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RESEARCH ARTICLE

REPRESENTATIVES OF SOME DIAGNOSTIC AGGLUTINATED FORAMINIFERAL GENERA OF THE SUBCLASS MONOTHALAMANA (BATHYSIPHON, ORBULINELLOIDES, REPMANINA, MILIAMMINA, AGGLUTINELLA, DENTOSTOMENIA, AMMOMASSILINA, PSAMMOLINGULINA) IN THE TETHYS

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ABSTRACT

The present study deals with the paleontology, stratigraphy, paleogeography and paleoenvironment of the sixteen representatives of the Paleogene agglutinated benthic foraminifer Monothalamana of eight genera: Bathysiphon Sars, Orbulinelloides Saidova, Repmanina Suleymanov, Miliammina Heron-Allen & Earland, Agglutinella El-Nakhal, Dentostomina Cushman, Ammomassilina Cushman, Psammolingulina Silvestri. One species Orbulinelloides kaminskii is believed here to be new. As a whole these faunae are rarely described in the micropaleontological literatures, that's why this study is detected. The recorded species are distributed on both sides of the Northern Tethys (Hungary, France), Southern Tethys (Egypt, UAE, Pakistan), Pacific and Atlantic Ocean. It seems that the changes in paleoceanographic conditions should accentuate the benthic faunal changes. Some of the recorded species are mostly confined to that mention localities in the Atlantic and Pacific Ocean, Northern and Southern Tethys, and it was recorded by a few authors. The deeper water species have smooth tests, while the shallow water specimens are coarser grained. The number differences of the recorded species between the different localities in the Tethys may be due to one or more parameters: the deficiency of available literatures, differences in ecological or environmental conditions (depth, salinity, water temperature, dissolved oxygen, nutrient, land barrier) and not homogeneity in the generic or species concept according to different authors.

KEYWORDS

Monothalamana, agglutinated foraminifera, Paleogene, Tethys.

1. INTRODUCTION

An attempt has been made to study holotypes and hypotypes of sixteen species of eight Paleogene Monothalaminid agglutinated genera as possible in connection with the original descriptions and figures. The identified fauna was recorded from both sides of the Tethys which originally described from some Tethyan localities: Egypt, UAE, Pakistan (Southern Tethys), France, Hungary (Northern Tethys), Atlantic and Pacific Ocean (Figure 1, 2). The intent of this study is to bring together many data scattered in the literature under a unifying theme of these genera that originally erected from the Tethys, Atlantic and Pacific Oceans, and to detect its paleontology, stratigraphy, paleoenvironment and paleogeographic distribution of them, particularly in the both sides of the Tethys.

2. SYSTEMATIC PALEONTOLOGY

Sixteen Paleogene agglutinated foraminiferal species are identified and illustrated in Plate 1. The suprageneric systematics of agglutinated foraminifera of is used here (Kaminski, 2014). Some modern references have been added new taxonomic considerations, to complete synonymies and the description of the recorded species.

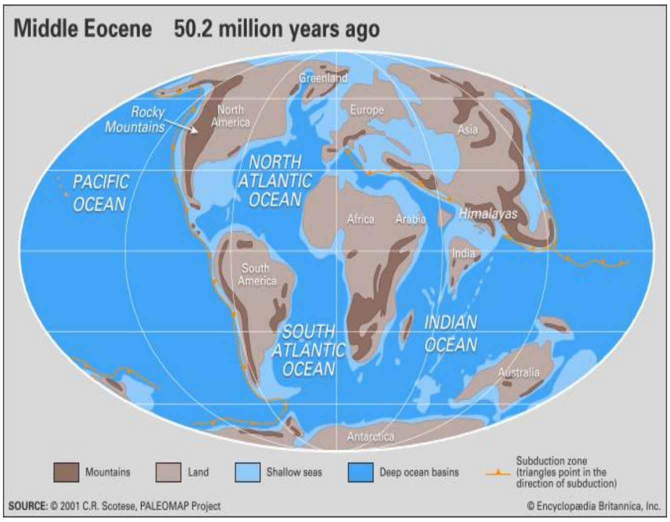

Figure 1: The paleogeographic map showing the distribution of the oceans in the Middle Eocene time.

