	4.8	0.5	4.0	3.5	34.9	31.9
Mar-11	0.4	0.4	12.6	12.4	1.8	0.5	0.8	0.5	36.5	38.5
Apr-11	1.1	0.9	6.1	6.2	0.5	0.4	0.5	0.6	23.4	22.4
May-11	1.7	1.4	3.6	3.0	0.8	0.2	0.9	0.8	11.8	13.8
Jun-11	1.2	1.0	3.2	3.1	4.3	0.9	1.2	1.4	21.4	18.4
Jul-11	0.9	0.5	4.3	4.1	4.8	2.0	1.1	1.0	5.4	9.0
Aug-11	0.6	0.6	4.6	4.2	0.9	1.5	0.7	0.8	35.4	33.1
Sep-11	0.1	0.4	1.2	1.5	1.6	0.2	1.2	1.1	14.1	13.4
Oct-11	0.4	0.5	5.2	5.1	0.6	1.2	0.9	1.4	21.4	20.4
Nov-11	0.2	0.4	5.1	5.6	0.9	0.5	2.7	2.1	18.3	18.5
Dec-11	0.3	0.3	4.6	4.8	0.2	2.0	2.9	2.5	29.7	30.4
Jan-12	0.4	0.4	6.6	6.2	1.2	1.6	2.8	2.2	38.4	39.9
Feb-12	0.4	0.4	5.4	5.1	0.6	0.8	0.9	0.5	36.4	35.1
Mar-12	0.6	0.6	5.3	5.0	1.1	0.9	1.5	1.2	19.7	28.7
Apr-12	0.2	0.2	8.3	8.0	0.8	0.3	2.3	1.9	35.4	33.4
May-12	0.4	0.4	0.5	0.9	1.2	0.2	0.8	0.4	23.5	22.8

Table-10.1. *Chemical Properties of near shore water at Gulf of Kutch at station 4*

Months	Temp (S)	Temp (B)	pH (S)	pH (B)	Sal (S)	Sal (B)	DO (S)	DO (B)	BOD (S)	BOD (B)
Dec-10	19.6	20.3	7.4	8.1	38.1	38.1	4.3	3.8	2.7	2.8
Jan-11	20.1	20.1	7.3	7.8	37.5	37.4	4.7	4.1	4.5	4.8
Feb-11	24.5	20.5	7.5	8.1	39.3	37.3	4.5	4.2	0.9	0.6
Mar-11	25.3	23.5	8.1	8.5	40.1	37.7	5.4	6.4	2.0	2.4
Apr-11	25.8	25.1	8.0	8.0	39.7	39.2	5.7	6.4	1.6	1.7
May-11	27.0	25.9	8.0	7.8	39.0	41.2	5.3	6.0	4.6	4.8
Jun-11	25.4	27.3	8.3	8.2	37.8	41.2	4.5	3.9	3.4	3.6
Jul-11	25.7	25.1	7.1	7.0	32.1	37.5	4.6	3.7	2.9	2.4
Aug-11	25.5	25.3	7.7	7.8	33.2	32.1	4.5	4.1	2.6	2.3
Sep-11	27.3	25.9	8.3	7.8	33.2	33.2	4.8	3.4	2.3	2.0
Oct-11	26.4	27.0	7.6	7.5	34.8	33.2	4.6	4.7	2.7	3.1
Nov-11	22.5	26.7	7.9	8.1	39.1	34.8	4.5	4.5	1.9	2.4
Dec-11	19.5	22.8	8.4	8.1	37.1	39.1	7.1	6.4	2.7	2.2
Jan-12	21.8	19.1	8.2	8.1	36.8	37.1	6.9	6.1	0.9	1.0
Feb-12	29.5	21.2	8.2	8.2	39.8	36.8	6.8	5.8	1.8	1.2
Mar-12	31.4	29.4	8.3	8.4	39.4	39.8	6.9	5.7	0.3	0.8
Apr-12	29.8	31.4	8.5	8.1	39.5	39.4	6.7	6.4	2.9	2.2
May-12	30.9	32.1	8.2	8.3	39.4	39.5	5.7	5.9	2.3	2.9

Table-10.2. *Chemical Properties of near shore water at Gulf of Kutch at station 4*

