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Sayan Bhattacharya
Dept. of Zoology Raja N.L. khan Women's College, Midnapore, India

Sujoy Midya
Dept. of Zoology Raja N.L. khan Women's College, Midnapore, India

Dipak Kumar Tamili
Egra S.S.B. College, Principal, Egra, India

Susanta Kumar Chakraborty
Dept. of Zoology, Vidyasagar University, Midnapore, West Bengal, India

Correspondence:
Sayan Bhattacharya
Dept. of Zoology Raja N.L. khan Women's College, Midnapore, India

Temporal and Spatial Variation of Meiobenthic Fauna at a Newly Developed Tourist Spot of Midnapore (East), West Bengal, India

Sayan Bhattacharya, Sujoy Midya, Dipak Kumar Tamili

Abstract
Meiofauna are known to be sensitive indicators of environmental perturbations. They may play vital role in the tropic level of any marine estuary coastal environment and become an important subject in marine ecology. Present study was initiated at one intertidal belt along ride the coast of Tajpur of Midnapore (East) district, West Bengal, India in order to record the seasonal dynamics of meiobenthic fauna along with cross shore distribution pattern. Environmental parameters like temperature, salinity, pH, DO and texture of the soil have been found to play a vital role to determine density and distribution of meiobenthic fauna. Maximum density of meiobenthic fauna are observed at Low Tide Level (LTL) rather than High Tide Level (HTL). Soil sample analysis result showed that upper portion rich in diversity of meiobenthic fauna than lower portion due to the exposure of different nutritional sources, other physical factors and inundation for the growth and survival of the biotic community. Nematoda represent the most common and dominant group among the meiobenthic community of the study site.

Keywords: Meiobenthos, High Tide Level (HTL), Low Tide Level (LTL), Nematoda, Cross-shore

Introduction
An example of a unique and truly productive zone is coastal tract. It is also necessary for consecutive and proper development of human habitat 50% of the world's human establishment happens with in 60 Km. Of the coastal region, and it could be increased up to 75% by the year 2020 [1]. Free living marine nematodes are common in benthic communities and play an important note in coastal trophic food webs. Urbanization and anthropogenic load creates immense pressure at the narrow coastal tract leading to the loss biodiversity. The scanty information on the meio- benthos of the Indian subcontinent after being initiated by with Annandable[2,3] have not geared that much momentum as it was excepted to be excepting few[4,5]. The study of meiobenthic fauna was also done by Datta & Chakraborty[6,7] at digha mohana and Rao and Misra[8,9] in Sagar Island, West Bengal, India. But still data on population dynamics of meiobenthic fauna are nominal from the coastline of West-Bengal· Phylum Nematoda of the meiobenthic community is considered as a bioindicator for the analysis of quality of marine ecosystem [10]. The present paper has attempted to record seasonal distribution and diversity of meiobenthic fauna and analysed the health of marine ecosystem at Tajpur, Midnapore (East) district, West Bengal.

Material and Methods
Collection & Preservation
Random collection of different Meiobentic and associated faunal component from two transects lying on different zones of intertidal belts i.e. low tide level (LTL) and high tide level (HTL) were made from a contrasting study sites at Tajpur.
Tajpur,East Midnapore, West Bengal ((21°38'53"N, 87°38'10"E and 21°38 '48"N, 87°38'4"E), with the help of a hand corer from Nov, 2014 to Oct, 2016 to cover the three main seasons viz. Pre-monsoon (March - June), monsoon (July - October) and post-monsoon

(November - February). Collections were done from two intertidal station viz. High Tide Level (HTL) or High Water Level and Low Tide Level (LTL) or Low Water Level [11]. Two replicates of the each sample were collected each time. Each 15 cm. column core was then separated into three equal divisions of height of 5 cm. viz. upper, middle and lower layer.

