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RESEARCH ARTICLE

PALEONTOLOGY, STRATIGRAPHY, PALEOGEOGRAPHY OF TWO HUNDREDS SOUTHERN TETHYAN CAMPANIAN-PALEOGENE ROTALIID BENTHIC FORAMINIFERAL SPECIES

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ABSTRACT

Two hundreds calcareous benthic foraminiferal species of the Suborder Rotaliina belong to sixty genera from twenty countries in the Southern Tethys (Chile, Argentina, Angola, Nigeria, Tanzania, Mali, Algeria, Tunisia, Egypt, Palestine, Lebanon, Syria, Jordan, Saudi Arabia (SA), Yemen, Qatar, United Arab Emirates (UAE), Iraq, Iran and Pakistan) have been studied. The modern taxonomical consideration of the species is used. The recorded species were previously noted in the literatures, while two of them are believed here as new: *Stainforthia abdelkarimi* and *Siphonodosaria misrensis*. Forty species of them are recorded from Egypt (about 41%), twenty seven from Pakistan (~ 28%), ten from UAE (~ 10.5%), six from Qatar (~ 6%), four from each of Algeria and Iran (~ 4%), three from three from Jordan (~ 3%), two from each of Palestine and Iran (~ 2%), and only one from each of Iraq and India (~ 1%). Most of the Southern Tethyan recorded species are endemic to their original description, while five of them are also recorded in some other Southern Tethys, and also Northern Tethyan countries (Atlantic Ocean, France, Spain, Slovenia, Austria, Turkey, Turkmenia and Kazakhstan).

KEYWORDS

Suborder Rotaliina, *Stainforthia abdelkarimi*, *Siphonodosaria misrensis*

1. INTRODUCTION

During the past seven decades, many authors of the Southern Tethyan had been engaged in paleontology, stratigraphy and paleoenvironmental investigations of the small calcareous benthic foraminiferal Maastrichtian-Paleogene succession in seventeen Southern Tethyan countries: Chile, Argentina, Tanzania, Tunisia, Libya, Egypt, Palestine, Jordan, Syria, Lebanon, Saudi Arabia, Yemen, Qatar, UAE, Iraq, Iran, Pakistan (Figure 1). Most of the species have been erected from Egypt (1 benthic genus, 1 Recent species and many benthic foraminiferal species and subspecies). 17 species from UAE, while and the others from the many countries in the Southern Tethys. The taxonomic consideration and stratigraphic implication of the identified taxa are presented and discussed.

2. MATERIAL OF STUDY

Rich and well-preserved two hundreds Rotaliid calcareous benthic foraminiferal species from twenty countries in the Southern Tethys made it possible to elucidate them with modern taxonomical consideration. Following the Code of Zoological Nomenclature, a taxonomic revision of two species of them are re-described its morphological features and considered here as a new: *Stainforthia abdelkarimi* and *Siphonodosaria misrensis*.

Figure 1: Paleogeographic map of the Southern Tethys countries: A: Tanzania, Angola, Nigeria, Algeria, Tunisia, Libya, Egypt, Palestine, Lebanon, Syria, Jordan, Saudi Arabia (SA), Yemen, United Arab Emirates (UAE), Iraq, Iran, Pakistan and India; B: Chile and Argentina.

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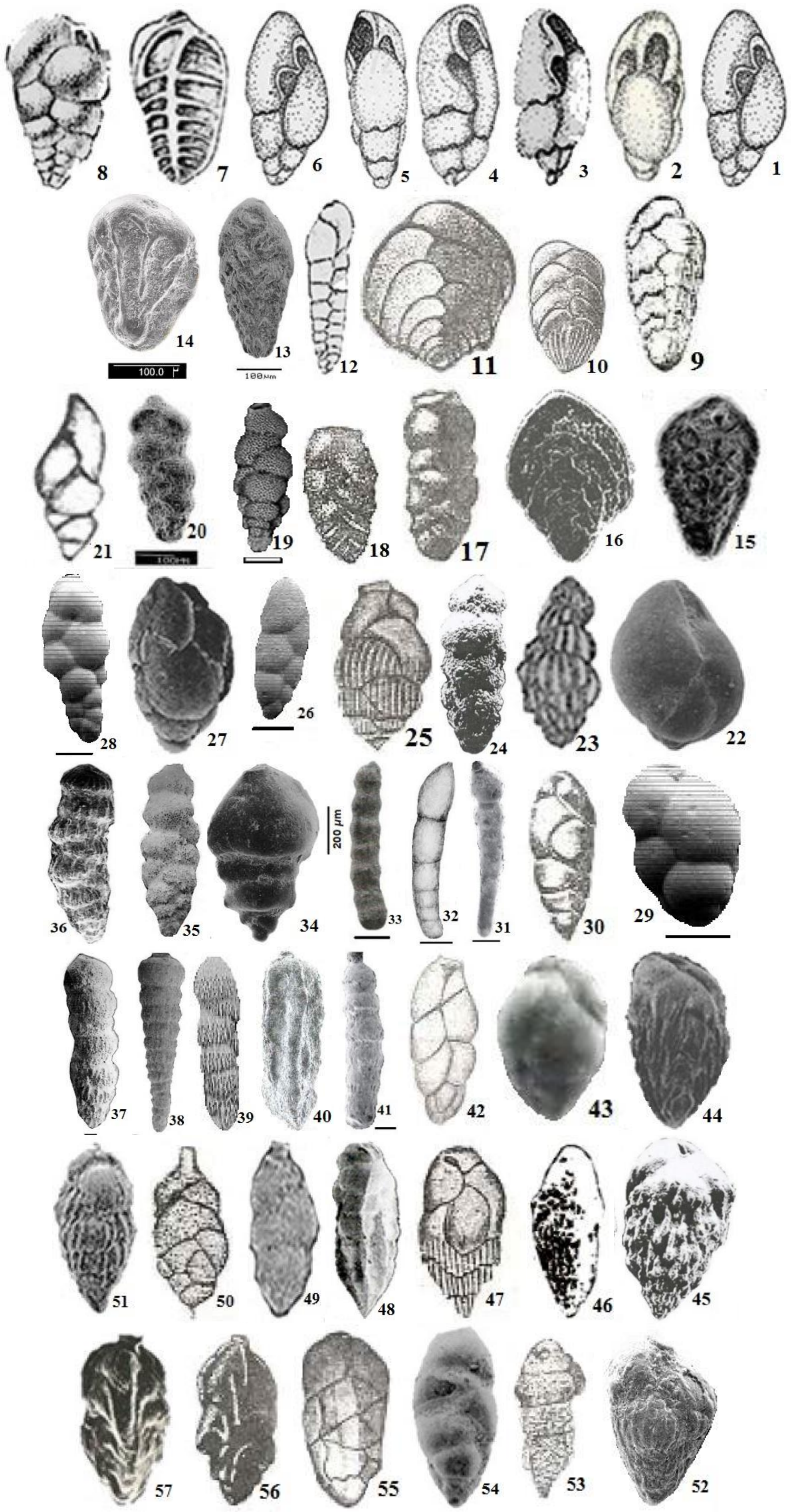
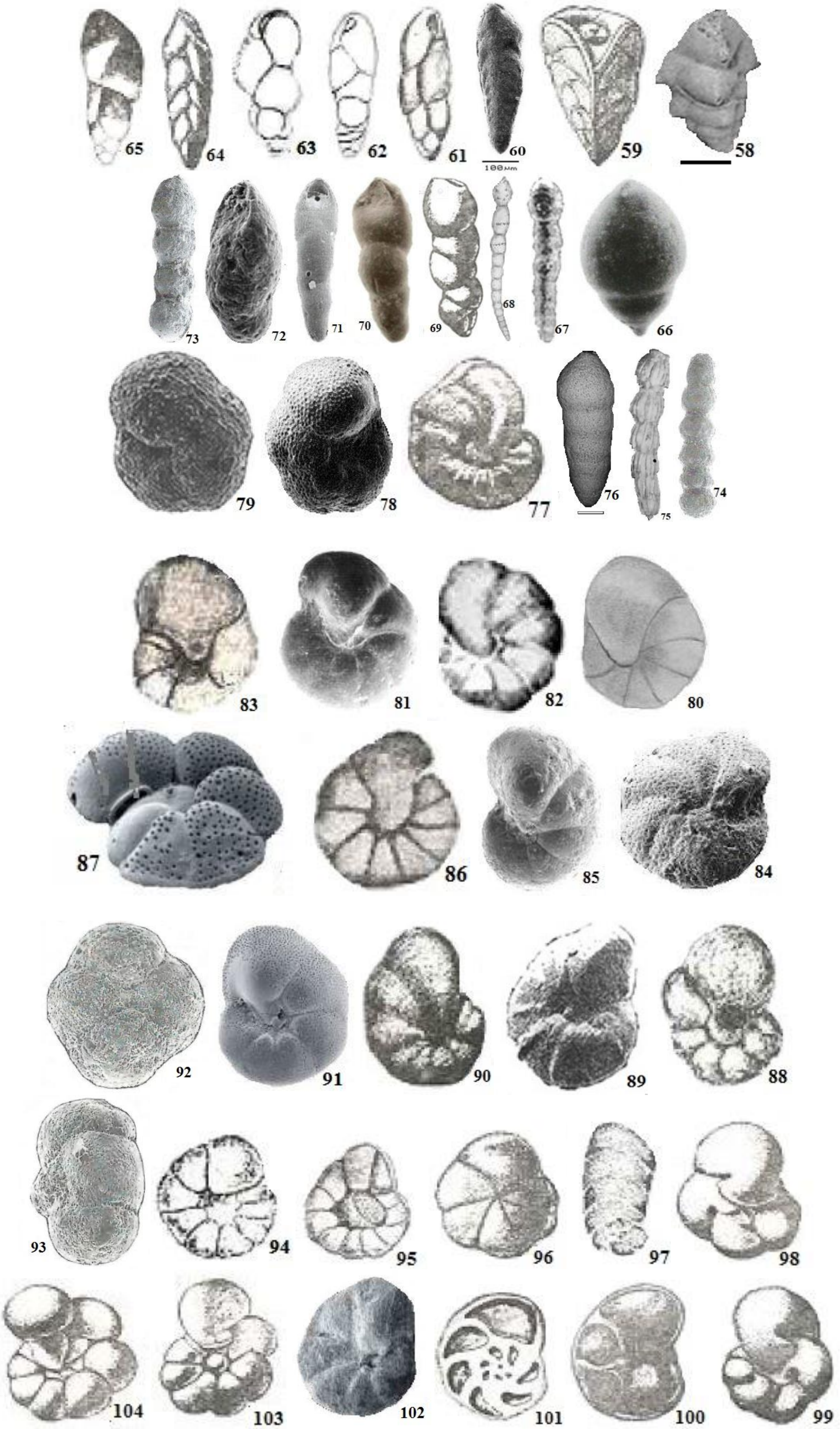
3. Systematic Paleontology

