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A summary of the Late Palaeozoic and Mesozoic lithostratigraphy (par- autochthonous units) and macrofossils of the northern United Arab Emirates

International Programme

Internal Report IR/02/148

A summary of the Late Palaeozoic and Mesozoic lithostratigraphy (par-autochthonous units) and macrofossils of the northern United Arab Emirates

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Foreword

This report summarises lithostratigraphical and palaeontological information about the par-autochthonous Late Palaeozoic and Mesozoic succession in the northern United Arab Emirates. This work is in preparation for forthcoming mapping by the BGS in this region.

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Summary

This report summarises the par-autochthonous Late Palaeozoic and Mesozoic lithostratigraphy of the northern United Arab Emirates. The data are summarised on Table 1, and the details of key marker-beds and faunas are described below.

1 Introduction

This report summarises stratigraphical, lithological, palaeontological and palaeoenvironmental details of the Late Palaeozoic and Mesozoic succession in the northern United Arab Emirates, as currently understood. This account represents a synthesis of data from existing publications (Alsharhan & Nairn, 1997; Glennie et al., 1974; Hudson, 1960; Hudson & Chatton, 1959; Searle et al., 1983; Smith et al., 1995; Toland et al., 1993). Although much of the palaeontological information is from old literature, and the taxonomy of many of the fossils can be presumed to have since changed, fossil names have not been up-dated for this work. The data are presented in the form of a table (Table 1), on which key marker-beds and macrofossil faunas have been identified by sequential numbers. These marker-beds and faunas are described below, and where possible the fossils are illustrated (Plates 1 - 5).

2 Marker-Beds

(see Table 1 for stratigraphical positions)

- Marker-Bed 1:** A three metre thick interval of thin-bedded, brecciated, porcellaneous limestone, weathering almost white. Recorded as occurring around the middle of the Bih Formation.
- Marker-Bed 2:** The uppermost 90 m of the Bih Formation, comprising thin-bedded, dark brown weathering dolomites, lacking any paler-coloured limestones.
- Marker-Bed 3:** A dark-grey limestone breccia with prominent fragments of light coloured porcellaneous limestone, occurs immediately below the top of the Hagil Formation.
- Marker-Bed 4:** A 25 m thick interval of massive-bedded dolomites forming a distinct topographic feature (steep cliff front) c. 13 m below the top of the Ghail Formation.
- Marker-Bed 5:** Non-dolomitised limestone at the base of the Milaha Formation that weathers back from the underlying Ghail Formation.
- Marker-Bed 6:** A limestone in the upper part of the Milaha Formation containing abundant large fragments and specimens of the very thick-shelled bivalve *Megalodon* (= 'Megalodon Beds').
- Marker-Bed 7:** A 2 m thick band of ferruginous quartz sand just above the base of the Ghalilah Formation.
- Marker-Bed 8:** Rubbly, shelly limestone with phosphatic pebbles and bedding planes crowded with bivalves (*Pteria* and *Avicula*), above a thin, purplish weathering sandstone. Occurs just below the top of the Ghalilah Formation.
- Marker-Bed 9:** 51 m thick, dark brown weathering dolomitic limestone interval, c. 77 m from base of the Orbitopsella Limestone (= unit 'a') of Hudson & Chatton (1959), containing abundant nodules up to 50 mm across.

Marker-Bed 10: The 'White Band Limestone Marker', comprising a c. 16 m thick interval of light grey porcellaneous limestone with large, thick-shelled bivalves (e.g. *Megalodon*, *Lithiotis*), c. 50 m above Marker-Bed 9 (= middle part of Orbitopsella Limestones of Hudson & Chatton, 1959; see above).

Marker-Bed 11: 9 m thick interval of fossiliferous limestones, with abundant iron-staining, small haematite nodules and marls. Occurs immediately above base of Trocholina Limestones (= unit 'd') of Hudson & Chatton (1959).

Marker-Bed 12: The Beni Zaid Limestone (= unit 'e') of Hudson & Chatton (1959), characterised by abundant corals and stromatoporoids.

Marker-Bed 13: The Ashhab Limestone (= unit 'g') of Hudson & Chatton (1959), comprising debris-flow breccias and conglomerates, with rudist bivalves (e.g. *Diceras*) preserved in some of the constituent blocks.

