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**DIVERSITY OF MEIOFAUNA ASSOCIATED WITH NINE DIFFERENT SPECIES
OF ALGAE AT VISAKHAPATNAM COAST**

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ABSTRACT

Data presented in this paper based on 89 samples collected from three rocky intertidal localities at Visakhapatnam coast to study the abundance, diversity and distribution of meiofaunal groups associated with algae. Quantitative ecological studies of phytal meiobenthos from this region are currently lacking. Our aim in this study is to investigate the relationship between the nature of the algal habitat and distribution of meiobenthos. In particular, the study focuses on testing whether there are significant differences in the abundance, diversity and species composition of phytal meiobenthos on 9 different kinds of algae.

Keywords: Meiofauna, Diversity, Algae, Visakhapatnam coast

INTRODUCTION

Reports of sediment-dwelling marine meiofauna are common in the scientific literature, but relatively little has been published on phytal meiofauna. This is true particularly for quantitative community studies, especially in Indian coast, where such published work is wanting. Phytal assemblages elsewhere are known to harbor an abundant and diverse meiofauna and usually are dominated by harpacticoid

copepods, animals that typically are important food items for many juvenile fishes [1, 2, 3, and 4].

The purpose of this preliminary report is to provide the first quantitative estimates of meiofauna density from Visakhapatnam intertidal phytal assemblage. Hopefully, this baseline will serve to encourage further investigations of this neglected fauna.

In recent years, the importance of phytal meiofauna in the littoral ecosystem has been increasingly realised because of the ease with which the predators can find them, their nutritive value and high turn over rates [5, 6]. Although there are several investigations on the systematics and ecology of invertebrates dwelling on marine algae, very little information is available with special reference to meiofauna. [7] have reported the relative numerical abundance of phytal macro and meiofauna from Chilka Lake and [4] has reported the relative numerical abundance of phytal macro and meiofauna from Gangavaram coast.

MATERIALS AND METHODS

The present study is aimed to comprehend the distribution, composition and abundance of phytal associated meiofauna in the intertidal zone of Visakhapatnam Coast at three different locations [1. Lawson's Bay: Latitude -17°43'972" N, Longitude - 83°20'641" E, 2. Palm Beach: Latitude - 17°43'811" N, Longitude - 83°20'190" E and 3. Coastal Battery: Latitude - 17°42'185" N, Longitude - 83°18'538" E]. During the investigation, sampling frequency was scheduled on monthly basis from August, 2009 to July, 2010. Nine physiognomical types of algae were selected to study the faunal association in

the intertidal zone, out of which 6 species (*Chaetomorpha antennina*, *Ulva fasciata*, *Ulva lactuca*, *Spongomorpha indica*, *Caulerpa taxifolia*, and *Caulerpa fastigiata*) belong to Chlorophyceae; and 3 species (*Amphiroa fragillisma*, *Gracilaria corticata* and *Bryocladia thwaitessi*) to Rhodophyceae. These algae generally occur in distinct belts in the tidal zone and in collecting the algae care was taken to see that the sampling was done from locations where one or the other type was exclusively present.

Eighty nine quantitative quadrat samples of nine different algae were studied with special emphasis on the relative abundance, density, composition and distribution of phytal meiofauna. The collection of fauna associated with the alga was carried out following the procedure advocated by [8] and expressed in terms of average number of animals per 100 g of alga. The composition, distribution and structure of faunal associations of the algae were determined from quadrat sampling supplemented with field observations. The area covered by each of the quadrat samples was 100 cm². To minimize the effect of possible patchy distribution in the present study, two or three samples of each alga were collected, pooled and then analysed.

RESULTS AND DISCUSSION

During this investigation, 18 diverse taxa of meiobenthos (non sessile) represented by foraminifera (38.4%), nematoda (21.8%), copepoda (21.2%), polychaeta (8.7%), bivalvia (2.8%), halacaridae (2.6%), chironomidae (2.0%), ostracoda (0.9%), tanaidacea (0.5%), amphipoda (0.4%), gastropoda (0.4%), turbellaria (0.2%), isopoda (0.1%) and anthozoa (0.1%) were encountered (**Figure 1**). Amphineura, sipuncula, pycnogonida and cirripedia are sporadic in occurrence. The range, mean and number of months of occurrence of each group of fauna are provided in **Table 1** and **Figure 2**.

The mean values (number of animals/100g of alga) of the phytal meiofauna associated with the nine species of seaweeds of the Visakhapatnam Coast were presented in descending order.

