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Nannobiostratigrphy of Shiranish Formation in Balad Well No. 8, Northern Baghdad, Iraq

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ABSTRACT

Eight samples of Shiranish Formation were obtained from Balad well No. 8, (northern Baghdad) central Iraq. Details investigated carried out identify calcareous nannofossils, where identified sixteen species; eleven descried from other region and five left under open name because of lack of material or rare of samples, On the basis of stratigraphic distribution of the species, two biozones proposed these are :

2- *Reinhardites levis* Interval Biozone(CC24)
1- *Tranolithus phacelosus* Interval Biozone(CC23b)

The proposed biozones correlated with others calcareous nannofossils biozones from regional schemes led to conclusion that the age of Shiranish Formation in studied section Early Maastrichtian.

الطباقية الحياتية لمتحجرات النانو الكلسية لتكوين شرانش في بئر بلد ٨، شمال بغداد، العراق

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الملخص

درست ثمانية نماذج من تكوين شرانش في بئر بلد ٨ (شمال بغداد) وسط العراق. تم وصف ستة عشر نوعا منها احد عشر موصوفا سابقا وخمسة أنواع تركت للتسمية المفتوحة لرداءة الحفظ أو لقلة العينات، وبالاعتماد على التوزيع الطباقي لهذه الحشود تم تحديد نطاقين حياتيين وهما:

2- *Reinhardites levis* Interval Biozone(CC24)
1- *Tranolithus phacelosus* Interval Biozone(CC23b)

تم مضاهاة الانطقة المحددة مع دراسات إقليمية قادت إلى الاستنتاج بان عمر تكوين شرانش في المقطع قيد الدراسة الماسترختيان المبكر.

INTRODUCTION

Shiranish Formation is the most important rock unit throughout the upper Cretaceous of north Iraq. It's type section is first described by Henson, 1940 (cited in Bellen *et al.,* 1959) lies at Shiranish Islam Village near Zakho City, reaches about 228 meters in thickness. It consists mainly of marl and marly limestone representing off shore, open sea sediment of the Late Campanian-Maastrichtian age on the basis of the foraminiferal assemblages contents.

MATERIALS

The studied section situated in the unstable shelf (Buday and Jassim,1987) Fig. 1, Shiranish Formation is recorded from well Balad No. 8, between (1607.5-1652.5 meter depths) about 45 meters thickness, consist mainly of marly limestone, Eight samples were investigated to identify the nannofossils species.

Systematic Paleontology

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

Arkhangelskilla cymbiformis Vekshina, 1959

Pl. 1, Fig. 1

1959 *Arkhangelskilla cymbiformis* Vekshina; Sniggims, Vol. 2, P. 66, Pl. 2, Fig. 3 a, b.
1968 *Arkhangelskilla cymbiformis* Vekshina ;Gartner; Univ. Kans. Paleont. Contrib., P. 38, Pl. 1, Fig. 1-4, Pl. 6, Fig. 1a-c.
1985 *Arkhangelskilla cymbiformis* Vekshina; Perch-Nielsen; Plankton Stratigraphy, P. 354.

Description: Heterococcoliths, placolith coccoliths with central area spanned by axial crosses and grills, or 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 although darker towards outer edge. The central area is

continuous with the fourth tier and is divided into four quadrants by sutures lines subparallel to major and minor axes of the ellipse.

