

RECENT BENTHIC FORAMINIFERA FROM THE LOCAL WATER OF QATAR, ARABIAN GULF

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دراسة الفورامينيفرا القاعية الحديثة في رواسب المياه الإقليمية القطرية

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تم تعريف خمسين نوعاً من الفورامينيفرا من رواسب القاع في المياه الإقليمية القطرية على الجانبين الشرقي والشمالي لشبه جزيرة قطر في الخليج العربي، وقد شملت سبعة أنواع تتبع تحت رتبة *Textulariina* ونوع واحد يتبع *Carterinina* (وهي نادرة التواجد في العينات المدروسة)، واثنين وثلاثين نوعاً تحت رتبة *Miliolina* وعشرة أنواع تتبع تحت رتبة *Rotaliina* وقد لوحظ أن *Miliolina* هي المجموعة الأكثر انتشاراً وتمثل 45,9% من الفورامينيفرا المعروفة، بينما تمثل *Rotaliina* 29,8% و *Textulariina* 24,3%، كما تم دراسة توزيع هذه الأنواع في العينات المدروسة وعددها أربعة وعشرون عينة موزعة في منطقة يتراوح عمقها بين عدة أمتار قليلة قرب الشاطئ وأكثر من ستة وثلاثين متراً نحو وسط الخليج، وقد نوقشت العلاقة بين توزيع الفورامينيفرا في منطقة الدراسة والعوامل البيئية المؤثرة في هذا التوزيع، كما أجريت مقارنة بين مجموعة الفورامينيفرا المسجلة في هذه الدراسة ومجموعات الفورامينيفرا المسجلة في بعض مناطق الخليج العربي والبحر الأحمر وخليج العقبة.

Key Words : Recent Foraminifera, foraminiferal ecology, Qatar Peninsula.

ABSTRACT

In the present study, fifty species of Foraminifera are identified from the bottom sediments of the local Qatari waters on the eastern and northern sides of Qatar Peninsula in the Arabian Gulf. These comprise 7 species of *Textulariina*, one species of *Carterinina*, 32 species of *Miliolina* and 10 species of *Rotaliina*. *Miliolina* constitutes the most frequent group as it represents 45.9% of the fauna, while *Textulariina* represents 24.3% and *Rotaliina* 29.8%. The distribution of the identified species in 24 studied bottom grab samples distributed in an area ranging in depth from few meters near shore to more than 20 fathoms (36m) depth are studied. The ecological factors controlling the distribution of the identified fauna are discussed. A comparison between that fauna and those in some parts of the Arabian Gulf, Red Sea and Gulf of Aqaba is attempted.

INTRODUCTION

The Recent Foraminifera of the Arabian shores were studied previously by many authors. The important studies are those of Said (1949, 1950) on the Red Sea; Houbolt (1957) on the Persian Gulf near Qatar; Murray (1965 a & b, 1966 a, b & c and 1973) on some parts of the Trucial Coast; Bahafzallah (1979) on Jiddah Bay (Red Sea-Saudi Arabia); El-Nakhal (1980 a & b) on the shores of Yemen Arab Republic; Basha (1983) on Jordanian part of Gulf of Aqaba; Anan (1984) on Quseir-Marsa Alam area on Red Sea Coast, Egypt; El-Deeb (1990 & 1992) on United Arab Emirates.

The aim of the present work is to study the Recent benthic Foraminifera on the eastern and northern sides of the Qatar Peninsula. The distribution of this fauna is shown on figure (2). The relations between the prevailing ecological parameters and the distribution of the fauna are discussed. A comparison between this assemblage and those recorded in some surroundings areas are shown, (fig. 5). A triangular plot for the studied samples is given on fig.4.

METHODS OF STUDY

Twenty-four bottom samples have been collected from the area of the local Qatari waters on the eastern and northern sides of the Qatar Peninsula. These samples were taken along six lines, starting from the shore line towards the deeper waters of the gulf, and covering the area from east Umm Said to north of Al-Ruwais (Fig.1). The study area covers about 100km around the peninsula on the eastern and northern sides. The depth in the study area ranges from a few meters near the shore to more than 36m towards the basin. The studied samples are grab samples and were collected by the Marine Lab. of Qatar University. One-hundred grams of each sample were washed over a set of three sieves (60-120-200 meshes) to study and count their benthonic foraminiferal content. Samples are not stained. Selected species are photographed on the SEM and shown on plates 1-2.

TAXONOMY

The identified 50 foraminiferal species are arranged according to the scheme of Loeblich and Tappan (1988) and shown on Table (1).

DISTRIBUTION OF THE STUDIED FAUNA

The ecological parameters of the southern part of the Arabian Gulf was studied by Purser and Seibold (1973). According to these authors, the east area of Qatar Peninsula is a broad, shallow area (depth 10-20 m) studded with numerous

sholas and salt-dome islands. This area is affected by strong north winds and high air temperatures (45°– 50°C). The surface salinity in the studied area is about 40 – 50‰ or more in the remote lagoons and coastal embayments. The water temperatures can fluctuate between 40°C in summer and 15°C in winter, seasonal variations being less marked in the deeper parts of the basin.

Murray (1973) considered the Persian Gulf as a hypersaline shallow land-locked shelf sea marked by low diversity fauna, and he was of the opinion that it needed to be investigated much more because of its great geological importance.

