

A study of Macro Fossils (Bivalvia) From Fat'ha Formation (Middle Miocene) at Shaqlawa area, Northeast of Iraq

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Abstract

The bivalvia shell have been systematically described from Fat'ha Formation in the Shaqlawa area at the northern limb of Safen anticline that extended about 50 Km, parallel to the Zagros series which generally trending northwest-southeast direction.

More than 20 Sample were collected from the carbonate unit and seven species belonging to six genera and six families were characteristic in the current study representing by: *Nuculana minima*, *Ostera bellovacina*, *Ostera semiplana*, *Mytilus edulis*, *Glycymeris obovata*, *Parastarte* sp. and *Pecten* sp.

This species are indicating that the carbonate beds in the studied section of Fat'ha formation were deposited in the shallow marine between sub to inter tidal environment, under low salinity.

Key words: Bivalvia, Fat'ha Formation, Middle Miocene, Shaqlawa area and safen anticline.

Introduction

The study area is located in the northern limb of Safen anticline near the Merawa village at Shaqlawa area, about 45 km NE of Erbil city between (44° and 44° 40') longitude and (36° 15' and 36° 45') latitude, within the high folded zone of the unstable shelf according to [1], (Fig. 1)

Ten formations besides recent deposits, expose in the anticline, extending from Lower Cretaceous (Albian) to Upper Miocene. These formations are: Qamchuqa,

Bekhme, Shiranish, Kolosh, Khurmala, Gercus, Avanah, Pila Spi, Fat'ha and Injana

The aim of the current study is to identify and describe systematically bivalvia shells from Fat'ha Formation, (Fig. 2) as well as tracking the environmental envelopes for the studied taxa is carried out in order to simulate paleo- environmental conditions in which the formation deposited.

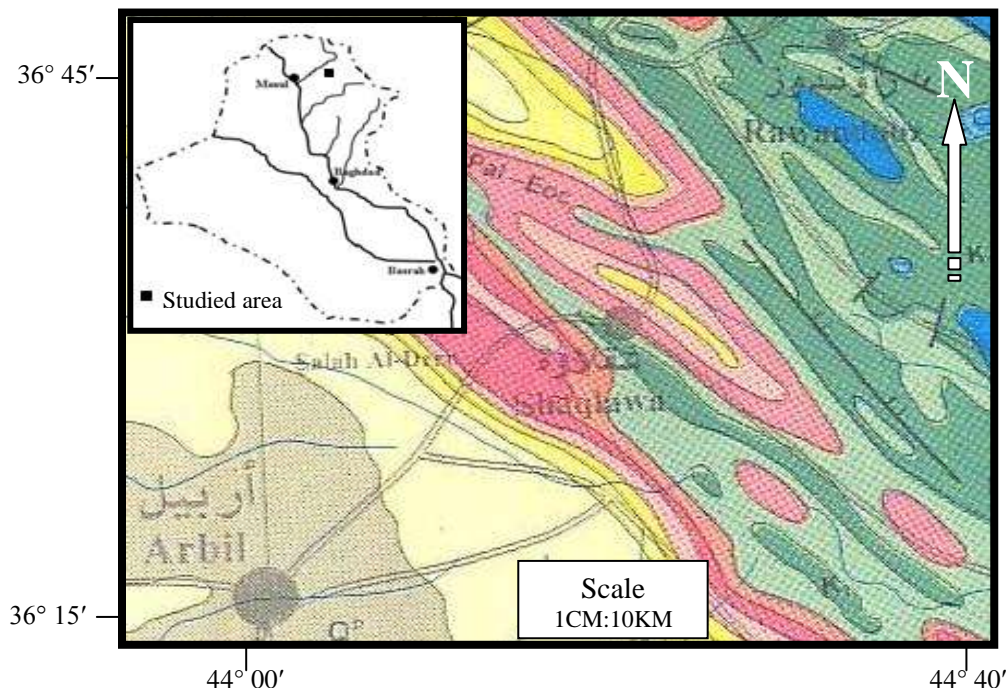


Figure (1): Location map (modified from State company of Geological Survey and Mining)