The taxonomy of Loeblich & Tappan (1988) is followed here for 200 Rotaliid calcareous benthic foraminiferal species, which considered an excellent marker species for the Southern Tethys. The new taxonomic considerations and evolutionary lineages are used for the recorded species. The species are illustrated in Plate 1.

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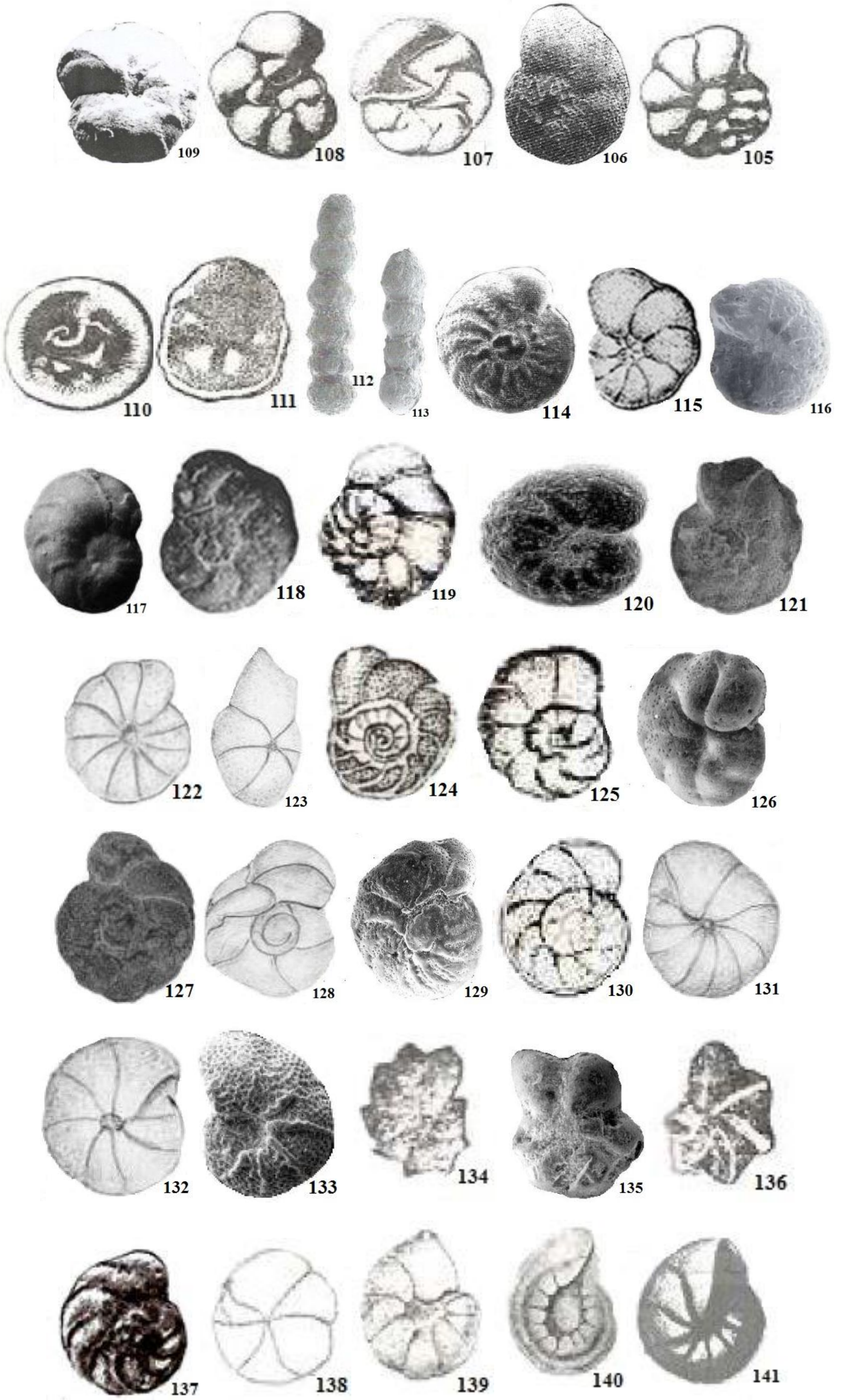
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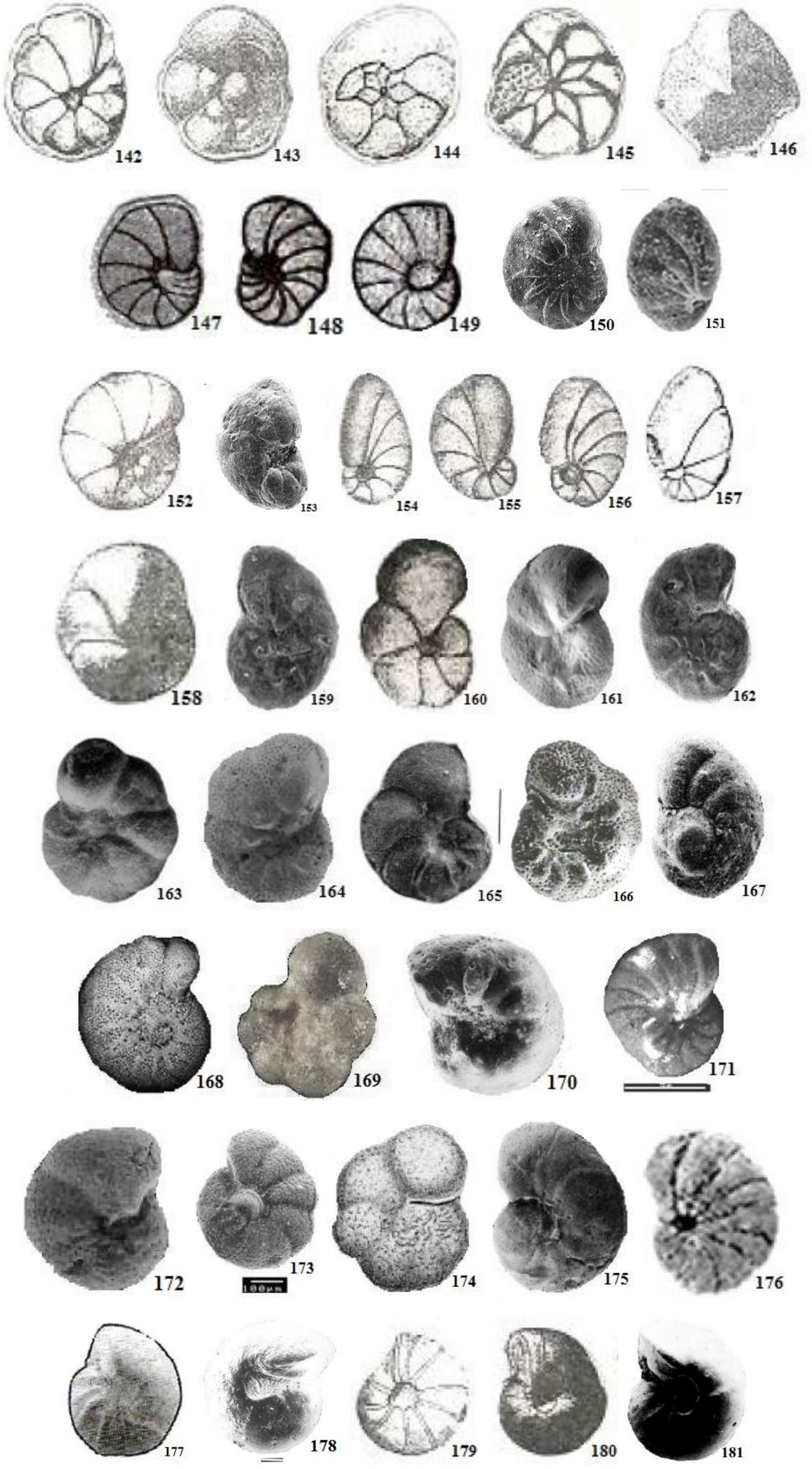
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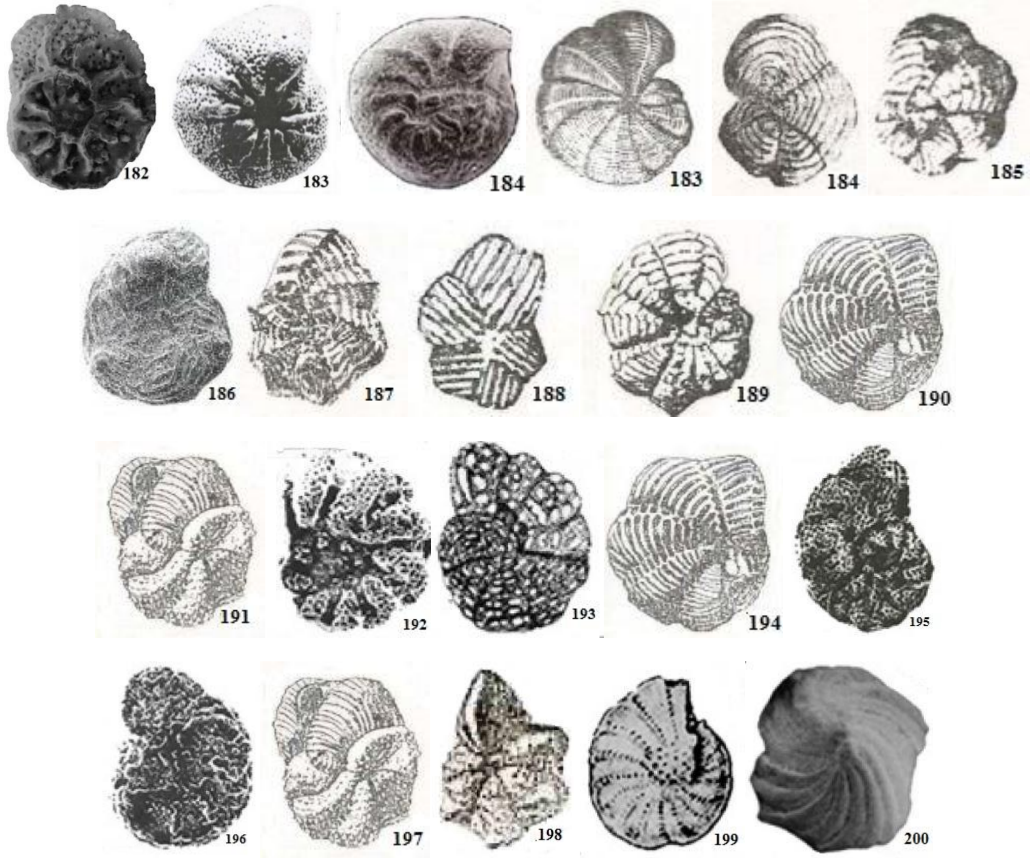

