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West Indian recent foraminifera

Abstract

Two hundred and twenty-two agglutinated and calcareous benthic and planktic foraminiferal species of the Suborders Textulariina, Miliolina, Lagenina, Robertinina, Globigerinina and Rotaliina belong to eighty-three genera have been studied from the coasts of two localities in the west Indian Ocean: Dir Ali Beach of Shabwah Governorate, south Yaman of Arabian Sea (southwest Asia, North Equator), and Zanzibar Archipelago (Tanzania, East Africa, South Equator). 104 species of them are recorded from Yemen (about 47%), while the others 118 species from Tanzania (about 53%). The modern taxonomical consideration of the species is used. 42 of the recorded species are believed here as new (about 18.5%): *Spiroplectinella tanzanica*, *S. yamanensis*, *Sahulia tanzanica*, *Textularia arabica*, *T. biraliensis, T. zanzibarica*, *Siphotextularia thissenae*, *S. africana*, *Fischerina africana, Adelosina tanzanica, Spiroloculina africana*, *S. biraliensis*, *S. tanzanica*, *S. zanzibarica*, *Cycloforina aboshomari, C. abuzaidi, C. bushrae*, *Quinqueloculina abohahii, Q. alwosabii, Q. biraliensis*, *Q. munefi*, *Q. tanzanica*, *Q. zanzibarica*, *Affinetrina africana, Miliolinella bassiounii*, *M. biraliensis* , *M. tanzanica, M. thissenae*, *M. zanzibarensis*, *Pyrgo basardahi, Triloculina cherifi, T. ennaggari, T. ennakhali, T. thissenae, T. usamai, Pseudotriloculina moradi, Loxostomina yahiai*, *Reussella salamai, R. farouki*, *Orbitina tanzanica*, *O. thissenae* and *Rosalina alwosabii*. Only 23 species (about 1%) are recorded in both localities, which interpret that each country has an own assemblage and differs from the other environmental coast.

Keywords: Recent benthic and planktic foraminifera, Indian ocean, Yaman, Tanzania

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Haidar Salim Anan
Stratigraphy and micropaleontology, Al-Azhar University-Gaza, Palestine

Correspondence: Haidar Salim Anan, Stratigraphy and micropaleontology, Al-Azhar University-Gaza, Palestine

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Introduction

Many authors[1-13] had been engaged in paleontology and paleoenvironmental investigations of littoral benthic foraminiferal species of west Indian Ocean, particularly coasts of Yaman and Tanzania (Figure 1).

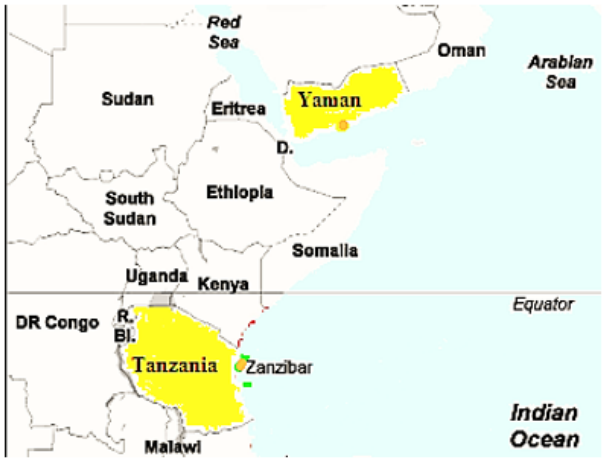

Figure 1 Geographic distribution of the two studied coasts of Yaman and Tanzania in the west Indian Ocean, north and south Equator.

The coastal area of Yaman (north Equator) is characterized by a relatively confined shallow shelf of the Arabian Sea, which slopes gently to deeper water environments and affected by active wave and surface currents favoring the formation and dispersal of carbonates and terrigenous material (Figure 2). The Zanzibar Archipelago of Tanzania (south Equator) consists the largest reef system in eastern Africa and represents a part of the East African coral coast and protected area of the Tanzanian coast.

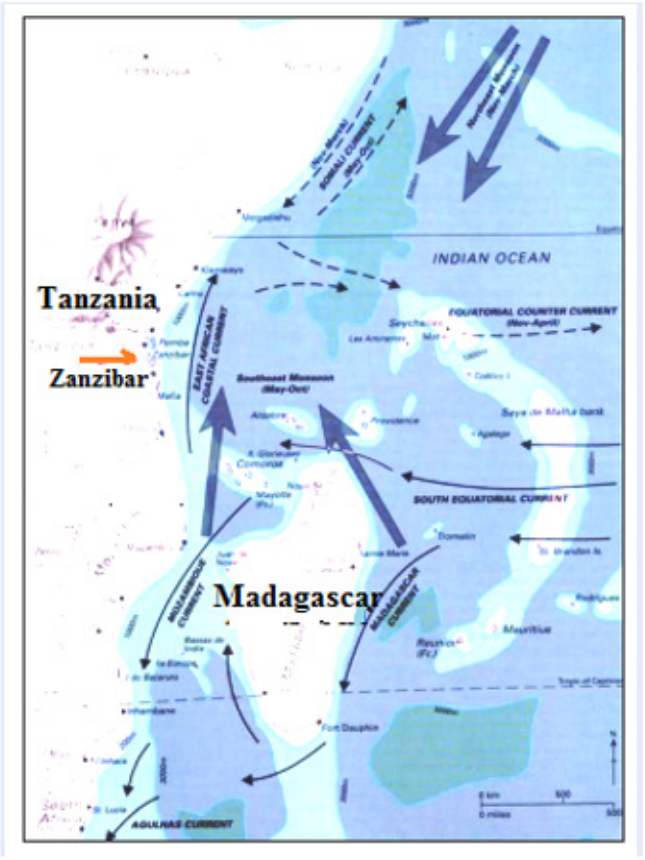

Figure 2 Map of the Western Indian Ocean current system and monsoon phases. The red arrow indicates the location of Zanzibar (after Thissen, 2014).

Material of study

This study is based on the total foraminiferal tests picked in two localities in the west Indian Ocean: Yaman and Tanzania. Rich and well-preserved two hundred and twenty-two agglutinated and calcareous benthic foraminiferal species from two countries in the west Indian Ocean (118 from Tanzania and 104 species from Yaman) made it possible to elucidate them with modern taxonomical consideration. Following the Code of Zoological Nomenclature, a taxonomic revision of 42 species of them are redescribed its morphological features and treated here as new.

Systematic paleontology

The taxonomy of Loeblich & Tappan[14] is followed here for 222 benthic and planktic foraminiferal species, which were recorded in the littoral cast of the two countries in the west Indian Ocean: Yaman and Tanzania by different references are presented in Table 1. With modern taxonomic consideration, forty-two species of the assemblage are treated here as new, presented and illustrated in Table 1.

Sn	Recent foraminiferal species	Y	T	Sn	Recent foraminiferal species	Y	T	Sn	Recent foraminiferal species	Y	T
1	Hormosina globulifera		x	47	Siphonaperta horrida	x		93	Pyrgo basardahi	x	
2	Ammobaculites exiguus		x	48	Siphonaperta irregularis	x		94	Pyrgo denticulata		x
3	Spiroplectinella sagittula	x		49	Cycloforina aboshomari		x	95	Pyrgo oblonga	x	x
4	Spiroplectinella tanzanica		x	50	Cycloforina abuzaidi		x	96	Pyrgo striolata		x
5	Spiroplectinella yemenensis	x		51	Cycloforina bushrae		x	97	Triloculina affinis	x	
6	Gaudryina rudis	x		52	Cycloforina exmouthensis		x	98	Triloculina asymmetrica		x
7	Sahulia tanzanica		x	53	Cycloforina semiplicata		x	99	Triloculina bertheliniana		x
8	Sahulia kerimbaensis		x	54	Hauerina diversa	x		100	Triloculina brongniatiana	x	
9	Textularia agglutinans	x	x	55	Quinqueloculina abohanii		x	101	Triloculina cherifi		x
10	Textularia arabica	x		56	Quinqueloculin. agglutinata	x		102	Trilocu. elongotricarinata	x	
11	Textularia biraliensis	x		57	Quinqueloculina alwosabii	x		103	Triloculina ennaggari		x
12	Textularia candeiana	x		58	Quinqueloculina biraliensis	x		104	Triloculina ennakhali		x
13	Textularia conica	x		59	Quinqueloculina bradyana	x		105	Triloculina fichteliana	x	x
14	Textularia foliacea		x	60	Quinqueloc. carinatastriata	x		106	Triloculina insignis	x	
15	Textularia gramen	x		61	Quinqueloculina corrugate	x		107	Triloculina marioni	x	
16	Textularia occidentalis		x	62	Quinqueloculina debenayi	x		108	Triloculina oblonga	x	
17	Textularia porrecta		x	63	Quinqueloculina eburnea		x	109	Triloculina plicata	x	
18	Textularia zanzibarica		x	64	Quinqueloc. granulocostata	x		110	Triloculina serrulata		x
19	Siphotextularia thissenae		x	65	Quinqueloculina jugosa	x		111	Triloculina rotunda	x	
20	Siphoniferoides africana		x	66	Quinquelocul. lamarckiana	x		112	Triloculina terquemiana	x	x
21	Clavulina difformis		x	67	Quinqueloculina lata	x		113	Triloculina tricarinata	x	
22	Clavulina multicamerata		x	68	Quinqueloc. multimarginata	x		114	Triloculina trigonula	x	x
23	Fischerina africana		x	69	Quinqueloculina munefi	x		115	Triloculina trihedral	x	
24	Planispirinella exigua	x		70	Quinquelocul. neapolitana	x		116	Triloculina thissenae		x
25	Vertebralina striata		x	71	Quinqueloculina parkeri	x		117	Triloculinella usamai		x
26	Adelosina laevigata	x		72	Quinqueloculin. patagonica	x		118	Sigmoihauerina bradyi	x	x
27	Adelosina mediterranensis	x		73	Quinqueloculina plicosa	x	x	119	Sigmoihauerina involuta		x
28	Adelosina tanzanica	x		74	Quinqueloculina poeyana	x		120	Articulina scrobiculata		x
29	Cribrolinoides curta	x		75	Quinquel. pseudoreticulata	x		121	Rupertianella rupertiana	x	x
30	Spiroloculina acutimargo	x		76	Quinqueloculina seminulum	x		122	Pseudohauerina moradi		x
31	Spiroloculina aequa	x		77	Quinqueloculi. subpolygona	x		123	Pseudohauerina dissidens		x
32	Spiroloculina africana		x	78	Quinqueloculina tanzanica			124	Pseudohauer. fragilissima		x
33	Spiroloculina antillarum	x	x	79	Quinqueloculina trigonula	x	x	125	Borelis schlumbergeri	x	x
34	Spiroloculina attenuata		x	80	Quinquelo. undulosecostata	x		126	Coscinospira hemprichii	x	
35	Spiroloculina biraliensis	x		81	Quinquelocnlina vulgaris	x		127	Peneroplis arietinus	x	
36	Spiroloculina communis	x		82	Quinqueloculi. zanzibarica		x	128	Peneroplis bradyi	x	
37	Spiroloculina corrugata		x	83	Affinetrina africana		x	129	Peneroplis pertusus	x	x

