

A review on research studies of marine and brackish water meiofauna from Odisha, India

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Abstract In any marine system, meiofauna plays a key role in the functioning of the food web and sustain important ecological processes. Benthic research has long been carried out both in spatial and temporal scale on the distribution, species diversity, community structure and abundance. Very few works have been reported on meiofauna along Odisha coast during last few decades. The present work is aimed to review how much work has actually made along Odisha Coast, East Coast of India during last few decades.

Aktualny stan wiedzy na temat mejofauny wybrzeża Odisha (Indie)

Słowa kluczowe mejofauna, słonawa woda morska, przegląd, Odisha, Indie

Streszczenie W każdym systemie morskim mejofauna odgrywa kluczową rolę w funkcjonowaniu sieci pokarmowej, odpowiadając za wiele ważnych procesów ekologicznych. Mimo prowadzenia od dawna szeroko zakrojonych badań bentosu w zakresie zmian rozmieszczenia, różnorodności gatunkowej, struktury społeczności i liczebności, niewiele wiadomo na temat mejofauny wschodniego wybrzeża Indii. W artykule przedstawiono stan wiedzy na temat mejofauny wybrzeża Odisha z ostatnich kilku dekad.

Introduction

Term meiofauna derived from the Greek word ‘meio’ means the smaller and was introduced and defined by Mare (1942) and suggested 2 mm for the topmost size limit for meiofauna but Solwedel (2000) commented that ‘today 1mm is commonly accepted as the upper size limit for meiobenthic investigations.’ Wigley and McIntyre (1964) used 74 μm as lower size limit for the meiobenthos, while Thiel (1966) used 65 μm , while Dinet (1973), Thiel (1971) set the lower limit to 50 μm and 42 μm respectively. Solwedel (2000) commented that today a lower size limit of 32 μm

seems to be commonly accepted. Generally, organisms larger than 500 μm are called macrofauna; between 500 μm and 63 μm are called meiofauna and smaller than 63 μm are called microfauna.

Generally, benthic communities are much more diverse in terms of species richness than those of the surface and mid water layers (the so called pelagic realm). Approximately 98% of all marine species are supposed to belong to the benthos (Peres, 1982). “Permanent meiofauna” are species of meiofaunal size throughout their lives, while “temporary meiofauna” are of this size only when they are immature. Meiofauna are also known to be sensitive indicators of environmental disturbances and have great potential as pollution indicators, by giving attention to their species diversity, abundance and biomass. The reason which makes them potential indicators is that they live in very high numbers in small areas, have high diversity, have limited mobility which makes them consistently and intimately exposed to their immediate environment, and have short life cycles. Meiofauna also plays a key ecological role in linking detritus (and prokaryotic) resources with higher trophic levels: in fact most of the meiofaunal taxa eat microalgae, prokaryotes and detritus; and it is a well known fact that meiofauna are a good food source for macrofauna and fishes. Meiofauna and nematodes, based on laboratory and in-situ experiments, are in fact able to influence microbial activities and to graze their production (Pusceddu et al., 2014). Meiofauna are ubiquitous in marine soft-sediment communities, form an important link in transferring carbon primary and secondary production to higher trophic levels (Baguley et al., 2008). Although their biomass is generally low, their high abundance and high metabolic and reproductive rates render them potentially important in benthic fluxes of carbon and nutrients (Kuipers et al., 1981; Coull 1999; Moens et al., 2005).

In terms of total marine biomass meiobenthos constitute $\approx 80\%$ and is of great importance in the marine ecology and marine mineralogy (McIntyre, 1969), making meiobenthic investigation a very active research field (Kitazato et al., 2003; Gwyther, 2004). Meiofauna has been regarded as an important component in benthic ecosystems due to their small size, high abundance and fast turnover rates (Heip et al., 1985; Coull, 1999). This component of the benthos exhibits high abundance, diversity and productivity in most sedimentary habitats and plays an important role in marine benthic food chains (Gee, 1989).