The foraminiferal contents of 24 bottom sediment samples are studied and shown on fig.2. Percentages of suborders Textulariina, Miliolina and Rotaliina in each of the studied samples are shown on fig.3. A triangular plot for the studied samples is shown on fig.4. The occurrence ratios and comparison between the studied assemblage and those in some parts of the Red Sea and in north Gulf of Aqaba are shown on fig. (5).

The overall distribution of the studied fauna enables the following general observations:

- The Suborder Miliolina is the main group in this fauna and represents 45.9%, while the Textulariina represents 24.3% and Rotaliina 29.8%.
- The number of species, which reflects the diversity of the fauna varies between three species in sample 502b and 18 species in sample 502.
- The sloping sea floor in the studied area, which is a part of the Arabian Homocline, is characterized by a great variety of marine highs and depressions (Purser, 1973). This great variation in the bathymetry of the basin reflects greatly on the distribution of foraminifera, as in the deeper parts of the basin there are some highs changing it to shallower environment.

The most frequent species are *Textularia foliacea* (13.5%), *Operculina costata* (12.2%), *Spiroloculina manifesta* (9.5%), *Ammonia beccarii* (8.2%), *Triloculina tricarinata* (7.2%), *Triloculina affinis* (6.9%), *Textularia* sp. (6.3%), *Spiroloculina clara* (4.2%), *Quinqueloculina granulocostata* (3.3%), *Amphistegina lessonii* (3.0%), *Textularia lateralis* (2.8%), *Quinqueloculina plicosa* (2.3%) and *Peneroplis planatus* (2.1%), (fig.5). These thirteen species represent about 81.5% of the identified individuals.

At the genus level, the most frequent genera are *Textularia* (24.0%), *Triloculina* (18.4%), *Spiroloculina*