Table 1 Continued....

38	Spiroloculina depressa	x		84	Miliolinella bassiounii		x	130	Peneroplis planatus	x	x
39	Spiroloculina elegans	x		85	Miliolinella biraliensis	x		131	Amphisorus hemprichii		x
40	Spiroloculina foveolata		x	86	Miliolinella tanzanica		x	132	Sorites marginalis	x	
41	Spiroloculina tanzanica		x	87	Miliolinella thissenae		x	133	Sorites orbiculus	x	x
42	Spiroloculin. tenuiseptata	x		88	Miliolinella zanzibarensis		x	134	Tollmannia catesbyi		x
43	Spiroloculina zanzibarica		x	89	Miliolinella suborbicularis		x	135	Lenticulina vortex		x
44	Agglutinella robusta	x		90	Pseudomassilina macilenta		x	136	Alliatinella panayensis		x
45	Schlumberg. alveoliniformis		x	91	Pseudomassilina reticulata		x	137	Bolivina pseudoplicata	x	
46	Siphonaperta agglutinans	x		92	Pseudomassil. pacificiensis	x		138	Bolivina pseudopunctata	x	
139	Bolivina variabilis	x		166	Cibicides pseudolobatulus		x	194	Ammonia faceta		x
140	Brizalina ordinaria		x	167	Cibicidella variabilis		x	195	Ammon. parkinsoniana	x	
141	Brizalina simpsoni		x	168	Fontbotia wuellerstorfi		x	196	Challengerella bradyi		x
142	Brizalina striatula		x	169	Planorbuli. mediterranensis	x	x	197	Elphidium aculeatum	x	
143	Loxostomina costulata		x	170	Planorbulina larvata		x	198	Elphidium advenum	x	
144	Loxostomina yahiai		x	171	Cymbalopor. tabellaeformis	x		199	Elphidium crispum	x	
145	Sagrinella lobata	x		172	Cymbaloporetta bermudezi		x	200	Elphidium gerthi	x	
146	Reussella salamai		x	173	Cymbaloporetta bulloides		x	201	Elphidium jenseni		x
147	Reussella spinulosa	x		174	Millettiana milletti		x	202	Elphidium limbatum		x
148	Pavonina flabelliformis		x	175	Acervulina mabahethi		x	203	Elphidium macellum	x	x
149	Cancris bubnanensis		x	176	Sphaerogypsina globula		x	204	Elphidi. margaritaceum	x	
150	Cancris farouki		x	177	Asanonella tubulifera		x	205	Elphidium milletti		x
151	Eponides repandus	x	x	178	Pseudoeponid. falsobeccarii		x	206	Elphid striatopunctatum		x
152	Pegidia lacunata		x	179	Epistomaroides punctulatus		x	207	Elphidium voorthuyseni		x
153	Orbitina tanzanica		x	180	Amphistegina bicirculata		x	208	Assilina ammonoides		x
154	Orbitina thissenae		x	181	Amphistegina lessonii	x	x	209	Assilina discoidalis		x
155	Rotorbis auberii		x	182	Amphistegina lobifera	x	x	210	Heterostegina depressa		x
156	Rotorbis rosacea		x	183	Amphistegina papillosa		x	211	Globorotalia menardii		x
157	Rosalina alwosabii	x		184	Amphistegina radiata	x	x	212	Pullenia obliquiloculata		x
158	Rosalina anomala	x		185	Nonion fabum	x	x	213	Globigerina bulloides	x	x
159	Rosalina bradyi	x		186	Nonionoides grateloupi		x	214	Globigerina calida		x
160	Rosalina globularis	x		187	Anomalinella glabrata		x	215	Globigerinell. siphonifera		x
161	Siphonina tubulosa		x	188	Anomalinella rostrata			216	Globigerino. conglobatus		x
162	Siphoninoides echinatus		x	189	Gyroidina neosoldanii		x	217	Globigerinoides ruber		x
163	Valvobifarina mackinnonii		x	190	Neorotalia calcar	x	x	218	Globigerinoide. sacculifer		x
164	Discorbinella minuta		x	191	Ammonia aoteana	x		219	Globoturborot. rubescens		x
165	Hyalinea balthica	x		192	Ammonia beccarii	x		220	Orbulina universa		x
				193	Ammonia convexa	x	x				

Order: Foraminiferida Eichwald,

1) *Hormosina globulifera* Brady. It is recorded from littoral coast of Zanzibar Archipelago, Tanzania (East Africa) and west Indian Ocean.

2) *Ammobaculites exiguus* Cushman & Brönnimann.[14] Zanzibar, Tanzania.

3) *Spiroplectinella sagittula*. Bir Ali beach (South Yaman), Gulf of Iskenderun of eastern and western Mediterranean Sea.

4) *Spiroplectinella tanzanica* Anan, n. sp., Pl. 1, Figure 3.1a&b (=*Spiroplectammina* sp. A - Thissen,[12] Figure 3. 14, 15).

Etymology: after Zanzibar Archipelago, Tanzania, East Africa, west Indian Ocean.

Diagnosis: Test long biserial chambers throughout, triangular in outline, semi-rounded apertural view, aperture basil with long open slit.

Remarks: This new species belongs here to the genus *Spiroplectinella* due to its triangular test with small initial coil planispiral, then narrow elongate test with large initial coil planispiral as in *Spiroplectammina*. It is distinguished by very coarse wall test, and semi-rounded apertural view.

5) *Spiroplectinella yamanensis* Anan, n. sp., Pl. 1, Figure 3.2a&b (=*Spiroplectinella* sp. - Al-Wosabi et al.,[13] (Figure 3.2-4).

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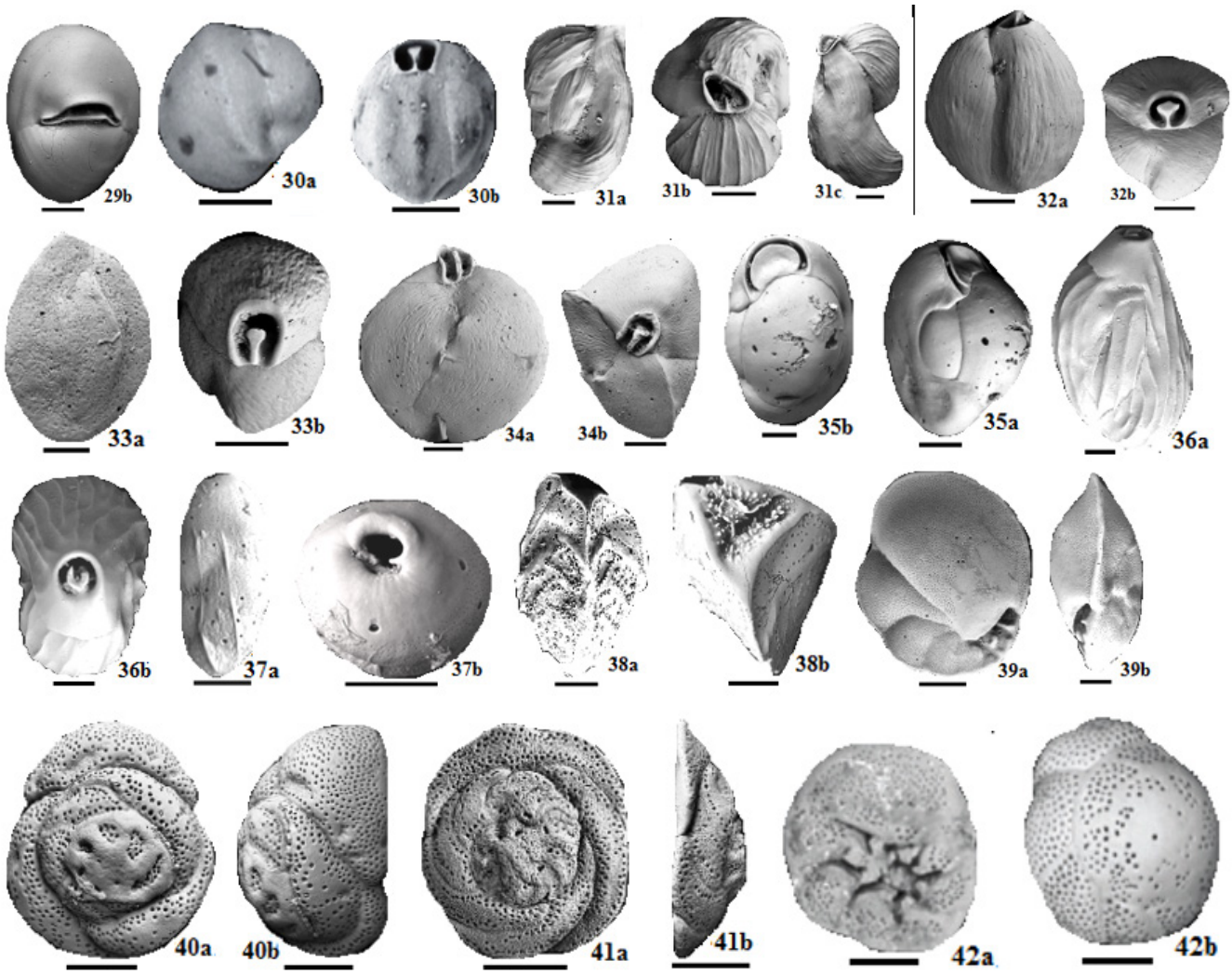

