

Chapter 2

Distribution of Live Planktonic and Benthic Foraminifera in the Shelf off Port Blair and Hut Bay, Andaman Group of Islands, India

P. M. Mohan, P. Dhivya and K. Narayanamurthy

Abstract Studies on the foraminiferal distribution in the waters and sediments of the Port Blair and Little Andaman environment revealed that there are 189 species. Out of 189 species, 170 species were from the sediment samples and 19 species were identified as planktonic samples. Among 170 species of sediment samples, 115 species are from the Little Andaman and 76 species from the Port Blair. And 21 species are common in both the environments. The planktonic samples exhibit 19 species under eight genera, grouped into two categories namely, Little Andaman and Port Blair. The species distribution has been found out that more number of species recorded in Little Andaman than Port Blair in planktonic and sediment environments. Based on the above results, it has been concluding that the Little Andaman environment shows more suitable for foraminiferal growth than Port Blair environment. This may be due to the high anthropogenic interference on Port Blair sample stations.

Keywords Andaman · Distribution · Diversity · Foraminifera · Sediments

2.1 Introduction

Foraminifera (Hole-bearers) are unicellular protists had geological range from the earliest Cambrian to present day. Mostly found in all marine and estuarine environments and rarely in fresh water (Allogromiida). The major foraminiferal research commenced during second half of twentieth century by Phleger and Fred (1959). Foraminifera are mainly two types, benthic and planktonic. They are usually less than 1 mm in size but some are much larger in size and the largest

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specimen was 19 cm. The world's oceans exhibited 4,000 living species of foraminifera, out of these, 45 species are planktonic (Hemleben et al. 1989). Of the 45 species of planktonic forms, 29 species are common in the world ocean. They are also very useful in paleo-climatology and paleoceanography studies. Geographic pattern seen in the fossil records is also useful to reconstruct ancient ocean current, because certain types of foraminifera are found only in certain environments make a useful biostratigraphic markers.

Planktonic foraminifera placed into the distinct major order Globigerinida (Loeblich and Tappan 1992). Planktonic study of foraminifera in off coast of Boso Peninsula and Kinkazan, Japan revealed that population gradually increased from nearshore to offshore and it may be related to a small gyres of the Kuroshio and species dominant are *Globigerinoides ruber* and *Globigerina eggeri* (Uchio 1959). Rao et al. (1991) and reported 30 species of planktonic foraminifera from the eastern Arabian Sea and 25 species from the submerged coral banks of Lakshadweep Islands (Rao et al. 1992) in south eastern Arabian Sea. Rajashekar and Kumaran (1998) reported on the agglutinated foraminiferal assemblages in marsh environment of Velas coast of Maharashtra. The experimental study on benthic foraminiferal species of *Rosalina leei* confirms the effects of environment on its dimorphic mode of reproduction carried out by Nigam and Caron (2000).

According to Moodley et al. (2000), meiobenthic community of foraminifera plays an important role in the carbon cycle of the sediments in Oosterschelde estuary, Netherland. Mitra et al. (2004) reported the occurrence of live foraminifera in the Bay of Bengal. Nagendhra et al. (2004) examined the benthic foraminifera distribution in relation to total organic contents. Kumar and Srinivasan (2004) reported 56 species belonging to 31 genera, out of these 13 were arenaceous agglutinated, 11 in calcareous porcellaneous and remaining 32 were calcareous perforate forms from Coleroon river estuary, Tamil Nadu.

Krishnamoorthy et al. (2005) studied the sediments of Andaman and Nicobar Islands for micropaleontological studies of tsunami sediments. The studies on the effect of salinity variations on benthic foraminiferal species *Pararotalia nipponica* (Asano) showed that lower salinities are much more detrimental to the foraminifera tests than higher salinities. The studies on the effect of salinity variations on benthic foraminiferal species *Pararotalia nipponica* (Asano) showed that lower salinities are much more detrimental to the foraminiferal tests than higher salinities. Nagampam (2007) studied the distribution of planktonic foraminifera at Sisostris Bay, Port Blair, Andaman waters and reported 10 species from this water. Based on the above facts, the present work has been carried out to understand the distribution of planktonic and benthic foraminifera in the nearshore waters of off Port Blair and Little Andaman.

2.1.1 Study Area

Two different areas were selected for this study (Fig. 2.1; Table 2.1). The first study area falls in Port Blair which has three stations viz., Off Carbyns Cove (OCC), Off Marina Park (OMP), and Off Chatam Jetty (OCJ). The second study area falls in Little Andaman which is 100 Nautical Miles away from the Port Blair. In Little Andaman, the station covers Off Hutbay Jetty (HOJ), Off Farm Tikkery (HBJ), and Off Netaji Nagar (HNN).