Temperature, salinity and pH of the habitat water were collected on the spot. Sediments were analysed after sun drying. Meiofaunal samples were treated with 5% formalin and left for overnight. Then samples were sieved with two brass sieves, upper one of 500mm. mesh and lower one of 63mm. mesh size. Those retained on the sieve of 63mm. mesh width are considered as meiofauna [12]. The sieved samples were preserved in 5% neutral formalin solution in wide mouth plastic vials. Meiofauna taxa were separated with the help of compound microscope. Meiofaunal densities were calculated for 10 cm2. Meiofauna has been identified on the basis of Records of the Zoological Survey of India. [13]

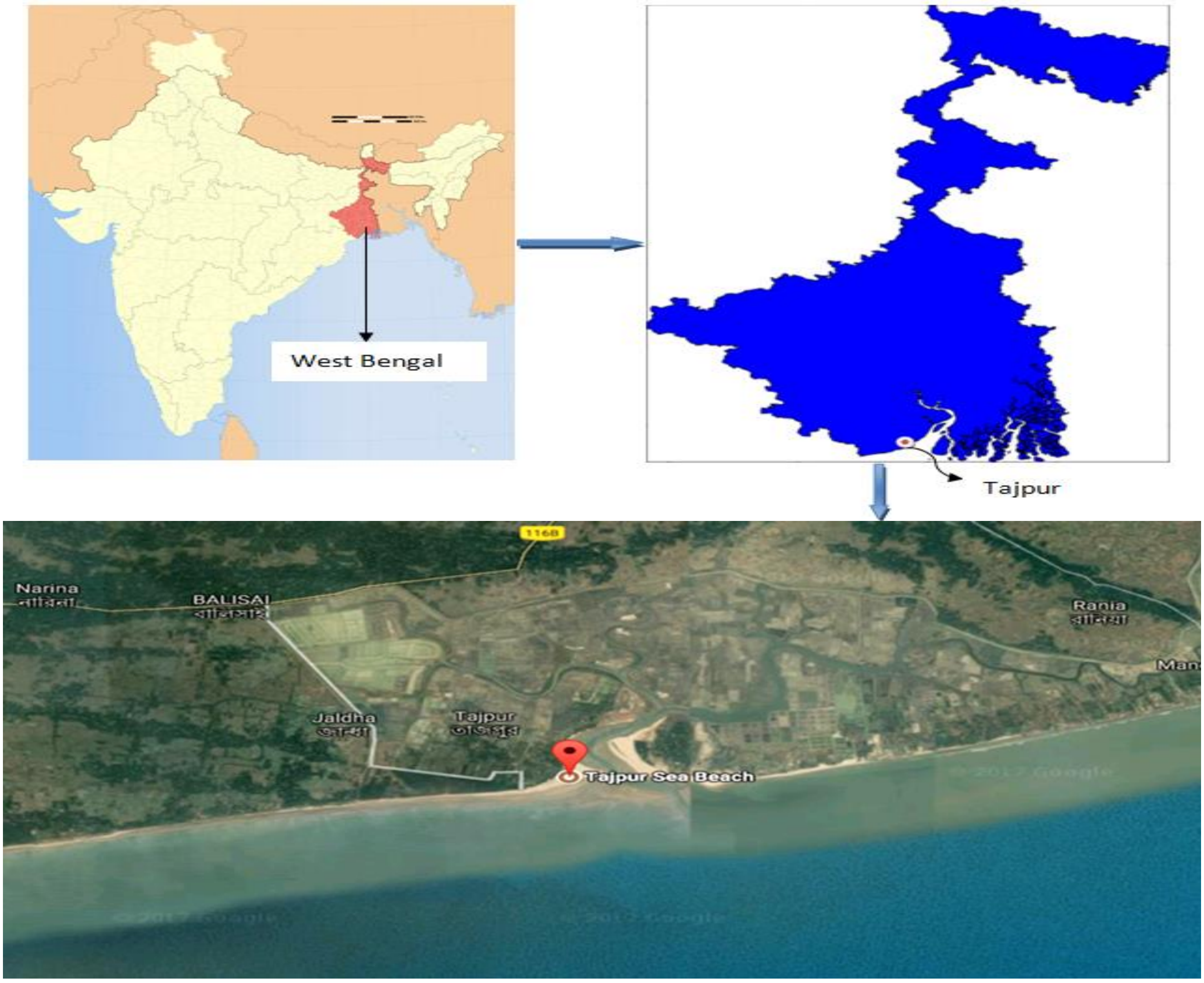

Fig. 1: Study site

Physico-Chemical Parameters of Soil and Water

Monthly sampling of soil and interstitial water are being made from different tidal levels of three study stations for estimating the different physicochemical parameters following standard methods (FAO, 1976 and APHA, 2005) and with the help of Water Quality Checker (TOA, Model No. - WQC22A, Japan).

Analysis of interstitial soil and water samples:

Temperature (0C)

The temperatures of interstitial water & soil from two tidal levels in each study stations were measured with a mercury thermometer having 0.10C graduation.

1. **pH:** pH of interstitial water & soil were measured using portable pH meter as well as by using automatic water quality checker (TOA, model no - WQC22A, Japan).
2. **Salinity (ppm):** Salinity of interstitial water was measured by using automatic water quality checker (TOA, model no.- WQC22A, Japan). But in case of soil, a soil suspension of fresh sample in distilled water at the ration of 1:5 was prepared and the suspension was stirred mechanically for one hour and filtered through No 42 filter paper. Then salinity of that filtrate was measured by following the standard method as mentioned by Strickland and Parsons [14].