Figure 3 *Spiroplectinella tanzanica*, 2. *S. yamanensis*, 3. *Sahulia tanzanica*, 4. *Textularia arabica*, 5. *T. biraliensis*, 6. *T. zanzibarica*, 7. *Siphotextularia thissenae*, 8. *Siphoniferoides africana*, 9. *Fischerina africana*, 10. *Adelosina tanzanica*, 11. *Spiroloculina africana*, 12. *S. biraliensis*, 13. *S. tanzanica*, 14. *S. zanzibarica*, 15. *Cycloforina aboshomari*, 16. *C. abuzaidi*, 17. *C. bushrae*, 18. *Quinqueloculina abohanii*, 19. *Q. alwosabii*, 20. *Q. biraliensis*, 21. *Q. munefi*, 22. *Q. tanzanica*, 23. *Quinqueloculina zanzibarica*, 24. *Affinetrina africana*, 25. *Miliolinella bassiounii*, 26. *M. biraliensis* , 27. *M. tanzanica*, 28. *M. thissenae*, 29. *M. zanzibarensis*, 30. *Pyrgo basardahi*, 31. *Triloculina cherifi*, 32. *T. ennaggari*, 33. *T. ennakhali*, 34. *T. thissenae*, 35. *T. usamai*, 36. *Pseudotriloculina moradi*, 37. *Loxostomina yahiai*, 38. *Reussella salamai*, 39. *R. farouki*, 40. *Orbitina tanzanica*, 41. *O. thissenae*, 42. *Rosalina alwosabii*.

Note: (Scale bars =100µm, a: Side view, or ventral view, b: apertural view, c: dorsal view, except figs. 40-42)

Etymology: after the Republic of Yaman.

Diagnosis: Test biserial chambers throughout, triangular in outline, fusiform apertural view, wall coarsely agglutinated, sutures slightly depressed, aperture basil with open slit.

Remarks: It differs from *S. tanzanica* by its fusiform apertural view, then semi-rounded shape in the latter.

6) *Gaudryina rudis* Wright. West of Scotland (United Kingdom), western Mediterranean Sea, Yaman, New Caledonia and Southwestern Pacific.

7) *Sahulia tanzanica* Anan, n. sp., Pl.1, Figure 3.3a-c (=*Sahulia cf. barkeri* - Thissen,[12] Figure 3.16-18).

Etymology: after Zanzibar Archipelago, Tanzania, East Africa, west Indian Ocean.

Diagnosis: Test coarsely agglutinated, biserial throughout and forming a low cone with circular outline, sutures depressed straight to nearly arched, aperture basal and nearly straight slit.

Remarks: Differs from *Textularia* in the low and conical rather than elongate test.

8) *Sahulia kerimbaensis*.[1] Zanzibar (Tanzania) and Egyptian Red Sea.

9) *Textularia agglutinans* d'Orbigny. Bermuda islands, Adriatic Sea, Spain, Norway, Egyptian Red Sea, western Mediterranean Sea, Yaman, Tanzania, east India, Thailand, Indonesia, Philippines.

10) *Textularia* arabica Anan, n. sp., Pl. 1, Figure 3.4a&b (=*Textularia* sp.1 - Al-Wosabi et al.,[13] Figure 3.2).

Etymology: after Bir Ali beach, south Yaman, Arabian Sea.

Diagnosis: This new species has biserial rough test throughout, nearly sylindrical in outline, sutures depressed, basal with wide slit open aperture.

Remarks: It is distinguished by nearly sylindrical test in outline, and basal with wide slit open aperture.

11) *Textularia biraliensis* Anan, n. sp., Pl. 1, Figure 3.5a (=*Textularia* sp. 2 - Al-Wosabi et al.,[13] Figure 3.2).

Etymology: after Bir Ali beach, south Yaman.

Diagnosis: Test biserial chambers throughout, nearly triangular in outline, wall very coarsely agglutinated, and sutures slightly depressed.

Remarks: It is characterized by very coarsely agglutinated test.

12) *Textularia candeiana* d'Orbigny. North American Atlantic, Caribbean Region, Yaman, Western Australia.

13) *Textularia conica* d'Orbigny. Northern Adriatic Sea, Eastern and western Mediterranea Sea, Egyptian Red Sea, Yaman, Arabian Sea.

14) *Textularia foliacea* Heron-Allen & Earland. Egyptian Red Sea, Arabian Sea, Zanzibar (Tanzania).

15) *Textularia gramen* d'Orbigny. Caribbean Region, Spain, northern Argentina, western Mediterranean Sea, Yemen, Arabian Sea.

16) *Textularia occidentalis* Heron-Allen & Earland. Zanzibar (Tanzania), Arabian Sea.

17) *Textularia porrecta* Brady. It is recorded from littoral coast of Zanzibar (Tanzania).

18) *Textularia zanzibarica* Anan, n. sp., Pl. 1, Figure 3.6a&b (=*Textularia* sp. A - Thissen,[12] Figure 3.13,14).

Etymology: after the littoral coast of Zanzibar, Tanzania.

Diagnosis: This species has elongate biserial test throughout with rough agglutinated wall, sutures depressed, nearly rounded apertural view, basal short slit aperture.

Remarks: The new species *Textularia zanzibarica* differs from *T. arabica* by its elongate triangular test with small slit basal aperture, then nearly parallel test sides with wide basal aperture of the latter.

19) *Siphotextularia thissenae* Anan, n. sp., Pl. 1, Figure 3.7a&b (=*Siphotextularia* sp. A - Thissen,[12] Figure 3.23,24).

Etymology: after micropaleontologist Jens Michael Thissen.

Diagnosis: This new species *Siphotextularia thissenae* has elongate fine grained biserial test, triangular initial portion, aperture produced on a tubular neck.

Remarks: It characterized by triangular initial portion, but quadrangular later portion in the apertural view.

20) *Siphoniferoides africana* Anan, n. sp., Pl. 1, Figure 3.8a&b (=*Siphoniferoides* cf. *balearicus* - Thissen,[12] Figure 3.20- 22).

Etymology: after Zanzibar Archipelago, Tanzania, East Africa, west Indian Ocean.

Diagnosis: It is a species of the genus *Siphoniferoides* with similar projections in vertical bifurcating six rows of tubular outgrowths that forms small chamberlets, sutures depressed, aperture basal elongate open slit.

Remarks: It differs from the genus *Gaudryina* by its vertical bifurcating six rows of tubular outgrowths that forms small chamberlets.

21) *Clavulina difformis B*rady. Zanzibar (Tanzania).

22) *Clavulina multicamerata* Chapman. It is recorded from littoral coast of Zanzibar (Tanzania).

23) *Fischerina africana* Anan, n. sp., Pl. 1, Figure 3.9a&b (=*Fischerina* sp. A - Thissen,[12] Figure 3.3,4).

Etymology: after Zanzibar Archipelago, Tanzania, East Africa, west Indian Ocean.

Diagnosis: Test smooth discoidal, globular proloculus followed by enrolled nonseptate tubular chamber of about one whorl, then by two septated by radial to slightly raised curved sutures, aperture at the open end of the final chamber.

Remarks: It is characterized by last two septated whorls after one nonseptate whorl followed large globular proloculus.

24) *Planispirinella exigua*. Red Sea, Yaman, western Australia.

25) *Vertebralina striata* d'Orbigny. Zanzibar (Tanzania) and Egyptian Red Sea.

26) *Adelosina laevigata* d'Orbigny. Zanzibar (Tanzania) and Arabian Sea.

27) *Adelosina mediterranensis*. Zanzibar (Tanzania) and Arabian Sea.

28) *Adelosina tanzanica* Anan, n. sp., Pl. 1, Figure 3.10a&b (=*Adelosina* sp. - Thissen,[12] Figure 3.3.6-7).

Etymology: after the littoral coast of Zanzibar, Tanzania.

Diagnosis: It is a species of the genus *Adelosina* with planispirally enrolled costate surface, last three chambers visible, aperture terminal, rounded and produced on a neck.

Remarks: It is characterized by its nearly circular costate planispiral test, with visible last three chambers.

29) *Cribrolinoides curta*.[1] Yaman, Japan, North Pacific Ocean, Australia.