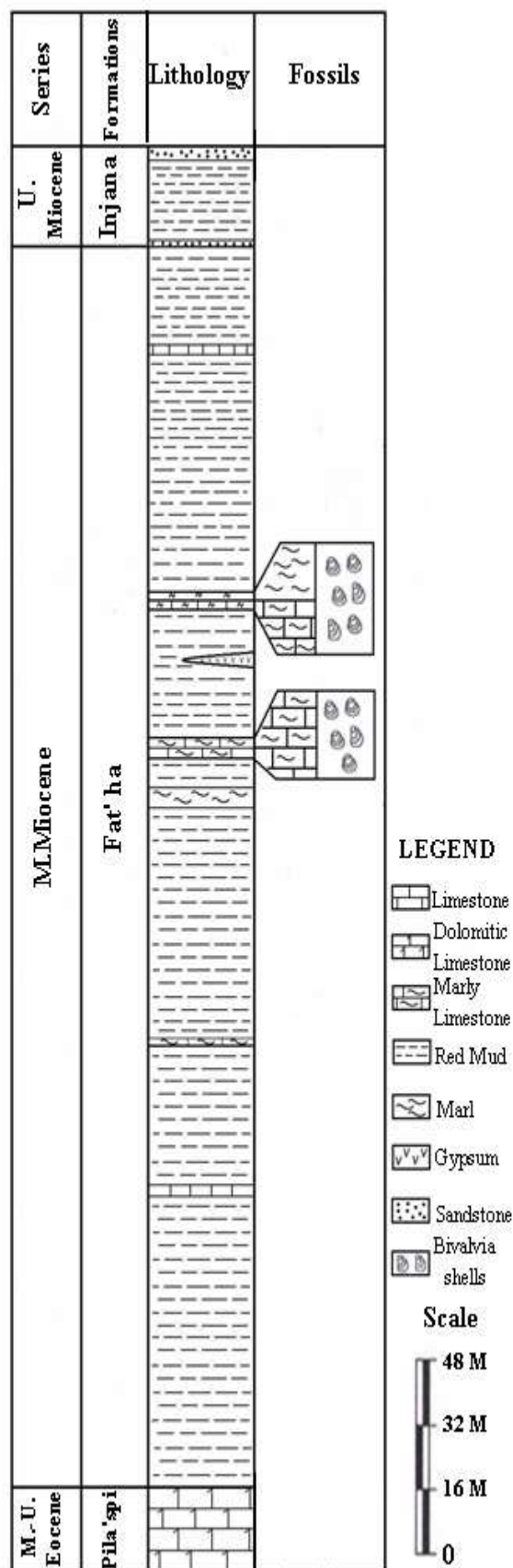


Fig (2): Lithological section of Fat'ha Formation, Safen anticline

Systematic description

The species were identified and described in the current study relied on diagnosis of [2], [Cox, et al., 1969, Cited by 3], [4], [5] and [6] and this study was based on [7] for classification of the specimens.

Seven species belonging to six genera and six families were illustrated and described by using their external and internal shell features and measured shell parameters (shell height and length) see sketch diagram (Fig. 3).

The Synonyms references which is not mentioned in the references list were cited by [8] and [9].

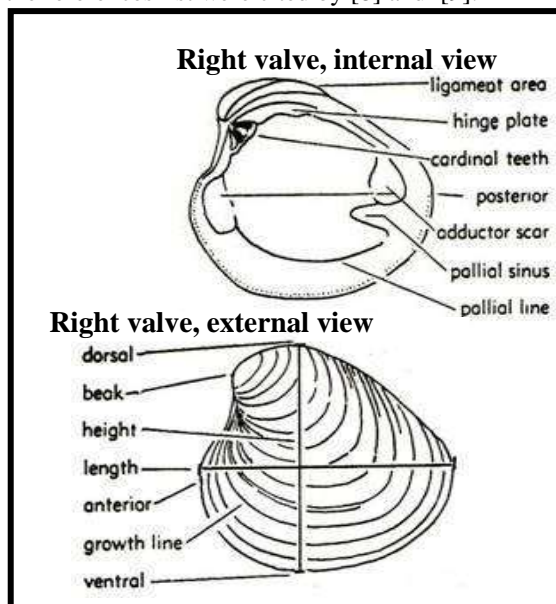


Figure (3): sketch diagram showing the measured bivalvia shell parameters; height and length means (H and L) respectively

Depository

All the specimens which studied were deposited in the Sallahaddin University, Department of Geology, lab. number (6), under the specimens numbers (Sh.1 – Sh.12).

