ZIBELINE INTERNATIONAL™ PUBLISHING

ISSN: 2990-9295 (Online)
CODEN: MAGACU

Malaysian Applied Geography (MAGG)

DOI: http://doi.org/10.26480/magg.01.2025.07.09

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RESEARCH ARTICLE

SPATIO-TEMPORAL DISTRIBUTION OF SOME DIAGNOSTIC TETHYAN LAGENID GENUS *ANNULOFRONDICULARIA*

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ARTICLE DETAILS

Article History:

Received 10 January 2025
Revised 18 February 2025
Accepted 19 March 2025
Available online 28 March 2025

ABSTRACT

Six *Annulofrondicularia* Paleogene-Neogene Lagenid benthic foraminiferal species are distributed in five localities in the Northern Tethys (France, Romania) and Southern Tethys (Tunisia, Egypt, Jordan). Taxonomic consideration of the recorded species are presented: *Annulofrondicularia annularis*, *A. bignoti, A. crihanae, A. nakkadyi, A. sztrakosae* and *A. tunisica.* The latter species is believed here as new. The prominent environment of the genus *Annulofrondicularia* and its members most probably are ranged from the middle-outer shelf environment.

KEYWORDS

Annulofrondicularia, Lagenid Benthic Foraminifera, Paleogene, Neogene, Tethys

1. INTRODUCTION

Six diagnostic species of Paleogene-Neogene Lagenid genus *Annulofrondicularia* are described by many authors from wide sites in the Northern and Southern Tethys (Figure 1) (d'Orbigny, 1846; Anan, 2002, 2022, 2024; Futyan, 1976; Popescu and Crihan, 2000; Karoui-Yaakoub, 2006). Two species of the assemblage were recorded from France: *Annulofrondicularia annularis* and *A. sztrakosae*, one species from Romania: *A. crihanae*, Tunisia: *A. tunisica* n. sp., Egypt: *A. bignoti*, and Jordan: *A. nakkadyi*.

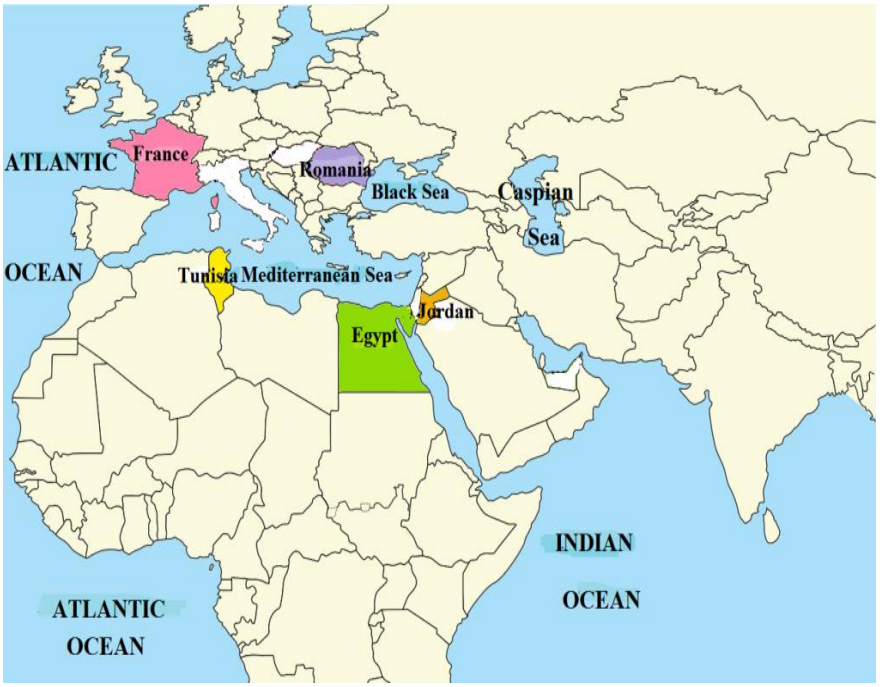

Figure 1: Location map of the recorded species of the genus *Annulofrondicularia* in different countries in west and east Europe (France, Romania), north Africa (Tunisia, Egypt) and southwest Asia (Jordan).