30) *Spiroloculina acutimargo* Brady. Caribbean region, Yaman, Arabian Sea, southwestern Pacific Ocean.

31) *Spiroloculina aequa* Cushman.[1] Yaman, Arabian Sea, India.

32) *Spiroloculina africana* Anan, n. sp., Pl. 1, Figure 3.11a&b (=*Spiroloculina* sp.2-Thissen,[12] Figure 3. 28, 29).

Etymology: after the littoral coast of Zanzibar, Tanzania, east Africa.

Diagnosis: It is a species of the genus *Spiroloculina* with truncated periphery, and rounded aperture with bifid tooth.

Remarks: The new species *S. africana* is characterized by its wider truncated width than other species of the genus.

33) *Spiroloculina antillarum* d'Orbigny. Caribbean Region, Egyptian Mediterranean and Red Sea, Arabian Sea, Yaman, Tanzania,

34) *Spiroloculina attenuata* Cushman & Todd. Zanzibar (Tanzania).

35) *Spiroloculina biraliensis* Anan, n. sp., Pl. 1, Figure 3. 12 (=*Spiroloculina* sp.1-Al-Wosabi et al.,[13] Figure 3.4.2-4).

Etymology: after Bir Ali beach, south Yaman.

Diagnosis: It is a species of the genus *Spiroloculina* with fusiform test, chambers increasing gradually in length and breadth as added, smooth rounded periphery, open end aperture of the final chamber and produced on a long neck.

Remarks: It is characterized by its regular fusiform test, one-half chambers coil increasing rapidly in length and breadth as added, with smooth rounded periphery.

36) *Spiroloculina communis* Cushman & Todd. Yaman, Arabian Sea, Philippines, Indonesia.

37) *Spiroloculina corrugata* Cushman & Todd. Egyptian Red Sea, Gulf of Aqaba, Tanzania, Mozambique.

38) *Spiroloculina depressa* d'Orbigny. Florida (USA), France, Turkish Dardanelles Strait and eastern Mediterranean, Egyptian Red Sea, Yaman, Arabian Sea, Indian coast, Thailand, Philippines.

39) *Spiroloculina elegans* Cushman. Yaman, Arabian Sea, Pacific Ocean.

40) *Spiroloculina foveolata* Egger. Tanzania, and Egyptian Red Sea.

41) *Spiroloculina tanzanica* Anan, n. sp., Pl. 1, Figure 3.13a&b (=*Spiroloculina* aff. *communis* - Thissen,[12] Figure 3.14& 15).

Etymology: after the littoral coast of Zanzibar, Tanzania.

Diagnosis: It is a species of the genus *Spiroloculina* with small proloculus, truncate periphery, aperture rounded at the open end of the final chamber produced on a long neck with bifid tooth.

Remarks: This species differs from *S. africana* by narrower truncate periphery, and more tighter coiling test.

42) *Spiroloculina tenuiseptata* Brady. It is recorded from coasts of Yaman, Turkish Gulf of Iskenderun, Dardanelles Strait, western Mediterranean, Arabian Sea.

43) *Spiroloculina zanzibarica* Anan, n. sp., Pl. 1, Figure 3.14a&b (=*Spiroloculina* cf. *nitida* - Thissen,[12] Figure 3.25&26).

Etymology: after the littoral coast of Zanzibar, Tanzania.

Diagnosis: This new species has small proloculus, followed by three one-half chambers coil increasing rapidly in length and breadth as added, and rounded aperture with simple tooth.

Remarks: It is characterized by its rounded periphery, and rounded aperture with simple tooth.

44) *Agglutinella robusta* El-Nakhal.[4] Egyptian Red Sea, Gulf of Aqaba, Yemen, Tanzania.

45) *Schlumbergerina alveoliniformis*. Northern Red Sea, Gulf of Aqaba, Tanzania, Pacific Ocean.

46) *Siphonaperta agglutinans*. Atlantic Ocean, Turkish Aegean Sea and western Mediterranean Sea, Gulf of Aqaba, Yaman, Philippines.

47) *Siphonaperta horrida*. Gulf of Mexico, Gulf of Aqaba, Yaman, central east India.

48) *Siphonaperta irregularis*. France, Turkish western Mediterranean, Yaman.

49) *Cycloforina aboshomari* Anan, n. sp., Pl. 1, Figure 3.15a&b (=*Cycloforina* sp. A- Thissen,[12] Figure 3.20-23).

Etymology: after the Palestinian writer Tawfik Aboshmar.

Diagnosis: It is a species of the genus *Cycloforina* with reticulate ornamentation all over the test, aperture circular with long bifid tooth.

Remarks: It is characterized by its reticulate ornamentation.

50) *Cycloforina abuzaidi* Anan, n. sp., Pl. 1, Figure 3.16a&b (=*Cycloforina* cf. *granulocostata* - Thissen,[12] Figure 3.14-16).

Etymology: after Prof. Mohammad Abu Zaid, Geology Department, Ain Shams University, Egypt.

Diagnosis: It is a species of the genus *Cycloforina* with quinqueloculine test, chambers have an angular edges and added against the previous whorl without aseparate chamber floor;aperture circular at the produced end of the final chamber, with a bifid tooth.

Remarks: The genus *Cycloforina* differs from the genus *Quinqueloculina* mainly with angular edges of the chambers.

51) *Cycloforina bushrae* Anan, n. sp., Pl. 1, Figure 3.17a&b (=*Cycloforina cf. semireticulosa* - Thissen,[12] Figure 3.24-26).

Etymology: after the Palestinian writer Bushra Abu Sharar.

Diagnosis: This new species has reticulate ornamentation of the most test, but with non-ornamented at the edges of the chambers, aperture circular at the end of the last chamber with short bifid tooth.

Remarks: *Cycloforina bushrae* differs from. *a aboshomari* by its the non- ornamented at the edges of the chambers, and short bifid tooth, than ornamented the whole test, and long bifid tooth of the latter.

52) *Cycloforina exmouthensis* Parker. Gulf of Aqaba, Egyptian Red Sea, Tanzania, Maldives, western Australia.

53) *Cycloforina semiplicata*. Red Sea and Gulf of Aqaba, Tanzania.

54) *Hauerina diversa* Cushman. Atlantic Ocean, France, Turkish western Mediterranean, Egyptian Red Sea, Palestinian Gulf of Aqaba and Haifa Bay, Yaman, Arabian Sea, Pacific Ocean.

55) *Quinqueloculina abohanii* Anan, n. sp., Pl. 1, Figure 3.18a-c (*Quinqueloculina* cf. *cuvieriana* - Thissen,[12] Figure 3.23-25).

Etymology: after Prof. Ata Abohani, Faculty of Science, Al Azhar University-Gaza, Palestine.

Diagnosis: It is a species of the genus *Quinqueloculina* with acute periphery, striated surface, and circular aperture with long bifid tooth.

Remarks: It is characterized by its striated ornamentation, andacute periphery.

56) *Quinqueloculina agglutinata* d'Orbigny. Atlantic shelf of USA, Denmark, Biscayne Bay of Europe, Egyptian Red Sea, Yaman, Arabian Sea, east India, north Pacific Ocean.

57) *Quinqueloculina alwosabii* Pl. 1, Figure 3.19a&b (=*Quinqueloculina cf. rugosa* - Al-Wosabi et al.,[13] Figure 3.5-7).

Etymology: after Prof. Mohammed Al-Wosabi Earth and Environmental Sciences Department, Faculty of Science, Sana'a University, Yaman.

Diagnosis: This species has a rugose surface with 3-4 longitudinal ribs, elongate open aperture with long bifid tooth.

Remarks: It differs from *Q. rugosa* by its more rugose surface, and elongate aperture with long bifid tooth.

58) *Quinqueloculina biraliensis* Anan n. sp., Pl. 1, Figure 3.20a&b (=*Quinqueloculina* sp.1, - Al-Wosabi et al.,[13] Figure 3. 6. 11-13).

Etymology: after Bir Ali Beach, Arabian Sea, Yaman.

Diagnosis: It has elongated test, protruding with an angular chamber, elongate open aperture with long bifid tooth.

Remarks: It is characterized by its protruding middle chamber, elongate open aperture with long bifid tooth.

59) *Quinquelocu bradyana* Cushman. Bermuda Island of northwest Atlantic Ocean, Yaman, Arabian Sea, Maldives Ridge, New Caledonia, southwestern Pacific Ocean.

60) *Quinqueloculina carinatastriata*. Aegean Sea (Greece), Yemen, India, Pacific Ocean.

61) *Quinqueloculina corrugate*. Yaman and Arabian Sea.

62) *Quinqueloculina debenayi*.[10] Yaman and Arabian Sea.

63) *Quinqueloculina eburnea*. Tanzania and Gulf of Aqaba.

64) *Quinquelocnlina granulocostata* Germeraad. Yaman, east of India, Indonesia, southeast Australia.

65) *Quinquelocnlina jugosa* Cushman. Carolina (USA), England, Turkish Dardanelles Strait, Yaman, Arabian Sea, Pacific Ocean.

66) *Quinquelocnlina lamarckiana* d'Orbigny. Jamaica, Atlantic shelf of USA, western North America, Bermuda islands, Turkish the Dardanelles Strait, Egyptian Red Sea, Yaman, Arabian Sea, India, Maldives Ridge.

67) *Quinqueloculina lata* Terquem. France, Atlantic shelf of USA, English Channel, western Mediterranean Sea, Yaman, Arabian Sea, India.

68) *Quinqueloculina multimarginata* Said.[1] Northern Red Sea, Yaman, Arabian Sea.