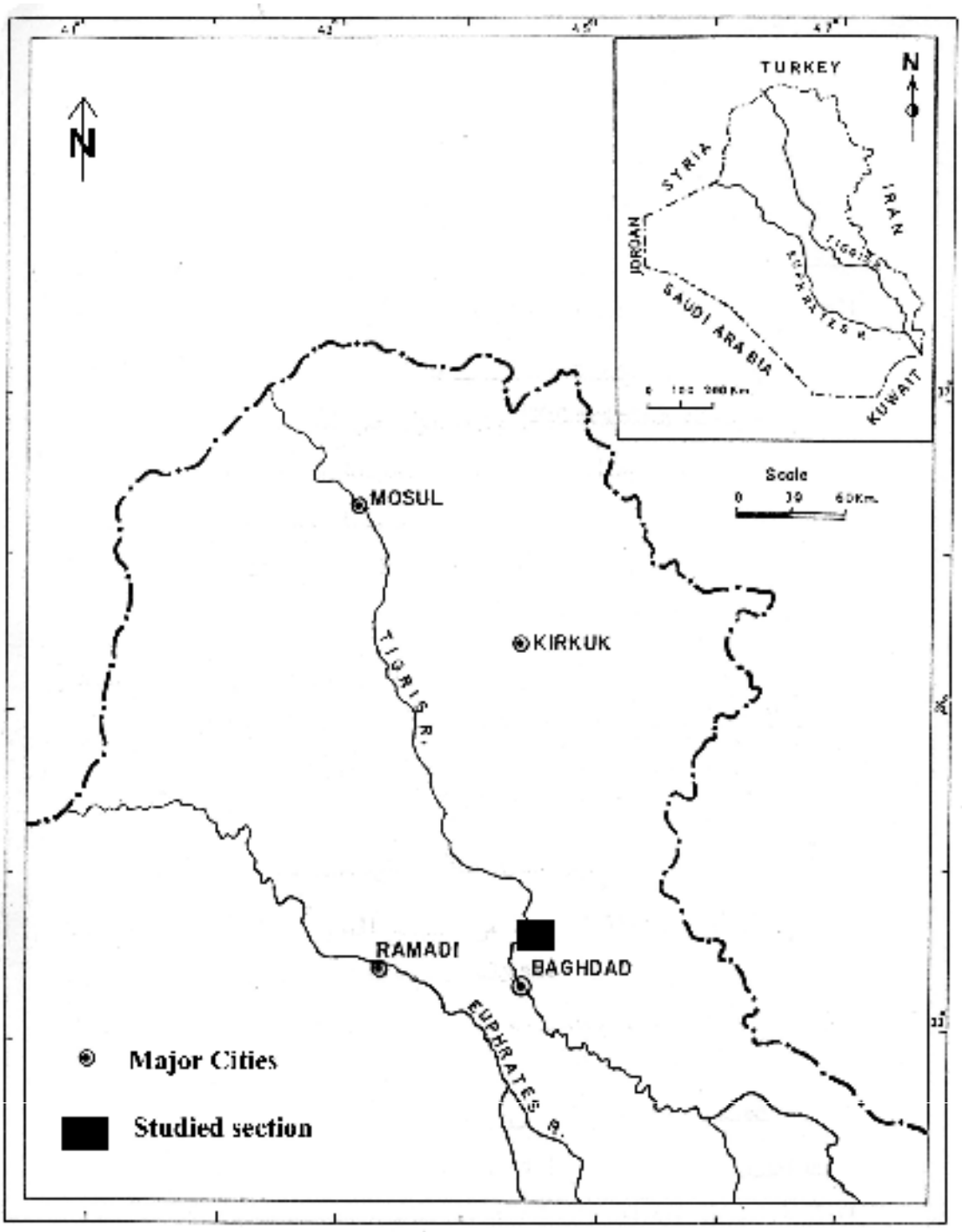

Fig. 1: Location Map of Studied Section.

Occurrences :

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

***Arkhangelskilla* sp.**

Pl. 1, Fig. 2

Description: Heterococcoliths, placolith coccoliths with central area spanned by axial crosses and grills, or 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 although darker towards outer edge.

Remarks: The central area and sutures are not clear, therefore the species left under open name.

Occurrences :

Authors	Age	Location
Present work	Early Maastrichtian	Iraq

Family Chiastozygaceae Rood, Hay and Barnard, 1973

Genus *Chiastozygus* Gartner, 1968

Type species : Zygodiscus amphipons Bramlette and Martini, 1964

***Chiastozygus* sp.**

Pl. 1, Fig. 3

Description: Heterococcoliths, Loxoliths with variably-developed proximal/inner-cycles and a central-area spanned by diagonal cross bars. LM image includes unicyclic type.

Remarks: The species left under open due to the lack of material.

