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Nannobiostratigraphy of Serikagni Formation in Southern limb of Sinjar anticline, Northwestern Iraq

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Abstract

Investigations of calcareous nannofossils were done on the Serikagni Formation in the southern limb of the Sinjar anticline northwest of Iraq, specifics of the identification process's investigation (18 species of calcareous nannofossils belonging to 10 genera). Two biozones were proposed in this study based on their stratigraphic distribution, and they are as follows: *Triquetrorhabdulus carinatus* partial range Biozone CN1 and *Sphenolithus belemnos* Interval Biozone CN2. Correlation with other calcareous nannofossil biozones from regional schemes led to the conclusion that the Serikagni Formation's age is Early Miocene (Aquitanian)in the studied sections. It can conclude from higher speciation for calcareous nannofossils that the bloom at the Miocene because of increased temperature impacts climate change on the warm ocean's ecosystem.

Keywords: Calcareous nannofossils; Serikagni; Miocene; Iraq.

الطباقية الحياتية لمتحجرات النانو الكلسية لتكوين سريكاكني في الجناح الجنوبي لطية سنجار المحدبة، شمال غربي العراق.

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الخلاصة

تمت دراسة متحجرات النانو الكلسية لمقطع من تكوين سريكاكني على الجناح الجنوبي لطية سنجار المحدبة في شمال غرب العراق، حيث تم تشخيص 18 نوعا تعود الى 10 اجناس من متحجرات النانو الكلسية.وبالاعتماد على الانتشار الطباقي لافراد هذه الانواع تم تحديد نطاقين حياتيين ***Triquetrorhabdulus carinatus*** **Interval Biozone CN1 and** ***Sphenolithus belemnos*** **Interval Biozone CN2.**

بعد اجراء المقارنة والمضاهاة لهذين النطاقين الحياتيين مع مخططات الانطقة الاقليمية لمتحجرات النانو الكلسية تم استنتاج ان عمر تكوين سريكاكني هو المايوسين المبكر(اكوانيان) في المقطع المدروس. كذلك ان التنوع الحاصل في متحجرات النانو الكلسية يدل على ازدياد الحرارة ودفئ في مياه المحيطات .

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Introduction

One of the several formations that make up the exposed sequence of the Sinjar anticline is the Serikagni Formation (lower Miocene), while the Shiranish Formation represents the late Cretaceous age and has the oldest exposed rocks. The Serikagni Formation is extensively exposed in a limited area surrounding the Sinjar anticline in northwest Iraq[1]

The type section can be found at (lat. 36°20'30" N., long. 41°29'00" E.), near the Jebel Sinjar and the Bara area. According to [2], the Serikagni Formation (lower Miocene) is overlain either conformably and generally gradationally by the Dhiban Formation (anhydrite) or unconformably by the Jeribe Formation. The lower boundary of the Serikagni Formation is unconformity bounded with Ibrahim Formation [2,3]. The researcher [4] studied the biozones of the Serikagni Formation near Sinjar city and found that age of this Formation is Early Miocene. The researcher [5] was study the Serikagni Formation's microfossils, biostratigraphy, and paleoecology in the Goulat area (Sinjar anticline) and established the Formation's age as the Early Miocene (Aquitanian to Burdigalian). She assumed the paleoenvironment as an open marine environment in tropical and subtropical conditions. According to [6], the Serikagni Formation in the Sinjar region returns to the Early Miocene. According to [7], the Serikagni Formation is a part of the Arabian Plate Tectonostratigraphic Megasequence eleven (AP11), which spans from the latest Eocene to the present (Figure 1). This mega-sequence is subdivided by [7] into three sequences, and the Serikagni Formation, together with the Euphrates, Dhiban, Ghar, Jeribe, and Fat'ha Formations, is a part of the middle sequence (Early to Middle Miocene Sequence) (Figure 1).

Serikagni Formation formed in the Conditions of compression prevailed before, during and after the Early Miocene which Deep marine facies were deposited in the Sinjar Graben [8]. Serikagni Formation represents central basin sediments and is equivalent to the shallow basin of the Euphrates Formation [9]. Only two studies using calcareous nannofossils deal with Miocene biostratigraphy in Iraq doen by [10,11], which definitive M. Miocene nannobiostratigraphy (Fatha Formation).