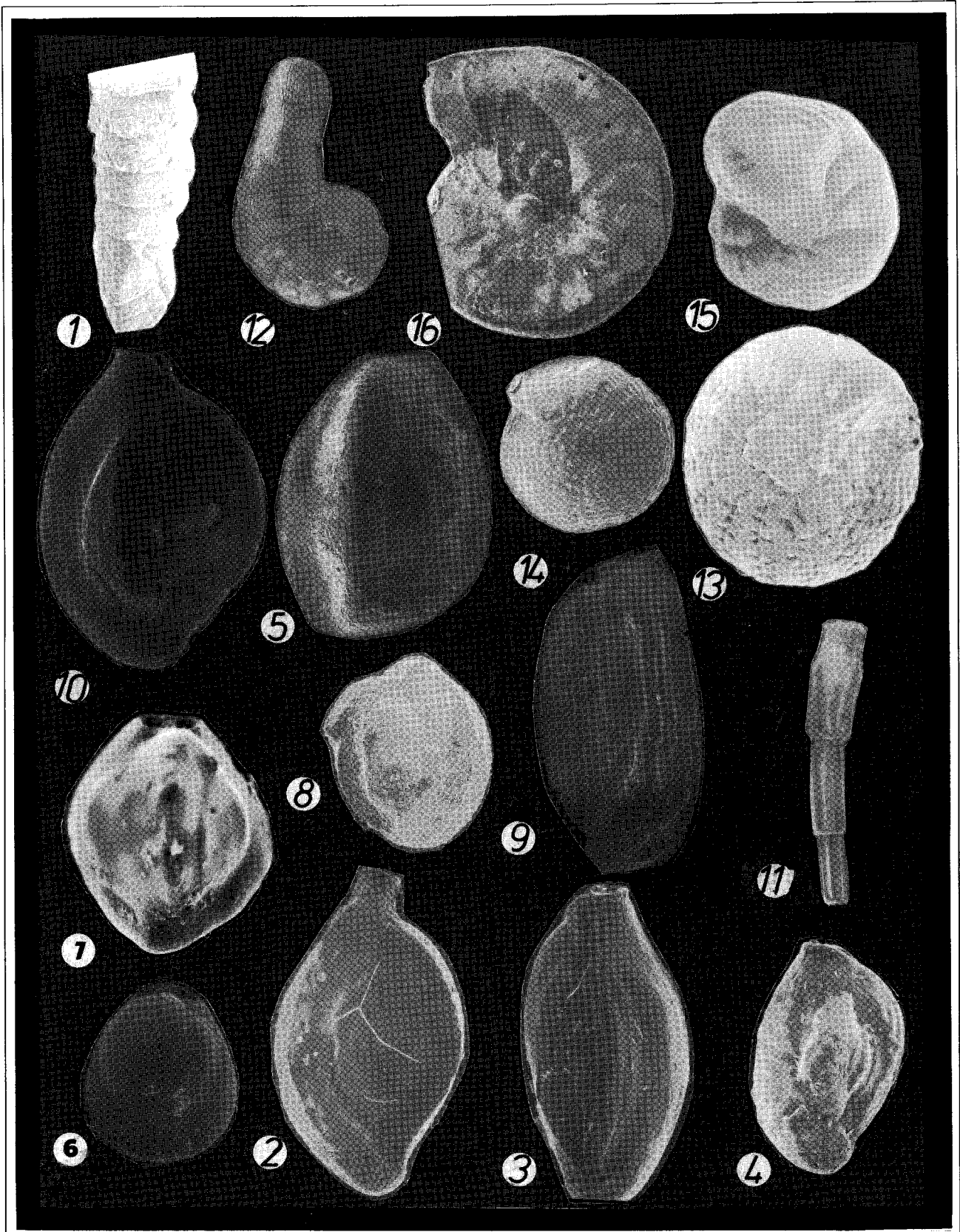


Plate 1: 1. *Clavulina angularis* d'Orbigny, X100; 2. *Spiroloculina manifesta* Cushman, X70; 3. *Quinqueloculina disparilis* d'Orbigny, X100; 4. *Quinqueloculina parkeri* Brady, 100; 5. *Pyrgo anomala* (Schlumberger), X150; 6. *Pyrgo* sp., X150; 7. *Triloculina trigonula* (Lamarck), X10; 8. *Triloculina neoinflata* El-Nakhal, X100; 9. *Triloculina oblonga* (Montagu), X100; 10. *Triloculina tricarinata* d'Orbigny, X100; 11. *Articulina sagra* d'Orbigny, X100; 12. *Spirolina arietina* (Batch.) X100; 13. *Ammonia beccarii* (Linne), X100; 14. *Elphidium crispum* Linne, X70; 15. *Cribrononion* sp., X150; 16. *Operculina costata* (d'Orbigny), X45.

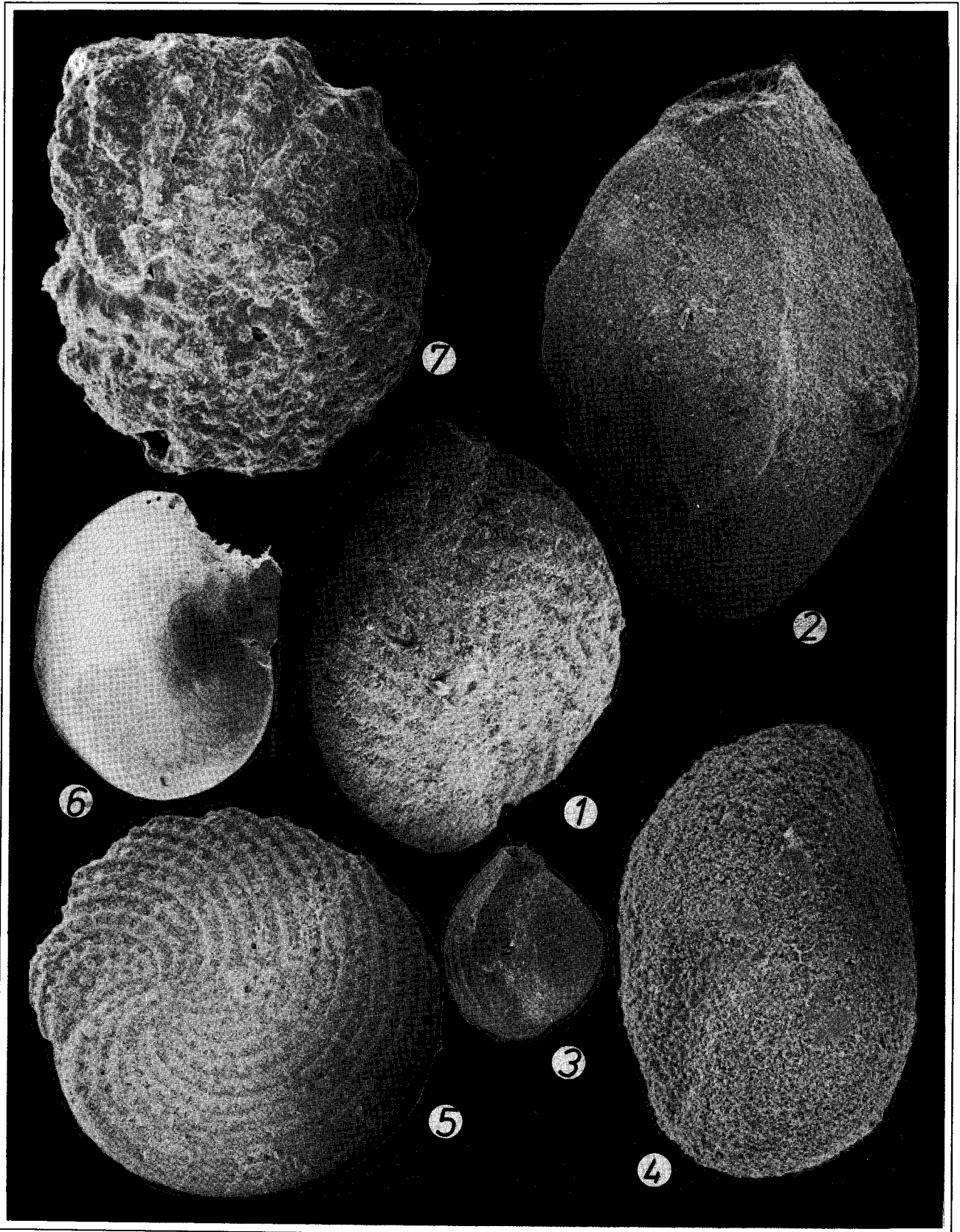


Plate 2: 1. *Quinqueloculina philippinensis* Parr, X140; 2. *Triloculina linneiana* d'Orbigny, X200; 3. *Triloculina trigonula* (Lamarck), X50; 4. *Triloculina trihedra* Loeblich and Tappan, X150; 5. *Peneroplis planatus* Fichtel and Moll, X90; 6. *Amphistegina lessonii* d'Orbigny, X45; 7. *Cribrononion frigidum* (Cushman), X140.