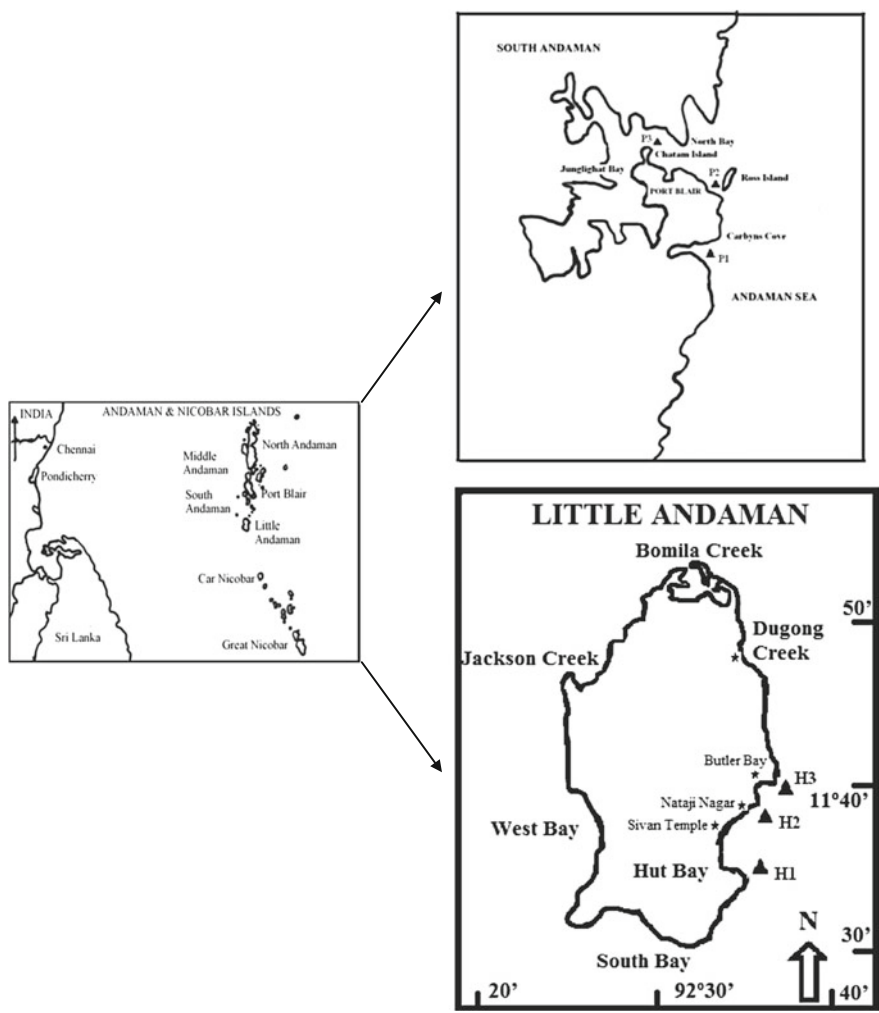


Fig. 2.1 Study area

Table 2.1 Coordinates of study stations in two different locations

Sl. no.	Stations	Coordinates	
1.	Off Carbin's Cove (OCC)	N 11°38'20.87''	E 92°45'09.53''
2.	Off Marina Park (OMP)	N 11°39'52.51''	E 92°45'38.81''
3.	Off Chatam Jetty (OCJ)	N 11°41'08.15''	E 92°43'27.96''
4.	Off Hutbay Jetty (HOJ)	N 10°35'43.37''	E 92°33'46.63''
5.	Off Farm Tikkery (HBJ)	N 10°36'41.21''	E 92°33'30.29''
6.	Off Netaji Nagar (HNN)	N 10°37'09.40''	E 92°33'10.65''

2.2 Methods

The present study was carried out to understand the distribution of benthic and planktonic foraminifera. The zooplankton net was hauled for 5-min duration to collect planktonic foraminifera under onboard condition. The duplicate sediment samples were collected using Van Veen Grab for the benthic foraminifera. The subsamples were taken by using a PVC corer (with an internal diameter of 2.5 cm, and a length of 5 cm) from the middle of each grab sample. After sample collection, 5 % formaldehyde was added into the samples for preservation. Along with the plankton and sediment samples collection the environmental data also collected using the Quanta Hydrolab probe. The preserved samples were brought to the laboratory and the plankton samples were splitted using the Folsom Splitter. The sediment samples were washed with filter seawater through a set of 500 and 63 μ m sieves for separation of foraminifera. The separated plankton and sediment samples were observed under a stereoscopic binocular microscope (Nikon—SMZ1500) for separation of foraminifera and photos were taken under the Zeiss digital microscope. The identification was carried out based on the standard systematic keys and the literature (Loeblich and Tappan 1964).

2.3 Results and Discussion

The studies on the foraminiferal distribution in the waters and sediments of the Port Blair and Little Andaman environment suggested that there are 189 species (Table 2.2). Of the 189 species, 170 species are from the sediment samples and 19 species identified as planktonic samples (Figures 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 2.11, 2.12, 2.13, 2.14). Among 170 species of sediment samples, 115 species are from the Little Andaman and 76 species from the Port Blair. Twenty-one species are common in both the environments.

In the case of planktonic samples, the identified 19 species under eight genere are grouped into two categories *viz.*, Little Andaman and Port Blair environments. Twelve species fallen in Little Andaman environment and Port Blair environment exhibit eight species. Out of 19 species, two species are common in both the

Table 2.2 Benthic and planktonic forms of foraminifera in Little Andaman and Port Blair

Sl. no.	Species	HOJ (H1)	HBJ (H2)	HNN (H3)	OCC (P1)	OMP (P2)	OCJ (P3)
Benthic Forms							
1.	<i>Cibicides</i> sp.		+				
2.	<i>Planulina</i> sp.		+				
3.	<i>Miliolinella</i> sp2.		+				
4.	<i>Spirillina limbata</i>	+	+		+	+	+
5.	<i>Spirillina vivipara</i>		+				
6.	<i>Nonion depressulum</i>	+	+				+
7.	<i>Quinqueloculina poeyana</i>		+				+
8.	<i>Lagena</i> sp1.		+				
9.	<i>Globigerinoides sacculifer</i>		+	+			
10.	<i>Spiroloculina nitida</i> *		+				
11.	<i>Spiroloculina</i> sp1.		+				
12.	<i>Triloculina</i> sp1.		+				
13.	<i>Brizalina</i> sp1.		+			+	
14.	<i>Bulimina</i> sp1.	+	+		+		
15.	<i>Quinqueloculina elongata</i>	+	+			+	
16.	<i>Osangularia</i> sp1.		+				
17.	<i>Edentostomina milletti</i>		+				
18.	<i>Spiroloculina orbis</i>		+				
19.	<i>Rotalia translucens</i>		+			+	+
20.	<i>Rotalia vilardeboana</i>		+				
21.	<i>Rotalida</i> sp1.		+				
22.	<i>Bolivina</i> sp1.		+				
23.	<i>Planorbulina</i> sp1.		+				
24.	<i>Globigerinoides ruber</i>		+				
25.	<i>Globigerina bulloides</i>		+				
26.	<i>Brizalina spathulata</i>	+	+				
27.	<i>Brizalina alata</i>		+				
28.	<i>Quinqueloculina bosciana</i>		+		+		+
29.	<i>Nonion grateloupi</i>		+			+	
30.	<i>Reussella spinulosa</i>	+	+			+	
31.	<i>Peneroplis</i> sp1.		+				
32.	<i>Heterostegina depressa</i>		+				
33.	<i>Gyroidina</i> sp1.		+	+			
34.	<i>Gyroidina danvillensis</i>	+	+				
35.	<i>Triloculina</i> sp2.		+				
36.	<i>Calcarina</i> sp1.		+				
37.	<i>Discorbis vesicularis</i>		+				
38.	<i>Loxostomum limbatum</i>		+				
39.	<i>Robulus stephensoni</i>		+	+			
40.	<i>Spiroloculina robusta</i>	+	+				
41.	<i>Staffella expansa</i>		+				

(continued)

Table 2.2 (continued)