2. MATERIAL OF STUDY

The modern taxonomical consideration of good preserved six Lagenid Paleogene-Neogene species of the genus *Annulofrondicularia* are treated in this study.

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Cite The Article: Haidar Salim Anan (2025). Spatio-Temporal Distribution Of Some Diagnostic Tethyan Lagenid Genus *Annulofrondicularia. Malaysian Applied Geography (MAGG), 3(1): 07-09.*

3. Systematic Paleontology

The taxonomy of Loeblich & Tappan (1988) is followed here for six Lagenid species of the genus *Annulofrondicularia*, which were recorded from the Paleocene-Miocene stratigraphic succession of five countries in Europe, Africa and Asia. These identified species are illustrated in Plate (1).

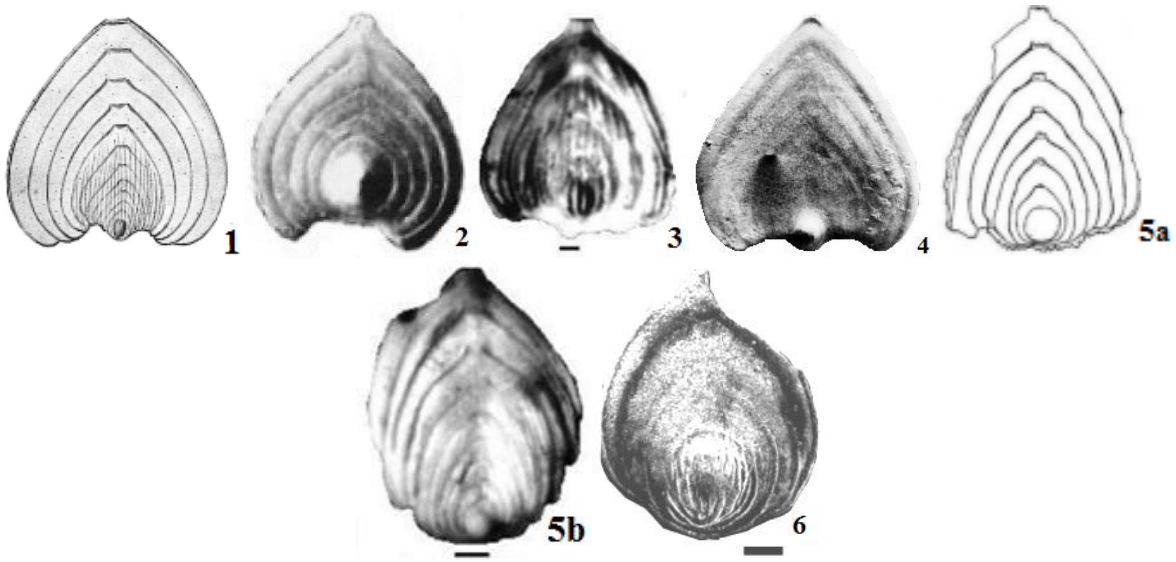

Plate 1 (bar=100µm)**: Figure 1.** *Annulofrondicularia annularis* d'Orbigny (1846), **2.** *A. bignoti* (Anan, 2002), **3.** *A. crihanae* Anan (2024), **4.** *A. nakkadyi* (Futyan, 1976), **5a, b.** *A. sztrakosae* Anan (2022), **6.** *A. tunisica* Anan, n. sp.

Order Foraminiferida Eichwald, 1830

Suborder Lagenina Delage and Hérouard, 1896

Genus *Annulofrondicularia* Keijzer, 1945

Type species *Frondicularia annularis* d'Orbigny, 1846

- **Annulofrondicularia *annularis* d'Orbigny, 1846**. Eocene-Miocene. France, Romania.

Remarks: This species has globular chamber ornamented with longitudinal striae with 7-8 broad low equitant arched chambers, but the last chambers smooth.

