

## REVIEW ARTICLE

# ORNATODELLA ANAN, A NEW YPRESIAN ROTALIID BENTHIC FORAMINIFERAL GENUS FROM PAKISTAN

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## ARTICLE DETAILS

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## ABSTRACT

*Ornatodella* Anan is introduced here to elucidate a new Ypresian Rotaliid benthic foraminiferal genus, which represents a transition from between the two benthic foraminiferal genera: *Ornatanomalina* Haque, 1956 (with the spiraling ribs in the end stage of coiling) and *Saudella* Hasson, 1985 (with pustule in the early stage). According to Loeblich & Tappan the two genera: *Ornatanomalina* Haque and *Saudella* Hasson appear to be both congeneric, which doesn't accepted here. *Ornatodella* n. gen. may represents an excellent biostratigraphic marker of the Paleocene Eocene Thermal Maximum (PETM, zone E1).

## KEYWORDS

Rotaliid Benthic foraminifera, *Ornatodella pustulosa*, Paleocene, Pakistan

## 1. INTRODUCTION

The new genus Ypresian *Ornatodella* is characterized by its pustules covering the early chambers of the twisted test, as in the genus *Saudella*, but differs from the *Ornatanomalina geei* Haque (the holotype of the genus *Ornatanomalina*), by its spiraling ribs covers the last two chambers of the last whorl (Loeblich and Tappan, 1988). The *Ornatodella* n. gen. most probably the ancestor of Ypresian *Saudella ornata* Hasson due to its pustules in the early stage of the last whorl (Hasson, 1985).

## 2. FAUNAL DISCUSSION

The genus *Ornatanomalina* Haque and its members were identified from Pakistan, while some of them were recorded also from UAE, Qatar, Iraq, Nigeria, Italy and France, while *Saudella* from Saudi Arabia (SA) has coarse porous infilling may overlies extinctions of the chambers, and the primary aperture has a slit or rounded opening with smooth apertural face (Haque 1956; Anan, 2021).

## 3. SYSTEMATIC PALEONTOLOGY

The taxonomy followed in this study is that of Loeblich & Tappan, 1988.

Order Foraminiferida Eichwald, 1830

Suborder Rotaliina Delage & Hérouard, 1896

Genus *Ornatanomalina* Haque, 1956

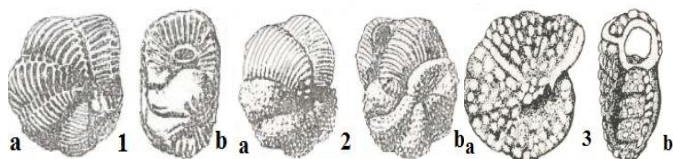


Plate 1: (a. dorsal view, b. apertural view, x 60)

Figure 1. *Ornatanomalina pakistanica* Anan (2021); 2. *Ornatodella pustulosa* (Haque, 1960), 3. *Saudella ornata* Hasson (1985).

***Ornatanomalina pakistanica* Anan, 2021**, p. 14, pl. 1, fig. 8. (= *Ornatanomalina* cf. *geei* Haque, 1960, p. 40, pl. 2, figure 1) (Plate 1, figure 1a.b)

Remarks: The Ypresian *Ornatanomalina pakistanica* Anan differs from the Thanetian *O. geei* Haque (the holotype of the genus) by its spiraling costae (instead of ribs), sharply angled costae interrupted near the depressed sutures at the edges of the chamber surface (not at the radial median ridges), round opening aperture (not slit-like aperture).

Genus *Ornatodella* Anan, n. gen. (Plate 1, figure 2a,b)

Type species *Ornatodella pustulosa* (Haque, 1960)

***Ornatodella pustulosa* (Haque, 1960)** (Plate 1, figure 2a.b) (= *Ornatanomalina* ? *pustulosa* Haque, 1960, p. 40, pl. 2, fig. 2).

Holotype: Illustrated specimen in Pl. 1, figure 2a, b.

