LARGER BENTHIC FORAMINIFERAL ASSEMBLAGES FROM SINJAR FORMATION, SW SULAIMANIYAH CITY KURDISTAN REGION, IRAQ

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Key words: Benthic Foraminifera, Paleocene, Eocene, Sinjar Formation, Sulaimaniyah, Iraq

ABSTRACT

Late Paleocene – early Middle Eocene shallow-water larger benthic foraminifera were identified from the Sinjar Formation that crops out in the southwest of Sulaimaniyah city, northeast Iraq. The present study is applied in an area extremely rich in paleofauna, mainly represented by larger benthic foraminifera. Three sections were studied: Section 1 (75 m thick) and section 2 (135 m thick) in Baranan Mountain, near Qazan and Hazar Merd villages, respectively, whereas section 3 (62 m thick) is in Qara Dagh Mountain, near Sulekan village. In total 461 samples were collected representing all lithological changes along the three sections, and 492 thin sections were prepared and studied under binocular microscope.

The benthic foraminiferal association documented in the study area belongs to 16 families. Thirty genus and twenty five species have been identified. Based on the identified species of larger foraminiferal assemblages, the age of Selandian – Lutetian is assigned to the Sinjar Formation, in the studied area.

الفورامينيفيرا القاعية الكبيرة ضمن تكوين سنجار، جنوب غرب السليمانية، إقليم كردستان، العراق

هيـام داود صالح

المستخلص

تتعلق الدراسة الحالية بتشخيص الفورامينيفيرا القاعية الكبيرة ضمن تكوين سنجار في جنوب غرب مدينة السليمانية، شمال شرق العراق والذي يعود إلى عمر الپاليوسين المتأخر – الإيوسين الأوسط المبكر. الهدف من هذا البحث هو تحديد الفورامينيفيرا القاعية في منطقة غنية بهذه المجموعة من المتحجرات. تمت دراسة ثلاثة مقاطع وهي: المقطع الأول (سماكة 75 م) والمقطع الثاني (سماكة 135 م) في جبل بارانان والقريبين من القريتين قازان وهازار ميرد، على التوالي، أما المقطع الثالث (سماكة 62 م) فهو قريب من قرية سوليكان في جبل قرة داغ. تم تحضير 492 شريحة رقيقة من 461 نموذج جمعت من المقاطع الثلاثة.

من الدراسة المجهرية للشرائح الرقيقة تم تحديد ثلاثين جنسا وخمسة وعشرين نوعا من الفورامينيفيرا القاعية الكبيرة والتي تنتمي إلى ست عشرة عائلة. وبالاعتماد على الأنواع المشخصة، تم تحديد العمر بشكل أدق من الدراسات السابقة والذي يمتد من الـ سيلانديان إلى لوتيتيان.

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INTRODUCTION

The Sinjar Formation was first described from the Jebel Sinjar (near Mamissa village) by Keller (1941) in Bellen *et al*. (1959). Bellen *et al*. (1959) regarded that the Sinjar Formation, in the type section (176 m thick) comprises of limestone of lagoonal miliolids (back reef), algal reef and nummulitic shoal facies (fore-reef) with age of Paleocene – Early Eocene. Al-Saddiki (1968) considered the Sinjar Formation in the type section to be the sole section, which contains three different facies that indicate the back-reef (miliolids), reef (algal facies), and fore-reef (Nummulites and discosyclinids). Bellen *et al*. (1959) and Ditmar and Iraqi – Soviet Team (1971) mentioned that the Sinjar Formation is rich in fossils and contains: *Alveolina* sp., *A. elliptica*, *A. oblonga*., *A. primaeva*, *Dictyoconus arabicus*, *Dictyokathina simplex*, *Idalina sinjarica*, *Miscellanea miscella*, *Nummulites atacicus*, *N. discorbinus*, *N. bolcensis*, *N. globulus*, *N. lucasanus*, *N. carpathica*, *N. frasi*, *Assilina placentula*, *Operculina salsa*, *Operculina herberti*, *Orbitolites complanatus*, *Daviesina ghilizarda*, *Rotalia trochidiformis*, *Discocyclina* sp., *Saudia labyrinthica*, and *Taberina daviesi*.

In Kurdistan Region, NE Iraq, the Sinjar Formation, usually, underlies the Gercus Formation and it is generally found to interfingers with the Kolosh Formation (Bellen *et al*., 1959). The contact between Sinjar and Gercus formations is gradational (Jassim *et al*., 1975), while the contact between Sinjar and Kolosh formations is conformable (Al-Surdashy, 1988).

The Sinjar Formation was described also, in other localities, by Al-Sayyab and Al-Saddiki (1970), Jassim *et al*. (1975), Al-Kufaishi (1977), Shathaya (1980), Al-Khafaji (1980), Mallick and Al-Qayim (1985) and Al-Fadhli and Mallick (1980). Al-Surdashy (1988), Lawa (2004), Daoud and Abdullah (2009) and Daoud (2009) also studied Sinjar Formation in several sections in Sulaimaniyah area and determined some microfacies and microfossils.

The purpose of this study is to determine the present species of larger benthic foraminifera in Sinjar Formation in the studied area, and to use the foraminiferal assemblages for determination the age of the formation.

LOCATION OF THE STUDIED SECTIONS

The exposed limestones in the studied sections (Fig.1) belong to the Sinjar Formation. They are exposed in the High Folded Zone, within the Unstable Shelf and developed as centimetric to metric banks, grey in colour and generally showing a massive texture.

Section (1) is located at about (1.5 – 2) Km south of Qazan village (Fig.1) with thickness of 75 m (Fig.2), it includes grey and light grey, fine crystalline limestone, with stratification ranging from tens of centimetres to meters. A total of 151 samples were collected, representing all lithological changes along the section.

Section (2) is located at about (1 – 1.5) Km, south of Hazar Merd Cave (Fig.1). Generally, the limestones occur as layers of (0.1 – 1) m thick and banks of several meters, light grey and grey in colour. The total thickness of the section is about 135 m (Fig.2). The samples were collected from each individual bank, at intervals selected to reflect all lithological changes. A total of 217 samples were collected along the whole section.

Section (3) is located at about 1 Km west of Sulekan Village, Qara Dagh Mountain, and approximately 20 Km southwest of Sulaimaniyah City (Fig.1). The thickness of the section is 62 m (Fig.3) and 93 samples were collected; representing all lithological changes along the section.

