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RESEARCH ARTICLE

ADDITIONAL NEW TAXA AND LINEAGES OF BENTHIC AND PLANKTIC FORAMINIFERA OF ANAN FROM SOUTH ASIA

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ABSTRACT

This study deals with a review of two new Paleogene benthic genera: *Ornatodella* Anan (2023) from Pakistan and *Marginulinoides* Anan (2024) from the United Arab Emirates (UAE), as well as one hundred and thirty-two Campanian-Paleogene and Recent benthic and planktic foraminiferal species were erected by the present author from twelve localities in South Asia: 18 species from Turkey (~ 13.6%), 2 Palestine, 3 Jordan, 1 Saudi Arabia (SA), 10 Yaman (~7.6%), 8 Oman (~6%), 29 UAE (~22%), 1 Qatar, 11 Iraq (~8%), 37 Iran (~28%),15 Pakistan (~11%), and 2 species from India. Six species of the assemblage are believed here as new: *Percultazonaria iranica, Percultazonaria iranensis, Lagena iranica, Aragonia iranica* and *Catapsydrax iranica* and *Subbotina iranica.* 39 species of the assemblage belong to Suborder Textulariina (~30%), 8 Miliolina (~6%), 29 Lagenina (~22%), 36 Rotaliina (~27%) and 20 Globigerinina (~15%). Twenty-two of the recorded species present an evolutionary foraminiferal lineage: **(**1) *Gaudryina acuta → G. pyramidata → G. limbata* lineage, (2) *Pseudoclavulina iranensis → P. iranica*, (3) *Textularia haquei → T. farafraensis*, (4) *Laevidentalina ameeri → L. hudae → L. salimi*, (5) *Ramulina pseudoaculeata → R. futyani*, (6) *Ramulina ornata → R. salahii*, (7) *Stilostomella impensia → S. turkiana*, (8) *Ellipsoglandulina turkiana → E. arafati*, (9) *Planulina mellahensis → P. turkiana*, (10) *Cibicidoides nekhlianus → C. turkiana*, (11) *Cibicides schwageri → Cibicides turkiana*, (12) *Nuttallides turkiana → N. turkiana*, (13) *Nonion havanense → N. turkiana*, (14) *Oridorsalis umbonatus → O. turkiana*, (15) *Osangularia turkiana → O. plummerae*, (16) *Anomalinoides turkiana → A. zitteli*, (17) *Valvulineria iraqensis → V. ranikotensis*, (18) *Ornatanomalina geei → O. pakistanica*, (19) *Morozovella lensiformis → M. arabica →M. crater →M. aragonensis → M. caucasica*, (20) *M. crater →M. hafitensis → M. caucasica*, (21) *Turborotalia cerroazulensis → T. semicunialensis → T. cocoaensis → T. cunialensis* lineage.

KEYWORDS

Paleontology, Stratigraphy, South Asia, Southern Tethys, evolutionary foraminiferal lineage

1. INTRODUCTION

The present paper aims to highlight the paleontology, stratigraphy, paleogeography, and paleoenvironment of 132 Campanian-Paleogene and Recent benthic and planktic foraminiferal species which were originally erected by the present author from twelve different localities in South Asia (Figure 1).

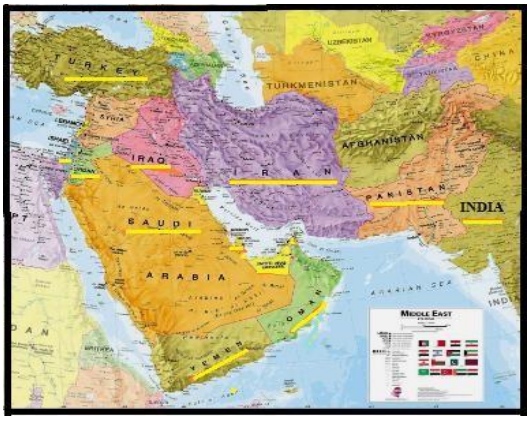

Figure 1: Location map of the twelve countries in South Asia: Turkey, Palestine, Jordan, Saudi Arabia (SA), Yaman, Oman, United Arab Emirates (UAE), Qatar, Iraq, Iran, Pakistan, India.

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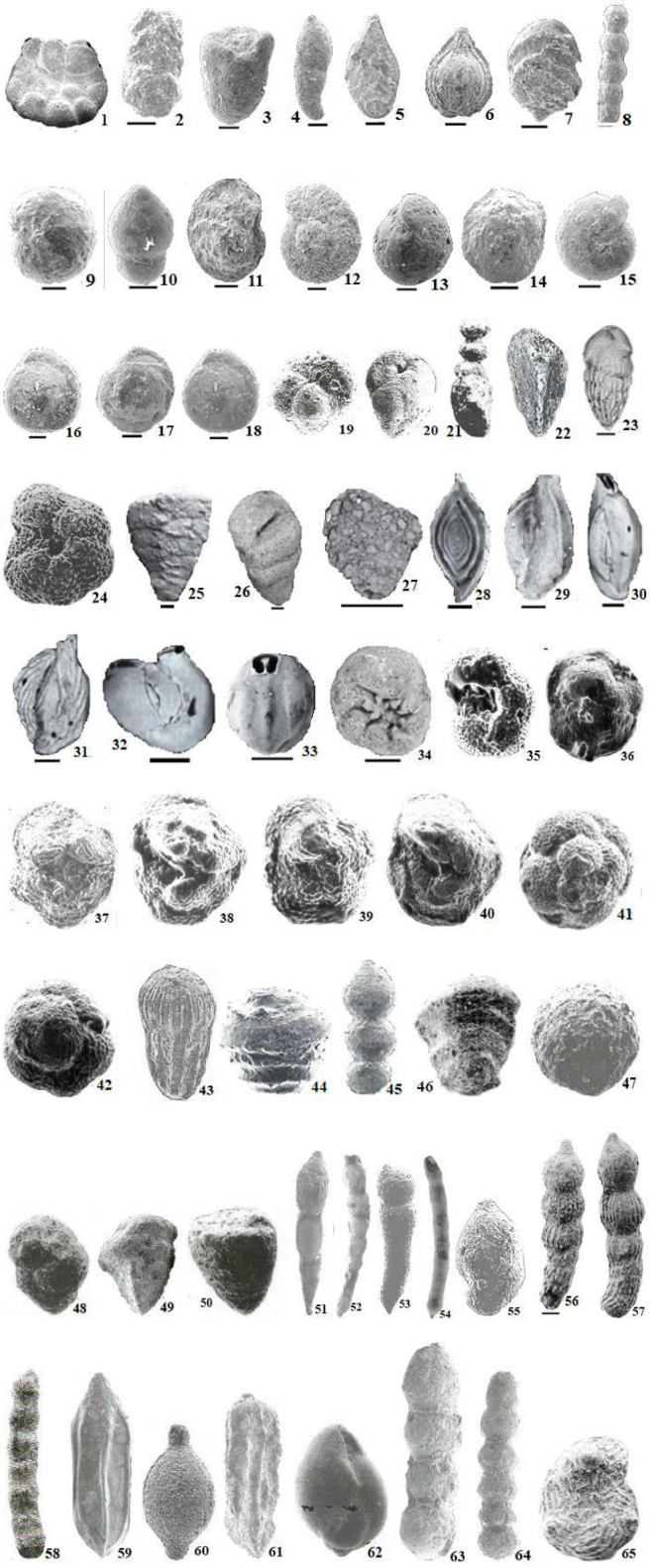
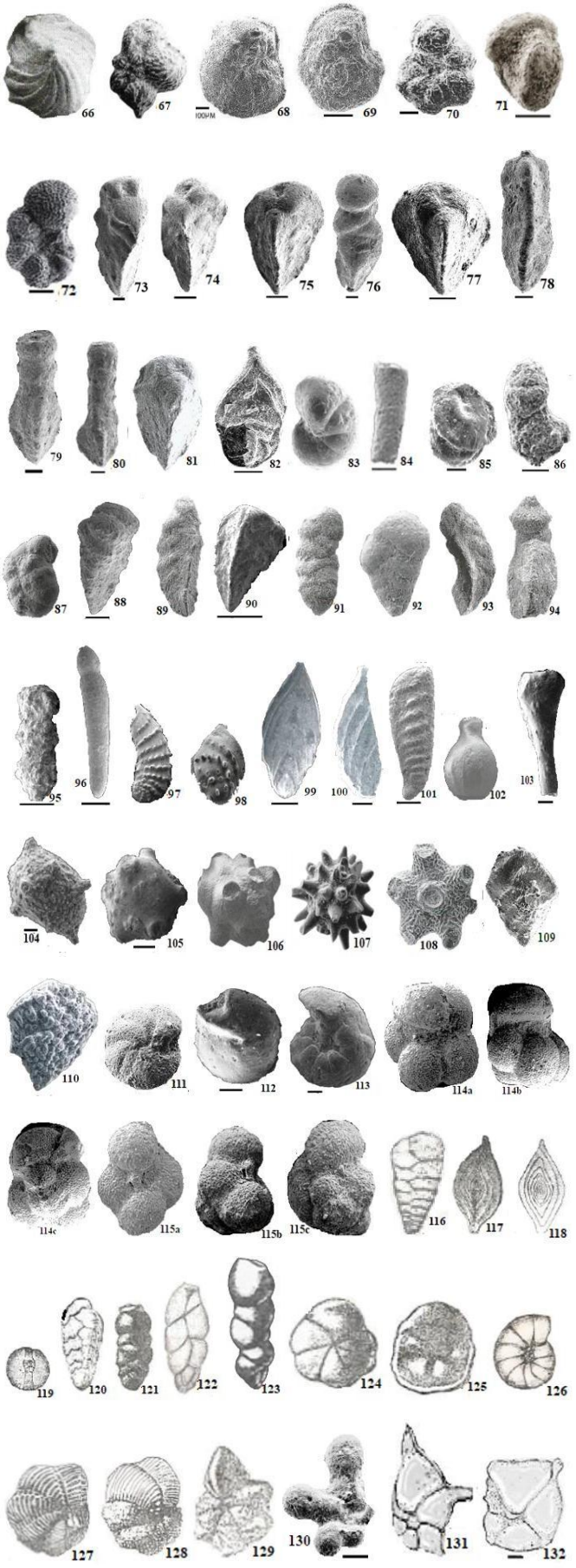
2. Systematic Paleontology

The taxonomy is followed here. This study deals with two Paleogene benthic genera: *Ornatodella* from Pakistan and *Marginulinoides* from the United Arab Emirates (UAE), as well as one hundred and thirty-two Campanian-Paleogene and Recent benthic and planktic foraminiferal species were erected by the present author from twelve localities in South Asia (Turkey, Palestine, Jordan, Saudi Arabia (SA), Yaman, Oman, United Arab Emirates (UAE), Qatar, Iraq, Iran, Pakistan, India), which are presented in Plate 1 of (Loeblich and Tappan, 1988; Anan, 2023; Anan, 2024).

