

REVIEW ARTICLE

SPATIO-TEMPORAL DISTRIBUTION OF PAKISTANIAN AND INDIAN BENTHIC AND PLANKTIC FORAMINIFERA OF ANAN

Haidar Salim Anan*

Department of Stratigraphy and Paleontology, Former Vice President of Al Azhar University-Gaza, P. O. Box 1126, Palestine.

*Corresponding Author Email: profanan@gmail.com

This is an open access article distributed under the Creative Commons Attribution License CC BY 4.0, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

ARTICLE DETAILS

Article History:

Received 07 April 2025
Revised 14 May 2025
Accepted 26 June 2025
Available online 05 July 2025

ABSTRACT

This study deals with taxonomic consideration of one new genus: *Ornatodella* Anan (2023) from Pakistan, and also thirteen benthic and two planktic foraminiferal species were erected from two countries in the Southern Tethys: Pakistan and India. The recorded foraminiferal species belong to thirteen benthic genera and two planktic genera (one from Pakistan and the other from India). Fifteen species of the recorded assemblage are from Pakistan (~94%), while only one species from India (~6%). One of the recorded species belongs to Suborder Textulariina, 2 to Miliolina, 1 to Lagenina, 12 to Rotaliina, while 2 species to Globigerinina. Some of the recorded species present an evolutionary foraminiferal lineages.

KEYWORDS

foraminiferal, species, evolutionary, benthic, taxonomic

1. INTRODUCTION

Sixteen diagnostic benthic and planktic foraminiferal species were

recorded and described from two Asian countries in the Southern Tethys: Pakistan and India (Figure 1).

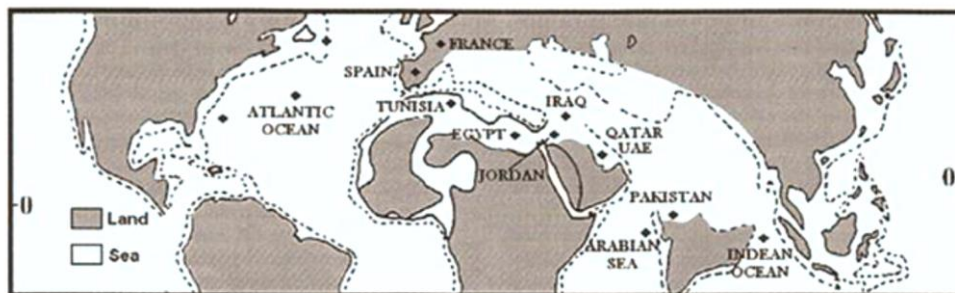


Figure 1: Maastrichtian-Paleogene paleogeographic map showing the locations of Pakistan and India.

2. TAXONOMY

The taxonomy followed here is that of (Loeblich and Tappan, 1988). Fourteen benthic foraminiferal species of the assemblage are related to Pakistan, while the other two planktic species is recorded from Pakistan, and the other from India. With modern taxonomic consideration, the recorded assemblage are presented and illustrated in Plate 1.

Table 1: (Scale bars 100 μ m)

Figure. 1. *Textularia haquei* Anan (2020a), *2. Spiroloculina haquei* Anan

(2021a), *3. Spiroloculina pakistanica* Anan (2021a), *4. Parafissurina pakistanica* Anan (2021a), *5. Bolivina pakistanica* Anan (2021b), *6. Hopkinsina haquei* Anan (2020b), *7. Loxostomum pakistanica* Anan (2021b), *8. Pleurostomella haquei* Anan (2019b), *9. Eponides pakistanica* Anan (2021b), *10. Rosalina haquei* Anan (2021b), *11. Nonionella haquei* Anan (2019a), *12. Ornatodella pakistanica* Anan (2021c), *13. Ornatodella pustulosa* (Haque, 1960), *14. Pararotalia pakistanica* Anan (2021b), *15a, b. Turborotalia semicunialensis* Anan (2023b), *a)* from UAE, *b)* from India, *16. Clavigerinella pakistanica* Anan (2024).