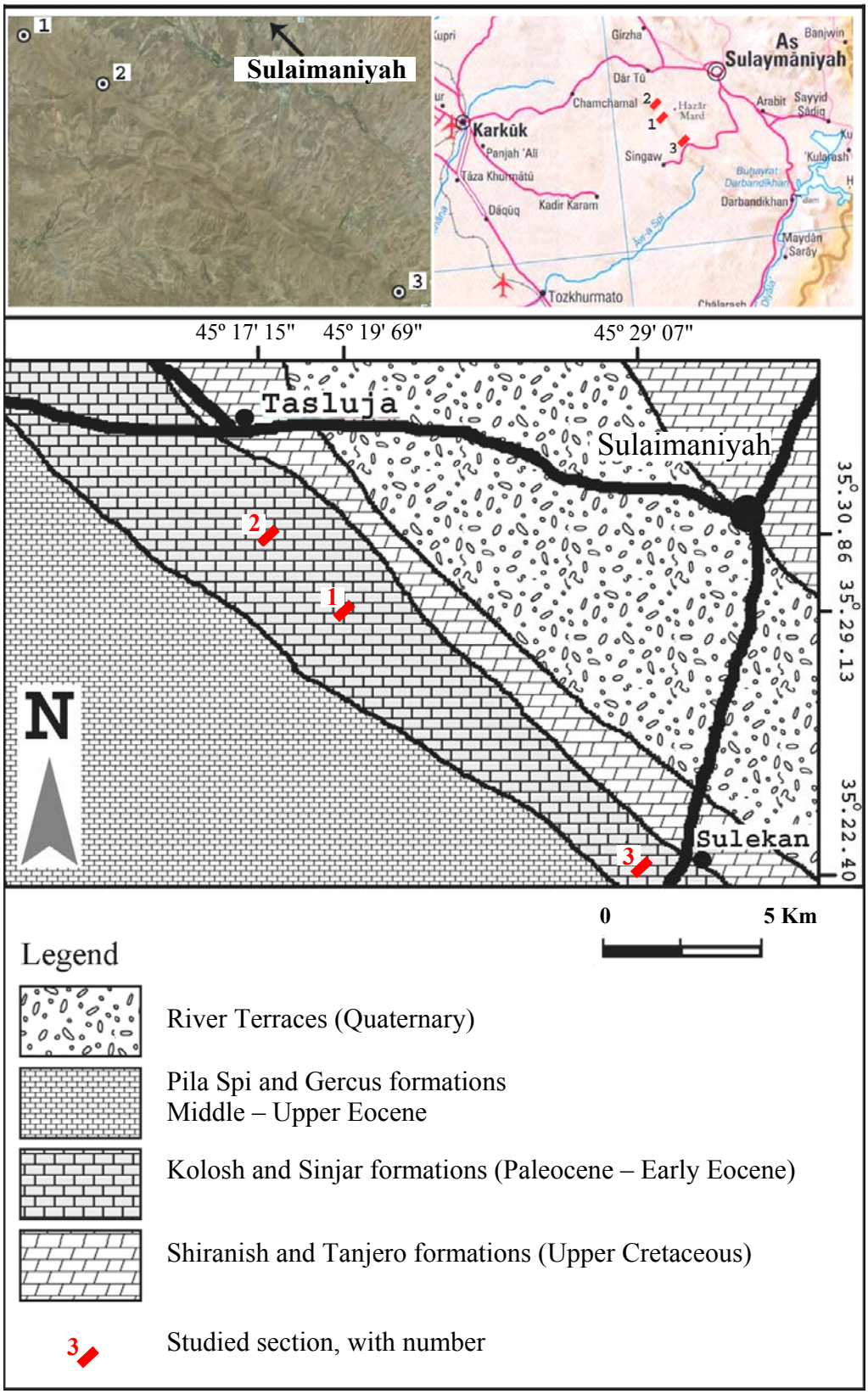

Fig.1: Location map of the studied sections:
1) Qazan Section, **2)** Hazar Merd Section, **3)** Sulekan Section
(Geology after Sissakian, 2000)

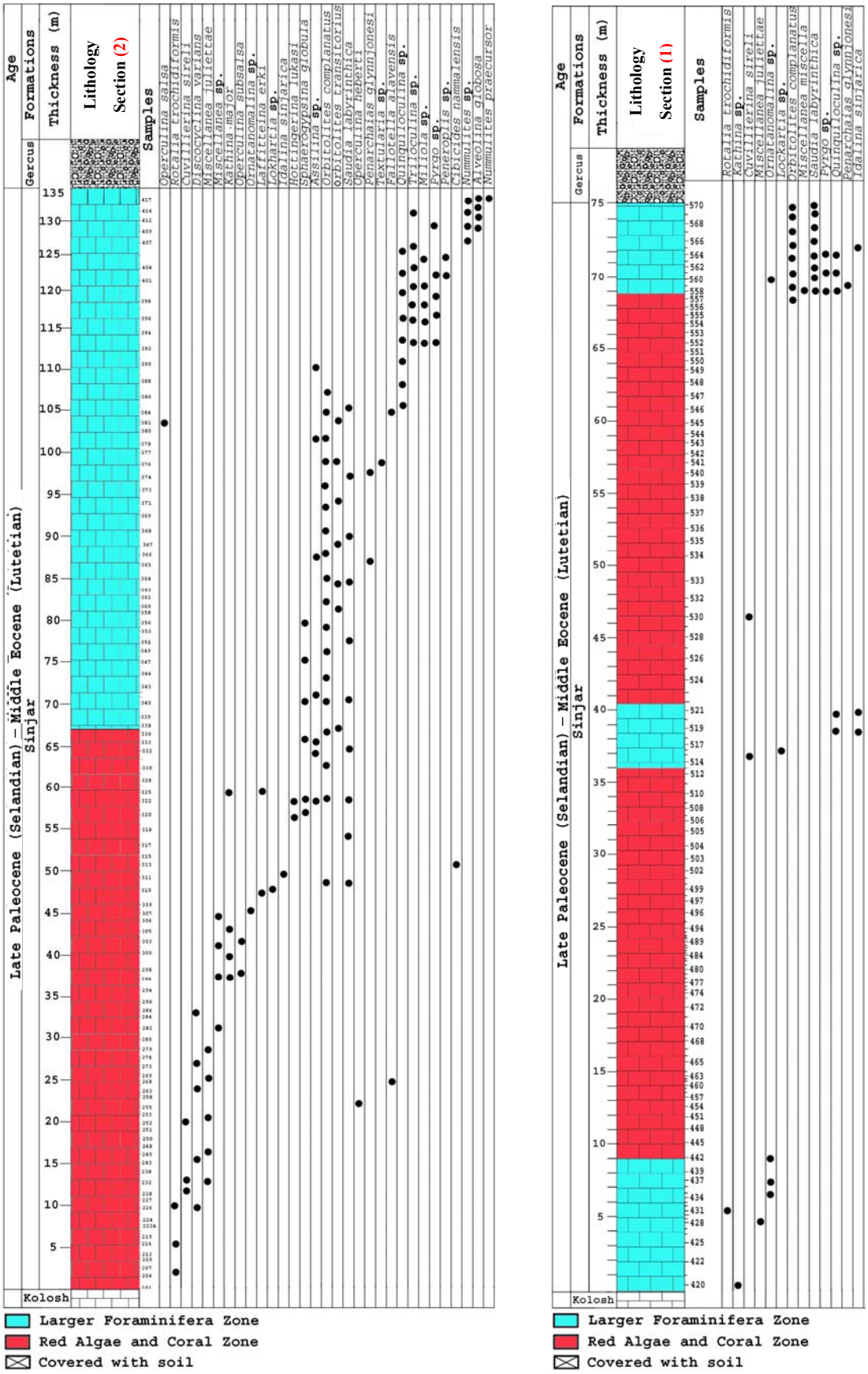

Fig.2: Lithology and distribution of larger foraminifera in sections (1 and 2)