Marker-Bed 14: A bioclastic carbonate interval (= Molluscan Limestone / unit 'o' of Hudson & Chatton, 1959), overlain by 18 m of limestone breccia (= base of unit 'p' of Hudson & Chatton, 1959).

Marker-Bed 15: Interval of red marls at the top of the Nahr Umr Formation.

3 Macrofossil Faunas

Images of some of the macrofossils listed below have been obtained from previously published literature (Cox, 1935; Cox et al., 1969; Durham et al., 1966; Hudson, 1954; Hudson & Jefferies, 1961; Lees, 1928; Muir-Wood, 1925, 1935; Woods, 1909, 1913) and reproduced in plates 1-5. In some cases (usually where a fossil image has been labelled with the genus only), images are used to illustrate the general habit of particular fossils, and are not representative of actual material from the UAE succession. Table 1 shows the stratigraphical horizons of the faunas described below.

Fauna 1 (see Plate 1)

Horizon: Milaha Formation

Details: Shell debris, ostracods, crinoids, algae and bryozoa common throughout. The large, thick-shelled bivalve *Megalodon* is abundant in a limestone unit in the upper part of the formation.

Fauna 2

Horizon: c. 42 m above the base of the Ghalilah Formation

Details: Common specimens of the brachiopod *Spiriferina griesbachi* Bitten.

Fauna 3 (see Plate 1)

Horizon: c. 108 m above the base of the Ghalilah Formation.

Details: A limestone with abundant stromatoporoids, underlain by occurrences of the bivalve *Dicerocardium* and locally common specimens of the brachiopod *Misolia*.

Fauna 4 (see Plate 2)

Horizon: c. 108 - 158 m above the base of the Ghalilah Formation.

Details: Abundantly fossiliferous, mostly with small bivalves, corals and stromatoporoids. There is an horizon of greenish-grey marls with abundant specimens of the bivalve *Modiola*, and a 29 m thick interval crowded with the oyster *Lopha blanfordi* (Lees). Other fossils include the bivalves *Modiolus jaworskii* Wanner & Knipscheer, *Modiolus* sp. nov., *Indopecten* cf. *clignetti* (Krumbeck), *Dimyodon* cf. *subrichtofeni* Krumbeck, *Lopha blanfordi* (Lees), *Pseudolimea cumaunica?* (Bittner), *Costatoria omanica* (Diener), *Palaeocardita trapezoidalis* (Krumbeck), *Anodontophora griesbachi* Bittner and *Pleuromya himaica* Diener. Corals, comprising specimens of *Thecosmilia* and *Thamnasteria*, and the brachiopod *Rhynchonella* cf. *bambanagensis* Bittner, also occur.

Fauna 5 (see Plate 3)

Horizon: Marly beds at the top of the lower part of the Upper Haurania Limestones (= 'c' of Hudson & Chatton, 1959).

Details:

Brachiopods: (abundant in the lower part of the section)

Burmirrhyndia tumida Buckman

Daghanirhyndia subversabilis (Weir)

D. platiloba Muir-Wood

Lobothyris cf. *ventricosa* (Davidson) non Hartman

Sphenorhyndia plicatella (J de C Sowerby)

Bivalves:

Camptonectes

Chlamys curvivarians Dietrich

Exogyra nana J Sowerby

Liostrea

cf. *Eligmus rollandi* Douvillé

Gryphaea costellata Douvillé (in upper part of section)

cf. *Lopha costata* J de C Sowerby

Pholadomya cf. *lirata* J Sowerby

Echinoids: *Arcosalenia* spp. (including *A. somaliensis* Currie)

Pygurus sp.

Corals: *Thecosmilia* (plus others not identified)

Fauna 6 (see Plate 3)

Horizon: Basal part of the Trocholina Limestones (= basal part of 'd') of Hudson & Chatton (1959), informally referred to by the latter authors as the 'Eligmus rollandi Limestones'.