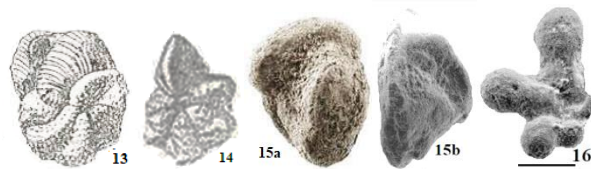
Quick Response Code



Access this article online

Website:
www.earthsciencespakistan.com

DOI:
10.26480/esp.01.2025.32.34



I. Suborder Textulariina Delage and Hérouard, 1896

(1) *Textularia haquei* Anan, 2020a, p. 87, pl. 1, figure. 15. Paleocene. Pakistan.

Remarks: This species is regarded as an ancestor of the descendent Early Eocene *T. farafraensis* LeRoy.

II. Suborder Miliolina Delage and Hérouard, 1896

(2) *Spiroloculina haquei* Anan, 2021a, p. 44, pl. 1, figure. 1. Paleocene. Pakistan.

Remarks: It has limbate sutures between the successive pair-chambers and thick final-chamber periphery.

(3) *Spiroloculina pakistanica* Anan, 2021a, p. 44, pl. 1, figure. 12. Paleocene. Pakistan.

Remarks: This species differs from *S. haquei* by its non limbate sutures, and more added pair-chambers in the test.

III. Suborder Lagenina Delage and Hérouard, 1896

(4) *Parafissurina pakistanica* Anan, 2021a, p. 45, pl. 2, figure. 7. Early Eocene. Pakistan.

Remarks: It is characterized by its double keel periphery, oval hooded subterminal crescentic aperture at a test apex.

IV. Suborder Rotaliina Delage and Hérouard, 1896

(5) *Bolivina pakistanica* Anan, 2021b, p. 57, pl. 1, figure. 1. Middle Eocene. Pakistan.

Remarks: It has zigzag sutures.

(6) *Hopkinsina haquei* Anan, 2020b, p. 4, pl. 1, figure. 16. Early Eocene. Pakistan.

Remarks: The Maastrichtian *H. arabina* Futyan most probably developed to the Early Eocene *H. haquei*, in *H. arabina* > *H. haquei* lineage.

(7) *Loxostomum pakistanica* Anan, 2021b, p. 57, pl. 1, figure. 4. Middle Eocene. Pakistan.

Remarks: It has rugose surface, three end uniserial chambers with rounded periphery.

(8) *Pleurostomella haquei* Anan, 2019b, p. 175, pl. 1, figure. 10. Middle Eocene. Pakistan.

Remarks: This species has lax biserial arrangement.

(9) *Eponides pakistanica* Anan, 2021b, p. 59, pl. 2, figure. 28. Middle Eocene. Pakistan.

Remarks: It has tight coiled test with 6 chambers in the last whorl.

(10) *Rosalina haquei* Anan, 2021b, p. 60, pl. 2, figure. 41. Middle

Eocene. Pakistan.

Remarks: It has circular concavo-convex smooth test.

(11) *Nonionella haquei* Anan, 2019a, p. 33, pl. 2, figure. 15. Paleocene-Early Eocene. Pakistan, Egypt.

Remarks: This species has closely resembles the Egyptian Paleocene *Nonionella* sp. of Said and Kenawy. It differs from the Egyptian Early Eocene *N. africana* of LeRoy in its larger and more elongated test and chambers.

(12) *Ornatanomalina pakistanica* Anan, 2021c, p. 14, pl. 1, figure. 8. Early Eocene. Pakistan.

Remarks: The Paleocene *Ornatanomalina geei* Haque is regarded here as an ancestor of Early Eocene *O. pakistanica* Anan, in *O. geei* > *O. pakistanica* lineage.

Genus *Ornatodella* Anan, 2023a

(13) *Ornatodella pustulosa* (Haque, 1960), p. 80, pl. 1, figure. 2. Early Eocene. Pakistan.

