



Planktonic Foraminiferal Biostratigraphy of Shiranish Formation in Sara Anticline in Dokan Area, Northeastern Iraq

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Article information

Received: 17- Jun -2021

Accepted: 22- Aug -2021

Available online: 30-Jun-2022

Keywords:

Biostratigraphy
Foraminiferal
Shiranish
Sara anticline

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ABSTRACT

Planktonic foraminiferal biostratigraphy of Shiranish Formation was studied in Sarah's anticline at the Dokan area, Sulaymania governate in, northeastern Iraq. The studied section consists of marl and marly limestone, Sixty-three Planktonic foraminiferal species belonging to seventeen genera have been recognized which permits the recognition of six zones; these are from older at the base

- 6- Abathomphalus mayaroensis interval zone (Part).
- 5- Gansserina gansseri interval zone.
- 4- Globotruncana aegyptiaca interval zone.
- 3-Globotruncanella havanensis interval zone.
- 2- Globotruncanita calcarata total range zone.
- 1-Globotruncana ventricosa interval zone (Part).

The Planktonic foraminiferal zones were correlated with other zonal schemes in and outside Iraq. They are considered to be extending from Middle Campanian to Late Early Maastrichtian.

DOI: [10.33899/earth.2022.174662](https://doi.org/10.33899/earth.2022.174662), ©Authors, 2022, College of Science, University of Mosul.

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الطباقية الحياتية للفورامينيفرا الطافية لتكوين شرانش في طية سارة المحدبة في منطقة دوكان، شمال شرقي العراق

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المخلص	معلومات الارشفة
درست الطباقية الحياتية للفورامينيفرا الطافية لتكوين شرانش في طية سارة المحدبة في منطقة دوكان، السليمانية في شمال شرقي العراق. يتألف مقطع الدراسة من صخور المارل والحجر الجيري المارلي، تم تسجيل 63 نوع من الفورامينيفرا الطافية تعود إلى 17 جنساً، واعتماداً عليها تم تحديد ستة أنطقة حياتية وهي من الأقدم إلى الأحدث:	تاريخ الاستلام: 17 يونيو-2021 تاريخ القبول: 22-أغسطس-2021 تاريخ النشر الإلكتروني: 30-يونيو-2021
6- Abathomphalus mayaroensis interval zone (Part). 5- Gansserina gansseri interval zone. 4- Globotruncana aegyptiaca interval zone. 3-Globotruncanella havanensis interval zone. 2- Globotruncanita calcarata total range zone. 1-Globotruncana ventricosa interval zone (Part). تمت مضاهاة الأنطقة الحياتية في الدراسة الحالية مع ما يماثلها من الأنطقة الحياتية في داخل وخارج العراق، حدد عمر تكوين شرانش ممتداً من الكامبانيان الأوسط – أواخر الماسترختيان المبكر.	الكلمات المفتاحية: الطباقية الحياتية الفورامينيفرا شرانش طية سارة المراسلة: الاسم: ياسين حسين حسن geomaster516@gmail.com

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Introduction

The studied section is located on the southwestern flank of Sara anticline in the Dokan area, which is about 67 km northwest of the city of Sulaymaniyah, Fig (1). The thickness of the Shiranish Formation in the studied section reaches 217 meters. It consists of successions of limestone and marl of a grayish-blue color. The formation is characterized by an abundance of planktonic foraminiferal fossils. The lower boundary of the Shiranish Formation is unconformity with the Kometan Formation evidence appearance a bed of gravel (Jassim and Goff, 2006), while the upper boundary of the Formation is conformable with the Tanjero Formation Which is determined by the variation in lithology.