Months	NO_2-N (S)	NO_2-N (B)	NO_3-N (S)	NO_3-N (B)	NH_4^+-N (S)	NH_4^+-N (B)	PO_4-P (S)	PO_4-P (B)	SiO_3-Si (B)	SiO_3-Si (B)
Dec-10	0.4	0.4	6.6	6.4	1.7	1.4	4.1	3.8	43.8	41.8
Jan-11	0.5	0.5	2.3	2.2	1.3	0.6	2.4	2.1	8.4	6.4
Feb-11	0.9	0.9	4.4	4.4	0.9	1.1	3.8	3.1	45.8	41.8
Mar-11	0.7	0.7	3.4	3.3	0.8	0.5	4.1	3.8	15.8	18.8
Apr-11	0.5	0.5	7.2	7.2	0.5	0.9	2.4	3.7	15.2	16.2
May-11	0.4	0.4	5.6	5.2	0.8	0.6	2.7	2.4	12.4	14.4
Jun-11	0.9	0.9	5.9	5.4	0.7	0.4	3.2	3.2	14.6	12.8
Jul-11	0.6	0.6	6.2	6.0	1.2	1.2	0.9	0.9	1.5	3.5
Aug-11	0.2	0.2	0.5	0.9	1.2	0.9	0.6	0.6	33.5	32.4
Sep-11	0.3	0.3	8.6	8.2	0.4	1.4	0.3	0.4	13.8	13.1
Oct-11	0.3	0.3	10.1	10.8	0.5	0.9	2.7	2.2	18.4	19.4
Nov-11	1.3	1.3	5.1	5.2	1.8	0.4	3.2	3.8	16.5	16.2
Dec-11	0.1	0.1	4.6	4.2	1.9	0.8	2.1	2.2	28.7	29.3
Jan-12	0.3	0.3	5.6	5.1	0.6	0.7	2.7	2.7	35.8	34.6
Feb-12	0.4	0.3	6.6	6.4	0.9	1.9	1.8	1.2	35.8	31.6
Mar-12	0.7	0.3	0.3	0.5	1.4	1.2	1.0	1.3	33.5	30.7
Apr-12	0.4	0.3	0.2	0.2	1.1	0.8	3.2	3.4	35.8	36.5
May-12	0.1	0.4	0.4	0.3	0.9	0.4	1.6	1.5	35.1	34.6

Table-11.1. *Chemical Properties of near shore water at Gulf of Kutch at station 5*

Months	Temp (S)	Temp (B)	pH (S)	pH (B)	Sal (S)	Sal (B)	DO (S)	DO (B)	BOD (S)	BOD (B)
Dec-10	21.2	20.8	8.2	8.0	37.4	37.5	5.1	4.8	3.5	3.9
Jan-11	20.5	21.4	8.4	8.1	35.7	35.3	5.7	5.1	3.6	3.6
Feb-11	24.8	20.8	8.2	8.3	38.4	38.5	5.4	5.3	2.5	2.2
Mar-11	25.8	24.8	7.9	7.7	39.9	39.6	4.9	4.4	4.0	3.0
Apr-11	29.7	25.3	8.5	8.3	39.4	39.8	4.8	4.8	3.0	3.5
May-11	28.5	29.5	8.3	8.4	38.4	38.5	6.4	7.1	1.5	1.9
Jun-11	25.1	28.2	8.0	8.1	37.1	37.8	4.1	4.2	1.0	1.6
Jul-11	24.9	25.3	7.4	6.8	32.4	32.8	4.8	3.9	2.2	2.5
Aug-11	25.3	24.4	7.6	7.5	34.5	34.8	4.8	3.6	2.6	2.2
Sep-11	27.0	25.0	8.4	7.9	34.1	34.5	6.2	6.2	2.6	2.1
Oct-11	24.9	26.9	7.8	7.8	32.4	32.6	6.5	6.2	1.6	1.6
Nov-11	20.5	24.8	8.4	7.8	38.1	38.2	7.2	5.6	1.1	1.4
Dec-11	19.8	20.9	8.1	8.3	36.8	36.8	7.3	6.4	2.5	2.6
Jan-12	21.8	19.2	7.9	7.7	36.7	36.5	6.6	6.4	0.7	0.2
Feb-12	28.2	21.2	8.1	8.1	38.4	38.5	6.8	5.6	3.0	3.5
Mar-12	31.7	27.9	8.3	8.3	39.1	39.5	5.9	5.1	2.9	2.0
Apr-12	30.4	30.7	8.2	8.4	39.3	39.4	5.2	4.1	3.6	3.5
May-12	30.3	31.5	8.1	8.2	38.1	38.5	4.9	4.9	4.0	3.2