Spongomorpha indica (1149471.4 no/100g)
 → *Caulerpa fastigiata* (796689.4 no/100g)
 → *Ulva fasciata* (607582.6 no/100g) →
Amphiroa fragillisma (503360.6 no/100g)
 → *Bryocladia thwaitessi* (423160 no/100g)
 → *Caulerpa taxifolia* (347657 no/100g) →
Ulva lactuca (317959.0 no/100g) →
Gracilaria corticata (305655.3 no/100g) →
Chaetomorpha antennina (32263.9 no/100g).

Among the nine seaweeds, the tufted shrub like *Spongomorpha indica* (1149471.4 no/100g) was observed to support the highest mean density of phytal fauna dominated by foraminifera (757523.8), nematoda (150967.9), copepoda (86297.3), bivalvia (68612.8), polychaeta (36543.1), amphipoda (29549.5) and others include chironomidae (4513.7), gastropoda (3544.6), amphineura (3431.8), turbellaria (2300.2), ostracoda (1820.3), tanaidacea (1560.8), anthozoa (1471.6), isopoda (626.4), sipuncula (419.8) and pycnogonida (287.9).

Caulerpa fastigiata ranks second highest in abundance supporting mean faunal density of 796689.4 no/100g represented by nematoda (338669.3), foraminifera (258501.2), copepoda (121643.5), polychaeta (30728.1), chironomidae (15288.2), bivalvia (11940.5) and others include halacaridae (6751.1), gastropoda (4835.2), ostracoda (2517.8), tanaidacea (2371.4), amphipoda (1155.9), turbellaria (1055.1), anthozoa (703.6) and amphineura (528.6).

The foliaceous plant, *Ulva fasciata* (607582.6 no/100g of algae) supported the third highest mean density of phytal fauna represented by copepoda (250864.7), foraminifera (212076.3), nematoda (49409.7), polychaeta (30986.5),

chironomidae (28247.2), halacaridae (10947.2) and others include ostracoda (7886.7), tanaidacea (6983.7), bivalvia (3413.7), gastropoda (2168.4), amphipoda (2101.6), isopoda (841.7), turbellaria (806.3), Cirripedia (553.7) and amphineura (294.9).

The next abundant mean faunal density was observed in the tufted, dichotomously branched algae *Amphiroa fragillisma* (503360.6 no/100g) represented by copepoda (140947.9), foraminifera (119608.3), polychaeta (95700.3), nematoda (87459.7), ostracoda (16444.8), chironomidae (13231.4) and others include tanaidacea (7359.0), amphipoda (6642.1), bivalvia (5560.1), halacaridae (5520.5), turbellaria (1970.1), gastropoda (1366.2), amphineura (712.3), isopoda (522.5) and sipuncula (315.4). Cirripedia, anthozoa and pycnogonida were not found in this alga.

The bushy algae, *Bryocladia thwaitessi* supported mean faunal density of 423160.0 no/100g algae, represented by copepoda (130566.2), foraminifera (89316.5), polychaeta (76764.3), nematoda (70209.4), halacaridae (29190.1), chironomidae (10513.1) and others include ostracoda (5734.5), bivalvia (4389.2), turbellaria (2002.7), amphipoda (1634.5), tanaidacea (1220.9), gastropoda (471.2), pycnogonida

(369.3), anthozoa (267.7), isopoda (265.8) and sipuncula (244.4).

The mean faunal density of fine crustaceous algae *Caulerpa taxifolia* (347657.9 no/100g) represented by nematoda (167252.7), copepoda (73679.8), polychaeta (60787.5), foraminifera (32781.5) and others include chironomidae (5923.7), amphipoda (2009.7), bivalvia (1698.9), halacaridae (1621.9), ostracoda (1045.6), gastropoda (489.7) and isopoda (366.7).

The foliaceous algae *Ulva lactuca* supported mean faunal density of 317959.0 no/100g represented by copepoda (106489.4), foraminifera (91,504), nematoda (48827.1), polychaeta (45182.7) and others include halacaridae (8732.3), chironomidae (8608.4), bivalvia (3052.1), ostracoda (1487.7), turbellaria (1383.5), gastropoda (1110.0) amphipoda (696.6), isopoda (345.6), anthozoa (272.0) and tanaidacea (267.7).

Next abundant mean faunal density was observed in bushy, dichotomously branched *Gracilaria corticata* (305655.3 no/100g) represented by foraminifera (152654.86), nematoda (56873.8), copepoda (33603.5), bivalvia (24944.0), halacaridae (17660.6) and others include polychaeta (8831.2), ostracoda (3205.8) amphipoda (1969.2), chironomidae (1647.9), gastropoda (1541.4), tanaidacea (843.0), amphineura

(564.9), anthozoa (474.7), isopoda (417.1), turbellaria (286.9) and pycnogonida (136.2).