Plate 1 (Scale bars =100µm)

Plate 1: *Altistoma aegyptiaca* Abdou & Abdel Kireem (1975), **2.** *A. compressa* Abdou & Abdel Kireem (1975), **3.** *A. eocaenica* Abdou & Abdel Kireem (1975), **4.** *A. fayoumensis* Abdou & Abdel Kireem (1975), **5.** *A. megaapertura* Abdou & Abdel Kireem (1975), **6.** *A. rayana* Abdou & Abdel Kireem (1975), **7.** *Bolivina esnehensis* Nakkady (1950), **8.** *B. daniana* Nakkady & Talaat, in Nakkady (1959), **9.** *B. pakistanica* Anan (2021), **10.** *B. sorangensis* Haque (1960), **11.** *B. soriensis* Haque (1960), **12.** *B. woodi* Nakkady (1950), **13.** *Bolivinoides curtus* Reiss (1954), **14.** *B. draco aegyptiacus* Anan (2017), **15.** *B. zikoi* Anan (2011)**,** **16.** *Aragonia semireticulata* (LeRoy, 1953), **17.** *Loxostomum pakistanica* Anan (2021), **18.** *L. rugosum* Haque (1960), **19.** *Elhasaella allanwoodi* Hamam (1976), **20.** *Eouvigerina aegyptiaca* Nakkady (1950), **21.** *E. hofkeri* Said & Kenawy (1956), **22.** *Turrilina hassani* Anan (2010), **23.** *Hopkinsina aegyptiaca* Ansary (1955), **24.** *H. arabiana* Futyan (1976), **25.** *H. haquei* Anan (2020), **26.** *Stainforthia abdelkarimi* Anan, n. sp., **27.** *S. farafraensis* (LeRoy, 1953), **28.** *S. gafsensis* (Grignani & Cococceta, 1974), **29.** *S. kamali* Bou Dagher (1988), **30.** *S. pseudoquadrata* (Haque, 1956), **31.** *Vaginulinopsis argentinica* Anan (2023), **32.** *V. deserti* (Said & Kenawy, 1956), **33.** *V. emiratensis* (Anan, 1993), **34.** *Euloxsostomum mouradi* Anan (2011), **35.** *Orthokarstenia esnehensis* (Nakkady, 1950)*,* **36.** *O. higazyi* Nakkady (1955), **37.** *O. nakkadyi* Anan (2009), **38.** *O. oveyi* (Nakkady, 1950)*,* **39.** *O. striata* Anan (2023), **40.** *Transversigerina hamdani* Anan (2022), **41.** *Rectuvigerina argentinica* Anan (2023), **42.** *R. lakiensis* (Haque, 1956), **43.** *Bulimina esnaensis* LeRoy (1953), **44.** *B. farafraensis* LeRoy (1953), **45.** *B. leroyi* Futyan (1976), **46.** *B. misrensis* Ansary (1955), **47.** *B. nammalensis* Haque (1956), **48.** *B. zikoi* Helal (2002), **49.** *Euuvigerina maqfiensis* LeRoy (1953), **50.** *E. subproboscidea* (Haque, 1956), **51.** *Uvigerina compressa* Ansary (1955). **52.** *U. fadeli* Bou Dagher (1988), **53.** *U. sori* Haque (1960), **54.** *Uvigerinella nakkadyi* Anan (1994), **55.** *Angulogerina laevigata* Haque (1956**)**, **56.** *A. dubia* Haque (1960**)**, **57.** *Trifarina esnaensis* LeRoy (1953), **58.** *Reussella aegyptiaca* Nakkady (1950), **59.** *R. johnstoni* Haque (1960), **60.** *Coryphostoma nekhliana* Said & Kenawy (1956), **61.** *Fursenkoina dubia* (Haque, 1956), **62.** *F. nagappai* (Haque, 1956)**,** **63.** *F. nammalensis* (Haque, 1956), **64.** *F. pseudoacuta* (Haque, 1960)**,** **65.** *F. robusta* Haque (1956**)**, **66.** *Ellipsoglandulina arafati* Anan (2009), **67.** *Nodosarella minuta* Said & Kenawy (1956), **68.** *N. misrensis* Said & Kenawy (1956), **69.** *Pleurostomella haquei* Anan (2019), **70.** *P. osmani* Anan (2017), **71.** *P. plummerae* Anan (2019), **72.** *P. waeli* Anan (2023), **73.** *Orthomorphina abdelghanyi* Anan (2022b), **74.** *O. abusaimai* Anan (2022b), **75.** *Siphonodosaria chileana* Todd & Kniker (1952), **76.** *Siphonodosaria misrensis* Anan, n. sp., **77.** *Sakhiella nammalensis* Haque (1956), **78.** *Baggina bismuthi* Bou Dagher, (1988), **79.** *B. eocaenica* Hewaidy & Al-Hitmi (1994), **80.** *Valvulineria aegyptiaca* LeRoy (1953), **81.** *V. brotzeni*, Nakkady (1959), **82.** *V. critchetti* LeRoy (1953), **83.** *V. hillsi* Haque (1956), **84.** *V. iranica* Anan (2023), **85.** *V. iraqensis* Anan (2023), **86.** *V. nammalensis* Haque (1956), **87.** *V. orali* (Inan, 2003), **88.** *V. patalaensis* Haque (1956), **89.** *V. pseudotumeyensis*, Futyan (1976), **90.** *V. ranikotensis* Haque (1956), **91.** *V. scrobiculata* (Schwager, 1883), **92.** *Praephysalidia quadrata* Hewaidy & Al-Hitmi (1994), **93.** *P. whittakeri* Hewaidy & Al-Hitmi (1994), **94.** *Cribrogloborotalia challinori* Haque (1956), **95.** *C. platti* Haque (1956), **96.** *Eponides pakistanica* Anan (2021), **97.** *Rectoeponides dubia* Haque (1956), **98.** *Hyderia dubia* Haque (1962), **99.** *H. crookshanki* Haque (1962), **100.** *S. ranikotensis* Haque (1956), **101.** *S. toddae* Haque (1960), **102.** *Discorbis convexa* Anan (2023d), **103.** *D. dubiformis* (Haque, 1960), **104.** *D. globiformis* Haque (1962), **105.** *D. metingensis* Haque (1962), **106.** *Discorbis pseudoscopos* Nakkady (1950), **107.** *D. pseudovesicularis* Haque (1962), **108.** *D. sindensis* Haque (1962), **109.** *Gavelinopsis baylissi* Futyan (1976), **110.** *Neoconorbina geei* Haque (1962), **111.** *Rosalina haquei* Anan (2021), **112.** *Orthomorphina abusaimai* Anan (2022), **113.** *O. abdelghanyi* Anan (2022), **114.** *Cibicidoides abudurbensis* (Nakkady, 1950) **115.** *C. beadnelli* (LeRoy, 1953)**,** **116.** *C. cristata* (Haque, 1956), **117.** *C. decoratus* (LeRoy, 1953), **118.** *C. farafraensis* (LeRoy, 1953), **119.** *C. ghalebi* (Haque, 1956), **120.** *C. grandis* (LeRoy, 1953), **121.** *C. libycus* (LeRoy, 1953), **122.** *C. loeblichi* (Said & Kenawy, 1956), **123.** *C. megaloperforatus* (Said & Kenawy, 1956), **124.** *C. mellahensis* (Nakkady, 1950), **125.** *C. nammalensis* (Haque, 1956), **126.** *C. patalaensis* (Haque, 1956), **127.** *C. pharaonis* (LeRoy, 1953), **128.** *C. praecursorius* (Schwager, 1883), **129.** *C. pseudoacutus* (Nakkady, 1950), **130.** *C. punjabensis* (Haque, 1960), **131.** *C. schwageri* (Said & Kenawy, 1956), **132.** *C. tappanae* (Said& Kenawy, 1956), **133.** *C. vulgaris* (Plummer, 1927), **134.** *Woodella granosa* Haque (1956), **135.** *W. jawdati* Anan (2023), **136.** *W. nammalensis* Haque (1956), **137.** *Planulina synaensis* Ansary (1954), **138.** *Epistominella dubia* Haque (1956), **139.** *Pseudogloborotalia khirabadensis* Haque (1956), **140.** *P. paleocenica* Haque (1956), **141.** *P. ranikotensis* Haque (1956), **142.** *P. oblonga* Haque (1956), **143.** *Asterigerinata baluchistanensis* Haque (1960), **144.** *A. cuniformis* (Haque, 1956) **145.** *A. nammalensis* (Haque, 1956), **146.** *A. brencei* Haque (1960), **147.** *Nonion fayoumensis* Ansary (1955), **148.** *N. maadiensis* Ansary (1955), **149.** *N. trompi* Ansary (1955), **150.** *N. tunisiensis* Bou Dagher (1988), **151.** *Nonionella africana* LeRoy (1953), **152.** *N. haquei* Anan (2019), **153.** *N. insecta* (Schwager, 1883), **154.** *N. lakiensis* Haque (1956), **155.** *N. minuta* Haque (1956), **156.** *N. nammalensis* Haque (1956), **157.** *N. thalmanni* Haque (1956), **158.** *Alabamina daubifera* (Haque, 1960)**,** **159.** *Anomalinoides aegyptiacus* (LeRoy, 1953), **160.** *A. bandyi* (Haque, 1956), **161.** *A. chileana* (Todd & Kniker, 1952), **162.** *A. dababiyaensis* Anan (2023), **163.** *A. desertorum* (LeRoy, 1953)**,** **164.** *A. esnehensis* (Nakkady, 1950), **165.** *A. fayoumensis* Ansary (1955), **166.** *A. leroyi* Anan (2008)**,** **167.** *A. lordi* Bou Dagher (1988), **168.** *A. masrensis* Anan (2023), **169.** *A. nakkadyi* Said & Kenawy (1956), **170.** *A. sinaensis* Said & Kenawy (1956), **171.** *A.*

