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UPPER CRETACEOUS MACROFOSSILS FROM JARDAS AL'ABID AREA, AL JABAL AL AKHADAR NORTHEAST LIBYA: A SYSTEMATIC PALAEONTOLOGY

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ABSTRACT

Forty nine macrofossil species and subspecies have been identified, systematically described, and discussed in detail. They have been collected from five Upper Cretaceous stratigraphic sections exposed at Jardas al'Abid area, Al Jabal Al Akadar, NE Libya. The studied fauna are belonging to Mollusca (Bivalvia, Gastropoda, and Cephalopoda) and Echinoidea. Bivalves constitute the main bulk of the taxa, being represented by 30 species and subspecies belonging to 24 genera. The gastropods comprise 11 species belonging to 10 genera, the cephalopods (ammonites) are 4 species belong to 4 genera, and the echinoids are 4 species belong to 3 genera. Among the prementioned fauna 19 species were recorded for the first time from Libya.

Key words: Macrofossils,Upper Cretaceous,Al Jabal Al Akhadar, Libya.

INTRODUCTION

The Upper Cretaceous sequence of the Jardas al'Abid area is fairly rich in marine invertebrates. Bivalves are considered the most abundant macrofossils among the various macrofossil groups, especially the oysters which are very abundant in the Cenomanian Qasr al'Abid Formation. Echinoids and gastropods represent the second abundant faunal elements. The ammonites are of subordinate occurrence and characterize the lower part of Al Baniyah Formation as well as the Al Majahir Formation.

Few systematic studies are carried out on the Late Cretaceous macrofauna of Al Jabal Al Akhadar including Naldini (1949) and Abdel-Gawad (1995 and 2008). In addition, few species were listed by Klen (1974) and Rölich (1974). The present work aims to represent a recent and more detailed systematic study of the Late Cretaceous macrofossils from Al Jabal Al Akhadar. Therefore, five stratigraphic sections are selected (Figs. 1-7); section 1 behind Jardas al'Abid School (X1), section 2 near well A1-18 (X2), Jardas Fortress section (X3), Quarry section (X4), and Ghawt Sas section (X5).

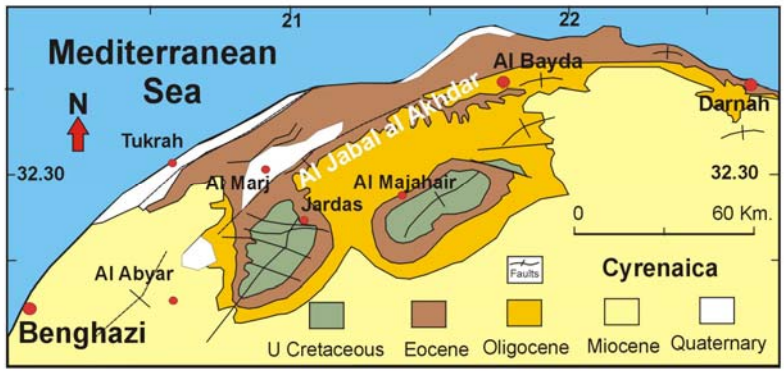


Fig. 1. Geological surface map of Al Jabal Al Akhadar (after El Hawat and Shelmani, 1993).

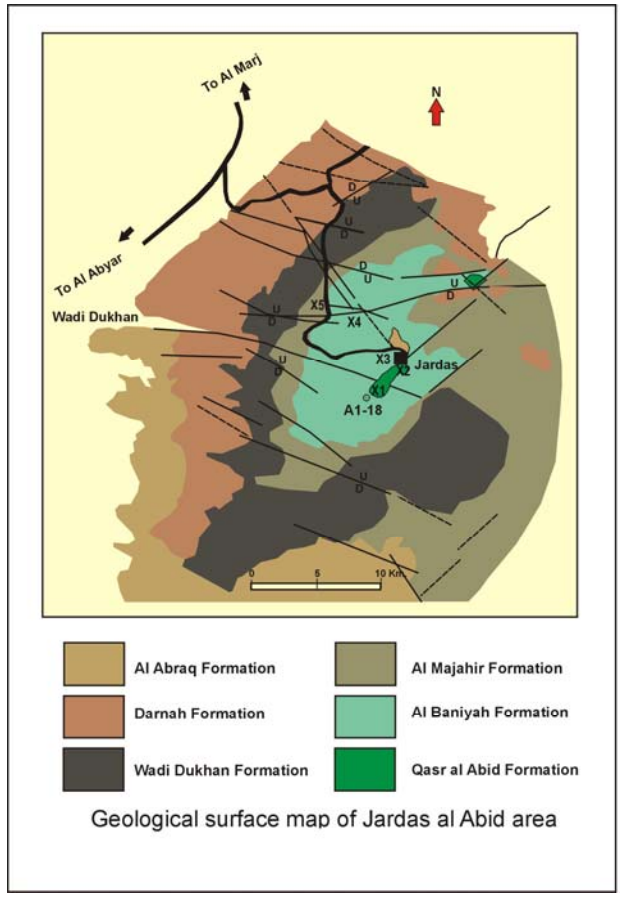


Fig. 2. Geological surface map of Jardas al'Abid area (after El Hawat and Shelmani, 1993).

LITHOSTRATIGRAPHY

The studied Upper Cretaceous lithostratigraphic units are Qasr al'Abid, Al Binyah, and Al Majahir formations. These formations are described briefly in the following;

Qasr al'Abid Formation (Cenomanian):

The term Qasr al'Abid was introduced by Kleinsmeide and Van Den Berg (1968) as "Gaser al'Abid Marl Member" of their 'Jardas Formation' after the fort at Jardas al'Abid village in northern Cyrenaica. Klen (1974) and Röhlich (1974) raised its rank to a formation and named it Qasr al'Abid Formation. The Qasr al'Abid Formation is the oldest lithostratigraphic unit exposed in northern Cyrenaica in two small inliers in the core of the Jardas al'Abid dome. The upper part of the formation is only exposed and consists of a sequence of gray to yellowish gray marl, with intercalations of marly limestone and calcareous claystone. It is overlain conformably by Al Baniyah Formation. The Qasr al'Abid Formation measures about 8 m thick in the first section (school section) and 9 m thick in the second section (near well A1-18) (see Figs. 3 and 4).

The formation is rich in macrofossils, especially the bivalves; *Ceratostreon flabellatum* (Goldfuss), *Costagyra olisiponensis* (Sharpe), *Neithea dutrugei* (Coquand), *Tenea delettrei* (Coquand), *Cucullaea* (*Idonearca*) *diceras* (Seguenza), *Parasea faba* (Sowerby). It yields also the gastropods; *Pterocera incerta* d'Orbigny, *Pterodonta deffisi* Thomas & Peron. In addition to the most abundant echinoid *Mecaster batnensis* (Coquand). The aforementioned fauna indicate a Late Cenomanian age for the Qasr al'Abid Formation of the studied sections.

Al Baniyah Formation (Late Cenomanian-Coniacian):

The name was introduced by Kleinsmeide and Van Den Berg (1968) as "Benia Limestone Member" of their 'Jardas Formation' after the village Al Baniyah (Benia) in northern Cyrenaica. Klen (1974) and Röhlich (1974) raised its rank to a formation and named it Al Baniyah Formation. The lower boundary with the Qasr al'Abid Formation is marked by a fairly sudden gradation of marls into chalky limestone, and the upper boundary is unconformable with the overlying Al Majahir Formation. Al Baniyah Formation at its type section consists of light coloured microcrystalline, well bedded limestone, at times chalky and marly, and gray massive dolomite. Two sections of Al Baniyah Formation were studied; the first one (Jardas Fortress section, X3) and the second section (Quarry section, X4). The first section (Fig. 5) measures 31 m thick and consists of chalky limestone at the base, while the intercalations of marly limestone and dolomitic limestone are characterizing the middle and the upper part. The second section (Fig. 6) measures 29 m and consists of chalky limestone, marl, and shale intercalations at the lower part. The middle part consists of marl, crystalline limestone and dolomitic limestone. The upper part consists of chalky limestone, marl, with minor claystone interbeds. The formation ranges in age from Cenomanian to Coniacian (Klen, 1974; Röhlich, 1974; and Megerisi and Mamgain, 1980).

The lower part of the formation yields the late Cenomanian oysters; *Costagyra olisiponensis* (Sharpe), *Pycnodonte (Phygraea) vesiculosum* (Sowerby), and *Plicatula auresensis* Coquand and the ammonites *Pseudaspidoceras* cf. *pseudonodosoides* (Choffat) and *Calycoceras* sp. Abdel-Gawad (2008) assigned a latest Cenomanian age (*Pseudaspidoceras pseudonodosoids* Zone) to this part of the formation based on the recording of the same prementioned fauna. The middle part of the formation which well exposed in the quarry section yields the early Turonian ammonite *Choffaticeras segne* (Solger) at its base. The top of this middle part yields the late middle-early late Turonian *Coilopoceras requienianum* (d'Orbigny). This middle part yields also the bivalves; *Curvostrea rouvillei* (Coquand), *Plicatula ferryi* Coquand, *Phelopteria gravida* (Coquand) *Cucullaea* spp., *Parasea faba* (Sowerby), *Pholadomya pedernalis* Roemer, *Apricardia* cf. *matheroni* (Coquand), *Radiolites* sp. The gastropods *Tylostoma* (*T.*) *globosum* Sharpe and *Nerinea* sp. In addition to the echinoids *Rachiosoma rectilineatum* (Peron & Gauthier) and *Mecaster* sp. The upper part is relatively poorly fossiliferous with macrofossils and yields poorly preserved bivalve molds. Consequently, the upper part of the formation is attributed questionably to late Turonian-?Coniacian age based on its stratigraphic position. Therefore, Al Baniyah Formation is ranged in age from latest Cenomanian to the ?Coniacian.

Al Majahir Formation (Campanian):

The name was introduced by Röhlich (1974) after the former Majahir fortresses (Qusur al Majahir) near Qandulah village in northern Cyrenaica. According to Kleinsmiede and Van Den Berg (1968) the formation is equivalent to Al Feitah Limestone Member and probably also to apart of the Ghawt Sas Marl Member. The Al Majahir Formation consists of marly limestone, microcrystalline limestone, dolomitic limestone to dolostone with subordinate of marls and calcareous claystone. It overlies Al Baniyah Formation with a pronounced angular unconformity and is conformably overlain by the Wadi al Dukhan Formation with a gradual lithologic transition.

The studied section (Fig. 7) at Ghawt Sas Valley (X5) can be subdivided into two main parts; the lower part measures 28 m and consists of intercalations of limestone, marl, and minor shale beds. The upper part consists mainly of limestones and dolomitic limestone with minor marl and calcareous claystones interbeds. Al Majahir Formation is relatively highly fossiliferous especially its lower part. It yields numerous shell fragments of "*Inoceramous*" sp. and the late Campanian ammonite *Pachydiscus* (*P.*) *perfidus* de Grossouvre. It yields also *Cucullaea schweinfurthi* Zittel, *Venericardia libyca* (Zittel), *Ambigostrea bretoni* (Thomas & Peron), *Pycnodonte* (*Phygraea*) *vesicularis vesicularis* (Lamarck), *Lucina dachelensis* Wanner. These fauna indicate a late Campanian age for the studied section of Al Majahir Formation.

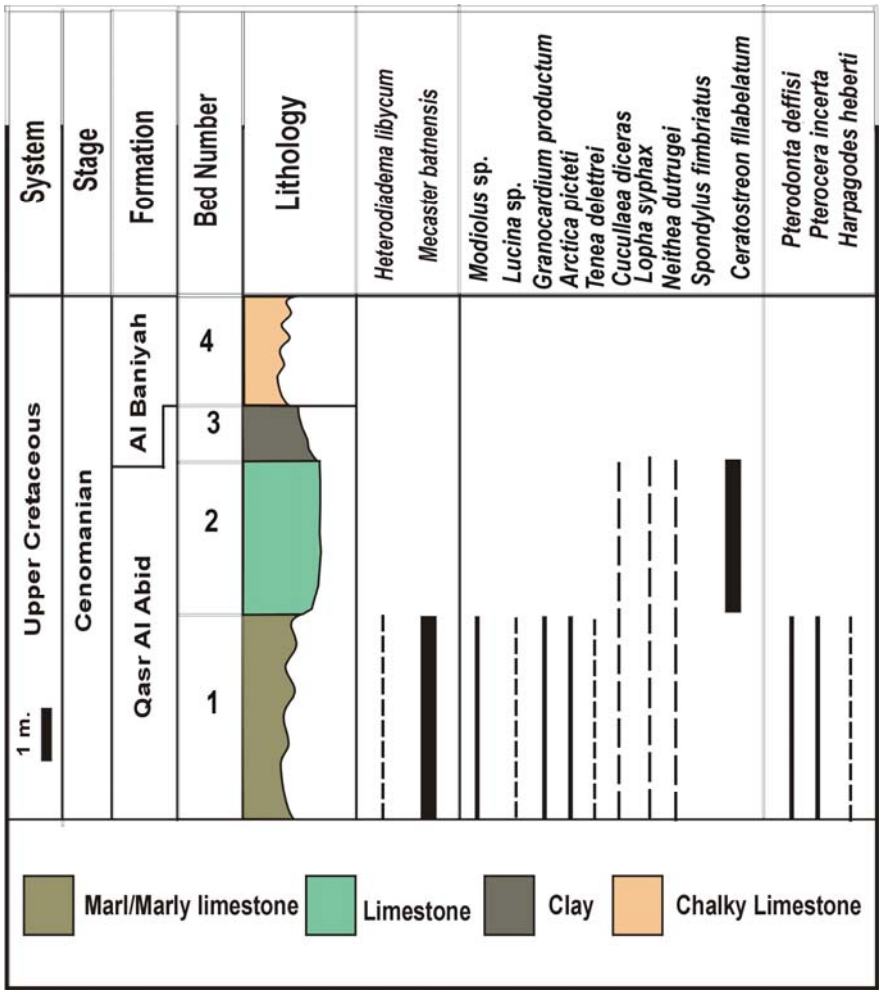


Fig. 3. Columnar section showing the litsostratigraphy and the stratigraphic range of the studied macrofossils of the Qasr al'Abid Formation at Jardas school section (X1).

SYSTEMATIC PALEONTOLOGY

1- Bivalvia

The systematic classification of the bivalves follows that of Amler *et al*. (2000). The terminology for the morphological features follows the glossary presented by Cox (1969) in the Treatise on Invertebrate Palaeontology, Part N (Bivalvia). The terminology for the morphological features of the oysters follows that of Stenzel (1971), that of the shell microstructure of Malchus (1990). All linear measurements (taken with Vernier Caliper) are given in millimeters.

Abbreviations used are as follows:

n = number of measured specimens;
L = shell length;
H = shell height;
C = thickness of articulated shell;
nr = number of ribs.

The age mentioned herein represents the age recorded in the present study, while the total stratigraphic range of the species is discussed in detail in the occurrence section of the species. The identification of the two rudists in the present study is based only on their general morphology.

Phylum Mollusca Cuvier, 1795
Class Bivalvia Linné, 1758
Subclass Pteriomorphia Beurlen, 1944
Order Mytiloida Ferussac, 1822
Subfamily Modiolinae Keen, 1958
Genus *Modiolus* Lamarck, 1799
Subgenus *Modiolus* Lamarck, 1799
***Modiolus* (*Modiolus*) sp.**
Pl. 1, Fig. 1

Material: One specimen from Qasr al'Abid Formation, Jardas al'Abid area.
Measurements (in mm**):**

n=1	H	C	C/H
	31	24	0.77

Description: The specimen is incomplete, but it seems to be closely similar to genus *Modiolus* being characterized by modiliform, equivalved, moderately inflated, strongly inequilateral. Ventral margin with shallow median concavity. Ornamentation consisting of smooth, fine, commarginal growth lamellae, separated by wider interspaces, the latter occupied by finer commarginal threads.
Age: Late Cenomanian.

Order Arcoida Stoliczka, 1871
Family Arcidae Lamarck, 1809
Subfamily Arcinae Lamarck, 1809
Genus *Barbatia* Gray, 1842
Subgenus *Barbatia* Gray, 1842
***Barbatia* (*Barbatia*) cf. *aegyptiaca* (Fourtau, 1917)**
Pl. 1, Fig. 8

cf. 1917 *Arca aegyptiaca* sp. nov. – Fourtau, p. 6, pl. 2, fig. 12.
cf. 1962 *Arca* (*Barbatia*) *aegyptiaca* (Fourtau) – Abbass, p. 16, pl. 2,figs. 1-2.
cf. 1981 *Barbatia* (*Barbatia*) *aegyptiaca* (Fourtau) – Collignon, p. 264, pl. 8, fig. 3.
cf. 2002 *Barbatia aegyptiaca* (Fourtau) – Abdelhamid & El Qot, p. 261, pl. 1, fig. 1.
cf. 2006 *Barbatia* (*Barbatia*) *aegyptiaca* (Fourtau) – El Qot, p. 22, pl. 2, figs. 3-5.

Material: Two specimens from Qasr al'Abid Formation, Jardas al'Abid area.
Measurements (in mm)**:**

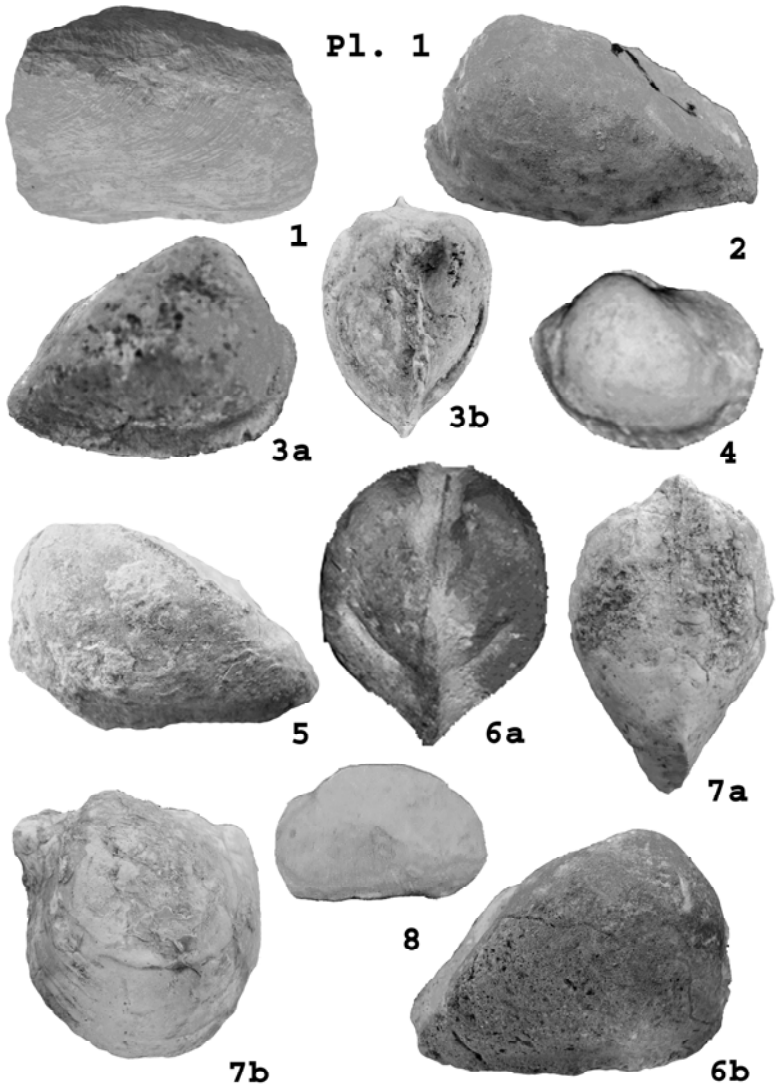


Fig. 1. ***Modiolus*** **(*Modiolus*) sp., incomplete articulated specimen, Upper Cenomanian, Qasr al'Abid Formation, section X1, side view, x1.**

Figs. 2,5. ***Cucullaea*** **(*Idonearca*) *diceras*** **(Seguenza, 1882). Articulated specimens, Upper Cenomanian, Qasr al'Abid Formation, section X1, side views, x 1.2.**

Fig. 3a-b. ***Cucullaea*** **(*Idonearca*) *trigona*** **(Seguanza, 1882). Articulated specimen, Turonian, Al Baniyah Formation, section X4 section, a: side view, b: posterior view, x1.3.**

Fig. 4. ***Cucullaea*** **(*Cucullaea*) *schweinfurthi*** **Zittel, 1902. Articulated specimen, Campanian, Al Majahir Formation, section X5, a: side view, b: posterior view, x1.3.**

Fig. 6a-b. ***Cucullaea*** **(*Idonearca*) *maresi*** **(Coquand, 1880). Articulated specimen; Turonian, Al Baniyah Formation, section X5 section, a: posterior view, b: side view, x0.7**

Fig. 7a-b. ***Phelopteria gravida*** **(Coquand, 1862). Articulated specimen, Turonian, Al Bniyah Formation, Section X4, a: dorsal view, b: side view, x1.**

Fig. 8. ***Barbatia*** **(*Barbatia*) cf. *aegyptiaca*** **(Fourtau,1917). Articulated specimen, Upper Cenomanian, Qasr al'Abid Formation, section X2, side view, x1.**

n=2	L	H	C	H/L	C/L
Range	35-61	19-37	14-29	0.54-0.61	0.40-0.47
Mean	48	28	21.5	0.58	0.44

Description: The specimens are medium-sized, ovoid, elongated, equivalved, inequilateral. Umbones placed one-fourth of shell length from the anterior end. Hinge line short, and inclined anteriorly. Posterior part of shell higher than the anterior one, which is much reduced. Ventral margin feebly convex. The specimens are internal molds, the smaller specimen show traces of reticulate ornamentation pattern which is clearly seen near ventral margin.

Age: Late Cenomanian.

Discussion: The collected specimens agree well in their outline and ornamentation to *Barbatia* (*Barbatia*) *aegyptiaca* (Fourtau) which was originally described and recorded from the Cenomanian of Egypt. They resemble to the material that was recorded from the Cenomanian of Iran by Collignon (1981). Due to the relatively poor preservation, the specimens were refered to the species with reservation.

Occurrence: *Barbatia* (*Barbatia*) *aegyptiaca* (Fourtau) was recorded from the Cenomanian of Egypt and Iran. It was recorded herein for the first time from Libya.

Family Cucullaeidae Stewart, 1930
Genus *Cucullaea* Lamarck, 1801
Subgenus *Cucullaea* Lamarck, 1801
***Cucullaea* (*Cucullaea*) *schweinfurthi* Zittel, 1902**
Pl. 1, Fig. 4

1902 *Cucullaea schweinfurthi* Zittel *in* Quass, p. 198, pl. 22, figs. 18-19; pl. 23, figs. 1-7.
1912 *Arca* (*Cucullaea*) *schweinfurthi* Zittel – Pervinquiere, p. 99, pl. 7, figs. 28-31.
1962 *Arca* (*Cucullaea*) *schweinfurthi* Zittel – Abbass, p. 20, pl. 2, figs. 9, 13.

Material: 3 specimens from Al Majahir Formation of Jardas al'Abid area.

Measurements (in mm)**:**

n=3	L	H	C	H/L	C/L
Range	20-29	15-23	12-19	0.75-81	0.80-86
Mean	23.7	18.6	15.5	0.78	0.83

Description: The specimens are medium-sized, subtriangular to trapezoidal, moderately inflated, equivalved, inequilateral. Umbones moderately prominent, broad, incurved. Hinge narrow, straight. Anterior margin rounded, grading into the very broadly rounded ventral margin. The posterior end of the shell is truncated. Ornamentation consisting of numerous, radial ribs, which are well developed near the ventral margin.

Age: Campanian.

Occurrence: *Cucullaea* (*C.*) *schweinfurthi* is common in the Senonian sediments of Tunisia and Egypt. It was recorded herein for the first time from Libya.

Subgenus *Idonearca* Conrad, 1862
Cucullaea (*Idonearca*) *diceras* (Seguenza, 1882)
Pl. 1, Figs. 2, 5

1882 *Arca diceras* Seguenza, p. 96, pl. 14, fig. 1 a-b.
1912 *Arca* (*Trigonarca*?) *diceras* Seguenza – Pervinquière, p. 102, pl. 7, figs. 23a-b,
25-26.
1917 *Arca diceras* Seguenza – Fourtau, p. 8.
1918 *Arca* (*Trigonarca*) *diceras* Seguenza – Greco, p. 29 (211), pl. 3 (29), figs. 14-15.
1937 *Arca* (*Trigonarca*) *diceras* Seguenza – Trevisan, p. 48, pl.2, figs. 12-13.
1962 *Arca* (*Idonearca*) *diceras* (Seguenza) – Abbass, p. 23, pl.2, fig. 10.
1963 *Arca* (*Trigonarca*) *diceras* Seguenza – Fawzi, p. 22.
2002 *Trigonarca diceras* (Seguenza) – Abdel-Gawad & Gameil, p. 81, pl. 1, fig. 10.
2006 *Cucullaea* (*Idonearca*) *diceras* (Seguenza) – El Qot, p. 24, pl. 2, figs.6-8.

Material: 5 specimens from Qasr al'Abid Formation, Jardas al'Abid area.
Measurements (in mm)**:**

n=5	L	H	C	H/L	C/L
Range	46-53	30-37	28-33	0.65-70	0.61-64
Mean	49	33	31	0.67	0.62

Description: The specimens are internal moulds, medium-sized, triangular in outline, strongly inflated, equivalved, inequilateral. Umbones prominent, broad, incurved, widely separated, with a sharply defined, strong internal rib extending to the postero-ventral part. Distance between umbones moderate to very wide. Hinge line nearly straight and inclined towards the ventral margin at the two extremities. Anterior margin shorter than the posterior one and forming an approximately right angle with the hinge line. Ventral margin nearly straight to slightly curved. Posterior margin nearly straight, forming an obtuse angle with the hinge line and a rounded acute angle with the ventral margin. The specimens carry traces of radial ribs; the latter are relatively well preserved near the ventral margin. These radials are separated by interspaces nearly as wide as the ribs themselves.

Age: Late Cenomanian.
Occurrence: The species is common in the Cenomanian sediments of North Africa (Algeria, Tunisia, Egypt, and Libya) and Italy.

Cucullaea (*Idonearca*) *maresi* (Coquand, 1880)
Pl. 1, Fig. 6a-b

1880 *Arca maresi* Coquand, p. 130.
1880 *Arca teutobochus* Coquand, p. 129.
1890 *Arca maresi* Coquand – Peron, p. 257, pl. 27, figs. 24-25.
1890 *Arca teutobochus* Coquand– Peron, p. 259, pl. 27, figs. 26-27.
1903 *Cucullaea* cf. *maresi* Coquand – Dacqué, p. 371, pl. 36, fig. 4.
1904 *Arca maresi* Coquand– Fourtau, p. 321.

1912 *Arca* (*Trigonarca*?) *maresi* Coquand – Pervinquière, p. 105.
1917 *Arca Maresi* Coquand – Fourtau, p. 10.
2006 *Cucullaea* (*Idonearca*) *maresi* (Coquand) – El Qot, p. 24, pl. 2, figs. 9-1.

Material: 3 specimens from Al Baniyah Formation, Jardas al'Abid area.
Measurements (in mm)**:**

n=3	L	H	C	H/L	C/L	C/H
Range	74-82	57-63	52-58	0.75-82	0.67-74	0.87-95
Mean	79	59	55	0.78	0.71	0.92

Description: The specimens are relatively large-sized, varying in outline from triangular to trapezoidal, moderately to strongly inflated, equivalved, inequilateral. Umbones prominent, broad, incurved, widely separated, with a sharply defined, strong internal rib extending to the postero-ventral part. Distance between umbones moderate to wide. Hinge line early straight and inclined towards the ventral argin at the two extremities. Anterior margin shorter than the posterior one and forming an approximately right angle with the hinge line. Ventral margin nearly straight to slightly curved. Posterior margin nearly straight, forming an obtuse angle with the hinge line and rounded acute angle with the ventral margin. The specimens are internal moulds carry traces of weak radial ribs, which are moderately preserved near the ventral margin.

