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Nannobiostratigraphy of the Lower Part of Shiranish Formation, Sinjar Anticline, NW Iraq

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ABSTRACT

Fifteen samples from the lower part of Shiranish Formation, Sinjar anticline, northwest Iraq, are investigated in order to identify calcareous nannofossils species of which twelve species are recorded as follow; one species of holococcoliths, seven are heterococcoliths and four are nannolith. On the basis of the above assemblages two biozones are proposed from oldest (at bottom) to youngest (at top):

2- *Tranolithus phacelosus* Interval Zone(Part) (CC23)
1- *Lithraphidites praequadratus* Partial Zone(Part) (CC22)

The above biozones are correlated with other calcareous nannofossils biozones from regional view led to conclude that the section is late Campanian in age.

الطباقية الحياتية لمتحجرات النانو الكلسية للجزء السفلي من تكوين شرانش، طية سنجار المحدبة، شمال غرب العراق

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الملخص

تم دراسة خمسة عشر نموذج للجزء السفلي من تكوين شرانش، طية سنجار، شمال غرب العراق. لتشخيص اثنا عشرنوع من متحجرات النانو الكلسية والتي سجلت كما يلي؛ نوع واحد (هولوكوكوليث) وسبعة أنواع (هيتروكوكوليث) و أربعة أنواع (نانوليث)، وبالاعتماد على مجاميع المتحجرات أعلاه تم اقتراح نطاقين حياتيين وهما من الاقدم الى الأحدث:

2- *Tranolithus phacelosus* Interval Zone(Part) (CC23)
1- *Lithraphidites praequadratus* Partial Zone(Part) (CC22)

تم مضاهاة النطاقين اعلاه مع انطقه متحجرات النانو الكلسية اقليميا حيث تبين بان عمر المقطع المدروس هو الكامبانيان المتأخر.

INTRODUCTION

The Shiranish Formation was first described by (Henson, 1940 in Bellen *et al*., 1959) from the High Folded Zone of North of Iraq, near the village of Shiranish Islam, Northeast of Zakho. It is belongs to the most widespread units of the Upper Campanian- Maastrichtian cycle in North Iraq.

The studied section exposed at the core of Sinjar anticline, northwest Iraq, which belongs to the Foothill Zone of the Unstable Shelf of the Nubio-Arabian platform (Buday and Jassim, 1987). The present study deals with the exposed stratigraphic successions (15 samples of Shiranish Formation), limited between 36º22'45" N, 41º41'25" E and 36º22'54N, 41º41'11" (Fig.1), consists of well beded blue marly limestone with two bed of conglomerate beds (10-15 cm.) in the upper part of studied section.

Systematic Paleontology

The describtion of calcareous nannofossils species based on Young and Bown (1997) as follows :

Kingdom Protista

Class Coccolithophyceae
Family Arkhangelskiellaceae Bukry, 1969
Genus *Arkhangelskilla* Vekshina, 1959
Type species : *Arkhangelskilla cymbiformis* Vekshina, 1959

Arkhangelskilla cymbiformis Vekshina, 1959
Pl. 1, Fig. 1

Description: Heterococcoliths, placolith coccoliths with central area filled by a perforate plate divided by axial sutures. The shields are typically bright in cross polarized light. 1-2 distal shield cycles; bright unicycle LM image.

