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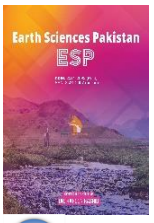

RESEARCH ARTICLE

MILIOLID SHALLOW RECENT FORAMINIFERA IN THE MEDITERRANEAN AND RED SEAS

Haidar Salim Anan*

Emeritus, former Vice President of Al Azhar University-Gaza, P. O. Box 1126, Palestine.
Corresponding Author Email: profanan@gmail.com

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ABSTRACT

This study has focused on the distribution, diversity and systematic paleontology are presented with more emphasis on their modern nomenclatural aspects and ecology of 174 Miliolid foraminiferal species, belonging to 39 genera, were identified from two marine bodies: Mediterranian Sea (MS) and Red Sea (RS). One hundred and nine of these species (~ 63 %) are recorded from MS, while the other species from RS (~37%). One hundred and fifteen Miliolids species (~69%) belong to nine diagnostic genera: 39 species to *Quinqueloculina*, followed by 16 to *Spiroloculina*, 11 to *Triloculina* and *Adelosina*, 10 to *Siphonaperta*, 9 to *Pyrgo* and *Cycloforina*, 8 to *Milliolinella* and *Pseudotriloculina*, while the other 52 species are distributed to the other thirty genera. Twenty of these species are treated here as new: *Adelosina cimermani*, *A. langeri, Spirophthalmidium mediterranensis, Siphonaperta italica, S. longata, Cycloforina cherifi, C. hewaidyi, Quinqucloculina bassiounii, Q. moradi, Milliolinella cimermani, M. langeri, Pseudotriloculina khetamae, P. nashwae, Pyrgo anani, P. haggagae, P. strougoi, Triloculinella hamimii, Sigmoilinita akmali, S. wagehi,* and *Nummoloculina boukharyi.* According to the present study, the Miliolid foraminiferal assemblage has more favorable environment in the Mediterranean Sea (MS) than Red Sea (RS), which may due to more active surface water and less water salinity in MS than RS.

KEYWORDS

Miliolid Recent foraminifera, Mediterranian Sea (Italy, Croatia, Tunisia, Palestine), Red Sea (Egypt, Saudi Arabia).

1. INTRODUCTION

The present study deals with the record of 174 Miliolid Recent benthic foraminiferal species from 6 localities in the Mediterranian Sea, and 3 localities in the Red Sea (Figure 1).

Figure 1. Location map of the studied localities in the Mediterranean Sea (Italy, Croatia, Tunisia, Palestine) and Red Sea (Egypt, Saudi Arabia).

The Mediterranean and Red Seas have played a major role among the traditional fields of foraminiferal work derive from this region. As regarded to the these sea, a comprehensive description of the foraminiferal assemblage of this marine bodies were presented: Mediterranean Sea, as well as many studies, while the foraminiferal assemblage of the Red Sea was presented by Said (1949, 1950a, b), followed by many authors (i.e. Cherif, 1970; Cherif et al, 1980; Anan, 1983, Ayadi et al, 2015, Bergamin et al., 2003; i.e. Anan, 1984; Abou Ouf et al. 1988; Haunold et al, 1997; Youssef, 2015; Cimerman and Langer, 1991). The variety of different ecological habitats between the two marine bodies offers a unique opportunity to study foraminiferal assemblages and the environmental parameters determining and controlling their distribution.

2. MATERIAL OF STUDY

One hundred and seventy-four well preserved of the Recent benthic foraminiferal species belong to suborder Miliolina are recorded and illustrated from six localities in the MS, as well as three localities in the RS, which are treated here with modern taxonomical consideration. Twenty species of them are considered here as a new.

3. SYSTEMATIC PALEONTOLOGY

The taxonomy of Loeblich and Tappan (1988) is followed here for 174 Miliolid Recent benthic foraminiferal species, which had been originally erected from nine localities in the Northern and Southern Tethys. With modern taxonomic consideration, following the Code of Zoological Nomenclature (CZN), twenty species of the assemblage are treated here as new, presented and illustrated in Plate 1.

Plate 1: **Figure. 1a,b.** *Adelosina cimermani,* **2.** *Adelosina langeri*, **3.** *Spirophthalmidium mediterranensis*, **4.** *Siphonaperta italica*, **5.** *Siphonaperta longata,* **6.** *Cycloforina cherifi,* **7.** *Cycloforina hewaidyi,* **8.**

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Quinqucloculina bassiounii, **9.** *Quinqucloculina moradi,* **10.** *Milliolinella cimermani,* **11.** *Milliolinella langeri,* **12.** *Pseudotriloculina khetamae,* **13.** *Pseudotriloculina nashwae,* **14.** *Pyrgo anani,* **15.** *Pyrgo haggagae,* **16.** *Pyrgo strougoi,* **17.** *Triloculinella hamimii,* **18.** *Sigmoilinita akmali,* **19.** *Sigmoilinita wagehi,* **20.** *Nummoloculina boukharyi.*

Order: Foraminiferida Eichwald, 1830

Suborder Miliolina Delage and Hérouard, 1896

1. Adelosina cimermani **Anan, n. sp.**(=*Adelosina* sp.1- Cimerman and Langer,1991, p. 28, pl. 21, figs.1-6) - Pl.1, fig. 1a, b.