Class: BIVALVIA Linne', 1785

Subclass: PROTOBRANCHIA Pelseneer, 1889

Order: NUCULOIDA Dall, 1889

Super family: NUCULANACEA H. Adams & A. Adams, 1858

Family: NUCULANIDAE Meek, 1864

Genus: Nuculana Link, 1807

Type species: Arca rostrata Chemnitz, 1774 OD
Nuculana minima Sowerby 1812

(Plate 1, Fig. A)

1812 *Nuculana minima* Sowerby P. 97.

Dimensions:

Specimen numbers (n)	height	length
1	1.6	2.2
2	1.7	2.5

Description

large sized shell, averaging about 71% as height as length (H= 1.7 cm, L= 2.4cm, n= 2), Sub trigonally ovoid with anterior, in equilateral to equivalent conjugated valves. Anterio-dorsal margin is longer and more pointed than the posterior-dorsal margin, ventral margin smoothly convex, umbo opisthogyal. The external shell surface is well ornamented by about 7 to 9 concentric growth lines. Lunule straight to slightly concave downwards. Ligament obscure beneath the umbo.

Remarks

The present species show some similarities to *Nuculana amygdaloides* Sowerby, 1827 Cited by [5] but the latter is more elongated in anterior- dorsally direction and the posterior margin is more convex and semi pointed than the current species.

Subclass: PTERIOMORPHIA Beurlen, 1944

Order: PTERIOIDA Newell, 1965

Sub order: OSTREINA Ferussac, 1822

Super family: OSTREACEA Ferussac, 1822

Family: OSTREIDAE Linne', 1785

Genus: *Ostrea* Linne', 1785

Type species: *Ostrea trigonalis* Conrad 1854

Ostrea bellovacina Lamarck 1811

(Plate 1, Fig. B)

1811 *Ostrea sulcata* Lamarck P. 206, PL. XXV, Fig. 4.

1904 *Ostrea bellovacina* Lamarck- Kittl, P. 58, PL. XV. Fig. 13.

1999 *Ostrea bellovacina* Lamarck -lucy, P.33.

Dimensions:

Specimen numbers (n)	height	length
1	1.8	1.4
2	2.0	1.5

Description

Medium sized shell, averaging about 79% as height as length (H= 1.9 cm, L= 1.5 cm, n=2), Shell outline oval to sub triangular, and elongated ventrally. In equilateral valve. Dorsal margin triangular, anterior and posterior margins are sub parallel and converging ventrally. Beak erect and pointed dorsally. Shell ornamented by 4 to 5 distanced laminated growth lines concentrated at the ventrio- lateral shell margins. Cardinal area obviously triangular with no hinge teeth, adductor scar monomyarian.

Remarks

This species is more likely similar to the *Ostrea velata* Wood, 1815 Cited by [4] but the latter differs by having numerous growth lines and the beak is inclined to the anterior margin. While the beak in the studied species is erect and pointed dorsally.

Ostrea semiplana Sowerby, 1825

(Plate 1, Fig. C)

1825 *Ostrea semiplana* Sowerby, P. 144, PL. 489, Fig. 3.