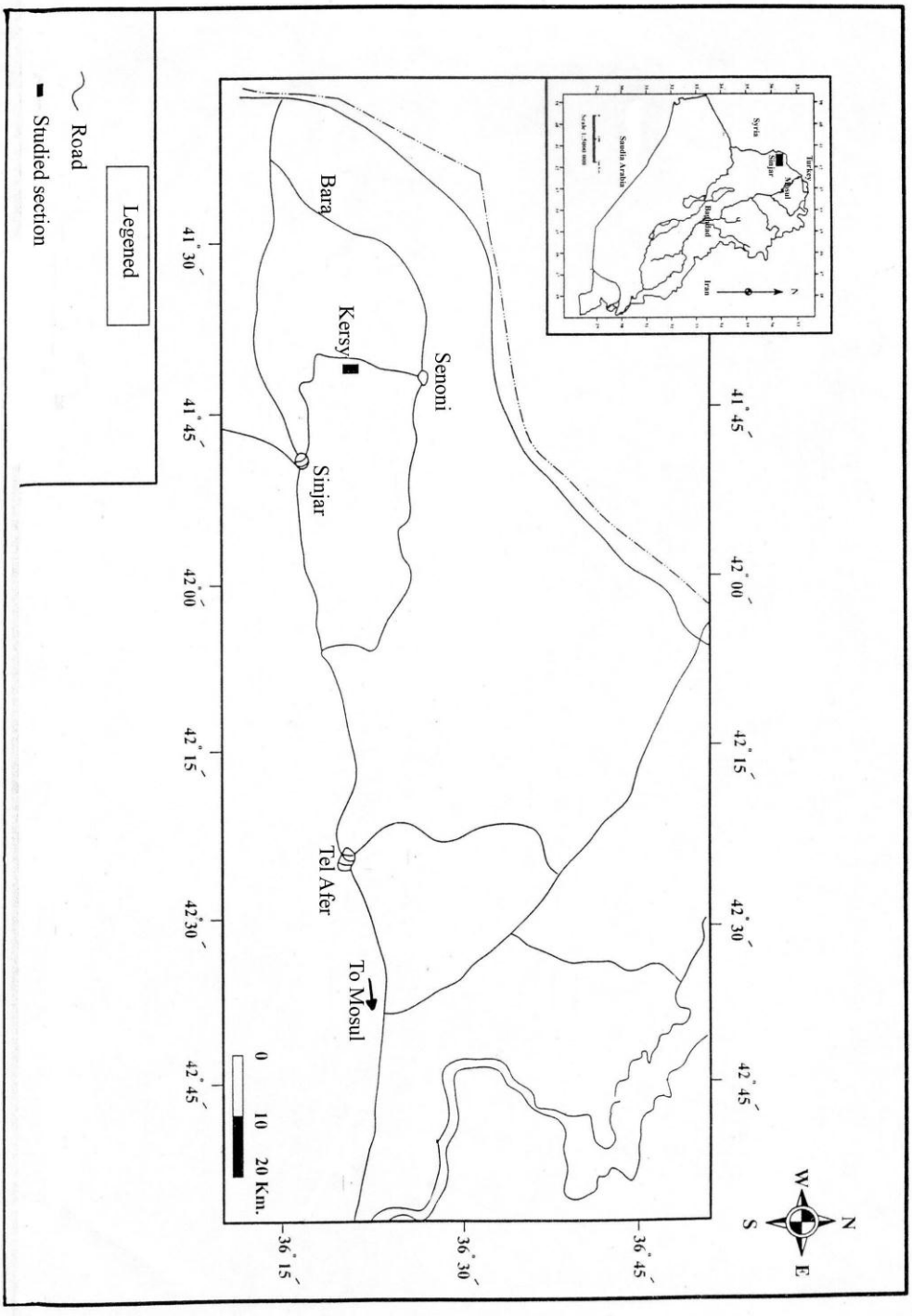

Fig. 1: Location Map of Studied Section.

Occurrences:

Authors	Age	Location
Vekshina, 1959	Maastrichtian	Siberia
Bramlette and Martini, 1964	Maastrichtian	type of Maastrichtian
Gartner, 1968	Maastrichtian	Denmark, France, Tunisia, U.S.A.
Perch-Nielsen, 1985	Campanian to Maastrichtian	World Wide
Wanderley and Aguiar, 2006	Campanian to Maastrichtian	Atlantic
Tantawy *et al.*, 2001	Campanian to Maastrichtian	Egypt
Chira *et al*., 2004	Upper Cretaceous	Romania

Arkhangelskilla sp.
Pl. 1, Fig. 2

Description: Heterococcoliths, placolith coccoliths with central area filled by a perforate plate. The shields are typically bright in cross polarized light. 1-2 distal shield cycles; bright unicycle LM image. The sutures of central area are not clear, therefore the species left under open name.

Occurrences:

Authors	Age	Location
Present work	Late Campanian	Iraq

Family Calyptrosphaeraceae Boudreaux and Hay, 1969
Genus *Calculites* Prins and Sisingh in Sissingh, 1977
Type species: *Calculites ovalis* (Stradner, 1963) Prins and Sisingh in Sissingh, 1977
Calculites obscurus (Deflandre, 1959) Prins and Sisingh in Sissingh, 1977
Pl. 1, Fig. 3

Description: Holococcolith, proximal plate of four blocks, ridged and pitted distil surface, narrow and hollow spines.

