

Ostracods from the Middle Jurassic of southern Tunisia

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Abstract. Micropalaeontologic investigations in the Jurassic of southern Tunisia yielded numerous rich ostracod faunas from Middle Jurassic deposits. 53 species belonging to 28 genera are described here, including 9 new species. Most of the ostracods were either adapted to brackish-limnic environments or tolerated salinity deviations. In the Callovian marine (euhaline) species also occur. In accordance with other biostratigraphic data the ostracods can be attributed to the Upper Bajocian-Lower Bathonian interval and to the Callovian. Lateral and vertical facies variations in the South-Tunisian Middle Jurassic deposits made more detailed biostratigraphic results impossible. The number of species which are restricted to Tunisia is relatively high suggesting a distinct endemic faunal character. In the Bajocian-Bathonian the ostracods correspond with those of Europe (southern France, Sardinia, England), while in the Callovian, species which are known in Israel, Jordan, Saudi Arabia and Morocco occur. Accordingly, the Callovian faunas are considered to be intermediate between the faunas from Arabia and northeastern Africa and those of northwestern Africa (Morocco).

■ *Ostracods, Taxonomy, Jurassic, southern Tunisia*

Zusammenfassung: Mikropaläontologische Untersuchungen im Jura Südtunesiens erbrachten eine große Anzahl reicher Ostrakodenfaunen aus dem Mittel-Jura. 53 Arten aus 28 Gattungen, einschließlich 9 neue Arten, werden beschrieben. Ein Großteil der Ostrakoden ist an brackisch-limnische Milieus angepaßt oder toleriert Saltinitätsschwankungen. Im Callov treten auch marine (euhaline) Arten auf. Die Ostrakodenfaunen lassen sich in Übereinstimmung mit anderen biostratigraphischen Daten in das Intervall oberes Bajoc-unteres Bathon und in das Callov stellen. Aufgrund von häufigen lateralen und vertikalen Fazieswechseln im Mittel-Jura Südtunesiens lieferten die Ostrakoden und die übrige Benthosfauna keine detaillierteren biostratigraphischen Ergebnisse. Die relativ hohe Anzahl von Ostrakodenarten, die auf Tunesien begrenzt sind, entspricht einem deutlich endemischen Faunencharakter. Für das Bajoc/Bathon wurden Faunenübereinstimmungen mit Europa (Südfrankreich, Sardinien, England) festgestellt. Im Callov treten Arten aus Israel, Jordanien, Saudi Arabien und Marokko auf. Demzufolge nehmen die Faunen des Callov eine vermittelnde Stellung ein zwischen den Faunen der Arabisch - Nordost-Afrikanischen Region und Nordwest-Afrika (Marokko).

■ *Ostrakoden, Taxonomie, Jura, Südtunesien*

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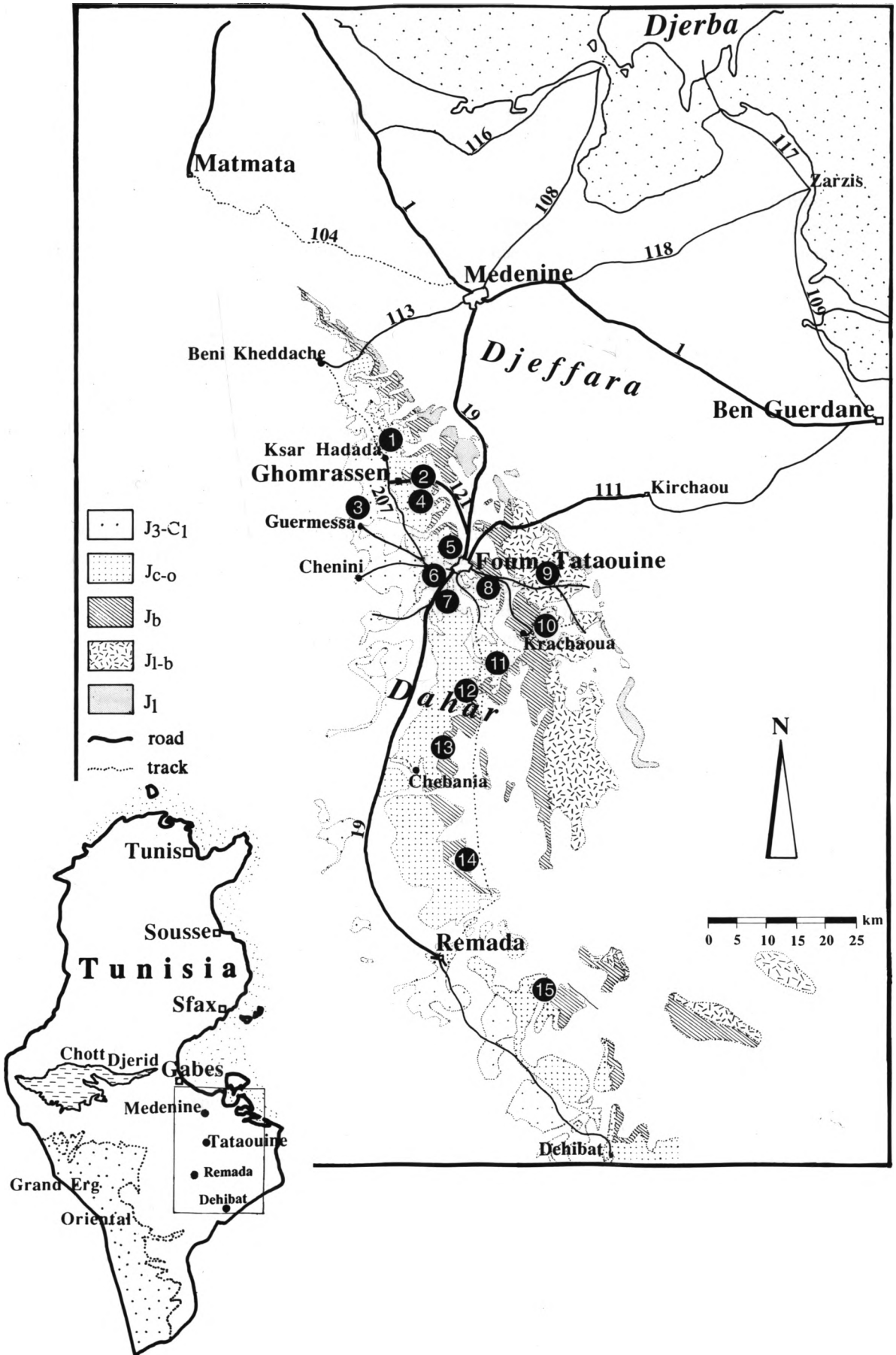
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Introduction

The present study is part of a comprehensive palaeontologic and palaeoecologic analysis of the Jurassic of southern Tunisia, largely concerned with the palaeobiogeography and climatic control on sedimentary environments and palaeocommunities along the

southern Tethyan margin. Although ostracods from the South-Tunisian Jurassic were recorded by earlier authors (KAMOUN 1988, BEN ISMAIL et al. 1989) they have not been described taxonomically. The present work yielded diverse ostracod faunas and conse-

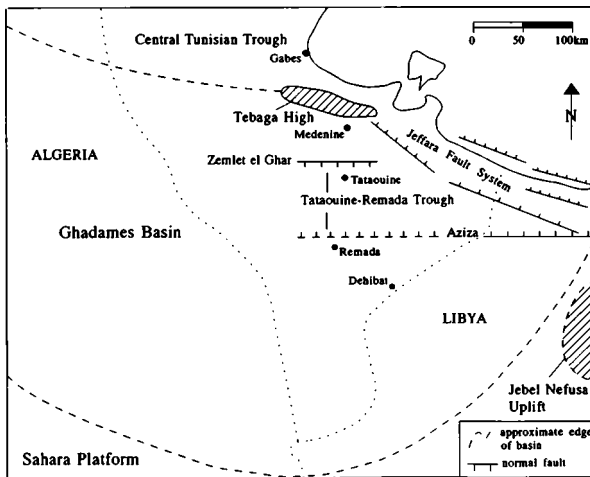


quently many more species than were documented previously. As most of the ostracods are not recorded

in the literature, the number of biostratigraphical important species is relatively small.

Geology, stratigraphy, and facies

The investigation area extends along the South-Tunisian Dahar Mountain Range, which separates the Djeffara Lowland in the east from the Sahara Platform in the west. Palaeoecologic and micropalaeontologic analyses were carried out on 15 sections of the South-Tunisian Jurassic (Text-fig. 1). The Jurassic sediments were deposited in the eastern part of an east-west trending shallow marine basin, the "Ghadames Basin", which is situated north of the Sahara Platform (Text-fig. 2). During the Jurassic, the investigation area ("Tataouine-Remada-Trough") was affected by east-west trending downfault structures which were probably caused by Late Palaeozoic to Early Mesozoic rifting between North-Gondwana and Europe (BEN ISMAIL & M'RABET 1990).



Text-fig. 2: Simplified geography and main structural elements of southern Tunisia (modified after BEN ISMAIL & M'RABET 1990 and WALLEY 1985).

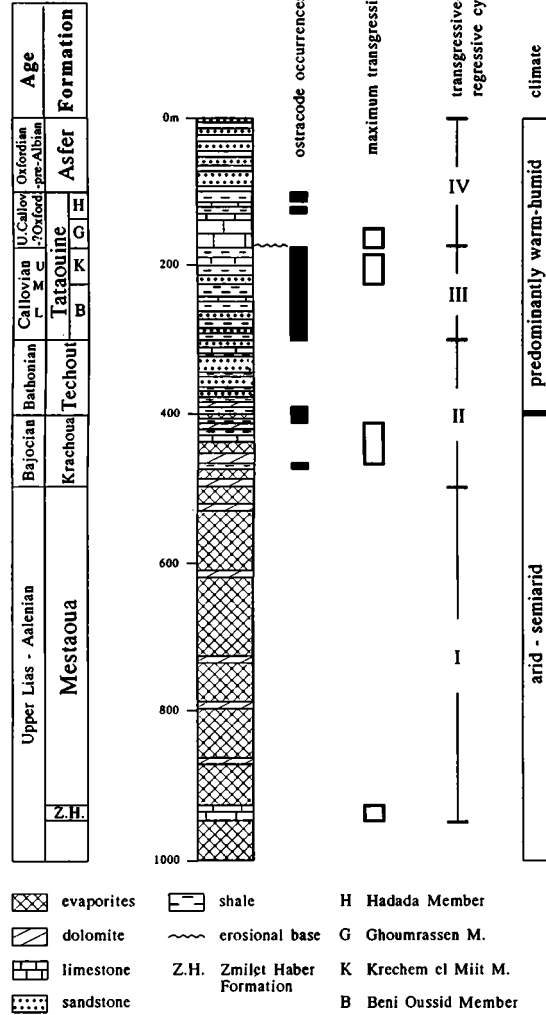
Generally, the Jurassic sequence can be divided into 4 major transgressive-regressive sedimentary cycles in the late Liassic-Aalenian (Zmilet Haber

Formation, Mestaoua Formation), Bajocian-Bathonian (Krachoua Formation, Techout Formation), Callovian (lower Tataouine Formation) and Late Callovian/? Oxfordian - Late Jurassic/Neocomian (upper Tataouine Formation, Asfer Formation) (Text-fig. 3). The climate was arid to semiarid in the Early and Early Middle Jurassic (Mestaoua Formation, Krachoua Formation) and predominantly humid and warm in the Late Middle and Late Jurassic (Techout Formation, Tataouine Formation, Asfer Formation).

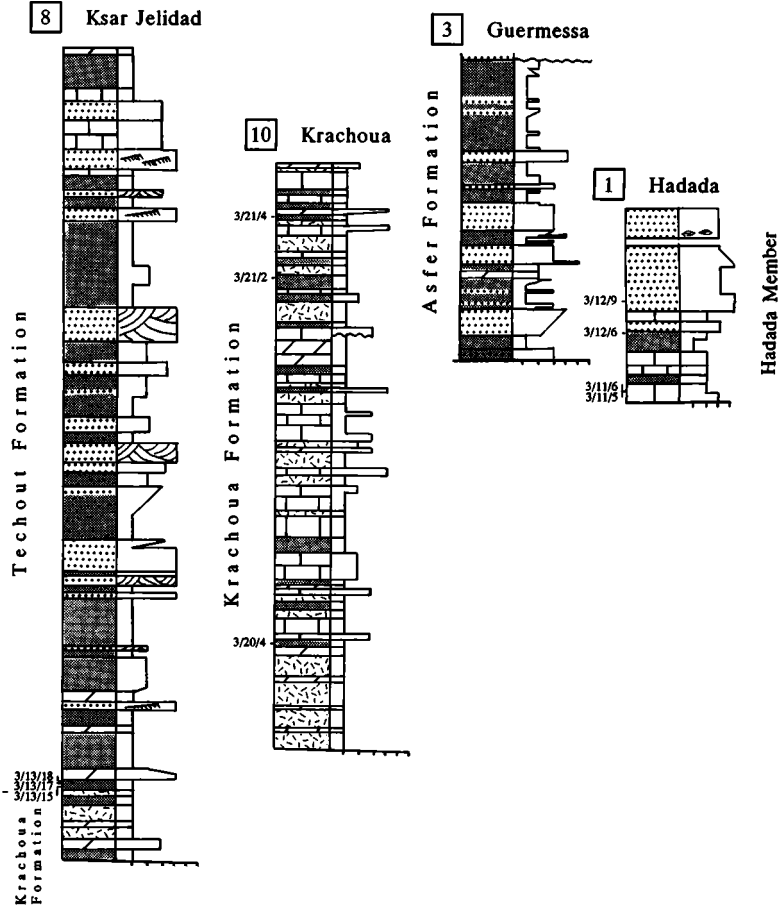
The ostracods described herein were obtained from the Krachoua Formation, the lower Techout Formation (Bajocian-Bathonian) and the Tataouine Formation (Callovian - ? Oxfordian) (Text-figs. 3, 4). The Krachoua Formation consists of dolomites, evaporites and limestones which were deposited in lagoons, sabkhas and tidal flats. The Techout Formation is a coarsening upwards sequence of siliciclastic tidal flat, lagoon and fore shore bar deposits. The lower Tataouine Formation ("Beni Oussid Member", "Krechem el Miit Member") is an intercalation of fossiliferous shales, sandstones, limestones and dolomites which were accumulated in lagoons, estuaries, tidal flats, coastal barriers and shoals. The upper Tataouine Formation is composed of platform carbonates (Ghoumrassen Member) and lagoonal carbonates and siliciclastics (Hadada Member).

The differentiation between the "Beni Oussid Member" and the "Krechem el Miit Member" in the present study is tentative and based on differences in fossil content and biofacies. The lithostratigraphic correlation by sponge horizons (BEN ISMAIL et al. 1989) is questionable. The stratigraphy and facies of the lithologic units and the palaeoecologic, biostratigraphic and palaeogeographic results are presented in detail in publications on the ostracod and macrobenthos palaeoecology (METTE in prep., FREYTAG in prep.).

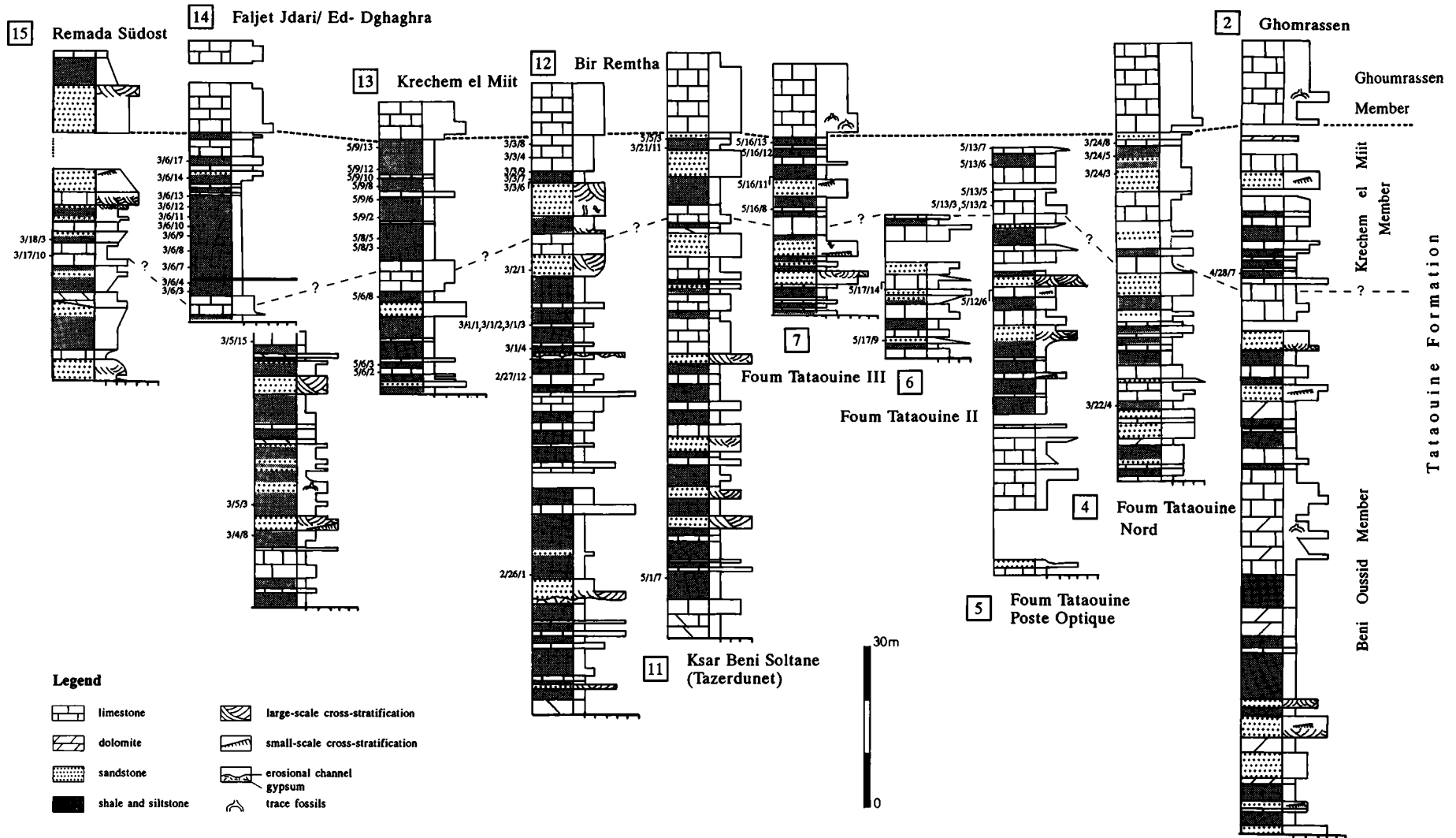
Text-fig. 1. Outline of the regional geology, the position of the sections (1-15) and the stratigraphic units: J1: Zmilet Haber Formation (Lower Lias), J1-b: Mestaoua Formation (Upper Lias), Jb: Krachoua and Techout Formations (Bajocian-Bathonian), Jc-o: Tataouine Formation (Callovian-Oxfordian), J3-C1: Asfer Formation (Upper Jurassic-Lower Cretaceous). From: Carte Géologique de la Tunisie 1: 50000 (1985), Office de la Topographie et de la Cartographie, Service Géologique National, Tunis.



Text-fig. 3: Stratigraphy, transgressive-regressive cycles, climatic development and ostracod occurrences in the Jurassic of southern Tunisia.



Text-fig. 4: Schematized lithology, stratigraphy and localities (sample numbers) of ostracod occurrences in the Krachoua Formation, Techout Formation and Tataouine Formation (sections 1-8, 10-15).



(Continuation of Text-fig. 4.)

The ostracod faunas from the upper Krachoua Formation and the lower Techout Formation can be attributed to the Upper Bajocian - Lower Bathonian interval by the occurrence of *Fabanella sarda*, *Fabanella bathonica*, *Darwinula incurva* and *Darwinula cf. leguminella* (METTE in prep.). This coincides with biostratigraphic data from brachiopods and calcareous algae (KAMOUN 1988). The Bajocian/Bathonian faunas are of low diversity and are comprised of exclusively brackish and limnic ostracods (*Limnocythere*, *Theriosynoecum*, *Fabanella*, *Darwinula*, *Timiriasevia*, *Klieana*).

The ostracods from the Tataouine Formation suggest, in accordance with brachiopods and ammonites (BEN ISMAIL et al. 1989), a Callovian age because of the presence of *Ektyphocythere zoharensis* and *Paranotacythere caudata* n. sp.. In contrast to BEN ISMAIL et al. (1989) the present results do not support an Upper Bathonian age of the lowermost Tataouine Formation. The Callovian faunas mainly consist of brackish and marine species of the genera *Metacypris*, *Schuleridea*, *Praeschuleridea*, *Hutsonia*, *Paranotacythere*, *Fastigatocythere*, *Cytherella*, *Ektypho-*

cythere, *Micropneumatocythere*, *Paracypris*, *Bairdia*, *Patellacythere*, *Acrocythere*, *Afrocytheridea* and *Pneumatocythere* ?. The following species predominantly occur: *Cytherella cf. index*, *Hutsonia minuta* n. sp., *Hutsonia* sp. 1, *Ektyphocythere zoharensis*, *Micropneumatocythere cf. subconcentrica*, *Fastigatocythere triangularis* n. sp., *Metacypris sinuosa* n. sp., *Paranotacythere caudata* n. sp., *Praeschuleridea* sp. 1, *Schuleridea angulata* n. sp..

The relatively high number of new species reflects the endemic character of the Bajocian/Bathonian and Callovian faunas. Because of the marginal marine character of the South-Tunisian Middle Jurassic with frequent facies changes a detailed biostratigraphic correlation of the lithostratigraphic units was not possible. The distribution and stratigraphic range of the ostracod species was mainly controlled by lateral and vertical salinity variations due to sea level changes and climatic fluctuations (METTE, in prep.). The general species distribution is indicated in the section on taxonomy. More detailed information can be deduced from the Appendix and the sections on Text-fig. 4.

Material and preparation

The ostracod species described here were obtained from 86 samples from sections 1, 2, 4, 5-8, 10-15 (Text-fig. 4). The palaeoecology of 56 faunas, comprising about 10.000 specimens, was statistically analysed (METTE in prep.). The type material and the figured specimens are housed at the Paläontologisches Institut der Universität Würzburg under the Number PIW1995IV.

The samples were crushed into pieces smaller than

2 centimetres and dissolved in H₂O₂. The sediment was sieved with 0.5 mm, 0.25 mm and 0.125 mm sieves. Every fraction was picked quantitatively while rare species were also picked qualitatively. The figured specimens were coated with gold and photographed using a ZEISS DSM 962 Scanning Elektron Microscope (SEM) at the Institut für Biowissenschaften der Universität Würzburg.

Systematic descriptions

The taxonomy of the suprageneric groups is partly based on the Treatise on Invertebrate Paleontology, Arthropoda 3, Part Q (MOORE et al. 1961). The classification of later established genera is adopted from the following publications: BASSIOUNI (1974), BATE (1963a, 1963b, 1975), GRÜNDEL (1966), GRÜNDEL & KOZUR (1972), MARTIN (1961), NEALE (1960) and WIENHOLZ (1967).

Abbreviations: c= carapace, rv= right valve, lv= left valve, l= length, h= height, w= width.

Order Podocopida MÜLLER 1894

Suborder Platycopina SARS 1866

Family Cytherellidae SARS 1866

Genus *Cytherella* JONES 1849

Type species. *Cytherina ovata* ROEMER 1840.

Cytherella cf. fullonica JONES & SHERBORN 1888

Pl. 1, Figs. 1-4

- ? 1888 *Cytherella fullonica* n. sp. - JONES & SHERBORN: 274, pl. 1, figs. 12a-c.
 ? 1963a *Cytherella fullonica* JONES & SHERBORN - BATE: 184, pl. 1, figs. 1-2.
 ? 1963b *Cytherella* sp. - OERTLI: pls. 33-35.
 ? 1969 *Cytherella fullonica* JONES & SHERBORN - BATE: 395, pl. 5, fig. 9, pl. 6, fig. 1.
 ? 1970 *Cytherella fullonica* JONES & SHERBORN - WHATLEY: 313, pl. 1, figs. 12-14, 16, 18.
 ? 1985 *Cytherella cf. fullonica* JONES & SHERBORN - MALZ: 307, pl. 2, fig. 19.

Material. 107 carapaces and valves.

Occurrence. Lower Tataouine Formation, "Beni Oussid Member", Krechem el Miit Member", Callovian, sections 7, 12-15.

Dimensions (mm).

		l	h	w
female	c	0.58	0.34	0.26
	rv	0.72	0.43	
	lv	0.56	0.30	
	rv	0.58	0.30	
male	c	0.55	0.32	0.22
	rv	0.57	0.32	

Remarks. The species strongly resembles *Cytherella fullonica* JONES & SHERBORN. In contrast to *C. fullonica* in the material described here, the greatest height of the females is reached in the posterior third and the greatest width of the males is shortly behind the middle. According to BATE (1978) *C. fullonica* occurs in Bajocian to Kimmeridgian strata of England. *Cytherella cf. fullonica* JONES & SHERBORN (MALZ 1985) from the Bathonian of Sardinia appears to be more strongly arched posterodorsally. *C. fullonica* from the Upper Bathonian of France (DEPECHE 1984) can be clearly distinguished from the specimens in this study because of its larger size.

Cytherella cf. index OERTLI 1959

Pl. 1, Figs. 5-8

- ? 1959 *Cytherella index* n. sp. - OERTLI: 16, pl. 1, figs. 13-25.
 ? 1963 *Cytherella index* OERTLI - GREKOFF: 1720, pl. 1, figs. 6-9.
 ? 1966 *Cytherella index* OERTLI - MAYNC: pl. 9, figs. 7-9.
 ? 1987 *Cytherella index* OERTLI - DEPECHE et al.: 226, pl. 1, fig. 4.
 ? 1991 *Cytherella index* OERTLI - ROSENFELD & HONIGSTEIN: 135, pl. 1, fig. 3.
 ? 1987 *Cytherella* sp. - ROSENFELD et al.: 254, pl. 4, fig. 14.
 ? 1994 *Cytherella index* OERTLI - DEPECHE in CHARRIERE et al.: 169, pl. 2, fig. 22.

Material. About 1700 carapaces and valves.

Occurrence. Lower Tataouine Formation, "Beni Oussid Member", "Krechem el Miit Member", Callovian, sections 5, 7, 11-15; upper Tataouine Formation, Hadada Member, Upper Callovian/? Oxfordian, section 1.

Dimensions (mm).

		l	h	w
female	rv	0.76	0.47	
	rv	0.72	0.43	
	lv	0.82	0.46	
	lv	0.79	0.43	
	c	0.86		0.42
male	c	0.84		0.42
	rv	0.83	0.4	
	rv	0.83	0.53	
	lv	0.82	0.40	
	lv	0.82	0.46	
	v	0.80	0.44	
	c	0.74	0.44	0.36
c	0.2		0.32	

Remarks. The species shows strong affinity to *Cytherella index* OERTLI. The assignment to *C. index* is uncertain because in the Tunisian specimens the posterior end of the right valve is rounded posteroventrally and less pointed above. In addition, the right valve of the Tunisian material has a more strongly convex ventral margin. In this respect it resembles the species from the Lower Callovian of Madagascar (GREKOFF 1963). Additionally, the Tunisian specimens are bigger than *C. index* from Europe but similar in size to *C. index* from Madagascar. *C. index* is known from the Callovian and Oxfordian of Western Europe, Israel, Saudi Arabia and Madagascar. *Cytherella cf. index* strongly resembles *Cytherella* sp. of ROSENFELD et al. (1987) from Sinai (Egypt) in lateral view. But it is questionable whether the Tunisian species is conspecific with *Cytherella* sp. because the latter is only illustrated in lateral view.

Cytherella sp. 1

Pl. 1, Figs. 10-12, Pl. 2, Figs. 1-5

Material. 91 carapaces and valves.

Occurrence. Lower Tataouine Formation, "Beni Oussid Member", "Krechem el Miit Member", Callovian, sections 5, 7, 12-14.

Dimensions (mm).

		l	h	w
female	c	1.02	0.6	0.43
	rv	0.92	0.55	
male	lv	1.04	0.57	
	lv	1.0	0.54	
	rv	0.95	0.52	
	c	0.92	0.50	0.32

Remarks. The species is characterized by its large carapace size and the weak convexity of the carapaces in dorsal view. The right valve overlaps the left valve at all margins. Furthermore, the females are not inflated posteriorly; their greatest width occurs shortly behind the middle.

Cytherella sp. 2

Pl. 2, Figs. 6-8, Pl. 3, Figs. 1-5

? 1993 *Cytherella* sp. 2 - MBTTE: 104, pl. 1, figs. 19-21, pl. 2, figs. 1-2.

Material. About 590 carapaces and valves.

Occurrence. Lower Tataouine Formation, "Beni Oussid Member", Krechem el Miit Member", Callovian, sections 5, 7, 12-14.

Dimensions (mm).

		l	h	w
female	c	0.88	0.52	0.4
	lv	0.91	0.50	
	lv	0.94	0.52	
	rv	0.97	0.6	
male	rv	0.90	0.54	
	lv	0.88	0.51	
	c	0.86	0.53	0.37

Remarks. *Cytherella* sp. 2 is relatively big and characterized by a subcylindrical carapace outline (dorsal view) in the females. It shows similarities to *Cytherella* sp. 2 of METTE (1993) from the Lower Callovian of northern Somalia in the carapace outline. The Somali specimens are smaller and more slender in dorsal view suggesting that they possibly comprise only male carapaces.

Genus *Cytherelloidea* ALEXANDER 1929

Type species. *Cytherelloidea williamsoniana* (JONES 1849).

Cytherelloidea aff. *jugosa* (JONES 1884)

Pl. 3, Figs. 6-8

1884 *Cytherella jugosa* n. sp. - JONES: 773, pl. 34, fig. 44.

? 1969 *Cytherelloidea jugosa* (JONES) - BATE: 381, pl. 1, figs. 3-4, text-fig. 1.

? 1981b *Cytherelloidea jugosa* (JONES) - SHEPPARD: 37, pl. 1, figs. 10-11.

? 1984 *Cytherelloidea jugosa* (JONES) - DEPECHE: 191, pl. 2, fig. 5.

? 1985 *Cytherelloidea jugosa* (JONES) - DEPECHE: pl. 29, fig. 4.

? 1987 *Cytherelloidea* sp. - ROSENFELD et al.: 238, pl. 1, fig. 6.

Material. 1 carapace and 1 valve.