1869 *Ostrea semiplana* Sowerby - Conrad: 74, pl. 25.1

1898 *Ostrea semiplana* Sowerby - Muller: 8, pl.1:1-4, pl.3: 3

Dimensions:

Specimen numbers (n)	height	length
1	2.0	1.1
2	2.1	1.3

Description

Medium sized shell, averaging about 57% as length as height (H= 2.1 cm, L= 1.2 cm, n= 2). Rhomboidal shape, elongated along the dorsal-ventral axis. In equilateral valve. Dorsal margin strongly curved. Beak slender, projecting towards the anterior side. Posterior margin convex, anterior margin straight to slightly concave. Both margins converging towards the semi-circular ventral margin. Shell are ornamented by few crenulated growth lines, in addition to the calcium carbonate material added during the growth giving some thickening to the external of valve.

Remarks

The shell shape and beak of this species is more gauntly than the *Ostrea tenera* (Sowerby, 1823). Cited by [4] .

Sub order: PTERINA Newell, 1965

Super family: PECTINACEA Rafinesque, 1815

Family: PECTINIDAE Rafinesque, 1815

Subfamily: PECTININAE Rafinesque, 1815

Genus: *Pecten* Müller, 1776

Type species: *Ostrea maxima* Linne' 1758, SD

***Pecten* sp.** (Plate 1, Fig. D)

Description

Medium sized shell, about 94 % as length as height (H= 1.6 cm, L= 1.5 cm, n=1). Circular to sub triangular in shell out line. Dorsal margin triangular. Umbo prosogyral. lateral shell margins are in equilateral and sub parallel, curved toward the ventral margin, to give the circular outline to the shell lateral. Shell surface are well ornamented by numerous radial ribs, radiating from the umbonal area towards the ventro- lateral crenulated shell margin. A rib index is 2-3 ribs per mm counted on 2/3 of the shell height. Monomyrian adductor muscle scar.

Remarks

The present species is more likely similar to the *Pecten duplicatus* Sowerby, 1822 Cited by [4]. but the latter is having a numerous faint concentric growth line crossing with the ribs while the studied species having a radial ribs only.

Order: MYTILOIDA Ferussac, 1822

Super family: MYTILACEA Rafinesque, 1815

Family: MYTILIDAE Rafinesque, 1815

Subfamily MYTILINAE Rafinesque, 1815

Genus *Mytilus* Linne', 1758

Type species: *Mytilus edulis* Linne' 1758, SD

Mytilus edulis Linne' 1758

(Plate 1, Fig. E)

1758 *Mytilus edulis* Linne', P. 123.

Description

Small sized shell, about 69% as length as height (H=1.6 cm, L= 1.1 cm, n= 1). Sub triangular to wedge in shell outline. In equilateral to semi equivalent valves. Dorsal margin triangular, umbo prosogyral, anterior margin smoothly, posterior margin strongly convex ventrally, both margins converging towards the ventral side. Shell surface ornamented by numerous faint concentric fila. Ligament external and slightly curved posteriorly towards the umbo, no hinge teeth.

Remarks

It differs from *Mytilus galloprovincialis* Lamarck, 1819 Cited by [6] in having a faint growth lines and the beak is more inclined than the above mentioned species.

Order: ARCOIDA Stoliczka, 1871

Super family: LIMOPSACEA Dall, 1895

Family: GLYCYMERIDIDAE Newton, 1922

Subfamily: GLYCYMERIDINAE Newton, 1922

Genus: Glycymeris Da Costa, 1778

Type species: Glycymeris concave Marshall, 1917 OD

Glycymeris obovata (Lamarck, 1819)

(Plate 1, Fig. F)

1819 *Arca obovata* Lamarck, p. 12, Pl.6, Fig. 113.

1975 *Glycymeris obovata* (Lamarck)-Thomas, P. 1. Fig. 8.

2004 *Glycymeris obovata* (Lamarck)-Bosselaers et al. P. 31.

Dimensions:

Specimen numbers (n)	height	length
1	2.0	2.1
2	2.0	2.2
3	2.2	2.4

Description

The studied species show resemblance to species *Parastarte triquetra* Conrad, 1846. Cited by [5] in shell shape, but the first one is more swollen shell and having a coarse growth lines than the species *Parastarte triquetra* which having faint growth lines.

Discussion and Conclusion

This study involve identified and described seven species belonging to the six genera and six families these are: *Nuculana minima*, *Ostrea bellovacina*, *Ostrea semiplana*, *Mytilus edulis*, *Glycymeris obovata*, *Parastarte* sp. and *Pecten* sp.