Sl. no.	Species	HOJ (H1)	HBJ (H2)	HNN (H3)	OCC (P1)	OMP (P2)	OCJ (P3)
42.	<i>Neoconorbina crustata</i>	+	+	+			+
43.	<i>Deckerellina</i> sp1.		+				
44.	<i>Brizalina striatula</i>		+				
45.	<i>Misellina ovalis</i>		+				
46.	Unknown 1		+				
47.	<i>Lagena</i> sp2.		+				
48.	<i>Lagena</i> sp3.		+				
49.	<i>Boivina</i> sp2.		+				
50.	<i>Gyroidina zelandica</i>		+				
51.	<i>Bolivina toruosa</i>			+			
52.	<i>Siphonodosaria abyssorum</i>			+			
53.	<i>Fissurina lacunata</i>			+			
54.	<i>Bolivina</i> sp3.			+			
55.	<i>Fissurina marginata</i>			+			
56.	<i>Karrieriella</i> sp1.			+			
57.	<i>Nonion pompiloides</i>			+			
58.	<i>Ophthalmidium inconstans</i>	+		+	+		
59.	<i>Spiroloculina</i> sp2.			+	+		
60.	<i>Spiroloculina corrugata</i>			+			
61.	<i>Eponides broeckhianus</i>			+		+	
62.	<i>Elphidium texanum</i>			+			
63.	Unknown 2			+			
64.	<i>Planorbulina distoma</i>			+			
65.	<i>Trifarina bradyi</i>			+			
66.	<i>Glabratella australensis</i>			+			
67.	<i>Rosalina bertheloti</i>			+	+	+	+
68.	<i>Bolivina incrassata</i>			+			
69.	<i>Calcarina calcar</i>			+			
70.	<i>Bolivina hantkeniana</i>			+			
71.	<i>Calcarina</i> sp2.			+			
72.	<i>Triloculina oblonga</i>	+		+		+	
73.	<i>Brizalina</i> sp2.			+			
74.	<i>Calcarina</i> sp3.			+			
75.	<i>Cymbaloporetta squamosa</i>	+					+
76.	<i>Planispirinella exigua</i>	+				+	
77.	<i>Quinqueloculina tasmanica</i>	+					
78.	<i>Pseudomassilina australis</i>	+					
79.	<i>Nonion ibericum</i>	+					
80.	<i>Quinqueloculina granulocostata</i>	+					
81.	<i>Bolivina rhomboidatis</i>	+					

(continued)

Table 2.2 (continued)

Sl. no.	Species	HOJ (H1)	HBJ (H2)	HNN (H3)	OCC (P1)	OMP (P2)	OCJ (P3)
82.	<i>Heronallenia wilsoni</i>	+			+		
83.	<i>Entzia tetrastomella</i>	+					
84.	<i>Spiroloculina</i> sp3.	+					
85.	<i>Karrerella baccata</i>	+					
86.	<i>Cibicides pseudoungerianus</i>	+					
87.	<i>Articulina carinata</i>	+					
88.	<i>Calcarina</i> sp4.	+					
89.	<i>Nodosaria</i> sp1.	+					
90.	<i>Spiroloculina</i> sp4.	+					
91.	<i>Spiroloculina</i> sp5.	+					
92.	<i>Ordorsalis umbonatus</i>	+					
93.	<i>Discorbinella</i> sp1.	+					
94.	<i>Miliammina</i> sp1.	+					
95.	<i>Truncatullina margaritifera</i>	+					
96.	Unknown 3	+					
97.	<i>Quinqueloculina agglutinans</i>	+					
98.	<i>Ammobaculites</i> sp1.	+					
99.	<i>Elphidium clavatum</i>	+					
100.	<i>Spirilloculina henbesti</i>	+					
101.	<i>Bolivina limbata</i>	+					
102.	<i>Robulus macrodiscus</i>	+					
103.	<i>Asterigerina carinata</i>	+					
104.	<i>Asterigerina</i> sp1.	+					
105.	<i>Spiroloculina</i> sp6.	+					
106.	Unknown 4	+					
107.	<i>Cibicides lobatulus</i>	+					
108.	<i>Quinqueloculina berthelotiana</i>	+					
109.	<i>Triloculina</i> sp3.	+					
110.	<i>Poroeponides</i> sp1.	+					
111.	<i>Quinqueloculina laevigata</i>	+					
112.	<i>Patellina</i> sp1.	+					
113.	<i>Toriyamaia</i> sp1.	+					
114.	<i>Discorbinella montereyensis</i>	+					
115.	<i>Bolivina vadesens</i>	+					
116.	<i>Rosalina flondana</i>				+		
117.	<i>Globorotalia hirsuta</i>				+		
118.	<i>Textularia candeiana</i>				+		
119.	<i>Quinqueloculina bicostata</i>				+		+
120.	<i>Quinqueloculina</i> sp1.				+		

(continued)

Table 2.2 (continued)

Sl. no.	Species	HOJ (H1)	HBJ (H2)	HNN (H3)	OCC (P1)	OMP (P2)	OCJ (P3)
121.	<i>Globigerina rubescens</i>				+		
122.	<i>Miliolinella</i> sp1.				+		
123.	<i>Triloculina</i> sp4.				+		
124.	Unknown 5				+		
125.	Unknown6				+		
126.	<i>Orbulina universa</i>				+	+	
127.	<i>Bulimina</i> sp2.				+		
128.	<i>Elphidium claticulatum</i>				+		
129.	<i>Triloculina</i> sp5.				+		
130.	<i>Bulimina</i> sp3.				+		
131.	<i>Buliminida</i> sp4.				+		
132.	<i>Lagena</i> sp4.				+		
133.	<i>Lagena</i> sp5.				+		
134.	<i>Discorbinella</i> sp2.				+		
135.	<i>Ophthalmidium</i> sp1.				+		
136.	<i>Quinqueloculina oblonga</i>					+	+
137.	<i>Miliammina oblonga</i>						+
138.	<i>Nonionella hantk</i>						+
139.	<i>Spiroculina</i> sp2.						+
140.	<i>Quinqueloculina singletoni</i>						+
141.	<i>Spiroloculina</i> sp7.						+
142.	<i>Spiroloculina</i> sp8.						+
143.	<i>Quinqueloculina</i> sp3.						+
144.	<i>Rosalina globularis</i>						+
145.	<i>Cibicides refulgens</i>						+
146.	<i>Eponides repandus</i>						+
147.	<i>Globigerinata glutinata</i>						+
148.	<i>Bolivina compacta</i>					+	+
149.	<i>Textularia porrecta</i>						+
150.	<i>Lagena</i> sp6.						+
151.	<i>Quinqueloculina seminulum</i>					+	
152.	<i>Alliatina</i> sp1.					+	
153.	<i>Triloculina irregularis</i>					+	
154.	<i>Eponides</i> sp1.					+	
155.	<i>Turborotalia</i> sp1.					+	
156.	<i>Quinqueloculina</i> sp4.					+	
157.	<i>Nonion</i> sp1.					+	
158.	<i>Spirillina</i> sp1.					+	
159.	<i>Rosalina bradyi</i>					+	
160.	<i>Rosalina vadescens</i>					+	
161.	<i>Rosalina anomala</i>					+	