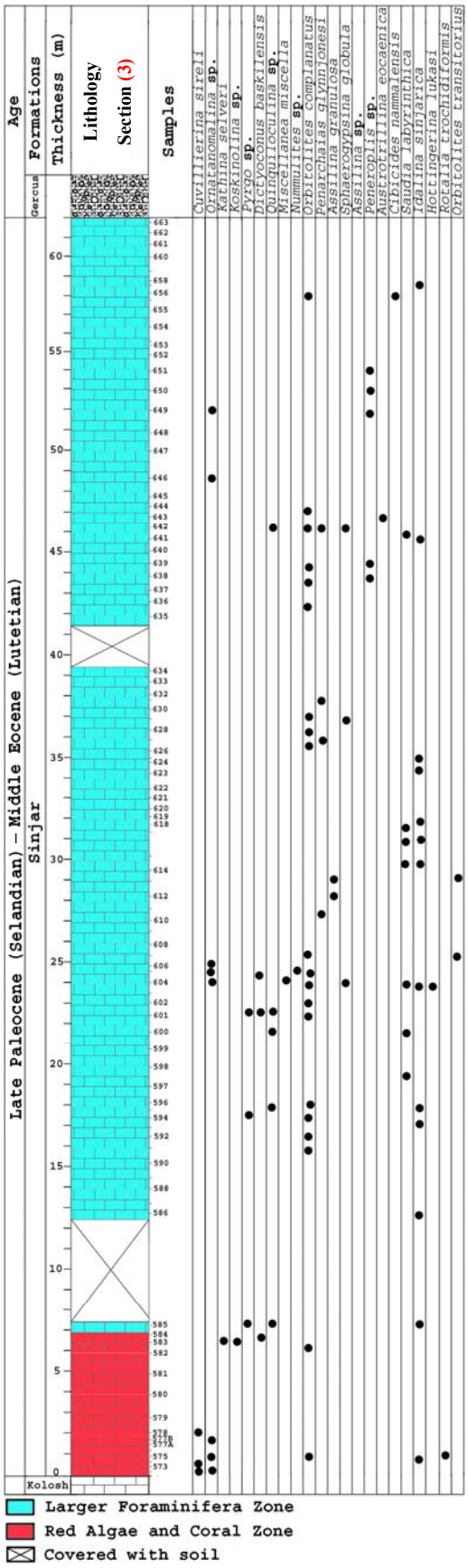

Fig.3: Lithology and distribution of larger foraminifera in section (3)

LARGER BENTHIC FORAMINIFERA

According to Hottinger (2001), the Upper Paleocene – Lower Eocene interval includes two phases in a global community maturation cycle, which consists of five phases of continuous, gradual biotic change. The Upper Paleocene represents phase 2 of this cycle, in which an increase in generic diversity occurred. The Lower Eocene represents phase 3, which is characterized by an abrupt diversification of different species and marks the full recovery after the collapse at the Cretaceous/ Paleogene (K/ P) boundary. Apart from the reorganization of larger foraminifera after the K/ P boundary, long-term and short-term paleoenvironmental trends were responsible for the success of larger foraminifera within this time interval (Scheibner *et al*., 2005). These trends include increasing oligotrophy and higher sea-surface temperatures, which led to the demise of corals in low latitudes and created new niches for larger foraminifera (Scheibner *et al*., 2005).

In the studied area, according to the field observations and investigation of thin sections (Fig.4), two zones were identified: One at the bottom of the sections, which consists largely of red algae, corals and sometimes green algae (Red Algae and Coral Zone), except section (1), where benthic foraminifers appear too, and a zone at the top of the sections that is rich in various larger benthic foraminifers (Larger Foraminifera Zone). Also, in section (1), two sequences of foraminifers occur in the Red Algae and Coral Zone, but they are poor in species (Fig.2). Comparing the three sections, it can be observed that there is increase in thickness of Larger Foraminifera Zone; from section (1) to section (3) and decrease in thickness of Red Algae and Coral Zone. Also, two subzones were observed in the Larger Foraminifera Zone: A subzone rich in soritids, especially orbitolites (lower part), where they are observed very clearly in the field with a magnifying lens, and a subzone rich in rotaliids (upper part).

In the studied three sections, the following were recorded: Five larger benthic foraminiferal families represented by: Discocyclinidae, Meandropsinidae, Miscellaneidae, Nummulitidae and Orbitolinidae, and eleven benthic foraminifer's family represented by: Acervulinidae, Alveolinidae, Austrotrillinidae, Cibicididae, Coskinolinidae, Miliolidae, Peneroplidae, Rotaliidae, Soritidae, Spirocyclinidae and Textulariidae.

The following thirty genera and twenty five species were identified in the three studied sections: *Textularia* sp. (Figs.5.5 and 7.4), *Assilina* sp. (Figs.6.4, 6.6, 6.7, 6.11, 6.15, 6.16, 7.1 and 9.17), *Triloculina* sp. (Fig.7.7), *Quinqueloculina* sp. (Figs.7.6, 7.8 and 8.10), *Pyrgo* sp. (Figs.7.10, 7.14, 8.9 and 9.5), *Miliola* sp. (Fig.7.11), *Peneroplis* sp. (Figs.7.12 and 9.18), *Coskinolina* sp. (Fig.9.4), *Nummulites* sp. (Figs.7.15, 7.16, 9.11 and 9.12), *Lockhartia* sp. (Figs.6.10 and 8.7), *Alveolina globosa* LEYNERIE (Figs.7.18 and 7.20), *Glomalveolina* sp. (Figs.7.17 and 7.19), *Rotalia trochidiformis* LAMARCK (Figs.5.1 and 8.3), *Cuvillierina sireli* INAN (Figs.5.2, 8.5, 8.6 and 9.1), *Operculina salsa* DAVIES and PINFOLD (Fig.5.3), *Discocyclina varians* KAUFMANN (Figs.5.4 and 5.13), *Miscellanea juliettae* LEPPIG (Figs.5.6 and 8.2), *Miscellanea* sp. (Fig.5.7), *Operculina subsalsa* DAVIES and PINFOLD (Fig.5.8), *Kathina major* SMOUT (Fig.5.9), *Ornatanomalina* sp. (Figs.5.10, 8.4, 8.12, 9.2 and 9.10), *Sphaerogypsina globula* REUSS (Figs.5.11, 6.7 and 9.9), *Laffitteina erki* SIREL (Fig.5.12), *Idalina sinjarica* GRIMSDALE (Figs.6.1, 8.16, 8.17 and 9.21), *Hottingerina Lukasi* DROBNE (Figs.6.2, 6.5 and 6.8), *Saudia labyrinthica* GRIMSDALE (Figs.6.12, 7.5, 8.15, 8.18 and 9.14), *Orbitolites complanatus* LAMARCK (Figs.6.13, 8.15, 8.18, 9.13 and 9.14), *Opertorbitolites transitorius* HOTTINGER (Fig.6.14), *Operculina heberti* MUNIER-CHALMAS (Fig.6.17), *Penarchaias glynnjonesi* HENSON (Figs.7.3 and 9.15), *Fallotella alavensis* MANGIN (Fig.7.9), *Nummulites praecursor* De la HARPE (Fig.7.13), *Kathina* sp. (Fig.8.1), *Miscellanea miscella* d'ARCHIAC and HAIME (Figs.8.8 and 9.9), *Kathina selveri* SMOUT (Fig.9.3), *Dictyoconus baskilensis* (Figs.9.6 and 9.7), *Assilina granulosa* d'ARCHIAC (Fig.9.16), *Austrotrillina eocaenica* HOTTINGER (Fig.9.19) and *Cibicides nammalensis* HAQUE (Fig.9.20).