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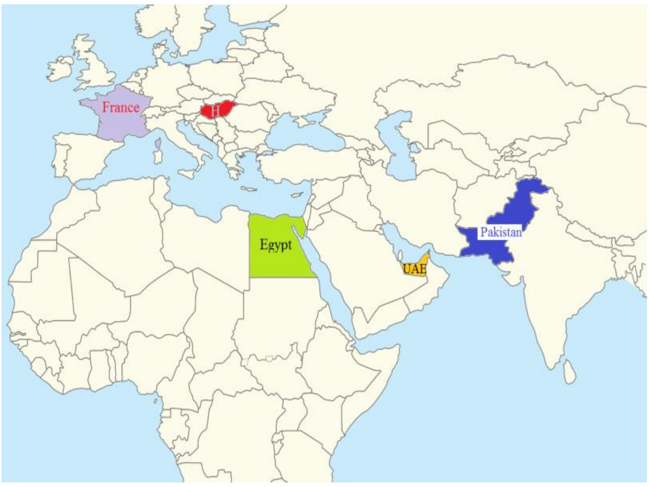

Figure 2: The geographic map showing the locations of the countries that the identified species are recorded in the Northern Tethys (France, Hungary) and Southern Tethys (Egypt, UAE, Pakistan)

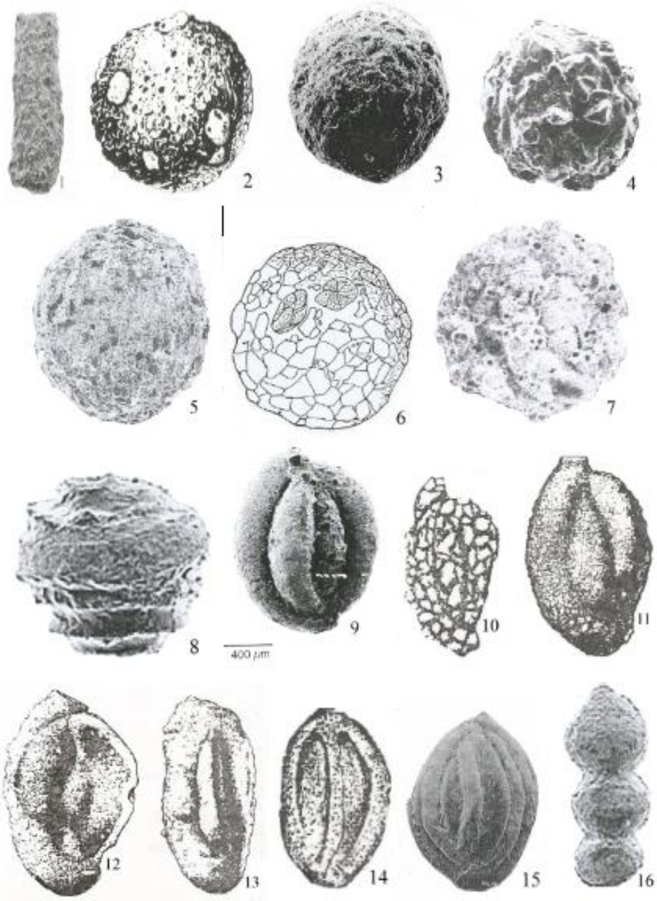

Fig. 1. *Bathysiphon saidi* 20, 2. *Orbulinelloides agglutinatus* (Saidova, 1970) x 85, 3. *O. arabicus* Anan, 2003 x 55, 4. *O. fusca* (Schultze, 1875) x 35, 5. *O. kaminskii* Anan, n. sp. x 4o, 6. *O. sztrakosae* Anan, 2021 x 35, 7. *O. testacea* (Flint, 1899) x 70. 8 (Anan, 1994). *Repmanina mazeni* Anan x 50, 9. *Miliammina kenawyi* Anan x 75, 10. *Agglutinella reinemundi* (Haque) x 90, 11. *A. sori* (Haque) x 60, 12. *Dentostomina ammobicarinata* (Haque) x30, 13. *D. ammoirregularis* (Haque) x 35, 14. *D. gapperi* (Haque) x 55, 15. *Ammomassilina misrensis* Anan x 30, 16. *Psammolingulina bahri* Anan x 90.