Age: Turonian.

Discussion: The authors agree with Pervinquière (1912) and El Qot (2006) in regarding *Arca maresi* Coquand, 1880 and *Arca teutobochus* Coquand, 1880 as synonyms, their only difference being that *teutobochus* is more inflated. Pervinquière (1912), in his discussion of this species, mentioned that it is very common in the Coniacian of Tunisia. He added that Peron (1890) specified the Santonian age of the Algerian material of Coquand as Coniacian and Santonian.

Occurrence: The species is ranging in age from the Turonian to the Santonian and being abundant in Algeria, Tunisia, and Egypt. It was recorded herein for the first time from Libya.

***Cucullaea* (*Idonearca*) *trigona* (Seguenza, 1882)**
Pl. 1, Fig. 3a-b

1882 *Arca trigona* Seguenza, p. 98, pl. 13, figs. 6, 6a.
1912 *Arca* (*Trigonarca*?) *trigona* Seguenza – Pervinquiere, p. 103, pl. 7, figs.20-21.
1918 *Arca* (*Trigonarca*) *trigona* Seguenza – Greco, p. 28 (210), pl. 2 (29), figs. 12-13.
1937 *Arca* (*Trigonarca*) *trigona* Seguenza – Trevisan, p. 47, pl. 2, fig. 10.
1963 *Arca* (*Trigonarca*) *trigona* Seguenza – Fawzi, p. 21.
2001 *Trigonarca trigona* (Seguenza) – Abdallah et al., pl. 2, fig. 1.
2006 *Cucullaea* (*Idonearca*) *trigona* – El Qot, p. 25, pl. 3, fig. 2a-b.

Material: 5 specimens from Al Baniyah Formation, Jardas al'Abid area.

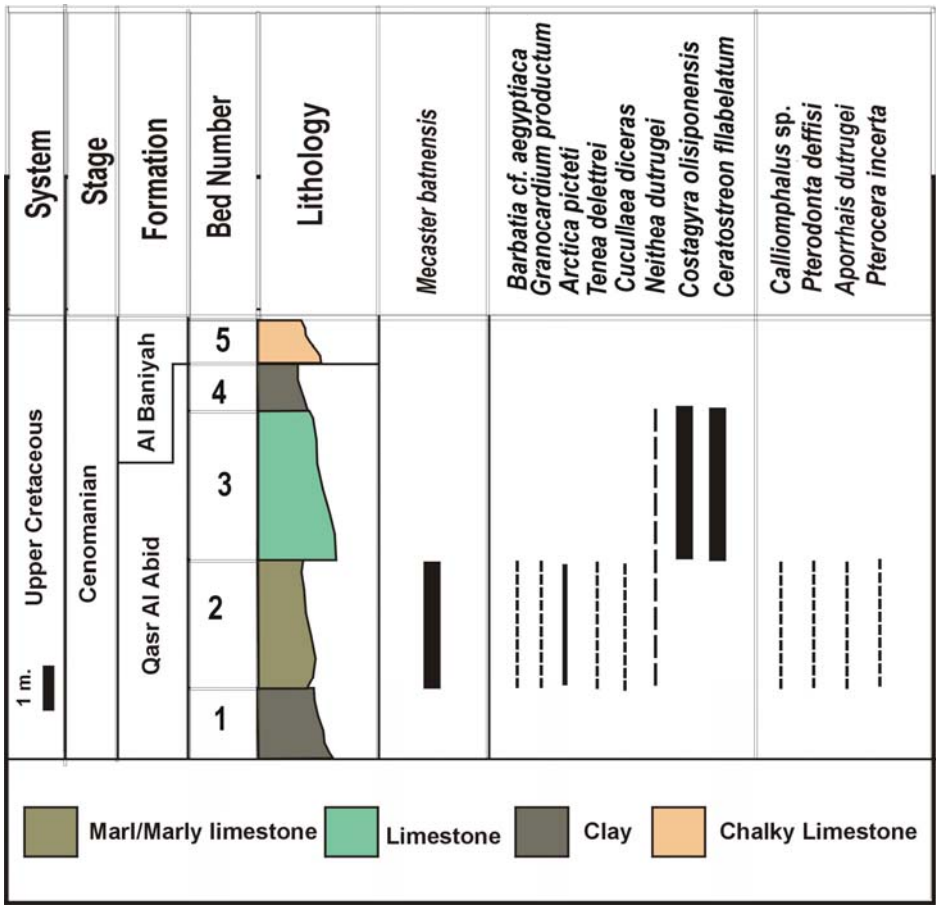


Fig. 4. Columnar section showing the litsostratigraphy and the stratigraphic range of the studied macrofossils of the Qasr al'Abid Formation of section X2 near well A1-18.

Measurements (in mm)**:**

n=5	L	H	C	H/L	C/L	C/H
Range	27-35	18-25	14-19	0.67-0.71	0.51-0.54	0.76-0.78
Mean	32	22	16	0.69	0.53	0.77

Description: The specimens are internal moulds medium-sized, subtriangular to trapezoidal, moderately inflated, equivalved, inequilateral. Umbones moderately prominent, incurved. Umbonal ridge subangular. Hinge narrow, nearly straight. Anterior margin subtruncated, grading into the very broadly rounded ventral margin. Postero-dorsal slope steep and straight, posterior margin strongly inclined with respect to the dorsal margin. The specimens show traces of radial ribs, which clearly seen near the ventral margin.

Age: Late Cenomanian- Turonian.

Discussion: *Cucullaea* (*Idonearca*) *diceras* Seguenza is easily distinguished from *C*. (*Idonearca*) *trigona* by being larger, more elongated, more inflated and by having more prominent umbones.

Occurrence: *Cucullaea* (*Idonearca*) *trigona* is widely distributed in the Cenomanian of North Africa and Italy, but it was recorded also from the lower Turonian of Tunisia by Pervinquière (1912). Moreover, it was recorded from the Cenomanian-Upper Turonian of Sinai by El Qot (2006).

Genus *Phelopteria* Stephenson, 1952
***Phelopteria gravida* (Coquand, 1862)**
Pl. 1, Fig. 7a-b

1912 *Avicula gravida* Coquand – Pervinquière, p. 109.
1917 *Avicula* cf. *gravida* Coquand – Fourtau, p. 16.
1934 *Avicula gravida* Coquand – Blanckenhorn, p. 178, pl. 7, fig. 2a-b.
1962 *Pteria* (*Electroma*) *tihensis* sp. nov. – Abbass, p. 38, pl. 5, fig. 5.
2002 *Phelopteria tihensis* Abbass – Abdel Gawad & Gameil, p. 83, pl. 1, fig. 18.
2002 *Pteria tihensis* Abbass – Abdelhamid & El Qot, p. 262, pl. 1, figs. 7-8.
2006 *Phelopteria gravida* (Coquand) – El Qot, p. 28, pl. 3,figs. 12, a-c, 13.
2007a *Phelopteria gravida* (Coquand) – Mekawy, p. 210, pl. 2, fig. 2.
Material: 3 pecimens from Al Baniyah Formation of Jardas al'Abid area.

Measurements (in mm**):**

n= 3	L	H	C	H/L	C/L
Range	50-53	49-55	31- 34	0.98-1.04	0.62-0.64
Mean	51.5	52	32.5	1.01	0.63

Description: The specimens are medium-sized, subquadrangular to nearly rounded, moderately inflated, and extended obliquely in a postero-ventral direction. Inequilateral, inequivalved; the left valve is slightly more inflated than the right one. Hinge line straight and forming an acute angle (55°-70°) with the main body axis. With the anterior margin of the anterior ear it forms an acute angle below which there is a shallow byssal concavity. Posterior ear larger and its posterior margin forming an obtuse angle with the hinge line. Umbones broad, slightly prominent and situated anteriorly; maximum inflation of the shell near the umbones. Ornamentation is represented by commarginal growth lines, which are separated by wider interspaces.

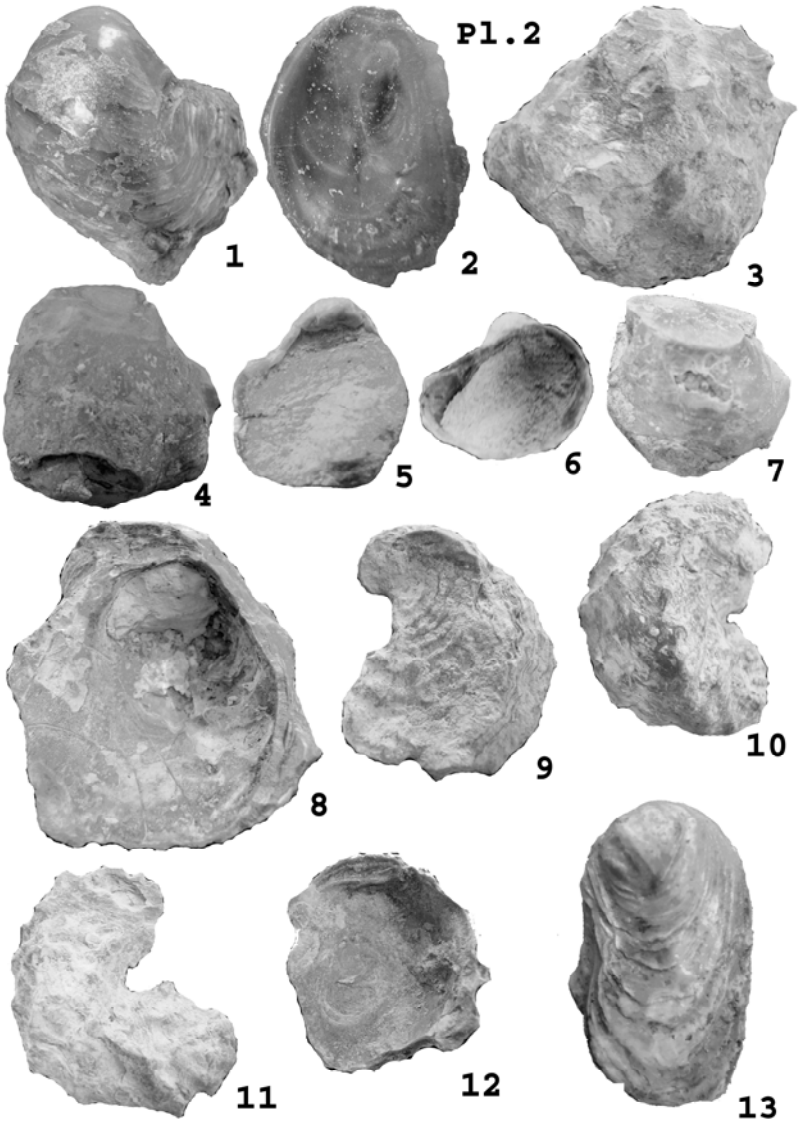
Age: Turonian.

Discussion: The authors agree with El Qot (2006) in regarding *Phelopteria tihensis* (Abbass) as a junior synonym of *Ph. gravida*. *Phelopteria caudigera* (Zittel) differs from the present species by its quadrangular outline, higher shell, wide and deeper umbonal cavity, and a main body axis that is more strongly inclined with respect to hinge line. *Ph. gravida* differs from *Ph. dalli* (Stephenson, 1936) by its large size, more rounded outline, and a more anteriorly placed umbo (for more detailed discussion, see El Qot, 2006).

Occurrence: *Phelopteria gravida* is considered a common species being characterizes the upper Cenomanian –middle Turonian sediments of North Africa and the Middle East.

Superorder Eupteriomorphia Boss, 1982
Order Ostreoida Ferussac, 1822 (= OstreinaWaller, 1978)
Family Gryphaeidae Vyalov, 1936
Subfamily Pycnodonteinae Stenzel, 1959
Genus *Pycnodonte* Fischer De Waldheim, 1835
Subgenus *Phygraea* Vyalov, 1936
***Pycnodonte (Phygraea) vesicularis vesicularis* (Lamarck, 1806)**
Pl. 2, Figs. 1-2

1806 *Ostrea vesicularis* Lamarck, p. 106.
1871 *Gryphea vesicularis* (Lamarck) – Stoliczka, p. 465, pl. 42, figs. 2-4; pl. 43, fig. 1; pl. 45, figs. 7-12.
1913 *Ostrea vesicularis* Lamarck – Woods, p. 360, pl. 55, figs. 4-9; text- figs. 143-182.
1918 *Pycnodonta vesicularis* Lamarck – Greco, p. 110 (130), pl. 13 (12), figs. 1-5.
1962 *Pycnodonte vesicularis* (Lamarck) – Abbass, p. 71, pl. 10, figs. 1-2.
1972 *Pycnodonte (Pycnodonte) vesicularis vesicularis* (Lamarck) – Freneix, p. 105, pl. 10, figs. 5-7.
1986 *Pycnodonte (Phygraea) vesiculare* (Lamarck) – Abdel-Gawad, p. 162, pl. 38, fig. 5; pl. 39, figs. 5-7.
1986 *Pycnodonte (Phygraea) vesicularis vesicularis* (Lamarck) – Freneix & Viaud, p. 33, pl. 2, figs. 11-14.
1990 *Pycnodonte (Phygraea) vesiculare* (Lamarck) – Malchus, p. 146, pl. 2, figs. 8-10; pl. 3, figs. 1-3, 5.
1992 *Pycnodonte (Phygraea) vesiculare* (Lamarck) – Abdel-Gawad & Zalat, pl. 5, fig. 9.
1993 *Pycnodonte (Phygraea) vesicularis* (Lamarck) – Dhondt, p. 242.
1993 *Pycnodonte (Phygraea) vesiculare* (Lamarck) – Aqrabawi, p. 80, pl. 5, fig. 3; text-fig. 53.
1995 *Pycnodonte (Pycnodonte) vesicularis* (Lamarck) – Strougo, p. 10, fig. 3 (9-10).
1995 *Pycnodonte (Phygraea) vesicularis* (Lamarck) – Kassab & Zakhira, p. 330, pl. 2, figs. 4-5.
2002 *Pycnodonte (Phygraea) vesicularis* (Lamarck) – Abdelhamid & El Qot, p. 267, pl. 2, fig. 5.
2004a *Pycnodonte (Phygraea) vesicularis vesicularis* (Lamarck) – Abdel- Gawad *et al.*, pl. 6, fig. 5a-b.



Figs. 1, 2. *Pycnodonte (Phygraea) vesicularis vesicularis* (Lamarck, 1806). 1: left valve of articulated specimen, 2: right valve, interior view, Campanian, Al Majahir Formation, section X5, x 1.

Figs.3, 8. *Costagyra olisiponensis* (Sharpe, 1850). Left valves, Upper Cenomanian, Qasr al'Abid Formation, X 2, 3: exterior view, x 0.5, 8: interior view, x 0.75.

Figs. 4-7. *Pycnodonte* (Phygraea) vesicularis vesiculosa (J. Sowerby, 1823). Late Cenomanian, Al Baniyah Formation, section X3, left valves, 4, 7: exterior views, 5, 6: interior views, 4, 5: x 1.2, 6, 7: x 1.4.

Figs. 9-12. *Ceratostreon flabellatum* (Goldfuss, 1833). 9: right valve, 10-12: left valves, Upper Cenomanian, Qasr al'Abid Formation, X 2, 9-11 exterior views, 12: interior view, x 1.

Fig. 13. *Curvostrea rouvillei* (Coquand, 1862). Articulated specimen, left valve view Turonian, Al Bniyah Formation, section X 4, x 1.5.

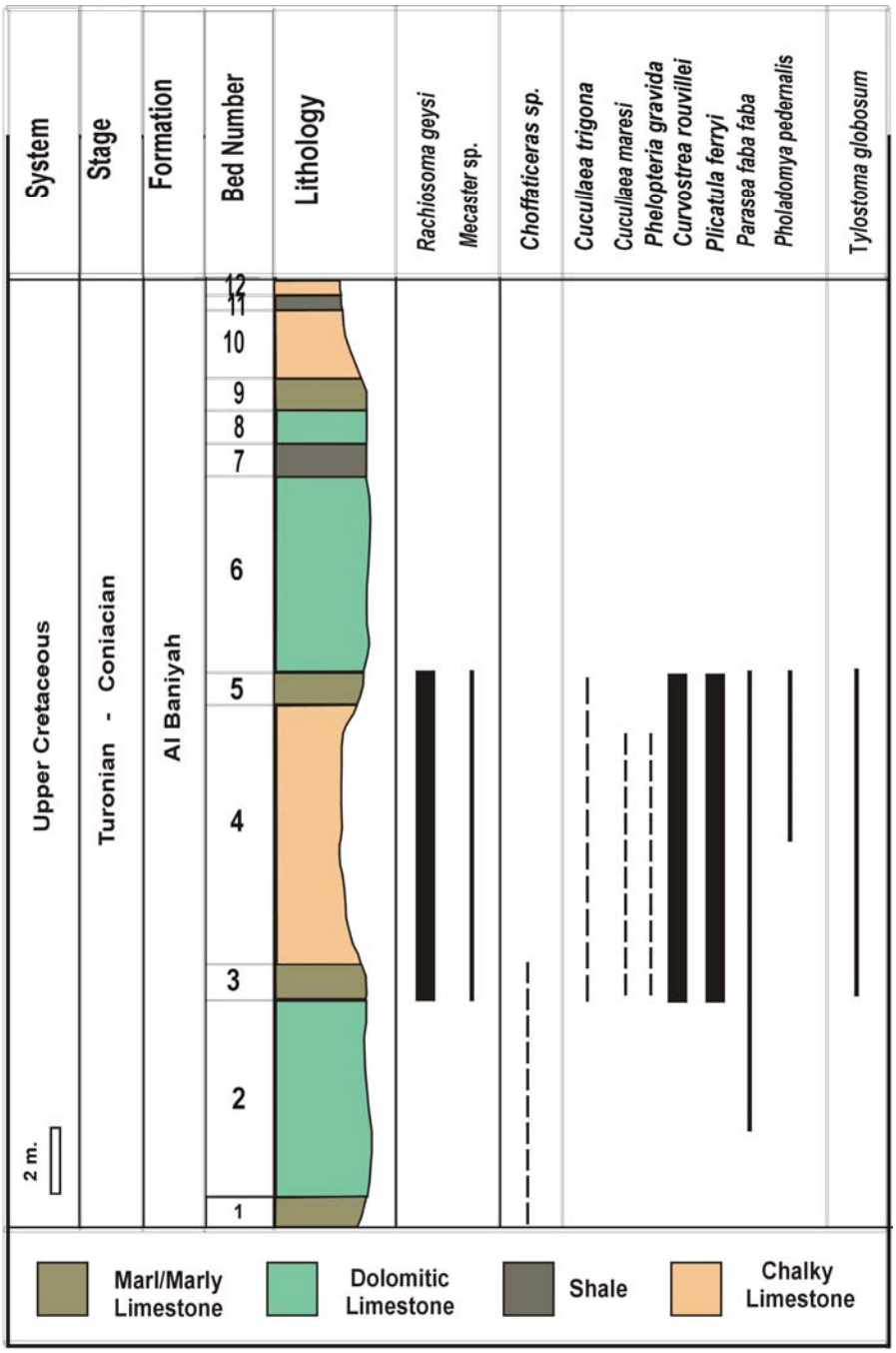


Fig. 5. Columnar section showing the litsostratigraphy and the stratigraphic range of the studied macrofossils of the Al Baniyah Formation at Jardas Fortress (section X3).

2006 *Pycnodonte (Phygraea) vesicularis vesicularis* (Lamarck) – El Qot, p. 36, pl. 5, fig. 9a-b; text-fig. 7 (with full synonymy).
2007 *Pycnodonte (Phygraea) vesicularis vesicularis* (Lamarck) – Abdel- Gawad *et al*, pl. 5, figs. 10, 11.

Material: 3 specimens from Al Majahir Formation, Jardas al'Abid area.
Measurements (in mm**):**

n=3	L	H	C	H/L	C/L
Range	25-37	36-45	19-29	1.08-1.44	0.51-1.16
Mean	33	40	24	1.33	0.81

Description: Shell varying in size from small to large, oval shaped, most specimens higher than long, inequivalved, left valve is strongly convex with clear posterior sulcus of variable strength. Right valve flat to concave. Umbo prominant, more or less incurved. Attachment area variable in size from large to absent. Adductor muscle scare oval and located postero-dorsally. Left valve covered with concentric lines of variable thickness.
Age: Campanian.
Discussion: Malchus (1990) distinguished six forms of *P. vesicularis* based on shape and stratigraphic position; F. *nikitini* (Coniacian to Santonian), 'form typica' (Santonian to Maastrichtian), F. *hippopodium,* and F. *proboscideum* (only from the Santonian). He introduced F. *communis* and F. *humilis* as two new forms and stated that F. *humilis* rarely occurs together with F. *communis* from the Coniacian to the upper Campanian, but is more abundant in the Maastrichtian. According to Malchus (1990) the latter two forms only occur in Egypt, while the four previous forms occur outside Egypt. Dhondt (1993) mentioned that *P. vesicularis* is a very widely distributed species, and that its cemented mode of life resulted in a wide variety of shapes, often in the same environment. According to her *P. hippopodium* (Nilsson), *P. clavatum* (Nilsson), *P. proboscideum* (D'Archiac), and the six new species introduced by Sobetski (1982); *P. frejdlini*, *P. transcaspicum*, *P. intermedium*, *P. adhaesum*, *P. consimile*, and *P. singulare* are junior synonyms of *P. vesicularis* (Lamarck).

Occurrence: Concerning the stratigraphic range of *Pycnodonte (Phygraea) vesicularis vesicularis* (Lamarck); according to Abbass (1962) it ranges in age from the Coniacian to the Maastrichtian. It is of Coniacian-Danian age according to Freneix (1972). Strougo (1995) confirmed the occurrence of the species in the Paleocene of Egypt. According to El Qot (2006) the species is of Campanian-Danian age. The species has a wide geographic distribution, having been reported from Europe, Africa, Asia, and South and North America.

***Pycnodonte* (*Phygraea*) *vesicularis vesiculosa* (J. Sowerby, 1823)**
Pl. 2, Figs. 4-7

1823 *Gryphea vesiculosa* J. Sowerby, p. 93, pl. 369.
1871 *Gryphea vesiculosa* J. Sowerby – Stoliczka, p. 466, pl. 39, figs. 1-2.
1890 *Ostrea vesiculosa* J. Sowerby – Peron, p. 126.
1904 *Ostrea Vesiculosa* J. Sowerby – Fourtau, p. 290.

1912 *Pycnodonta vesiculosa* J. Sowerby – Pervinquiere, p. 195.
1913 *Ostrea vesiculosa* (J. Sowerby) – Woods, p. 374, pl. 55, figs. 10-14; pl. 56, fig. 1.
1917 *Ostrea vesicularis* Lamarck race *vesiculosa* J. Sowerby, Fourtau, p. 56.
1918 *Pycnodonta vesicularis* Lamarck var. *vesiculosa* J. Sowerby – Greco, p. 13 (195), pl. 2 (18), fig. 12.
1937 *Pycnodonta vesicularis* Lamarck mut. *vesiculosa* J. Sowerby – Trevisan, p. 79, pl. 2, figs. 15-16.
1963 *Pycnodonta vesiculosa* J. Sowerby – Fawzi, p. 49, pl. 5, figs. 1-2.
1972 *Pycnodonte* (*Pycnodonte*) *vesicularis* (Lamarck) *vesiculosa* (J. Sowerby) – Freneix, p. 102, pl. 10, figs. 1-3; text-figs. 11-12.
1972 *Pycnodonte* (*Pycnodonte*) *vesicularis* (Lamarck) *subvesiculosa* Reningarten – Freneix, p. 105, pl. 10, fig.4; text-figs. 11-12.
1986 *Pycnodonte* (*Phygraea*) *vesicularis* (Lamarck) *pseudovesiculosa* (Couffon) – Freneix & Viaud, p. 30, pl. 1, figs. 3-6.
1986 *Pycnodonte* (*Phygraea*) *vesiculosa* (J. owerby) – Freneix & Viaud, pl. 1, fig. 7.
1986 *Pycnodonte* (*Phygraea*) *vesicularis* (Lamarck) *parvula* Freneix & Viaud, p. 31, pl. 2 , figs. 1-7.
1986 *Pycnodonte* (*Phygraea*) *vesicularis* (Lamarck) forme *hippopodium* (Nilsson) – Freneix & Viaud, p. 32, pl. 2, fig. 10.
1990 *Pycnodonte* (*Phygraea*) *vesiculosum* (J. Sowerby) – Malchus, p. 145, pl. 2, figs. 8- 10; pl. 3, figs. 1-3, 5.
1993 *Pycnodonte* (*Phygraea*) *vesiculosum* (J. Sowerby) – Aqrabawi, p. 79, pl. 5, figs. 15-16.
1995 *Pycnodonte* (*Phygraea*) *vesiculosum* (J. Sowerby) – Abdel-Gawad, p. 170, pl. 3, fig. 1.
1999 *Pycnodonte* (*Phygraea*) *vesiculosa* (J. Sowerby) – Seeling & Bengtson, p. 761,fig. 11a-c.
2006 *Pycnodonte* (*Phygraea*) *vesicularis vesiculosa* (J. Sowerby) - El Qot, p. 38, pl. 5, figs. 10-11; text-fig. 7.
2006 *Pycnodonte* (*Phygraea*) *vesicularis vesiculosa* (J. Sowerby) - Wilmsen & Voigt, p. 22, fig. 4C-G.
2007 *Pycnodonte* (*Phygraea*) *vesicularis vesiculosa* (J. Sowerby) – Abdel-Gawad et al., pl. 4, fig. 4.
2007a *Pycnodonte* (*Phygraea*) *vesiculosa* (J. Sowerby) – Mekawy, p. 213, pl. 2, figs. 7-8.

Material: 5 specimens from Al Binyah Formation, Jardas al'Abid area.

Measurements (in mm**):**

n=5	L	H	C	H/L	C/L
Range	22-28	22-32	10-21	1.09-1.14	0.52-0.70
Mean	25	27.6	18.6	1.12	0.59

Description: Shell varying in outline from high-oval to nearly rounded, commonly higher than long; medium in size, inequivalved. Left valve strongly convex. Right valve almost entirely concave, in some specimens nearly flat. Form and direction of the umbo generally depending on the mode of attachment but mostly prominent and strongly incurved. Attachment area varying in size from large to completely

absent. Posterior lobe consisting of a small triangular area marked by a wide radial groove extending from below the umbo to the postero-ventral margin. Shell essentially smooth except for irregularly spaced commarginal growth laminae.

Age: Late Cenomanian - Turonian.

Discussion: There is much confusion among authors who studied *Pycnodonte* (*Phygraea*) *vesicularis* and *Pycnodonte* (*Phygraea*) *vesiculosa*. Some of them regarded *P. vesicularis* (Lamarck) and *P. vesiculosa* (Sowerby) as two separate species (Stoliczka 1871, Woods 1913, Dhondt 1984, Freneix and Viaud 1986, Malchus 1990, Aqrabawi 1993, Dhondt *et al*. 1999, and Seeling and Bengtson 1999), *P. vesicularis* being characterised by its thick, large shell, whereas *P. vesiculosa* is distinguished by a less incurved, more pointed umbo, small attachment area, and a greater height-length ratio. With respect to their stratigraphic position, *P. vesiculosa* ranges from the (?Aptian) Albian to the Cenomanian, but occurs mainly in the Cenomanian, and *P. vesicularis* ranges from the (?Albian) Cenomanian to the Maastrichtian but has the peak of its distribution in the Senonian. Fourtau (1917) considered *P. vesiculosa* as a ''race'' of *P. vesicularis*. Greco (1918) considered *P. vesiculosa* as variety of *P. vesicularis*. Trevisan (1937) regarded *P. vesiculosa* as a ''mutation'' of *P. vesicularis*. Couffon (1936) erected the new subspecies *P. vesicularis pseudovesiculosa*. Renngarten (1964) erected *P. subvesiculosa* to accommodate small *P. vesicularis* specimens from the Caucasus. Freneix (1972) differentiated *P. vesicularis* into three subspecies, i.e. *P. vesicularis vesiculosa* from the Cenomanian, *P. vesicularis subvesiculosa* from the Coniacian, and *P. vesicularis vesicularis* from the Campanian. Freneix and Viaud (1986) differentiated *P. vesicularis* into *P. vesicularis pseudovesiculosa*, *P. vesicularis parvula*, *P. vesicularis* form *hippopodium*, and *P. vesicularis vesicularis.* They introduced *P. vesicularis parvula* as a new subspecies to describe specimens from the Upper Cenomanian and Lower Turonian of France with a maximum height of 30 mm. Abdel-Gawad (1995) realized that *P. vesiculosum* from the Upper Cenomanian of Gebel Al Akhdar in Libya is similar to small-sized *P. vesicularis* which characterizes the Coniacian marls of North Africa and Sinai. According to him *P. vesicularis* has a thicker shell and radial ornamentation on its right valve. Abdel-Gawad (1995) regarded *P. vesiculosum* as a local index fossil for the uppermost Cenomanian of Egypt.