3. **Dissolved Oxygen (mg/L):** Dissolved oxygen (DO) was estimated through titration by the modified Winkler's method [14] as well as by using automatic water quality checker (TOA, model no. - WQC22A, Japan).
4. **Salinity (ppm):** A soil suspension of fresh sample in distilled water at the ration of 1:5 was prepared and the suspension was stirred mechanically for one hour and filtered through No 42 filter paper. Then salinity of that filtrate was measured by following the standard method as mentioned by Strickland and Parsons [14].

Result and Discussion

Environmental determinants

Soil and Sea water temperature was recorded high during pre-monsoon (respectively 33.5°C & 33.8°C) and recorded the lowest during post-monsoon (respectively, 24.9°C & 18.1°C).Salinity was the highest during pre-monsoon (32.89 ppm for soil & 25.46 ppm for water); recording lowest during monsoon (10.63 ppm for soil & 5.12 ppm for water).pH was recored high during pre-monsoon (9.78 for soil and 8.3 for water). Dissolved Oxygen of water is ranging (6.55mg/L to 3.06 mg/L). Sand contents of intertidal region were recorded highest at HTL but LTL contained highest clay content throughout the year.

Species composition and distribution

During the period of survey, four major group's i.e Nematoda, Copepoda & ostracoda are identified rather than others. A total 24 species identified (nematode-11 species, ostracoda-3, opepoda-3 & others 7 species) and 6 unidentified (Ciliophora, Turbellaria, Rotifera, Gastrotricha, Oligochaeta & Cladocera) have been recorded in two years(Nov,14 to Oct,16). Long research study out of 11 Nematoda species, 6 species have been found to be in highest density (max-702/cm^2), while one Ostracoda species was recorded in all seasons.

Population fluctuation

Cross shore distributional pattern have been revealed that highest number meiobenthic fauna were aggregated at LTL and number of meiobenthic faunal composition seem to be low at HTL. It was revealed that upper portion of soil surface always contain highest number of meiobenthic communities rather than middle and bottom layer of soil throughout the season.

