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Gastropods of Aptian- Cenomanian of Qamchuqa Formation in Northern Iraq

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Abstract

Gastropod species belonging to Qamchuqa Formation (Aptian-Cenomanian) in the North of Iraq are studied. These species are *Harpagodes nodosus* (J.de C. Sowerby,1823), *Ampullina* sp.1 (Hannaa and Furisch, 2011), *Ampullina* sp.2 (Hannaa and Furisch, 2011), *Tylostoma pallaryi* (Peron and Fourtau, 1904), *Calliomphalus orientalis* (Douville,1916), and *Pyrgulifera* (Meek, 1871). They are recorded in the Upper Cretaceous succession of Northern Iraq for the first time. Most of these species are internal moulds and not abundant at any stratigraphic level but irregularly scattered in the formation.

Keywords: Qamchuqa, Iraq, Cenomanian, Gastropod.

بطنيات القدم للعمر الابتيان–السينومانيان لتكوين القمجوقة من شمال العراق

سلام اسماعيل الدليمي
قسم علم الأرض، كلية العلوم، جامعة بغداد، بغداد، العراق

الخلاصه

تم دراسة اجناس بطنية القدم العائدة الى تكوين القمجوقة (ابتيان–سينومانيان) في شمال العراق. و تم تثبيت الانواع الاتية:

Harpagodes nodosus (J.de C. Sowerby,1823); *Ampullina* sp.1 Hannaa and Furisch, 2011; *Ampullina* sp.2 Hannaa and Furisch, 2011; *Tylostoma pallaryi* (Peron and Fourtau, 1904); *Calliomphalus orientalis* (Douville,1916); *Pyrgulifera* Meek,1871

هذه الاجناس تم تسجيلها لأول مرة في تتابع الطباشيرى الاعلى في شمال العراق. معظم هذه الاجناس هي عبارة عن قوالب داخلية, و هي ليست غزيرة في اي وحدة طباقية منفردة و لكنها منتشرة بشكل غير منتظم في التكوين.

Introduction

The Qamchuqa Formation includes shallow water carbonate succession with broad distribution in north and northeast of Iraq, where it outcrops in the high folded zone and in the subsurface of the foothill zone.

Qamchuqa Formation was defined by Watzel in 1950 [1] in Qamchuqa village to the northeast of Sulaimaniya city, northeastern Iraq. According to Furst (1970) [2], the upper and lower Qamchuqa Formations in the middle and southern Iraq were renamed as Mauddud and Shuaiba formations,

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respectively. The same author mentioned that, in Iraq, the correlative formations are Dariyan (Aptian) and the Albian part of Sarvak Formation of the East Zagros Mountain. The aim of the present study is to describe and identify the gastropod fossil content of Qamchuqa Formation in northern Iraq.

Study area

The study area is located within Sulaimaniya governorate in northeast Iraq. Two geological sections were studied (Figure-.1), the first is Yoghsamr section located at latitude 35 50` 22`` N and longitude 45 13`24``E with a total thickness of 500 m (Figure-1). Yaghsmar section is exposed in the Surdash anticline. It lies north of Surdash town and runs in WNW-ESE direction within the Balambo-Tanjero zone [3]. The second is Zewe section which is exposed in the Peremagron anticline (Figure-1). It is located at latitude 35 44` 31``N and longitude 45 16`05`` with a total thickness of 480 m (Figure- 1).

Materials and Methods

Seventy Gastropod specimens were collected from the Qamchuqa Formation at Sulaimaniya Governorate, northeast Iraq (Figure- 1). Most of the specimens are preserved as internal molds.

The samples were arranged, cleaned, photographed and compared with other gastropods from United Arab Emirates, Saudi Arabia, and Egypt, where many studies were conducted on the Cretaceous gastropods.

The specimens were stored and studied in the Department of Geology, College of Science, University of Baghdad.

The taxonomic study in this research follows the classification achieved by an earlier work [4]. Abbreviations used in this study are: n: number of measured samples; H: height; D: maximum diameter; HL: height of last whorl; HA: height of aperture; WA: width of aperture; PA: pleural angle (in degrees); and nr: number of axial ribs. Based on size, the specimens were divided, according to a previously published approach [5], into small (1.0 cm), moderate (<1.0-1.5 cm), and large (< 2.5 cm). The spire was classified into low spired (pleural angle 110), moderately low spired (angle 90-110), moderately high spired (angle 50-90), and high-spired (< 50) [4].

