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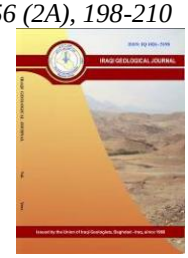

The Calcareous Nannofossils Biostratigraphy of the Cretaceous Red Bed the in Shiranish Formation, Hiran in Erbil Governorate and Smaqoli Area in Sulaimaniya Governorate, Northern Iraq

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Abstract

On the basis of the stratigraphic ranges of the reported calcareous nannfossils for several species, two sections of the Shiranish Formation from the Hiran in the Erbil Governorate and the Smaqoli area in Sulaimaniya Governorate, Northern Iraq, are analyzed. Four biozones are visible in the examined region, grouped as follows from oldest to youngest: *Uniplanarius gothicus* Interval zone; *Tranolithus phacelosus* Interval zone; *Rienhardtites lives* Interval zone; *Micula murus* Interval zone. The relationship between these biozones and those of other calcareous nannofossil biozones from local and regional sections allows scientists to determine that these fossils are from the Late Campanian to Early Maastrichtian period.

Keywords: Calcareous nannofossils; Biostratigraphy; Campanian; Maastrichtian; Iraq.

1. Introduction

The Shiranish Formation is regarded as one of the common and widely spread late Cretaceous successions in northern Iraq. The formation has an economic importance and considered as one of the most important oil reservoirs in several oilfields of Iraq due to presence of secondary fracture porosity and could be regarded as potential hydrocarbon source rocks as well. The Shiranish Formation has been described in numerous research papers and academic. Many studies were made on it that discussed the depositional paleoenvironment of formation in terms of foraminiferal biostratigraphy, geochemistry and microfacies.

The Shiranish Formation was first described by Henson (1940) in Bellen et al. (1959) from the High Folded Zone of Northern Iraq, near the village of Shiranish Islam, Northeast of Zakho. It is one of the most wide spread units of the Upper Campanian- Maastrichtian cycle in North Iraq. The stratigraphy of this formation has been studied previously by many researchers (e.g., Al-Badrani and Al-Assaf, 2011; Al-Shareefi et al., 2014; Al-Maamari and Al-Badrani 2019). The previous work was accomplished within different disciplines and by using different tools, such as foraminifera, ostracode as well as calcareous nano-fossils, in addition to numerous sedimentological and geochemical studies. Perhaps the reason for this interest is the importance of the Shiranish Formation as a cap rock of oil reservoirs in many oil-producing formations in southern Iraq. It is also considered as a reservoir rock unit in the areas of northern and central Iraq, including the area of the current study, due to the tiny joints and the micro fractures in its rock structure.

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In the recent study, an outcropped sections was chosen at Hiran area in Erbil Governorate and Smaqoli area in Sulaimaniya Governorate, Northern Iraq, and detailed field description was conducted including description of the stratigraphic units of the Shiranish Formation and the lithological characteristics. Additionally, biostratigraphy of the Shiranish Formation based on calcareous nannofossils was achieved.

The study aims to describe the biostratigraphy of the Shiranish Formation by determining the nannofossils and their ages and matching them globally and locally to determine the exact age of this formation.

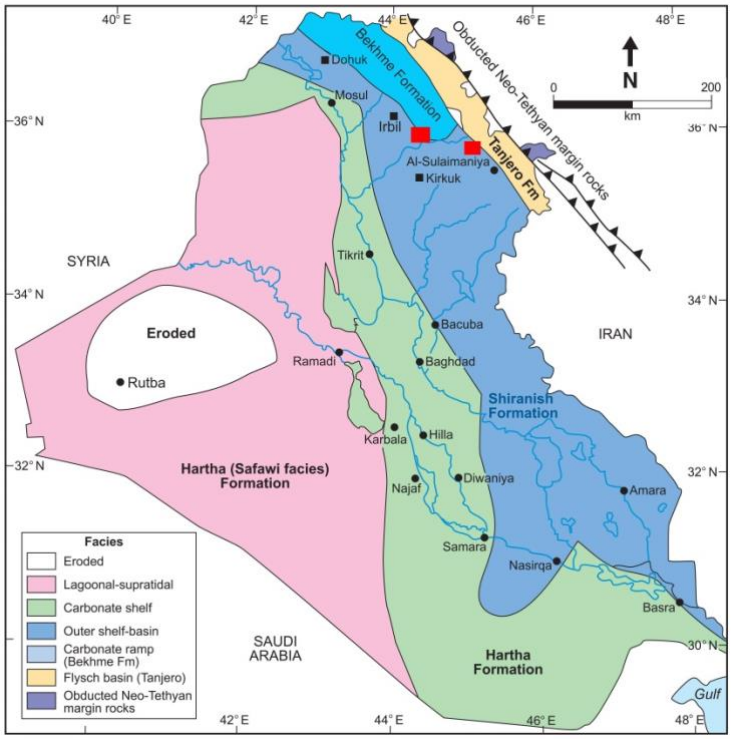

Fig. 1. Location map showing the sections at Hiran area in Erbil Governorate and Smaqoli area in Sulaimaniya Governorate, Northern Iraq

