Study of Meiofaunal Biodiversity on Suruchi Beach, Palghar, District, Maharashtra, India

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ABSTRACT:

Bassein beach or commonly called as Suruchi beach which is located on western coast of Vasai, Maharashtra, India shows a variety of habitat. This study deals with the survey of meiofauna observed at Suruchi beach. Suruchi beach has rich biodiversity due to different habitat and complex food chain. Biodiversity of nematodes, tardigrades at suruchi beach was assessed in the study and we observed sea-shells such as Foraminiferon shells and Ostracods shells. We observed variety of foraminiferon shells they are environmental indicators as foraminiferon responds quickly to small environmental changes. Ostracods shells are found in both marine and freshwater environment. We observed less population of tardigrades as tardigrades can survive in both polluted and non-polluted area. Tardigrades are important pollution indicators. Anthropogenic activities such as boat paintings, fishing, recreational activities, boat repairing etc. are observed at these beaches. Booming agricultural activities performed by tribal communities are disturbing the original habitat at Suruchi beach. Present study indicates that Suruchi beach is less polluted and shows healthy biodiversity of meiofauna.

Key Words: Nematodes, Foraminiferon Shell, Anthropogenic, Pollution, Ostracod Shell

INTRODUCTION:

Suruchi beach is a black sand beach which is located on west coast of Vasai, Maharashtra, India. The east side of the beach is having marshy area and dense mangroves, while the south side of this region shows moderate forest and grassland. The most reoccurring vegetation is pine trees, locally called as suru. Hence, the name Suruchibaugh. Due to the action of the tides, wind, and currents, the surface of sandy beaches is permanently moving. This is the reason why a sandy shoreline doesn't provide a place for attachment of surface-growing seaweeds but it can hold water between small grains, that's why the environment is unaffected beneath the sandy shore. A wide variety of organisms are inhabited in the space between the sediment particles, in damp sand, on sandy shores, among them most abundantly – meiofauna communities, although Sandy beaches appear dead and inhospitable, like a desert. Meiofaunal organisms are mobile metazoans which are smaller than macrofauna and larger than microfauna. Meiofauna are small benthic invertebrates and they can survive in both marine and fresh water environments. Several studies have shown that meiofauna can adapt to extreme environments. The discovery of abundant and well-adapted meiofaunal communities in several environments with extreme conditions has provided new insights into the ecology and physiology of species thriving in very challenging settings. Cairns etal (1993) and Alongi (1990) studied the history of biological

monitoring using benthic macro invertebrates in Freshwater biomonitoring and ecology of tropical soft bottom benthic micro invertebrates Meiofauna are source of food for other organisms like macrobenthos and they are sensitive to pollution due to which it acts as bioindicators. Vinex (1991) and Reshma (2015)studied the use of mieobenthos in pollution monitoring and freshwater meiofauna diversity in lakes. Due to small size and short life span meiofauna have been considered as powerful & precise indicators of all natural & human alteration in limnetic ecosystem (Maurer, 1985).Occurrence and distribution of meiofauna depends on the quality of water and climatic conditions. Patrick (1972)confirms the elimination of non-tolerant species or inhibition of reproduction due to adverse conditions in an ecosystem. Bahura et al (1993) reported the zooplanktonic community of Shivabari temple tank, Bikaner but didn't report meiofaunal diversity. Michael Q (1977) reported invertebrates of streams and rivers. Hannachi et al (2015) studied the free-living nematode as bioindicators. Ansari et al (2001)reported the Population fluctuation and vertical distribution of meiofauna in a tropical mudflat at Mandovi estuary but didn't report the meiofaunal biodiversity of rivers. Metagenomics sequencing (Bik et al., 2012), barcoding techniques (Bhadury et al., 2006), and molecular diagnosis of predator-prey relationships.