(continued)

Table 2.2 (continued)

Sl. no.	Species	HOJ (H1)	HBJ (H2)	HNN (H3)	OCC (P1)	OMP (P2)	OCJ (P3)
162.	<i>Quinqueloculina disparilis</i>					+	
163.	<i>Haplophragmoides canariensis</i>					+	
164.	<i>Quinqueloculina rhodiensis</i>					+	
165.	<i>Guembelitra</i> sp1.					+	
166.	<i>Rosalina vilardeboana</i>					+	
167.	<i>Nonionella limbata-striata</i>					+	
168.	<i>Quinqueloculina crassa</i>					+	
169.	<i>Spiroloculina</i> sp9.					+	
170.	<i>Quinqueloculina cuvieriana</i>					+	
Planktonic Forms							
171.	<i>Globorotalia theyeri</i>	+					
172.	<i>Cymbaloporeta squamosa</i>	+					
173.	<i>Globorotalia inflata</i>	+					
174.	<i>Globorotalia</i> sp1.	+					
175.	<i>Gallitellia</i> sp1.	+					
176.	<i>Globoquadrina</i> sp1.	+					
177.	<i>Globorotalia tumida</i>	+					
178.	<i>Globorotalia anfracta</i>	+					
179.	<i>Globorotalia</i> sp2.	+					
180.	<i>Globorotalia</i> sp3.	+					
181.	<i>Orbulina universa</i>	+	+			+	+
182.	Unknown sp1.		+				
183.	<i>Sphaeroidinella</i> sp1.						+
184.	<i>Globorotalia anfracta</i>						+
185.	<i>Globorotalia</i> sp4.						+
186.	<i>Globorotalia</i> sp5.						+
187.	<i>Globorotalia hirsuta</i>				+		
188.	<i>Planorbulina meliderganensis</i>				+		
189.	<i>Cymbaloporeta bradyi</i>				+		

environments (Table 2.3). Of the eight genus, two genus are available only in Port Blair. When compare the species distribution it has been found out that more number of species are noticed in Little Andaman than Port Blair. Based on the inferences, it has been concluding that the Little Andaman environment shows more suitable for the foraminifera growth than Port Blair environment. This may be due to the more human interference than the Little Andaman. This less number of foraminifera may be due to the high anthropogenic interference on Port Blair sample stations.

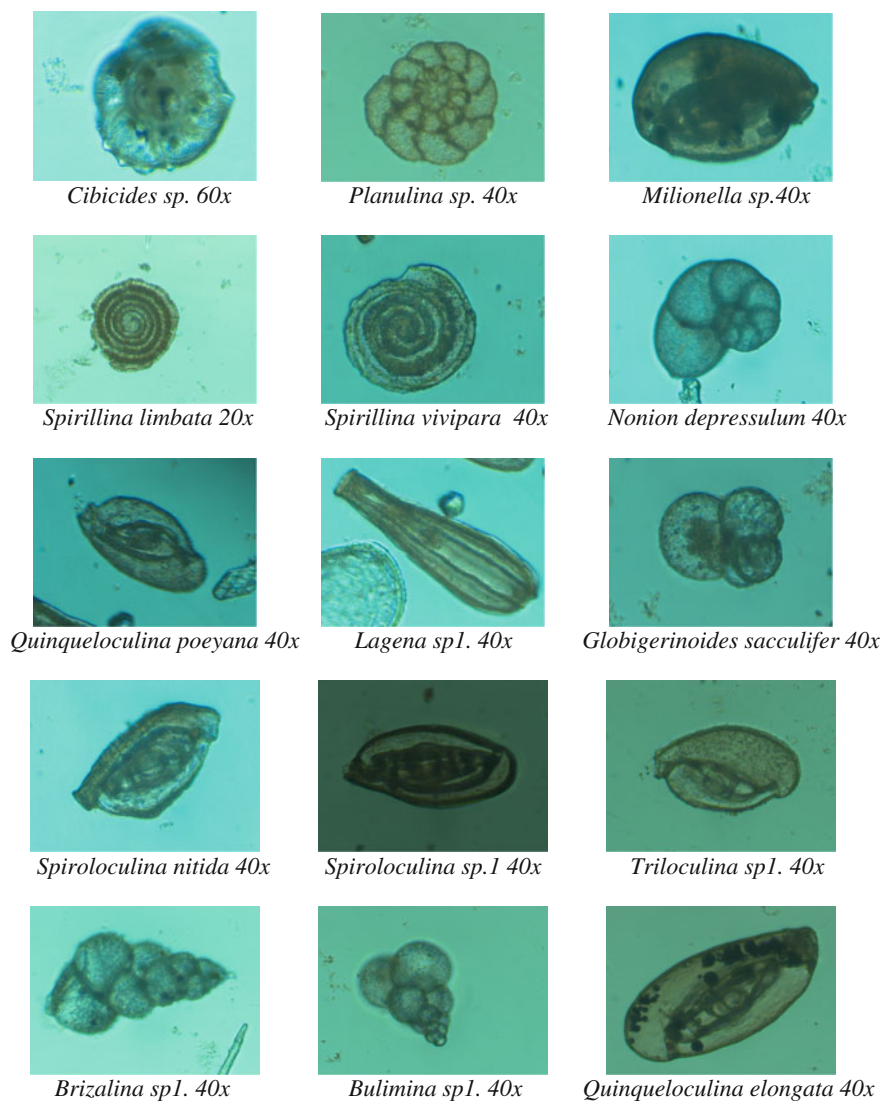
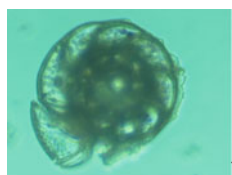
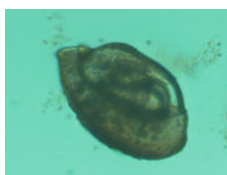