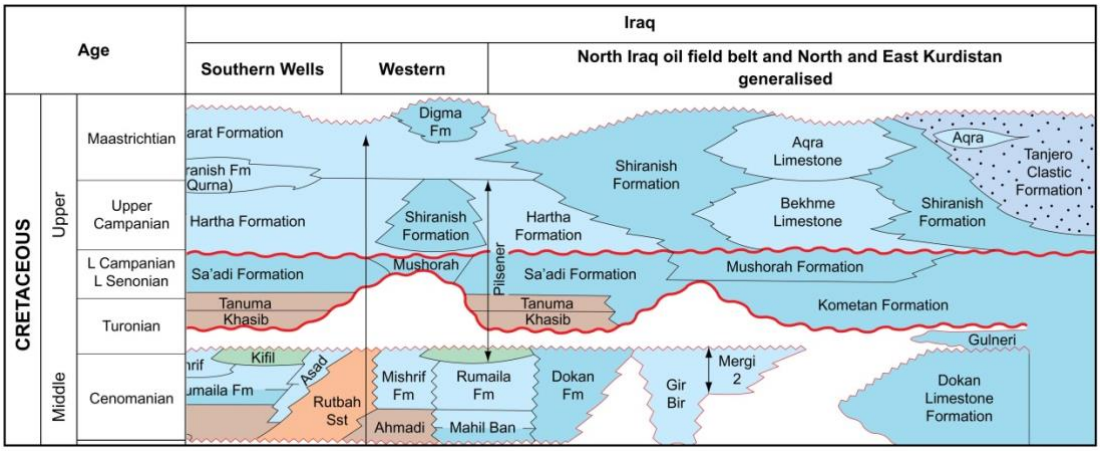

Fig. 2. Schematic regional rock unit correlation (After Haddad and Amin, 2007)

2. Methodology

2.1 Materials

Data for this study was generated from many samples of outcrouped samples from Shiranish Formation. Samples were collected at different interval which was obtained from northern Iraq, with Lithologic mainly from Limestone and marly limestone.

2.2 Laboratory Analysis

- (A) Nannofossil Slides preparation making by using the method (H) (Armstrong and Brasier, 2005), the procedure is as follows:
  A sieve used to separate each rock sample, which weighs around 5 grams. To serve as a dispersant, a tiny drop is introduced. A direct, low-heat source (hotplate) is used to completely dry the slide and residue, however contamination must always be avoided. A thin, uncontaminated cover slip has been coated with an amorphous oleoresin called as (Canada balsam). A dry drop of previously dried and hardened sample solution is poured over it, and the sample is then set up for observation under a transmitted microscope.
- (B) Observation Techniques
  Using a light microscope, cross-polarized transmitted lights, and gypsum plate, the slides were examined for the presence of calcareous nannofossils. The assemblages were thoroughly analyzed at x1000 magnification. Species were identified by utilizing a catalog that other authors have published online and in libraries.

3. Results and discussions

To identify numerous species of calcareous nannofossils, nannopaleontologists used a variety of paleontological sources, including Bown and Young (1997) and Perch-Nielsen (1985). The materials are kept in the Geology Department at the University of Mosul, Iraq.

3.1. Nannobiostratigraphy

1. Uniplanarius gothicus Interval zone

Definition: Interval Zone for Uniplanarius gothicus (Deflandre, 1959) Hattner & Wise, in Wind & Wise. The zone determinate from the FA for the Uniplanarius gothicus (Deflandre, 1959) Hattner & Wise, in Wind & Wise, and to the LA for Eiffilithus eximus (Stover, 1966; Perch- Nielsen, 1968).

Author: Sisingh (1977).

Age: Late Cmpanian

Thickness: Hiran 50 m and Smaqoli 15 m.

Remarks: This zone is comported with zone CC22 (Uniplanarius trifidus Zone) of Sisingh (1977) in the upper Campanian. and comported UC15 zone which is determined by Bown (1998), that aged upper Campanian age (Gradstein et al., 2012) (Figs. 3-11).

2. Tranolithus phaclosus Interval zone

Definition: Interval zone of Tranolithus phaclosus Stover, 1966. The zone studied by the LA for the Eiffilithus eximus (Stover, 1966; Perch- Nielsen, 1968) to the LA for Tranolithus phaclosus Stover (1966).

Author: Bukry and Bramlette (1970).

Age: late Campanian to early Maastrichtian

Thickness: Hiran 90 m and Smaqoli 65 m.

Remarks: This zone is comported with CC23 (Tranolithus phaclosus zone) which studied by the Sisingh (1977) which aged of the upper Campanian to lower Maastrichtian. and comported UC16, UC17 zone, which is studied by Bown (1998) that aged Campanian to lower Maastrichtian, age. (Gradstein et al., 2012) (Figs.3-11).