Class Foraminifera d'Orbigny, 1826

Subclass Monothalamana Pawlowski, Holzmann and Tyszka, in Kaminski, 2013

Order Astrorhizida Lankester, 1855

Suborder Astrorhizina Lankester, 1855

Superfamily Astrorhizoidea Brady, 1881

Family Rhabdamminidae Brady, 1884

Subfamily Bathysiphoninae Avnimelech, 1952

Genus *Bathysiphon* Sars, 1872

Type species *Bathysiphon filiformis* Sars, 1872

***Bathysiphon saidi* (Anan, 1994) – (Pl. 1, figure 1)**

1994 *Rhabdammina saidi* Anan, p. 218, fig. 8.1.☻{illustrated species}

2005 *Bathysiphon saidi* (Anan) - Anan, p. 19, pl. 1, fig. 2.

2007 *Bathysiphon saidi* Anan - Ozsvárt, p. 29, pl. 1, figs. 2,3.

2011 *Bathysiphon saidi* Anan - Boukhary et al., p. 537.

Remarks: This Bartonian-Priabonian species has an elongate test and wall constructed of firmly cemented coarse sand grains with rough exterior. The wide stratigraphic range of the Triassic-Holocene genus *Bathysiphon* differs from the Holocene *Rhabdammina* by its straight unbranched elongate tube (Sars, 1869). *B. saidi* originally described from Fayoum and Sinai of Egypt, and later also from the same stratigraphic horizon of Jabal Hafit, United Arab Emirates, UAE and Hungary (Anan, 2005; Ozsvárt, 2007).

Family Saccamminidae Brady, 1884

Subfamily Thurammininae Miklukho-Maklay, 1963

Genus *Orbulinelloides* Saidova, 1975

Type species *Orbulinelloides agglutinatus* Saidova, 1970

***Orbulinelloides agglutinatus* (Saidova, 1970) - (Pl. 1, figure 2)**

1970 *Orbulinoides agglutinatus* Saidova, p. 164.

1975 *Orbulinelloides agglutinatus* (Saidova) - Saidova, p. 41, pl. 21, fig. 10.

1988 *Orbulinelloides agglutinatus* (Saidova) - Loeblich & Tappan, p. 35, pl. 21, fig. 10.☻

Remarks: This Holocene species has spherical test, wall coarsely agglutinated with organic cement, apertures numerous rounded and scattered over the entire surface but not elevated on projections. It was originally recorded from boreal Pacific Ocean.

***Orbulinelloides arabicus* (Anan, 2003) – (Pl. 1, figure 3)**

2003 *Orbulinelloides arabicus* Anan, p. 531, fig. 4. 1. ☻

2011 *Orbulinelloides arabicus* Anan - Anan, p. 52, pl. 1, fig. 2.

Remarks: This Bartonian-Priabonian species has spherical-subspherical coarsely agglutinated test, and flush apertures with the surface. It was described from J. Hafit, UAE (Anan, 2003).

***Orbulinelloides fusca* (Schultze, 1875) – (Pl. 1, figure 4)**

1875 *Psammosphaera fusca* Schultze, p. 113.

1988 *Psammosphaera fusca* Schultze - Loeblich &Tappan, p. 28, pl. 19, figs. 2, 3.

2016 *Orbulinelloides fusca* Schultze - Orabi & Zaky, p. 187, pl. 2, fig. 1. ☻

Remarks: This Danian figured form of is treated also here to the genus *Orbulinelloides* (Orabi and Zaky, 2016). It has spherical-subspherical test consists of coarsely agglutinated sand grains, separated by large pores that serve as aperture, and rough periphery. It was described from Farafra Oasis, Egypt.

