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Calcareous nannofossils bioevent throughout the Cretaceous -Tertiary boundary in kh-4 well, Northern Iraq

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ABSTRACT

The specified systematic study of calcareous nannofossils was carried out on successions of Shiranish and Aaliji Formations. Four Samples have taken from (Kh-4) well, between (2600-2630) m, Northern Iraq. Twenty-five species were identified. According to the identified taxa, two biostratigraphic biozones were determined, from oldest to youngest:
1- *Rienhardtites lives* Interval Biozone (CC24) Part.
2- *Fasciculithus tympaniformis* Interval Biozone (CP4) Part.
Based on the above biozones, the age of the upper part of the Shiranish Formation was defined with Early Maastrichtian because of missing the CC25 and CC26 Biozones, and the lower part of Aaliji Formation that concludes the age of Middle Paleocene because of missing the CP1, CP2 and CP3 Biozones.

Introduction

The calcareous nannoplanktons have a diversification before and after the 60 Ma with the appearance of the important Cenozoic that genera *Fasciculithus*. We have studied these genera at using a combination of biostratigraphic and assemblage analyses. Our data show that the first appearances of the genus *Fasciculithus* is time of cenozoic, suggesting that these taxa were highly specialized or that ocean environments where they lived. The interval of diversification coincided with a major turnover among nannoplankton assemblages at the Cretaceous – Tertiary mass extinction.

The Cretaceous/Tertiary (K/T) boundary event is a thoroughly debated subject due to the greatest Mass extinctions of the Phanerozoic. It marks the major extinction of more than 90% of planktonic organisms particularly calcareous nannoplankton and planktic foraminifera, many groups as ammonites were complete extinction. The fossil record does not support a single cause for this great mass extinction and therefore probable multi-event scenarios such as major volcanism, rapid climate and sea level changes and one or more impacts have been proposed. Calcareous nannofossils are one of the most sensitive groups of organisms that may provide some answers to several questions related to the cause of the K/T mass extinction. Their distribution pattern around the K/T boundary has been the subject of many researches, with a significant number of them focused on the nannofloras related to the 1ow- to middle latitude successions (Perch Nielsen, 1979; 1981; Gardin, 2002; Tantawy, 2003).

There are several of studies (sedimentary, stratigraphy and paleontology) on the boundary between Cretaceous/Tertiary, but the study of nannofossils are few because this science began newly in Iraq. The Khabaz oilfield is located 12 Km Southest of Kirkuk city between 44º 03′ 10 ″E, 45º 15′ 04″E and 35º 10′ 01 ″N, 35º 20′ 50″ N, this field is a subsurfaces anticline, the axis is extended SE – NW, 20 Km long and 5Km width of the field. Tectonically the field is located within Hamrin – Makhul subzone [1] Fig. (1).

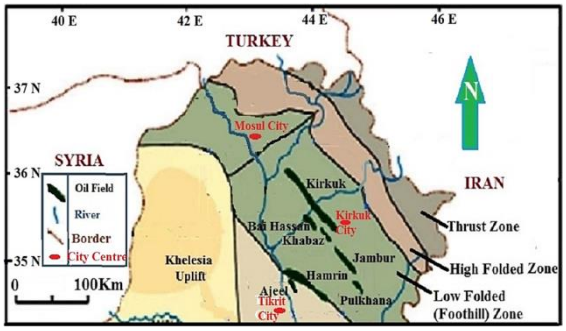


Fig. 1: Location map of the study area [1]

Materials and Method

Four core samples of marly limestone and marlstone were selected for the studying calcareous nannofossils using the thin sections (under transmitted-light microscope; Optika B-353POL Italy with M shot Digital Microscope Camera). The calcareous nannofossils are extracted using the method (H) [2]. It is an extraction method for microfossils that can be properly examined, when it is extracted from the rocks, each palaeontologist tends to have favorite methods for these procedures. The sample preparation is decanting and smear slides that provides a method for producing slides of calcareous nannofossils by small amount of the disaggregate sample, which is placed in distilled water. The cover slip is left to dry on a warm hotplate. To make permanent mounts allow the slide and residue to dry at a low temperature away from possible sources of contamination. Place a drop of mounting medium (e.g. Canada balsam) on a clean cover slip and drop this over the residue. Allow to dry before examining with transmitted light [2].