Eventhough much work was done on the distribution, species diversity, community structure, abundance of meiobenthos and effect of pollution on meiobenthos with respect to environmental parameters worldwide, also in and around Indian waters. But only a limited works have been reported on benthos especially on meiobenthos from Odisha coast. Recently Sharma (2016) attempted a review on macrobenthos studies of Odhisa coast. In the present study we are undertaking a detailed review of meiobenthic research conducted in brackishwater and coastal Odhisha, East Coast of India during the last few decades (1969–2015).

Brief description of Orissa coast

Odisha (formerly Orissa) is one of the 29 states of India, located in eastern India. It is surrounded by the states of West Bengal to the north-east, Jharkhand to the north, Chhattisgarh to the west and north-west, and Andhra Pradesh to the south. Odisha has 485 kilometers (301 miles) of coastline along the Bay of Bengal from Balasore to Ganjam.

The Orissa coast has bulged out in the middle portion from Brahmagiri at Chilika lake in the southwest (SW) to Chandrabali in the north north-east (NNE) where rivers the Mahanadi, Brahmani and Baitarani form a delta. In this portion, the coast is convex while from Chandbali to the Subarnarekha river mouth it is concave. If a straight line is drawn from Chandipur off

Balashore coast to Gopalpur, the recent delta formation in the Post-tertiary period in the middle portion becomes quite obvious by the protruding nature of the coast.

The bay-sandbars in the mouth of the Chilka lake, Devi river mouth and on the left bank of the Mahanadi mouth; and at other rivers Kushabhadra near Konark and Rushikulya are the best examples. In the Mahanadi mouth, the complex-spit with a number of hooks is formed due to the offshore long current and the strong longshore drift during the rainy season when the load discharge in the Mahanadi is the maximum. The high tidal prism keeps the mouths of the Devi, the Mahanadi, the Brahmani, the Baitarani and the Rushikulya open to form estuaries. In the north, along Balasore, the coast is crescent shaped embayment with inter tidal flat development and the mesotidal regime is quite conspicuous .

The salinity variation along the Orissa coast is quite large (18–35 PSU). The thermal regime of coastal plain of Orissa is mostly mega thermal type and the climate is either moist, sub humid or dry sub humid type. The rainfall in the coastal districts is mostly contributed by the monsoon depression during the southwest monsoon season (June–September), and cyclonic storms during post-monsoon (October–November) and pre – monsoon (March–May) period. The rainfall pattern along coastal stretch is maximum in the north and gradually decreases towards south.

Some remarks on coastal habitats and beaches and ecologically importance systems are as follows:

Gopalpur: Gopalpur is located at Ganjam district in the southern part of Odisha, India, around 160 km south of Paradip and 260 km north of Visakhapatnam. It is a natural, deep sea port on the east coast of India. Gopalpur lies on a 4 km stretch of barren coast line, with no mangrove or tropical forests. The coast line falls in the rain-shadow of the region.

Talsari: Talsari is located at the border of Orissa and West Bengal where River Subarnarekha meets the Bay of Bengal. There is a large mud flat, which remains submerged during high tides. The village is criss-crossed by the canals connected to the tributaries of the river Subarnarekha at its confluence with the Bay of Bengal. A natural Mangrove cover consisting of *Sonneratia apatala*, *Exocaria agalocha* and *Acanthus* sp., is coming up on the south west side.

Bhitarkanika: The Bhitarkanika Mangroves are a mangrove wetland in Kendrapara district of Odisha cover an area of 650 km². It is the 2nd largest mangrove ecosystem of India which consists mangrove forests, rivers, creeks, estuaries, backwater, accreted land and mud flats. The Bhitarkanika Mangrove ecosystem flourishes in the deltaic region, formed by rich alluvial deposits of Barahmani and Baitarani river. It receives inputes of untreated domestic and industrial wastes (including organic matter, oil and heavy metals). The Bhitarkanika Mangroves are home to 55 of India's 58 known mangrove species.