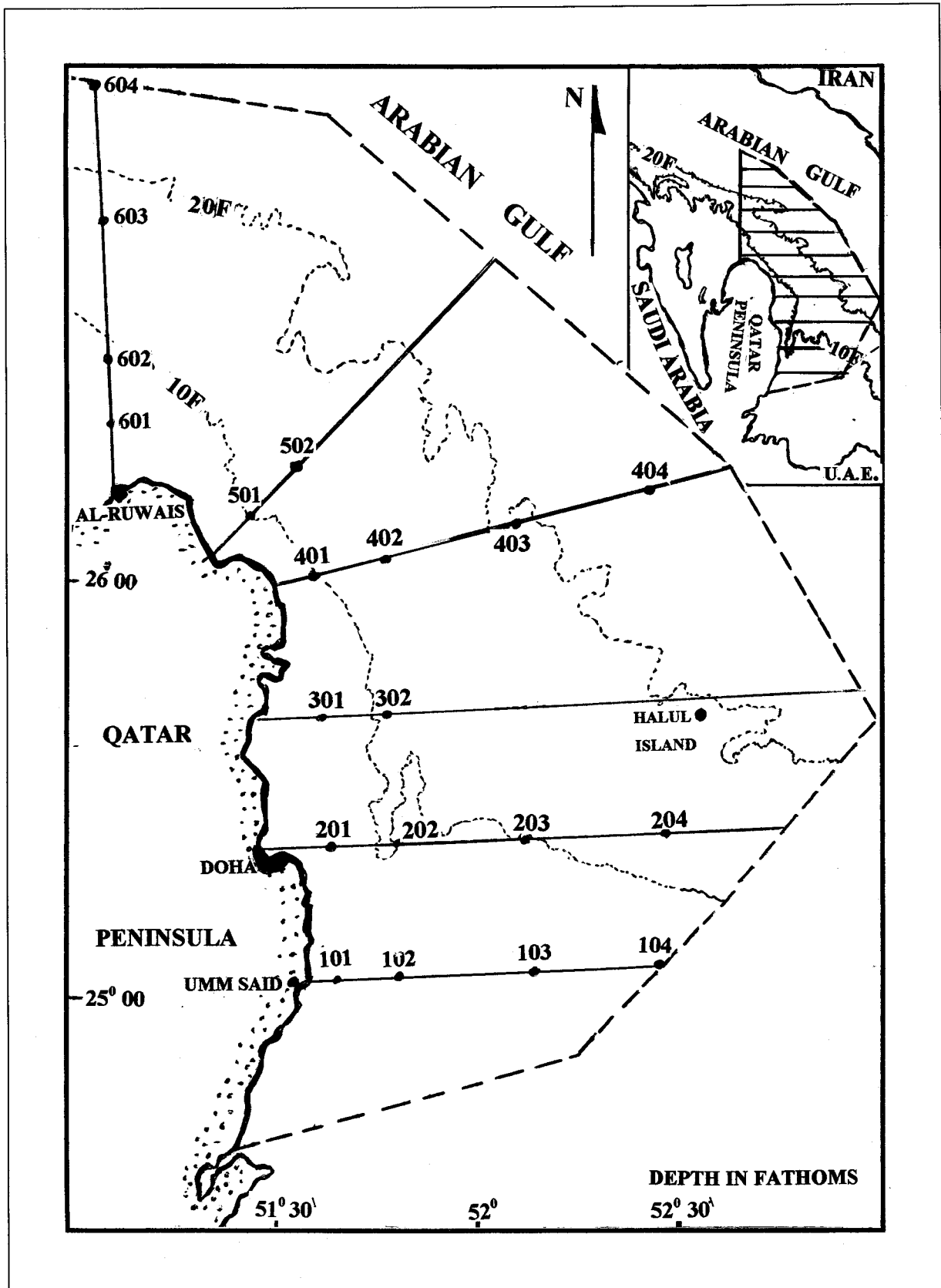


Figure 1: Location Map of the Study Area.

(13.7%), *Operculina* (12.2%), *Quinqueloculina* (9.6%), *Ammonia* (8.2%), *Amphistegina* (3.0%), *Asterigerina* (3.0%) and *Peneroplis* (2.1%), (fig.5). These nine genera represent about 94.2% of the identified individuals.

The areal distribution of the fauna, shows that *Textularia foliacea*, *Spiroloculina manifesta*, *Ammonia beccarii* and *Elphidium crispum* are distributed in different sites of the area. *Amphistegina lessonii*, *Asterigerina simplex*, *Bolivina* sp., *Carterina spiculotesta*, *Gaudryina* sp. *Cibicides* sp., *Clavulina angularis*, *Glomospira* sp., *Operculina costata* and *Spiroloculina clara* are found only in the northern part of the area, which is deeper and more open to the sea, (fig.2).