Materials and Methods

Data for this study was generated from ten samples are collected from the outcrops representing the Serikagni Formation in the southern limb of the Sinjar anticline (Jaddala section (Figure 2). samples were collected according to lithology, colour and their variations.
Serikagni Formation in the studied area is 51 m thick and is composed of alternations of limestone and marly limestone that are arranged frequently in a regular form but are not essentially complete tempos (Figure 4). The Formation consists of succession beds of white and pale grey chalky limestone ranging in thickness from 1m to 1.5 m., with intercalation of pale grey marly limestone ranging from 0.5m to 1m. The lower contact in this section is unconformable with the underlying Ibrahim Formation(Oligocene). The upper contact is unconformable with the Jeribe Formation. Using method (H) [12], the Nannofossil Slides are prepared. The information and pictures are set aside in the Department of Geology at the University of Mosul, Iraq.

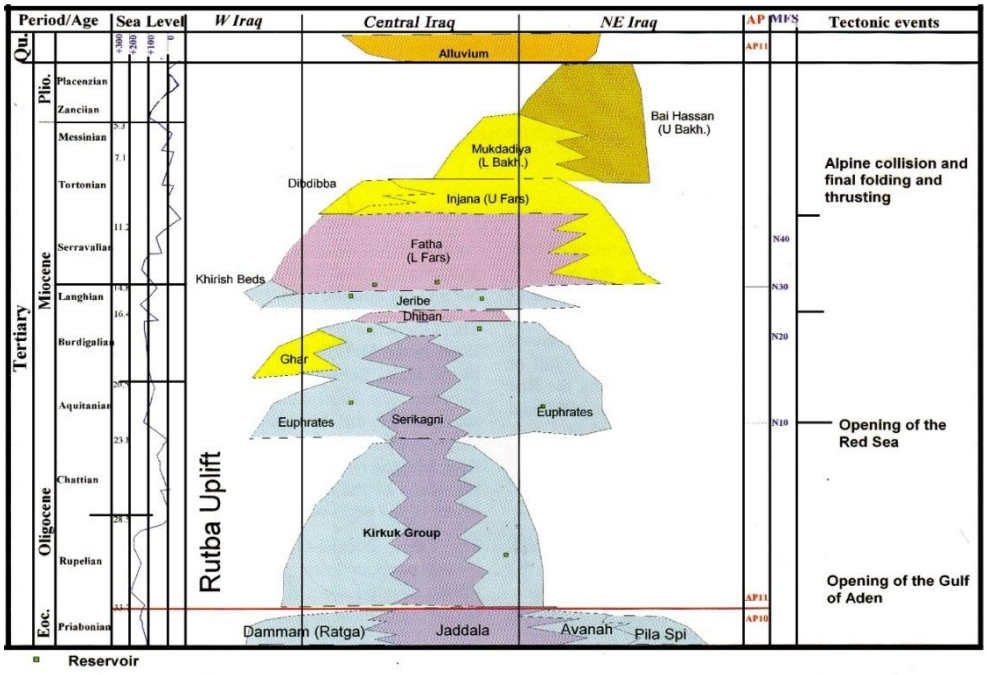

Figure 1: Stratigraphic correlation of formations from Megasequence Ap11, [7]

