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Barremian ostracods from the Serre de Bleyton (Drôme, SE France)

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(With 8 plates and 1 figure)

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Abstract

The turbiditic Barremian of the Serre de Bleyton, Drôme, SE France has yielded 67 species of marine ostracods belonging to 38 different genera. Several species are known from the Hauterivian to Aptian of Western Europe and strong affinities exist with the Barremian of Transcaucasia (Azerbaijan). Many species are left in open nomenclature.

Keywords: Early Cretaceous, Barremian, Ostracoda, SE France

Zusammenfassung

Die turbiditische Sedimente des Barremium von Serre de Bleyton, in Drôme, Südost-Frankreich lieferten 67 Arten (in 38 Gattungen) mariner Ostracoden. Einige der Arten sind aus dem Hauterivium bis Aptium von West-Europa bekannt, starke Beziehungen bestehen auch zum Barremium von Transkaukasien (Azerbaijan). Ein großer Teil der Arten wird in offener Nomenklatur benannt.

Schlüsselwörter: Unter-Kreide, Barremium, Ostracoda, Südost-Frankreich

Introduction

Although Aptian ostracod faunas from SE France are relatively well known (OERTLI 1958; SAUVAGNAT 1999; BABINOT et al. 2007), very few works have been devoted to the study of Barremian ostracods from SE France. In 1963, OERTLI illustrated 3 assemblages

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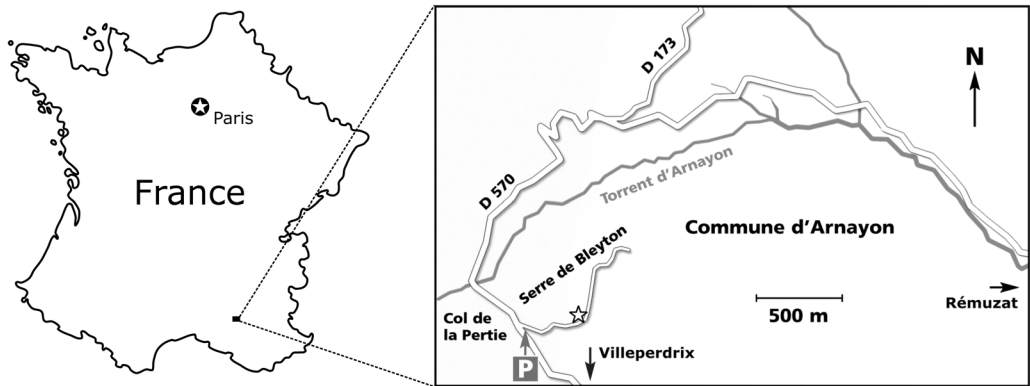


Fig. 1. Location of map of studied sites at Serre de Bleyton. The star indicates the position of the studied section.

from the Barremian of the departments of Gard, Alpes-de-Haute-Provence and Drôme and MOULLADE (1963) described one species of *Protocythere* in the Barremian of Drôme. DONZE (1971) compared the ostracod associations of 2 synchronous Barremian outcrops in Ardèche and Alpes-de-Haute-Provence and later (DONZE & LAFARGE 1979), used the ostracod assemblages as palaeobathymetric indicators in the lower Barremian of Ardèche. The first important taxonomic study in this area is the thesis (unpublished) of SCARENZI-CARBONI (1984); many of the species from this work are illustrated in the Atlas des Ostracods de France (BABINOT et al. 1985). A first check-list of marine ostracods (66 species belonging to 23 genera) from the Barremian of SE France has been published by SAUVAGNAT et al. (2001).

Study area and geological setting

The studied section is located in the Commune d'Aranyon (Drôme provençale), and is exposed on the southern side of the Serre de Bleyton ridge, east of Col de Perty and lies about 20 km north-east of Nyons and 2 km south-east of Arnayon (Fig. 1). There fossiliferous Barremian sediments occur in form of siliciclastic and turbiditic beds, the so-called “*coulées boueuses*”. These are channels and fan-structures terminating in the Vocontian Through (ADATTE et al. 2005; ARNAUD 2005). Fossils are generally rare in the pelagic deposits of the “*coulées boueuses*”, apart from ammonites only few other macrofossils are preserved. At Serre de Bleyton, however, several turbidite horizons are present, which contain a rich invertebrate fauna. The material is interpreted to derive from the Provence Platform and hemipelagic areas to the north-west of the Vocontian trough.