Fig. 2.2 Benthic foraminifera

The following species *Calcarina calcar*, *Cymbaloporella squamosa*, *Heterostegina depressa*, *Peneroplis* sp., and *Planorbulina distoma* are representing the coral reef environments (Rao et al. 1987). The genus *Peneroplis*, *Calcarina*, and *Heterostegina* are suggested that they are from the larger foraminifera, these larger foraminifera normally available in the habitat of sea grass and coralline algae (Rao et al. 1987). This also supports the habitat characters of Little Andaman and Port



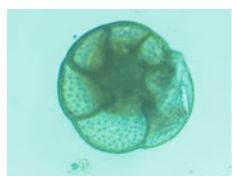
Osangularia sp1. 40x



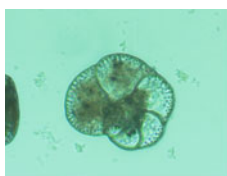
Edentostomina milletti 40x



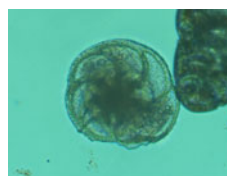
Spiroloculina orbis 40x



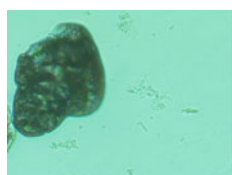
Rotalia translucens 40x



Rotalia vilardeboana 20x



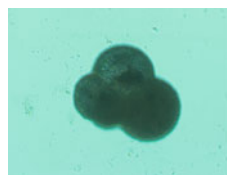
Rotalida sp1. 40x



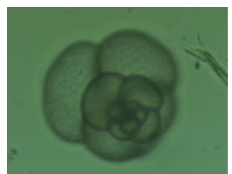
Bolivina sp1. 20x



Planorbulina sp1. 20x



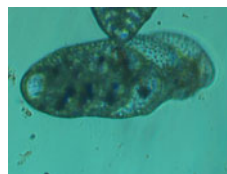
Globigerinoides ruber 20x



Globigerina bulloides 40x



Brizalina spathulata 40x



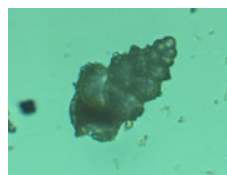
Brizalina alata 40x



Quinqueloculina bosciana 40x



Nonion grateloupi 20x



Reussella spinulosa 40x

Fig. 2.3 Benthic foraminifera

Blair. The genus *Peneroplis* existence in an environment suggests that the particular environment has more amount of calcium carbonate. This also supports these environments has more calcium carbonate in the sediments (Mohan et al. 2012). The *Planorbulina* genus availability in these environments suggests that this environment has rocky bottoms as well as dead shells.

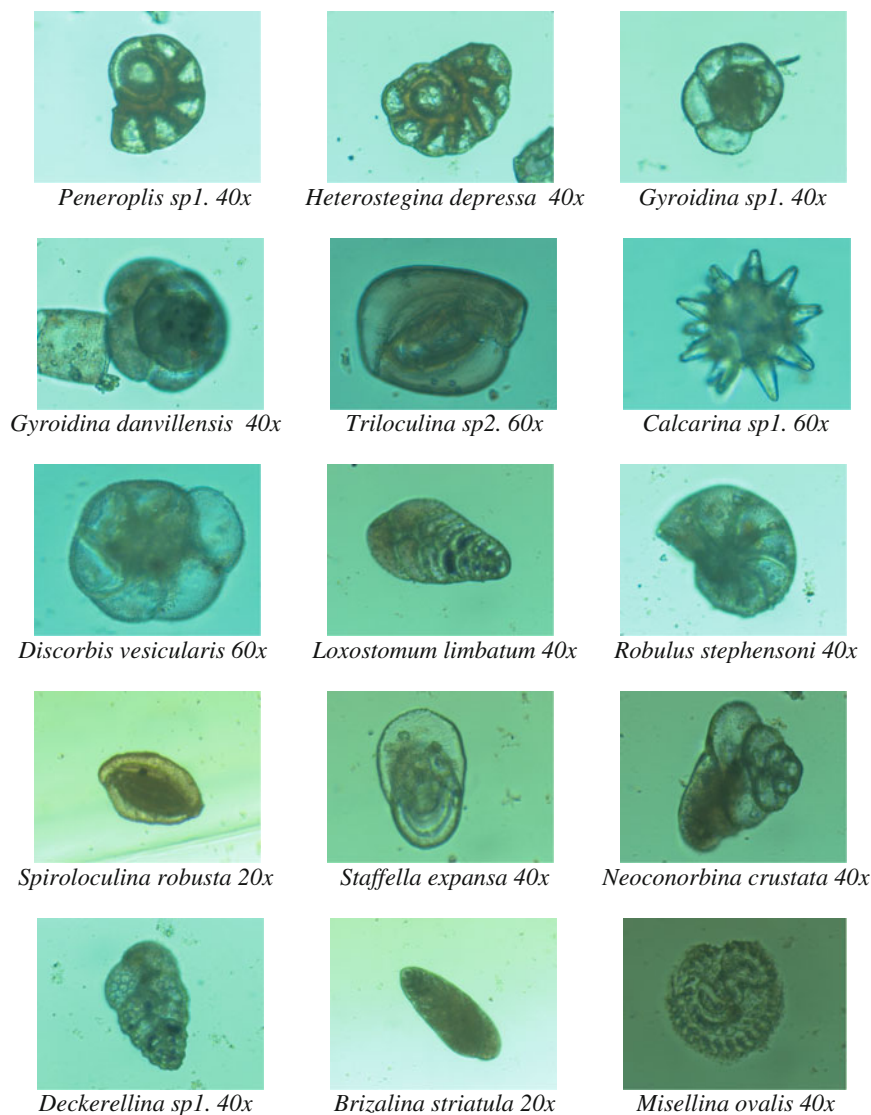


Fig. 2.4 Benthic foraminifera

The planktonic species *Globigerinoides ruber*, *G. sacculifer*, and *Orbulina universa* normally presents in the warm waters (Rao 1972). The presence of this species in these sediments suggests that these waters are in warm conditions. However, the availability of the cold water species *G. bulloides* in the Little Andaman sediments suggests that this species might be transported from the deeper and cold waters of off Little Andaman. Since, samples are collected from