Table-11.2. *Chemical Properties of near shore water at Gulf of Kutch at station 5*

Months	NO_2-N (S)	NO_2-N (B)	NO_3-N (S)	NO_3-N (B)	NH_4^+-N (S)	NH_4^+-N (B)	PO_4-P (S)	PO_4-P (B)	SiO_3-Si (B)	SiO_3-Si (B)
Dec-10	0.9	0.8	8.3	8.4	0.8	1.3	4.4	4.5	43.2	41.2
Jan-11	0.5	0.3	10.2	10.5	0.9	0.8	11.7	12.7	22.1	18.2
Feb-11	0.2	0.1	9.3	9.4	0.7	0.8	2.7	53.4	41.5	36.5
Mar-11	0.1	0.3	12.2	12.3	0.2	1.4	3.2	3.1	16.0	14.0
Apr-11	0.4	0.4	7.8	7.2	0.4	0.8	8.5	7.7	32.1	28.1
May-11	0.6	0.3	8.3	8.1	0.8	1.3	3.5	3.1	10.4	13.4
Jun-11	1.4	1.5	9.9	9.1	0.8	0.8	6.7	5.8	15.4	16.7
Jul-11	1.3	1.4	8.3	8.2	1.1	0.6	8.6	8.1	6.5	8.7
Aug-11	0.9	0.7	8.6	8.4	0.8	0.4	2.7	2.5	39.4	34.5
Sep-11	0.2	0.2	7.1	7.2	1.3	1.4	6.4	6.5	12.7	12.0
Oct-11	0.4	0.3	7.3	7.4	2.8	2.1	6.4	6.1	16.2	18.4
Nov-11	0.9	0.7	3.7	3.5	2.7	2.5	2.6	2.9	18.4	18.2
Dec-11	1.1	1.0	3.0	3.5	1.4	2.5	2.4	2.7	26.4	25.4
Jan-12	0.4	0.3	5.2	5.4	0.8	0.2	1.5	2.1	36.5	33.5
Feb-12	0.6	0.8	5.4	5.0	1.1	1.2	1.2	1.7	35.7	33.7
Mar-12	0.8	0.6	3.4	3.6	0.7	0.9	1.9	1.5	44.1	39.7
Apr-12	0.6	0.5	2.1	2.4	0.5	0.5	1.7	1.9	33.4	32.4
May-12	0.3	0.3	1.4	1.9	0.4	0.4	1.3	1.3	23.7	34.9

Table-12.1. *Chemical Properties of near shore water at Gulf of Kutch at station 6*

Months	Temp (S)	Temp (B)	pH (S)	pH (B)	Sal (S)	Sal (B)	DO (S)	DO (B)	BOD (S)	BOD (B)
Dec-10	20.5	20.8	8.1	8.3	37.5	37.4	4.9	4.5	1.5	1.2
Jan-11	20.6	20.8	8.3	8.2	38.8	37.9	4.6	4.2	0.8	0.2
Feb-11	24.9	20.7	8.4	8.5	37.4	37.8	4.9	4.5	1.1	1.4
Mar-11	24.7	23.8	8.2	8.0	37.8	37.5	4.8	4.7	2.6	2.4
Apr-11	28.9	24.4	8.4	8.0	37.9	37.8	5.2	5.4	1.6	1.6
May-11	26.5	28.7	8.2	8.3	39.2	39.5	5.4	5.3	2.5	2.5
Jun-11	23.8	26.1	7.9	7.7	36.4	36.8	4.3	4.5	4.8	4.1
Jul-11	24.3	23.1	7.4	7.1	34.5	34.8	4.8	4.2	4.4	4.4
Aug-11	25.1	24.0	7.9	7.8	32.1	32.4	5.8	6.1	3.7	3.0
Sep-11	27.5	25.8	8.4	8.1	33.1	33.3	6.4	5.8	3.5	3.5
Oct-11	26.8	27.0	7.7	7.9	34.5	34.5	7.1	6.3	2.8	3.4
Nov-11	20.2	26.2	8.4	8.1	37.1	37.1	8.0	5.9	2.5	2.4
Dec-11	20.1	20.5	8.3	8.2	37.2	37.7	6.9	6.9	2.9	2.4
Jan-12	22.5	20.3	7.8	7.9	36.4	36.4	6.8	6.2	4.4	4.5
Feb-12	28.7	22.2	7.9	7.9	37.1	37.8	3.7	4.3	1.9	1.8
Mar-12	32.8	27.9	8.4	8.2	37.8	37.8	2.2	3.4	1.1	1.5
Apr-12	29.7	29.8	8.1	8.3	38.9	38.2	4.6	4.7	2.2	2.8
May-12	30.6	30.5	8.4	8.3	39.8	39.1	5.2	4.3	2.5	2.9