69) *Quinqueloculina munefi* Anan, n. sp., Pl. 1, Figure 3.21 (=*Quinqueloculina* cf. *triangularis* - Al-Wosabi et al.,[13] Figure 3.6. 23-26).

Etymology: after Dr. Munef Mohammed, Earth and Environmental Sciences Department, Faculty of Science, Sana'a University, Yaman.

Diagnosis: This species has numerous ribs ornamented surface, open terminal aperture with a elongate neck.

Remarks: It is characterized by its numerous ribs ornamented surface.

70) *Quinqueloculina neapolitana* Sgarrella & Moncharmont Zei. Gulf of Naples (Italy), Yaman, Arabian Sea.

71) *Quinqueloculina parkeri* Brady. Hawaii Islands, northern Red Sea, Yaman, Arabian Sea, Arabian Gulf, East of India, Pacific Ocean.

72) *Quinqueloculina patagonica* d'Orbigny. France, and Gulf of Aqaba, Tanzania.

73) *Quinqueloculina plicosa* Costa. Yemen and Qatar.

74) *Quinqueloculina poeyana* d'Orbigny. Cuba, Atlantic shell of USA, Bermuda Islands, Yaman, Philippines.

75) *Quinqueloculina pseudoreticulata* Parr. Saudi Red Sea, Yaman, Arabian Sea, India, Australia.

76) *Quinqueloculina seminula*. Atlantic shelf of USA, west Scotland of UK., France, Denmark, Adriatic Sea, Eastern Mediterranean, Egyptian Red Sea, Yaman, Arabian Sea, India, southwestern Pacific Ocean.

77) *Quinqueloculina subpolygona* Parr. Yaman, Arabian Sea, New Zealand.

78) *Quinqueloculina tanzanica* Anan, n. sp., Pl. 1, Figure 3.22a-c (=*Quinqueloculina* cf. *rebeccae* - Thissen,[12] Figure 3.12-14).

Etymology: after the littoral coast of Zanzibar, Tanzania, east Africa.

Diagnosis: This new species has elongate test without ornamented surface, rounded aperture with bifid tooth.

It is a species of the genus *Quinqueloculina* with acute periphery, smooth surface, and circular aperture with long bifid tooth.

Remarks: It differs from *Q. africana* by its more elongated smooth test, and shorter tooth.

79) *Quinquelocnlina trigonula* Terquem. Northern France, Yaman, Arabian Sea.

80) *Quinqueloculina undulosecostata* Terquem. Yaman, Arabian Sea, India.

81) *Quinquelocnlina vulgaris* d'Orbigny. Atlantic Ocean, Bermuda, Yaman, Arabian Sea, Arabian Gulf, Tanzania, west India.

82) *Quinqueloculina zanzibarica* Anan, n. sp., Pl. 1, Figure 3.23a&b (=*Quinqueloculina* cf. *vulgaris* - Thissen,[12] Figure 3.15-18).

Etymology: after the littoral coast of Zanzibar, Tanzania, east Africa.

Diagnosis: This new species has smooth surface ovate test, regular increasing chambers as added, the third chamber is protruding periphery than other chambers, semi-rounded open aperture with short bifid tooth.

Remarks: It differs from *Q. tanzanica* by its shorter length but wider width, more rounded periphery.

83) *Affinetrina africana* Anan, n. sp., Pl. 1, Figure 3.24a&b (=*Affinetrina cf. A. quadrilateralis* - Thissen,[12] Figure 3. 1-4).

Etymology: after the littoral coast of Zanzibar, Tanzania, east Africa.

Diagnosis: It is a species of the genus *Affinetrina* with coarsely calcareous imperforate porcelaneous wall, crypto-quinqueloculine early stage with pseudoriloculine chamber arrangement, aperture a high arch enclosing a long slender tooth.

Remarks: It is characterized by its coarsely calcareous porcelaneous wall, pseudoriloculine chamber arrangement, high arch aperture with long slender tooth.

84) *Miliolinella bassiounii* Anan, n. sp., Pl. 1, Figure 3.25a&b (=*Miliolinella* cf. *hybrida* - Thissen,[12] Figure 3.27&28).

Etymology: after Prf. Amin Bassiouni, Geology Department, Ain Shams University, Egypt.

Diagnosis: This new species belong to the genus *Miliolinella* with rounded periphery, early stage quinqueloculine, cryptoquinqueloculine, triloculine later planispiral added in a single plane on alternate sides, only two chambers in the final whorl, aperture an arch, terminal on the final chamber, with a broad and low apertural flap-like tooth.

Remarks: It is characterized by early chambers quinqueloculine, and later added in a single plane on alternate sides as in *Massilina* and *Spiroloculina.*

85) *Miliolinella biraliensis* Anan, n. sp. Pl. 1, Figure 3.26a&b (=*Miliolinella* sp. - Al-Wosabi et al.,[13] Figure 3.6-7).

Etymology: after Bir Ali Beach, Arabian Sea, Yaman.

Diagnosis: Test smooth flattened elliptical in lateral view, early stage quinqueloculine, latter planispiral with four chambers in one side but three in the other per whorl, rounded periphery, aperture terminal at end of last chamber.

Remarks: This species differs from *M. africana* by its elliptical test than elongate form.

86) *Miliolinella tanzanica* Anan, n. sp., Pl. 1, Figure 3.27a&b (=*Miliolinella* sp. A - Thissen,[12] Figure 3. 1-3).

Etymology: after the littoral coast of Zanzibar, Tanzania, east Africa.

Diagnosis: It is a species of the genus *Miliolinella* with gradually increasing in width, wall smooth, aperture terminal, large extended at end of the last chamber.

Remarks: It differs from *Miliolinella biraliensis* by its semi-circular test, and large extended aperture than elliptical test and rectangular aperture of the latter.

87) *Miliolinella thissenae* Anan, n. sp. Pl. 1, Figure 3.28a (=*Miliolinella* sp. B - Thissen,[12] Figure 3.4&5).

Etymology: after micropaleontologist Jens Michael Thissen.

Diagnosis: Test quadrate in lateral view, the last whorl includes three angular chamber, elongate wide open chamber.

Remarks: It differs from *Miliolinella tanzanica* by its quadrate test and wide open chamber than semi-circular test.

88) *Miliolinella zanzibarensis* Anan, n. sp., Pl. 1, Figure 3.29a&b (=*Miliolinella* sp. C - Thissen,[12] Figure 3.6-7).

Etymology: after the littoral coast of Zanzibar, Tanzania, east Africa.

Diagnosis: Test smooth circular in outline, with two chambers in the last whorl, aperture an arch terminal on the final chamber, with a broad and low apertural flap.

Remarks: This species differs from *Miliolinella thissenae* in its two chambers in the last whorl than three chambers.

89) *Miliolinella suborbicularis*. Cuba and Tanzania.

90) *Pseudomassilina macilenta*. New Guinea, Egyptian Red Sea, Gulf of Aqaba, Tanzania, Mozambique, northwest Pacific Ocean, Australia.

91) *Pseudomassilina reticulata*. Tanzania, Mozambique, Egyptian Red Sea, Gulf of Aqaba, northwest Pacific Ocean.

92) *Pseudomassilina pacificiensis* Cushman. Gulf of Aqaba, Red Sea, Yaman, Arabian Sea, Pacific Ocean.

93) *Pyrgo basardahi* Anan, n. sp., Pl. 1, Figure 3.30a&b (=*Pyrgo* sp. - Al-Wosabi et al.,[13] Figure 3. 7. 12, 13).

Etymology: after Dr. Fahad Basardah, Oil and Gas Department, Faculty of Oil and Minerals, University of Aden, Shabwah, Yaman.

Diagnosis: Test smooth ovate in outline, but subcircular in cross section, chambers with longitudinal two elongated grooves, bifid tooth with a thin base in open subcircular aperture.

Remarks: It characterized by its two longitudinal elongated grooves of the chambers.

94) *Pyrgo denticulate* Brady. Gulf of Aqaba, Egyptian Red Sea, Tanzania, Mozambique, Pacific Ocean.

95) *Pyrgo oblonga*. Cuba, Gulf of Aqaba, Yaman, Arabian Sea, Tanzania, Pacific Ocean.

96) *Pyrgo striolata*. Atlantic Ocean, New Guinea, Gulf of Aqaba, Arabian Gulf, Tanzania, Mozambique.

97) *Triloculina affinis*. France, Egyptian Red Sea, Yaman, Arabian Gulf, Tanzania, Pacific Ocean.

98) *Triloculina asymmetrica* Said.[1] Gulf of Aqaba, Egyptian Red Sea, Tanzania.

99) *Triloculina bertheliniana*. Gulf of Aqaba, Egyptian Red Sea, Arabian Gulf, Tanzania.

100) *Triloculina brongniatiana* d'Orbigny. Puerto Rico, Italy, Yaman, Arabian Gulf.

101) *Triloculina cherifi* Anan, n. sp., Pl. 1, Figure 3.31a-c (=*Triloculina* ? sp. C - Thissen,[12] Figure 3.6-8).

Etymology: after late Prof. Omar H. Cherif, Geology Department, Ain Shams University, Egypt.

Diagnosis: It is a species of the genus *Triloculina,* with elongate test in outline, semicircular in cross section, with some twisted chambers, ripped ornamentation, sutures depressed, hearty-shape open aperture with simple tooth.

Remarks: It characterized by its twisted coiling, ripped surface, and hearty-shape with simple tooth.

102) *Triloculina elongotricarinata* Debenay. Yaman, Arabian Sea, South Pacific.

103) *Triloculina ennaggari* Anan, n. sp., Pl. 1, Figure 3.32a&b (=*Triloculina* sp. B - Thissen,[12] Figure 3.4-5).