The section crops out along a forest road on the southern slope of the Serre de Bleyton ridge, but is poorly exposed and affected by local tectonics. It comprises a light-grey intercalation of marls and limestone beds. Three of fossiliferous turbidite horizons men-

tioned above have been sampled by Gero Moosleitner. The ostracod material of two of these horizons (locality 1 and 2) forms the base for the present study. For more detail on the study area see KROH et al. (2010).

Locality 1: N 44°28'55'', E 05°18'00''

Locality 2: N 44°28'54'', E 05°17'58''

Biostratigraphical data relating to the “*coulées boueuses*” are rare, data gained from the study of the cephalopods retrieved from the samples studied here (ammonites – LUKENEDER 2010; belemnites – JANSSEN 2010) indicates a Barremian, possibly Late Barremian age for the horizons containing the ostracods fauna (localities 1 and 2). Other co-occurring organism groups (asteroids – VILLIER 2010; bryozoans – TAYLOR 2010; corals – LÖSER 2010; crinoids – JÄGER 2010; rhyncholites – RIEGRAF & MOOSLEITNER 2010) did not include age-indicative taxa.

Material and Methods

The study of the Barremian ostracods of the Serre de Bleyton has been undertaken mostly on outcrop 2. The outcrop 1 although quantitatively much smaller, has yielded a similar fauna on the taxonomic point of view. The material comes from marly sediments and the ostracods were picked and cleaned by Gero MOOSLEITNER (Salzburg) using an ultrasonic bath and the tenside Rewoquat (LIERL 1992).

Several thousands of specimens compose this assemblage which is absolutely exceptional in terms of richness and species diversity. In this paper we have tried to illustrate the great majority of the encountered species, but due to the great amount of specimens it is most likely that some are omitted.

The ostracod fauna observed is composed of 67 species belonging to 38 different genera. Amongst them, 24 species could be related to taxa already known, the remaining ones (often rare specimens) are left in open nomenclature until additional study. A main characteristic of this material is that it is quasi-exclusively composed of closed carapaces, with very rare loose valves, which in some cases precludes accurate taxonomic assignments.

Main results

Qualitatively, the assemblage is clearly dominated by the Cytheridae with the genera *Schuleridea*, *Asciocythere*, *Dolocytheridea*, the Bairdiidae, the Trachyleberididae with several species of *Rehacythereis* and the Cytherettidae with the genera *Hehticythere*, *Strigosocythere* and *Protocythere*. This last family is generally well represented during the whole Lower Cretaceous. The scarcity of the Cytherellidae and notably the genus *Cytherella* is noticeable as well as the absence of the trachyleberidid genus *Platycythereis*,

usually often present during this period in Europe (BABINOT et al. 1985; SAUVAGNAT et al. 2001).

In a very complex geodynamic setting, it is most likely that the microfaunas have been very quickly transported in enormous quantities. This scenario is suggested by numerous impact traces visible on the carapaces (Pl. 5, Figs 1, 11, 20; Pl. 6, Fig. 14; Pl. 8, Fig. 11 for example), as well as by a clear degree of wear of the ornamentation in numerous specimens. No size selection has been observed

All the genera and species recognized are characteristic of a marine environment, probably middle-shelf and not a single specimen of brackish or fresh-water ostracods (*Cypridea*) has been encountered. Qualitatively, this fauna is typical of the Lower Cretaceous (Hauterivian to Aptian) without more precision although several species are known until now to be restricted to the Barremian. Sauvagnat et al. (2001) have already demonstrated that on the basis of the ostracod faunas it was not possible to differentiate the Barremian from the lower Aptian. It is important to note the presence of few “praecursor” genera which will develop during the Upper Cretaceous (already in the Cenomanian) such as *Kingmaina*?, *Dumontina*, *Kamajcythereis*, “*Cytheretta*”...