Occurrence. Lower Tataouine Formation "Krechem el Miit Member", Middle-Upper Callovian, sections 11, 13.

Dimensions (mm).

	l	h	w
rv	0.59	0.31	
c	0.55	0.29	0.24

Remarks. Analysis of the Tunisian material suggests conspecificity with or a close relationship to *Cytherelloidea jugosa* (JONES 1884). In contrast to the latter species, in *C.* aff. *jugosa* the median ridge is connected with the peripheral ridge posteriorly. The peripheral ridge is interrupted posteroventrally and probably also anterodorsally. The species also shows affinities to *Cytherelloidea* sp. of ROSENFELD et al. (1987) but the latter has a continuous peripheral ridge. Because of the poor preservation and the small amount of carapaces the species is left under open nomenclature. *C. jugosa* is distributed in the English Bathonian and *Cytherelloidea* sp. occurs in the Oxfordian Kidod Formation of Israel.

Cytherelloidea cf. *difficila* LUBIMOVA & MOHAN
1960

Pl. 3, Fig. 9

? 1960 *Cytherelloidea difficila* n. sp. - LUBIMOVA & MOHAN: 18, pl. 1, fig. 4 a-b.

Material. 1 valve.

Occurrence. Lower Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, section 14.

Dimensions (mm).

	l	h
	0.51	0.29

Remarks. This species is probably closely related to *Cytherelloidea difficila* LUBIMOVA & MOHAN but the Tunisian specimen is smaller and differs in its more external position of the peripheral ridge. In addition, the Tunisian species is probably reticulate on the lateral surface (poorly preserved) and bears two or three fine ribs along the ventral margin. *C. difficila* is known from the Callovian of Kachchh. *C.* cf. *difficila* can be clearly distinguished from *Cytherelloidea weberi* STEGHAUS 1951 by the absence of a median ridge.

Suborder **Podocopina** SARS 1866

Superfamily **Bairdiacea** SARS 1888

Family *Bairdiidae* SARS 1888Genus *Bairdia* MCCOY 1844Type species. *Bairdia curtus* MCCOY 1844.*Bairdia hilda* JONES 1884

Pl. 3, Figs. 10-11, Pl. 4, Figs. 1-2

1884 *Bairdia hilda* n. sp. - JONES: 771, pl. 34, fig. 20.1963a *Bairdia hilda* JONES - BATE: 188, pl. 2, figs. 9-12, pl. 3, figs. 1-4.1969 *Bairdia hilda* JONES - BATE: 383, pl. 1, figs. 5-6, pl. 4, fig. 5.1976 *Bairdia* cf. *hilda* JONES (type B) - ROHR: 29, pl. 1, fig. 2.

Material. 6 carapaces and 6 valves.

Occurrence. Lower Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, sections 5, 7, 12-14.

Dimensions (mm).

	l	h	w
lv	0.75	0.41	
rv	0.74	0.32	
c	0.81	0.42	0.31

Remarks. The species is relatively small compared to the material in BATE (1963a), who described specimens of more than 0.9 mm length. Compared to *Bairdia* aff. *hilda* JONES in ROSENFELD et al. (1987) and to *Bairdia* aff. *hilda* in ROSENFELD & HONIGSTEIN (1991) the present specimens are more slender in dorsal and lateral views and the ventral margin of the left valve is straight. *Bairdia hilda* JONES is recorded from the Bajocian and Bathonian of England (JONES 1884, BATE 1963, 1969). It is also recorded without illustrations from the Bathonian of Ireland (AINSWORTH et al. 1989). *Bairdia* cf. *hilda* JONES (type B) from the Bathonian of Sardinia (ROHR 1976) is also suggested to be conspecific with the Tunisian species. ROHR recorded three types of *B.* cf. *hilda* JONES which may be different species.

Bairdia aff. *hilda* JONES 1884

Pl. 4, Figs. 3-4

? 1975 *Bairdia* sp. C - BATE: 175, pl. 2, figs. 9, 13.? 1966 *Bairdia* aff. *hilda* JONES - MAYNC: pl. 9, figs. 27-32.? 1976 *Bairdia* cf. *hilda* JONES (type A) - ROHR: 29, pl. 1, fig. 1.? 1987 *Bairdia* aff. *hilda* JONES - DEPECHE et al.: 228, pl. 1, fig. 12.? 1987 *Bairdia* aff. *B. hilda* JONES - ROSENFELD et al.: 254, pl. 4, fig. 15.? 1991 *Bairdia* aff. *hilda* JONES - ROSENFELD & HONIGSTEIN: 136, pl. 1, figs. 4-5.

Material. 11 carapaces and valves.

Occurrence. Lower Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, section 15.

Dimensions (mm).

	l	h	w
c	0.94	0.56	0.52
c	1.0	0.57	
c	0.98		

Remarks. The Tunisian species is similar to *Bairdia* aff. *hilda* JONES, which is common in the Bajocian-Callovian of Israel (MAYNC 1966, ROSENFELD et al. 1987, ROSENFELD & HONIGSTEIN 1991) and Arabia (DEPECHE et al. 1987) and to *Bairdia* cf. *hilda* from the Bathonian of southern France (ROHR 1976). The material comprises fragmentary specimens and only one complete carapace which is corroded at the posterior. This carapace is more strongly convex than *Bairdia hilda* in dorsal view and at the ventral margin of the left valve. It also shows some affinity to *Bairdia* sp. C of BATE (1975), but the latter is also poorly preserved. The poor preservation and the scant material precludes an exact determination.

Bairdia sp. 1

Pl. 4, Figs. 5-6

? 1986 *Bairdia* sp. - NEALE & SINGH: 353, pl. 1, fig. 13.

Material. 1 carapace.

Occurrence. Lower Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, section 14.

Dimensions (mm).

l	h	w
0.53	0.25	0.21

Remarks. *Bairdia* sp. 1 resembles *Bairdia hilda* JONES 1884. However, in contrast to *B. hilda* it is less arched dorsally, has less pronounced cardinal angles and is much smaller. In dorsal view the present species is less compressed anteriorly and posteriorly than *B. hilda*. It also differs from *Bairdia* aff. *hilda* in the more slender carapace outline in lateral view and in the slightly concave ventral margin. *Bairdia* sp. 1 is somewhat similar to *Bairdia* sp. of NEALE & SINGH (1986) from the Bathonian/Callovian of India (Kachchh). The latter is only represented by a juvenile specimen.

Bairdia sp. 2

Pl. 4, Figs. 7-8

Material. 4 valves.

Occurrence. Lower Tataouine Formation, "Beni Oussid Member", "Krechem el Miit Member", Callovian, sections 7, 14.

Dimensions (mm).

l	h
0.77	0.49
0.73	0.48

Remarks. In contrast to the other species of *Bairdia* described herein the present species is short, has a relatively short, narrowly rounded posterior end and is more strongly arched dorsally.

Bairdia sp. 3

Pl. 4, Fig. 9

Material. 1 valve.

Occurrence. Lower Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, section 7.

Dimensions (mm).

l	h
0.87	0.52

Remarks. This left valve is characterized by a relative short and narrowly rounded posterior end and a slight inclination of the anterodorsal margin. The complete valve surface is densely punctate.

Genus *Ptychobairdia* KOLLMANN 1960

Type species. *Ptychobairdia kuepperi* KOLLMANN 1960.

Ptychobairdia ? sp.

Pl. 4, Figs. 11-12

Material. 3 carapaces.

Occurrence. Lower Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, sections 7, 14.

Dimensions (mm).

l	h	w
0.80	0.39	0.29

Remarks. *Ptychobairdia* ? sp. is probably a new species. It has been left under open nomenclature because it is represented by only three poorly preserved carapaces. The median part of the lateral

surface is delimited at the anterior and posterior by short subvertical ridges. There is no longitudinal ridge. The lower half of the median area is widened laterally. The median area, the anterior margin and the posteroventral margins are densely covered by granulae. The genus *Ptychobairdia* is represented by several species from the alpine Triassic and the Lower Jurassic. One species has been found in the Middle and Upper Bathonian of Normandy (SHEPPARD 1981).

Genus *Bythocypris* BRADY 1880

Type species. *Bythocypris reniformis* BRADY 1880.

Bythocypris ? sp. 1

Pl. 5, Figs. 3-5

? 1991 *Bythocypris* sp. - ROSENFELD & HONIGSTEIN: 437, pl. 1, figs. 6-7.

Material. 150 carapaces and valves.

Occurrence. Lower Tataouine Formation, "Beni Oussid Member", "Krechem el miit Member", Callovian, sections 7, 13.

Dimensions (mm).

	l	h	w
c	0.67	0.34	0.29
c	0.67	0.33	
c	0.74	0.38	
lv	0.70	0.38	
lv	0.66	0.36	
lv	0.69	0.35	

Remarks. The species is characterized by a narrowly rounded posterior margin and a symmetrically rounded anterior margin. The ventral margin is straight to slightly concave and the left valve overlaps the right valve around all margins, particularly anterodorsally, posterodorsally and at the posterior. The greatest height is just in front of the middle, the greatest length is at 1/3 of the height and the greatest width is located at the middle. The systematic position of the species is questionable as internal features were not observed. *Bythocypris* ? sp. 1 is similar to *Bythocypris* sp. from the Callovian-Oxfordian of southern Israel (ROSENFELD & HONIGSTEIN 1991). The latter slightly differs in its more slender carapace and the more narrowly rounded posterior end. The species probably indicates brackish water environments. It is predominantly associated with *Metacypris sinuosa* n. sp. and *Metacypris* cf. *sinuosa* n. sp. (METTE in prep.).

Bythocypris ? sp. 2

Pl. 5, Figs. 6-8

Material. 133 carapaces and valves.

Occurrence. Lower Tataouine Formation, "Beni Oussid Member", "Krechem el Miit Member", Callovian, sections 5, 6, 12, 13.

Dimensions (mm).

	l	h	w
c	0.74	0.37	0.33
c	0.87	0.47	
c	0.76	0.36	
c	0.80	0.40	
lv	0.80	0.42	
lv	0.80	0.38	
lv	0.78	0.38	
lv	0.88	0.44	

Remarks. Compared to *Bythocypris* ? sp. 1 the species is bigger and the posterior margin is more broadly rounded. The ventral margin is straight to slightly concave and the left valve overlaps the right valve along all margins but anteriorly and mid-dorsally very weakly. The specimens show some variability in the convexity of the dorsal margin. The greatest height is at the middle, the greatest length at 1/3 of the height and the greatest width occurs centrally. Internal features could be investigated only on one fragmentary valve. Marginal pore canals and a duplicature are missing. The central muscle scars are poorly preserved, but appear similar to those of *Paracypris*. *Bythocypris* ? sp. 2 shows some affinity to *Bythocypris* ? sp. of BALLENT (1991) but the latter is much smaller and less convex dorsally than the Tunisian taxon. The taxon occurs predominantly in association with *Metacypris sinuosa* n. sp. and is restricted to the Tataouine Formation (Callovian) (METTE in prep.).

Family Macrocyprididae MÜLLER 1912

Genus *Macrocypris* BRADY 1868Type species. *Macrocypris minna* (BAIRD 1850).*Macrocypris* sp.

Pl. 5, Figs. 11-12

Material. 2 carapaces.

Occurrence. Lower Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, section 13.

Dimensions (mm).

l	h	w
0.86	0.29	0.24

Remarks. In carapace outline *Macrocypris* sp. resembles *Macrocypris* sp. 51 of OERTLI (1959) from the Oxfordian of Switzerland. In the Tunisian species the valves are subequal. The left valve overlaps the right valve only at the mid-dorsal margin. Greatest height and width are in the middle.

Superfamily Cypridacea BAIRD 1845

Family Paracyprididae SARS 1923

Genus *Paracypris* SARS 1866Type species. *Paracypris polita* SARS 1866.*Paracypris* ? sp.

Pl. 5, Fig. 13

Material. 12 carapaces.

Occurrence. Lower Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, section 13.

Dimensions (mm).

l	h	w
0.58	0.29	0.16
0.60	0.30	
0.60	0.28	
0.58	0.30	

Remarks. The species is more narrowly rounded at the posterior than *Bythocypris* ? sp. 1 and slightly angulated dorsally. The ventral margin is straight to slightly concave. The left valve overlaps the right valve along the dorsal, ventral and posterior margins. Because internal features are not accessible it is left under open nomenclature. The species shows affinity to *Paracypris terrafullonica* (JONES & SHERBORN 1888). *Paracypris* ? sp. differs in the broadly convex anterodorsal and posterodorsal margins. Furthermore, in the Tunisian material the greatest height occurs centrally in both valves.

Paracypris aff. *contermia* LUBIMOVA & MOHAN 1960

Pl. 6, Fig. 1

? 1960 *Paracypris contermia* n. sp. - LUBIMOVA & MOHAN: 22, pl. 2, fig. 2.? 1975 *Paracypris* aff. *P. contermia* LUBIMOVA & MOHAN - BATE: 177, pl. 2, fig. 6.

? 1976 *Paracypris contermia* LUBIMOVA & MOHAN - GUHA:
86, pl. 3, fig. 19.

Material. 13 carapaces.

Occurrence. Lower Tataouine Formation, "Beni Oussid Member",
"Krechem el Miit Member", Callovian, sections 5, 12,
13.

Dimensions (mm).

l	h	w
0.67	0.26	0.22
0.61	0.25	
0.62	0.26	
0.66	0.28	

Remarks. The species is represented by some poorly preserved carapaces. It resembles *Paracypris contermia* LUBIMOVA & MOHAN but the dorsal margin of the present specimens lacks a posterodorsal angulation. *P. contermia* has been recorded from the Callovian (LUBIMOVA & MOHAN 1960), Callovian-Oxfordian (NEALE & SINGH 1986) and Upper Jurassic (GUHA 1976) of Kachchh (India). The material in GUHA (1976) is of larger size. In comparison to *Paracypris* sp. of ANDREU et al. (1995) *P. aff. contermia* is somewhat longer and narrower and differs also in the central position of the greatest width. Another probably related species is *Paracypris aff. P. contermia* which occurs in the Middle Callovian of Tanzania (BATE 1975). *P. aff. contermia* differs from *Paracypris* sp. 1 of METTE (1993) in its concave ventral margin and its central position of the greatest width.

Paracypris sp. 1

Pl. 6, Fig. 2

Material. 5 valves.

Occurrence. Lower Tataouine Formation, "Beni Oussid Member",
"Krechem el Miit Member", Callovian, sections 6, 13.

Dimensions (mm).

l	h
0.45	0.19
0.42	0.19
0.44	0.18

Remarks. *Paracypris* sp. 1 is characterized by its strongly concave ventral margin. The species resembles *Paracypris* sp. B of ROSENFELD et al. (1987), but is more slender. In contrast to *Paracypris* sp. 1 *Paracypris* sp. of RAFARA (1990) has an angulated dorsal margin. The Tunisian species differs from *Paracypris* sp. A of BATE (1975) in the more symmetrically rounded anterior end and the convex posterodorsal slope.

Genus *Pontocyprrella* MANDELSTAM 1955

Type species. *Bairdia harrisiana* JONES 1849.

Pontocyprrella ? sp. 1

Pl. 6, Figs. 4, 6

Material. 21 carapaces and valves.

Occurrence. Krachoua Formation, Lower Techout Formation,
Bajocian-Lower Bathonian, sections 8, 10.

Dimensions (mm).

	l	h	w
c	0.56	0.26	0.23
c	0.59	0.26	
c	0.57	0.27	
c	0.60	0.26	
c	0.60	0.28	

Remarks. Based on the carapace outline the species is placed in *Pontocyprrella*. The left valve overlaps the right valve dorsally, mid-ventrally and posteriorly. The most distinct overlap is at the anterodorsal and posterodorsal margin. The maximum width and height are in the middle. Internal features are not accessible.

Pontocyprrella ? sp. 2

Pl. 6, Figs. 7-8

Material. 4 carapaces.

Occurrence. Lower Tataouine Formation, "Krechem el Miit Member",
Middle-Upper Callovian, sections 5, 14.

Dimensions (mm).

	l	h	w
	0.4	0.18	0.17
	0.39		0.17
	0.37	0.19	
	0.42	0.20	

Remarks. The species is angulated dorsally, in the right valve more distinctly than in the left valve. The dorsal and ventral margins are straight. The dorsal margin is gently inclined towards the posterior. The left valve overlaps the right valve along all margins and most strongly at the posterodorsal, posterior and anterodorsal margins. The greatest height is in the anterior half and the greatest width is located centrally. Internal features were not observed.

Superfamily *Darwinulacea* BRADY & NORMAN 1889Family *Darwinulidae* BRADY & NORMAN 1889Genus *Darwinula* BRADY & ROBERTSON 1885

Type species. *Darwinula stevensoni* (BRADY & ROBERTSON 1870).

Darwinula cf. *leguminella* (FORBES 1855)

Pl. 6, Figs. 13-17

- ? 1855 *Cypris leguminella* sp. nov. - FORBES in LYELL: 294, fig. 334c.
- ? 1885 *Darwinula leguminella* (FORBES) - JONES: 346, pl. 8, figs. 3-31.
- ? 1886 *Darwinula leguminella* (FORBES) - JONES: 147, pl. 4, figs. 4a-c.
- ? 1940 *Darwinula leguminella* (FORBES) - MARTIN: 317, pl. 4, figs. 58-61.
- ? 1940 *Darwinula leguminella* (FORBES) - WICHER: 268, pl. 2, fig. 8.
- ? 1954 *Darwinula leguminella* (FORBES) - BARTENSTEIN & BURRI: pl. 26.
- ? 1956 *Darwinula* cf. *leguminella* (FORBES) - OERTLI in BERNARD et al.: 757, pl. 21, figs. 8-11.
- ? 1961 *Darwinula leguminella* (FORBES) - MARTIN: 119, pl. 14, fig. 19.
- ? 1962 *Darwinula leguminella* (FORBES) - KLINGLER et al.: 187, pl. 25, fig. 14.
- ? 1963a *Darwinula leguminella* (FORBES) - OERTLI: 20, pl. 6, fig. 40.
- ? 1963 *Darwinula leguminella* (FORBES) - CHRISTENSEN: 21-23, pl. 2, fig. 2a-c.
- ? 1966 *Darwinula leguminella* (FORBES) - BARKER: 472, pl. 7, fig. 9.
- ? 1968 *Darwinula leguminella* (FORBES) - KILENYI & ALLEN: 144, pl. 29, fig. 8.
- ? 1971 *Darwinula leguminella* (FORBES) - ANDERSON: 110, pl. 18, fig. 8.
- ? 1971 *Darwinula leguminella* (FORBES) - RAMALHO: 161, pl. 22, fig. 14.
- ? 1975 *Darwinula leguminella* (FORBES) - BIELECKA: 368, pl. 14, fig. 5.
- ? 1976 *Darwinula leguminella* (FORBES) - BRENNER: 141, pl. 10, figs. 23-25.
- ? 1976 *Darwinula* cf. *leguminella* (FORBES) - ROHR: 33, pl. 2, figs. 1-3.
- ? 1978 *Darwinula leguminella* (FORBES) - KILENYI & NEALE: 314, pl. 6, figs. 12, 14.
- ? 1984 *Darwinula leguminella* (FORBES) - DEPECHE: 208, pl. 5, fig. 9.
- ? 1985 *Darwinula leguminella* (FORBES) - COLIN & OERTLI: 160, pl. 40, fig. 1.
- ? 1985 *Darwinula* cf. *leguminella* (FORBES) - DEPECHE: pl. 28, fig. 6.
- ? 1985 *Darwinula leguminella* (FORBES) - ANDERSON: 34, pl. 11, fig. 8.

? 1991 *Darwinula leguminella* (FORBES) - ZHRUL: 59, pl. 1, fig. 9.

? 1994 *Darwinula leguminella* (FORBES) - SCHUDACK: 106, pl. 17, figs. 9-10.

Material. 147 carapaces and valves.

Occurrence. Upper Krachoua Formation, Lower Techout Formation, Upper Bajocian-Lower Bathonian, sections 8, 10; Lower Tataouine Formation, "Beni Oussid Member", "Krechem el Miit Member", Callovian, sections 6, 11.

Dimensions (mm).

	l	h	w
c	0.65	0.29	0.21
rv	0.63	0.27	
lv	0.59	0.28	
lv	0.68	0.32	
lv	0.62	0.28	

Remarks. The species is very similar to *Darwinula* cf. *leguminella* (FORBES) from the Lower to Middle Bathonian of central France (DEPECHE 1984, 1985, BERNARD et al. 1956) and *D.* cf. *leguminella* from the Bathonian of southern France (ROHR 1976). ROHR mentioned a conspicuous variability in carapace width. To a lesser degree the Tunisian species is also variable in carapace width. In accordance with *D.* cf. *leguminella* and *D. leguminella* the left valve overlaps the right valve at all margins except the dorsal margin. In addition, the Tunisian species is characterized by a straight dorsal margin. In this respect it differs from *D. leguminella* (FORBES) which is slightly convex at the dorsal margin. However, WEISS (1995) noted a considerable variability in carapace outline of *D. leguminella* and suggested the species to be synonymous with *Darwinula oblonga* (ROEMER 1839). ROHR suggested the Bathonian *D.* cf. *leguminella* to be conspecific with *D. leguminella* (FORBES), but this remains to be proved. *D. leguminella* (FORBES) is recorded from the Purbeck and Wealden of northern Germany, Sweden, Spain, Portugal, Switzerland, Poland, and England and from the Oxfordian/Kimmerian of Ireland (AINSWORTH et al. 1989).

Darwinula incurva BATE 1967

Pl. 6, Figs. 18-19

1965 *Darwinula* sp. A - BATE: 751, pl. 109, figs. 1-4.

1967 *Darwinula incurva* n. sp. - BATE: 28, pl. 1, figs. 7-12.

1976 *Darwinula incurva* BATE - ROHR: 32, pl. 1, figs. 8-10.

1994 *Darwinula incurva* BATE - WAKEFIELD: 64, pl. 11, figs. 1-4, 7.

Material. 4 carapaces.

Occurrence. Lower Techout Formation, Lower Bathonian, section 8.

Dimensions (mm).

l	h	w
0.81	0.36	0.29
0.84	0.38	
0.82	0.38	

Remarks. The species is characterized by the concavity of the anterior ventral margin and the strong ventral and posterior overlap. Its relatively small size compared to *Darwinula incurva* BATE from the Bathonian of England (WAKEFIELD 1994, BATE 1965, 1967) and from southern France (ROHR 1976) suggests that the present specimens are A-1 juveniles. *D. incurva* is also recorded without illustrations from the Bathonian of Ireland (AINSWORTH et al. 1989). The present specimens can be distinguished from *Darwinula cicatricosa* WAKEFIELD 1994 by the more sinuous shape of the anteroventral left valve overlap.

Darwinula techoutensis n. sp.

Pl. 6, Fig. 20, Pl. 7, Figs. 1-2, 4, Text-fig. 5

?1963 *Darwinula* sp. - GREKOFF: 1760, pl. 6, fig. 181.

Derivation of name. According to its occurrence in the Techout Formation.

Holotype. Carapace, PIW1995IV 751; Pl. 6, Fig. 20; Pl. 7, Fig. 1.

Type locality. Section 8; outcrop near the Tataouine-Ksar Jelidat road; about 1 km west of Ksar Jelidat; 32° 54' N / 10° 31' E; southern Tunisia.

Type horizon. At the base of the Techout Formation; about 4 m above the last gypsum horizon of the Krachoua Formation and 1 m above a fossil horizon with *Mytilus* and *Modiolus* (Text-fig. 4); intercalation of marls with packstones of pelecypods (*Mytilus*); Lower Bathonian; sample 3/13/17.

Paratypes. 96 carapaces and 5 valves; PIW1995IV D7.

Occurrence. Upper Krachoua Formation, lower Techout Formation, Upper Bajocian-Lower Bathonian, sections 8, 10; questionable: Lower Tataouine Formation, "Beni Oussid Member", Lower-Middle Callovian, section 6.

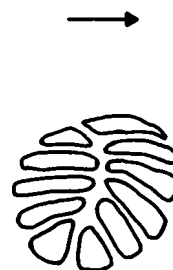
Dimensions (mm).

	l	h	w
c	0.88	0.41	0.34
c	0.87		0.34
c	0.98		0.39
c	0.88		0.35
lv	0.96	0.46	
lv	0.88	0.46	
rv	0.87	0.42	
lv	1.03	0.50	
lv	1.0	0.48	
rv	0.90	0.42	

Diagnosis. A large species of *Darwinula* with a relatively high posterior end, a broadly convex dorsal margin and a broad shallow concavity at the ventral margin before the middle.

Description. Carapace in lateral view strongly tapering towards the anterior. In dorsal view almond-shaped with broadly rounded posterior end and narrowly rounded anterior end. Maximum height and width at 1/3 of carapace length. Dorsal margin broadly convex; posterior third gently arched or nearly straight and subparallel to ventral margin. At about 1/3 of the carapace length the dorsal margin slopes relatively steeply towards the ventral margin. Posterior end slightly asymmetrical and broadly rounded; posterodorsally more narrowly than posteroventrally. Anterior end much more narrowly rounded. Ventral margin with a broad, shallow concavity before the middle. Left valve overlaps right valve around all margins but most strongly at the ventral margin and most weakly at the dorsal and anteroventral margins.

The muscle-scar rosette consists of 11 scars which are closely clustered towards the centre (Text-fig. 5).



Text-fig. 5: Central muscle scars of the right valve of *Darwinula techoutensis* n. sp. (not to scale).

They are characterized by a symmetrical pair of subequal scars at the ventral side and two quite different scars at the dorsal side.

Remarks. *Darwinula techoutensis* n. sp. closely resembles *Darwinula* sp. of GREKOFF (1963). The conspecificity of *D. techoutensis* and *Darwinula* sp. is questionable because the latter species is only illustrated in lateral view and not described in detail. *Darwinula* sp. of GREKOFF (1963) occurs in the Upper Bajocian-Lower Bathonian of Madagascar. The new species is differentiated from *Darwinula magna* ROHR by its smaller size and the rounded posterior end (dorsal view). *Darwinula pulmo* WAKEFIELD 1994 from the Bathonian of Scotland has a more strongly convex dorsal margin and its greatest width lies just behind the middle. In addition, the muscle scars differ

in shape and arrangement (no. 5 and 6 in WAKEFIELD 1994). Some specimens which are similar to the species were found in the lower Tataouine Formation which is probably of Early to Middle Callovian age.

Superfamily Cytheracea BAIRD 1850

Family Cytheridae BAIRD 1850

Genus *Fabanella* MARTIN 1961

Type species. *Fabanella prima* MARTIN 1961.

Fabanella sarda MALZ 1985

Pl. 7, Figs. 3, 6-10

1985 *Fabanella sarda* n. sp. - MALZ: 315, pl. 1, figs. 4-11, pl. 2, figs. 12-18.

Material. 210 valves and 20 carapaces.

Occurrence. Upper Krachoua Formation, Upper Bajocian/? Lower Bathonian, section 10.

Dimensions (mm).

		l	h
female	lv	0.64	0.39
	lv	0.72	0.44
	lv	0.68	0.45
	lv	0.66	0.40
	rv	0.66	0.40
male	lv	0.78	0.42
	lv	0.84	0.46
	lv	0.82	0.46
	rv	0.79	0.34
	rv	0.78	0.39

Remarks. The species is characterized by distinct sexual dimorphism. In the Tunisian material *F. sarda* exhibits 14 to 16 straight and simple anterior marginal pore canals and 6 to 8 posterior marginal pore canals. The left valve has a narrow accommodation groove. The inner margin and line of conchescence coincide. *F. sarda* has been recorded from the Bajocian to Lower Bathonian of Sardinia (MALZ 1985).

Fabanella bathonica (OERTLI 1956)

Pl. 7, Figs. 11-12, Pl. 8, Figs. 1-4

1956 *Cyprideis ? bathonica* sp. nov. - OERTLI in BERNARD et al.: 758-761, pl. 21, figs. 12-20, pl. 22, figs. 1-6, 12 (non figs. 7-10).

1963b *Fabanella bathonica* (OERTLI) - OERTLI: pl. 28, fig. m.

1967 *Fabanella bathonica* (OERTLI) - BATE: 33, pl. 4, figs. 1-5.

1968 *Fabanella bathonica* (OERTLI) - DEPECHE: pl. 1, fig. 16.

1976 *Fabanella bathonica* (OERTLI) - ROHR: 38, pl. 4, figs. 1-15.

1984 *Fabanella bathonica* (OERTLI) - DEPECHE: 327, pl. 5, fig. 10.

1985 *Fabanella bathonica* (OERTLI) - DEPECHE: pl. 28, fig. 3.

Material. 146 carapaces and 1 valve.

Occurrence. Lower Techout Formation, Lower Bathonian, section 8.

Dimensions (mm).

		l	h	w
female	c	0.73	0.40	
	c	0.72	0.41	
	c	0.70	0.40	0.38
	c	0.71	0.38	
male	c	0.82	0.41	0.43
	c	0.82	0.41	0.40
	c	0.81	0.41	

Remarks. In some specimens the lateral surface of the Tunisian species is somewhat uneven, almost reticulate. The ventral surface of each valve bears four ridges. Internal features are not accessible. *Fabanella bathonica* (OERTLI) is known from the Bathonian of the Paris Basin, central France (BERNARD et al. 1956, DEPECHE 1968, 1984) and England (BATE 1967), the Bathonian of southern France (ROHR 1976), and possibly also from the Bathonian of Sardinia (DEPECHE in BASSOULET et al. 1976). According to DEPECHE (1984, 1985) in France it is restricted to the Lower and Middle Bathonian. The specimens which were proposed as being juveniles of *F. bathonica* in BERNARD et al. (1956) belong to another species (ROHR 1976).

Fabanella sp. 1

Pl. 8, Figs. 5-6, 8

Material. 5 carapaces and 7 valves.

Occurrence. Lower Krachoua Formation, Bajocian, section 10.

Dimensions (mm).

		l	h
female	rv	0.58	0.36
	rv	0.65	0.38
male	rv	0.72	0.39

Remarks. The species is represented by three right valves. It is characterized by a distinct surface ornamentation. A strong ventrolateral ridge and a few weak ventral ribs extend along the mid-ventral margin. A long and narrow subcentral vertical sulcus runs from the dorsal margin to a point at 1/3 of the

height. A rounded anterodorsal ridge runs from the anterior cardinal angle to mid-height. Behind this ridge a short oblique sulcus is located. Posterodorsally the valve is inflated and additionally bears a subventral rounded ridge. *Fabanella* sp. 1 is similar to *Fabanella bathonica* (OERTLI) in outline but differs in the above mentioned ornamentation. The species occurs in the middle part of the Krachoua Formation.