Occurrences:

Authors	Age	Location
Deflandre,1959	Santonian to Campanian	France
Perch-Nielsen,1985	Santonian to Maastrichtian	World Wide

Family Eiffellithaceae Reinhardt, 1965
Genus *Eiffelithus* Reinhardt, 1965

Type species: *Zygolithus turriseiffeli* Deflandre, 1954
Eiffelithius eximius (Stover, 1966) Perch- Nielsen, 1969
Pl. 1, Fig. 4

Description: Heterococcoliths, Loxoliths with crossbars generally fibrous and spine-bearing, central area is perforate.

Occurrences:

Authors	Age	Location
Stover, 1966	Upper Cretaceous	France
Perch-Nielsen, 1985	Turonian to Campanian	World Wide
Jiang and Gartner, 1986	Cretaceous	Texas
Watkins *et al*., 1998	Late Albian	Ghana
Chira *et al.*, 2004	Upper Cretcaeous	Romania
Lees and Bown, 2005	Upper Cretaceous	Pacific

Family Microrhabdulaceae Deflandre, 1963
Genus *Lithraphidites* Deflandre, 1963
Type species : *Lithraphidites carniolensis* Deflandre, 1963
Lithraphidites praequadratus Roth, 1978
Pl. 1, Fig. 5

Description: Nannoliths, Elongated rod-like with a cruciform or circular cross-section, which have expanded lateral blades.

Occurrences:

Authors	Age	Location
Roth, 1978	Cretaceous	Atlantic
Perch-Nielsen, 1985	Campanian to Maastrichtian	World Wide
Tantawy *et al.*, 2001	Campanian to Maastrichtian	Egypt
Wanderley and Aguiar, 2006	Campanian to Maastrichtian	Atlantic

Family Polycyclolithaceae Forchheimer 1972

Genus *Micula* Vekshina, 1959

Type species: *Micula decussata* Vekshina, 1959

Micula decussata Vekshina 1959

Pl. 1, Figs. 6,7

Description: Nannoliths, four blocky, strongly twisted, wall-cycle elements, joined along sutures which go out to the points of the cube.

Occurrences:

Authors	Age	Location
Vekshina, 1959	Maastrichtian	Siberia
Gartner, 1968	Upper Cretaceous	U.S.A.
Bukry, 1969	Upper Cretaceous	U.S.A.
Perch-Nielse, 1985	Coniacian to Maastrichtian	World Wide
Watkins *et al*., 1998	Late Albian	Ghana
Tantawy *et al.*, 2001	Campanian to Maastrichtian	Egypt
Chira *et al.*, 2004	Upper Cretaceous	Romania
Lees and Bown, 2005	Upper Cretaceous	Pacific
Wanderley and Aguiar, 2006	Campanian to Maastrichtian	Atlantic

Micula swastica Stradner and Steinmetz 1984

Pl. 1, Fig. 8

Description: Nannoliths, 4 blocky, strongly twisted, wall-cycle elements, joined along oblique sutures which go out to the points of the cube.

Occurrences:

Authors	Age	Location
Stradner and Steinmetz, 1984	Upper Cretaceous	Angola
Wanderley and Aguiar, 2006	Campanian to Maastrichtian	Atlantic

Family Prediscosphaeraceae Rood, Hay and Barnard 1971

Genus *Prediscosphaera* Vekshina, 1959

Type species : *Prediscosphaera decorate* Vekshina, 1959

Prediscosphaera cretacea(Arkhangelsky,1912) Gartner, 1968

Pl. 1, Fig. 9

Description: Heterococcoliths, elliptical to circular placoliths with two shields and a central-area spanned by cross bars which support tall. The distal shield is typically bicyclic, with a broad outer cycle.

Occurrences:

Authors	Age	Location
Arkhangesky, 1912	Upper Cretaceous	Russia
Gartner, 1968	Campanian to Maastrichtian	U.S.A.
Bukry, 1969	Upper Cretaceous	U.S.A.
Donnaly, 1989	Upper Cretaceous	Greenland
Tantawy *et al.*, 2001	Campanian to Maastrichtian	Egypt

Family Rhagodiscaeae Hay 1977

Genus *Rhagodiscus* Reinhardt, 1967

Type species: *Discolithus asper* Stradner, 1963

Rhagodiscus angustus (Stradner, 1963) Reinhardt, 1971

Pl. 1, Fig. 10

Description: Heterococcliths, Loxoliths with a dominant outer-cycle and a central-area typically filled by a plate of granular calcite. The central structure may be spine-bearing, perforate. The LM image is generally unicyclic.