Results and Discussions

1 – Systematic Paleontology

Mesozoic Calcareous Nannofossils

Family Chiastozygaceae Rood, Hay and Barnard, 1973
Genus *Reinhardtites* Perch- Nielsen, 1968a
Reinhardtitus levis Prins and Sissingh, 1977
Genus *Zeugrhabdotus* Reinhardt, 1965
Zeugrhabdotus sp.
Family Axopodorhabdaceae Bown and Young, 1997
Genus *Nephrolithus* Gorka, 1957
Nephrolithus sp.
Family Prediscosphaeraceae Rood et al., 1971
Genus *Prediscosphaera* Vekshina, 1959
Prediscosphaera grandis Perch-Nielsen, 1979
Prediscosphaeara cf. *cretacea* (Arkhangelsky, 1912) Gartner,1968
Family Watznaueriaceae Rood et al., 1971
Genus *Watznauria* Reinhardt, 1964
Watznaueria barnesae (Black and Barnes, 1959) Perch –Nielsen, 1968
Watznauria biporta Bukry, 1969
Watznauria sp.
Family Arkhangelskiellaceae Bukry, 1969
Genus *Arkhangelskiella* Vekshina, 1959
Arkhangelskiella cymbiformis Vekshina, 1959
Family Microrhabdulaceae Deflandre, 1963
Genus *Lithraphidites* Deflandre, 1963
Lithraphidites quadratus Bramlette and Martini, 1964
Lithraphidites sp
Genus *Microrhabdulus* Deflandre, 1959
Microrhadulus decuratus Deflandre, 1959
Family Polycyclolithaceae Varol, 1992
Genus *Micula* Vekshina, 1959
Micula staurophora (Gardet, 1955) Stradner, 1963
Micula swastika Stradner and Steinmetz, 1984
Micula sp.
Genus *Ceratolithoides* Bramlette and Martini, 1964
Ceratolithoides aculeus (Stradner, 1961) Prins and Sissingh, 1977

Cenozoic Calcareous Nannofossils

Family Prinsiaceae Hay and Mohler, 1967
Genus *Prinsius* Hay and Mohler, 1967
Prinsius Martini (Perch-Nielsen, 1969) Haq, 1971
Family Braarudosphaeraceae Deflandre, 1947
Genus *Biantholithus* Bramlette and Martini, 1964
Biantholithus sparsus Bramlette and Martini, 1964
Family Discoasteraceae Tan, 1927
Genus *Discoaster* Tan,1927
Discoaster elegans Bramlette and Sullivan, 1961.
Discoaster sp.
Family Fasciculithaceae Hay and Mohler, 1967
Genus *Fasciculithus* Bramlette and Sullivan,1961
Fasciculithus bobii Perch-Nielsen, 1971.
Fasciculithus clinatus Bukry, 1971
Fasciculithus tympaniformis Mohler and Roth, 1967.
Fasciculithus sp.
Family Heliolithceae Hay and Mohler, 1967
Genus *Heliolithus* Bramlette and Sullivan, 1961
Heliolithus sp.

