Bull. Iraq nat. Hist. Mus.
(2012)12 (2): 15-24

MICROFACIES ANALYSIS OF SHIRANISH FORMATION AT HIJRAN SECTION- NE IRAQ

Saadi K. Jan*, Aqeel A. Al- Zubaidi*, Salam I. Al- Dulaimi**
*Natural History Research Centre and Museum, University of Baghdad.
**Department of Geology, College of Science, University of Baghdad.

ABSTRACT

Shiranish Formation (Late Campanian- Maastrichtian) that cropping out north east Iraq, is studied by microfacies analysis of 52 thin section collected from Hijran Section, about 10 km west Shaqlawa Town, Governorate of Erbil. According to petrography, mineralogy and organic contents, rocks are subdivided to crystalline carbonate and microfacies units (biowackstone, packstone, and mudstone facies). Biowackstone facies have high ratio of the rock components, while the other facies have low ratio. Microfacies analysis led to relatively quiet deep marine environment.

INTRODUCTION

Shiranish Formation (Late Campanian-Maastrichtian) was first described at Shiranish Islam near Zakho, by Henson (1940) in (Bellen *et al*., 1959), consisting of marl and thin bedded marly limestone contains planktonic foraminifera. It's thickness at Hijran section about 100m (Aba- Hussan, 1983). The lower contact is conformable with Bekhme Formation (Bellen *et al*., 1959); (Buday, 1980) and the upper contact is conformable with Aaliji Formation (Aba-Hussan, 1983). It is deposited at basional environment far away from beach during transgressive cycle (Bellen *et al*., 1959; Buday, 1980; Aba-Hussain, 1983). It is exposed in most areas of north and north east Iraq, and also at subsurface sections when the drilled wells reaching the Upper Cretaceous rock units (Bellen *et al*., 1959) particularly at Ain Zala Oil Field (Daniel, 1954; Dunnington, 1958). Tectonic activities during Upper Cretaceous affected on the type and distribution of rock units as well as changed thickness of Shiranish Formation (Al- Naqib, 1959). The formation was subdivided into many subzones according to planktonic foraminifera's contents (Al-Kassab, 1979). Many authors emphasized that the age of the formation is Late Campanian- Maastrichtian (Bellen *et al*., 1959; Buday, 1980; Jassim and Goff, 2006). This study attempt to determine the deposional environment of Shiranish Formation at Hijran section (Fig. 1).

MATERIAL AND METHODS

Fifty two rock samples were collected from Shiranish Formation, Hijran section. Thin sections were prepared to study them, from the lower to the upper contact. Thin sections were studied by polarized microscope and analyzed by microfacies technique to recognize them according to Dunham classification (1962) that is modified by Wilson (1962) and Flugel (2010), to determine the environment of deposition.

RESULTS AND DISCUSSION

The results reflect the following:

1- Crystalline Carbonate: this lithofacies which is resulted from diagenetic process composed of dolostone. It is occurred at the lower part and has 6% of the total

thickness. It contains dolomite of equidimentional crystal, named sugary texture (plate 1- a). This texture produces from replacement diagenetic processes on the carbonate sediments. Crystal size shows coarsening upward which reflects more mature diagenetic processes (Fuechtbauer, 1977) and have high permeability due to late dolomitization. The absence of organic content reflect supratidal environment.

2- Packstone facies: This facies occurred at the lower and middle part of the formation and have 10% of the total thickness. It contains planktonic foraminifera, *Globotruncana sp*. (plate 1-b) which consider index fossil of Upper Cretaceous age (Cushman, 1969) and quiet deep marine environment (Milliman, 1974) and also contains cubic pyrite (plate 1-c). Availability of micrite refers to the absence of high energy current and lack of pores, which allow to the carbonate solution to pass through it and deposited as sparite (Folk, 1974). Iron oxides were deposited at the pores of matrix (plate 1- d). This facies similar to the S. M. F. 4, zone F. Z (Flugel, 2010).

FZ 4 Slope

Setting: Distinctly inclined sea floor (commonly 5˚to nearly vertical) seaward of platform margins. Very narrow facies belt.

Biota: Slope benthos and some deep-water benthos and Plankton.