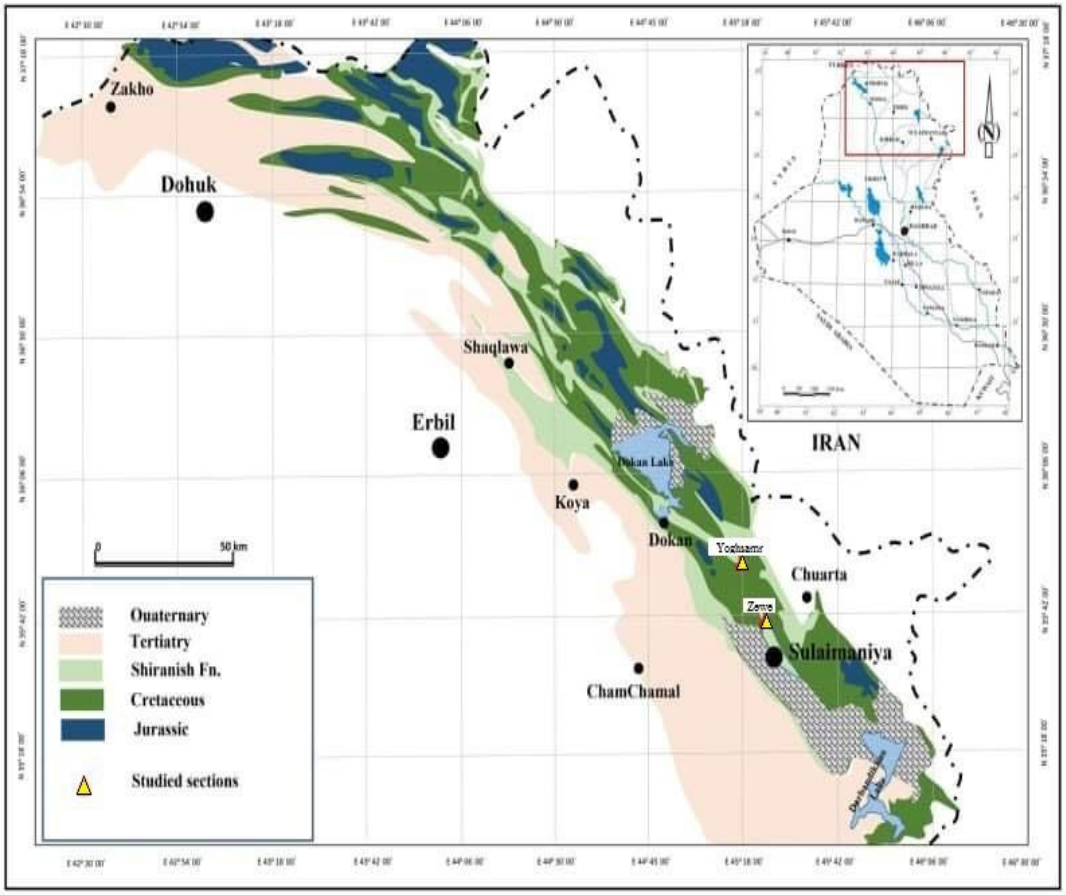

Figure 1-Geologic map showing the location of the study area.

Stratigraphy

The Qamchuqa Formation is considered as one of the most important rock units of Iraq. It consists of massive to thick bedded limestone and dolomite .The age of Qamchuqa Formation is the Hauterivian-Albian [1]. A previous work [6] divided Qamchuqa Formation into a lower unit of the Barremian-Aptian age and an upper unit of the Albian age (Figure-2). The Qamchuqa Formation was originally believed to extend into the Cenomanion according to the occurrence of *Orbitolina concave* [1].

In the studied sections, Qamchuqa Formation consists of limestone and dolomite units, without clastic beds, that separate the formation into two parts (Figure- 3).

In the study area, the formation is underlain by Sarmord Formation and overlain by Kometan Formation (Figures-(2 and 3). The lower contact between Qamchuqa and Sarmord formations is conformable at the studied sections. But the upper contact is unconformable with Kometan Formation.