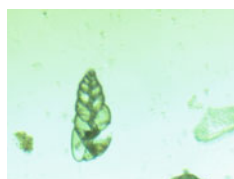
Unknown1 40x



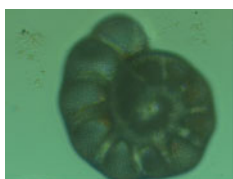
Lagena sp2. 20x



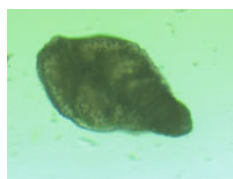
Lagena sp3. 20x



Boivina sp2. 20x



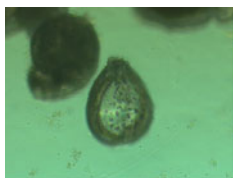
Gyroidina zelandica 40x



Bolivina toruosa 20x



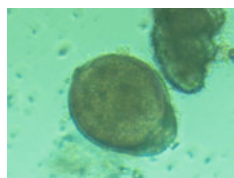
Siphonodosaria abyssorum 20x



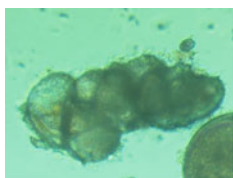
Fissurina lacunata 20x



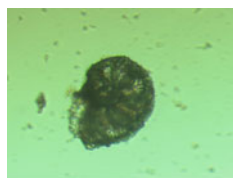
Bolivina sp3. 40x



Fissurina marginata 40x



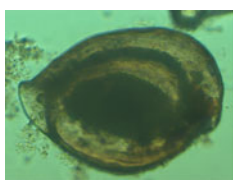
Karreriella sp1. 40x



Nonion pompiloides 20x



Ophthalmidium inconstans 40x

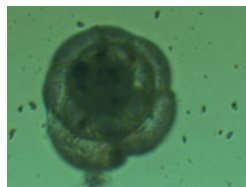
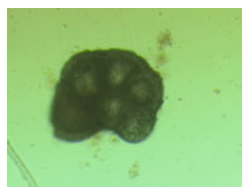


Spiroloculina sp2. 40x

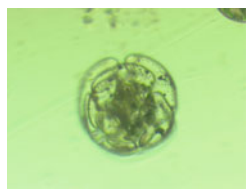
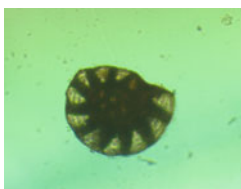
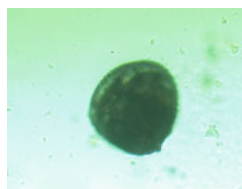
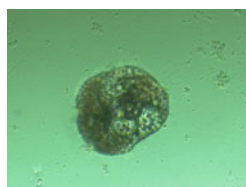
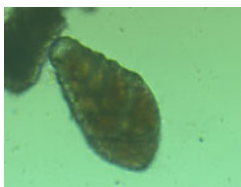
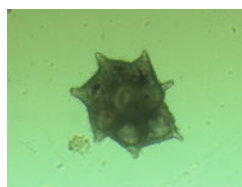
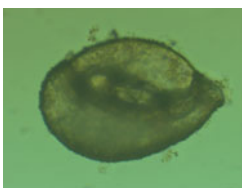
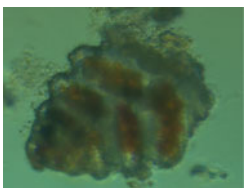
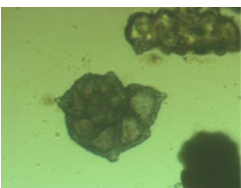
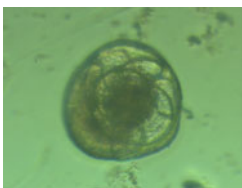


Spiroloculina corrugate 40x

Fig. 2.5 Benthic foraminifera

*Eponides broeckhianus* 40x*Elphidium texanum* 20x

Unknown 2 20x

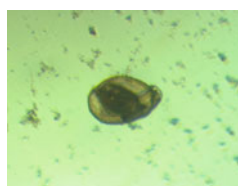
*Planorbulina distoma* 20x*Trifarina bradyi* 20x*Glabratella australensis* 20x*Rosalina bertheloti* 20x*Bolivina incrassata* 40x*Calcarina calcar* 20x*Bolivina hantkeniana* 20x*Calcarina* sp2. 40x*Triliculina oblonga* 40x*Brizalina* sp1. 60x*Calcarina* sp3. 20x*Cymbaloporeta squamosa* 40x**Fig. 2.6** Benthic foraminifera



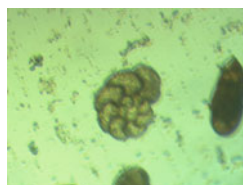
Planispirinella exiqua 40x



Quinqueloculina tasmanica 20x



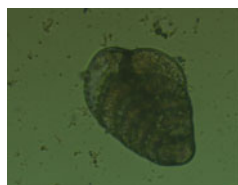
Pseudomassilina australis 20x



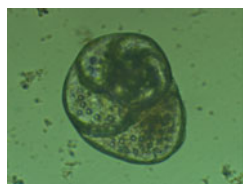
Nonion ibericum 20x



Quinqueloculina granulocostata 20x



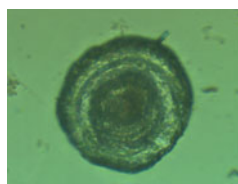
Bolivina rhomboidatis 20x



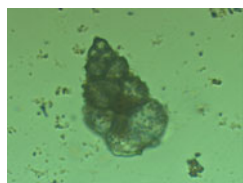
Heronallenia wilsoni 20x



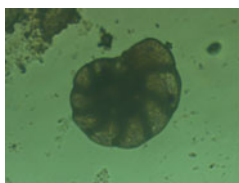
Entzia tetrastomella 20x



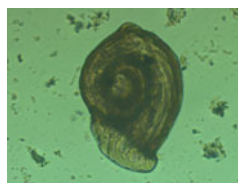
Spiroloculina sp3. 40x



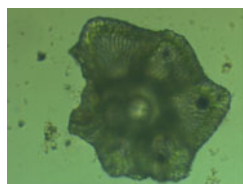
Karreriella baccata, 40x



Cibicides pseudoungerianus 40x



Articulina carinata 40x



Calcarina sp4. 40x

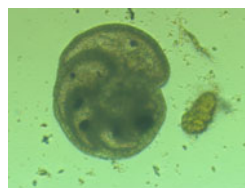
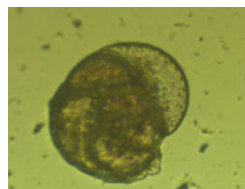
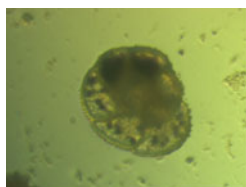
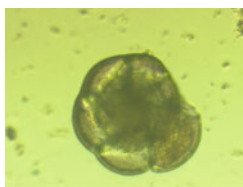