Balaramgari: Balaramgari is a flat exposed sandy strip along the north east coast of India at Chandipur of Balasore district, Odisha. It consists estuarine flow from Burhabalganga river, and sand bar formation at the mouth of estuary. The sediment is composed of medium to fine sand, silt and clay.

Puri and Konark: Puri and Konark beaches are sandy beach, flat, exposed beach. Due to Tourist, beaches are mostly affected by anthropogenic activities. Hotels and restaurants dotting along the Puri beach also are responsible for polluting the area by letting their effluents into the sea.

Chilka lagoon (Lake): is a brackish water lagoon, spread over the Puri, Khurda and Ganjam districts of Odisha state on the east coast of India, at the mouth of the Daya River, flowing into the Bay of Bengal, covering an area of over 1,100 km². It is the largest coastal lagoon in India. Chilika Lake is a shallow bar-built estuary with large areas of mudflats. The western and southern margins of the lake are fringed by the Eastern Ghats hill range. Several inland rivers, which bring silt into

the lake, control the northern end of the lake. A 60 km long barrier beach called Rejhansa, formed by northerly currents in the Bay of Bengal, resulted in the formation of this shallow lake and forms its eastern side. As an ephemeral lake, its water surface area varies from 1,165 km² (449.8 sq mi) in the summer monsoon season to 906 km² (349.8 sq mi) in the winter dry season.

Results

We presented here some brief idea about the major research publications which dealt with the meiofauna of Orissa coast.

In one of the early publication Rao (1969) reported more than 100 interstitial species of diverse invertebrate groups collected in December 1966, during a preliminary faunistic survey of Odisha (Orissa) coast at Puri and Konarak. He commented that intertidal and vertical distribution of fauna showed that majority of species inhabits medium sands with moderate water saturation below surface near mid- tide level. In general, most of the foraminifera member occurred near the low water level; Archiannelida, Polychaeta, Ostracoda occurred between low- and mid-water levels at sediment depths of 10–30 cm below surface. The distribution of some gastrotrichs, kinoehynchs showed preference to deeper layer of sands 30–50 cm below surface towards the mid-tide level, associated with low oxygen content. Species of nematods, oligochaets, copepods, isopods, Acarina occurred sporadically at all levels and depths of the intertidal sand, indicating their adaptation to diverse environmental factors.

Nagabhusanam and Rao (1969) made preliminary observations on- a collection of shore fauna of Orissa coast. They reported more than 160 species of meiofauna. Nagabhusanam (1972) reported interstitial meiofauna (mentioned in the paper as microfauna) along the Puri and Konarak coast. He has reported different species of meiofauna belong to Foraminifera, Coelenterata, Turbellaria, Nematoda, Gastrotricha, Kinorhyncha, Nemartina, Rotifera, Annelida, Ostracoda, Tardigrada and Mollusca. He further reported that fine grades of sand yielded very poor interstitial fauna, possibly due to paucity of interstitial space and blocking of the interstices due to organic matters.

Pattanaik (1971) reported the seasonal abundance and bottom fauna of Chilka lagoon. He studied month-wise abundance during April, 1963 to March, 1964. Highest population density was during October to December and lowest during July to September (monsoon). The meiobenthos (author reported as microbenthos) was dominated by Foraminifera and nematodes.

Sarma and Satapathy (1978) reported phytal fauna in and around Balugaon in Chilka lake. They studied five algal species viz, *Cladophora glomerata*, *Enteromorpha compressa*, *Chaetomorpha linum*, *Polysiphonia serialarioides* and *Potamogeton pectinatus*. They did not separate macro- and meiofauna was and thus provided group-wise density for all epifauna. They suggested that the algae and sediment accumulated on the thalli and of the environment affected the qualitative and quantitative association and distribution of the phytal fauna. *Potamogeton* followed by *Cladophora*, *Enteromorpha*, *Chaetomorpha*, *Polysiphonia* supported faunal abundance.

Subsequently, Pattnaik and Mohanti (1980) reported preliminary observations on foraminifera from the Mahanadi estuary and Ganti and Mohanti (1989) reported the recent foraminifera from the Hukitola Bay. In their subsequent study Ganti and Mohanti (1992) have reported 25 species of foraminifera from the inner shelf of Orissa.

