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REVIEW ARTICLE

MEMBERS OF SOME DIAGNOSTIC SMALL CALCAREOUS LAGENID BENTHIC FORAMINIFERAL GENERA *LINGULINA, TRISTIX* AND *CITHARINA*

Haidar Salim Anan*

Emeritus, Prof. Stratigraphy and paleontology, former Vice president of Al Azhar Univ.-Gaza, P. O. Box 1126, Palestine.
Corresponding Author Email: profanan@gmail.com

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ABSTRACT

This study deals with the taxonomy, stratigraphy, and paleogeography of ten Campanian-Paleogene diagnostic calcareous benthic foraminiferal species belong to three lagenid genera which were erected from many localities in the world (North America, Europe and North Africa). These taxa are: *Lingulina* (*L. carinata, L. sliteri*), *Tristix* (*T. liasina*, *T. aubertae*, *T. sliteri, T. sztrakosae*), *Citharina* (*C. strigillata*, *C. polonica, C. plummerae, C. plumoides*). Four of these species, were recorded from three different localities in the world (Mexico, Poland, France, Egypt) are believed to be new: (1) The Late Campanian *Lingulina sliteri* Anan, n. sp. from Mexico, (2) The Early Maastrichtian *Tristix sliteri* Anan, n. sp. from Mexico, (3) The Lutetian *Tristix sztrakosae* Anan, n. sp. from France, and (4) The Danian *Citharina polonica* Anan, n. sp. from Poland. These taxa show an affinity with Midway-Type Fauna (MTF). The paleogeographic distribution of the recorded species indicate an open connection between the Atlantic and Indo-Pacific Oceans in that time.

KEYWORDS

Lagenid foraminifera, North America, Europe, North Africa, South Asia, South Australia

1. INTRODUCTION

Most of the identified benthic foraminiferal species were erected originally earlier in nineteen century or later by European, American and other authors from different localities in their own countries and used after that in all over the world throughout the open Tethys in the Late Cretaceous-Paleogene times. Inspite of the matter of fact that the author had not the possibility to see the original specimens of the recorded species in this study, I consider useful to present a copy, making in this way more accessible for understanding it. An attempt has been made to study many described Lagenid calcareous benthic foraminiferal species, which belong to three diagnostic genera: *Lingulina* (*L. carinata, L. sliteri*), *Tristix* (*T. liasina*, *T. aubertae*, *T. sliteri, T. sztrakosae*), *Citharina* (*C. strigillata*, *C. polonica, C. plummerae, C. plumoides*).

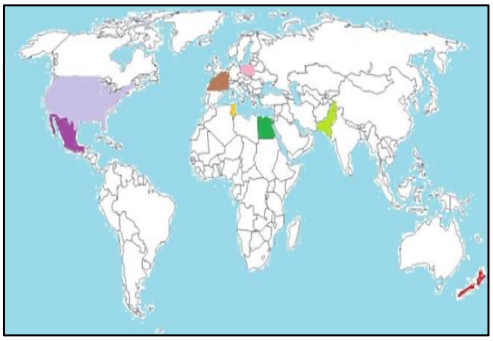
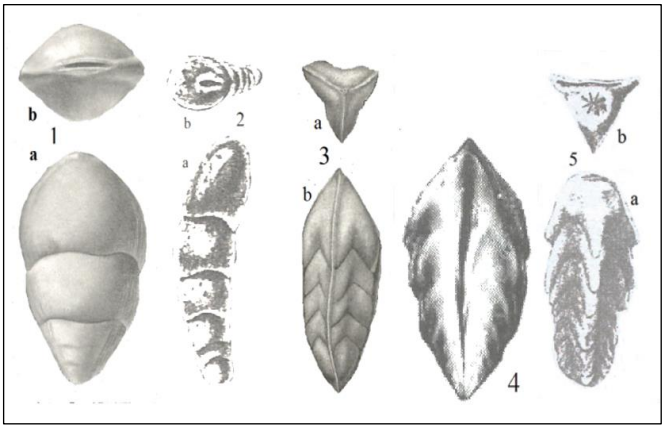


Figure 1: Location map of ten identified benthic foraminiferal species North America (USA, Mexico), Europe (France, Polonica), North Africa (Tunisia, Egypt) and South Asia (Pakistan), and South Australia (New Zealand).