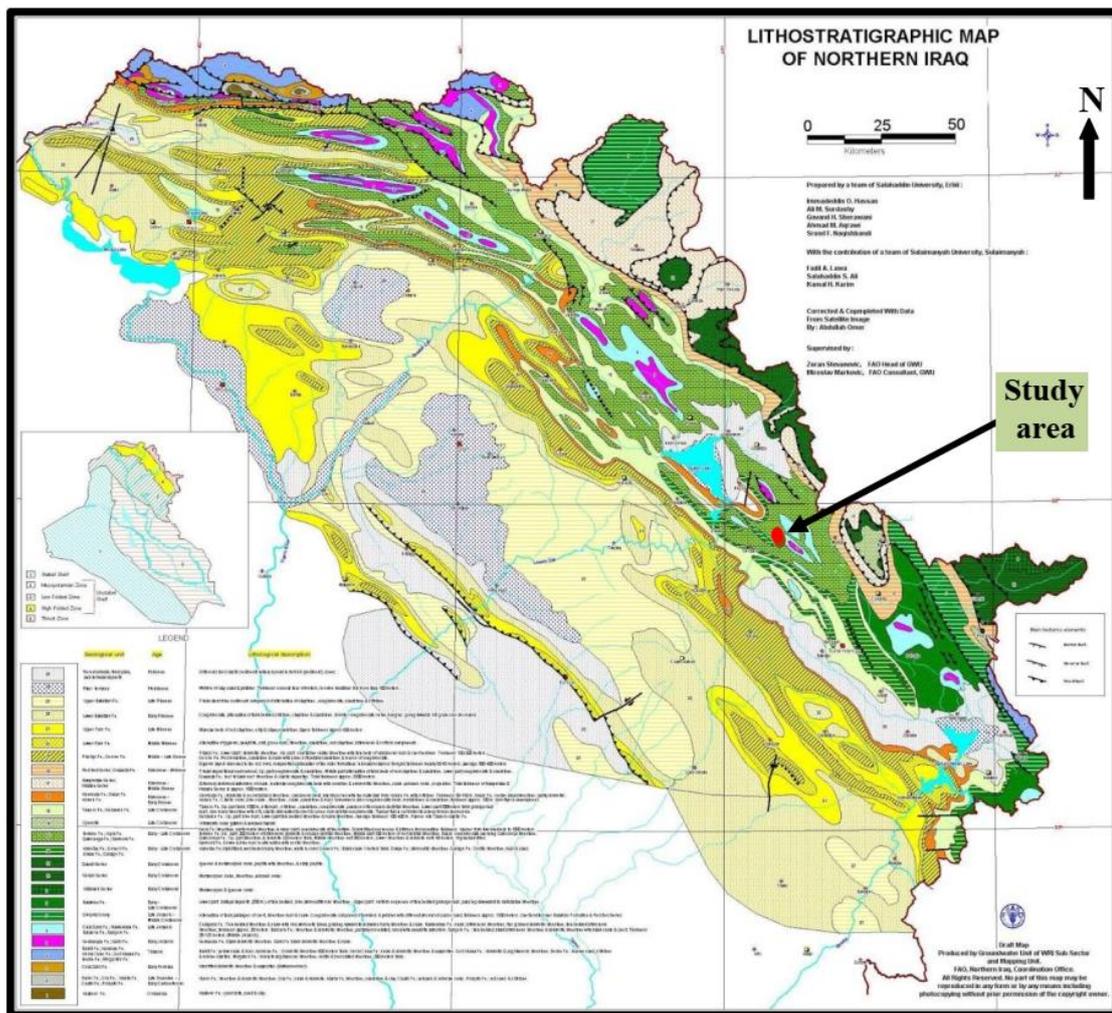
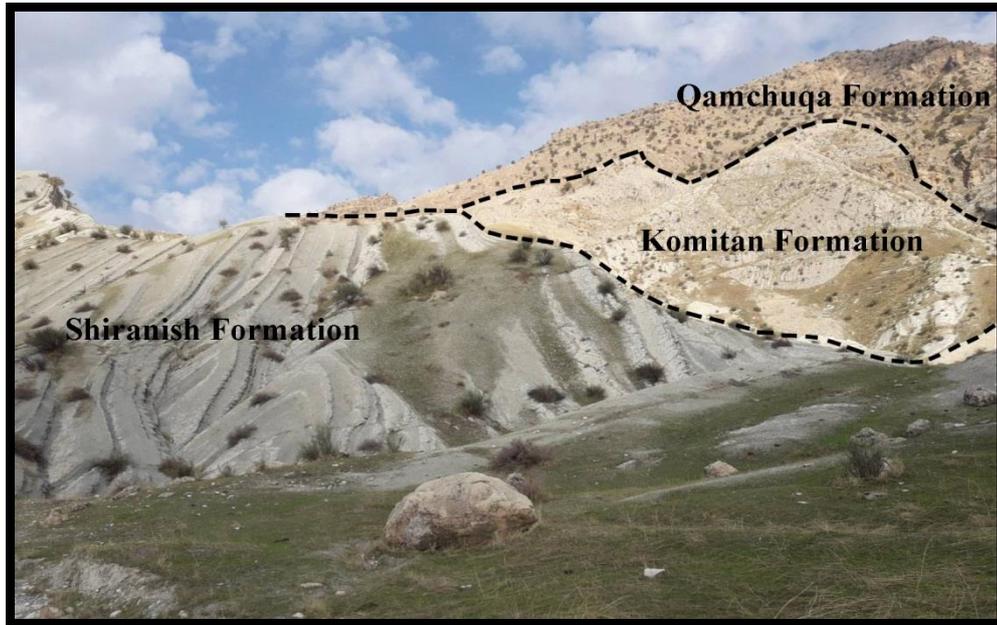