Etymology: after Prof. Zaghlol Ennaggar, Geology Department, Kuwait University.

Diagnosis: Test with fine granulated porcelaneous wall, elongate in outline, semi-triangular in cross section,

chambers increased gradually as added, sutures depressed, semi-circular open aperture with bifid tooth.

Remarks: It is distinguished by its fine granulated porcelaneous wall.

104) *Triloculina ennakhali* Anan, n. sp., Pl. 1, Figure 3.33a&b (=*Triloculina* sp. A - Thissen,[12] Figure 3.1-3).

Etymology: after late Prof. Hamed A. Ennakhal, Earth and Environmental Sciences Department, Islamic University-Gaza, Palestine.

Diagnosis: Test more elongated than width in outline, semi-circular in cross section, sutures slightly depressed, circular open aperture with bifid tooth with simple rugose surface, bifid tooth with a thin base in open circular aperture.

Remarks: It is characterized by its fine rogue's wall.

105) *Triloculina fichteliana* d'Orbigny. Turkey, Red Sea, Yaman, Arabian Sea, Tanzania, eastern and southwestern Pacific Ocean.

106) *Triloculina insignis* Brady. Yaman, Arabian Sea, India, New Zealand.

107) *Triloculina marioni* Schlumberger.[15] Western Mediterranean Sea, Turkish Dardanelles Strait eastern Mediterranean, Yaman, Arabian Sea.

108) *Triloculina oblonga*. Bermuda islands, Bahama, England, Turkish Eastern Mediterranean, Red Sea, Yaman, Arabian Sea, Arabian Gulf, Tanzania, west India.

109) *Triloculina plicata* Terquem. western Mediterranean Sea, Turkish Dardanelles Strait, Eastern Mediterranean, Yaman, Arabian Sea.

110) *Triloculina serrulata* McCulloch. Gulf of Aqaba, Egyptian Red Sea, Tanzania, Mozambique, Maldives, southwestern Pacific.

111) *Triloculina rotunda* d'Orbigny. Puerto Rico, Bermuda islands, Adriatic Sea, Italy, Yaman, Arabian Sea, western India, South Pacific.

112) *Triloculina terquemiana*. Yaman, Arabian Sea, Tanzania, Madagascar, Mozambique, western India, southwestern Pacific.

113) *Triloculina tricarinata* d'Orbigny. Aegean Sea, Adriatic Sea, Eastern Mediterranean, Red Sea, Yaman, Arabian Sea, Arabian Gulf, centraleast India, Indonesia.

114) *Triloculina trigonula*. Gulf of California (USA), Bahama, France, Aegean Sea, Egyptian Mediterranean coast, Yaman, Arabian Sea, Arabian Gulf, Tanzania, India, Philippines.

115) *Triloculina trihedra* Loeblich &Tappan.[14] Arctic Ocean, north Alaska, Greenland, Yaman, Arabian Sea.

116) *Triloculina thissenae* Anan, n. sp., Pl. 1, Figure 3.34a&b (=*Triloculina* cf. *T. serrulata* - Thissen,[12] Figure 3.16-18).

Etymology: after micropaleontologist Jens Michael Thissen.

Diagnosis: Test subtriangular in section, early stage cryptoquinqueloculine, later triloculine, two large chambers visible but the third one is minute too small, aperture elongate open slit with bifid tooth.

Remarks: It differs from *Triloculina serrulata* by its only two large visible obviously, and rounded open aperture.

117) *Triloculinella usamai* Anan, n. sp., Pl. 1, Figure 3.35a&b (=*Triloculinella* cf. *pilasensis* - Thissen,[12] Figure 3. 9-10).

Etymology: after late Prof. Usama Zeineddin, Geology Department, Al Azhar University-Gaza, Palestine.

Diagnosis: It is a species of the genus *Triloculinella* with smooth subcircular test in outline rounded periphery, arrangement cryptoquinqueloculine to quinqueloculine, while the final three chambers visible from the exterior, subcircular arch aperture at the end of the final chamber, with largely covered by a broad apertural flap.

Remarks: It is distinguished by subcircular arch aperture, with largely covered by a broad apertural flap.

118) *Sigmoihauerina bradyi*. Egyptian Red Sea, Gulf of Aqaba, Yaman, Tanzania, North Pacific.

119) *Sigmoihauerina involuta*. Tanzania and North Pacific.

120) *Articulina scrobiculata*. Tanzania and Mozambique.

121) *Rupertianella rupertiana*. Gulf of Aqaba, Yaman, Arabian Sea, Arabian Gulf, Tanzania, India.

122) *Pseudotriloculina moradi* Anan, n. sp. Pl. 1, Figure 3.36a&b (=*Pseudotriloculina cf. P. limbata* - Thissen,[12] Figure 3. 10-12)

Etymology: after late Prof. Morad I. Youssef, Geology Department, Ain Shams University, Egypt.

Diagnosis: It is a species of the genus *Pseudohauerina* with ovate and ripped ornamented test, the final three chambers visible from the exterior, aperture circular at the end of the final chamber with large bifid tooth.

Remarks: It is distinguished by ripped ornamented test, and large bifid tooth.

123) *Pseudohauerinella dissidens*. Tanzania.

124) *Pseudohauerina fragilissima*. Red Sea, Gulf of Aqaba, Arabian Gulf, Tanzania, North Pacific.

125) *Borelis schlumbergeri* Reichel. Red Sea, Gulf of Aqaba, Yaman, Arabian Sea, Arabian Gulf, Tanzania, Mozambique, Western Australia.

126) *Coscinospira hemprichii* Ehrenberg. Turkey, Yaman, Arabian Sea, New Caledonia, Western Australia.

127) *Peneroplis arietinus*. Italy, eastern Mediterranean Sea, Egyptian Red Sea, Yaman, Arabian Sea, southeastern China Sea, northeast Australia.

128) *Peneroplis bradyi* Cushman. Jamaica, Bahama, Yaman, Arabian Sea.

129) *Peneroplis pertusus*. Egyptian Red Sea, Gulf of Aqaba, Arabian Sea, Tanzania, Mozambique, North and South Pacific.

130) *Peneroplis planatus*. Florida (USA), Aegean Sea, Turkish Dardanelles Strait in Eastern Mediterranean, Egyptian Red Sea, Yaman, Arabian Sea, Tanzania, east India, Indonesia, Philippines.

131) *Amphisorus hemprichii* Ehrenberg. Egyptian Red Sea, Gulf of Aqaba, Tanzania, Mozambique, North and South Pacific.

132) *Sorites marginalis* Lamarck. Egyptian Red Sea, Yaman, Arabian Sea.

133) *Sorites orbiculus*. Turkish Dardanelles Strait Eastern Mediterranean, Egyptian Mediterranean Sea, Gulf of Aqaba, Yaman, Arabian Sea, Tanzania, Mozambique, centraleast India, North and South Pacific.

134) *Tollmannia catesbyi* (=*Pyramidulina catesbyi* - Thissen,[12] Figure 3. 10-11). Cuba, Egyptian Red Sea, Gulf of Aqaba, Tanzania.

135) *Lenticulina vortex*. Tanzania, North and South Pacific.

136) *Alliatinella panayensis*. Egyptian Red Sea, Gulf of Aqaba, Tanzania.

137) *Bolivina pseudoplicata* Heron-Allen & Earland. California (USA), France, western Mediterranean Sea, Yaman, Arabian Sea, New Zealand.

138) *Bolivina pseudopunctata* Höglund. Caribbean Region, west Scotland (UK), West Greenland, Yaman, Arabian Sea, Maldives Ridge, West Antarctica.

139) *Bolivina variabilis*. North American Atlantic, Caribbean Region, Bermuda islands, France, Yaman, India, North American Pacific.

140) *Brizalina ordinaria*. Egyptian Red Sea, Gulf of Aqaba, Tanzania.

141) *Brizalina simpsoni*. Egyptian Red Sea, Gulf of Aqaba, Tanzania, Mozambique.

142) *Brizalina striatula*. Canada, Red Sea, Gulf of Aqaba, Tanzania, Mozambique, Australia.

143) *Loxostomina costulata.* Egyptian Red Sea, Gulf of Aqaba, Tanzania, Philippines, North and South Pacific.

144) *Loxostomina yahiai* Anan, n. sp., pl. 1, Figure 3.37a&b (=*Loxostomina* ? cf. *sinuosa* - Thissen,[12] Figure 3. 22-23).

Etymology: after the astronomist Yahya A. Aljaro, Gaza, Palestine.

Diagnosis: It is a species of the genus *Loxostomina* with short test in outline, nearly rounded in section, small biserial early stage and one chamber finally stage, surface ornamented with few fine longitudinal striae crossing the sutures, aperture oval with thick lip.

Remarks: It is distinguished by its short test, with few longitudinal ribs.

145) *Sagrinella lobata* Brady. Yaman, Arabian Sea, Pacific Ocean.

146) *Reussella salamai* Anan, n. sp., pl. 1, Figure 3.38a&b (=*Reussella* cf. *insueta* -Thissen,[12] Figure 3.10-13).

Etymology: after A, Prof. Gamal Salama, Department of Biological and Geological Sciences, Faculty of Education, Ain Shams University, Cairo, Egypt.

Diagnosis: It is a species of the genus *Reussella* with regular pyramidal triserial triangular form, limbate raised curved sutures, pustulose surface, acute periphery, large triangular aperture with an internal spout-like toothplate.

Remarks: It distinguished by its pustulose surface, raised limbate curved sutures, and large triangular aperture.