Fauna:

- Corals: *Calamophyllia flabellum* de Blainville
 Brachiopods: *Terebratula* cf. *superstes* Douvillé
 Bivalves: *Eligmus rollandi* Douvillé

Fauna 7 (see Plate 4)

Horizon: Beni Zaid Limestone

Details: Abundant corals and stromatoporoids, plus rhynchonellid and terebratulid brachiopods, usually preserved as brown silicified remains. The fauna includes:

Corals: species of the following genera:

Actinastrea
Isastrocoenia
Thamnasteria
Convexastrea
Cyathophora
Heliocoenia
Stylina
Isastrea
Microphyllia
Ovalastrea
Microsolena
Dendraraea

Stromatoporoids:

Actinostromarianina praesalevensis (Zuff.-Com.)
Parastromatopora sp.
Parksia kefétensis Lecompte
Shuqraia arabica Hudson
S. zuffardiae (Wells)

Brachiopods:

Somalirhynchia jordanica (Noetling)
S. bihenensis (Muir-Wood)
S. somalica (Dacqué)
Septirhynchia
'Terebratula' aualites Stefanini

Fauna 8

Horizon: Valvulinella Limestones or underlying Beni Zaid Limestones (= units 'e' or 'f') of Hudson & Chatton (1959).

Details:

Corals:

Convexastraea cf. *sexradiata* (Goldfuss)

Cyathophora bourgueti (Defrance)

Stephanocoenia digitiformis Kuhn

Stromatoporoids:

Promillepora douvillei (Dehorne)

Stromatopora harrensis Wells

Fauna 9 (see Plate 4)

Horizon: Thin bed of marly limestone, c. 39 m from the base of the Valvulinella Limestones (= 'f') of Hudson & Chatton (1959).

Details: Numerous rhynchonellid brachiopods, including: *Septirhynchia azaisi* (Cottreau) and *S. pulchra* (Muir-Wood & Cooper).

Fauna 10

Horizon: Upper 18 m of bed 'j' (= Neocomian Limestones) of Hudson & Chatton (1959).

Details: Common gastropods throughout, including: *Ampullina syriaca* (Conrad) and *Tylostoma syriaca* (Conrad).

Fauna 11 (see Plate 4)

Horizon: Bed 'm' (= Neocomian Limestones) of Hudson & Chatton (1959).

Details: Common specimens of the stromatoporoid *Bekhmeia*, including *B. wetzeli* Hudson.

Fauna 12 (see Plate 5)

Horizon: Bed 'n' (= Neocomian Limestones) of Hudson & Chatton (1959).

Details: Echinoid spines, corals, gastropods, fragmented bryozoa and algae, exogyrid bivalves and the oyster *Rastellum carinatum* (Lamarck)

Fauna 13 (see Plate 5)

Horizon: Bed 'o' (= lower part of Aptian Limestones & Breccias) of Hudson & Chatton (1959).

Details:

Foraminifera: *Orbitolina*

Corals: astraeiform and phaceloid corals

- Bivalves: *cf. Caprinula cedrorum* Blanckenhorn (rudist bivalve; abundant specimens up to 8 cm across)
 Hinnites renevieri Coquand
 cf. Pholadomya gigantea J Sowerby
 Pterodonta cf. altispira Whitfield
- Gastropods: *Harpogodes pelagi* Brongniart
- Echinoids: *Heteraster musandamensis* Lees
 H. aff. couloni Agassiz

Fauna 14

- Horizon: Bed 'p' (= upper part of Aptian Limestones & breccias) of Hudson & Chatton (1959)
- Fauna: Corals (including *Calamophyllia*) and fragments of rudist bivalves

Fauna 15

- Horizon: Qahlah and Simsima formations.
- Details: Abundantly fossiliferous, particularly the Simsima Formation, with numerous echinoids, molluscs (including rudist bivalves and occasional ammonites), stromatoporoids and corals. The fauna has been described by Skelton et al. (1990) and extensively detailed and figured by Smith et al. (1995), and plates of specimens are not reproduced herein.

4 Conclusions

A review of the literature published on the Late Palaeozoic and Mesozoic succession of the northern United Arab Emirates, suggests that the par-autochthonous units (Table 1) contain at least 15 lithostratigraphical marker-beds and 15 macrofossil faunas. These should prove useful for correlation and mapping in the forthcoming field survey of the region.

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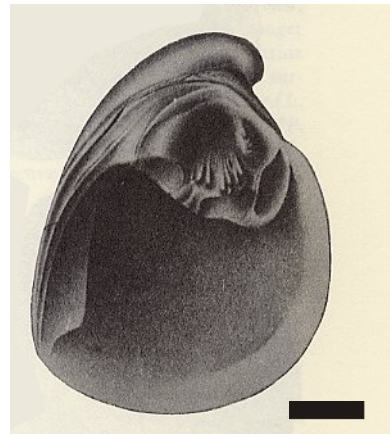
WOODS, H. 1913. A Monograph of the Cretaceous Lamellibranchia of England. *Monograph of the Palaeontographical Society, London*, 341-473.

