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## Macrofaunal Fossil Assemblage from Beit Ummar, Hebron, Palestine

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### ABSTRACT

Eighteen molluscan and echinoderm elements comprising eleven Bivalvia, three Gastropoda, two Cephalopoda and two Echinoidea are described from a marl bed outcropping in the northern part of Beit Ummar, Hebron District, Palestine. This fossil community belongs to the Middle Cenomanian time and is similar to nearby macrofaunal assemblages in the Eastern Mediterranean region. The species extracted indicate a shallow marine warm environmental condition that prevailed in the sea at that time frame in what is now the Hebron Hills.

**Keywords:** Palestine, Hebron, Macrofauna, Middle Cenomanian.

### INTRODUCTION

Palestinian geologic studies proliferated with the increased interests of Europeans in Palestine in the second half of the 19<sup>th</sup> century (see Benzinger 1895; Blanckenhorn, 1896; Lartet 1873; Lynch, 1852; Russell 1888). Recent literature showed that the tectonic movements resulted in multiple openings and closing of the sea basins and uplifts that produced the rich fossil fauna of the Eastern Mediterranean region (Lewy 1990; Ben-Avraham et al. 2002). Of the various geologic eras studied in our region, the Mid Cretaceous (particularly Cenomanian 93-100 MYA) provided an interesting assemblage of geological and paleontological material (Braun and Hirsch 1994; Philip 1978). Geological studies, made by Palestinians are rare and we chose to study the areas of the occupied Palestinian territories near Hebron because of its rich fossil beds. Research and development in our area lags behind nearby areas (Qumsiyeh and Issac, 2012). This study focused on one area near Hebron to understand the assemblage of Cenomanian fossils.

**MATERIALS AND METHODS**

The area selected for study is located in the town of Beit Ummar approximately 15 km north of Hebron city with coordinates 31°37'50.1"N 35°06'38.3"E (31.630593, 35.110633). The main outcropping rocks here are the marls of Yatta Formation (Fig. 1) according to the adopted Palestinian Stratigraphic Nomenclature (Abed and Wisshaee, 1999); intercalated within these marls are some medium hard marlstone and hard dolomitic limestone that are highly fractured and broken due to the intensive ancient earthquakes that affected the whole region in late Cenozoic times and lead to the formation of the greatest on Earth Afro-Arabian rift system which extends from Mozambique in the far south to Anatolia in the north.

This hilly area is a part of a geologic anticline which extends from Beer Saba' in the south to the Samaritan and Galilee hills in the north.

	Age	Thickness	Lithology	Main Facies	Formation	
655 m	<b>Senonian</b>	> 30m		Chalk	<b>Abu Dis</b>	
	<b>Turonian</b>	150m		L.S. ,massive	<b>Jerusalem</b>	
				Marlstone		
				L.S. ,massive		
	<b>Cenomanian</b>	<b>Upper</b>	105m		Marl + <L.S.	<b>Bethlehem</b>
					Chalk + Marl + <L.S.	
					Chalky L.S. dolomitic	
		<b>Hebron</b>	170m		L.S. dolomitic	
					Dol. , massive	
		<b>Yatta</b>	<b>Middle</b>	110m		L.S. + Dol.
					Marl + L.S. thin	
	L.S. + Marl thin					
<b>Upper Beit Kahil</b>	<b>Lower</b>	90m		Chalk + Marl		
				L.S. + Marl		
				Marl		

**Figure 1:** Lithological section of Cenomanian outcrops in Hebron area and vicinity showing the lithology, age and approx. thickness of Yatta Formation rocks (modified after Abed & Wisshaee, 1999).

Due to the uplifting of the central mountain regions of Palestine and the syntectonical erosional forces especially during the many ice ages accompanied by intensive rainfalls causing erosion of the landscape. The formation that the locality belongs to is termed the Yatta formation (Abed and Wishaher, 1999). From the hydrogeological point of view, the Yatta formation is considered an aquiclude but it contains locally some economic deposits of kaolinite (a mineral essential for cement, pottery and ceramics industries mined especially in Dura area).

Rock facies dominating the site are soft beige marls and the medium hard whitish marlstone inter-beds (140 m) with some dolomitic limestone inclusions. The fossils were collected from within the excavated rock beds. The selected fossils were cleaned and catalogued at the Palestine Museum of Natural History Geology/paleontology collection (PMNHG numbers assigned) at Bethlehem University.