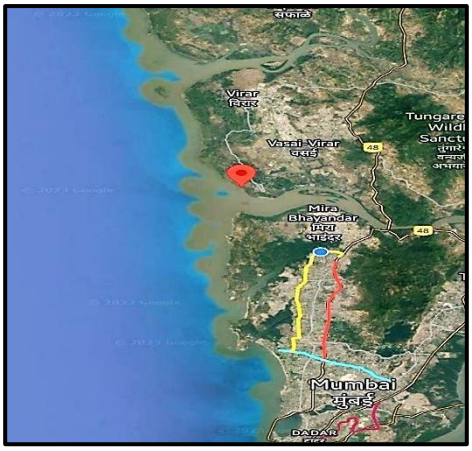


Figure 1 : Indication of Study Area on Map

STUDY AREA AND OBJECTIVE OF STUDY:

The study area, Suruchi Beach is located in Vasai region in Palghar district of Maharashtra lies between Lat- 19°20'20"N and Lon-72°47'26"E comprising meiofaunal habitat, mangrove habitat and Australian pine tree abundant in number.

Figure 2 : Indication of 9 different Station at Study Area on Map

The main objective of study at Suruchi beach is to gain information of about the meiofaunal organisms present in that particular area and to know the status of meiofaunal biodiversity at Suruchi. This study help government to aware of rich heritage in biodiversity of this selected area and suggest measures for conserving the ecological status and to maintain the biodiversity status.

STATIONS	LATITUDE	LONGITUDE
Station 1	19º20'23" N	72º47'25" E
Station 2	19º20'22" N	72º47'25" E
Station 3	19º20'22" N	72º47'26" E
Station 4	19º20'21" N	72º47'26" E
Station 5	19º20'21" N	72º47'27" E
Station 6	19º20'20" N	72º47'27" E
Station 7	19º20'20" N	72º47'27" E
Station 8	19º20'19" N	72º47'28" E
Station 9	19º20'19" N	72º47'28" E

Table 1 : Representation of Latitude and Longitude of each station

MATERIALS AND METHODS:

The sampling was undertaken in the month of February during the low tide period. The sampling area was divided into 9 'stations' at intervals of 20 m below the low tide level. For the collection of sand samples, a 5-inch pipe with a diameter of 2 inches was used, a pipe was then pushed in the soil up to 3 inches. A leakproof plastic container was used to collect the samples. For the separation of meiofauna from the sediment we use the concentration (decantation)method which depends on the characteristics of the particles such as size, specific weight, form, and surface structure. The sinking rate and the transport by water flow are determined characteristics. We use the Ludox solution (colloidal silica material- silica source to develop a porous substrate for constructing thermally responsive gel-infused surface) for the extraction of meiofauna and it has specific gravity of 1.18 while the specific gravity of meiofauna is 1.13. The sample is stirred up in a dish, glass beaker or measuring glass. After allowing a short time for the settlement of "heavier" sand grains or other constituents of the sample sink at the bottom and the supernatant water is poured out through a sieve or a set of sieves. Larger particles, including the organisms, wanted, are retained, while mud particles pass through the sieves. The mesh size of the sieve used depends on the size of the animals to be considered in the investigation. Collected samples were preserved in 10%water and formalin. The organisms were stained with rose Bengal. Then the samples were mounted on the slide and placed under the microscope for the identification of organisms. Organisms were identified up to group level.

RESULTS AND DISCUSSION:

Minor or major rocks, or pebbles observed along the beach so the tidal water current flow without interruption. We observed macro shells on the surface of the soil which are partially embedded. The sampling sites were selected in a linear

manner below the low tide level at intervals of 20m. The area was rich in meiofaunas in the form of nematodes, tardigrades, foraminiferon shells, ostracod shells, amphipods, and organic matter which could be observed in the vicinity of sampling sites. Visual observation during the sieving of samples revealed the presence of meiofauna such as nematodes, foraminiferon shells, tardigrades, etc. In every sample that was analyzed, nematodes were observed in abundance.

NEMATODES

Nematodes are important for us because it regulates the populations of other soil organisms, mineralize nutrients into plant-available forms, provide a food source for other soil organisms, and consume disease-causing organisms.

TARDIGRADES

They help to break down waste, returning nutrients to the soil. Scientists use tardigrades as ecological indicators of the condition of their environments.

FORAMINIFERAL SHELLS

Foraminiferal shells are the shells of microscopic organisms called foraminifera, which build intricate shells from the calcium carbonate they collect while drifting through the water. Their shells have settled on the seafloor for 500 million years, and are used by scientists to study the earth's changing climate.

They help to know the sea level, temperature, and ocean conditions of Earth millions of years ago Foraminifera have been used to map past distributions of the tropics, locate ancient shorelines, and track global ocean temperature changes during the ice ages.

