World Wide Journal of Multidisciplinary Research and Development

WWJMRD 2018; 4(3): 29-34
www.wwjmrd.com
International Journal
Peer Reviewed Journal
Refereed Journal
Indexed Journal
UGC Approved Journal
Impact Factor MJIF: 4.25
E-ISSN: 2454-6615

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Seasonal Variation of Meiobenthic Fauna Specially Nematode, Copepoda and Ostracoda at Digha Coastal Belt, Midnapore (East), West Bengal, India

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Abstract
Meiofauna are known to be sensitive important bio-indicators of environmental perturbations. They may play very important role in the tropic level of any marine estuary coastal environment and become a main topic in marine ecology. Present study was initiated at one intertidal coastal belt along ride the coast of Digha of Midnapore (East) district, West Bengal, India in order to record the seasonal dynamics of meiobenthic faunal community along with cross shore distribution pattern. Environmental parameters like temperature, salinity, pH, DO and texture of the soil have been found to play an essential role to determine density and distribution of meiobenthic interstitial fauna. Maximum density of meiobenthic fauna are recorded at Low Tide Level (LTL) rather than High Tide Level (HTL). Sediment sample analysis result observed that upper portion rich in diversity of meiobenthic fauna than lower portion due to the revelation of special nutritional sources, other physio chemical factors and inundation for the increase and survival of the biotic community. Nematoda represent a large amount of dominant group among the meiobenthic faunal community of the study site.

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

Introduction
Digha coastal belt is a unique and truly productive zone. It is also required for successive and proper progress of human habitat 50% of the world's human establishment happens with in 60 Km. Of the marine coastal region, and it could be enlarged up to 75% by the year 2020 [1]. Free living marine nematodes are general in benthic communities and play a significant note in marine coastal trophic food webs. Urbanization and anthropogenic load creates huge pressure at the slight coastal tract leading to the dicrease biodiversity. The insufficient information on the meio- benthos of the Indian subcontinent after being initiated by with Annandable[2,3] have not geared that much drive as it was excepted to be excluding few[4,5]. The study of meiobenthic fauna was also observed by Datta & Chakra borty [6, 7] at digha mohana and Rao and Misra[8,9] in Sagar Island, West Bengal, India. But still data of density dynamics of meiobenthic fauna are supposed from the shoreline of West-Bengal. Phylum Nematoda of the meiofauna community is measured as a bio-indicator for the analysis of quality of oceanic ecosystem [10]. The present paper has attempted to record seasonal distribution and diversity of meiobenthic interstitial fauna and analysed the health of oceanic ecosystem at Digha, Midnapore (East) district coastal belt, West Bengal, India.

Material and Methods
Collection & Preservation
Random collection of different groups of Meiobentic and associated benthic faunal component from two transects lying on different zones of intertidal coastal belts i.e. low tide level (LTL) and high tide level (HTL) were made from a special study sites at Digha,. Midnapore (East), West Bengal ((21°38'53"N, 87°38'10"E and 21°38 '48"N, 87°38'4"E)

India,with the assist of a hand corer from Nov, 2014 to Oct, 2016 to cover the three major seasons viz. Pre-monsoon (March - June), monsoon (July - October) and post-monsoon (November - February). Collections were through 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 every sample were collected every time. Each 15 cm. column core (plastic) was then separated into three the same divisions of height of 5 cm. viz. upper, middle and lower layer.

Temperature, salinity and pH of the habitat interstitial water were collected on the study sites (Digha). Soil parameters were analysed after sun drying. Meio-benthic fauna collection were treated with 4% formalin and left for overnight. Then collection of meiofauna were sieved with two brass sieves, upper one of 500µm. mesh and lower one of 63µm. mesh size. Those retained on the sieve of 63µm. mesh width are measured as meio-benthic fauna [12]. The sieved samples were preserved in 4% neutral formalin solution in plastic vials. Meiofauna were observed with the help of compound microscope. Meiofaunal densities were calculated for 10 cm^2. Meiofauna has been acknowledged on the basis of Records of the Zoological Survey of India. [13].