Plate 1 (Scale bars 100 μm)

Figure 1: *Trochamminoides turkiana* Anan (2026), **2.** *Spiroplectinella gurayi* Anan (2026), **3.** *Dorothia turkiana* Anan (2026), **4.** *Enantiodentalina turkiana* Anan (2026), **5.** *Neoflabellina turkiana* Anan (2026), **6.** *Lagena turkiana* Anan (2026), **7.** *Aragonia turkiana* Anan (2026), **8.** *Stilostomella turkiana* Anan (2026), **9.** *Globocassidulina turkiana* Anan (2026), **10.** *Ellipsoglandulina turkiana* Anan (2026), **11.** *Planulina turkiana* Anan (2026), **12.** *Cibicidoides turkiana* Anan (2026), **13.** *Cibicides turkiana* Anan (2026), **14.** *Nuttallides turkiana* Anan (2026), **15.** *Nonion turkiana* Anan (2026), **16.** *Oridorsalis turkiana* Anan (2026), **17.** *Osangularia turkiana* Anan (2026), **18.** *Anomalinoides turkiana* Anan (2026), **19.** *Arenobulimina beitjebrinensis* Anan (2022), **20.** *Arenobulimina jerusalemensis* Anan (2022), **21.** *Pseudoclavulina futyani* Anan (2021), **22.** *Verneuilina jordanica* Anan (2022), **23.** *Bulimina jordanica* Anan (2026), **24.** *Acarinina saudica* Anan (2025), **25.** *Spiroplectinella yamanensis* Anan (2025), **26.** *Textularia arabica* Anan (2025), **27.** *Textularia biraliensis* Anan (2025), **28.** *Spiroloculina biraliensis* Anan (2025), **29.** *Quinqueloculina alwosabii* Anan (2025), **30.** *Quinqueloculina biraliensis* Anan (2025), **31.** *Quinqueloculina munefi* Anan (2025), **32.** *Miliolinella biraliensis* Anan (2025), **33.** *Pyrgo basardahi* Anan (2025), **34.** *Rosalina alwosabii* Anan (2025), **35.** *Acarinina umbilicata* Anan (2024), **36.** *Morozovella elbadrii* Anan (2024), **37.** *Morozovella elsayighi* Anan (2024), **38.** *Morozovella omanica* Anan (2024), **39.** *Morozovella surensis* Anan (2024), **40.** *Morozovella wadimusawaensis* Anan (2024), **41.** *Globigerinatheka arabica* Anan (2024), **42.** *Globigerinatheka omanica* Anan (2024), **43.** *Tollmannia qatarica* Anan (2025), **44.** *Repmanina mazeni* Anan (2021), **45.** *Psammolingulina bahri* Anan (2021), **46.** *Spiroplectinella hamdani* (Anan, 1993), **47.** *Orbulinelloides arabicus* Anan (2003), **48.** *Plectina emiratensis* Anan (2003), **49.** *Gaudryina arabica* Anan (2022), **50.** *Marssonella hafitensis* Anan (2003), **51.** *Chrysalogonium qarnelbarrensis* Anan (2022), **52.** *Laevidentalina ameeri* Anan (2022), **53.** *Laevidentalina hudae* Anan (2015), **54.** *Laevidentalina salimi* Anan (2009), **55.** *Hemirobulina olae* Anan (2015), **56.** *Marginulinoides arabica* Anan (2024), **57.** *Marginulinoides karimae* (Anan, 2009), **58.** *Vaginulinopsis emiratensis* (Anan, 1993), **59.** *Procerolagena emiratensis* Anan (2022), **60.** *Ramulina futyani* Anan (2015), **61.** *Transversigerina hamdani* Anan (2022), **62.** *Turrilina hassani* Anan (2010), **63.** *Orthomorphina abdelghanyi* Anan (2022), **64.** *Orthomorphina abusaimai* Anan (2022), **65.** *Ornatanomalina ennakhali* Anan (1996), **66.** *Elphidium cherifi* Anan (2010), **67.** *Plummerita hudae* Anan (2022), **68.** *Morozovella arabica* Anan (2024), **69.** *Morozovella hafitensis* Anan (2024), **70.** *Morozovella arabiana* Anan (2025), **71.** *Turborotalia semicunialensis* Anan (2023), **72.** *Praemurica arabica* Anan (2025), **73.** *Gaudryina acuta* Anan (2023), **74.** *Gaudryina jaffi* Anan (2023), **75.** *Gaudryina lawai* Anan (2023), **76.** *Pseudogaudryinella iraqensis* Anan (2022), **77.** *Verneuilina iraqensis* Anan (2022), **78.** *Tritaxia longa* Anan (2023), **79.** *Pseudoclavulina farisi* Anan (2023), **80.** *Pseudoclavulina iraqensis* Anan (2026), **81.** *Pseudogaudryina iraqensis* Anan (2022), **82.** *Neoflabellina iraqensis* Anan (2024), **83.** *Valvulineria iraqensis* Anan (2023), **84.** *Bathysiphon iranica* Anan (2026), **85.** *Glomospira iranica* Anan (2025), **86.** *Ammobaculinus iranica* Anan (2026), **87.** *Haplophragmoides iranica* Anan (2026), **88.** *Gaudryina iranica* Anan (2026), **89.** *Pseudogaudryinella iranensis* Anan (2022), **90.** *Verneuilina iranica* Anan (2026), **91.** *Dorothia iranica* Anan (2022), **92.** *Textularia salahii* Anan (2022), **93.** *Clavulinoides iranica* Anan (2022), **94.** *Pseudoclavulina iranica* Anan (2022), **95.** *Pseudoclavulina iranensis* Anan (2026), **96.** *Dentalinoides iranica* Anan (2026), **97.** *Percultazonaria iranica* Anan, n. sp., **98.** *Percultazonaria iranensis* Anan, n. sp., 99. *Neoflabellina iranica* Anan (2024), **100.** *Citharina iranica* Anan (2026), **101.** *Vaginulina iranica* Anan (2026), **102.** *Lagena iranica* Anan, n. sp., **103.** *Ramulina ghoorchaeii* Anan (2026), **104.** *Ramulina iranica* Anan (2026), **105.** *Ramulina iranensis* Anan (2026), **106.** *Ramulina irregularis* Anan (2026), **107.** *Ramulina radiata* Anan (2026), **108.** *Ramulina salahii* Anan (2022), **109.** *Aragonia iranica* Anan, n. sp., **110.** *Bolivinoides iranensis* Anan (2026), **111.** *Valvulineria iranica* Anan (2023), **112.** *Globorotalites iranensis* Anan (2026), **113.** *Gyroidinoides iranica* Anan (2026), **114a-c.** *Catapsydrax iranica* Anan, n. sp., **115a-c.** *Subbotina iranica* Anan, n. sp., **116.** *Textularia haquei* Anan (2020), **117.** *Spiroloculina haquei* Anan (2021), **118.** *Spiroloculina pakistanica* Anan (2021),**119.** *Parafissurina pakistanica* Anan (2021), **120.** *Bolivina pakistanica* Anan (2021), **121.** *Loxostomum pakistanica* Anan (2021), **122.** *Hopkinsina haquei* Anan (2020), **123.** *Pleurostomella haquei* Anan (2019), **124.** *Eponides pakistanica* Anan (2021), **125.** *Rosalina haquei* Anan (2021), **126.** *Nonionella haquei* Anan (2019), **127.** *Ornatanomalina pakistanica* Anan (2021), **128.** *Ornatodella* Anan (2023), **129.** *Pararotalia pakistanica* Anan (2021), **130.** *Clavigerinella pakistanica* Anan (2024), **131.** *Hantkenina indica* Anan (2025), **132.** *Hantkenina quadrata* Anan (2025).





I. TURKEY

(1) *Trochamminoides turkiana* Anan, 2026, p. 37, pl. 1, fig. 2.

Remarks: The Paleocene-Eocene Turkish species differs from the holotype *Trochamminoides proteus* (Karrer) by its less evolute test, rounded outline of the test, lesser number of the whorls and also chambers in the last whorl.

(2) *Spiroplectinella gurayi* Anan, 2026, p. 37, pl. 1, fig. 3.

Remarks: This Paleocene-Early Eocene species was most probably developed from the Maastrichtian *S. hamdani* (Anan,1993), but differs by depressed sutures than raised, and elongated parallel biserial stage than triangular shape.

(3) *Dorothia turkiana* Anan, 2026, p. 37, pl. 1, fig. 4.

Remarks: This Paleocene-Early Eocene species differs from *Dorothia nacataensis* (White), by wider semiglobular initial early stage than conical shape of the latter.

(4) *Enantiodentalina turkiana* Anan, 2026, p. 37, pl. 1, fig. 5.

Remarks: The Paleocene-Early Eocene Turkish species belongs here to the genus *Enantiodentalina* (not *Dentalina*) due to its smooth surface, biserial to uniserial test arrangement, not only uniserial with longitudinal costae.

(5) *Neoflabellina turkiana* Anan, 2026, p. 38, pl. 1, fig. 6.

Remarks: The Paleocene-Early Eocene *N. turkiana* differs from *N. rugosa* (d'Orbigny) by smaller planispiral, and smaller numbers of the uniserial chambers.

(6) *Lagena turkiana* Anan 2026, p. 38, pl. 1, fig. 7.

Remarks: This Paleocene-Early Eocene Turkish species belongs here to the genus *Lagena* (not *Fissurina*) with aligned puntuations ornamentation and double peripheral keels, instead of smooth surface, ovate to terminal aperture within a slightly depressed fissure at the test apex of the latter.

(7) *Aragonia turkiana* Anan, 2026, p. 38, pl. 1, fig. 9.

Remarks: This Paleocene-Early Eocene Turkish species has less length/width (L/W) than equal equation in *A. aragonensis,* and straighter sutuers than zigzag sutural ridges of the latter.

(8) *Stilostomella turkiana* Anan, 2026, p. 38, pl. 1, fig. 10.

Remarks: This Paleocene-Early Eocene species differs from Maastrichtian *S. impensia* (Cushman) by rectilinear test nearly with parallel sides, instead of slightly arcuate test of the latter. The *S. turkiana* most probably developed from *S. impensia* in *Stilostomella impensia → S. turkiana* lineage.

(9) *Globocassidulina turkiana* Anan, 2026, p. 38, pl. 1, fig. 11.

Remarks: This Early Eocene species is characterized by its biserial enrolled globular smooth test, and zigzag sutures.

(10) *Ellipsoglandulina turkiana* Anan, 2026, p. 38, pl. 1, fig. 12.