Occurrences :

Authors	Age	Location
Present work	Early Maastrichtian	Iraq

Family Microrhabdulaceae Deflandre, 1963

Genus *Lithraphidites* Deflandre, 1963

Type species : *Lithraphidites carniolensis* Deflandre, 1963

***Lithraphidites carniolensis* Deflandre, 1963**

Pl. 1, Fig. 5

1963 *Lithraphidites carniolensis* Deflandre; Seances Acad. Sci. Paris, 256, 3484-3486.

1968 *Lithraphidites carniolensis* Deflandre ,Gartner; Univ. Kans. Paleont. Contrib. P. 43, Pl. 5, Fig. 4.

1985 *Lithraphidites carniolensis* Deflandre, Perch-Nielsen ; Plankton Stratigraphy, P. 373.

Description: Nannoliths, Elongated rod-like with a cruciform or circular cross-section, which have expanded lateral blades, it is rods have four equal keels that run the whole length of the rods.

Occurrences :

Authors	Date	Age	Location
Deflandre	1963	Cretaceous	U.S.A.
Bukry	1969	Albian to Maastrichtian	U.S.A.
Perch-Nielsen	1985	Berriasian to Maastrichtian	General
Tantawy et al.	2001	Maastrichtian	Egypt

***Lithraphidites* sp.**

Pl. 1, Fig. 6

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

Remarks: The present species differs from all other species in having rods at two ends, therfore left under open name.

Occurrences :

Authors	Age	Location
Present work	Early Maastrichtian	Iraq

Genus *Microrhabdulus* Deflandre, 1959

Type species : *Microrhabdulus decoratus* Deflandre, 1959

***Microrhabdulus decoratus* Deflandre,1959**

Pl. 1, Fig. 7

1959 *Microrhabdulus decoratus* Deflandre ; Micropaleont., 2, 127-52.
1985 *Microrhabdulus decoratus* Deflandre; Perch-Nielsen ; Plankton Stratigraphy, P. 374.

Description: Nannoliths, Elongated rod-like with a cruciform or circular cross-section, which generally taper at both ends, circular cross-section complex construction.

Occurrences :

Authors	Date	Age	Location
Deflandre	1959	Santonian through Maastrichtian	U.S.A.
Perch-Nielsen	1985	Turonian to Maastrichtian	General
Tantawy et al.	2001	Maastrichtian	Egypt

Family Podrorhabdaceae Noel, 1965
Genus *Cribrosphaerella* Deflandre, 1952
Type species : *Cribrosphaerella ehrenbergii* ,Arkhengesky, 1912

***Cribrosphaerella ehrenbergii*, Arkhengesky, 1912**

Pl. 1, Fig. 4

1912 *Cribrosphaerella ehrenbergii* Arkhengesky; Mater. Geol. Russl., Vol. 24, P. 412, Pl. 6, Fig. 19-20.
1968 *Cribrosphaerella ehrenbergii* Arkhengesky ;Gartner Univ. Kans. Paleont. Contrib. P. 40, Pl. 1, Fig. 14-15.
1985 *Cribrosphaerella ehrenbergii* Arkhengesky; Perch-Nielsen ; Plankton Stratigraphy, P. 387.

Description: Heterococcoliths, Elliptical to circular placoliths with elliptical to subrectangular rim; multiperforate central-area net.

Occurrences :

Authors	Date	Age	Location
Arkhengesky	1912	Upper Cretaceous	Russia
Bramlette and Martini	1964	Maastrichtian	Type of Maastrichtian
Gartner	1968	Maastrichtian	Denmark, France, Tunisia, U.S.A.
Wanderley and Aguiar	2006	Campanian to Maastrichtian	Atlantic Ocean
Tantawy *et al.*	2001	Campanian to Maastrichtian	Egypt

Genus *Stradneria* Reinhardt, 1964

***Stradneria crenulata* Bramlette and Sullivan, 1964**

Pl. 1, Fig. 15

1964 *Stradneria crenulata* Bramlette and Sullivan ; Micropaleontol, 7, 129-88.

1985 *Stradneria crenulata* Bramlette and Sullivan, Perch-Nielsen ; Plankton Stratigraphy, P. 386.