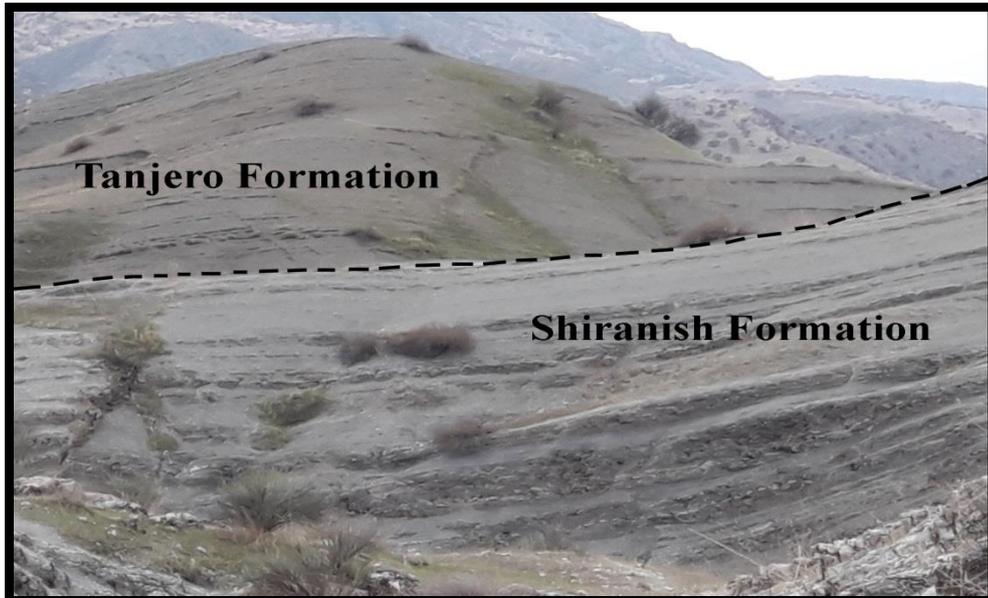
Fig. 1. Geological map of northern Iraq showing in the location of the studied section (Jassim and Goff, 2006)

Lithology of the Section Studied

Shiranish Formation can be subdivided in the study section into two rock units depending on the difference in lithology, the lower unit thickness is 120 m represented by the sequences of marly limestone and marl, And the upper unit thickness is 97 m consists mainly of marl beds alternate with marly limestone beds, Fig (2). The lower boundary of the Shiranish Formation represented by unconformable surface with the Kometan Formation, as evidenced by the appearance of a bed of gravel based (Jassim and Goff, 2006), Picture (1). The upper boundary of the Shiranish Formation is that it is stratigraphically conformity with the Tanjero Formation, which is determined by the variation in the lithology, it consists of marl, sandstone, and shale olive green color, Picture (2).



Picture .1 Shows the lower boundary of the Shiranish Formation with the Kometan Formation in the studied section



Picture. 2 Shows the Upper boundary of the Shiranish Formation with the Tanjero Formation in the studied section