The simple unbranched filamentous algae *Chaetomorpha antennina* was observed to support low (32263.9 no/100g) mean faunal density among the nine seaweeds represented by copepoda (7056.5), halacaridae (6332.4), foraminifera (6047.2), nematoda (5858.0), polychaeta (2617.3), chironomidae (1522.2), bivalvia (1175.3) and others include gastropoda (657.7), amphipoda (503.9), tanaidacea (197.7), ostracoda (185.0) and anthozoa (110.7).

In the present investigation, the phytal meiofauna existing in nine different algae of Visakhapatnam Coast were dominated by **foraminifera** contributing 38.4% of the total phytal fauna. The highest (757523.8 no/100g) annual mean population of foraminifera is observed in *Spongomorpha indica* followed by *Caulerpa fastigiata* (258501.2 no/100g alga); *Ulva fasciata* (212076.3 no/100g alga); *Gracilaria corticata* (152654.9 no/100g alga); *Amphiroa fragillisma* (119608.3 no/100g alga); *Ulva lactuca* (91504.3 no/100g alga); *Bryocladia thwaitessi* (89316.5 no/100g alga); *Caulerpa taxifolia* (32781.5no/100g alga) and *Chaetomorpha antennina* (6047.2 no/100g alga). **Figure 3a and 3b** shows the mean abundance of

different taxa of nine algae at Visakhapatnam Coast.

Nematoda ranked next to foraminifera constituting 21.8% of the total phytal meiofauna. Among the nine species of algae the highest abundance of nematoda was observed in *Caulerpa fastigiata* (338669.3 no/100g alga) followed by *Caulerpa taxifolia* (167252.7 no/100g alga); *Spongomorpha indica* (150967.9 no/100g alga); *Amphiroa fragillisma* (87459.7no/100g alga); *Bryocladia thwaitessi* (70209.4 no/100g alga); *Gracilaria corticata* (56873.8 no/100g alga); *Ulva fasciata* (49409.7 no/100g alga); *Ulva lactuca* (48827.1 no/100g alga) and *Chaetomorpha antennina* (5858.0 no/100g alga). *Dorylaimopsis punctata*, *Halichoanolaimus dolichurus*, *Viscosia cobbi*, *Paracanthochus caecus*, *Halalaimus longicaudatus*, *Metalinhomoeus longiseta*, *Sabatieria punctata*, *Desmolaimus zeelandicus*, *Daptonema setifer* and *Terschellingia communis* were commonly encountered.

Copepoda was the third dominant group constituting 21.2 % of the total population. The highest (250864.7 no/100g alga) annual mean number of copepoda was recorded on *Ulva fasciata* followed by *Amphiroa fragillisma* (140947.9 no/100g alga); *Bryocladia thwaitessi* (130566.2 no/100g

alga); *Caulerpa fastigiata* (121643.5 no/100g alga); *Ulva lactuca* (106489.4 no/100g alga); *Spongomorpha indica* (86297.3 no/100g alga); *Caulerpa taxifolia* (73679.8 no/100g alga); *Gracilaria corticata* (33603.5 no/100g alga) and *Chaetomorpha antennina* (7056.5 no/100g alga). *Porcellidium clavigerum*, *Parastenhelia littoralis*, *Scutellidium* sp., *Laophonte cornuta*, *Orthopsyllus linearis*, *Harpacticus gracilis*, *Parastenhelia littoralis*, *Amphiascopsis cinctus*, *Paradactylopodia tisboides* and *Ameira parvula* were encountered.

Polychaetes, contributed 8.7% of the total population with the highest (95700.3 no/100g alga) mean density observed in *Amphiroa fragillisma* followed by *Bryocladia thwaitessi* (76764.3 no/100g alga); *Caulerpa taxifolia* (60787.5 no/100g alga); *Ulva lactuca* (45182.7 no/100g alga); *Spongomorpha indica* (36543.1 no/100g alga); *Ulva fasciata* (30986.5 no/100g alga); *Caulerpa fastigiata* (30728.1 no/100g alga); *Gracilaria corticata* (8831.2 no/100g alga) and *Chaetomorpha antennina* (2617.3 no/100g alga). Polychaetes observed in seaweeds were predators, deposit and detritus feeders. *Nereids*, *sabellids* and serpulid juveniles were mostly observed during the study period.