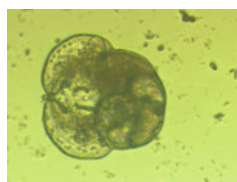
Nodosaria sp1. 20x



Spiroloculina sp4. 40x

Fig. 2.7 Benthic foraminifera

*Spiroloculina sp5.40x**Ordorsalis umbonatus 40x**Discorbinella sp1.40x**Miliammina sp1.20x**Truncatullina margaritifera 20x**Unknown3 20x**Quinqueloculina agglutinans 40x**Ammobaculites sp.40x**Elphidium clavatum 40x**Spiriloculina henbesti 40x**Bolivina limbata 20x**Robulus macrodiscus 40x**Asterigerina carinata 40x**Asterigerina sp1. 40x**Spiroloculina sp6.40x***Fig. 2.8** Benthic foraminifera



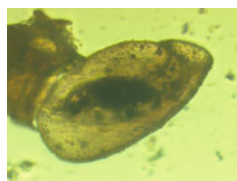
Unknown 4 40x



Cibicides lobatulus 40x



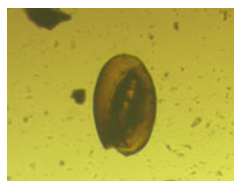
Quinqueloculina berthelotiana 40x



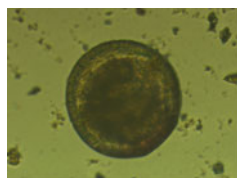
Triloculina sp3. 40x



Poroeponides sp1. 40x



Quinqueloculina laevigata 20x



Patellina sp1. 40x



Toriyamaia sp1. 40x



Discorbinella montereyensis 40x



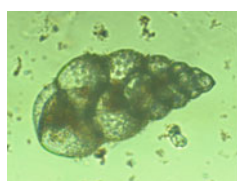
Bolivina vadeszens 40x



Rosalina flondana 40x



Globorotalia hirsute 40x



Textularia candeiana 40x



Quinqueloculina bicostata 40x

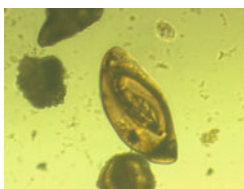


Quinqueloculina sp1. 40x

Fig. 2.9 Benthic foraminifera



Globigerina rubescens 40x



Miliolinella sp1. 40x



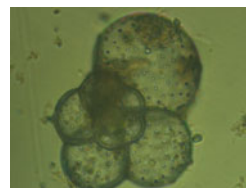
Triloculina sp4. 40x



Unknown 5 40x



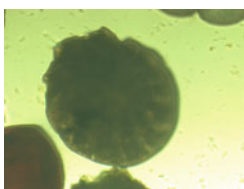
Unknown 6 40x



Orbulina universa 60x



Bulimina sp2. 40x



Elphidium claticulatum 20x



Triloculina sp5. 40x



Bulimina sp3. 20x



Buliminida sp4. 20x



Lagenella sp4. 40x



Lagenella sp5. 40x



Discorbinella sp2. 40x



Ophthalmidium sp1. 40x

Fig. 2.10 Benthic foraminifera



Quinqueloculina oblonga 40x



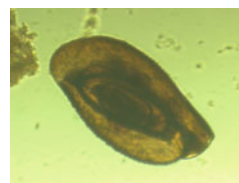
Miliammina oblonga 40x



Nonionella hantk 20x



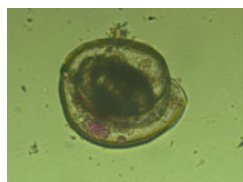
Spiroculina sp2. 40x



Quinqueloculina singletoni 10x



Spiroculina sp7. 40x



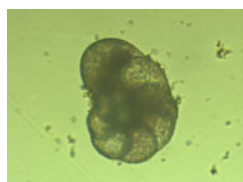
Spiroculina sp8. 40x



Quinqueloculina sp3. 40x



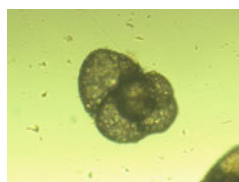
Rosalina globularis 60x



Cibicides refulgens 40x



Eponides repandus 40x



Globigerinata glutinata 20x



Bolivina compacta 40x

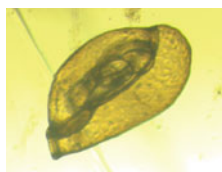


Textularia porrecta 20x



Lagena sp6. 40x

Fig. 2.11 Benthic foraminifera



*Quinqueloculina
seminulum* 20x



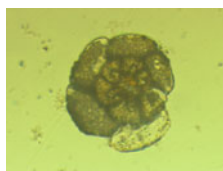
Alliatina sp1. 40x



Triloculina irregularis 60x



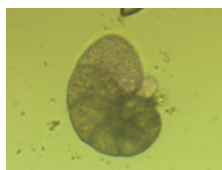
Eponides sp1. 60x



Turborotalia sp1. 40x



Quinqueloculina sp4. 20x



Nonion sp1. 40x



Spirillina sp1. 20x



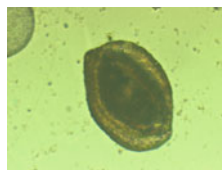
Rosalina bradyi 40x



Rosalina vadeszens 40x



Rosalina anomala 40x



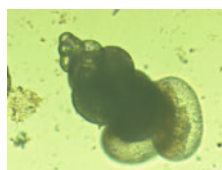
Quinqueloculina disparilis 40x



*Haplophragrnoides
canariensis* 40x



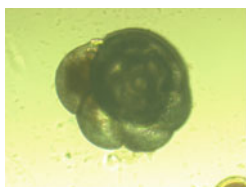
*Quinqueloculina
rhodiensis* 20x



Guembelitra sp1. 40x

Fig. 2.12 Benthic foraminifera

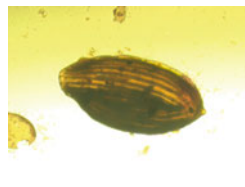
(a)



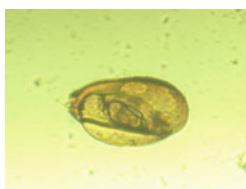
Rosalina vilardeboana 20x



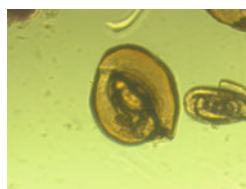
Nonionella limbata-striata 20x



Quinqueloculina crassa 10x



Spiroloculina sp9. 20x

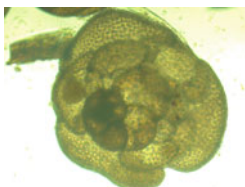


Quinqueloculina cuvieriana 20x

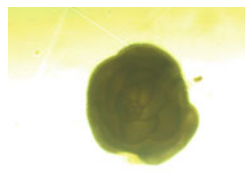
(b)