El Qot (2006) recorded different forms of the species from the same bed in the Upper Cenomanian of the East Themed area in Sinai. Some of them being longer than high, others higher than long, the attachment area varying from large to completely absent. In addition, some right valves from the aforementioned bed show radial striations. Similar forms were recorded from the lower Turonian and lower Coniacian of the same locality. Moreover, he recorded identical specimens from the Santonian of Gebel Ekma, Sinai. Consequently, he divided *P. vesicularis* in two subspecies, *P. vesicularis vesiculosa* and *P. vesicularis vesicularis*. *P. vesicularis vesiculosa* is characterised by relatively thin and small-sized shells and ranges in age from the Cenomanian to the Santonian. *P. vesicularis vesicularis* in turn is characterised by thick and large shells and is Campanian-Danian in age.

Wilmsen and Voigt (2006) followed El Qot (2006) and divided *P. vesicularis* into the two prementioned subspecies. The authors agree with El Qot (2006) in his division of *P. vesicularis* in two subspecies, *P. vesicularis vesiculosa* and *P. vesicularis vesicularis*.

Occurrence: *Pycnodonte* (*Phygraea*) *vesicularis vesiculosa* (J. Sowerby) is very abundant in the the Cenomanian-Santonian sediments of Europe, Africa, Middle East, India, and Brazil, and it may extend older to the ?Aptian.

Subfamily Exogyrinae Vyalov, 1936
Tribe Exogyrini Vyalov, 1936.
Genus *Costagyra* Vyalov, 1936
***Costagyra olisiponensis* (Sharpe, 1850)**
Pl. 2, Figs. 3, 8

1850 *Exogyra Olisiponensis* Sharpe, p. 185, pl. 19, figs. 1-2.
1869 *Ostrea Olisiponensis* Sharpe – Coquand, p. 125, pl. 45, figs. 1-7.
1904 *Ostrea Olisiponensis* (Sharpe) – Fourtau, p. 283, figs. 3-5.
1912 *Exogyra Olisiponensis* Sharpe – Pervinquière, p. 174, pl. 13, figs. 4-5, 9.
1918 *Exogyra Olisiponensis* Sharpe – Greco, p. 5 (187), pl. 1 (17), figs. 12-14.
1937 *Exogyra olisiponensis* Sharpe –Trevisan, p. 67, pl. 4, figs. 2-6.
1962 *Exegyra olisiponensis* Sharpe – Abbass, p. 69, pl. 9, fig. 10.
1963 *Exogyra disiponensis* Sharpe – Fawzi, p. 45, pl. 4, figs. 6-7.
1972 *Exogyra olisiponensis* Sharpe – Freneix, p. 89, pl. 5, figs. 6a-c.
1981 *Exogyra (Costagyra) olisiponensis* (Sharpe) – Amard *et al.*, p. 83, pl. 3, figs. 1-2 ; pl. 4, figs. 1-2.
1990 *Exogyra (Costagyra) olisiponensis* Sharpe – Malchus, p.134, pl. 10, figs. 1-6.
1993 *Exogyra (Costagyra) olisiponensis* Sharpe – Aqrabawi, p. 67, pl. 4, figs. 3-5; pl. 5, figs. 1-2.
1995 *Exogyra (Costagyra) olisiponensis* Sharpe – Abdel-Gawad, p. 168, fig. 3 (2-6).
1999 *Costagyra olisiponensis* (Sharpe) – Dhondt *et al.*, pl. 1, figs. 6-7.
1999 *Exogyra (Costagyra) olisiponensis* Sharpe – Seeling & Bengtson, p. 756, figs. 9a-c.
2001 *Costagyra olisiponensis* (Sharpe) – Abdallah *et al.*, pl. 2, fig. 7.
2002 *Exogyra (Costagyra) olisiponensis* (Sharpe) – Abdel-Gawad & Gameil, p. 85, pl. 2, figs. 5-7.
2002 *Exogyra (Costagyra) olisiponensis* (Sharpe) – Abdelhamid & El Qot, p. 268, pl. pl. 3, fig. 1.
2004a *Costagyra olisiponensis* (Sharpe) – Abdel-Gawad *et al.*, pl. 7, fig.1.
2006 *Costagyra olisiponensis* (Sharpe) – El Qot, p. 39, pl. 6, figs. 1-4; text-fig. 7c (with full synonymy).
2007 *Costagyra olisiponensis* (Sharpe) – Abdel-Gawad *et al.*, pl. 5, fig.3.

Material: 12 specimens from Qasr al'Abid Formation and 5 specimens from Al Baniyah Formation, Jardas al'Abid area.

Measurements (in mm**):**

n=17	L	H	C	H/L	C/L
Range	41-80	53-115	23-59	1.17-1.38	0.58-0.71
Mean	73	86	47	1.25	0.65

Description: Shell varies in size from medium to large, high oval or pear-shaped to subrounded, inequilateral and inequivalved, very thick shell. The left valve is larger and strongly convex, where the right one is nearly concave to flat and smaller. Umbo is highly incurved with opisthogyrate direction and relatively small opisthodetic ligament. Adductor muscle scare, large in size, rounded to oval in shape, located postero-dorsally. Left valve ornamented with strong and spinose radial ribs which crossed by fine concentric lines, where right valve ornamented with fine radial ribs crossed by concentric lines.

Age: Late Cenomanian.

Discussion: The variability in shape, thickness, the size of attachment area, ribbing, spines and scaliness of the growth lamellae in *Costagyra olisiponensis* (Sharpe) led some authors (e.g. Trevisan, 1937) to differentiate this species into different varieties (var. *oxyntas* Coquand, var. *ecostata* Seguanza) apart from the forma typica. Others erected new species (see the synonymy list of Malchus, 1990). Yet others misidentified the species as another species (e.g., as *Ostrea overwegi* Coquand, 1862 non V. Buch; *Ostrea oxyntas* Coquand, 1880). Moreover, Amard et al. (1981) erected the new genus *Freneixostrea* based on some right valves of *Costagyra olisiponensis*. However, these variabilities are related to palaeoecological factors (Malchus, 1990 and Aqrabawi, 1993).

Occurrence: The species is geographically widely distributed and its stratigraphic range is from the Albian to the Coniacian. It is particularly abundant in the Cenomanian (Freneix, 1972).

Genus *Ceratostreon* Bayle, 1878.
Ceratostreon flabellatum (Goldfuss, 1833)
Pl. 2, Figs. 9-12

1833 *Exogyra flabellata* Goldfuss, p. 38, pl. 87, fig. 6.
1918 *Exogyra flabellata* Goldfuss- Greco, p. 11(193), pl. 2(18), figs. 9-11.
1937 *Exogyra flabellata* Goldfuss-Trevisan, p. 77, pl. 5, figs. 11-12.
1955 *Exogyra complicata* Mahmoud, p. 111, pl. 7, figs. 1-10; pl. 8, figs. 1-12; text-figs. 52-54.
1962 *Exogyra flabellata* Goldfuss – Abbass, p. 66, pl. 9, figs. 4-6.
1963 *Exogyra flabellata* Goldfuss – Fawzi, p. 43, pl. 4 , figs. 10-12.
1972 *Ceratostreon flabellatum* (Goldfuss) – Freneix, p. 19, pl. 5,figs.8-9.
1981 *Ceratostreon flabellatum* (Goldfuss) – Amard *et al.*,p 84, pl. 3, figs. 4-7.
1981 *Ceratostrean flabellatum* (Goldfuss) – Collignon, p. 269, pl. 8, fig.14.
1990 *Amphidonte (Ceratostreon) flabellatum* (Goldfuss) – Malchus, p. 111, pl. 14, figs. 4-11; pl. 5, figs. 1-7.
1992 *Ceratostreon flabellatum* (Goldfuss) – Abdel-Gawad & Zalat, pl. 2, figs. 9-11.

1993 *Amphidonte (Ceratostreon) flabellatum* (Goldfuss) – Aqrabawi, p. 63, pl. 2, figs. 2-5.
1999 *Amphidonte (Ceratostreon) flabellatum* (Goldfuss) – Seeling & Bengtson, p. 755, fig. 8a-d.
2002 *Ceratostreon flabellatum* (Goldfuss) –Abdel-Gawad & Gameil, p. 86, pl. 2, fig. 8.
2002 *Ceratostreon flabellatum* (Goldfuss) – Abdelhamid & El Qot, p. 269, pl. 3, fig. 2.
2004a *Ceratostreon flabellatum* (Goldfuss) – Abdel-Gawad *et al*., pl.7, figs. 8, 9a-b.
2006 *Ceratostreon flabellatum* (Goldfuss) – El Qot, p. 40, pl. 6, figs. 5-8; text-fig. 8 (with full synonymy).
2007 *Ceratostreon flabellatum* – Videt & Néraudeau, p. 48, Fig. 5/5.
2007a *Ceratostreon flabellatum* – Mekawy, p. 215, pl. 2, fig. 11, pl. 3, fig. 6.
2008 *Ceratostreon flabellatum* – Mekawy & Abu-Zied, p. 301, pl. 2, fig. 1.
Material: 43 specimens from Qasr al'Abid Formation, Jardas al'Abid area.

Measurements (in mm**):**

n=43	L	H	C	H/L	C/L
Range	16-46	25-54	6-25	1.0-1.7	0.25-0.41
Mean	28.7	36.1	12.8	1.36	0.33

Description: Shell variable in size, from small to relatively large, highly variable in outline, inequivalved. Left valve larger than the right one, strongly convex, with well defined spiral keel dividing the outer surface of the valve into a posterior concave and anterior convex part. Right valve mostly flat and occasionally convex, with a stronger keel than the left valve. Umbo twisted, opisthogyrate. Chomata straight to vermiculate, developed along the periphery of the valve. Adductor muscle scar nearly subrounded, located posteriorly to subcentrally. Ornamentation consisting of strong radial ribs; these ribs are closer to each other dorsally and posteriorly and fine radial threads may be developed between them; small spines may be irregularly developed towards the margin.

Age: Late Cenomanian.

Discussion: The great morphological variability of *Ceratostreon flabellatum* led many authors to divide it into several varieties and forms. For instance, Seguanza (1882) divided the species into five varieties; var. *dilatata*, var. *trigona*, var. *ecostata*, var. *crassiplicata*, and var. *semilunata*. In addition, Fawzi (1963) recognized two varieties, “form typique” and the new variety *excavata.* Malchus (1990) recognized three forms for this species; forma *typica*, forma *musa* and forma *intermedia*.

In fact, it is very difficult to distinguish between these different varieties and forms, because in very large populations, the different forms are linked by transitional ones to make it impossible to differentiate the species into varieties or forms (see El Qot, 2006).

Occurrence: The species is geographically widely distributed and ranges from the Albian to the Senonian (Freneix, 1972). It is particularly widespread in the Cenomanian of Africa and Europe.

Family Ostreidae Rafinesque, 1815
Subfamily Liostreinae Malchus, 1990
Genus *Curvostrea* Vyalov, 1936
***Curvostrea rouvillei* (Coquand, 1862)**
Pl. 2, Fig. 13; Pl. 3, Figs. 1, 4, 5

1862 *Ostrea Rouvillei* Coquand, p. 232, pl. 22, figs. 8-10.
1869 *Ostrea Rouvillei* Coquand – Coquand, p. 89, pl. 21, figs. 3-6; pl. 24, figs. 711.
1869 *Ostrea Rediviva* Coquand, p. 154, pl. 42, figs. 8-11; pl. 54, figs. 18-30.
1912 *Liostrea Rouvillei* Coquand – Pervinquière, p. 168.
1917 *Ostrea Rouvillei* Coquand – Fourtau, p. 50.
1918 *Liostrea Rouvillei* Coquand – Greco, p. 4 (186), pl. 1 (17), figs. 6-11.
1962 *Ostrea* (*Crassostrea*) *rouvillei* (Coquand) – Abbass, p. 74, pl. 11, fig. 8.
1963 *Liostrea rouvillei* Coquand – Fawzi, p. 36, pl. 2, fig. 7.
1972 *Liostrea rouvillei* (Coquand) – Freneix, p. 97, text-fig. 10ad.
1990 *Curvostrea rouvillei* (Coquand) – Malchus, p. 154, pl. 14, figs. 1-7, 16.
2002 *Liostrea rouvillei* (Coquand) – Abdel-Gawad & Gameil, p. 88, pl. 2, fig. 11.
2006 *Curvostrea rouvillei* (Coquand) – El Qot, p. 47, pl . 8, figs. 5a-b, 6.
2007 *Curvostrea rouvillei* (Coquand) – Videt & Néraudeau, p. 8, fig. 5/9.
2007a *Curvostrea rouvillei* (Coquand) – Mekawy, p. 218, pl. 3, fig. 5.
Material: 37 specimens from Al Baniyah Formation, Jardas al'Abid area.

Measurements (in mm**):**

n=37	L	H	C	H/L	C/L
Range	12-44	19.5-71	5-16	1.1-2.1	0.27-0.86
Mean	18.5	27.2	9.6	1.68	0.56

Description: Shell small to large-sized; varying in outline from high-oval, tongue-shaped, or flat, plate shaped to slightly curved, tear-shaped, higher than long, inequilateral, mostly inequivalved. Left valve flat t slightly convex. Right valve less convex to slightly concave. Umbo small, not prominent. Attachment area small. Ligamental area triangular and relatively small. Adductor muscle scar oval to nearly circular and situated postero-ventrally. Relict chomata seen only anterodorsally. Ornamentation consisting of fine commarginal growth lines and closely spaced stepped lamellae developed at irregular intervals. In some forms, these elements are crossed by fine radial striations.

Age: Turonian.

Discussion: Stenzel (1971: N1168) placed *Curvostrea* Vyalov, 1936 in his group of genera of uncertain systematic position, because the internal characters of the shell were not known. Malchus (1990) assigned the genus to his new subfamily Liostreinae within the Family Ostreidae Rafinesque, 1815. The present authors agree with Malchus (1990), Seeling and Bengtson (1999) and El Qot (2006) in regarding *Ostrea rediviva* Coquand, 1869 as a synonym of *Curvostrea rouvillei*.

Occurrence: *Curvostrea rouvillei* (Coquand) ranges from the Albian to the Coniacian, but is particularly abundant in the Cenomanian (Freneix, 1972). The

species is geographically widely distributed being recorded from North and Central Africa, the Middle East, Europe, India, and South America. It was recorded herein for the first time from Libya.

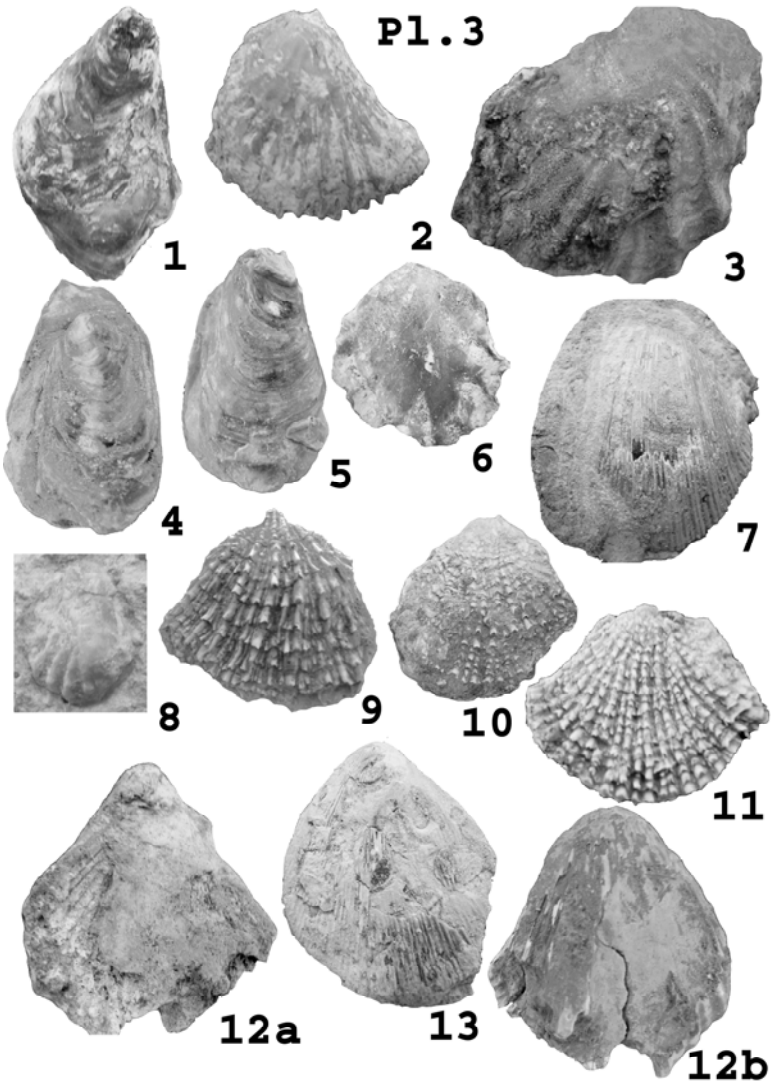
Tribe Ambigostreini Malchus, 1990
Genus *Ambigostrea* Malchus, 1990
***Ambigostrea bretoni* (Thomas & Peron, 1891)**
Pl. 3, Fig. 2

1891 *Ostrea Bretoni* Thomas & Peron *in* Peron, p. 197, pl. 25, figs. 37-39.
1990 *Ambigostrea bretoni* (Peron & Thomas) – Malchus, p. 179, pl. 21, figs. 13-25.
2006 *Ambigostrea bretoni* (Thomas & Peron) – El Qot, p. 54, pl. 10, figs. 3-4
Material: 3 specimens from Al Majahir Formation, Jardas al'Abid area.
Measurements (in mm**):**

n=3	L	H	C	H/L	C/L
Range	17-38	19-38	5-16	1 -1.1	0.29-0.42
Mean	28.5	29.2	9.6	1.05	0.36

Description: Shell relatively small, oval to suboval, higher than long, subequivalved to inequivalved. Left valve slightly flat to moderately convex. Right valve flat to slightly concave. Attachment area relatively large. Umbo pointed, orthogyrate; umbonal cavity very small to absent in some specimens. Ligamental area narrow, high, consisting of a triangular, broad, deep resilifer, flanked by equal, narrow, flat bourrelets. Relict chomata developed dorsally, pustulose chomata developed all over the shell margins. Ornamentation consisting of numerous radial ribs intersected by irregular commarginal striations.

Age: Late Campanian.
Discussion: Malchus (1990) erected the genus *Ambigostrea,* placed it in his new tribe Ambigostreini, and considered his new species *Ambigostrea pseudovillei* as the type species of this genus. According to its external morphology the genus *Ambigostrea* seems to be closely related to the subfamily Lophinae, but based on its simple foliated microstructure Malchus (1990) attributed it, as well as all radially (on one or both valves) ribbed *Lopha* like oysters with simple-foliated microstructure, to his new subfamily Liostreinae. Malchus (1990) erected *A. dominici* and *A. pseudovillei* from the Cenomanian of Egypt. *A. bretoni* differs from these two species in being smaller and strongly convex, an additional difference being the stratigraphic position. The type material of *A. bretoni* comes from the Danian of Tunisia (Peron 1891). According to Malchus (1990) *A. bretoni* is Coniacian-Maastrichtian in age. He defined the Maastrichtian as stratum typicum, and regarded *Alectryonia destefanii* Parona, 1923 from the Coniacian-Santonian of Libya as a synonym. So far, *A. bretoni* has not been recorded from Egypt from levels below or above the Campanian. Recording the species herein from the Majahir Formation confirmed that *Alectryonia destefanii* Parona, 1923 is a synonym to the present species.
Occurrence: *Ambigostrea bretoni* ranges in age from the Coniacian to the Maastrichtian and it was recorded from Tunisia, Libya, and Egypt.



Figs. 1, 4, 5. ***Curvostrea rouvillei*** **(Coquand, 1862). 1: left valve, 4, 5: articulated specimen, 4: right valve view, 5: left valve view, Turonian, Al Baniyah Formation, section X4, x 1.5.**

Fig. 2. ***Ambigostrea bretoni*** **(Thomas & Peron, 1891). Left valve, exterior view, Upper Campanian, Al Majahir Formation, section X5, x 1.**

Figs. 3, 6. ***Lopha syphax*** **(Coquand). Left valves, 3: exterior view, 6: interior view, Upper Cenomanian, Qasr al'Abid Formation, section X1, 3: x 1. 2, 6: x 1.4.**

Figs. 7, 12a-b. ***Neithea*** **(*Neithea*)** ***dutrugei*** **(Coquand, 1862). 7, 12b Right valve views, 12a: left valve view, Upper Cenomanian, Qasr al'Abid Formation, section X1, 7: x 1.4, 12: x 1.**

Fig. 8. ***Plicatula auressensis*** **Coquand. Articulated specimen; Upper Cenomanian, Al Baniyah Formation, section X3, left valve view, x 1. 5.**

Figs. 9-11. ***Plicatula ferryi*** **Coquand, 1862. Articulated specimens, left valve views, Turonian, Al Baniyah Formation, section X4, x 1.**

Fig. 13. ***Spondylus fimbriatus*** **Goldfuss, 1835. Articulated specimen, left valve view, Upper Cenomanian, Qasr al'Abid Formation, section X 1, x 1. 2.**

Genus *Lopha* Röding, 1798
Lopha syphax (Coquand, 1854)
Pl. 3, Figs. 3, 6

1854 *Ostrea syphax* Coquand, p. 143, pl. 4, figs. 1-4.
1862 *Ostrea syphax* Coquand – Coquand, p. 228, pl. 20, figs. 1-4
1869 *Ostrea syphax* Coquand – Coquand, p. 138, pl. 55, fig. 13, pl. 56, 58, figs.1-5.
1912 *Alectryonia Syphax* Coquand – Pervinquière, p. 203, pl. 14, figs. 15-18.
1917 *Ostrea Syphax* Coquand – Fourtau, p. 53.
1937 *Alectryonia Syphax* Coquand – Trevisan, p. 80, pl. 4, fig. 7.
1954 *Lopha scyphax* Coquand – Rutsch & Salvador, p. 422, pl. 40, figs. 4-5.
1963 *Lopha syphax* Coquand – Fawzi, p. 51, pl. 5, fig. 5.
1972 *Lopha syphax* Coquand – Freneix, p. 93, pl. 6, figs. 1-5, pl. 7, fig. 1a-b, pl. 8, figs. 1-4, text-fig. 9.
2002 *Lopha syphax* Coquand – Abdel-Gawad & Gameil, p. 88, pl. 2, fig. 12.
2004b *Lopha syphax* Coquand – Abdel-Gawad *et al.*, pl. 2, fig. 4a-b.

Material: 3 specimens from Qasr al'Abid Formation, Jardas al'Abid area.

Measurements (in mm**):**

n=3	L	H	C	H/L	C/L
Range	21-49	23-37	4.5-9	0.76-1.1	0.21-0.40
Mean	31.5	28.3	7.2	0.98	0.29

Description: Shell medium-sized, oval in outline, and inequilateral. Left valve strongly convex. Posterior margin nearly straight, with strongly convex antero-ventral margin. Ventral margin plicated, rounded, and meeting the anterior margin in a continuous curve. Umbones small, terminal, and little pointed. Ligamental area wide, rectangular, and slightly depressed. Resilifer shallow, narrow with small bourrelets on either side. Adductor muscle scar tear-shaped and located close the postero-central side. Attachment area large. Ornamentation consisting of regular, subequal, sharp-crested ribs, separated by deep V-shaped furrows nearly as wide as the ribs themselves. These ribs are crossed by imbricated commarginal lamellae. Dichotomizing ribs occur near the ventral margin.

Discussion: Abdel-Gawad and Gameil (2002) distinguished three forms of *Lopha syphax* (Coquand), one type with a trigonal shell, a second with an elongated and curved shell, and a third type, which is similar to the second except that the postero-ventral margin is much longer. According to Freneix (1972) the present species differs from *L. dichotoma* where the latter is characterized by having dense ribs which are uniformly distributed, the ligament occupies a median position and its muscle scars are transverse and lie near the median line. Moreover, the stratigraphic range of *L. dichotoma* is much younger (Coniacian-Campanian) than that of the present species.

Occurrence: The species is geographically widely distributed where it was recorded from North Africa (Egypt, Tunisia, Algeria and Morocco), Italy, and Western Venezuela and being to be restricted to the Cenomanian stage. It was recorded herein for the first time from Libya.

Superfamily Plicatulacea Watson, 1930
Family Plicatulidae Watson, 1930
Genus *Plicatula* Lamarck, 1801
***Plicatula auressensis* Coquand, 1862**
Pl. 3, Fig. 8.

1862 *Plicatula auressensis* Coquand, p. 222, pl. 16,figs. 14-16.
1862 *Plicatula Reynesi* Coquand, p. 222, pl. 17, figs.1-2.
1912 *Plicatula Auressensis* Coquand – Perviquiere, p. 156, pl.11, figs. 2-18.
1917 *Plicatula auressensis* Coquand – Fourtau, p. 20.
1934 *Plicatula reynesi* Coquand – Blanckenhorn, p. 193.
1937 *Plicatula auressensis* Coquand –Trevisan, p. 60, pl. 3, figs.5-10.
1962 *Plicatula auressensis* Coquand – Abbass, p. 61, pl. 7, figs.17-19.
1962 *Plicatula reynesi* Coquand – Abbass, p. 62, pl. 7, figs. 8-14.
1963 *Plicatula auressensis* Coquand – Fawzi, p. 32.
1972 *Plicatula auressensis* Coquand – Freneix, p. 82, pl. 4, figs.7-10.
2006 *Plicatula auressensis* Coquand – El Qot, p. 62, pl.12, figs, 2a-c,3-4.
Material: 4 specimens from Al Baniyah Formation, Jardas al'Abid area.
Measurements (in mm**):**

n=4	L	H	C	H/L	C/L	nr
Range	9-12	11-15	4- 4.7	1.22-1.28	0.39-0.44	12-16
Mean	10.5	12. 7	4.5	1.25	0.42	14

Description: Shell small-sized, inequivalved, mostly inequilateral, pear-shaped to nearly circular. Anterior margin concave. Posterior margin convex. Right valve mostly convex. Left valve convex. Umbo low and small. Attachment area variable in size. Ornamentation consisting of relatively few, strong, radial ribs, occasionally carrying spines near the ventral margin. These radials are crossed by commarginal lamellae at irregular intervals.

Age: Late Cenomanian.

Occurrence: *Plicatula auressensis* is geographically widely distributed, being recorded from North and central Africa, the Middle East, southern Europe, and South America. It ranges in age from the Albian to the Senonian, but it is widespread in the Cenomanian.

***Plicatula ferryi* Coquand, 1862**
Pl. 3, Figs. 9-11

1862 *Plicatula Ferryi* Coquand, p. 221, pl. 16, figs. 7-10.
1880 *Plicatula Batnensis* Coquand, p. 162, (photo Heinz: pl. 3).
1891 *Plicatula Batnensis* Coquand – Peron, p. 205, pl. 26, fig. 16.
1891 *Plicatula Ferryi* Coquand – Peron, p. 207, pl. 26, figs. 18-19.
1903 *Plicatula Ferryi* Coquand – Dacqué, p. 361.
1904 *Plicatula Batnensis* Coquand – Fourtau, p. 312.
1904 *Plicatula Ferryi* Coquand – Fourtau, p. 313, pl. 3, figs. 2-3.