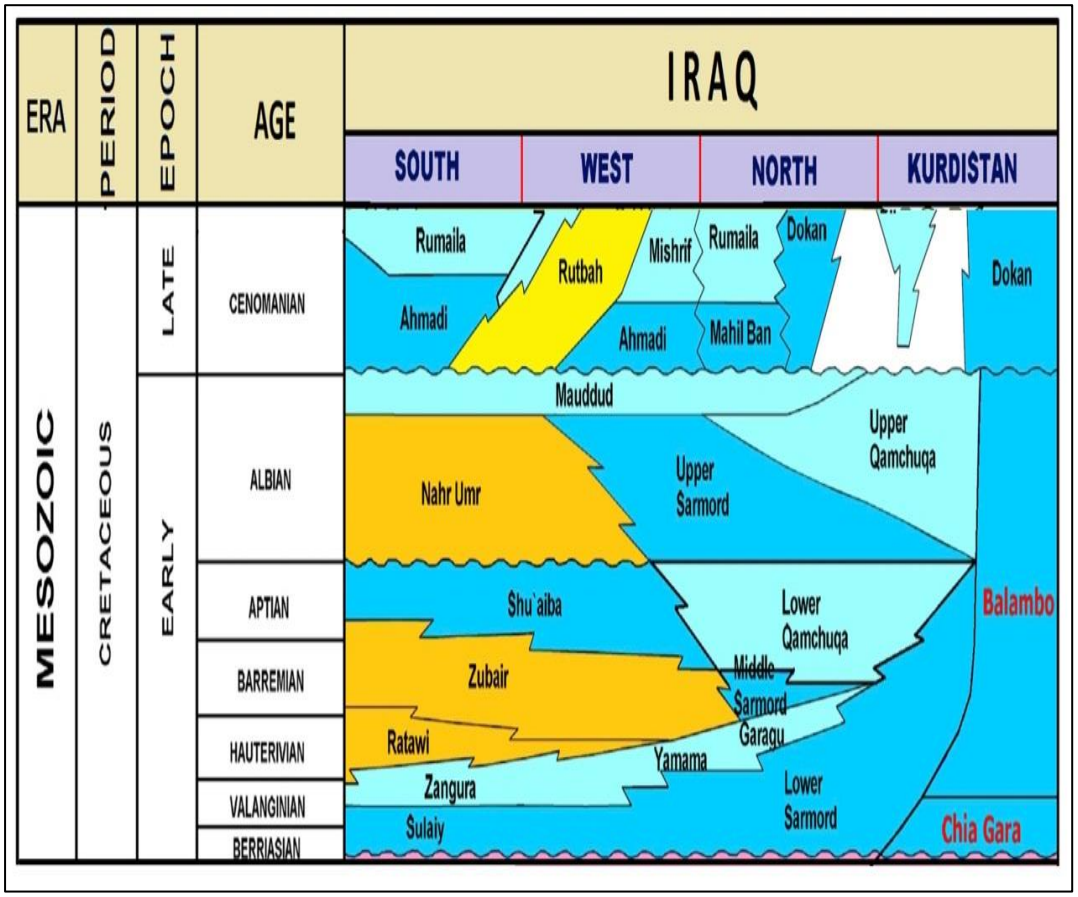

Figure 2-Stratigraphy of Qamchuqa Formation and its equivalents in Iraq (Modified after [7]).

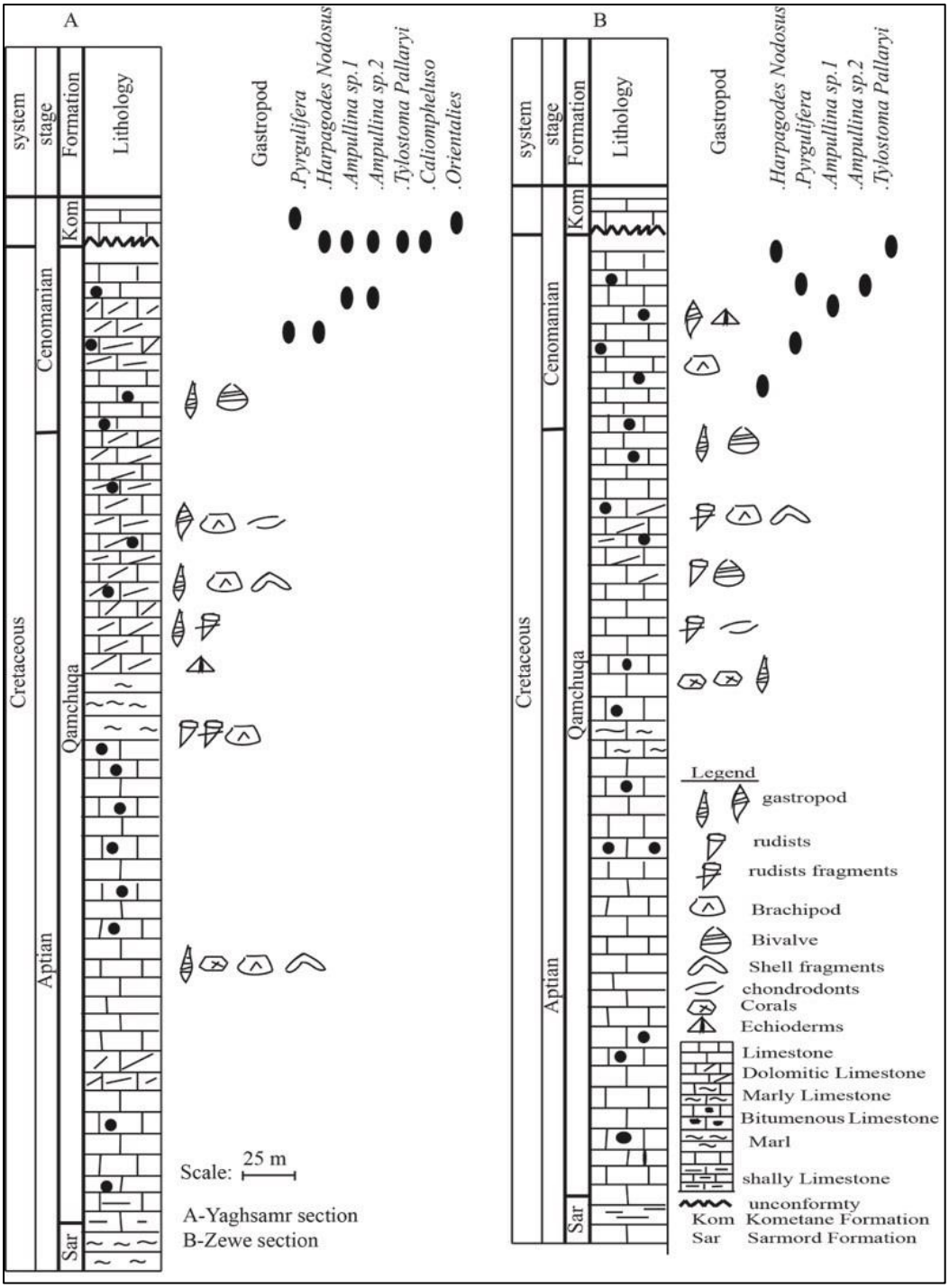

Figure 3-Litho- and biostratigraphy of the two studied outcrops. A- Yaghsmar section; B- Zewe section.