Remarks: The Paleocene-Early Eocene Turkish species has three chambers of smooth test, and about 1.37 of (length/width), compared with two chambers, and about 1.5 (length/width) in the Egyptian Early Eocene *E. arafati* Anan (2009). It seems that The Paleocene-Early Eocene Turkish species most probably the ancestor of the Egyptian Early Eocene *E. arafati* in *Ellipsoglandulina turkiana → E. arafati* lineage.

(11) *Planulina turkiana* Anan, 2026, p. 38, pl. 1, fig. 13.

Remarks: The Early Eocene Turkish species differs from the Egyptian Danian *P. mellahensis* Nakkady by more compressed test, tighter umbilicus, and more elongated arched aperture. The *Planulina mellahensis* most probably the ancestor of *P. turkiana* in *Planulina mellahensis → P. turkiana* lineage.

(12) *Cibicidoides turkiana* Anan, 2026, p. 38, pl. 1, fig. 14.

Remarks: The Paleocene-Early Eocene Turkish species differs from the Egyptian Maastrichtian *C. nekhlianus* (Said & Kenawy, 1956) by a greater number of chambers, and larger umbo. It seems that *Cibicidoides nekhlianus* most probably the ancestor of the *C. turkiana* in *Cibicidoides nekhlianus → C. turkiana* lineage.

(13) *Cibicides turkiana* Anan, 2026, p. 38, pl. 1, fig. 15.

Remarks: The Paleocene Turkish species differs from the Egyptian Danian *Cibicides schwageri* Said & Kenawy (1956) by tighter and wider opening umbilical area, and acuter angular periphery. It seems that *C. schwageri* most probably the ancestor of the *C. turkiana* in *Cibicides schwageri → Cibicides turkiana* lineage.

(14) *Nuttallides turkiana* Anan 2026, p. 38, pl. 1, fig. 16.

Remarks: The Paleocene-Early Eocene Turkish *Nuttallides turkiana* differs from the Mexican Maastrichtian-Paleocene *N. truempyi* (Nuttall,

1930) with nearly planoconvex test, carinate periphery, and more open umbilical area in *N. truempyi.* It seems that *N. truempyi* most probably the ancestor of the *N. turkiana* in *Nuttallides turkiana → N. turkiana* lineage.

(15) *Nonion turkiana* Anan, 2026, p. 39, pl. 1, fig. 17.

Remarks: The Paleocene-Early Eocene Turkish *Nonion turkiana* differs from the Egyptian Paleocene *Nonion havanense* Cushman & Bermúdez of Alegret & Ortiz (2006/2007), by rounded periphery and nearly flush sutures, compared with lobulate periphery and slightly depressed sutures of the latter. It seems that *N. havanense* most probably the ancestor of the *N. turkiana* in *Nonion havanense → N.s turkiana* lineage.

(16) *Oridorsalis turkiana* Anan, 2026, p. 39, pl. 1, fig. 18.

Remarks: The Paleocene-Early Eocene Turkish *Oridorsalis turkiana* differs from the Maastrichtian-Paleocene *Oridorsalis umbonatus* (Reuss) by less convex spiral side, tighter aperture, and wider rounded periphery. It seems that *O. umbonatus* most probably the ancestor of the *O. turkiana* in *Oridorsalis umbonatus → O. turkiana* lineage.

(17) *Osangularia turkiana* Anan, 2026, p. 39, pl. 1, fig. 19.

Remarks: The Paleocene-Early Eocene Turkish *Osangularia turkiana* differs from the Early Eocene Egyptian *O. plummerae* Brotzen (from the P/E Dababiya Stratotype section of Egypt) by trapezoidal chambers with carinate periphery than triangular chambers with ragged transparent keel. It seems that *O. turkiana* most probably the ancestor of the *O. plummerae* in *Osangularia turkiana → O. plummerae* lineage (Alegret and Ortiz, 2006, 2007).

(18) *Anomalinoides turkiana* Anan, 2026, p. 39, pl. 1, fig. 20.

Remarks: The Paleocene-Early Eocene Turkish *Anomalinoides turkiana* differs from the Egyptian Early Eocene *A. zitteli* (LeRoy) by biconvex test, rounded periphery, extended aperture on the spiral side, instead of nearly planoconvex test, acute periphery with imperforated keel, and limited extended aperture on both sides of the apertural face of the latter. It seems that *A. turkiana* most probably the ancestor of *A. zitteli* in *Anomalinoides turkiana → A. zitteli* lineage.

II. PALESTINE

(19) *Arenobulimina beitjebrinensis* Anan, 2022, p. 25, pl. 1, fig. 58.

Remarks: This Maastrichtian species is characterized by its compressed smooth test, four making up at last whorl, tapering initial part, distinct loop-shaped aperture.

(20) *Arenobulimina jerusalemensis* Anan, 2022, p. 25, pl. 1, fig. 59.

Remarks: This species differs from *A. beitjebrinensis* in its shorter length and width smooth compressed test.

III. JORDAN

(21) *Pseudoclavulina futyani* Anan, 2021, p. 87, pl. 1, fig. 16.

Remarks: This Danian species has large triserial part and comprise one-half of the test, the uniserial part has slightly irregular three flask-shaped inflated chambers with rounded terminal at end of tubular neck, and deeply excavated sutures.

(22) *Verneuilina jordanica* Anan, 2022, p. 78, pl. 1, fig. 4.

Remarks: This Thanetian-Ypresian species differs from the holotype of the late Cretaceous *V. tricarinata* d'Orbigny in its more rounded margins, and more coarse-grained test.

(23) *Bulimina jordanica* Anan, 2026, p. 4, pl. 1, fig. 22.

Remarks: This Early Eocene species differs from the Eocene *B. midwayensis* Cushman & Parker by its subcylindrical elongate test, about 2/1 length/width of the test.

IV. SAUDI ARABIA

(24) *Acarinina saudica* Anan, 2025, p. 53, pl. 1, fig. 26.

Remarks: This species is distinguished by its low trochospiral test, large and widely open umbilicus, 6 chambers in the last whorl, round periphery, umbilical-extraumbilical aperture. It differs from *Acarinina pentacamerata* with only 5 compact chambers in the last whorl, and deeper small umbilicus.

V. YAMAN

(25) *Spiroplectinella yamanensis* Anan, 2025, p. 172, pl. 3, fig. 5.

Remarks: Test biserial chambers throughout, triangular outline fusiform in apertural view, wall coarsely agglutinated, sutures slightly depressed, aperture basil with open slit.

(26) *Textularia arabica* Anan, 2025, p. 174, pl. 3, fig. 10.

Remarks: It is distinguished by nearly cylindrical test in outlie and basal with wide slit open aperture.

(27) *Textularia biraliensis* Anan, 2025, p. 175, pl. 3, fig. 11.

Remarks: It is characterized by very coarsely agglutinated test.

(28) *Spiroloculina biraliensis* Anan, 2025, p. 175, pl. 3, fig. 35.

Remarks: It is characterized by its regular fusiform test, one-half chambers coil increasing rapidly in length and breadth as added, with smooth rounded periphery, and open-end aperture of the final chamber produced on a long neck.

(29) *Quinqueloculina alwosabii* Anan, 2025, p. 176, pl. 3, fig. 57.

Remarks: This species has a rugose surface with 3-4 longitudinal ribs, elongate open aperture with long bifid tooth. It differs from *Q. rugosa* by its more rugose surface, and elongate aperture with long bifid tooth.

(30) *Quinqueloculina biraliensis* Anan, 2025, p. 177, pl. 3, fig. 58.

Remarks: It is characterized by its protruding middle chamber, and elongate open aperture with long bifid tooth.

(31) *Quinqueloculina munefi* Anan, 2025, p. 177, pl. 3, fig. 69.

Remarks: It is characterized by its numerous ribs ornamented surface.

(32) *Miliolinella biraliensis* Anan, 2025, p. 178, pl. 3, fig. 85.

Remarks: Test smooth flattened elliptical in lateral view, early stage Quinqueloculina, latter planispiral with four chambers in one side but three in the other per whorl, rounded periphery, aperture terminal at end of last chamber.

(33) *Pyrgo basardahi* Anan, 2025, p. 179, pl. 3, fig. 93.

Remarks: It characterized by its two longitudinal elongated grooves of the chambers.

(34) *Rosalina alwosabii* Anan, 2025, p. 180, pl. 3, fig. 157.

Remarks: This species is distinguished by its depressed and backward curved sutures in ventral side, but limbate raised in the dorsal side, umbilicus is open, an interiomarginal-extraumbilical arched aperture separated by the umbilical folium.

VI. OMAN

(35) *Acarinina umbilicata* Anan, 2024, p. 49, pl. 1, fig. 26.

Remarks: This Early Eocene species has compact strongly perforated test, and deep wide-open umbilicus.

(36) *Morozovella elbadrii* Anan, 2024, p. 49, pl. 1, fig. 35.

Remarks: This Middle Eocene species differs from all other known *Morozovella* species in having raised curved spiral sutures, depressed shallow wide-open umbilicus, and low arch and is umbilical to extraumbilical aperture.

(37) *Morozovella elsayighi* Anan, 2024, p. 49, pl. 1, fig. 36.

Remarks: This species *M. elsayighi* differs from *M. acuta* (Toulmin) by its rhomboidal low trochospiral test than semi-rounded test of the latter.

(38) *Morozovella omanica* Anan, 2024, p. 49, pl. 1, fig. 19.

Remarks: This Late Paleocene species differs from the holotype of *Morozovella parva* Rey in being higher or more conical in shape, in having more chambers in the last whorl and a more circular outline.

(39) *Morozovella surensis* Anan, 2024, p. 50, pl. 1, fig. 19.

Remarks: This Early Eocene species is characterized by its 4-5 angular chambers, acute periphery, and spinose surface.

(40) *Morozovella wadimusawaensis* Anan, 2024, p. 50, pl. 1, fig. 23.

Remarks: This Early Eocene species is characterized by its 4-5 chambers in the last whorl, thick peripheral margin with thick keel, and raised curved limbate dorsal sutures.

(41) *Globigerinatheka arabica* Anan, 2024, p. 48, pl. 1, fig. 11.

Remarks: This Middle Eocene species has globular coarsely perforate test

with four chambers in the last whorl, which increasing in size towards the last whorl, sutures deep and curved, only two to three openings visible between chambers, without obvious bulla. *G. arabica* species is similar to *Globigerinatheka barri* but lacks the bullae.

(42) *Globigerinatheka omanica* Anan, 2024, p. 48, pl. 1, fig. 14.

Remarks: This Middle Eocene species has globular to subglobular coarsely perforations with reticulate ornament test, chambers globular increased moderately in size towards the end of the last whorl, which three chambers are present in the last whorls, sutures slightly curved deep sutures, large bulla is obvious. It is smaller in size and has less chambers in the last stage than *Globigerinatheka curryi*.