***Orbulinelloides sztrakosae* (Anan, 2021) – (Pl. 1, figure 5)**

2000 *Psammosphaera* sp. Sztrákos, p. 156, pl. 1, fig. 2. ☻

2021b *Orbulinelloides sztrakosae* Anan - Anan, p. 85, pl. 1, fig. 3.

Remarks: This Ypresian-Lutetian species is characterized by its large spherical test, coarsely ill-sorted angular agglutinated wall with organic cement, aperture scattered over the entire surface. Loeblich and Tappan treated the genus *Psammosphaera* of as a junior synonym of the Silurian-Permian genus *Thurammina* of while treated the genus *Psammosphaera* of as a separate genus (Loeblich and Tappan, 1988; Hofker, 1972; Brady, 1879; Kaminski, 2014; Schulze, 1875). The figured form of Sztrákos (from France) treated here to belong to the genus *Orbulinelloides*. The latter genus has coarsely agglutinated grains with organic cement, and numerous scattered apertures on the entire surface without elevated on projection. The Early-Middle Eocene species *Orbulinelloides sztrakosae* Anan has an older stratigraphic occurrence than the Arabian Middle-Late Eocene *O. arabicus* Anan.

Orbulinelloides kaminskii **Anan, n. sp. - (Pl. 1, figure 6)**

1991 *Psammosphaera* sp. Kaminski & Huang, p. 178, pl. 1, figure 11. ☻

Holotype: Illustrated specimen in Pl. 1, figure 6.

Age: Early Eocene.

Etymology: After Prof. M. Kaminski, King Fahd Univ. of Petroleum and Minerals, Saudi Arabia (SA).

Depository: The private collection of Prof. M. Kaminski.

Diagnosis: The figured specimen of Kaminski & Huang has coarsely to moderate agglutinated grains of the globular test, without elevated apertures on projection.

Remarks: As noted before, treated the genus Psammosphaera of as a junior synonym of the Silurian-Permian genus *Thurammina* of while treated the genus *Psammosphaera* of as a separate genus (Loeblich and Tappan, 1988; Hofker, 1972; Brady, 1879; Kaminski, 2014; Schulze, 1875). The figured form of is treated here to the genus *Orbulinelloides* (Kaminski and Huang, 1991). It differs from the Bartonian-Priabonian *O. arabicus* Anan and Ypresian-Lutetian *O. sztrakosae* Anan in its less scattered large apertures without elevated on projection and older stratigraphic occurrence from Ypresian. It may be the ancestor of that other species in Arabia and France. It is, so far, an endemic to Pacific Ocean.

Orbulinelloides testacea **(Flint, 1897) – (Pl. 1, figure 7)**

1897 *Psammosphaera fusca* var. *testacea* Flint, p. 268, pl. 8, fig. 2.

1918 *Psammosphaera testacea* Flint - Cushman, p. 38, pl. 15, figs. 1-3.

1972 *Psammosphaera testacea* Flint - Hofker, p. 33, pl. 7 figs. 6-7.

1989 *Psammosphaera testacea* Flint - Kaminski et al., p. 725, pl. 1, fig. 13. ☻

Remarks: Test globular; wall composed of foraminiferal tests, mostly Globigerines, in a single layer, cemented by greyish granular matter, small openings in the cement function as apertures. Flint described this species from the Gulf of Mexico, while Heron-Allen & Earland recorded it from about Great Britain, which occurs in fossil assemblages, and was recorded from the Eocene of the Lizard Springs Formation of Trinidad, and from the Eocene of ODP Site 647 in the Labrador Sea (Atlantic Ocean) (Kaminski et al., 1989; Flint, 1897; Heron-Allen and Earland, 1913).

Order Ammodiscida Mikhalevich, 1980

Suborder Ammodiscina Mikhalevich, 1980

Superfamily Ammodiscacea Reuss, 1862

Family Ammodiscidae Reuss, 1862

Subfamily Uzbekistaniinae Vyalov, 1968

Genus *Repmanina* Suleymanov, 1966

Type species *Trochammina squamata* Jones & Parker var. *charoides* Jones & Parker, 1860

Repmanina mazeni **Anan, 2021– (Pl. 1, figure 8)**

2016 *Repmanina* sp. Anan, p. 244, fig. 4.7. ☻

2021b *Repmanina mazeni* Anan - Anan, p. 85, pl. 1, fig. 4.