Systematic Paleontology

Class Gastropoda, Cuvior 1797

Clade Vetigastropoda, Salvini-Plawen, 1980

Super family Stromboidea, Rafinesque, 1815

Family Aporrhaidae, Gray, 1850

Sub Family Harpagodinae, Pchelintsev, 1963

Remarks: The New Family Harpagodesidae (recteHarpagodidae) is characterized by a globular shell, a small basal notch, and a broadly expanded wing [8]. An earlier report [9] designated the Subfamily Harpagodinae to the family Strombidae, based on the occurrence of a similar small basal notch in the

Aporrhaidae [4]. Another study [10] allocated the Family Harpagodinae in the Family Aporrhaidac. Furthermore, the Harpagodinae have about four augulations, which enhance the broadly delineated labrum [11]. The subfamily includes some genera such as *Harpagodes* Gill,1870, *Phyllocheilus* Gabb, 1868, *Harpospira* Neagu and Pana, 1995, *Harpodactylus* Kollmann, 2005, and *Quadrinervus* Cossmann [11]. These species are described below.

Genus *Harpagodes* Gill, 1870

Remarks: This genus is characterized by:

(1) Large, moderately high-spired, (2) Obconical or globular shell, (3) Convex to angular whorls, (4) and Strong, spiral ribs [10]. The body whorl carries slightly five strong ribs extending into broadly spreading labral wings, where they culminate in spines, which are strongly curved and occasionally furcate [11]. For other descriptions see [12] and [13].

Harpagodes nodosus (J.de C.Sower, 1823)

(Plt1. Figures- A-C; Table-1)

2011Harapagodes nodosus (J.de C. Sower, 1823)-Hannaa W.A. and Fursich, F.T:Figure-.11 A-C.

Material and occurrence: Three internal moulds from the upper part of Qamchchuqa Formation at Yaghsamer and Zewe sections, Northern Iraq.

Description: Specimens are very large, wiith obconical and low spired gastropod. Spire is slightly protruding above the basal whorl and consists of two compressed whorls with deep sutures.

Harpagodes nodosus has a very large body whorl, which is conical and roundly swollen at the shoulder, occupying more than 90% of the total height. The body whorl is ornamented, not well preserved, with strong spirel ribs. The aperture is large, elongated, lanceolate to semi-oval, and only slightly shorter than the length of the bode whorl. The anterior siphonal canal is short and arced slightly towards left. The base is wide and slightly concave. The Stromboid notch is not preserved. The inner lip is straight to slightly concave.

Occurrence: *Harpagodes nodosus* was recorded from the Cenomanian of Algeria, Lower Turonian of Nigeria, and the Lower Albian-Turonian of Egypt [11]. The species is widely found in the Upper Albian-Cenomanian of the Tethys [14].