The present study aims at throwing light on (1) to present together many data scattered in the literatures for these genera and its members under a unifying theme, (2) to detect its paleontology, stratigraphy, paleogeographic distribution and its paleoenvironments, (3) to present a new species of these three genera. Moreover, this fauna has wide stratigraphic levels from the Late Cretaceous and Paleogene, and also wide geographic distribution in the world: North America (USA and Mexico), Europe (France, Poland and North Sea), North Africa (Egypt and Tunisia) and South Asia (Pakistan) and South Australia (New Zealand) (Figure 1).

2. SYSTEMATIC PALEONTOLOGY

The taxonomy of Loeblich & Tappan (1988) of the recorded benthic foraminiferal species is followed in this study and illustrated in Plate 1.



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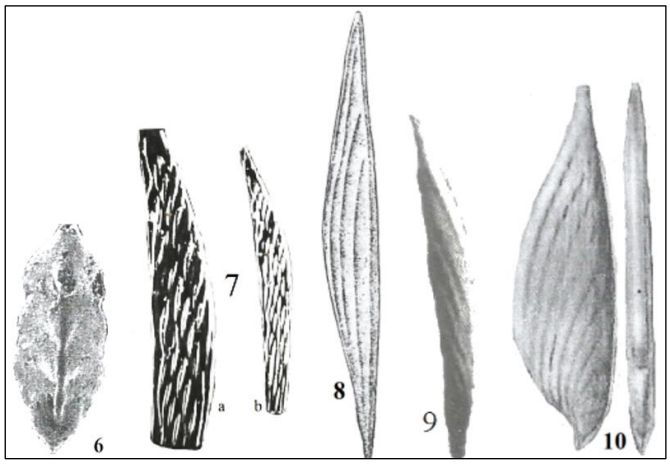

Plate 1: Figure 1. *Lingulina carinata* d'Orbigny (1826) x 15, 2. *Lingulina sliteri* Anan, n. sp. x 85, 3. *Tristix liasina* (Berthelin, 1879) x 80, 4. *Tristix aubertae* Anan (2002) x 30, 5. *Tristix sliteri* Anan, n. sp. x 35, 6. *Tristix sztrakosae* Anan, n. sp., x 80, 7. *Citharina strigillata* Reuss (1846) x 90, 8. *Citharina polonica* Anan, n. sp. x 100, 9. *Citharina plummerae* Anan (2001) x 100, 10. *Citharina plumoides* (Plummer, 1927) x 40.

Suborder Lagenina Delage & Hérouard, 1896

Superfamily Nodosariacea Ehrenberg, 1838

Family Nodosariidae Ehrenberg, 1838

Subfamily Lingulininae Loeblich & Tappan, 1961

Genus *Lingulina* d'Orbigny, 1826

Type species *Lingulina carinata* d'Orbigny, 1826

***Lingulina carinata* d'Orbigny, 1826 - (Pl. 1, figure 1)**

1826 *Lingulina carinata* d'Orbigny, p. 61, p. 256, pl. 12, fig. P.

1927 *Lingulina carinata* d'Orbigny - Cushman, p. 46, pl. 9, fig. 3.

1988 *Lingulina carinata* d'Orbigny - Loeblich & Tappan, p. 399, pl. 442, figs. 1-3. {illustrated specimen}

Remarks: This species is characterized by its an elongate terminal slit aperture in the plane of compression. It was recorded from Europe and North America.

***Lingulina sliteri* Anan, n. sp. - (Pl. 1, figure 2)**

1968 *Lingulina* sp. Sliter, p. 75, pl. 9, fig. 11.

Holotype: Specimen of Pl. 1, fig. 2.

Dimensions: Length 0.54 mm, breadth 0.17 mm, thickness 0.15 mm.

Etymology: In the honor of the late American micropaleontologist William V. Sliter.

Type locality: Rosario Formation at Punta Descanso (D142), Mexico.

Age: Late Campanian (*Globotruncana rosetta* Zone).

Remarks: This species differs from the type species *Lingulina carinata* in its arcuate longitudinal test, chambers gradually added, and the elongate slit terminal aperture is shifted to one side, not centered. It is, so far, an endemic to Mexico.