Description: Heterococcoliths, Placoliths with two shields and a central-area spanned by a variety of structures, most commonly fibrous axial cross bars with subsidiary lateral bars and a solid central spine or process; the elements are usually radial or near radial and do not appear to imbricate. LM image is moderately birefringent.

Occurrences :

Authors	Date	Age	Location
Perch-Nielsen	1985	Upper Cretaceous	General
Tantawy et al.	2001	Maastrichtian	Egypt

Family Polycyclolithaceae Forchheimer, 1972

Genus *Quadrum* Princ and Perch-Nielsen, 1977

Type species: *Quadrum gartneri* Princ and Perch-Nielsen, 1977

***Quadrum cf. trifidum* Stradner and Papp, 1961**

Pl.1,Fig.10

1961 *Quadrum trifidum* Stradner and Papp; Jahrb. geol. Bundesants. (Wien), 7, 1-159.

1985 *Quadrum trifidum* Stradner and Papp Perch-Nielsen ; Plankton Stratigraphy, P. 390.

Description: Nannoliths, Elements have tangential *c*-axis orientation, 3-5 ray-like wall-cycle elements, the elements are joined along sutures which go out to the mid-point of the cube edges, no central opening or diaphragm.

Occurrences :

Authors	Date	Age	Location
Stradner and Papp	1961	Upper Cretaceous	Italy
Perch-Nielsen	1985	Campanian to Maastrichtian	General
Tantawy *et al*.	2001	Campanian to Maastrichtian	Egypt

Family Prediscosphaeraceae Rood, Hay and Barnard, 1971
Genus *Prediscosphaera* Vekshina, 1959
Type species : *Prediscosphaera decorate* Vekshina, 1959

***Prediscosphaera cretacea* Arkhangelsky, 1912**

Pl. 1, Fig. 8

1912 *Prediscosphaera cretacea* Arkhangesky ; Mater. Geol. Russ., 25, 1- 631.
1985 *Prediscosphaera cretacea* Arkhangesky, Perch-Nielsen ; Plankton Stratigraphy, p. 394.

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, The LM image is bicyclic, with the outer cycle dark, and inner cycle bright.

Occurrences :

Authors	Date	Age	Location
Arkhangesky	1912	upper Cretaceous	Russia
Gartner	1968	Campanian to Maastrichtian	U.S.A.
Donnaly	1989	Upper Cretaceous	Greenland

***Prediscosphaera grandis* Perch-Nielsen, 1979**

Pl. 1, Fig. 9

1979 *Prediscosphaera grandis* Perch-Nielsen ; IUGS Series A, 6, 223-72.
1985 *Prediscosphaera grandis* Perch-Nielsen Perch-Nielsen; Plankton Stratigraphy, p. 394.

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, The LM image is bicyclic, with the outer cycle dark, and inner cycle bright. very close to the species above but small and more cyclical.

Occurrences :

Authors	Date	Age	Location
Perch-Nielsen	1979	Maastrichtian	Italy
Perch-Nielsen	1985	Maastrichtian	General

Family Rhagodiscaeae Hay, 1977
Genus *Rhagodiscus* Reinhardt, 1967

***Rhagodiscus angustus* Stradner, 1963**

Pl. 1, Fig. 13

1963 *Rhagodiscus angustus* Stradner ; Proc. Petro. Set. 1, 1-16.

1985 *Rhagodiscus angustus* Stradner, Perch-Nielsen ; Plankton Stratigraphy, P. 394.

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

Occurrences :

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

***Rhagodiscus* sp.**

Pl. 1, Fig. 14

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

Remarks: Central area is not clear, Therefore left under open name.

Occurrences :

Authors	Age	Location
Present work	Early Maastrichtian	Iraq

Family Zygodiscaceae Hay and Mohler, 1967

Genus *Reinhardites* Perch-Nielsen, 1968

***Reinhardites levis* Sissingh, 1977**

Pl. 1, Fig. 10

1985 *Reinhardites levis* Sissingh Perch-Nielsen ; Plankton Stratigraphy, p. 407.

Description: Heterococcoliths, Loxoliths with variably-developed proximal/inner-cycles and a central-area spanned by a single transverse bar. LM image includes both unicyclic, very broad rim, with narrow central-area spanned/filled by a bar.