OSTRACODS

Ostracods are small crustaceans commonly called seed shrimps that are found in both freshwater and marine environments. One of the defining characteristics of ostracods is their carapace or shell. Ecologically, marine ostracods can be part of the zooplankton or (most commonly) are part of the benthos, living on or inside the upper layer of the sea floor. While Myodocopa is restricted to marine environments, the Podocopida are also common in freshwater, and terrestrial species of Mesocypris. They allow relative dating of the rocks in which they are found and enable correlation to be made.

AMPHIPODS

Amphipods comprise an order of crustacea, shrimp-like in a form which contains mostly marine and freshwater forms. They lack carapace or shells. They are almost always an important component of aquatic ecosystems, often acting as mesograzers, and scavengers. They contribute to nutrient recycling and provide high-quality food for a variety of animals

Visual observation of samples during sieving revealed that there is a large population of foraminiferal shells and nematodes it suggesting that soil of Suruchi beach is suitable for the growth of foraminiferon as well as nematodes. It has also observed during present investigation that soil of beach is black in color must be contains high concentration of iron must be helpful for growth of foraminiferon and nematodes.

We observed the species of foraminifera such as ***Globorotalia truncatulinoides, G.menardii, G.limbata, Globorotalia multicamerata, G.cultrata***. Among of

these species, we observed the species *G.multicamerata* abundantly. This species has 10 to 12 chambers of final whorls. *G.multicamerata* and *G.limbata* are closely related species and it's difficult to differentiate between them. They differ in several chambers, the presence of circular test outlines, and circular and deep umbilicus. In every sample, we observed a large amount of organic matter and eggs of unrecognized origin. As this beach is a black sandy beach it shows abundant iron content which is helpful for the survival of meiofaunal organism. We observed very less population of tardigrades, amphipods that indicates that the beach is less polluted. Ostracods species such as Cytheralison species, *Semicytherura sulcata* and Species of *Cytherelloidea leroyi* are observed. Nematode species such as Roundworms, *Ascaris lumbericoides*, *Brugia spp*., Necator americanus, Wuchereria sp., Loa loa are assessed during the study.

At station 2 we found very high population of nematodes whereas at station 8 we observed a very less population of tardigrades, and amphipods which indicates that the beach is less polluted. Population of foraminiferons at station 7 is high as compared to other stations this indicates that the area of station 7 shows more favourable conditions for the growth of that particular organism. Tardigrades are maximum at station 1 and station 5 while the range of ostracods, foraminiferans are minimum at these stations. The observation representing the population density and abundance in the study are presented in the following graphs and table.

CORRELATION:

The population density of nematodes and foraminiferens are the highest population whereas the population of amphipods and tardigrade is lowest as compared to other groups observed. Balamurungan et.al (2002) reported the seasonal variation in non-marine ostracods population in Cauveri river. They reported 106/m^3 population of ostracods during the month may. In this current study the presence of ostracods population found to be 5.15% of total population of observed meiofauna. Pathare et.al (2011) reported that the biodiversity of meiofauna in TIFR Coast ,South Mumbai. This investigation is in continuation of the study of biodiversity of meiofauna. Bahura et al (1993) reported the zooplanktonic community of Shivabari temple tank, Bikaner but didn't report meiofaunal diversity. In this present study, we observed the diversity of life forms such as ostracods, nematodes, foraminiferon, tardigrades, amphipods that are found in marine environments. Kumar et.al (2001) reported the probable role of foraminiferons assemblage in the formation of shelf sediments. There is some possibility of foraminiferans attributing to the texture of sediment of the current study. Afonso et.al (2011) have reported the presence of mieobenthos like oligocheate, polycheate, nematodes etc., in the sediment of Girgaon Chowpatty South Mumbai. Present study indicates the dominance of nematodes in the area of study and also the abundance of foraminiferens and ostracods in the same habitat.