Remarks: The *Ornatodella pustulosa* (holotype of the genus *Ornatodella*) is regarded here as an ancestor of the Early Eocene *Saudella ornata* Hasson (1985).

(14) *Pararotalia pakistanica* Anan, 2021b, p. 64, pl. 4, figure. 80. Middle Eocene. Pakistan.

Remarks: This species most probably was developed to the Early Miocene *Pararotalia armata* of Cherif et al. (1992) from of Jabal Hafit, United Arab Emirates (UAE).

V. Suborder Globigerinina Delage and Hérouard, 1896

(15) *Turborotalia semicunialensis* Anan, 2023b, p. 39, pl. 1, figure. 9. Late Eocene. Egypt, UAE, India.

Remarks: This species was originally erected from UAE, and on later from Egypt and India (Anan, 2023c).

(16) *Clavigerinella pakistanica* Anan, 2024, p. 97, pl. 1, figure. 30. Middle Eocene. Pakistan.

Remarks: This species differs from the type species *Clavigerinella akersi* Bolli, from Trinidad by its radially elongate chambers, not terminally bulbous, and more chambers in the whorl (Loeblich and Tappan, 1957).

3. PALEOENVIRONMENT

The Asian benthic and planktic foraminiferal assemblage of the study area are endemic to their original description, which mainly controlled by different water depths, lack of available literatures, different stratigraphical levels of species, and/or misidentification of some species by different authors. Due to their small size and abundance, they are the most widely used for environmental interpretation (Figure 2).

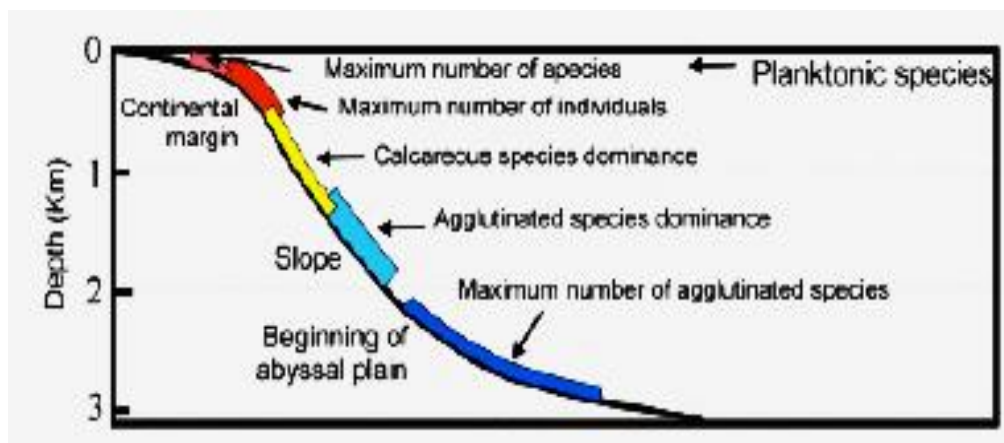


Figure 2: Depth distribution of planktic and benthic foraminiferal fauna.