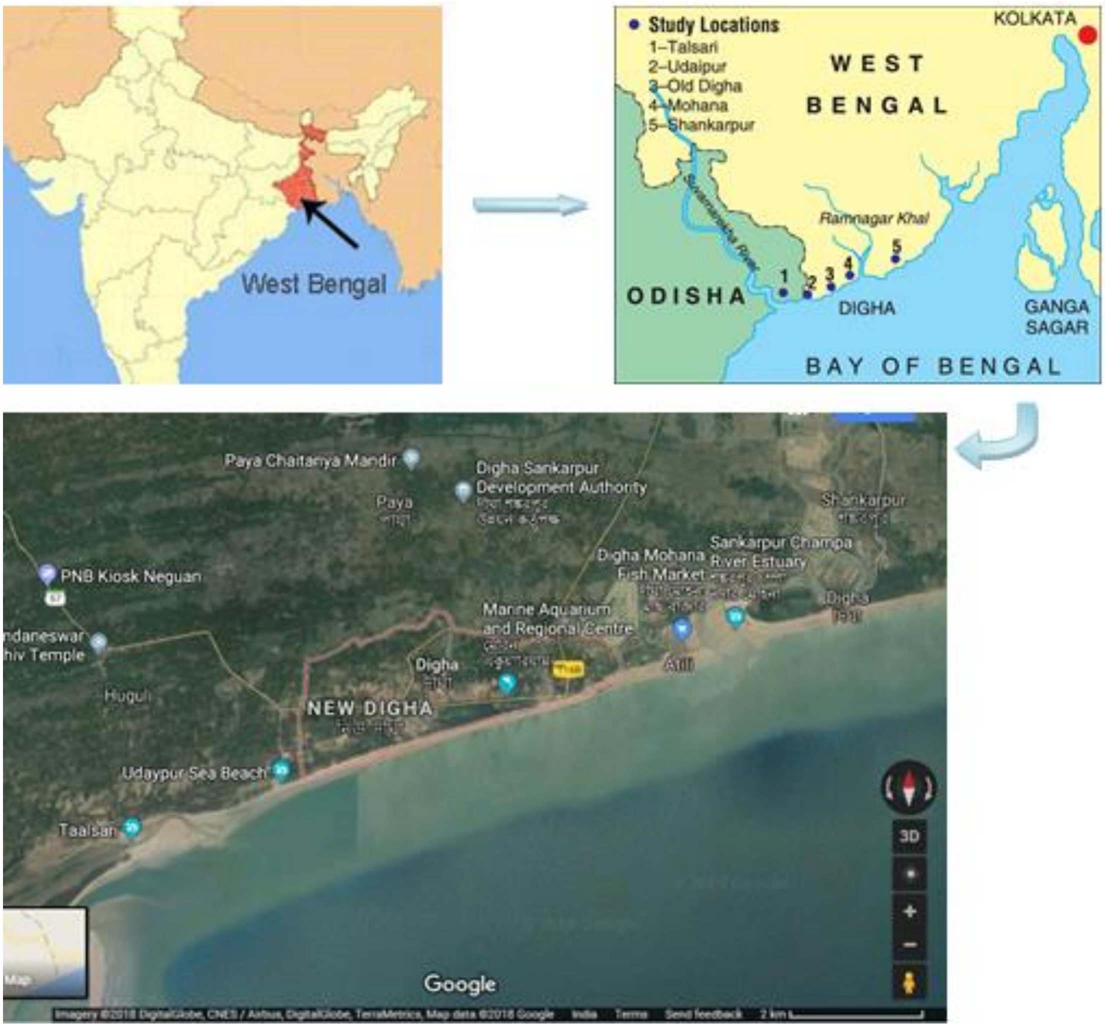

Fig.1

Physico-Chemical Parameters of Soil and Water

Monthly sampling of sediment and interstitial sea 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 (ºC)

The temperatures of interstitial water & soil from two tidal levels in each study stations were measured with a mercury thermometer having 0.1ºC graduation.