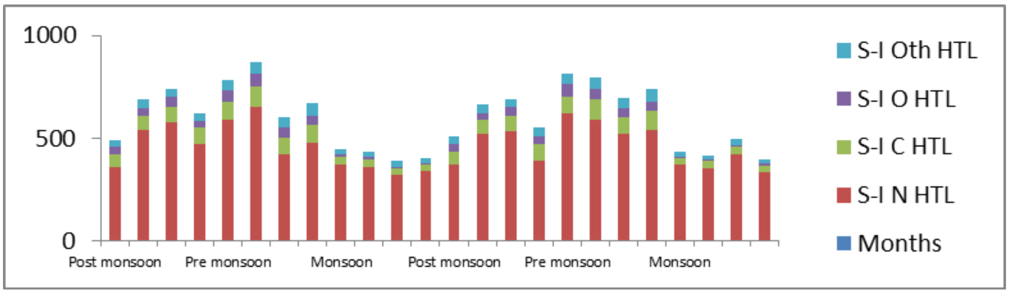

Fig.2: Vertical population distributional profile of meiofaunal communities in different seasons due to HTL

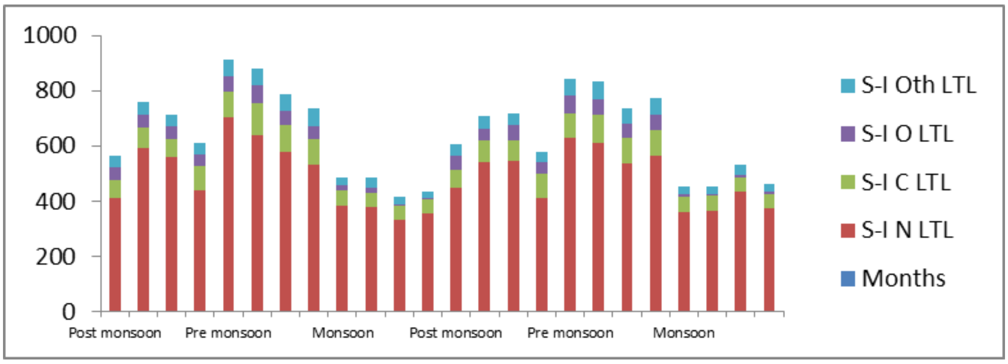

Fig.3: Vertical population distributional profile of meiofaunal communities in different seasons due to LTL