Remarks: This Paleocene species has regular trochospiral coiled test with a straight axis formed a depressed crown-like coiled in outline, central part is wider than the starting and its end coiling, chambers have sharply edges, smooth finely agglutinated wall. It differs from *R. charoides* by its regular trochoid test, sharply edges chambers, and younger stratigraphic occurrence, and differs from *Glomospira gordialis* by its regular and depressed crown coiled in outline. It is, so far, an endemic to UAE.

Order Schlumbergerinida Mikhalevich, 1980

Suborder Schlumbergerinina Mikhalevich, 1980

Superfamily Rzehakinoidea Cushman, 1933

Family Miliamminidae Saidova, 1981

Subfamily Miliammininae Saidova, 1981

Genus *Miliammina* Heron-Allen & Earland, 1930

Type species *Miliammina oblonga* (Montagu) *arenacea* Chapman, 1916

Miliammina kenawyi **Anan, 1994 - (Pl. 1, figure 9)**

1994 *Miliammina kenawyi* Anan, p. 218, fig. 8. 2. ☻

2005 *Miliammina kenawyi* Anan - Anan, p. 19, pl. 1, fig. 3.

2011 *Miliammina kenawyi* Anan - Anan, p. 53, pl. 1, fig. 3.

Remarks: This Bartonian-Briabonian species has fine agglutinated smooth wall with loose quinqueloculine arrangement test with half coil chambers. It was described from Fayoum area, Egypt, and later from J. Hafit, UAE (Anan, 2005; Anan, 1994).

Genus *Agglutinella* El-Nakhal, 1983

Type species *Agglutinella soriformis* El-Nakhal, 1983

The genus *Agglutinella* has inner calcareous imperforated porcelaneous wall, but with outer agglutinated cover. Loeblich and Tappan considered the genus *Agglutinella* belongs to the Suborder Miliolina with its porcelaneous wall, not to Suborder Schlumbergerinina with agglutinated arenaceous wall according (Loeblich and Tappan, 1988; Kaminski, 2014). The Eocene to Resent genus *Agglutinella* has quinqueloculininae early stage with only three triloculine arrangement of chambers visible in the exterior, agglutinated external wall with simple or bifid tooth and porcelaneous imperforate lip. It is similar to both *Triloculina* and *Trilocularena*, but *Agglutinella* differs from *Triloculina* by its agglutinated external wall, the presence of a porcelaneous inner wall and a simple or bifid tooth plate (d'Orbigny, 1826; Loeblich and Tappan, 1955). *Agglutinella* differs from *Trilocularena* by its an agglutinated wall throughout and a broad tooth.

Agglutinella reinemundi **(Haque, 1960) - (Pl. 1, figure 10)**

1960 *Triloculina reinemundi* Haque, p. 19, pl. 2, fig. 5. ☻

2021a *Agglutinella reinemundi* (Haque) - Anan, p. 44, pl. 1, fig. 3.

Remarks: This Eocene species belongs here to the genus *Agglutinella* due to its triloculine arrangement of chambers, agglutinated external wall and porcelaneous imperforate inner wall, and a simple aperture with simple tooth. It is characterized by its elongated test with coarsely agglutinated external wall, and, so far, an endemic to Pakistan.

Agglutinella sori **(Haque, 1960) - (Pl. 1, figure 11)**

1960 *Triloculina sori* Haque, p. 20, pl. 5, fig. 9. ☻

2021a *Agglutinella sori* (Haque) - Anan, p. 44, pl. 1, fig. 4.