STAGE		PALAEOCENE			CONIACIAN - MAASTRICHTIAN (Cenomanian mostly absent)			ALBIAN		APTIAN		BERRIASIAN - BARREMIAN			BATHONIAN - TITHONIAN			BAOCHIAN - PELENSBACHIAN			SINEMURIAN						
GROUP		Pabdeh Group			Aruma Group			Wasia Group		G r o u p			M u s a n d a m			M u s a n d a m			M u s a n d a m			M u s a n d a m					
FORMATION		Secile et al. (1983)			Hudson et al., 1954			Hudson & Chatton, 1959		M4			Middle Musandam Limestone (Hudson et al., 1954)			Upper Musandam Limestone			M3			M2			M1		

Fauna 1

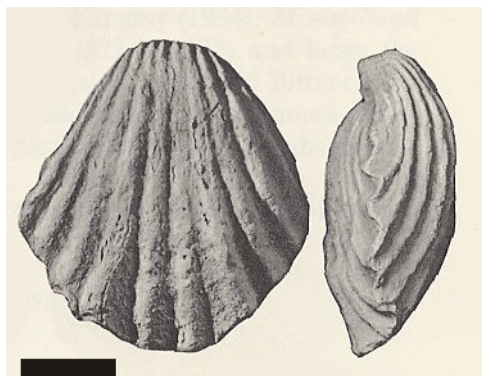


Megalodon-rich limestone

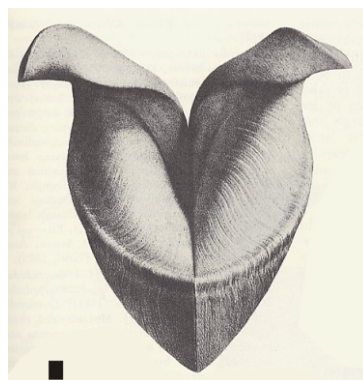


Megalodon

Fauna 3



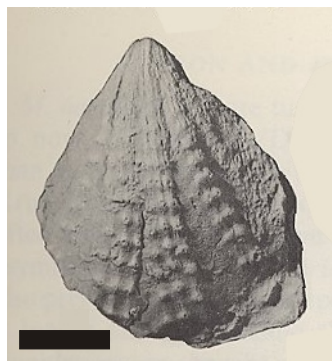
Misolia



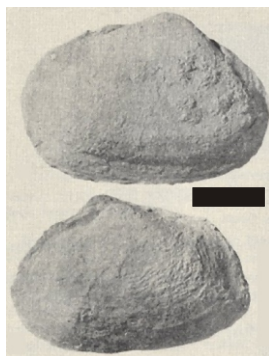
Dicerocardium

(scale bars are 10 mm)

Fauna 4



Indopecten clignetti asperior Hudson & Jefferies, 1961



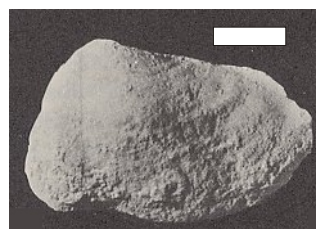
Anodontophora griesbachi Bittner



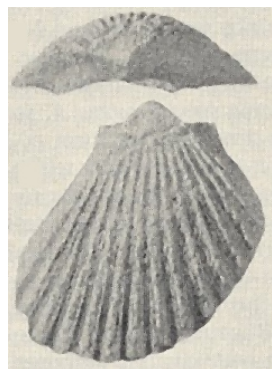
Costatoria omanica (Diener)



Modiolus jaworskii Wanner & Knipscheer



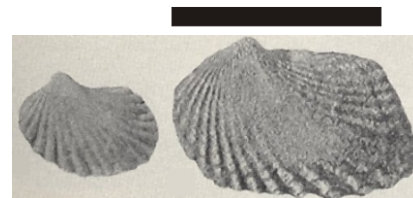
Pleuromya himaica Diener



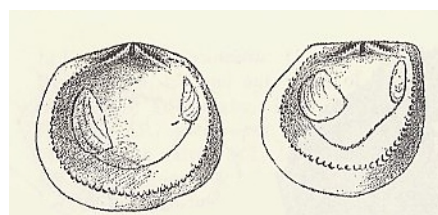
Pseudolimea caumaunica (Bittner)