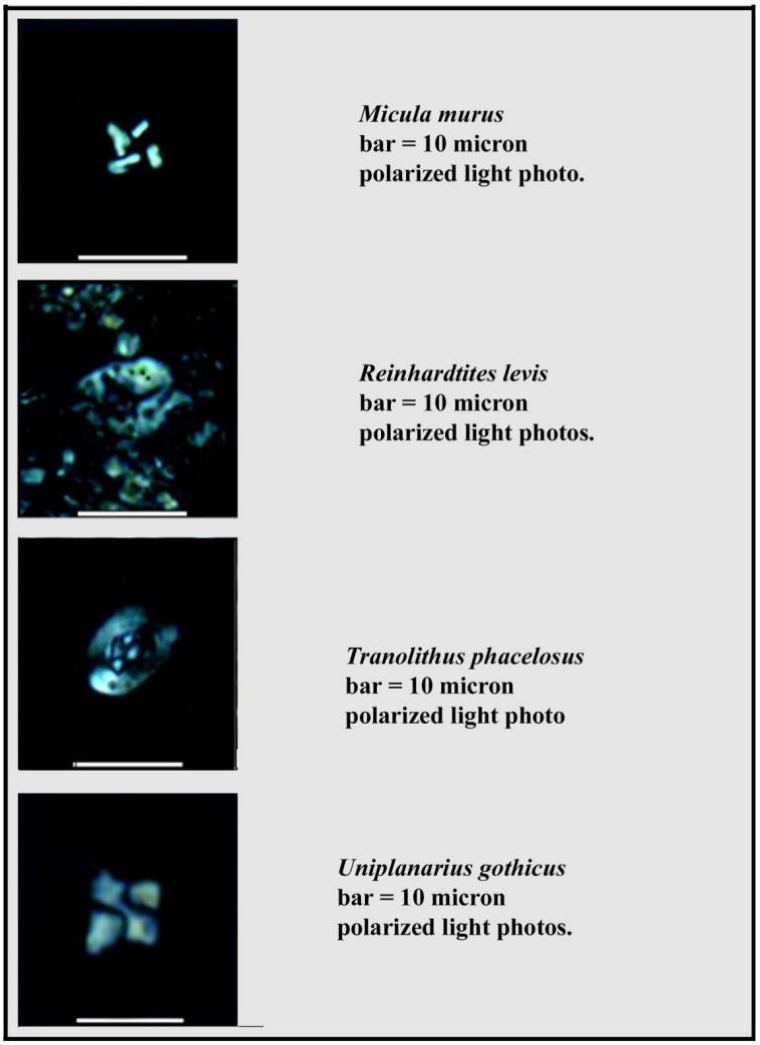

Fig. 3. Index calcareous nannofossils for The Shiranish Formation, Northern Iraq

3. Reinhardtites levis Interval zone

Definition: Interval zone of Reinhardtites levis Prins and Sisingh in Sisingh (1977). The zone determinate by the LA for Tranolithus phaclosus Stover, (1966) to the LA for Reinhardtites levis Sisingh (1977) or Micula murus (Martini, 1961; Bukry, 1973).

Author: Sisingh (1977).

Age: lower Maastrichtian

Thickness: Hiran 60 m and Smaqoli 50 m.

Remarks: This zone is comported with CC24 (Reinhardtites levis zone) which studied by the Sisingh (1977) at the age of the upper Campnian to lower Maastrichtian. and comported UC18 zone that is studied by Bown (1998) that aged Maastrichtian age (Gradstein et al., 2012) (Figs. 3-11).

4. Micula murus Interval zone

Definition: Interval zone for Micula murus (Martini, 1961; Bukry, 1973). The zone determinate by the LA for Reinhardtites levis Prins and Sisingh in Sisingh (1977) or Micula murus (Martini, 1961; Bukry, 1973) to the FA of Nepholithus frequens Górka (1957).

Author: Perch-Nielsen (1972).

Age: Late Maastrichtian

Thickness: Hiran 10 m and Smaqoli 15 m.

Remarks: This zone is comported with (CC25) (Arkhngelskiella cymbiformis zone) Sisingh (1977) is divided into three subdivisions by the FA for the species Arkhngelskiella cymbiformis and the FA for species Lithraphidites quadratus at Maastrichtian age, and comported UC19 zone that is studied by Bown (1998) that aged upper Maastrichtian age (Gradstein et al., 2012) (Figs. 3-11).