VII. QATAR

(43) *Tollmannia qatarica* Anan, 2025, p. 52, pl. 1, fig. 12.

Remarks: This Cenomanian species belongs here to the genus *Tollmannia* due to its rapidly increasing uniserial chambers (than gradually), and the last chamber represent about (~⅓) size of the test. It is resembled *T. costata* (d'Orbigny) from Tertiary Basin of Vienna, but differs by a smaller number of the longitudinal ribs, more rapidly increasing chambers, without apical early stage and apertural neck.

VIII. UNITED ARAB EMIRATE (UAE)

(44) *Repmanina mazeni* Anan, 2021, p. 85, pl. 1, fig. 4.

Remarks: This Danian species has regular trochospiral coiled smooth finely agglutinated test, straight axis formed a depressed crown-like coiled in outline, wider central part than the start and end of its coiling, sharply edges chambers.

(45) *Psammolingulina bahri* Anan, 2021, p. 85, pl. 1, fig. 6.

Remarks: This Danian species has an elongated rectilinear uniserial coarse quartz particle giving a rough surface test, inflated globular three chambers, rounded periphery, depressed sutures, terminal aperture.

(46) *Spiroplectinella hamdani* (Anan, 1993), p. 652, pl. 1, fig. 14.

Remarks: This Maastrichtian species has smooth test with larger coiled stage, and highly raised sutures than *S. knebeli* (LeRoy). It was originally recorded from United Arab Emirates (UAE), and later on Egypt.

(47) *Orbulinelloides arabicus* Anan, 2003, p. 531, fig. 4.1.

Remarks: This middle Late Eocene species is characterized by its spherical to subspherical coarsely agglutinated test.

(48) *Plectina emiratensis* Anan, 2003, p. 534, fig. 4. 2.

Remarks: This Bartonian species has short subconical test, coarse-grained surface, subterminal and traverse elongate slit aperture on the apertural face of the last chambers and rather coarse-grained arenaceous wall.

(49) *Gaudryina arabica* Anan, 2022, p. 28, pl. 1, fig. 11.

Remarks: The front acute periphery of the test is very distinct in this Late Maastrichtian species, which exists along the chamber of the triserial stage, without extending to biserial stage. The elongation and tapering final chamber with semi-circular aperture at the apertural face is distinguished this species and all other species of *Gaudryina*.

(50) *Marssonella hafitensis* Anan, 2003, p. 535, fig. 4.3.

Remarks: This Middle-Late Eocene species has nearly equal length and breadth test, coarse-grained wall and concave terminal face.

(51) *Chrysalogonium qarnelbarrensis* Anan, 2022, p. 40, pl. 1, fig. 9.

Remarks. Progressively more elongate smooth test, small proloculus, 3-4 uniserial rectilinear cylindrical to pyriform gradually as added chambers but slowly in breadth, straight horizontal incised sutures, terminal aperture on neck.

(52) *Laevidentalina ameeri* Anan, 2022, p. 40, pl. 1, fig. 9.

Remarks. This Maastrichtian species has large proloculus with apiculate end, elongate test with 8 uniserial arcuate globular-semiglobular circulars in section chambers, straight horizontal limbate sutures, smooth surface, terminal with large rounded aperture. It is most probably the ancestor of the Danian *Laevidentalina hudae* Anan (2015), which may develop to the Middle-Late Eocene *L. salimi* Anan (2009) in *Laevidentalina ameeri → L. hudae → L. salimi* lineage.

(53) *Laevidentalina hudae* Anan, 2015, p. 65, pl. 1, fig. 1.

Remarks: This Selandian species has elongate arcuate smooth test, apiculate globular proloculus, uniserial chambers nearly cylindrical smaller than proloculus, ended by two globular chambers, straight flush sutures except slightly depressed in the latest two chambers.

(54) *Laevidentalina salimi* Anan, 2009, p. 3, pl. I, fig. 2.

Remarks: This Middle-Late Eocene species is characterized by its apiculate proloculus, second and later chambers are

smaller than the globular proloculus, chambers nearly cylindrical and grow gradually, flush limbate sutures in the early uniserial chambers with almost parallel sides, then are slightly depressed in the latest chambers.

(55) *Hemirobulina olae* Anan, 2015, p. 71, pl. 1, fig. 8.

Remarks: This Selandian species has inflated chambers, nearly circular in section, grow gradually added in slightly curved axis. The Paleocene *Hemirobulina olae* most probably the ancestor of the Early Lutetian *H. yehiai* and developed to the Bartonian *H. bassiounii*, in *Hemirobulina olae → H. yehiai → H. bassiounii* lineage (Anan, 2023; Anan, 1994).

(56) *Marginulinoides arabica* Anan, 2024, p. 2, pl. 2, fig. 1.

Remarks: The new genus *Marginulinoides* Anan (2024) differs from the other Lagenid genera by its closed coiled early stage, followed by uniserial chambers, and spinose and knobs ornamented surface. The type species *M. arabica* has close coiled early-stage test, later elongate uncoiled uniserial and rectilinear, 3-5 semiglobular uniserial chambers, periphery rounded, surface ornamented by heavily spinose and knobs, aperture central terminal with neck, may be shifted slightly to the dorsal angle.

(57) *Marginulinoides karimae* (Anan, 2009), p. 9, pl. 1, fig. 8.

Remarks: This Late Eocene species regarded here to the genus *Marginulinoides* due to its closed coiled early stage, followed by uniserial chambers, and spinose, knobs or costate ornamented surface. *M. karimae* is characterized by 20-22 longitudinal costate surface continude its extension over the suture lines, straight and depressed sutures in the uniserial part but indistinct in the initial part, terminal aperture on a short wide neck.

(58) *Vaginulinopsis emiratensis* (Anan, 1993), p. 657, pl. 2, fig. 12.

Remarks: This Maastrichtian smooth species has an elongate rectilinear to gently arcuate test, initial portion planispirally coiled followed by 5-7 inflated chambers, depressed sutures, terminal aperture with neck.

(59) *Procerolagena emiratensis* Anan, 2022, p. 41, pl. 2, fig. 16.

Remarks. This Late Maastrichtian species has cylindrical elongate unilocular test, parallel sides periphery, 4 longitudinal rips along surface, radial on neck with phialine lip aperture.

(60) *Ramulina futyani* Anan, 2015, p. 72, pl. 1, fig. 11.

Remarks: This Paleocene species has globose test with hispid surface. It differs from Maastrichtian-Paleocene *R. pseudoaculeata* by its more globular test. It seems that *R. pseudoaculeata* was developed to *Ramulina futyani* in *Ramulina pseudoaculeata → R. futyani* lineage (Olsson, 1960).

(61) *Transversigerina hamdani* Anan, 2022, p. 42, pl. 2, fig. 19.

Remarks. This Late Maastrichtian species has triserial early stage of test followed by later uniserial, sutures horizontal, surface with 4 thick parallel longitudinal continuous costae along the test, terminal rounded aperture on neck.

(62) *Turrilina hassani* Anan, 2010, p. 160, pl. 1, fig. 3.

Remarks: This Middle Eocene species differs from other *Turrilina* spp. by its opposite V-shaped aperture at the interiomarginal of the last chamber, and the last three chambers consist about ⅞ time of the whole test.

(63) *Orthomorphina abdelghanyi* Anan, 2022, p. 22, pl. 2, fig. 21.

Remarks. This Late Maastrichtian species has elongated uniserial rectilinear smooth test, proloculus globular, followed by 3 chambers increasing slowly in height, sutures straight limbate, terminal rounded aperture.

(64) *Orthomorphina abusaimai* Anan, 2022, p. 22, pl. 2, fig. 20.

Remarks. This Late Maastrichtian species has elongated uniserial rectilinear to slightly curved smooth test, proloculus globular, followed by 6 ovoid-discoidal chambers increasing rapidly in height, slowly decreased in breadth, sutures straight depressed, terminal rounded aperture. *Orthomorphina abdelghanyi* differs from O. *abusaimai* in its larger test, globular chambers than slightly inclined, limbate than normal

sutures. It also differs from the Eocene *O.* sp. of Barr & Berggren (1980) from Libya in its semi globular chambers and gradually increased as added.

(65) *Ornatanomalina ennakhali* Anan, 1996, p. 154, fig. 4. 10.

Remarks: This Ypresian species is characterized by its discoidal test, weakly trochospiral in early stage but planispiral in the most later coiling final whorl with acute but semi lobulate periphery, as well as randomly arranged discontinuous ribs on the six to seven chamber surfaces ended by depressed sutures and equatorial aperture. It differs from the type species *O. geei* and its subspecies *Ornatanomalina geei compressa* and other six species of Haque (1965, 1960) from Pakistan (*O. crookshanki, O. c. rugosa. O. glaessneri, O. hafeezi, O. elegantula and O. pustulosa*) by its discontinuous ribs, not rounded periphery and lacking the radial median ridges across the chamber surface.

(66) *Elphidium cherifi* Anan, 2010, p. 172, pl. 2, fig. 8.

Remarks: Test lenticular, planispirally enrolled, involute, biumbonate (with umbilical plug on both sides),17-20 chambers in the last whorl, which have backward extensions at the acute periphery, and deeply incised sutures.

(67) *Plummerita hudae* Anan, 2022, p. 183, fig. 4A.

Remarks: This species has the last five chambered volution as *Plummerita hantkeninoides, P. costata, and P. inflata* Brönnimann. It is closely related to the latter species *P. inflata* Brönnimann but differs from it by the position of its larger fourth chamber than the last fifth chamber, and the third chamber exists perpendicular along the vertical line to the last fifth chamber of the test in the final whorl of the ventral side.

(68) *Morozovella arabica* Anan, 2024, p. 96, pl. 1, fig. 28.

Remarks: This Ypresian species is distinguished by its more pronouncedly plano-convex test with semi-circular outline, 5 chambers in the last whorl added gradually in size, sutures slightly depressed, umbilicus deep and relatively wide, aperture a low interiomarginal, umbilical-extraumbilical slit. It is located between *Morozovella lensiformis* and *M. crater* in the *M. lensiformis → M. arabica →M. crater →M. aragonensis → M. caucasica* lineage.

(69) *Morozovella hafitensis* Anan, 2024, p. 97, pl. 1, fig. 29.

Remarks: This Ypresian species is distinguished by its plano-convex test with slightly lobulate outline, 4½ mainly equidimensional chambers in last whorl, sutures slightly depressed to radial, heavily beaded ornamented, umbilicus deep and relatively wide, aperture a low, interiomarginal, umbilical-extraumbilical slit. It seems that *M. hafitensis* has been the direct ancestor of *M. caucasica*. It is located between *M. crater* and *M. caucasica* in the *M. crater →M. hafitensis → M. caucasica* lineage. It means that *M. crater* has developed in two directions: to *M. aragonensis*, ends with *M. caucasica*, while the other to *M. hafitensis* ends with *M. caucasica*.