## RESULTS

This study documented over 18 species of Cenomnian fossils from one locality near Beit Ummar, West Bank, Palestine. Hereby we describe the material collected which included members of three molluscan classes (Bivalvia, Gastropoda, and Cephalopoda) and one of the Phylum Echinodermata.

Class Bivalvia Linnaeus 1758  
Order Veneroida Adams & Adams, 1856  
Family Cardiidae Lamarck, 1809

*Cardium* sp. Fig. 2 B&D

**Material:** PMNHG053, PMNHG079, PMNHG083, PMNHG126.

**Remarks:** This is noted in the western part of upper Galilee, in some cases of having difficulties in distinguished identification between *Cerastoderma glaucum* and *Acanthocardia tuberculata* they use to name it *Cradium* sp. (Bar-Yosef Mayer, 1997).

Order Anomalodesmata Dall, 1889  
Family Pholadomyidae Dall, 1905

*Pholadomya cf. decorate* Fig. 2 C&E

**Material:** PMNHG034, PMNHG116

**Remarks:** This species of Bivalvia was recorded in the Eilat area from Palestine (Bartov et al., 1972). Our specimens are suspected to be *Pholadomya decorate* which is found in many locations in Europe and Palestine (Hirsch, 1980).



Figure 2: A & F: *Panopea* sp. B & D: *Cardium* sp.1. C + E: *Pholadomya* sp. G & H: *Mytiloides* sp. I: Remains of a shell of undeterminable *Neithea* sp. within a mother rock. J: (the 3 photos) *Arca* (*Eonavicula*) sp. K: *Neithea duturgei*. L&M&N: *Neithea quinquecostata*. Bar scale 5mm.

Order Arcoida Stoliczka, 1871  
Family Arcidae Lamarck, 1809

*Arca (Eonavicula) sp.* Fig. 2J

**Material:** PMNHG008, PMNHG018, PMNHG111, PMNHG114, PMNHG118, PMNHG123, PMNHG131, PMNHG133, PMNHG140, PMNHG142, PMNHG143.

**Remarks:** It is a species from the Middle Jurassic to Recent of Western Europe, found in Jordan in the Middle Cenomanian rocks (Perrilliat et al., 2006).

Family Limopsidae Dall 1895

*Limopsis sp.*

**Material:** PMNHG211

**Remarks:** A specimen similar to our specimen was collected from the Cenomanian of India (Kendrick & Vartak 2007). The globally distributed limopsid clade had its earliest occurrences in the Early Cretaceous of Europe and New Zealand (Brown et al. 2011).

Order Ostreoida F'erussac, 1822  
Family Pectinidae Refinesque, 1815

*Neithea duturgei* (Conquand, 1862) Fig. 2K

**Material:** PMNHG121, PMNHG196.

**Remarks:** It is noted from the late Cenomanian of Jordan (Perrilliat et al. 2006)

*Neithea quinquecostata* (SOWERBY, 1814) Fig 2 L M N

**Material:** PMNHG036, PMNHG038, PMNHG188, PMNHG232.

**Remarks:** mentioned from the Cenomanian of South India (Kendrick & Vartak 2007) and Egypt as *Pecten quinquecostata* (Mekawy 2007).

*Neithea sp.* Fig. 2I

**Material:** PMNHG150

**Remarks:** One specimen of an unidentified *Neithea* (previously *Pecten sp*) was collected

Order Myoida Stoliczka, 1870  
Family Hiattellidae Gray, 1824

*Panopea sp.* Fig. 2 A&F

**Material:** PMNHG044, PMNHG128, PMNHG203.

**Remarks:** We could not reach to the species identification for the bad preservation of the specimens. In general it is recorded in Jordan (Perrilliat et al., 2006).

Order Mytiloida Ferussac, 1822  
Family: Inoceramidae Giebel, 1852

*Mytiloides sp.* Fig. 2 G & H

**Material:** PMNHG002, PMNHG005, PMNHG013, PMNHG015, PMNHG057,

**PMNHG063, PMNHG081, PMNHG107.**

**Remarks:** This species mentioned from the Cenomanian of Jordan (Perrilliat et al. 2006). All specimens that collected are molds and identification is difficult.

Order Ostreida Férussac 1822  
Family Ostreidae Rafinesque, 1815

*Cerastostreon flabellatum* (Goldfuss, 1833)

**Material:** PMNHG006, PMNHG016, PMNHG020, PMNHG031, PMNHG033, PMNHG051, PMNHG056, PMNHG061, PMNHG064, PMNHG068, PMNHG075, PMNHG087, PMNHG089, PMNHG108, PMNHG120, PMNHG122, PMNHG145, PMNHG147, PMNHG162, PMNHG173, PMNHG191, PMNHG195, PMNHG197, PMNHG199, PMNHG201, PMNHG206, PMNHG207, PMNHG210, PMNHG218.