Occurrences:

Authors	Age	Location
Stradner, 1963	Upper Cretaceous	Germany
Perch-Nielsen, 1985	Aptian to Maastrichtian	World Wide
Tantawy *et al.*, 2001	Campanian to Maastrichtian	Egypt

Family Zygodiscaceae Hay and Mohler 1967

Genus *Reinhardites* Perch-Nielsen, 1968

Type species: *Reinhardites anthrophorus* Perch-Nielsen, 1968

Reinhardites sp.

Pl. 1, Fig. 1

Description: Heterococcoliths, Loxoliths with variably-developed inner-cycles and a central-area spanned by a single transverse bar. The central area is not clear, therefore the species left under open name.

Occurrences:

Authors	Age	Location
Present work	Late Campanian	Iraq

Genus *Tranolithus* Stover, 1966

Type species: *Tranolithus manifrstus* Stover, 1966

Tranolithus phacelosus Stover, 1966

Pl. 1, Fig. 12

Description: Heterococcoliths, Loxoliths with variably-developed inner-cycles and a central-area spanned by a single transverse bar. LM image includes both unicyclic and bicyclic types, platelets constitute a transverse bar, and there is a proximal net of lateral bars.

Occurrences:

Authors	Age	Location
Stover, 1966	Upper Cretaceous	France
Perch-Nielsen, 1985	Albian to Maastrichtian	World Wide
Wanderley and Aguiar, 2006	Campanian to Maastrichtian	Atlantic

Incerate Sedis

Genus *Ceratolithoides* Bramlette and Martini, 1964

Type species : *Ceratolithoides kampantri* Bramlette and Martini, 1964

Ceratolithoides aculeus Stradner, 1961

Pl. 1, Fig. 13

Description: Nannoliths, conical, arrowhead- or horseshoe-shaped nannoliths.

Occurrences:

Authors	Age	Location
Stradner, 1966	Albian	Mexico
Perch-Nielsen, 1985	Campanian to Maastrichtian	World Wide
Lees and Bown, 2005	Upper Cretaceous	Pacific

Nannobiostratigraphy

Depending on the stratigraphic distribution of the recorded species, the two following biozones are identified (Fig. 2) :

1- *Lithraphidites praequadratus* Partial Range Zone (Part) (CC22)

Definition: Interval from first occurrence of *Quadrun trifidum* Vekshina (1959) to last occurrence of *Reinhardites anthophorus* (Deflandre, 1959).

Thickness: (10) meters

Boundaries and Discussion: The lower boundary of this biozone is not exposed in the studied area which marked by first occurrence of *Quadrun trifidum* Vekshina (1959) which did not record recently, the upper boundary is marked by the last occurrence of *Reinhardites anthophorus*(Deflandre, 1959), or last occurrence of *Quadrun trifidum* Vekshina (1959) (Bukry and Bramlette, 1970) or the first occurrence of *Lithraphidites praequadratus* (Roth,1978) or the first occurrence of *Lithraphidites quadratus* (Verbeek, 1976). The last occurrence of *Eiffelithius eximius* Stover, 1966 coincided with last occurrence of *Reinhardites anthophorus* (Deflandre, 1959). The zone is correlated with *Quadrun trifidum* Biozone of Bukry and Bramlette (1970) which emended by Sissingh (1977) of Late Campanian age.

2- *Tranolithus phacelosus* Interval Zone (Part) (CC23)

Definition: Interval from last occurrence of *Reinhardites anthophorus* (Deflandre, 1959) to the last occurrence of *Tranolithus phacelosus* Stover(1966).

Thickness: (48) meters

Boundaries and Discussion: The lower boundary is marked by last occurrence of *Lithraphidites praequadratus* (Roth, 1978). The upper boundary not studied which is marked by last occurrence of *Tranolithus phacelosus* Stover (1966), that was not determined in this section. This zone correlated with *Tranolithus phacelosus* zone of Sissingh (1977) which assigned to Latest Campanian age.