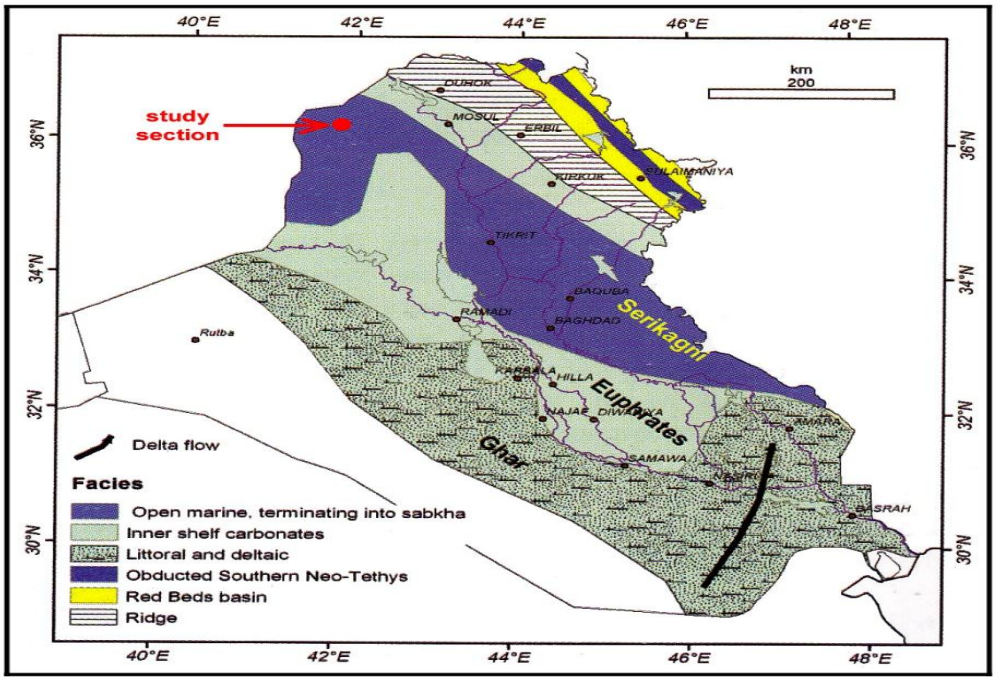

Figure 2: Paleogeography of Miocene in Iraq showing sited of Jaddala section [7]

Results

According to the systematic categorization of these fossils, there are 18 species of calcareous nannofossils based on numerous paleontological sources [13,14] (Figure 3).

Nannopaleontology
A-Heterococcolith
Family Helicosphaeraceae
Genus *Helicosphaera*
Species *Helicosphaera intermedia*
Family Pontosphaeraceae
Genus *Pontosphaera*
Species *Pontosphaera plana*
Family Coccolithaceae
Genus *Coccolithus*
Species *Coccolithus miopelagicus*
Species *Coccolithus pelagicus*
Species *Coccolithus* sp.
Family Noelaerhabdaceae
Genus *Cyclicargolithus*
Species *Cyclicargolithus abisectus*
Genus *Reticulofenestra*
Species *Reticulofenestra bisecta*
Species *Reticulofenestra dictyoda*

B- Nannoliths
Family Braarudosphaeraceae
Genus *Braarudosphaera*
Species *Braarudosphaera bigelowii*
Genus *Micrantholithus*
Species *Micrantholithus cf. pinguis*
Family Ceratolithaceae
Genus *Triquetrorhabdulus*
Species *Triquetrorhabdulus carinatus*
Family Discoasteraceae
Genus *Discoaster*
Species *Discoaster cubensis*
Species *Discoaster cf. deflandrei*
Species *Discoaster druggii*
Species *Discoaster lidzi*
Family Sphenolithaceae
Genus *Sphenolithus*
Species *Sphenolithus spiniger*
Species *Sphenolithus belemnos*
Species *Sphenolithus* sp.

Nannobiostratigraphy
1 - *Triquetrorhabdulus carinatus* partial range Biozone CN1
Definition: Partial range biozone of *Triquetrorhabdulus carinatus*, determinate by last occurrence of *Sphenolithus ciperoens*is (did not determinate recently), to the first occurrence of *Sphenolithus belemnos* .
Thickness: 23 meters
Correlation and Discussion: This biozone is correlated with CN1 (*Triquetrorhabdulus carinatus* biozone), which was thoughtful by the [15] which determinates at the late Early Miocene, and correlated *Triquetrorhabdulus carinatus* NN1, *Discoaster druggii* NN2

biozones which thoughtful by[16], which aged Early Miocene in age; and correlated with *Sphenolithus conicus* biozone *; Sphenolithus disbelemnos / Triquetrorhabdulus carinatus* biozone *; Helicosphaera euphratis* biozone*; Helicosphaera carteri* biozone CNM1-4 biozones which thoughtful by the [17], which determinates at the Early Miocene, and correlated (*Triquetrorhabdulus carinatus* biozone) which thoughtful by[18,19,20], which aged Early Miocene in age, and correlated (*Discoaster deflandrei and Discoaster druggii* biozones) which thoughtful by[21], which aged Early Miocene in age therefore we determinates the age of biozone as Early Miocene [22],(Figure 4,5).

2 - *Sphenolithus belemnos* Interval Biozone CN2
Definition: Interval biozone of Sphenolithus *belemnos*, determinate by last occurrence of *Sphenolithus belemnos*, to the first occurrence of *Sphenolithus heteromorphus* .