Family Limnocytheridae SARS 1925

Genus *Limnocythere* BRADY 1867

Type species. *Limnocythere inopinate* (BAIRD 1843).

Limnocythere sp.

Pl. 9, Figs. 2-4

Material. 50 carapaces and valves.

Occurrence. Upper Krachoua Formation, Upper Bajocian/? Lower Bathonian, section 10.

Dimensions (mm).

		l	h	w (incl. alar prolongation)
male	c	0.58	0.32	0.34
	c	0.60	0.33	0.36
	rv	0.62	0.36	
	lv	0.62	0.35	
	lv	0.58	0.33	
female	c	0.68	0.40	0.32
	c	0.74	0.40	0.36
	c	0.64	0.35	0.35
	rv	0.66	0.40	

Remarks. The species is characterized by five tubercles and a relatively fine reticulation. The most prominent tubercle builds an alar prolongation which is situated at the mid-ventral margin and points towards the posterior. Another big tubercle occurs in a posterodorsal position, a third near the posterior margin and two in the anterior half. The left valve overlaps the right valve around the anterior, posterior and ventral margins. The females differ from the males in the posterior carapace inflation and the greater carapace size. Internal features are not preserved. *Limnocythere* sp. is probably a new species, but it is left under open nomenclature because of the poor preservation.

Genus *Theriosynoecum* BRANSON 1936

Type species. *Theriosynoecum wyomingense* (BRANSON 1935).

Theriosynoecum daharensense n. sp.

Pl. 9, Figs. 5-11

Derivation of name. According to its occurrence in the Dahar Mountain Range, southern Tunisia.

Holotype. Female carapace, PIW1995IV 558; Pl. 9, Figs. 10-11.

Type locality. Section 8; outcrop near the Tataouine-Ksar Jelidat road; about 1 km west of Ksar Jelidat; 32° 54' N / 10° 31' E; southern Tunisia.

Type horizon. At the base of the Techout Formation; about 4 m above the last gypsum horizon of the Krachoua Formation and 1 m above a fossil horizon with *Mytilus* and *Modiolus*; intercalation of marls with packstones of pelecypods; Lower Bathonian; sample 3/13/18.

Paratypes. 95 carapaces and valves; PIW1995IV T1.

Occurrence. Lower Techout Formation, Lower Bathonian, section 8.

Dimensions (mm).

		l	h	w
female	c	0.85	0.50	0.53
	c	0.82		0.46
	c	0.84	0.51	0.50
	c	0.90	0.54	0.60
	c	0.80	0.48	
	c	0.88	0.50	
male	c	0.86	0.51	0.43
	c	0.92	0.54	0.44
	c	0.94	0.54	
	c	0.96	0.58	

Diagnosis. The species is characterized by a weak reticulate dorsolateral node, more or less strongly developed ventral ridges and by the almost smooth lateral surface.

Description. Carapace elongate subovate in lateral view; in dorsal view strongly convex subovate in male and pear-shaped in female; anterior end blunt. Greatest width shortly behind the middle (male) or in the posterior third (female). Dorsal and ventral margins parallel. Dorsal margin straight with a distinct wing-like posterior extension forming a sharp posterior cardinal angle. Anterior margin asymmetrically rounded. Ventral margin straight to slightly convex with a short concavity just in front of the middle; in lateral view ventral margin not visible because of the ventrolateral overhang. Posterior margin obliquely running from the posterior cardinal angle towards the venter; straight to slightly convex in female and broadly rounded in male. The complete ventral surface of each valve is covered by five ventral ridges and a shorter ventrolateral ridge which starts near the posterior end and extends to the anterior third; in some specimens the ridges are very distinct, in others they are weak or almost lacking. Dorsocentral and anterodorsal sulci

weak. In some specimens there is a weak reticulate node on the dorsolateral surface, just behind the dorso-central sulcus. Some juveniles bear two nodes near the anterior and posterior cardinal angles. In adults nodes have not been observed.

Hinge lophodont with a long straight median bar in the right valve and a narrow accommodation groove above. The central muscle scars consist of a subvertical row of four adductors, two round mandibular scars and a round frontal scar in front of the dorsal adductor scar.

Remarks. The species differs from *Theriosynoecum alatum* n. sp. in the relatively strongly inflated carapace, the oblique posterior margin, the absence of a distinct alar prolongation and the occurrence of a reticulate dorsolateral node. In the almost smooth lateral surface and in the weak sulci it differs from all other species of *Theriosynoecum*. The occurrence of the median bar and accommodation groove in the right valve suggests that the present species may be assigned to a new subgenus of *Theriosynoecum*. However, a new subgenus is not erected because other internal features are not accessible.

Theriosynoecum alatum n. sp.

Pl. 10, Figs. 1-8

Derivation of name. From winged = alatus (Lat.); referring to the distinct alar prolongation of the species.

Holotype. Male carapace, PIW1995IV 710; Pl. 10, Figs. 3, 5.

Type locality. Section 10; roadcut on the Krachoua-Ksar Jedid road; about 2 km east of Krachoua; 32° 49' N / 10° 35' E; southern Tunisia.

Type horizon. Green marl; near the top of the Krachoua Formation; 3 m below the last thick gypsum horizon; Upper Bajocian/? Lower Bathonian; sample 3/21/2.

Paratypes. 126 valves and carapaces of females and males; PIW1995IV TH.

Occurrence. Upper Krachoua Formation, Upper Bajocian/? Lower Bathonian, section 10.

Dimensions (mm).

		l	h	w
female	c	0.87	0.52	0.47
	rv	0.85	0.51	0.50
	lv	0.84	0.52	
	lv	0.90	0.46	
male	c	0.87	0.53	
	c	0.88	0.43	
	rv	0.95	0.54	0.44
	rv	0.82	0.50	
	lv	0.94	0.52	
	lv	0.86	0.54	

Diagnosis. A species of *Theriosynoecum* with a smooth lateral surface and a distinct alar prolongation, which bears four ventral ridges on each valve.

Description. Carapace elongate-ovate in lateral view. In dorsal view males relatively weakly convex; females pear-shaped and distinctly swollen posteriorly. Dorsal and ventral margin parallel. Greatest height centrally or just behind the middle; greatest width at 1/3 of carapace length in male and at 1/4 in female. Dorsal margin slightly convex and prolonged posteriorly by a short wing-like extension. Anterior margin strongly asymmetrically rounded in female and weakly asymmetrically rounded in male. Ventral margin straight in male and slightly convex in female. Posterior margin posterodorsally broadly rounded (male) or almost straight (female) and posteroventrally more narrowly rounded. Lateral surface smooth. The ventral surface is strongly extended laterally by an alar prolongation which bears four longitudinal ridges on each valve. The ridges extend on the flat ventral surface from the posteroventral margin to the antero-ventral margin where they turn up parallel to the margin. In dorsal view the alar prolongation appears in males as a distinct arrow-shaped extension of 2/5 of the carapace length. The dorso-central and anterodorsal sulci are weak in males but more strongly developed in females where they coalesce into a deep U-shaped depression. Nodes have not been observed in the adults and juveniles.

Hinge lophodont with a median bar and a relatively broad accommodation groove in the left valve. Vestibula small. Central muscle scars consist of a subvertical row of four adductors; mandibular and frontal scars are not preserved.

Remarks. The assignment to *Theriosynoecum* is based on the presence of an accommodation groove and a ventrolateral alar prolongation. The absence of a reticulate posterodorsal node contrasts with the taxonomic definition of *Theriosynoecum* proposed by PINTO & SANGUINETTI (1984) and SCHUDACK (1994). This suggests that the differentiation of *Theriosynoecum*, *Bisulcoocypris* and *Dryelba* of the latter authors is not generally practicable and that the proposal of WAKEFIELD (1994) that *Dryelba* is synonymous with *Theriosynoecum* is correct. *Theriosynoecum alatum* n. sp. differs from all other species of *Theriosynoecum* in the presence of a distinct alar prolongation and in the smooth lateral surface.

Theriosynoecum sp. 1

Pl. 10, Figs. 9-10, Pl. 11, Figs. 1-4

Material. 170 carapaces and valves.

Occurrence. Lower Techout Formation, Lower Bathonian, section 8.

Dimensions (mm).

		l	h	w
female	c	1.15	0.65	0.67
	c	1.18	0.71	0.66
	c	1.12	0.66	
	c	1.06	0.64	
	c	1.04	0.64	
male	c	1.08	0.68	
	c	1.16	0.67	0.52
	c	1.15	0.67	0.54
	c	1.13	0.65	
	c	1.12	0.66	
	c	1.14	0.66	
	c	1.10	0.64	

Remarks. The lateral surface is reticulate; the reticulation fades away at the dorsocentral and anterodorsal sulci. Near the anterior and ventral margins the reticulation passes into a concentric rib pattern. The ventral surface is ornamented by four more or less distinct ridges at each valve. The juveniles bear up to eight nodes. According to the generic diagnosis (PINTO & SANGUINETTI 1984) the present species is assigned to *Theriosynoecum* because of the presence of a narrow accommodation groove in the left valve. In a single valve, about 30 straight and simple anterior pore canals and a moderate vestibulum have been observed.

The species is similar to *Bisulcoocypris planiverrucosa* (KLINGLER 1955) of GRAMANN & LUPPOLD (1991) from the Upper Jurassic of northern Germany, but differs in the strong ventral ribs, the distinct posterodorsal ridge and the absence of a posterodorsal inflation of the carapace. There is some affinity to *Bisulcoocypris aveyronensis* ROHR. *Theriosynoecum* sp. 1 differs from *B. aveyronensis* in the rounded posterior margin, the more pronounced two anterodorsal furrows and the incurvation of the posterior margin (dorsal view). In addition, the Sardinian species is smaller than *Theriosynoecum* sp. 1. The Tunisian species differs from *Theriosynoecum conopium* WAKEFIELD & ATHERSUCH 1990 in the relatively coarse reticulation, the more strongly inflated posterior carapace and the compressed anterior margin.

Theriosynoecum ? sp. 1

Pl. 11, Figs. 5-9

Material. 43 carapaces.

Occurrence. Lower Techout Formation, Lower Bathonian, section 8; Lower Tataouine Formation, "Beni Oussid Member", Lower-Middle

Callovian, section 6, sample 5/17/14.

Dimensions (mm).

		l	h	w
female	c	0.70	0.40	0.34
	c	0.69	0.40	0.34
	c	0.68	0.40	0.33
male	c	0.67	0.38	0.31
	c	0.66	0.40	0.30
	c	0.68	0.38	0.32
	c	0.63	0.29	
	c	0.67	0.39	

Remarks. The species is characterized by a subovate carapace which slightly tapers towards the posterior. The reticulation passes ventrally into ridges and diminishes in the anterodorsal area. The dorsocentral and anterodorsal sulci are very faint. In addition, sexual dimorphism is very weakly developed. The females lack a posterior carapace inflation and the males differ from the females only in the slightly less convex outline in dorsal view. Nodes have not been observed in adults or juveniles. Internal features are not accessible, so that the species is left under open nomenclature. *Theriosynoecum* ? sp. 1 differs in the above mentioned features from all other species of *Theriosynoecum* and *Bisulcoocypris*.

Genus *Timiriasevia* MANDELSTAM 1947

Type species. *Timiriasevia epidermiformis* MANDELSTAM 1947.

Timiriasevia aff. *uptoni* TIMBERLAKE 1988

Pl. 11, Figs. 10-13

? 1976 *Timiriasevia* sp. 1 - ROHR: 66, pl. 10, figs. 13-16.

? 1988 *Timiriasevia uptoni* TIMBERLAKE n.sp. - ATHERSUCH et al.: 49, pls. 15-50; 15-52; 15-54; 15-56.

Material. 6 valves and 1 carapace.

Occurrence. Upper Krachoua Formation, Upper Bajocian/? Lower Bathonian, section 10.

Dimensions (mm).

		l	h	w
female	rv	0.55	0.31	
	lv	0.55	0.34	
	lv	0.48	0.28	
	lv	0.50	0.28	
male	c	0.47	0.27	0.31
	lv	0.48	0.29	
	rv	0.46	0.26	

Remarks. The species is probably closely related to *Timiriasevia uptoni* TIMBERLAKE because of the

resemblance in carapace outline and ornamentation. *T. aff. uptoni* is ovate (male) or pyriform (female) in dorsal view with the maximum width at 2/5 of carapace length. The ventral surface is planar and is extended laterally by a ventrolateral keel. The surface is ornamented laterally by subconcentric costae and ventrally by longitudinal costae. The left valve has a relatively broad accommodation groove. The Tunisian specimens differ from *T. uptoni* TIMBERLAKE in the absence of nodes and in the less broadly developed ventrolateral keel. In addition, the maximum width is situated more posteriorly than in *T. uptoni*. In carapace size the present material coincides with the smallest specimen of *T. uptoni*. *T. aff. uptoni* TIMBERLAKE is also similar to *Timiriasevia* sp. of MALZ (1985) from the Lower Bajocian of Sardinia and to *Timiriasevia* sp. 1 of ROHR (1976) from the Middle Bathonian of southern France. It differs from both species in the less convex dorsal margin and in the more slender carapace outline in dorsal view. *T. uptoni* TIMBERLAKE has been recorded from the Bathonian of England (TIMBERLAKE 1982). The similarity between *T. aff. uptoni* and the above mentioned species suggests *T. aff. uptoni* belongs to an evolutionary lineage from the Lower Bajocian to the Bathonian. This evolutionary lineage was proposed by ATHERSUCH et al. (1988).

Genus *Metacypris* BRADY & ROBERTSON 1870

Type species. *Metacypris cordata* BRADY & ROBERTSON 1870.

Metacypris sinuosa n. sp.

Pl. 12, Figs. 2-3, 5-14

1994 *Metacypris* ? sp. - DEPECHE in CHARRIERE et al.: 168, pl. 1, figs. 9-21.

Derivation of name. From *sinuosus* (Lat.); according to the sinuous dorsal margin of the females.

Holotype. Female carapace, PIW1995IV 102; Pl. 12, Figs. 2-3.

Type locality. Section 6; wadi-outcrop about 6 km southwest from the center of Tataouine; near the Tataouine-Remada road; 32° 54' N / 10° 23' E; southern Tunisia.

Type horizon. Ostracode packstone intercalated between pelecypod packstones (oysters, *Modiolus*), which are overlain by a calcareous sandstone with oysters; "Beni Oussid Member", Lower Tataouine Formation; Lower-Middle Callovian; sample 5/17/9.

Paratypes. About 1100 carapaces and valves; PIW1995IV A.

Occurrence. Lower Tataouine Formation, "Beni Oussid Member",

"Krechem el Miit Member", Callovian, sections 5, 6, 7, 12, 13.

Dimensions (mm).

		l	h	w
female	c	0.62	0.38	
	c	0.58	0.33	
	c	0.56	0.30	
	c	0.56	0.33	0.33
	c	0.54		0.32
	c	0.59	0.35	0.38
	lv	0.60	0.36	
	lv	0.62	0.38	
	lv	0.68	0.40	
	rv	0.66	0.40	
male	c	0.59		0.28
	c	0.51	0.30	
	c	0.51		0.26
	c	0.59	0.31	
	c	0.57		0.27
	c	0.54	0.31	
	c	0.56	0.34	0.28

Diagnosis. The species is elongate subovate and turned up posteriorly. It has a sinuous dorsal margin in the females. The central lateral surface bears a faint reticulation which passes into weak costae on the marginal lateral and ventral surface.

Description. Carapace elongate subovate in lateral view, turned up posteriorly in females. Outline in dorsal view subrhomboidal (male) or pear-shaped (female). Some of the specimens are somewhat more elongate in lateral and dorsal view. Greatest height centrally; greatest width centrally (male) or at 2/5 of carapace length (female); greatest length at mid-height. Dorsal and ventral margins subparallel. Dorsal margin in male slightly convex in right valve and in left valve slightly sinuous with a short concavity at 1/5 of carapace length. Dorsal margin of right valve in female more strongly convex than in male; dorsal margin of left valve in female distinctly sinuous with a deep concavity at 1/5 of carapace length and strongly convex in the middle and anteriorly. Anterior margin with a very narrow compressed zone; strongly asymmetrical and gradually passing into dorsal margin. Ventral margin straight to sinuous with a more or less distinct anteroventral concavity. In lateral view ventral margin almost completely hidden by a weak ventrolateral carapace inflation. Left posterior margin in male almost symmetrically rounded and in female posterodorsally more narrowly rounded than posteroventrally. Posterior margin in right valve pointed at mid-height due to a distinct posterior cardinal angle and an oblique posterodorsal slope.

In well preserved specimens a reticulation of the central lateral surface is visible. In the marginal areas this ornamentation passes into concentric costae and on

the ventral surface into three longitudinal ridges on each valve. The left valve slightly overlaps the right valve anteriorly, anterodorsally and most strongly at the posterodorsal margin. Sexual dimorphism is pronounced and obviously documented by the strongly inflated carapace and the sinuous dorsal margin of the females.

The hinge is lophodont with narrow and elongated cardinal teeth in the right valve which merge into the selvage; they are connected by a shallow groove. The left valve has corresponding narrow elongate sockets and a thin projecting median hinge bar. The inner lamella is narrow with a small anterior vestibulum. There are about 50 normal pore canals on each valve. Marginal pore canals have not been observed. The central muscle scars consist of a subvertical row of four ovate scars.

Remarks. *Metacypris sinuosa* n. sp. coincides with *Metacypris* ? sp. of DEPECHE (1994) from the Upper Bathonian/Lower Callovian of the Central Atlas (Morocco). However, DEPECHE (1994) did not record males of the type of *M. sinuosa* n. sp.. The Tunisian species is also similar to *Bisulcocypris pusilla* ROHR 1976 but differs in the more convex and sinuous dorsal margin, the absence of a distinct compressed zone at the anterior margin and the greater size. *M. sinuosa* n. sp. is distributed throughout the Tataouine Formation, which is dated as Callovian. It predominantly occurs in brackish low diversity ostracode assemblages (METTE in prep.).

Metacypris cf. *sinuosa* n. sp.

Pl. 11, Fig. 14, Pl. 12, Figs. 1, 4

? 1994 *Metacypris* ? sp. - DEPECHE in CHARRIERE et al.: 168, pl. 1, figs. 9-21.

Material. 887 carapaces and valves.

Occurrence. Lower Tataouine Formation, "Beni Oussid Member", "Krechem el Miit Member", Callovian, sections 4, 5, 7, 11, 12, 14; Upper Tataouine Formation, Hadada Member, Upper Callovian/? Oxfordian, section 1.

Dimensions (mm).

	l	h	w
female lv	0.54	0.31	
lv	0.56	0.36	
lv	0.54	0.34	
rv	0.56	0.36	
c	0.56		0.37
c	0.59	0.33	0.34
male lv	0.54	0.31	
lv	0.49	0.30	
rv	0.59	0.35	

c	0.54	0.30	0.28
c	0.52	0.28	0.28
c	0.52	0.30	0.30
c	0.49		0.27

Remarks. The species is very similar to *Metacypris sinuosa* n. sp. The only morphologic difference is the less sinuous dorsal margin in females so that the carapace is only faintly turned up posteriorly. Additionally, the maximum carapace size of the females of *Metacypris* cf. *sinuosa* is less than the maximum carapace size of the females of *M. sinuosa*. No ornamentation has been observed. This may be due to the poor preservation of the material. The species is probably an ecological variant of *M. sinuosa* n. sp. because it is associated with marine-brackish ostracods and occurs in different sediment types than *M. sinuosa* (METTE in prep.).

Metacypris ? sp. 1

Pl. 12, Figs. 15-18

Material. 102 carapaces and valves.

Occurrence. Lower Tataouine Formation, "Beni Oussid Member", "Krechem el Miit Member", Callovian, sections 5, 12, 13.

Dimensions (mm).

	l	h	w
female rv	0.55	0.28	
rv	0.54	0.30	
rv	0.48	0.28	
lv	0.52	0.28	
c	0.51		0.29
c	0.49	0.27	
male rv	0.48	0.27	
c	0.44		0.23
c	0.44	0.24	
c	0.44		0.24

Remarks. The subovate lateral carapace outline and the strong posterior inflation of the females suggest that the species belongs to the genus *Metacypris*, although the ornamentation strongly resembles that of *Cytherelloidea*. The males and females also differ in the posterior margin; it is broadly rounded (females) or has a straight posterodorsal slope (males). The dorsal and ventral margins are parallel and the greatest width is located shortly behind the middle (males) or at 1/4 of the length (females). The lateral surface is distinctly reticulate and bears a longitudinal median ridge. The ridge is more or less sinuous; it starts at 1/4 of carapace length and disappears just before the anterior margin. The ventral surface of each valve bears 6 longitudinal ridges; the ventrolateral ridge is the most prominent one; anteriorly the ventral ridges

turn up and meet with the anterior end of the median ridge. Anteriorly, dorsally and posteriorly the lateral surface is framed by a thin marginal ridge. The anterior and posterior margins are narrowly compressed. The left valve slightly overlaps the right valve along the anterior and posterodorsal margin. The lateral surface has a shallow anterodorsal sulcus. Its distinct ornamentation suggests that *Metacypris* ? sp. 1 is probably a new species. It is left under open nomenclature because internal features are not accessible and the specimens are poorly preserved.

Family Bythocytheridae Sars 1926

Subfamily Bythocytherinae Sars 1926

Genus *Patellacythere* GRÜNDEL & KOZUR 1972

Type species. *Patellacythere williamsi* (STEPHENSON 1946).

Patellacythere sp.

Pl. 13, Figs. 4-6

? 1985 *Patellacythere* sp. - DEPECHE: pl. 31, fig. 18.

Material. 31 carapaces and valves.

Occurrence. Lower Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, sections 13, 14.

Dimensions (mm).

	l	h	w
lv	0.55	0.25	
lv	0.56	0.26	
c	0.61	0.28	0.26
c	0.55	0.26	0.25

Remarks. The species closely resembles *Patellacythere* sp. from the Upper Bathonian of France (DEPECHE 1984, 1985). However, the question of conspecificity is unresolved, because in the Tunisian specimens the carapace is somewhat more elongate, the caudal process is longer and the punctuation of the surface appears to be less dense. *Patellacythere* sp. is also similar to *Patellacythere vulsa* (JONES & SHERBORN) from the Middle Jurassic of England and to *Patellacythere paravulsa* BRAND from the Upper Bathonian of northern Germany (BRAND 1990). *Patellacythere* sp. can be clearly distinguished from *P. vulsa* (JONES & SHERBORN) by the conspicuously smaller size and the weaker ornamentation. Furthermore, the caudal process is less compressed laterally and the posteroventral margin is more distinctly angulated in the present material. The present species

differs from *P. paravulsa* BRANDT in its weak ornamentation and thick anterior and posterior margins (in dorsal view).

Family Cytheruridae MÜLLER 1894

Subfamily Cytherurinae MÜLLER 1894

Genus *Paranotacythere* BASSIOUNI 1974

Subgenus *Paranotacythere (Unicosta)* BASSIOUNI 1974

Type species. *Paranotacythere (Paranotacythere) diglypta* (TRIEBEL 1941).

Paranotacythere (Unicosta) caudata n. sp.

Pl. 13, Figs. 8-15

1987 *Paranotacythere* sp. - DEPECHE in DEPECHE et al. 1987: 246, pl. 9, fig. 2.

? 1994 *Pseudoprotocythere* sp. - DEPECHE in CHARRIERE et al.: pl. 2, figs. 16-17.

Derivation of name. From *caudatus* (Lat.); referring to the distinct caudal process.

Holotype. Female carapace, PIW1995IV 611; Pl. 13, Fig. 13.

Type locality. Section 13; outcrop at the hills of Chebania; about 38 km north of Remada; east of the Tataouine-Remada road; 32° 39' N / 10° 24' E; southern Tunisia.

Type horizon. Grey marl with intercalated fossiliferous limestones; about 8 m above a 5 m thick limestone with calcareous algae and dendroid Porifera; "Krechem el Miit Member"; Lower Tataouine Formation; Middle-Upper Callovian; sample 5/9/2.

Paratypes. 110 valves and carapaces; PIW1995IV H.

Occurrence. Lower Tataouine Formation, "Beni Oussid Member", "Krechem el Miit Member", Callovian, sections 5, 7, 11-14.

Dimensions (mm).

	l	h	w
female	lv	0.42	0.26
	lv	0.44	0.26
	lv	0.48	0.30
	lv	0.43	0.25
	c	0.46	0.27
	c	0.47	0.30
	c	0.48	0.28
	c	0.47	0.28
	c	0.45	0.25
	c	0.45	0.27
male	lv	0.48	0.23
	lv	0.52	0.25
	rv	0.47	0.22
	c	0.51	0.25
	c	0.51	0.27

Diagnosis. A species of *Paranotacythere* with concentric ridges, a broad subtriangular caudal process, distinct eye tubercles and without other tubercles.

Description. Carapace subrectangular in lateral view and subovate in dorsal view with the greatest width at the middle. Dorsal and ventral margins subparallel and straight. At the anterior cardinal angle the anterodorsal margin is distinctly elevated. Anterior margin almost symmetrically rounded in male and distinctly asymmetrically rounded in female; posterior margin straight to slightly convex and relatively steep (about 45°) climbing towards the subdorsal caudal process. Caudal process rounded triangular, broad, smooth and situated relatively low, at 3/5 of the height. The subcentral sulcus is almost smooth and divided into a short anterodorsal part and a long subcentral part; the anterodorsal part extends to a point just above mid-height and the subcentral part reaches a point just below the valve-center (females) or below mid-height (males); both parts of the sulcus taper in this direction. The lateral surface is coarsely reticulate and additionally ornamented by a maximum of three more or less distinct and discontinuous concentric ridges: They start in the anterior marginal area and at the anterior cardinal angle, run parallel to the ventral and posteroventral margin to the posterior and posterodorsal area where they turn towards the anterior; the most external ridge strongly projects above the posterodorsal margin. In some specimens two ridges continue from the posterodorsal area towards the anteroventral area. The ventral surface is covered by some longitudinal ridges. The eye tubercles are prominent.

In the right valve the entomodont-like hinge consists of short terminal dentate elements with six teeth and a straight median groove which is slightly broadened anteriorly; the left valve has corresponding terminal sockets and a median element which is crenulated anteriorly. The inner margin coincides with the line of concrescence. At the anterior margin seven simple and straight radial pore canals occur.

Sexual dimorphism is pronounced; the males are more slender in dorsal and lateral view and longer than the females.

Remarks. The hinge is more similar to that of *Orthonotacythere* ALEXANDER 1933 than that of *Paranotacythere* BASSIOUNI 1974. However, the species is classed with *Paranotacythere* because of the strongly developed anterior sulcus and the presence of ridges.

Paranotacythere (*Unic.*) *caudata* n. sp. agrees in its external features with *Paranotacythere* sp. from

the Middle Callovian of Saudi Arabia (DEPECHE et al. 1987). *Pseudoprotocythere* sp. from the Bathonian/Callovian of Morocco (CHARRIERE et al. 1994) is also very similar to the Tunisian species, but the figured specimen is poorly preserved. *P. caudata* differs from other species of *Paranotacythere* in its distinct caudal process, concentric lateral ridges and short terminal hinge elements.

Genus *Orthonotacythere* ALEXANDER 1933

Type species. *Orthonotacythere hannai* (ISRAELSKY 1929).

Orthonotacythere ? sp.

Pl. 13, Figs. 16-20

Material. 10 carapaces.

Occurrence. Lower Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, section 14, sample 3/6/4.

Dimensions (mm).

		l	h	w
female	c	0.30	0.17	0.16
	c	0.29	0.16	0.16
	c	0.31	0.17	
male	c	0.28	0.16	
	c	0.26	0.14	0.14
	c	0.29		0.16

Remarks. The small species is distinctly dimorphic, the presumed females being almost evenly convex and the males being morphologically more differentiated, compressed laterally at the posterior end and tapering towards the anterior (dorsal view). The greatest width is located in the posterior half (female) or in the posterior third (male). In females only a faint ventrolateral ridge is present and the subcentral vertical sulcus is almost invisible. The male carapace has a more pronounced subcentral vertical sulcus, a rounded posterodorsal ridge and a rounded ventrolateral alar process which broadens towards the posterior. The rounded eye tubercles are strongly developed. The lateral and ventral surface is coarsely reticulate but not ornamented by tubercles. As the material comprises carapaces only, internal features are not accessible.

Genus *Acrocythere* (NEALE 1960)

Type species. *Acrocythere hauteriviana* (BARTENSTEIN 1956).

Acrocythere sp. 1

Pl. 21, Figs. 11-17

? 1987 *Acrocythere* sp. - ROSENFELD & HONIGSTEIN in
ROSENFELD et al.: 242, pl. 2, figs. 6-7.

? 1990 *Acrocythere* sp. A - RAFARA: 424, pl. 2, figs. 13-16.

Material. 22 valves and carapaces.

Occurrence. Lower Tataouine Formation, "Krechem el Miit Member",
Middle-Upper Callovian, sections 12-15.

Dimensions (mm).

		l	h	w
female	lv	0.44	0.25	
	lv	0.43	0.25	
	c	0.47		0.28
	c	0.45	0.25	
	c	0.45	0.27	
	c	0.46	0.27	
male	lv	0.48	0.23	
	lv	0.52	0.25	
	c	0.51	0.25	
	c	0.51		0.27

Remarks. The species has a characteristic ornamentation of two lateral, two ventral, one anterodorsal and one dorsal ridge. The lateral subparallel ridges extend from the posterior end to the anterior margin; the lower one is sinuous. The upper ridge is angulated in the posterior half where a less prominent branch runs to the dorsal margin; just in front of the middle a second S-shaped branch runs to the anterodorsal ridge. The anterodorsal ridge extends from the more or less well developed eye tubercle at the anterior cardinal angle to the anterior margin, reaching it just above mid-height. The dorsal ridge overreaches the dorsal margin and is only visible in dorsal view. It extends from the posterior cardinal angle to the anterior cardinal angle with a concave deviation from the dorsal margin. The two ventral ridges run from the posteroventral area to the anteroventral margin. Additionally, the complete lateral surface is covered by a regular, coarse polygonal reticulation and some widely spaced tubercles. The internal features are poorly preserved. The hinge elements appear to be crenulated.

Acrocythere sp.1 is very similar to *Acrocythere* sp. A from the Lower Oxfordian of Madagascar (RAFARA 1990) with respect to the lateral carapace outline and ornamentation pattern. The Tunisian species has a more distinct reticulation, a distinct sinuous lower lateral ridge, a more convex carapace outline in dorsal view and is bigger. The Tunisian species also shows strong affinity to *Acrocythere* sp. from the Oxfordian of Israel (ROSENFELD et al. 1987) in its outline and ornamentation. Additionally, the two species coincide

in the carapace size. In the species from Israel reticulation is not visible, probably due to poor preservation. Due to the similarities in the ridge patterns the three mentioned species are believed to be closely related.