Ph

pH of interstitial water & soil were calculated using portable pH meter as well as by using automatic water quality checker (TOA, model no - WQC22A, Japan).

Salinity (ppm)

Salinity of interstitial water was measured by using automatic water quality checker (TOA, model no - WQC22A, Japan). 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].

Dissolved Oxygen (mg/L)

Dissolved oxygen (DO) was estimated through titration by the modified Winkler's method as well as by using automatic water quality checker (TOA, model no. - WQC22A, Japan).

Result and Discussion

Environmental determinants

Soil and marine interstitial water temperature was recorded high during pre-monsoon (respectively 34.3°C & 32.9°C) and recorded the lowest during post-monsoon (respectively, 24.8°C & 20.2°C).Salinity was the highest during pre-monsoon (31.6 ppm for soil & 28.31 ppm for water); recording lowest during monsoon (8.48 ppm for soil & 6.98 ppm for water).pH was recored high during pre-monsoon (9.57 for soil and 8.5 for water). Dissolved Oxygen of water is range in between (5.6mg/L to 3.65 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, three major group's i.e Nematoda, Copepoda & ostracoda are identified rather than others. A total 22 species identified (nematode-10 species, ostracoda-3, opepoda-3 & others 6 species) and 5 unidentified (Ciliophora, Turbellaria, Gastrotrich, Oligochaeta & Cladocera) have been recorded in two years (Nov, 14 to Oct, 16). Long research study out of 10 Nematoda species, 7 species have been found to be in highest density (max-472/cm2), while one Copepoda species was recorded in all seasons.

Population fluctuation

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

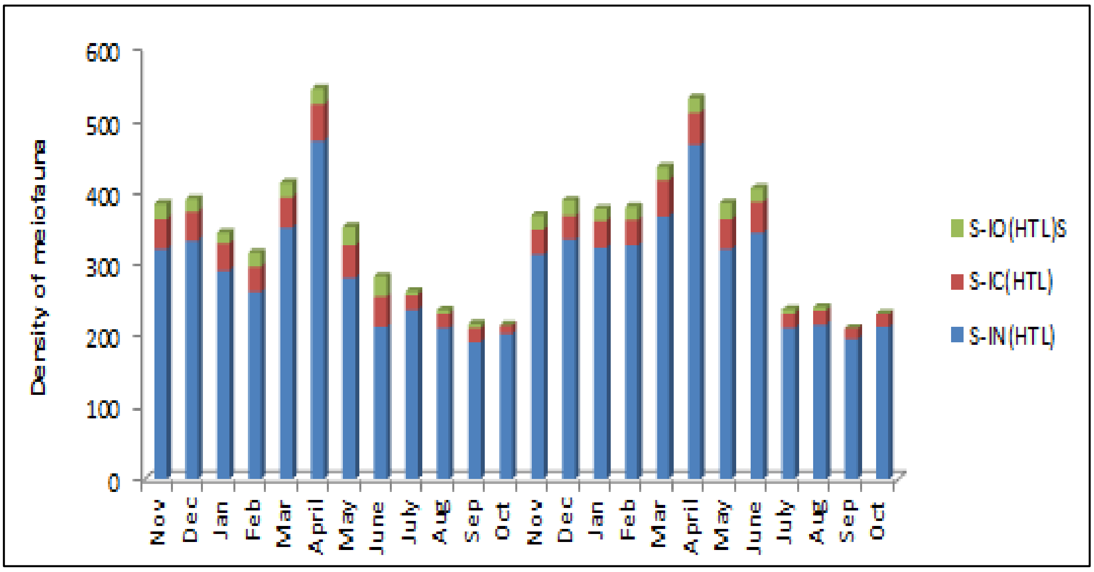

Fig.2: Vertical population distributional profile of meiofaunal communities in different seasons due to HTL.