2- Biostratigraphy

The detailed systematic study of Cretaceous nannofossils was correlated out on succession of the Shiranish and the Aaliji Formations. Four samples have taken from KZ-4 well between depths (2600–2630 m), twenty-five species were identified. There are many previous studies on the contact between the Shiranish and the Aaliji Formations from sedimentary and stratigraphy determine of the foraminifera of importance because it represents an unconformity contact between sequence Cretaceous / Paleocene as indicated most studies to presence of unconformity surface (Fig.2).[3,4] indicated to contact surface and subsurface between the Shiranish and the Aaliji Formations unconformity in all areas middle and north of Iraq because loss of Late Maastrichtian–Early Paleocene. The [5] indicated unconformity surface between the Shiranish and the Aaliji Formations in well KZ-4 depending on planktonic foraminifera; the Late Maastrichtian – Early Paleocene is missing. Nannofossils important group of fossils is divided and correlated the Upper Cretaceous and the Paleogene rocks on global a scale, but a few study was conducted in Iraq. The study the contact between the Upper Cretaceous and the Paleocene selected and described as following:

1 – *Rienhardtites lives* Interval Biozone.
This zone part of index species *Rienhardtites lives*, it determined in the upper part of the Shiranish Formation/Maastrichtion age. Lower boundary of this zoneis determinatedbased on the first appearance of *Arkhangelskiella cymbiformis* and *Bianolithordus sparsus*, upper boundary of this zone first appearance of the *Fasciculithus clinatus* and thickness of this zone is 15 m. This zone is correlated with *Gansserina gansseri* zone of the planktonic foraminifera [6,7,8,9,10]. In Iraq the correlation to *Gansserina gansseri* Zone, it determined studied by [6,11,12,13,14,15,16] (Age of the zone Early Maastrichtian. (Fig. 2).
2 - *Fasciculithus tympaniformis* Interval Biozone.
The zone is part of index fossil *Fasciculithus tympaniformis* in the Aaliji Formation Middle Paleocene age. The lower boundary is represented by the first appearance of *Fasciculithus tympaniformis* and *Fasciculithus clinatus*, Thikness of this zone 15 m in lower part of the Aaliji Formation. This zone is correlated to *Globorotalia uncinata* Zone, it determined of [11,17,18] and *Morozovella angulata* zone of determined at [3]. This zone is correlated *Morozovella angulata* Zone of planktonic foraminifera determine outside of Iraq from several others [19,20,21,22]Age of this zone Middle Paleocene (fig. 2).

Conclusion

1 – The study identified twenty-five species of calcareous nannofossils.
2 – Two of calcareous nannofossils biostratigraphic zones are determined these are from oldest to youngest:
a- *Rienhardtites lives* Interval Biozone CC24 part.
b- *Fasciculithus tympaniformis* Interval Biozone CP4 part.
3 - The age of the upper part of the Shiranish Formation is Early Maastrichtian, and the lower part of the Aaliji Formation is Middle Paleocene.
Therefore, there are Hiatus by missing CC25 and CC26 zones, and missing CP1, CP2 and CP3 zones at the boundary between Cretaceous and Tertiary.