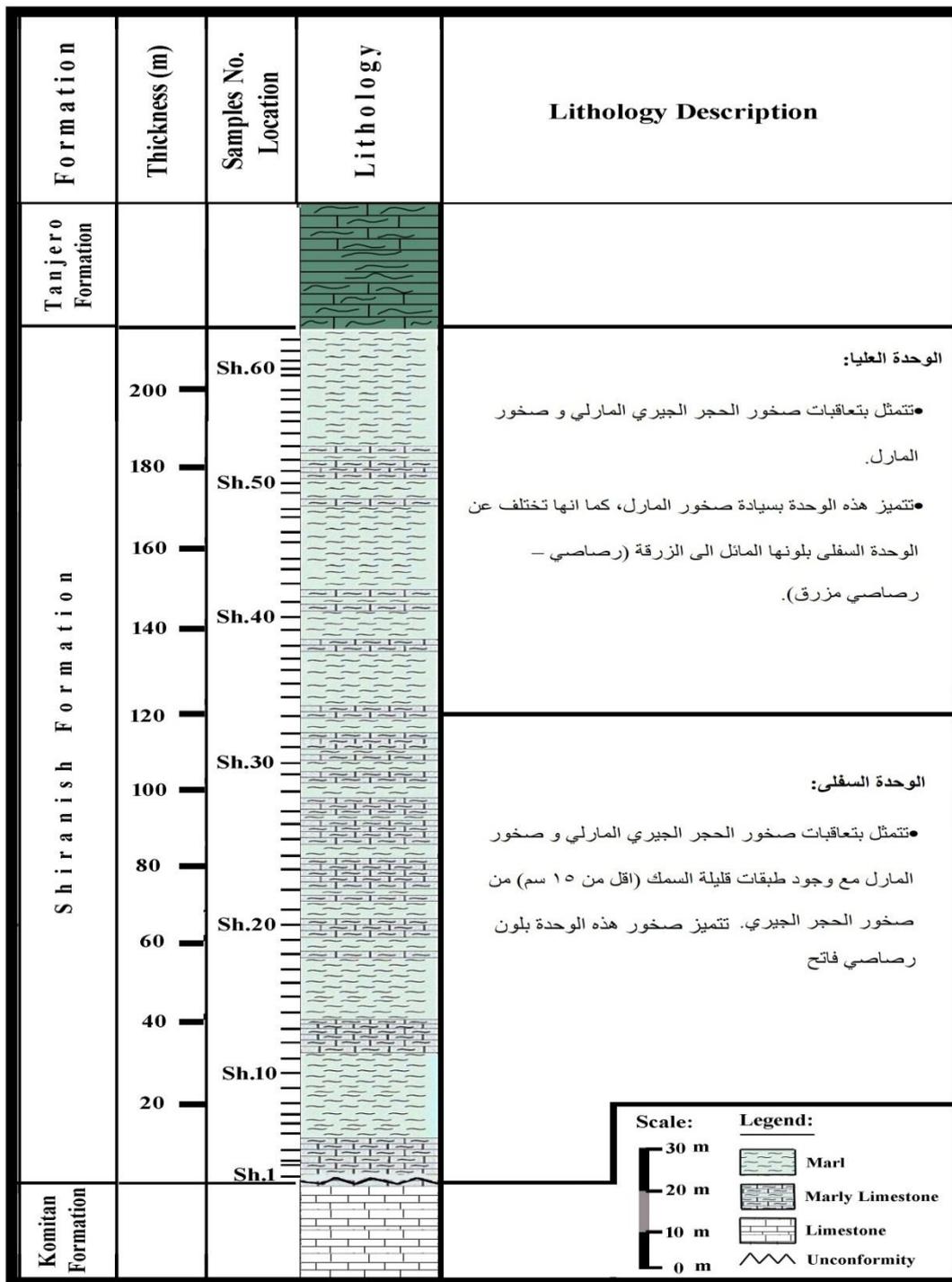


Fig. 2. Stratified column and lithology description of Shiranish Formation in the studied section

Previous Studies

Raof, 2011 Studied the biostratigraphy of Shiranish Formation and the nature of its contact with the Aliji Formation of the Qayyarah/54 and Balkanah7 wells in northern Iraq and determined the age of the Shiranish formation middle late Campanian - Early Maastrichtian. Al-Wazzan, 2013, studied the biostratigraphy of the planktonic foraminifera of the Shiranish Formation in Kirkuk well K-306, northern Iraq, and determined the age of the Shiranish Formation in the mentioned well the Late Campanian - Early Maastrichtian. and Al-Mutiwy,2020 studied the biostratigraphy of the planktonic foraminifera of the Shiranish Formation in the Bira magroon anticline in the Sulaymaniyah area - northeastern Iraq, and determine the age of Shiranish Formation of the Middle Campanian - Early Maastrichtian.

Studied Objectives

The purpose of this paper is to record the planktonic foraminiferal species in the studied section and establish the biostratigraphic zones and correlate them with their equivalent biozones in and outside Iraq in order to determine the age of the studied section.

Biostratigraphy

Based on the stratigraphic distribution of the planktonic foraminiferal species, Fig (3). Based on the stratigraphic distribution of the planktonic foraminiferal species the Shiranish Formation was divided in the studied section into six biozones with an extended age from the Middle Campanian to Late Early Maastrichtian. The identified Planktonic foraminiferal biozones were correlated these biozones have been correlated locally with previous identified in the previous studies in Iraq. and in different regions of the world, Figs (4,5). These biozones were described below starting from older to younger.

Planktonic Foraminiferal Zones

1- Globotruncana ventricosa interval zone (Part):

Definition:

This interval zone defined between FO of *Globotruncana ventricosa* to the FO *Globotruncanita calcarata* (Cushman).