suturatus Said & Kenawy (1956), **172.** *A. tunisica* Anan (2023), **173.** *A. umbonifera* (Schwager, 1883), **174.** *A. vanbelleni* Ten Dam & Sigal (1950), **175.** *A. zitteli* (LeRoy, 1953), **176.** *Gyroidinoides aegyptiaca* (Ansary, 1955), **177.** *G. luterbacheri* Anan (2004), **178.** *G. reussi* Said & Kenawy (1956), **179.** *G. sarwari* (Haque, 1956), **180.** *G. tayyabi* (Haque, 1960), **181.** *G. tellburmaensis* Futyan (1976), **182.** *Stensiöeina esnehensis* Nakkady (1950), **183.** *Angulogavelinella bandata* Futyan (1976), **184.** *A. nekhliana* (Said & Kenawy, 1956), **185.** *Ornatanomalina acuta* Haque (1956), **186.** *O. crookshanki* Haque (1956), **187.** *O. elegantula* Haque (1956), **188.** *O. ennakhali* Anan (2011), **189.** *O. geei* Haque (1956), **190.** *O. glaessneri* Haque (1956), **191.** *O. hafeezi* Haque (1956), **192.** *O. inflata* (Hasson, 1985), **193.** *O. ornata* (Hasson, 1985), **194.** *O. pakistanica* Anan (2021), **195.** *O. porosa* (Hasson, 1985), **196.** *O. rugosa* (Hasson, 1985), **197.** *Ornatodella pustulosa* (Haque, 1960), **198.** *Pararotalia pakistanica* Anan (2021), **199.** *Elphidiella africana* (LeRoy,1953), **200.** *Elphidium cherifi* Anan (2010).

Order Foraminiferida Eichwald, 1830

Suborder Rotaliina Delage and Hérouard, 1896

1) *Altistoma aegyptiaca* Abdou & Abdel Kireem, 1975. It is recorded from Eocene, Egypt.

2) *Altistoma compressa* Abdou & Abdel Kireem, 1975. Eocene, Egypt.

3) *Altistoma eocaenica* Abdou & Abdel Kireem, 1975. Eocene, Egypt.

4) *Altistoma fayoumensis* Abdou & Abdel Kireem, 1975. Eocene, Egypt.

5) *Altistoma megaapertura* Abdou & Abdel Kireem, 1975. Eocene, Egypt.

6) *Altistoma rayana* Abdou & Abdel Kireem, 1975. Eocene, Egypt.

7) *Bolivina esnehensis* Nakkady,1950. Eocene, Egypt.

8) *Bolivina daniana* Nakkady & Talaat, in Nakkady, 1959. Paleocene, Egypt.

9) *Bolivina pakistanica* Anan, 2021a (=*Bolivina* sp., Haque, 1960, p. 27, pl. 5, fig. 2). Eocene, Pakistan.

10) *Bolivina sorangensis* Haque, 1960. Eocene, Pakistan.

11) *Bolivina soriensis* Haque, 1960. Eocene, Pakistan.

12) *Bolivina woodi* Nakkady, 1950. Paleocene, Egypt.

13) *Bolivinoides curtus* Reiss, 1954, Paleocene, Palestine, Egypt (Said & Kenawy, 1956), UAE (Anan, 1993).

14) *Bolivinoides draco aegyptiacus* Anan, 2017. Maastrichtian, Egypt.

15) *Bolivinoides zikoi* Anan, 2011. Maastrichtian, Egypt.

16) *Aragonia semireticulata* (LeRoy, 1953) (=*Bolivina semireticulata* LeRoy, 1953). Eocene, Egypt and Atlantic Ocean (Tjalsma & Lohmann, 1983).

17) *Loxostomum pakistanica* Anan, 2021a (=*Loxostomum* sp. Haque, 1960). Eocene, Pakistan.

18) *Loxostomum rugosum* Haque, 1960. Eocene, Pakistan.

19) *Elhasaella allanwoodi* Hamam, 1976. Campanian-Maastrichtian, Jordan and Egypt (El-Balkiemy, 2022.).

20) *Eouvigerina aegyptiaca* Nakkady, 1950. Maastrichtian, Egypt, UAE (Anan, 1993).

21) *Eouvigerina hofkeri* Said & Kenawy, 1956. Maastrichtian-Paleocene, Egypt.

22) *Turrilina hassani* Anan, 2010. Eocene, UAE.

23) *Hopkinsina aegyptiaca* Ansary, 1955. Eocene, Egypt.

24) *Hopkinsina arabiana* Futyan, 1976. Maastrichtian, Jordan.

25) *Hopkinsina haquei* Anan, 2020 (=*Hopkinsina* sp. Haque, 1956). Paleocene-Eocene, Pakistan.

26) *Stainforthia abdelkarimi* Anan, n. sp. (=*Stainforthia* sp. Ali, 2003).

Holotype: Plate 1, Figure 26.

Etymology: After Prof. M. Rashad Abelkarim, Geology Department, Alexandria University, Egypt.

Type locality and sample no.: Kurkur Naqb Dungul section, South Egypt, Sample 21 (Fig. 2A).

Stratigraphic level: Late Paleocene, Zone P5 (Fig. 2B).