REFERENCES

- Anan, H.S., 2019a. Contribution to the paleontology, stratigraphy and paleobiogeography of some diagnostic Pakistanian Paleogene foraminifer in the Middle East. *Earth Science Pakistan (ESP)*, 3 (1), Pp. 29-34.
- Anan, H.S., 2019b. On the variability of benthic foraminiferal species of the genus *Pleurostomella* in the Tethys. *Journal of Microbiology and Experimentation*, 7 (3), Pp. 173-181.
- Anan, H.S., 2020a. Taxonomic consideration and stratigraphic implication of the accelerated evolution of the Maastrichtian-Eocene transition of twenty benthic foraminiferal species in the Tethys. *Earth Sci. Pakistan (ESP)*, 4 (1), Pp. 1-6.
- Anan, H.S., 2020b. Taxonomic consideration and stratigraphic implication of the accelerated evolution of the Maastrichtian-Eocene transition of twenty benthic foraminiferal species in the Tethys. *Earth Science Pakistan (ESP)*, 4 (1), Pp. 1-6.
- Anan, H.S., 2021a. Paleontology and paleoenvironment of the early Paleogene Pakistanian benthic foraminiferal species of Haque-Suborders *Miliolina* and *Lagenina*. *Earth Science Pakistan (ESP)*, 5 (1), Pp. 42-47.
- Anan, H.S., 2021b. Paleontology, paleoenvironment and paleogeography of the Early Paleogene Pakistanian benthic foraminiferal species of Haque - Suborders *Rotaliina*. *Earth Science Pakistan (ESP)*, 5 (2), Pp. 56-67.
- Anan, H.S., 2021c. Paleontology and paleogeography of the Tethyan Early Paleogene *Rotaliid* benthic foraminiferal Pakistanian genus *Ornatomalina* and other related genera. *Earth Science Pakistan*, 5 (1), Pp. 12-15.
- Anan, H.S., 2023a. *Ornatodella* Anan, a new Ypresian *Rotaliid* benthic foraminiferal genus from Pakistan. *Geological Behavior (GBR)*, 7 (2), Pp. 75-77.
- Anan, H.S., 2023b. *Turborotalia semicunialensis*, a new Late Eocene planktic foraminiferal species from Jabal Hafit, United Arab Emirates (UAE). *Earth Sciences Pakistan (ESP)*, 7(2), Pp. 38-42.
- Anan, H.S., 2023c. New geographic record of the UAE planktic foraminifera *Turborotalia semicunialensis* Anan in India and Egypt. *Earth Sciences Pakistan (ESP)* 7(2), Pp. 38-42.
- Anan, H.S., 2024. Paleontology and Paleogeography of Forty Diagnostic Southern Tehran Cretaceous-Paleogene Globigerinid Planktic Foraminifera. *Acta Scientifica Malaysia (ASM)*, 8(2), Pp. 93-98.
- Bolli, H.M., Loeblich, A.R., Tappan, H., 1957. Planktonic foraminiferal families *Hantkeninidae*, *Orbulinidae*, *Globorotalidae* and *Globotruncanidae*. *United States Natural Museum Bulletin, Studies in foraminifera*, 215, Pp. 3-50.
- Cherif, O.H., Al-Rifaiy, I.A., El Deeb, W.Z., 1992. "Post-Nappes" early Tertiary foraminiferal paleoecology of the northern Hafit area, south of Al Ain City (United Arab Emirates). *Micropaleontology*, 38 (1), Pp. 37-56.
- 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. 1-229.
- Haque, A.F.M.M., 1960. Some middle to late Eocene smaller foraminifera from the Sor Rang, Quetta District, West Pakistan. *Pakistan Geological Survey Memoir, Palaeontologica Pakistanica*, 2 (2), Pp. 9-57.
- LeRoy, L.W. 1953. Biostratigraphy of Maqfi section, Egypt. *Geological Society of American Memoir*, 54, 1-73.
- Loeblich A.R., Tappan H., 1988. Foraminiferal genera and their classification. *Van Nostrand Reinhold (VNR)*, New York, Part 1, Pp. 970, part 2, Pp., 847.
- Mukhopadhyay, S.K., 2005. *Turborotalia cerroazulensis* group in the Paleogene sequence of Cambay Basin, India with a note on the evolution of *Turborotalia cunialensis* (Toumarkine and Bolli). *Revue de Paléobiologie*, 24 (1), Pp. 29-50.
- Naz, H., 2013. Bathymetric study of Tiyon Formation based on foraminiferal assemblage around Laki Range, Lower Indus Basin, Sindh. Ph. D. Thesis, Centre for Pure and Applied Geology University of Sindh, Jamshoro, Pakistan, Pp. 1-211.
- Said, R., Kenawy, A. 1956. Upper Cretaceous and Lower Tertiary foraminifera from northern Sinai, Egypt. *Micropaleontology*, 2 (2), Pp. 105-173.