Next abundant group was **bivalvia** constituting 2.8% of the total phytal meiofauna. The highest number of bivalvia was recorded in *Spongomorpha indica* (68612.8 no/100g alga) followed by *Gracilaria corticata* (24944.0 no/100g alga); *Caulerpa fastigiata* (11940.5 no/100g alga); *Amphiroa fragillisma* (5560.1 no/100g alga); *Bryocladia thwaitessi* (408.4 no/100g alga); *Ulva fasciata* (3413.7 no/100g alga); *Ulva lactuca* (3052.1 no/100g alga); *Caulerpa taxifolia* (62.6 no/100g alga) and *Chaetomorpha antennina* (1175.3 no/100g alga). Juveniles of bivalves were encountered during the study period.

Halacaridae contributed 2.6% of the total population with the high mean density observed in *Spongomorpha indica* (29549.5 no/100g alga) followed by *Bryocladia thwaitessi* (29190.1 no/100g alga); *Gracilaria corticata* (17660.6 no/100g alga); *Ulva fasciata* (10947.2 no/100g alga); *Ulva lactuca* (8732.3 no/100g alga); *Caulerpa fastigiata* (6751.1 no/100g alga); *Chaetomorpha antennina* (6332.4 no/100g alga); *Amphiroa fragillisma* (5520.5 no/100g alga) and *Caulerpa taxifolia* (1621.9 no/100g alga). *Copidognathus waltirensis*, *C. andhraensis*, *C. gitae*, and *C. eblingi* were commonly encountered.

Overall the **chironomidae** contributed 6.0% of the total population. Among the nine algae *Ulva fasciata* was observed to

support the highest (28247.2 no/100g alga) mean faunal density followed by *Caulerpa fastigiata* (15288.2 no/100g alga); *Amphiroa fragillisma* (13231.4 no/100g alga); *Bryocladia thwaitessi* (10513.1 no/100g alga); *Ulva lactuca* (8608.4 no/100g alga); *Caulerpa taxifolia* (5923.7 no/100g alga); *Spongomorpha indica* (4513.7 no/100g alga); *Gracilaria corticata* (1647.9 no/100g alga) and *Chaetomorpha antennina* (1522.2 no/100g alga).

Ostracoda are found to comprise 0.9% of the total population. Abundance of mean faunal density in nine algae are as follows: *Amphiroa fragillisma* supported highest (16444.8 no/100g alga) mean faunal density followed by *Ulva fasciata* (7886.7 no/100g alga); *Bryocladia thwaitessi* (5734.5 no/100g alga); *Gracilaria corticata* (3205.8 no/100g alga); *Caulerpa fastigiata* (2517.8 no/100g alga); *Spongomorpha indica* (1820.3 no/100g alga); *Ulva lactuca* (1487.7 no/100g alga); *Caulerpa taxifolia* (1045.6 no/100g alga) and *Chaetomorpha antennina* (185.8 no/100g alga). *Semicytherura* sp., *Paradoxostoma* sp., *Sclerochilus contortus*, *Xestoleberis* sp., *Microcythere* sp., *Caudites* sp., *Bythocypris* sp., *Tanella* sp., *Neonesidea villosa*, *Neocyprideis* sp., *Xestoleberis aurantia*, *Leptocythere* sp. and *Heterocytheris* sp. were commonly encountered.

Tanaidacea constituted 0.5% of the total meiofaunal population. The highest (7359.0 no/100g alga) mean population of tanaidaceans was recorded in *Amphiroa fragillisma* followed by *Ulva fasciata* (6983.7 no/100g alga); *Caulerpa fastigiata* (2371.4 no/100g alga); *Spongomorpha indica* (1560.8 no/100g alga); *Bryocladia thwaitessi* (1220.9 no/100g alga); *Gracilaria corticata* (843.0 no/100g alga); *Ulva lactuca* (267.7 no/100g alga) and *Chaetomorpha antennina* (197.7 no/100g alga). *Caulerpa taxifolia* was devoid of tanaidaceans.

Amphipoda are found to comprise 0.4% of the total meiofauna. The highest (6642.14 no/100g alga) mean density was observed in *Amphiroa fragillisma* followed by *Spongomorpha indica* (3431.8 no/100g alga); *Ulva fasciata* (2101.61 no/100g alga); *Caulerpa taxifolia* (2009.7 no/100g alga); *Gracilaria corticata* (1969.2 no/100g alga); *Bryocladia thwaitessi* (1634.5 no/100g alga); *Caulerpa fastigiata* (1155.86 no/100g alga); *Ulva lactuca* (696.6 no/100g alga) and *Chaetomorpha antennina* (503.9 no/100g alga).