Genus *Paracytheridea* MÜLLER 1894

Type species. *Paracytheridea depressa* MÜLLER 1894.

Paracytheridea ? sp.

Pl. 22, Figs. 1-8

Material. 28 carapaces.

Occurrence. Lower Tataouine Formation, "Krechem el Miit Member",
Middle-Upper Callovian, section 14, sample 3/6/4.

Dimensions (mm).

	l	h	w
c	0.32	0.18	0.16
c	0.33		0.15
c	0.32	0.17	0.14
c	0.33		0.14
c	0.30	0.15	
c	0.32	0.16	
c	0.31	0.16	0.13

Remarks. The carapace outline and ornamentation suggest that the species belongs to *Paracytheridea*. The ventrolateral alar processes broaden towards the posterior producing a flat ventral surface. The lateral surface bears three marked ridges: A dorsal longitudinal ridge extends from the posterior to the anterior cardinal angle and overreaches the dorsal margin; an anterodorsal oblique ridge runs from the eye tubercle to the mid-anterior margin; an oblique median ridge runs from the posterodorsal area, where it is connected with the dorsal ridge, to the anteroventral margin. The eye tubercles are prominent. The lateral surface is additionally covered by tubercles and some specimens show a coarse reticulation which is missing in other specimens probably due to their poor preservation. Some specimens bear strongly developed tubercles along the dorsal margin. At the posterior end, near the caudal process, a spine-like process occurs. As the material comprises carapaces only, the internal features are not accessible.

Family *Protocytheridae* LUBIMOVA 1955Subfamily *Protocytherinae* LUBIMOVA 1955Genus *Hutsonia* SWAIN 1946

Type species. *Hutsonia vulgaris* SWAIN 1946.

Hutsonia minuta n. sp.

Pl. 14, Figs. 9-20

? 1991 *Bythoceratina* sp. - ROSENFELD & HONIGSTEIN: 139, pl. 2, fig. 11.

Derivation of name. From *minutus* (Lat.)= small, tiny; referring to the tiny posterior end of the caudal process.

Holotype. Male carapace, PIW1995IV 507; Pl. 14, Fig. 11.

Type locality. Section 14; outcrop about 14 km northeast of Remada and about 5 km south of Bir Fatnassia; east of the Tataouine-Remada road; 32° 26' N / 10° 27' E; southern Tunisia.

Type horizon. Grey-green marl about 5 m above a fossiliferous (gastropods, calcareous algae, echinoderms) limestone sequence of 3 m thickness; "Krechem el Miit Member"; Lower Tataouine Formation; Middle-Upper Callovian; sample 3/6/7.

Paratypes. 145 carapaces and valves; PIW1995IV G1.

Occurrence. Lower Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, section 13, 14.

Dimensions (mm).

		l	h	w
female	rv	0.38	0.22	
	rv	0.35	0.21	
	lv	0.37	0.23	
	lv	0.36	0.23	
	c	0.36	0.22	0.20
	c	0.36	0.23	
	lv	0.36	0.21	
	lv	0.35	0.19	
	c	0.36		0.21
	c	0.33	0.21	
male	rv	0.31	0.19	
	lv	0.41	0.23	
	c	0.40	0.23	0.22
	c	0.43		0.22
	c	0.40	0.22	
	lv	0.39	0.22	
	rv	0.39	0.21	
	rv	0.40	0.21	

Diagnosis. A bisulcate and unilobate *Hutsonia* ("Group 2" according to BISCHOFF 1990) with an almost smooth lateral valve surface in males and with concentric posterior ridges in females. Both sulci are connected above mid-height by a deep and broad transverse furrow and the posterior sulcus is extended posteriorly by an r-shaped subcentral furrow. The laterally compressed posterior end of the caudal process is very small and delicate.

Description. Carapace outline subrectangular to pear-shaped in lateral view and ovate (males) or pear-

shaped (females) in dorsal view with the extreme posterior end being laterally compressed. Dorsal and ventral margins subparallel; dorsal margin straight but slightly projected medially by a dorsolateral carapace inflation. Anterior margin more or less asymmetrical and broadly rounded. Ventral margin straight with a short anterior concavity and in lateral view hidden medially by the ventrolateral carapace inflation. The broadly convex posterior margin rises steeply to the pointed or narrowly rounded posterior end which is located at 3/4 of the carapace height. Greatest width centrally. Left valve overlaps right valve along all margins except extreme posterior and anterior margins. Closed carapace with ovate caudal opening.

The lateral surface is sculptured in the anterior half by two sulci separated by one lobe ("L 2" according to BISCHOFF 1990). The species therefore belongs to BISCHOFF's morphological "Group 2". The two sulci differ greatly in width: the posterior sulcus extends from the anterodorsal area to an anteroventral point at about 1/5 of carapace height, where it broadens and is U-shaped; it is directed vertically above mid-height and turns towards the anteroventral margin below mid-height; the anterior narrow sulcus runs from the anterodorsal margin to mid-height and is concave towards the anterior. The separating lobe is interrupted above mid-height providing a connection between the two sulci. The posterior sulcus is extended posteriorly by an r-shaped narrow furrow in the lower half, which is followed itself by another posteriorly bordering shallow oblique furrow. The central lateral surface is smooth except for the widely spaced openings of the lateral pore canals. The female carapace bears some faint concentric ribs at the posterior end. The ventral surface is ornamented by a few fine ribs, which continue along the posteroventral and anterior margin more or less distinctly.

Sexual dimorphism pronounced: female carapaces are shorter and taper more distinctly towards the posterior than male carapaces.

Hinge antimerodont, consisting of six terminal teeth and a coarsely crenulated shallow median groove in the right valve; left valve with corresponding loculate terminal elements and a crenulated median element.

Remarks. *Hutsonia minuta* n. sp. coincides in lateral outline and shape and arrangement of the sulci with *Bythoceratina* sp. from the Callovian of southern Israel (ROSENFELD & HONIGSTEIN 1991). The poorly preserved specimens from Israel are probably conspecific with *H. minuta*, but a more detailed examination is required. *H. minuta* differs from all other species of

Hutsonia in the shape of the sulci, the occurrence of an r-shaped subcentral furrow and the shape of the caudal process. The present species is the second pre-Oxfordian species of *Hutsonia*, besides *Hutsonia asiatica* NEALE & SINGH 1986 from India (Kachchh).

The genus *Hutsonia* shows a close similarity to *Otocythere* TRIEBEL & KLINGER 1959. The latter authors distinguished between the two genera on the basis of the absence of a distinct subcentral tubercle, the longer median hinge elements and the anterior position of the greatest height in *Hutsonia*. As a number of new species of *Hutsonia* have been published since then with variable carapace shape, ornamentation and hinge elements (SWAIN & BROWN 1972, BISCHOFF 1990) the validity of the genus *Otocythere* should be verified. *Hutsonia* and *Otocythere* are here suggested to be synonymous.

Hutsonia sp. 1

Pl. 14, Figs. 21-23, Pl. 15, Figs. 1-6

1994 *Paranotocythere* sp. - DEPECHE in CHARRIERE et al.: pl. 2, figs. 20-21.

Material. 115 carapaces and valves.

Occurrence. Lower Tataouine Formation, "Beni Oussid Member", "Krechem el Miit Member", Callovian, sections 4, 5, 7, 11, 12, 13; Upper Tataouine Formation, Hadada Member, Upper Callovian/? Oxfordian, section 1.

Dimensions (mm).

		l	h	w
female	lv	0.43	0.26	
	lv	0.4	0.30	
	lv	0.44	0.27	
	lv	0.37	0.23	
	c	0.36		0.21
	c	0.39	0.25	
	c	0.40	0.24	
	c	0.43		0.25
	c	0.46	0.23	
	c	0.54	0.30	
male	c	0.53	0.27	
	c	0.56		0.24
	c	0.56		0.23
	c	0.55	0.27	
	c			

Remarks. The species has two sulci in the anterior half, partially separated by a lobe. The sulci are connected by an interruption of the lobe above mid-height. The narrow anterior sulcus runs convexly from the anterior dorsal margin towards the anteroventral margin to a point just below mid-height. The posterior broad sulcus extends from the mid-dorsal region to a point shortly above the anterior ventral margin; it is directed obliquely towards the anteroventral

area above mid-height and vertically below mid-height. The posterior sulcus is bordered by a shallow and broad subcentral carapace depression, which is subdivided by ribs into two or three subovate dents. The lateral surface, including the subcentral carapace depression, is coarsely reticulate, except for the anterior sulci. Additionally, the marginal lateral and ventral surface bears a number of concentric ribs, which run along the posterodorsal, posterior, ventral and anterior margins; they are most prominent on the ventral surface; the external two ribs slightly overreach the posterodorsal margin. The caudal process is narrowly compressed at the posterior end. The left valve slightly overlaps the right valve at the anterior, ventral and posteroventral margins and more distinctly at the anterodorsal margin.

The antimerodont hinge consists of six terminal teeth and a coarsely crenulated shallow groove on the right valve and corresponding loculate sockets and a median element with eight or nine split crenulations on the left valve. The inner margin coincides with the line of concrescence.

Hutsonia sp. 1 is identical in its external features to *Paranotocythere* sp. of DEPECHE (in CHARRIERE et al. 1994) from the Upper Bathonian/Lower Callovian of Morocco. It differs from all other species of *Hutsonia* in its reticulation pattern and characteristic subcentral carapace depression.

Subfamily Kirtonellinae BATE 1963

Genus *Ektyphocythere* BATE 1963

Type species. *Ektyphocythere triangula* (BRAND 1961).

Ektyphocythere zoharensis ROSENFELD & GERRY 1987

Pl. 15, Figs. 7-15

1987 *Ektyphocythere zoharensis* n. sp. - ROSENFELD & GERRY in ROSENFELD et al.: 263, pl. 6, figs. 5-6.

1987 *Amicytheridea dierallaensis* (BASHA), forme B - DEPECHE in DEPECHE et al.: 232, pl. 3, figs. 13-16.

1991 *Ektyphocythere zoharensis* ROSENFELD & GERRY - ROSENFELD & HONIGSTEIN: 143, pl. 4, figs. 3-6.

Material. 236 carapaces and valves.

Occurrence. Lower Tataouine Formation, "Beni Oussid Member", "Krechem el Miit Member", Callovian, sections 5, 6, 7, 11-14.

Dimensions (mm).

		l	h	w
female	lv	0.54	0.35	
	lv	0.52	0.36	

	lv	0.56	0.36	
	lv	0.52	0.34	
	rv	0.49	0.33	
	c	0.54		0.32
	c	0.51	0.31	0.30
	*c	0.45	0.28	
	*c	0.46	0.30	0.25
male	*rv	0.49	0.24	
	rv	0.66	0.36	
	c	0.64		0.38
	c	0.59	0.34	0.35
	c	0.61	0.36	0.35
	*c	0.51	0.29	0.29
	*c	0.51	0.26	0.26

Remarks. *Ektyphocythere zoharensis* ROSENFELD & GERRY occurs in the Callovian ("*Ektyphocythere zoharensis* - zone") of Egypt (ROSENFELD et al. 1987), the Callovian-Oxfordian ("JJ-4 - zone" - "JJ-5 - zone") of southern Israel (ROSENFELD & HONIGSTEIN 1991) and the Bathonian-Middle Callovian of Saudi Arabia (DEPECHE et al. 1987).

In southern Tunisia the species is differentiated into a group with normal carapace size, which is distributed throughout the Beni Oussid Member and Krechem el Miit Member, and a group with smaller size (*, Pl. 15, Figs. 8, 14), which is restricted to the Krechem el Miit Member in sections 13 and 14 in the southern part of the investigation area. This differentiation is suggested to be ecologically induced, probably by salinity variations. In the present material the antimerodont hinge of *E. zoharensis* on the right valve is differentiated into six posterior and five anterior teeth and a shallow coarsely crenulate median groove, while the left valve has relatively deep terminal loculate sockets, a coarsely denticulate median bar with about 16 crenulations, and a broad accommodation groove.

Family Cytherideidae Sars 1925

Subfamily Cytherideinae Sars 1925

Genus *Praeschuleridea* Bate 1963

Type species. *Praeschuleridea subtrigona* (JONES & SHERBORN 1888).

Praeschuleridea sp. 1

Pl. 15, Figs. 16-17, Pl. 16, Figs. 1-8

? 1994 *Praeschuleridea* sp. - DEPECHE in CHARRIERE et al.: pl. 2, fig. 18.

Material. 409 carapaces and valves.

Occurrence. Lower Tataouine Formation, "Beni Oussid Member", "Krechem el Miit Member", Callovian, sections 6, 7, 12, 13, 14.

Dimensions (mm).

		l	h	w
female	rv	0.55	0.36	
	rv	0.56	0.37	
	rv	0.54	0.36	
	lv	0.56	0.40	
	lv	0.56	0.41	
	lv	0.56	0.42	
	lv	0.62	0.48	
	c	0.54	0.40	
	c	0.55		0.30
	c	0.64		0.33
male	c	0.65	0.43	0.33
	c	0.68	0.44	
	rv	0.63	0.37	
	rv	0.64	0.38	
	lv	0.66	0.42	
	lv	0.64	0.44	
	lv	0.68	0.44	
	lv	0.70	0.48	
	lv	0.68	0.48	

Remarks. The species shows some similarity to *Praeschuleridea quadrata* BATE 1967 from the English Bathonian, but it differs from the latter particularly in the subtriangular posterior end of the right valve. In addition, the posterior cardinal angle in the left valve is less pronounced and the males of the Tunisian species are less elongate. In contrast to *P. quadrata* the posterior is also more narrowly rounded in the males than in the females and the greatest width is situated behind the middle in both dimorphs. The anterior margin is relatively broadly compressed laterally. The anterior margin of the right valve is concave anterodorsally and the valves are clearly depressed in the anterodorsal area. As with *P. quadrata*, the left valve overlaps the right valve along all margins but most strongly dorsally. The paleo-hemimerodont hinge of *Praeschuleridea* sp.1 differs from that of *P. quadrata* in its longer median hinge element. In the present specimens the anterior and posterior terminal elements of the right valve consist of six or seven teeth (poorly preserved). On the left valve corresponding terminal loculate sockets and a long denticulate median bar occur with a broad accommodation groove above. The Tunisian species is probably conspecific with *Praeschuleridea* sp. of DEPECHE (1994) from the Upper Bathonian/Lower Callovian of Morocco (DEPECHE in CHARRIERE et al. 1994). But this remains questionable until the latter species has been described in more detail.

Praeschuleridea sp. 2

Pl. 16, Figs. 9-11

- ? 1966 *Praeschuleridea* aff. sp. 1 (LUTZE) form O OERTLI - MAYNC: 32, pl. 9, figs. 39-47.
 ? 1985 *Praeschuleridea* cf. *confossa* SHEPPARD - DEPECHE: pl. 31, figs. 6-7.
 ? 1987 *Praeschuleridea* sp. - DEPECHE et al.: 245, pl. 9, figs. 15-16.
 ? 1991 *Praeschuleridea* sp. - ROSENFELD & HONIGSTEIN: 137, pl. 1, figs. 9-12.

Material. 1 carapace and 5 valves.

Occurrence. Lower Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, section 13.

Dimensions (mm).

		l	h	w
female	lv	0.6	0.41	
	rv	0.55	0.35	
	rv	0.54	0.34	
	c	0.55	0.37	0.29

Remarks. *Praeschuleridea* sp. 2 occurs in one sample and is represented only by a few female specimens. On the right valve the posterior elements of the paleo-hemimerodont hinge consist of six teeth; on the left valve there is a broad accommodation groove above the median bar. Other internal features are not preserved. The species is similar to *Praeschuleridea* cf. *confossa* SHEPPARD 1981 from the Upper Bathonian of France (DEPECHE 1985). The latter has a more distinct posterior cardinal angle and a more steeply inclined posterodorsal margin in the right valve. The Tunisian species shows affinities with *Praeschuleridea* aff. sp. 1 (LUTZE) form O OERTLI from the Bathonian of Israel (MAYNC 1966) but, as there are no males in the present material, the determination remains uncertain. *Praeschuleridea* sp. 2 coincides in carapace outline with *Praeschuleridea* sp. of DEPECHE et al. (1987) from the Callovian of Saudi Arabia and with *Praeschuleridea* sp. of ROSENFELD & HONIGSTEIN (1991) from the Callovian-? Oxfordian of southern Israel. These specimens are regarded as being conspecific with *Praeschuleridea* aff. sp. 1 (LUTZE) (DEPECHE et al. 1987, ROSENFELD & HONIGSTEIN 1991). However, the assignment of the present specimens to the species from Saudi Arabia and Israel remains questionable because the latter have a more pronounced overlap at the ventral margin.

Genus *Schuleridea* SWARTZ & SWAIN 1946Type species. *Schuleridea acuminata* SWARTZ & SWAIN 1946.*Schuleridea angulata* n. sp.

Pl. 16, Figs. 12-14, Pl. 17, Figs. 1-7

Derivation of name. From *angulatus* (Lat.); referring to the angulated dorsum of the females.

Holotype. Female left valve, PIW1995IV 242; Pl. 17, Fig. 5.

Type locality. Section 14; outcrop about 14 km northeast of Remada and about 5 km south of Bir Fatnassia; east of the Tataouine-Remada road; 32° 26' N / 10° 27' E; southern Tunisia.

Type horizon. Dolomitic fine-grained sandstone of 20 cm thickness with pelecypods intercalated between green marls bearing fossil wood; about 1 m above the first 2 m thick massive sandstone bed; "Beni Oussid Member"; Lower Tataouine Formation; Lower-Middle Callovian; sample 3/5/3.

Paratypes. 330 carapaces and valves; PIW1995IV E1.

Occurrence. Lower Tataouine Formation, "Beni Oussid Member", "Krechem el Miit Member", Callovian, sections 5, 7, 12, 13, 14.

Dimensions (mm).

		l	h	w
female	c	0.54	0.37	
	c	0.58	0.40	0.33
	c	0.58	0.41	0.32
	c	0.54		0.30
	lv	0.61	0.44	
	lv	0.61	0.43	
male	lv	0.55	0.38	
	rv	0.56	0.34	
	c	0.72	0.42	0.32
	c	0.70	0.42	0.30
	lv	0.64	0.38	
	lv	0.78	0.46	
	rv	0.66	0.35	

Diagnosis. A species of *Schuleridea* with marked sexual dimorphism, the females being strongly convex and subangulate dorsally and the males being slender in lateral view.

Description. Carapace subtriangular and strongly arched dorsally (female) or subovate (male) in outline with the greatest height just in front of the middle and the greatest width centrally; greatest length slightly below mid-height. Left dorsal margin in females almost straight and steeply inclined towards the posterior; with a pronounced anterior and a weak posterior cardinal angle. Left dorsal margin in males gently inclined towards the posterior; broadly convex; with a weak anterior cardinal angle and merging into the posterior margin without angulation. Right dorsal margin in females gently inclined with distinct anterior and posterior cardinal angles. Right dorsal margin in males distinctly angulated anteriorly, almost parallel to the ventral margin, slightly convex and merging into the posterior margin without angulation.

Anterior margin strongly asymmetrically rounded with the right valve distinctly concave in the anterodorsal part. Ventral margin in females strongly convex and in males slightly convex; distinctly incurved in the anteromedian part. Left and right posterior margins in males narrowly rounded. Posterior margin in females subtriangular with a straight posterodorsal slope and pointed just below mid-height; angulation in right valve more distinct than in left valve. The left valve overlaps the right valve along all margins except at the posteroventral margin and most distinctly at the dorsal and ventral margins. Surface smooth; weak eye swelling with a shallow carapace depression behind on both valves. Sexual dimorphism strong; females shorter, dorsal and ventral margins in females more convex.

Hinge paleomerodont; consisting on the left valve of a very short median groove, a short anterior socket with five teeth and a long posterior socket with nine teeth. Accommodation groove small and shallow. Right valve with corresponding terminal dentate ridges bearing five anterior and nine posterior teeth. Inner margin and line of concrescence coincide. Marginal pore canals not completely preserved but very densely spaced suggesting a number of more than 30.

Remarks. *Schuleridea angulata* n. sp. shows some affinities to *Schuleridea triebeli* (STEGHAUS 1951) from the Upper Jurassic of Europe but the former tapers more distinctly towards the posterior, the anterior compressed margin is less marked and the anterior cardinal angle is less pronounced. *S. triebeli* is of greatest width posteriorly. In addition, *S. angulata* n. sp. has a shorter median hinge groove and more posterior teeth than *S. triebeli*. *Schuleridea ? ovoides* SWARTZ & SWAIN 1946 also has a more broadly rounded posterior end than the Tunisian species and the greatest width occurs behind the middle.

Schuleridea dispar n. sp.

Pl. 17, Figs. 8-12, Pl. 18, Figs. 1-6

Derivation of name. From *dispar* (Lat.)= different; referring to the length-discrepancy of the median and terminal hinge elements.

Holotype. Female carapace, PIW1995IV 316; Pl. 18, Figs. 5-6.

Type locality. Section 13; outcrop at the hills of Chebania; about 38 km north of Remada; east of the Tataouine-Remada road; 32° 39' N / 10° 24' E; southern Tunisia.

Type horizon. 2 m thick dolomitic marl; underlain by a calcareous sandstone and overlain by a thick-bedded fossiliferous limestone

(molluscs, calcareous algae); upper part of the "Beni Oussid Member"; Lower Tataouine Formation; Lower-Middle Callovian; sample 5/6/8.

Paratypes. 23 carapaces and valves; PIW1995IV E2.

Occurrence. Lower Tataouine Formation, "Beni Oussid Member", "Krechtem el Miit Member", Callovian, section 13.

Dimensions (mm).

		l	h	w
female	rv	0.57	0.34	
	rv	0.63	0.38	
	rv	0.67	0.38	
	rv	0.65	0.39	
	lv	0.66	0.46	
	lv	0.63	0.44	
	c	0.63	0.42	0.32
	c	0.66	0.45	0.32
male	rv	0.74	0.39	
	rv	0.78	0.40	
	rv	0.80	0.40	
	lv	0.78	0.47	
	lv	0.78	0.46	
	c	0.73		0.31
	c	0.74	0.43	0.34

Diagnosis. A species of *Schuleridea* with a subtriangular (female) to subovate (male) carapace outline and a hinge with extremely short median elements and very long terminal elements.

Description. Greatest height of carapace just in front of the middle; greatest width centrally; greatest length just below mid-height. Carapace strongly dimorphic; left dorsal margin in females distinctly angulated anteriorly and weakly angulated posteriorly, straight and strongly inclined towards the posterior. Left dorsal margin in males straight and gently inclined towards the posterior, with faint cardinal angles. In males and females very weak concavity behind the anterior cardinal angle of left valve. Right dorsal margin in females slightly convex and gently inclined with a distinct anterior and a faint posterior cardinal angle. Right dorsal margin in males almost straight and subparallel to ventral margin, merging into anterior and posterior margins. Anterior margin strongly asymmetric and in right valve straight to broadly convex anterodorsally. Ventral margin in left valve slightly (males) or strongly (females) convex and distinctly incurved in median part; ventral margin in right valve almost straight and slightly incurved anteromedially. Posterior margin in females subtriangular and pointed just below mid-height, rounded posteroventrally and straight posterodorsally; posterior margin in males almost symmetrically rounded, in right valve more narrowly than in left valve. Left valve overlaps right valve along all margins except

the posteroventral margin, most strongly ventrally and dorsally; dorsal overlap is somewhat roof-shaped with apex between middle and the anterior cardinal angle. Surface smooth; distinct eye swelling with a marked carapace depression behind on right valve.

Hinge paleomerodont; in right valve with extremely short dentate median ridge and very long terminal dentate ridges with seven anterior and eight or nine posterior teeth. Hinge in left valve with corresponding short median groove and terminal loculate sockets; small and shallow accommodation groove above. Muscle scars consist of a crescentic row of four oval adductors and an oval anteromedian antennal scar (type C according to BATE 1963). Inner margin and line of concrescence coincide. Anterior radial pore canals about 30 in number and in a fan-like arrangement.

Remarks. *Schuleridea dispar* n.sp. differs from *S. angulata* n. sp. in the straight and, in females, strongly inclined dorsal margin of the left valve; the more strongly developed eye swelling which only occurs on the right valve; in the shorter median hinge elements, and the more numerous anterior and posterior hinge teeth. The species resembles *S. triebeli* (STEGHAUS 1951), but *S. dispar* n. sp. tapers more distinctly towards the posterior, with the posterior end just below mid-height; it has more pronounced cardinal angles and is not laterally compressed at the anterior margin.

Genus *Afrocytheridea* BATE 1975

Type species. *Afrocytheridea laevigata* BATE 1975.

Afrocytheridea faveolata BATE 1975

Pl. 18, Figs. 7-9

- 1963 *Lophocythere* ? 4777 - GREKOFF: 1730, pl. 3, figs. 53-54.
 1963 *Lophocythere* 323 a - GREKOFF: 1730, pl. 2, fig. 47.
 1966 *Progonocythere* ? aff. *anoda* PETERSON - MAYNC: pl. 10, figs. 81-83.
 1975 *Afrocytheridea faveolata* n. sp. - BATE: 196, pl. 8, figs. 12-13.
 1987 *Afrocytheridea faveolata* BATE - DEPECHE et al.: 243, pl. 7, figs. 1-10.
 1987 *Afrocytheridea* cf. *faveolata* BATE - DEPECHE et al.: 243, pl. 7, figs. 11-15.
 1991 *Afrocytheridea* cf. *faveolata* BATE - ROSENFELD & HONIGSTEIN: 439, pl. 3, figs. 1-10.
 ? 1993 *Afrocytheridea somaliensis* n. sp. - METTE: 92, pl. 6, figs. 1-13.

Material. 15 carapaces and valves.

Occurrence. Lower Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, section 14, sample 3/6/4.

Dimensions (mm).

		l	h	w
female	c	0.67	0.40	0.39
	c	0.69	0.40	0.38
	c	0.70	0.40	0.34
	c	0.70	0.40	0.38

Remarks. The species almost coincides in carapace outline and ornamentation with *Afrocytheridea* cf. *faveolata* BATE of DEPECHE et al. (1987) and with the more slender specimens of *A. faveolata* BATE of ROSENFELD & HONIGSTEIN (1991). The only difference is the replacement of the finer ribs in favour of a very fine irregular network in the intercostal areas in the present material. However, this difference may fall within intraspecific variability caused by ecological factors. Due to their different carapace outline *A. faveolata* in DEPECHE et al. (1987) and the more squat specimens in ROSENFELD & HONIGSTEIN (1991) (pl. 3, figs. 9-10) are possibly a subspecies of *A. faveolata*; however this needs to be examined in more detail.

In the present specimens the median element of the lobodont hinge bears two anterior teeth in accordance to *A. faveolata*. The Tunisian material is also closely related to *A. somaliensis* METTE 1993 from the Lower Oxfordian of northern Somalia. The latter species has four anteromedian hinge-teeth. *A. faveolata* is widely distributed in the Ethiopian Province including the Callovian and Oxfordian of Saudi Arabia (DEPECHE et al. 1987), the Callovian of Madagascar (GREKOFF 1963) and Tanzania (BATE 1975), and the Upper Bathonian-Oxfordian of Israel (MAYNC 1966, ROSENFELD & HONIGSTEIN 1991). In southern Tunisia it has been found only in one sample from the Middle-Upper Callovian "Krechem el Miit Member" (lower Tataouine Formation).

Family *Progonocytheridae* SYLVESTER-BRADLEY 1948

Subfamily *Progonocytherinae* SYLVESTER-BRADLEY 1948

Genus *Micropneumatocythere* BATE 1963

Type species. *Micropneumatocythere convexa* BATE 1963.

Micropneumatocythere cf. *subconcentrica* (JONES 1884)

Pl. 18, Figs. 10-12, Pl. 19, Figs. 1-8

- ? 1884 *Cythere subconcentrica* n. sp. - JONES: 768, pl. 34, figs. 28-29.
- ? 1888 *Cytheridea limaciformis* n. sp. - JONES & SHERBORN: 209, pl. 3, fig. 12a-c.
- ? 1967 *Micropneumatocythere subconcentrica* (JONES) - BATE: 60, pl. 21, figs. 1-13.
- ? 1976 *Micropneumatocythere subconcentrica* (JONES) - ROHR: 82, pl. 14, figs. 4-12.
- ? 1979 *Micropneumatocythere subconcentrica* (JONES) - BATE & SHEPPARD: 85, pl. 1, figs. 8-9.
- ? 1984 *Micropneumatocythere subconcentrica* (JONES) - DEPECHE: 257, pl. 14, figs. 2-3, 5-6.
- ? 1994 *Micropneumatocythere* sp. - DEPECHE in CHARRIERE et al.: pl. 2, fig. 19.

Material. About 1000 carapaces and valves.

Occurrence. Lower Tataouine Formation, "Beni Oussid Member", "Krechem el Miit Member", Callovian, sections 4, 5, 7, 11-15.

Dimensions (mm).

		l	h	w
female	rv	0.52	0.32	
	lv	0.56	0.38	
	c	0.56	0.33	
	c	0.48		0.32
	c	0.51		0.34
	c	0.52	0.35	0.35
male	rv	0.59	0.31	
	lv	0.60	0.36	
	c	0.58	0.34	
	c	0.58		0.36
	c	0.62		0.38
	c	0.59		0.34

Remarks. The species has a relatively strong convex subovate outline in lateral and dorsal view. It is characterized by a marked posterior cardinal angle, especially in the female and in the right valve. The posterior margin is pointed centrally with a concave or occasionally straight (male) posterodorsal margin and a slightly convex posteroventral margin in the right valve and has a straight posterodorsal and a convex posteroventral margin in the left valve. The left valve overlaps the right valve along all margins but most strongly at the dorsal and posterior margins. The lateral surface is reticulate and the ventral surface bears five or six longitudinal ridges on each valve. The antimerodont hinge consists of seven posterior and five anterior teeth and a loculate median groove in the right valve and in the left valve has loculate terminal sockets, a denticulate median bar and an accommodation groove.