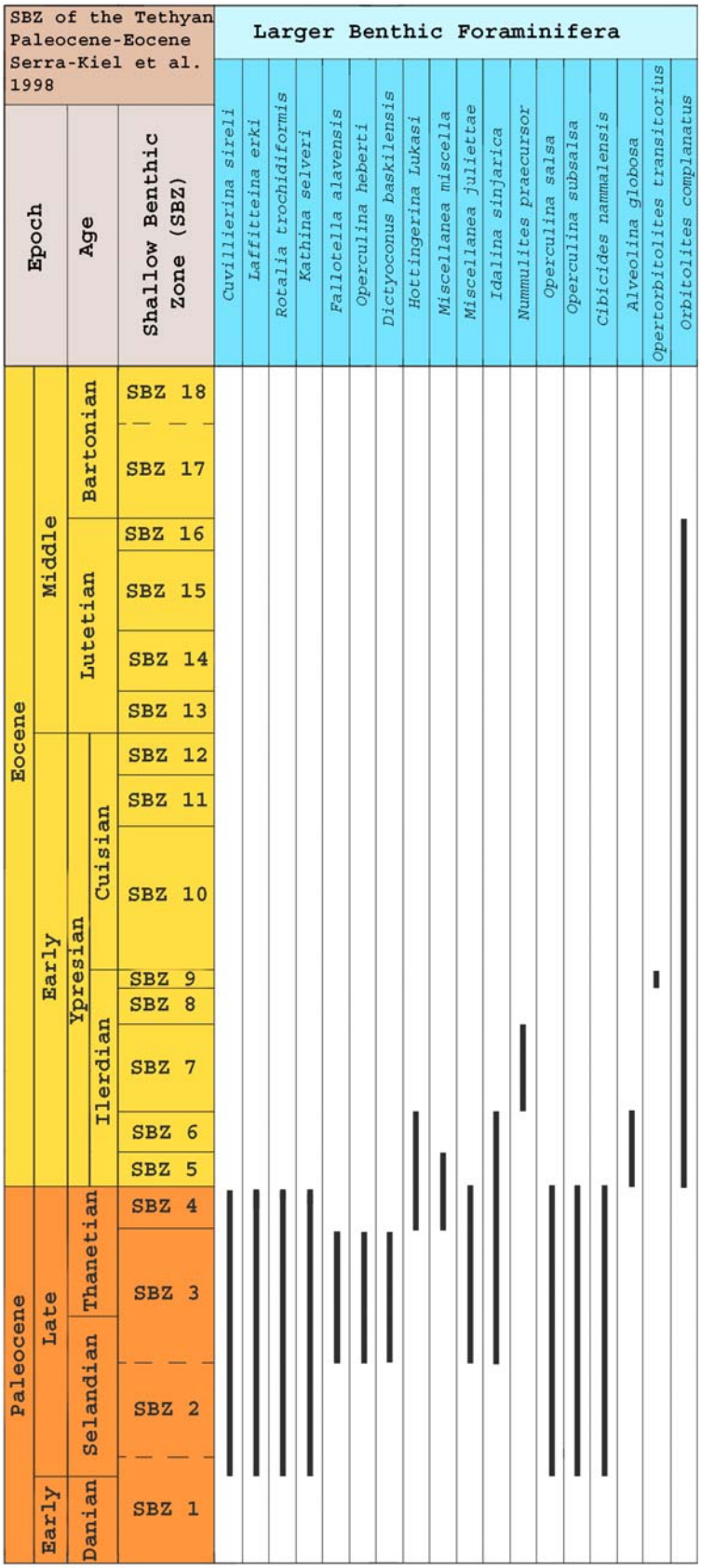

Fig.4: Stratigraphic distribution of the larger benthic foraminifera identified in the studied three sections

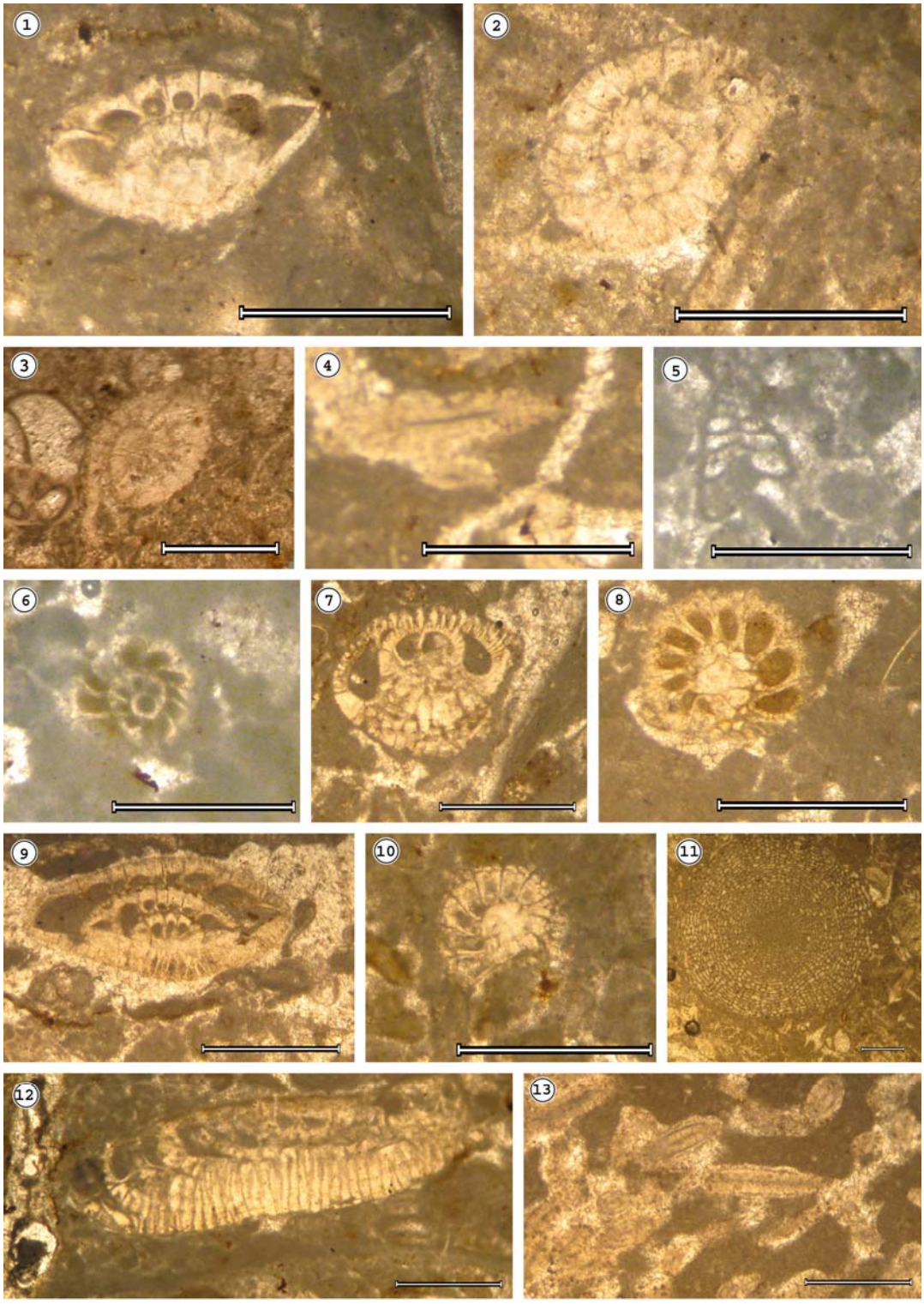

Fig.5: Hazar Merd Section (section 2)
1) *Rotalia trochidiformis* LAMARK, **2)** *Cuvillierina sireli* INAN, **3)** *Operculina salsa* DAVIES & PINFOLD, **4**, **13)** *Discocyclina varians* KAUFMANN, **5)** *Textularia* sp. **6)** *Miscellania juliettae* LEPPIG, **7)** *Miscellanea* sp., **8)** *Operculina subsalsa* DAVIES and PINFOLD, **9)** *Kathina major* SMOUT, **10)** *Ornatanomalina* sp., equatorial section, **11)** *Sphaerogypsina globula* REUSS, **12)** *laffitteina erki* SIREL
Note: The bar scale is 1 mm