Medium sized shell, averaging about 95% as height as length (H= 2.1 cm, L= 2.2 cm, n= 3). Sub quadrate to semi-circular in shell outline, in flatten with equivalent conjugated valves. Dorsal margin sub triangular, umbo prosogyral, lateral margins in equilateral, sub parallel, converging toward the circular ventral side. External shell surface are well ornamented by numerous concentric growth lines particular concentrated underneath the umbo. Ligament external. Teeth generally taxodont

Remarks

This species is resemble to the species *Glycymeris deleta* (Solander, 1766) Cited by [6] in shell outline but the latter is characterized by having numerous radial ribs crossing with the growth lines, while the present species having a growth lines only.

Subclass: HETERODONTA Neumayr, 1884

Order: VENEROIDA Adam & Adam, 1856

Super family: VENERACEA Rafinesque, 1815

Family: VENERIDAE Rafinesque, 1815

Subfamily: GEMMINAE Dall, 1902

Genus: Parastarte Conrad, 1862

Type species: Astarte triquetra Conrad, 1846 OD

Parastarte sp.

(Plate 1, Fig. G)

Description

Large sized shell, about 85% as length as height (H= 2.7 cm, L= 2.3 cm, n= 1). Globose triangular shell shape, plump, equilateral to semi equivalent conjugated valves. Dorsal margin triangular, prominent beak turned inwards and slightly forwards. Lateral margins straight to slightly curved converging ventrally. Ornamentation shows numerous concentric growth lines. Lunule wide and deeper than the shallow elongated escutcheon. Teeth generally heterodont.

Remarks:

Furthermore, the identified taxa; *Nuculana minima*, *Mytilus edulis*, *Glycymeris obovata*, *Parastarte* sp. and *Pecten* sp. were more likely inhabitants inter to sub tidal environment condition of the shallow marine environment, probably lived under depth ranging between 20 – 90m [12, 13 and 14].