Occurrences :

Authors	Date	Age	Location
Perch-Nielsen	1985	Campanian to Maastrichtian	General
Tantawy *et al.*	2001	Maastrichtian	Egypt

***Reinhardites* sp.**

Pl. 1, Fig. 11

Description: Heterococcoliths, Loxoliths with variably-developed proximal/inner-cycles and a central-area spanned by a single transverse bar. LM image includes both unicyclic, very broad rim, with narrow central-area spanned/filled by a bar.

Remarks: The species very closed to *Reinhardites levis* Sissingh,1977 but smaller in size and due to the lack of material the present species left under open name.

Occurrences :

Authors	Age	Location
Present work	Early Maastrichtian	Iraq

Genus *Tranolithus* Stover, 1966

***Tranolithus phacelosus* Stover, 1966**

Pl. 1, Fig. 16

1966 *Tranolithus phacelosus* Stover ; Micropaleontol. 12, 133 - 67.

1985 *Tranolithus phacelosus* Stover Perch-Nielsen ; Plankton Stratigraphy, p. 408.

Description: Heterococcoliths, Loxoliths with variably-developed proximal/inner-cycles and a central-area spanned by a single transverse bar. LM image includes both unicyclic and bicyclic types. central-area spanned by 2-4 broad, disjunct platelets constitute a transverse bar, and there is a proximal net of lateral bars.

Occurrences :

Authors	Date	Age	Location
Stover	1966	Upper Cretaceous	France
Perch-Nielsen	1985	Albian to Maastrichtian	General

Nannobiostratigraphy

Sixteen species of calcareous nannofossils were identified, depending on the stratigraphic distribution of the recorded species (Fig. 2), the two following biozones are identified:

1-*Tranolithus phacelosus* Interval Biozone(CC23b)

Definition: Interval from Last occurrence of *Reinhardites anthrophorus* (Defandre,1959) to Last occurrence of *Tranolithus phacelosus* Stover (1966).
Thickness: Lower (30) meters consist of marly limestone.
Boundaries: The lower boundary of this biozone not included in the studied section, The upper boundary is marked by the last occurrence of *Tranolithus phacelosus* Stover (1966).

Discussion: This biozone correlated with *Tranolithus phacelosus* (CC23) by Perch-Nielsen (1979) and Sissingh (1977) aged Late Campanian to Early Maastrichtian, and correlated with *Quadrum tifidum* by Doeven (1983). aged Early Maastrichtian, and correlated with *Tetralithus trifidus* by Roth (1978). The *Aspidolithus parcus* subdivided the biozone CC23 into CC23a and CC23b, according to Sissingh (1977) which disappear in this section, therefore this Biozone aged Early Maastrichtian (Fig. 3).

2- *Reinhardites levis* Interval Biozone(CC24)

Definition: Interval from Last occurrence of *Tranolithus phacelosus* Stover (1966) to Last occurrence of *Renhardites levis* (Sissingh, 1977).
Thickness: Upper (15) meters consist of marly limestone.
Boundaries: The lower Boundary is marked by last occurrence of *Tranolithus phacelosus* Stover (1966),and the upper boundary is not included in the studied section.

Discussion: This biozone correlated with *Renhardites levis* (CC24) by Perch-Nielsen (1979) and Sissingh (1977) aged Early Maastrichtian, and correlated with *Arkhangeskilla cymbiformis* by Doeven (1983) aged Early Maastrichtian, and correlated with *Lithraphidites praequardatus* by Roth (1978). Therefore this biozone aged Early Maastrichtian.