Lopha blamfordi (Lees)



Palaeocardita trapezoidalis (Krumbeck)



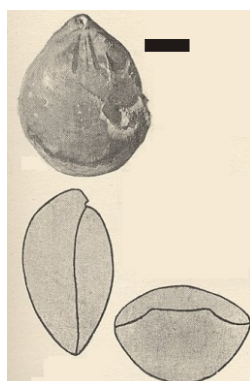
Dimyodon

5mm

Fauna 5



Burmihynchia tumida Buckman



Lombothyris ventricosa (Davidson) non Hartman



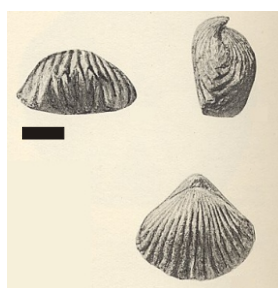
Lopha costata (J de C Sowerby)



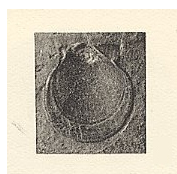
Exogyra nana (Douvill )



Chlamys curvivaricans Dietrich



Daghanirhynchia platiloba Muir-Wood



Camptonectes



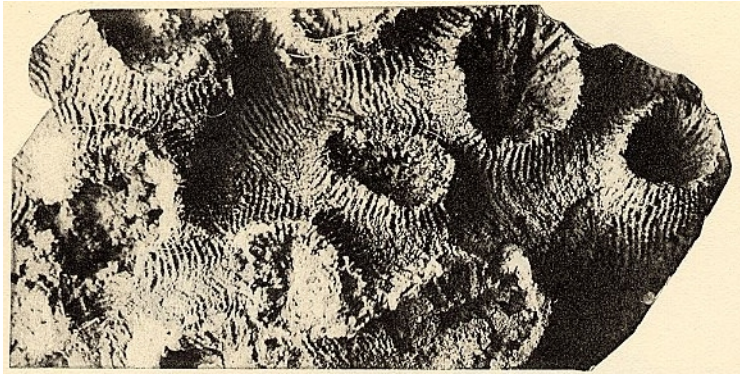
Pygurus

Fauna 6

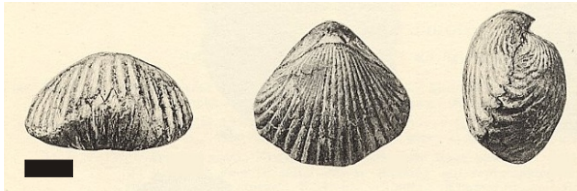


Elligmus rollandi Douvill 

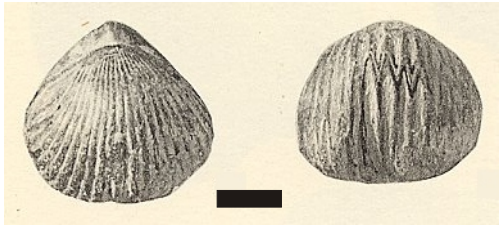
Fauna 7



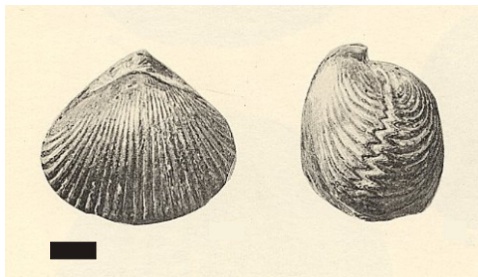
Ovalastraea



Somalirhynchia bihenensis Muir-Wood

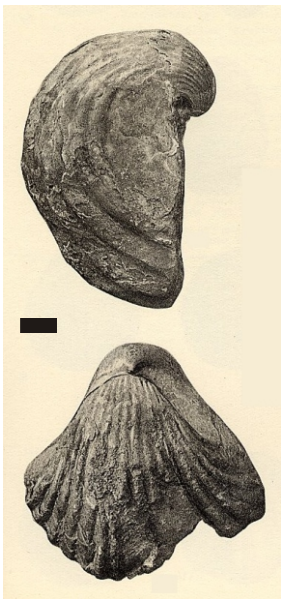


Somalirhynchia somalica (Dacqué)