Boundaries:

The lower boundary of this zone is not visible in the study section, and it is determined by the first appearance of the index species *Globotruncana ventricosa* White, while the first appearance of the index species *Globotruncanita calcarata* (Cushman) represents the upper boundary of the zone.

Thickness: (11) m represented by the samples (1-3).

Age: Middle Campanian

Correlation and age determination:

The current zone is equivalent to the *Globotruncana ventricosa* zone reported by (Caron,1985) in Europe, (Gradstein, *et al.*, 2004) in Germany,

(EL-Sabbagh, *et al.*, 2004) in Egypt, (Darvishzad and Abdolalipour, 2009), in northern Iran and it age is recorded the Middle Campanian .in Iraq equivalent *Rugoglobigerina rugosa* zone reported by(Bamerni,2010) in northern Iraq, and equivalent *Globotruncana ventricosa* zone reported by (Al-Mutiwy, 2020) in northern Iraq and it age is recorded the Middle Campanian, and thus is the age of the zone is assigned to the Middle Campanian.

2- Globotruncanita calcarata total range zone:

Definition:

This zone is represented as a total range zone of the marker species *Globotruncanita calcarata* (Cushman).

Boundaries:

The first appearance of *Globotruncanita calcarata* (Cushman) represents the lower boundary of the zone, and the disappearance of the species itself represents the upper boundary of the zone.

Thickness: (54) m represented by the samples (4-20).

Age: Early Late Campanian.

Correlation and age determination:

The biozone of *Globotruncanella calcarata* is equivalent to the total range zone of *Globotruncana calcarata* recorded by (Caron, 1985) in Europe, (Liangquan, Li, *et al.*, 1999) and (Gradstein, *et al.*, 2004) in Germany, (EL-Sabbagh, *et al.*, 2004) in Egypt, (Chacon and Chivelet, 2005) in Spain, (Sari, 2006) in Turkey, (Darvishzad and Abdolalipour, 2009) in northern Iran at the age of the Early Late Campanians. In Iraq equivalent *Globotruncana calcarata* zone defined by (AL-Joboury, 2002), (AL-Omari, *et al.*, 2005), (Bamerni, 2010) and (Raouf, 2011) in well Qayyarah / 54 is the age of the Early Late Campanian, and thus is the age of the zone is assigned to the Early Late Campanian.

3- *Globotruncanella havanensis* interval zone:

Definition:

It represents the stratigraphic range of the index species *Globotruncanella havanensis* (Voorwijk) which precede the appearance of *Globotruncana aegyptiaca* Nakkady.

Boundaries:

The lower boundary of this zone marked by the first appearance of the species *Globotruncanella havanensis* (Voorwijk) while the first appearance of the species *Globotruncana aegyptiaca* Nakkady represents the upper boundary of this zone.

Thickness: (20) m represented by the samples (21-24).

Age: Middle Late Campanian.

Correlation and age determination:

The present zone is equivalent to the *Globotruncanella havanensis* zone

defined by (Caron, 1985) in Europe, (Liangquan Li, *et al.*, 1999) of Early lower Maastrichtian age. and (Gradstein, *et al.*, 2004) in Germany, (EL-Sabbagh, *et al.*, 2004) in Egypt, (Darvishzad and Abdolalipour, 2009) in northern Iran of Late Campanian age. In Iraq the present zone is equivalent the *Globotruncanella havanensis* zone described by (Hammoudi, 2000), The zone of *Globotruncanella havanensis*-*Rosita fornicata* described by (Al-Juboury, 2002), To the *Globotruncanella havanensis* zone described by (AL-Omari, *et al.*, 2005) of Early lower Maastrichtian age, It is also equivalent to the zones described by (Bamerni, 2010), (Al-Mutiwy, 2020) at the age of the late Campanian, and Thus is the age of the zone is assigned to the Middle Late Campanian.

4- *Globotruncana aegyptiaca* Interval zone:

Definition:

This Interval range zone represented by the stratigraphic range of the index species *Globotruncana aegyptiaca* Nakkady preceding the appearance of the species *Gansserina gansseri* (Bolli).

Boundaries:

The first appearance of index species *Globotruncana aegyptiaca* Nakkady Represent the lower boundary of this zone, while the first appearance species of *Gansserina gansseri* (Bolli) indicate the upper boundary of the zone.

Thickness: (40) m represented by the samples (25-34).

Age: Upper Late Campanian.