Remarks: The Pakistanian Eocene species *Agglutinella sori* has inflated elongated chambers, subcircular cross-section, curved depressed sutures, simple tooth in circular opening aperture. It differs from *A. reinemundi* by its more inflated chambers, subcircular cross-section, and less coarsely agglutinated external wall. With its simple tooth, this species differs from the Recent foraminiferal species *Agglutinella soriformis* by its bifid tooth, which recorded from Jeddah sea shore of Saudi Arabia, Gulf of Suez of Egypt, and Mukha sea shore of Yemen (El-Nakhal, 1983).

Genus *Dentostomina* Cushman, 1933

Type species *Dentostomina bermudiana* Carman, 1933

Dentostomina ammobicarinata **(Haque, 1960) - (Pl. 1, figure 12)**

1960 *Triloculina ammobicarinata* Haque, pl. 6, fig. 6.☻

2021a *Dentostomina ammobicarinata* (Haque) - Anan, p. 44, pl. 1, fig. 5.

Remarks: This Eocene species belongs here to the genus *Dentostomina* due to its quinqueloculine arrangement test with crenulated margin, agglutinated quartz grains outer layer, terminal circular aperture with long narrow bifid tooth. It is, so far, an endemic to Pakistan.

Dentostomina ammoirregularis **(Haque, 1960) - (Pl. 1, figure 13)**

1960 *Triloculina* ammo-irregularis Haque, pl. 6, figure 4. ☻

2021a *Dentostomina ammoirregularis* (Haque) - Anan, p. 44, pl. 1, fig. 6.

Remarks: This Eocene species belongs also to the genus *Dentostomina*. It is characterized by its mainly elongated test with simple tooth in semi-circular open aperture, then the other species E. ammobicarinata which has semi-circular crenulated test and long bifid tooth in circular aperture. It is, so far, an endemic to Pakistan.

Dentostomina gapperi **(Haque, 1956) - (Pl. 1, figure 14)**

1956 *Quinqueloculina gapperi* Haque, p. 54, pl. 32, fig. 11. ☻

2007 *Quinqueloculina gapperi* Haque - Gibson, p. E12.

2021a *Dentostomina gapperi* (Haque) - Anan, p. 44, pl. 1, fig. 7.

Remarks: This Paleocene species has quinqueloculine arrangement test with median ridge, surface layer of agglutinated small quartz particles, and simple tooth in oval-shaped aperture. It is, so far, an endemic to Pakistan.

Family Ammomassilinidae Mikhalevich & Kaminski, 2008

Subfamily Ammomassilininae Mikhalevich & Kaminski, 2008

Genus *Ammomassilina* Cushman, 1933

Type species *Massilina alveoliniformis* Milleti, 1898

***Ammomassilina misrensis* Anan, 2021 - (Pl. 1, figure 15)**

1994 *Ammomassilina* sp. Anan, p. 219, fig. 8.5. ☻

2011 *Ammomassilina* sp. Anan - Boukhary et al., p. 104.

2021b *Ammomassilina* sp. Anan - Anan, p. 88, pl. 1, fig. 22.

Remarks: According to this genus was treated in the suborder Miliolina due to its porcelaneous wall, while consider it belongs to agglutinated foraminifera due its agglutinated quartz particles on its surface (Loeblich and Tappan, 1988; Kaminski, 2014). This Bartonian-Briabonian species is characterized by its large test, more than 1 mm in length, chambers one-half coil in length, quinqueloculine early stage, later added on opposite sides, imperforated calcareous porcelaneous wall with surface layer of agglutinated quartz particles. The genus *Ammomassilina* was originally described from the Holocene in Pacific Ocean., but it was recorded from the Late Eocene from Fayum area, Egypt. It is, so far, an endemic to Egypt.

Order Lituolida Lankester, 1885

Suborder Hormosinina Mikhalevich, 1980

Superfamily Hormosinacea Haeckel, 1894

Family Glaucoamminidae Saidova, 1904

Genus *Psammolingulina* Silvestri, 1904

Type species *Lingulina papillosa* Neugeboren, 1904

***Psammolingulina bahri* Anan, 2021- (Pl. 1, figure 16)**

2016 *Psammolingulina* sp. Anan, p. 244, fig. 4.8. ☻

2021b *Psammolingulina bahri* Anan - Anan, p. 85, pl. 1, fig. 4.