Table 2 : Total population of member of Meiofauna showing horizontal zonation's

Sr. No.	Meiobenthos	St.1	St.2	St.3	St.4	St.5	St.6	St.7	St.8	St.9
1	Nematodes	13	42	15	16	24	35	29	11	27
2	Tardigrades	3	1	0	1	2	0	1	0	0
3	Amphipods	0	1	1	0	1	0	0	1	0
4	Ostracod shells	2	7	3	1	2	0	1	3	0
5	Foraminiferon shells	4	10	19	9	11	6	30	23	15

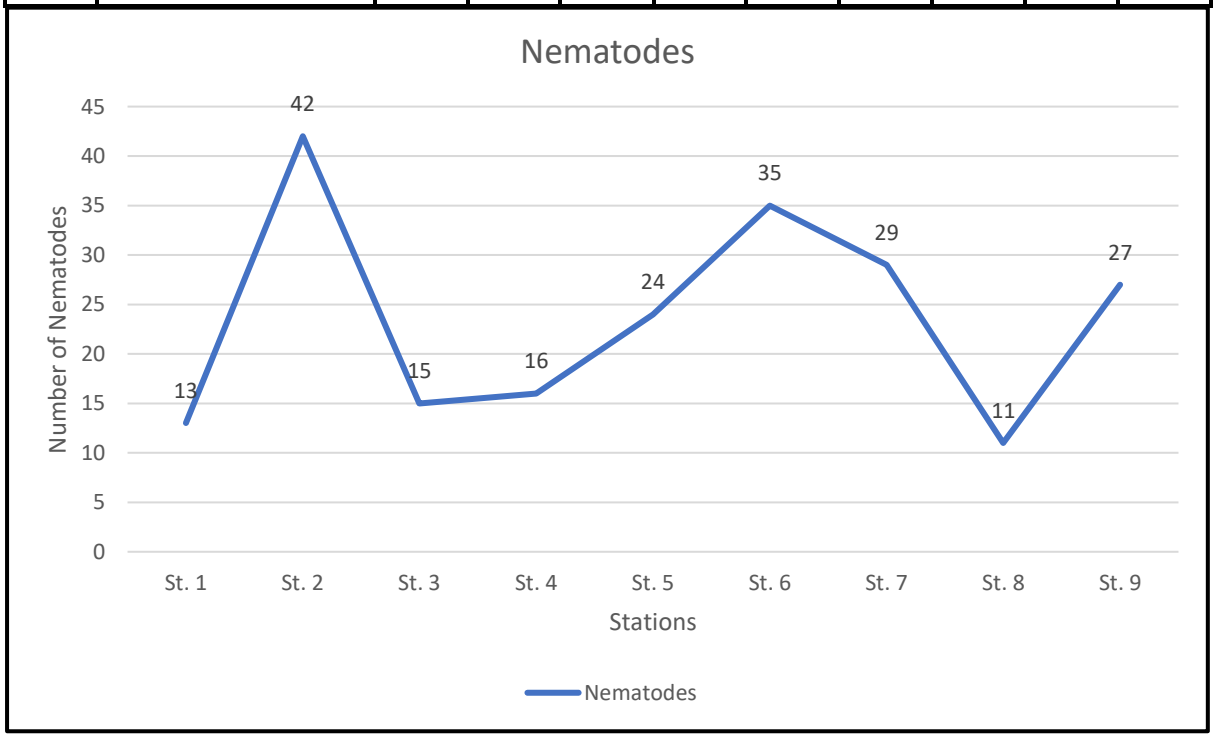


Figure 3 : Graphical representation of Total Population of Nematodes