3- Biowackstone facies: This facies occurred at the upper part of the formation, and have 78% of total thickness, and recognized by available of the planktonic foraminifera such as *Globogerina sp*. and *Globotruncana sp*. (plate 2- a), and fossil chamber filled by spary cement which are coincided with Scholle and Scholle (2003), pyrite also recognized at the chamber of some planktonic foraminifera (plate 2- b) and at fossil's pores which consider ideal condition to the pyrite precipitation due to availability of organic matter that makes alkali reducing environment promote crystallization of pyrite (Siesser, 1967). Micrite change upward to microsparite which is reflects the change from quite deep marine environment to the less depth marine environment. This facies similar to the standard facies (S. M. F. 3) zone (F. Z. 3) (Flugel, 2010).

FZ 3 Toe-of-slope apron (deep shelf margin)

Setting: Below wave base and barely at oxygen level. Moderately inclined sea floor (over 1.5˚) basin ward of steeper slopes. Water depths similar to FZ 2 and perhaps 200 to 300 m. Narrow facies belt.

Biota: Some deep-water benthos and plankton.

4-Mudstone facies: This facies occurred at the upper part of the formation and have 6% of the total thickness. It's matrix contains micrite that partly or completely transformed to microspare (plate 2- c) and less than 10% planktonic foraminifera. Fossils chamber filled by cement or micrite (plate 2-3) and sometimes by pyrite (plate 2- d). Carbonate mudstone characterized by the lack of fossils due to the high amount of clay materials which prevents production of organic carbonate (Wilson, 1975). This facies similar to the standard facies (S. M. F. 3) zone (F. Z. 1) (Flugel, 2010).

FZ 1B Cratonic deep-water basin

Setting: Below wave base, below the euphotic zone. Water depth about 30 m to several 100s m. Wide facies belt.

Biota: Predominantly nekton (e.g. ammonites) and plankton (radiolarians, pelagic foraminifera, calpionellids, coquinas of thin-shelled bivalves). Occasionally benthos (abundant sponge spicules).

CONCLUSION

1- Four microfacies were subdivided from lower to upper contact: crystalline carbonate, packstone facies, biowackstone facies and mudstone facies.

2- Planktonic foraminifera composed the main component of the framework and the micrite composed the main component of the matrix, led to quite deep marine environment.

3- Diagenitic processes are limited and confined to dolomitization and cementation.

4- The change of the rocks from lower to upper are: crystalline carbonate, packstone facies, biowackstone facies and mudstone facies which was resulted from the high speed of grain production relative to carbonate accumulation.

5- Wilson Model refers to relatively nearly quiet deep marine deposional environment.

LITEREATURE CITED

Aba-Hussan , A. A., 1983. petrography and Geochemistry of Shiranish Formation in Selected Area-Northern of Iraq, Unpub. M. Sc. Thesis (in Arabic), Univ. of Baghdad, Baghdad.163p.

Al-Kassab, I. I., 1979. The genus Globotruncana Cushman from the upper Cretaceous of Northern Iraq. Jour. Geol. Soc. Iraq. V.13, pp 27-127.

AL-Nanqib, K. M., 1959. Geology of the Southern area of Kirkuk Liwa, Iraq. Iraq petroleum Co. Technical Pub., London. 50p.

Bellen, R. C. VAN; Dunnington, H. V.; Watzel., and Morton, D. M., 1959. Lexique Stratigraique International, Asie.V.3, Fasc, 10a, Iraq, Paris 333p.

Buday, T. 1980. The regional geology of Iraq. Vol.1, stratigraphy and paleography, edit by Kassab, I. and Jassim, S. Z., GEOSURV, Baghdad, 445pp.

Cushman, N., J. A., 1969. Foraminifera their Classification and Economic Use. Cambridge, Harvard University Press, 4th ed., 605p.

Daniel, E. j. A., 1954, Fractured reservoir of Middle East. Bull. AAPG. V.38, p. 77- 815.

Dunnington, H. V., 1958. Generation, migration, accumulation and dissipation of oil in northern Iraq, in week: L. G. (ed.), Habitat of oil, a symposium AAPG. Spec. pub., 1194-1251.

Dunham, R. T. 1962. Classification of carbonate rocks according to depositional texture. In Ham pp. 108-121.

Fluegel, E., 2010. Microfacies of Carbonate Rock, Analysis, Interpretation and Application. 2nd Edition, 984 p.

Folk, L., 1974. petrology of sedimentary rocks. Hemphill, Texas, 182 p.