Remarks: This Paleocene species has an elongated rectilinear uniserial test, inflated globular three chambers, rounded periphery, depressed sutures, wall of coarse quartz particles giving a rough surface, terminal aperture. This species differs from the Miocene-Pliocene *P. papillosa* by its more inflated chambers, more depressed sutures, and older stratigraphic occurrence. It is, so far, an endemic to UAE.

3. Paleogeography

The paleogeographic maps of some authors show a that the ancestral Tethys is connected with the ancestral Atlantic, Indian and Pacific Oceans via Mediterranean sea (Mintz, 1981). Sixteen small benthic foraminiferal species belong to eight diagnostic agglutinated foraminiferal genera (Bathysiphon, Orbulinelloides, Repmanina, Miliammina, Agglutinella, Dentostomina, Ammomassilina, Psammolingulina) were identified from some localities in the Southern Tethys (Egypt, UAE, Pakistan), Northern Tethys (France, Hungary), Atlantic and Pacific Oceans (Figure 1, 2). The following remarks of the paleogeographic distribution of the recorded species can be added:

1. Thirteen of the identified agglutinated species are recorded from the Southern Tethys 13/16 (about 81%): Pakistan 5/16 (about 31%), Egypt 3/16 (about 19%), and UAE 3/16 (about 19%).

2. Three of the identified species were erected from Pacific Ocean 3/16 (about 19%).

3. One species from Atlantic Ocean (about 0.06%), and also one from France 1/16 (about 0.06%).

4. *Orbulinelloides testacea* (Flint) was recorded in Gulf of Mexico, Great Britain, Trinidad and Labrador Sea.

5. *Orbulinelloides agglutinatus* (Saidova) and *O. kaminskii* (n. sp.) were recorded in the Pacific Ocean.

6. *Orbulinelloides fusca* (Schultz) was recorded from Atlantic Ocean and Egypt.

7. *Orbulinelloides arabicus* Anan was recorded, so far, from UAE.

8. *Orbulinelloides sztrakosae* Anan was recorded, so far, from France.

9. *Agglutinella reinemundi, A. sori, Dentostomina ammobicarinata, D. ammoirregularis, D. gapperi* were recorded, so far, from Pakistan, by Haque.

10. *Bathysiphon saidi* (Anan) was recorded from Egypt and Hungary.

11. *Miliammina kenawyi* (Anan) was recorded from Egypt and UAE.

12. *Repmanina mazeni* (Anan) and *Psammolingulina bahri* (Anan) were recorded, so far, from UAE.

13. *Ammomassilina misrensis* (Anan) was recorded, so far, from Egypt.

14. The number differences of the recorded species between the different localities may be due to not detailed study, different environmental parameters, and/or misidentification.