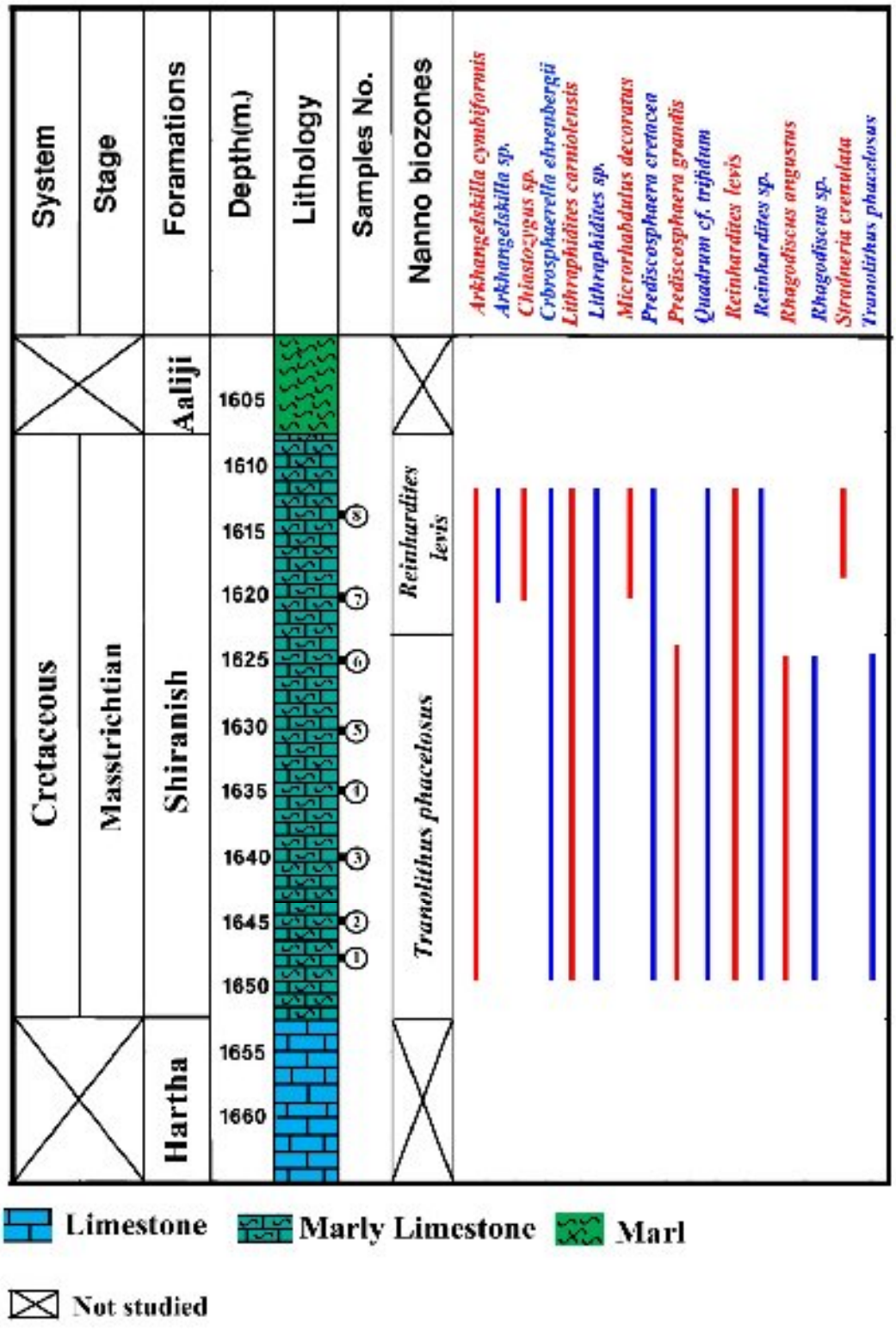

Fig. 2: Stratigraphic Distribution of Calcareous nannofossils.