1912 *Plicatula Ferryi* Coquand – Pervinquière, p. 160, pl. 9, fig. 22a-b; pl. 12, figs.6 14.
1912 *Plicatula Batnensis* Coquand – Pervinquière, p. 162, pl. 9, fig. 21a-c.
1917 *Plicatula batnensis* Coquand – Fourtau, p. 22.
1917 *Plicatula Ferryi* Coquand – Fourtau, p. 22.
1934 *Plicatula ferryi* Coquand – Blanckenhorn, p. 194.
1962 *Plicatula ferryi* Coquand – Abbass, p. 63, pl. 7, figs. 1-5, 26.
1963 *Plicatula* aff. *batnensis* Coquand – Fawzi, p. 33.
1972 *Plicatula* cf. *batnensis* Coquand – Freneix, p. 83, pl. 4, fig. 12a-b.
1987b*Plicatula ferryi* Coquand – Kora & Hamama, pl. 1, fig. 6.
1992 *Plicatula ferryi* Coquand – Abdel-Gawad & Zalat, pl. 5, fig. 2.
1998 *Plicatula ferryi* Coquand – El-Sheikh *et al*., pl. 2, fig. h.
2001 *Plicatula ferryi* Coquand – El-Hedeny *et al*., p. 299, fig. 3/a-d.
2002 *Plicatula ferryi* Coquand – Kora *et al*., pl. 2, fig. 8.
2006 *Plicatula ferryi* Coquand – El Qot, p. 63, pl. 12, figs. 5-10; text-fig. 10b
2007 *Plicatula ferryi* Coquand – Abdel-Gawad *et al*., plate 5, fig. 7.

Material: 27 specimens from Al Baniyah Formation, Jardas al'Abid area.

Measurements (in mm**):**

n=27	L	H	C	H/L	C/L	nr
Range	24-39	25-45	7- 14	0.80-1.25	0.22-0.38	22-38
Mean	31.5	33. 7	9.3	1.15	0.34	32

Description: Shell varying in size from small to medium, and in outline from triangular, pear-shaped, or oval to subrounded. Equilateral, slightly to moderately inflated, slightly inequivalved, with the right valve slightly more convex than the left one. Umbo low, not terminal and obscured in some specimens by the attachment area. Attachment area variable in size. Ventral margin rounded and crenulated. Ornamentation consisting of numerous radial ribs separated by wider interspaces. These ribs are crossed by commarginal growth lamellae. At their points of intersection scaly tubercles are produced, which commonly become spinose on the ventral part of the shell.

Age: Turonian.

Discussion: The great similarity of *Plicatula ferryi* Coquand, 1862 and *P. batnensis* Coquand, 1880 led Abbass (1962) to consider *P. batnensis* as a variety of *P. ferryi*. According to him *batnensis* differs only in being more inflated. Peron (1891) and Pervinquière (1912) recorded *P. ferryi* from the Turonian-Campanian of Tunisia and Pervinquière (1912) recorded it from the Cenomanian and lower Turonian of Tunisia. El Qot (2006) examined numerous individuals from the Cenomanian to Campanian sediments of different localities of Sinai, Egypt that belong to both aforementioned forms. He noticed that *ferryi* differs only in having a relatively large attachement area and in being generally larger. Considering that the two forms have nearly the same morphology and that there is a gradually increase in size stratigraphically from the Cenomanian-Turonian to the Coniacian-Santonian. Consequently, he agreed with Abbass (1962) and considered *P. batnensis* as a junior synonym of *P. ferryi*. In agreement with Abbass (1962) and El Qot (2006) *P. batnensis* was regarded as a junior synonym of *P. ferryi*.

Occurrence: *Plicatula ferryi* ranges in age from the Cenomanian to the Campanian. Geographically, it is abundant in North Africa and the Middle East, but also recorded from the lower Turonian of Nigeria by Barber (1958). It was recorded herein for the first time from Libya.

Order Pectinoida Newell & Boyd, 1995
Pectinina Waller, 1978)
Superfamily Pectinacea Wilkes, 1810
Family Pectinidae Wilkes, 1810
Subfamily Neitheinae Sobetskij, 1960
Genus *Neithea* Drouet, 1824
Subgenus *Neithea* Drouet, 1824
***Neithea* (*Neithea*) *dutrugei* (Coquand, 1862)**
Pl. 3, Figs. 7-12a-b

1862 *Janira Dutrugei* Coquand, p. 219, pl. 13, figs.1-2.
1918 *Pecten* (*Neithea*) *Dutrugei* Coquand – Greco, p. 24 (206), pl. 3 (19), figs. 7-9.
1973 *Neithea* (*Neithea*?) *dutrugei* (Coquand)–Dhondt, p. 59,pl. 4, fig. 3; pl. 5, fig. 4.
1992 *Neithea dutrugei* (Coquand) – Abdel-Gawad & Zalat, pl. 2, fig. 3.
1993 *Neithea* (*Neithea*) *dutrugei* (Coquand) – Dhondt & Dieni, p. 190, pl. 4, fig. 17.
2002 *Neithea dutrugei* (Coquand) – Abdelhamid & El Qot, p. 263, pl. 2, fig. 1.
2006 *Neithea dutrugei* (Coquand) –El Qot, p. 65, pl. 12, figs. 16-17.

Material: 5 specimens from Qasr al'Abid Formation, Jardas al'Abid area.

Measurements (in mm**):**

n=5	L	H	C	H/L	C/L
Range	21-42	22-47	10-15	1.05-1.20	0.32-45
Mea	33.5	37.9	12.2	1.13	0.39

Description: Shell small- to medium-sized, oval to triangular, inequilateral, inequivalved. Right valve strongly convex. Left valve concave. Umbo incurved. Ventral margin strongly convex, crenulated. Ornamentation consisting of strong, tripartite principal ribs. Every two principal ribs enclose five intercalated ribs, of which the middle one is more strongly developed. These radials are crossed by commarginal striae.

Age: Late Cenomanian.

Occurrence: *Neithea dutrugei* ranges in age from the Albian to the Senonian (Dhondt, 1973). Geographically, it is abundant in North Africa, Middle East, and Southern Europe.

Family Spondylidae Gray, 1826
Genus *Spondylus* Linné, 1758
***Spondylus fimbriatus* Goldfuss, 1835**
Pl. 3, Fig. 13, Pl. 4, Fig. 1

1835 *Spondylus fimbriatus* Goldfuss, p. 97, pl. 106, fig. 2.

1847 *Spondylus dutempleanus* D'Orbigny, p. 672, pl. 460, figs. 6-11.
1889 *Spondylus dutempleanus* D'Orbigny – Holzapfel, p. 244, pl. 27, figs. 8-10.
1901 *Spondylus dutempleanus* D'Orbigny – Woods, p. 125, pl. 22, figs. 11-14; pl. 23, figs. 1-5.
1962 *Spondylus dutempleanus* D'Orbigny – Abbass, p. 57, pl. 6, figs. 18-23.
1986 *Spondylus dutempleanus* D'Orbigny – Abdel-Gawad, p. 156, pl. 35, figs. 1-3.
1990 *Spondylus fimbriatus* Goldfuss – Dhondt & Dieni, p. 169, pl. 1, fig. 1; pl. 3, figs. 1-6; text-figs. 2-3, 8-9 (with full synonymy).
2006 *Spondylus fimbriatus* Goldfuss – El Qot, P. 65, pl. 13, figs. 1a-b, 2.
2007a *Spondylus fimbriatus* Goldfuss – Mekawy, P. 226, pl. 4, figs. 8, 9.
2008 *Spondylus fimbriatus* Goldfuss – Abdel-Gawad, p. 205.

Material: 3 specimens from Qasr al'Abid Formation of Jardas al'Abid area.

Measurements (in mm**):**

n= 3	L	H	C	H/L	C/L	C/H
Range	22-49	27-51	9-19.5	1.05 -1.23	0.40-0.41	0.33-0.38
Mean	31.1	38.6	14.3	1.16	0.41	0.36

Description: Shell small to medium-sized; oval to rounded in outline; subequilateral, inequivalved. Left valve generally convex. Right valve varying from flat to moderately convex. Ornamentation consisting of numerous, irregularly placed and rarely straight radial ribs with narrow intercostal grooves; primary ribs separated by a variable number of narrower secondary ones.

Age: Cenomanian.

Discussion: Dhondt & Dieni (1990) considered *Spondylus dutempleanus* D'Orbigny, 1847 as a junior synonym of *S. fimbriatus* Goldfuss. For an extensive description and discussion see Dhondt & Dieni (1990).

Occurrence: *Spondylus fimbriatus* Goldfuss was recorded from Europe, Egypt, Libya, and India. Concerning the stratigraphic range of the species, it ranges from the Cenomanian to the Maastrichtian in Europe. In Egypt, it was recorded by Abbass (1962) from the Campanian of El-Bahariya Oasis and from the lower Santonian of Southern Sinai and Eastern Desert by El Qot (2006) and Mekawy (2007a), respectively. In Libya, It was recorded by Abdel-Gawad (2008) from the Cenomanian of Jardas al'Abid area and it was recorded herein from the same age and locality.

Subclass Heteroconchia Hertwing, 1895
Order Hippuritoida Newell, 1965
Superfamily Hippuritacea Gray, 1848
Family Requieniidae Douvillé, 1914
Genus *Apricardia* Guéraguer, 1853
***Apricardia*? *matheroni* (Coquand, 1862)**
Pl. 4, Figs. 2a-b, 4

1862 *Caprina matheroni* Coquand, p. 223, pl. 17, figs. 10-11.

Material: 3 articulated specimens from Al Baniyah Formation, Jardas al'Abid area.

Measurements (in mm**):**

n=3	L	H	C	H/L	C/L
Range	22-28	30-41	34-44	1.36-1.46	1.55-157
Mean	25	36	39	1.41	1.56

Description: Shell medium-sized, inequivalved, left valve larger than the right one, both valves coiled, *Diceras*-shaped, left valve more strongly incurved than the right one. The shell bears traces of radial striae, crossed by fine commarginal growth lines.
Age: Turonian.

Discussion: The studied specimens are closely resemble *Caprina matheroni* Coquand which has been established based on material collected from the upper Turonian of Algeria in general shape, umbo coiling, and ornamentation. Many genera of the family Requieniidae have been described and distinguished according to their internal features e.g. hinge, teeth, and muscle insertion. Due to all the studied specimens are articulated and consequently, the hinge, teeth, and muscle insertion can not observed. Therefore, the specimens are tentatively assigned to genus *Apricardia* Guéraguer 1853.
Occurrence: The species was established from the Turonian of Algeria and it was recorded herein for the first time from Libya.

Family Radiolitidae Gray, 1848
Subfamily Radiolitinae Gray, 1848
Genus *Radiolites* Lamarck, 1801
***Radiolites?* sp.**
Pl. 4, Figs. 3, 6

Material: 4 incomplete specimens from Al Baniyah Formation, Jardas al'Abid area.

Description: The studied specimens are incomplete attached valves, medium-sized, strongly inequivalved, conical-elongate. They are ornamented with numerous longitudinal ribs.
Age: Turonian.

Order Veneroida H. Adams & A. Adams, 1856
Family Lucinidae Dall, 1901
Subfamily Lucininae Fleming, 1828
Genus *Lucina* Bruguière, 1797
***Lucina dachelensis* Wanner, 1902**
Pl. 4, Fig. 5

1902 *Lucina dachelensis* Wanner, p. 123, pl. 17, fig. 6.
1902 *Lucina dachelensis* Wanner – Quass, p. 213, pl. 24, figs. 6-12.
1906 *Lucina dachelensis* Wanner – Krumbeck, p. 108, pl. 8, fig. 10.
1917 *Lucina dachelensis* Wanner – Fourtau, p. 76, pl. 1, fig. 9.
1962 *Lucina dachelensis* Wanner – Abbass, p. 107, pl. 22, fig. 2.

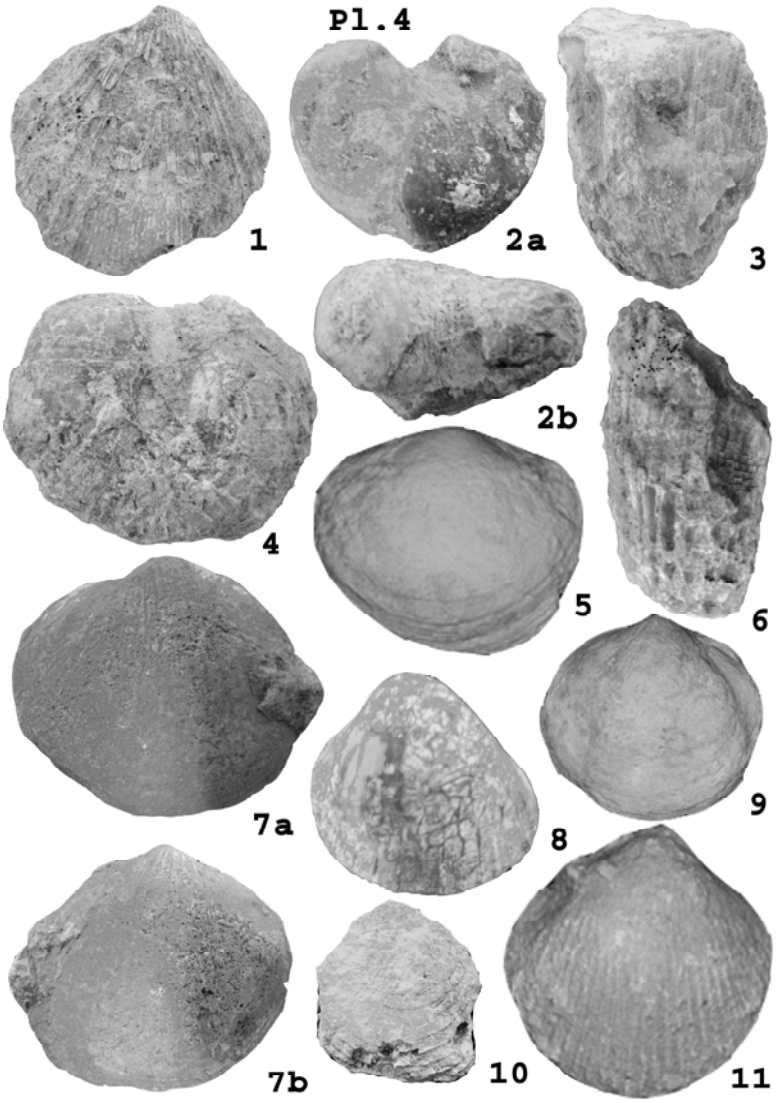


Fig. 1. ***Spondylus fimbriatus*** **Goldfuss, 1835. Articulated specimen, left valve view, Upper Cenomanian, Qasr al'Abid Formation, X 1, x 0.85**

Figs. 2a-b, 4. ***Apricardia*****? cf.** ***matheroni*** **(Coquand, 1862). Articulated specimens 2a, 4: anterior views, 2b: dorsal view, Turonian, Al Baniyah Formation, section X4, 2: x 1.3, 4: x 1.**

Figs. 3, 6. ***Radiolites*****? sp. Side view of incomplete attached valves, Turonian, Al Baniyah Formation, section X4, x0.75.**

Fig. 5. ***Lucina dachelensis*** **Wanner, 1902 Articulated specimen, right valve view, Upper Campanian, Al Majahir Formation, section X5, x 1.5.**

Figs. 7a-b, 9. ***Fimbria*** **sp. Articulated specimens, 7a, 9: left valve views, 7b: right valve view, Upper Campanian, Al Majahir Formation, section X5, 7: x 1, 9: x 0. 75.**

Figs. 8, 11. ***Venericardia libyca*** **(Zittel). Articulated specimens, Upper Campanian, Al Majahir Formation, section X5, x 1.5.**

Fig. 10. ***Lucina*** **sp. Articulated specimen, Upper Cenomanian, Qasr al'Abid Formation, section X 1, x 1.**

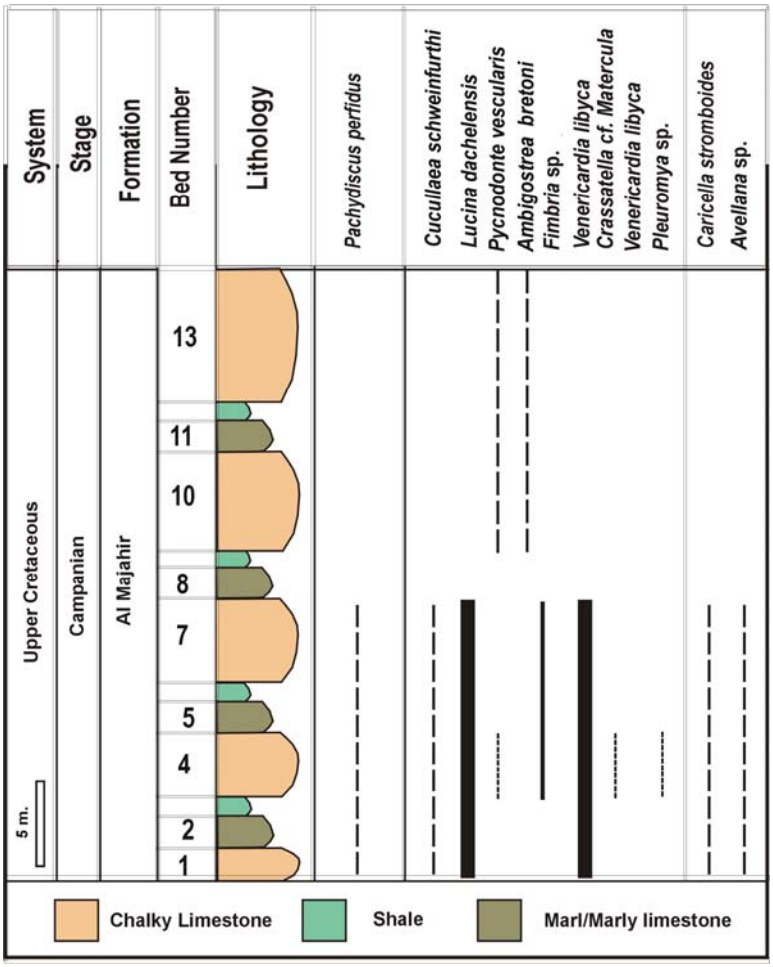


Fig. 6. Columnar section showing the litsostratigraphy and the stratigraphic range of the studied macrofossils of the Al Baniyah Formation of the Quarry section (X4).

Material: 13 specimens from Al Majahir Formation, Jardas al'Abid area.

Measurements (in mm**):**

n=13	L	H	C	H/L	C/L	C/L
Range	28-37	23-32	14-20	0.82-1.00	0.43-0.54	0.47-0.63
Mean	32.3	28.7	15.9	0.89	0.49	0.56

Description: The specimens are medium-sized, oval to subcircular, equivalved, moderately inflated. Umbones small, prominent, prosogyrate. The anterior part of the shell is smaller than the posterior one. The ventral margin is strongly convex and is continuous with the anterior and posterior margins. Ornamentation consisting of regular, widely spaced, commarginal growth lines. These interspaces

are crossed by faint fine radial threads, which become more prominent near the ventral margin.

Age: Campanian.
Occurrence: *Lucina dachelensis* Wanner being to be restricted to the Senonian of Egypt and Libya.

***Lucina* sp.**
Pl. 4, Fig. 10

Material: 3 specimens from Qasr al'Abid Formation, Jardas al'Abid area.

Measurements (in mm**):**

n=3	L	H	C	H/L	C/L
Range	24-29.5	26-30	7-11	1.0-1.04	0.29-0.32
Mean	26.3	27.3	8.7	1.02	0.30

Description: Specimens small-sized, subcircular to circular, equivalved, subequilateral, moderately inflated. Umbones small, prosogyrate, pointed, slightly prominent, placed medially. Ornamentation consisting of strong commarginal growth lines, separated by interspaces three to four times wider than these lines themselves.These interspaces are crossed by faint fine radial threads.

Age: Late Cenomanian.

Remarks: The studied specimens are closely resemble *Lucina saharica* (Quaas, 1902) which has been established and recorded from the upper Senonian of Egypt in general shape and ornamentation, but *L. saharica* differs in being more inflated and its length is slightly exceed its height, whereas the present material is slightly higher.

Family Fimbriidae Nicol, 1950
Genus *Fimbria* Megerle Von Mühlfeld, 1811
***Fimbria* sp.**
Pl. 4, Figs. 7a-b, 9

Material: 11 specimens from the Al Majahir Formation, Jardas al'Abid area.
Measurements (in mm**):**

n=11	L	H	C	H/L	C/L	C/H
Range	20-50	19-45	9-24	0.90-1.04	0.42-0.55	0.45-0.60
Mean	33.4	32.4	17	0.97	0.50	0.51

Description: Shell small to medium, oval-shaped, equivalved, slightly longer than high. Anterior margin rounded, forming an angle with the hinge margin and passing gradually into the rounded ventral margin with which it forms a regular curve. Umbones prosogyrate. Ornamentation consisting of numerous and moderately strong radial ribs. The latters are crossed by faint commarginal ribs which form a reticulate pattern. The commarginal elements are slightly wider than the radials ones.

Age: Late Campanian.

Discussion: The diagnostic reticulate ornamenation and the general shape of the shell closely resemble the genus *Fimbria* (Cox *in* Moore 1969: N513). The present specimens differ from those of *Fimbria* sp. which have been recorded from the Cenomanian of Egypt by El Qot (2006) in being higher and in having a more developed and dense radial ribs.

Superfamily Carditacea Fleming, 1820
Family Carditidae Fleming, 1820
Subfamily Carditesinae Chavan, 1969
Genus *Venericardia* Lamarck, 1801
***Venericardia libyca* Zittel, 1902**
Pl. 4, Figs. 8, 11; pl. 5, Fig. 2

1902 *Cardita libyca* Zittel *in* Quass, p. 203, pl. 23, figs. 13-21; pl. 32, figs. 3-6.
1906 *Cardita beaumonti* D'Archiac – Krumbeck, p. 105, pl. 8, fig. 6a-b.
1962 *Venericardia libyca* (Zittel) – Abbass, p. 116, pl. 17, fig. 1.
1995 *Venericardia libyca* (Zittel) – Kassab & Zakhera, p. 338, fig. 3(11, 12).

Material: 18 specimens from Al Majahir Formation, Jardas al'Abid area.

Measurements (in mm**):**

n= 18	L	H	C	H/L	C/L	C/H
Range	14-28	13.5-25	10.5-20	0.8-1.00	0.64-0.78	0.67-0.83
Mean	21.3	19.8	15.1	0.93	0.72	0.69

Description: The specimens are internal moulds, small- to medium-sized, outline trapizoidal, slightly longer than high strongly inflated, inequilateral, and enlarged posteriorly. Umbones prominent, relatively broad, and strongly prosogyrate. Ventral margin strongly convex, meeting the anterior and posterior margins in a rounded curve. Anterior margin rounded. The posterior margin is truncated and is higher than the anterior one. Ornamentation consists of strong radial ribs, separated by wide interspaces. These interspaces are concave and become narrower towards the umbonal area.
Age: Campanian.

Occurrence: *Venericardia libyca* (Zittel) being to be restricted to the Senonian of Egypt and Libya.

Superfamily Cardiacea Lamarck, 1809
Family Cardiidae Lamarck, 1809
Subfamily Cardiinae Lamarck, 1809
Genus *Granocardium* Gabb, 1868
***Granocardium productum* (J. De C. Sowerby, 1832)**

Pl. 5, Fig. 4

1832 *Cardium productum* J. De C. Sowerby, p. 417, pl. 39, fig. 15.
1850 *Cardium olisiponensis* Sharpe, p. 181, pl. 14, fig. 4a-b.

1871 *Cardium* (*Trachycardium*) *productum* Sowerby – Stoliczka, p. 217, pl. 11, figs. 15-16.
1912 *Cardium* (*Trachycardium*) *productum* Sowerby – Pervinquière, p. 259, pl. 19, figs. 25-27.
1937 *Cardium* (*Trachycardium*) *productum* Sowerby – Trevisan, p. 102.
1962 *Granocardium hassani* Abbass, p. 122, pl. 20, figs. 2-3.
1993 *Granocardium productum* (Sowerby) – Dhondt & Dieni, p.229, pl.14, figs. 4-9.
2002 *Granocardium productum* (Sowerby) – Abdelhamid & El Qot, p. 277, pl. 5, fig. 7-8.
2006 *Granocardium productum* (J. De C. Sowerby) – El Qot, p. 77, pl. 16, figs. 2-3 (with additional synonymy).

Material: 6 specimen from Qasr al'Abid Formation, Jardas al'Abid area.

Measurements (in mm**):**

n=6	L	H	C	H/L	C/L	C/H
Range	29-74	44-98	38-92	1.32-2.4	1.24-2.05	0.84-0.95
Mean	54	78.7	75.6	1.53	1.37	0.91

Description: The specimens are medium- to large-sized, oval to pear-shaped or subquadrangular, higher than long, strongly inflated, slightly inequilateral, more or less equally truncated anteriorly and posteriorly. Umbones prominent, orthogyrate, incurved. Hinge nearly straight and wide. Anterior and posterior margins convex and crenulated. Ventral margin strongly convex and crenulated. Ornamentation consisting of radial ribs, which are moderately well preserved near the ventral margin.

Age: Late Cenomanian.

Occurrence: According to Dhondt and Dieni (1993) *Granocardium productum* (J. De C. Sowerby) is a cosmopolitan taxon and has a wide stratigraphic range (Cenomanian to Maastrichtian).

Family Arcticidae Newton, 1891
Genus *Arctica* Schumacher, 1817
***Arctica picteti* (Coquand, 1862)**
Pl. 5, Figs. 3, 5

1862 *Crassatella Picteti* Coquand, p. 199, pl. 13, figs.10-11.
1890 *Cyprina Picteti* Coquand – Peron, p. 293.
1912 *Cyprina Picteti* Coquand – Pervinquière, p. 223, pl. 16figs. 6-8.
1937 *Cyprina Picteti* Coquand – Trevisan, p. 88, pl. 6, figs. 15-18.
1963 *Cyprina picteti* Coquand var. *allongata* var. nov. – Fawzi, p. 55, pl. 5, fig.6a-b.
2006 *Arctica picteti* (Coquand) – El Qot, p. 84, pl. 17, figs. 2-3.

Material: 6 specimens from Qasr al'Abid Formation, Jardas al'Abid area.

Measurements (in mm**):**

n=6	L	H	C	H/L	C/L
Range	48-65	35-53	25-40	0.71-0.91	0.51-0.65
	56	43	32	0.82	0.59

Description: Specimens medium- to large-sized subtriangular to ovate, strongly inflated, equivalved, strongly inequilateral. Umbones broad, prominent, strongly prosogyrate and situated anteriorly. Antero-dorsal margin concave below the umbo. Postero-dorsal margin slightly convex. Anterior margin rounded, curving rapidly to passing gradually into the broadly rounded and convex ventral margin. Posterior margin broadly rounded. A faint carina extending from the umbo to the postero ventral end. Ornamentation consists of numerous, strong commarginal ribs.

Age: Late Cenomanian.

Occurrence: *Arctica picteti* (Coquand) is very abundant in the Cenomanian of North Africa and Italy. It was recorded herein for the first time from Libya.