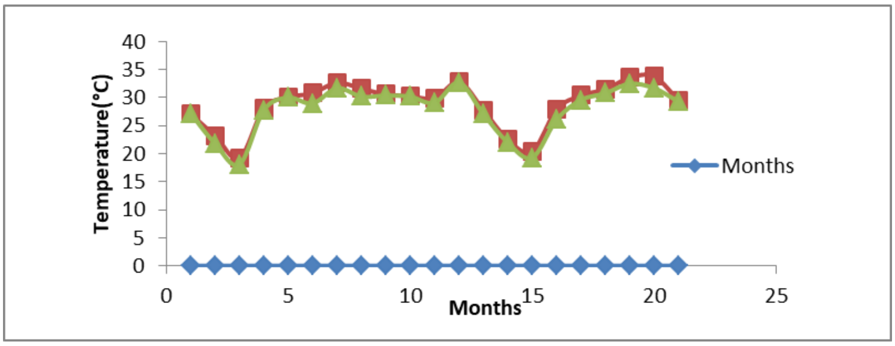

Fig.4: Seasonal changes of sea-water temperature

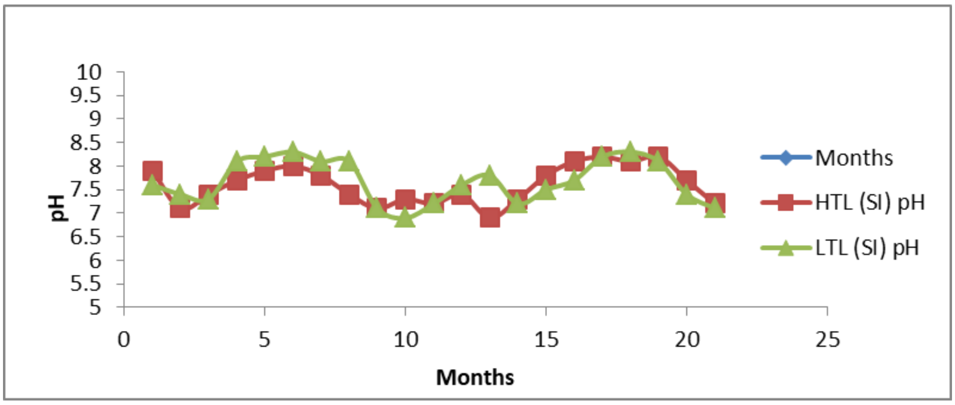

Fig.5: Seasonal changes of sea-water pH

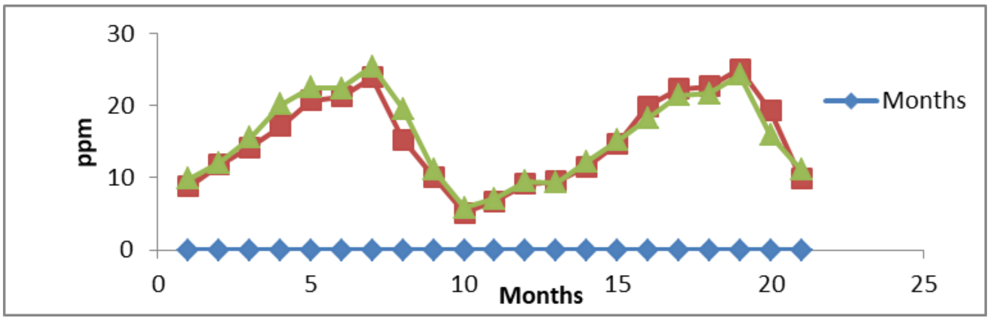

Fig.6: Seasonal changes of sea-water Salinity (sal)