Table-12.2. *Chemical Properties of near shore water at Gulf of Kutch at station 6*

Months	NO_2-N (S)	NO_2-N (B)	NO_3-N (S)	NO_3-N (B)	NH_4^+-N (S)	NH_4^+-N (B)	PO_4-P (S)	PO_4-P (B)	SiO_3-Si (B)	SiO_3-Si (B)
Dec-10	0.1	0.1	18.2	14.5	3.8	3.4	10.4	8.7	41.7	40.7
Jan-11	0.5	0.4	18.5	14.2	5.7	2.1	11.1	11.5	14.6	13.6
Feb-11	0.9	0.8	18.3	16.4	3.6	1.4	1.8	1.4	40.6	38.6
Mar-11	0.4	0.5	5.8	5.2	3.9	0.6	2.9	2.9	29.3	27.3
Apr-11	0.2	0.3	4.6	4.6	1.6	0.4	2.0	2.0	21.2	24.2
May-11	0.1	0.5	3.0	3.2	0.5	0.4	1.6	1.6	8.7	10.7
Jun-11	0.9	0.8	5.1	5.4	1.5	0.7	3.0	3.5	21.1	23.4
Jul-11	0.5	0.6	4.9	5.1	3.7	0.7	1.5	1.5	5.6	8.9
Aug-11	0.2	0.3	3.4	4.2	1.2	0.8	2.4	2.4	11.8	14.5
Sep-11	0.4	0.4	6.6	5.9	1.4	0.4	0.5	0.6	12.4	3.4
Oct-11	0.3	0.4	1.4	1.5	3.5	0.7	0.4	0.5	24.8	23.4
Nov-11	1.3	1.8	20.3	19.4	3.4	3.4	0.2	0.5	12.4	12.9
Dec-11	1.1	1.4	19.6	18.4	3.2	2.4	1.9	1.4	23.7	23.6
Jan-12	0.8	0.8	6.8	6.2	1.6	0.7	0.5	0.4	35.3	34.2
Feb-12	0.6	0.5	5.4	5.2	0.9	0.5	0.8	0.4	35.1	29.8
Mar-12	0.8	0.4	2.8	2.9	1.4	0.2	4.3	4.4	32.5	30.2
Apr-12	0.6	0.3	4.6	4.1	1.2	1.1	1.9	1.4	32.5	31.7
May-12	0.4	0.2	9.2	9.1	1.3	0.7	3.0	3.1	33.9	32.4

Table-13. *Correlation matrix for selected parameters during the period December 2010 -May 2012*

	8	DO	BOD	NO_2-N	NO_3-N	NH_4^+-N	PO_4-P	SiO_3-Si	Meio_D	Meio_Simpson_1-D	Meio_Shannon_H	Meio_Evenness_e^H/S	Meio_Margalef	
Sal	1.00													
DO	**-0.04 @**	1.00												
BOD	**0.65 ****	**0.01 @**	1.00											
NO_2-N	**0.39 ***	**0.23 ***	**0.27 ***	1.00										
NO_3-N	0.36 *	-0.08	**0.40 ****	-0.07	1.00									
NH_4^+-N	-0.27	-0.41	0.00	-0.17	-0.09	1.00								
PO_4-P	**0.06 @**	-0.14	-0.12	**0.03 @**	-0.30	-0.30	1.00							
SiO_3-S	**0.08 @**	-0.23	**0.40 ***	**-0.08 @**	**0.29 ***	0.29	-0.26	1.00						
Meio_Dominance_D	-0.22	-0.26	-0.31	-0.20	-0.43	**0.25 ***	**0.26 ***	**-0.02**	-0.52	1.00				
Meio_Simpson_1-D	**0.22 ***	**0.26 ***	**0.3***	**0.20 ***	**0.43 ***	-0.25	-0.26	0.02 @	**0.52***	-1.00	1.00			
Meio_Shannon_H	0.13	0.16	0.36	0.11	0.44	-0.18	-0.23	**0.27 ****	**0.74****	**-0.94@**	**0.94****	1.00		
Meio_Evenness_e^H/S	0.36	0.39	**0.23 ***	**0.32 ***	**0.07 @**	-0.32	-0.17	-0.54	**-0.44**	**-0.49**	**0.49****	**0.22***	1.00	
Meio_Margalef	-0.12	-0.12	**0.26 ***	-0.14	**0.43 ***	-0.04	-0.13	0.55	**0.98****	**-0.56****	**0.56****	**0.78****	-0.37	1.00