Genus *Tenea* Conrad, 1870
***Tenea delettrei* (Coquand, 1862)**
Pl. 5, Fig. 7

1862 *Venus Delettrei* Coquand, p. 194, pl. 8, figs. 3-4.
1862 *Venus Forgemoli* Coquand, p. 194, pl. 8, figs. 7-8.
1912 *Dosinia Delettrei* Coquand – Pervinquière, p. 270, pl. 20,figs. 4-8.
1917 *Dosinia Delettrei* Coquand – Fourtau, p. 87.
1917 *Dosinia Delettrei* var. *Forgemoli* Coquand – Fourtau, p. 87, pl. 7, fig. 8.
1918 *Dosinia Delettrei* Coquand – Greco, p. 49 (231), pl. 5 (21),figs. 6-10.
1934 *Dosinia delettrei* Coquand – Blanckenhorn, p. 250.
1937 *Dosinia Delettrei* Coquand – Trevisan, p. 113, pl. 7, figs29-31.
1937 *Dosinia Forgemoli* Coquand – Trevisan, p. 114, pl. 7, figs.32-33.
1962 *Dosinia delettrei* (Coquand) – Abbass, p. 151, pl. 23, figs.8-9.
1962 *Dosinia forgemoli* (Coquand) – Abbass, p. 152, pl. 23, figs.6-7.
1963 *Dosinia delettrei* (Coquand) – Fawzi, p. 76, pl. 6, figs. 5-6.
1963 *Dosinia delettrei* var. *forgemoli* (Coquand) – Fawzi, p. 76,pl. 6, fig. 7.
1992 *Dosinia delettrei* (Coquand) – Abdel-Gawad & Zalat, pl. 3, fig. 3.
1994 *Dosinia delettrei* (Coquand) – Kassab & Ismael, p. 238, fig. 5/13.
2002 *Dosinia delettrei* (Coquand) – Abdel-Gawad & Gameil, p. 94, pl. 3, figs.21-22.
2002 *Dosinobia delettrei* (Coquand) – Abdelhamid & El Qot, p. 283, pl. 6, figs. 7-8.
2002 *Dosinobia forgemoli* (Coquand) – Abdelhamid & El Qot, p. 283, pl. 6, fig. 9; pl. 7, fig. 1.
2006 *Tenea delettrei* (Coquand) – El Qot, p. 84, pl. 17, figs. 4-9; text-fig.11b.
2007a *Tenea delettrei* – Mekawy, p. 233, pl. 5, fig. 11.

Material: 7 specimens from Qasr al'Abid Formation, Jardas al'Abid area.

Measurements (in mm**):**

n=7	L	H	C	H/L	C/L	C/H
Range	20-35	22-39	12-20	0.96-1.15	0.45- 0.58	0.44- 0.54
Mean	29.3	30.9	15.7	1.08	0.51	0.49

Description: The specimens are small- to medium-sized, circular to suborbicular in outline, compressed, inequilateral, equivalved. Umbones prosogyrate, moderately prominent. Lunule small and deep. Escutcheon long, deep, narrowand extending to the middle of the postero-dorsal margin. Antero-dorsal margin concave below the

umbo. Postero-dorsal margin slightly convex. Anterior and posterior margins strongly convex and forming a continuous curve with the rounded ventral margin. The studied specimens are internal moulds bear no ornamentation.

Age: Cenomanian.

Discussion: As seen from the list of synonymies, El Qot (2006) attributed this species to genus *Tenea* based on the hinge structure and consequently moved this species from family Veneridae Rafinesque, 1815, subfamily Dosininae Deshayes, 1853 to family Arcticidae Newton, 1891. For more discussion of the species see El Qot (2006).

Occurrence: *Tenea delettrei* (Coquand) is very abundant in the Cenomanian of North Africa, Middle East, and Italy. Moreovere, it has been recorded also from the Turonian of Algeria and Syria.

Superfamily Veneracea Rafinesque, 1815
Family Veneridae Rafinesque, 1815
Subfamily Tapetinae Adams, 1857
Genus *Paraesa* Casey, 1952
***Parasea faba faba* (J. De C. Sowerby, 1827)**
Pl. 5, Figs. 1, 6

1827 *Venus Faba* J. De C. Sowerby, p. 129, pl. 567,fig. 3.
1836 *Venus* (*?*) *sublaevis* J. De C. Sowerby, p. 243, 342, pl. 17, fig. 5.
1836 *Venus immersa* J. De C. Sowerby, p. 242, 342, pl. 17, fig. 6.
1862 *Venus Reynesi* Coquand, p. 193, pl. 7, figs. 11-12.
1889 *Tapes faba* Sowerby – Holzapfel, p. 165, pl. 13, figs. 7-10.
1890 *Venus Reynesi* Coquand – Peron, p. 307, pl. 29, figs. 13-14.
1904 *Venus Reynesi* Coquand – Fourtau, p. 337.
1908 *Cyprimeria* (*Cyclorisma*) *faba* (Sowerby) – Woods, p. 187, pl. 29, figs. 7-13.
1908 *Cyprimeria* (*Cyclorisma*) *sublaevis* (Sowerby) – Woods, p. 189, pl. 29, fig.14.
1908 *Cyprimeria* (*Cyclorisma*) *immersa* (Sowerby) – Woods, p. 189, pl. 29, fig. 15.
1912 *Venus* (?) *Reynesi* Coquand – Pervinquere, p. 274.
1918 *Venus Reynesi* Coquand – Greco, p. 47 (229), pl. 5 (19), fig. 4.
1934 *Venus reynesi* Coquand – Blanckenhorn, p. 251, pl. 13,fig.151; pl.14,fig. 154.
1962 *Meretrix faba* (Sowerby) – Abbass, p. 146, pl. 22, fig. 21.
1963 *Venus reynesi* Coquand – Fawzi, p. 80, pl. 6, fig. 8.
1972 *Parasea faba faba* (Sowerby) – Freneix, p. 178, pl. 18,figs. 10-12, text- fig.46.
1992 *Meretrix faba* (Sowerby) – Abdel-Gawad & Zalat, pl.3, fig. 2.
2002 *Meretrix faba* (Sowerby) – Abdelhamid & El Qot, p. 284, pl. 7, figs. 2-3
2006 *Parasea faba faba* (J. De C. Sowerby) – El Qot, p. 88, pl.18, figs.1,3; text fig.11a.

Material: 12 specimens from Qasr al'Abid Formation and 11 specimens from Al Baniyah Formation, Jardas al'Abid area.

Measurements (in mm**):**

n=23	L	H	C	H/L	C/L	C/H
Range	15-40	12-40	7-26	0.79-1.00	0.41-0.76	0.44-0.76
Mean	28.4	26.3	17.2	0.91	0.60	0.65

Description: Specimens small to medium-sized, oval in outline, equivalved, inequilateral. Umbo small, prominent, prosogyrate and placed anteriorly. Antero-dorsal margin below the umbo concave, anterior margin convex. Postero-dorsal margin slightly convex and gently inclined.Ventral margin smooth and convex. Ornamentation is represented by traces of numerous, regular, commarginal ribs separated by interspaces of nearly equal width.

Age: Cenomanian-Turonian.

Occurrence: *Parasea faba faba* (J. De C. Sowerby) ranges from the Albian to the Campanian, but it is very abundant in the Albian of Europe and the Cenomanian of North Africa and Middle East.

Order Pholadomyoida Newell, 1965
Family Pholadomyidae Gray, 1847
Genus *Pholadomya* J. De C. Sowerby, 1823
Subgenus *Pholadomya* J. De C. Sowerby, 1823
***Pholadomya* (*Pholadomya*) *pedernalis* Roemer, 1852**
Pl. 5, Figs. 9, 10

1852 *Pholadomya pedernalis* Roemer, p. 45, pl. 6, fig. 4.
1912 *Pholadomya pedernalis* Römer – Pervinquière, p. 288, pl. 21, figs. 5-7.
1934 *Pholadomya pedernalis* Römer – Blanckenhorn, p. 261.
1962 *Pholadomya pedernalis* Römer – Abbass, p. 161, pl. 24, fig. 4.
1992 *Pholadomya pedernalis* Römer – Abdel-Gawad & Zalat, pl. 3, fig. 9.
2002 *Pholadomya pedernalis* Römer – Abdel-Gawad & Gameil, p. 97, pl. 4, figs. 9-10.
2002 *Pholadomya pedernalis* Römer - Abdelhamid & El Qot, p. 284, pl. 7, fig. 6.
2006 *Pholadomya* (*Pholadomya*) *pedernalis* Roemer – El Qot, pl. 18, figs. 4, 5a-b.

Explanation of Plate 5

Figs. 1, 6. *Parasea faba faba* (J. De C. Sowerby, 1827). Articulated specimen, left valve views, Upper Cenomanian, Qasr al'Abid Formation, section X 1, x 1.

Fig. 2. *Venericardia libyca* (Zittel). Articulated specimen, Upper Campanian, Al Majahir Formation, section X5, x 1.5.

Figs. 3, 5. *Arctica picteti* (Coquand, 1862). Articulated specimens, 2: left valve view, 4: right valve view, Upper Cenomanian, Qasr al'Abid Formation, section X 1, x 0.75.

Fig. 4. *Granocardium productum* (J. De C. Sowerby, 1832). Articulated specimen; right valve view, Upper Cenomanian, Qasr al'Abid Formation, section X 1, x 0.6

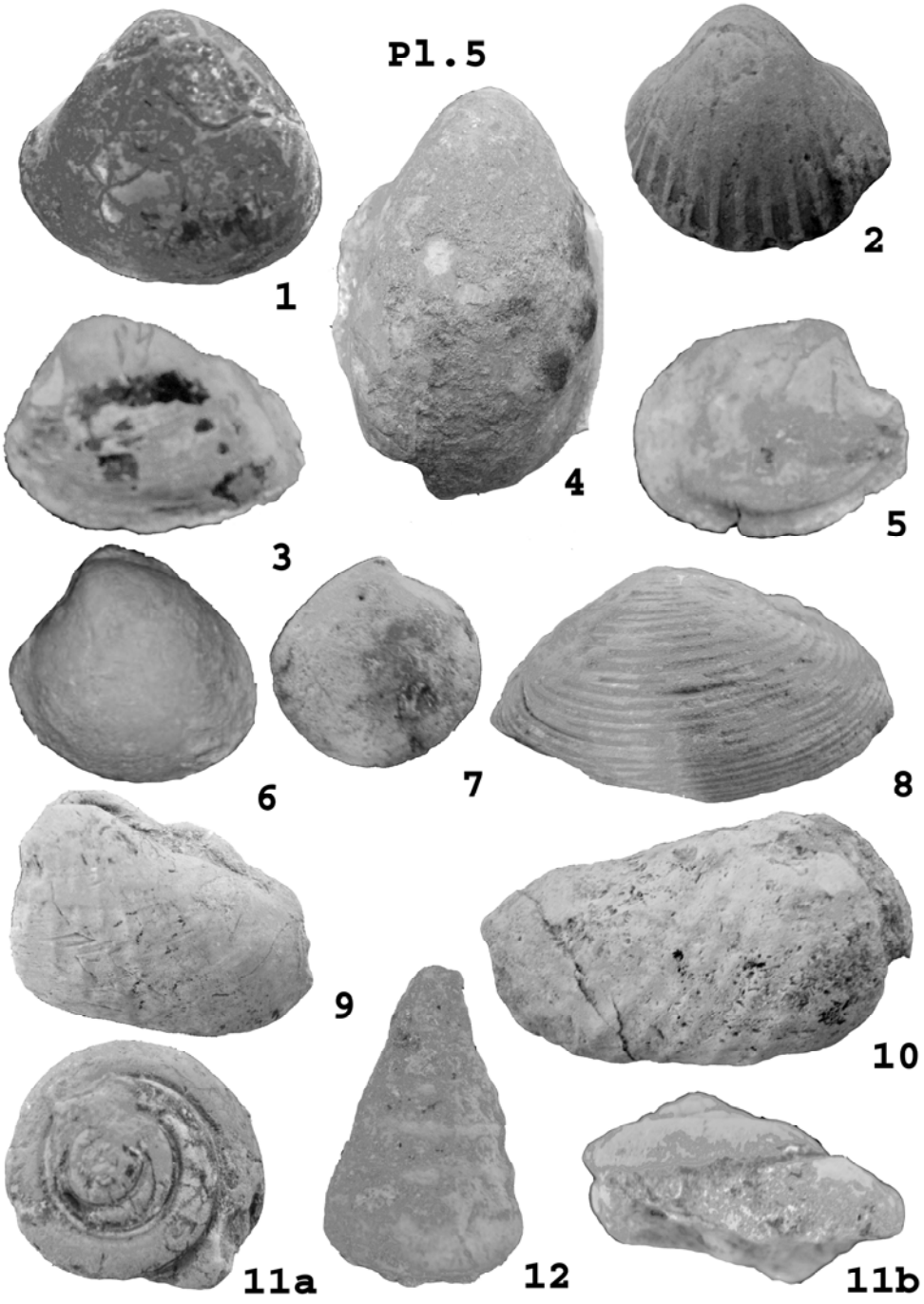
Fig. 7. *Tenea delettrei* (Coquand, 1862). Articulated specimen, right valve view, Upper Cenomanian, Qasr al'Abid Formation, section X 1, x 1. 3.

Fig. 8. *Pleuromya* sp. Articulated specimen, Upper Campanian, Al Majahir Formation, section X 5, left valve view, x 1.1.

Figs. 9, 10. *Pholadomya* (*Pholadomya*) *pedernalis* Roemer, 1852. Articulated specimens, 8: left valve view, 9: right valve view,Turonian, Al Baniyah Formation, section X 4, x1.2.

Fig. 11a-b. *Calliomphalus* (*Calliomphalus*) sp., Upper Cenomanian, Qasr al'Abid Formation, section X 1, a: apical view, b: apertural view, a: x 1. 3, b: x 1.6.

Fig. 12. *Pyrazus* (*Pyrazus*) *valeriae* (Verneuil & Lorière, 1868). Upper Cenomanian, Qasr al'Abid Formation, section X 1, a: side view, b: apertural view, x 1.


Pl.5
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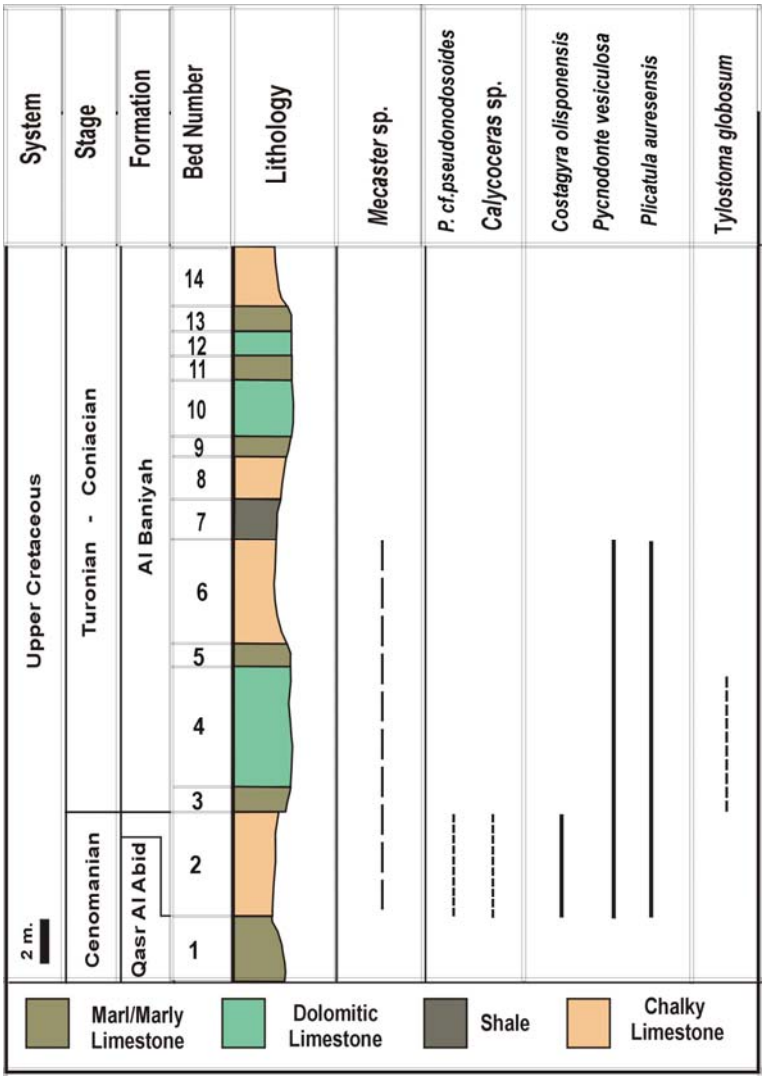


Fig. 7. Columnar section showing the litsostratigraphy and the stratigraphic range of the studied macrofossils of the Al Majahir Formation at Ghawt Sas (section X5).

Material: 10 specimens from Al Baniyah Formation of Jardas al'Abid area.
Measurements (in mm**):**

n= 10	L	H	C	H/L	C/L	C/L
Range	33-69	22-48	18-35	0.66-0.73	0.46-0.55	0.71-0.82
Mean	46.5	31.2	22.7	0.70	0.51	0.76

Description: The specimens are medium-sized, elongated-ovate, equivalved, strongly inequilateral. Umbones broad, incurved, not prominent and placed

anteriorly, more inflated anteriorly. Anterior end nearly as high as the posterior one. Ventral margin convex, meeting the anterior and posterior margins in even curves. Ornamentation consists of numerous, faint, commarginal ribs, separated by interspaces nearly half the width of the ribs. These ribs are crossed by relatively few, strong, radial ribs separated by wider interspaces. Faint tubercles are produced at the intersections between the radials and the commarginal ribs.

Age: Turonian.
Occurrence: *Pholadomya (P.) pedernalis* Roemer ranges from the Aptian to the Santonian. It is recorded from Texas, Southern Europe, North Africa (Tunisia and Egypt), Middle East, and Nigeria. It was recorded herein for the first time from Libya.

Family Pleuromyidae Zittel, 1895
Genus *Pleuromya* Agassiz, 1842
***Pleuromya* sp.**
Pl. 5, Fig. 8

Material: One specimen from Al Majahir Formation of Jardas al'Abid area.
Measurements (in mm**):**

n= 1	L	H	C	H/L	C/L
	50	35	27	0.70	0.54

Description: Specimen medium-sized, elongated-ovate, equivalved, strongly inequilateral. Umbones broad, incurved, not prominent and placed anteriorly. Anterior end nearly as high as the posterior one. Ventral margin convex, meeting the anterior and posterior margins in even curves. Ornamentation consists of numerous, strong, commarginal ribs, separated by interspaces nearly half the width of the ribs.
Age: Campanian.

2- Gastropods

As the systematics of the gastropods are still in a state of flux, the classification used here is that of Moore (1960) for Archaeogastropoda and Wenz (1938) for Mesogastropoda and Caenogastropoda. The terminology used is mainly that of Cox (1960). All linear measurements (taken with Vernier Caliper) are given in millimeters.

Abbreviations used are:
n = number of measured specimens;
H = shell height;
D = maximum diameter of shell;

Subclass Prosobranchia Milne-Edwards, 1848
Order Archaeogastropoda Thiele, 1925
Family Trochidae Rafinesque, 1815
Subfamily Angariinae Thiele, 1924
Genus *Calliomphalus* Cossmann, 1888
***Calliomphalus* (*Calliomphalus*) sp.**
Pl. 5, Fig. 11a-b

Material: 3 specimens from Qasr al'Abid Formation of Jardas al'Abid area.
Measurements (in mm**):**

n=3	H	D	D/H
	10-15	25- 28	1.87-2.25
	12	26.6	2.1

Description: Specimens small, turbiniform, spire conical. Whorls convex in outline, their width nearly twice their height. Body whorl accounting for more than half of the shell height. All specimens are internal moulds that show no trace of ornamentation. Aperture nearly circular.
Age: Late Cenomanian.

Family Potamididae H. & A. Adams, 1854
Genus *Pyrazus* Montfort, 1910
Subgenus *Pyrazus* Montfort, 1910
***Pyrazus* (*Pyrazus*) *valeriae* (Verneuil & Lorière, 1868)**
Pl. 5, Fig. 12

1868 *Cerithium Valeriae* Verneuil & Lorière, p. 11, pl. 2, fig. 1.
1916 *Pyrazus Valeriae* Verneuil & Lorière – Douvillé, p. 136, pl. 18, figs. 6-8.
1992 *Pyrazus valeriae* (Verneuil & Lorière) – Abdel-Gawad & Gameil, p. 74, fig. 2/11-12.
2006 *Pyrazus valeriae* (Verneuil & Lorière) – El Qot, p. 97, pl. 19, figs. 9-11.

Material: Two specimens from Qasr al'Abid Formation, Jardas al'Abid area.

Measurements (in mm**):**

n=2	H	D	D/H
Range	34-45	15-22	0.44-0.49
Mean	39.5	18.5	0.47

Description: Specimens medium-sized, turriculate. Spire acute and relatively long. Body whorl accounting for about 1/3 of shell height. The specimens are partialy covered but have traces of axial ribs. Aperture nearly oval.

Age: Late Cenomanian.

Occurrence: This species was originally described by Verneuil & Lorière from the Lower Cretaceous of Spain. It was also recorded from the Albian –Cenomanian of Egypt. It was recorded herein for the first time from Libya.

Family Aporrhaidae Adams, 1858
Subfamily Aporrhainae Gabb, 1868
Genus *Aporrhais* Da Costa, 1778
***Aporrhais dutrugei* (Coquand, 1862)**
Pl. 6, Figs. 1, 2a-b, 6

1862 *Rostellaria Dutrugei* Coquand, p. 185, pl. 5,fig. 4.
1889 *Pterodonta? Dutrugei* Coquand – Peron, p. 83, pl. 20, figs.15-16.
1912 *Aporrhais* (?) *Dutrugei* Coquand – Pervinqiere, p. 24, pl.2, figs. 1-7.

1916 *Aporrhais* (?) *Dutrugei* Coquand – Greco, p. 155.
1927 *Pterodonticeras Dutrugei* Coquand – Blanckenhorn, p. 168, pl. 5, fig. 93.
1937 *Aporrhais* (?) *Dutrugei* Coquand – Trevisan, p. 35, pl. 2,fig. 8.
1992 *Aporrhais dutrugei* (Coquand) – Abdel-Gawad &Gameil, p. 77, fig. 3/13.
2001 *Aporrhais dutrugei* (Coquand) – Kora *et al*., pl. 3, fig.5.
2001 *Aporrhais dutrugei* (Coquand) – Abdallah *et al*., pl. 1,figs. 2-3.
2006 *Aporrhais dutrugei* (Coquand) – El Qot, p. 100, pl. 20, figs. 7-8.
2007b *Aporrhais dutrugei* (Coquand) – Mekawy, p. 160, pl. 1, fig. 15.

Material: 8 specimens from Qasr al'Abid Formation and 4 specimens from Al Baniyah Formation, Jardas al'Abid area.

Measurements (in mm**):**

n=12	H	D	D/H
Range	26-68	16-42	0.56-0.76
Mean	46.3	33.7	0.68

Description: Specimens medium- to large-sized, spindle-shaped. Spire moderately high, pointed, consisting of 2-3whorls of convex outline. Body whorl relatively large and accounting for about half of shell height. Suture deeply impressed. Some specimens are ornamented with axial ribs. Aperture elongated, with commonly incomplete outer lip.

Age: Cenomanian.

Occurrence: *Aporrhais dutrugei* (Coquand) ranges from the Cenomanian to the Turonian, but it is abundant in the Cenomanian. The species was recorded from North Africa (Algeria, Tunisia, Libya, and Egypt), Middle East, and Italy.

Genus *Harpagodes* Gill, 1870

***Harpagodes heberti* (Thomas & Peron, 1889)**

Pl. 7, Fig. 2a-b

1889 *Pterocera Heberti* Thomas & Peron *in* Peron, p. 77, pl. 21, figs. 1-2.
1904 *Pterocera Heberti* Thomas & Peron – Fourtau, p. 275.
1916 *Harpagodes Heberti* Thomas & Peron – Greco, p. 157, pl. 18, fig. 7.
1963 *Harpagodes* aff. *heberti* Thomas & Peron – Fawzi, p. 95, pl. 7, fig. 5.
1992 *Harpagodes heberti* (Thomas & Peron) – Abdel-Gawad & Gameil, p. 80, fig. 4/10.
2006 *Harpagodes heberti* (Thomas & Peron) – El Qot, p. 102, pl. 21, figs. 2, 3.

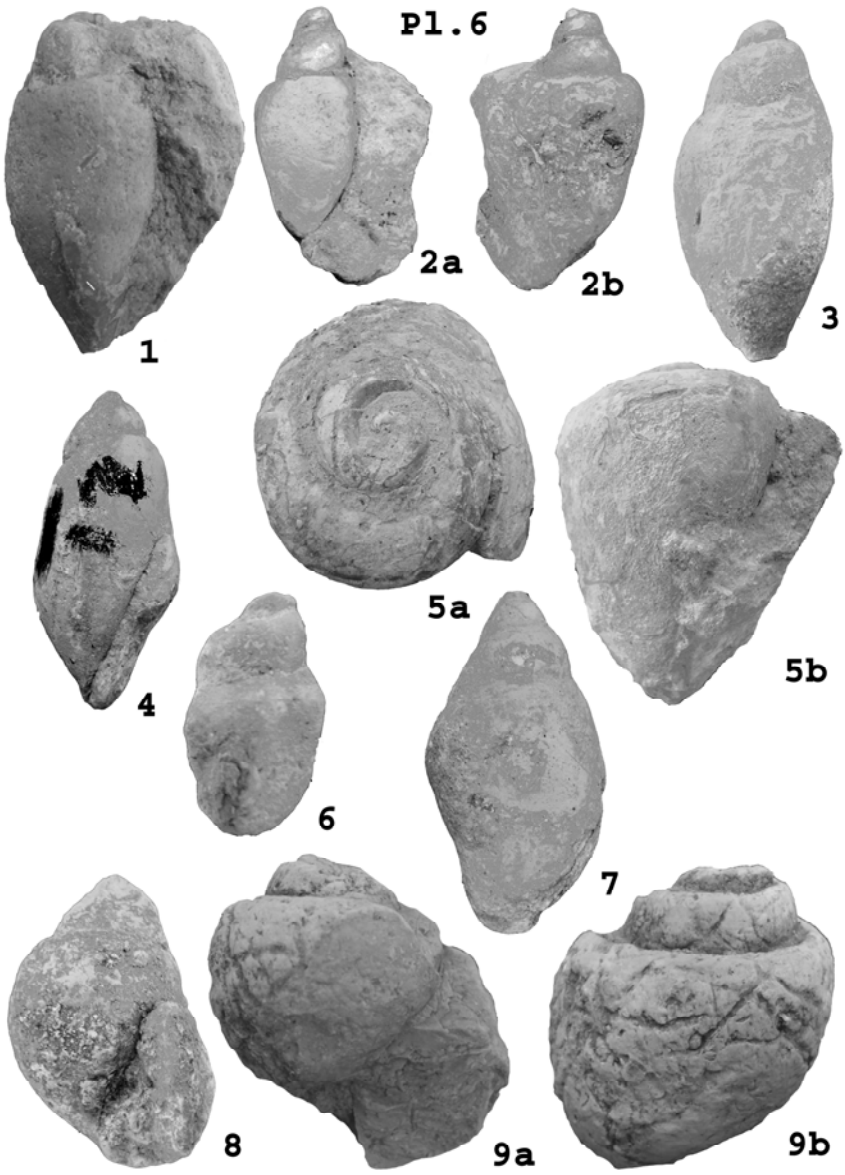
Material: 1 specimen from Qasr al'Abid Formation, Jardas al'Abid area.

Measurements (in mm**):**

n =1	H	D	D/H
	78	63	0.81

Description: Specimen relatively large-sized, spindle-shaped. Spire of moderate height, consisting of 2 whorls. Body whorl large nearly circular in outline, bicarinate and accounting for more than half the shell height. Suture deeply impressed. The specimen is an internal mould lacking ornamentation. Aperture lanceolate, with incomplete outer lip.

Age: Cenomanian.



Figs. 1, 2a-b, 6. *Aporrhais dutrugei* (Coquand, 1862). 1, 2a: apertural views, 2b, 6: side views, Upper Cenomanian, Qasr al'Abid Formation, section X 1, 1, 6: x 1., 2: x 0. 6.

Figs. 3, 4, 7. *Pterodonta deffisi* Thomas & Peron, 1889. 3, 7: side views, 4: apertural view, Upper Cenomanian, Qasr al'Abid Formation, section X 1, x 0.75

Fig. 5a-b. *Pterocera incerta* D'Orbigny, 1842. a: apical view, b: apertural view, Upper Cenomanian, Qasr al'Abid Formation, section X 1, x 0.65.