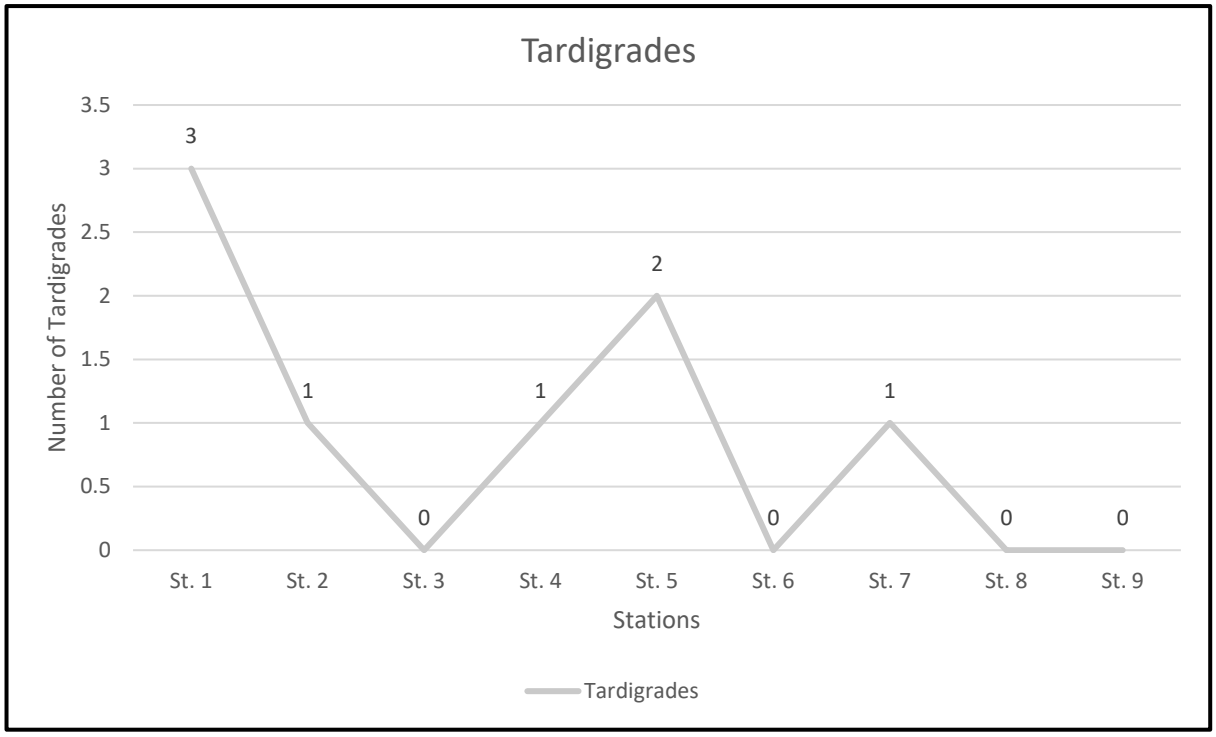


Figure 4 : Graphical representation of Total Population of Tardigrades

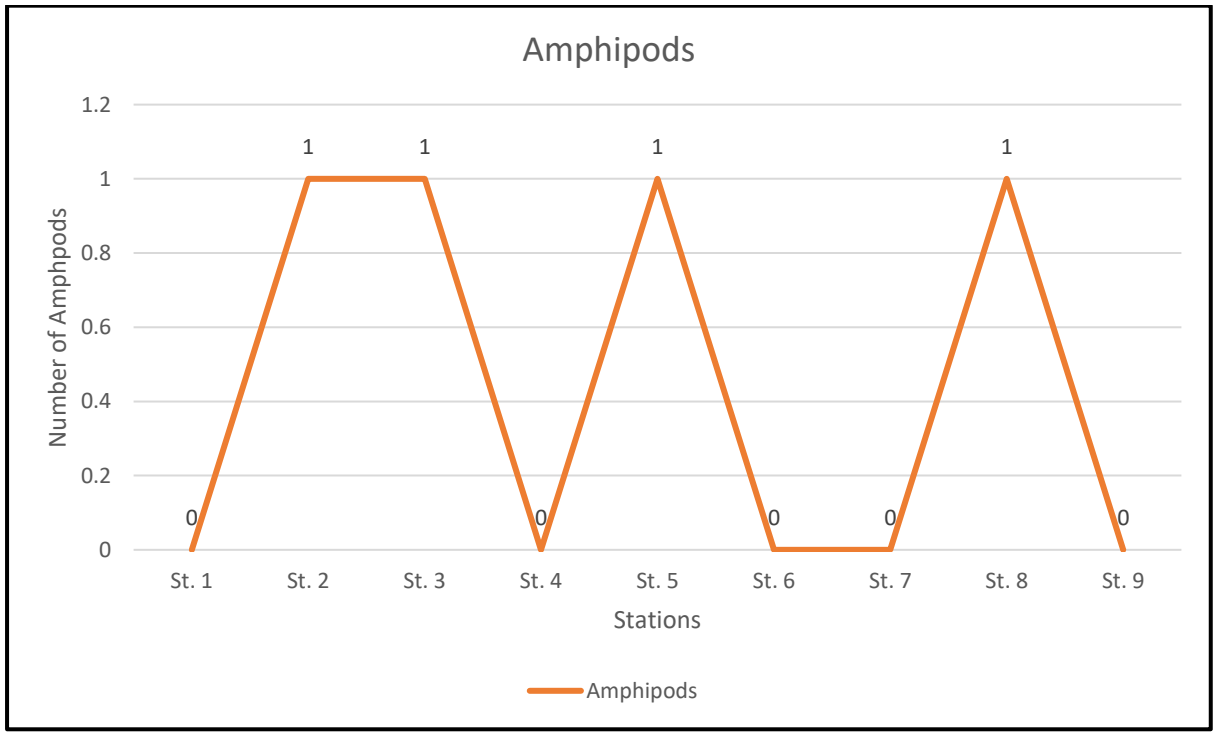


Figure 5 : Graphical representation of Total Population of Amphipods