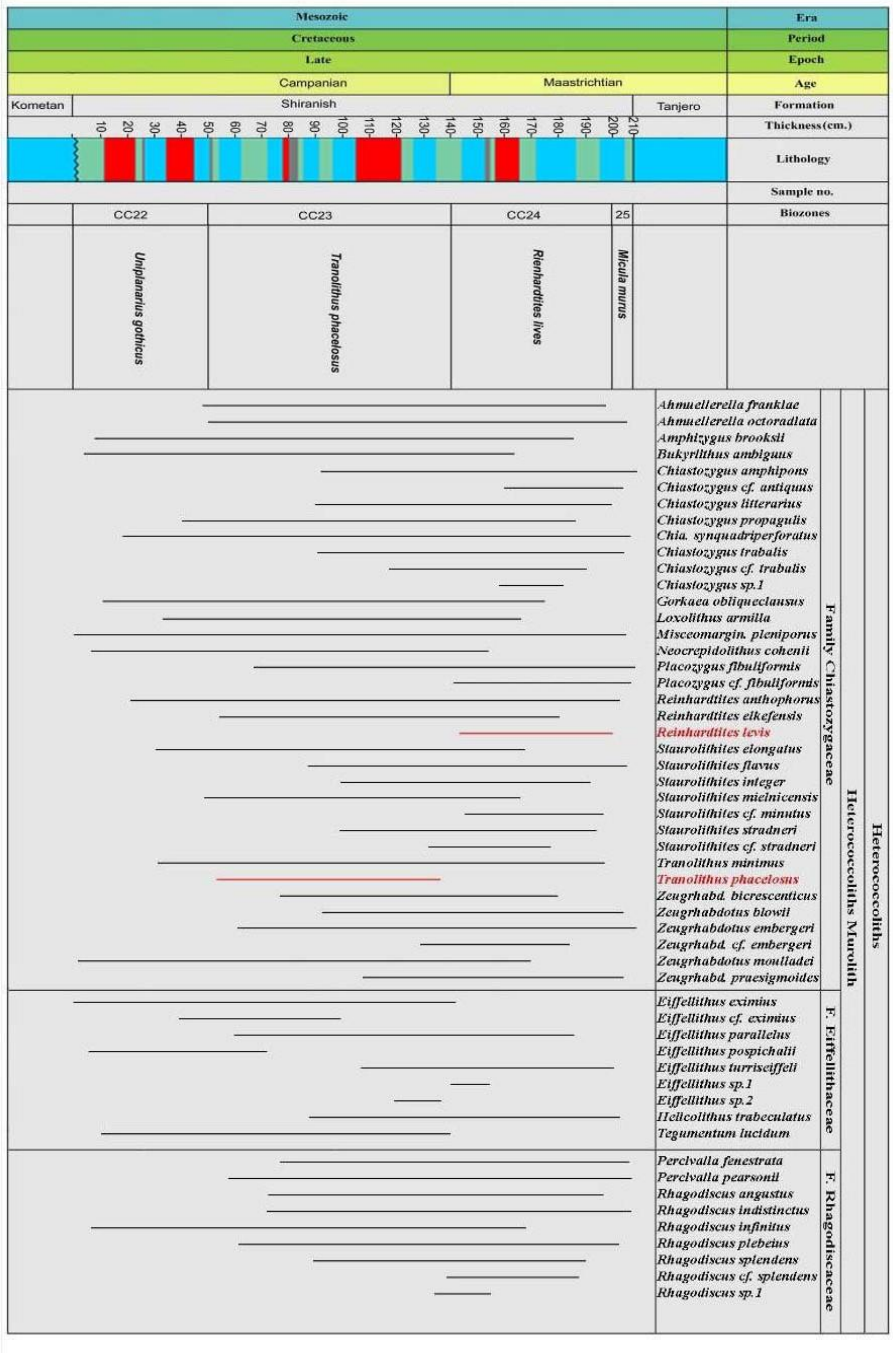

Fig. 4. Range chart for calcareous nannofossils for Hiran section (Part 1)

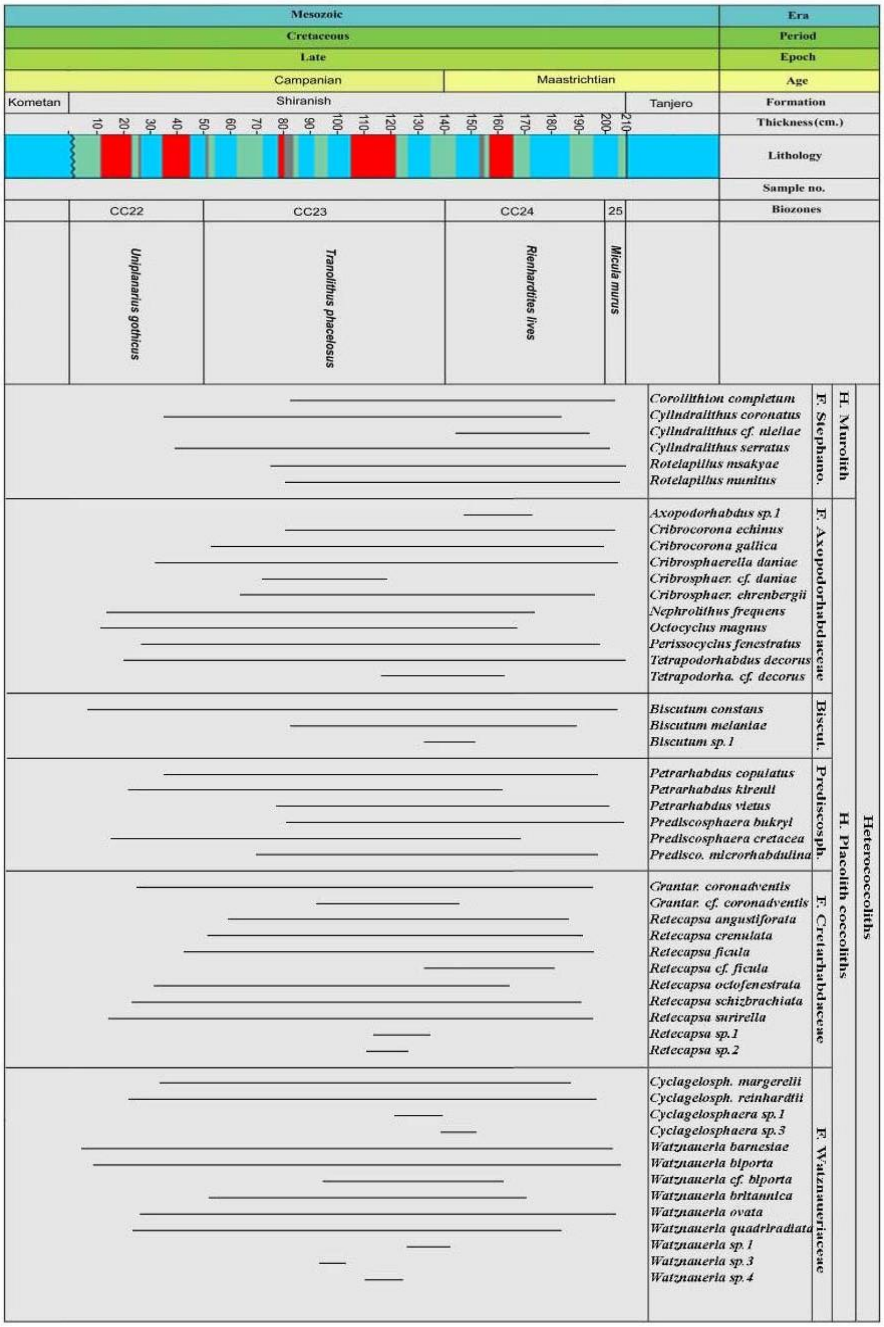

Fig. 5. Range chart for calcareous nannofossils for Hiran section (Part 2)