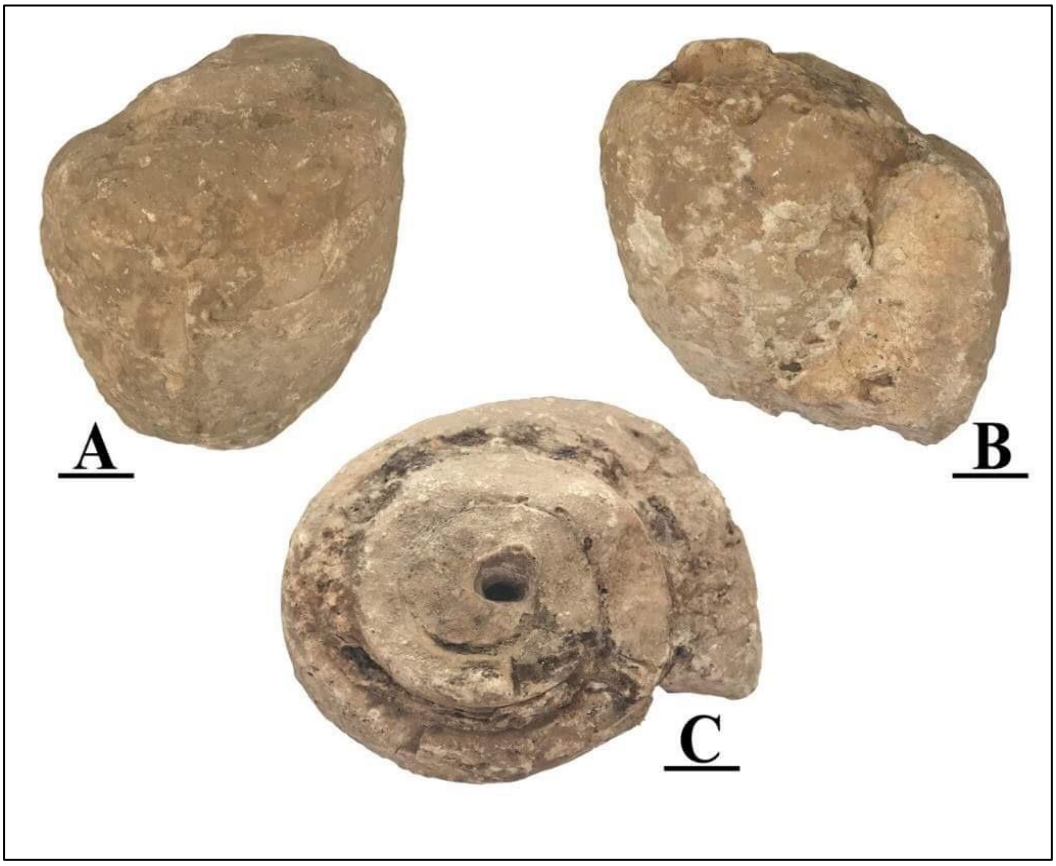

Plate-1: Mould of *Harpagodes nodosus*: (A) Abapertual view. (B) Apertural view. (C) Apical view. Bar scale = 1cm.

Table 1-Dimensions (in cm) of *Harpagodes nodosus* (J.dec. Sowerby, 1823).

N=3	H	D	HL	HA	WA	PA	NS	D/H	HL/H	WA/HA
Range	6-13	6.5-8.5	5-11.5	4-10	2-3	50-70	3	1.08-0.63	0.83-0.88	0.5-0.3
Mean	8.5	7.5	8.25	7	2,5	60	3	0.8	0.85	0.4

Superfamily Camponaniloidea Douville, 1904
Family Ampullinidae Cossmann, 1919
(Gyrodinae Wen2, 1938)

Remarks: the specimens are positioned as Ampullinidae rather the Naticidae, Forbes (1838), as discussed earlier [11]. Although the current material consists of internal moulds, the subovate aperture, relatively low spire, and moderately broad umbilicus indicate that the specimens belong to the genus *Ampullina*.

Genus *Ampullina* Bowdich, 1822
Ampullina sp.1 Hannaa and Furish, 2011
(Plt.2, Figure-s. A-C and Table- 2)

Material: Two internal moulds from the Lower Aption-Lower Cenomanian Qamchuqa Formation, at Yaghsamer and Zewe sections, northern Iraq.

Description: this species is characterized by small to moderately sized moulds, globular to ovate and moderately low spired. The spire is conical and consists of 2-3 overlapping, moderately convex whorls, with deep sutures and raised shoulders (Plt.2, Figure-. C).

The body whorl is broad, rounded in outline, highly inflated, and occupying about 80% of the total height. The apex is broken off. The base is broadly rounded and has an oval and small aperture with highly convex outer lip and slightly concave inner lip. The specimens are of poorly preserved ornamentation.

Discussion: According to a previous study [11], due to the poor preservation of the specimens, identification at the species level is very difficult. However, the present material strongly resembles *Ampullina* sp.1 Hannaa and Fursich, 2011.

Occurrence: *Ampullina* sp1 was recorded from the Upper Turonian Wata Formation, bed 93 and 97, at wadi Quseib in Egypt.

Table 2-Dimensions (in cm) of *Ampullina* sp.1 Hannaa and Fursich 2011

N=2	H	D	HL	HA	WA	PA	NW	D/H	HL/H	WA/HA
Range	4-6	3.5-5.5	2-4	1.5-4	o.9-2	72-88	2-3	0.87-0.91	0.5-0,6	0.5-0.6
Mean	5	4.5	3	2.75	1.45	80	2	0.89	0.55	0.55

Ampullina sp.2 Hannaa and Fursich 2011
(Plt.2, Figure-ures D-F and Table-3)

Material: Three specimens from Aptian-Cenomanian Qamchuqa Formation at the Yaghsmer and Zewe sections, northern Iraq.

Description: *Ampullina* sp.2 is a moderately large, subglobose to ovate noticoid, and moderately high spired Gastropod. The spire is conical and includes three slightly convex whorls, which gradually reduce in height toward the apex and have moderately deep suture. The body whorl is large and occupying 60% of the total height. The apex is broken. The aperture is large, about 60% of the total height, wide, and ovate with small and narrow umbilicus (Plt.2, Figures. D-F). The outer lip is strongly convex, with a concave inner lip.

Discussion: Globose shape, moderately high spire, narrow umbilicus-narrow whorls, and sharp apex. They are strongly similar to *Ampullina* sp.2 Hannaa and Fursich, 2011 in shape and dimension.

Occurrence: This species was recorded from the middle carbonate member of the Cenomanian Hala Formation, bed 15 at Gebel Areif EL-Neqa, Egypt.