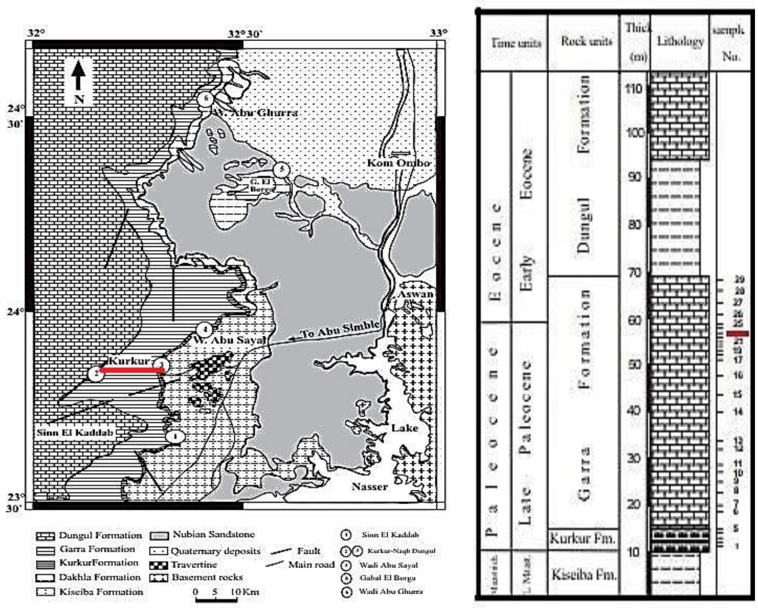

Figure 2: Location (A) and stratigraphic log of the Kurkur Naqb Dungul section (B), South Egypt.

Diagnosis: Test smooth, elongate and sides nearly parallel, triserially arranged in the early stage and later in a twisted biserial arrangement, periphery slightly lobulate, sutures depressed, aperture loop-shaped.

Remarks: This species has nearly parallel elongate test.

27) *Stainforthia farafraensis* (LeRoy, 1953) (=*Neobulimina farafraensis* LeRoy, 1953) Paleocene-Eocene, Egypt and Tunisia (Speijer, 1994).

28) *Stainforthia gafsensis* (Grignani & Cococceta, 1974) (=*Pseudo-virgulina gafsensis* Grignani & Cococceta, 1974; Ali, 2003). Eocene, Tunisia and Egypt.

29) *Stainforthia kamali* Bou Dagher, 1987 (plate 8: 9-10) (=*Stainforthia kamali* Bou Dagher, 1987). Eocene, Tunisia and Egypt.

30) *Stainforthia pseudoquadrata* (Haque, 1956) (=*Bulimina pseudoquadrata* Haque, 1956). Paleocene, Pakistan.

31) *Vaginulinopsis argentinica* Anan, 2023a (=*Laevidentalina* sp. Jannou et

al., 2022). Eocene, Argentina,

32) *Vaginulinopsis deserti* (Said & Kenawy, 1956) (=*Marginulinopsis deserti* Said & Kenawy, 1956). Maastrichtian, Egypt,

33) *Vaginulinopsis emiratensis* (Anan, 1993) (=*Marginulinopsis emiratensis* Anan,1993). Maastrichtian, UAE.

34) *Euloxsostomum mouradi* Anan, 2011a. Maastrichtian, Egypt.

35) *Orthokarstenia esnehensis* (Nakkady, 1950) (=*Siphogenerina esnehensis* Nakkady, 1950). Anan (1998) considered the *O. eleganta* (Plummer) in *O. esnehensis-O. eleganta* lineage in one hand, and *O. higazyi* (Nakkady) in O. *esnehensis-O. higazyi* lineage in the other. Maastrichtian-Paleocene, Egypt.

36) *Orthokarstenia higazyi* Nakkady, 1955 (=*Siphogenerina higazyi* Nakkady, 1955). Paleocene, Egypt and Jordan (Futyan, 1976).

37) *Orthokars*tenia *nakkadyi* Anan, 2009 (= Transitional form between *Orthokarstenia higazyi* (Nakkady) and *O. eleganta* (Plummer) - Anan, 1998). Paleocene-Eocene, Egypt, Tunisia (Saint-Marc,1992) and France (Sztrákos, 2000).

38) *Orthokarstenia oveyi* (Nakkady, 1950) *(=Siphogenerina oveyi* Nakkady, 1950). Maastrichtian*,* Egypt, Jordan (Futyan, 1976), and Nigeria (Fadiya et al., 2014). It is considered as an excellent marker species for the K/T boundary in Southern Tethys.

39) *Orthokarstenia striata* Anan, 2023b (=*Siphogenerinoides* sp. aff. *S. elegantus* (Plummer) - Jannou, 2009, fig. 8.C). *O. striata* differs from *O. eleganta* (Plummer) by its striated surface, in the *O. esnehensis* → *O. eleganta* → *O. striata* lineage.

40) *Transversigerina hamdani* Anan, 2022a, p. 42, pl. 2, fig. 19 (=*Transversigerina* sp. - Abdelghany, 2003). Maastrichtian, UAE.

41) *Rectuvigerina argentinica* Anan, 2023c (=*Stilostomella* sp. Jannou et al. 2022). Eocene, Argentina.

42) *Rectuvigerina lakiensis* (Haque, 1956) (=*Uvigerina lakiensis* Haque, 1956). Paleocene, Pakistan.

43) *Bulimina esnaensis* LeRoy, 1953. Eocene, Egypt.

44) *Bulimina farafraensis* LeRoy, 1953. Eocene, Egypt.

45) *Bulimina leroyi* Futyan, 1976. Eocene, Jordan.

46) *Bulimina misrensis* Ansary, 1955 (=*Bulimina jarvisi misrensis* Ansary, 1955). Eocene, Egypt and UAE (Cherif et al., 1992).

47) *Bulimina nammalensis* Haque, 1956. Paleocene, Pakistan.

48) *Bulimina zikoi* Helal, 2002. Eocene, Egypt.

49) *Euuvigerina maqfiensis* LeRoy, 1953 (=*Uvigerina maqfiensis* LeRoy, 1953). Eocene, Egypt.

50) *Euuvigerina subproboscidea* (Haque, 1956) (=*Uvigerina subproboscidea* Haque, 1956). Paleocene-Eocene, Pakistan and Egypt (Abul-Nasr, 2000).

51) *Uvigerina compressa* Ansary, 1955. Eocene, Egypt.

52) *Uvigerina fadeli* Bou Dagher, 1988. Eocene, Tunisia and Egypt (Youssef & Taha, 2012).

53) *Uvigerina sori* Haque, 1960. Eocene, Pakistan.

54) *Uvigerinella nakkadyi* Anan, 1994. Eocene, Egypt.

55) *Angulogerina laevigata* Haque, 1956. Paleocene, Pakistan.

56) *Angulogerina dubia* Haque, 1960 (=*Angulogerina selseyensis dubia* Haque, 1960). Eocene, Pakistan.

57) *Trifarina esnaensis* LeRoy, 1953. Eocene, Egypt and Tanzania (Pearson et al., 2004).

58) *Reussella aegyptiaca* Nakkady, 1950. Maastrichtian, Egypt and Jordan (Futyan, 1976).

59) *Reussella johnstoni* Haque, 1960. Eocene, Pakistan.

60) *Coryphostoma nekhliana* Said & Kenawy, 1956 (=*Bolivina decurrens parallela* Said & Kenawy, 1956; *Bolivina decurrens nekhliana*; Thalmann, 1959). Maastrichtian-Paleocene, Egypt and UAE (Anan, 2021).

61) *Fursenkoina dubia* (Haque, 1956) (=*Virgulina dubia* Haque, 1956). Paleocene, Pakistan and Egypt (Anan, 2019).

62) *Fursenkoina nagappai* (Haque, 1956) (=*Virgulina cylindrical* Cushman & Bermudez var. *nagappai* Haque, 1956). Paleocene, Pakistan.

63) *Fursenkoina nammalensis* (Haque, 1956) (=*Virgulina nodosa* Stewart & Stewart var. *nammalensis* Haque, 1956). Paleocene, Pakistan.

64) *Fursenkoina pseudoacuta* (Haque, 1960) (=*Virgulina pseudoacuta* Haque, 1960). Eocene, Pakistan.

65) *Fursenkoina robusta* Haque, 1956 (=*Virgulina dubia* var. *robusta* Haque, 1956). Paleocene, Pakistan.

66) *Ellipsoglandulina arafati* Anan, 2009. Eocene, Egypt.

67) *Nodosarella minuta* Said & Kenawy, 1956. Paleocene, Egypt.

68) *Nodosarella misrensis* Said & Kenawy, 1956. Maastrichtian, Egypt.

69) *Pleurostomella haquei* Anan, 2019 (=*Pleurostomella* sp. Haque1960). Eocene, Pakistan.

70) *Pleurostomella osmani* Anan, 2017. Maastrichtian, Egypt.

71) *Pleurostomella plummerae* Anan, 2019 (=*Pleurostomella alternans* Plummer, 1927). It may evolved from *P. osmani*. Paleocene.

72) *Pleurostomella waeli* Anan, 2023c (=*Pleurostomella* sp.- Alegret et al., 2009). Eocene, Spain. This Early Eocene species differs from the other species of the genus, particularly *P. acuta* Hantken by its rounded initial test. The former may developed to the latter.