Etymology: after Mag. Franc Cimerman, Paleontological Institut Ivana Rakovca, Yugoslavia.

Diagnosis: It is a species of the genus *Adelosina* with Quinqueloculine early stage, followed by planispirally enrolled fusiform test, three to four visible exterior chambers, surface ornamented by thick acute costae, rounded aperture produced on a neck.

Remarks: It is characterized by its thick acute costate ornamented test, and aperture without tooth.

2. Adelosina langeri **Anan, n. sp.**(=*Adelosina* sp.2- Cimerman and Langer,1991, p. 28, pl. 21, figs.7-9) - Pl. 1, fig. 2a, b.

Etymology: after Dr. Martin R. Langer, Geologisch-Palaontologisches Institut der Universitat Basel, Switzerland.

Diagnosis: It is a species of the genus *Adelosina* with regular fusiform test, three to four visible exterior chambers, surface ornamented by numerous longitudinal striae, nearly rounded aperture produced on a neck, with a short bifid tooth.

Remarks: This species differs from *A. cimermani* by its regular fusiform test, longitudinally striae, and short bifid tooth.

3.Spirophthalmidium mediterranensis **Anan, n. sp.** (=*Spirophthalmidium* sp. 1- Cimerman and Langer, 1991, p. 26, pl. 17, figs.8-10) - Pl. 1, fig. 3a,b.

Etymology: after the Mediterranean Sea.

Diagnosis: It is a species of the genus *Spirophthalmidium* with fusiform test, carinate periphery, ovate terminal aperture at the end of a long tapering neck and without tooth.

Remarks: This species differs from *S. acutimargo* (Brady) by its more longer test than width, and longer tapering neck.

4. Siphonaperta italica **Anan, n. sp.** (=*Siphonaperta* sp. 1**-** Cimerman and Langer, 1991, p. 32, pl. 25, figs. 7-9) - Pl. 1, fig. 4a,b.

Etymology: after the State of Italy.

Diagnosis: It is a species of the genus *Siphonaperta* with elongate test with five visible chambers, covered by externally by heterogeneous agglutinated material, rounded aperture at the end of a short wide neck, with a broad bifid tooth.

Remarks: This species is characterized by its heterogeneous agglutinated material, and broad bifid tooth.

5. Siphonaperta longata **Anan, n. sp.** (=*Siphonaperta* sp. 2**-** Cimerman and Langer, 1991, p. 32, pl. 26, figs. 7-9) - Pl. 1, fig. 5.

Etymology: after the long shape of the test.

Diagnosis: It is another species of the genus *Siphonaperta* with regular fusiform test, which covered by with weakly agglutinated fine material, subrounded aperture on a short neck with small bifid tooth.

Remarks: This species differs from *S. longata* in its finer agglutinated surface, and smaller bifid tooth.

6. Cycloforina cherifi **Anan, n. sp.**(=*Cycloforina* sp. 1- Cimerman and Langer, 1991, p. 32, pl. 26, figs. 7-9) - Pl. 1, fig. 6a,b.

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

Diagnosis: It is a species of the genus *Cycloforina* with flattened elongate test, subrounded periphery, anastomosing costate ornamentation, subelliptical aperture on a long ornamented neck with a short tooth.

Remarks: This species is distinguished by its anastomosing costate ornamented elongate test, and long ornamented apertural neck.

***7. Cycloforina hewaidyi* Anan, n. sp.** (=*Cycloforina* sp. 2- Cimerman and Langer, 1991, p. 32, pl. 26, figs. 7-9) - Pl. 1, fig. 7.

Etymology: after Prof. Abdel Galil Hewaidy, Geology Department, Al Azhar University, Egypt.

Diagnosis: It is another species of the genus *Cycloforina* with Rapidly increasing five chambers as added, thick curved nearly regular longitudinal costate ornamentation, subrounded aperture on medium neck with T-shaped tooth.

Remarks: This species differs from *C. cherifi* by its more regular ornamented costae, and shorter elongated apertural neck with T-shaped tooth.

***8. Quinqucloculina bassiounii* Anan, n. sp.** (=*Quinqucloculina* sp. 1 - Cimerman and Langer, 1991, p. 39, pl. 35, figs. 9-12) - Pl. 1, fig. 8a,b.