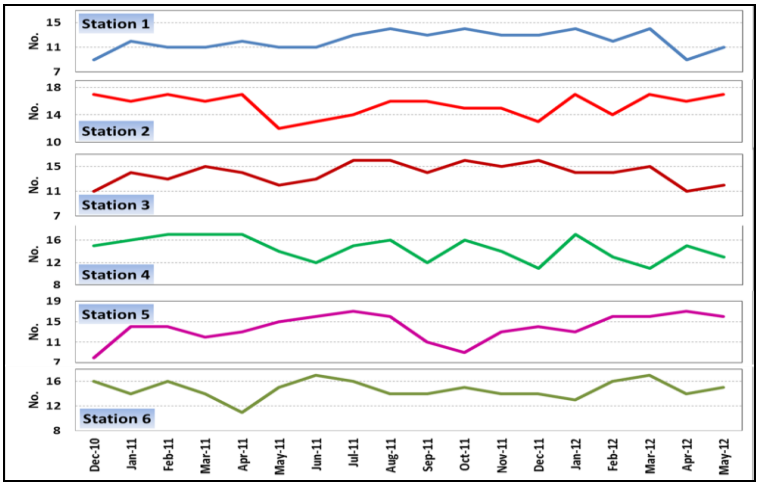

Fig-2.*Total Number of meiofauna Taxa encountered during the period December 2010 -May 2012*

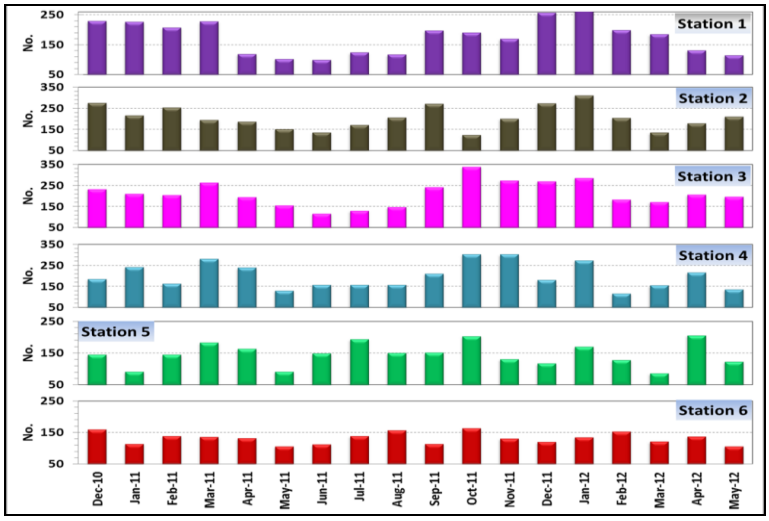

Fig-3.*Total Number of meiofauna Individuals encountered during the period December 2010 -May 2012*

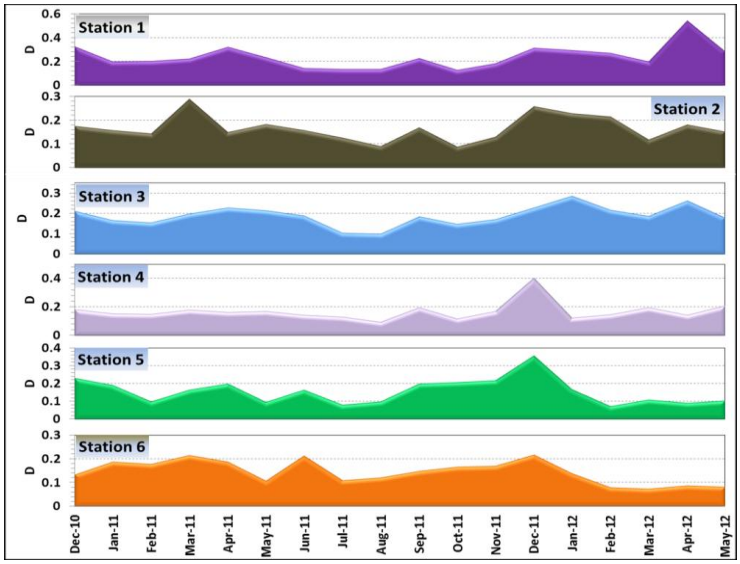

Fig-4.*Station-wise Species Dominance (D) of meiofauna during the period December 2010 -May 2012*