Correlation and age determination:

The current zone is equivalent of zone *Globotruncana aegyptiaca* identified by (Caron, 1985) in Europe, (Liangquan Li, *et al.*, 1999) in Germany, with an age of late Maastrichtian, and equivalent of zone (Gradstein, *et al.*, 2004) in Germany, (Darvishzad and Abdolalipour, 2009) in northern Iran at the age of the late Campanian. In Iraq the current zone equivalent is of zone *Globotruncana aegyptiaca* registered by (Al-Juboury, 2002), (AL-Omari, *et al.*, 2005) with an age of Late Early Maastrichtian, and equivalent of the zones by (Al-Douri, 2010),

(Bamerni, 2010), (Raof, 2011) in well Qayyarah / 54, (Al-Mutiwty, 2020) at the age of the lates Campanian, and Thus is the age of the zone is assigned to the Upper Late Campanian.

5- Gansserina gansseri Interval zone:

Definition:

This zone represents the stratigraphic range of the index species *Gansserina gansseri* (Bolli) which precede the appearance of *Abathomphalus mayaroensis* (Bolli).

Boundaries:

The first appearance of *Gansserina gansseri* (Bolli) represents the lower boundary of this zone, while the first appearance of *Abathomphalus mayaroensis* (Bolli) indicate the upper boundary of the zone.

Thickness: (15) m represented by the samples (35-39).

Age: Upper Late Campanian- Lower Early Maastrichtian.

Correlation and age determination:

The current zone is equivalent to the zone *Gansserina gansseri* defined by (Caron,1985) in Europe, (Liangquan Li, *et al.*,1999) in Germany indicating the age of Late Maastrichtian and (Gradstein, *et al.*, 2004) in Germany, (EL-Sabbagh, *et al.*, 2004) in Egypt, (Chacon and Chivelet, 2005) in Spain, (Sari, 2006) in Turkey, (Darvishzad and Abdolalipour, 2009) in northern Iran at the age of the Early Maastrichtian. In Iraq the current zone equivalent *Gansserina gansseri* the zone of registered by (Hammoudi, 2000), (Al-Juboury, 2002), (Al-Omari, *et al.*, 2005), at the age of the late Maastrichtian, and equivalent of zones defined by (Al-Douri, 2010), (Bamerni, 2010), (Raof, 2011) in well Qayyarah / 54, (Al-Mutiwty, 2020) at the age of the Early Maastrichtian, and Thus is the age of the zone is assigned to the Upper Late Campanian- Lower Early Maastrichtian.

6- Abathomphalus mayaroensis total range zone:

Definition:

This represent part of interval zone of the index species *Abathomphalus mayaroensis* (Bolli).

Boundaries:

The onset of disappearance index species *Gansserina gansseri* (Bolli) represents the lower boundary of this zone, and the last disappearance index species *Abathomphalus mayaroensis* (Bolli) represents the upper boundary of this zone.

Thickness: (77) m represented by the samples (40-63).

Age: Late Early Maastrichtian.

Correlation and age determination:

The current zone is equivalent of zone of *Abathomphalus mayaroensis* described by (Caron,1985) in Europe, (Liangquan Li, *et al.*,1999) and (Gradstein, *et al.*, 2004) in Germany, (Chacon and Chivelet, 2005) in Spain, (Sari, 2006) in Turkey, at the age of the Latest Maastrichtian. In Iraq the current zone is equivalent zone of *Abathomphalus mayaroensis* diagnosed by (Bamerni, 2010), and the zone of *Plummerita hantkeninoides* recorded by (Al-Douri, 2010) with the age of the Latest Maastrichtian, and Thus is the age of the zone is assigned to the Late Early Maastrichtian.