Fuechtbauer, 1977. sedimente und sedimentgesteine, schweizerbartische Verlags buchhandlung. Stuttgart. 784 pp.

Henson, F. R. S., 1940. Shiranish Formation (Cretaceous). Unpub. Report. In Bellen, R. C. VAN; Dunnington, H. V.; Watzel., and Morton, D. M.,1959. Lexique Stratigraique International, Asie.V.3, Fasc, 10a, Iraq, Paris 333p.

Jassim, S. Z. and Goff, J. C., 2006. Geology of Iraq. Dolin, Prague and Moravian Museum, Brono, Czech Republic, 341p.

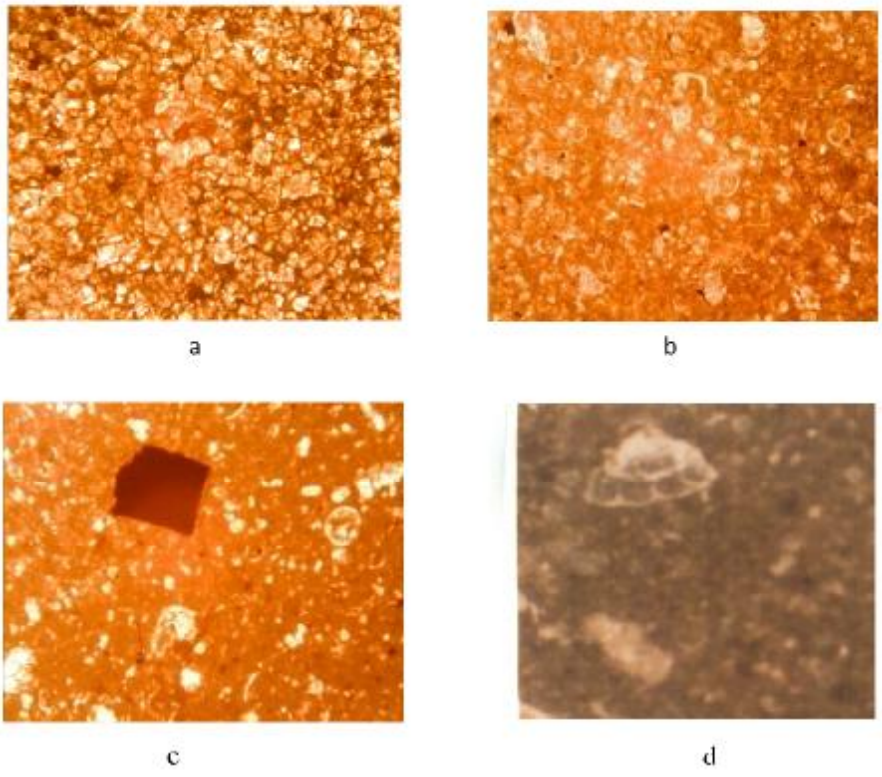
Milliman, J. D., 1974. Marine Carbonates. Berlin, springer verlag.375 p .

Siesser, W. G. 1967. Authigenic pyrite and gypsum in South West African Contenetal slop, sedimentology, Vol. 23, p.579.

Scholle, P. A. and Scholle, D. S. U., 2003. A color guide to the petrography of carbonate rocks: Grains, textures, porosity, diageneses. AAPG Memoir 77, Tulsa, Oklahama, USA, 459p.

Wilson, J. L. 1975. Carbonate Facies in Geologic History. Springer Verlag, pub.1., Berlin-Heidelberg-New York 471 p.

Plate -1



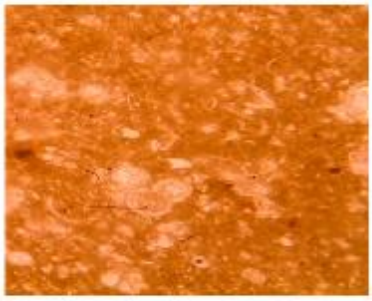
a- Sugary texture of dolostone facies. 40x.

b- Planktonic foraminifera *Glopotruncana sp.* at packstone facies. 100x.

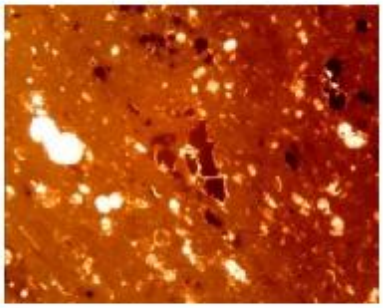
c- Cubic pyrite at packstone facies. 40x.

d- Micrite at fossil's chambers. 40x.

