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RESEARCH ARTICLE

DISTRIBUTION OF BENTHIC FORAMINIFERA IN SOUTH ANDAMAN, INDIA

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ABSTRACT

The distribution and diversity of foraminifera a single celled protozoan was studied in the sediments closely adjacent to reef of South Andaman Island. A total of 18 species belong to 8 genera were recorded in our investigation. Calcarinidae made larger contribution to the total abundance followed by Hauerinidae, Elphididae, Peneroplidae, Spiroloculinidae and Amphisteginidae. *Calcarina spengleri* were found to be the most dominant species at all stations. The species such as *Calcarina spengleri, Calcarina calcar, Spiroloculina henbesti, Quinqueloculina insignis, Peneroplis pertusus, Quinqueloculina intricate, Quinqueloculina pseudoreticulata, Elphidium craticulatam* were the most prevalent foraminifera encountered in the samples. The study indicated that the densities of foraminifera found in the sediments were richer.

INTRODUCTION

Benthic foraminifera are common in marine sediments; they are cosmopolitan, have a good fossil preservation and represent a useful tool for oceanographic and palaeoceanographic studies (Murgese and Deckker, 2005). A wide range of physical, chemical and biological parameters, such as temperature, salinity, depth, sediment, oxygen, food, toxic substances, as well as biological interactions, influence the distribution of benthic foraminifera (Murray, 1991; Jorissen, 1999). The abundance and distribution of deep-sea benthic foraminifera are dominantly controlled by two, usually inversely related, parameters: the flux of organic matter (food) to the sea floor and the oxygen concentrations of bottom and pore waters (Gooday *et al*., 2000; Fontanier *et al*., 2002; Gooday, 2003; Fontanier *et al*., 2005). Benthic foraminifera may provide a useful proxy for estimating the flux of organic matter to the ocean floor resulting from surface productivity (Herguera and Berger, 1991) and also can be used as indirect indicators for modification of environmental parameters. Literatures available on benthic foraminifera in the South Andaman Island are meagre. In view of the importance and scarcity of reports from this area, the present work was undertaken to investigate the distribution of benthic foraminifera.

MATERIALS AND METHOD

Samples were collected closely adjacent to reefs in the North Bay (5m depth) Aberdeen Bay (15 m depth), Sisostris Bay (7m depth), Chidyatapu (5m depth) and Wandoor (7m depth) in South Andaman Island, India (Figure 1). The Samples were collected through Van veen grab sampler subsequently treated with Rose Bengal dye to distinguish living and deceased species. Specimens were collected by hand after sieving and drying of the sediment samples, and preserved in paleontological slides. Using Stereoscopic Binocular Microscope (Nikon – SMZ1500) microscope, species were identified and taken photographs.

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FEI Quanta 200 Environmental Scanning Electron Microscope (ESEM) with Energy-Dispersive X-ray Spectroscopy (EDAX EDS) system was used to study the variety of anomalous ultra features and chemical characteristic of foraminiferal species. In this system The EDAX is attached with SEM that enables to analysis the elemental composition and also the ultra structure of the foraminiferal samples. For that specimens were rinsed in deionised water and air dried on paleontological slides. Then the species were mounted on aluminium SEM stubs using double-sided adhesive tabs. In this study the characteristic of an element with atomic structure is identified uniquely from one another in the form in the form of EDX spectrum along with ultra structures of the same species. After scrutinize the foraminiferal species through light microscope, species comes under the order Miliolida, Bulimida and Rotaliida.

The identified foraminifera were belonging to diverse groups such as Hauerinidae (7) (Figure 3a), Peneroplidae (3) (Figure 3b), Elphididae (3) (Figure 3c), Spiroloculinidae (2) (Figure 3d), Calcarinidae (2) (Figure 3e) and Amphisteginidae (1) (Figure 3f). *Calcarina spengleri Calcarina spengleri, Calcarina calcar, Spiroloculina henbesti, Quinqueloculina insignis, Peneroplis pertusus, Quinqueloculina intricate, Quinqueloculina pseudoreticulata, Elphidium craticulatam.*