**Remarks:** *Cerastostreon* is noted from the Cenomanian rocks of Libya (El Qot et al. 2013), Egypt (Gawad 2007 and Khalil 2007), Marocco, Algeria, Tunisia, Algeria and Jordan (Dhondt et al., 1999). Abdel-Gawad et al., (2006) mentioned that this is a wide distributed species in the southern part of Palestine.

Order Venerida Rafinesque, 1815  
Family Fimbriidae Nicol, 1950

*Fimbria* sp.

**Material:** PMNHG 001, PMNHG 035, PMNHG043, PMNHG043, PMNHG046, PMNHG071, PMNHG085, PMNHG088, PMNHG101, PMNHG110, PMNHG113, PMNHG124, PMNHG134, PMNHG151, PMNHG182, PMNHG209, PMNHG220.

**Remarks:** is noted from the Cenomanian rocks of Libya (El Qot et al. 2013) and as *Protocardia hillana* (Sow., 1813) from Middle Cenomanian to Santonian of Egypt (Mekawi 2007).

Class Gastropoda Cuvier, 1795  
Order Stromboidea Rafinesque, 1815  
Family Tylostomatidae Stoliczka, 1868

*Tylostoma (s.str.) pallaryi* (Peron & Fourtau, 1904 ) Fig. 3 A-D&F

**Material:** PMNHG041, PMNHG86, PMNHG194.

**Remarks:** This ammonite is mentioned from the Cenomanian of Algeria (need ref). and Tunisia under the name *Aporrhais dutrugei* (Conquand) reported from Late Cenomanian (Kennedy & Gale 2015).

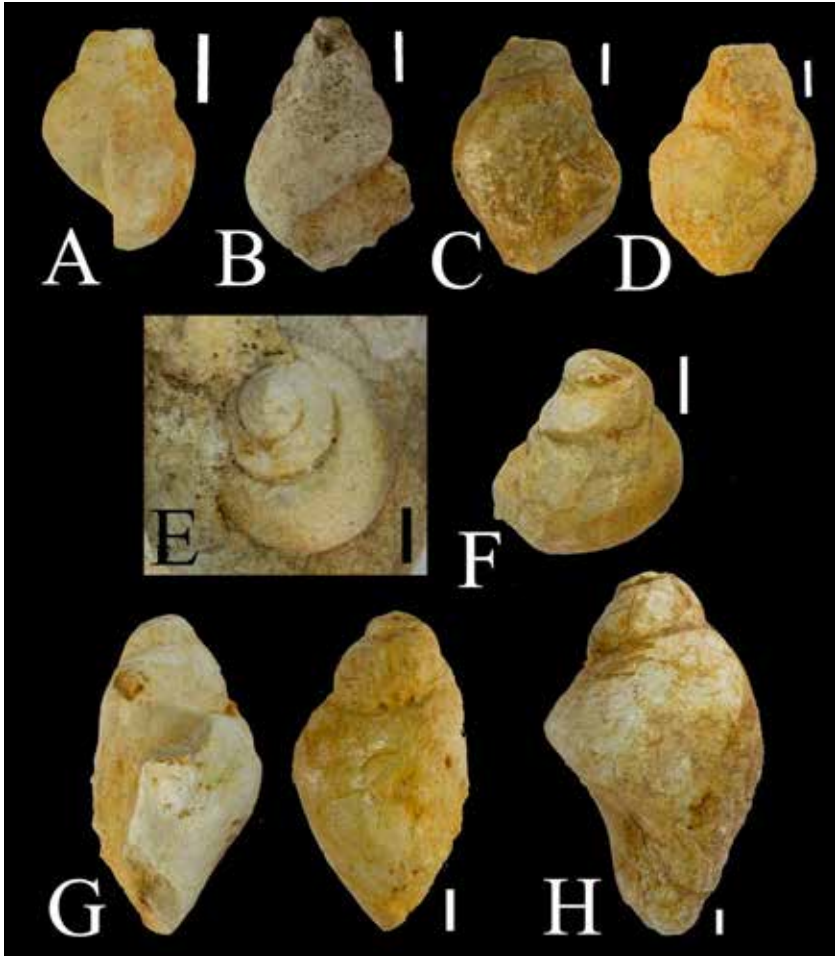
*Pterodonta* sp. Fig 3 G

**Material:** PMNHG029, PMNHG049.

**Remarks:** Noted previously from Upper Albian/Cenomanian rocks of Egypt (Kiel 2001). From Middle Cenomanian of eastern Sinai (Ayoub-Hannaa 2011). And found in the argillaceous limestone in southern part of the Historic Palestine (Bartov et al., 1972).