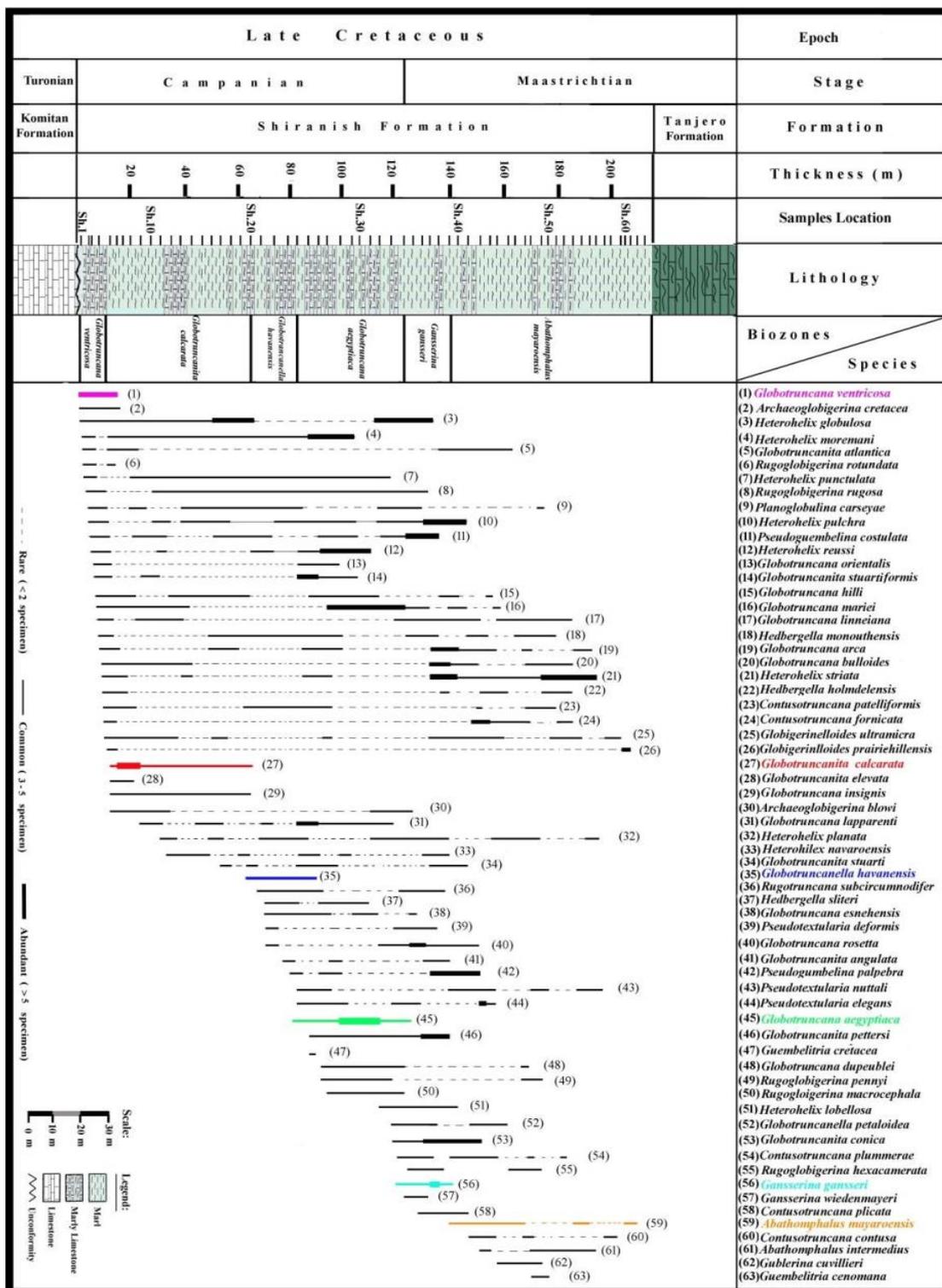


Fig. 3. The geological range and biozones of Planktonic Foraminiferal of Shiranish Formation in the studied section

4-Based on the stratigraphic distribution of these planktonic foraminifera six biozones are recognized, these are from older at the base:

6- *Abathomphalus mayaroensis* interval zone (Part).

5-*Gansserina gansseri* interval zone.

4-*Globotruncana aegyptiaca* interval zone.

3-*Globotruncanella havanensis* interval zone.

2-*Globotruncanita calcarata* total range zone.

1-*Globotruncana ventricosa* interval zone (Part).

5-The distribution of faunal sequence and the correlation between these zones with other zonal schemes in and outside Iraq reveals a Middle Campanian – Late Early Maastrichtian age for Shiranish Formation.

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Plate (1)

- Fig.1. *Globotruncana ventricosa* White. Spiral side. Sample No. 2.
- Fig.2. *Globotruncana ventricosa* White. Side view. Sample No. 2.
- Fig.3. *Globotruncana ventricosa* White. Umbilical side. Sample No. 2.
- Fig.4. *Globotruncanita calcarata* (Cushman). Spiral side. Sample No. 4.
- Fig.5. *Globotruncanita calcarata* (Cushman). Umbilical side. Sample No.4.
- Fig.6. *Globotruncanella havanensis* (Voorwijk). Spiral side. Sample No. 21.
- Fig.7. *Globotruncanella havanensis* (Voorwijk). Side view. Sample No. 21.
- Fig.8. *Globotruncanella havanensis*(Voorwijk). Umbilical side. SampleNo.21.
- Fig.9. *Globotruncana aegyptiaca* Nakkady. Spiral side. Sample No. 25.
- Fig.10. *Globotruncana aegyptiaca* Nakkady. Side view. Sample No. 25.
- Fig.11. *Globotruncana aegyptiaca* Nakkady. Umbilical side. Sample No. 25.
- Fig.12. *Gansserina gansseri* (Bolli). Spiral side. Sample No. 36.
- Fig.13. *Gansserina gansseri* (Bolli). Side view. Sample No. 36.
- Fig.14. *Gansserina gansseri* (Bolli). Umbilical side. Sample No. 36.
- Fig.15. *Abathomphalus mayaroensis* (Bolli). Spiral side. Sample No. 41.
- Fig.16: *Abathomphalus mayaroensis* (Bolli). Side view. Sample No. 41.
- Fig.17. *Abathomphalus mayaroensis* (Bolli). Umbilical side. Sample No. 41.