Globorotalia theyeri 20x



Cymbaloporeta squamosa 20x



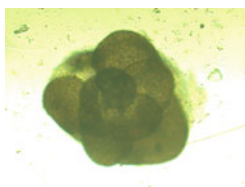
Globorotalia inflata 10x



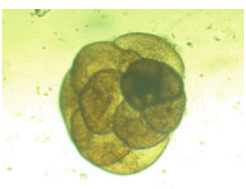
Globorotalia sp1. 20x



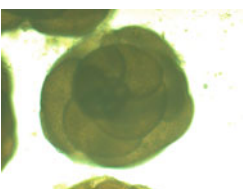
Gallitellia sp1. 20x



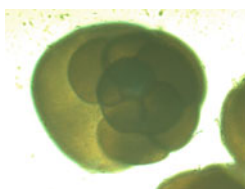
Globoquadrina sp1. 20x



Globorotalia tumida 20x



Globorotalia anfracta 20x



Globorotalia sp2. 20x

Fig. 2.13 a Benthic foraminifera. b Planktonic foraminifera

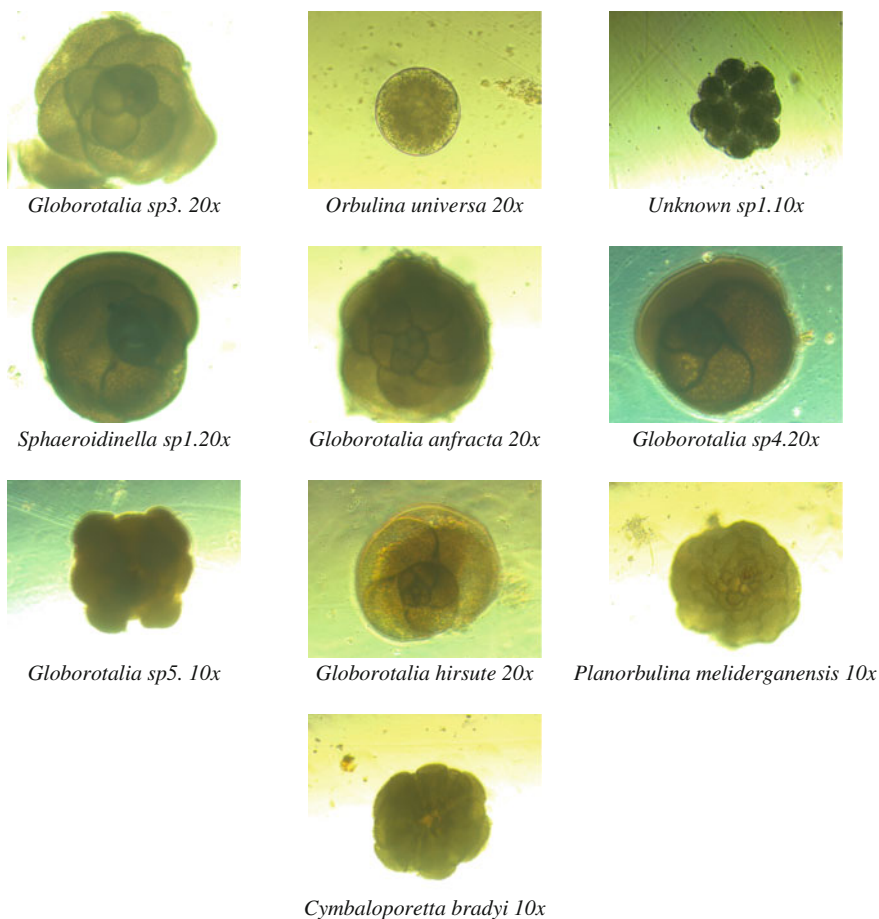


Fig. 2.14 Planktonic foraminifera

the nearshore environment, it may be considered the upwelling waters or some other process might be brought this species to the nearshore environment. The availabilities of the *G. ruber* in the sediments of Little Andaman suggest that this water may have high salinity than the Port Blair waters. Rao (1972) reported that the planktonic species of *G. ruber* normally available in the high saline environment. The genus *Planorbulina* and *Sphaeroidinella* are reported only in Port Blair waters.

The genus *Cymbaloporeta* is available in both benthic and planktonic forms. However, there is no report of this species as a planktonic form. The six numbers of unknown species of benthic and one number of planktonic foraminifera suggest some new species also occurred in these waters. A detailed study is essential on taxonomy to understand these species.

Table 2.3 Common species list of benthic foraminifera in Little Andaman and Port Blair

Sl. no.	Species	Little Andaman	Port Blair
1.	<i>Bolivina incrassata</i>	H3	P3
2.	<i>Brizalina</i> sp1.	H2	P2
3.	<i>Bulimina</i> sp1.	H1, 2	P1
4.	<i>Entzia tetrastomella</i>	H1	P1, 2
5.	<i>Eponides broeckhianus</i>	H3	P2
6.	<i>Heronallenia wilsoni</i>	H1	P1
7.	<i>Miliolinella</i> sp1.	H2	P1
8.	<i>Neoconorbina crustata</i>	H1, 2, 3	P3
9.	<i>Nonion depressulum</i>	H1, 2	P3
10.	<i>Ophthalmidium inconstans</i>	H1, 3	P1
11.	<i>Planispirinella exiqua</i>	H1	P2
12.	<i>Quinqueloculina bosciana</i>	H2	P1, 3
13.	<i>Quinqueloculina elongata</i>	H1, 2	P2
14.	<i>Quinqueloculina poeyana</i>	H2	P3
15.	<i>Reussella spinulosa</i>	H1,2	P2
16.	<i>Rosalina bertheloti</i>	H3	P1, 2, 3
17.	<i>Rotalia translucens</i>	H2	P2, 3
18.	<i>Spirillina limbata</i>	H1, 2	P1, 2, 3
19.	<i>Spiroloculina</i> sp1.	H3	P1
20.	<i>Spiroloculina</i> sp2.	H2	P3
21.	<i>Triloculina oblonga</i>	H1, 3	P2

H1—HOJ; H2—HBJ; H3—HNN; P1—OCC; P2—OMP; P3—OCJ

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