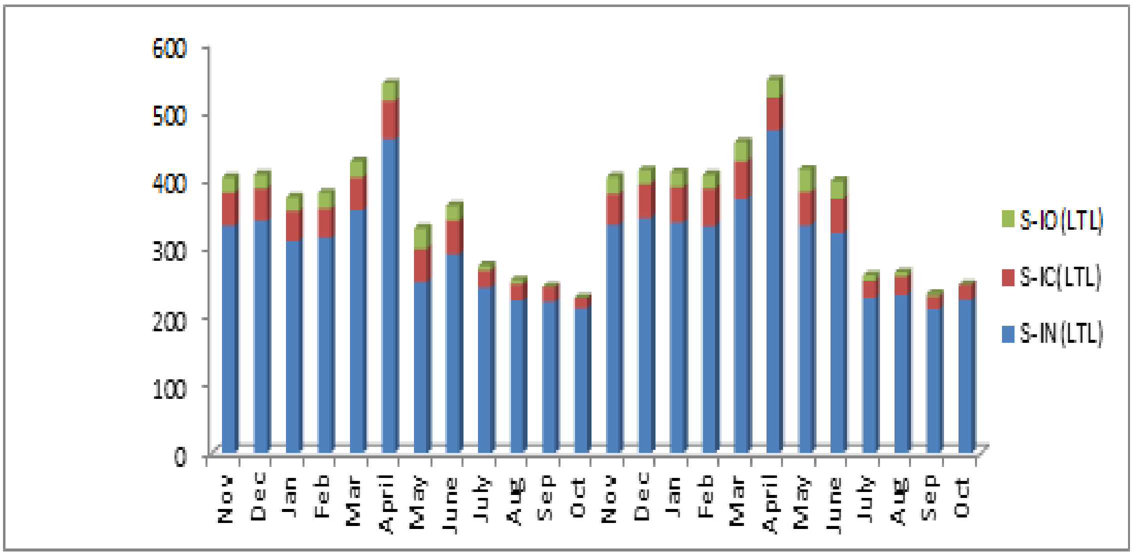

Fig.3: Vertical population distributional profile of meiofaunal communities in different seasons due to LTL

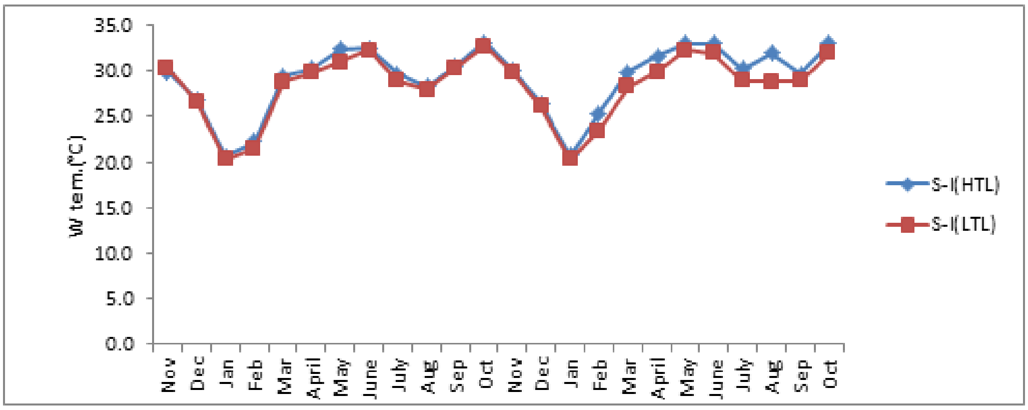

Fig.4: Seasonal change of sea water temperature.