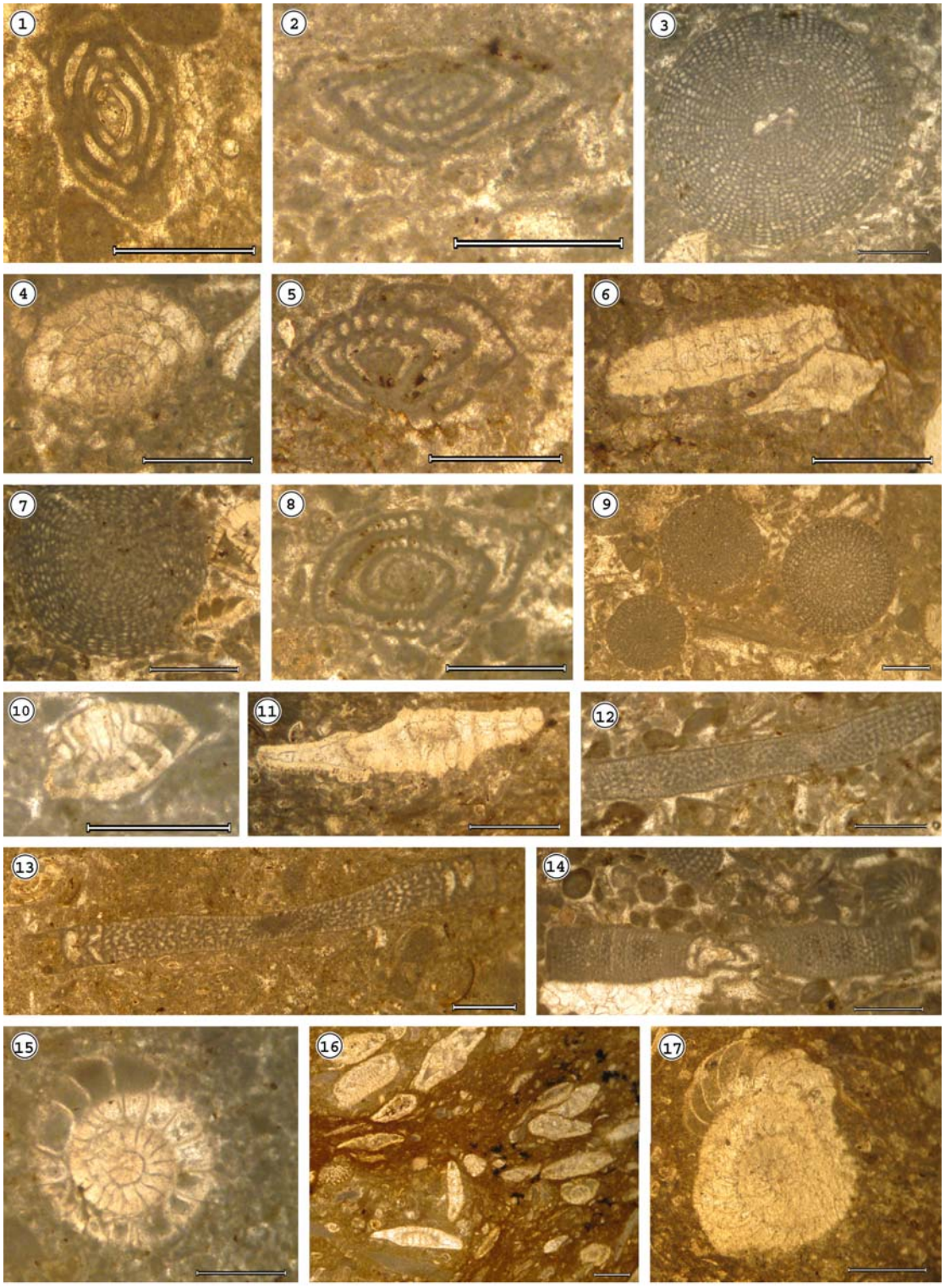

Fig.6: Hazar Merd Section (section 2)
1) *Idalina sinjarica* GRIMSDALE, **2**, **5**, **8)** *Hottingerina lukasi* DROBNE, **3)** *Orbitolites* sp., **4**, **6**, **11**, **15**, **16)** *Assilina* sp., **7)** *Sphaerogypsina globula* REUSS (left) and *Assilina* sp. (right), **9)** Different section of *Sphaerogypsina*, **10)** *Lockhartia* sp., **12)** *Saudia labyrinthica* GRIMSDALE, **13)** *Orbitolites complanatus* LAMARK, **14)** *Opertorbitolites transitorius* HOTTINGER, **17)** *Operculina heberti* MUNIER-CHALMAS
Note: The bar scale is 1 mm