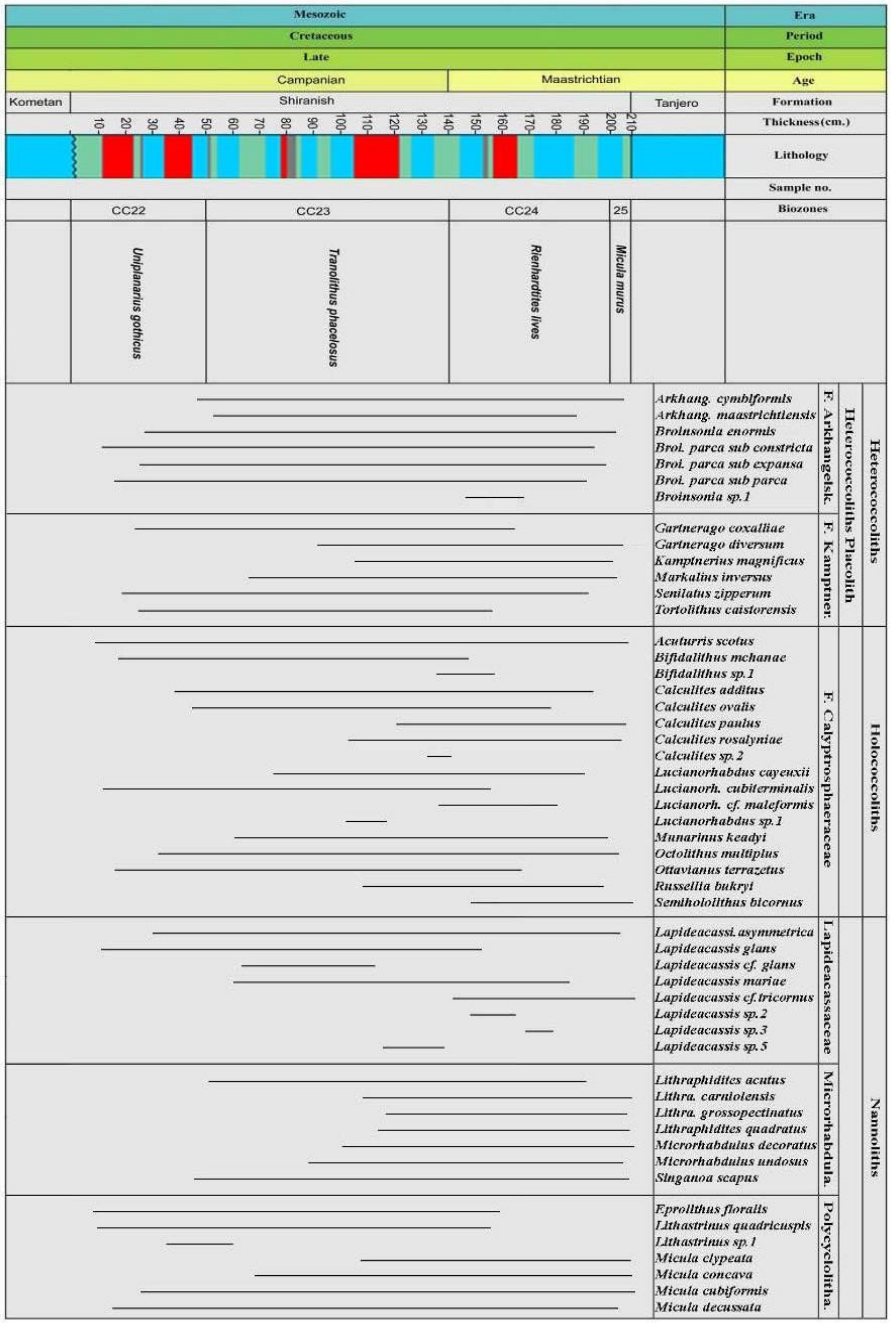

Fig. 6. Range chart for calcareous nannofossils for Hiran section (Part 3)