Gastropoda contributed 0.4% of the total fauna. The highest (4835.2 no/100g alga) annual mean population was recorded in *Caulerpa fastigiata* followed by *Spongomorpha indica* (3544.6 no/100g alga); *Ulva fasciata* (2168.4 no/100g alga);

Gracilaria corticata (1541.4 no/100g alga); *Amphiroa fragillisma* (1366.2 no/100g alga); *Ulva lactuca* (1110.0 no/100g alga); *Chaetomorpha antennina* (657.7 no/100g alga); *Caulerpa taxifolia* (489.7 no/100g alga) and *Bryocladia thwaitessi* (471.2 no/100g alga).

Turbellaria constituted 0.2% of the total population. The annual mean population was highest (2300.2 no/100g alga) in *Spongomorpha indica* followed by *Bryocladia thwaitessi* (2002.7 no/100g alga); *Amphiroa fragillisma* (1970.1 no/100g alga); *Ulva lactuca* (1383.5 no/100g alga); *Caulerpa fastigiata* (1055.1 no/100g alga); *Ulva fasciata* (806.3 no/100g alga) and *Gracilaria corticata* (286.9 no/100g alga). Turbellaria was not found in *Chaetomorpha antennina* and *Caulerpa taxifolia*.

Isopoda was encountered in six algal varieties constituting 0.1% of total meiofauna. *Ulva fasciata* was observed to support the highest (841.7 no/100g alga) mean density of phytal fauna followed by *Spongomorpha indica* (626.4 no/100g alga); *Amphiroa fragillisma* (522.5 no/100g alga); *Gracilaria corticata* (417.1 no/100g alga); *Caulerpa taxifolia* (366.7 no/100g alga); *Ulva lactuca* (345.6 no/100g alga) and *Bryocladia thwaitessi* (265.8 no/100g alga). Isopoda was not found in *Caulerpa fastigiata* and *Chaetomorpha antennina*.

Anthozoa constituted 0.1% of total phytal fauna supporting high (1471.6 no/100g alga) mean faunal density in *Spongomorpha indica* followed by *Caulerpa fastigiata* (703.606 no/100g alga); *Gracilaria corticata* (474.7 no/100g alga); *Ulva lactuca* (272.0 no/100g alga); *Bryocladia thwaitessi* (267.7 no/100g alga) and *Chaetomorpha antennina* (110.7 no/100g alga). Anthozoans were not found in *Amphiroa fragillisma*, *Ulva fasciata* and *Caulerpa taxifolia*. Amphineura, sipuncula, pycnogonida and cirripedia are sporadic in occurrence.

The mean faunal density of **amphineura** was recorded high (712.3 no/100g alga) in *Amphiroa fragillisma* followed by *Gracilaria corticata* (564.9 no/100g alga); *Caulerpa fastigiata* (528.6 no/100g alga) and *Ulva fasciata* (294.9 no/100g algae). Amphineura were not found in *Spongomorpha indica*, *Chaetomorpha antennina*, *Bryocladia thwaitessi*, *Ulva lactuca* and *Caulerpa taxifolia*.

Sipuncula recorded the highest (419.8 no/100g alga) mean population in *Spongomorpha indica* followed by *Amphiroa fragillisma* (315.4 no/100g alga) and *Bryocladia thwaitessi* (244.4 no/100 g algae). Sipuncula was not found in *Ulva fasciata*, *Caulerpa fastigiata*, *Gracilaria corticata*, *Chaetomorpha antennina*, *Ulva lactuca* and *Caulerpa taxifolia*.

Pycnogonida has been encountered and supported highest (369.3 no/100g alga) mean density in *Bryocladia thwaitessi* followed by *Spongomorpha indica* (287.9 no/100g alga) and *Gracilaria corticata* (136.2 no/100 g algae). Pycnogonida was absent in *Amphiroa fragillisma*, *Ulva fasciata*, *Caulerpa fastigiata*, *Chaetomorpha antennina*, *Ulva lactuca*, and *Caulerpa taxifolia*.

Among nine seaweeds, **Cirripedia** was encountered only in *Ulva fasciata* (553.7 no/100g alga) and absent in rest of the algal seaweeds.

Area wise meiofauna showed significant variations (F: 5.598, $P \leq 0.002$). Meiofaunal density was abundant at Palm Beach when compared to Lawson's Bay and Coastal Battery. Highest peak was observed at Palm Beach in the month of March 2010. The seasonal change was not clear for individual taxa. Two groups can be distinguished, one including foraminiferans, gastropods (Palm Beach), amphipods (Lawson's Bay) with its highest density in March, May 2010, and another including ostracods, copepods (coastal battery), nematodes, bivalves (Palm beach), with its highest density in October, November and December 2009 (**Figure 4**).