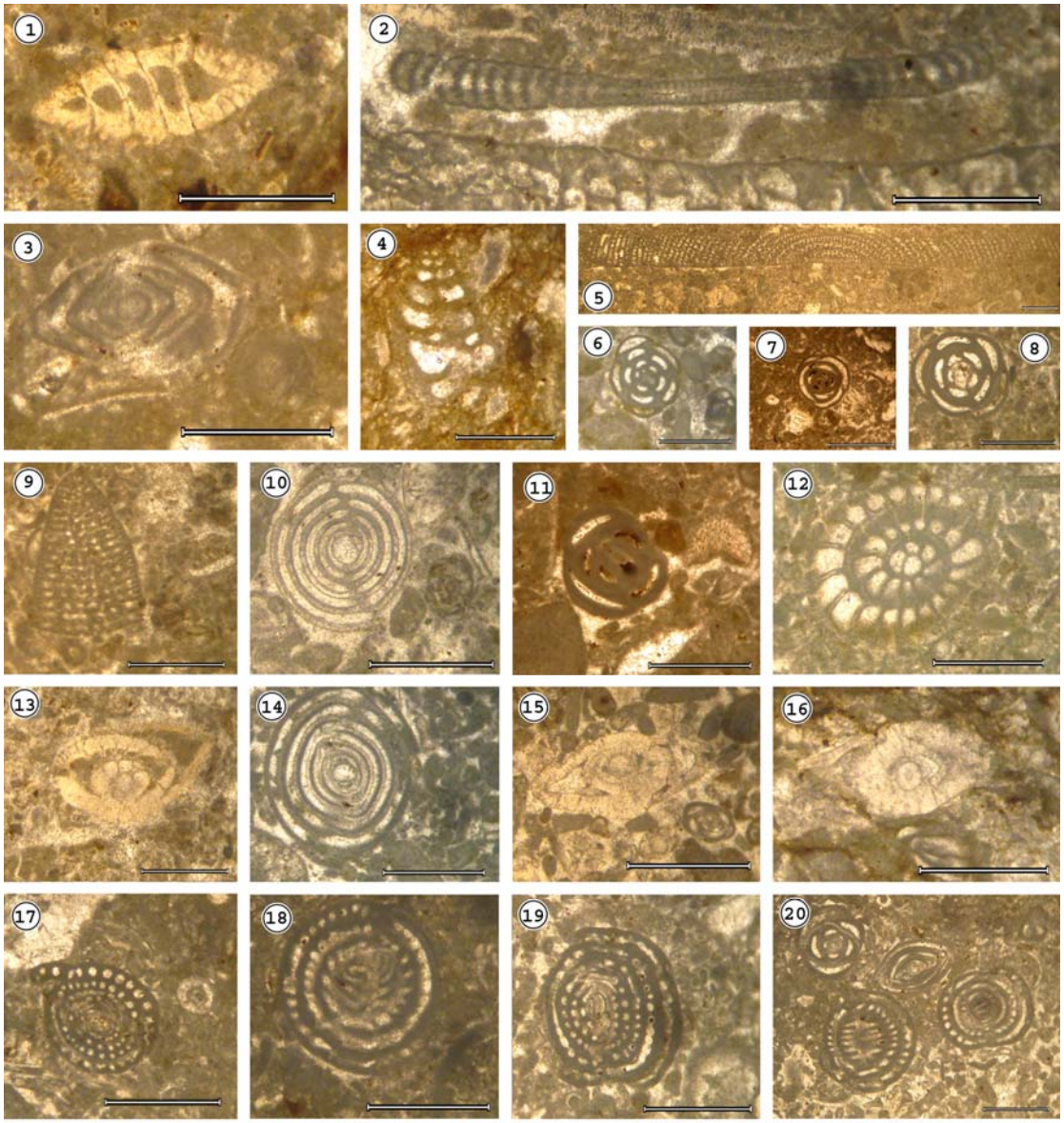

Fig.7: Hazar Merd Section (section 2)
1) *Assilina* sp., **2)** *Orbitolites* sp., **3)** *Penarchaias glynnjonesi* HENSON.
Axial section shows the symmetry of the interiomarginal foramina in the spiral chamber,
4) *Textularia* sp., **5)** *Saudia labyrinthica* GRIMSDALE, **6**, **8)** *Quinqueloculina* sp.,
7) *Triloculina* sp., **9)** *Fallotella alavensis* MANGIN, **10**, **14)** *Pyrgo* sp., **11)** *Miliola* sp.,
12) *Peneroplis* sp., **13)** *Nummulites praecursor* De la HARPE .Oblique-equatorial section,
15, **16)** *Nummulites* sp., **17**, **19)** *Glomalveolina* sp., **18**, **20)** *Alveolina globosa* LEYNERIE
Note: The bar scale is 1 mm

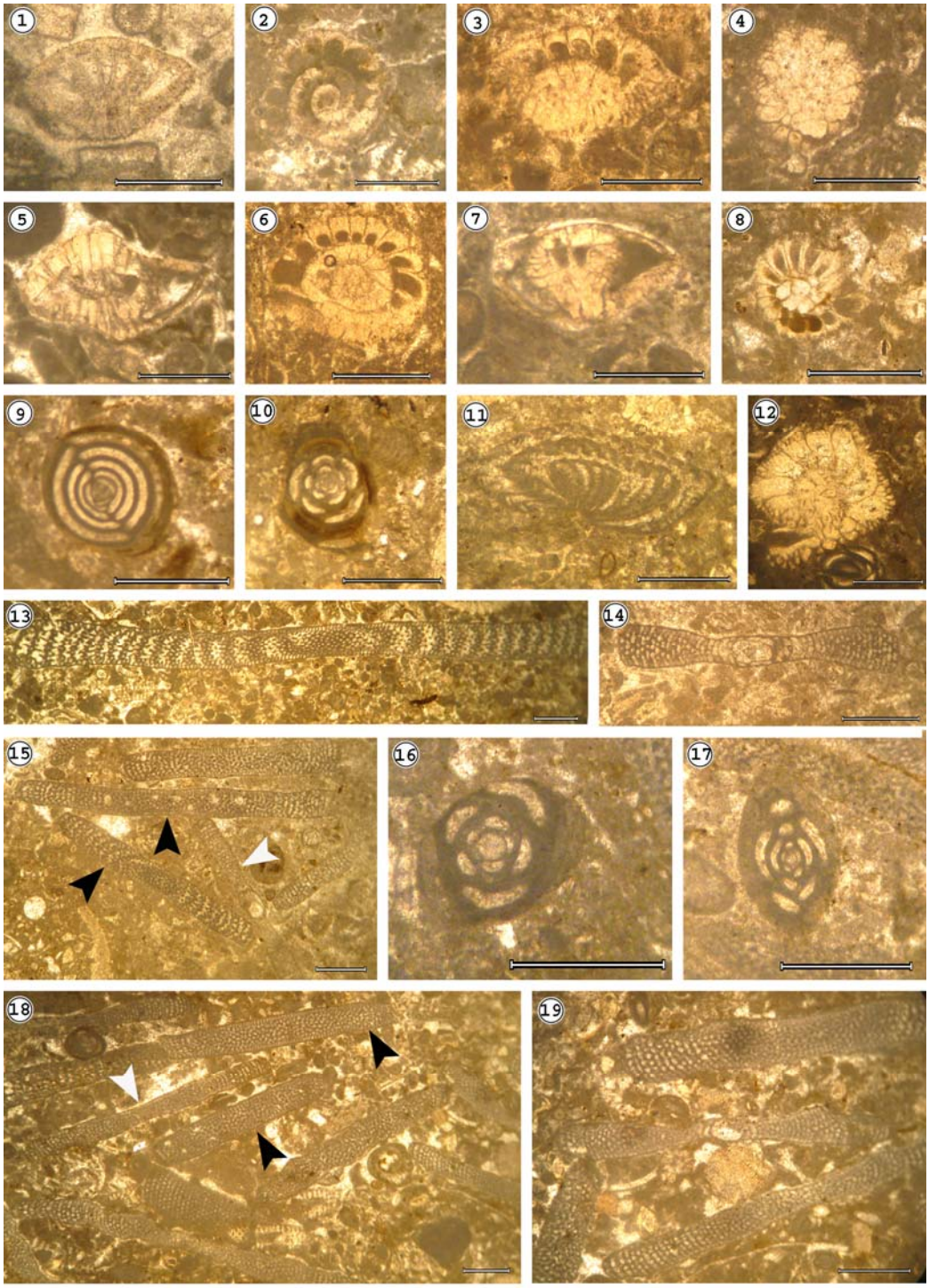

Fig.8: Qazan Section (section 1)
1) *Kathina* sp., axial section, **2)** *Miscellanea juliettae* LEPPIG, **3)** *Rotalia trochidiformis* LAMARK, **4**, **12)** *Ornatanomalina* sp., equatorial sections, **5**, **6)** *Cuvillierina sireli* INAN, axial and equatorial sections, **7)** *Lockhartia* sp., **8)** *Miscellanea miscella* D'ARCHIAC and HAIME, **9)** *Pyrgo* sp., **10)** *Quinqueloculina* sp., **11)** *Penarchaias glynnonesi* HENSON, tangential section, **13)** *Saudia labyrinthica* GRIMSDALE, **14**, **19)** *Orbitolites complanatus* LAMARK, **15**, **18)** *Saudia labyrinthica* (black arrow) and *Orbitolites complanatus* (white arrow), **16**, **17)** *Idalina sinjarica* Grimsdale, equatorial and axial sections
Note: The bar scale is 1 mm