Subfamily Frondicularìinae Reuss, 1860

Genus *Tristix* Macfadyen, 1941

Type species *Rhabdogonium liasinum* Berthelin, 1879

***Tristix liasina* (Berthelin, 1879) - (Pl. 1, figure 3)**

1879 *Rhabdogonium liasinum* Berthelin, p. 35.

1988 *Tristix liasina* (Berthelin) - Loeblich & Tappan, p. 401, pl. 440, figs. 9-14.

Remarks: This species is characterized by triangular in section, aperture terminal radiate and slightly produced. It is recorded throughout Jurassic-Eocene, from North America and Europe.

***Tristix aubertae* Anan, 2002 - (Pl. 1, figure 4)**

2002 *Tristix aubertae* Anan, p. 634, fig. 2. 6.

2021 *Tristix aubertae* Anan - Anan, p. 89, pl. 1, fig. 27.

Remarks: This Danian species has elongated triangular thin test face, 8 concave triangular chambers with acute periphery. It was described from Duwi section of Egypt, Southern Tethys (Figure 2).

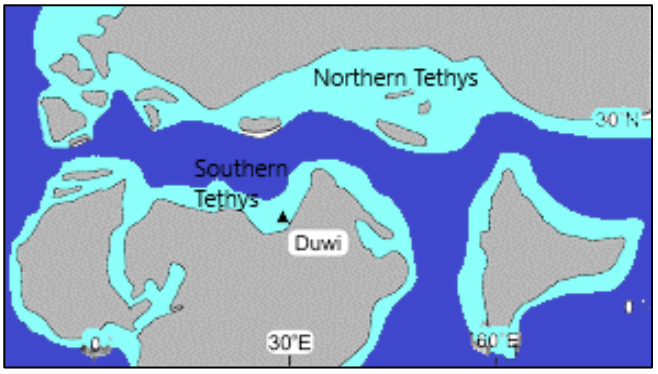

Figure 2: Paleogene paleogeographic map of the Northern and Southern Tethys, with the detection of Duwi section, Egypt.

***Tristix sliteri* Anan, n. sp. – (Pl. 1, figure 5)**

1968 *Tristix* sp. Sliter, p. 80, pl. 10, fig. 15.

Holotype: Specimen of Pl. 1, fig. 5.

Dimensions: Length 0.94 mm, breadth 0. 19 mm.

Etymology: In the honor of the late American micropaleontologist William V. Sliter.

Type locality: Rosario Formation at La Jolla (C137), Mexico.

Age: Early Maastrichtian (*Rugoglobigerina rugosa* Zone).

Remarks: This species resemble the type species *Tristix liasina*, but differs in its larger test, larger numbers in chambers, ragged periphery, more opening terminal and radiate aperture, younger stratigraphic level and may be evolved from it. *Tristix sliteri*, so far, an endemic to Mexico.

***Tristix sztrakosae* Anan, n. sp. - (Pl. 1, figure 6)**

2000 *Tristix* cf. *carinatus* (Sidebottom) - Sztrákos, p. 160, pl. 9, fig. 12.

Holotype: Specimen of Pl. 1, fig. 6.

Dimensions: Length 0.86 mm, breadth 0.36 mm.

Etymology: In the honor of the French micropaleontologist Kàroly Sztràkos.

Type locality: Adour Basin, France.

Age: Lutetian (E12, 13).

Remarks: *Tristix sztrakosae* resembles the Liasic *T. liasina* but differs in its more depressed sutures, more produced aperture and younger stratigraphic level. It is, so far, an endemic to France.

Subfamily Vaginulininae Reuss, 1860

Genus *Citharina* d'Orbigny, 1839

Type species *Vaginulina (Citharina) strigillata* Reuss, 1846

***Citharina strigillata* Reuss, 1846 - (Pl. 1, figure 7)**

1846 *Vaginulina (Citharina) strigillata* Reuss, p. 106.

1988 *Citharina strigillata* Reuss - Loeblich & Tappan, p. 412, pl. 452, figs. 1, 2.

Remarks: This species is characterized by its strongly angled chambers back toward the base, and sutures oblique and curved.