RESULTS AND DISCUSSION

The patterns of distribution of benthic foraminiferal faunas document major changes in paleoenvironmental conditions. A total of 18 species belong to 8 genera were recorded from five different stations. The identified foraminifera were belonging to diverse groups such as Hauerinidae (7) (Figure 3a), Peneroplidae (3) (Figure 3b), Elphididae (3) (Figure 3c), Spiroloculinidae (2) (Figure 3d), Calcarinidae (2) (Figure 3e) and Amphisteginidae (1) (Figure 3f). *Calcarina spengleri* were found to be the most dominant species whereas *Spirolina arietinus* were recorded very low in the sediments closely adjacent to reefs at all stations. The high abundance of *Calcarina spengleri* inhibits the reef might have the influence of seasonality and overall productivity leading to a complex reaction of benthic foraminifera in

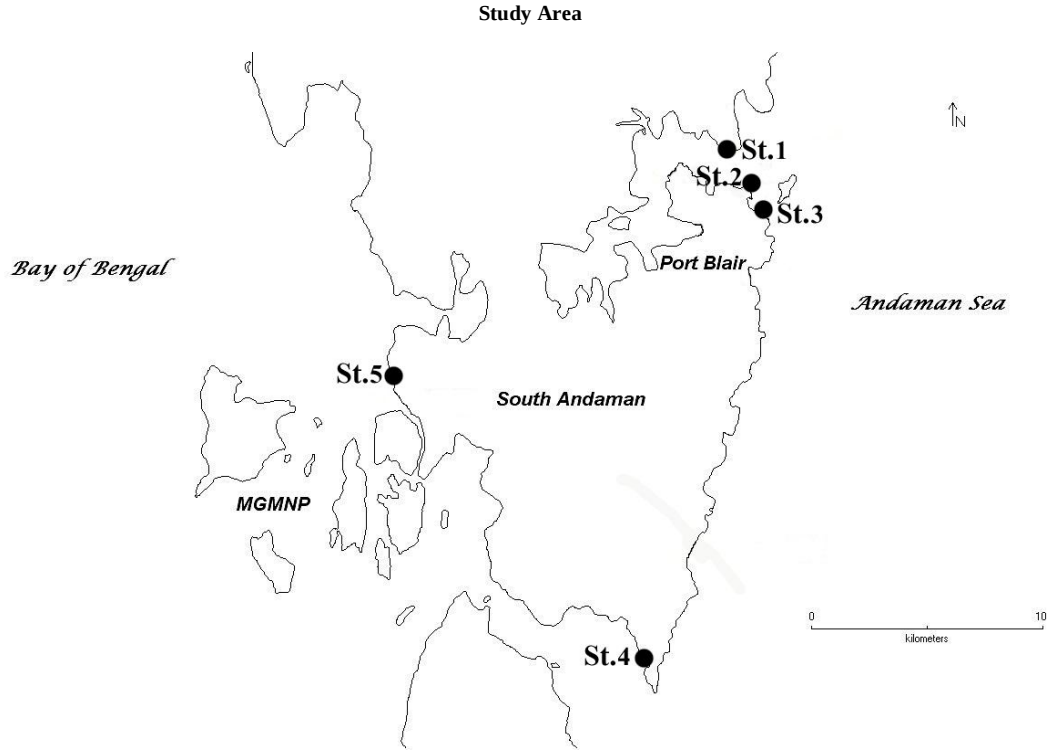

Figure 1. St.1-North Bay (5m depth), St.2-Aberdeen Bay (15 m depth), St.3- Sisostris Bay (7 m depth), St.4- Chidyatapu beach (5 m depth)and St.5-Wandoor (7 m depth). MGMNP- Mahatma Gandhi Marine National Park