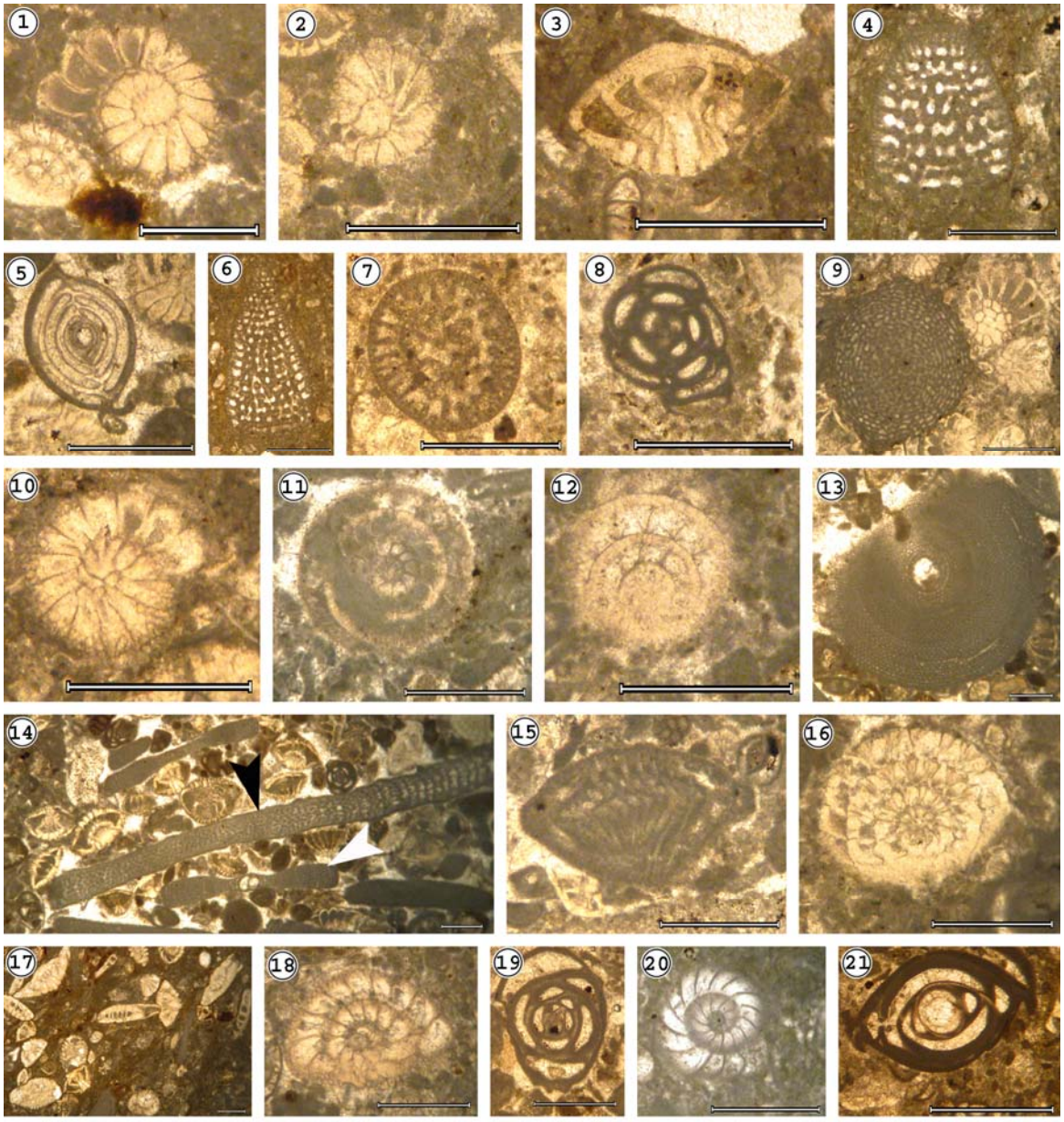

Fig.9: Sulekan Section (section 3)
1) *Cuvillierina sireli* INAN, equatorial section, **2**, **10)** *Ornatanomalina* sp., equatorial sections, **3)** *Kathina selveri* SMOUT, axial section, **4)** *Coskinolina* sp., **5)** *Pyrgo* sp., **6**, **7)** *Dictyoconus baskilensis*, axial and equatorial sections respectively, **8)** *Quinqueloculina* sp., **9)** *Miscellanea miscella* d'ARCHIAC and HAIME (right) and *Sphaerogypsina globula* REUSS (left), **11**, **12)** *Nummulites* sp., **13)** *Orbitolites complanatus* LAMARK, axial section, **14)** *Orbitolites complanatus* LAMARK (white arrows) and *Saudia labyrinthica* (black arrow), **15)** *Penarchaias glynnjonesi* HENSON, **16)** *Assilina granulosa* d'ARCHIAC, **17)** *Assilina* sp., **18)** *Peneroplis* sp., **19)** *Austrotrillina eocaenica* HOTTINGER, **20)** *Cibicides nammalensis* HAQUE, **21)** *Idalina sinjarica* GRIMSDALE
Note: The bar scale is 1 mm

DISCUSSION

The species *Cuvillierina sireli* İNAN was identified in Sierra Espuna area (Spain) and Eastern Pontides (Turkey) (Inan and Inan, 2008). According to Serra-Kiel *et al*. (1998) this species indicates Early Paleocene age (Selandian) or Shallow Benthic Zone 2 (SBZ 2). The species *Dictyoconus baskilensis* SIREL was described at the basal limestone of the Thanetian Sequence (SBZ 3) of Baskil (Turkey) (Sirel, 2009). The first appearance of *Laffitteina erki* SIREL, *Rotalia trochidiformis* LAMARCK, *Kathina selveri* SMOUT and *Cuvillierina sireli* İNAN is in Selandian and they range up into the Thanetian (Inan and Inan, 2008). The agglutinated form, like *Fallotella alavensis* MANGIN, which is indicative of very shallow water, and belongs to the SBZ 3 (Scheibner and Speijer, 2009 and Serra-Kiel *et al*., 1998), also the presence of *Operculina heberti* MUNIER-CHALMAS indicates the SBZ 3 (Tosquella *et al*., 1998). The species *Hottingerina lukasi* DROBNE was identified in Slovenia in SBZ4 (Drobne, 1975) and it ranges throughout the SBZ 4 (Late Thanetian**)** to SBZ 6 (Early Ilerdian) in Oman (White, 1992). *H. lukasi* was considered by Serra-Kiel *et al*. (1998) and Scheibner and Speijer (2009) as index fossil of SBZ 4, also it was described in the Galala Mountains (Egypt) from the SBZ 4 (Gietl, 1998, Kuss and Leppig, 1989). The species *Miscellanea miscella* is described within SBZ 4 in the Galala Mountains (Scheibner and Speijer, 2009), whereas *Miscellanea miscella* ranges from SBZ 4 to SBZ 5 (Serra-Kiel *et al*, 1998) and *Miscellanea juliettae* ranges from SBZ 3 to SBZ 4 (Inan and Inan, 2008). According to Serra-Kiel *et al*. (1998), the species *Idalina sinjarica* ranges between SBZ 3 – SBZ 6, and *Nummulites praecursor* is restricted to the SBZ 7. The species *Operculina salsa* and *Operculina subsalsa* indicate Late Paleocene (Baig and Munir, 2007). The species *Cibicides nammalensis* has been recorded from the Late Paleocene of Salt Range (Haque, 1956) and Hazara area (Latif, 1976) from Pakistan. Serra-Kiel *et al*. (1998) reported that the first occurrence of the genus *Orbitolites* and *Alveolina globosa* is in the SBZ 5 and SBZ 6. Khosrotehrani *et al*. (2005) and Avşar *et al*. (2010) reported that the species *Orbitolites complanatus* is in the lower part of the Middle Eocene (Lutetian) in Jahrum Formation (Shiraz), and in Yozgat Region (Turkey), respectively, whereas Özgen-Erdem (2008) reported it in Ilerdian from Tosya Region (Turkey). According to Serra-Kiel *et al*. (1998), the species *Orbitolites complanatus* belongs to SBZ 12 – SBZ 16 (Uppermost Cuisian – Lutetian) and the *Opertorbitolites transitorius* belongs to SBZ 9 (Uppermost Ilerdian).