(70) *Morozovella arabiana* Anan, 2025, p. 62, pl.1, fig. 4.

Remarks: This Danian-Thanetian species has low trochospiral planoconvex finally subspinose test, 6-7 triangular inflated chambers gradually increased in size as added, periphery sharply angled, sutures straight and deep, fairly open wide deep umbilicus with low arch interiomarginal umbilical-extraumbilical aperture. It differs from *M. angulata* by its more numbers of chambers in the last whorl, and wider umbilical area.

(71) *Turborotalia semicunialensis* Anan, 2023, p. 36, pl. 1, fig. 9.

Remarks: This Late Eocene species has raised keel in the first two chambers of the last whorl than the moderate trochospiral test without keel in all chambers in the last whole of *T. cerroazulensis* (Cole). It represents a transitional form between *T. cerroazulensis* (Cole) and *Turborotalia cocoaensis* (Cushman) in *Turborotalia cerroazulensis → T. semicunialensis → T. cocoaensis → T. cunialensis* lineage.

(72) *Praemurica arabica* Anan, 2025, p. 86, pl. 1, fig. 1b.

Remarks: This Danian species has elongated test, compressed triangle initial chambers on the ventral side of the last whorl and inflated later chambers. It represents a transitional form between *P. inconstans* of Subbotina (=*P. trinidadensis* of Bolli) and *P. uncinata* of Bolli. The initial chambers of the last whorls have development of subconical-shaped chambers (as *P. uncinata*), followed by inflated chambers (as *P. inconstans*).

IX. IRAQ

(73) *Gaudryina acuta* Anan, 2023, p. 83, pl. 1, fig. 3.

Remarks: This Late Campanian species has smooth surface agglutinated arenaceous test, the test of somewhat longer than broad, nearly triangular in transverse section, truncate periphery, sutures deeply depressed, high large opening aperture of the inner margin of the last formed chamber. The Iraqi *Gaudryina acuta* resembles the Egyptian Danian *G. limbata* Said & Kenawy, but differs by its lesser length and width, more truncated test, more deeply sutures, smaller last biserial chamber, and semicircular larger opening aperture. Moreover, the Danian *G. limbata* differs from the Maastrichtian *G. pyramidata* Cushman in having a less elongated test, sharper edges. The *G. acuta* is considered here the ancestor of the Maastrichtian *G. pyramidata.* The three species consists a new lineage in *Gaudryina acuta → G. pyramidata → G. limbata* lineage.

(74) *Gaudryina jaffi* Anan, 2023, p. 38, pl. 1, fig. 5.

Remarks: This Late Campanian species has smooth surface agglutinated arenaceous test, longer test than broad, nearly triangular in transverse section, elongate last chamber, the front carinate rib is very distinct in this species, which appears in the semi-final chamber of the biserial stage as well as the whole triserial portion, sutures slightly depressed, periphery acute, aperture elongate with semi-circular at the apertural face of the final biserial chamber. *Gaudryina jaffi* resembles the Ypresian *G. ameeri,* but differs in its more elongated test, more elongated aperture in the apertural face, lesser front carinate rib.

(75) *Gaudryina lawai* Anan, 2023, p. 39, pl. 1, fig. 7.

Remarks: This Late Campanian species has smooth agglutinated arenaceous surface, longer test of than broad, nearly triangular in transverse section, the carinate rib is very distinct in this species, which exists in the triserial stage and extends to the chamber of the biserial stage, acute last chamber with more semi-circular aperture in the apertural face. *Gaudryina lawai* resembles the Early Eocene *G. speijeri* Anan, but differs from it by the position of the carinate rib which extends only on the chambers of the triserial stage than on both triserial and biserial stages, the semi-circular aperture than circular aperture in the *G. speijeri*.

(76) *Pseudogaudryinella iraqensis* Anan, 2022, p. 25, pl. 1, fig. 45.

Remarks: This Campanian species has an elongate test, triserial triangular early stage, followed by biserial, and finally uniserial arrangement, terminal and rounded aperture. It belongs to the genus *Pseudogaudryinella* and differs from the genus *Tritaxia* in having a biserial stage intercalated between the triserial and uniserial ones, and differs from the genus *Gaudryina* in becoming uniserial in adult.

(77) *Verneuilina iraqensis* Anan, 2022, P. 78, pl. 1, fig. 3.

Remarks: This Late Campanian species has pyramidal fine-grained triserial test, triangular transverse section with sharply acute edges, an interiomarginal arch aperture. This species is closely related to the Ypresian Egyptian *V. luxorensis* Nakkady in its sharply acute edges of test with triangular transverse section, but differs in its younger stratigraphic level.

(78) *Tritaxia longa* Anan, 2023, p. 39, pl. 1, fig. 11.

Remarks: This Campanian species belongs to the genus *Tritaxia* in having a triangular cross section throughout the elongate agglutinated arenaceous smooth test with carinate angles, sutures flush, rounded terminal aperture on neck. This species resembles the Early Eocene species *Tritaxia elongata* (Haque), but differs from it in its more elongate test, less parallel test sides, thicker front carinate edge.

(79) *Pseudoclavulina farisi* Anan, 2023, p. 37, pl. 1, fig. 1.

Remarks: This Late Campanian species distinctly large triserial and triangular in cross section early stage, then uniserial with discoidal chambers and circular in top view, suture strongly depressed in uniserial stage, wall finely arenaceous, aperture terminal. The species resemble the Egyptian Paleocene *P. hewaidyi* Anan, but differs from it by its longer test, more width triserial early stage, and less limbate sutures uniserial stage.

(80) *Pseudoclavulina iraqensis* Anan, 2026, p. 34, pl. 1, fig. 19.

Remarks: This Late Campanian species has a large triserial initial part of the fine-grained agglutinated test, which comprise about ⅓ size of the test, followed by ⅔ parallel discoidal-shaped chambers uniserial with rounded periphery, sutures depressed, rounded terminal aperture without neck.

(81) *Pseudogaudryina iraqensis* Anan, 2022, p. 15, pl. 1, fig. 4.

Remarks: This Late Campanian fine-grained agglutinated species which has triangular throughout test, triserial stage to biserial arrangement, one end of the biserial has a pointed edge of the test, aperture wide interiomarginal arch.

(82) *Neoflabellina iraqensis* Anan, 2024, p. 56, pl. 1, 71a.

Remarks: This Late Campanian species has large test, up to 5 mm in length and 1.8 mm in breadth, flattened palmate to rhomboid in outline, fewer coiled early chambers in a planispiral rectilinear, higher elevated sutures with irregularly shaped loops and break up into nodes, aperture terminal on neck and radiate.

(83) *Valvulineria iraqensis* Anan, 2023, p. 71, pl. 1, fig. 6.

Remarks: This Late Campanian species has an elongate smooth test, eight triangular chambers in the last whorl increased rapidly as added, depressed sutures, and the large last chamber covered small area of the ventral umbilical region. This species resembles the Pakistanian Paleocene *V. ranikotensis* (Haque), but differs by its smaller number of chambers, rabidly added chambers than ten chambers and gradually added chambers of the latter. It seems that *V. iraqensis* may represents the ancestor of in *V. ranikotensis* in *Valvulineria iraqensis* → *V. ranikotensis* lineage.

X. IRAN

(84) *Bathysiphon iranica* Anan, 2026, p. 2, pl. 1, fig. 2.

Remarks: The Maastrichtian species has straight unbranched elongate tube, finely agglutinated rough exterior test.

(85) *Glomospira iranica* Anan, 2025, p. 3, pl.1, fig. 5.

Remarks: This Maastrichtian species differs from the *Ammobaculites* spp. by close coiled planispiral early portion test, more uniserial rectilinear chambers, and coarser agglutinated wall.

(86) *Ammobaculinus iranica* Anan, 2026, p. 3, pl. 1, fig. 3.

Remarks: This Maastrichtian species differs from the *Ammobaculites* spp. by coarser agglutinated wall, close coiled planispiral early portion test, and more uniserial rectilinear chambers.

(87) *Haplophragmoides iranica* Anan, 2026, p. 2, pl.1, fig. 4.

Remarks: This Maastrichtian species has large semi-lenticular planispirally test, 9-10 chambers increasing gradually as added, medium agglutinated wall, sutures depressed, lobulate periphery.

(88) *Gaudryina iranica* Anan, 2026, p. 3, pl. 1, fig. 7.

Remarks: This Maastrichtian species differs from *G. pyramidata* Cushman by more elongated test, more inflated final biserial chambers, and less acute periphery.

(89) *Pseudogaudryinella iranensis* Anan, 2022, p. 16, pl. 1, fig. 5.

Remarks: This Ypresian species has elongate test, triserial triangular early stage, followed by biserial, and finally uniserial rounded in section, aperture rounded terminal on the short neck in the last chamber. This species differs from *Pseudogaudryinella iraqensis* Anan by longer and irregular triserial portion, and lesser size of the uniserial final chamber.

(90) *Verneuilina iranica* Anan, 2026, p. 3, pl. 1, fig. 9.

Remarks: This Maastrichtian species has fine grained agglutinated elongate inclined triserial test, wall, triangular in cross section, chambers increasing rapidly in size as added, periphery acute.

Remarks: It belongs to the genus *Clavulinoides* due to its triserially early chambers and later abruptly becoming uniserial. It differs from *V. jordanica* Anan (2022) by more acute periphery, and wider last chambers.

(91) *Dorothia iranica* Anan, 2022, p. 26, pl. 1, fig. 61.

Remarks: The genus *Dorothia* has triserial early portion followed by biserial chambers, without uniserial end portion. This species differs from *Dorothia bulletta* (Carsey) by its more elongated test, more depressed sutures and more large numbers of the inflated biserial chambers.

(92) *Textularia salahii* Anan, 2022, p. 28, pl.2, fig. 8.

Remarks: This Middle Eocene smooth species has medium test, length equal the top part of the last biserial inflated chambers, expanding rapidly, periphery broadly round, sutures depressed and nearly straight. This species differs from the other species of *Textularia* by its smaller size, not elongated test, five additional biserial chambers.

(93) *Clavulinoides iranica* Anan, 2022, p. 27, pl. 1, fig. 68.

Remarks: This Middle Eocene species has triserially curved triangle early chambers in cross section and later abruptly becoming uniserial discoidal last chamber. It is characterized by its curved test than other most species of the genus.

(94) *Pseudoclavulina iranica* Anan, 2022, p. 16, pl. 1, fig. 6.

Remarks: This Ypresian species has fine-grained agglutinated test with large triserial part which comprise about ⅔ of the test, followed by two chambers of the flask-shaped uniserial portion, deep sutures, and rounded terminal aperture on a short neck. This Iranian species differs from the Jordanian species *P. futyani* Anan in its larger triserial part, and lesser numbers of the uniserial part.