Table 3-Dimensions (in cm) of *Ampullina* sp.2 Hannaa and Fursich 2011

N=3	H	D	HL	HA	WA	PA	NW	D/H	HL/H	WA/HA
Range	3.3-3.7	2.3-3.4	2.2-2.6	1.7-2.4	1-1.2	70-80	3	0.69-0.9	0.66-0.7	0.48-0.58
mean	3.5	2.8	2.4	2	1.1	65	3	0.7	0.68	0.53

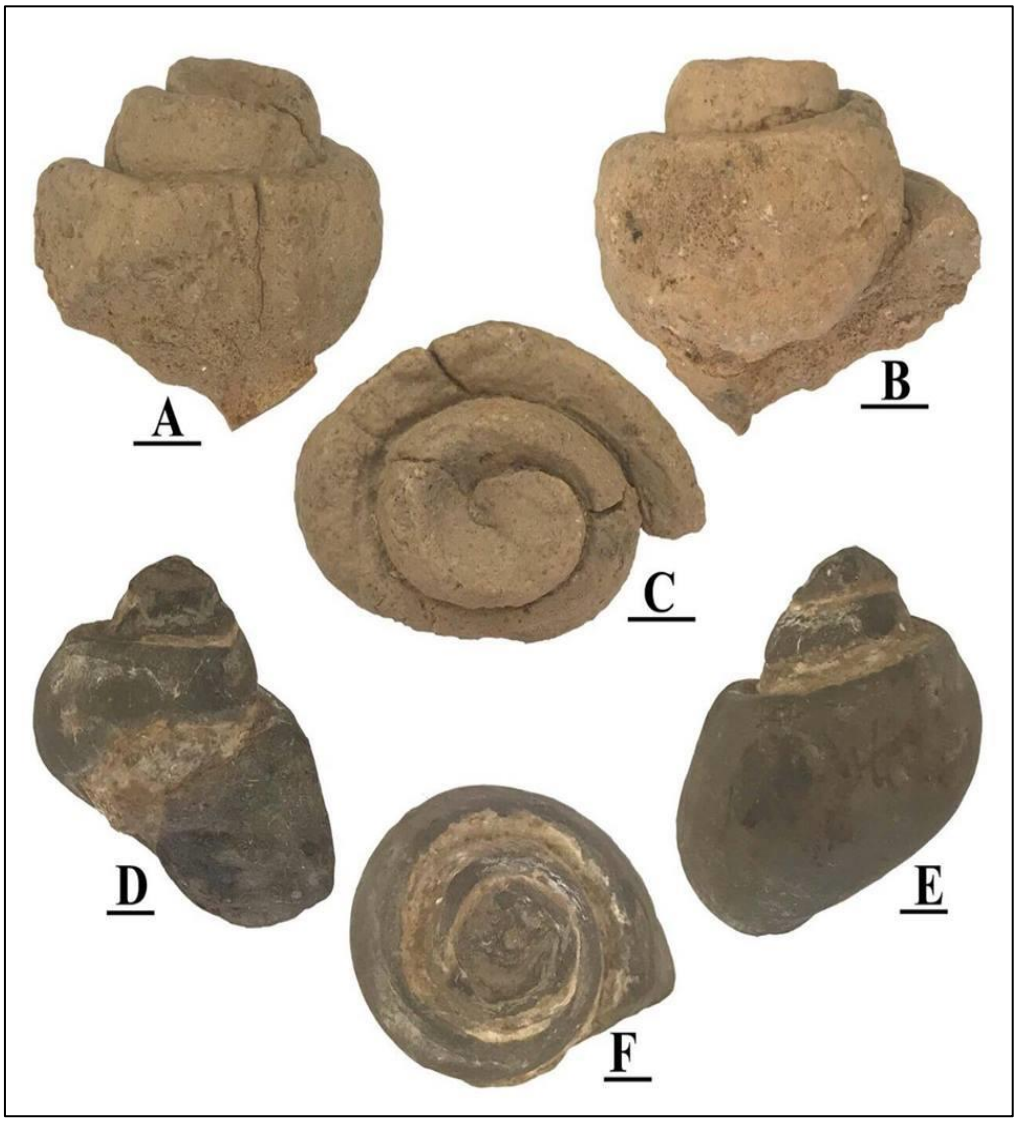

Plate-2: (A-C) Internal mould of *Ampullina* sp.1; (A) Abapertural view showing the deep suture. (B) Apertural view. (C) Apical view. (D-F) Internal mould of *Ampullina* sp.2 (D) Apertural view.(E) Abapertural view. (F) Apical view. Bar scale = 1cm.

Family Tylostomatidae Stoliczka, 1868
Genus *Tylostoma* sharp, 1849
Tylostoma pallaryi (Peron and Fourtau, 1904) (Plt.3, Figure-s. A and B, Table- 4)
2015 *Tylostoma pallaryi* (Peron and Fourtau): Gameil and El-sorogy : 135, Figure-. 5.
Material: Two internal moulds from Aptain-Cenomanian of Qamchuqa Formation at Zewe and Yaghsmer sections, northern Iraq.
Description: Ovate shape, moderately large-to large-sized and moderately high spired Gastropods. The spire is conical, with three overlapping smooth whorls. These whorls are slightly convex and divided by slight sutures. The body whorl is large, semi- conical, with convex flank, and occupying about 75% of the total height. Narrow and lanceolate aperture, partly broken. The lips are jointed apically at a sharp angle. Ornaments are not preserved.
Discussion: According to an earlier work [11], T*ylostsma pallaryi* (Peron and Fourtu) is smaller than *T.globosums* and has a relatively high spire. *T.syriacum* (Conrad, 1852) of Blanckenhorn (1927:137, pl.2, Figure- 4) from the Cenomanian of Syria closely resembles *T.pallaryi* in general shape, but varies in being larger and having a shallow umbilicus with carved suture.
Occurrence: *Tylostoma pallaryi* was documented from the Cenomanian in Algeria and Egypt and from the Campanian-Maastrichtian Aruma Formation, Saudi Arabia [15]