While reporting four new species of Gastrotricha from Odisha coast Rao (1981a) reported a new species of macrodasyid Gastrotricha *Crasiell indica* from the intertidal zone of Gopalpur beach; three species of Gastrotricha viz. *Tubanella indica* from intertidal sand of Gopalpur beach

Tetranychrodormia littoralis and *Cephalodasya caudatus* from intertidal zone of Puri beach (Rao, 1981b) were reported. Sarma et al. (1981) documented phytal macro- and meiofauna of *Gracilaria lichenoides* from Kalijai off Chilka lagoon, *Potamogeton pectinatus* and *Halophylla ovata* Parikud, Chilka lake (lagoons) In *Potamogeton pectinatus* meiofauna comprised 17 animal groups and dominated by nematodes. In *Halophylla ovalis* 16 animal taxa were observed and copepods were dominant group. They observed that the fauna of more silted *Potamogeton* was dominated by nematodes followed by tanaidaceans and copepods; relatively less sedimented thalli of *Halophylla* inhabited by crustaceans (copepods, crustacean naupli and ostracods) and nematodes; least silted thalli of *Gracilaria* occupied by copepods and ostracods. Rao (1989) investigated meiofauna of eight localities on the coast near Chandipur, Bhadrakh, Paradwip, Konarak, Puri, Rambha Bay (Chilka Lake), Bahuda Estuary and Gopalpur. The material reported here comprises in all 130 species of the diverse groups of meiofauna: Hydrozoa (2 species), Turbellaria (4 species), Nematoda (27 species), Gastrotricha (22 species), Kinorhyncha (2 species), Archiannelida (12 species), Polychaeta (18 species), Ostracoda (1 species), Copepoda (35 species). Of the total 130 species dealt in the community 16 (12.4%) are cosmopolites, 45 (34.6%) eurytopics occurring on warm temperate and tropical beaches, 64 (49.2%) Indian Ocean forms and 5 (3.8%) endemics.

Pattanaik and Rao (1990) studied the composition and distribution of interstitial meiofauna of the sandy beach at Gopalpur, south Odhisa coast. In this paper a total of 15 meiofaunal group were recorded. Harpacticoid copepods are the most dominant group, forming nearly 70% of the total interstitial population followed by nematodes (14.68%). Other common groups are Turbellaria, Archeannelida, Polychaeta and Isopoda. They reported meiofauna population densities at low, mid and high tide level.

A new species of halacarid mite *Copidognathus sambhui* was described from Chilka lagoon (Chatterjee, 1991). Chatterjee and Sarma (1993) also reported new record of another halacarid mite *Copidognathus sideus* from Chilka lagoon. Rao and Sarma (1994) presented the seasonal abundance and breeding cycles of 15 species of meiobenthic harpacticoid copepods inclusive of ovigerous females inhabiting the littoral sediments of Parikud islands in Chilka lagoon.

Sarma and Wilsanand (1994) reported the littoral meiofauna of Bitrakanika mangroves sediments of Mahanadi river system, in the Orissa state, east coast of India. It included 11 major faunal taxa, of which nematodes were the dominant group. Chatterji et al. (1995a) reported seasonality in meiofaunal distribution from Balramgarhi coast. The meiofauna was comprised of eight faunal groups viz. Nematoda, Harpacticoida, Tubellaria, Ostracoda, Lamellibranchiata, Amphipoda, Isopoda and Cladocera encountered in different seasons. Maximum density of meiofauna was recorded during the southwest monsoon season. The major part of the faunal group consisted of Cladocera (47.70%), followed by nematodes (15.71%) and harpacticoids (14.12%). They have reported Cladocera *Diaphanosoma excism* in Balaramguri beach in relatively higher densities particularly during the southwest monsoon season. This is a typical freshwater form recorded in several states in India (Chatterjee et al., 2013). Chatterji et al. (1995a,b) also reported that densities of Cladocera was maximum at low tide level and minimum at high tide level during fair and southwest monsoon season. They further commented that occurrence of these cladocerans in estuarine beach could be due to land runoff because the discharge of the river Burhabalanga also reported to be high during southwest monsoon season. Rao and Satapathy (1996) worked on demecology of Kinorhyncha of Chilka lagoon (Bay of Bengal). They reported for the first time *Echinoderes* sp and *Pycnophyes* sp in the Chilka lagoon. Both species were found in sediments as well as phytal (*Halophylla ovata*) biotopes. *Pycnophyes* sp constituted 80–90% of the total kinorhynch population. In this paper tri-monthly values of environmental parameters, sediment as