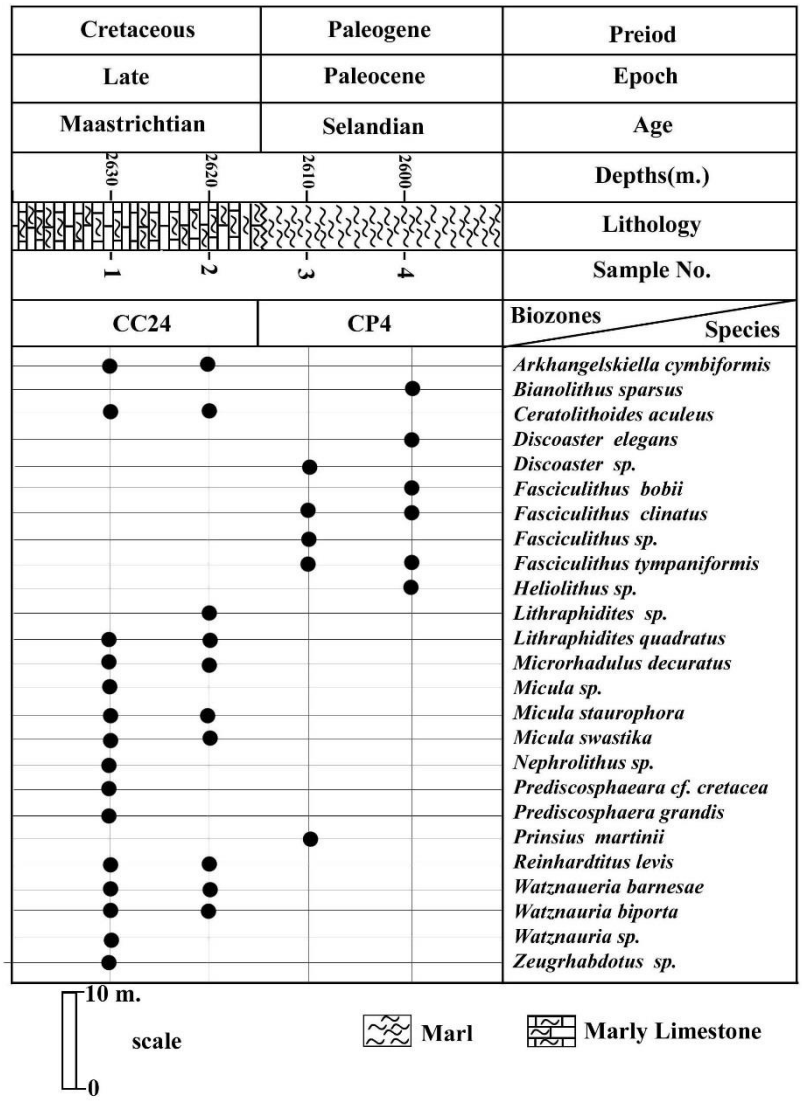


Fig. 2: Stratigraphic Range chart in study well

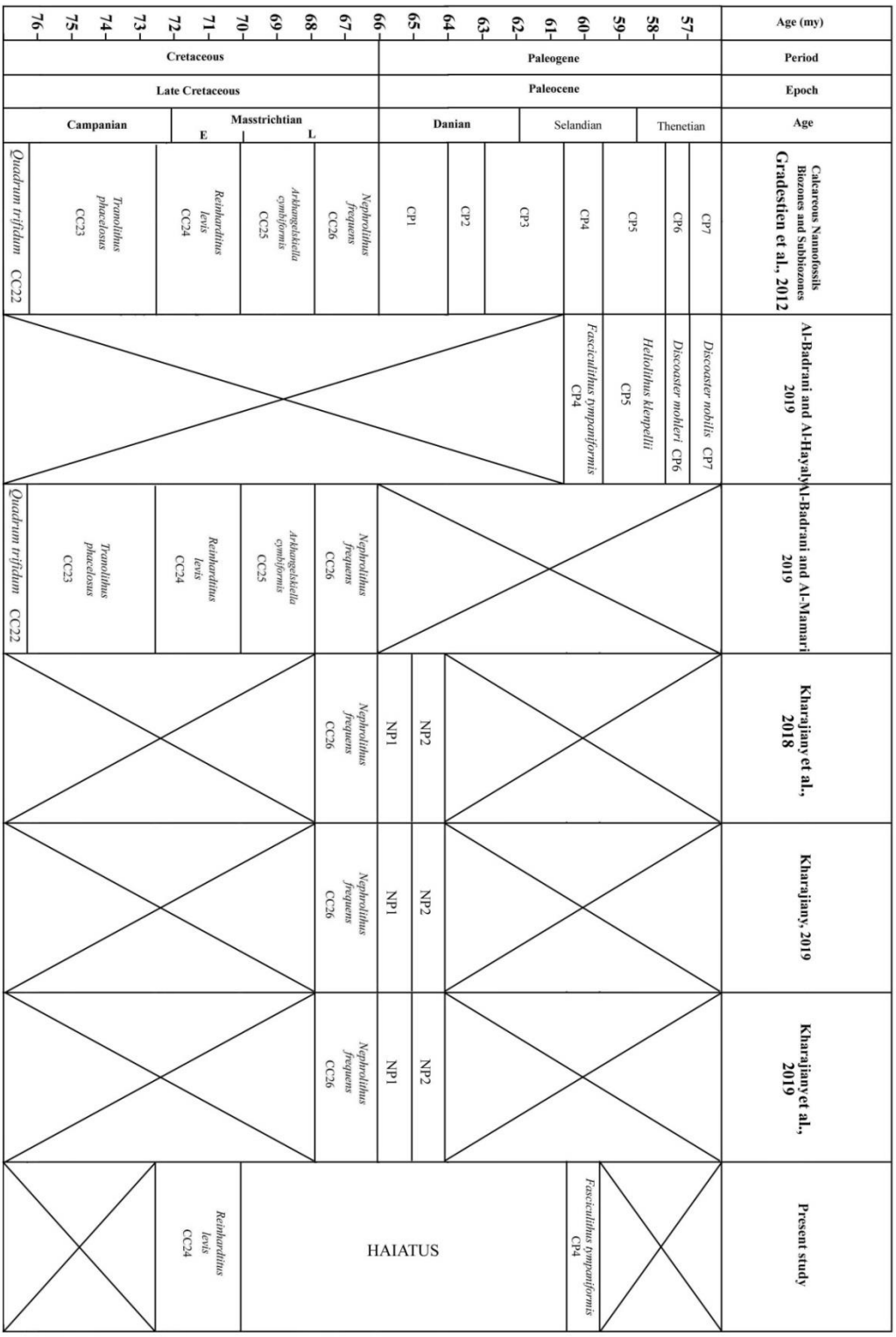


Fig. 3: Correlation chart for the studied section.

Plate- 1
Mesozoic Calcareous Nannofossils
1 - *Arkhangelskiella cymbiformis* Vekshina, 1959.
2 - *Ceratolithoides aculeus* (Stradner, 1961) Prins and Sissingh, 1977.
3 - *Lithraphidites quadratus* Bramlette and Martini, 1964.
4 - *Lithraphidites* sp. 5 - *Microrhadulus decuratus* Deflandre, 1959.
6 - *Micula staurophora* (Gardet, 1955) Stradner, 1963.
7 - *Micula swastika* Stradner and Steinmetz, 1984. 8- Micula sp.
9 - *Nephrolithus* sp.
10 -*Prediscosphaera grandis* Perch-Nielsen, 1979
11- *Prediscosphaeara* cf. *cretacea* (Arkhangelsky, 1912) Gartner,1968 .
12 - *Reinhardtitus levis* Prins and Sissingh, 1977
13 - *Watznaueria barnesae* (Black and Barnes, 1959) Perch –Nielsen, 1968
14-*Watznauria barnesae*.
15 - *Watznauria biporta* Bukry, 1969
16 - *Zeugrhabdotus* sp.

Plate- 2
Cenozoic Calcareous Nannofossils
1-*Bianolithus sparsus* Bramlette and Martini, 1964
2-*Discoaster elegans* Bramlette and Sullivan, 1961.
3- *Discoaster* sp.
4-*Fasciculithus bobii* Perch-Nielsen, 1971.
5-*Fasciculithus clinatus* Bukry, 1971
6-*Fasciculithus tympaniformis* Mohler & Roth, 1967
7-*Fasciculithus* sp.
8-*Heliolithus* sp.
9-*Prinsius martinii* (Perch-Nielsen, 1969) Haq, 1971