The following elements are recorded – mainly-in the shallower parts (in the southern part and near shore in the northern part) of the study area: *Peneroplis planatus*, *Quinqueloculina* spp., *Spirolina arietina* and *Triloculina* spp.

The triangular plot for the 24 studied samples (fig.4) shows that it is possible to arrange the different samples in four groups. Each group includes samples from different lines having the same depth. These groups are: (101, 201, 501,601), 102,202, 302, 302a, 402, 502), (103, 403, 603) and (404,604). These four groups reflect the change in the composition of the foraminiferal assemblages with increasing depth from the shore towards the sea. Some samples are scattered out of this general distribution and may reflect the depth anomalies of the sea floor in the study area. A comparison between this triangular plot and the triangular plots of environments discussed by Murray (1973) shows some similarities with hypersaline lagoons, beaches, mangrove swamps and shallow epicontinental seas.

Comparison of the studied fauna with those in the neighboring areas

A comparison of the studied foraminiferal assemblage with some foraminiferal assemblages in neighbouring areas is shown on fig.5. Of the 50 foraminiferal species identified in the studied area, 16 species were recorded in U.A.E. shores (El-Deeb, 1992). These species were recorded from the shallow shore area of U.A.E. with maximum depth 1.5m, and are recorded with similar ratios in the southern shallower part of

the study area. Exceptions are *Ammonia beccarii* which is slightly more frequent in our area, and *Peneroplis planatus* which is less frequent, (fig.5). Four deeper species were not recorded by El-Deeb (1992) due to the limited depth range of his samples (all his samples are coastal samples, while our samples are distributed in an area ranging in depth from the shore line to more than 20 fathoms). The similarity with the Red Sea is limited, as only 6 species from our 50 species were recorded by Bahafzallah (1979) from Jiddah Bay (east coast of the Red Sea), Saudi Arabia. On the other side of the Red Sea, in Qusier-Marsa Alam stretch (Egypt), Anan (1984) identified 50 species of Foraminifera, of these only 9 species are recorded in the deeper parts of our area. There is a great variation in the percentages of the recorded species in the two areas, (fig.5). The ratios of the three main suborders Textulariina-Miliolina – Rotaliina were 2.89-74.52.58 in Quseir-Marsa Alam area, while they are 24.3-45.9-29.8 off Qatar. A comparison with north Gulf of Aqaba, which was studied by Basha (1983) reveals that only 11 species are found in common between the two areas. All of these species are recorded in the deeper samples of our area and none of them are *Quinqueloculina* or *Triloculina*.

The studies of Murray (1965 a&b, 1966 a,b&c) on shallow waters and hypersaline lagoons and shoal environments in some parts of the Trucial Coast area showed a great similarity with the fauna recorded in the shallower southern samples in our study area, (fig. 2&5).

The genus *Quinqueloculina* and its allied species were the target of detailed studies by Cherif (1973) in northeastern part of the Mediterranean Sea, El-Nakhal (1980) in southeastern Red Sea (Yemen Arab Republic shores) and El-Deeb (1990) in southeastern coast of the Arabian Gulf (U.A.E. shores). El-Deeb (1990) compared the results of these studies and reached the conclusion that there is a great similarity between the frequencies of the quinqueloculine species of the Arabian Gulf area and those of the northeastern part of the Mediterranean Sea, while this similarity is less marked with the fauna of the Red Sea localities. This conclusion is supported in the present study.

FORAMINIFERAL SPECIES	SAMPLE STATIONS																								
	100				200				300				400				500				600				
	1	2	3	4	1	2	3	4	1	2	2	2	1	2	2	3	4	1	2	2	2	1	2	3	4
1- <i>Ammonia beccarii</i>			+				+				+					+	+								
2- <i>Amphistegina lessonii</i>																									
3- <i>Articulina sagra</i>			+																						
4- <i>Asterigerina simplex</i>											+				+										
5- <i>Bolivina sp.</i>																									
6- <i>Carterina spiculotesta</i>															+					+	+				
7- <i>Cibicides sp.</i>															+										
8- <i>Clavulina angularis</i>																				+					
9- <i>Cribrononion frigidum</i>											+	+													
10- <i>Cribrononion sp.</i>																									
11- <i>Elphidium crispum</i>	+										+									+	+	+	+		
12- <i>Eponoides barthelotianus</i>																									
13- <i>Gaudryina sp.</i>																									
14- <i>Glomospira sp.</i>																									
15- <i>Operculina costata</i>			+								+	+	+							+	+				
16- <i>Peneroplis planatus</i>	+	+		+							+													+	+
17- <i>Pyrgo anomala</i>											+														
18- <i>Pyrgo sp.</i>																									
19- <i>Quinqueloculina disparilis</i>			+																						
20- <i>Q. distorta</i>															+										
21- <i>Q. granulocostata</i>																									
22- <i>Q. lata</i>			+																						
23- <i>Q. lamarckiana</i>																									
24- <i>Q. parkeri</i>				+				+																	
25- <i>Q. philippinensis</i>											+														
26- <i>Q. plicosa</i>	+										+	+													
27- <i>Q. polygona</i>			+					+																	
28- <i>Q. rugosa</i>																									
39- <i>Q. subdecorata</i>			+																						
30- <i>Sigmoilina edwardsi</i>											+	+													
31- <i>Spiroloculina manifesta</i>	+		+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
32- <i>Spiroloculina clara</i>				+			+			+	+	+	+	+	+	+	+	+	+	+	+	+	+		
33- <i>Spirolina arietina</i>			+	+																					
34- <i>Textularia foliacea</i>	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
35- <i>Textularia lateralis</i>							+	+	+	+	+											+			+
36- <i>Textularia rugosa</i>											+		+												
37- <i>Textularia sp.</i>											+		+	+	+	+	+	+	+	+					
38- <i>Triloculina affinis</i>			+		+	+				+	+							+	+	+	+				
39- <i>T. howchini</i>				+		+																			
40- <i>T. linneiana</i>																									
41- <i>T. neoinflata</i>			+																						
42- <i>T. oblonga</i>	+																								
43- <i>T. quadrata</i>				+																					
44- <i>T. reversaformis</i>				+																					
45- <i>T. rotundata</i>							+																		
46- <i>T. subramulata</i>				+																					
47- <i>T. tricarinata</i>	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
48- <i>T. trigonula</i>							+																		
49- <i>T. trihedra</i>															+										
50- <i>T. tubiformis</i>											+														