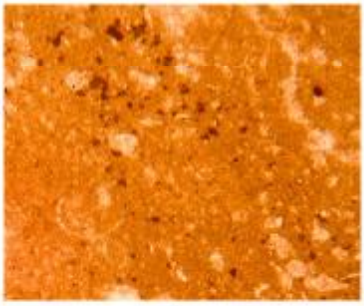
Plate - 2



a



b



c

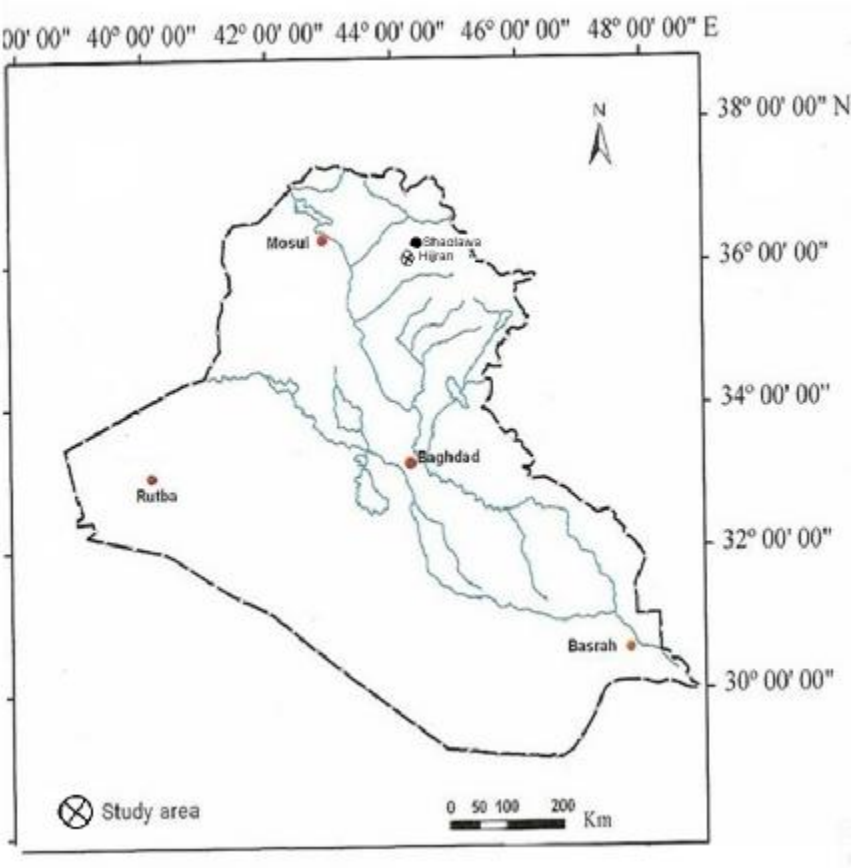
d

a- Planktonic foraminifera *Globogerina sp.* at biowackstone facies. 40x.

b- Pyrite precipitation at planktonic foraminifera chambers. 40x.

c- Micrite partly transformed to microspar. 40x.

d- Calcite cement filled fossil's chamber at mudstone facies. 40x.


00' 00" 40° 00' 00" 42° 00' 00" 44° 00' 00" 46° 00' 00" 48° 00' 00" E
38° 00' 00" N
36° 00' 00"
34° 00' 00"
32° 00' 00"
30° 00' 00"
N
Mosul
Shaqlawa
Hijran
Baghdad
Rutba
Basrah
Study area
0 50 100 200
Km