It is cosmopolitan and recorded from Jurassic-Paleocene.

***Citharina polonica* Anan, n. sp. - (Pl. 1, figure 8)**

1958 *Citharina* cf. *strigillata* Reuss, p. 172, pl. 14, fig. 11.

1965 *Citharina* sp. Pożaryska, p. 81, pl. 11, figs. 8, 9.

Holotype: Specimen of Pl. 1, fig. 8.

Dimensions: Length 1.44 mm, width 0.20 mm.

Etymology: After the Poland Republic.

Type locality: G6ra Pulawska, Polish Basin, Bochotnica quarry, Poland.

Age: Danian.

Remarks. This species is characterized by its very elongate proloculus and test, never previously described any species of *Citharina*. It is, so far, an endemic to Poland.

***Citharina plummerae* Anan, 2001 - (Pl. 1, figure 9)**

2001 *Citharina plummerae* Anan, p. 135, pl. 1, fig. 1.

2017 *Citharina plummerae* Anan - Hewaidy et al., p. 85, pl. 3, fig. 22.

Remarks: This Paleocene species is characterized by its wing-shaped flattened test with thin acuminates. It was originally described from Duwi section (Figure 3). It was recorded, so far, from Egypt.

***Citharina plumoides* (Plummer, 1927) - (Pl. 1, figure 10)**

1927 *Vaginulina plumoides* Plummer, p. 113, pl. 6, fig. 6.

1951 *Vaginulina plumoides* Plummer - Cushman, p. 28, pl. 8, fig. 16.

1956 *Vaginulina* sp. Haque, p. 77, pl. 5, fig. 14.

1965 *Citharina plumoides* (Plummer) - Pożaryska, p. 81, pl. 11, fig. 10.

1976 *Citharina plumoides* (Plummer) - Aubert & Berggren, p. 413, pl. 2, fig. 8.

2003 *Citharina plumoides* (Plummer) - Ali, p. 119, pl. 5, fig. 21.

2005 *Citharina plumoides* (Plummer) - Sztrákos, p. 186, pl. 14, fig. 30.

2017 *Citharina plumoides* (Plummer) - Anan, p. 280, fig. 6.17b.

Remarks. The figured specimen of Haque is closely related to *Citharina plummerae* (Haque, 1956; Anan, 2001). *Citharina plumoides* has wide geographic distribution, which recorded from the Paleocene of North America (USA, Mexico), Europe (France, Polonica, North Sea), North Africa (Tunisia, Egypt), South Asia (Pakistan), South Australia (New Zealand).

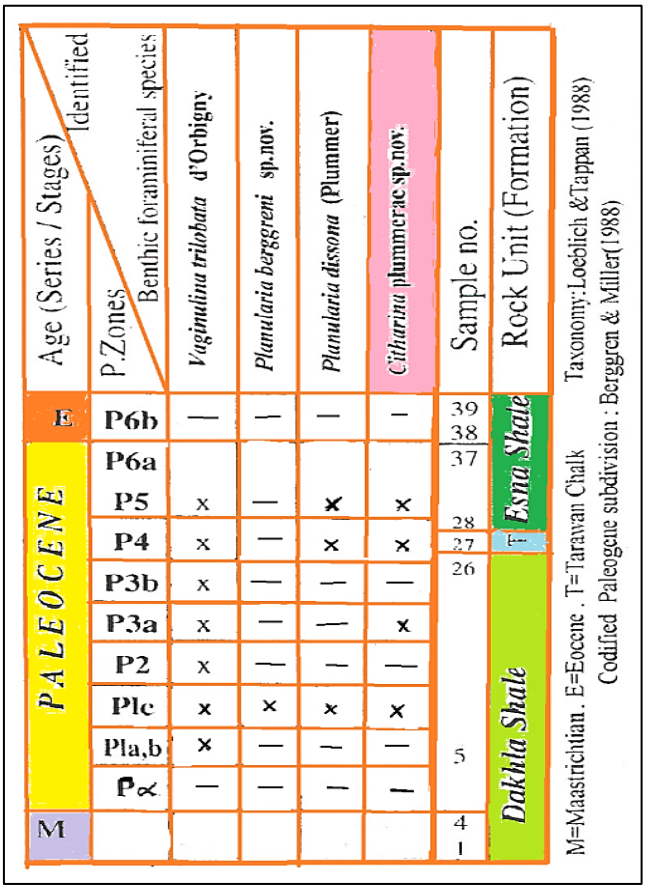

Figure 3: The stratigraphic range of some recorded foraminiferal species (including *C. plummerae*) in Duwi section, Egypt (Anan, 2001).