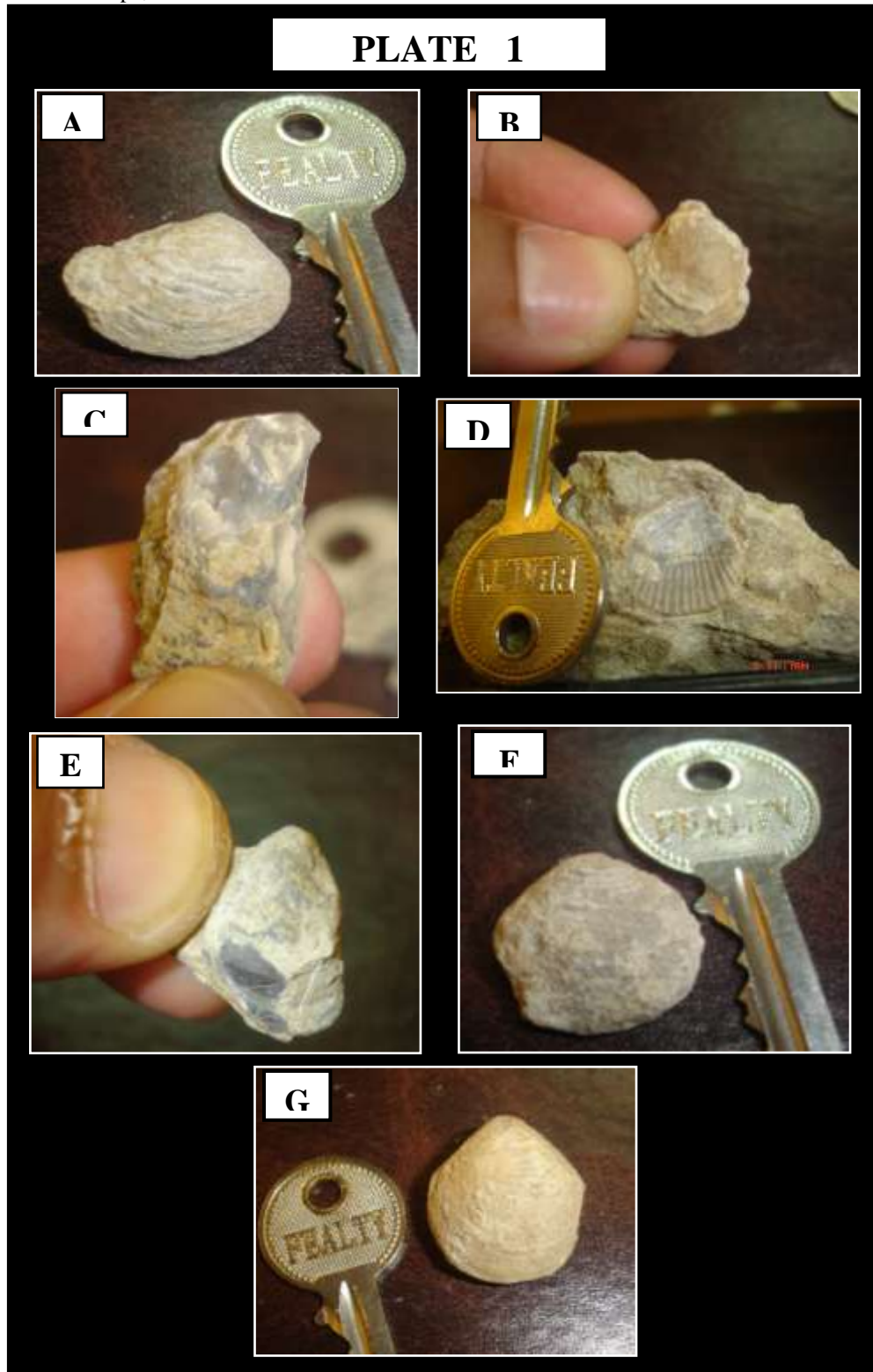
As well as the oyster shell indicate to the brackish water environment under salinity up to 23% [15]. The presence of oysters associated with the above mentioned species, in the studied carbonate bed of Fat'ha formation, is most probably pointed to shallow marine, between the sub to inter tidal environment, under low salinity.

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PLATE 1

- Fig. A: *Nuculana minima* Sowerby 1812, X= 1.5
- Fig. B: *Ostera bellovacina* Lamarck 1811, X= 1.1
- Fig. C: *Ostera semiplana* Sowerby, 1825, X= 2.3
- Fig. D: *Pecten* sp., X= 1.1
- Fig. E: *Mytilus edulis* Linne' 1758, X= 2.5
- Fig. F: *Glycymeris obovata* (Lamarck, 1819), X=1.2
- Fig. G: *Parastarte* sp. , X= 1.2



دراسة المتحجرات الكبيرة (المحاريات) من تكوين الفتحة (المايوسين الأوسط) في منطقة شقلاوة، شمال شرق العراق

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الملخص

تضمن البحث الحالي إجراء دراسة تصنيفية لأصداف المحاريات من تكوين الفتحة ضمن منطقة شقلاوة في الطرف الشمالي من طيه سفين والتي يمتد طول محورها حوالي ٥٠ كم بموازاة سلسلة جبال زاكروس والتي تتجه باتجاه شمال غرب - جنوب شرق.

تم تجميع أكثر من ٢٠ نموذجاً صُنفت إلى سبعة أنواع تابعة إلى ستة أجناس وستة عوائل في هذه الدراسة وهي:

Nuculana minima, *Ostera bellovacina*, *Ostera semiplana*, *Mytilus edulis*, *Glycymeris obovata*, *Parastarte* sp. and *Pecten* sp.

تشير هذه الحشود الحياتية إلا أن طبقات المارلي لايمستون المدروسة من تكوين الفتحة قد ترسبت في بيئة المياه الضحلة المدية وتحت المدية، ذات ملوحة منخفضة.

الكلمات الدالة: المحاريات، تكوين الفتحة، المايوسين الأوسط، منطقة شقلاوة، طيه سفين.