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

Diagnosis: It is a species of the genus *Quinqucloculina* with polygonal slightly rough test, U-shaped aperture with Y-shaped tooth.

Remarks: This species is distinguished by its Y-shape aperture and tooth.

***9. Quinqucloculina moradi* Anan, n. sp.** (=*Quinqucloculina* sp. 2- Cimerman and Langer, 1991, p. 39, pl. 35, fig. 8) - Pl.1, fig. 9.

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

Diagnosis: It is another species of the genus *Quinqucloculina* with subelliptical test, panana-shape five visible chambers, circular aperture with a bifid tooth.

Remarks: This species differs from *Q. bassiounii* by its banana-shape chambers and circular apertural face.

***10. Milliolinella cimermani* Anan, n. sp**.(=*Milliolinella* sp. 1- Cimerman and Langer, 1991, p. 42, pl. 39, fig. 5) - Pl. 1, fig. 10.

Etymology: after Mag. Franc Cimerman, Paleontological Institut Ivana Rakovca, Yugoslavia.

Diagnosis: It is a species of the genus *Milliolinella* with an oval smooth test, rapidly increasing chambers in size and volume as added, terminal and crescentic aperture with an apertural flap.

Remarks:

***11. Milliolinella langeri* Anan, n. sp.** (=*Milliolinella* sp. 2- Cimerman and Langer, 1991, p. 42, pl. 39, figs. 6-8) - Pl. 1, fig. 11a,b.

Etymology: after Dr. Martin R. Langer, Geologisch-Palaontologisches Institut der Universitat Basel, Switzerland.

Diagnosis: It is another species of the genus *Milliolinella* with subglobular smooth test, rapidly increasing chambers, terminal aperture with an U-shaped apertural flap.

Remarks: This species differs from *M. cimermani* by its more rounded test in lateral and apertural view, with an U-shaped apertural flap.

***12. Pseudotriloculina khetamae* Anan, n. sp.** (=*Pseudotriloculina* sp. 1- Cimerman and Langer, 1991, p. 44, pl. 39, fig. 11) - Pl. 1, fig. 12.

Etymology: after my sister Khetam Salim Anan.

Diagnosis: It is a species of the genus *Pseudotriloculina* with an oval smooth test with rounded periphery, terminal subcircular aperture with an anvil-shaped tooth.

Remarks: This species is characterized by its anvil-shaped tooth.

***13. Pseudotriloculina nashwae* Anan, n. sp.** (=*Pseudotriloculina* sp. 1- Cimerman and Langer, 1991, p. 44, pl. 39, figs. 7, 8) - Pl. 1, fig. 13.

Etymology: after my sister Nashwa Salim Anan.

Diagnosis: It is another species of the genus *Pseudotriloculina* with anastomosing fine grained material giving the test a slightly rough appearance, ovate aperture with short bifid tooth.

Remarks: This species differs from *P.* in its rough surface and bifid tooth.

***14. Pyrgo anani* Anan, n. sp.** (=*Pyrgo* sp.1- Cimerman and Langer, 1991, p. 45, pl. 42, figs. 4, 5) - Pl. 1, fig. 14.

Etymology: after Prof. Tareq Anan, Geology Department, Mansoura University, Egypt.

Diagnosis: It is a species of the genus It is a species of the genus *Pyrgo* with two inflated smooth chambers visible from the exterior with rounded periphery, elliptical aperture with broad bifid tooth.

Remarks: This species is characterized by its broad bifid tooth.

***15. Pyrgo haggagae* Anan, n. sp.** (=*Pyrgo* sp.2- Cimerman and Langer, 1991, p. 45, pl. 42, figs. 6, 7) - Pl. 1, fig. 15.

Etymology: after Prof. Mona Haggag, Geology Department, Ain Shams University, Egypt.

Diagnosis: It is another species of the genus *Pyrgo* with two inflated smooth chambers visible from the exterior with rounded periphery, with medium bifid tooth.

Remarks: This species differs from *P.* in its smaller bifid tooth.

***16. Pyrgo strougoi* Anan, n. sp.** (=*Pyrgo* sp.3- Cimerman and Langer, 1991, p. 45, pl. 42, figs. 1-3) - Pl. 1, fig. 16.

Etymology: after Prof. Amin Strougo, Geology Department, Ain Shams University, Egypt.

Diagnosis: It is another species of the genus *Pyrgo* with inflated smooth chambers visible from the exterior, truncated periphery forming distinct shoulders with lateral flat wall, semicircular aperture with short broadly bifid tooth.

Remarks: This species differs from the other two previous species of *Pyrgo* in its truncated periphery, and semicircular aperture with short broadly bifid tooth.