well as numbers and biomass of phytal Kinorhyncha was provided. It was reported that the density distribution of Kinorhyncha in different sampling sites through seasons reveals the maximum abundance of the organisms corroborates with the salinity distribution than with any other co-chemical parameters. It was observed that the abundance or distribution of kinorhynchs related with salinity, sediment nature and vegetation cover of the bottom. Fine grained sediments with a detrital surface layer were more favourable for the development of phytal fauna.

While working on the meiofauna of outer channel of Chilka lagoon Sarma and Wilsanand (1996) reported the presence of 12 major taxa, of which nematodes and copepods were the dominant. The average total meiofaunal densities were significantly correlated with the sediment temperature, pH and salinity. No significant correlation was found between total meiofaunal densities, mean grain size and the organic matter. Kameswar Rao et al. (2000) reported foraminifera from the Chilka lagoon. A total of 69 foraminiferal species belonging to 27 genera and 19 families have been identified from the sediment samples. *Miliammina fusca*, *Ammobaculites exiguus*, *Ammonia beccarii* and *A. tepida* were the most abundant species.

Jayalakshmy and Kameswar Rao (2001) reported 69 foraminiferal species from the sediment samples collected from the Chilka Lake. These species have been quantitatively studied in regard to their relative abundance and distribution. Frequency distribution study of Foraminifera shows that *Miliammina fusca*, *Ammobaculites exiguus*, *Trochammina hadai*, *Jadammina macrescens*, *Gaudryina exilis*, *Ammonia beccarii* (Linne), *A. tepida* and *Asterorotalia dentata* are the dominant species of the fauna. The sites dominated by *M. fusca* and *A. exiguus* are mostly inside the lagoon, while those dominated by *A. beccarii* (Linne) besides *T. hadai*, *G. exilis*, *Hanzawaia asterizans*, *H. nitidula*, *A. tepida*, *A. dentata*, *Elphidium crispum* and *E. galvestonense* are in the outer channel of the lake.

Jayalakshmy and Kameswar Rao (2003) reported Multivariate statistical study with a factor analysis of Foraminiferal fauna from the surface sediments of the Chilka Lake along the east coast of India has been studied as regards distribution of its assemblages. Among the species recorded, 16 species during post-monsoon season (November) and 34 species during pre-monsoon season (May) form the differential factor groups providing maximum information for the distribution of the fauna. It is obvious from the factor score distributions of stations against latitude (N) and species with respect to average absolute abundance that the species observed are from a continuously varying population least affected by insidious environmental changes in the study area.

Jayalakshmy and Kameswar Rao (2006) reported some aspects of foraminifera from Chilka lagoon. They concluded that $\approx 30\%$ of the species always clustered together during early pre- and late-monsoon, indicating the possibility of species succession during November. Moreover the species replacement takes place over a seasonal cycle. This finding could be an indication of the seasonality of foraminiferal community through species succession.