Figure 2: Distribution chart of the identified foraminiferal species in the studied area.

Recent benthic foraminifera from the local water of Qatar, Arabian Gulf

STATION	TEXRULIRIINA	MILIOLINA	ROTALIINA	NO.OF SPECIES
101	7.3	88.2	4.5	7
102	46.7	43.3	10.0	4
103	7.7	55.8	36.5	12
104	--	100	--	10
201	2.8	97.2	--	5
202	24.3	35.5	40.2	8
203*	46.7	53.3	--	5
204	13.0	80.0	7.0	13
301	90.0	8.0	2.0	7
302	32.0	36.0	32.0	8
302a	34.4	46.9	18.8	13
401	14.3	85.7	--	6
402	46.7	21.9	31.4	10
402a	6.0	94.0	--	4
403	10.5	46.2	43.3	8
404	28.4	24.7	46.9	9
501	4.4	77.8	17.8	11
502	37.1	25.8	37.1	18
502a	9.6	7.7	82.7	6
502b*	57.1	28.6	14.3	3
601	13.5	67.6	18.9	8
602*	---	87.8	12.5	4
603	19.5	29.8	50.7	12
604	31.0	10.3	58.7	10
AVERAGE	24.3	45.9	29.8	
AVERAGE of W.Red Sea (Anan,1984)	2.89	74.52	22.58	

* samples with few foraminiferal number (less than 20 individuals in the sample).

□ DEPTH TO 10 F □ DEPTH 10-20 F ▨ DEPTH > 20 F.

Figure 3: Percentages of the three foraminifera suborders and number of species in different studied samples.

ACKNOWLEDGEMENT

The author wishes to thank the Department of Oceanography, Qatar University for providing the samples of the present study. Sincere thanks are extended to Prof. Abdel Galil Hewaidy, Al-Azhar University for reading the manuscript and critical discussions.

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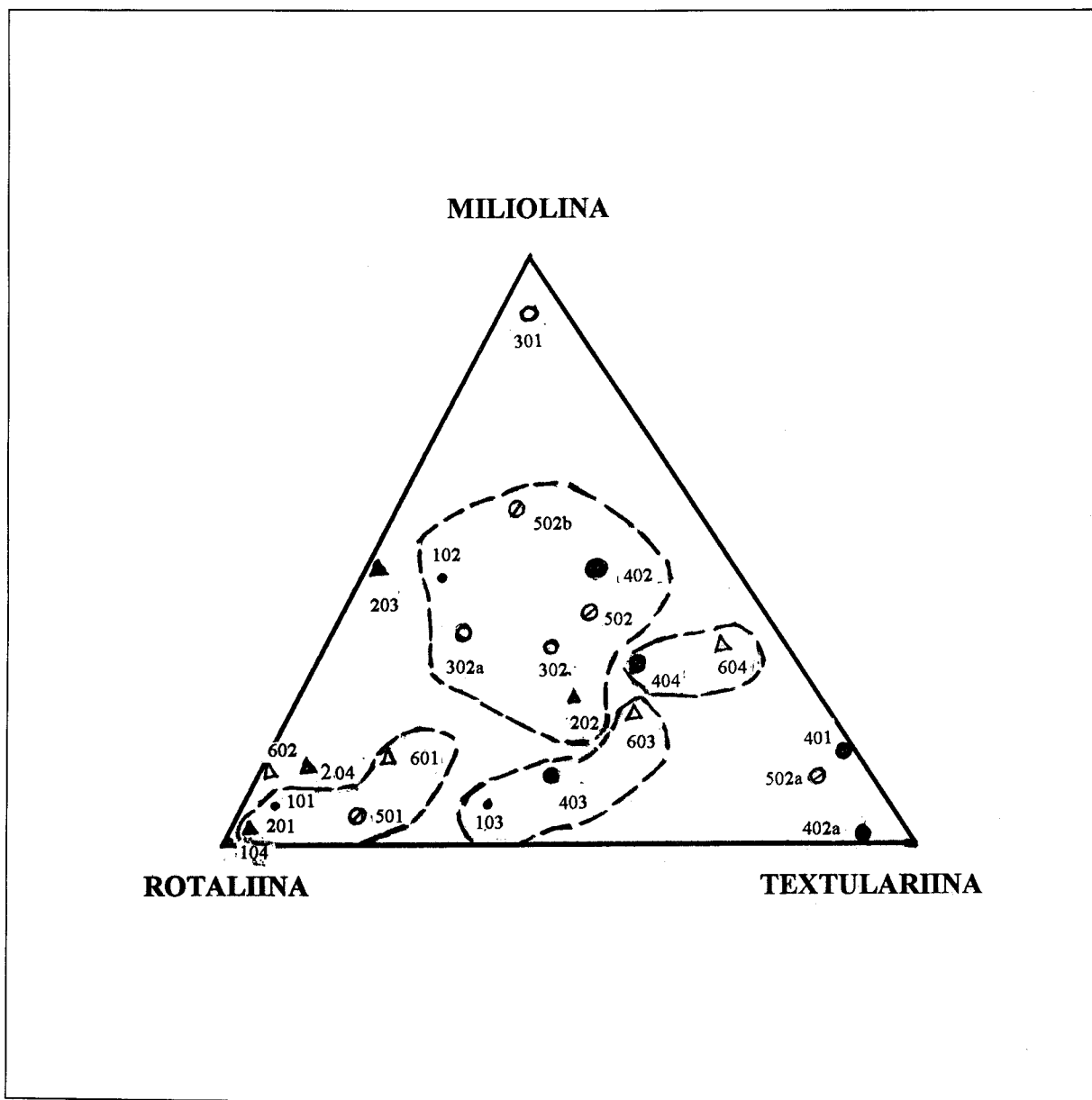