## Order Architectibranchia Haszprunar 1985

Family Acteonellidae Gill, 1871

*Trochactaeon* sp. Fig. 3 H**Material:** PMNHG052, PMNHG106.**Remarks:** Reported from the Egypt under the name *Colombellina fusiformis* (Douville', 1916) from the Middle Cen. of Sinai (Mekawy 2007).

**Figure 3:** A - F: *Tylostoma (s.str.) pallaryi*. E: Internal mold of undetermined Gastropode in mother rock; similar to our specimen can be seen in Žitt et al from the Cenomanian of Czech republic. G: *Pterodonta* sp. H: *Trochoacteon* sp. Bar scale 5mm.

Class Cephalopoda Cuvier, 1797  
 Order Ammonoidea Zittel, 1884  
 Family: Acanthoceratidae Grossouvre 1894

*Metoicoceras geslinianum* D'Orbigny Fig. 4 A&B

**Material:** PMNHG019, PMNHG028, PMNHG062, PMNHG099, PMNHG109, PMNHG129, PMNHG161.

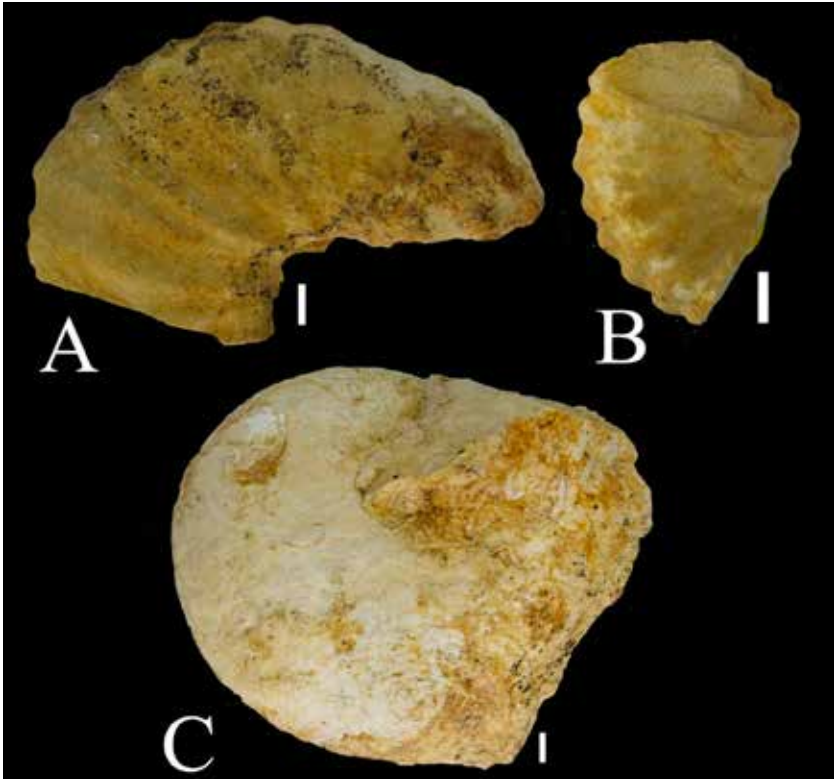
**Remarks:** Mentioned from the Lower Upper Cenomanian rocks of Germany (Owen & Smith 1991). But it is also similar to material described as *Neolobites vibrayeanus* (D'Orbig., 1841) from the Cenomanian rocks of Egypt (Nagm & Wilmsen 2012) and Tunias ( Al-Sabbagh et al. 2011; Kennedy & Gale 2015). It is reported from the Negev' Cenomanian (Lewy et al., 1984).

**Family:** Vascoceratidae Douvillé 1912

*Vascoceras cauvinii* Chudeau Fig. 4C

**Material:** PMNHG104

**Remarks:** This species is reported in association with *Metoicoceras geslinianum* fossils in the same layers as ours in the Negev (Lewy et al., 1984).