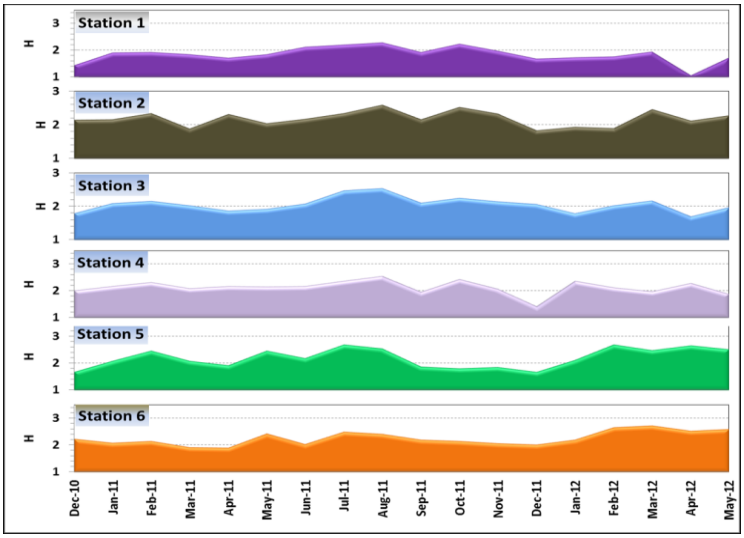

Fig-5. *Shannon Diversity Indices of meiofauna during the period December 2010 -May 2012*

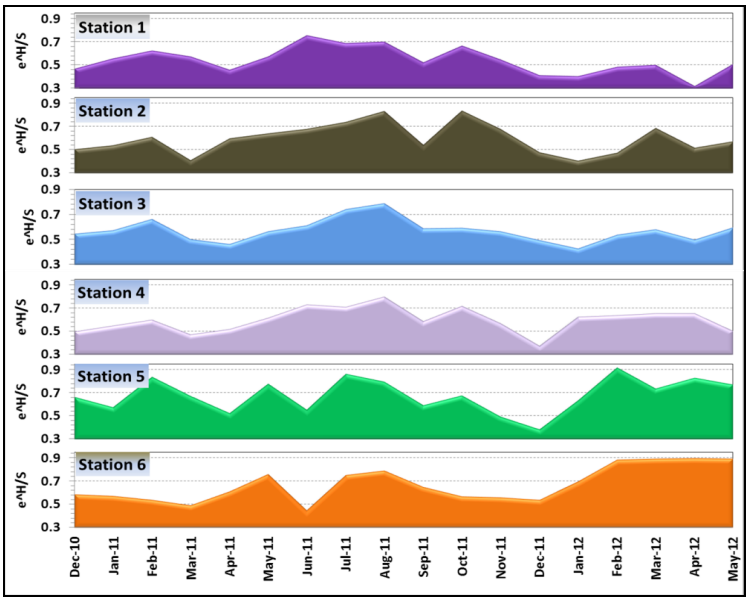

Fig-6. *Species Evenness of meiofauna during the period December 2010 -May 2012*

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AUTHORS' BIOGRAPHY

Name: Shivanagouda N Sanagoudra, PHD RESEARCH SCHOLAR DEPARTMENT OF MARINE BIOLOGY, KARNATAKA UNIVERSITY P.G CENTER, KARWAR, INDIA-581303.

Research area: Environmental Relationship of Benthic Fauna in the near shore waters off Gulf Of Kutch North West Coast of India"Marine sampling, Coastal Monitoring, handling of Lab instruments, collection, isolation, culture and identification of Marine Flora& Fauna.

Prof.U.G.Bhat , Dept of Marine Biology, Karnatak University's P.G.Centre, Kodibag, Karwar, Karnataka.

Teaching: Teaching M.Sc. and M.Phil in Marine Biology for the past 27 years, since Aug. 1985. Evolved teaching methods in theory and practical programs of M.Sc. and M.Phil - Marine Biology course of Karnatak University.

Research Guidance: Successfully guided 10 Ph.D. Thesis and 3 M.Phil Thesis. Two PhD theses are submitted and 3 more Doctoral works in progress.. Guided 69 M.Sc. Dissertaions. Evolved simple experiments and field work topics for the dissertations and higher research programs, including the M.Phil, Ph.D. and funded research projects.