Thickness: 25 meters
Correlation and Discussion: This biozone is correlated with CN1 (*Sphenolithus belemnos* biozone) which thoughtful by the [15]which determinates at the late Early Miocene, and correlated *Sphenolithus belemnos* NN3 biozones, which is studied by [16], which determinates at Early Miocene in age; and correlated with *Sphenolithus belemnos* CNM5 biozones which thoughtful by the [17], which determinates at the Early Miocene, and correlated (*Sphenolithus belemnos* biozone) which thoughtful by[20, 21], which aged Early Miocene, and correlated (*Discoaster deflandrei* biozone) which thoughtful by [18,19], which aged Early Miocene, therefore, it was determinated the age of biozone as the Early Miocene [22],(Figure 4,5).

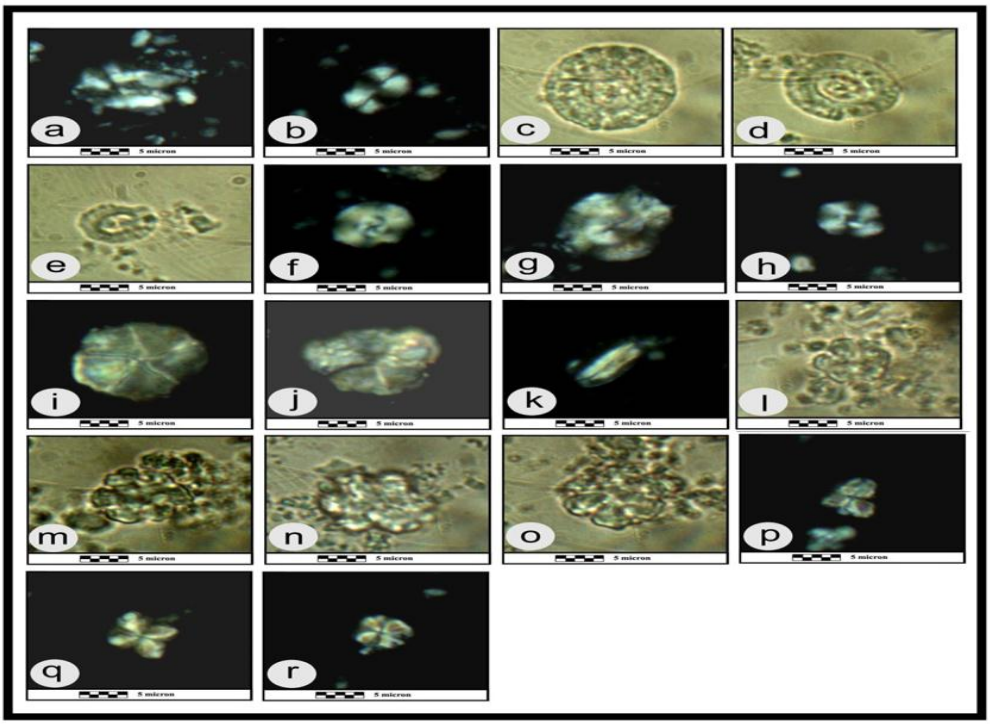

Figure 3: Polarized micrographs of calcareous nannofossil from the Serikagni Formation. *(a) Helicosphaera intermedia*; *(b) Pontosphaera plana*; *(c)Coccolithus miopelagicus*; *(d) Coccolithus pelagicus*; *(e) Coccolithus* sp.; *(f) Cyclicargolithus abisectus*; *(g) Reticulofenestra bisecta*; *(h) Reticulofenestra dictyoda*; *(i) Braarudosphaera bigelowii*; *(j) Braarudosphaera* sp.; *(k) Triquetrorhabdulus carinatus*; (l) *Discoaster cubensis*; *(m) Discoaster cf.*

deflandrei; *(n) Discoaster druggii*; (o) *Discoaster lidzi*; *(p) Sphenolithus belemnos*; *(q) Sphenolithus spiniger*; *(r) Sphenolithus* sp