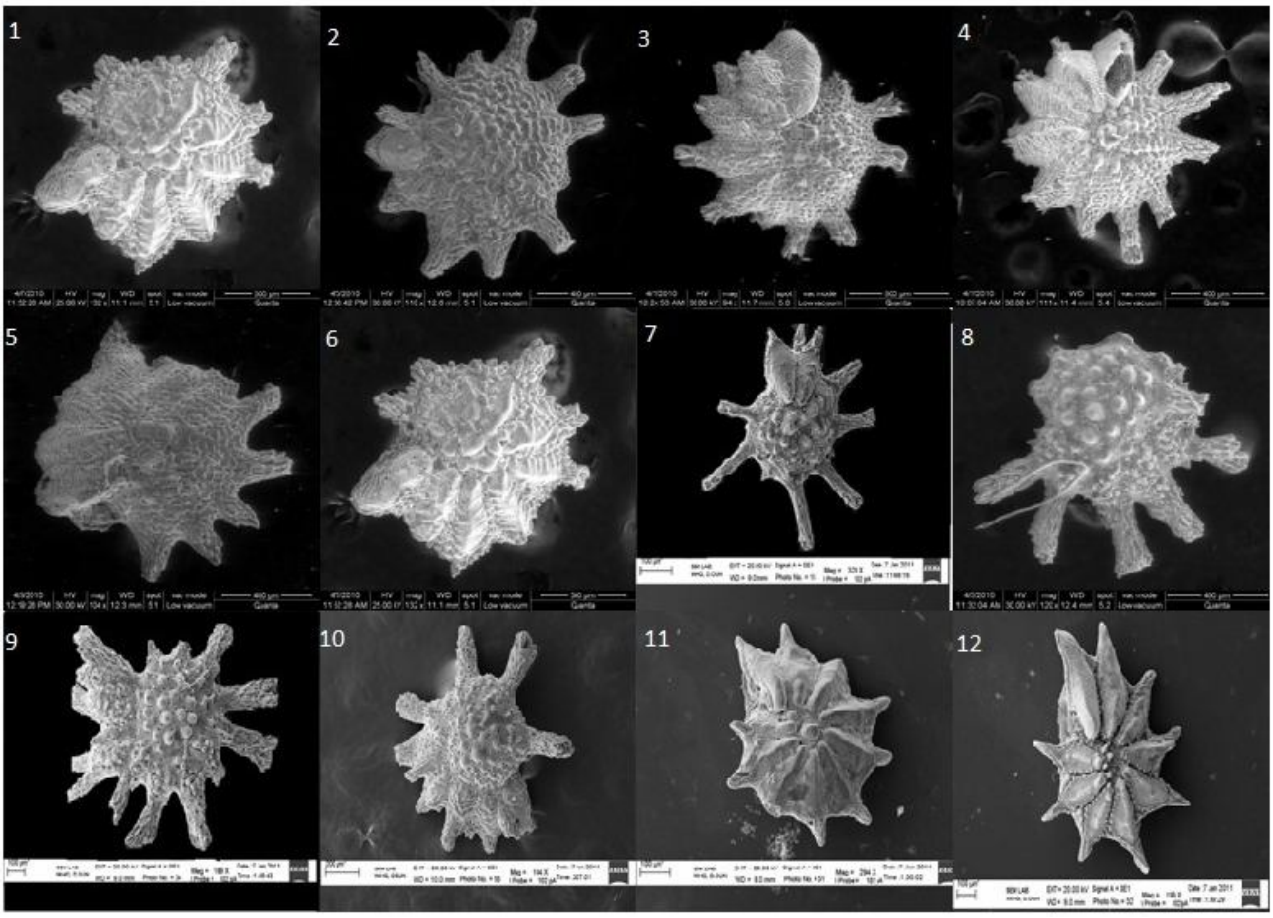

Figure 2. 1, 3, 5, 6, 7, 8, 9 and 10 *Calcarina spengleri* (Gmelin1791) umbical view 2 and 4 *Calcarina spengleri* (Gmelin1791) dorsal view 11 and 12 *Calcarina calcar* (Gmelin1791) umbical view