Among the nine seaweeds, the tufted shrub like *Spongomorpha indica* retains large quantities of sediment and offers more

protection from desiccation, was observed to support the highest (3274172 no/100g) mean density of non-sessile phytal fauna than thin filamentous fronds of *Chaetomorpha antennina* with poor sediment retention capacity. It has been suggested that algae of small, simple fronds offer insufficient protection to most meiofaunal organisms against predation, desiccation and wave abrasion [9, 10]. Faunal associations can also be affected by different physical and chemical properties of algae [11, 12]. The composition of the meiofauna is the result of the various characteristics such as the shape and texture of the stalks of the plants; the interstices, the accumulation of sediment and detritus, the quantity of epiphytes, the degree of protection from the waves and dessication [4, 13]. The large number of harpacticoids is correlated with the low silt-clay texture and detritus retained in the algal substratum [5, 14]. Besides, all the harpacticoid genera found during study period characteristic of the phytal habitat (*Tisbe* sp., *Ectinosoma* sp., *Diarthrodes* sp., *Amphiascus* sp., *Scutellidium* sp., and *Harpacticus* sp. are indicating a smaller amount of sediment on the algae [15].

The period (September to April) of occurrence of high numbers of meiobenthic populations coincided with the breeding season of the phytal organisms when the

larvae, juveniles are present. Temporal variation in phytal populations can be caused by seasonality in their reproductive activity and recruitment [16, 17, and 18]. Another hypothesis regarding the higher density of the meiofauna may be linked to the reproductive period of some species and is reflected in the higher density observed in the summer. Among these, the nauplii of

Harpacticoida were the most abundant, indicating the predominance of young stages over the adult meiofauna. Our observations are in agreement with [19] observations that the greatest microfauna density associated with *Fucus serratus* was also correlated with the reproductive period of many species in the summer.

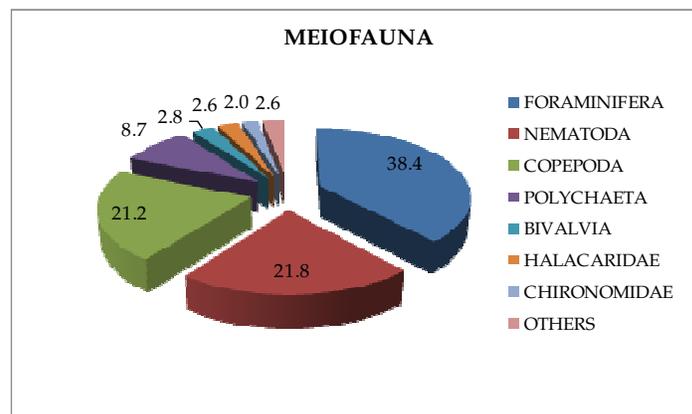


Figure 1: The (%) Distribution of Phytal Meiofauna

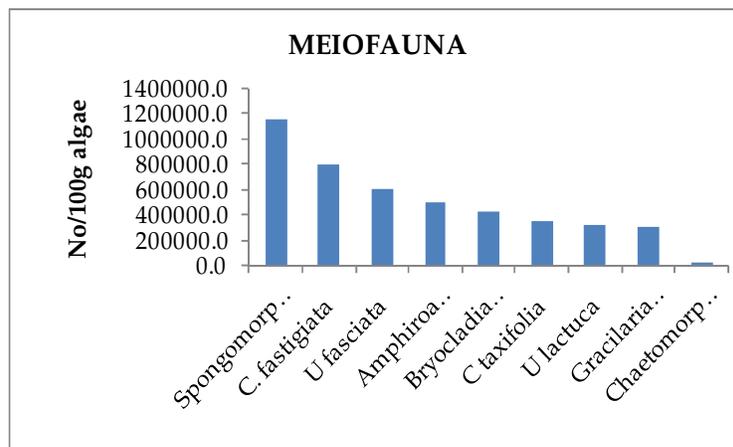


Figure 2: Mean Meiofaunal Abundance of Nine Different Algae at Visakhapatnam Coast

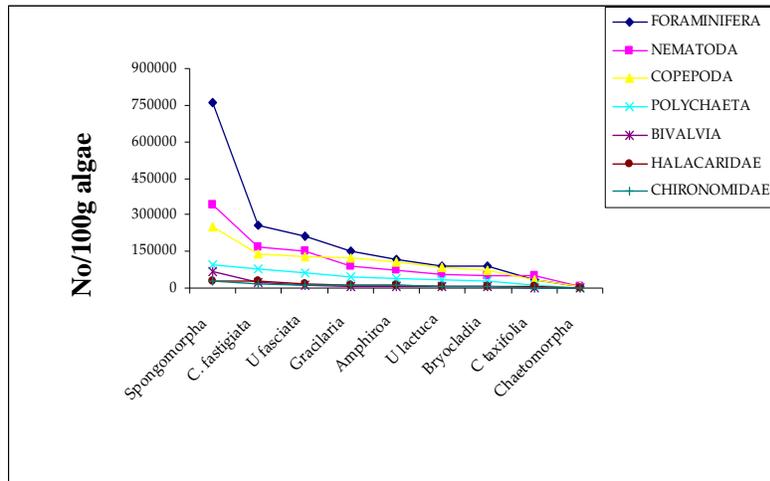


Figure 3a: The Mean Meiofaunal Abundance of Different Taxa of Nine Algae at Visakhapatnam Coast