Figure 4: Triangular plots of Qatar samples.

FORAMINIFERAL SPECIES	Present Study	U. A. E. El-Deeb,92	Jiddah Bay Bahafzallah,79	Quseir area Anan, 84	Gulf of Aqaba Basha,83	
1- <i>Ammonia beccarii</i> (Linne)	8.2	5.8	+	1.5	+	
2- <i>Amphistegina lessonii</i> DOrbigny	3.0				+	
3- <i>Articulina sagra</i> D Orbigny	0.1	0.5				
4- <i>Asterigerina simplex</i> DOrbigny	3.0				+	
5- <i>Bolivina</i> sp.	0.3					
6- <i>Carterina spiculotesta</i> (Carter)	0.2			0.15		
7- <i>Cibicides</i> sp.	1.2					
8- <i>Clavulina angularis</i> DOrbigny	0.1	0.6		1.17	+	
9- <i>Cribronion frigidum</i> (Cushman)	0.1	0.2		1.41		
10- <i>Cribronion</i> sp.	0.2					
11- <i>Elphidium crispum</i> Linne	1.2	0.2		2.19	+	
12- <i>Eponoides berthelotianus</i> (DOrbigny)	0.2					
13- <i>Gaudryina</i> sp.	0.1					
14- <i>Glomospira</i> sp.	0.1					
15- <i>Operculina costata</i> (DOrbigny)	12.2				+	
16- <i>Peneroplis planatus</i> Fichtel&Moll	2.1	14.2	+	26.67	+	
17- <i>Pyrgo anomala</i> (Schlumberger)	0.2					
18- <i>Pyrgo</i> sp.	0.1					
19- <i>Quinqueloculina disparilis</i> DOrbigny	0.5	0.2				
20- <i>O. distraeta</i> Cushman	0.3	0.3				
21- <i>O. granulocostata</i> Germeraad	3.3					
22- <i>O. lata</i> Terquem	0.4					
23- <i>O. lamarckiana</i> DOrbigny	0.5	0.7		1.9		
24- <i>O. parkeri</i> Brady	0.5					
25- <i>O. philippinensis</i> Parr	0.3	0.5				
26- <i>O. plicosa</i> Cosia	2.3	0.2				
27- <i>O. polygona</i> DOrbigny	0.5	0.2				
28- <i>O. rugosa</i> DOrbigny	0.5					
29- <i>O. subdecorata</i> El-Nakhal	0.5					
30- <i>Sigmolina edwardsi</i> (Schlumberger)	1.2					
31- <i>Spiroloculina manifesta</i> Cushman	9.5				+	
32- <i>S. clara</i> Cushman	4.2					
33- <i>Spirolina arietina</i> (Batch)	0.5	0.5	+	0.8	+	
34- <i>Text. foliacea</i> Heron-Allen & Earland	13.5	0.3		0.19	+	
35- <i>T. lateralis</i> Lalicker	2.8					
36- <i>T. rugosa</i> (Reuss)	1.4					
37- <i>T. sp.</i>	6.3					
38- <i>Triloculina affinis</i> DOrbigny	6.9		+			
39- <i>T. howchini</i> Schlumberger	0.2					
40- <i>T. linneiana</i> DOrbigny	0.5					
41- <i>T. meoinflata</i> El-Nakhal	1.0	0.2				
42- <i>T. oblonga</i> (Montagu)	0.2		+			
43- <i>T. quadrata</i> Colline	0.7					
44- <i>T. reversaformis</i> El-Nakhal	0.4					
45- <i>T. rotundata</i> DOrbigny	0.5	0.6				
46- <i>T. subgranulata</i> Cushman	0.3					
47- <i>T. tricarinata</i> DOrbigny	7.2					
48- <i>T. trigonula</i> (Lamarck)	0.3		+			
49- <i>T. trihedra</i> Loeblich and Tappan	0.1					
50- <i>T. tubiformis</i> Yabe & Asano	0.1	50	16	6	9	11

Figure 5: Occurrence ratios and comparison between the foraminiferal assemblages of the study area and some neighboring areas.