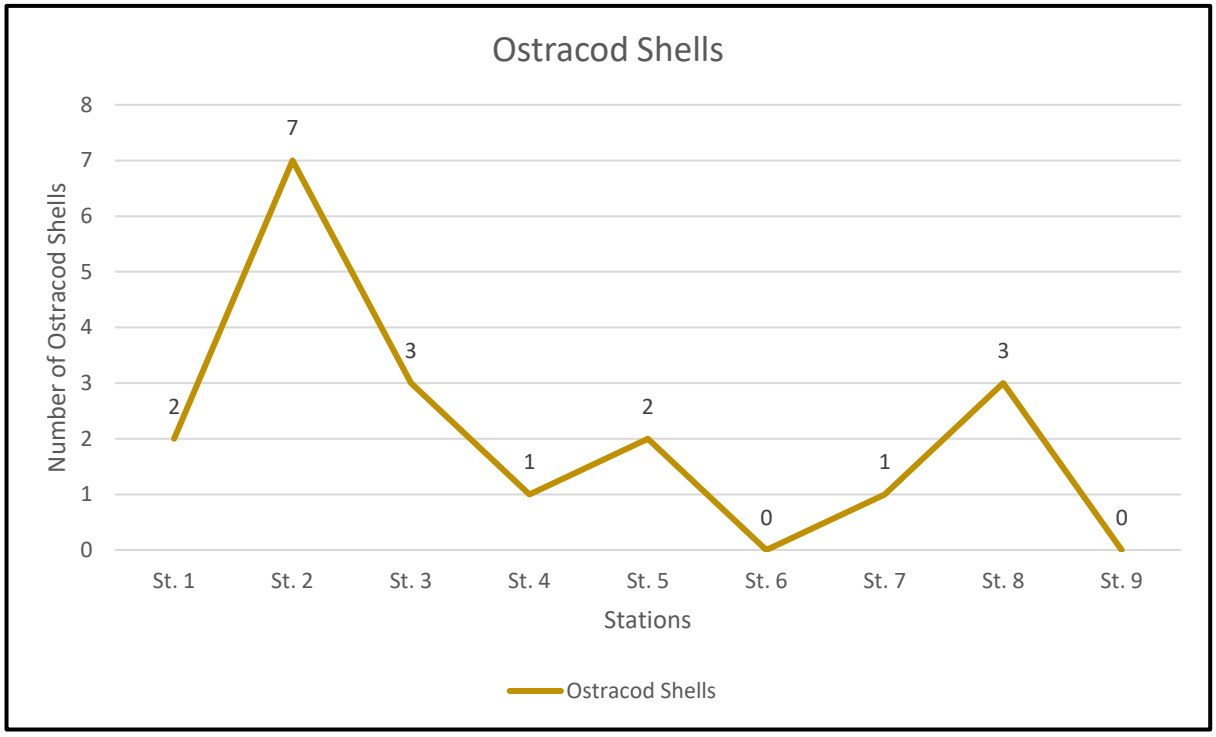


Figure 6 : Graphical representation of Total Population of Ostracod Shells

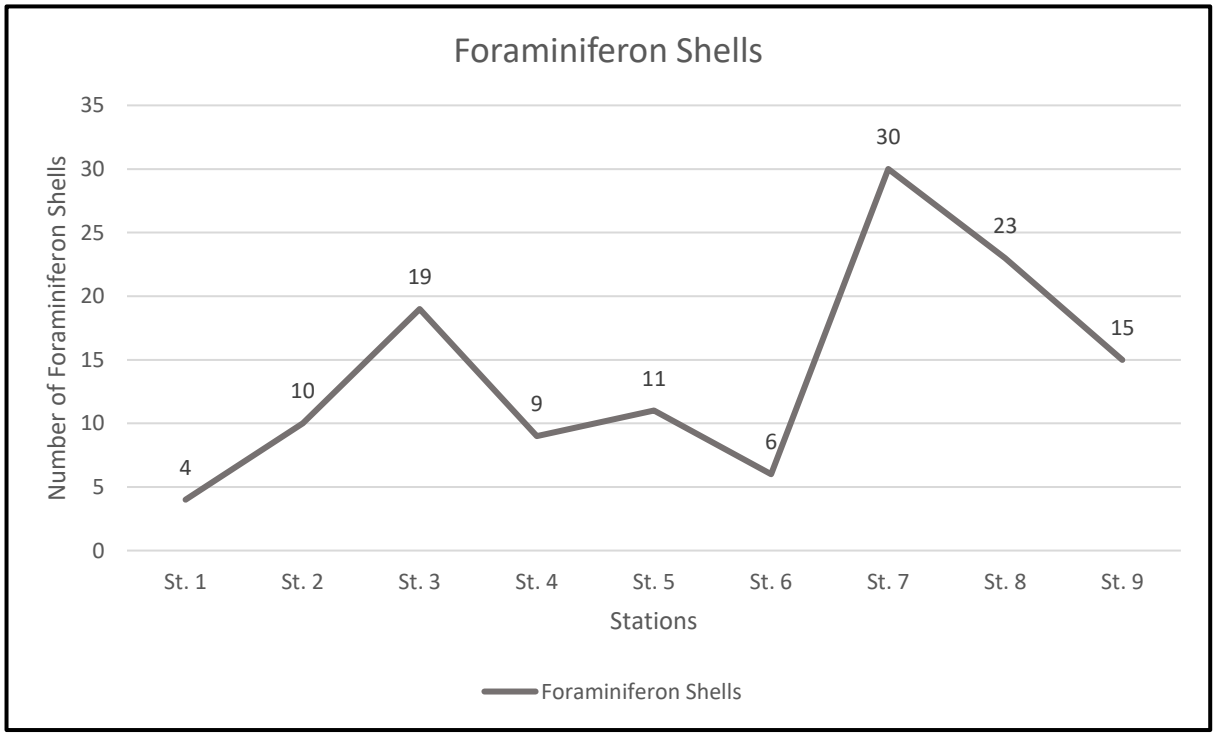
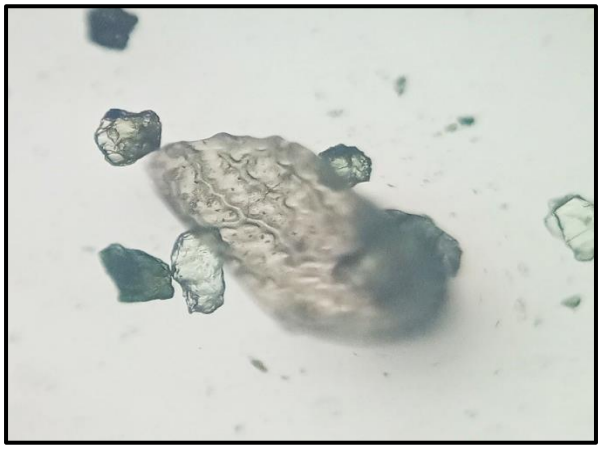