147) *Reussella spinulosa*.[16] North American Atlantic, Caribbean Region, Yaman, Arabian Sea, Pakistan, east India, Philippines.

148) *Pavonina flabelliformis* d'Orbigny. Tanzania, Mozambique, Arabian Sea, North Atlantic, Pacific Ocean.

149) *Cancris bubnanensis*. Tanzania, Mozambique, South Pacific.

150) *Cancris farouki* Anan, n. sp., pl. 1, Figure 3.39a&b (=*Cancris cf. carinatus* -Thissen,[12] Figure 3.7-9).

Etymology: after Prof. Sherif Farouk Exploration Department, Egyptian Petroleum Research Institute, Cairo, Egypt

Diagnosis: It is a species of the genus *Cancris* with subrounded in outline smooth test, chambers increasing rapidly in breadth as added, last chamber about half of the test, keeled periphery, arched depressed sutures, aperture a low interiomarginal with lip.

Remarks: It distinguished by its subrounded test, last chamber about half of the test.

151) *Eponides repandus*. Yaman, Arabian Sea, Tanzania, west India, New Caledonia.

152) *Pegidia lacunata* d'Orbigny. France, Tanzania, Mozambique.

153) *Orbitina tanzanica* Anan, n. sp., pl. 1, Figure 3.40a&b (=*Orbitina* sp. A -Thissen,[12] Figure 3.4, 5).

Etymology: after the littoral coast of Zanzibar, Tanzania, east Africa.

Diagnosis: It is a species of the genus *Orbitina* with high trochospiral planoconvex coarsely perforated test, circular in outline, crescentic chambers, depressed oblique sutures elevated in the early whorls, but outer whorls depressed.

Remarks: It distinguished by its high trochospiral planoconvex coarsely perforated test.

154) *Orbitina thissenae* Anan, n. sp., pl. 1, Figure 3.41a&b (=*Orbitina* cf. *exquisita* Thissen,[12] Figure 3.1-3).

Etymology: after micropaleontologist Jens Michael Thissen.

Diagnosis: Test low trochospiral planoconvex coarsely perforated test, and acute periphery.

Remarks: *Orbitina thissenae* differs from *O. tanzanica* by its low trochospiral test, and acute periphery.

155) *Rotorbis auberii*. Tanzania, Philippines, southwest Pacific.

156) *Rotorbis rosacea*. Tanzania and Mozambique.

157) *Rosalina alwosabii* Anan, n. sp., pl. 1, Figure 3.42a&b (=*Rosalina* sp. - Al-Wosabi et al.,[13] Figure 3.10. 18,19).

Etymology: after Prof. Mohammed Al-Wosabi Earth and Environmental Sciences Department, Faculty of Science, Sana'a University, Yaman.

Diagnosis: It is a species of the genus *Rosalina* with perforated surface, sutures are depressed and backward curved on the ventral side, while raised on dorsal side, umbilicus is open, an interiomarginal-extraumbilical arched aperture separated by the umbilical folium.

Remarks: This species is distinguished by its depressed sutures in ventral side, but limbate raised in the dorsal side.

158) *Rosalina anomala* Terquem. Atlantic Ocean, Scotland (UK), Sweden, western Mediterranean Sea, Yaman.

159) *Rosalina bradyi* Cushman. France, Turkish Dardanelles Strait, Yaman, India, Australia.

160) *Rosalina globularis* d'Orbigny. France, west Scotland (UK), Aegean Sea, Turkey, Yaman, Arabian Sea.

161) *Siphonina tubulosa* Cushman. Egyptian Red Sea, Gulf of Aqaba, Tanzania, North and South Pacific.

162) *Siphoninoides echinatus*. Egyptian Red Sea, Gulf of Aqaba, Tanzania, Mozambique.

163) *Valvobifarina mackinnonii*. Gulf of Aqaba, Tanzania, Mozambique, Malaysia, North Pacific.

164) *Discorbinella minuta* Buzas, Smith & Beem. Jamaica and Tanzania.

165) *Hyalinea balthica*. Scotland (UK), Greece, Italy, Turkish Marmara Sea, Yaman.

166) *Cibicides pseudolobatulus* Perelis & Reiss. Gulf of Aqaba, Tanzania, South Pacific.

167) *Cibicidella variabili*s d'Orbigny. Cuba, Tanzania, Mozambique.

168) *Fontbotia wuellerstorfi*. Tanzania and South Pacific.

169) *Planorbulina mediterranensis* d'Orbigny. Caribbean Sea, Bermuda Islands, France, Turkish Dardanelles Strait, Yaman, Arabian Sea, Tanzania.

170) *Planorbulina larvata* Parker & Jones. North Atlantic and Arctic Ocean, Egyptian Red Sea, Gulf of Aqaba, Tanzania, Mozambique,

171) *Cymbaloporella tabellaeformis* Brady. Egyptian Red Sea, Yaman, Arabian Sea, Maldives Ridge.

172) *Cymbaloporetta bermudezi*. Egyptian Red Sea, Gulf of Aqaba, Tanzania.

173) *Cymbaloporetta bulloides*. Tanzania, and Mozambique.

174) *Millettiana milletti*. Egyptian Red Sea, Gulf of Aqaba, Tanzania, Mozambique, North and South Pacific.

175) *Acervulina mabahethi*.[1] Red Sea, Gulf of Aqaba, Tanzania, Mozambique, Kenya, South Pacific.

176) *Sphaerogypsina globula*.[16] Egyptian Red Sea, Gulf of Aqaba, Tanzania, Mozambique, North and South Pacific.

177) *Asanonella tubulifera*. Tanzania, North and South Pacific.

178) *Pseudoeponides falsobeccarii* Rouvillois. France, Tanzania, Gulf of Aqaba.

179) *Epistomaroides punctulatus*. Egyptian Red Sea, Gulf of Aqaba, Tanzania, Mozambique.

180) *Amphistegina bicirculata*. Egyptian Red Sea, Gulf of Aqaba, Tanzania.

181) *Amphistegina lessonii* d'Orbigny. North American Atlantic, Caribbean Region, Bermuda Islands, Egyptian Red Sea, Arabian Sea, Yaman, Tanzania, Mozambique, Australia.

182) *Amphistegina lobifera* Larsen. Palestinian Haifa Bay, Yaman, Arabian Sea, Arabian Gulf, Tanzania, North and South Pacific.

183) *Amphistegina papillosa* Said.[1] Egyptian Red Sea, Gulf of Aqaba, Arabian Sea, Tanzania, South Pacific.

184) *Amphistegina radiata*. Egyptian Red Sea, Gulf of Aqaba, Yaman, India, New Guinea.

185) *Nonion fabum* South Iberia (South Europe). western Mediterranean Sea, Greece, Yaman, Arabian Sea, Namibia (south Africa).

186) *Nonionoides grateloupi*. Gulf of Aqaba, Tanzania, North and South Pacific.

187) *Anomalinella glabrata*. Gulf of Aqaba, Tanzania, North and South Pacific.

188) *Anomalinella rostrata*. Tanzania, Mozambique, North and South Pacific.

189) *Gyroidina neosoldanii* Brotzen. Tanzania and Mozambique.

190) *Neorotalia calcar* d'Orbigny. Caribbean Region, Egyptian Red Sea, Gulf of Aqaba, Yaman, Tanzania, Mozambique, India, Indonesia, North and South Pacific.

191) *Ammonia aoteana*. Yaman, Arabian Sea, Australia, New Caledonia.

192) *Ammonia beccarii*. North American Atlantic, Caribbean region, west Scotland (UK), Egyptian Red Sea, Yaman, Arabian Sea, Arabian Gulf, North American Pacific, Australia.

193) *Ammonia convexa*. Yaman, Arabian Sea, Arabian Gulf, Tanzania, Kenya, Mozambique, North and South Pacific, Australia.

194) *Ammonia faceta* He, Hu & Wang. Tanzania and North Pacific.

195) *Ammonia parkinsoniana*. Atlantic Ocean, central Adriatic Sea, Caribbean Region, Aegean Sea Biscayne Bay, Yaman, Arabian Sea.

196) *Challengerella bradyi* Billman, Hottinger & Oesterle. Red Sea, Gulf of Aqaba, Arabian Sea, Tanzania.

197) *Elphidium aculeatum*. Western Mediterranean Sea, Greece, Turkish Dardanelles Strait, Yaman.

198) *Elphidium advenum*. Florida (USA), Caribbean Region, Aegean Sea, Egyptian Red Sea, Yaman, Arabian Sea, east India.

199) *Elphidium crispum*. France, southwestern Iberia, central Adriatic Sea, south Turkey, Egyptian Red Sea, Yaman, Arabian Sea, Arabian Gulf. Philippines.

200) *Elphidium gerthi* Van Voorthuysen. Scotland, Marmara Sea, Yaman, Arabian Sea, India.

201) *Elphidium jenseni* Cushman. Tanzania, Mozambique, North and South Pacific.

202) *Elphidium limbatum*. Kenya Tanzania, Mozambique, North and South Pacific.

203) *Elphidium macellum*. North Atlantic, Italy, Greece, Turkish Marmara Sea, Yaman, India.

204) *Elphidium margaritaceum* Cushman. Atlantic Ocean, Caribbean Region, western Mediterranean Sea, Italy, Greece, Yaman, Arabian Sea, east India.

205) *Elphidium milletti*. Tanzania, Kenya, Mozambique, North and South Pacific.

206) *Elphidium striatopunctatum*. Gulf of Aqaba, Tanzania, Mozambique.

207) *Elphidium voorthuyseni* Haake. Gulf of Aqaba and Tanzania.