Paikaray et al. (2012) has undertaken a study to understand the species composition, population density and relative abundance of meiobenthos occurring in the intertidal beach sediment of South Orissa Coast, especially in mouth area of the Rushikulya estuary and on the beach sand of Gopalpur. During the study, salinity values in the Rushikulya estuary ranged from 21.8 to 26.8 PSU, whereas at Gopalpur it ranged from 27.3 to 30.8 PSU. From the granulometry analysis it was found that sediment particles remained predominantly sandy. Nematodes formed the dominant group in all the stations followed by crustaceans and polychetes. Among the crustaceans, Harpacticoid copepods were more abundant than the others. The population size of meiobenthos during the study period exhibited moderate variation between different stations as well as

different months. Annapurna et al. (2012) reported free living nematode *Sphaerolaimus balticus* Schneider from Paradweep.

Jaikumar and Annapurna (2012) made a comprehensive study of the species composition, abundance and biomass of the meiobenthic fauna in general, and the free-living marine nematode community structure of the Chilka lagoon in particular. The samples were obtained from 36 stations spread over four pre-determined sectors inside the Chilka lake namely, southern sector, central sector, northern sector and outer channel along the east coast of India. Observations on meiobenthos presented in the thesis are based on 154 samples collected inside the Chilka Lake during monsoon.1 (Oct'04), pre monsoon (Jan'05), post monsoon (May'05) and monsoon.2 (Oct'05). During this investigation a total of six diverse meiofaunal taxa represented by nematodes (58.76%), foraminiferans (11.79%), copepods (9.22%), amphipods (7.56%), kinorhynchs (6.69%) ostracods (4.63%) and others (1.35%) were encountered. Nematodes represented 58.76% of the total meiofauna with greater diversity when compared to the remaining groups. In the present study, in nematodes, altogether there were 84 species represented by 61 genera in 25 families were reported from different seasons. The dominant nematode species encountered during this study include *Metalinhomoeus longiseta*, *Metalinhomoeus filiformis*, *Metalinhomoeus* sp., *Sabatieria punctata*, *Sabatieria* sp., *Terschellingia gorbaultae*, *Sphaerolaimus balticus*, *Sphaerolaimus papillatus*, *Daptonema procerum*, *Microlaimus* sp., *Phanoderma* sp., *Paralinhomoeus* sp., and *Viscosia* sp. The foraminiferans represented by *Miliammina* sp., *Ammobaculites* sp., *Trochammina* sp., *Ammonia* sp. The harpacticoid copepods represented by *Stenhelia* sp., *Ectinosoma* sp., *Harpacticus* sp., *Enhydrosoma* sp., kinorhynchs represented by 2 genera namely *Echinoderes bengalensis*, *Pycnophyes* sp. The ostracods were represented by *Phlyctenophora* sp., *Tanella* sp., and *Cypridopsis* sp. Since nematodes constituted one of most important faunal group in view of their numerical abundance and species richness, they were examined and studied in detail in the study area and correlated with the environmental parameters. One of the objectives of this study was to locate the presence of specific nematode species assemblages for the Chilka lagoon, east coast of India. Three communities could be distinguished in the lagoon, named after the most important (determining) species: *Sabatieria* sp. (Group 1), *Metalinhomoeus longiseta* (Group 2) and *Metalinhomoeus* sp (Group 3) representing southern sector and outer channel; central sector and northern sector categories respectively. This is perhaps surprising since lagoon assemblages must be viable over a greater range of environmental conditions than those found subtidally in brackish water habitats, and suggests that despite their isolated nature, dispersal opportunities remain sufficient to maintain the input of estuarine/marine species. Bhattacherjee et al. (2013) reported benthic foraminiferal assemblages along coastal Orissa. Thirty-nine species (belonging to 6 order and 23 families) of Foraminifera were collected from three coastal areas viz. Rushikulya, Devi and Gahirmata.

Datta et al. (2014) made a new record of a nematode species *Oncholaimellus brevicauda* from sediments of Talsari. Baliarsingh et al. (2015) reported a first record of *Desmoscolex falcatus* (nematode: Adenophorea: Desmoscolecida: Desmoscolecidae) from Rushikulya estuary, Odisha, India.