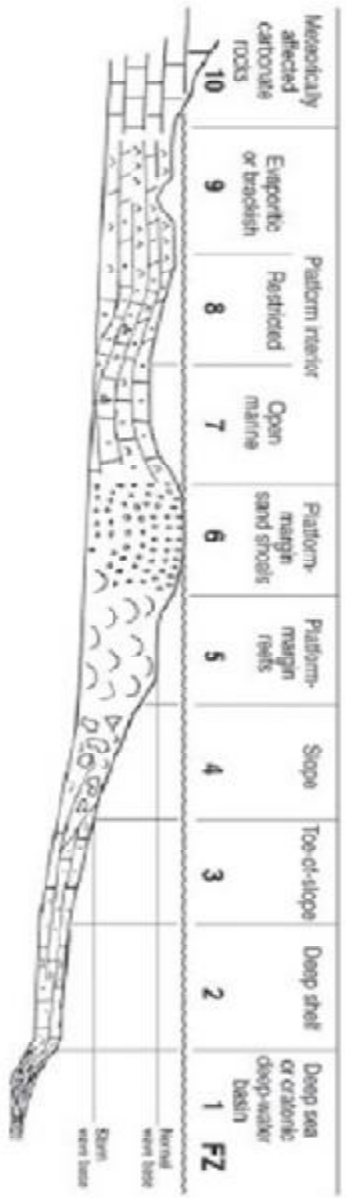


Fig. 2 . Rimmed carbonate platform: The Standard Facies Zone of the modified Wilson model (Wilson, 1975).

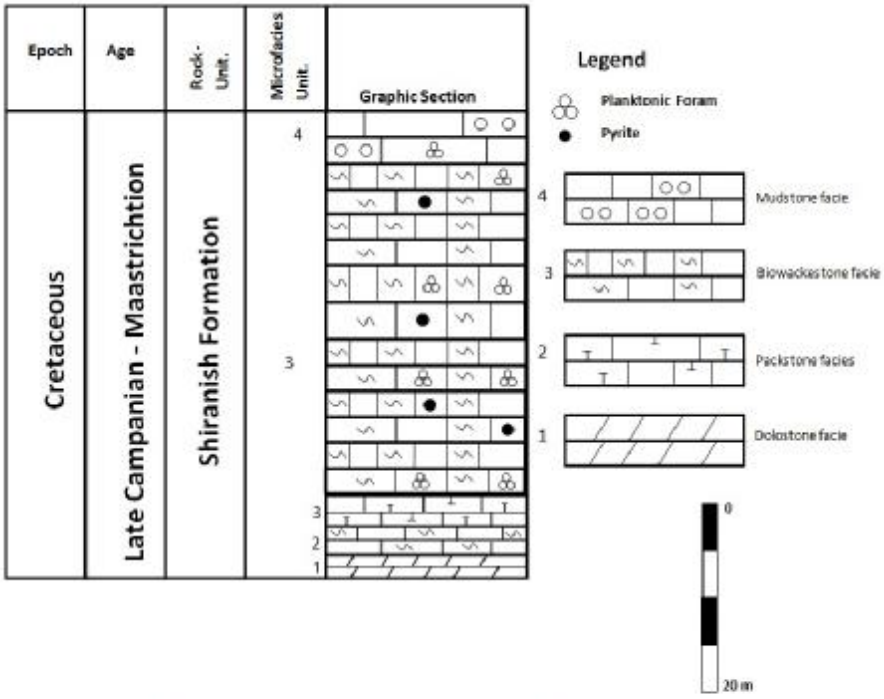


Fig.3: Micro facies chart of Shiranish Formation at Hijran section.

Bull. Iraq nat. Hist. Mus.
(2012)12 (2): 15-24

السحنات الدقيقة لتكوين شيرانش مقطع حجران شمال شرق العراق

سعدي خان جان* و عقيل عباس الزبيدي* و سلام اسماعيل الدليمي**
*مركز بحوث ومتحف التاريخ الطبيعي ، جامعة بغداد .
** قسم علم الارض، كلية العلوم، جامعة بغداد .

الخلاصة

درس تكوين شيرانش (كامبانيان متأخر- ماسترختيان) الذي تنكشف صخوره في شمال شرق العراق، بطريقة تحليل السحنات الدقيقة بعد تحضير ٥٢ شريحة صخرية، جمعت من مقطع حجران الذي يبعد ١٠ كم عن مدينة شقلاوة في محافظة اربيل. استناداً الى الصخارية، والمعدنية، والمحتوى الحياتي قسمت طبقات صخور التكوين الى صخور جيرية متبلورة و سحنات دقيقة (سحنة الحجر الجيري الواكي الحياتي ، وسحنة الحجر الجيري المرزوم، وسحنة الحجر الجيري الوحلي)؛ واشار تحليل السحنات المجهرية الدقيقة للتكوين الى انه ترسب في بيئة بحرية عميقة هادئة نسبياً.