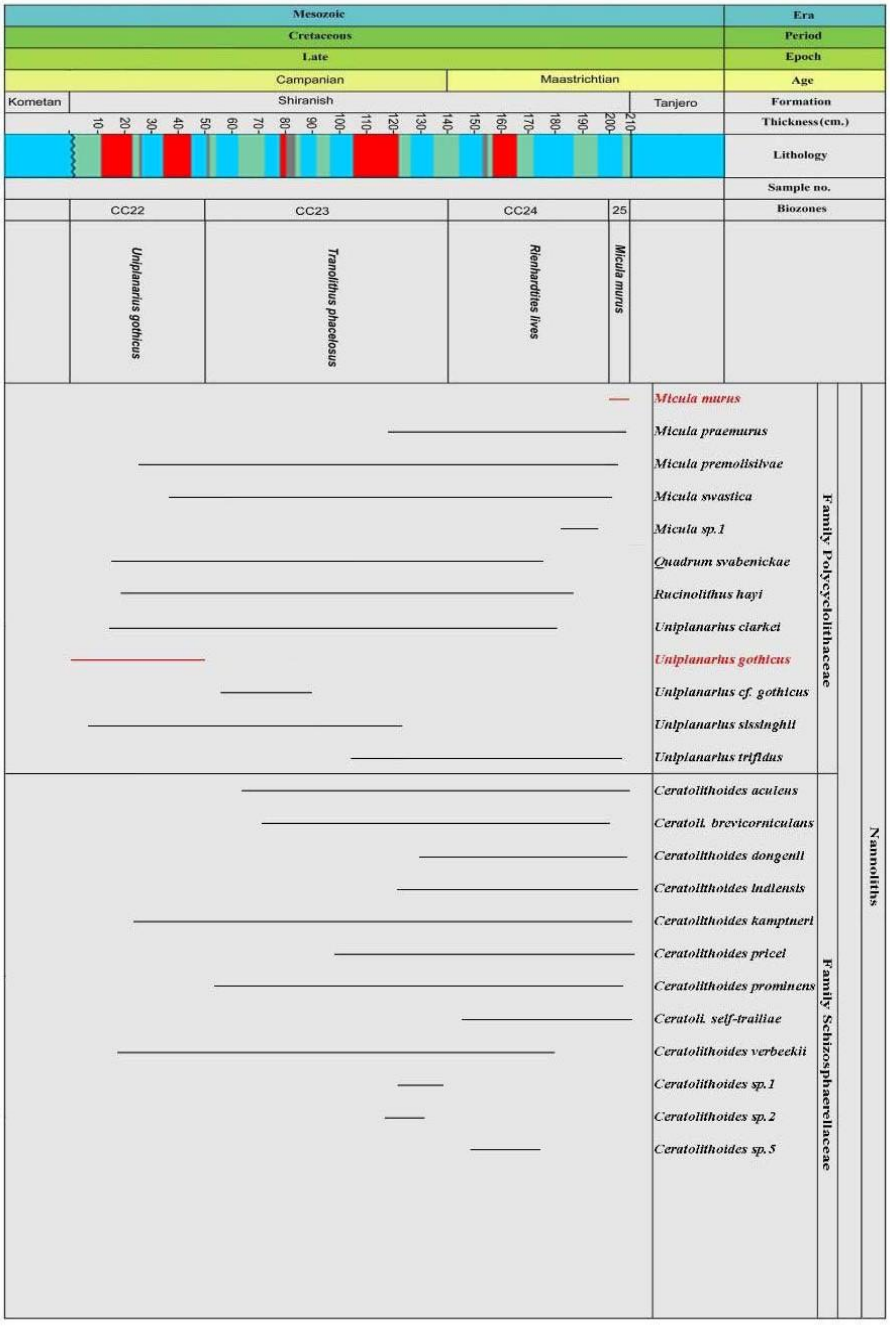

Fig. 7. Range chart for calcareous nannofossils for Hiran section (Part 4)

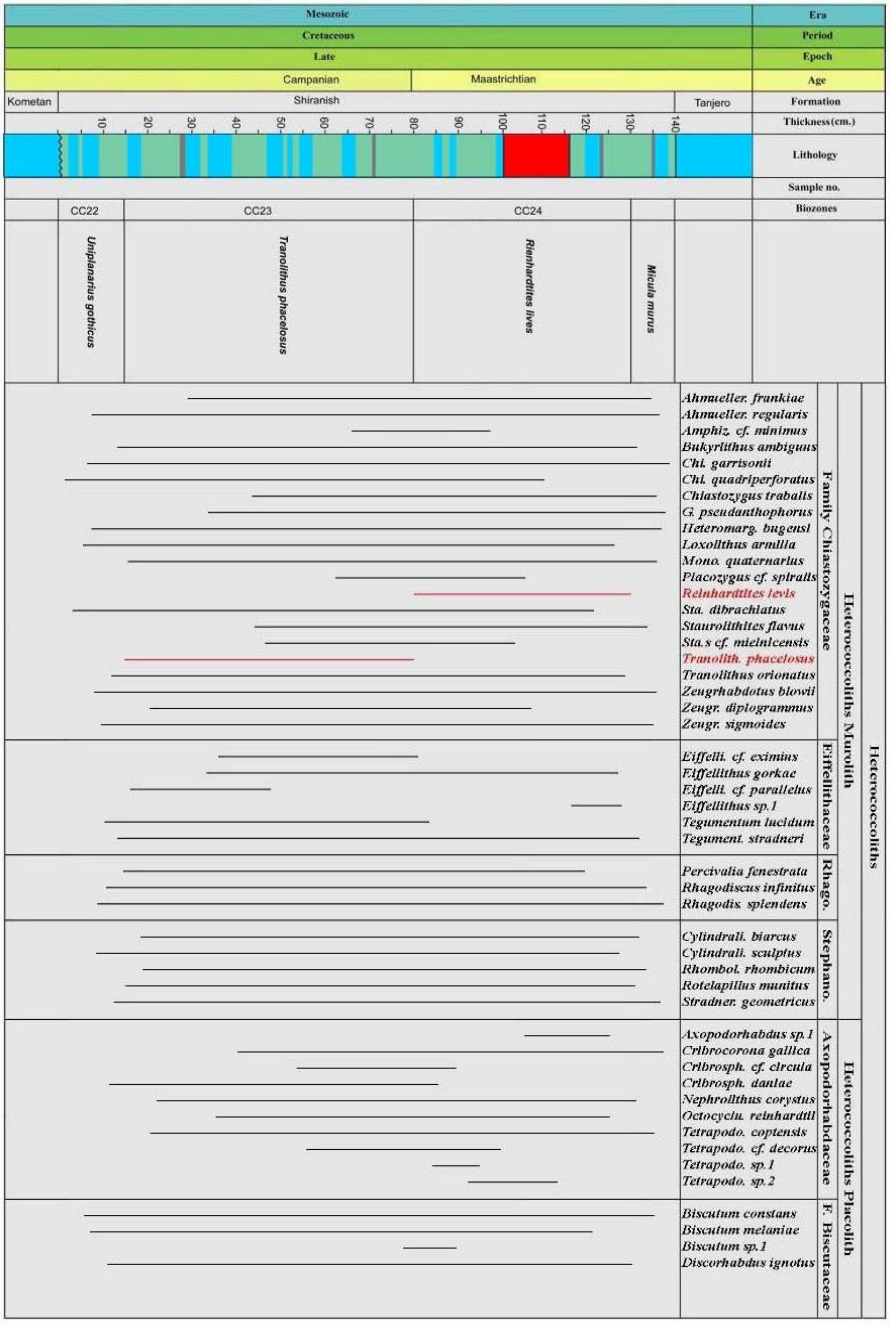

Fig. 8. Range chart for calcareous nannofossils for Smaqoli section (Part 1)