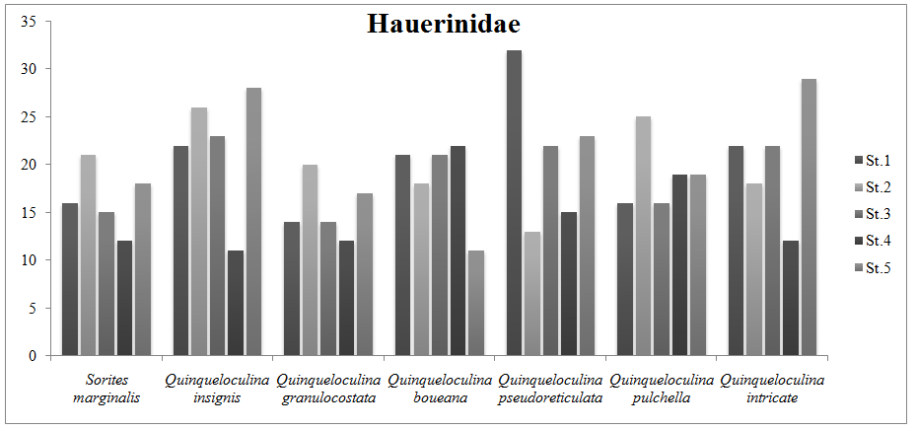

Figure 3a. Occurrences of species in the family Haueriniidae from different stations

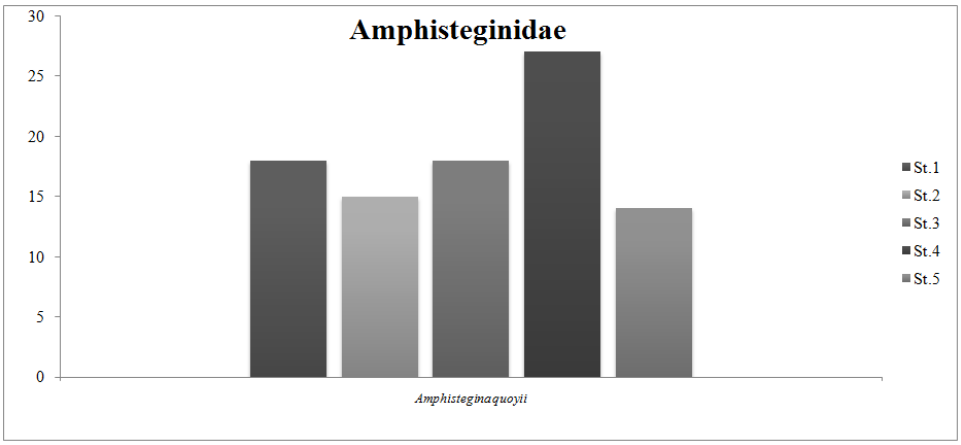

Figure 3b. Occurrences of species in the family Amphistenginidae from different stations

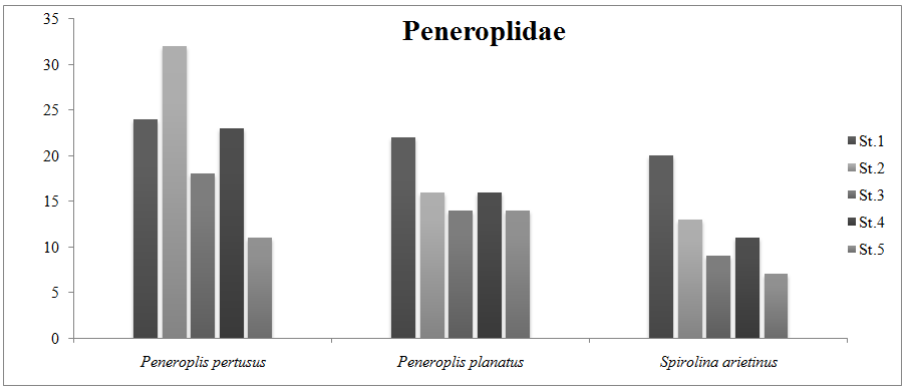

Figure 3c. Occurrences of species in the family Peneroplidae from different stations