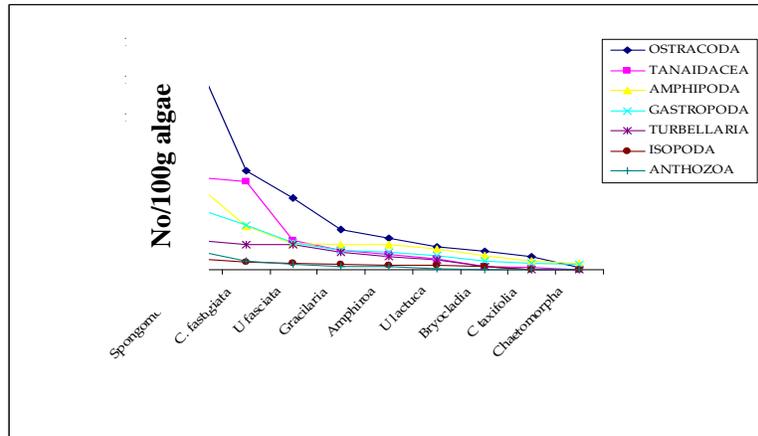


Figure 3b: The Mean Meiofaunal Abundance of Different Taxa of Nine Algae at Visakhapatnam Coast

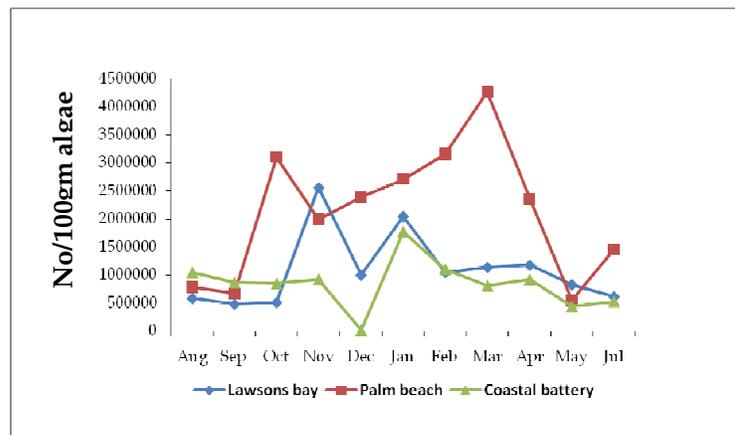


Figure 4: The seasonal Meiofaunal Distribution at Three Areas of Visakhapatnam Coast

CONCLUSIONS

Summing up, meiofaunal habitat has received comparatively little research attention in Indian waters and this study has provided a substantial contribution to current knowledge on the taxonomy and ecology of phytal meiofauna. More importantly, the available information is clearly biased towards the taxonomic approach, quantitative ecological data being scarce.

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Table 1: Phytal Meiofauna (number of animals/100g alga) Associated with Nine Different Algal Species at Visakhapatnam Coast