(95) *Pseudoclavulina iranensis* Anan, 2026, p. 3, pl. 1, fig. 9.

Remarks: This Maastrichtian species is distinguished by coarse grained test. It differs from *Pseudoclavulina iranica* Anan by its coarse-grained wall, smaller triserial part, and semi-globular uniserial part. It seems that *P. iranensis* may be developed to *P. iranica* in *Pseudoclavulina iranensis* → *P. iranica* lineage. On the other hand, the Iraqi species *Pseudoclavulina iraqensis* Anan differs from the Iranian *P. iranica* species by smaller triserial portion, discoidal uniserial chambers than flask-shaped uniserial portion, and differs from the Jordanian species *P. futyani* Anan in its lesser depressed sutures, and more numbers of the uniserial part.

(96) *Dentalinoides iranica* Anan, 2026, p. 3, pl. 1, fig. 12. (=*Dentalina* sp. - Ghoorchaei et al., 2012, p. 42, pl. 4, fig. 9).

Remarks: This Maastrichtian species has elongated smooth uniserial slightly arcuate test, circular in section, chambers enlarging gradually as added, sutures horizontal, aperture terminal.

(97) *Percultazonaria iranica* Anan, n. sp. (=*Marginulinopsis* sp. of Salahi, 2021, p. 316, pl. 5, figs. 31, 32; *non* fig. 33).

Etymology: after the Islamic Republic of Iran, showing the study section Kopet-Dagh sedimentary Basin (Fig. 2).

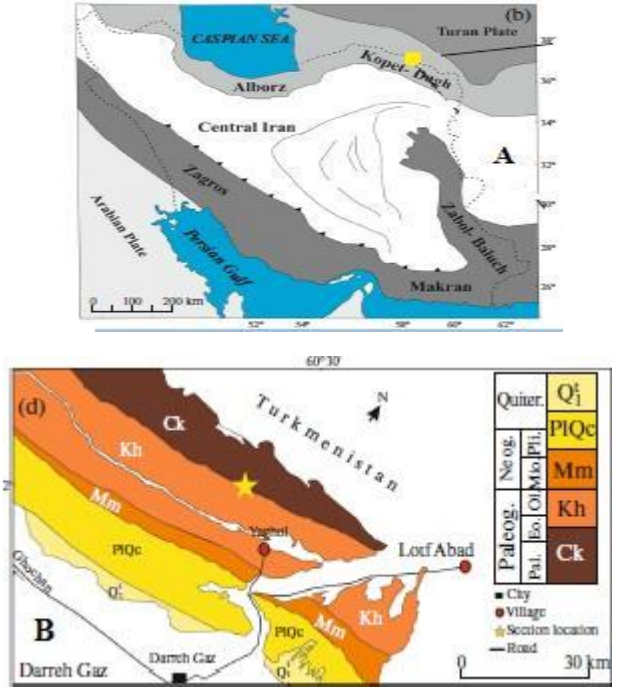


Figure 2: A) Location map of the study section (Kopet-Dagh Basin), northeast Iran, **B)** stratigraphy of the study area (Salahi, 2021).

Stratigraphic level: Paleocene-Early Eocene.

Diagnosis: This species distinguished by its an elongate test, somewhat flattened, early stage close coiled, later uncoiled nearly inclined, 8-9 uniserial chambers broad and low, periphery subacute to carinate in the coil and on the dorsal margin, surface ornamented by strongly elevated sutures that broken into a row of nodes, peripheral keel may be spinose, wall between sutures smooth, aperture radiate terminal at the dorsal angle, produced on a neck.

Remarks: The Iranian species differs from the Paleocene-Middle Eocene Egyptian *Percultazonaria allami* Anan (2015)

by smaller coiled stage, more number and less width uniserial chambers.

(98) ***Percultazonaria iranensis*** **Anan, n. sp.** (=*Marginulinopsis* sp. - Salahi, 2021, p. 316, pl. 5, fig. 33, *non* figs. 31, 32).

Etymology: after the Islamic Republic of Iran, showing the study section Kopet-Dagh sedimentary Basin (see Fig. 2).

Stratigraphic level: Paleocene-Early Eocene.

Diagnosis: This species distinguished by its small size close coiled early stage, followed by 3 incline uniserial chambers, ornamented node surface and bead-like tubercles that are arranged in inclined lines in closed planispiral involute part and last inclined short uniserial part.

Remarks: The Iranian species differs from the Eocene *Percultazonaria fragaria* (Gümbel) by smaller size test, less width and more inclined uniserial part. It also differs from *P. iranica* by its smaller test size, fewer number of the uniserial part, and larger size of the sutural tubercles.

(99) ***Neoflabellina iranica*** **Anan, 2024,** p. 4, pl. 1, fig. 15.

Remarks: This species differs from *N. rugosa* d'Orbigny by its smooth surface than coarse perforations ornamented.

(100) ***Citharina iranica*** **Anan, 2026,** p. 4, pl. 1, fig. 14.

Remarks: This species resembles *Citharina plumoides* (Plummer), but differs from it by shorter test.

(101) ***Vaginulina iranica*** **Anan, 2026,** p. 4, pl. 1, fig. 16.

Remarks: The genus *Marginulina* ornamented by longitudinal costae than the smooth surface of *Vaginulina.* This Maastrichtian species has elongated uniserial smooth test, arcuate as in *Dentalina* but laterally compressed, ovate to lenticular in section, sutures thickened and elevated slightly oblique, aperture terminal at the dorsal angle.

(102) ***Lagena iranica*** **Anan, n. sp.** (=*Lagena* sp. of Salahi, 2021, p. 319, pl. 6, fig. 36).

Etymology: after the Islamic Republic of Iran, showing the study section Kopet-Dagh sedimentary Basin (see Fig. 2).

Stratigraphic level: Paleocene-Early Eocene.

Diagnosis: this species has subglobular-globular unilocular test, lower and middle parts of the test ornamented with 10 strongly bladed longitudinal costae, aperture terminal and has wide rounded short neck.

Remarks: The Iranian species differs from the Miocene German *Lagena striatula* (Egger) by smaller test, less numbers of longitudinal costate ornamentation (10 than 20), and wider apertural neck.

(103) ***Ramulina ghoorchaeii*** **Anan, 2026,** p. 42, pl. 1, fig. 19.

Remarks: This Maastrichtian Iranian species has globular chamber with few radiating tubular extinctions (at least 3 arms), and one of these extinctions is longer than the others, sporadic knobs distributed along the chamber and its arms.

Remarks: This Maastrichtian Iranian species differs from the Egyptian Paleocene-Early Eocene *Ramulina elongata* Ismail (1991), by globular and wider chamber and its two arms, less sporadic ornamented knobs cover all over the wall of the chamber and its extinctions.

(104) ***Ramulina iranica*** **Anan, 2026,** p. 4, pl. 1, fig. 17.

Remarks: This Maastrichtian species has large globular ornamented knobed chamber with more than ten radiated medium wide arms. This Iranian species differs from the American *R. globotubulosa* Cushman by more globular knobbed test, and wider opening arms, than radiate spines and thin elongated arms.

(105) ***Ramulina iranensis*** **Anan, 2026,** p. 4, pl. 1, fig. 18.

Remarks: This Maastrichtian species has large globular chamber ornamented with sporadic knobed, with 8-10 radiated large wide arms. This species differs from *R. navarronae* Cushman by more globular sporadic knobbed test, and smaller opening arms. It differs also from Maastrichtian *R. ornata* Cushman by irregular and smaller wide arms, and coarser knobed ornamentation.

(106) ***Ramulina irregularis*** **Anan, 2026,** p. 34, pl. 1, fig. 20.

Remarks: This Lutetian smooth species is distinguished by its an irregular arm of the chamber. This species differs from Maastrichtian-Lutetian *Ramulina plummerae* Anan by multi-rounded tubular isolated arms. It seems that *R. plummerae* represents the ancestor of *Ramulina irregularis* in *Ramulina plummerae* → *R. irregularis* lineage.

(107) ***Ramulina radiata*** **Anan, 2026,** p. 35, pl. 1, fig. 22.

Remarks: This Lutetian species has globular chambers with multi elongate radiate arms of the chamber. This species differs from all members of the genus *Ramulina* by multiradiate elongated arms.

(108) ***Ramulina salahii*** **Anan, 2022,** p. 5, fig. 3.5.

Remarks: This Lutetian species is characterized by its semiglobular reticulate ornamented surface with eight short thick rounded regular arms, which are distributed regularly around the periphery. This species differs from Maastrichtian *Ramulina ornata* Cushman in its eight rounded tubular isolated arms, and reticulate ornamented surface. It seems that *R. ornata* represents the ancestor of *Ramulina salahii* in *Ramulina ornata* → *R. salahii* lineage.

(109) ***Aragonia iranica*** **Anan, n. sp.** (=*Aragonia* n. sp. of Salahi, 2021, p. 316, pl. 5, fig. 29).

Etymology: after the Islamic Republic of Iran, showing the study section Kopet-Dagh sedimentary Basin (see Fig. 2).

Stratigraphic level: Paleocene-Early Eocene.

Diagnosis: This species has rhomboidal biserial test in outline, chambers increasing rapidly in breadth as added, sutures straight thickened and raised, aperture basal of the last chamber.

Remarks: The Iranian species differs from *Aragoina velascoensis* by sub-rhombohedral test, slightly curved strongly oblique sutures, compared with rhomboidal test and straight limbate sutures.

(110) ***Bolivinoides iranensis*** **Anan, 2026,** p. 4, pl. 1, fig. 20.

Remarks: This species differs from other species of the genus by ornamented broken costae or elongate tubercles in an irregular distributed all over the test surface. It seems that the Iranian *Bolivinoides iranensis* may be evolved from the Egyptian *Bolivinoides ayyadi* Anan (2024).

(111) ***Valvulineria iranica*** **Anan, 2023,** p. 70, pl. 1, fig. 5.

Remarks: This Ypresian species *V. iranica* differs from other members of the genus by its tighter coiling test, more convex dorsally than ventrally, and smaller-size umbilical region. This species resembles the Ypresian Egyptian *V. critchetti* LeRoy due its tight coil of the two species, nearly the same number chambers in the last whorl, but differs from it by biconvex test from the former than planoconvex test of the latter.

(112) ***Globorotalites iranensis*** **Anan, 2026,** p. 5, pl. 1, fig. 27.

Remarks: This Maastrichtian Iranian species has smooth planoconvex lenticular test, tight umbilical area, periphery rounded acute with faint keel, sutures flush, umbilical-extraumbilical aperture at the margin of the final chamber on the ventral side. It differs from *Globorotalites micheliniana* (d'Orbigny) by its more rounded outline, tighter umbilical area flush sutures, than large umbilical area and slightly depressed sutures of the latter.