208) *Assilina ammonoides*. Gulf of Aqaba, Tanzania, Mozambique, North and South Pacific.

209) *Assilina discoidalis*. North Atlantic Ocean, Tanzania, Australia.

210) *Heterostegina depressa* d'Orbigny. Gulf of Aqaba, Arabian Sea, Tanzania, Mozambique, South Pacific.

211) *Globorotalia menardii*. Tanzania and Mozambique.

212) *Pulleniatina obliquiloculata*. Tanzania and Mozambique.

213) *Globigerina bulloides* d'Orbigny. Egyptian Red Sea and Yaman.

214) *Globigerina calida* Parker. Egyptian Red Sea, Gulf of Aqaba, Tanzania, Mozambique.

215) *Globigerinella siphonifera* d'Orbigny. Gulf of Aqaba and Tanzania.

216) *Globigerinoides ruber* d'Orbigny. Egyptian Red Sea, Gulf of Aqaba, Tanzania.

217) *Globigerinoides conglobatus*. Egyptian Red Sea, Gulf of Aqaba, Tanzania.

218) *Globigerinoides sacculifer*. Egyptian Red Sea, Gulf of Aqaba, Tanzania.

219) *Globoturborotalita rubescens*. Gulf of Aqaba and Tanzania.

220) *Orbulina universa* d'Orbigny. Egyptian Red Sea, Gulf of Aqaba, Arabian Gulf, Tanzania, Mozambique.

Geographic distribution

The recorded species were recorded originally from two localities in the west Indian Ocean: Yaman and Tanzania. Most of the identified species show a wide geographic distribution from USA and Argentina (Atlantic Ocean) in the west, to Malaysia and Australia (Pacific Ocean) in the east, throughout the Indian Ocean (Figure 4).

Figure 4 Location of the two studied countries Yaman and Tanzania, west Indian Ocean.

Environment and ecology

All the recorded littoral (inner neritic) benthic and planktic foraminiferal species in this study (222 species) have an excellent preservation, in spite that these localities are distinguished by their own particular environmental conditions (Figure 5).

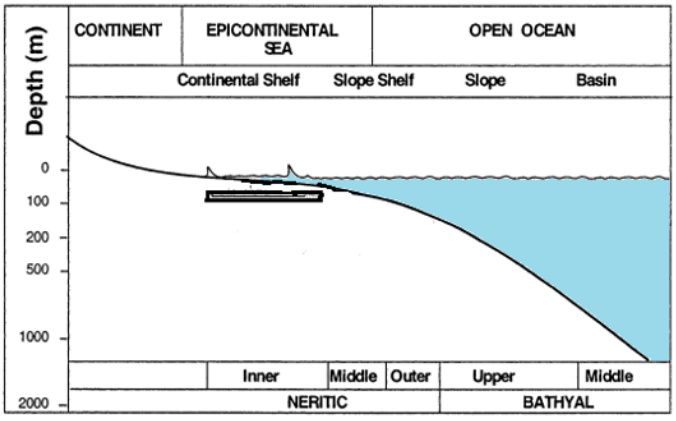

Figure 5 The environmental settings of shallow littoral (inner neritic) of recorded foraminiferal species.

The largest areas of the Indian Ocean are characterized by nutrient-rich waters. The deep-sea waters of the ocean are the main food supply for the phytoplankton, the base of the marine food chain, and brought up to the surface by seasonal up-welling at the Somalian and Arabian coast The foraminiferal assemblage of the study area reflected a remarkable similarity with the species identified in previous studies from the coasts of Atlantic Ocean, East Africa, Arabian Sea, Arabian Gulf, Red Sea, Gulf of Aqaba, Mediterranean Sea, and Pacific Ocean. The highly diverse of both sides of the Equator, open marine shelf of Yaman, and for reefs shallow lagoon of Zanzibar show that even in relatively small-scale environments. Both habitats play a prominent excellently discriminable by foraminiferal assemblages. Zanzibar is characterized by a tropical warm and humid climate with average temperatures of about 27°C. The southeast monsoon brings warm water from the central Indian Ocean, with high humidity. Foraminifera most considerably modify their habitats by producing large amounts of tests which effect ecosystems.

Some environment remarks can be added:

a. The study area is characterized by a high amount of miliolids like *Quinqueloculina, Triloculina, Miliolinella*, or *Pyrgo* and generally high percentages of smaller foraminifera

b. *Sorites orbiculus* and *Amphisorus hemprichii* which recorded in the study area, are known also from the tropical areas of all oceans. The latter species indicates high-energy habitats right beneath the reef crest.

c. *Neorotalia calcar* is the most common species and present in tropical areas all around the globe.

d. *Assilina* and *Heterostegina* are present in the western Indian Ocean. *Heterostegina depressa* is a widespread cosmopolitan genus, while *Assilina* restricted to the Indo-Pacific

e. *Ammonia convexa* is highly specialized and mainly found in shallow-water, semi-brackish environments.

f. The same applies to *Neorotalia calcar* in high-energy but unpolluted shallow-waters.

Summary and conclusion

The distribution patterns of foraminiferal taxa reflect the ecological adaptations and display useful information for the reconstruction of fossil environments. The main results of this study are:

a. Two hundred and twenty-two benthic and planktic foraminiferal species belonging to 83 genera were identified in samples from nearshore and reefal habitats.

b. Most of the recorded assemblage (222 species) have wide geographic distribution, not only in the two studied localities, but also another different sites in the whorl, from the west in Atlantic Ocean to the east in Pacific Ocean throughout Indian Ocean, which indicates an open marine environment between these localities.

c. The recorded assemblage of Tanzania displays a high diversity (~53.0%), which has a wide range of benthic and planktic foraminiferal morphospecies, followed by Yaman (~47.0%).

d. The most abundant calculated wall type in the study area based on the number of the all identified species is porcelaneous, followed by hyaline wall, and lesser by agglutinated species.

e. The recorded species are distributed with different percentages on the foraminifera suborders with a noticeable ratio of Miliolina suborder in particular the genus *Quinqueloculina*.

f. The foraminiferal assemblage of the study area reflected a remarkable similarity with the species identified in previous studies from the Arabian Sea, Indian Ocean, Red Sea and Mediterranean Sea.

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None.

Conflicts of interest

We declare that there is no conflict of interest of any kind.

References

1. Said R. *Foraminifera of the Northern Red Sea*. Cushman Laboratory for Foraminiferal Research, Spec. Publ. 1949;26:1–44.
2. Pereira CPG. *Fora miniferal distribution and ecology in the fringing reef complex of the coast, near Mombasa, Kenya*. University of Wales, PhD Thesis. 1979.
3. Bhatia SB. Recent foraminifera from shore sands of western India. *Contribution from the Cushman Laboratory for Foraminiferal Research.* 1956;7:15–24.
4. El–Nakhal HA. *Agglutinella*, A New Miliolid Genus (Foraminiferida). *Journal of Foraminiferal Research*. 1983;13(2):129–133.
5. Anan HS. Littoral Recent foraminifera from the Qossier–Marsa Alam stretch of the Red Sea coast, Egypt. *Revue de Paléobiologie*. 1984;3(2):235–244.
6. Rao KK, Sivadas P, Narayanan B, et al. Distribution of foraminifera in the lagoons of certain islands of the Lakshadweep Archipelago. Arabian Sea. *Indian Journal of Marine Science*. 1987;16:161–178.
7. Hottinger L, Halicz E, Reiss Z. Recent Foraminiferida from the Gulf of Aqaba, Red Sea. *Slovenska Akademija Znanosti in Umenosti (Ljubljana), classis.* 1993;4(33):1–179.
8. Cherif OH, Al–Ghadban AN, Al–Rifaiy IA. Distribution of foraminifera in the Arabian Gulf. *Micropaleontology.* 1997;43(3):253–280.
9. Abu–Zied RH, Rohling EJ, Jorissen FJ, et al. Benthic foraminiferal response to changes in bottom–water oxygenation and organic carbon flux in the eastern Mediterranean during LGM to Recent times. *Journal of Marine Micropaleontology*. 2008;67:46–68.
10. Langer MR, Thissen JM, Makled WA, et al. The foraminifera from the Bazaruto Archipelago (Mozambique). *Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen*. 2013;267(2):155–170.
11. Madkour HA. Recent benthic foraminifera of shallow marine environment from the Egyptian Red Sea coast. *Global Advanced Research Journal of Geology and Mining Research*. 2013;2(1):5–14.
12. Thissen JM. *The Foraminifera of the Zanzibar Archipelago (Tanzania, East Africa)*. Ph.D, Faculty of Mathematics and Natural Sciences the Rhenish Friedrich Wilhelm University of Bonn. 2014;1–225.
13. Al–Wosabi1 M, Mohammed M, Basardah F. Taxonomy and Distribution of Recent Benthic Foraminifera from Bir Ali Beach, Shabwah Governorate, Arabian Sea, Yemen. *Türkiye Jeoloji Bülteni, Geological Bulletin of Turkey*. 2017;60:383–432.
14. Loeblich AR, Tappan H. *Foraminiferal genera and their classification*. Van Nostrand Reinhold Company, New York. 1998;Part 1:970. Part 2:847.
15. Schumacher S, Jorissen FJ, Dissard D, et al. Live (Rose Bengal stained) and dead benthic foraminifera from the oxygen minimum zone of the Pakistan continental margin (Arabian Sea). *Marine Micropaleontology*. 2007;62:45–73.
16. Reiss Z, Hottinger L. The Gulf of Aqaba. *Ecological Micropaleontology, Ecological studies, Berlin–Heidelberg: Springer–Verlag*. 1984;50:1–354.