Plate 1
Mesozoic Calcareous Nannofossils

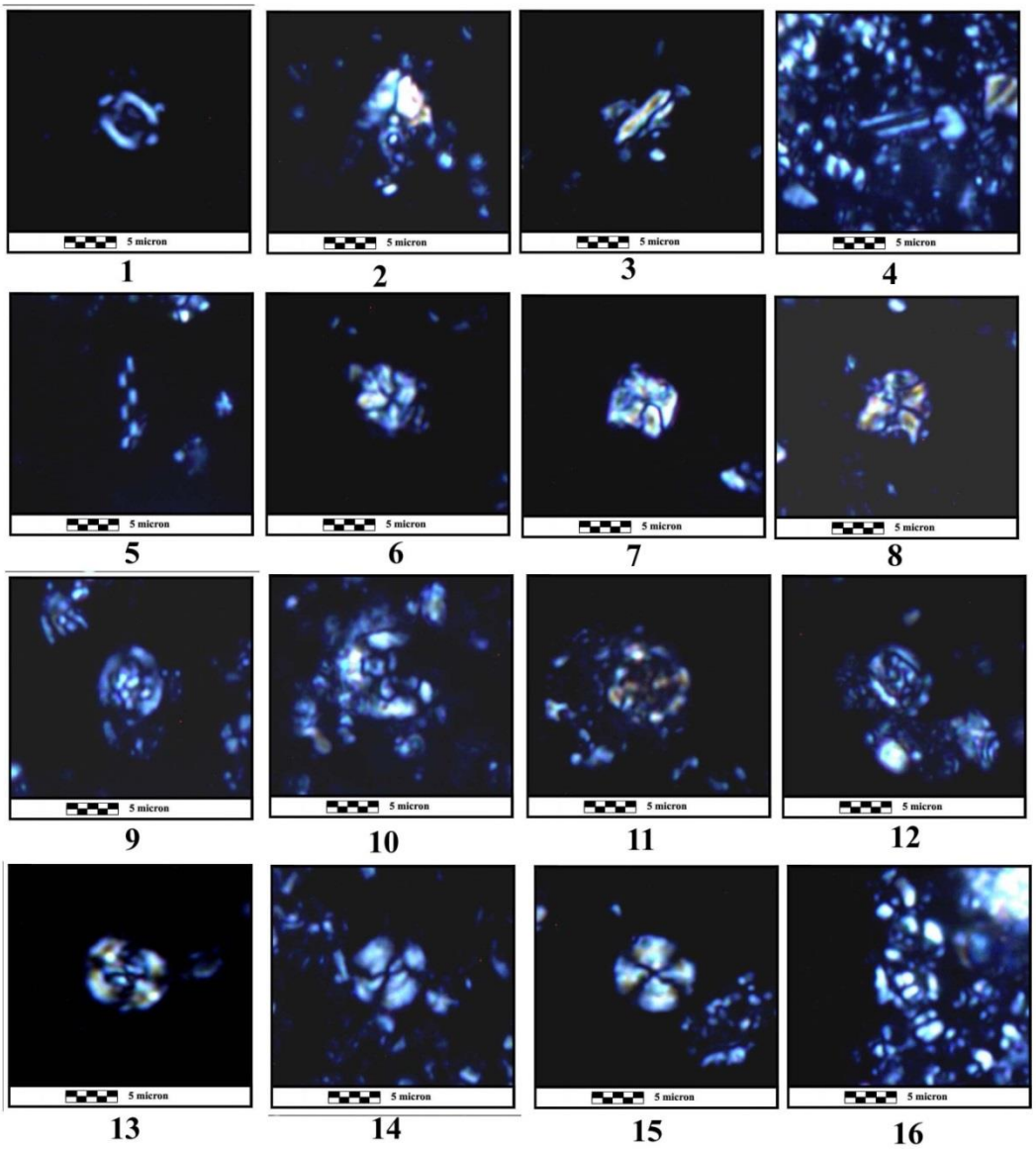
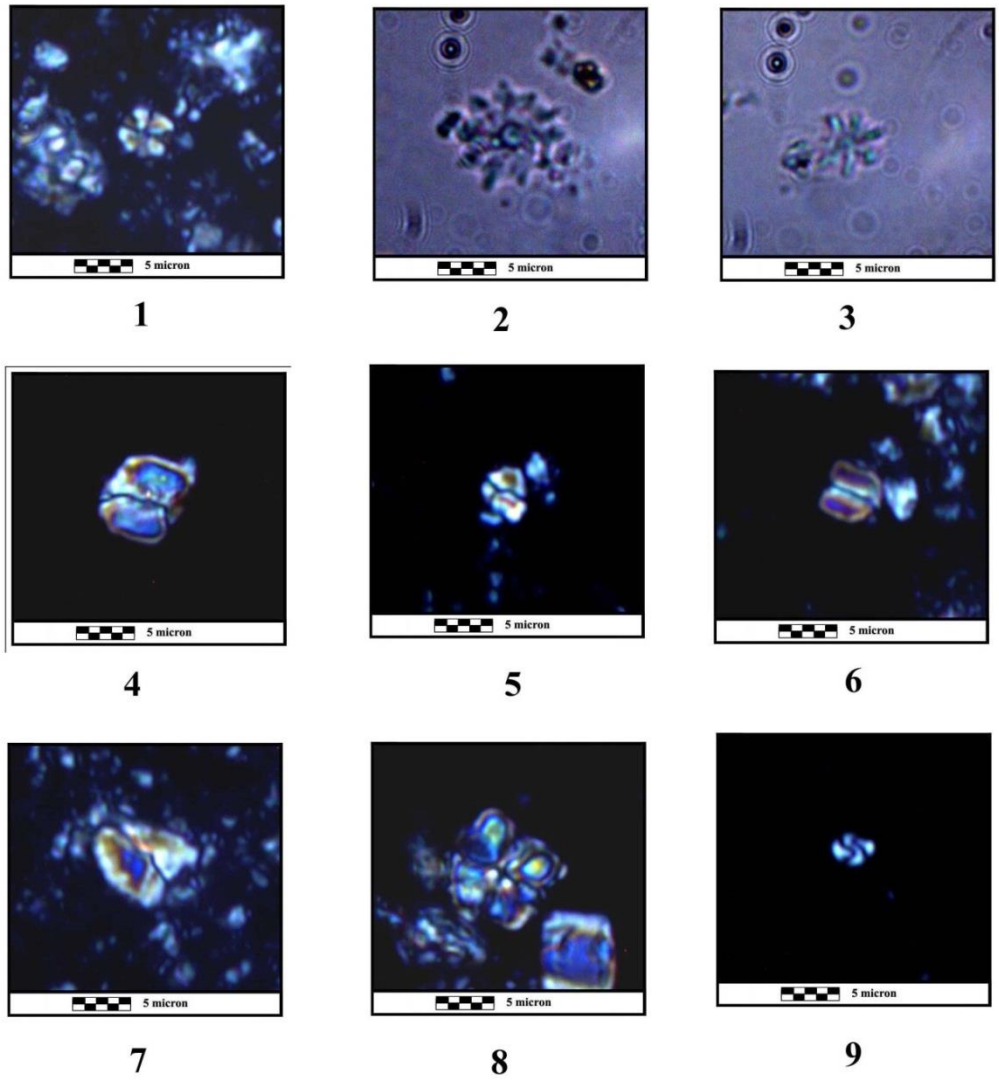


Plate 2
Cenozoic Calcareous Nannofossils



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التغير الأحيائي لمتحجرات النانو الكلسية خلال الحد الكريتاسي – التيرشري، شمالي العراق.

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الملخص

درست متحجرات النانو الكلسية بصورة تفصيلية لتتابعات تكويني شرانش وعليجي، لأربعة نماذج في بئر (Kh-4) ما بين الاعماق (2600–2630) متر، شمالي العراق. سجل خمسة وعشرين نوع، وطبقا لامتداداتها تم تحديد نطاقين حياتيين هما من الاقدم الى الاحدث:

1.*Rienhardtites lives* Interval Biozone (CC24) Part.
2. *Fasciculithus tympaniformis* Interval Biozone (CP4) Part.

بالاعتماد على النطاقين اعلاه تم استنتاج بان الجزء الاعلى من تكوين شرانش بعمر الماسترختيان المبكر حيث لم يسجل النطاقين (CC25) و (CC26)، وان الجزء السفلي لتكوين عليجي بعمر الباليوسين الاوسط بسبب فقدان الانطقة (CP1) و (CP2) و (CP3).