***17. Triloculinella hamimii* Anan, n. sp.**(=*Triloculinella* sp. 1- Cimerman and Langer, 1991, p. 47, pl. 44, fig. 5) - Pl. 1, fig. 17.

Etymology: after Prof. Zakaria Hamimi, Geology Department, Banha University, Egypt.

Diagnosis: It is a species of the genus *Triloculinella* with smooth elongate test with rounded periphery, five chambers visible from the exterior, arch aperture covered by broad apertural flap.

Remarks: This species is characterized by its elongate test with arch aperture covered by broad apertural flap.

***18. Sigmoilinita akmali* Anan, n. sp.** (=*Sigmoilinita* sp. 1- Cimerman and Langer, 1991, p. 47, pl. 46, figs. 1-5) - Pl. 1, fig. 18a,b.

Etymology: after Prof. Akmal Marzouk, Geology Department, Mansoura University, Egypt.

Diagnosis: It is a species of the genus *Sigmoilinita* with subelliptical flattened smooth test, one-half coil chambers in length with carinate angles, triangular apertural opening on a short neck and is bordered by a thickened rim.

Remarks: This species is characterized by its subelliptical flattened test, triangular apertural opening on a short neck

***19. Sigmoilinita wagehi* Anan, n. sp**.(=*Sigmoilinita* sp. 2-Cimerman and Langer, 1991, p. 47, pl. 46, figs. 6-8) - Pl. 1, fig. 19.

Etymology: after Prof. Wageh Abdelmalek, Geology Department, Ain Shams University, Egypt.

Diagnosis: It is another species of the genus *Sigmoilinita* with elongate and flattened test, chambers with subrounded peripheral margins, rounded terminal aperture on a short neck.

Remarks: It differs from *Pyrgo akmali* in its subrounded peripheral margins, rounded aperture on a short neck.

***20. Nummoloculina boukharyi* Anan, n. sp.** (=*Nummoloculina* sp. 1 - Cimerman and Langer, 1991, p. 47, pl. 44, figs. 9-11) - Pl. 1, fig. 20a,b.

Etymology: after Prof. M. Abdelqader Boukhary, Geology Department, Ain Shams University, Egypt.

Diagnosis: It is a species of the genus *Nummoloculina* with lenticular smooth test, rounded periphery, nearly flush sutures, semicircular aperture with broad flap-like tooth.

Remarks: This species is characterized by its lenticular smooth test with rounded periphery, nearly flush sutures, broad flap-like tooth in semicircular aperture.

4. Geography Distribution

The geography of nine littoral coasts in the study area are very interest

and widely distributed in the Northern and Southern Tethys, which indicates an open marine environment between the sixth different localities in MS: Italy, Croatica, Tunisia and Palestine, as well as the three localities in RS: Egypt and Saudi Arabia (Figure 1). 109 of these species (~ 63 %) are recorded from MS, while the other species from RS (~37%). The geographic distribution of the recorded assemblage in these two marine bodies is presented in Table 1.

Table 1: Mediterranean Sea (M): Italy and Croatia (Cimerman and Langer, 1991; Bergamin et al, 2003), Greece (Cherif, 1970), Tunisia (Ayadi et al., 2015), Egypt (Cherif et al, 1988), Palestine (Anan, 1983), Red Sea **(R)**: Egypt (Said, 1949; 1950a,b; Anan, 1984; Abou Ouf et al, 1988; Haunold et al, 1997), Saudi Arabia (Youssef, 2015), (⊙=illustrated new species, x =recorded species).