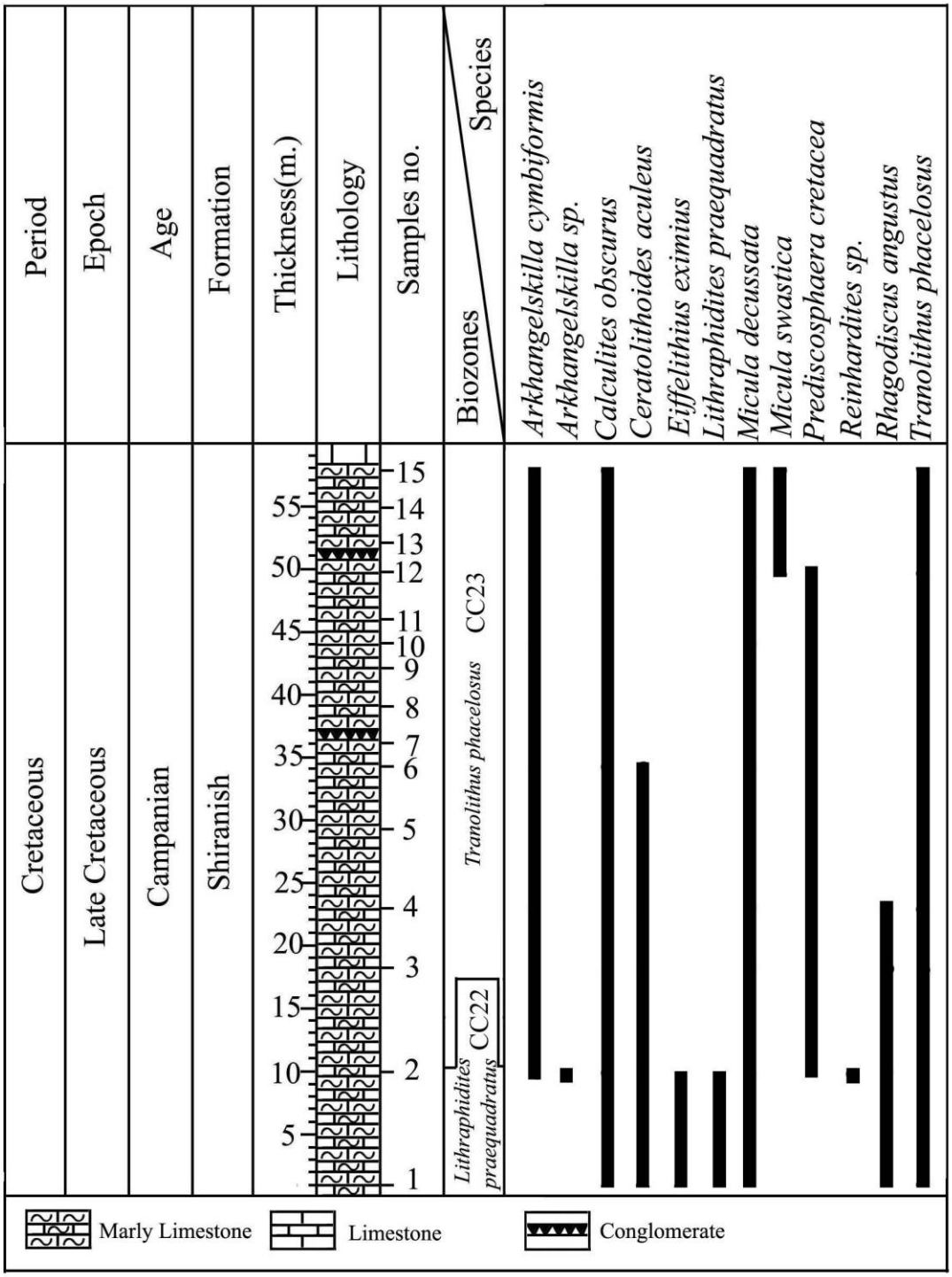

Fig. 2 : Range Chart of Calcareous Nannofossils of the Studied Section.