Micropneumatocythere subconcentrica frequently occurs in the Upper Bathonian of England and France. The present material is very similar to *M. subconcentrica* (JONES 1884) and especially to the material from the Bathonian of southern France

(ROHR 1976) which is similarly ornamented. According to MALZ (1985) a closely related species of *Micropneumatocythere* also occurs in the Bathonian of Sardinia. But the Tunisian species appears to have a more pronounced posterior cardinal angle than *M. subconcentrica*. In addition, in the Tunisian specimens the greatest height is not located centrally but shortly in front of the middle. *M. subconcentrica* from the Upper Bathonian of France (DEPECHE 1984) is also reticulate and differs only in its smaller carapace size. *Micropneumatocythere* sp. from the Upper Bathonian/Lower Callovian of Morocco (CHARRIERE et al. 1994) also strongly resembles the Tunisian material, but has not been described in detail.

There is also a distinct affinity to *Micropneumatocythere globosa* BATE 1964. But the latter is distinguished from *M. subconcentrica* by the smaller carapace size and the weaker ventral ridges (BATE 1964, ROHR 1976). The present material differs from *Micropneumatocythere laevireticulata* ROSENFELD & HONIGSTEIN 1991 in the more pronounced sexual dimorphism, the males being longer than the females. Moreover the Tunisian species is not laterally compressed at the anterior margin. In this feature the present species also differs from *Micropneumatocythere* sp. 1 from Saudi Arabia (DEPECHE et al. 1987). In *Micropneumatocythere convexa* BATE 1963b the position of the ventrolateral carapace inflation varies from almost median to posterior and the most significant overlap is situated at the anterior margin and the mid-dorsal margin.

Genus *Pneumatocythere* BATE 1963

Type species. *Pneumatocythere bajociana* BATE 1963.

Pneumatocythere ? cf. *juglandiformis* MALZ 1985

Pl. 19, Figs. 9-15

- ? 1963b *Progonocythere* ? *juglandica* (JONES 1884) - OERTLI: pl. 28/2b.
- ? 1968 *Fastigatocythere* sp. - DEPECHE: 212, pl. 1, figs. 7-9.
- ? 1976 *Lophocythere* (*Fastigatocythere*) aff. *juglandica* (JONES 1884) - ROHR: 68, pl. 11, figs. 1-10.
- ? 1985 *Pneumatocythere* ? *juglandiformis* n. sp. - MALZ: 317, pl. 4, figs. 36-45.
- ? 1994 *Kinkellina* cf. *triangulata* BATE 1975 - DEPECHE in CHARRIERE et al.: 169, pl. 2, figs. 1-2.

Material. 55 carapaces and valves.

Occurrence. Lower Tataouine Formation, "Beni Oussid Member", "Krechem el Miit Member", Callovian, sections 4, 5, 12, 13; upper Tataouine Formation, Hadada Member, Upper Callovian/? Oxfordian,

section 1.

Dimensions (mm).

		l	h	w
female	c	0.61	0.37	
	c	0.61	0.38	0.37
	c	0.62		0.42
	c	0.67		0.42
	lv	0.57	0.37	
	lv	0.68	0.42	
male	lv	0.68	0.40	
	c	0.73		0.40
	c	0.76	0.42	0.42
	c	0.72	0.39	
lv	0.76	0.42		

Remarks. Because of the relatively small number of specimens and their poor preservation internal features could not be investigated in detail. Therefore the generic determination is questionable. The females of the species coincide with *Pneumatocythere* ? *juglandiformis* MALZ 1985 from the Bathonian of Sardinia in carapace outline, ornamentation and antimerodont hinge type which suggest that the Sardinian and Tunisian species are probably closely related. However, the specimens in the present material are conspicuously smaller than *P.?* *juglandiformis*. Another difference is the more pronounced sexual dimorphism of the Tunisian species. The males of the present species are more elongate and at the posterior almost symmetrically rounded and broadly compressed laterally. According to MALZ (1985) *P.?* *juglandiformis* is conspecific with *Lophocythere* (*Fastigatocythere*) aff. *juglandica* from the Bathonian of southern France (ROHR 1976). The females of *Kinkellina* cf. *triangularata* BATE 1975 from the Upper Bathonian/Lower Callovian of Morocco (CHARRIERE et al. 1994) also have the same carapace outline and ornamentation as the females of the Tunisian material. Unfortunately there are no males documented in CHARRIERE et al. (1994).

A relationship with *Amicytheridea triangularata* BATE 1975 is excluded by the lophodont hinge type and the distinct triangular carapace outline of the latter species.

Genus *Fastigatocythere* WIENHOLZ 1967

Type species. *Fastigatocythere rugosa* WIENHOLZ 1967.

Fastigatocythere triangularis n. sp.

Pl. 20, Figs. 9-18

? 1975 *Fastigatocythere* aff. *brentonensis* (DINGLE 1972) - BATE: 186, pl. 6, figs. 9-10.

1994 *Fastigatocythere* aff. *brentonensis* (DINGLE 1972) - DEPECHE in CHARRIERE et al.: 169, pl. 2, figs. 3-6.

Derivation of name. From triangulus (Lat.); referring to the triangular carapace outline.

Holotype. Female carapace, PIW1995IV 122; Pl. 20, Fig. 10.

Type locality. Section 13; outcrop at the hills of Chebania; about 38 km north of Remada; east of the Tataouine-Remada road; 32° 39' N / 10° 24' E; southern Tunisia.

Type horizon. Grey marl intercalated with fossiliferous limestones; about 12 m below the Ghoumrassen Limestone; "Krechem el Miit Member"; Lower Tataouine Formation; Middle-Upper Callovian; sample 5/9/6.

Paratypes. More than 280 carapaces and valves; PIW1995IV B.

Occurrence. Lower Tataouine Formation, "Beni Oussid Member", "Krechem el Miit Member", Callovian, sections 4, 5, 7, 11-14; upper Tataouine Formation, Hadada Member, Upper Callovian/? Oxfordian, section 1.

Dimensions (mm).

		l	h	w
female	c	0.50		0.30
	c	0.54		0.34
	c	0.49	0.30	
	c	0.49	0.31	
	lv	0.56	0.34	
	lv	0.54	0.32	
	lv	0.52	0.30	
	lv	0.48	0.30	
	lv	0.48	0.27	
	male	c	0.53	0.28
c		0.62		0.28
c		0.56	0.31	0.28
c		0.56	0.29	
lv		0.60	0.32	
lv		0.64	0.34	
lv		0.60	0.32	

Diagnosis. A species of *Fastigatocythere* with a subtriangular carapace outline; weakly ornamented by a ventrolateral ridge and more or less distinct oblique lateral ridges.

Description. Carapace subtriangular and strongly arched dorsally in lateral view and subrhomboidal in dorsal view. Greatest length in lower half of carapace; greatest height at anterior cardinal angle at 2/3 of carapace length; greatest width centrally. Dorsal margin straight in right valve and straight to slightly convex in left valve; steeply inclined towards posterior. Cardinal angles in left valve rounded and in right valve more distinct, particularly the posterior one. Anterior margin broadly and strongly asymmetrical rounded. Ventral margin straight with an

anteromedian concavity and centrally hidden by a ventrolateral carapace inflation. Posterior margin pointed at 1/3 of the height with a short straight to slightly concave (right) or slightly convex (left) posterodorsal slope. Anterior and anteroventral margin broadly compressed and posterior margin narrowly compressed laterally. Left valve overlaps right valve along anterodorsal, dorsal and posterior margins. Ventral surface of each valve bears four weak ridges. The ventral surface is delimited from the lateral surface by a more or less strong ventrolateral wing-like ridge which is most prominent in the median part and diminishes near the anterior and posterior compressed zones. The lateral surface is almost smooth or covered by more or less distinct ridges which are oriented in the posterior area subconcentrically; in the middle and anteriorly they run slightly obliquely from the dorsal margin towards the ventral margin. The lateral surface is separated from the anterior compressed zone by an oblique anterior ridge which starts at the anterior cardinal angle. Behind and below the anterior cardinal angle lies a more or less distinct oblique carapace-depression.

The entomodont hinge consists of nine posterior and seven anterior teeth and a denticulate median groove in the right valve and corresponding loculate terminal sockets, a denticulate median bar and a long and relatively broad accommodation groove above. Inner margin and line of concrescence coincide.

Remarks. The species coincides in external features with *Fastigatocythere* aff. *brentonensis* DINGLE 1972 from the Upper Bathonian/Lower Callovian of Morocco (CHARRIERE et al. 1994). *F.* aff. *brentonensis* (DINGLE) from the Kimmeridgian of Tanzania (BATE 1975) is also very similar, but the Tunisian species is less strongly ornamented. Unfortunately, BATE found only three relatively small valves, probably juveniles. Therefore the assignment of the Tunisian material to the species from Tanzania remains uncertain.

F. triangularis n. sp. is similar in carapace outline to *Majungaella brentonensis* (DINGLE 1972) but it differs from the latter in its greater number of terminal hinge teeth, lack of reticulation, long anterior compressed zone and distinct sexual dimorphism.

Family **Trachyleberididae** SYLVESTER-BRADLEY
1948

Subfamily **Exophthalmocytherinae** GRÜNDEL 1966

Tribe **Exophthalmocytherini** GRÜNDEL 1966

Genus *Exophthalmocythere* TRIEBEL 1938

Type species. *Exophthalmocythere mamillata* TRIEBEL 1938.

Exophthalmocythere ? kidodensis ROSENFELD &
GERRY 1987

Pl. 21, Figs. 7-10

1987a *Exophthalmocythere kidodensis* n. sp. - ROSENFELD &
GERRY in ROSENFELD et al.: 264, pl. 6, figs. 7-9.

1987b *Exophthalmocythere ? kidodensis* ROSENFELD &
GERRY - ROSENFELD et al.: 243, pl. 3, fig. 1.

1991 *Exophthalmocythere ? kidodensis* ROSENFELD &
GERRY - ROSENFELD & HONIGSTEIN: 140, pl. 4, figs. 1-
2.

Material. 3 carapaces.

Occurrence. Lower Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, section 14, sample 3/6/4.

Dimensions (mm).

l	h	w
0.64	0.34	0.43
0.56	0.30	0.27
0.56	0.30	0.32

Remarks. In contrast to the material from Egypt the Tunisian specimens bear 10 round denticles on the anterior rim.

Exophthalmocythere ? kidodensis ROSENFELD & GERRY 1987 is indicative of the Lower Oxfordian ("*Exophthalmocythere ? kidodensis* - Zone") in Israel and Egypt (Sinai) and not known there from older strata. In southern Tunisia it has been found only in one sample at the base of the "Krechem el Miit Member" which is Middle to Late Callovian in age. In Israel and Egypt the species is also represented by only a few specimens.

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Plates 1-22

(all specimens are coated with gold and photographed using a
ZEISS DSM 962 Scanning Electron Mikroscope)

Plate 1

Figs. 1-4. *Cytherella* cf. *fullonica* JONES & SHERBORN, sample 5/9/6, section 13, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian.

1, 4. Male carapace, 1: left side, 4: dorsal view, PIW1995IV 538.

2-3. Female carapace, 2: left side, 3: dorsal view, PIW1995IV 539.

Figs. 5-8. *Cytherella* cf. *index* OERTLI, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian.

5. Male right valve, sample 5/9/6, section 13, PIW1995IV 545.

6-7. Female carapace, 6: left side, 7: dorsal view, sample 3/6/11, section 14, PIW1995IV 541.

8. Male carapace, dorsal view, sample 5/9/6, section 13, PIW1995IV 544.

Fig. 9. *Cytherella* aff. *index* OERTLI, ? juvenile carapace, left side, sample 5/9/6, section 13, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 547.

Figs. 10-12. *Cytherella* sp. 1, Tataouine Formation.

10. Female carapace, dorsal view, sample 5/6/8, section 13, "Beni Oussid Member", Lower-Middle Callovian, PIW1995IV 526.

11-12. Male carapace, 11: left side, 12: dorsal view, sample 5/13/3, section 5, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 525.

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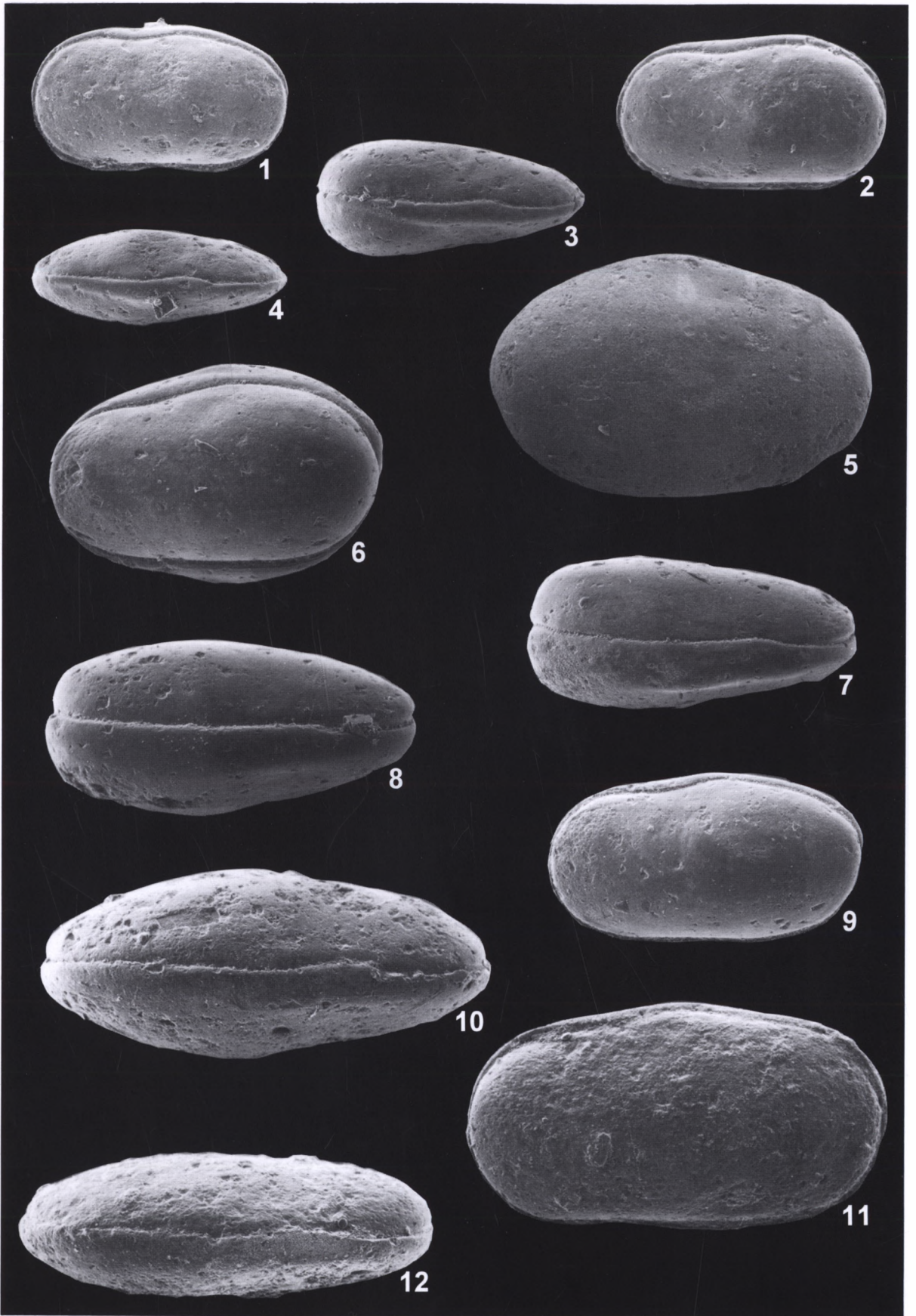


Plate 2

Figs. 1-5. *Cytherella* sp. 1, Tataouine Formation.

1. Female left valve, sample 5/6/8, section 13, "Beni Oussid Member", Lower-Middle Callovian, PIW1995IV 528.
2. Male carapace, left side, sample 5/6/8, section 13, "Beni Oussid Member", Lower-Middle Callovian, PIW1995IV 526.
3. Male left valve, sample 5/6/8, section 13, "Beni Oussid Member", Lower-Middle Callovian, PIW1995IV 527.
4. Female right valve, sample 5/13/3, section 5, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 524.
5. Male right valve, sample 5/16/8, section 7, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 523.

Figs. 6-8. *Cytherella* sp. 2, Tataouine Formation, "Beni Oussid Member", Lower-Middle Callovian.

6. Male left valve, sample 5/6/8, section 13, PIW1995IV 532.
7. Female carapace, dorsal view, sample 2/27/12, section 12, PIW1995IV 534.
8. Male carapace, dorsal view, sample 5/6/8, section 13, PIW1995IV 529.

all figures: x 80



Plate 3

Figs. 1-5. *Cytherella* sp. 2, Tataouine Formation, x 80.

1. Male carapace, left side, sample 5/6/8, section 13, "Beni Oussid Member", Lower-Middle Callovian, PIW1995IV 529.
2. Female carapace, left side, sample 5/13/3, section 5, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 534.
3. Male right valve, sample 5/13/3, section 5, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 533.
4. Female right valve, sample 5/16/8, section 7, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 530.
5. Female left valve, sample 5/16/8, section 7, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 531.

Figs. 6-8. *Cytherelloidea* aff. *jugosa* (JONES), sample 5/9/10, section 13, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, x 90.

6. Right valve, PIW1995IV 647.
- 7-8. Carapace, 7: left side, 8: dorsal view, PIW1995IV 646.

Fig. 9. *Cytherelloidea* cf. *difficila* LUBIMOVA & MOHAN, right valve, sample 3/6/10, section 14, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 834, x 90.

Figs. 10-11. *Bairdia hilda* JONES, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, x 80.

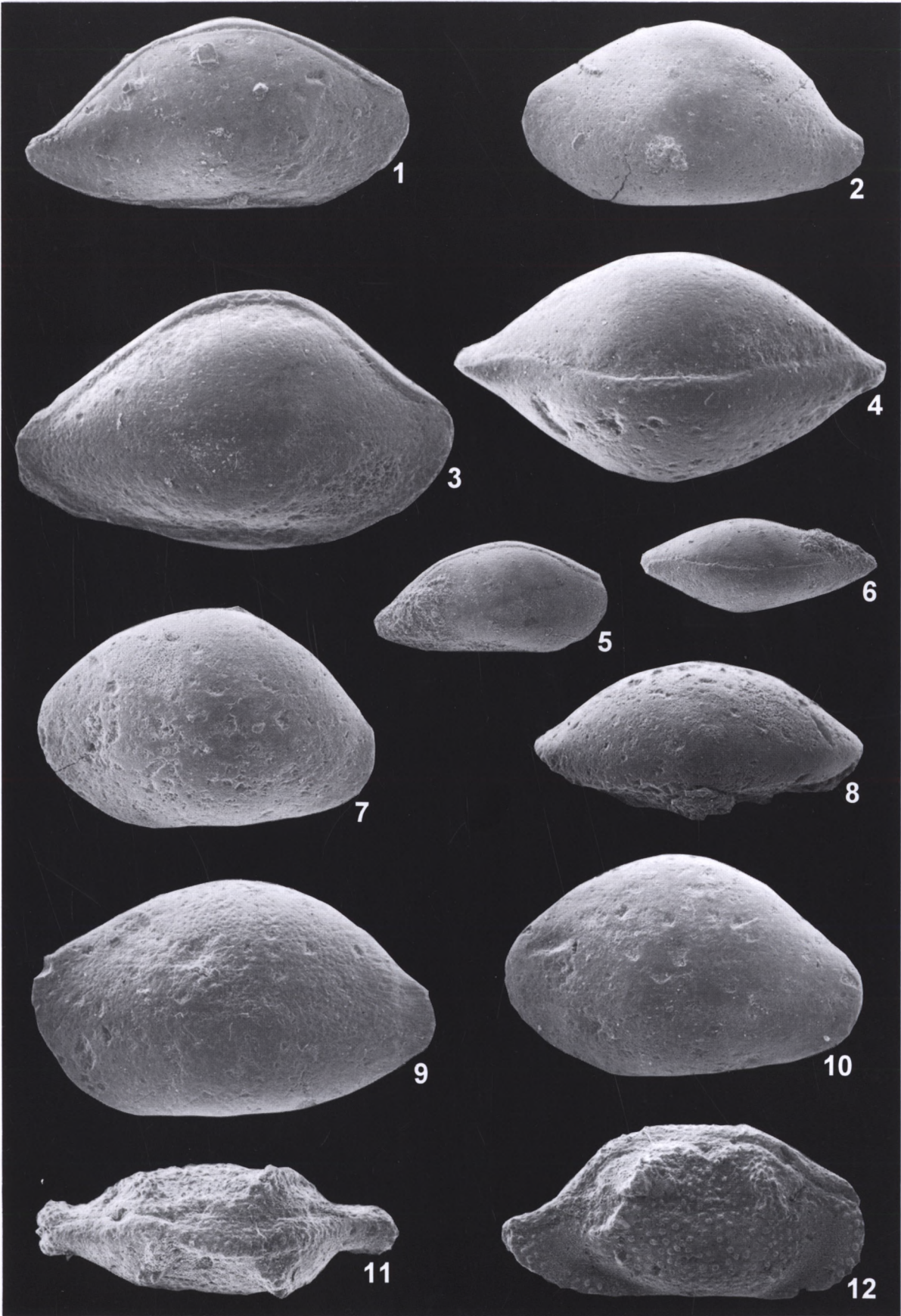
10. Carapace, dorsal view, sample 3/6/4, section 14, PIW1995IV 757.
11. Carapace, dorsal view, sample 5/9/6, section 13, PIW1995IV 756.



Plate 4

- Figs. 1-2. *Bairdia hilda* JONES, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian.
1. Carapace, right side, sample 5/9/6, section 13, PIW1995IV 756.
 2. Left valve, sample 3/6/4, section 14, PIW1995IV 755.
- Figs. 3-4. *Bairdia* aff. *hilda* JONES, carapace, sample 3/17/10, section 15, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 760.
3. right side.
 4. dorsal view.
- Figs. 5-6. *Bairdia* sp. 1, carapace, sample 3/6/4, section 14, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 758.
5. right side.
 6. dorsal view.
- Figs. 7-8. *Bairdia* sp. 2, left valve, sample 3/5/3, section 14, Tataouine Formation, "Beni Oussid Member", Lower Middle Callovian, PIW1995IV 759.
7. external view.
 8. dorsal view.
- Fig. 9. *Bairdia* sp. 3, left valve, sample 5/16/8, section 7, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 761.
- Fig. 10. *Bairdia* cf. sp. 2, left valve, sample 5/16/8, section 7, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 762.
- Figs. 11-12. *Ptychobairdia* ? sp., carapace, sample 3/6/4, section 14, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 754.
11. dorsal view.
 12. right side.

all figures: x 80



Fakouss Formation, Lower Palaeogene, BIVIER-SIV 7512, 80

Plate 5

- Figs. 1-2. *Bairdia* ? sp., carapace, sample 5/13/7, section 5, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 863, x 80.
1. right side,
 2. dorsal view. s
- Figs. 3-5. *Bythocypris* ? sp. 1, sample 5/6/2, section 13, Tataouine Formation, "Beni Oussid Member", Lower-Middle Callovian, X 80.
- 3-4. Carapace, 3: dorsal view, 4: right side, PIW1995IV 521.
 5. Left valve, PIW1995IV 522.
- Figs. 6-8. *Bythocypris* ? sp. 2, sample 5/17/14, section 6, Tataouine Formation, "Beni Oussid Member", Lower- Middle Callovian, X 80.
- 6-7. Carapace, 6: dorsal view, 7: right side, PIW1995IV 518.
 8. Carapace, left side, PIW1995IV 520.
- Figs. 9-10. *Bythocypris* ? sp., carapace, sample 5/17/9, section 6, Tataouine Formation, "Beni Oussid Member", Lower-Middle Callovian, PIW1995IV 516, x 100.
9. dorsal view.
 10. right side.
- Figs. 11-12. *Macrocypris* sp., carapace, sample 5/9/8, section 13, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 669, x 90.
11. right side.
 12. dorsal view.
- Fig. 13. *Paracypris* ? sp., carapace, left side, sample 5/9/6, section 13, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 667, x 90.

Continuation of plate 6

- Figs. 18-19. *Darwinula incurva* BATE, (? juvenile) carapace, sample 3/13/18, section 8, lower Techout Formation. Lower Bathonian, PIW1995IV 750, x 80.
18. dorsal view.
 19. right side.
- Fig. 20. *Darwinula techoutensis* n. sp., holotype, carapace, dorsal view, sample 3/13/17, section 8, lower Techout Formation, Lower Bathonian, PIW1995IV 751, x 80.

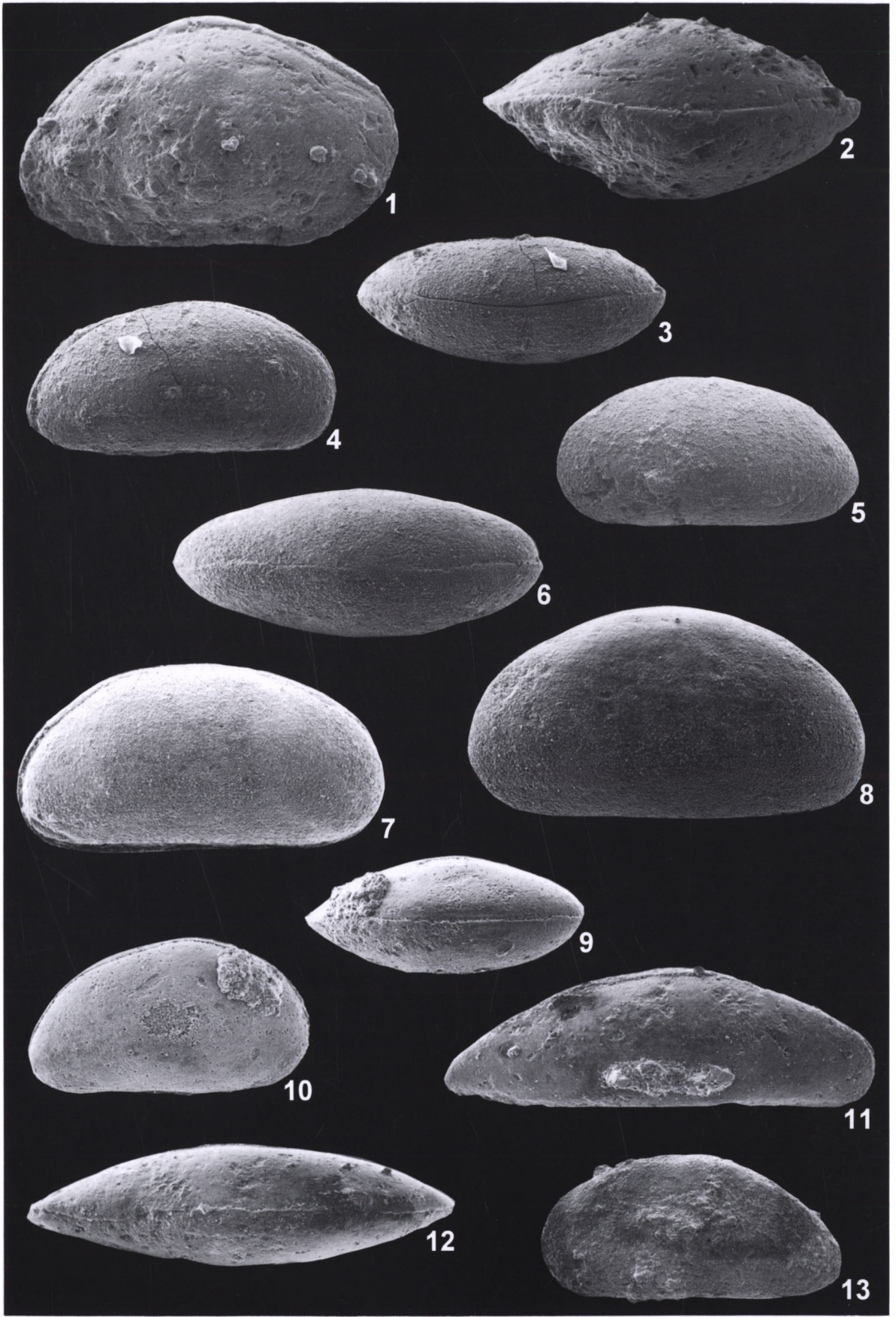


Plate 6

- Fig. 1. *Paracypris* aff. *contermia* LUBIMOVA & MOHAN, carapace, left side, sample 3/1/1, section 12, Tataouine Formation, "Beni Oussid Member", Lower-Middle Callovian, PIW1995IV 664, x 90.
- Fig. 2. *Paracypris* sp. 1, right valve, sample 5/9/8, section 13, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 671, x 90.
- Fig. 3, 5. gen. et sp. indet., carapace, sample 5/17/9, section 6, Tataouine Formation, "Beni Oussid Member", Lower-Middle Callovian, PIW1995IV 672, x 80.
3. dorsal view.
5. left side.
- Figs. 4, 6. *Pontocyprrella* ? sp. 1, carapace, sample 3/13/15, section 8, lower Techout Formation, Lower Bathonian, PIW1995IV 657, x 90.
- 4 dorsal view.
6. right side.
- Fig. 7-8. *Pontocyprrella* ? sp. 2, carapace, sample 3/6/4, section 14, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 661, x 90.
7. right side.
8. dorsal view.
- Figs. 9-10. gen. et sp. indet., carapace, sample 3/6/4, section 14, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 826, x 90.
9. dorsal view.
10. right side.
- Figs. 11-12. gen. et sp. indet., sample 5/17/14, section 6, Tataouine Formation, "Beni Oussid Member", Lower-Middle Callovian., x 90.
- 11: Carapace, right side, PIW1995IV 653.
12: Carapace, dorsal view, PIW1995IV 652.
- Figs. 13-17. *Darwinula* cf. *leguminella* (FORBES) JONES, x 80.
- 13-14, 16-17. Section 8, lower Techout Formation, Lower Bathonian.
13. Left valve, sample 3/13/18, PIW1995IV 748.
14. Right valve, sample 3/13/18, PIW1995IV 747.
- 16-17. Carapace, 16: dorsal view, 17: right side, sample 3/13/18, PIW1995IV 746.
15. Carapace, dorsal view, sample 3/21/2, section 10, upper Krachoua Formation, Upper Bajocian/? Lower Bathonian, PIW1995IV 749.