Dimension: Length 38 mm, width 22 mm.

Etymology: A compiled name between the prefix of *Ornatanomalina* and the suffix of *Saudella*.

Type locality: From sample KSR-5, Sor Range, Quetta District, West Pakistan (Figure 1).

Age: Ypresian.

Depository: Geological Survey of Pakistan (GSP).

Diagnosis: This benthic foraminiferal Rotaliid genus and its species differs from *Ornatanomalina* spp. of Haque, by its pustules covering the early five chambers of the twisted test, but spiraling ribs covers the last two chambers of the last whorl, and large round opening interior marginal and equatorial aperture, with imperforated limbate border.

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Remarks: The *Ornatodella pustulosa* most probably the ancestor of the Ypresian *Saudella ornata* Hasson (1985).

Ypresian of Umm er Radhuma Formation in the Rub' Al Khali basin wells, SA (Figure 2).

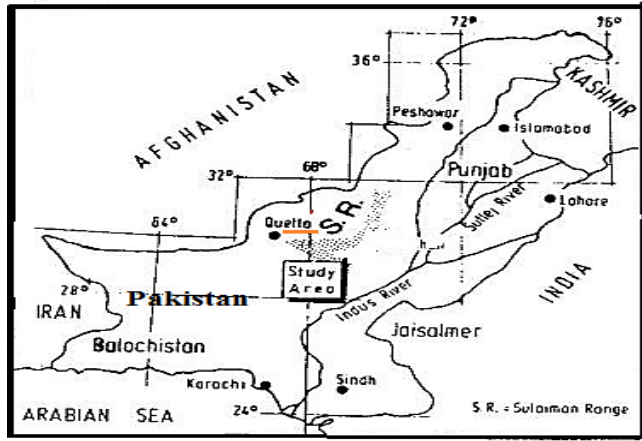


Figure 1: Location map of Quetta District, West Pakistan (after Afzal, 1996).

Genus *Saudella* (Hasson, 1985)

*Saudella ornata* Hasson, 1985, p. 348, pl. 1, figs 6-9 - (Plate 1, figure 3a, b)

Remarks: *Saudella ornata* has nearly planispiral evolute coiling test, ornamented by heavy pustules covering both sides of test, apertural face smooth bordered by a raised imperforate rim. It was recorded from



Figure 2: Location map showing the geographic distribution of the identified genera and species.

4. PALEO GEOGRAPHY

The *Ornatanomalina pakistanica* and *Ornatodella pustulosa* are corded from Pakistan. Some of the *Ornatanomalina* spp. are recorded also *O. ennakhali* from UAE (Anan, 1996), *O. hafeezi* from Qatar (Hewaidy, 1994) and Nigeria (Haynes & Nwabufo-Ene, 1998), while the *Saudella ornata* is confined, so far, to Saudi Arabia (Hasson, 1984). The interpretations that have been presented by different authors (e. g., Berggren & Aubert, 1975; Nomura & Brohi, 1995; Haynes & Nwabufo-Ene, 1998; VahdatiRad et al., 2016) are documented the extended realms of Indo-Pacific Ocean via ancestral Tethys to Atlantic Ocean (Figure 3).

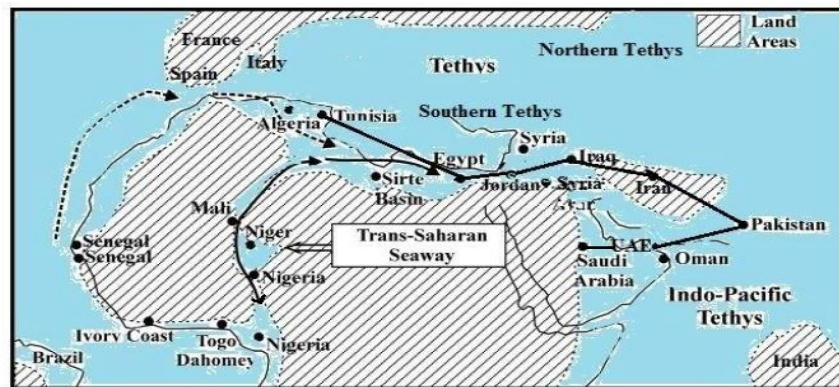


Figure 3: The Early Paleogene open sea water between many countries in the Southern Tethys: Pakistan, UAE, SA, Iran, Iraq, Egypt, Tunisia and Nigeria through the Trans-Sahara Seaway (after Morsi et al., 2008, with some modifications)