Figure 7 : Graphical representation of Total Population of Foraminiferon Shells

Figure 8 : Nematode

Figure 9 : Tardigrade



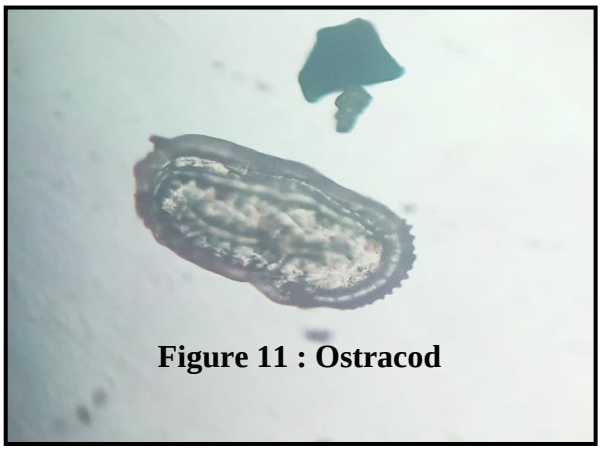


Figure 11 : Ostracod

Figure 12 : Foraminiferon Shell

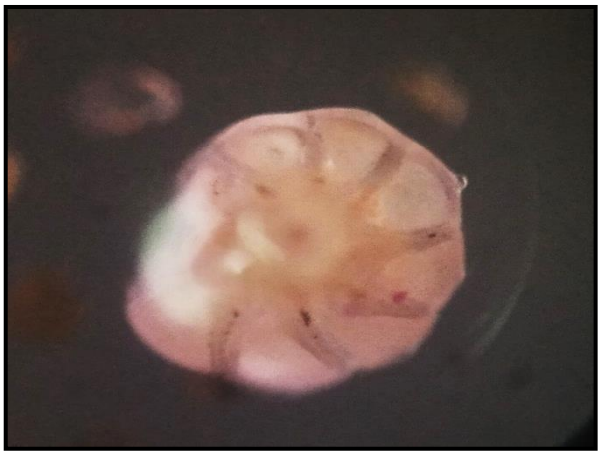


Figure 13 : Foraminiferon Shell

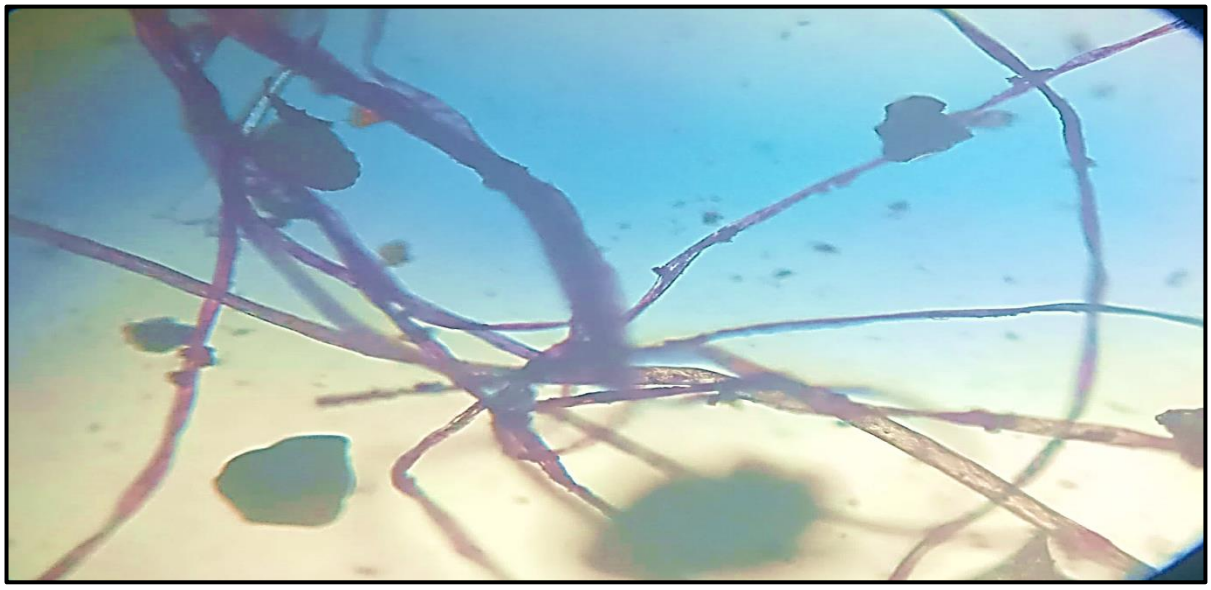


Figure 14 : Mixed group of Nematodes

CONCLUSION:

- The result of this study indicates that such beach is less polluted and shows healthy biodiversity of meiofauna. Meiofauna are pollution indicators(Nematodes and Tardigrades).
- Anthropogenic activities are observed in this region which destroy the habitat of life forms that are present in that particular region.
- Recyclable wastes such as plastics and glass are observed.

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