73) *Orthomorphina abdelghanyi* Anan, 2022b (=*Nodosarella gracillima* Cushman-Abdelghany, 2003). Maastrichtian, UAE.

74) *Orthomorphina abusaimai* Anan, 2022b (=2003 *Stilostomella spinae* Cushman-Abdelghany). Maastrichtian, UAE.

75) *Siphonodosaria chileana* Todd & Kniker, 1952. Eocene, Chile.

76) *Siphonodosaria misrensis* Anan, n. sp. (=*Pseudonodosaria* sp., Ayyad et al., 2023).

Holotype: Illustrated specimen in Plate 1, Figure 76.

Etymology: After the Arab Republic of Egypt (Misr).

Type locality and sample no.: El-Sheikh Fadl section (Fig. 3A), sample 2 (Fig. 3B).

Stratigraphic level: Early Eocene, Thebes Formation.

Diagnosis: Test elongate and straight uniserial, discoidal chambers, rounded periphery, sutures slightly depressed, surface smooth, aperture rounded produced on a slight neck with bordering phialine lip,

Remarks: This species differs from *S. hispidula* Cushman by its smooth surface, and chambers enlarging gradually and strongly overlapping.

77) *Sakhiella nammalensis* Haque, 1956 (=*Sakhiella nammalensis* Haque, 1956). Paleocene, Pakistan.

78) *Baggina bismuthi* Bou Dagher, 1988. Eocene, Tunisia.

79) *Baggina eocaenica* Hewaidy & Al-Hitmi, 1994. Eocene, Qatar.

80) *Valvulineria aegyptiaca* LeRoy, 1953. Eocene, Egypt.

81) *Valvulineria brotzeni*, Nakkady, 1959. Paleocene, Egypt.

82) *Valvulineria critchetti* LeRoy, 1953. Eocene, Egypt.

83) *Valvulineria hillsi* Haque, 1956. Paleocene, Pakistan.

84) *Valvulineria iranica* Anan, 2023d (=*Cibicidoides* sp., Salahi, 2021). Eocene, Iran.

85) *Valvulineria iraqensis* Anan, 2023d (=*Gyroidinoides globosus* (Hagenow) - Jaff & Lawa, 2019). Campanian, Iraq.

86) *Valvulineria nammalensis* Haque, 1956. Paleocene, Pakistan.

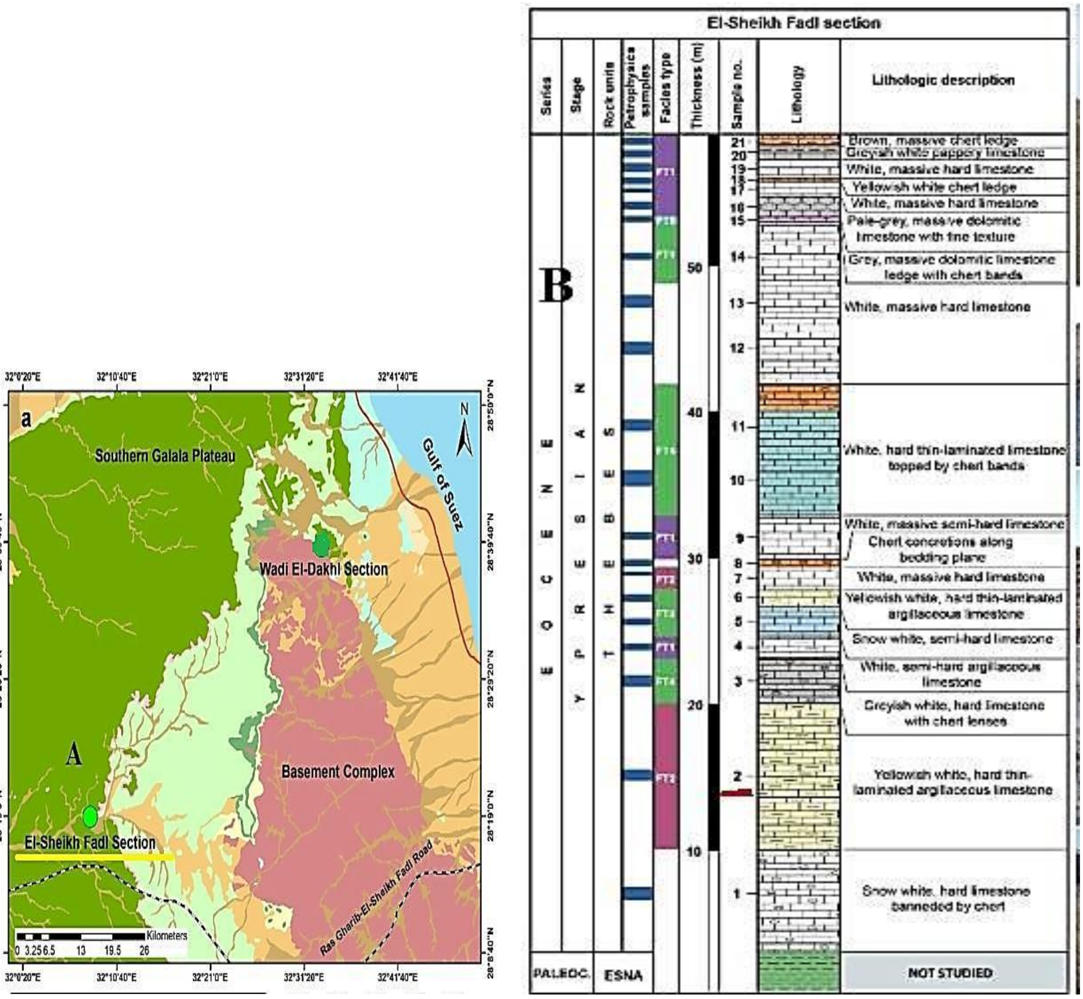

Figure 3 A,B: Location (A) and stratigraphic log (B)of El-Sheikh Fadl section, west Gulf of Suez, Egypt.

87) *Valvulineria orali* (Inan, 2003) (=*Cocoarota orali* Inan, 2003). Maastrichtian to Eocene, Turkey, Spain (Consorti et al, 2019) and Austria (Sanders et al., 2019).

88) *Valvulineria patalaensis* Haque, 1956. Paleocene, Pakistan.

89) *Valvulineria pseudotumeyensis*, Futyan, 1976. Eocene, Jordan and Angola.

90) *Valvulineria ranikotensis* Haque, 1956. Paleocene, Pakistan.

91) *Valvulineria scrobiculata* (Schwager, 1883) (=*Anomalina scrobiculata* Schwager, 1883). Eocene, Egypt, Tunisia and Kazakhstan (Deprez et al, 2015).

92) *Praephysalidia quadrata* Hewaidy & Al-Hitmi, 1994. Maastrichtian, Qatar.

93) *Praephysalidia whittakeri* Hewaidy & Al-Hitmi, 1994. Maastrichtian, Qatar.

94) *Cribrogloborotalia challinori* Haque, 1956. Paleocene, Pakistan.

95) *Cribrogloborotalia platti* Haque, 1956. Paleocene, Pakistan.

96) *Eponides pakistanica* Anan, 2021a (=*Eponides* (?) sp. Haque). Eocene, Pakistan.

97) *Rectoeponides dubia* Haque, 1956. Paleocene, Pakistan.

98) *Hyderia dubia* Haque, 1962. Eocene, Pakistan.

99) *Hyderia crookshanki* Haque, 1962. Eocene, Pakistan.

100) *Stomatorbina ranikotensis* Haque, 1956. Paleocene-Eocene, Pakistan and SA.

101) *Stomatorbina toddae* Haque, 1960. Eocene, Pakistan.

102) *Discorbis convexa* Anan, 2023d (=*Discorbis* sp.- Jannou et al., 2022). Eocene, Argentina.

103) *Discorbis dubiformis* (Haque, 1960) (=*Pararotalia* (?) *dubiformis* Haque, 1960). Eocene, Pakistan.

104) *Discorbis globiformis* Haque, 1962. Eocene, Pakistan.

105) *Discorbis metingensis* Haque, 1962. Eocene, Pakistan.

106) *Discorbis pseudoscopos* Nakkady, 1950. Maastrichtian, Egypt.

107) *Discorbis pseudovesicularis* Haque, 1962. Eocene, Pakistan.

108) *Discorbis sindensis* Haque, 1962. Eocene, Pakistan.

109) *Gavelinopsis baylissi* Futyan, 1976. Maastrichtian, Jordan.

110) *Neoconorbina geei* Haque, 1962. Eocene, Pakistan and SA.

111) *Rosalina haquei* Anan, 2021a (=*Rosalina* sp. Haque, 1960). Eocene, Pakistan.

112) *Orthomorphina abusaimai* Anan, 2022a (*Stilostomella spinae* Cushman - Abdelghany, 2003). Maastrichtian, UAE.

113) *Orthomorphina abdelghanyi* Anan, 2022a (=*Nodosarella gracillima* Cushman - Abdelghany, 2003). Maastrichtian, UAE.