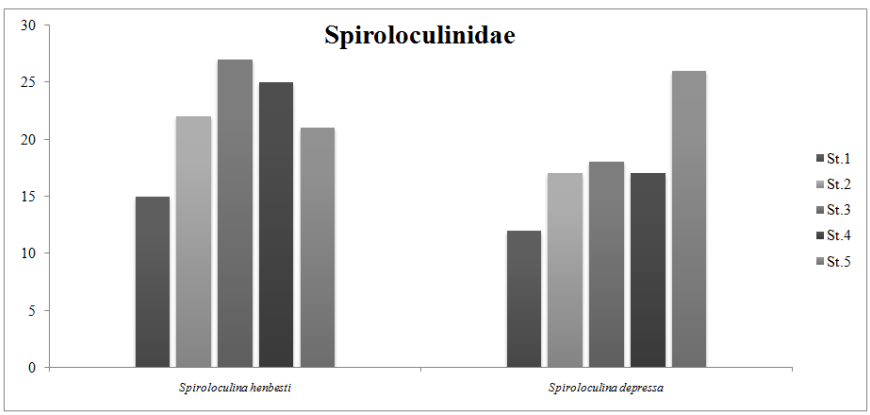

Figure 3d. Occurrences of species in the family Spiroloculinidae from different stations

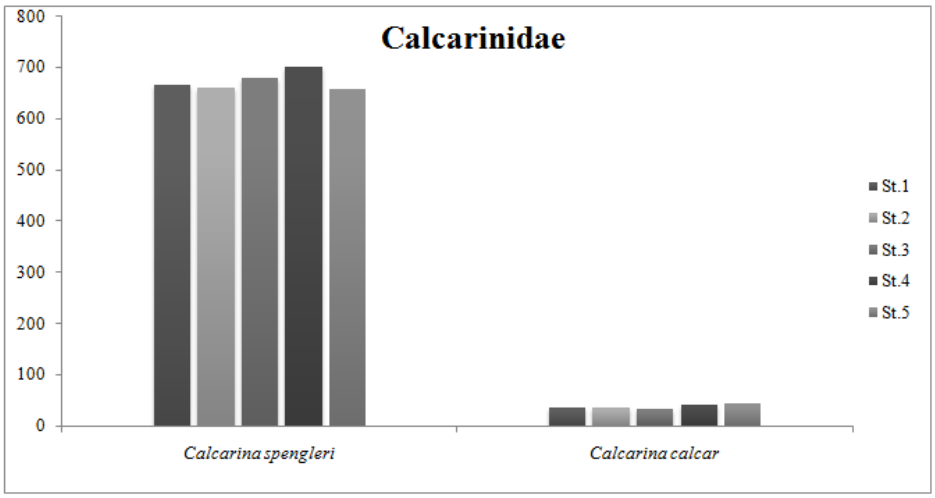

Figure 3e. Occurrences of species in the family Calcarinidae from different stations

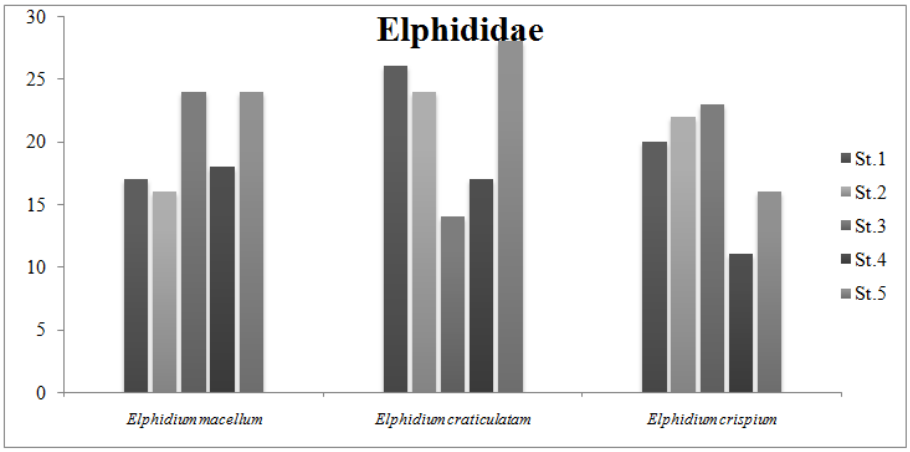

Figure 3f. Occurrences of species in the family Elphididae from different stations