5. PALEOENVIRONMENT

A marked fall of the sea level took place near the close of the Late Paleocene (~54 Ma) followed by the deepening paleobathymetric trend in the western Pakistan in the Early Eocene (Figure 4) most probably have

been produced by local tectonism, which documented by Khan et al. (2016) and Khawaja et al. (2018) that Pakistan lies on the boundaries between Indo-Pakistan, Arabian and Eurasian Plates (Figure 5).

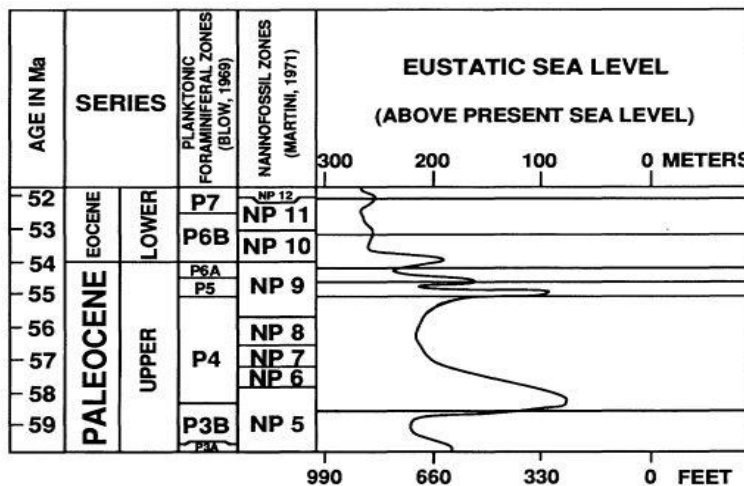


Figure 4: The planktonic foraminiferal and calcareous nannofossil zonation across the Paleocene-Eocene boundary and the eustatic sea-level curves proposed for this part of the Paleogene (after Haq et al., 1987).

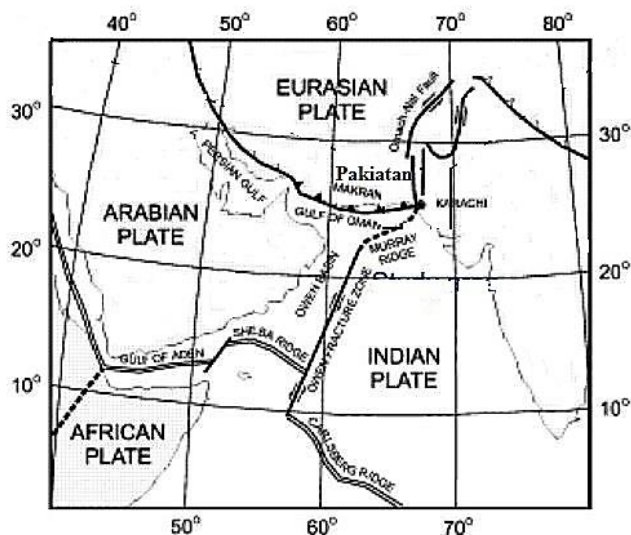


Figure 5: The major plate boundaries around Pakistan: Eurasian, Arabian and Indian Plates (after Khan et al., 2016).