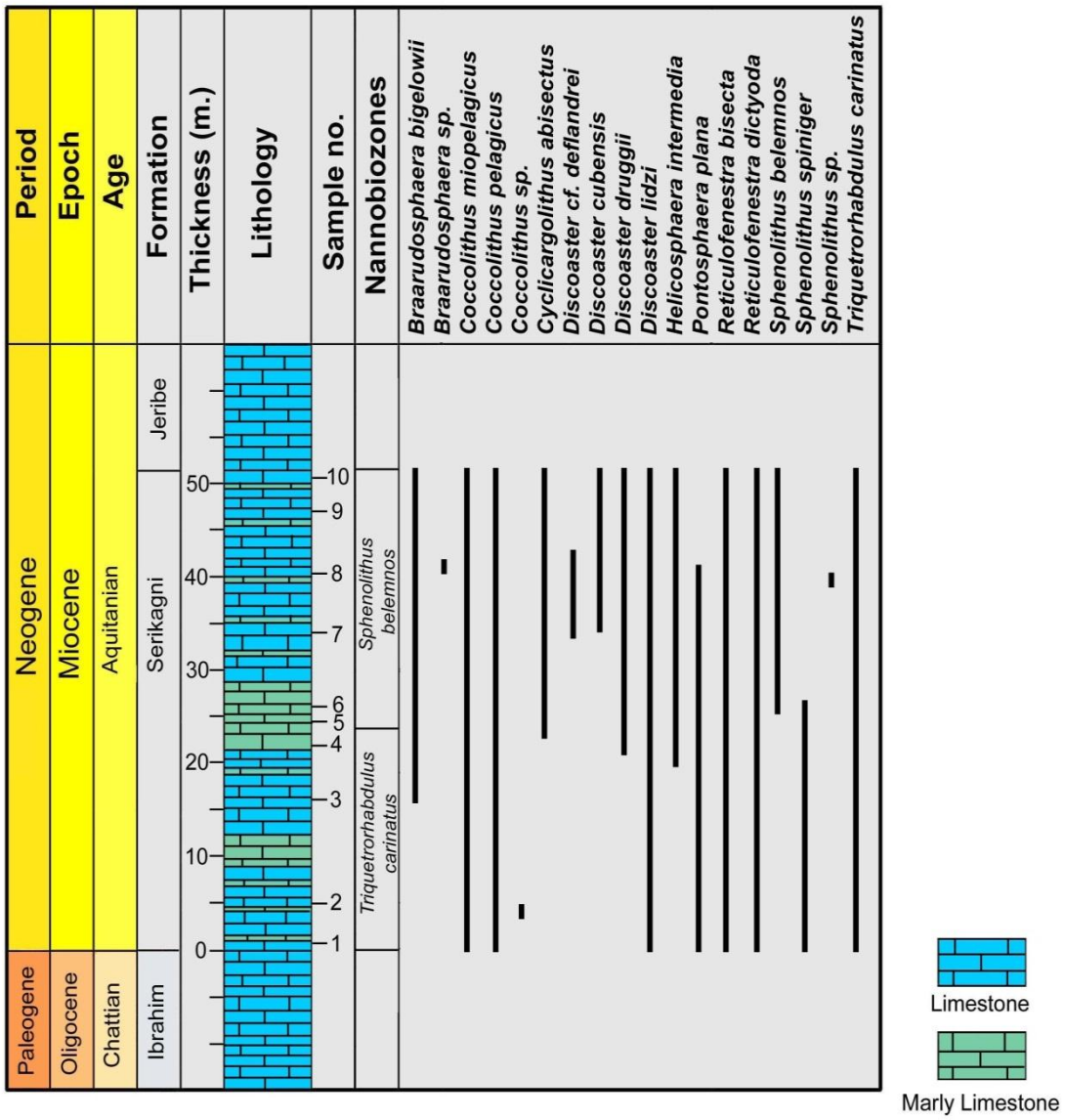

Figure 4: Range chart of calcareous nannofossils for the Serikagni Formation, Jaddala section, Northern Iraq.