Sam. no.	Miliolid Recent Foraminiferal Species	M	R
1.	*Spirillina limbata* Brady, 1884	x	
2.	*Spirillina vivipara* Ehrenberg, 1841	x	x
3.	*Patellina corrugata* Williamson, 1858	x	
4.	*Carterina spiculotesta* (Carter, 1877)		x
5.	*Cornuspira foliacea* (Philippi, 1844)	x	
6.	*Cornuspira involvens* (Reuss, 1850)	x	
7.	*Cornuspiroides striolata* (Brady, 1882)	x	
8.	*Triscgmentina compressa* Wiesner, 1931	x	
9.	*Vertebralina striata* d'Orbigny, 1826	x	x
10.	*Adelosina cicgans* (Williamson, 1858)	x	
11.	*A. cliarensis* (Heron-Allen and Earland, 1930)	x	
12.	*Adelosina cimermani* Anan, n. sp.	⊙	
13.	*Adelosina dubia* (d'Orbigny, 1826)	x	
14.	*Adelosina duthiersi* Schlumberger, 1886	x	
15.	*Adelosina intricata* (Terquem, 1878)	x	
16.	*Adelosina italica* Terquem, 1878	x	
17.	*Adelosina laevigata* d'Orbigny, 1826		x
18.	*Adelosina langeri* Anan, n. sp.	⊙	
19.	*Adelosina longirostra* d'Orbigny, 1826	x	
20.	*A.mediterranensis*(LeCalvezandLeCalvez,1958	x	
21.	*Adelosina partschi* (d'Orbigny, 1846)	x	
22.	*Adelosina pulchella d'Orbigny, 1846*	x	
23.	*Nubeculina divaricata* (Brady, 1879)	x	
24.	*Calcituba polymorpha* Rohoz, 1884	x	
25.	*Spirophthalmidium acutimargo* (Brady,1884)	x	
26.	*Spirophthalmid. mediterranensis* Anan, n. sp.	⊙	
27.	*Spiroloculina angulata* (Cushman, 1917)	x	x
28.	*Spiroloculina angulosa* Terquem, 1878	x	
29.	*Spiroloculina antillarum* d'Orbigny, 1839	x	x
30.	*Spiroloc. communis* Cushman and Todd, 1944		x
31.	*Spiroloc. cuorrugata* Cushman and Todd, 1944		x
32.	*Spiroloculina cymbium* d'Orbigny, 1839	x	
33.	*Spiroloculina depressa* d'Orbigny, 1826	x	x
34.	*Spiroloculina dilatata* d'Orbigny, 1846	x	
35.	*Spiroloculina eactivaia* d'Orbigny, 1846	x	
36.	*Spiroloculina elegantissima* Said, 1949		x
37.	*Spiroloculina excavata* d'Orbigny 1848	x	
38.	*Spiroloculina krumhachi* Wiesner, 1912	x	
39.	*Spiroloculina nummiformis* Said, 1948		x
40.	*Spiroloculina lucida* Cushman and Todd, 1944		x
41.	*Spiroloculina ornata* d'Orbigny, 1839	x	x
42.	*Spiroloculina tenuiseptata* Brady, 1884	x	
43.	*Nubecularia lucifuga* Defrance, 1825	x	
44.	*Siphonaperta agglutinans* (d'Orbigny, 1839)	x	x

Table 1 (cont): Mediterranean Sea (M): Italy and Croatia (Cimerman and Langer, 1991; Bergamin et al, 2003), Greece (Cherif, 1970), Tunisia (Ayadi et al., 2015), Egypt (Cherif et al, 1988), Palestine (Anan, 1983), Red Sea **(R)**: Egypt (Said, 1949; 1950a,b; Anan, 1984; Abou Ouf et al, 1988; Haunold et al, 1997), Saudi Arabia (Youssef, 2015), (⊙=illustrated new species, x =recorded species).

45.	*Siphonaperta arenata* (Said, 1949)		x
46.	*Siphonaperta aspera* (d'Orbigny, 1826)	x	
47.	*Siphonap. dilatata* (LeCalvez, J.andY, 1958)	x	
48.	*Siphonaperta distorqueata* (Cushman, 1954)		x
49.	*Siphonaperta hauerina* (Wiesner, 1923)	x	
50.	*Siphonaperta irregularis* (d'Orbigny, 1826)		x
51.	*Siphonaperta italica* Anan, n. sp.	⊙	
52.	*Siphonaperta longata* Anan, n. sp.	⊙	
53.	*Siphonaperta pittensis* (Albani, 1974)		x
54.	Cycloforina *cherifi* Anan, n. sp.	⊙	
55.	*Cycloforina colomi* (Le Calvez, J.andY., 1958)	x	
56.	*Cycloforina contorta* (d'Orbigny, 1846)	x	
57.	*Cycloforina hewaidyi* Anan, n. sp.	⊙	
58.	*Cycloforina juleana* (d'Orbigny, 1846)	x	
59.	*Cycloforina quinquecarinata* (Collins, 1958)		x
60.	*Cycloforina rugosa* (d'Orbigny, 1852)	x	
61.	*Cycloforina tenuicollis* (Wiesner, 1923)	x	
62.	*Cyclofor. villafranca* (LeCalvez, J.andY, 1958)	x	
63.	*Hauernia bradyi* Cushman, 1917		x
64.	*Hauernia diversa* Cushman, 1946		x
65.	*Massilina gualtieriana* (d'Orbigny, 1839)	x	
66.	*Massilina secans* (d'Orbigny, 1826)	x	
67.	*Quinqueloc. agglutinata* d'Orbigny, 1839	x	x
68.	*Quinqueloculina akneriana* d'Orbigny, 1846	x	
69.	*Quinqueloculina angularis* d'Orbigny, 1826		x
70.	*Quinqueloc. annectens* (Schlumberger, 1893)	x	
71.	*Quinqueloculina auheriana* d'Orbigny, 1839	x	
72.	*Quinqueloculina bassiounii* Anan, n. sp.	⊙	
73.	*Quinqueloc. berthelotiana* d'Orbigny, 1839	x	x
74.	*Quinqueloculina bidentata* d'Orbigny, 1839	x	x
75.	*Quinqueloculina bosciana* d'Orbigny, 1839	x	
76.	*Quinqueloc. brongniartina* (d'Orbigny, 1839)		x
77.	*Quinqueloculina catalinensis* Nutland, 1928		x
78.	*Quinqueloculina crassa* d'Orbigny, 1850		x
79.	*Quinqueloculina depressa* d'Orbigny, 1839	x	
80.	*Q. disparilis* d'Orbigny, Schlumberger, 1893	x	
81.	*Quinqueloculina flavescens* d'Orbigny, 1826		x
82.	*Quinquelocnlina jugosa* Cushman, 1944	x	
83.	*Quinqueloculina laevigata* d'Orbigny, 1826		x
84.	*Quinqueloc. lamarckiana* d'Orbigny, 1839		x
85.	*Quinqueloculina lapidea* Cherif. 1973		x
86.	*Quinqueloculina limbata* d'Orbigny, 1826	x	x
87.	*Quinqueloculina ludwigi* Reuss, 1866	x	
88.	*Quinqueloculina moradi* Anan, n. sp.	⊙	
89.	*Quinqueloculina mosharrafi* Said, 1949		x
90.	*Quinqueloc. neostriatula* Thalmann, 1950		x
91.	*Quinqueloculina nodulosa* Wiesner, 1923	x	
92.	*Quinqueloculina partschii* d'Orbigny, 1846		x
93.	*Quinqueloc. parvula* Schlumberger, 1894	x	
94.	*Quinqueloc. peregrina striata* (Wiesner,1912		x
95.	*Quinqueloc. phoenicia* (Martinotti, 1920)	x	
96.	*Q. pseudobuchiana* Luczkowska, 1974	x	
97.	*Quinqueloculina puichella* d'Orbigny, 1826		x