Fig. 8. *Tylostoma* (*Tylostoma*) *cossoni* Thomas & Peron, 1889, apertural view, Upper Cenomanian, Qasr al'Abid Formation, section X 1, x 1.

Fig. 9a-b. *Tylostoma* (*Tylostoma*) *globosum* Sharpe, 1849. a: apertural view, b: side view, Turonian, Al Baniyah Formation, section X 4, x 1.

Occurrence: The species is common in the Cenomanian of North Africa (Tunisia and Egypt). It was recorded herein for the first time from Libya.

Genus *Pterodonta* D'Orbigny, 1842
Pterodonta deffisi Thomas & Peron, 1889
Pl. 6, Figs. 3, 4, 7

1889 *Pterodonta Deffisi* Thomas & Peron *in* Peron, p. 83, pl. 20, figs. 17-18.
1916 *Pterodonta Deffisi* Thomas & Peron – Greco, p. 158, pl.19, figs. 6-9.
1934 *Pterodonta deffisi* Thomas & Peron – Blanckenhorn, p. 272.
1963 *Pterodonta gigantica* sp. nov. – Abbass, p. 83, pl. 7, figs.1-7.
1963 *Pterodonta deffisi* Thomas & Peron – Fawzi, p. 98, pl. 7, fig. 7.
1992 *Pterodonta deffisi* Thomas & Peron – Abdel-Gawad & Gameil, p. 80, fig. 3/14-16.
1992 *Pterodonta deffisi* Thomas & Peron – Abdel-Gawad & Zalat, pl. 1, fig. 6.
2001 *Pterodonta deffisi* Thomas & Peron – Abdallah et al., pl. 1, figs. 4-5.
2006 *Pterodonta deffisi* Thomas & Peron – El Qot, p. 105, pl. 21, figs. 9-10.
2007b *Pterodonta deffisi* Thomas & Peron – Mekawy, p. 163, pl. 2, figs. 4, 5.

Material: 10 specimens from Qasr al'Abid Formation, Jardas al'Abid area.

Measurements (in mm**):**

n=10	H	D	D/H
Range	38-62	19-34	0.46-0.58
Mean	58.6	28.2	0.51

Description: Specimens relatively large, fusiform to elongate-oval. Spire acute, consisting of two to three overlapping whorls. Body whorl large and accounting for little more than half of shell height. Suture flush. Aperture elongate and narrow.
Age: Late Cenomanian.
Occurrence: The species is common in the Cenomanian sediments of North Africa and Middle East.

Family Strombidae Rafinesque, 1815
Genus *Pterocera* Lamarck, 1799
Pterocera incerta D'Orbigny, 1842
Pl. 6, Fig. 5a-b; Pl. 7, Fig. 1

1842 *Pterocera incerta* D'Orbigny, p. 308, pl. 215, fig. 1.
1912 *Strombus* (?) *incertus* D'Orbigny – Pervinquière, p. 27, pl.2, figs. 19-23.
1916 *Strombus* (?) *incertus* D'Orbigny – Greco, p. 160, pl. 19,fig. 10.
1963 *Strombus incertus* D'Orbigny – Fawzi, p. 96, pl. 7, fig. 6.
1963 *Strombus* (*Dilatilabrum*) *tihensis* sp. nov. – Abbass, p. 84,pl. 8, figs. 7-8.
1985 *Harpagodes incertus* D'Orbigny – Kollmann, p. 101, fig.4/j-k.
1992 *Strombus incerta* D'Orbigny – Abdel-Gawad & Gameil, p. 81, fig. 3/17.
1992 *Pterocera incerta* D'Orbigny – Abdel-Gawad & Zalat, pl. 1, fig. 2.
2001 *Pterocera incerta* D'Orbigny – Abdallah et al., pl. 1, figs. 8-9.
2006 *Pterocera incerta* D'Orbigny – El Qot, p. 105, pl. 22, fig. 1.
2007b *Pterocera incerta* D'Orbigny – Mekawy, p. 163, pl. 2, fig. 6.

Material: 5 specimens from Qasr al'Abid, Jardas al'Abid area.

Measurements (in mm**):**

n=5	H	D	D/H
Range	26-119	21-105	0.67-0.96
Mean	81.6	69.6	0.79

Description: Specimens obconical in shape, varying in size from small to very large. Spire varying from short to very short, particularly in large forms. Body whorl accounting for the main part of shell. Body whorl ornamented with strong spiral cords, separated by wide and flat spiral bands. Aperture lanceolate; outer lip thick and expanded posteriorly into wing-like expansion.

Age: Cenomanian.

Occurrence: The species is widely distributed in the upper Albian-Cenomanian of the Tethys being recorded from North Africa (Tunisia and Egypt), Middle East, and Southern Europe. It was recorded herein for the first time from Libya.

Order Mesogastropoda Thiele, 1927
Superfamily Naticacea Forbes, 1838
Family Naticidae Gray, 1834
Genus *Tylostoma* Sharpe, 1849
Subgenus *Tylostoma* Sharpe, 1849
***Tylostoma* (*Tylostoma*) *cossoni* (Thomas & Peron, 1889)**
Pl. 6, Fig. 8

1889 *Tylostoma cossoni* sp. nov. – Thomas & Peron *in* Peron:57, pl. 19, figs. 24-25.
1912 *Tylostoma cossoni* Thomas & Peron – Pervinquiere, p. 54, pl. 4, figs.1112.
1916 *Tylostoma cossoni* Thomas & Peron – Greco, p. 144 (86), pl. 17 (9), fig. 13.
1971 *Tylostoma cossoni* Thomas & Peron – Collignon, p. 147, pl. A, fig. 7.
1974 *Tylostoma* (*Tylostoma*) *cossoni* Thomas & Peron –Albanesi & Busson, p. 308, pl. 25, figs. 2-3.
1992 *Tylostoma cossoni* Thomas & Peron – Abdel-Gawad & Gameil, p. 82, fig. 4/8.
2001 *Tylostoma cossoni* Thomas & Peron – Abdellah *et al*., pl. 1, figs. 10-11
2006 *Tylostoma* (*Tylostoma*) *cossoni* Thomas & Peron - El Qot, p. 108, pl. 22, fig.7a-b.
2007a *Tylostoma* (*Tylostoma*) *cossoni* Thomas & Peron - Mekawy, p. 166, pl. 3, fig. 3a-b.

Material: 3 specimens from Qasr al'Abid Formation 4 specimens from Al Al Baniyah Formation, Jardas al'Abid area.

Measurements (in mm**):**

n=7	D	H	D/H
Range	32-53	34-63	0.84-0.94
Mean	44.8	49	0.89

Description: The specimens are medium -sized, globular. Spire moderately low and consisting of 3 whorls, which have a convex outline. Body whorl large, circular

in outline and accounting for about ¾ of shell height. The specimens are internal mould without traces of ornamentation. Aperture semi-lunar.

Age: Cenomanian-Turonian.

Occurrence: The species is very abundant in the Turonian of Tunisia, Algeria, Madagascar, and Gabon. In Egypt and Libya it has been recorded from the Cenomanian-Turonian. The species was recorded also from the Albian of Somalia and Angola (see Albanesi and Busson, 1974).

***Tylostoma (Tylostoma) globosum* Sharpe, 1849**
Pl. 6, Fig. 9a-b

1849 *Tylostoma globasum* Sharpe, p. 379, pl. 9, figs. 5-6.
1912 *Tylostoma globosum* Sharpe – Pervinquière, p. 53, pl. 4, figs. 9-10.
1916 *Tylostoma globosum* Sharpe – Greco, p. 143 (85), pl. 17 (9), figs. 11-12.
1974 *Tylostoma (Tylostoma) globosum* Sharpe – Albanesi and Busson, p. 309, pl. 25, fig. 1.
1985 *Tylostoma* aff. *globosa* Sharpe – Kollmann, p. 102, fig. 5/k.
1992 *Tylostoma globosum* Sharpe – Abdel-Gawad & Gameil, p. 81, fig. 4/9.
2001 *Tylostoma globosum* Sharpe – Abdallah *et al*., pl. 1, figs. 14-15.
2004a *Tylostoma* (*Tylostoma*) *globosum* Sharpe – Abdel-Gawad *et al*., pl. 6, fig. 2.
2006 *Tylostoma* (*Tylostoma*) *globosum* Sharpe – El Qot, p. 109, pl. 22, fig. 8.
2007a *Tylostoma* (*Tylostoma*) *globosum* Sharpe - Mekawy, p. 166, pl. 3, fig. 3a-b.

Material: 11 specimens from Al Baniyah Formation, Jardas al'Abid area.

Measurements (in mm**):**

n=11	H	D	D/H
Range	34-61	32-59	0.77-1.02
Mean	46.7	45.8	0.93

Description: Specimens medium- to large-sized, globose. Spire varying from low to very low. Body whorl large, nearly circular in outline and accounting for the main part of the shell. The specimens are internal moulds without ornamentation. Aperture semi-lunar.

Age: Turonian.

Discussion: *Tylostoma* (*T.*) *globosum* Sharpe differs from *T.* (*T.*) *cossoni* Thomas & Peron in having a more globose shell, low spire and highly overlapping whorls.

Occurrence: The present species is very common in the Turonian of Southern Europe, Tunisia and Algeria and has been recorded from the Cenomanian and Turonian of Egypt. It was recorded herein for the first time from Libya.

Order Neogastropoda Wenz, 1938
Family Volutidae Rafinesque, 1815
Subfamily Volutinae Rafinesque, 1815
Genus *Voluta* Linné, 1758
***Voluta* cf. *conspicua* (Coquand, 1862)**
Pl. 7, Fig. 4.

cf. 1862 *Fusus conspicuus* Coquand, p. 187, pl. 4, fig. 15.

cf. 1912 *Voluta conspicua* (Coquand) – Pervinquiere: 74.
cf. 2006 *Voluta* cf. *conspicua* (Coquand) – El Qot, p. 112, pl. 23, figs. 4, 5a-b.
cf. 2006 *Voluta* cf. *conspicua* (Coquand) – Mekawy, p. 169, pl. 4, fig. 4.

Material: One specimen from Al Baniyah Formation, Jardas al'Abid area.

Measurements (in mm**):**

n = 1	H	D	D\H
	34	21.5	0.63

Remarks: The specimen is incomplete internal moulds, which closely resemble in their general shape *Voluta conspicua* (Coquand), which has been established from the Mornasien (UpperTuronian) of Algeria. It resembles also the specimens recorded from the Coniacian of Tunisia (Pervinquière,1912) and that from the upper Turonian of Egypt by El Qot (2006) and Mekawy (2007b). It is recorded herein for the first time from Libya.

Age: Turonian.

Occurrence: *Voluta conspicua* (Coquand) ranges from the Turonian to the Coniacian. The species was recorded from North Africa (Algeria, Tunisia, and Egypt) and it was recorded herein for the first time from Libya.

Subfamily Scaphellinae H. & A. Adams, 1858
Genus *Caricella* Conrad, 1835
Caricella stromboides (Munier-Chalmas, 1881)
Pl. 7, Fig. 3a-b

1881 *Scolymus stromboides* Munier-Chalmas, p. 87, pl. 5, figs. 10-11.
1912 *Voluta* (*Aulica*) *stromboides* Munier-Chalmas – Pervinquière, p. 77, pl. 6, figs.14- 19.
1971 *Aulica stromboides* (Munier-Chalmas) – Collignon, p.157, pl. C, fig. 3.
1974 *Caricella stromboides* (Munier-Chalmas)–Albanesi & Busson, p. 319, pl. 27, fig.3; pl. 28, fig. 2.
2000 *Caricella stromboides* (Munier-Chalmas)–Abdel Gawad, p.1522, pl.2, figs.5-6.
2006 *Caricella stromboides* (Munier-Chalmas) – El Qot, p. 112, pl. 23, figs. 7-9.

Explanation of Plate 7

Fig. 1. *Pterocera incerta* D'Orbigny, 1842, apertural view, Upper Cenomanian, Qasr al'Abid, section X 1, x 2.

Fig. 2a-b. *Harpagodes heberti* (Thomas & Peron, 1889), a: apertural view, b: side view, Upper Cenomanian, Qasr al'Abid Formation, section X 1, x 0.5.

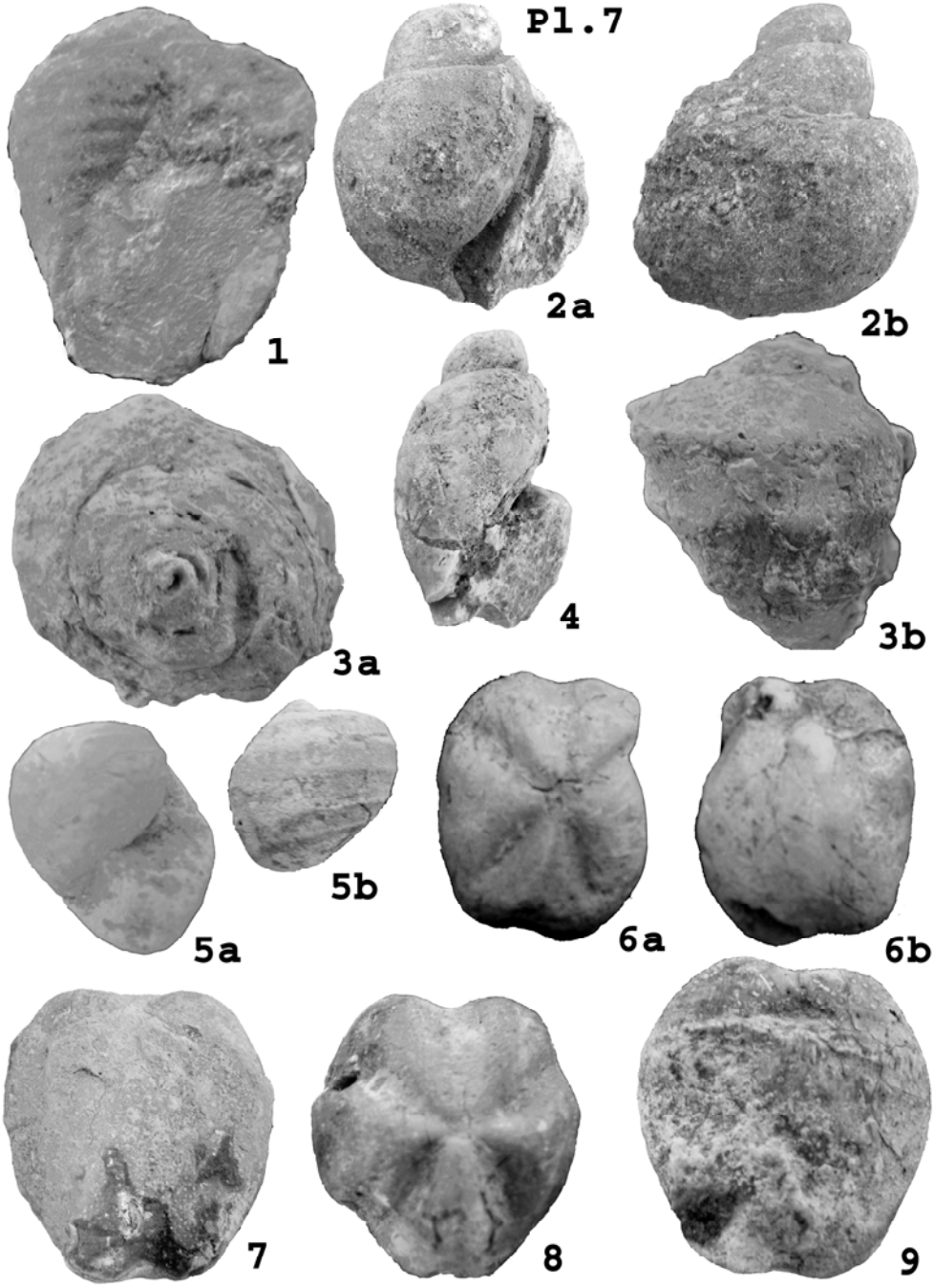
Fig. 3a-b. *Caricella stromboides* (Munier-Chalmas, 1881), a: apical view, b: side view, Upper Campanian, Al Majahir Formation, section X 5, a: x 1. 1, b: x 1.

Fig. 4. *Voluta* cf. *conspicua* (Coquand), apertural view, Turonian, Al Baniyah Formation, section X 4, x1.2

Fig. 5a-b. *Avellana* sp., a: apertural view, b: side view, Upper Campanian, Al Majahir Formation, section X 5, a: x 1.3, b: x 1

Figs. 6a-b, 7: *Mecaster batnensis* (Coquand, 1862)., 6a: aboral view, 6b, 7: oral views, Upper Cenomanian, Qasr al'Abid Formation, section X 4, 6: x 0.8, 7: x 1.3.

Figs. 8, 9: *Mecaster* sp., 8: aboral view, 9: oral view, Turonian, Al Baniyah Formation, section X 4, x 1.3.


Pl.7
1
2a
2b
3a
4
3b
5a
5b
6a
6b
7
8
9

Material: One specimen from Al Majahir Formation, Jardas al'Abid area.
Measurements (in mm**):**

n = 1	H	D	D\H
	46	41	0.89

Description: Specimen medium-sized, stromboid in shape. Spire low, consisting of three whorls. Body whorl large, accounting for the main part of the shell. The specimen is an internal mould and the body whorl is oranamented with strong spiral and axial cord, rounded tubercles are produced at their intersection. Aperture is partially damaged.
Age: Campanian.

Discussion: Abdel-Gawad (2000) distinguished this species from *Caricella chalmasi* Quaas (1902: 291, pl. 27, figs. 12-13), the latter having axial ribs covering both the spire and the body whorl, and an inner lip with three columellar folds.

Occurrence: *Caricella stromboides* (Munier-Chalmas) is common in the Upper Senonian of North Africa (Algeria, Tunisia, Libya, and Egypt) and Central Asia.

Subclass Euthyneura Milne-Edwards, 1848
Order Cephalaspidea Fischer, 1883
Family Ringiculidae Fischer, 1887
Genus *Avellana* D'Orbigny, 1842
***Avellana* sp.**
Pl. 7, Fig. 5a-b

Material: One specimen from Al Majahir Formation, Jardas al'Abid area.
Measurements (in mm**):**

n=1	H	D
	~21	21

Description: Specimen small, globose, spire lost but seems to be very low. Body whorl with a nearly circular outline forming the main part of shell. The specimen is an internal mould, and bears five strong, equally spaced, spiral cords. The bands between these spirals contain fine spiral lines. Aperture pear-shaped and relatively large.

Age: Late Campanian.

3- Cephalopods

The ammonites are classified according to the scheme of Wright *et al*. (1996). The terminology used for the description of the taxa follows the glossary in the Treatise on Invertebrate Paleontology, Part L, Mollusca 4 (1996). All linear measurements, taken with a Vernier Caliper, are given in millimetres.

Abbreviations used are as follows:

n = number of measured specimens;

D = shell diameter;
Wh = whorl height;
Wb = whorl width or breadth;
U = umbilical diameter.

Class Cephalopoda Cuvier, 1795
Order Ammonoidea von Zittel, 1884
Suborder Ammontina Hyatt, 1889
Family Acanthoceratidae Grossouvre, 1894
Subfamily Mantelliceratinae Hyatt, 1903
Genus *Calycoceras* Hyatt, 1900
***Calycoceras* sp.**
Pl. 8, Fig. 4

Material: One incomplete specimen from Al Baniyah Formation, Jardas al'Abid area.
Measurements (in mm**):**

n= 1	Wb
	32.5

Remarks: The studied specimen is incomplete, but the general form of the shell, the very broadly rounded venter and its strong ribs ornamentation are closely similar to members of the genus *Calycoceras*. Moreover, the specimen is closely similar to specimens described by Abdel-Gawad (2008) as *Calycoceras naviculare* (Mantell) from the same stratigraphic level of the same locality (Fortress section). However, the standard *Calycoceras naviculare* Zone is early Late Cenomanian age which is certainly below this level herein. Consequently, the studied specimen as well as Abdel- Gawad's material are belong to other species of *Calycoceras*.

Age: late Late Cenomanian (as it was recorded from the late Late Cenomanian *Pseudaspidoceras pseudonodosoides* Zone of Abdel-Gawad, 2008).

Subfamily Euomphaloceratinae Cooper, 1978
Genus *Pseudaspidoceras* Hyatt, 1903
Pseudaspidoceras* cf. *pseudonodosoides
Pl. 8, Fig. 1a-d

cf. 1899 *Acanthoceras* (?) *pseudonodosoides* sp. nov. – Choffat, p. 65, pl. 16, figs. 5- 8; pl. 22, figs. 32-33.
cf. 1969 *Pseudaspidoceras* cf. *pseudonodosoides* (Choffat) – Freund & Raab, p. 14, pl. 1, figs. 10-11; text-fig. 4j-k.
cf. 1989 *Pseudaspidoceras pseudonodosoides* (Choffat) – Cobban *et al*., p. 40, figs. 41, 81-83.
cf. 1993 *Pseudaspidoceras pseudonodosoides* (Choffat) – Robaszynski *et al*., p. 413, pl. 14, figs. 4, 6, 8.
cf. 2004a *Pseudaspidoceras pseudonodosoides* (Choffat) – Abdel-Gawad *et al*., pl. 4, fig. 1a-b.

cf. 2006 *Pseudaspidoceras pseudonodosoides* (Choffat) – El Qot, p. 117, pl. 25, fig. 1a-b.
cf. 2007 *Pseudaspidoceras pseudonodosoides* (Choffat) – Abdel-Gawad *et al.*, pl. 2, fig. 1.
cf. 2008 *Pseudaspidoceras pseudonodosoides* (Choffat) – El Qot, p. 261, pl. 2, figs.1, 4; text-figs. 1E, 2F (with full synonymy).
cf. 2008 *Pseudaspidoceras pseudonodosoides* (Choffat) – Abdel-Gawad, p. 212, pl. 1, fig. 3a-b.

Material: One incomplete specimen from Al Baniyah Formation, Jardas al'Abid area.

Measurements (in mm**):**

n= 1	Wh	Wb	Wb/Wh
	40	41	1.03

Remarks: The studied specimen is incomplete and it is characterized by a rectangular whorl section, slightly wider than heigh. The venter very broadly rounded. Ornamentation consisting of strong umbilical and inner ventrolateral tubercles, and low rectiradiate flank ribs. The prementioned features seem to be closely similar to *Pseudaspidoceras pseudonodosoides* (Choffat). Moreover, the specimen is closely similar to specimens described by Abdel-Gawad (2008) as *Pseudaspidoceras pseudonodosoides* from the same stratigraphic level of the same locality (Fortress section) and being associated with the prementioned *Calycoceras* sp. However, due to the studied specimen is a small fragment the authors refer it to *P. pseudonodosoides* with reservation.

Age: late Late Cenomanian.

Occurrence: *Pseudaspidoceras pseudonodosoides* (Choffat) is considered as an upper Upper Cenomanian species, occurring in *Neocardioceras juddii* Zone. Concerning the geographic distribution, it was recorded from Portugal, Egypt, Tunisia, Libya, Nigeria, Israel, New Mexico, and Texas.

Family Pseudotissotiidae Hyatt, 1903
Subfamily Pseudotissotiinae Hyatt, 1903
Genus *Choffaticeras* Hyatt, 1903
Subgenus *Choffaticeras* Hyatt, 1903
***Choffaticeras* (*Choffaticeras*) *segne* (Solger, 1903)**
Pl. 8, Figs. 2a-c, 3.

1903 *Pseudotissotia segnis* Solger, p. 77, pl. 4, figs. 1-2; text-figs. 16-21.
1914 *Pseudotissotia segnis* Solger – Eck, p. 204, pl. 15, fig. 3.
1969 *Choffaticeras segne* (Solger) – Freund & Raab, p. 54, text-fig. 10/j-l.
1987a *Choffaticeras segne* (Solger) – Kora & Hamama, pl. 1, fig. 7.
1994 *Choffaticeras* (*Choffaticeras*) *segne* (Solger) – Chancellor *et al.*, p. 88.
2001 *Choffaticeras segne* (Solger) – Aly & Abdel-Gawad, p. 43, pl. 7, fig. 1.
2001b *Choffaticeras segne* (Solger) – Kora *et al.*, pl. 2, figs. 1-2.
2002 *Choffaticeras segne* (Solger) – El-Hedeny, p. 410, figs. 5/c-d, 8c.
2004a *Choffaticeras segne* (Solger) – Abdel-Gawad *et al.*, pl. 3, figs. 2, 6.

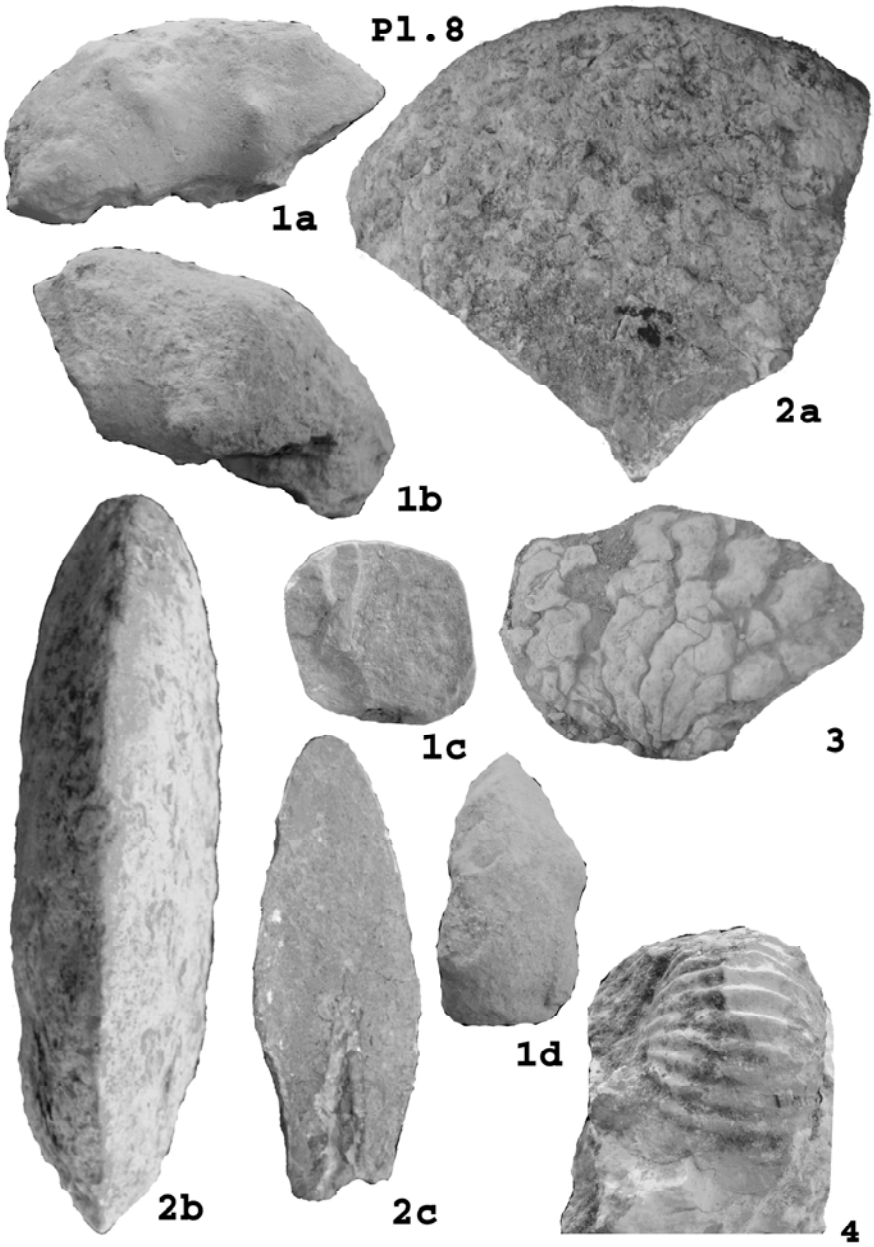


Fig. 1a-d ***Pseudaspidoceras*** **cf.** ***pseudonodosoides*** **(Choffat, 1899), a, b: side views, c: whorl section view, d: venter view, upper Upper Cenomanian, Al Baniyah Formation, section X 4, a, b: x0.65, c: x 1, d: x 0.5.**

Figs. 2a-c, 3. ***Choffaticeras*** **(*Choffaticeras*)** ***segne*** **(Solger, 1903), 2a, 3: side views, 2b: venter view, 2c: whorl section view, Lower Turonian, Al Baniyah Formation, section X 4, x 0.5.**

Fig. 4. ***Calycoceras*** **sp. venter view, upper Upper Cenomanian, Al Baniyah Formation, section X 4, x1.**

2006 *Choffaticeras* (*Choffaticeras*) *segne* (Solger) – El Qot, p. 124, pl. 28, figs.2, 6.
2006 *Choffaticeras segne* (Solger) – Abdel-Gawad *et al.*, pl. 2, figs. 3, 4, 6.
2008 *Choffaticeras* (*Choffaticeras*) *segne* (Solger) – El Qot, p. 124, pl. 28, figs. 2, 6. (with full synonymy).
Material: 3 incomplete specimens from Al Baniyah Formation, Jardas al'Abid area.
Measurements (in mm**):**

n= 1	Wh	Wb	Wb/Wh
	133	62	0.47

Description: The studied specimens are incomplete, but seem to be closely similar to *Choffaticeras segne* (Solger) and are characterized by strongly compressed shell, umbilicus seems to be narrow. Whorl section lanceolate. Venter narrow. The specimens lack ornamention. Suture very poorly preserved.