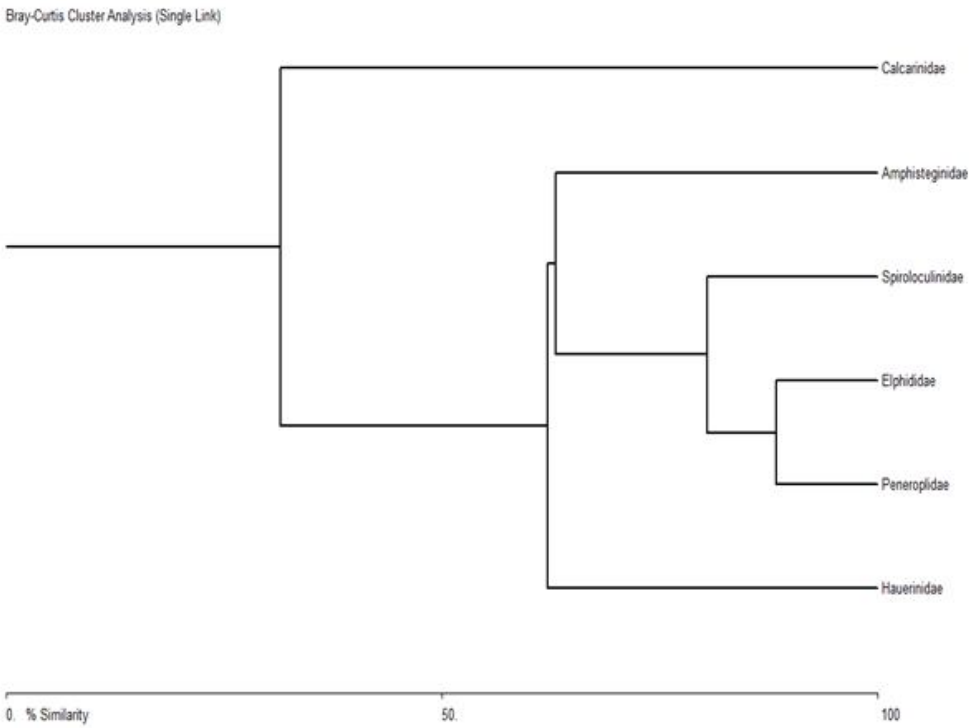

Figure 4. Hierarchical clustering of species richness based on different families

which high productivity taxa dominated in some periods and at some locations (specifically where upwelling was high and more pronounced) (Smart *et al*., 2007). The most dominant species were recorded in various stations *viz. Calcarina spengleri, Calcarina calcar, Spiroloculina henbesti, Quinqueloculina insignis, Peneroplis pertusus, Quinqueloculina intricate, Quinqueloculina pseudoreticulata, Elphidium craticulatam.* The abundance of high-productivity taxa of the sites, could suggest that either one or both of these proxies do not simply reflect food arrival at the sea floor, but incorporate information on such factors as the quality of organic matter (labile, refractory) or seasonality (Smart *et al*., 2007). Significant changes of foraminifera taxa at the different sites illustrate the complexity of factors controlling their distribution and abundance (Murray, 2001). The species richness was abundant in St.1 as compared to others could have resulted in more vigorous vertical mixing and upwelling of nutrient waters. Moreover, the slightly increasing values of benthic foraminifera in the sediments might be in part due to increased dissolution, which is indicated by the high percentages of planktic foraminiferal fragments (Thunell, 1975; Le and Shackleton, 1992). There were two major clusters were observed in our study (Figure 4), which were mainly segregated based on species richness towards different families. The first group was Calcarinidae; the second group consist of Amphisteginidae, Spiroloculinidae, Elphididae, Peneroplidae, and Hauerinidae. Among all the families, Elphididae showed more similarity with peneroplidae in foraminifera community composition than with spiroloculinidae.

Conclusions

Calcarina spengleri and *Calcarina calcar* is present in 90% available from the beach sand for study and those reported in the literature, These two species occur recent beach sand in various part of Port Blair. So we suggest that local fluctuations of fauna have taken place within the area of Andaman Sea.

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