Table 1 (cont): Mediterranean Sea (M): Italy and Croatia (Cimerman and Langer, 1991; Bergamin et al, 2003), Greece (Cherif, 1970), Tunisia (Ayadi et al., 2015), Egypt (Cherif et al, 1988), Palestine (Anan, 1983), Red Sea **(R)**: Egypt (Said, 1949; 1950a,b; Anan, 1984; Abou Ouf et al, 1988; Haunold et al, 1997), Saudi Arabia (Youssef, 2015), (⊙=illustrated new species, x =recorded species).

98.	*Quinqueloculina samoensis* Cushman, 1924		x
99.	*Quinqueloculina seminula* (Linnaeus, 1758)	x	x
100.	*Quinqueloc. stel1igera* Schlumberger, 1893	x	
101.	*Quinqueloc. triangularis* d'Orbigny, 1826	x	
102.	*Quinqueloculina ungeriana* d'Orbigny, 1846	x	
103.	*Quinqueloculina variolata* d'Orbigny, 1826	x	
104.	*Quinqueloculina vulgaris* d'Orbigny, 1826	x	x
105.	*Quinq. wiesneri* Le CalvezandLe Calvez, 1958	x	
106.	*Affinetrina planciana* (d'Orbigny, 1839)	x	
107.	*Milliolinella cimermani* Anan. n. sp.	⊙	
108.	*Miliolinella dilatata* (d'Orbigny, 1839)	x	
109.	*Miliolinella grata* (Terquem, 1878)	x	
110.	*Miliolinella labium* (d'Orbigny, 1839)	x	
111.	*Milliolinella langeri* Anan, n. sp.	⊙	
112.	*Miliolinella semicostata* (Wiesner, 1923)	x	
113.	*Milliolinella subrotunda* (Montagu, 1803)	x	x
114.	*Milliolinella webbiana* (d'Orbigny, 1836)	x	x
115.	*Pseudomassilina pacificiensis* Cushman,1924		x
116.	*Pseudotriloculina cuneata* (Karrer, 1867)	x	
117.	*Pseudotriloculina elongata* (d'Orbigny 1826)	x	
118.	*Pseudotriloculina khetamae* Anan, n. sp.	⊙	
119.	*Pseudotriloculina laevigata* (d'Orbigny, 1826	x	
120.	*Pseudotriloculina nashwae* Anan, n. sp.	⊙	
121.	*Pseudotriloculina oblonga* (Montagu, 1803)	x	
122.	*Pseudotriloculina rotunda* (d'Orbigny, 1826)	x	
123.	*Pseudotriloc. sidebottomi* (Martinotti, 1920)	x	
124.	*Pyrgo anani* Anan, n. sp.	⊙	
125.	*Pyrgo anomala* (Schlumberger, 1891)	x	
126.	*Pyrgo elongata* d'Orbigny, 1826	x	
127.	*Pyrgo haggagae* Anan, n. sp.	⊙	
128.	*Pyrgo labiata* (Schlumberger, 1891)	x	
129.	*Pyrgo lucernula* (Schwager, 1866)	x	
130.	*Pyrgo strougoi*	⊙	
131.	*Pyrgo* subsphaerica (Wiesner, 1923)	x	
132.	*Pyrgo wiesneri* Le Calvez, J. and Y., 195*8*	x	
133.	*Pseudotriloculina elongata* (d'Orbigny 1826)	x	
134.	*Pyrgoella sphaera (d'Orbigny, 1839)*	x	
135.	*Triloculina adriatica* Le Calvez, J.andY., 1958	x	
136.	*Triloculina affinis* d'Orbigny, 1826		x
137.	*Triloculina marioni* Schlumberger, 1893	x	
138.	*Triloculina ornata* Le Calvez, J. andY., 1958	x	
139.	*Triloculina plicata* Terquem, 1876	x	
140.	*Triloculina rotunda* d'Orbigny, 1826	x	
141.	*Triloculina schreiberiana* d'Orbigny 1839	x	
142.	*Triloculina serrolata* McCulloch, 1977		x
143.	*Triloculina suborbicularis* d'Orbigny, 1826		x
144.	*Triloculina terquemiana* (Brady, 1884)		x
145.	*Triloculina tricarinata* d'Orbigny, 1826	x	x
146.	*Triloculina trigonula* (Lamarck, 1804)	x	
147.	*Triloculinella hamimii* Anan, n. sp.	⊙	
148.	*Scutuloris australis* (Parr, 1932)		x
149.	*Scutuloris dilletata* (d'Orbigny, 1839)		x
150.	*Scutuloris labiosa* (d'Orbigny, 1839)		x