Age: Early Turonian

Occurrence: The species is diagnostic of the lower Turonian of North Africa (especially Tunisia and Egypt) and Middle East. Recording of this species herein represents the first record of the species and the genus from Libya.

Superfamily Desmoceratoidea von Zittel, 1895
Family Pachydiscidae Spath, 1922
Genus *Pachydiscus* von Zittel, 1884
Subgenus *Pachydiscus* von Zittel, 1884
***Pachydiscus* (*Pachydiscus*) *perfidus* de Grossouvre,** 1894
Pl. 9, Fig. 1a-c; Text-Fig. 8.

1894. *Pachydiscus perfidus* de Grossouvre, p. 213, pl. 34, fig.1.
1894. *Pachydiscus neubergicus* F. von Hauer, sp. emend. - de Grossouvre, p. 207, pl. 38, fig. 3.
1980. *Pachydiscus perfidus* Grossouve - Błaszkiewicz, p.43, pl. 29, figs 1–4; pl. 30, figs 1, 3, 4; pl. 31, figs 1–3; pl. 32, figs 1–3; pl. 33, figs 3, 4; pl. 37, figs 1, 2.
1984. *Pachydiscus* (*Pachydiscus*) *perfidus*de Grossouvre - Kennedy & Summesberger, p. 160, pl. 3; pl. 6, fig. 6.
1993. *Pachydiscus* (*Pachydiscus*) *perfidus* de Grossouvre - Hancock & Kennedy, p. 161, pl. 9, figs 9, 10;pl. 10, figs 1, 2, 4, 5; pl. 11, figs 5, 6; pl. 12, figs 1–4,6; pl. 13, figs 3, 4.
2001. *Pachydiscus perfidus* de Grossouvre - Courville & Odin, p. 533, pl. 5, figs 37, 39.
2001. *Pachydiscus perfidus*; Odin *et al.*, pl. 2 (bottom figure).2112. *Pachydiscus* (*Pachydiscus*) *neubergicus* (von Hauer,1858); Machalski, p. 99, pl. 2, figs 1–3; pl. 3; pl. 4; pl. 5, fig. 2; text-figs. 3a–C, 4, 5a).
2004. *Pachydiscus (Pachydiscus) perfidus* De Grossouvre; Summesberger & Kennedy, p. 170, pls. 1, 2; text-fig. 3.
2012. *Pachydiscus* (*Pachydiscus*) *perfidus* de Grossouvre Machalski, p. 97, pl. 1, figs. 1–2; pl. 2, fig. 4.
Material: One complete specimen and three fragments from Al Majahir Formation, Jardas al'Abid area.

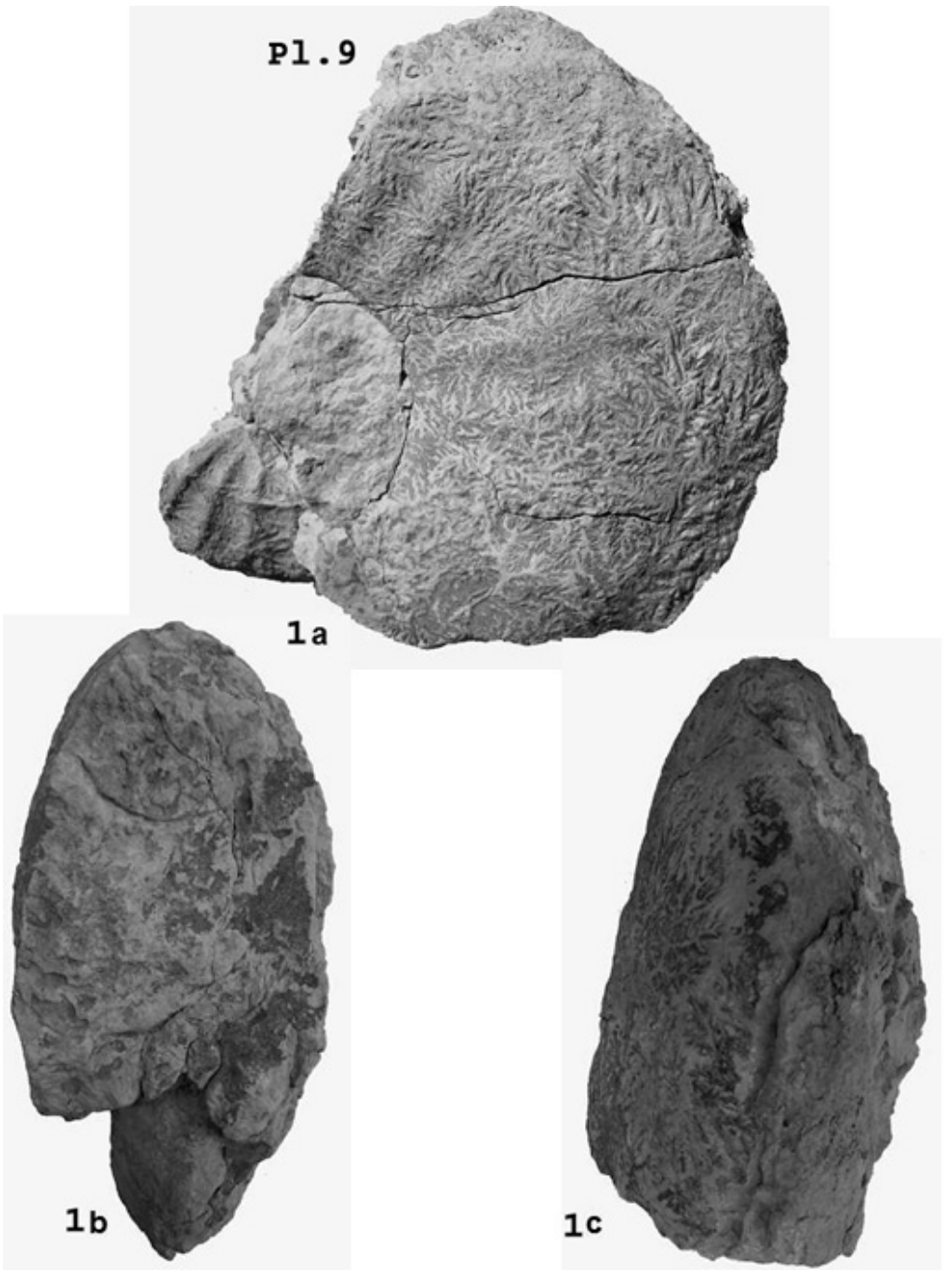


Fig. 1a-c *Pachydiscus* (*Pachydiscus*) *perfidus* de Grossouvre, 1894. , a: side view, b: apertural view, c: venter view, b, Upper Campanian, Al Majahir Formation, section X 5, x 0.25.

Measurements (in mm**):**

D	Wh	Wb	U	Wh/D	Wb/D	Wb/Wh	U/D
360	230	135	130	0.64	0.38	0.59	0.36

Description: Crushed internal mold of wholly septate compressed, moderately involute *Pachydiscus* as part of the phragmocone, with sides high, flat to relatively convex. Whorls expanding at moderate rate. Umbilicus comprises around 36 percent of diameter, with low, rounded wall. Whorl section relatively determined, although it seems to have been compressed, with rounded inner flanks, convergent outer flanks and rounded venter. Primary ribs arise at umbilical seam, sweep back, strengthen, and are concave on umbilical wall and develop into distant umbilical bullae. Bullae extend across inner third of flanks, weakening, and passing into one or two ribs, which increase by branching and intercalation and sweep slightly forwards to cross venter in shallow convexity. Suture line well preserved as typically deeply intricately and subdivided.

Discussion: For full description and discussion of the species see Hancock and Kennedy (1993).

Occurrence: Upper Campanian *Nostoceras hyatti*– Zone of France, Poland and Austria. Recording of *Pachydiscus* (*Pachydiscus*) *perfidus* de Grossouvre herein represents the first record of the species for the first time from Libya and North Africa.

4- Echinoids

The systematic classification of the echinoids follows that of Kroh and Smith (2010). The terminology used in the description of the taxa follows the glossary of Durham and Wagner (1966). All linear measurements (taken with Vernier Caliper) are given in millimetres.

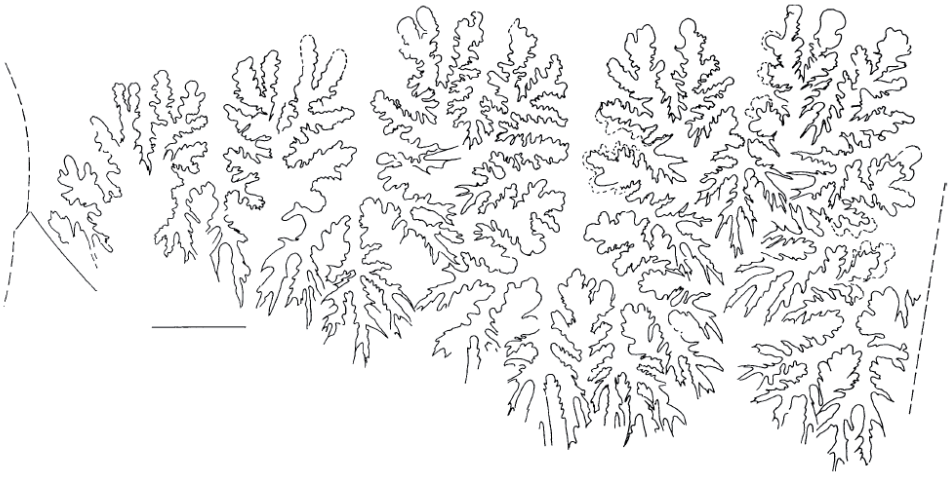


Fig. 8. External suture of *P. (P.) perfidus* De Grossouvre (after Summesberger and Kennedy, 2004)

Abbreviations:
D = test diameter in regular echinoids; **dp** = diameter of peristome (in regular echinoids); **H** = test height; **L** = test length; **W** = test width; **Ls** = length of apical disc; **Ws** = width of apical disc; **Wa** = width of ambulacral area at the ambitus; **Wi** = width of interambulacral area at the ambitus; **Na** = number of tubercles in one column of ambulacrum; **Ni** = number of tubercles in one column of interambulacrum.

Subclass Euechinoidea Bronn, 1860
?Cohort Diadematacea Duncan, 1889
?Order Diadematoida Duncan, 1889
Family Heterodiadematidae Smith & Wright, 1993
Genus *Heterodiadema* Cotteau, 1864
Heterodiadema libycum (Desor, 1846)
Pl. 10, Fig. 2a-b

1846 *Hemicidaris libyca* Desor *in* Agassiz & Desor, p. 338.
1864 *Heterodiadema libycum* Desor – Cotteau, p. 522, pl. 1124.
1921 *Heterodiadema libycum* Desor – Fourtau, p. 16.
1925 *Heterodiadema libycum* Desor – Blanckenhorn, p. 85, pl. 7, fig. 1.
1963 *Heterodiadema libycum* Desor – Fawzi, p. 5.
1975 *Heterodiadema libycum* (Desor) – Zaghbib - Turki, p. 26, pl. 1, fig. 4.
1980 *Heterodiadema libycum* (Desor) – Geys, p. 449, pl. 8.
1985 *Heterodiadema libycum* (Desor) – Bandel & Geys, p. 97, pl. 4, figs. 6-7;
1990 *Heterodiadema libycum* (Desor) – Smith *et al*., p. 43, figs. 8c-g, 9-10, pl. 5, figs. 1-2.
1993 *Heterodiadema libycum* (Desor) – Néraudeau *et al*., p. 283, pl. 1, figs. B-D.
1995 *Heterodiadema libycum* (Desor) – Néraudeau *et al*., p. 406, fig. 3 (e).
2001 *Heterodiadema libycum* (Desor) – Abdelhamid & El Qot, p. 7, fig. 3L-N.
2003 *Heterodiadema libycum* (Desor) – Abdelhamid & Azab, p. 857, pl. 1, fig. Q.
2003 *Heterodiadema libycum* (Agassiz & Desor) – Berndt, p. 78, fig. 3/1a-c, 2a-b.
2006 *Heterodiadema libycum* (Desor) – El Qot, p. 132, pl. 30, figs. 6-9 (with full synonymy).
2006 *Heterodiadema libycum* (Desor) – Abdel-Gawad *et al*., pl. 3, figs. 3, 6.
2007 *Heterodiadema libycum* (Desor) – Abdel-Gawad *et al*., pl.6, fig. 6a-b.
2010 *Heterodiadema libycum* (Desor) – El Qot, p. 265, pl. 1, figs. 3, 5, 6.

Material: One specimen from Qasr al'Abid Formation, Jardas al'Abid area.

Measurements (in mm**):**

n=1	D	H	H/D	Wa	Wi	Wa/Wi
	36.5	14	0.48	8	12	0.67

Description: Test of medium sized, nearly circular in outlie. Adapical surface slightly convex. Adoral surface partially covered but seems to be slightly depressed around peristome. Apical disc covered. Ambulacral areas are wide at the ambitus. Interperiferous zone bearing two rows of perforated, crenulated primary tubercles, reduced in size above the ambitus. Interambulacral areas with two rows of perforated, crenulated, primary tubercles, which decrease in size similar to the

ambulacral tubercles. Peristome mostly covered but the exposed part shows moderately developed gill notches.

Discussion: *Heterodiadema libycum* shows a wide variation related to the size-reduction of primary tubercles above the ambitus and to the degree to which the apical disc penetrates into the posterior interambulacrum (for more discussion see Abdelhamid and El Qot, 2001 and El Qot, 2006). *H. auremense* De Loriol which has been erected based on material from the Cenomanian of Portugal differs from *H. libycum* in having a globular test.

Occurrence: *Heterodiadema libycum* is common in the Cenomanian sediments of the Tethys, Middle Asia, West Africa and the Persian Gulf. It has been recorded from the Turonian of Jordan (Bandel and Geys, 1985), the Coniacian-Santonian from Sinai (Abdelhamid and El Qot 2001), and the Campanian of Belgium (Geys, 1980) and Saudi Arabia (Néraudeau *et al*., 1995). The species was recorded herein for the first time from Libya.

Superorder Calycina Gregory, 1900
Order Phymosomatoida Mortensen, 1904
Family Phymosomatidae Pomel, 1883
Genus *Rachiosoma* Pomel, 1883
***Rachiosoma rectilineatum* (Peron & Gauthier, 1881)**
Pl. 10, Fig. 1a-d

1881 *Cyphosoma rectilineatum* Peron & Gauthier *in* Cotteau *et al*., p. 104, pl. 7, figs. 1-4.
1921 *Rachiosoma rectilineatum* Peron & Gauthier – Fourtau, p. 40.
1985 *Rachiosoma rectilineatum* (Peron & Gauthier) – Bandel & Geys, p. 111, pl. 8, figs. 3-7; pl. 9, fig. 1.
1992 *Rachiosoma rectilineatum* (Peron & Gauthier) – Geys, p. 147, pl. 2, figs. 8-9.
2010 *Rachiosoma rectilineatum* (Peron & Gauthier) – El Qot, p. 272, pl. 4, figs. 2,4-5; text-fig. 5b.

Material: 19 specimens from Al Baniyah Formation, Jardas al'Abid area.

Measurements (in mm**):**

n =19	D	H	H/D	Wa	Wi	Wa/Wi	Na	Ni	dp	dp/D	Ls	Ls/D
Range	17-28	9-13	0.43-0.49	3.8-5.3	6-9	0.56-0.67	10-12	8-12	6-8	0.36-0.38	6-7.5	0.30-0.38
Mean	21.2	10.5	0.46	4.7	7.5	0.63	11	10	7.3	0.37	7.1	0.33

Description. Test small- to medium-sized, rounded in outline. Adapical surface convex and high. Adoral surface flattened. Apical disc pentagonal, large and caducous. Ambulacral area wide. Poriferous zones uniserial. Interporiferous zone with two rows of imperforated, crenulated primary tubercles as large as interambulacral tubercles. Interambulacral area with two rows of primary tubercles, each tubercle being separated from the neighbouring one by a horizontal series of very fine granules. Adradial extrascrobicular surface wide and occupied by well developed granules. Interradial extrascrobicular surface with two rows of small granules. Peristome rounded and large; gill slits moderately to well developed.

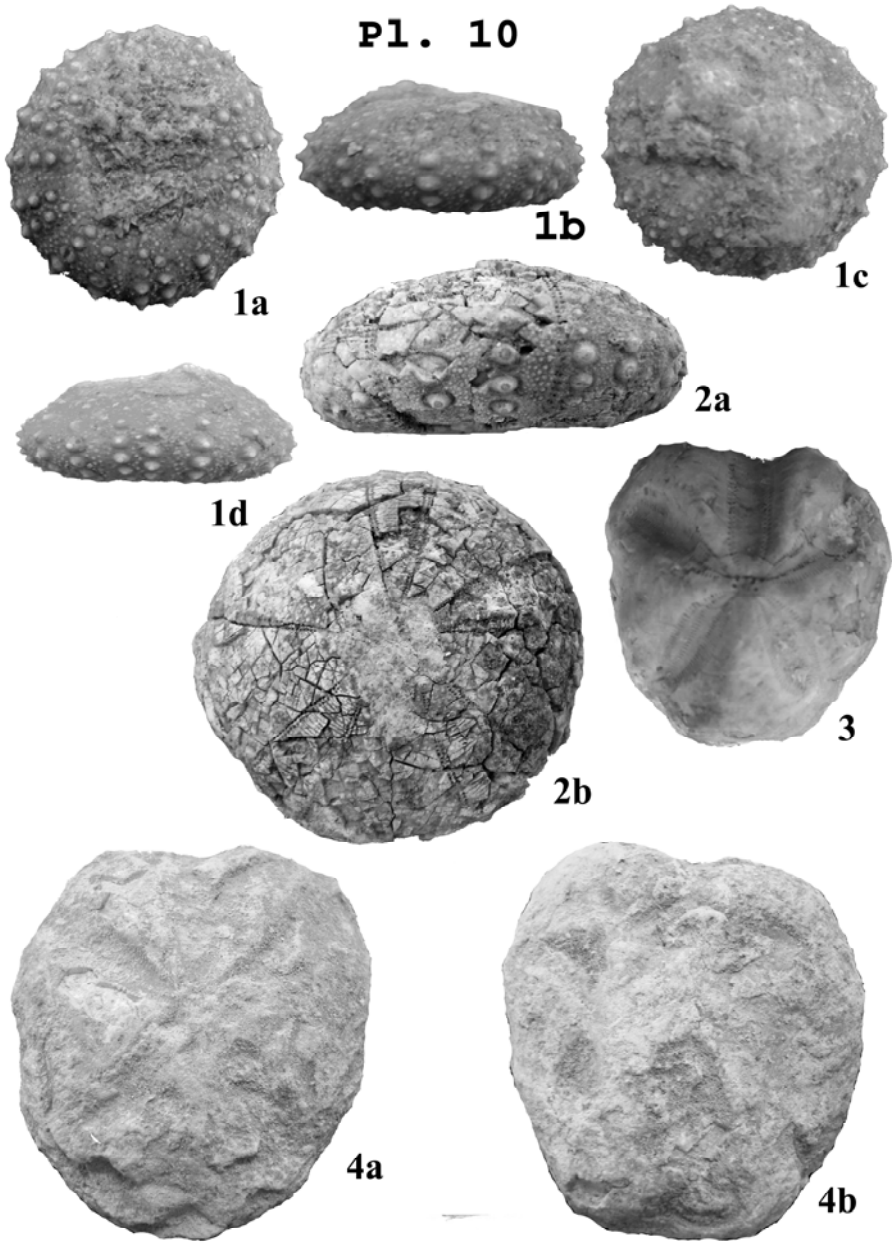


Fig. 1a-d: ***Rachiosoma rectilineatum*** **(Peron & Gauthier); a: oral view, c: aboral, b, d: side views, Turonian, Al Baniyah Formation, section X 4, x 2.**

Fig. 2a-b: ***Heterodiadema libycum*** **(Desor, 1846), a: side view, b: aboral view, Upper Cenomanian, Qasr al'Abid Formation, section X 1, x 1. 5.**

Fig. 3: ***Mecaster*** **sp., aboral view, Turonian, Al Baniyah Formation, section X 4, x 1.4.**

Fig. 4a-b: ***Mecaster batnensis*** **(Coquand, 1862); a: aboral view, b: oral view, Upper Cenomanian, Qasr al'Abid Formation, section X 1, x 1. 2.Age:** Late Cenomanian.

Discussion: *Rachiosoma irregulare* Fourtau, 1921 differs from *R. rectilineatum* (Peron and Gauthier, 1881) in having wider ambulacra at the apex, well-developed ambulacral tubercles adapically, and a relatively higher test. *Rachiosoma geysi* Abdelhamid and El Qot, 2001 differs from the present species in having four rows of well developed primary tubercles on each interambulacrum. It can be distinguished also from *R. delamarrei* Deshayes where the ambulacral plates are 4-geminate and the poriferous zones are straight. In *R. delamarrei* the ambulacral plates are 5-geminate and the poriferous zones are slightly sinuous. In addition to, the secondary tubercles are more developed in *R. rectilineatum*.

Occurrence: *Rachiosoma rectilineatum* (Peron & Gauthier) has a relatively wide stratigraphical range, extended from basal Turonian (possibly uppermost Cenomanian) up to the Santonian (Geys, 1992). It was recorded from Algeria, Egypt and Jordan. The species is recorded herein for the first time from Libya.

Order Spatangoida Claus, 1876
Family Hemiasteridae Clark, 1917
Genus *Mecaster* Pomel, 1883
***Mecaster batnensis* (Coquand, 1862)**
Pl. 7, Figs. 6a-b, 7; Pl. 10, Fig. 4a-b

1862 *Hemiaster Batnensis* Coquand, p. 248, pl. 26, figs. 6-8.
1925 *Hemiaster saulcyanus* D'Orbigny var. *batnensis* Coquand – Blanckenhorn, p. 101, pl. 8, figs. 31-32.
1963 *Hemiaster batnensis* Coquand – Fawzi, p. 13.
1989 *Hemiaster batnensis* Coquand – Zaghbib-Turki, p. 70.
1991 *Mecaster batnensis* (Coquand) – Smith & Bengston: 56,pl. 12, figs. A- L; pl. 13, figs. A-N; text-figs. 45 D-G, 46-49.
1993 *Mecaster batnensis* (Coquand) – Neraudeau et al., p. 294, pl. 4, fig. H.
2001 *Hemiaster batnensis* Coquand – Abdelhamid & El Qot, p. 24, fig. 6L-N.
2003 *Hemiaster* (*Mecaster*) cf. *batnensis* Coquand – Berndt, p. 86, fig. 4/4a-c.
2006 *Hemiaster* (*Mecaster*) *batnensis* Coquand – El Qot, p. 152, pl. 33, fig. 11.
2010 *Mecaster batnensis* (Coquand) – El Qot, p. 279, pl. 6, fig. 1a-b.

Material: 38 specimens from Qasr al'Abid Formation, Jardas al'Abid area.

Measurements (in mm**):**

n=38	L	W	H	W/L	H/L
Range	19-50	16-47	13-28	0.87-0.94	0.46-0.67
Mean	31.2	30.7	19.6	0.92	0.58

Description: Test medium- to large-sized, subrectangular in outline, slightly narrowing posteriorly, posterior margin straight with vertical to slightly oblique truncation. Adapical surface convex, gradually sloping anteriorly. Adoral surface flattened to feebly convex. Apical disc large, quadrate, centric to slightly eccentric posteriorly, madreporite moderately developed. Frontal ambulacrum deep, wide, non petaloid; pores oval; pore pair oblique, separated by a granule. Interporiferous

zone wide, covered by abundant, scattered granules. Paired ambulacra petaloid and deep. Posterior paired petals slightly shorter and less divergent than the anterior ones. Poriferous zones wide; pores slit-shaped, equal, conjugated. Interporiferous zone narrower than the width of one poriferous zone. Fascioles are poorly preserved in some specimens and composed of a wide band of peripetalous fasciole. Peristome semi-lunar and placed a quarter of test length from the anterior end. Periproct oval, situated at top of the posterior truncation.

Age: Late Cenomanian.

Occurrence: *Mecaster batnensis* (Coquand) is a common Cenomanian species but has also been recorded from the Turonian of Brazil and Texas (Smith and Bengtson, 1991). The species was recorded from North Africa (Algeria and Tunisia), Middle East, Somalia, Portugal, and Brazil. The species is recorded herein for the first time from Libya.

***Mecaster* sp.**
Pl. 7, Figs. 8, 9; Pl. 10, Fig. 3

Material: 15 specimens from Al Baniyah Formation, Jardas al'Abid area.

Measurements (in mm**):**

n= 15	L	W	H	W/L	H/L
Range	26-41	24-38	15-28	0.85- 0.93	0.58-0.68
Mean	33.2	28.6	21.5	0.90	0.65

Description: Test medium-sized, subrectangular in outline, slightly narrowing posteriorly, posterior margin straight with vertical to slightly oblique truncation. Adapical surface convex, gradually sloping anteriorly. Adoral surface flattened to feebly convex. Apical disc large, quadrate, centric to slightly eccentric posteriorly, madreporite well developed. Frontal ambulacrum deep, wide, non-petaloid; pores oval; pore pair oblique, separated by a granule. Interporiferous zone wide, covered by abundant, scattered granules. Paired ambulacra petaloid and deep. Posterior paired petals slightly shorter and less divergent than the anterior ones. Poriferous zones wide; pores slit-shaped, equal, conjugated. Interporiferous zone narrower than the width of one poriferous zone. Fascioles are poorly preserved in some specimens and composed of a wide band of peripetalous fasciole. Peristome semi-lunar and placed a quarter of test length from the anterior end. Periproct oval, situated at top of the posterior truncation.

Age: Turonian.

Discussion: The present specimens are closely similar in outline and measurements to *Mecaster turonensis* (Fourtau) which is very abundant in the Turonian of Egypt. Future work may explain the relation of the present material to *M. turonensis*. The present material differs from *M. batnensis* (Coquand) in having relatively shorter and higher test.

REFERENCES

Abbass, H. L., 1962: A monograph on the Egyptian Cretaceous pelecypods. - Geological Survey and Mineral Research Department of the United Arab Republic, Palaeontological Series, Monograph 1: 224 pp.

Abbass, H. L., 1963: A monograph on the Egyptian Createcous gastropods. Geological Survey and Mineral Res. Depart. United Arab Rep., Palaeontol. Ser., Monograph, 2: 146 pp.