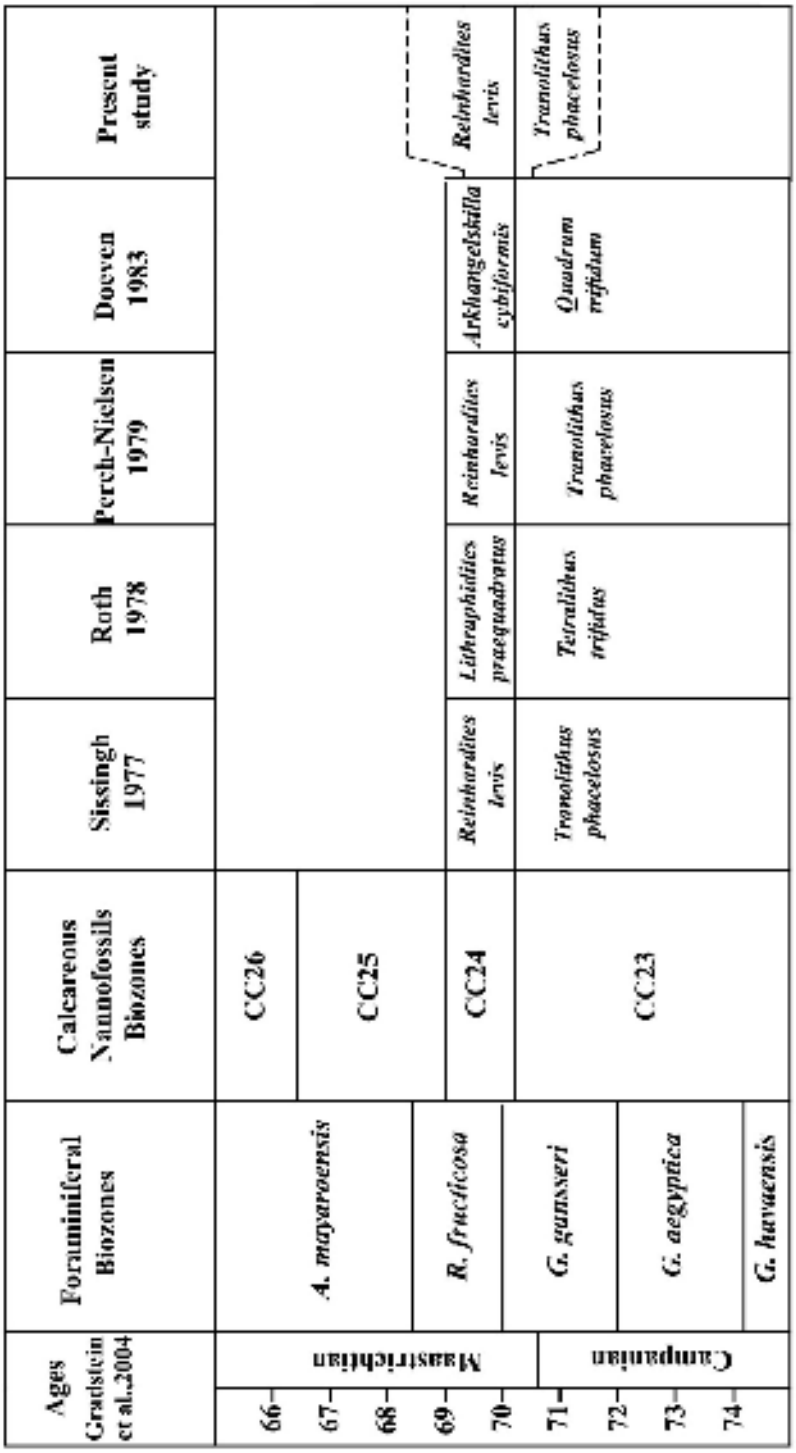

Fig. 3: Correlated Chart for Present Work with Regional Studies.

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Plate 1

1 *Arkhangelskilla cymbiformis* Vekshina (1959)
2 *Arkhangelskilla* sp.
3 *Chiastozygus* sp.
4 *Cribrosphearella ehrenbergii* (Arkhengesky, 1912)
5 *Lithraphidites carniolensis* Deflandre (1963)
6 *Lithraphidites* sp.
7 *Microrhabdulus decoratus* Deflandre (1959)
8 *Prediscosphaera cretacea* (Arkhangesky, 1912)
9 *Prediscosphaera grandis* Perch-Nielsen (1979)
10 *Quadrum cf. trifidum* (Stradner and Papp, 1961)
11 *Reinhardites levis* (Sissingh, 1977)
12 *Reinhardites* sp.
13 *Rhagodiscus angustus* (Stradner, 1963)
14 *Rhagodiscus* sp.
15 *Stradneria crenulata* (Bramlette and Sullivan, 1964)
16 *Tranolithus phacelosus* Stover (1966)

Plate 1