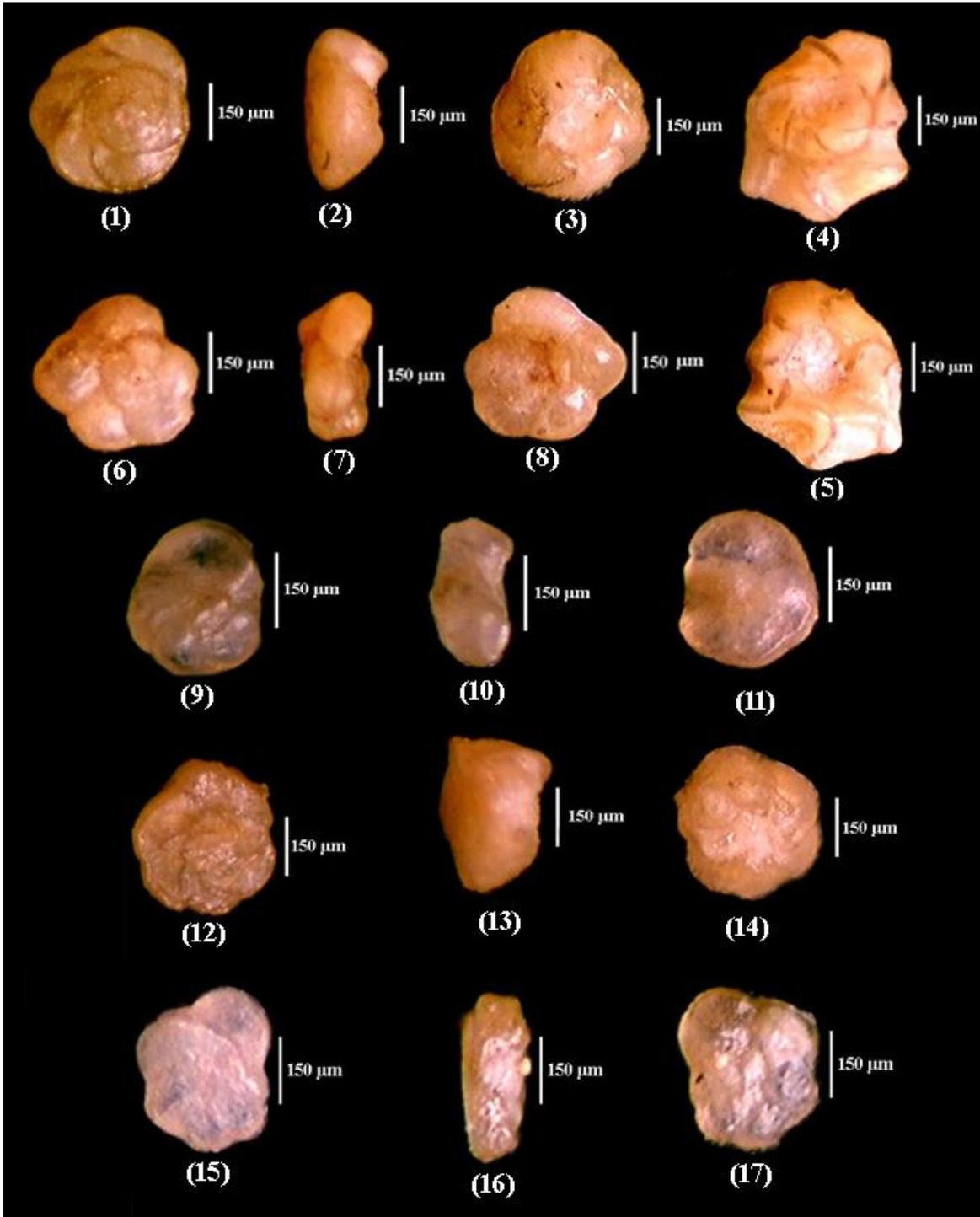


Plate (1)