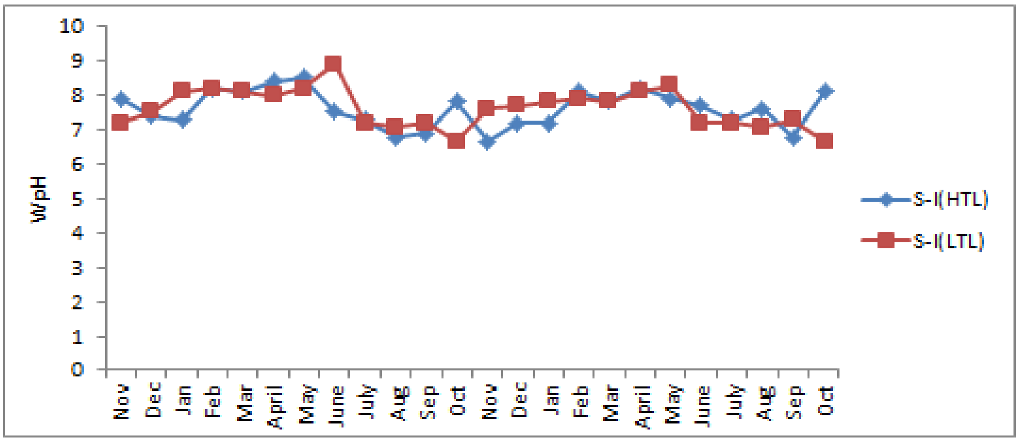

Fig.5: Seasonal change of sea water ph.