From a palaeobiogeographical point of view, one main characteristic of this fauna is the clear Tethyan nature. If many species are known from NW Europe, several have been described from the Barremian of Transcaucasia (Azerbaijan) such as *Annosocythere costaflexuosa* KUZNETSOVA, 1957, *Bairdoppilata luminosa* KUZNETSOVA, 1961, *Kentrodictyocythere quasiconcentrica* (KUZNETSOVA, 1961), *Neocythere* (*Centrocythere*) *djaffarovi* (KUZNETSOVA, 1961), *Paracypris levis* KUZNETSOVA, 1961, *Quasihermanites retrusa* (KUZNETSOVA, 1961), *Strigosocythere chaililovi* (KUZNETSOVA, 1961), *Trochinus consuetus* KUZNETSOVA, 1961, *Trochinus* cf. *irobustus* KUZNETSOVA, 1961). Only 20 species were previously reported from the Vocontian trough, SE France (SCARENZI-CARBONI, 1984).

Affinities with North Africa and the Middle East are more subtle: *Cytherelloidea* cf. *ghabounensis* BISCHOFF, 1964, *Cytherelloidea* sp. 1, *Schuleridea* cf. *btaterensis* BISCHOFF, 1990... and few other species are known from both side of the Tethys: *Hehticythere derooi* (OERTLI, 1963), *Hehticythere hehti* (TRIEBEL, 1958), *Protocythere bedoulensis* MOULLADE, 1963.

Systematic Palaeontology

All the illustrated specimens are deposited in the ostracod collection of the Musée de Paléontologie, Université de Provence, Marseille, France (n° BSB 1–BSB 141). Another set of specimens is stored in the collection of the Naturhistorischen Museums of Vienna, Austria. For the supra-generic taxa we have followed the classification proposed by HORNE et al. 2002) otherwise the HARTMANN & PURI (1974) classification has been globally adopted.

Subclass Podocopa G.W. MÜLLER, 1894

Order Platycopida G.W. MÜLLER, 1894

Suborder Platycopina SARS, 1866

Superfamily Cytherelloidea SARS, 1866

Family Cytherellidae SARS, 1866

Genus *Cytherella* JONES, 1849

***Cytherella* IR K 22 GROSDIDIER, 1973**

(Pl. 1, Fig. 1)

Distribution: Aptian of Iran (GROSDIDIER 1973).

***Cytherella* sp. 1**

(Pl. 1, Fig. 2)

Remarks: This species of *Cytherella* is elongate and has parallel dorsal and ventral margins.

Genus *Cytherelloidea* ALEXANDER, 1929

***Cytherelloidea* cf. *ghabounensis* BISCHOFF, 1964**

(Pl. 1, Figs 3–5)

= *Cytherelloidea* aff. *rehburgensis* BARTENSTEIN & BRAND, 1959 in OERTLI (1989) (Pl., 1, Fig. 2)

= *Cytherelloidea* sp. 1 in SCARENZI-CARBONI (1984) (Pl. 1, Figs 14–16) and BABINOT et al. (1985) (Pl. 46, Fig. 1)

Distribution: Hauterivian of the Swiss Jura (OERTLI 1989); Barremian of the Vocontian trough, SE France (SCARENZI-CARBONI 1984; BABINOT et al. 1985). *Cytherelloidea ghabounensis* BISCHOFF, 1964, is known from the Aptian of Lebanon and Israel (BISCHOFF 1964; ROSENFELD & RAAB 1984) and the Hauterivian-Barremian of Tunisia (DAMOTTE et al., 1987).

***Cytherelloidea* sp. 1**

(Pl. 1, Fig. 6)

Remarks: This species shows strong affinities with *Cytherelloidea ovata* WEBER, 1934, *sensu* ROSENFELD & RAAB (1984) from the Aptian of Israel.

Order Podocopida G.W. MÜLLER, 1894

Suborder Podocopina G.W. MÜLLER, 1894

Superfamily Cytheroidea BAIRD, 1850

Family Bythocytheridae SARS, 1866

Genus *Patellacythere* GRÜNDEL & KOZUR, 1972

***Patellacythere* sp. 1**

(Pl. 1, Figs 7, 8)

Genus *Striatojonesia* SCHORNIKOV, 1990

***Striatojonesia* aff. *striatoides* (BONNEMA, 1941)**

(Pl. 1, Fig. 9)

Remarks: This species has very strong affinities with BONNEMA's species from the Upper Cretaceous of the Netherlands which is more elongate.