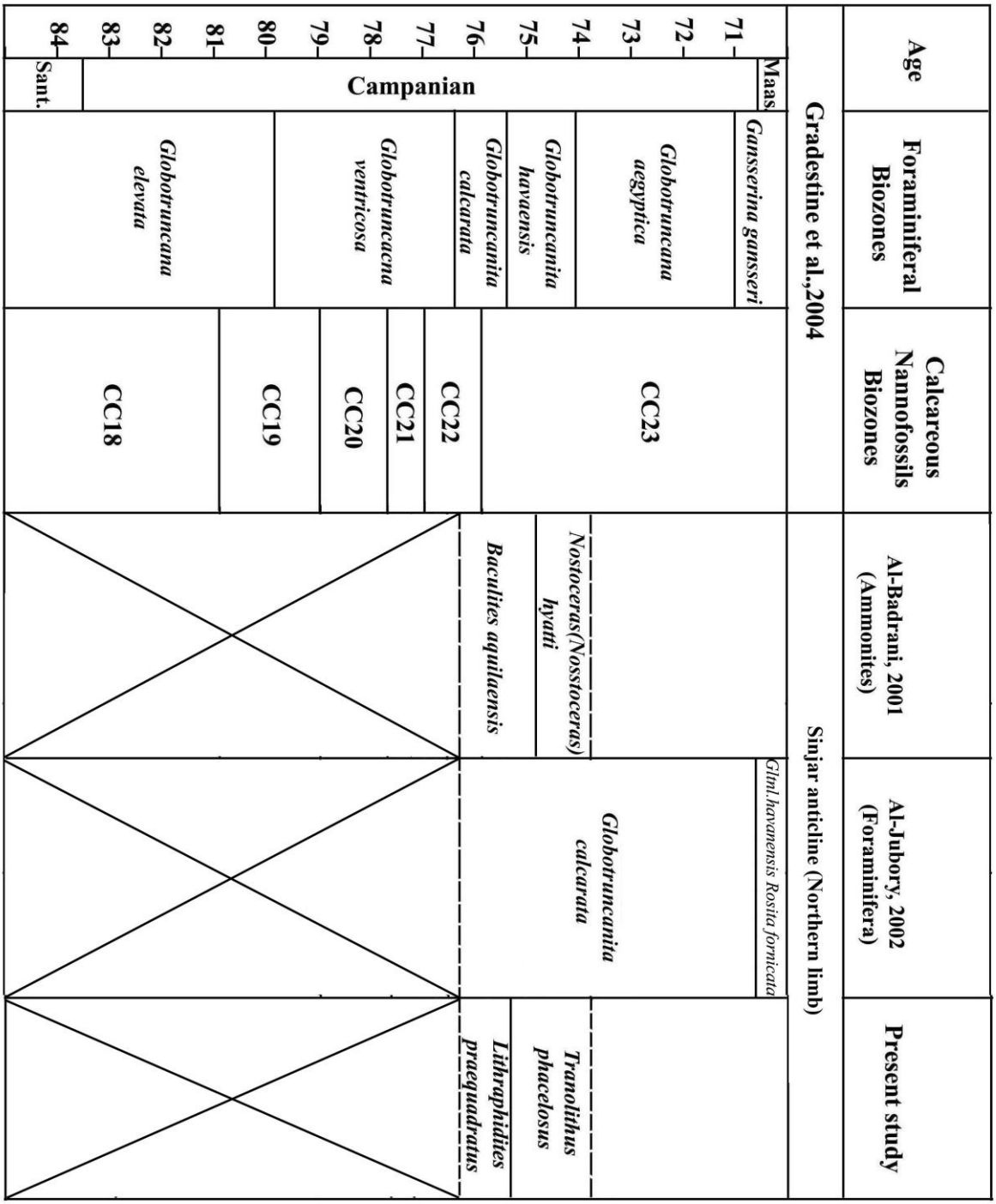

Fig. 3: Chart Showing Campanian Nannobiozones Compared with Iraqi Studies of Ammonites and Foraminifera.