Continuation on plate 5

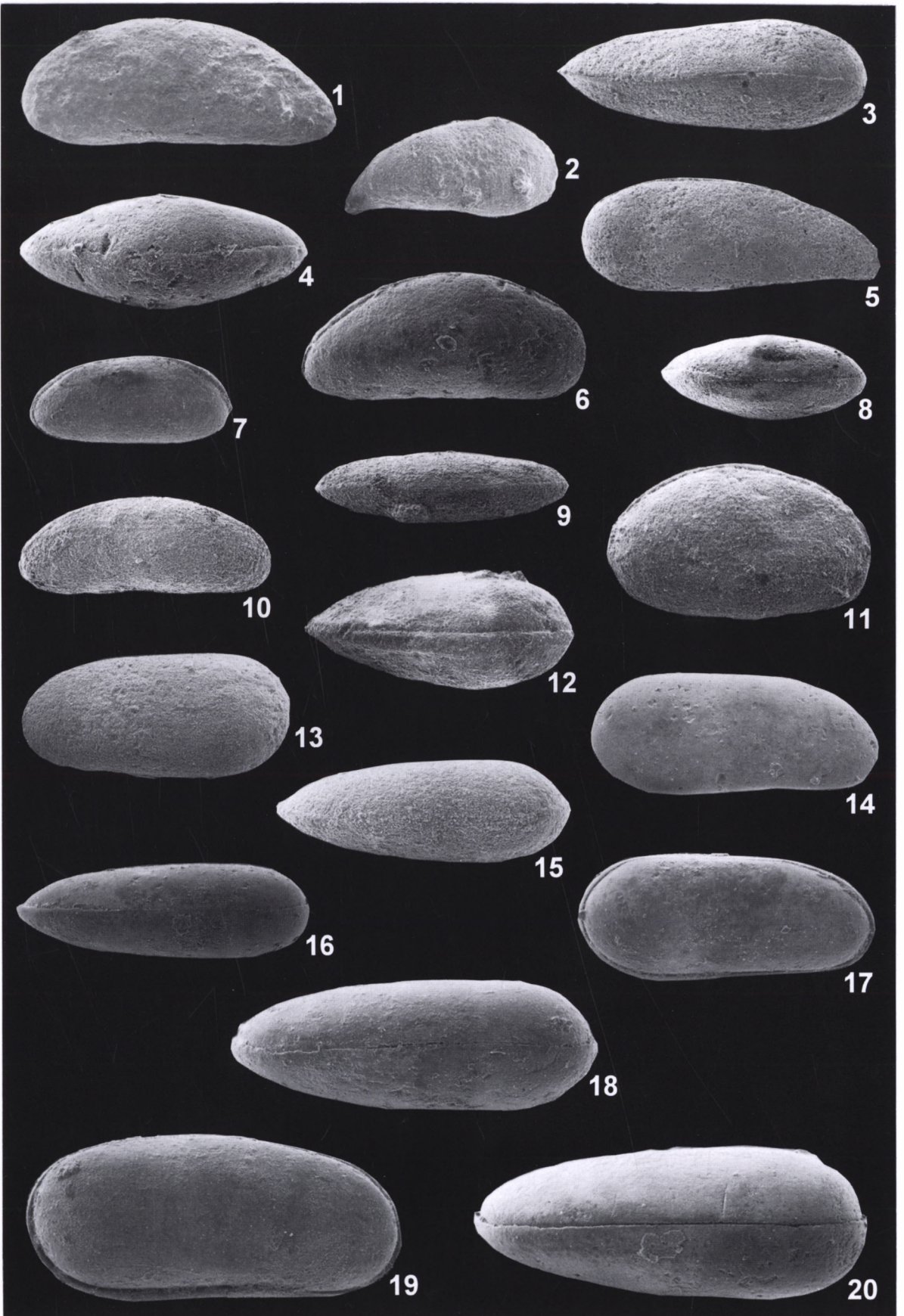


Plate 7

Figs. 1-2, 4. *Darwinula techoutensis* n. sp..

1. Holotype, carapace, right side, sample 3/13/17, section 8, lower Techout Formation, Lower Bathonian, PIW1995IV 751.
2. Carapace, left side, sample 3/13/17, section 8, lower Techout Formation, Lower Bathonian, PIW1995IV 752.
4. Carapace, right side, sample 3/21/2, section 10, upper Krachoua Formation, Upper Bajocian/? Lower Bathonian, PIW1995IV 753.

Figs. 3, 6-10. *Fabanella sarda* MALZ, sample 3/21/4, section 10, upper Krachoua Formation, Upper Bajocian/? Lower Bathonian.

3. Male right valve, PIW1995IV 724.
6. Female left valve, PIW1995IV 718.
7. Male left valve, PIW1995IV 719.
8. Female right valve, PIW1995IV 722.
9. Male left valve, PIW1995IV 720.
10. Male right valve, PIW1995IV 723.

Figs. 11-12. *Fabanella bathonica* (OERTLI), sample 3/13/15, section 8, lower Techout Formation, Lower Bathonian.

11. Female carapace, dorsal view, PIW1995IV 716.
12. Female carapace, ventral view, PIW1995IV 715.

all figures: x 80



Plate 8

Figs. 1-4. *Fabanella bathonica* (OERTLI), sample 3/13/15, section 8, lower Techout Formation, Lower Bathonian, x 80.

1. Female carapace, right side, PIW1995IV 714.
2. Male carapace, left side, PIW1995IV 717.
3. Female left valve, internal view, PIW1995IV 712.
4. Male carapace, dorsal view, PIW1995IV 713.

Figs. 5-6, 8. *Fabanella* sp. 1, sample 3/20/4, section 10, lower Krachoua Formation, Bajocian, x 80.

5. Male right valve, PIW1995IV 728.
6. Male right valve, internal view, PIW1995IV 726.
8. Female right valve, PIW1995IV 727.

Figs. 7, 9-10. *Fabanella* ? sp., sample 3/20/4, section 10, lower Krachoua Formation, Bajocian, x 90.

- 7, 9. Female carapace, 7: dorsal view, 9: right side, PIW1995IV 730.
10. Male carapace, right side, PIW1995IV 729.

Figs. 11-12. *Klieana* sp. 1, sample 3/20/4, section 10, lower Krachoua Formation, Bajocian, x 100.

11. Carapace, right side, PIW1995IV 732.
12. Carapace, dorsal view, PIW1995IV 733.

Figs. 13-14. *Klieana* sp. 2, sample 3/4/8, section 14, Tataouine Formation, "Beni Oussid Member", Lower-Middle Callovian, x 80.

13. Right valve, PIW1995IV 832.
14. Left valve, PIW1995IV 831.

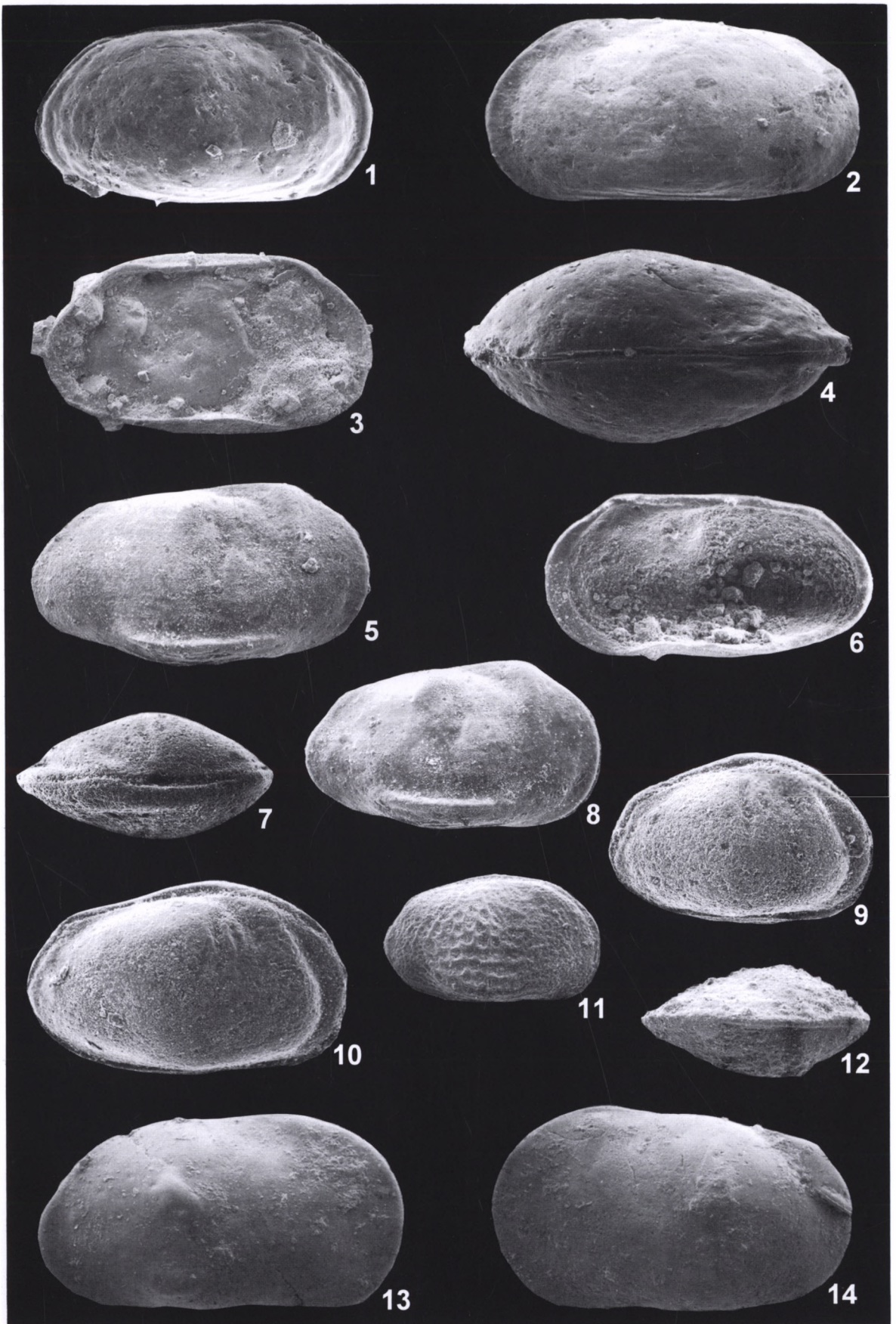


Plate 9

- Fig. 1. *Klieana* sp. 2, carapace, dorsal view, sample 3/4/8, section 14, Tataouine Formation, "Beni Oussid Member", Lower-Middle Callovian, PIW1995IV 833, x 80.
- Figs. 2-4. *Limnocythere* sp., sample 3/21/2, section 10, upper Krachoua Formation, Upper Bajocian/? Lower Bathonian, x 90.
- 2, 4. Female carapace, 2: right side, 4: dorsal view, PIW1995IV 741.
3. Female carapace, right side, PIW1995IV 743.
- Figs. 5-11. *Theriosynoecum daharensense* n. sp., section 8, lower Techout Formation, Lower Bathonian, x 80.
5. Male left valve, internal view, sample 3/13/17, PIW1995IV 560.
- 6, 9. Female carapace, 6: dorsal view, 9: left side, sample 3/13/18, PIW1995IV 557.
- 7-8. Male carapace, 7: dorsal view, 8: right side, sample 3/13/17, PIW1995IV 561.
- 10-11. Holotype, female carapace, 10: ventral view, 11: right side, sample 3/13/18, PIW1995IV 558.

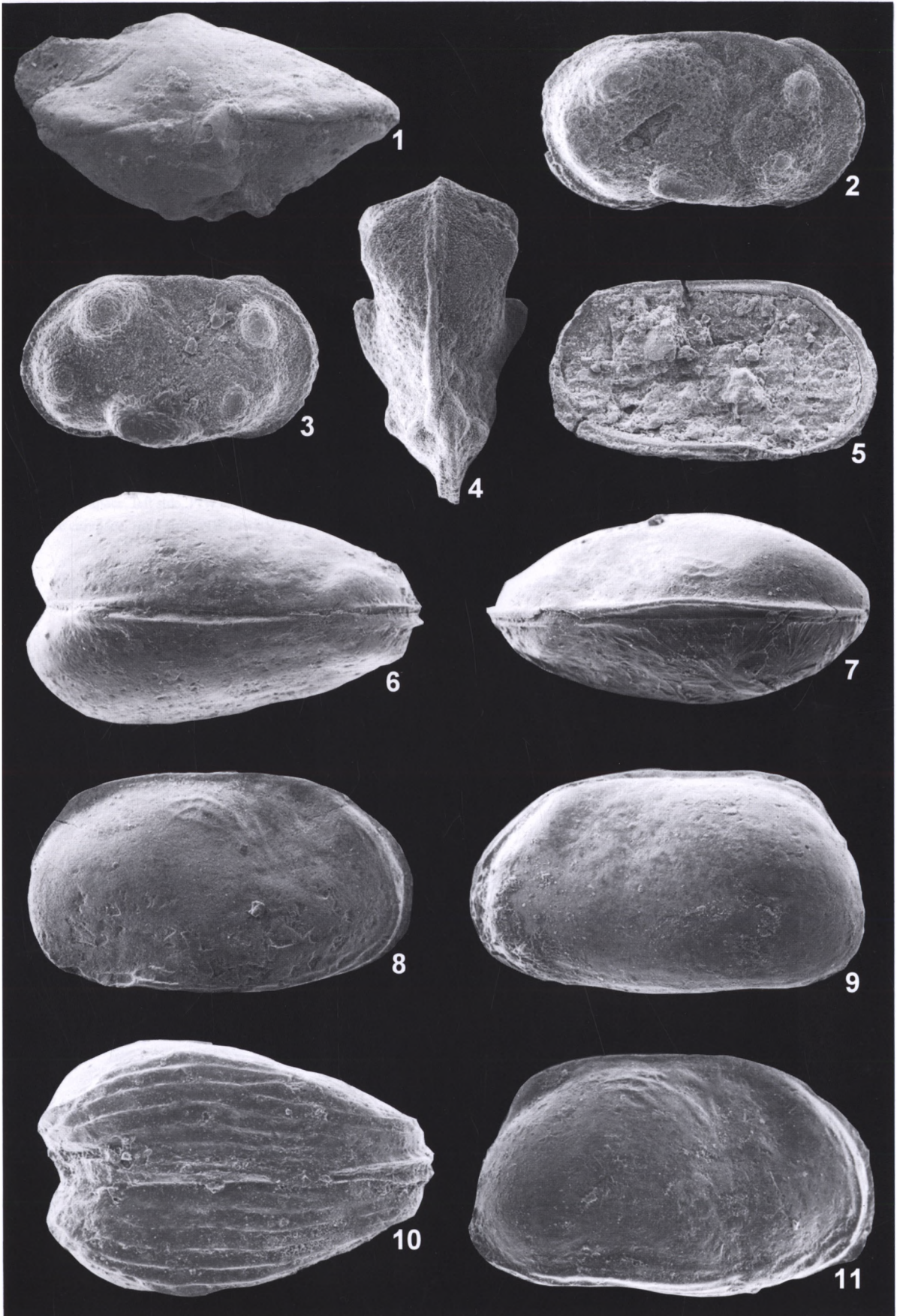


Plate 10

Figs. 1-8. *Theriosynoecum alatum* n. sp., sample 3/21/2, section 10, upper Krachoua Formation, Upper Bajocian/? Lower Bathonian, x 80.

- 1, 7. Female carapace, 1: left side, 7: dorsal view, PIW1995IV 709.
2. Female right valve, PIW1995IV 708.
- 3, 5. Holotype, male carapace, 3: left side, 5: ventral view, PIW1995IV 710
4. Male right valve, with central muscle scars, PIW1995IV 707.
6. Male carapace, dorsal view, PIW1995IV 711.
8. Female left valve, internal view, PIW1995IV 706.

Figs. 9-10. *Theriosynoecum* sp. 1, sample 3/13/17, section 8, lower Techout Formation, Lower Bathonian, x 60.

9. Male carapace, left side, PIW1995IV 703.
10. Male carapace, right side, PIW1995IV 721.

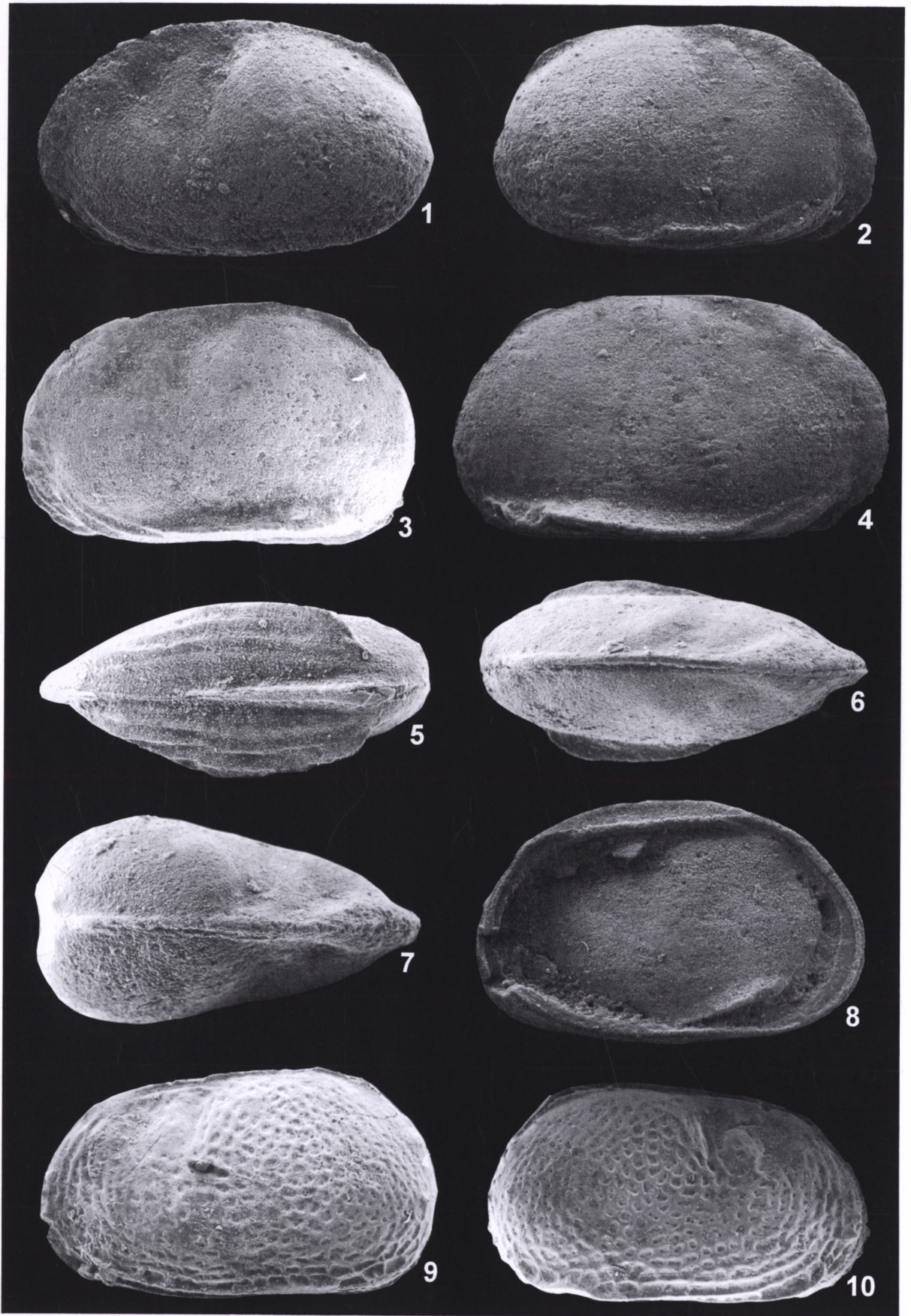


Plate 11

Figs. 1-4. *Theriosynoecum* sp. 1, sample 3/13/17, section 8, lower Techout Formation, Lower Bathonian, x 60.

1. Male carapace, right side, PIW1995IV 704.
2. Female carapace, dorsal view, PIW1995IV 701.
3. Female carapace, ventral view, PIW1995IV 702.
4. Male carapace, dorsal view, PIW1995IV 703.

Figs. 5-9. *Theriosynoecum* ? sp. 1, sample 3/13/17, section 8, lower Techout Formation, Lower Bathonian, x 80.

- 5, 7. Male carapace, 5: right side, 7: dorsal view, PIW1995IV 839.
- 6, 9. Female carapace, 6: left side, 9: ventral view, PIW1995IV 840.
8. Female carapace, dorsal view, PIW1995IV 841.

Figs. 10-13. *Timiriasevia* aff. *uptoni* TIMBERLAKE, sample 3/21/2, section 10, upper Krachoua Formation, Upper Bajocian/ ? Lower Bathonian, x 90.

10. Female right valve, PIW1995IV 849.
- 11-12. Male carapace, 11: dorsal view, 12: right side, PIW1995IV 852.
13. Female right valve, dorsal view, PIW1995IV 851.

Fig. 14. *Metacypris* cf. *sinuosa* n. sp., male left valve, sample 3/24/8, section 4, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 110, x 90.

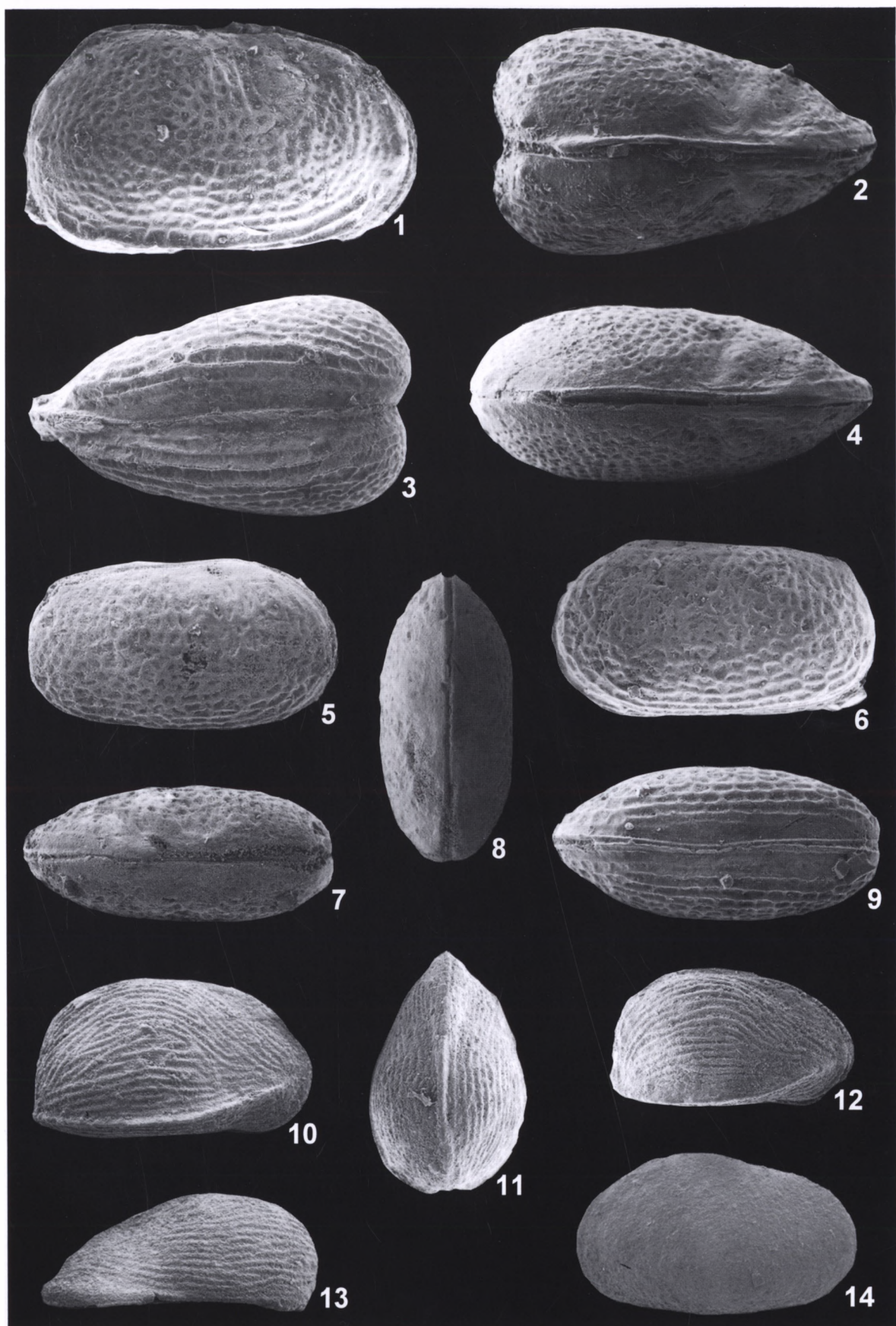


Plate 12

Figs. 1, 4. *Metacypris* cf. *sinuosa* n. sp., sample 3/24/8, section 4, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian.

1. Female left valve, PIW1995IV 109.
4. Female carapace, right side, PIW1995IV 111.

Figs. 2-3, 5-14. *Metacypris sinuosa* n. sp., Tataouine Formation.

- 2-3. Holotype, female carapace, 2: dorsal view, 3: right side, sample 5/17/9, section 6, "Beni Oussid Member", Lower-Middle Callovian, PIW1995IV 102.
- 5, 7. Female carapace, 5: right side, 7: ventral view, sample 5/17/9, section 6, "Beni Oussid Member", Lower-Middle Callovian, PIW1995IV 105.
- 6, 14. Male carapace, 6: right side, 14: dorsal view, sample 5/6/2, section 13, "Beni Oussid Member", Lower-Middle Callovian, PIW1995IV 108.
- 8, 12. Female carapace, 8: right side, 12: dorsal view, sample 5/13/7, section 5, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 106.
9. Male right valve, internal view, sample 5/17/9, section 6, "Beni Oussid Member", Lower-Middle Callovian, PIW1995IV 101.
10. Female carapace, left side, sample 5/17/9, section 6, "Beni Oussid Member", Lower-Middle Callovian, PIW1995IV 103.
- 11, 13. Male carapace, 11: right side, 13: dorsal view, sample 5/17/9, section 6, "Beni Oussid Member", Lower-Middle Callovian, PIW1995IV 104.

Figs. 15-18. *Metacypris* ? sp. 1, Tataouine Formation.

15. Female carapace, dorsal view, sample 5/6/2, section 13, "Beni Oussid Member", Lower-Middle Callovian, PIW1995IV 636.
- 16-17. Male carapace, 16: right side, 17: dorsal view, sample 5/13/7, section 5, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 634.
18. Male carapace, ventral view, sample 5/13/7, section 5, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 633.

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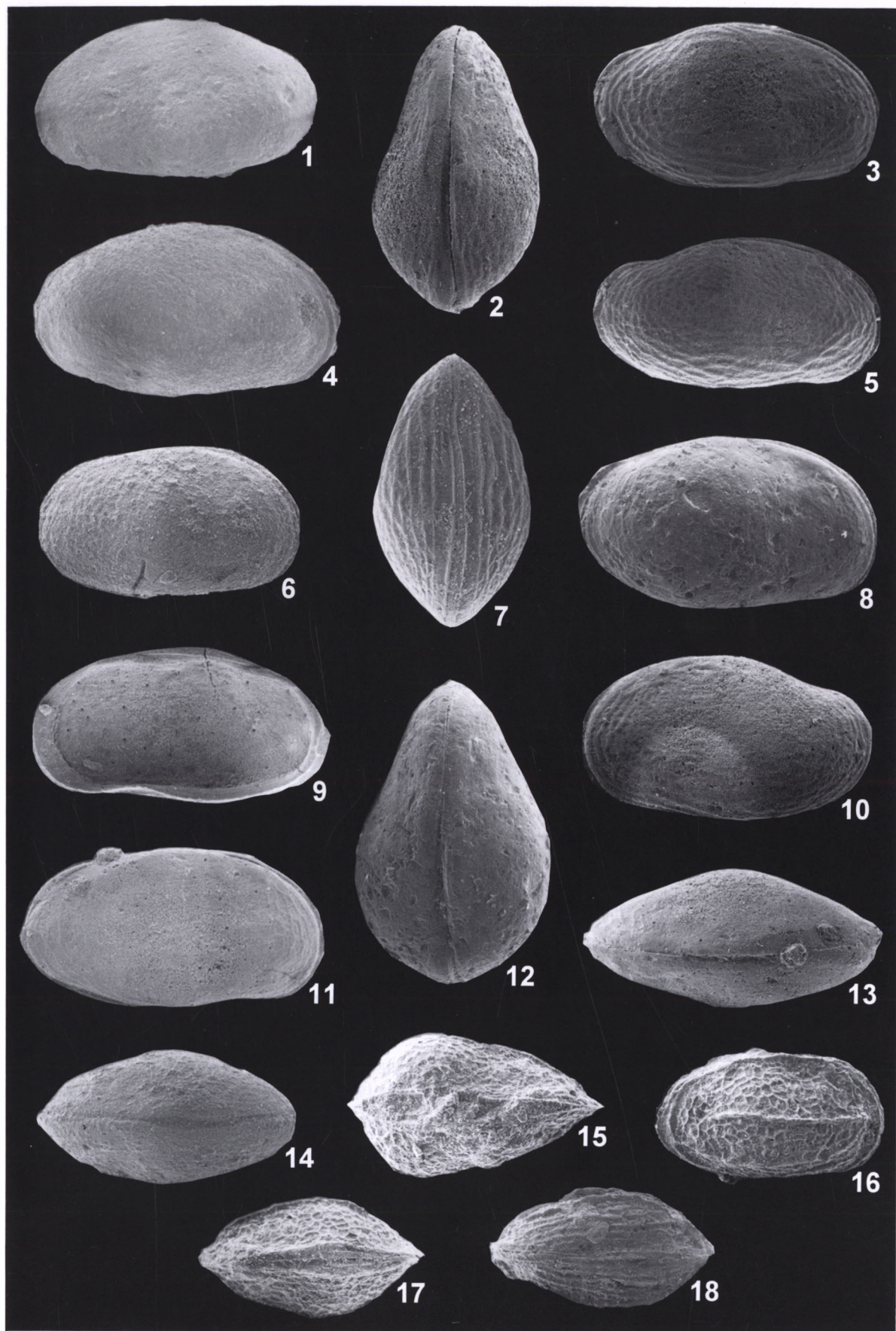


Plate 13

- Figs. 1-2. *Metacypris* sp. 2, carapace; sample 3/3/9, section 12, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 830, x 90.
1. right side;
 2. dorsal view;
- Fig. 3. *Metacypris* sp., carapace, left side, sample 3/3/4, section 12, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 829, x 100.
- Figs. 4-6. *Patellacythere* sp., sample 3/6/10, section 14, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, x 90.
4. Carapace, left side, PIW1995IV 625.
 5. Left valve, PIW1995IV 627.
 6. Carapace, dorsal view, PIW1995IV 626.
- Fig. 7. *Monoceratina* sp., right valve, sample 3/6/13, section 14, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 650, x 90.
- Figs. 8-15. *Paranotacythere caudata* n. sp., Tataouine Formation, x 100.
8. Male left valve, sample 3/5/3, section 14, "Beni Oussid Member", Lower-Middle Callovian, PIW1995IV 608.
 9. Male carapace, dorsal view, sample 5/6/8, section 13, "Beni Oussid Member", Lower-Middle Callovian, PIW1995IV 609.
 10. Male right valve, hinge structure, sample 5/16/8, section 7, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 601.
 11. Female carapace, left side, sample 5/9/2, section 13, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 616.
 12. Female carapace, dorsal view, sample 5/6/8, section 13, "Beni Oussid Member", Lower-Middle Callovian, PIW1995IV 613.
 13. Holotype, female carapace, left side, sample 5/9/2, section 13, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 611.
 14. Female left valve, sample 5/13/3, section 5, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 610.
 15. Female right valve, hinge structure, sample 5/9/2, section 13, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 605.
- Figs. 16-20. *Orthonotacythere* sp., sample 3/6/4, section 14, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, x 140.
- 16, 19. Male carapace, 16: right side, 19: dorsal view, PIW1995IV 819.
 - 17-18. Female carapace, 17: right side, 18: dorsal view, PIW1995IV 821.
 20. Female carapace, left side, PIW1995IV 822.