(113) ***Gyroidinoides iranica*** **Anan, 2026,** p. 5, pl. 1, fig. 26.

Remarks: This Iranica species differs from *G. girardanus* (Reuss) by tighter umbilical area and more rounded periphery, from the Jordanian Maastrichtian-Danian *G. tellburmaensis* Futyan by depressed sutures and less angular periphery, from the Egyptian Danian *G. luterbacheri* Anan (2004) by less wide but without deep umbilicus, from the Paleocene *G. Tunisica* Anan (2024) by wider and deeper umbilical area.

(114a-c) ***Catapsydrax iranica*** **Anan, n. sp.** (=*Globoturborotalita martini* of Raviz et al, 2020, p. 194, pl. 2, fig. 4).

Etymology: after the Islamic Republic of Iran, showing the study section Sabzevzran section, Southeast Iran (Fig. 3).

Stratigraphic level: Bartonian.

Diagnostic: This species has large globular lobulate test with small to moderate cancellate wall texture, 4 inflated, appressed chambers in the final whorl, with an umbilical bulla with one infralaminal apertures.

Remarks: This Iranian species differs from *Globoturborotalita martini* by larger test and chambers, smaller cancellate wall texture, and larger longer bulla.

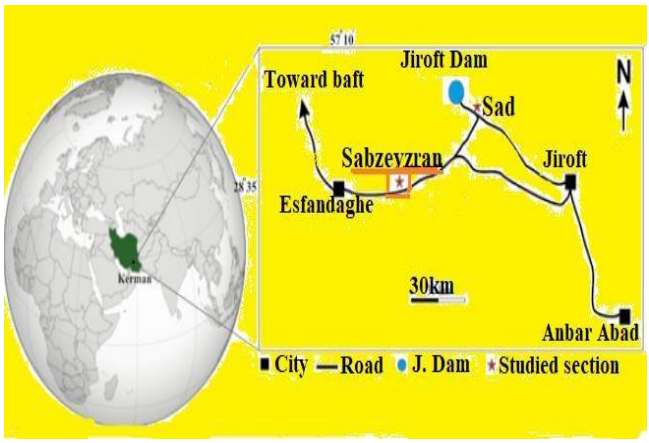


Figure 3: Location map of Sabzevzran section, Southeast Iran.

(115a-c) *Subbotina iranica* Anan, n. sp. (=*Subbotina* sp. 2, of Raviz et al, 2020, p. 194, pl. 2, fig. 9).

Etymology: after the Islamic Republic of Iran, showing the study section Sabzevzran section, Southeast Iran (Fig. 3).

Stratigraphic level: Early Eocene.

Diagnosis: This Iranian species has high trochospiral globular test, with loosely coiled spire, 4 globular loosely embracing chambers in ultimate whorl increasing moderately in size, sutures deeply depressed, umbilicus moderate enclosed by surrounding chambers, aperture umbilical moderate.

Remarks: This Early Eocene *Subbotina iranica* differs from Middle Eocene-Oligocene *Subbotina gortanii* (Borsetti, 1959) by its smaller aperture without thickened bordered by a narrow rim. It seems that *Subbotina iranica* represents the ancestor of *S. gortanii* in *Subbotina iranica* → *S. gortanii* lineage.

XI. PAKISTAN

(116) *Textularia haquei* Anan, 2020, p. 3, pl. 1, fig. 6.

Remarks: Test has 8-10 biserial elongate chambers gradually increasing in size as added.

This Pakistanian Paleocene species is closely related to the Egyptian Early Eocene species *T. farafraensis* LeRoy (1953), but differs by its smaller test, moderate coarse wall. It seems that the Pakistanian species represents the ancestor of the Egyptian species in *Textularia haquei* → *T. farafraensis* lineage.

(117) *Spiroloculina haquei* Anan, 2021, p. 44, pl. 1, fig. 1.

Remarks: This Paleocene species is characterized by its limbate sutures between the successive pair-chambers and thick final-chamber periphery, aperture rounded at the open end of the final chamber with projecting neck and simple teeth.

(118) *Spiroloculina pakistanica* Anan, 2021, p. 44, pl. 1, fig. 2.

Remarks: This Paleocene species is characterized by its simple not limbate sutures, less thick final-chambers periphery than *S. haquei* and more added pair-chambers in the test.

(119) *Parafissurina pakistanica* Anan, 2021, p. 45, pl. 2, fig. 7.

Remarks: This Early Eocene species is characterized by its unilocular globular smooth test, double keels periphery, oval hooded subterminal crescentic aperture at the test apex, which consisting of radially arranged slits that lead through channels to the interior.

(120) *Bolivina pakistanica* Anan, 2021, p. 57. pl. 1, fig. 1.

Remarks: This Middle Eocene species is characterized by its zigzag sutures and numerous longitudinal striation ornamentation, aperture at the base of apertural face.

(121) *Loxostomum pakistanica* Anan, 2021, p. 57. pl. 1, fig. 4.

Remarks: This Middle Eocene species is characterized by elongate rugose pustulosa test, chambers biserial followed by three end uniserial chambers with rounded periphery, wide open terminal aperture with lip on produced neck.

(122) *Hopkinsina haquei* Anan, 2020, p. 4, pl. 1, fig. 6.

Remarks: This Early Eocene species has triserial initial portion followed by uniserial chambers, surface smooth, and wide opening terminal aperture bounded by lip.

(123) *Pleurostomella haquei* Anan, 2019, p. 175, pl. 1, fig. 10.

Remarks: This Middle-Late Eocene species has erected and elongate test with lax biserial arrangement, and the final uniserial chamber inflated and nearly globular, but the terminal part is unfortunately broken.

(124) *Eponides pakistanica* Anan, 2021, p. 59, pl. 2, fig. 28.

Remarks: This species is characterized by its tight coiled test, 6 chambers in the last whorl, keeled periphery, aperture low interiomarginal extending from umbilical to periphery bordered by a narrow lip, lack of supplementary areal opening.

(125) *Rosalina haquei* Anan, 2021, p. 60, pl. 4, fig. 41.

Remarks: This Middle Eocene species is characterized by its circular concavo-convex smooth test, limbate keeled periphery, sutures straight depressed in concave ventral side but curved raised limbate in the convex dorsal side, umbilicus open but bordered by a triangular umbilical flap.

(126) *Nonionella haquei* Anan, 2019, p. 33, pl. 2, fig. 15.

Remarks: This Paleocene-Late Eocene species has large inflated test, equally biconvex but not symmetrically developed, periphery rounded, chambers about twelve in the last formed whorls, suture distinct, a slit on the periphery at the base of the last chamber. It seems that the Pakistanian species and the Egyptian Paleocene *Nonionella* sp. of Said & Kenawy (1956) are very closed, but differs from the Early Eocene Egyptian *N. africana* LeRoy (1953) in its larger and more elongated test and chambers.

(127) *Ornatanomalina pakistanica* Anan, 2021, p. 7, pl. 1, fig. 8.

Remarks: This Early-Middle Eocene species is characterized by its discoidal test, 5-7 chambers weakly trochospiral in the early stage and later planispiral, rounded periphery, surface with spiraling costae that interrupted near the depressed sutures at the edges of the chamber surface, aperture interiomarginal and equatorial, round opening with imperforated limbate border. It differs from the type species Late Paleocene *O. geei* by its spiraling costae (instead of ribs) that flush with the surface (not raised), sharply angled 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). It seems that the *O. geei* represents the ancestor of *O. pakistanica* in *Ornatanomalina geei* → *O. pakistanica* lineage.

(128) Genus *Ornatodella* Anan, 2023, p. 80, pl. 1, fig. 2.

Remarks: This Ypresian genus represents a transitional form between 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). The type species *Ornatodella pustulosa* (Haque, 1960) most probably the ancestor of the Ypresian *Saudella ornata* Hasson (1985).

(129) *Pararotalia pakistanica* Anan, 2021, p. 64, pl. 4, fig. 80.

Remarks: This Middle-Late Eocene Pakistanian species is distinguished by having triangular elongate chambers, pustulosis ornamentation and closed umbilical area. It differs from *P. audouini* (d'Orbigny) by its open narrow umbilicus than prominent umbilical plug of the latter. It seems that the figured specimen from Early Miocene *Pararotalia armata* of Jabal Hafit (UAE) by Cherif et al. (1992) is closely related to this Pakistanian species.

(130) *Clavigerinella pakistanica* Anan, 2024, p. 97, pl. 1, fig. 30.

Remarks: This Lutetian Pakistanian species differs from the Early-Middle Eocene type species *C. akersi* from Trinidad by radially elongate chambers, more chambers in the whorl, and not terminally bulbous (Bolli et al., 1957).

XII. INDIA

(131) *Hantkenina indica* Anan, 2025, p. 66, pl. 1, fig. 8.

Remarks: This Late Eocene species is characterized by its small test, distinct five inflated chambers ended with hollow long tubulospine spines bending backward, aperture terminal on long neck, depressed sutures.

(132) *Hantkenina quadrata* Anan, 2025, p. 67, pl. 1, fig. 16.

Remarks: It is distinguished by 4 chambers with quadratic shape, small thick straight and hollow tubulospines slender and tapering to a point

inclined forward in the direction of coiling, radial slightly depressed sutures, equatorial arch aperture bordered by a narrow lip.

3. PALEOGEOGRAPHY

The Paleogene paleogeographic maps of some authors (i.e., Salahi, 2021) show that the Tethyan realm had been connected with the Indo-Pacific Ocean from east to Atlantic Ocean to the west (Figure 4).

Figure 4: Paleogene paleogeography of the Tethys Ocean (Salahi, 2021)

The distribution of the Campanian-Bartonian Textulariid benthic foraminiferal species of Anan in the South Asia, Southern Tethys (1. Turkey, 2. Palestine, 3. Jordan, 4. SA, 5. Yaman, 6. Oman, 7. UAE, 8. Qatar, 9. Iraq, 10. Iran, 11. Pakistan, 12. India) is shown in (Table 1), Miliolid (Table 2), Lagenid (Table 3), Rotaliid (Table 4), and Globigerinid (Table 5).