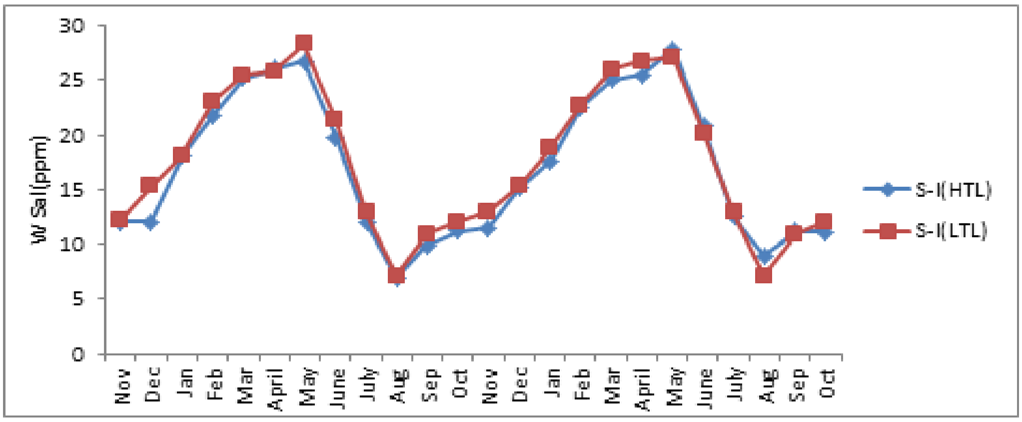

Fig.6: Seasonal change of sea water salinity

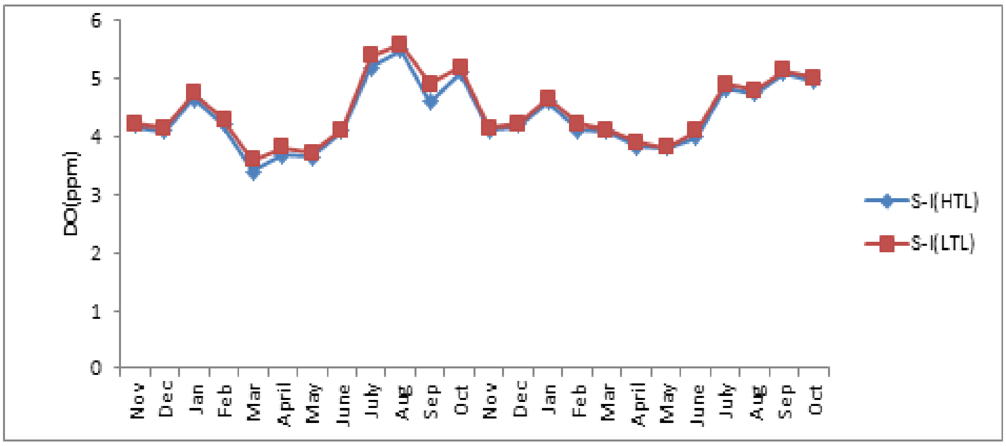

Fig.7: Seasonal changes of sea water DO

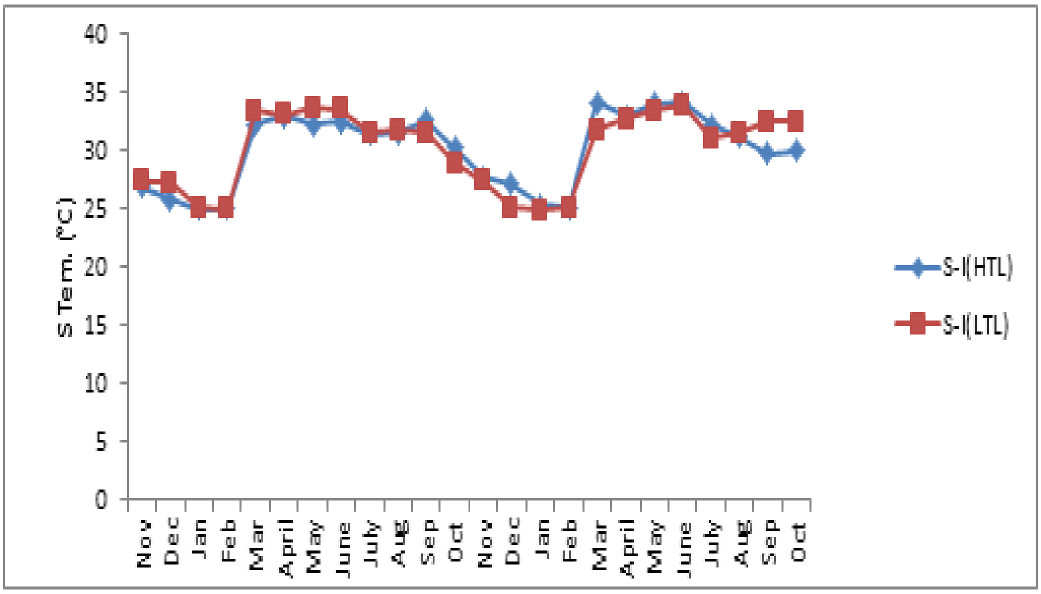

Fig.8: Seasonal change of soil temperature.

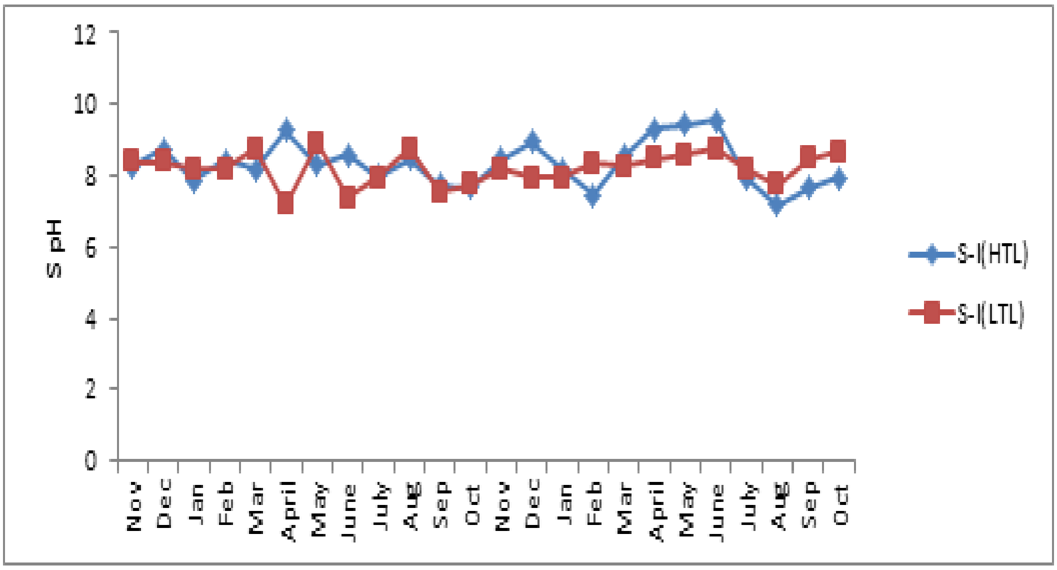

Fig.9: Seasonal change of soil pH.