Based on the aforementioned benthic foraminiferal species; identified in the studied three sections and comparing them with those identified in other countries, especially the biozonation of larger foraminifera of the Tethyan Paleocene and Eocene recorded by Serra-Kiel *et al*. (1998), we assigned Late Paleocene (Selandian) to early Middle Eocene (Lutetian) age to the Sinjar Formation in the studied area (Fig.4).

CONCLUSIONS

- The Larger Benthic Foraminifera are recorded and systematically classified in the studied region.
- Thirty genus and twenty five species, which belong to sixteen families have been identified.
- Two zones have been recognized: Larger Benthic Foraminifera Zone and Red Algae and Coral Zone.
- Two subzones have been recognized within the Larger Benthic Foraminifera Zone: A subzone rich in soritids, in the lower part and a subzone rich in rotaliids; in the upper part.
- The age Selandian – Lutetian has been assigned to the Sinjar Formation in the studied area.

Appendix: Taxonomic list

Order: Foraminiferida EICHWALD, 1830
Family: Acervulinidae SCHULTZE, 1854
Genus: *Sphaerogypsina* GALLOWAY, 1933
Species: *Sphaerogypsina globula* REUSS, 1848

Suborder: Miliolina DELAGE and HEROUARD, 1896
Superfamily: Alveolinacea EHRENBERG, 1839
Family: Alveolinidae EHRENBERG, 1839
Genus: *Alveolina* d'ORBIGNY, 1826
Species: *Alveolina globosa* LEYNERIE, 1846
Species: *Glomalveolina* sp.

Family: Austrotrillinidae LOEBLICH and TAPPAN, 1986
Genus: *Austrotrillina* PARR, 1942
Species: *Austrotrillina eocaenica* HOTTINGER, 2007

Family: Cibicididae CUSHMAN, 1927
Genus: *Cibicides* MONTFORT, 1808
Species: *Cibicides nammalensis* HAQUE, 1956

Family: Coskinolinidae MOULLADE, 1965
Genus: *Coskinolina* STACHE, 1875
Species: *Coskinolina* sp.

Family: Discocyclinidae GALLOWAY, 1928
Genus: *Discocyclina* GÜMBEL, 1870
Species: *Discocyclina varians* KAUFMANN, 1867

Family: Rotaliidae EHRENBERG, 1839
Subfamily: Rotaliinae EHRENBERG, 1839
Genus: *Rotalia* LAMARK, 1804
Species: *Rotalia trochidiformis* LAMARK, 1804
Genus: *Cuvillierina* DEBOURLE, 1955
Species: *Cuvillierina sireli* INAN, 1988
Genus: *Kathina* SMOUT, 1954
Species: *Kathina major* SMOUT**,** 1955
Species: *Kathina selveri* SMOUT, 1954
Species: *Kathina* sp.
Genus: *Laffitteina* MARIE, 1946
Species: *Laffitteina erki* SIREL, 1969
Genus: *Lockhartia* DAVIES, 1932
Species: *Lockhartia* sp.
Genus: *Ornatanomalina* HAQUE 1956
Species: *Ornatanomalina* sp.

Family: Miliolidae EHRENBERG, 1839
Genus: *Pyrgo* d'ORBIGNY, 1826
Species: *Pyrgo* sp.
Genus: *Miliola* LAMARCK, 1804
Species: *Miliola* sp.
Genus: *Quinqueloculina* d'ORBIGNY, 1826
Species: *Quinqueloculina* sp.
Genus: *Triloculina* d'ORBIGNY, 1826

Species: *Triloculina* sp.
Genus: *Idalina* SCHLUMBERGER and MUNIER-CHALMAS, 1884
Species: *Idalina sinjarica* GRIMSDALE, 1952

Family: Meandropsinidae HENSON, 1948
Genus: *Hottingerina* DROBNE, 1975
Species: *Hottingerina lukasi* DROBNE, 1975
Superfamily: Nummulitacea de BLAINVILLE, 1825

Family: Miscellaneidae SIGAL, 1952
Genus: *Miscellanea* PFENDER, 1935
Species: *Miscellanea miscella* d'ARCHIAC and HAIME, 1853
Species: *Miscellanea juliettae* LEPPIG, 1988
Species: *Miscellanea* sp.
Suborder: Rotaliina
Superfamily: Nummulitacea de BLAINVILLE, 1827

Family: Nummulitidae De BLAINVILLE, 1827
Genus: *Assilina* d'Orbigny, 1839
Species: *Assilina granulosa* d'ARCHIAC, 1853
Species: *Assilina sp*.
Genus: *Nummulites* LAMARCK, 1801
Species: *Nummulites praecursor* DE LA HARPE, 1883
Species: *Nummulites* sp.
Genus: *Operculina* d'ORBIGNY, 1826
Species: *Operculina salsa* DAVIES & PINFOLD, 1937
Species: *Operculina subsalsa* DAVIES & PINFOLD, 1937
Species: *Operculina heberti* MUNIER-CHALMAS, 1884

Family: Orbitolinidae MARTIN, 1980
Genus: *Dictyoconus* BLANCKENHORN, 1900
Species: *Dictyoconus baskilensis* SIREL, 2009
Genus: *Fallotella* MANGIN, 1954
Species: *Fallotella allavensis* MANGIN, 1954
Family: Peneroplidae SCHULTZE, 1854
Genus: *Penarchaias* HOTTINGER, 2007
Species: *Penarchaias glynnjonesi* HENSON, 1950
Genus: *Peneroplis* de MONTFORT, 1808
Species: *Peneroplis* sp.

Family: Soritidae, EHRENBERG, 1839
Genus: *Orbitolites* LAMARCK, 1801
Species: *Orbitolites complanatus* LAMARCK, 1801
Genus: *Opertorbitolites* NUTTALL, 1925
Species: *Opertorbitolites transitorius* HOTTINGER, 1972

Family: Spirocyclinidae MUNIER-CHALMAS, 1887
Genus: *Saudia* HENSON, 1948
Species: *Saudia labyrinthica* GRIMSDALE 1952

Family: Textulariidae CUSHMAN, 1927
Genus: *Textularia* DEFRANCE, 1824
Species: *Textularia* sp.

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