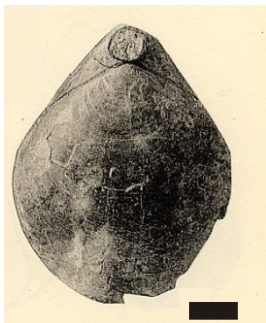


'Somalirhynchia jordanica (Noetling)

Fauna 9



Septirhynchia azaisi (Cottreau)



'Terebratula' aualites Stefanini

(all scale bars are 10 mm)

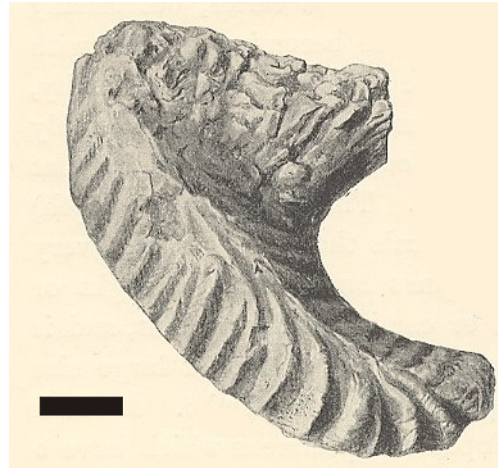
Fauna 11



Bekhmeia wetzeli Hudson

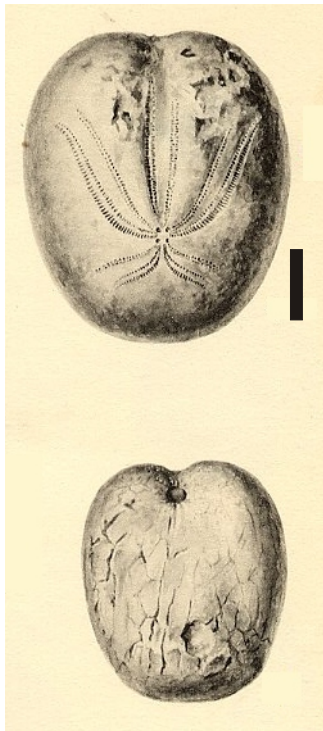
} greatly magnified

Fauna 12

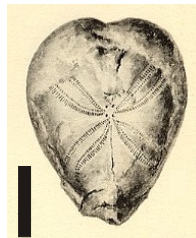


Rastellumcarinatum

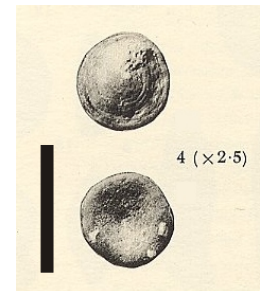
Fauna 13



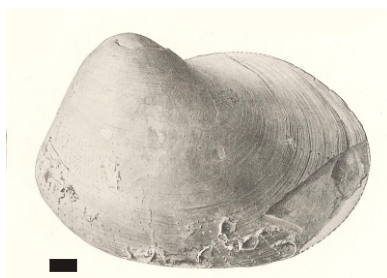
Heteraster musandamensis Lees



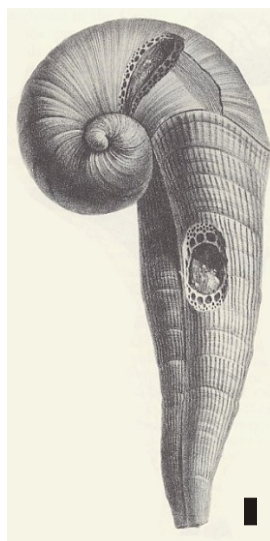
Heteraster couloni Agassiz



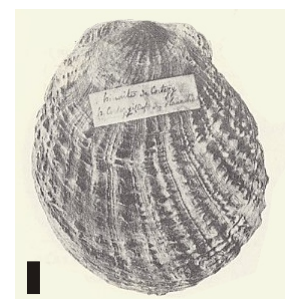
Orbitolina



Pholadomya



Caprinula



Hinnites

(all scale bars are 10 mm)