Table 1 (cont): Mediterranean Sea (M): Italy and Croatia (Cimerman and Langer, 1991; Bergamin et al, 2003), Greece (Cherif, 1970), Tunisia (Ayadi et al., 2015), Egypt (Cherif et al, 1988), Palestine (Anan, 1983), Red Sea **(R)**: Egypt (Said, 1949; 1950a,b; Anan, 1984; Abou Ouf et al, 1988; Haunold et al, 1997), Saudi Arabia (Youssef, 2015), (⊙=illustrated new species, x =recorded species).			
151.	*Sigmoilinita akmali* Anan, n. sp.	⊙	
152.	*Sigmoilinita costata* (Schlumberger, 1893)	x	
153.	*Sigmoilinita grata* (Terquem, 1878)	x	
154.	*Sigmoilinita fermis* (Czjzek, 1848)	x	
155.	*Sigmoilinita wagehi* Anan, n. sp.	⊙	
156.	*Wellmanellinella striata (Sidebottom)*	x	
157.	*Nummoloculina boukharyi* Anan, n. sp.	⊙	
158.	*Pseudoschlumberg. ovata* (Sidebottom,1904)		x
159.	*Articulina carinata* Wiesner, 1923	x	
160.	*Articulina pacifica* Cushman 1944		x
161.	*Parrina bradyi* (Milieu, 1898)	x	
162.	*Varidentella neostriatula* (Thalmann, 1950)		x
163.	*Pseudohauerina orientalis* (Cushman, 1946)		x
164.	*Borelis schlumbergeri* Reichel, 1937		x
165.	*Coscinospira hemprichii* Ehrenberg, 1839	x	x
166.	*Peneroplis karreri* Wiesner, 1923	x	
167.	*Peneroplis pertusus* (Forskal, 1775)	x	x
168.	*Peneroplis planatus* (Fichtel and Moll, 1803)	x	x
169.	*Dendritina arbscula* Cushman, 1927		x
170.	*Spirolina arietina* (Batch, 1884)		x
171.	*Amphisorus hemprichi* Ehrenberg, 1838		x
172.	*Sorites marginalis* (Lamarck, 1816)		x
173.	*Sorites orbiculus* Forskal, 1775	x	x
174.	*Sorites variabilis* Lacroix, 1940	x	

An additional remarks of the paleogeographic distribution of the recorded species can be presented:

- Only 20 species of the assemblage (~11%) have wide geographic distribution, which recorded in the two marine bodies in the MS and RS: *Spirillina vivipara*, *Vertebralina striata*, *Spiroloculina angulata*, *S. antillarum*, *S. depressa*, *S. ornata, Siphonaperta agglutinans, Quinqueloculina agglutinata, Q. berthelotiana, Q. bidentata*, *Q. limbata*, *Q. seminula*, *Q. vulgaris*, *Milliolinella subrotunda*, *M. webbiana*, *Triloculina tricarinata*, *Coscinospira hemprichii, Peneroplis pertusus*, *Peneroplis planatus* and *Sorites orbiculus*. This low percentage means the two marine bodies have different environmental parameters.
- The other species in the two study areas (~88%) are recorded only from one marine body of them: (~68%) from MS, while only (~32%) from RS.