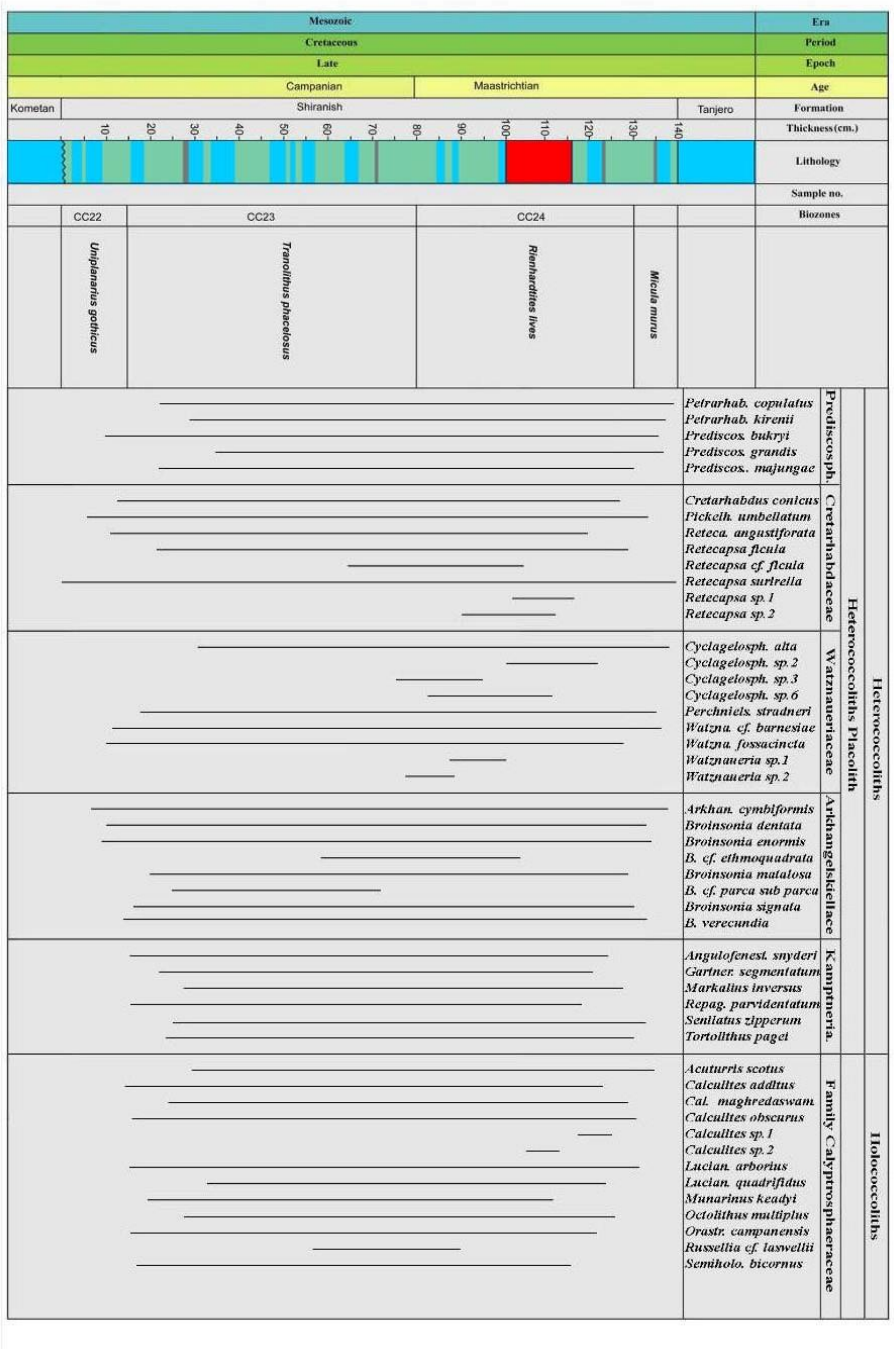

Fig. 9. Range chart for calcareous nannofossils for Smaqoli section (Part 2)