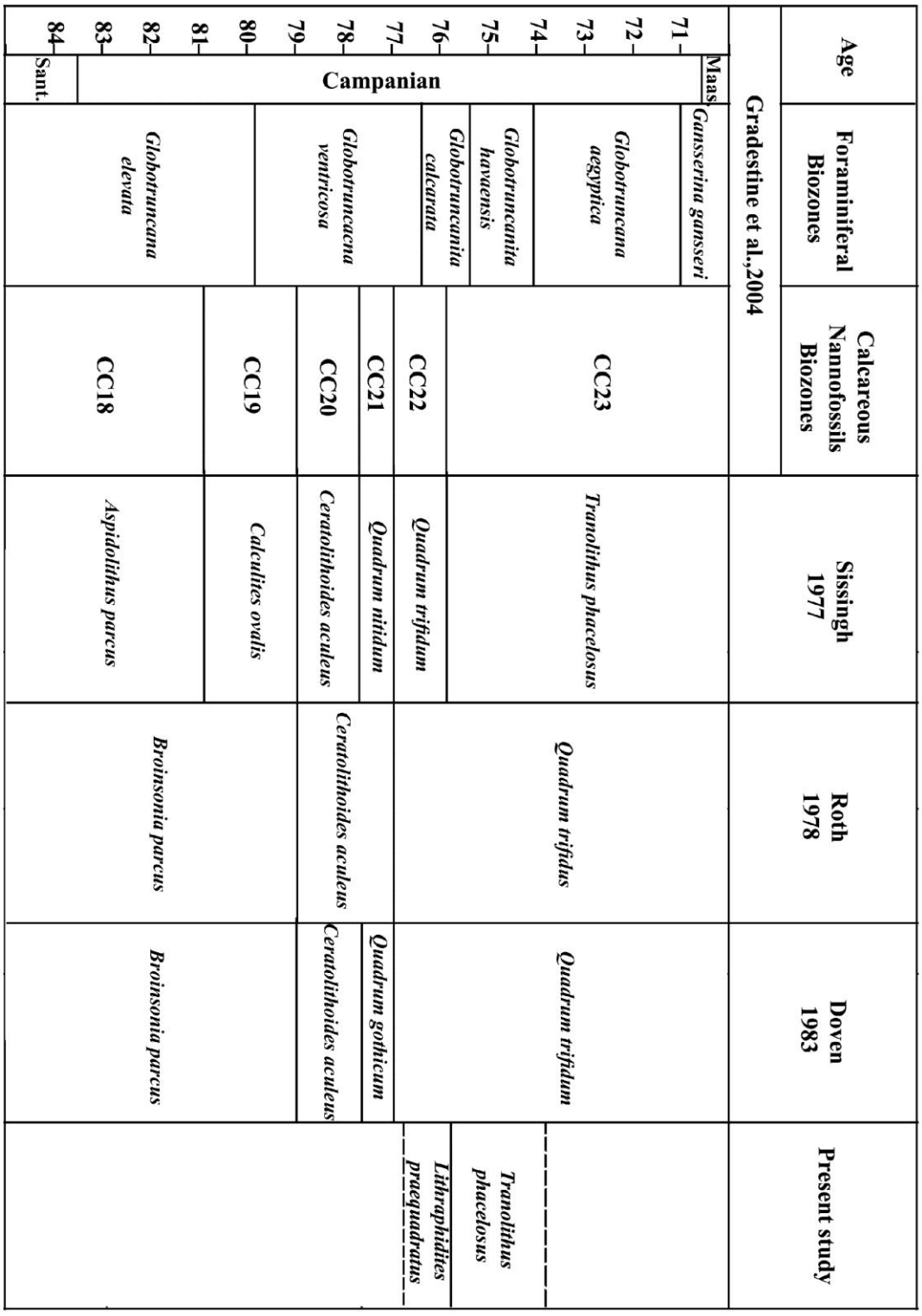

Fig. 4 : Chart Show Campanian Nannobiozones Compared to Regional Studies.