114) *Cibicidoides abudurbensis* (Nakkady, 1950) (=*Cibicides abudurbensis* Nakkady, 1950). Maastrichtian-Paleocene, Palestine (Almogi-Labin et al., 1990), UAE (Anan, 1993), Tunisia (Speijer, 1994), Spain (Alegret et al, 2003) and France (Sztrákos, 2005). Anan (2004, after Nakkady, 1955) believes that the Paleocene *Cibicidoides pseudoacutus* (Nakkady) was evolved from the Maastrichtian *C. abudurbensis*, in *C. abudurbensis* - *C. pseudoacutus* lineage., due to the former species distinguished from the descendent by its flat dorsal side and its indistinct central boss.

115) *Cibicidoides beadnelli* (LeRoy, 1953) (=*Cibicides beadnelli* LeRoy,1953). Eocene, Egypt.

116) *Cibicidoides cristata* (Haque, 1956) (=*Cibicides alleni* (Plummer) var. *carinata* Haque, 1956; *Cibicides alleni cristata* Haque - Thalmann, 1959). Paleocene, Pakistan.

117) *Cibicidoides decoratus* (LeRoy, 1953) (=*Cibicides decoratus* LeRoy, 1953). Ypresian, Egypt (LeRoy, 1953) and Tunisia (Speijer, 1994).

118) *Cibicidoides farafraensis* (LeRoy, 1953) (=*Cibicides farafraensis* LeRoy,1953). Ypresian, Egypt and Tunisia (Berggren & Aubert, 1975).

119) *Cibicidoides ghalebi* (Haque, 1956) (=*Cibicides multifaria* (Schwager) *limbata* Haque, 1956; *Cibicides multifaria ghalebi* Haque - Thalmann, 1959). Paleocene, Pakistan.

120) *Cibicidoides grandis* (LeRoy, 1953) (=*Anomalina grandis* LeRoy, 1953). Maastrichtian-Ypresian, Egypt.

121) *Cibicidoides libycus* (LeRoy, 1953) (=*Cibicides libycus* LeRoy, 1953). Paleocene-Ypresian, Egypt (LeRoy, 1953), Libya and Tunisia (Berggren & Aubert, 1975), France (Sztrakos, 2005), Turkmenia and Soviet Union (Saperson & Janal,1980).

122) *Cibicidoides loeblichi* (Said & Kenawy, 1956) (=*Cibicides loeblichi* Said & Kenawy, 1956). Maastrichtian-Paleocene, Egypt.

123) *Cibicidoides megaloperforatus* (Said & Kenawy, 1956) (=*Cibicides megaloperforatus* Said & Kenawy, 1956). Paleocene, Egypt.

124) *Cibicidoides mellahensis* (Nakkady, 1950) (=*Cibicides multifaria* (Schwager) var. *mellahensis* Nakkady, 1950). Maastrichtian, Egypt and UAE (Anan, 1993).

125) *Cibicidoides nammalensis* (Haque, 1956) (=*Cibicides mensilla* (Schwager) var. *nammalensis* Haque, 1956). Paleocene-Eocene, Pakistan and France (Sztràkos, 2005).

126) *Cibicidoides patalaensis* (Haque, 1956) (=*Cibicides lobatulus* (Walker & Jacob) var. *patalaensis* Haque, 1956). Paleocene, Pakistan.

127) *Cibicidoides pharaonis* (LeRoy, 1953) (=*Cibicides pharaonis* LeRoy,1953). Paleocene-Ypresian, Egypt.

128) *Cibicidoides praecursorius* (Schwager, 1883) (=*Cibicides praecursorius* Schwager, 1883). Ypresian, Egypt (Schwager, 1883) and Tunisia (Karoui-Yaakoub, 2006).

129) *Cibicidoides pseudoacutus* (Nakkady, 1950) (=*Anomalina pseudoacuta* Nakkady, 1950). Maastrichtian, Egypt, Tunisia (Speijer, 1994), Spain (Alegret et al., 2003) and France (Sztrákos, 2005).

130) *Cibicidoides punjabensis* (Haque, 1960) (=*Cibicides punjabensis* Haque, 1960). Eocene, Pakistan and India (Khanolkar & Saraswati, 2019).

131) *Cibicidoides schwageri* (Said & Kenawy, 1956) (=*Cibicides schwageri* Said & Kenawy, 1956). Paleocene, Egypt (Said & Kenawy, 1956).

132) *Cibicidoides tappanae* (Said& Kenawy, 1956) (=*Cibicides tappanae* Said & Kenawy, 1956). Maestrichtian, Egypt.

133) *Cibicidoides vulgaris* (Plummer, 1927) (=*Truncatolina vulgaris* Plummer, 1927). Paleocene-Ypresian, USA (Plummer, 1927), Argentina and Turkmenia (Berggren & Aubert, 1975), Egypt (Anan & Sharabi, 1988) and Iran (VahdatiRad et al., 2016).

134) *Woodella granosa* Haque, 1956. Paleocene, Pakistan.

135) *Woodella jawdati* Anan, 2023b. (=*Elphidium* sp. Jannou, 2009). Eocene, Argentina.

136) *Woodella nammalensis* Haque, 1956. Paleocene, Pakistan.

137) *Planulina synaensis* Ansary, 1954. Eocene, Egypt and France (Sztrákos, 2000).

138) *Epistominella dubia* Haque, 1956. Paleocene, Pakistan.

139) *Pseudogloborotalia khirabadensis* Haque, 1956. Paleocene, Pakistan.

140) *Pseudogloborotalia paleocenica* Haque, 1956. Paleocene, Pakistan

141) *Pseudogloborotalia ranikotensis* Haque, 1956. Paleocene, Pakistan.

142) *Pseudogloborotalia oblonga* Haque, 1956 (=*Pseudogloborotalia ranikotensis* var. *oblonga* Haque, 1956). Paleocene, Pakistan.

143) *Asterigerinata baluchistanensis* Haque, 1960. Eocene, Pakistan.

144) *Asterigerinata cuniformis* (Haque, 1956) (=*Asterigerina cuniformis* Haque, 1956). Paleocene-Eocene, Pakistan and France (Sztràkos, 2000).

145) *Asterigerinata nammalensis* (Haque, 1956) (=*Asterigerina texana* (Stadnichena) var. *nammalensis* Haque, 1956). Paleocene, Pakistan.

146) *Asterigerina brencei* Haque, 1960. Eocene, Pakistan, Spain (Ortiz & Thomas, 2006) and Slovenia (Cimerman et al., 2006).

147) *Nonion fayoumensis* Ansary, 1955, Eocene, Egypt.

148) *Nonion maadiensis* Ansary, 1955. Eocene, Egypt.

149) *Nonion trompi* Ansary, 1955. Eocene, Egypt.

150) *Nonion tunisiensis* Bou Dagher, 1988. Eocene, Tunisia.

151) *Nonionella africana* LeRoy, 1953. Eocene, Egypt and Pakistan (Haque, 1956).

152) *Nonionella haquei* Anan, 2019a. (*Nonionella* sp. Said & Kenawy,1956; *Nonionella* sp. Haque, 1960). Paleocene-Eocene, Egypt and Pakistan.

153) *Nonionella insecta* (Schwager, 1883), (=*Anomalina insecta* Schwager, 1883). Eocene, Egypt and Tunisia (Bou Dagher, 1988).

154) *Nonionella lakiensis* Haque, 1956. Paleocene, Pakistan.

155) *Nonionella minuta* Haque, 1956 (=*Nonionella jacksonensis* Cushman var. *minuta* Haque, 1956). Paleocene, Pakistan.

156) *Nonionella nammalensis* Haque, 1956 (=*Nonionella cretacea nammalensis* Haque, 1956). Paleocene, Pakistan.

157) *Nonionella thalmanni* Haque, 1956 (=*Nonionella escavata* d'Orbigny var. *nammalensis* Haque, 1956). Paleocene, Pakistan.

158) *Alabamina daubifera* (Haque, 1960) *(=Globorotalites daubifera* Haque, 1960). Eocene, Pakistan and SA (Hasson, 1985).

159) *Anomalinoides aegyptiacus* (LeRoy, 1953) (=*Anomalina aegyptiaca* LeRoy,1953). Paleocene-Early Eocene, Egypt and Tunisia (Speijer, 1994).

160) *Anomalinoides bandyi* (Haque, 1956) (=*Anomalina bandyi* Haque, 1956). Paleocene, Pakistan and SA (Hasson, 1985).

161) *Anomalinoides chileana* (Todd & Kniker, 1952) (=*Anomalina chileana* Todd & Kniker,1952). Ypresian, Chile and Argentina (Jannou, 2009).

162) *Anomalinoides dababiyaensis* Anan, 2023 (=*Anomalinoides* sp. B Alegret & Ortiz, 2007). Ypresian, Egypt.

163) *Anomalinoides desertorum* (LeRoy, 1953) (=*Anomalina desertorum* LeRoy,1953). Paleocene-Ypresian, Egypt and Arabian Sea (Boltovskoy et al., 1993).

164) *Anomalinoides esnehensis* (Nakkady, 1950) (=*Anomalina scrobiculata* (Schwager) var. *esnehensis* Nakkady, 1950). Paleocene-Ypresian, Egypt.

165) *Anomalinoides fayoumensis* Ansary, 1955 (=*Anomalina fayoumensis* Ansary, 1955). Eocene, Egypt.