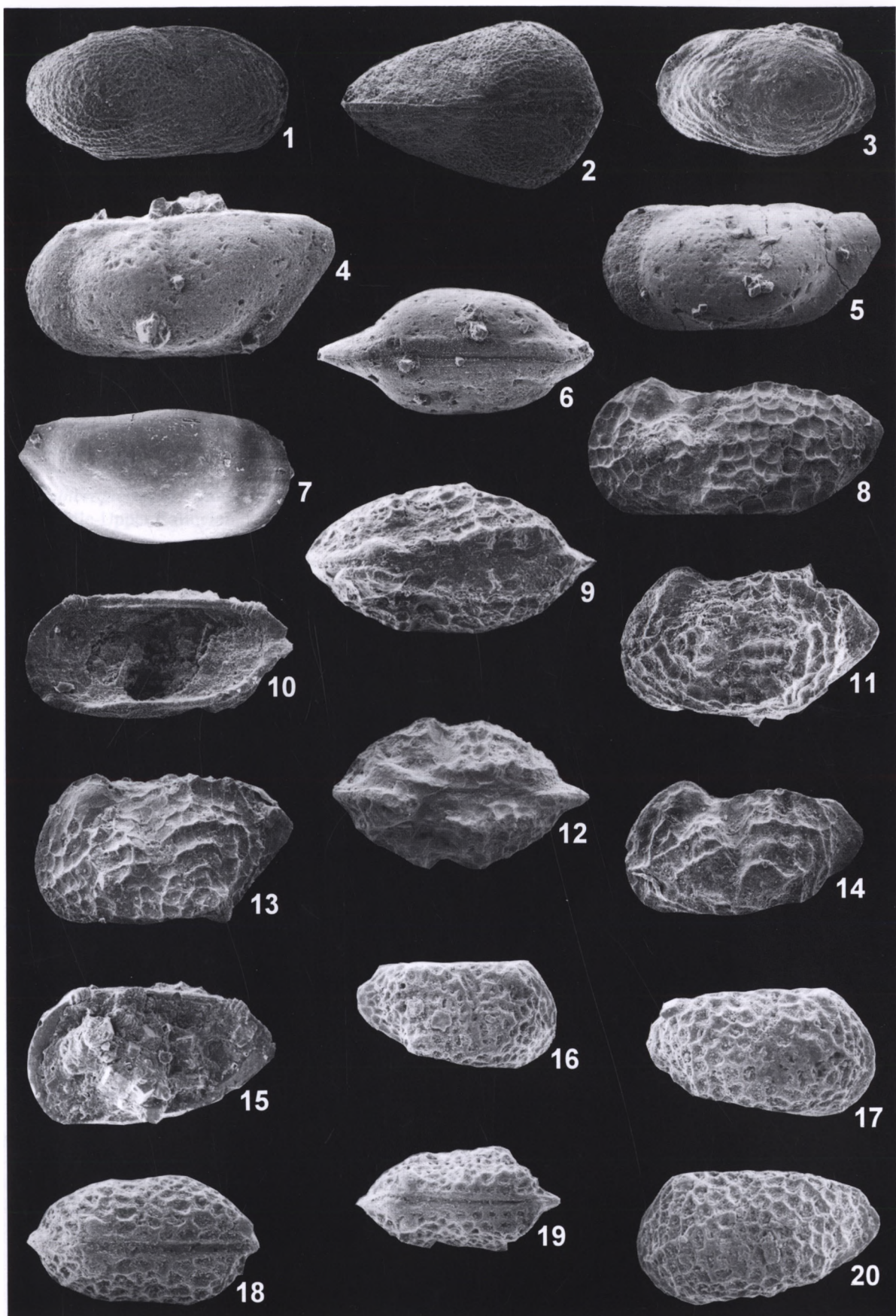


Plate 14

Figs. 1-2. *Cytheropteron* sp. 1, carapace, sample 3/6/11, section 14, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 649, x 100.

1. left side;
2. ventral view;

Figs. 3-4. *Cytheropteron* sp. 2, sample, 3/1/1, section 12, Tataouine Formation, "Beni Oussid Member", Lower-Middle Callovian, x 100.

3. Carapace, right side, PIW1995IV 827.
4. Carapace, dorsal view, PIW1995IV 828.

Figs. 5, 7. *Cytheropteron* sp., sample 5/13/3, section 5, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, x 100.

5. Carapace, right side, PIW1995IV 862.
7. Carapace, dorsal view, PIW1995IV 861.

Figs. 6, 8. *Procytherura* ? sp., carapace; sample 5/9/8, section 13, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 857, x 100.

6. right side;
8. dorsal view;

Figs. 9-20. *Hutsonia minuta* n. sp., section 14, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, x 110.

9. Female left valve, sample 3/6/12, PIW1995IV 511.
10. Male carapace, dorsal view, sample 3/6/11, PIW 1995IV 506.
11. Holotype, male carapace, right side, sample 3/6/7, PIW1995IV 507.
12. Female right valve, sample 3/6/7, PIW1995IV 508.
13. Female carapace, dorsal view, sample 3/6/12, PIW1995IV 512.
14. Male left valve, sample 3/6/12, PIW1995IV 509.
15. Female right valve, hinge structure, sample 3/6/7, PIW1995IV 502.
16. Male left valve, hinge structure, sample 3/6/7, PIW1995IV 501.
17. Female carapace, right side, sample 3/6/11, PIW1995IV 505.
18. Female right valve, hinge structure, sample 3/6/7, PIW1995IV 503.
19. Female left valve, hinge structure, sample 3/6/7, PIW1995IV 504.
20. Female right valve, sample 3/6/12, PIW1995IV 515.

Figs. 21-23. *Hutsonia* sp. 1, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, x 100.

21. Female carapace, ventral view, sample 5/9/8, section 13, PIW1995IV 353.
22. Male carapace, left side, sample 5/13/3, section 5, PIW1995IV 347.
23. Female left valve, hinge structure, sample 5/13/3, section 5, PIW1995IV 338.

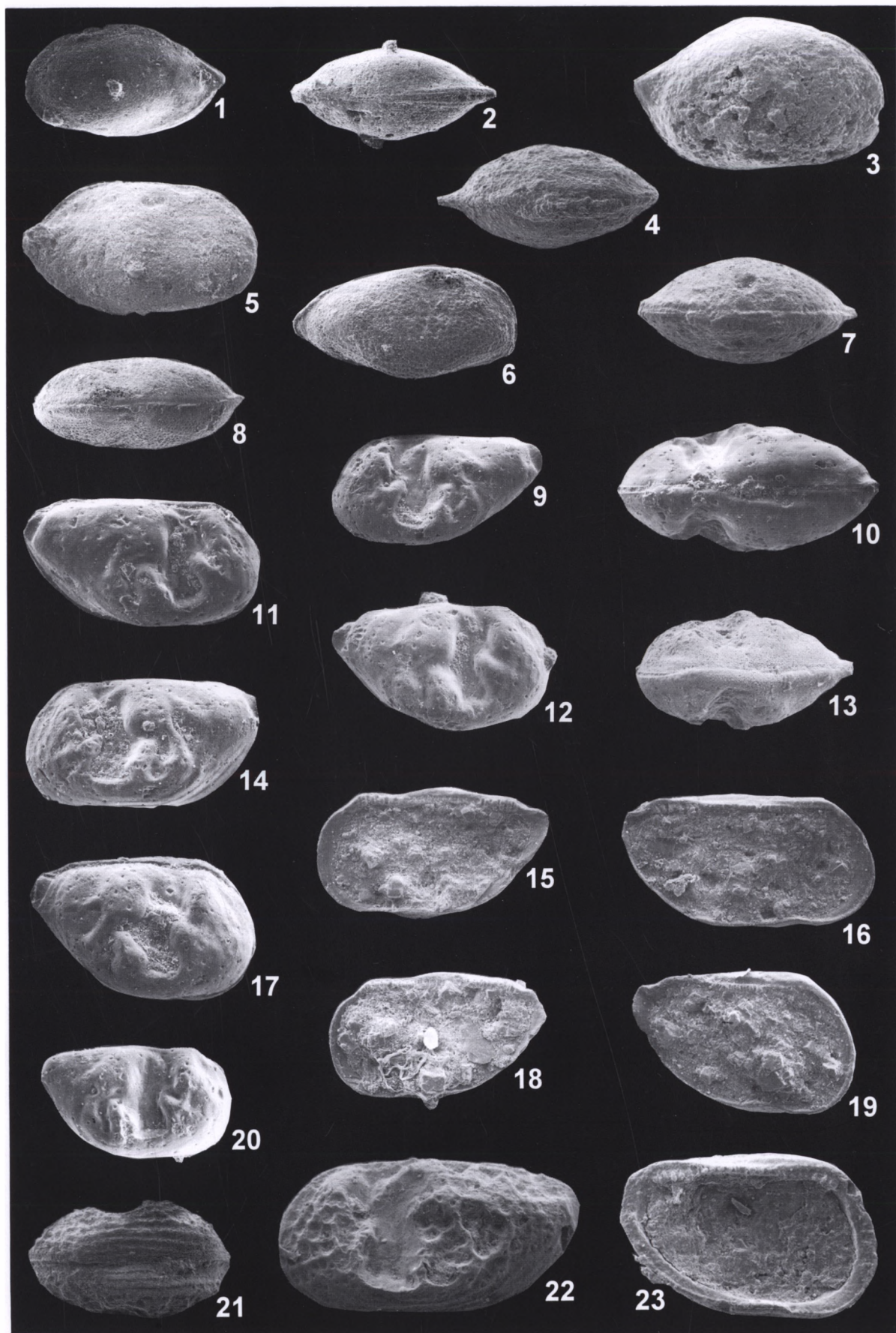


Plate 15

Figs. 1-6. *Hutsonia* sp. 1, Tataouine Formation, x 100.

1. Male carapace, right side, sample 3/1/1, section 12, "Beni Oussid Member", Lower-Middle Callovian, PIW1995IV 348.
- 2-5. Sample 5/9/8, section 13, "Krechem el Miit Member", Middle-Upper Callovian.
 2. Male left valve, PIW1995IV 360.
 3. Female carapace, dorsal view, PIW1995IV 357.
 4. Female carapace, left side, PIW1995IV 355.
 5. Male carapace, dorsal view, PIW1995IV 358.
6. Male right valve, hinge structure, sample 5/13/3, section 5, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 343.

Figs. 7-15. *Ektypocythere zoharensis* ROSENFELD & GERRY, Tataouine Formation, x 100.

- 7, 9, 11-13, 15. sample 5/6/8, section 13, "Beni Oussid Member", Lower-Middle Callovian.
 7. Female carapace, ventral view, PIW1995IV 209.
 9. Female right valve, PIW1995IV 204.
- 11, 15. Male carapace, 11: right side, 15: dorsal view, PIW1995IV 210.
 12. Female right valve, hinge structure, PIW1995IV 203.
 13. Female left valve, hinge structure, PIW1995IV 202.
- 8, 14. Male carapace, small variant, 8: dorsal view, 14: right side, sample 3/21/11, section 11, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 855.
10. Female carapace, right side, sample 5/16/8, section 7, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 206.

Figs. 16-17. *Praeschuleridea* sp. 1, sample 5/16/8, section 7, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, x 90.

16. Female right valve, hinge structure, PIW1995IV 222.
17. Female carapace, dorsal view, PIW1995IV 231.

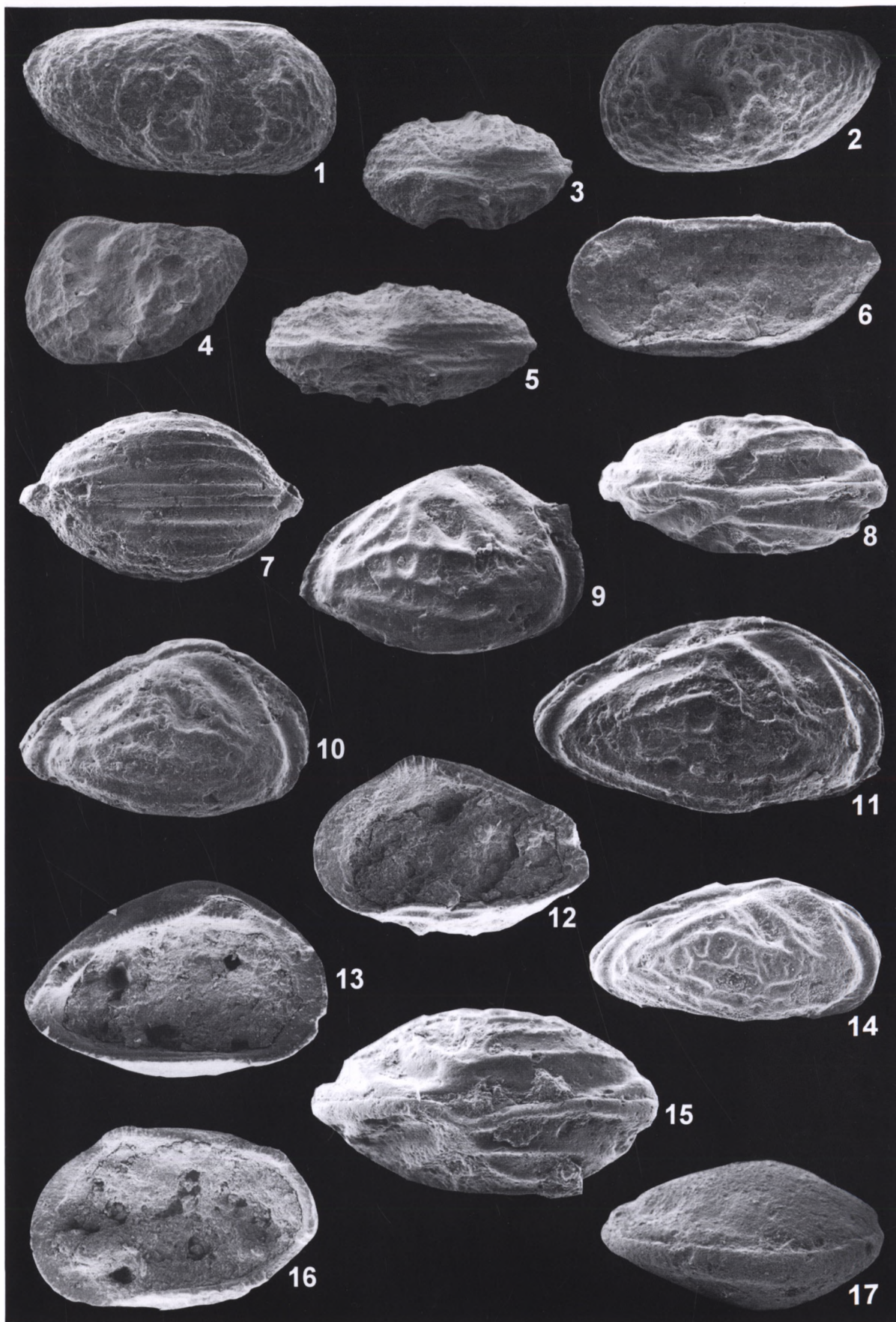


Plate 16

Figs. 1-8. *Praeschuleridea* sp. 1, sample 5/16/8, section 7, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian.

1. Male left valve, PIW1995IV 228.
2. Female left valve, hinge structure, PIW1995IV 224.
3. Female carapace, right side, PIW1995IV 231.
4. Female right valve, PIW1995IV 229.
5. Male carapace, right side, PIW1995IV 227.
6. Female left valve, PIW1995IV 232.
7. Male right valve, hinge structure, PIW1995IV 226.
8. Male right valve, PIW1995IV 230.

Figs. 9-11. *Praeschuleridea* sp. 2, sample 5/9/10, section 13, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian.

- 9, 11. Female carapace, 9: dorsal view, 11: right side, PIW1995IV 305.
10. Female right valve, PIW1995IV 304.

Figs. 12-14. *Schuleridea angulata* n. sp., sample 5/9/10, section 13, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian.

12. Female left valve, hinge structure, PIW1995IV 238.
13. Female carapace, dorsal view, PIW1995IV 240.
14. Female right valve, hinge structure, PIW1995IV 237.

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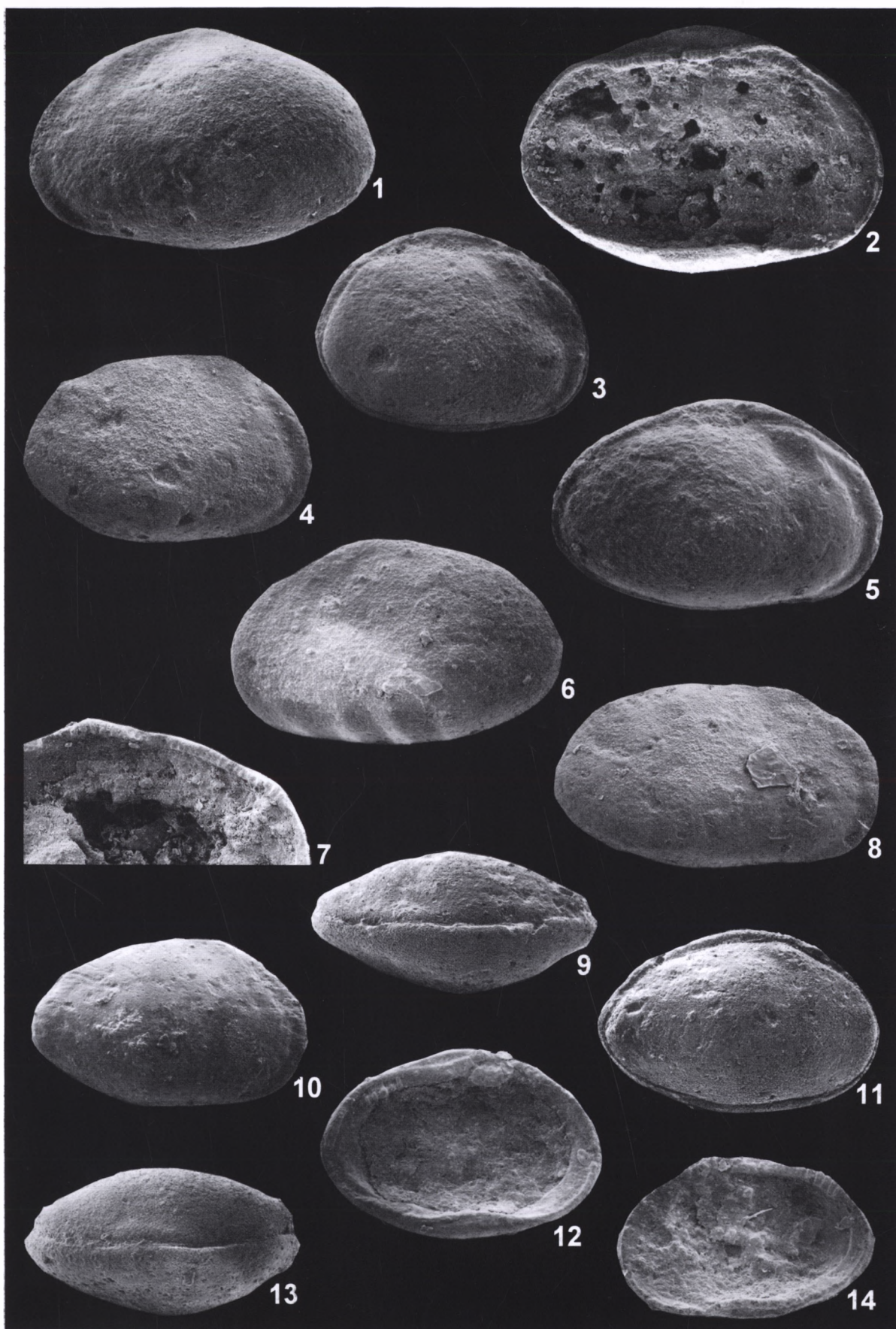


Plate 17

Figs. 1-7. *Schuleridea angulata* n. sp., Tataouine Formation, x 90.

1. Female carapace, right side, sample 5/9/10, section 13, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 240.
2. Male left valve, hinge structure, sample 5/13/3, section 5, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 239.
- 3-4, 5, 7. Sample 3/5/3, section 14, "Beni Oussid Member", Lower-Middle Callovian.
3. Female left valve, hinge structure, PIW1995IV 241
4. Female left valve, PIW1995IV 243.
5. Holotype, female left valve, hinge structure, PIW1995IV 242.
7. Male left valve, PIW1995IV 245.
6. Male right valve, sample 5/13/3, section 5, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 248.

Figs. 8-12: *Schuleridea dispar* n. sp., sample 5/6/8, section 13, Tataouine Formation, "Beni Oussid Member", Lower-Middle Callovian.

8. Female left valve, hinge structure, PIW1995IV 313., x 90.
9. Female right valve, hinge structure, PIW1995IV 310, x 90.
- 10, 12. Female right valve, 10: internal view, x 90; 12: central adductor muscle scars, PIW1995IV 306, x 160.
11. Female right valve, PIW1995IV 319, x 90.

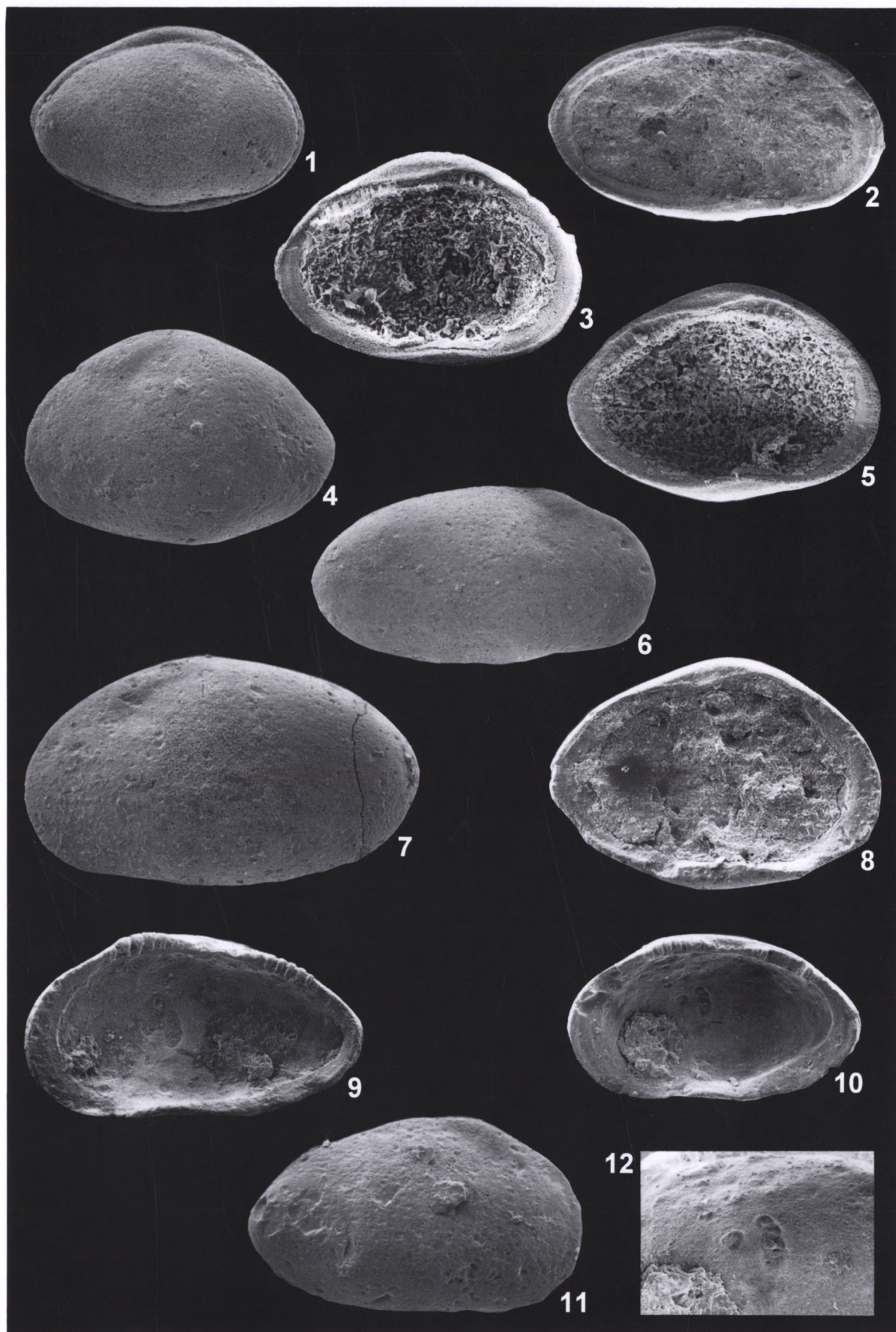


Plate 18

Figs. 1-6. *Schuleridea dispar* n. sp., sample 5/6/8, section 13, Tataouine Formation, "Beni Oussid Member", Lower-Middle Callovian.

1. Male left valve, PIW1995IV 322.
2. Male carapace, right side, PIW1995IV 317.
3. Female left valve, PIW1995IV 320.
4. Male right valve, PIW1995IV 321.
- 5-6. Holotype, female carapace, 5: right side, 6: dorsal view, PIW1995IV 316.

Figs. 7-9. *Afrocytheridea faveolata* BATE, sample 3/6/4, section 14, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian.

- 7, 9. Female carapace; 7: left side; 9: dorsal view, PIW1995IV 804.
8. Female carapace, right side, PIW1995IV 805.

Figs. 10-12. *Micropneumatocythere* cf. *subconcentrica* (JONES), section 13, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian.

10. Male right valve, sample 5/9/6, PIW1995IV 134.
11. Female carapace, left side, sample 5/9/6, PIW1995IV 139.
12. Male left valve, sample 5/9/8, PIW1995IV 138.

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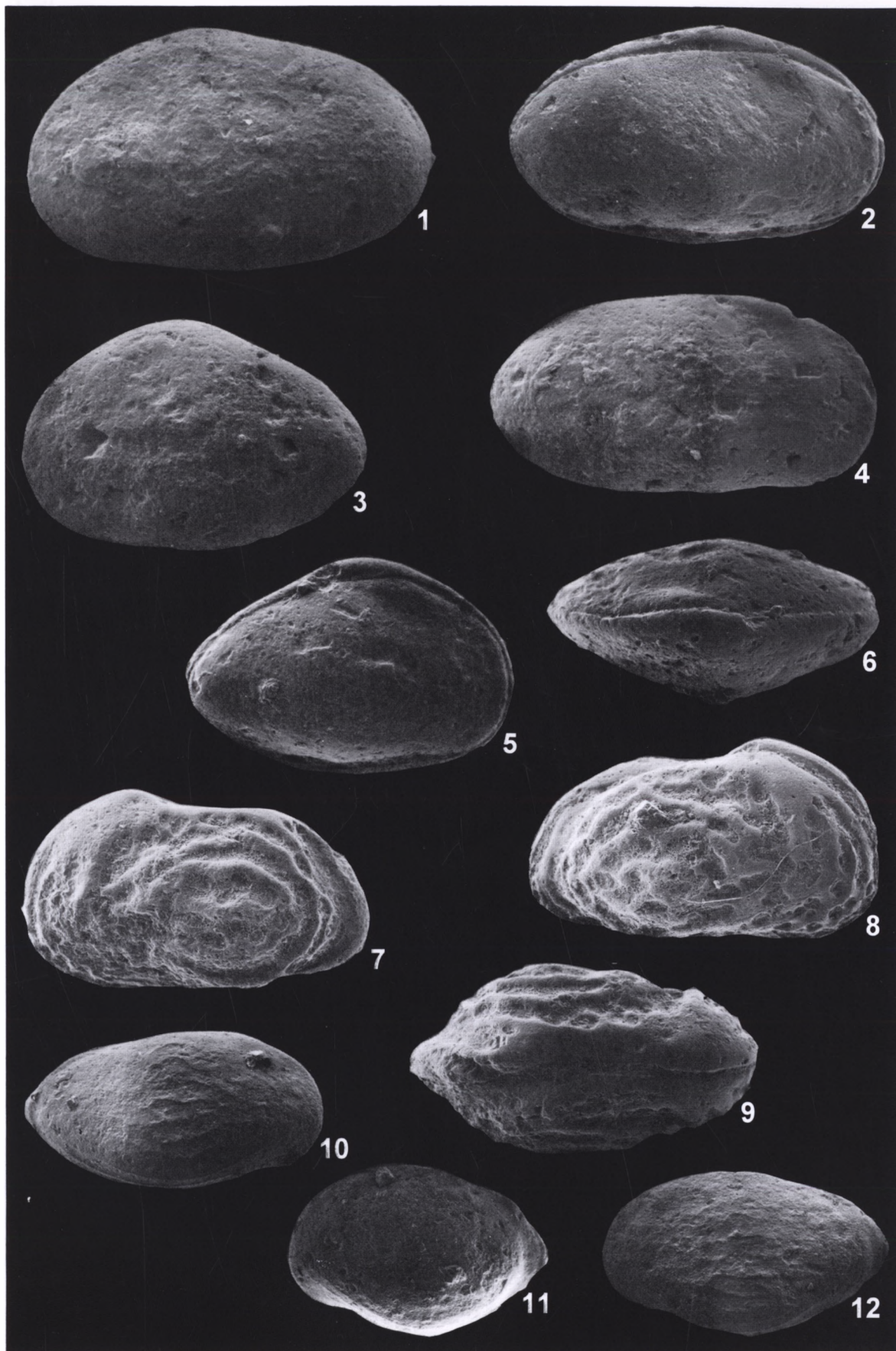


Plate 19

Figs. 1-8. *Micropneumatocythere* cf. *subconcentrica* (JONES), Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian.