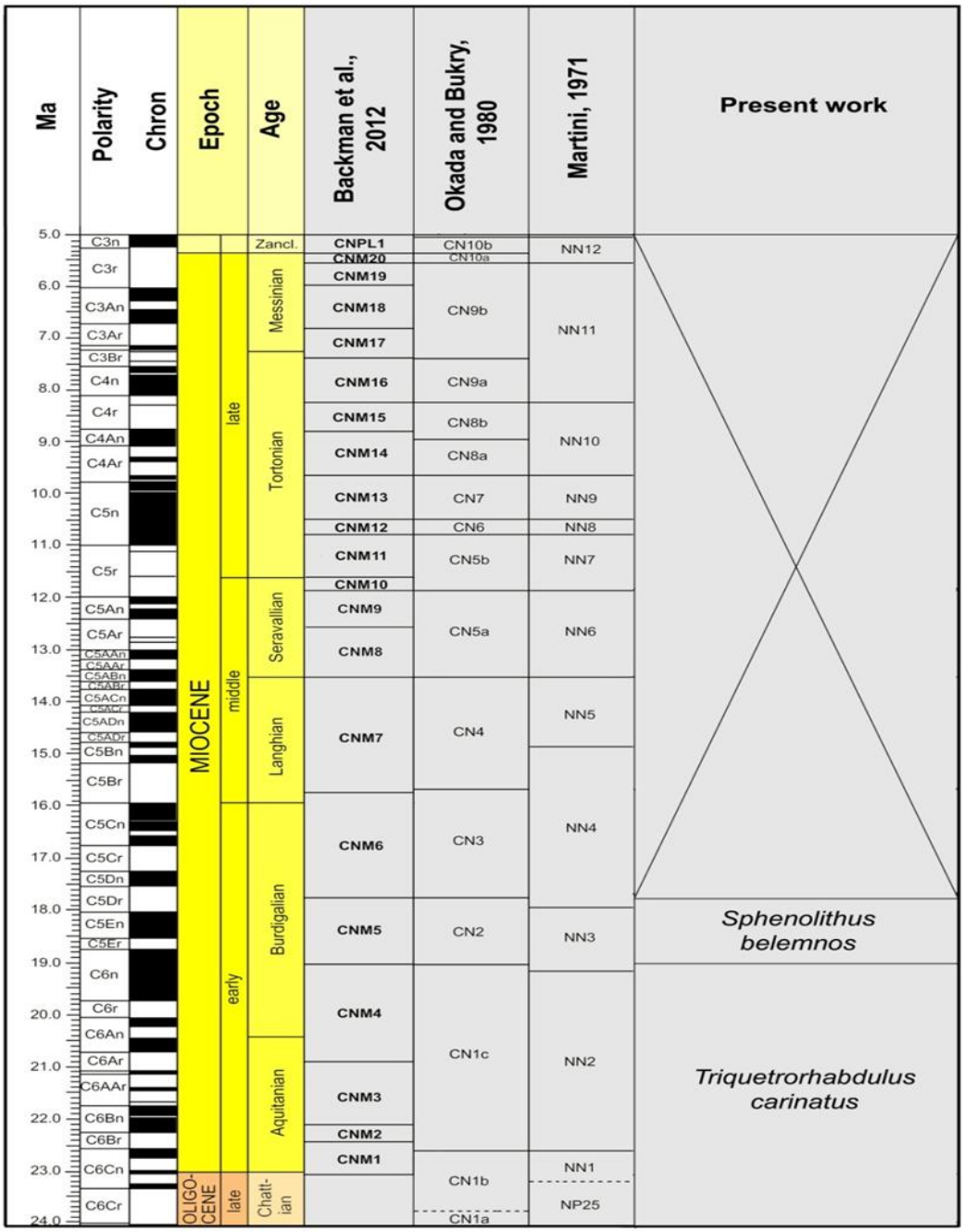

Figure 5: Chart of calcareous nannofossils age correlation for the Serikagni Formation, Jaddala section, Northern Iraq.

Paleoclimatology

Golden-brown, unicellular marine algae are called coccolithophores. Throughout their lifecycle, coccoliths, or extremely minute calcium carbonate scales, are produced. Since the late Triassic, this group has been a significant source of the calcite in the open sea. These algae have become more popular because they are essential to the global carbon cycle. Heterococcolith is the most common type of coccolith. They are mainly composed of crystal units that might vary in size and shape. The holococcolith, another less uncommon type, comprises numerous tiny crystallites that seem to calcify the extracellular environment.

In the geological record, the Miocene Paleoclimate represented worldwide warming. especially the rise in the percentage of the Discoaster genus, which is characterized by increased speciation for calcareous nannofossils. This is clearly associated with the Miocene epoch's period of global warming. The appearance of characteristics in an Iraqi Serikagni Formation setting describes the response of calcareous nannofossils (e.g., Discoaster spp.). The oligotrophic taxa with inferred abundances dominate these assemblages (Discoaster spp.). The percentage of assemblages during the Miocene is evidence of adaptation and a long-term change in the nannoplankton community that lasts past the Eocene and causes a high-latitude assemblage to disappear.