## 6. CONCLUSION

The present study deals with the recording of a new Rotaliid benthic foraminiferal genus *Ornatodella* as well as another two related genera *Ornatanomalina* of Haque and *Saudella* Hasson and its species. The first genus *Ornatanomalina* throughout some species of it have wide geographic distribution around Pakistan in southwest Asia (UAE, Qatar, SA) and westcentral Africa (Nigeria). The new genus *Ornatodella* is confined, so far, from Pakistan, and *Saudella* from SA. The unclosed record of these species in different Tethyan localities around Pakistan and Arabia, may due to lack of detailed study, land barriers, miss identification, and/or different paleoenvironmental conditions. *Ornatodella* n. gen. may represents an excellent biostratigraphic marker of the PETM (zone E1).

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## REFERENCES

- Afzal, J., 1996. Late Cretaceous to Early Eocene foraminiferal biostratigraphy of the Rakhi Nala area, Sulaiman Range, Pakistan. *Pakistan Journal of Hydrocarbon Research*, 8 (1), Pp. 1-24.
- Anan, H.S., 1996. Early Eocene foraminifera of Jabal Hafit, United Arab Emirates. *Middle East Research Center, Ain Shams University, Earth Science Series, Cairo*, 10, Pp. 147-162.
- Anan, H.S., 2021. Paleontology and paleogeography of the Tethyan Early Paleogene Rotaliid benthic foraminiferal Pakistanian genus *Ornatanomalina* and other related genera. *Earth Sciences Pakistan (ESP)*, 5 (1), Pp. 12-15.
- 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.
- Haq, B.U., Hardenbol, J., Vial, P.R., 1987. Chronology of fluctuating sea level since the Triassic. *Science, New York*, 235, Pp. 1156-1167.
- Haque, A.F.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., 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.
- Hasson, P.H., 1985. New observations on the biostratigraphy of the Saudi Arabian Umm er Radhuma Formation (Paleogene) and its correlation with neighboring regions. *Micropaleontology*, 31 (4), Pp. 335-364.
- Haynes, J., Nwabufu-Ene, K., 1998. Foraminifera from the Paleocene phosphate beds, Sokoto, Nigeria. *Revue Española de Micropaleontologia*, 30 (2), Pp. 51-76.
- Hewaidy, A.A., 1994. Biostratigraphy of the Umm Er Radhuma Formation in South-East Qatar, Arabian Gulf - *Neues Jahrbuch für Geologie und Paläontologie, Abh.*, 193, 2, Pp. 145-164.
- Khan, N., Rehman, Kh., Ahmad, S., Khokher, J., Iqbal Hajana, M., Hanif, M., 2016. Sequence stratigraphic analysis of Eocene Rock Strata, Offshore Indus, southwest Pakistan. *Mar Geophys Res.*, 37: Pp. 207-228.
- Khawaj, M.S., Faisal, M., Ur Rehman, Q., Ahmad, T., Khattak, S.A., Saeed, A., Adnan, M.T., Irfan, Ur Rehman, S., Ahmed, I., Ishfaq, M., 2018. Benthic foraminiferal biostratigraphy, microfacies analysis and depositional environment of Chorgali Formation Yaadgar section, Muzaffarabad, Pakistan. *Pakistan Journal of Geology (PJG)*, 2 (1), Pp. 21-29.
- Loeblich A.R., Tappan H., 1988. Foraminiferal genera and their classification. *Van Nostrand Reinhold (VNR), New York, Part 1, Pp. 970, part 2, 847 Pp. USA.*
- Morsi, A.M., Faris, M., Zalal, A., Salem, R.F., 2008. Maastrichtian-Early Eocene ostracodes from west-central Sinai, Egypt. taxonomy, biostratigraphy, paleoecology and paleobiogeography. *Revue de Paléobiologie* 27 (1), Pp. 159-189. 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.
- VahdatiRad, M., Vahidinia, M., Sadeghi, A., 2016. Early Eocene planktonic and benthic foraminifera from the Khangiran formation (northeast of Iran). *Arabian Journal of Geosciences*, 9, 677, Pp. 1-13.