- 1, 3. Female carapace, 1: dorsal view; 3: right side; sample 5/9/6, section 13, PIW1995IV 137.
2. Male carapace, dorsal view, sample 3/3/4, section 12, PIW1995IV 135.
4. Female right valve, sample 5/9/6, section 13, PIW1995IV 133.
- 5-6. Female carapace, 5: right side; 6: ventral view; sample 3/3/4, section 12, PIW1995IV 136.
7. Female right valve, hinge structure, sample 5/9/6, section 13, PIW1995IV 873.
8. Female left valve, hinge structure, sample 5/9/8, section 13, PIW1995IV 130.

Figs. 9-15. *Pneumatocythere* ? cf. *juglandiformis* MALZ, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian.

9. Female carapace, ventrolateral view, sample 3/24/8, section 4, PIW1995IV 333.
- 10-14. Sample 5/13/7, section 5.
10. Female left valve, PIW1995IV 330.
- 11, 13. Female carapace, 11: right side, 13: dorsal view, PIW1995IV 328.
12. Male carapace, left side, PIW1995IV 334.
14. Juvenile right valve, PIW1995IV 327.
15. Male carapace, right side, sample 3/24/8, section 4, PIW1995IV 332.

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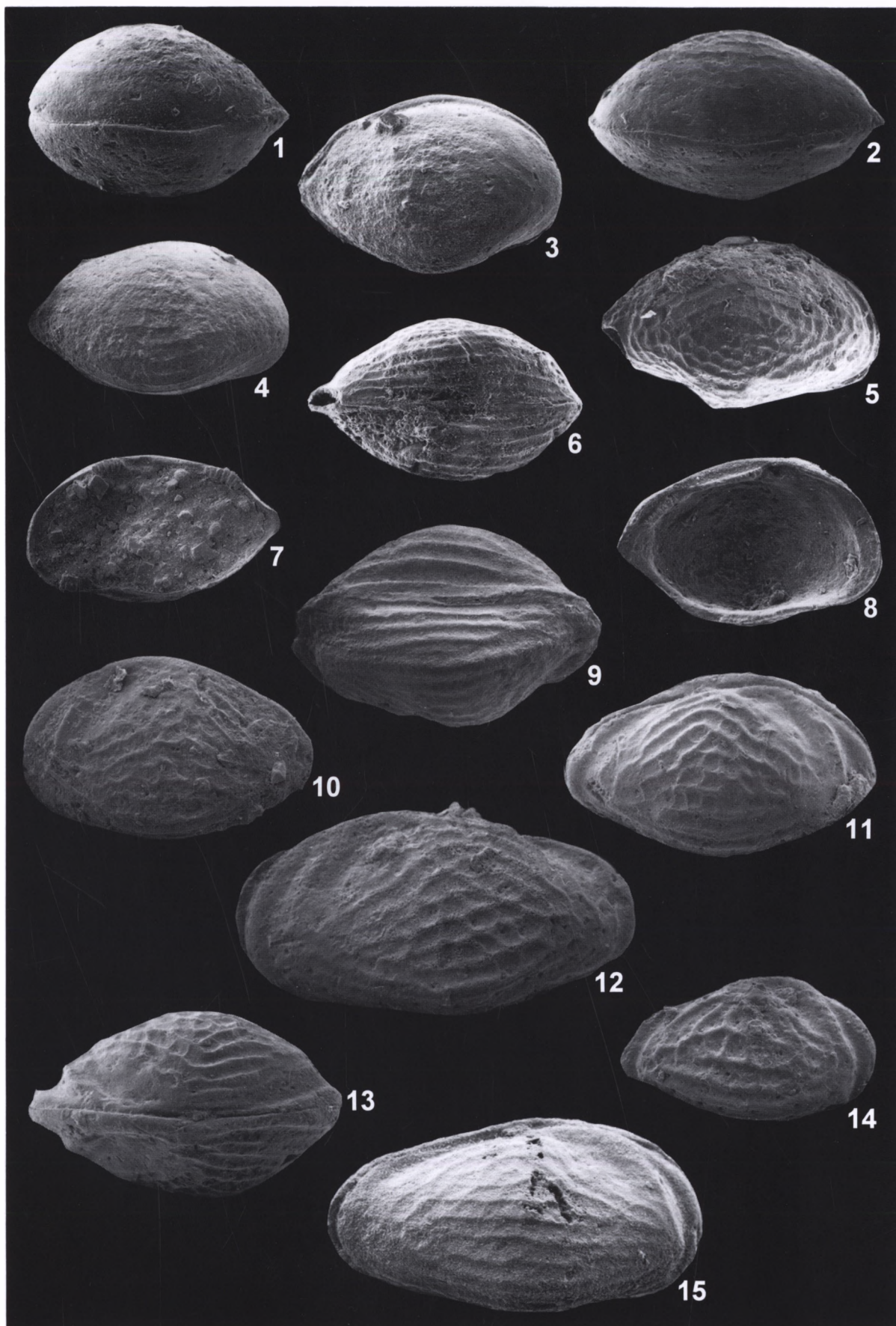


Plate 20

- Fig. 1. *Pneumatocythere* ? cf. *juglandiformis* MALZ, male carapace, dorsal view, sample 5/13/7, section 5, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 331.
- Figs. 2-5. *Pneumatocythere* ? sp. 1, sample 5/17/9, section 6, Tataouine Formation, "Beni Oussid Member", Lower-Middle Callovian.
2. Female carapace, right side, PIW1995IV 867.
 3. Female carapace, dorsal view, PIW1995IV 869.
 4-5. Male carapace; 4: dorsal view; 5: right side, PIW1995IV 868.
- Figs. 6-8. *Pneumatocythere* ? cf. sp. 1, sample 3/21/4, section 10, upper Krachoua Formation, Upper Bajocian? Lower Bathonian.
- 6, 8. Female carapace, 6: dorsal view; 8: right side, PIW1995IV 660.
 7. Male carapace, right side, PIW1995IV 659.
- Figs. 9-18. *Fastigatocythere triangularis* n. sp., Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian. 9-10, 13, 17: sample 5/9/6, section 13.
9. Male carapace, left side, PIW1995IV 123.
 10. Holotype, female carapace, right side, PIW1995IV 122.
 13. Male carapace, dorsal view, PIW1995IV 121.
 17. Male right valve, hinge structure, PIW1995IV 125.
- 11-12. Female carapace, 11: right side; 12: ventrolateral view, sample 3/6/13, section 14, PIW1995IV 119.
 14. Female left valve, sample 3/6/13, section 14, PIW1995IV 120.
 15. Male left valve, hinge structure, sample 3/24/8, section 4, PIW1995IV 876.
 16. Male left valve, hinge structure, sample 3/24/8, section 4, PIW1995IV 126.
 18. Female right valve, hinge structure, sample 5/13/3, section 5, PIW1995IV 117.

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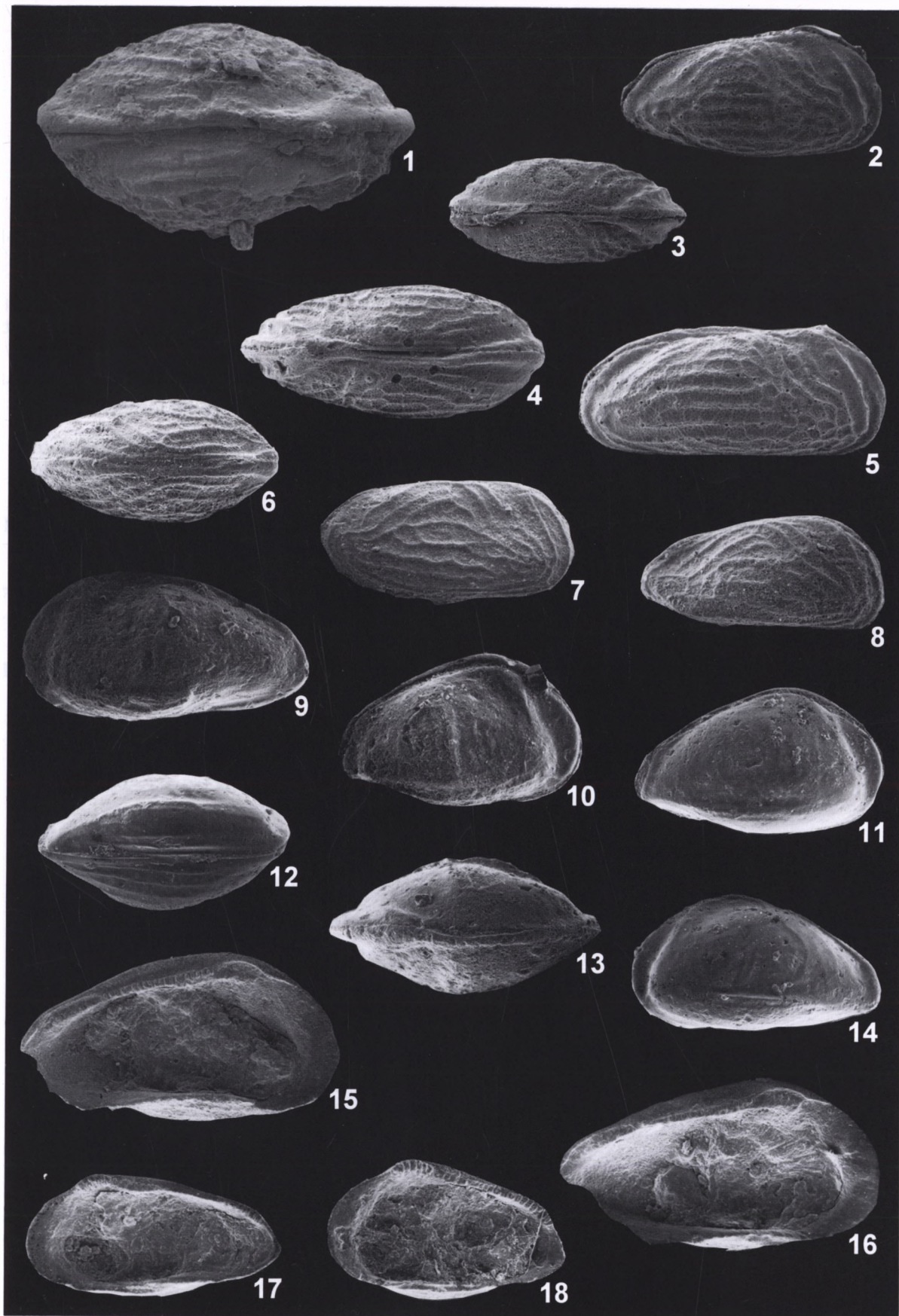


Plate 21

- Figs. 1-4.** *Fastigatocythere* ? sp., sample 3/21/4, section 10, upper Krachoua Formation, Upper Bajocian/? Lower Bathonian, x 90.
- 1-2. Male carapace, 1. left side; 2. dorsal view, PIW1995IV 550.
3-4. Female carapace, 3. left side; 4. dorsal view, PIW1995IV 556.
- Figs. 5-6.** *Acanthocythere* ? sp., sample 3/6/4, section 14, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, x 90.
5. Carapace, left side, PIW1995IV 806.
6. Carapace, left side, PIW1995IV 807.
- Figs. 7-10.** *Exopthalmocythere* ? *kidodensis* ROSENFELD & GERRY, sample 3/6/4, section 14, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, x 90.
- 7-8. Carapace, 7. dorsal view; 8. left side, PIW1995IV 823.
9-10. Carapace, 9. left side; 10. dorsal view, PIW1995IV 824.
- Figs. 11-17.** *Acrocythere* sp. 1, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, x 100.
- 11-12, 14-17. sample 3/6/4, section 14.
11. Female left valve, PIW1995IV 644.
12. Female carapace, right side, PIW1995IV 637.
14. Male carapace, left side, PIW1995IV 638.
15. Male right valve, PIW1995IV 645.
16. Female carapace, dorsal view, PIW1995IV 642.
17. Female carapace, ventral view, PIW1995IV 641.
13. Male left valve, internal view, sample 3/17/10, section 15, PIW1995IV 845.

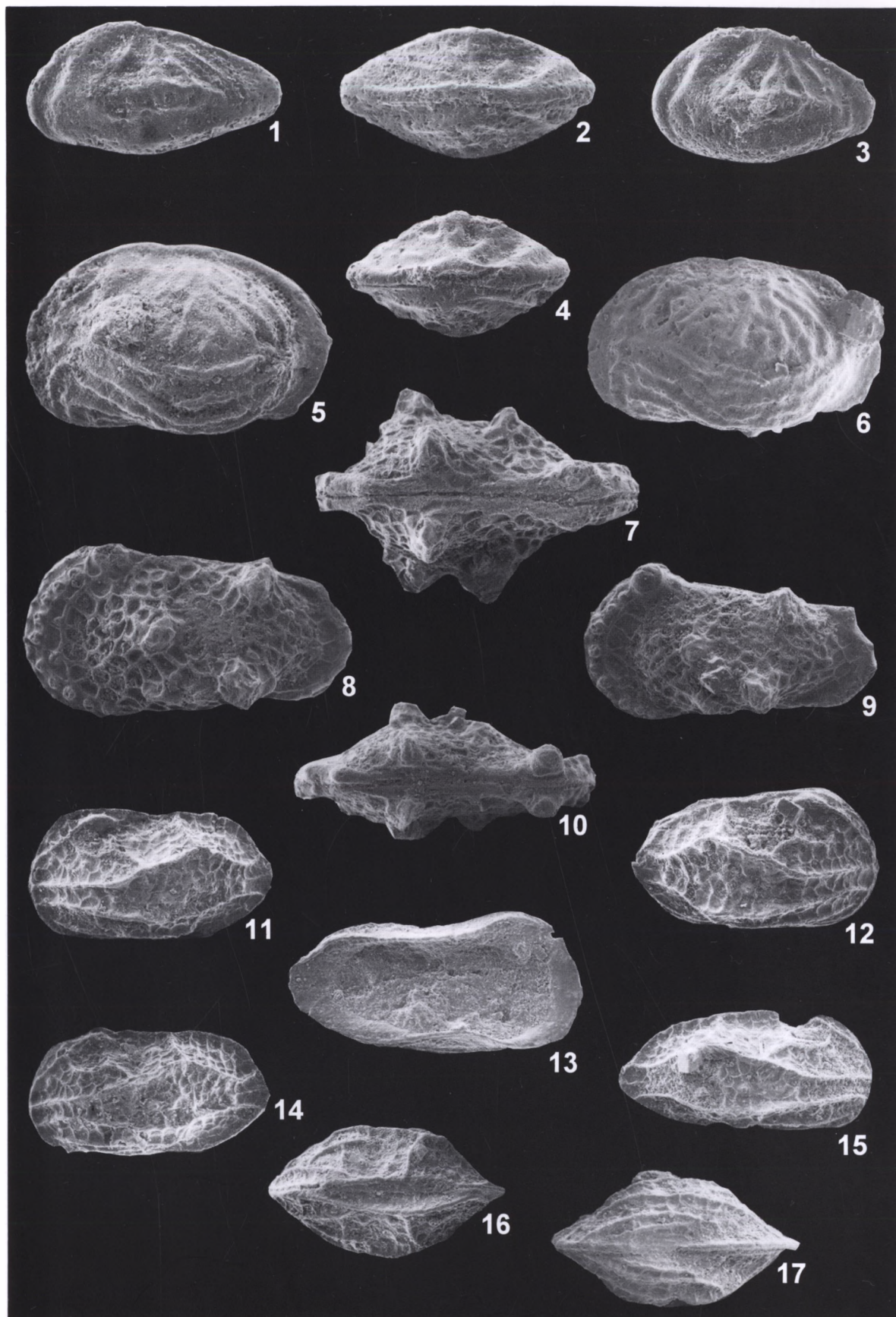


Plate 22

Figs. 1-8. *Paracytheridea* ? sp., sample 3/6/4, section 14, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, x 140.

- 1, 7. Carapace, 1. right side,;7. dorsal view, PIW1995IV 809.
- 2. Carapace, right side, PIW1995IV 815.
- 3, 8. Carapace, 3. right side; 8. dorsal view, PIW1995IV 817.
- 4. Carapace, left side, PIW1995IV 813.
- 5-6. Carapace, 5. left side; 6. dorsal view, PIW1995IV 811.

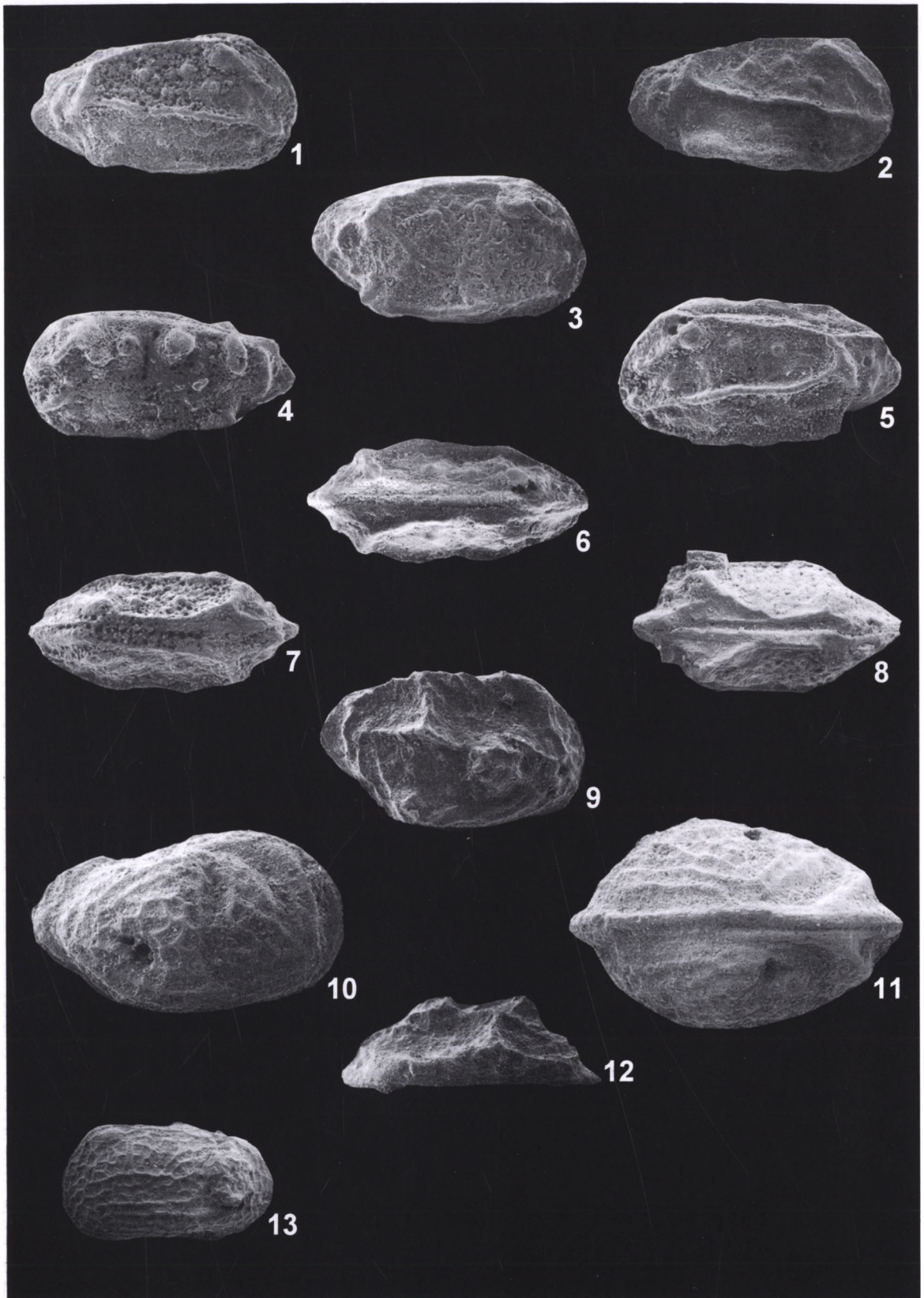
Figs. 9, 12. *Paranotacythere* ? sp., right valve; sample 5/13/3, section 5, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 859, x 100.

- 9. lateral view;
- 12. dorsal view;

Figs. 10-11. *Pneumatocythere* ? sp., sample 3/12/9, section 1, Tataouine Formation, Hadada Member, Upper Callovian-? Oxfordian, x 90.

- 10. Female carapace, right side, PIW1995IV 835.
- 11. Female carapace, dorsal view, PIW1995IV 836.

Fig. 13. *Acrocythere* ? sp., left valve, sample 5/13/2, section 5, Tataouine Formation, "Krechem el Miit Member", Middle-Upper Callovian, PIW1995IV 624, x 90.



W. METTE: Middle Jurassic ostracods from southern Tunisia

associations	Cytherella-Bairdia					Hutsonia-Micropneum.			Cytherella A		Metacypris B							
	3/17/10	3/6/3	3/6/4	5/8/5	3/6/17	3/6/7	3/6/11	3/6/12	3/6/10	3/6/14	5/12/6	5/13/2	5/13/5	3/24/8	3/12/6	3/11/6	3/11/5	3/4/8
<i>Monoceratina</i> ? sp.									0,4									
<i>Cytherella</i> sp.									0,4									
<i>Cytherella</i> sp.								9										
<i>Progonocythere</i> sp.										6								
<i>Metacypris</i> ? sp.																		
<i>Fabanella</i> sp.																		
<i>Monoceratina</i> ? sp.																		
<i>Bythocypris</i> sp.																		
<i>Darwinula</i> sp.																		
<i>Paracypris</i> sp.																		
<i>Progonocythere</i> ? sp.																		
<i>Procytheridea</i> ? sp.																		
<i>Metacypris</i> sp.2							+											
<i>Monoceratina</i> sp.																		
<i>Oligocythereis</i> ? sp.																		
<i>Procytherura</i> ? sp.																		
<i>Cytherella</i> sp.																		
<i>Cytherelloidea</i> sp.																		
<i>Monoceratina</i> sp.																		
<i>Cytherella</i> sp.																		
<i>Bairdia</i> sp.																		
<i>Bairdia</i> sp.																		
<i>Cytheropteron</i> sp.2																		
<i>Paracypris</i> sp.																		
<i>Pontocyprilla</i> ? sp.																		
<i>Bythocypris</i> ? sp.																		
<i>Metacypris</i> sp.																		
<i>Bairdia</i> sp.																		
<i>Pontocyprilla</i> ? sp.																		
<i>Progonocythere</i> sp.																		
<i>Fabanella</i> sp.																		
<i>Darwinula</i> sp.																		
<i>Monoceratina</i> sp.																		
<i>Ektyphocythere</i> ? sp.																		
<i>Pneumatocythere</i> ? sp.1																		
<i>Bythocypris</i> sp.																		
<i>Pontocyprilla</i> ? sp.																		
<i>Theriosynoecum</i> sp.																		
<i>Paracypris</i> sp.																		
<i>Bythocypris</i> ? sp.																		
<i>Pneumatocythere</i> ? sp.																		
<i>Acanthocythere</i> ? sp.			+															
<i>Metacypris</i> ? sp.																		
<i>Pontocyprilla</i> ? sp.																		
<i>Cytherella</i> sp.																		
<i>Fabanella</i> ? sp.										2								
<i>Pontocyprilla</i> ? sp.										1								
<i>Cytheropteron</i> sp.																		
<i>Fabanella</i> sp.												14						
<i>Bythocypris</i> ? sp.												6						
<i>Cytherella</i> sp.																		
<i>Cytherelloidea</i> sp.																		
<i>Cytherella</i> sp.														0,5				
gen. et sp. indet								1,6										
gen. et sp. indet										1								
<i>Theriosynoecum</i> sp.																		
<i>Fabanella</i> ? sp.																		
<i>Theriosynoecum</i> ? sp.																		
<i>Metacypris</i> sp.																		
<i>Bythocypris</i> ? sp.																		
<i>Cytherella</i> sp.																11		
gen. et sp. indet													0,5					

samples	Cytherella-Bairdia					Hutsonia-Micropneum.			Cytherella A		Metacypris B							
	3/17/10	3/6/3	3/6/4	5/8/5	3/6/17	3/6/7	3/6/11	3/6/12	3/6/10	3/6/14	5/12/6	5/13/2	5/13/5	3/24/8	3/12/6	3/11/6	3/11/5	3/4/8
gen. et sp. indet.	2																	
"		1																
<i>Bythocypris</i> ? sp.																		4
<i>Pontocyprilla</i> ? sp.																		2
gen. et sp. indet.																		
<i>Pneumatocyth?</i> cf. sp. 1																		
gen. et sp. indet.											3							
"																		
<i>Pontocyprilla</i> ? sp.																		
<i>Paranotocythere</i> ? sp.																		
gen. et sp. indet.																		
<i>Paracypris</i> ? sp.		1																
<i>Cytherella</i> sp.		3																
<i>Paracypris</i> ? sp.			1															
<i>Bythocypris</i> ? sp.			2															
gen. et sp. indet.																		
"																		
"																		
<i>Bairdia</i> ? sp.																		
gen. et sp. indet.			+															
"																		
"																		
General statistic data and relative abundance (%) of the associated microfauna																		
number of species	7	7	18	4	6	5	6	3	9	6	7	5	3	7	5	1	1	4
number of specimens	61	65	92	95	72	98	119	75	229	51	88	223	35	205	55	164	84	175
%J <i>Metac. cf. sinuosa</i>											0,11	0,45	0,21	0,07	0	0,15	0,64	0,29
%C <i>Metac. cf. sinuosa</i>											0,44	0,11	0,39	0,62	0,42	0,94	0,93	0,60
characeae																	2	
vertebrate teeth						1				2								
gastropods				1									7					
lituolid foraminifera	57		13															
foraminifera		3		7	1	2								0,5				
holothurian sclerites							11	5	2									
echinoderms		6	5							4				0,5				

samples	Micropn.- Metacypr.		Metacypris A								Cytherella-Schuleridea					Micropneum.- Cytherella		
	3/21/11	5/16/13	5/6/2	5/6/3	3/1/2	3/1/3	3/2/1	5/16/11	5/17/9	5/13/7	5/6/8	3/5/3	2/27/12	5/16/8	5/13/3	5/9/2	3/6/13	3/3/4
gen. et sp. indet.																		
"																		
<i>Bythocypris</i> ? sp.																		
<i>Pontocyprilla</i> ? sp.																		
gen. et sp. indet.																		
<i>Pneumatocyth?</i> cf. sp. 1																		
gen. et sp. indet.																		
"																		
<i>Pontocyprilla</i> ? sp.												0,7						
<i>Paranotacythere</i> ? sp.														1,2				
gen. et sp. indet.			1,6															
<i>Paracypris</i> ? sp.																		
<i>Cytherella</i> sp.																		
<i>Paracypris</i> ? sp.																		
<i>Bythocypris</i> ? sp.																		
gen. et sp. indet.	7																	
"									+									
"										+								
<i>Bairdia</i> ? sp.																		
gen. et sp. indet.																		
"																		
"																		
General statistic data and relative abundance (%) of the associated microfauna																		
number of species	15	7	15	2	5	3	4	4	8	9	10	10	13	15	13	9	8	6
number of specimens	102	61	390	141	101	64	113	71	274	351	322	135	148	526	575	370	57	51
%J <i>Metac. sinuosa</i>			0,06	0,01	0,46	0	0,02	0,14	0,10	0,01								
%C <i>Metac. sinuosa</i>			0,58	0,96	0,52	0,90	0,93	0,92	0,87	0,35								
characeae	18																	
vertebrate teeth									1	1			1					
gastropods																		
lituolid foraminifera	2										1							
foraminifera												1	1	2		5		64
holothurian sclerites	1															5		
echinoderms													1		2	1		

samples	Cytherella B		Micropn. Praesch.		Cytherella- Micropneumatoc.				Ektyphoc. Hutsonia		Byth.	Kliea na	Fabanella		Theriosyn.- Darwinula		
	3/3/6	3/3/8	5/9/8	5/9/10	5/9/6	3/3/9	5/9/12	5/9/13	5/13/6	3/1/1	5/17/14	3/20/4	3/21/4	3/13/15	3/13/17	3/13/18	3/21/2
gen. et sp. indet.																	
"																	
<i>Bythocypris</i> ? sp.																	
<i>Pontocyprilla</i> ? sp.																	
gen. et sp. indet.												3	1				
<i>Pneumatocyth?</i> cf. sp. 1													0,4				
gen. et sp. indet.																	
"									6,8								
<i>Pontocyprilla</i> ? sp.																	
<i>Paranotacythere</i> ? sp.																	
gen. et sp. indet.																	
<i>Paracypris</i> ? sp.																	
<i>Cytherella</i> sp.																	
<i>Paracypris</i> ? sp.																	
<i>Bythocypris</i> ? sp.																	
gen. et sp. indet.																	
"																	
"											16						
<i>Bairdia</i> ? sp.																	
gen. et sp. indet.																	
"						3											
"																	2,6
General statistic data and relative abundance (%) of the associated microfauna																	
number of species	6	6	10	12	11	11	12	7	9	9	10	5	5	2	9	8	5
number of specimens	99	69	521	220	550	99	330	131	51	162	129	102	269	150	311	158	278
%J <i>Micropn. cf. subc.</i>			0,63	0,29	0,18	0,56	0,20	0,07									
%C <i>Micropn. cf. subc.</i>			0,04	0,29	0,44	0,12	0,11	0,52									
characeae																	
vertebrate teeth						1		1			7						
gastropods						1											
lituolid foraminifera								5									
foraminifera		3		8		1			2								
holothurian sclerites						1											
echinoderms									2								

Legend:

cl	claystone
cm	calcareous marl
ml	marly limestone
l	limestone
dm	dolomitic limestone
sm	silty marl
ms	sandy marl
fs	finegrained sandstone
ds	sandy dolomite
cp	calcareous ostracod packstone
op	sandy ostracod packstone
dp	dolomitic ostracod packstone

Taphonomy and Ecology

	adult/juvenile ratio:	
+	high energy ostracod fauna	> 1
+/-	moderate energy ostracod fauna	0,5 - 1
-	low energy ostracod fauna	0,2 - 0,5
*	low energy thanatocoenosis	< 0,2
#	mixed ostracod fauna (parautochthonous)	
%J	relative portion of juveniles	
%C	relative portion of carapaces	
■	stenohaline species	
⊠	freshwater and brackish species (limnic-mesohaline)	
—	species described and/or illustrated here	
+	occurrence of rare species, not considered for statistical analysis	