Recently, Ansari et al. (2015) reported the nematode assemblage from the Chilka lagoon and provided a checklist of 64 free-living marine nematode species belonging to 32 genera and 13 families. Among these, *Oncholaimus oxyuris* has been reported as new distributional record from the Indian waters. The distribution of encountered nematode species was investigated in relation with environmental variables such as salinity and sediment texture throughout the lagoon. Accordingly the nature of sediments varied from sandy to silt/clay. Most of the nematode species were found in high salinity zone.

Discussion

It is interesting to note that meiofaunal of the Orissa coast although have been studied since 1970's very few studies deal with the overall biodiversity of meiofauna. In the early investigations G.C Rao and co-worker's have contributed significantly to the meiofaunal ecology, taxonomy and biogeography. Sediment samples collected in late 1966 ZSI more than 480 interstitial species of diverse invertebrate fauna (1969). The early investigations of ZSI indicated the presence of very rich benthic meiofauna (microfauna). The intertidal and vertical distribution of fauna showed that majority of species inhabit in medium sands with moderate water saturation below the surface near mid-tide level. The distribution of some gastrotrichs, kinorhynchans showed preference in sediment deeper layer down to 30–50 cm below surface. Species of nematodes, oligochaetes, copepods, isopods, acarids occurred sporadically along the beach gradient indicating their adaptation to diverse environmental factors.

Nagabhusanam and Rao (1969) made preliminary observations on a collection of shore fauna of Orissa coast. They reported more than 160 species of meiofauna. In early 1980's Sarma and Satpathy (1978) studied the phytal fauna of the Chilika lagoon and Sarma and Rao (1980) investigated the meiofauna of the Chilika lagoon. The fauna was comprised of 17 major taxa and was dominated by Foraminifera (>71%). This was followed by nematodes (19%) and copepods. Chattarji et al. (1990) studied the meiofauna of northern Orissa. While our knowledge has been certainly improved with the recent findings of Ingole, Ansari et al. and Annapurna et al. This is particularly true for the meiofauna of the southern Orissa, especially on the nematode species distribution from the Chilika lagoon. However, we do not know much about the seasonality and species distribution with respect to rest of the Orissa Coast.

Based on this review we recommend that following studies may be initiated at the early stage which will help in understanding the seasonal species abundance, distribution and overall role of meiofauna benthic food web: 1) Meiofaunal community structure in different coastal marine habitats. 2) Meiofaunal community structure in different coastal marine habitats. 3) Response of meiofauna to physical disturbance (dredging, sewage dumping, oil spill, harbour development, dumping of various pollutants. 4) Microfauna-Meiofauna-macrofaunal interactions. 5) Role of meiofauna in feeding preference of demersal feeding fish species. 6) Meiofauna of the ecologically sensitive/specialized habitats such as – Turtle nesting grounds; Breeding beaches of Horseshoe Crab; Seagrass beds; Subtidal corals habitats; Phytal rocky habitats (though in very less area rocky algae found); Mangrove mudflats.

Conclusions

Scattered attempts have been made to understand the quantitative nature and community structure of benthos from different regions of the country. A number of benthic studies in Indian seas were published; most of them pertaining to studies on major estuaries or backwaters and shallow coastal regions. In most studies, much attention was given to macrobenthos part and very often the role played by meiobenthos is neglected. This may have been partly due to their smaller size and lack of taxonomic expertise. This lacuna in the information regarding meiobenthos led to embark upon the present study. The review of meiofaunal study with reference to Odisha coast suggested that even though in the different marine environments such as beaches, tidal flats, nearshores, continental shelf, deep sea, salt marshes, mangroves and other related environments, distribution and diversity have been documented; there is certainly a need for more research

efforts. Most of the available published studies have dealt with group taxon/level and were not undergone to species level identification. In India, meiofaunal study mainly concentrated on Nematoda and Harpacticoida (Copepoda), foraminifera and to certain extent to Polychaeta. Further, the biomass study, interrelationship with trophic level, pollution monitoring systems, culture aspects with reference to aquaculture and mariculture related activities, drugs from the sea, etc. in relation to meiofauna are also other research areas where the marine biologist should concentrate and work for the developmental activities for the humankind.

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