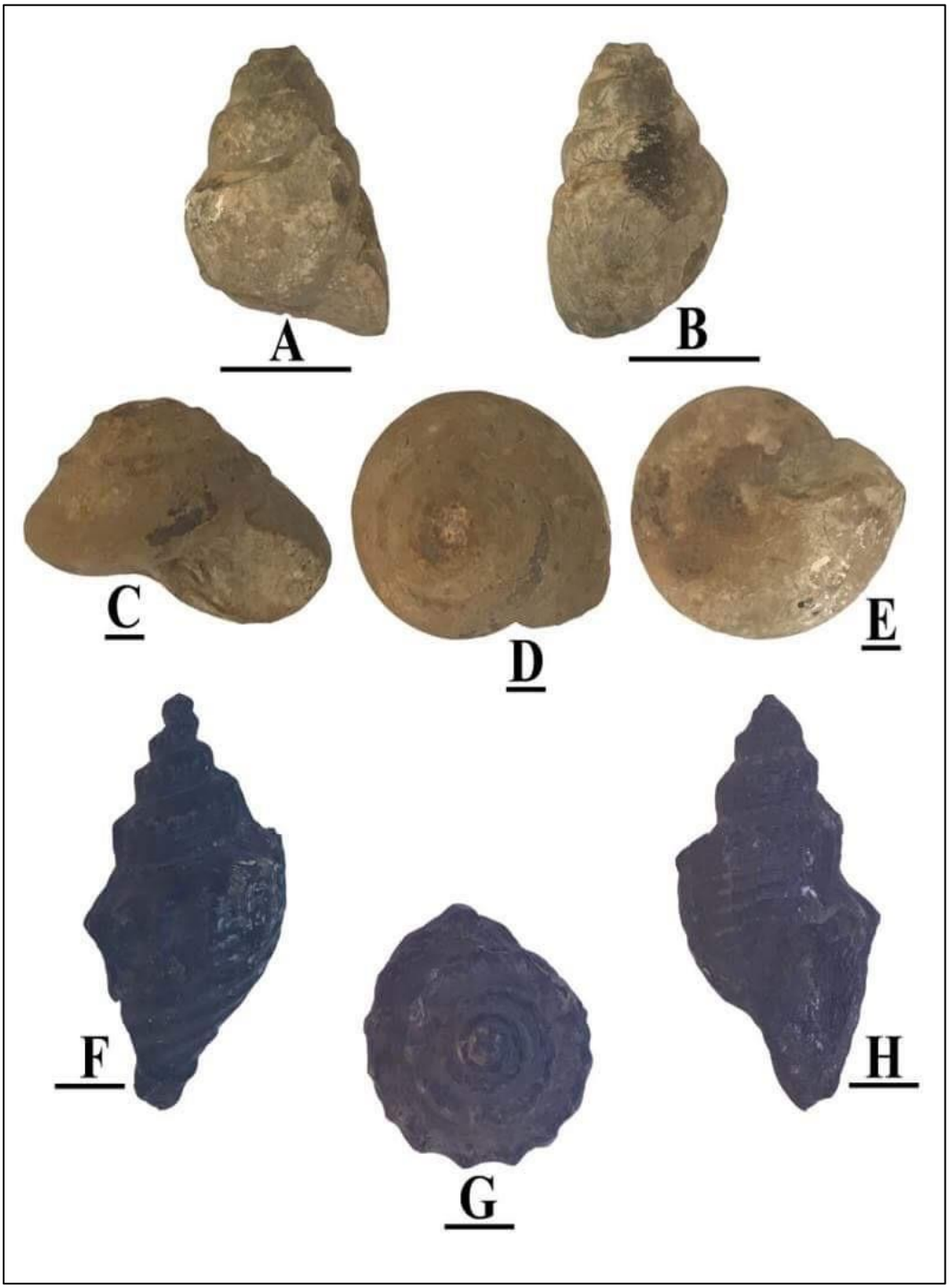

Plate-3: A and B: Internal mould of *Tylostoma pallaryi*. (A) Apertural view. (B) Abapertural view. (C-E) Internal mould of *Calliomphalus orientalis* (C) Apertural view (D) Apical view (E) Ventral view (F-H) Internal mould of *Pyrgulifera* (F) Abapertural view (G) Apertural view (H) Apical view. Bar scale = 1cm.