3. Paleogeography

Many authors documented that the Tethys was connected with the Atlantic Ocean in the west to Indo-Pacific in the east (Pozaryska, 1965; Sliter, 1968; Nomura and Brohi, 1995; Sztràkos 2005; Anan, 2020). The existence of some species in more than one locality, especially a large distance between them, prove the prevailing of the same environmental conditions (i. e. depth, water temperature, salinity, nutrients, dissolved oxygen) or any other reasons failed to migrate them through the time. One of these species documented this phenomenon is *C. plumoides* (Plummer), which were recorded from N. Atlantic (USA), Europe (France, Poland), N. Africa (Tunisia, Egypt), S. Asia (Pakistan), and S. Pacific (New Zealand) (Figure 1).

4. Paleoenvironment

Haque (1956) noted that many foraminiferal forms which were recorded from Europe, America and Egypt are also recorded in the Laki Formation of Pakistan. Pożaryska noted (1965) that there are three factors responsible for the facial pattern of the Danian and Montian in Poland: climatic conditions, eustatic movements of the sea level and tectonic movements. During the noted that the Upper Cretaceous foraminiferal fauna from southeastern California (USA) and northeastern Mexico ranging in age from Late Campanian to Early Maastrichtian (1968). which located in tropical province with its characteristic Tethyan fossil. Nomura and Brohi (1995) noted that the southern Pakistan with its variety of Mesozoic and Cenozoic sedimentary rocks, is an ideal place to test the Indian-Asian convergence model from the viewpoint of paleo-environmental changes. Such a collision event should have led to distinct environmental changes in the Tethys Sea and the Indian Ocean, the Tethys has been reduced to a long channel.

5. Conclusion

The ten members of three Lagenid genera (*Lingulina, Tristix, Citharina*) from eight Tethyan localities: North America (USA, Mexico), Europe (France, Poland), North Africa (Tunisia, Egypt), South Asia (Pakistan), South Pacific (New Zealand) emphasizes the interpretations that have been presented by different authors about the extended realms of Indo-Pacific via ancestral Tethys, which was connected with the ancestral Atlantic Ocean. These ten members of the recorded genera are: *Lingulina carinata*, *L. sliteri*, *Tristix liasina*, *T. aubertae*, *T. sliteri*, *T. sztrakosae*, *Citharina strigillata*, *C. polonica*, *C. plummerae*, *C. plumoides*, and four species out of them are believed new: *Lingulina sliteri*, *Tristix sliteri*, *T. sztrakosae, C. polonica*. The identified species in this study are recorded from Europe (France and Poland) 5/10 (50 %), North America (Mexico and USA) 3/10 (30 %), and North Africa (Egypt) 2/10 (20 %). These taxa represent middle-outer neritic environment (100-200 m) and show an affinity with Midway-Type Fauna (MTF).

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References

Ali, M.Y., 2003. Micropaleontological and stratigraphical analyses of the Late Cretaceous/Early Tertiary succession of the Southern Nile Valley (Egypt). Der Fakultät für Geowissenschaften an der Ruhr-Universität Bochum vorgelegte Dissertation zur Erlangung des Grades eines, Pp. 1-197.

Anan, H.S., 2001. Paleocene Vaginulininae (benthic foraminifera) of Duwi section, Red Sea coast, Egypt. Egyptian Journal of Paleontology, 1, Pp. 135-139.

Anan, H.S., 2002. Stratigraphy and paleobiogeography of some Frondicullariinae and Palmulinae benthic foraminiferal general in the Paleocene of Egypt (Misr). Neues Jahrbuch für Geologie und Paläontologie, Mh., 10, Pp. 629-640.