Groups	<i>Amphiroa fragillisma</i>			<i>Ulva fasciata</i>			<i>Caulerpa fastigiata</i>			<i>Spongomorpha indica</i>			<i>Gracilaria corticata</i>		
	Range	Mean	No	Range	Mean	No	Range	Mean	No	Range	Mean	No	Range	Mean	No
FORAMINIFERA	27778-369855	119608.3	11	27703-516975	212076.3	11	6075-894591	258501.2	11	22165-2737307	757523.8	10	5840-577114	152654.9	11
ANTHOZOA	0	0	0	0	0.0	0	317-1091	703.6	2	424-2519	1471.6	2	156-1302	474.7	4
TURBELLARIA /NEMERTINEA	1970	1970.1	1	424-1189	806.3	2	574-1536	1055.1	2	1679-3328	2300.2	4	139-435	286.9	2
NEMATODA	13158-249110	87459.7	11	5513-175581	49409.7	11	106734-810231	338669.3	11	22286-339384	150967.9	10	10819-208603	56873.8	11
POLYCHAETA	6579-367972	95700.3	11	5105-84884	30986.5	11	6718-53980	30728.1	10	4000-100464	36543.1	10	1350-21263	8831.2	11
SIPUNCULA	229-402	315.4	2	0	0.0	0	0	0.0	0	420	419.8	1	0	0.0	0
PYCNOGONIDA	0	0.0	0	0	0.0	0	0	0.0	0	288	287.9	1	122-148	136.2	3
OSTRACODA	1111-63830	16444.8	11	492-45349	7886.7	11	545-4950	2517.8	8	442-5757	1820.3	8	417-12999	3205.8	11
COPEPODA	34290-270014	140947.9	11	60246-908951	250864.7	11	7241-503300	121643.5	11	5143-231562	86297.3	10	10819-74216	33603.5	11
CIRRIPIEDIA	0	0.0	0	316-791	553.7	2	0	0.0	0	0	0.0	0	0	0.0	0
TANAIDACEA	229-20559	7359.0	7	295-39535	6983.7	7	337-4827	2371.4	9	280-2099	1560.8	4	139-2837	843.0	5
AMPHIPODA	1054-22397	6642.1	10	295-6403	2101.6	9	337-1676	1155.9	4	485-10725	3431.8	9	367-5208	1969.2	8
ISOPODA	367-678	522.5	2	295-1272	841.7	3	0	0.0	0	370-883	626.4	2	417	417.1	1
CHIRONOMIDAE	7486-29924	13231.4	11	1447-173369	28247.2	9	3372-29107	15288.2	11	1714-9709	4513.7	10	400-7022	1647.9	11
HALACARIDAE	91-17554	5520.5	10	791-69444	10947.2	11	562-33003	6751.1	10	1714-93935	29549.5	10	5380-44701	17660.6	11
AMPHINEURA	367-1357	712.3	4	295	294.9	1	512-545	528.6	2	0	0.0	0	148-1302	564.9	4
GASTROPODA	299-3632	1366.2	8	492-9259	2168.4	10	265-20117	4835.2	9	140-22075	3544.6	9	596-2807	1541.4	8
BIVALVIA	1054-14627	5560.1	11	410-9302	3413.7	11	1593-31353	11940.5	11	7752-196893	68612.8	10	995-113281	24944.0	11

Groups	<i>Chaetomorpha antennina</i>			<i>Bryocladia thwaitessi</i>			<i>Ulva lactuca</i>			<i>Caulerpa taxifolia</i>		
	Range	Mean	No	Range	Mean	No	Range	Mean	No	Range	Mean	No
FORAMINIFERA	1216-21638	6047.1	10	26667-182588	89316.4	9	5796-213814	91503.9	10	3305-74807	32781.5	6
ANTHOZOA	111	110.7	1	241-295	267.6	2	234-310	271.9	2	0	0	0
TURBELLARIA /NEMERTINEA	0	0	0	2003	2002.6	1	238-3541	1383.4	3	0	0	0
NEMATODA	446-20348	5857.9	10	14815-110411	70209.3	9	5684-188786	48827.1	10	76348-266558	167252.7	6
POLYCHAETA	457-10046	2617.2	7	21978-196288	76764.2	9	5272-123978	45182.6	10	20087-119179	60787.4	6
SIPUNCULA	0	0	0	244	244.4	1	0	0	0	0	0	0
PYCNOGONIDA	0	0	0	369	369.2	1	0	0	0	0	0	0
OSTRACODA	185-185	184.9	1	496-23607	5734.5	9	186-4313	1487.7	8	157-4034	1045.6	5
COPEPODA	1121-24879	7056.4	10	56626-256342	130566.2	9	16594-344901	106489.4	10	20630-220755	73679.8	6
CIRRIPEDIA	0	0	0	0	0	0	0	0	0	0	0	0
TANAIDACEA	146-255	197.6	3	797-1542	1220.9	4	238-298	267.7	2	0	0	0
AMPHIPODA	296-759	503.9	7	244-4673	1634.5	6	310-1592	696.5	4	1086-2934	2009.7	2
ISOPODA	0	0	0	266	265.8	1	238-453	345.5	2	367	366.7	1
CHIRONOMIDAE	282-6119	1522.1	10	4444-19941	10513.0	9	113-30181	8608.4	10	476-10332	5923.7	5
HALACARIDAE	1456-18792	6332.4	10	5071-94793	29190.1	9	234-32515	8732.3	9	695-2381	1621.9	6
AMPHINEURA	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	518-798	657.6	2	169-1335	471.1	6	298-2125	1109.9	5	367-626	489.6	3
BIVALVIA	291-2296	1175.3	6	1014-17356	4389.2	9	682-8784	3052.1	10	184-5134	1698.9	6