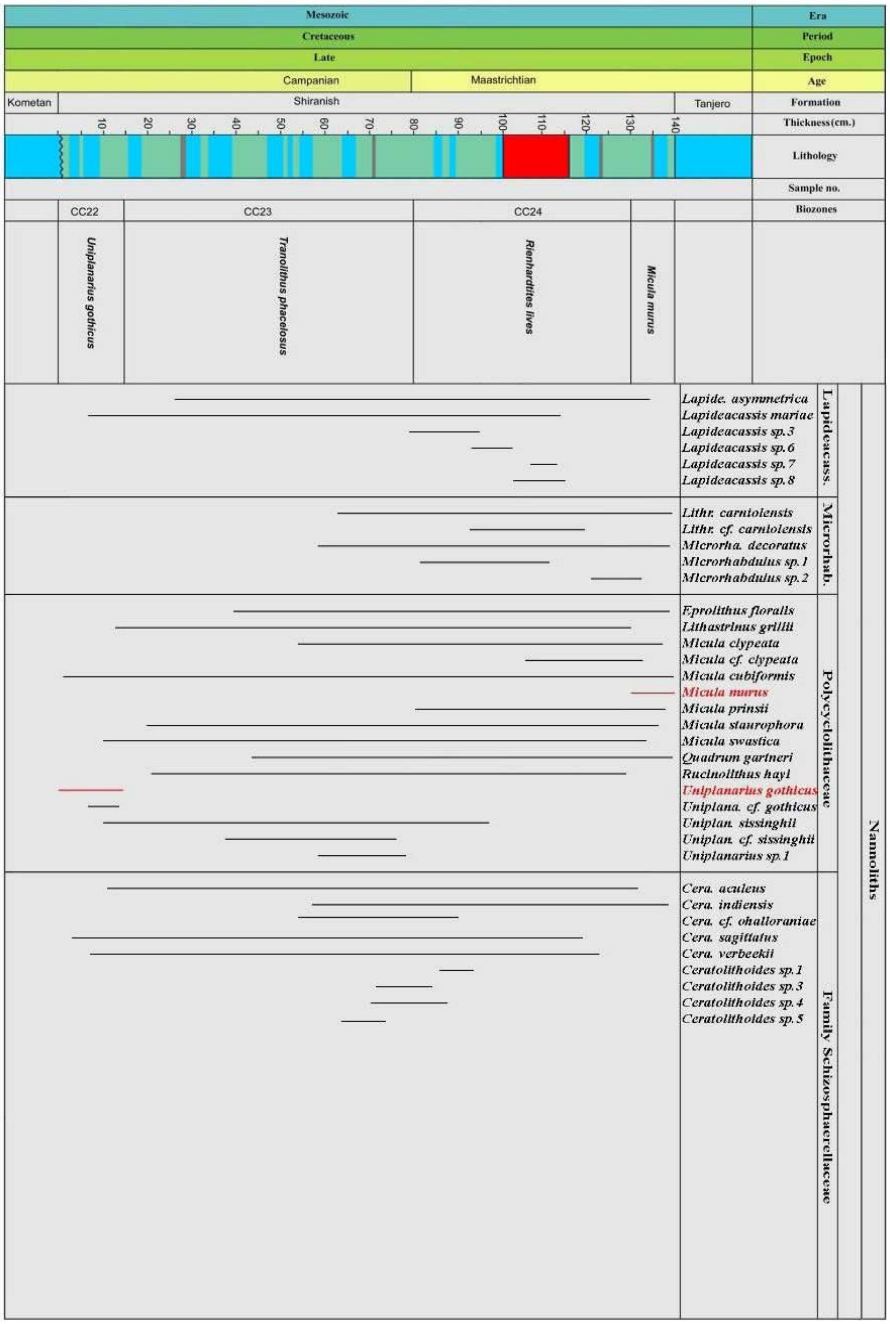

Fig. 10. Range chart for calcareous nannofossils for Smaqoli section (Part 3)

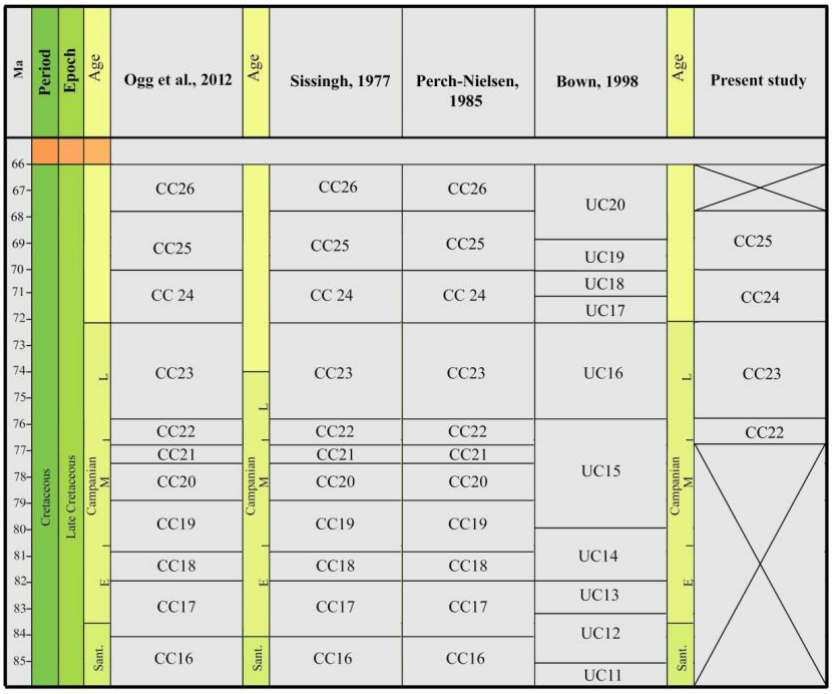

Fig. 11. Age correlation chart of calcareous nannofossils for The Shiranish Formation, Northern Iraq

4. Conclusion

From this study the followings are concluded:

1. many spcies of calacreous nanaofosssil recored from Shiranish Formation from Kurdistan region, Northern Iraq.
2. The species categorized into four biozones as follow:

   Uniplanarius gothicus Interval zone
   Tranolithus phacelosus Interval zone
   Rienhardtites lives Interval zone
   Micula murus Interval zone

3. The biozones corellted to other calcareous nannofossil biozones from both anothers sections and aged the Late Campanian to Early Maastrichtian.

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