Abdallah, A. M., Abdel-Gawad, G. I. and Mekawy, M. S., 2001: Stratigraphy of the Ceonomanian and Turonian sequence of El Guddi pass, North Western Sinai, Egypt. Proc. 6th Con. Geol. Sinai for development, 6: 211-229.

Abdel-Gawad, G. I., 1986: Maastrichtian non-cephalopod mollusks (Scaphopoda, Gastropoda and Bivalvia) of the Middle Vistula Valley, Central Poland. – Acta Geologica Polonica 36(1-3): 224 pp.

Abdel-Gawad, G. I., 1995: Late Cenomanian fauna from Jardas Al-Abid area, NW Jabal Al-Akhdar, Libya. - Middle East Research Center, Ain Shams University, Earth Science Series 9: 161-172.

Abdel-Gawad, G. I., 2000: Coniacian gastropods from Sinai, Egypt. - Proceedings of the fifth international Conference on the Geology of the Arab World, Cairo University, Egypt 3: 1509-1526.

Abdel-Gawad, G. I., 2008: Late Cenomanian ammonites from NE Libya and the Western Desert of Egypt.- Geology of East Libya, 3: 161-172.

Abdel-Gawad, El Qot, G. M. and Mekawy, M. S., 2006: Cenomanian-Trunian macrobiostratigraphy of Abu Darag area, Northern Galala, Eastern Desert, Egypt. Proceedings of the 8th Internat. Con. Geol. of the Arab World, 8: 553-568.

Abdel-Gawad, G. I., El Qot, G. M. and Mekawy, M. S., 2007: Macrobiostratigraphy of the Upper Cretaceous Succession from Southern Galala, Eastern Desert, Egypt. 2nd Internat. Con. Geol.of the Tethys, Cairo Univ., 2: 329-349.

Abdel-Gawad, G. I., El Sheikh, H. A., Abdelhamid, M. A., El Beshtawy, M. K., Abed, M. M., Fürsich, F. T. and El Qot, G. M., 2004a: Stratigraphic studies on some Upper Cretaceous succession in Sinai, Egypt. Egypt. J. Paleontol., 4: 263-303.

Abdel-Gawad, G. I. and Gameil, M., 1992: Cenomanian gastropods from Gebel Nezzazat area, West Central Sinai, Egypt. Middle East Res. Center, Ain Shams Univ., Earth Science Ser., 6: 69-85.

Abdel-Gawad, G. I. and Gameil, M., 2002: Bivalves taxonomy of the Cenomanian –Turonian strara of Gabal Nezzazat, West Central Sinai, Egypt. J. Fac. Sci., U.A.E, 124: 70-107.

Abdel-Gawad, G.I., Orabi, O.H. and Ayoub-Hannaa, W.S., 2004b: Macrofauna and biostratigraphy of the Cretaceous section of Gebel El-Fallig area, northwest Sinai, Egypt. Egypt. J. Paleontol., 4: 305–333.

Abdel-Gawad, G. I. and Zalat, A., 1992: Some Upper Cretaceous macroinvertebrates from Gebel El-Hamra and Gebel Um- Heriba, Mitla Pass, Western-Central Sinai, Egypt. 1st Internat. Con. Geol. of the Arab world, Cairo Univ., 1: 333-344.

Abdelhamid M. A. M., and Azab, M. M., 2003: Aptian-Cenomanian echinoids from Egypt.- Revue Paléobiologie, 22(2): 851-876.

Abdelhamid, M. A. M., and El Qot, G. M. E., 2001: Cenomanian-Santonian echinolds from Gebel El-Hamra and El-Minsherah, north and West Central Sinai, Egypt. Middle East Research Center, Ain Shams Unive., Earth Science Ser.,15: 1-20.

Abdelhamid, M. A. M. and El Qot, G. M. E., 2002: Some Upper Cretaceous bivalves from Gebel El-Minsherah and Gebel El-Hamra, North and West Central Sinai, Egypt. Egypt. J. of Paleontol., 2: 259-288.

Agassiz, L. and Desor, E., 1846-1847: Catalogue raisonné des families des generes et des espéces de la classe des Echinodermes. - Annales des Sciences Naturelles , Zoologie 3: 6-8, Paris.

Albanesi, C. and Busson, G., 1974: Gasteropodes du Cretace superieur de l' extreme-sud tunisien et de la region du tinrhert (Shara Algerien). Rivista italiana di paleontologia stratigrapfia, 80(2): 251-342.

Aly, M. F. and Abdel-Gawad, G. I., 2001: Upper Cenomanian – Lower Turonian ammonites from north and central Sinai, Egypt. – El Minia Science Bulletin 13(2)-14(10): 17-60.

Amard, B., Collignon, M. and Roman, J., 1981: Etude stratigraphique et paléontologique du Crétacé supérieur et Paléocéne du Tinhert-W et Tademait-E (Sahara Algérien). - Documents des Laboratoires de Géologie de la Faculté des Sciences de Lyon, Hors Série 6: 15-173.

Amler, M., Fischer, R. and Rogalla, N. S., 2000: Muscheln. Akademischer Verlag, Stuttgart, 214 pp.

Aqrabawi, M., 1993: Oysters (Bivalvia, Pteriomorphia) of the Upper Cretaceous rocks of Jordan: Palaeontology, stratigraphy and comparison with the Upper Cretaceous oysters of Northwest Europe. - Mitteilungen aus dem Geologisch-Paläontologischen Institut der Universität Hamburg, 75: 1-136.

Bandel, K. and Geys, J. F.,1985: Regular echinoids in the Upper Cretaceous of the Hashemite Kingdom of Jordan. Annales de la Société Géologique du Nord, 104 : 97-115.

Barber, W., 1958: Upper Cretaceous Mollusca from northeastern Nigeria. – R. Geol. Surv. Nigeria Bull. (for 1956)14–46.

Berndt, R., 2003: Cenomanian echinoids from Southern Jordan. Neues Jahrbuch fur Geologie and palantologie, Monatshefte, 2: 73-90.

Blanckenhorn, M., 1925: Die Seeigelfauna der Kreide Palästinas. - Palaeontographica 67: 83-113.

Blanckenhorn, M., 1927: Die fossilen Gastropoden und Scaphopoden der Kreide von Syrien-Palästina. - Palaeontographica 69: 111-186.

Blanckenhorn, M., 1934: Die Bivalven der Kreideformation von Syrien-Palästina nebst einem ergänzenden Anhang über Brachiopoden, Gastropoden und Pterodonten und einem Überblick über die gesamte Molluskenfauna. - Palaeontographica, A 81: 161-296.

Błaszkiewicz, A., 1980: Campanian and Maastrichtian ammonites of the Middle Vistula River Valley, Poland: a stratigraphic−paleontological study. Prace Instytutu Geologicznego, 92: 3–63.

Chancellor, G. R., Kennedy, W. J. and Hancock, J. M., 1994: Turonian ammonite faunas from Central Tunisia. Special Papers in Palaeontology, 50: 118.

Choffat, P., 1886-1902: Recueil d'études paléontologiques sur la faune crétacique du Portugal. – Com. Serv. Geol. Portugal, 1: 1-171.

Cobban, W. A., Hook, S. C. and Kennedy, W. J. 1989. Upper Cretaceous rocks and ammonite faunas of southwestern New Mexico. - New Mexico Bureau of Mines and Mineral Resources, Memoir 45**:** 137 pp.

Collignon, M., 1971: Gastéropodes et lamellibranches du Sahara. – Ann. Paléont. (Invert.), 57: 143-202.

Cotteau, G. 1861-1867. Paléontologie francaise. Description de animaux invertébrés commencée par Alcide D'Orbigny. - Terrain Crétacé 7, echinides regulièrs, 894 pp.

Cotteau, G., Peron, P. and Gauthier, V., 1876-1881: Echinides fossiles de l'Algérie, pt. 7(1881), Etage Senonien, 118 pp.

Coquand, M. H., 1854: Déscription géologique de la province de Constantine. – Mém. Soc. Géol. France, 2(5): 140-154.

Coquand, M. H., 1862: Géologie et Paléontologie de la région sud de la Province de Constantine. – Mém. Soc. d'Emul. Prov., 2: 1-341.

Coquand, M. H., 1869: Monographie du genre "*Ostrea*". – Terrain crét.: 215pp., Baillière et fils, Paris.

Coquand, M. H., 1880: Etudes supplémentaires sur paléontologie algerienne faisant à la déscription géologique et paléontologique de la region sud de la province de Constantine. – Bull. Acad. d'Hippone, 15: 1-451

Courville, P. and Odin, G. S., 2001: les ammonites spiralées du Campanian et du Maastrichtian de Tercis les Bains (landes, France). in: Odin, G.S. (Ed.), The Campanian-Maastrichtian stage boundary: characterisation at Tercis les Bains (France): correlation with Europe and other continents. Developments in Palaeontology and Stratigraphy, 19: 529–549.

Cox, L. R., 1960: General characteristics of gastropods. - In: MOORE, R. C. (ed.). Treatise on Invertebrate Paleontology, Part I (Mollusca 1), I249-I251. - Geological Society of America, Boulder, and Kansas University Press.

Cox, L. R., 1969: Morphological terms applied to bivalve shells and soft parts affecting shell. - In: Moore, R. C. (ed.). Treatise on Invertebrate Paleontology, Part N (Mollusca 6, Bivalvia), N102-N109. - Geological Society of America, Boulder, and Kansas University Press, Lawrence.

Dacqué, E., 1903: Mitteilungen über den Kreide Complex von Abu Roasch bei Kairo.- Palaeontographica 30: 337-392,

Dhondt, A. V., 1973: Systematic revision of the subfamily Neitheinae (Pectinidae, Bivalvia, Mollusca) of the European Cretaceous. - Institut Royal des Sciences naturelles de Belgique, Mémoire 176: 101 pp.

Dhondt, A. V., 1993: Upper Cretaceous bivalves from Tercis, Landes, SW France. - Bulletin de l'Institut Royal des Sciences Naturelles de Belgique, Sciences de la Terre 63: 211-259.

Dhondt, A. V. and Dieni, I., 1990: Unusual inoceramid-spondylid association from the Cretaceous Scaglia Rossa of Passo del Brocon (Trento, N. Italy) and its palaeoecological significance. - Memorie di Science Geologiche 42: 155-187.

Dhondt, A. V. and Dieni, I., 1993: Non-rudistid bivalves from Late Cretaceous rudist limestones of NE Italy (Col di Schiosi and Lago di S. Croce areas). - Memorie di Science Geologiche 45: 165-241.

Dhondt, A. V., Malchus, N., Boumaza, L. and Jaillard, E., 1999: Cretaceous oysters from North Africa: origin and distribution. - Bulletin de la Société Géologique de France 170(1): 67-76

Douvillé, H., 1916: Les Terrains secondaires dans le massif du Moghara, á l'est de l'isthme de Suez, d'aprés les explorations de M. Couyat Barthoux. - Mémoires de l' Académie des Sciences de l'Institut de France 54(2): 1-184.

Durham, J. W., Caster, K. C , Exline, H., Fell, H. B., Fischer, A. G., Frizzell, D. L., Kesling, R. V., Kier, P. M., Melville, R. V., Moore, R. C, Pawson, D. L., Regnell, G., Spencer, W. K., Ubaghs, G., Wagner, C. D., and Wright, C. W., 1966: Part U, Echinodermata 3, Volume 2. In Moore, R. C. (Ed.), Treatise on Invertebrate Paleontology: Lawrence, KS (Geol. Soc. Am. and Univ. Kansas Press), U367-U695.

Durham, J. W. and Wagner, C. D., 1966: Glossary of morphological terms applied to echinoids. In: Moore, R.C. (ed.), Treatise on Invertebrate Paleontology, Part U, Echinodermata, 3(1): U251, U253-U256. Geological Society of America & University of Kansas Press, New York & Lawrence.

Eck, O., 1914: Die Cephalopoden der Schweinfurthschen Sammlung aus der oberen Kreide Ägyptens. - Zeitschrift der Deutschen Geologischen Gesellschaft 66: 179-216.

El Hawat, A. S. and Shelmani, M. A., 1914: Ahort notes and guidebook on the geology of Al Jabal Al Akhadar, Cyrenaica, NE Libya. Earth Sci. Soc. Libya, 70 pp.

El-Hedeny, M. M., Abdel Aal, A.A., Maree, M. and Seeling, J., 2001: Plicatulid bivalves from the Coniacian-Santonian Matulla Formation, Wadi Sudr, Western Sinai, Egypt. Cretaceous Res., 22: 295-308.

El Qot, G. M. E., 2006: Late Cretaceous macrofossils from Sinai, Egypt. Beringeria, 36: 163 pp.

El Qot, G. M. E., 2008: Upper Cenomanian-Lower Santonian ammonites from Galala Plateaux, North Eastern Desert, Egypt: A systematic Paleontology. Egypt. J. Paleontol., 8: 247-289.

El Qot, G. M. E., 2010: Upper Cretaceous echinoids from Galala Plateaux, North Eastern Desert, Egypt.– Revue de Paléobiologie, 29 (1) : 261-291, Genève.

El Qot, G., Fürsich, F. T., Abdel-Gawad, G. and Hannaa, W., 2009: Taxonomy and palaeoecology of Cenomanian-Turonian (Upper Cretaceous) echinoids from eastern Sinai, Egypt. - Beringeria 40: 55-98.

El-Sheikh, H. A., Abdelhamid, M. A. M. and El Qot, G. M. E., 1998: Macrofossils and foraminiferal biostratigraphy and paleoecology of some Cenomanian-Santonian sequences in North and West Central Sinai Egypt. Egypt. J. Geol., 42(2): 471-495.

Fawzi, M. A., 1963: La faune Cenomanienne d'Egypte. – Geological Survey of Egypt, Monograph 2: 133 pp.

Fourtau, R., 1904: Contribution á l'étude de la faune Crétacique 'Egypte. Bulletin de l'Institut Egyptien 4(4): 231-249

Fourtau, R. 1917. Catalogue des invertébrés fossiles de l'Egypte representes dans les collections du Musée de Géologie au Caire. Terrains Crétacés, 2, Mollusques, Lamellibranches. – Geological Survey of Egypt, Palaeontological Series 3: 108 pp.

Fourtau, R., 1921: Catalogue des invertébrés fossiles de l'Egypte.Terrains Crétacés, 3, Échinodermes (Supplément). – Geological Survey of Egypt, Palaeontological Series 5: 101 pp.

Freneix, S., 1972: Le Bassin Contire de Tarfaya (Maroc méridional). - Notes et Mémoires du Service Géologique 228: 1-255.

Freneix, S. and Viaud, J.-M., 1986: Huîtres du Crétacé supérieur du basin de Challans-Commequiers (Vendée). Biostratigraphie, Taxonomie, Paléobiologie. - Bulletin trimestriel de la Société Géologique de Normandie et Amis du Muséum du Havre 73 (1+2): 14-79.

Freund, R. and Raab, M. 1969: Lower Turonian ammonites from Israel. - Special Papers in Palaeontology 4: 1-83.

Geys, J. F., 1980: *Heterodiadema libycum* (Agassiz & Desor, 1846) a hemicidaroid echinoid from the Campanian of Belgium. - Annales de la Société Géologique du Nord 99: 449-451.

Geys, J. F., 1992: Regular echinoids, other than Hemicidaroida from Upper Cretaceous deposits in the Wadi Qena area (Eastern Desert, Egypt). - Bulletin de l'Institut Royal des Science Naturelles de Belgique 62: 139-154.

Goldfuss, A., 1833-1844: Petrefacta Germaniae. Lamellibranchia, Volume 2: 1-68 (1833), 69-140 (1836), 141-224 (1837), 225-312 (1840). Gastropoden, Volume 3: 1-121(1841-1844).

Greco, B., 1916: Fauna Cretacea dell' Egitto raccolta da Figari Bey. Parte 2. Gastropoda. - Palaeontographica Italica 22: 103 -169.

Greco, B. 1918. Fauna Cretacea dell' Egitto racolta da Figari Bey. Parte 3, fasc. 2. Lamellibranchiata. - Palaeontographica Italica 24: 1-58.

Grossouvre, a. de, 1894: Recherches de la craie supérieure, 2, Paléontologie. les ammonites de la craie supérieure. Mémoires du Service de la Carte géologique détaillée de France. imprimerie nationale (Paris), 264 pp.

Hancock, J.M. and kennedy, W.J., 1993: The high Cretaceous ammonite fauna from Tercis, landes, France. Bulletin de l'Institut Royal des Sciences Naturelles de Belgique, Sciences de la Terre, 63, 149–209.

Holzapfel, E., 1889: Die Mollusken der Aachener Kreide. – Palaeontographica 35(3- 6): 139-268.

Kassab, A. S. and Zakhera, M. S. 1995. Maastrichtian and Paleocene bivalves from the Western Desert, Egypt. - Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen 196: 227-246.

Kennedy, W.J. and Summesberger, H., 1984: Upper Campanian ammonites from the Gschliefgraben (Ultrahelvetic, Upper austria). Beiträge zur Paläontologie von Österreich, 11: 149–178.

Kleinsmiede, W. F. J.and Van Den Berg, N. J., 1968: Surface geological of the Jabal Al Akhadar, Northern Cyrenaica, Libya. *In:* Geology and Archaeology of Northern Cyrenaica, Libya. (ed.F. T. Barr). Petrol. Explor. Soc. Libya, Tripoli, 115-123.

Klen, L., 1974: Geological Map of Libya; 1: 250 000. Benghazi sheet (NI 34-41). Explanatory Booklet. Ind. Res. Cent., Tripoli, 56 pp.

Knight, J.B., Cox, L. R., Keen, A. M., Batten, R. L., Yochelson, E. L. and Robertson, R. 1960: Systematic descriptions [Archaeogastropoda], In RC Moore (ed.), Treatise on Invertebrate Paleontology. Part I. Mollusca. Geol. Soc. Am. and Kansas Univ. Press, 1: 169-310.

Kollmann, H. A., 1985: Upper Cretaceous gastropods from excavations for the highways A10 (Charente, France). Cretaceous Res., 6: 85-111.

Kora, M. and Hamama, H., 1987a: Biostratigraphy of the Cenomanian-Turonian of Gabal Gunna, Southeastern Sinai, Egypt. -Mans. Sci. Bull. 14(2), 289-301.

Kora, M. and Hamama, H., 1987b: Biostriatrigaphy of the Senonian succession in Bir Safra area, Southeastern Sinai, Egypt.- Mans. Sci. Bull. 14(2): 303-314.

Kora, M., Hamama, H. and Sallam, H., 2002: Senonian macrofauna from West Central Sinai: Biostrtigraphy and palaeobiogeography. - Egypt. J. Paleontol., 2: 435-258.

Kora, M., Khalil, H. and Sobhy, M., 2001: Cenomanian-Trunian macrofuna from the Gulf of Suez region; biostratigrapgy and paleobiogeography. –Egypt. J. Geol., 45(1): 441-462.

Kroh, A., Smith, A.B., 2010: Classification and phylogeny of post-Paleozoic echinoids. - Journal of Systematic Palaeontology 7, 147-212.

Krumbeck, L., 1906: Beiträge zur Geologie und Palaeontologie von Tripolis. – Palaeontographica 53, 93-112.

Lamarck, J. B. De., 1806: Sur les fossils des environs de Paris. – Annales du Musée d'Histoire Naturelle: 156- 166.

Machalski, M., 2012: Stratigraphically important ammonites from the Campanian–Maastrichtian boundary interval of the Middle Vistula River section, central Poland. Acta Geologica Polonica, 62(1): 91–116.

Malchus, N., 1990: Revision der Kreide-Austern (Bivalvia: Pteriomorphia) Ägyptens (Biostratigraphie, Systematik). - Berliner Geowissenschaftliche Abhandlungen A125: 1-213.

Mekawy, M. S., 2007a: Upper Cretaceous bivalves from Galala Plateaux, North Eastern Desert, Egypt: A systematic paleontology. – Egypt. J. Paleontol., 7: 197-243.

Mekawy, M. S., 2007b: Gastropods of the Cenomanian-Santonian sequence from North Eastern Desert, Egypt. –Egyption Journal of Geology, 51: 149-176.

Mekawy, M.S. and Abu-Zied, H., 2008: Lower Cretaceous molluscan fauna from North Sinai,Maghara area, Egypt. – Egypt. J. Paleont. 8: 291–334.

Munier-Chalmas, E., 1881: Note paléontologique sur les fossiles recueillis par M. Le commandant Roudaire dans son expedition scientifique en Tunisie. - In: Roudaire, F. E. Mission dans les Chotts tunisiens: 59-79.

Naldini, E., 1949: Faunae Cretacee della Cirenaica. Palaeontol. Ital., 45(15), 85-110.

Neraudeau, D., busson, G. and Cornee, A., 1993: Les échinides du Cénomanian Supérieur et du Turonien Inférieur du Tinrhert oriental et Central (Sahara Algérien). Ann. de paléontol., 79 (4): 273-313.

Néraudeau, D., David, B. and Al Muellem, M. S., 1995: Cretaceous echinoids from Saudi Arabia. Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen, 197: 399-424.

Neraudeau, D. and Moreau, P., 1989: Paleoecologie et paleobiogeographie des faunes des echinides du Cenomanien nord-aquitain (Charente-maritime, france). Geobios, 22(3): 293-324.

Odin, G.S., 2001: The Campanian-Maastrichtian boundary: characterisation at Tercis (landes, SW France). in Odin, G.S. (Ed.), The Campanian-Maastrichtian stage boundary: characterisation at Tercis les Bains (France): correlation with Europe and other ontinents. Developments in Palaeontology and Stratigraphy, 19, 785–804.

Orbigny, A.d'.,1842-1843: Paléontologie francaise. Description des Mollusques et Rayonnés fossiles; Terrains Crétacés. 2 Gasteropoda. Masson édited, Paris, 5- 456.

Orbigny, A.d'., 1844-1847: Paléontologie francaise. Description des Mollusques et Rayonnés fossiles; Terrains Crétacés. 3 Lamallibranches. Masson édited, Paris 1844, pp. 1-288; 1845, 289-448; 1846, 449-520; 1847, 521-807.

Peron, A., 1889-1891: Description des Mollusques fossiles des Terrains Crétacés de la Région sud des Hauts-Plateaux de la Tunisie recueillis en 1885 et 1886 par M. P.

Thomas. In: - Exploration Scientifique de la Tunisie, Imprimerie Nationale 405 pp.

Pervinquière, L., 1912: Etudes de Paléontologie tunisienne II, gastropodes et lammellibranches des Terrains Crétacés.- Carte Géologique de la Tunisie. De Ruddeval, Paris, 352 pp.

Quaas, A., 1902: Beitrag zur Kenntniss der fauna der obersten bildungen Kreide in der Libyschen Wüste (overwegischichten und Blätterthone). Palaeontographica 30, 153-334.

Robaszynski, F., Caron, M., Amédro, F., Dupuis, C., Hardenbol, J., Gonzales Donoso, J. M., Linares, D. & Gartner, S., 1993: Le Cénomanien de la région de Kalaat Senan (Tunisie centrale): litho-biostratigraphie et interprétation séquentielle. – Revue de Paléobiologie 12: 351-505,

Roemer, F., 1852: Die Kreidebildungen vonTexas und ihre organische Einschlüsse (Pelecypods), 44-81.

Röhlich, P., 1974: Geological Map of Libya; 1: 250 000. Al Bayda sheet (NI 3-15). Explanatory Booklet. Ind. Res. Cent., Tripoli, 70 pp.

Röhlich, P., 1980: Tectonic development of Al Jabal al Akhadar. *In*: The Geology of Libya (eds M. J. Salem and M. T. Buserwil). Academic Press, London, 3: 923-932.

Rutsch, R.F. and Salvador, A., 1954: Mollusks from the Cogollo and La Luna formations (Cretaceous) of the Chejendé area, western Venezuela. – J. Paleont. 28: 417–426.

Seeling, J. and Bengtson, P. 1999: Cenomanian oysters from the Sergipe Basin, Brazil. Cretaceous Research 20: 747-765.

Seguenza, G., 1882: Studii geologici e palaeontologici sul Cretaceo Medio dell' Italia Meridionale. - Atti délla Accademia Nazionale dei Lincei (serie 3) 65-214.

Sharpe, D., 1849: On *Tylostoma*, a proposed Genus of Gastropodous Mollusks. Quarterly J. Geol. Soc., 5: 376-381.

Sharpe, D., 1850: On the secondary district of Portugal which lies on he North of the Tagus. - Quarterly Journal of the Geological ociety 6: 135-195.

Smith, A. B. and Bengston, P., 1991: Cretaceous echinoids from North-Eastern Brazil. - Fossils and Strata 31: 88 pp.

Smith, A. B., Simmons, M. D. and Racey, A., 1990: Cenomanian echinoids larger foraminifera and calcareous Algae from the Natih formation, Central Oman Mountains. Cretaceous Res., 11: 29-69.

Sobetski, V. A., 1982: Bivalvia. *In*: Sobetski, V. A., Atlas of the marine Late Cretaceous invertebrates of the Precaspian depression. Trudy Paleontologicheskogo Instituta Akademii Nauk SSSR 187: 50-166.

Sowerby, J. and Sowerby J. de C. 1,812-1846: The Mineral Conchology of Great Britain; or coloured figures and descriptions of those remains of testaceous animals or shells which have been preserved at various times and depth in the earth, 7 vols.

Stenzel, H. B., 1971: Oysters. - In: Moore, R. C. (ed.). Treatise on Invertebrate Paleontology, Part N, Volume 3, Mollusca 6, Bivalvia: N 953-N1224,Geological Society of America, Boulder, and University of Kansas, Lawrence.

Stoliczka, F., 1870-71: Cretaceous fauna of southern India: Pelecypoda. –Paleontologica Indica 6/3, 557 pp.

Strougo, A., 1995: The earliest Paleocene Bivalvia of Egypt. – Middle East Research Center, Ain Shams University, Earth Science Series **9**: 1-26.

Summesberger, H. and Kennedy, W., 2004: More Ammonites (Puzosiinae, Pachydiscidae, Placenticeratidae, Nostoceratidae, Diplomoceratidae) from the Campanian (Late Cretaceous) of the Gschliefgraben (Ultrahelvetic Nappe; Austria). Ann. Naturhist. Mus. Wien 106 A, 167–211.

Trevisan, L., 1937: La fauna ei giacimenti del Cenomaniano di facies africana della Sicilia occidentale. **-** Mémoire dell'Istituto geologico della Universita di Padova 12: 132 pp., Padova.

Vyalov, O. S., 1936: Sur la classification des huitres. – Doklady Akademia Nauk SSSR, American Geological Institute 4 (13), No. 1(105): 17-20.

Vider, B. and Néraudeau, D., 2007: Paléoécologie des ostréidés cénomaniens de la bordure nord du Bassin aquitian (SWFrance). – Bull. Soc. Géol. France 178: 39–50.

Wanner, J., 1902: Die fauna der obserten Weissen Kreide der Libyschen Wuste. – Palaeontographica 30(2): 91-157.

Wenz, W., 1938-1944: Gastropoda Handbuch Paleozoologie. 7 vols., 1639 pp.

Wilmsen, M. and Voigt, T., 2006: The Middle-Upper Cenomanian of Zilly (Sachsen-Anhalt, northern Germany) with remarks on the *Pycnodonte* Event. – Acta Geol. Polon., 56: 17-31.

Woods, H., 1899-1913: A monograph of the Cretaceous lamellibranchia of England. – Monographs of the Palaeontological Society 705 pp.

Wright, C. W., Calloman, J. H. and Howarth, M. K., 1996: In Treatise on Invertebrate Paleontology, part L, Mollusca 4, volume 4: cretaceous ammonoidea (ed. Kasler, R. L.) 362 p. (Geol. Soc. Am., Boulder and University of Kansas, Lawrence).

Zaghbib-Turki, D., 1975: Echinoids du cretace de tunisie centrale etudes systematiques, Paleobiometrique et Paleoecologique-these 3e cycle Univ. Orsay, C. E. R. P. A. B. contrib., 10: 117.

Zaghbib-Turki, D., 1989: Les echinides indicateurs des paleoenvironments, un example dans le Cenomanien de Tunisie- ann. Paleont. (Vert. invert), 75(2): 63-81.