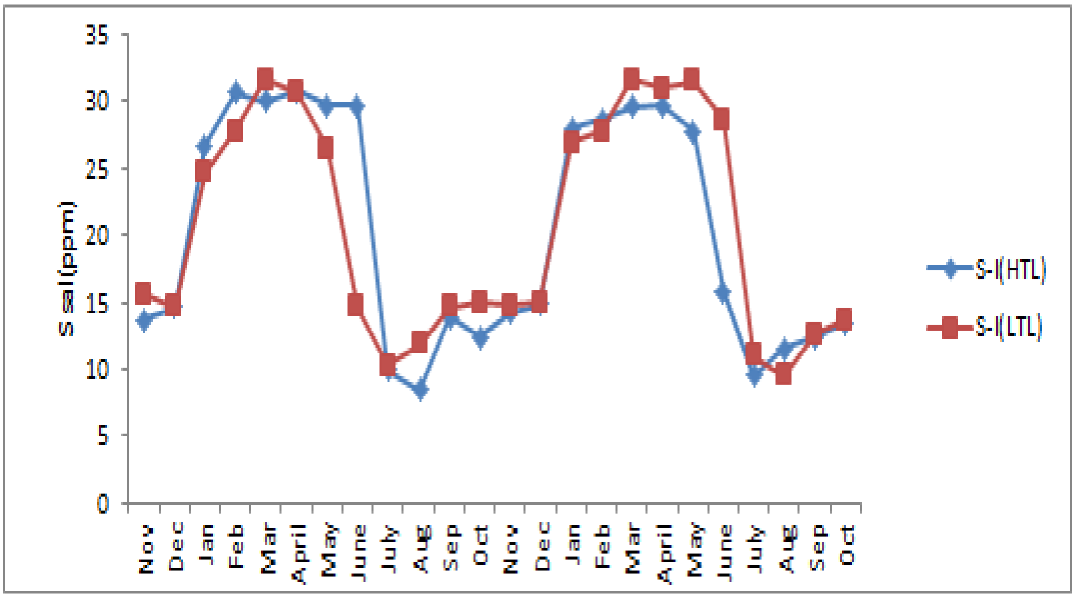

Fig.10: Seasonal change of soil salinity

Table.1: Meiobenthic faunal diversity at Digha

Species	Digha (S-I)
Foraminiferan: Triloculina sp.	++
Rotalinoides sp.	+++
Astropecten sp.	+
Ammonia sp.	++
Nematoda: Sabatiera 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.	+
Copepoda: Echinolaophonte sp.	+++
Ancorabolus sp.	++
Cylindropsyllus sp.	+

Conclusion

Environmental ecological parameters like temperature, salinity have been considered major controlling factor for marine invertebrates organisms [15,16]. It has been exposed that the Nematoda is the highest abundant meiobenticfauna in the upper littoral zone of the study site. Meiofauna show sharp declination trends according to the increased depth. For this basic ground a clean adaptive zonation pattern of these meiobenthic fauna along the intertidal part is found throughout the three major seasons. The density of meiobenthic fauna, size of nematoda showed radical change as the pollution levels increase. Meiobenthic faunna is measured as an indicator of environment because of their tiny size and short generation time. They can incorporate the effect of several stresses caused by anthropogenic activities. Their presence and absence evaluate the health of marine ecosystem. Future research should study the changes that occur at the species or genus level while bio-monitoring anthropogenic stress on a normal basis. When we will be able to better quantify the level of pollution and how it affects the meiobenthic fauna ratio, we will be able to associate and assess the situation of the different coasts of study area.

Acknowledgements

Authors are highly grateful to the Department of Zoology, Vidyasagar University for providing necessary facilities to complete the present work. The first author is also thankful to Zoological Survey of India for identification of specimens**.**

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