Anan, H.S., 2017, Paleontology, paleogeography and paleoenvironment of the Paleocene benthic foraminiferal species of Plummer in the Tethys, a review. Journal of Tethys, 5 (3), Pp. 272-296.

Anan, H.S., 2020. Southern Tethyan benthic foraminifera in Northern Tethys. Earth Sciences Pakistan (ESP), 4 (2), Pp. 70-75.

Anan, H.S., 2021. Paleontology, stratigraphy, paleoenvironment and paleogeography of the seventy Tethyan Maastrichtian-Paleogene foraminiferal species of Anan, a review. Journal of Microbiology & Experimentation, 9 (3), Pp. 81-100.

Aubert, J., Berggren, W.A., 1976. Paleocene benthonic foraminiferal biostratigraphy and paleoecology of Tunisia. Bulletin du Centre de Recherches Pau- SNPA, 10 (2), Pp. 379- 469.

Berggren, W.A., Miller, K.G., 1988. Paleogene tropical planktonic foraminiferal biostratigraphy and magnetobiochronology. Micropaleontology, 34 (4), Pp. 362-380.

Berthelin, G., 1879. Foraminifères du Lias Moyen de la Vendée. Revue et Magasin de Zoologie Pure et Applique, Paris, 3 (7), Pp. 24-41.

Cushman, J.A., 1927. An outline of the re-classification of the Foraminifera. Contributions from the Cushman Laboratory for foraminiferal Research, 3, Pp. 1-105.

Cushman, J.A., 1951. Paleocene Foraminifera of the Gulf Coastal Region of the United States and Adjacent Areas- Descriptions and illustrations of smaller Foraminifera from the Gulf Coastal Region, Cuba, Central America, Haiti, and Trinidad. United States Geological Survey, Professional Paper, 232, Pp. 1-75.

Haque, A.F.M.M., 1956. The foraminifera of the Ranikot and the Laki of the Nammal Gorge, Salt Range, Pakistan. Pakistan Geological Survey Memoir, Palaeontologica Pakistanica, 1, Pp. 229.

Haynes, J., Nwabufo-Ene, K., 1998. Foraminifera from the Paleocene phosphate beds, Sokoto, Nigeria. Revue Española de Micropaleontologia, 30 (2), Pp. 51-76.

Hewaidy, A.A., Farouk S., EL-Balkiemy, A.F., 2017. Foraminiferal Biostratigraphy, Stages Boundaries and Paleoecology of the Uppermost Maastrichtian-Lower Eocene Succession at Esh El-Mellaha Area, Northeastern Desert, Egypt. Journal of American Science, 13 (5), Pp. 74-113.

Loeblich, A.R., Tappan, H., 1988. Foraminiferal genera and their classification.- Van Nostrand Reinhold (VNR), New York, Part 1, Pp. 1-970, part 2, Pp. 1-847.

Nomura, R., Brohi, I.A., 1995. Benthic foraminiferal fauna during the time of the Indian-Asian contact, in southern Balochistan, Pakistan. Marine Micropaleontology, 24, Pp. 215-238.

Orbigny, A.D. d', 1826. Tableau méthodique de la classe des Céphalopodes. Annals des Sciences de la Naturelles, Paris, 7, Pp. 245-314.

Plummer, H.J., 1927. Foraminifera of the Midway Formation in Texas. Bulletin University of Texas, 2644, Pp. 3-206.

Pożaryska, K., 1965. Foraminifera and biostratigraphy of the Danian and Montian in Poland. Paleontologica Polonica, 14, Pp. 1-156.

Reuss, A.E., 1846. Die Versteinerungen der Böhmischen Kreideformation, pt. 2. Stuttgart: E. Schweizerbart'sche Verlagsbuchhandlung und Druckerei.

Reuss, A.E., 1858. Zeitschrift der Deutschen Geologischen Gesellschaft, Berlin, 10, Pp. 1-434.

Sliter, W.V., 1968. Upper Cretaceous foraminifera from Southern California and Northwestern Baja California, Mexico. University of Kansas Paleontological Contribution, 49 (7), Pp. 1-141.

Sztrákos, K., 2005. Paleocene and lowest Eocene foraminifera from the north Pyrenean trouph (Aquitaine, France). Revue de Micropaléontologie, 48, Pp. 175-236.