166) *Anomalinoides leroyi* Anan, 2008. Maastrichtian-Paleocene, Egypt.

167) *Anomalinoides lordi* Bou Dagher, 1988. Eocene, Tunisia.

168) *A. masrensis* Anan, 2023e, p. 39, pl. 1, fig. 10 (=*Anomalinoides* cf. *alazanensis* of Ayyad et al, 2023). Eocene and Iran (*A.* aff. *trinitatensis* (Nuttall) of Salahi, 2021).

169) *Anomalinoides nakkadyi* Said & Kenawy, 1956. Maastrichtian, Egypt.

170) *Anomalinoides sinaensis* Said & Kenawy, 1956. Maastrichtian, Egypt.

171) *Anomalinoides suturatus* Said & Kenawy, 1956. Maastrichtian, Egypt.

172) *Anomalinoides tunisica* Anan, 2023e (=*Anomalinoides* sp. 2 Speijer, 1994). Maastrichtian, Tunisia.

173) *Anomalinoides umbonifera* (Schwager, 1883) (=*Discorbis praecursoria* var. *umbonifera* Schwager, 1883). Maastrichtian-Ypresian, Egypt.

174) *Anomalinoides vanbelleni* Ten Dam & Sigal, 1950. Paleocene, Algeria and Egypt (Said & Kenawy, 1956).

175) *Anomalinoides zitteli* (LeRoy, 1953) (=*Cibicides zitteli* LeRoy, 1953). Paleocene-Ypresian, Egypt.

176) *Gyroidinoides aegyptiaca* (Ansary, 1955) (=*Gyroidina aegyptiaca* Ansary, 1955). Eocene, Egypt.

177) *Gyroidinoides luterbacheri* Anan, 2004. Paleocene, Egypt.

178) *Gyroidinoides reussi* (Said & Kenawy, 1956) (=*Gyroidina reussi* Said & Kenawy, 1956). Paleocene, Egypt.

179) *Gyroidinoides sarwari* (Haque, 1956) (=*Gyroidina girardana* (Reuss) var. *limbata* Haque, 1956; *Gyroidina girardana sarwari* Haque, 1959 - Thalmann, 1959). Paleocene, Pakistan.

180) *Gyroidinoides tayyabi* (Haque, 1960) (=*Gyroidina tayyabi* Haque, 1960). Eocene, Pakistan.

181) *Gyroidinoides tellburmaensis* Futyan, 1976. Jordan and Tunisia (Speijer, 1994).

182) *Stensiöeina esnehensis* Nakkady, 1950. Maastrichtian, Egypt.

183) *Angulogavelinella bandata* Futyan, 1976. Paleocene, Jordan.

184) *Angulogavelinella nekhliana* (Said & Kenawy, 1956)(=*Cibicides nekhliana* Said & Kenawy, 1956). Maastrichtian, Egypt. Anan (2004) considered this Maastrichtian species with its distinct umbilical umbo as a former species of the Paleocene species *Angulogavelinella avnimelechi* (Reiss) which lacks this umbo, but has moderately deep and open umbilicus in the *A. nekhliana - A. avnimelechi* lineage.

185) *Ornatanomalina acuta* Haque, 1956. Paleocene, Pakistan.

186) *Ornatanomalina crookshanki* Haque, 1956. Paleocene, Pakistan.

187) *Ornatanomalina elegantula* Haque, 1956. Paleocene, Pakistan.

188) *Ornatanomalina ennakhali* Anan, 2011c. Eocene, UAE.

189) *Ornatanomalina geei* Haque, 1956. Paleocene, Pakistan.

190) *Ornatanomalina glaessneri* Haque, 1956. Paleocene, Pakistan.

191) *Ornatanomalina hafeezi* Haque, 1956. Paleocene, Pakistan, Qatar (Hewaidy, 1994) and Nigeria (Haynes & Nwabufo-Ene, 1998).

192) *Ornatanomalina inflata* (Hasson, 1985) (=*Saudella inflata* Hasson, 1985). Eocene, SA. Loeblich & Tappan (1988) considered the genus *Ornatanomalina* Haque from Pakistan as a senior synonym of *Saudella* Hasson (1985) from Saudi Arabia (SA), and considered *O. hafeezi* as a junior synonym of *O. geei* (the type species of the genus *Ornatanomalina*).

193) *Ornatanomalina ornata* (Hasson, 1985) (=*Saudella ornata* Hasson, 1985). Eocene, SA.

194) *Ornatanomalina pakistanica* Anan, 2021b (=*Ornatanomalina* cf. *geei* Haque, 1960). Eocene, Pakistan. *O. pakistanica* differs from *O. geei* by spiraling costae (instead of ribs) that flush with the surface.

195) *Ornatanomalina porosa* (Hasson, 1985) (=*Saudella porosa* Hasson, 1985). Eocene, SA.

196) *Ornatanomalina rugosa* (Hasson, 1985) (=*Saudella rugosa* Hasson, 1985). Eocene, SA.

197) *Ornatodella pustulosa* (Haque, 1960) (=*Ornatanomalina* ? *pustulosa* Haque, 1960). Eocene, Pakistan.

198) *Pararotalia pakistanica* Anan, 2023f (=*Pararotalia* (?) sp. Haque, 1960). Eocene, Pakistan.

199) *Elphidiella africana* (LeRoy, 1953) (=*Elphidium africanum* LeRoy, 1953). Eocene, Egypt (LeRoy, 1953), Libya, Mali (Berggren, 1974) and Nigeria (Haynes & Nwabufo-Ene, 1998).

200) *Elphidium cherifi* Anan, 2010. Eocene, UAE.

4. Paleogeography

The ancestral Tethys is connected with the ancestral Atlantic and Indian Oceans via Mediterranean Sea (Solakius et al, 1990). Some species has recorded from two or more than one countries: *Aragonia semireticulata* (is recorded from Egypt and Atlantic Ocean), *Elhasaella allanwoodi* Hamam, *Orthokarstenia higazyi*, *Reussella aegyptiaca* (are recorded from Egypt and Jordan), *Eouvigerina aegyptiaca, Coryphostoma nekhliana, Bulimina misrensis, Cibicidoides mellahensis* (Egypt and UAE), *Stainforthia farafraensis*, *S. gafsensis*, *Stainforthia kamali*, *Cibicidoides praecursorius, Nonionella insecta*, *Anomalinoides aegyptiacus* (Egypt and Tunisia), *Orthokars*tenia *nakkadyi, Uvigerina fadeli* (Egypt, Tunisia and France, *Valvulineria scrobiculata* (Egypt, Tunisia and Kazakhstan), *Orthokarstenia oveyi* (Egypt, Jordan and Nigeria), *Trifarina esnaensis* (Egypt and Tanzania), *Cibicidoides abudurbensis* (Egypt, Tunisia, Palestine, UAE, Spain and France), *Planulina synaensis* (Egypt and France), *Cibicidoides libycus* (Egypt, Libya, Tunisia, France and Turkmenia), *Elphidiella africana* (Egypt, Libya, Mali and Nigeria), *Bolivinoides curtus* (Palestine, Egypt and UAE), *Euuvigerina subproboscidea, Fursenkoina dubia*, *Nonionella africana*, *N. haquei*, *Sakhiella nammalensis*, *Cibicidoides grandis* (Pakistan and Egypt), *Stomatorbina ranikotensis, Alabamina daubifera, Anomalinoides bandyi* (Pakistan and Saudi Arabia), *Asterigerinata cuniformis, Cibicidoides nammalensis* (Pakistan and France), *Asterigerina brencei* (Pakistan, Spain and Slovenia), *Discorbis globiformis* (Pakistan and Qatar), *Ornatanomalina hafeezi* (Pakistan, Qatar and Nigeria), *Cibicidoides nammalensis* (Pakistan, Iraq and France), *Gyroidinoides tellburmaensis* (Jordan and Tunisia), *Valvulineria pseudotumeyensis* (Jordan and Angola), *Anomalinoides chileana* (Chile and Argentina).

5. Paleoenvironment

The paleoenvironment of the Southern Tethyan taxa mainly would have been a middle-outer shelf sea of normal salinity, as is suggested by the dominance of infaunal morphotypes and excellent preservation of the tests by many authors (e.g. Alegret & Thomas, 2005; Alegret & Ortiz, 2007; Sprong et al, 2012; Abed, 2013; Anan, 2023b).

6. Conclusions

The present study deals with the recording of two hundreds diagnostic Campanian-Paleogene species of Southern Tethys Rotaliid calcareous foraminiferal genera which needs a taxonomic revision to accommodate the modern nomenclature. Two out of these species are treated here as new: *Stainforthia abdelkarimi* and *Siphonodosaria misrensis*. About 41 % of the total recorded Rotaliid species are described from Egypt, while 27% from Pakistan. Some of the identified species are confined to its original description, but others were recorded from two or many localities in the Southern Tethys South America, North and Central Africa, Middle East, and West Asia (Turkey, Turkmenia and Kazakhstan), and also Europe (Spain, France, Austria, Slovenia). The extended realms of the Tethys have extended from the Indo-Pacific to the Atlantic Oceans via the Mediterranean Sea during the Campanian-Paleogene time, and the fauna exhibit pronounced similarities.

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