5. Environment and Ecology

- All the recorded littoral (inner neritic) Miliolid benthic foraminiferal species in this study have an excellent preservation of the tests, in spite that these different localities are distinguished by their own particular environmental conditions (Figure 2).
- Twenty of the recorded assemblage have wide geographic distribution in two marine bodies, which indicates an open marine environment between these two localities, and also in another marine bodies, like: Arabian Sea (Al-Wosabi et al., 2012; 2017; Al-Wosabi and Al-Qadassi, 2024) and Arabian Gulf (Cherif et al., 1997; Amao et al., 2018; 2022).
- The Miliolid species in the study area reflects warm climate conditions.
- The favor precipitation of calcareous binding material for the porcelaneous tests, which favor the forms thriving in shallow and warm environment, are used as indicator for environmental changes.
- Minor differences in the morphology of the test, wall structure, size, ornamentation, aperture, and type of periphery are recognized as being of decisive generic or specific value.

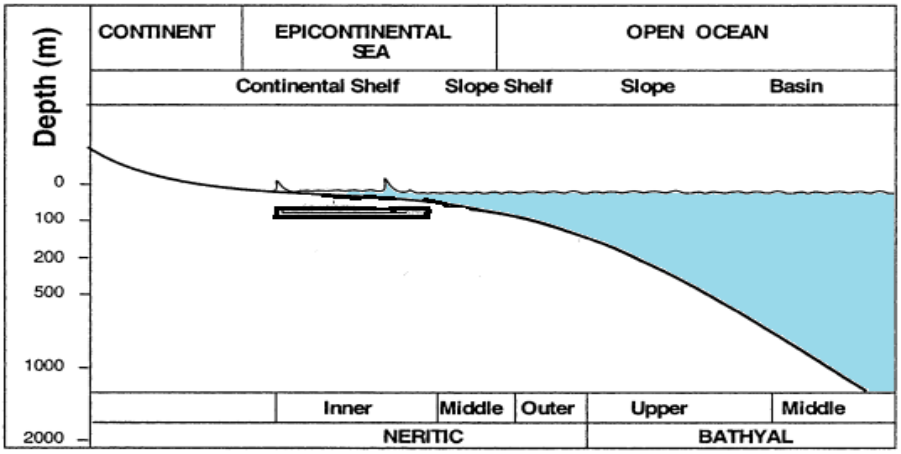

Figure 2: The environmental settings of shallow littoral (inner neritic) of recorded foraminiferal species in MS and RS.

The studied area of MS is generally dynamically active, and characterized by its endemic fauna that adapted to dilution from freshwater input from different in north and south Mediterranean Sea, from south European drainage (i.e.: rivers of Arno and Rhine) and north Africa (River Nile).

- High extremes of salinity (about 40 - 36.5 ‰) of RS, due to high temperature and nutrients terrigenous sedimentation, in spite rare dilution from freshwater input from African and Asian drainages.
- The present study, concluded that the Miliolid foraminiferal assemblage has more favorable environment in the MS than RS, may due to more active surface water (Figure 3) in MS, which produce more nutrients and organic carbonates for the biological community, and less water salinity in MS due to drainage fresh-water from Europe I winter and Africa in summer than RS.

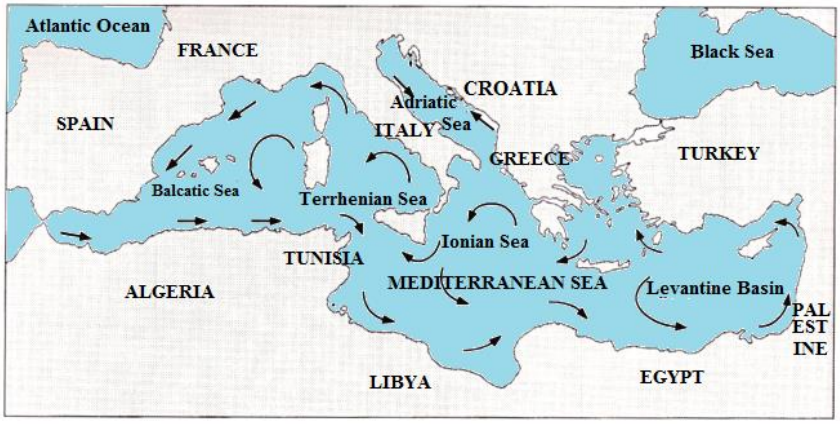

Figure 3: Generalized surface circulation pattern in topographic units of the MS (after Cimerman and Langer, 1991).

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