Table 1: The identified foraminiferal species arranged according to the scheme of Loeblich and Tappan (1988)

Suborder	Superfamily	Family	Subfamily	Genus	Species	NO
Textulariina	Ammodiscacea	Ammodiscidae	Ammovertellinae	<i>Glomospira</i>	sp.	1
Dlage&	Reuss	Reuss	Saidova	Rzehak		
Herouard	1862	1862	1981	1885		
1896	Verneulinacea	Verneulinidae	Verneulininae	<i>Gaudryina</i>	sp.	2
	Cushman	Cushman	Cushman	DOrbigny		
	1911	1911	1911	1839		
	Textulariaceae	Textulariidae	Textulariinae	<i>Textularia</i>	<i>foliacea</i>	3
	Ehrenberg	Ehrenberg	Ehrenberg	Defrance	<i>lateralis</i>	4
	1838	1838	1838	1824	<i>rugosa</i>	5
					sp.	6
		Valvulinidae	Valvulininae	<i>Clavulina</i>	<i>angularis</i>	7
		Barthelin	Barthelin	DOrbigny		
		1880	1880	1826		
Carterinina		Carterinidae		<i>Carterina</i>	<i>spiculotesta</i>	8
Loeblich and		Loeblich and		Brady		
Tappan		Tappan		1884		
1981		1955				
Miliolina	Miliolacea	Spiroloculinidae		<i>Spiroloculina</i>	<i>manifesta</i>	9
Delage &	Ehrenberg	Wiesner,		DOrbigny	<i>clara</i>	10
Herouard	1839	1920		1826		
1896		Hauerinidae	Hauerininae	<i>Quinqueloculina</i>	<i>disparilis</i>	11
		Schwager	Schwager	DOrbigny	<i>distrqueta</i>	12
		1876	1876	1826	<i>granulocostatat</i>	13
					<i>lata</i>	14
					<i>lamarckiana</i>	15
					<i>parkeri</i>	16
					<i>philippinensis</i>	17
					<i>plicosa</i>	18
					<i>polygona</i>	19
					<i>rugosa</i>	20
					<i>subdecorata</i>	21
			Miliolinellinae	<i>Pyrgo</i>	<i>anomala</i>	22
			Vella	Defrance,	sp	23
			1957	1824		
				<i>Triloculina</i>	<i>affinis</i>	24
				DOrbigny	<i>howchini</i>	25
				1826	<i>linneiana</i>	26
					<i>neoinflata</i>	27
					<i>oblonga</i>	28
					<i>quadrata</i>	29
					<i>reversaformis</i>	30
					<i>rotundata</i>	31
					<i>subramulata</i>	32
					<i>tricarinata</i>	33
					<i>trigonula</i>	34
					<i>trihedra</i>	35
					<i>tubiformis</i>	36

			Sigmoilitinae	<i>Sigmoilina</i>	<i>edwardsi</i>	37
			Luczkowska	Schlumberger		
			1974	1887		
			Tubinellinae	<i>Articulina</i>	<i>sagra</i>	38
			Rhumbler	DOrbigny		
			1906	1826		
		Peneroplidae		<i>Peneroplis</i>	<i>planatus</i>	39
		Schultze		de Montfort		
		1854		1808		
				<i>Spirolina</i>	<i>arietina</i>	40
				Lamarck		
				1804		
Rotaliina	Bolivinacea	Bolivinidae		<i>Bolivina</i>	sp.	41
Delage &	Glaessner	Glaessner		DOrbigny		
Herouard,	1937	1937		1839		
1896						
	Discorbacea	Eponididae	Eponidinae	<i>Eponides</i>	<i>barthelotianus</i>	42
	Ehrenberg	Hofker	Hofker	de Montfort		
	1838	1951	1951	1808		
	Planorbulinacea	Cibicididae	Cibicidinae	<i>Cibicides</i>	sp.	43
	Schwager	Cushman	Cushman	de Montfort		
	1877	1927	1927	1808		
	Asterigerinacea	Asterigerinidae		<i>Asterigerina</i>	<i>simplex</i>	44
	d Orbigny	d Orbigny		d Orbigny		
	1839	1839		1839		
		Amphisteginidae		<i>Amphistegina</i>	<i>lessonii</i>	45
		Cushman		d Orbigny		
		1927		1826		
	Rotaliacea	Rotaliidae	Ammoniinae	<i>Ammonia</i>	<i>beccarii</i>	46
	Ehrenberg	Ehrenberg	Saidova	Brunnich		
	1839	1839	1981	1772		
		Elphidiidae	Elphidiinae	<i>Cribrononion</i>	<i>frigidum</i>	47
		Galloway	Galloway	Thalman	sp.	48
		1933	1933	1947		
				<i>Elphidium</i>	<i>crispum</i>	49
				de Montfort		
				1808		
	Nummulitacea	Nummulitidae		<i>Operculina</i>	<i>costata</i>	50
	de Blainville	de Blainville		d Orbigny		
	1827	1827		1826		