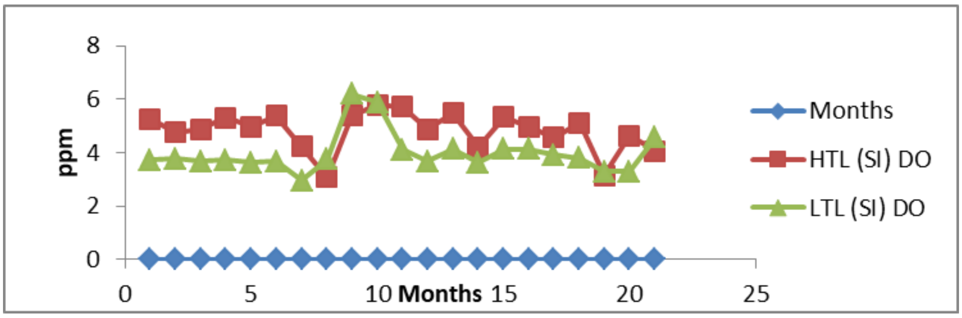

Fig.7: Seasonal changes of sea-water DO

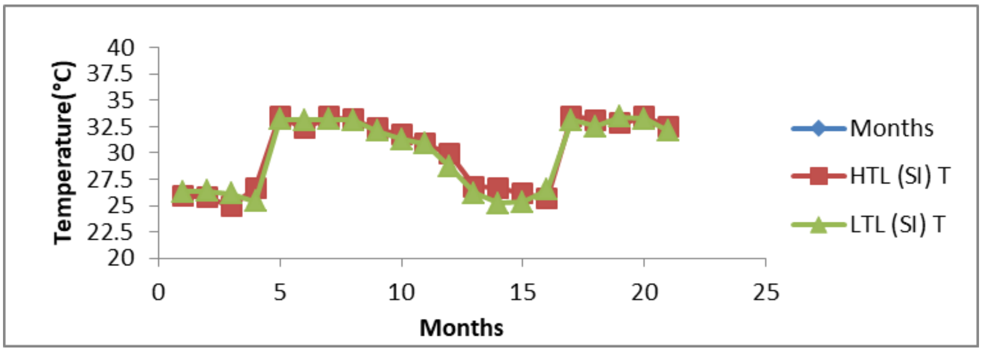

Fig.8: Seasonal changes of Soil temperature

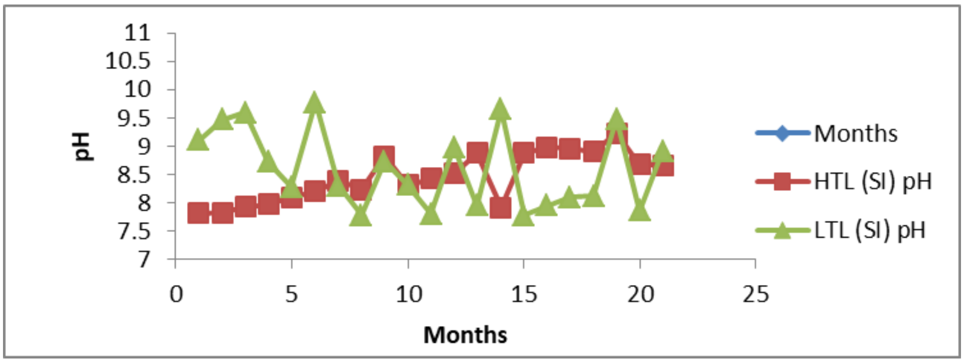

Fig.9: Seasonal changes of Soil pH

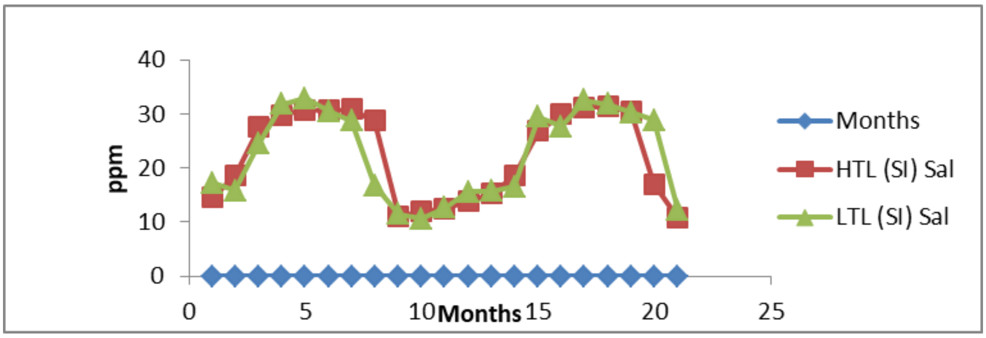

Fig.10: Seasonal changes of Soil salinity (sal)

Table.1: Meiobenthic faunal diversity at Tajpur

Species	Tajpur(SI)
Foraminiferan: Triloculina sp.	+
Rotalinoides sp.	+
Astropecten sp.	++
Ammonia sp.	++
Nematoda: Sabatiera sp.	+
Oxystomina sp.	++
Oncholaimus sp.	++
Oncholaimellus sp.	+
Cyathoshiva sp.	+++
Sphaerolaimus sp.	++
Rhynchonema sp.	+++
Halalaimus sp.	++
heristus sp.	+
Daptonema sp.	+
Chromadora sp.	++
Ostracoda: Cypridina sp.	++
Eucypris sp.	+
Bairdioppilata sp.	+++
Polychaeta: Scoloplos sp.	+
Psyllidae sp.	+
Pionosyllis sp.	++
Copepoda: Echinolaophonte sp.	++
Ancorabolus sp.	+
Cylindropsyllus sp.	++

Table.2: Meiofaunnal distribution during Premonsoon(PRM), Postmonsoon(POM) & Monsoon(MON) per $10cm^2$

	Months	UPER(0-5cm)	MIDDLE (5-10cm)	LOWER (10-15cm)
Nematoda	POM	426.3	48.0	7.0
	PRM	346.3	140.0	12.8
	MON	286.3	47.5	14.3
	POM	416.3	31.8	6.3
	PRM	350.0	197.5	20.0