Our investigation focuses on the response of calcareous nannoplankton to Paleoclimatology based on analysis of the Serikagni Formation from Northwestern Iraq. The nannofossil assemblage fluctuations are observed at *Discoaster* spp., It can conclude from higher speciation for calcareous nannofossils that the bloom at Miocene has an increase in temperature has implications for climate change impacts on the ecosystem, suggesting possibly similar permanent changes to nannoplankton community structure as the oceans warm. (Figure 6).

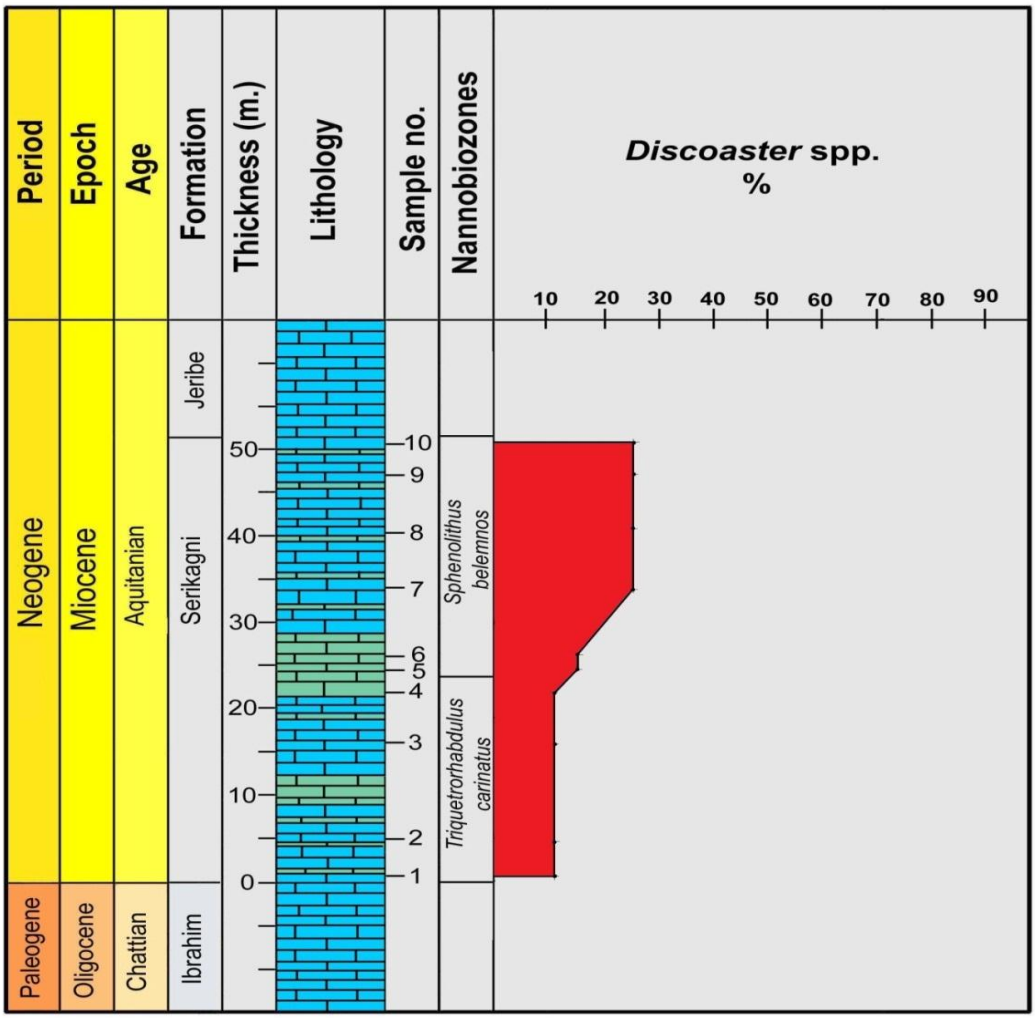

Figure 6: Percentage chart of *Discoaster* spp. for study Jaddala section

Conclusions

The outcomes of this study show that the Serikagni Formation comprises 18 species of calcareous nannofossils belonging to 10 genera. Two biozones are identified for the Serikagni Formation and they are as follows: *Triquetrorhabdulus carinatus* partial range Biozone (CN1). *Sphenolithus belemnos* Interval Biozone (CN2). The recorded two biozone are point to Early Miocene (Aquitanian) age, it can conclude from a higher increase in speciation of calcareous nannofossils has an ecosystem on the Warm Ocean.

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