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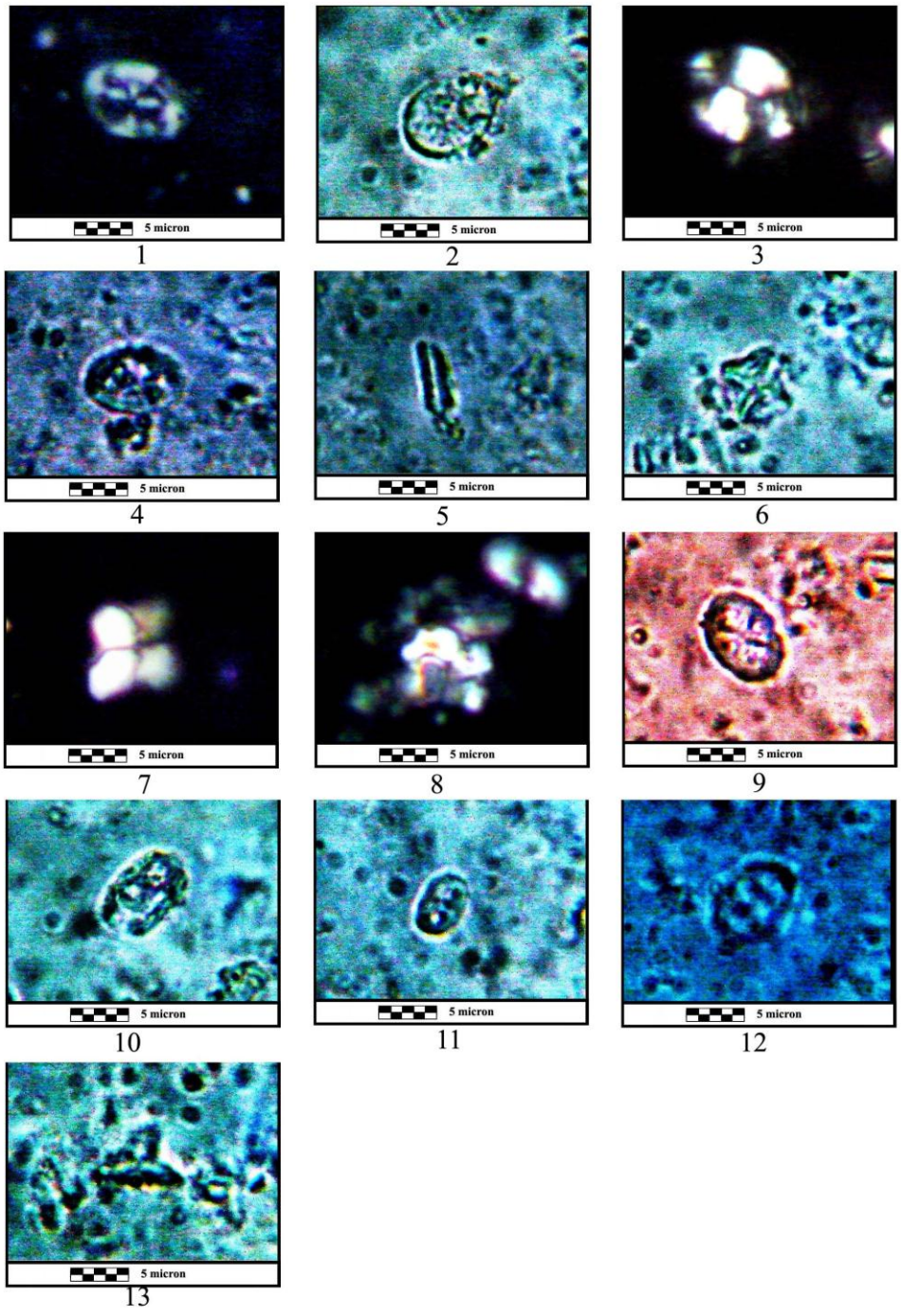
PLATE 1

1- *Arkhangelskilla cymbiformis* Vekshina, 1959, sample No. 10, polarized transmitted light.
2- *Arkhangelskilla* sp. , sample No. 2, normal transmitted light.
3- *Calculites obscurus* Deflandre, 1959, sample No. 12, polarized transmitted light.
4- *Ceratolithoides aculeus* Stradner,1961 , sample No. 2, normal transmitted light.
5- *Eiffelithius eximius* Stover, 1966, sample No.1, normal transmitted light.
6- *Lithraphidites praequadratus* Roth, 1978, sample No. 1, normal transmitted light.
7- *Micula decussata* Vekshina, 1959, sample No. 2, normal transmitted light.
8- *Micula decussata* Vekshina, 1959, sample No. 10, polarized transmitted light.
9- *Micula swastica* Stradner and Steinmetz, 1984, sample No. 12, polarized transmitted light.
10- *Prediscosphaera cretacea* Arkhangesky, 1912, sample No. 2, normal transmitted light.
11- *Reinhardites* sp., sample No. 2, normal transmitted light.
12- *Rhagodiscus angustus* Stradner, 1963, sample No. 2, normal transmitted light.
13- *Tranolithus phacelosus* Stover, 1966, sample No. 1, normal transmitted light.

Plate 1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