- ***Annulofrondicularia bignoti* (Anan, 2002)** (=*Frondicularia bignoti*). Paleocene. Egypt.

Remarks: This species has 4-5 uniform chambers surrounding the large smooth proloculus.

- ***A. crihanae* Anan, 2024**(=*Annulofrondicularia annularis* of Popescu & Crihan, 2000, p. 396, pl. 1, fig. 13). Miocene. Romania.

Remarks: This species has ornamented surface with longitudinal costae. *A. crihanae* may be evolved from the Late Eocene *A. sztrakosae* Anan (2022)

- ***Annulofrondicularia nakkadyi* (Futyan, 1976)** (=*Frondicularia nakkadyi*). Maastrichtian-Paleocene. Jordan, Egypt.

Remarks: This species is distinguished by its large smooth test.

- ***Annulofrondicularia sztrakosae* Anan, 2022** (=*Annulofrondicularia* sp. Sztràkos, 2000; *A. annularis* of Popescu & Crihan, 2000). Eocene-Miocene. France, Romania.

Remarks: The illustrated specimen *A. annularis* of Popescu & Crihan is closely related to *A. sztrakosae* Anan.

- ***Annulofrondicularia tunisica* Anan, n. sp.**(=*Frondicularia* sp. Karoui-Yaakoub, 2006, p. 581, pl. 1, fig. 9).

Holotype: illustrated specimen in Plate 1, fig. 6.

Etymology: after the Republic of Tunisia (Fig. 2A).

Stratigraphic range: Late Paleocene-Early Eocene (2B).

Diagnosis: This species has large semi-circular test, large ornamented proloculus by numerous longitudinal ribs, five uniform chambers surrounding the proloculus, slightly raised suture, terminal aperture.

Remarks: This new species is closely resemble the Egyptian *A. bignoti*, but differs by larger ornamented proloculus and raised sutures, than smooth smaller proloculus and slightly depressed sutures of the latter.

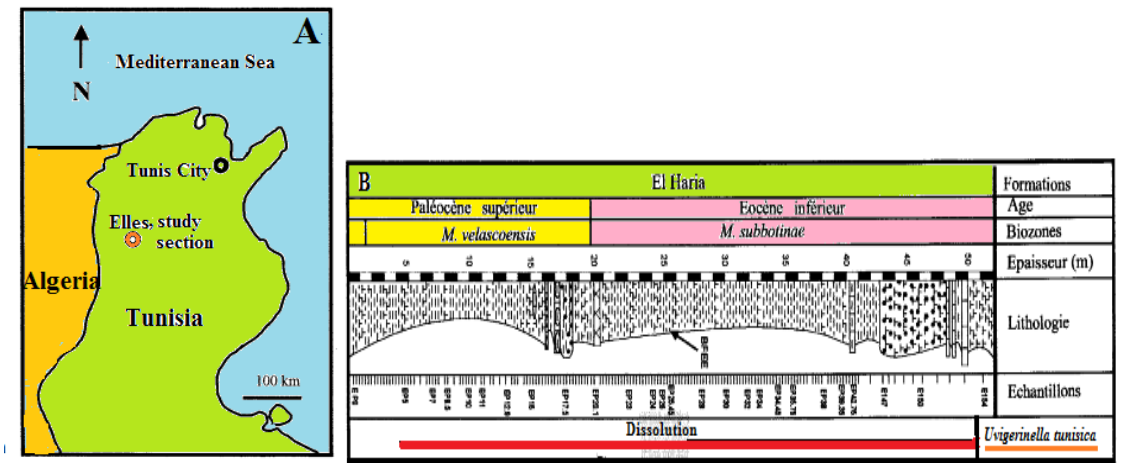

Figure 2: A. Location map of the study Ellés section, northwest Tunisia, B. stratigraphic section and stratigraphic range of the *Annulofrondicularia tunisica* Anan, n. sp.