4. Paleoenvironment

A group researcher infers that certain hydrographic properties (low oxygen, high CO3, low pH, and thus more corrosive waters) favor the development of agglutinated assemblages (Miller et al., 1982). Cherif and El Deeb noted that close to the end of Bartonian, the previously arid climates became markedly wetter and seems accompanied by a cooling of the water temperature, and the climatic changes inferred the Hafit area seem widespread, at least in parts of the Middle East (Cherif and El Deeb, 1984). Loeblich and Tappan noted that the foraminiferal suborder Astrorhizina reinstated for the typical monothalamous agglutinated taxa whose cementing material is solely organic, the suborder Haplophragmiina reinstated for multilocular agglutinated taxa with organic cement and simple to alveolar walls (Loeblich and Tappan, 1989). Kaminski and Huang noted that the deep-water agglutinated foraminifers were examined from reddish brown claystones in Celebes Sea in the western Pacific, which includes cosmopolitan assemblage also in the Atlantic and western Mediterranean region (Kaminski and Huang, 1991). Anan and Hamdan noted that an incursion of warm temperate water-mass on the foredeep was sporadic and intermittent throughout the Paleocene of Al Ain area, UAE (Anan and Hamdan, 1992). Anan noted that in the UAE, the Eocene time and surrounding areas had been located in the tropical and warm-temperate region based on many faunal environmental elements (Anan, 1995). Rögl noted that by the end of the Eocene the Tethys Ocean had already vanished, a new Indian Ocean was born, the western end of the Tethys was reduced to a Mediterranean Sea, Europe was still an archipelago and intercontinental seas covered large areas of the European platform and of western Asia (Rögl, 1999). Between the stable Eurasian platform and the relics of the western Tethys, an elongate deep basin had formed and north of India a marine connection stretched to the west Pacific. A group researcher noted that clay mineral assemblages reflect continental morphology and tectonic activity, as well as climate evolution and associated sea-level fluctuations (Adatte e al., 2002). Anan noted that most of the recorded species from the Middle-Upper Eocene of Jabal Hafit, UAE (e.g. *Bathysiphon saidi, Miliammina kenawyi*) are endemic to the tropical-subtropical regions (Anan, 2005). Ozsvárt noted that the diversity and composition of benthic foraminiferal assemblages is strongly controlled by water temperature and salinity of water mass, in shallow and deeper region on shelves, where changes in temperature and salinity might pass off rapidly (Ozsvárt, 2007). Gibson noted that the Patala Formation in the western Salt Range, Nammal Gorge area of Pakistan were deposited in somewhat deeper water, open-marine environments (Gibson, 2007). A group researcher figured that the tubular test like the genus *Bathysiphon* has tranquil bathyal with low organic flux environment (Setoyama et al., 2011). Jones noted that the modern smaller agglutinating foraminifera occur in all marine environments, from marginal to deep, and some are tolerant of hyposalinity as well as normal marine salinity and/or of hypoxia or dysoxia (Jones, 2014). They appear better able than their calcareous benthic counterparts to tolerate conditions of high fresh-water flux, and of high sediment and organic carbon flux, and associated lowered oxygen availability (also of lowered alkalinity, although this may be, at least in part, a preservational phenomenon). Orabi noted that the agglutinated tests are weakly held by organic material, which potentially oxidized within the surface layer of sediments (Orabi, 2020). Most recorded species in this study were erected from the Southern Tethys in Pakistan, UAE and Egypt indicate open connection of the both sides of the Tethys and represent middle-outer neritic environment (100-200 m) and show an affinity with Midway-Type Fauna "MTF", while the other faunal assemblage in Atlantic and Pacific Oceans belong to deep water agglutinated foraminifera "DWAF" which may live around carbonate compensation depth "CCC", and suggested a lower slope setting at about 1000 m water depth in an open marine basin. The deeper water species have smooth tests, while the shallow water specimens are coarser grained.

5. Conclusion

The present study deals with the recording of sixteen identified species belong to eight agglutinated genera: *Bathysiphon saidi* (Anan), *Orbulinelloides agglutinatus* Saidova, *O. arabicus* Anan, *O. fusca* (Schultz), *O. sztrakosae* Anan, *O. testacea* (Flint), *Repmanina mazeni* (Anan), *Miliammina kenawyi* Anan, *Agglutinella reinemundi* (Haque), *A. sori* (Haque), *Dentostomina ammobicarinata* (Haque), *D. ammoirregularis* (Haque), *D. gapperi* (Haque), *Ammomassilina misrensis* Anan and *Psammolingulina bahri* Anan in five localities of the Southern Tethys (Egypt, UAE, Pakistan), Northern Tethys (France, Hungary), Pacific and Atlantic Oceans. Most of these species are confined, so far, on their mentioned localities. One species *Orbulinelloides kaminskii* is believed here to be new. The identified agglutinated species are recorded from the Southern Tethys 13/16 (about 81%): Pakistan 5/16 (about 31%), Egypt 3/16 (about 19%), UAE 3/16 (about 19%), while the Pacific, Atlantic Oceans and Northern Tethys about (31%). In this study, most of the faunal assemblage (about 81%) was recorded from three localities (Pakistan, UAE, Egypt) in the southern Tethys in an open marine basin. The deeper water species have smooth tests, while the shallow water specimens are coarser grained.

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