	MON	316.3	42.5	12.5
Copepoda	POM	65.5	5.3	1.3
	PRM	68.8	17.8	3.0
	MON	20.0	4.5	2.0
	POM	66.3	4.5	2.0
	PRM	77.3	8.0	1.3
	MON	19.5	5.3	1.0
Ostracoda	POM	33.3	4.3	1.67
	PRM	37.0	12.5	1.50
	MON	6.5	2.3	1.00
	POM	30.0	6.0	1.33
	PRM	36.0	10.8	3.50
	MON	5.3	1.5	1.00
Others	POM	32.3	4.5	1.33
	PRM	33.3	21.3	2.00
	MON	21.0	3.8	1.00
	POM	34.3	5.0	1.00
	PRM	37.0	17.5	1.67
	MON	17.0	5.3	1.00

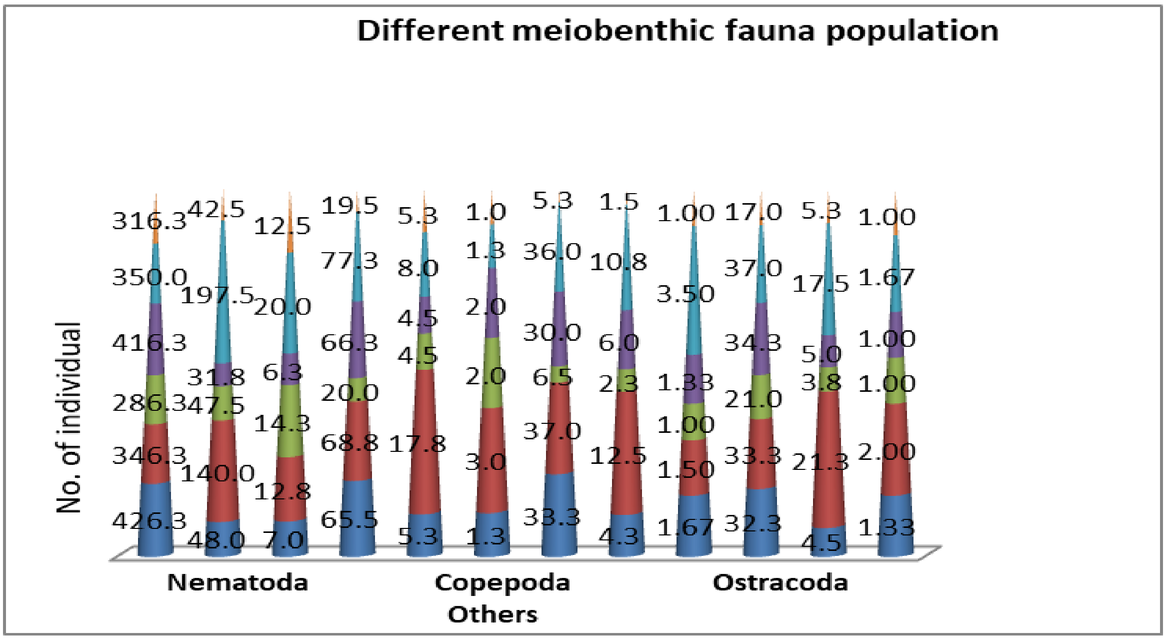

Fig. 11: Vertical distributional profile of meiofaunal communities in different seasons.

Conclusion

Environmental parameters like temperature, salinity have been considered major controlling factor for marine invertebrates [15,16]. It has been revealed that the Nematoda is the highest abundant fauna in the upper littoral zone of the study site. Organisms show sharp declination trends according to the increased depth. For this reason a clean adaptive zonation pattern of these meiobenthic taxa along the intertidal region is found throughout the seasons. The meiobenthic population size of nematoda showed drastic change as the pollution levels rise [17] [18]. Meiobenthic faunna is considered as a good indicator of environment because of their small size and short generation time. They can integrate the effect of different stresses caused by anthropogenic activities. Their presence and absence evaluate the health of coastal ecosystem. Future research should study the changes that occur at the species or genus level while monitoring anthropogenic stress on a regular basis. When we will be able to better quantify the level of pollution and how it affects the meiobenthic species ratio, we will be able to associate and evaluate the conditions of the different coasts of study area.

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