4. PALEOGEOGRAPHY

The paleogeographic distribution of the Lagenid species of the genus *Annulofrondicularia* are expanded into five different countries in the Northern Tethys (France and Romania) and Southern Tethys (Tunisia, Egypt and Jordan). The Early Paleogene paleogeographic maps of some authors show a large east-west Tethyan Sea extended from the Indo-Pacific Ocean in the east to the Atlantic Ocean in the west (Figure 3) (Zachos et al., 1993).

Figure 3: The paleogeography distribution of the Northern Tethys (France, Romania) and Southern Tethys (Tunisia, Egypt, Jordan).

5. PALEOENVIRONMENT

The recorded species of the genus *Annulofrondicularia* are indicated an open Tethys and represent middle-outer neritic environmental facies (100-200m), which related to the "Midway-Type Fauna" of Berggren & Aubert (1975) (Fig. 4).

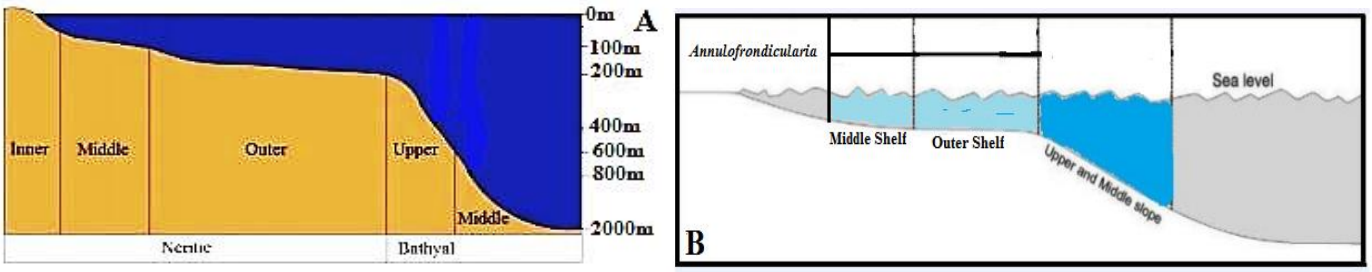

Figure 4A,B: The water depth distribution of the genus *Annulofrondicularia* and its members, from middle-outer shelf neritic environment.

REFERENCES

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., 2024. Contributions to the Romanian Miocene benthic foraminifera. Earth Sciences Pakistan (ESP), 8 (2), Pp. 113-117.

Berggren, W.A., Aubert, J., 1975. Paleocene benthonic foraminiferal biostratigraphy, paleobiogeography and paleoecology of Atlantic-Tethyan regions: Midway-type fauna. Palaeogeography, Palaeoclimatology, Palaeoecology, 18, Pp. 73-192.

Futyan, A.I., 1976. Late Mesozoic and Early Cainozoic benthonic foraminifera from Jordan. Palaeontology, 19 (3), Pp. 53-66.

Karoui-Yaakoub, N., 2006. Effet du réchauffement climatique global sur le comportement des foraminifères benthiques de l'intervalle de passage Paléocène-Eocène de la coupe d'Ellès, Tunisie[Effect of global warming on the behavior of foraminifera benthics of the Paleocene-Eocene transition interval of the Ellès section, Tunisia]. Revue de Paléobiologie, Genève, 25 (2), Pp. 575-591.

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.

Orbigny, A.D.d'., 1846. Die fossilen Foraminiferen des Tertiären Beckens von Wien. Foraminifères fossiles du Bassin Tertiaire de Vienne [Fossil foraminifera from the Tertiary Vienna Basin], Pp.1- 312.

Popescu, G., Crihan, I-M., 2000. Contributions to the knowledge of the calcareous unicameral foraminifera from the Middle Miocene of Romania. Acta Palaeontologica Romaniae, 4, Pp. 403-421.

Sztrákos, K., 2000. Eocene foraminifers in the Adour Basin (Aquitaine, France): biostratigraphy and taxonomy. Revue de Micropaléontologie, 43 (1-2), Pp. 71-172.

Zachos, J.C., Lohmann, K.C., Walker J.C.G., Wise S.W., 1993. Abrupt climate change and transient climates during the Paleogene: A marine perspective. Journal of Geology, 101, Pp. 191-213.