Table 1: Comparative Campanian-Bartonian Textulariid benthic foraminiferal species of Anan in the South Asia (1. Turkey, 2. Palestine, 3. Jordan, 4. SA, 5. Yaman, 6. Oman, 7. UAE, 8. Qatar, 9. Iraq, 10. Iran, 11. Pakistan, 12. India)

Sp. No.	Campanian-Paleogene benthic forami- niferal species of Anan in South Asia	1	2	3	4	5	6	7	8	9	10	11	12
1	*Trochamminoides turkiana* Anan, 2026	x											
2	*Spiroplectinella gurayi* Anan, 2026	x											
3	*Dorothia turkiana* Anan, 2026	x											
4	*Arenobulimina beitjebrinensis* Anan, 2022		x										
5	*Arenobulimina jerusalemensis* Anan, 2022		x										
6	*Pseudoclavulina futyani* Anan, 2021			x									
7	*Verneuilina jordanica* Anan, 2022			x									
8	*Spiroplectinella yamanensis* Anan, 2025					x							
9	*Textularia arabica* Anan, 2025					x							
10	*Textularia biraliensis* Anan, 2025					x							
11	*Repmanina mazeni* Anan, 2021								x				
12	*Psammolingulina bahri* Anan, 2021								x				
13	*Spiroplectinella hamdani* (Anan, 1993)								x				
14	*Orbulinelloides arabicus* Anan, 2003								x				
15	*Plectina emiratensis* Anan, 2003								x				
16	*Gaudryina arabica* Anan, 2022								x				
17	*Marssonella hafitensis* Anan, 2003								x				
18	*Gaudryina acuta* Anan, 2023									x			
19	*Gaudryina jaffi* Anan, 2023									x			
20	*Gaudryina lawai* Anan, 2023									x			
21	*Pseudogaudryinella iraqensis* Anan, 2022									x			
22	*Verneuilina iraqensis* Anan, 2022									x			
23	*Tritaxia longa* Anan, 2023									x			
24	*Pseudoclavulina farisi* Anan, 2023									x			
25	*Pseudoclavulina iraqensis* Anan, 2026									x			
26	*Pseudogaudryina iraqensis* Anan, 2022									x			
27	*Bathysiphon iranica* Anan, 2026										x		

Table 1(Cont.): Comparative Campanian-Bartonian Textulariid benthic foraminiferal species of Anan in the South Asia (1. Turkey, 2. Palestine, 3. Jordan, 4. SA, 5. Yaman, 6. Oman, 7. UAE, 8. Qatar, 9. Iraq, 10. Iran, 11. Pakistan, 12. India)													
28	*Glomospira iranica* Anan, 2025										x		
29	*Ammobaculinus iranica* Anan, 2026										x		
30	*Haplophragmoides iranica* Anan, 2026										x		
31	*Gaudryina iranica* Anan, 2026										x		
32	*Pseudogaudryinella iranensis* Anan, 2022										x		
33	*Verneuilina iranica* Anan, 2026										x		
34	*Dorothia iranica* Anan, 2022										x		
35	*Textularia salahii* Anan, 2022										x		
36	*Clavulinoides iranica* Anan, 2022										x		
37	*Pseudoclavulina iranica* Anan, 2022										x		
38	*Pseudoclavulina iranensis* Anan, 2026										x		
39	*Textularia haquei* Anan, 2020											x	

Table 2: Comparative Campanian-Bartonian Miliolid benthic foraminiferal species of Anan in the South Asia (1. Turkey, 2. Palestine, 3. Jordan, 4. SA, 5. Yaman, 6. Oman, 7. UAE, 8. Qatar, 9. Iraq, 10. Iran, 11. Pakistan, 12. India)													
Sp. No.	Campanian-Paleogene and Recent benthic foraminiferal species of Anan in South Asia	1	2	3	4	5	6	7	8	9	10	11	12
1	*Spiroloculina biraliensis* Anan, 2025					x							
2	*Quinqueloculina alwosabii* Anan, 2025					x							
3	*Quinqueloculina biraliensis* Anan, 2025					x							
4	*Quinqueloculina munefi* Anan, 2025					x							
5	*Miliolinella biraliensis* Anan, 2025					x							
6	*Pyrgo basardahi* Anan, 2025					x							
7	*Spiroloculina haquei* Anan, 2021											x	
8	*Spiroloculina pakistanica* Anan, 2021											x	

Table 4: Comparative Campanian-Bartonian Rotaliina benthic foraminiferal species of Anan in the South Asia (1. Turkey, 2. Palestine, 3. Jordan, 4. SA, 5. Yaman, 6. Oman, 7. UAE, 8. Qatar, 9. Iraq, 10. Iran, 11. Pakistan, 12. India).													
Sp. No	Campanian-Paleogene Lagenid benthic foraminiferal species of Anan in South Asia	1	2	3	4	5	6	7	8	9	10	11	12
1	*Enantiodentalina turkiana* Anan, 2026	x											
2	*Neoflabellina turkiana* Anan, 2026	x											
3	*Lagena turkiana* Anan 2026	x											
4	*Tollmannia qatarica* Anan, 2025								x				
5	*Chrysalogonium qarnelbarrensis* Anan, 2022							x					
6	*Laevidentalina ameeri* Anan, 2022							x					
7	*Laevidentalina hudae* Anan, 2015							x					
8	*Laevidentalina salimi* Anan, 2009							x					

Table 4(Cont.): Comparative Campanian-Bartonian Rotaliina benthic foraminiferal species of Anan in the South Asia (1. Turkey, 2. Palestine, 3. Jordan, 4. SA, 5. Yaman, 6. Oman, 7. UAE, 8. Qatar, 9. Iraq, 10. Iran, 11. Pakistan, 12. India).

9	*Hemirobulina olae* Anan, 2015							x					
10	*Marginulinoides arabica* Anan, 2024							x					
11	*Marginulinoides karimae* (Anan, 2009)							x					
12	*Vaginulinopsis emiratensis* (Anan, 1993)							x					
13	*Procerolagena emiratensis* Anan, 2022							x					
14	*Ramulina futyani* Anan, 2015							x					
15	*Neoflabellina iraqensis* Anan, 2024									x			
16	*Dentalinoides iranica* Anan, 2026										x		
17	*Percultazonaria iranica* Anan, n. sp.										x		
18	*Percultazonaria iranensis* Anan, n. sp.										x		
19	*Neoflabellina iranica* Anan, 2024										x		
20	*Citharina iranica* Anan, 2026										x		
21	*Vaginulina iranica* Anan, 2026										x		
22	*Lagena iranica* Anan, n. sp.										x		
23	*Ramulina ghoorchaeii* Anan, 2026										x		
24	*Ramulina iranica* Anan, 2026										x		
25	*Ramulina iranensis* Anan, 2026										x		
26	*Ramulina irregularis* Anan, 2026										x		
27	*Ramulina radiata* Anan, 2026										x		
28	*Ramulina salahii* Anan, 2022										x		
29	*Parafissurina pakistanica* Anan, 2021											x	

Table 5: Comparative Maastrichtian-Priabonian Globigerinid benthic foraminiferal species of Anan in the South Asia (1. Turkey, 2. Palestine, 3. Jordan, 4. SA, 5. Yaman, 6. Oman, 7. UAE, 8. Qatar, 9. Iraq, 10. Iran, 11. Pakistan, 12. India).

Sp. No.	Maastrichtian-Paleogene Rotaliid planktic foraminiferal species of Anan in South Asia	1	2	3	4	5	6	7	8	9	10	11	12
1	*Acarinina saudica* Anan, 2025				x								
2	*Acarinina umbilicata* Anan, 2024						x						
3	*Morozovella elbadrii* Anan, 2024						x						
4	*Morozovella elsayighi* Anan, 2024						x						
5	*Morozovella omanica* Anan, 2024						x						
6	*Morozovella surensis* Anan, 2024						x						
7	*Morozovella wadimusawaensis* Anan, 2024						x						
8	*Globigerinatheka arabica* Anan, 2024						x						

Table 5(Cont.): Comparative Maastrichtian-Priabonian Globigerinid benthic foraminiferal species of Anan in the South Asia (1. Turkey, 2. Palestine, 3. Jordan, 4. SA, 5. Yaman, 6. Oman, 7. UAE, 8. Qatar, 9. Iraq, 10. Iran, 11. Pakistan, 12. India).

9	*Globigerinatheka omanica* Anan, 2024						x						
10	*Plummerita hudae* Anan, 2022							x					
11	*Morozovella arabica* Anan, 2024							x					
12	*Morozovella hafitensis* Anan, 2024							x					
13	*Morozovella arabiana* Anan, 2025							x					
14	*Turborotalia semicunialensis* Anan, 2023							x					x
15	*Praemurica arabica* Anan, 2025							x					
16	*Catapsydrax iranica* Anan, n. sp.										x		
17	*Subbotina iranica* Anan, n. sp.										x		
18	*Clavigerinella pakistanica* Anan, 2024											x	
19	*Hantkenina indica* Anan, 2025												x
20	*Hantkenina quadrata* Anan, 2025												x

5. PALEOENVIRONMENT

The Mediterranean Sea was part of the southern epicontinental shelf of the Neo-Tethys Ocean, and the seaway was connected westward to the Pacific Ocean via the Caribbean Tethys, and a uniform and strong W-trending Tethyan Circumglobal Current (TCC) flowing throughout the Neo-Tethys Ocean was driven by winds blowing from the same direction. Tectonics and sea-level changes played an important role in the depositional history of this area during the Cretaceous. Circulation in the South Atlantic was, and still is, anticlockwise; the northerly flowing current joined the TCC in the Caribbean Tethys near the Equator and then flowed westward into the Pacific Ocean (Figure 5).

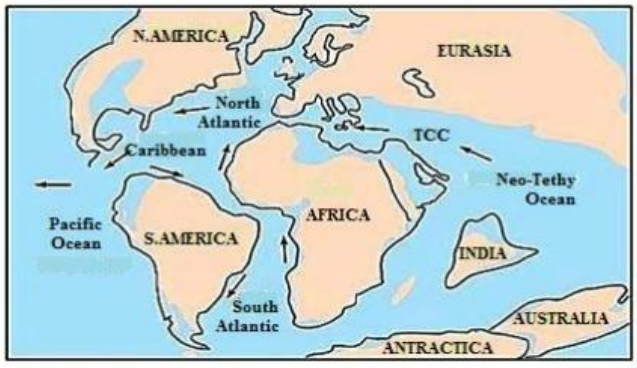


Figure 5: The Neo-Tethys Ocean during the Maastrichtian showing the flow direction of the Tethyan Circumglobal Current (TCC) from east to west (after Abed, 2013).

The depth distribution of the different assemblages of planktic and benthic foraminifers is shown in Figure 6.

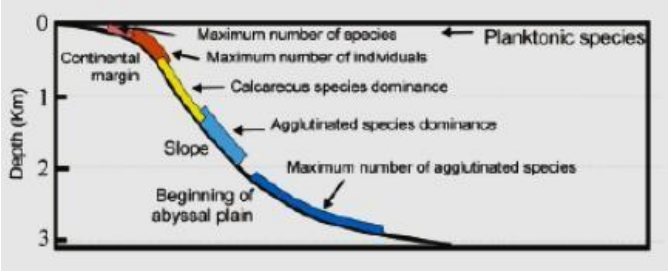


Figure 6: Depth distribution of planktic and benthic foraminifera.

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