Table 4-Dimensions (in cm) of *Tylostoma pallaryi* (Peron and Fourtau)

N=3	H	D	HL	HA	WA	PA	NW	D/H	HL/H	WA/HA
Range	4.5-5.6	3-3.5	2.5-3.2	1.2-2	0,8-1.5	60-70	5-6	0.66-0.63	0.55-0.63	0.66-0.75
mean	5.05	3.2	2.85	1.6	1.15	65	5	0.64	0.63	0.70

Superfamily Trochoidea Rafineque, 1815
Family Trochoidea Rafineque, 1815
Subfamily Trochinae Rafineque, 1815
Genus *Calliomphalus* Cossmann, 1888
Calliomphalus orientalis (Douville, 1916)
(Plt.3, Figure-s. F-H, Table-5)
1916 *Meteriomphalus orientalis* Douville:145, pl.18, Figure-.31.
1991 *Meteriomphalus orientalis* Douville- Aboul Ela et al.: pl-2, Figure -1.
1992 *Meteriomphalus* (*calliomphalus*) *orientalis* (Douville)-Abdal-Gawad and Gamil:71, Figure-2/1.
2006 *Meteriomphalus* (*calliomphalus*) *orientalis* (Douville)-El Qot:93, pl.19, Figure-1.
2008 *Calliomphalus* (*calliomphalus*) *orientalis* (Douville)-Mekawy and Abu sied: 317, pl.4, Figure-.3.
2011 *Calliomphalu*? *orientalis* (Douville) Hannaa and Fursich:118. Figure-3.
2015 *Calliomphalus orientalis* (Douville)-Gameil and El-sarogy:131. Figure-4A and B.
Material: two internal moulds from the upper part of Qamchuqa Formation at Zewe section, northern of Iraq.
Description: The shell is medium-sized, trochoid, with conical, moderately high spire consisting two-thirds of the total shell height. The suture is depressed, with large aperture, and semicircular in shape. The umbilicus is deep and narrow. The ornamentation consists of spiral lines, divided by wide interspace, which increases with increasing the size of whorls.

Table 5-Dimensions (in cm) of *calliomphalus orientalis* Douville

N=3	H	D	HL	HA	WA	PA	NW	D/H	HL/H	WA/HA
Range	1.2-1.5	1.6-2	0.5-0.8	0.3-0.4	0.7-1	90 - 100	3	1.3-1.3	0.41-0.53	2.3-2.5
mean	1.35	1.8	0.65	0.35	0.8	95	3	1.3	0.47	2.4

Remarks: the present species closely resembles *Calliomphalu sorientalis* [16], which was originally described in Egypt [17, 18, 11]. Also, it is very similar to *C. orientalis*, which was described in Saudi Arabia [15].
Occurrence: Albian-Cenomanian of Egypt. Campanian-Maastrichtian from Saudi Arabia.
Family Pyrguliferidae Delpey 1941
Genus *Pyrgulifera* Meek, 1871
(Plt.3, Figure-s. A-B, Table- 6)
Material: three internal moulds from the upper part of Qamchuqa Formation at Zewe and Yaghsmer sections, northern Iraq.
Remarks: The name is only diagnosed. It is not available under Art.13.2.1, except the discovery of the author who used the name before 2000 [4].
Description: The shell is large in size with a turreted spire, slightly about 50% of the total shell height; pleural angle near 60; moderately high spired; the spire consists of 4-5 overlapping whorls. The body whorl is relatively large, occupying about half of the height of the specimen. The suture is impressed. Typically, shouldered whorls do not develop until the second teloconch whorl. The teloconch whorls are posteriorly constricted to a strong subsutural collar, below which there is a strongly excavated band leading to a nodose shoulder. The ornamentation consists of coarse ribs that are direct and continuous, suture to suture, on the rounded sides of the first teloconch whorl, with development of the shoulder on the second whorl; the ribs retract from suture to shoulder and become more widely spaced; on the third teloconch whorl, nodes on the collar develop in harmony with the ribs, but have an excavated area between shoulder and suture that is barren of transverse ornament save for growth lines and occasional connective swellings; on the body, the transverses ribs decrease in strength below the shoulder and die out on the basal slope; the transverse ribs have the numbers 14-16 on the body whorl. The spiral ornamentation on the early whorls is composed of broad spiral ribbons, with a very narrow interspace, that are absent on the excavated bond between shoulders and collar, as well as strings on the shoulder angulation where they are accentuated to nodes; on the later whorls, spiral development varies, but commonly is restricted to spiral cords on the basal slope. Also, aperture, subovate, incomplete siphonal canal, and inner lip occur.
Occurrence: this genus was recorded from Cretaceaou in France [4].

Table 6-Dimensions (in cm) of *Pyrgulifera*

N=3	H	D	HL	HA	WA	PA	NW	D/H	HL/H	WA/HA
Range	2.7-3	1.4-1.7	1.5-1,6	1-1.4	0.5-0.7	58-60	4-5	0.51-0.56	o.53-0.55	0.5-0.5
mean	2.8	1.55	1.55	102	0.6	59	5	0.5	0.5	0.5

Conclusions

Six species of gastropod are identified from the Aptian-Cenomanian of Qamchuqa Formation, northern Iraq. These species are recorded for the first time from Cretaceous rocks of Iraq. The identified species were previously recorded from Cretaceous rocks of France, Tunisia, Algeria, Nigeria, Egypt, and Saudi Arabia

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