**Figure 4:** A&B: Ammonite *Metoicoceras geslinianum*. C: Ammonite *Vascoceras* sp.  
 Bar scale 5mm.

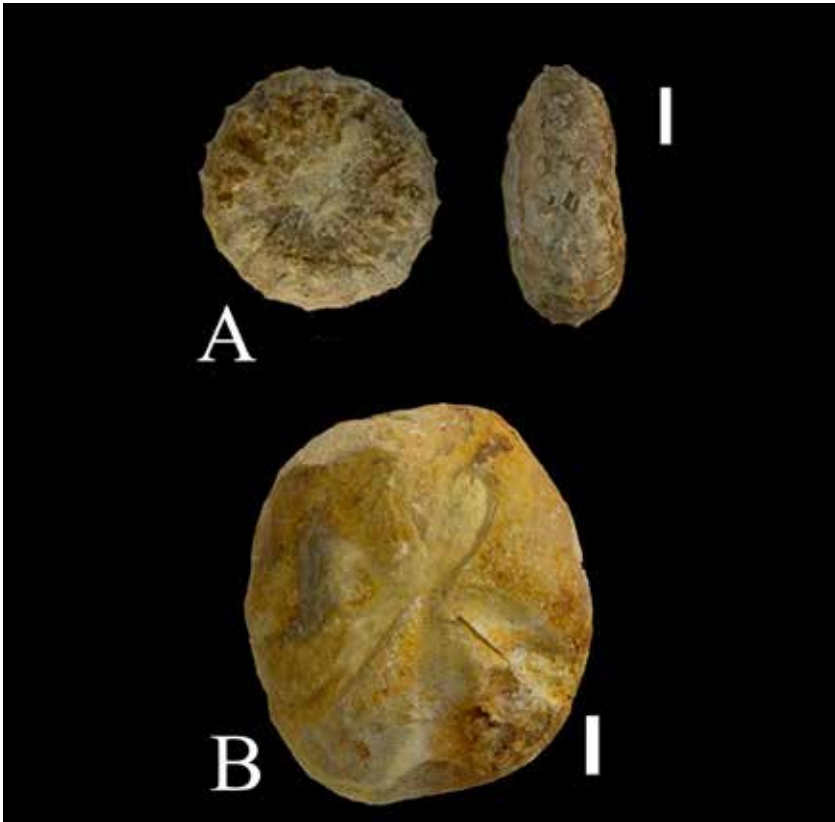


Phylum Echinodermata  
Class Echinoidea  
Order Hemicidaroida Beurlen, 1937  
Family Pseudodiadematida Pomel, 1883

*Heterodiadema lybicum* (Agassiz & Desor 1846) Fig. 5 A

**Material:** PMNHG168

**Remarks:** Our specimen is very similar to the description given for this species by Néraudeau et al. (1995) as well as Abdelhamid and El-Qot (2016) who both reported it from Saudi Arabia. It is also reported from the cenomanian of Egypt (gawad 2007; El Qot et al. 2013). It is reported from Palestine several times (Blanckenhorn, 1925; Lartet, 1873). Abdelhamid and El-Qot (2016) shows the distribution of this species in three continent (Asia, Africa and Europe).



**Figure 5:** A: *Heterodiadema lybicum*. B: *Hemiaster (Hemiaster) cubicus*

Order Spatangoida Claus, 1876  
Family Hemiasteridae Clark, 1876

*Hemiaster (Hemiaster) cubicus* (DESOR,1847) Fig. 5B

Material: PMNHG022, PMNHG065, PMNHG073, PMNHG153, PMNHG170, PMNHG176.

Remarks: This is noted from Middle Cenomanian of Egypt both by Gawad (2007) and as *Hemiaster (Hemiaster) syriacus* (Conrad, 1852) from Wadi Quseib by El-Qot et al. (2013). It is also noted from Sinai as *Mecraster batnensis* (Conquand) (Kassab & Abdel-Maksoud 2007).

## DISCUSSION

The study of the fossil assemblage proved that the site rocks were deposited under shallow warm sea conditions in the Middle Cenomanian time. A total of 18 species of macro-fauna with nine Bivalves, five Gastropods, two Ammonites and two Echinoids were extracted from a marl bed outcropping in the northern part of Beit Ummar town north of Hebron District of Palestine. There are some notable findings including three species of Neithea, and the presence of *Ceratostreon flabellatum* and *Trochoacteon sp* in these deposits.

Much more paleontological work is needed in this rich area of the Arab world. We also think it important to encourage geologic and paleontologic studies at Arab Universities and other research institutions beyond the usual geologic studies in this region focused on oil exploration. There is a new trend of establishing natural history museums as centers of education and exploration in our region (Qumsiyeh et al. 2017) and we recommend that geology and paleontologic studies should be integral to this. The rich biodiversity evident in this small location and in similar studies portend well for future studies.

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