Family Cytherettidae TRIEBEL, 1952

Subfamily Cytherettinae TRIEBEL, 1952

Genus *Hechtcythere* GRÜNDEL, 1978

***Hechtcythere derooi* (OERTLI, 1958)**

(Pl. 1, Figs 10, 11)

= *Protocythere (Kemperiana) paraderooi* BASSIOUNI, 2002 (Pl. 14, Figs 11–16)

Distribution: This species has been sporadically reported since the Hauterivian, and is particularly common in the Albo-Aptian of Europe, North Africa (Morocco, Tunisia, and Egypt), offshore eastern Canada, Venezuela and Ecuador (COLIN & BABINOT 1996; BABINOT et al. 2007).

Remarks: We consider the subgenus *Kemperiana* proposed by BASSIOUNI (2002) as not justified.

***Hechtcythere hechti* (TRIEBEL, 1938)**

(Pl. 1, Figs 12–16)

= *Protocythere* sp. 5 SCARENZI-CARBONI, 1984 (Pl. 5, Fig. 15)

Distribution: Upper Valanginian to Barremian of Germany, Great-Britain, Poland, Paris Basin (GRÜNDEL 1966; BABINOT et al. 1985); Hauterivian of the Swiss Jura (OERTLI

1989); Barremian of the Vocontian trough, SE France (SCARENZI-CARBONI 1984); Barremian to lower Albian of Morocco (ANDREU et al. 1993).

Remarks: *Protocythere jaffaensis* ROSENFELD & RAAB, 1984, and *Protocythere galileensis* ROSENFELD & RAAB, 1984, both from the Aptian of Israel could be conspecific.

***Hechtycythere pumila* (GROSDIDIER, 1964)**

(Pl. 1, Figs 1–18)

Distribution: Hauterivian of the Paris Basin and Germany (GROSDIDIER 1964; DAMOTTE 1971; GRÜNDEL 1966; BABINOT et al. 1985).

***Hechtycythere* sp. 1**

(Pl. 2, Figs 1, 2)

= “*Protocythere*” aff. *croutesensis* DAMOTTE & GROSDIDIER, 1963 in SCARENZI-CARBONI (1984) (Pl. 5, Figs 12–14) and BABINOT et al. (1985) (Pl. 47, Figs 6–7).

Distribution: Barremian of the Vocontian Trough, SE France (SCARENZI-CARBONI 1984; BABINOT et al. 1985).

Genus *Protocythere* TRIEBEL, 1938

***Protocythere bedoulensis* MOULLADE, 1963**

(Pl. 1, Fig. 19)

Distribution: Late Hauterivian to lower Aptian of SE France (MOULLADE 1963; DONZE 1976); Upper Hauterivian to lower Aptian of Morocco (ROSSI & MALZ 2005); Hauterivian-Barremian of Bulgaria and Aptian of Ecuador (BABINOT et al. 2007).

***Protocythere* “sp. intermédiaire” DONZE, 1976**

(Pl. 2, Fig. 3)

Distribution: Hauterivian of the Vocontian trough, SE France (DONZE 1976; BABINOT et al. 1985).

Remarks: According to DONZE (1976), this form is transitional between *Protocythere triplicata* ROEMER, 1841, and *Protocythere bedoulensis* MOULLADE, 1963. Following ROSSI (2006), these forms could be related *Protocythere praetriplicata* BARTENSTEIN & BRAND, 1959 from the Berriasian to Hauterivian of Europe and Morocco.

Genus *Strigosocythere* GRÜNDEL, 1978***Strigosocythere chalilovi* (KUZNETSOVA, 1961)**

(Pl. 2, Figs 4–6)

- = *Cythereis* sp. 307 OERTLI, 1958 (Pl. 8, Fig. 170; pl. 9, Fig. 199)
- = “*Cythereis*” gr. sp. 307 OERTLI, 1958 in COLIN et al. (1981) (Pl. 11.2, Fig. 10)
- = *Cythereis* ? gr. C 307 OERTLI, 1958 in AINSWORTH (1986a) (Figs 13.9, 11–13)
- = “*Protocythere*” sp. 2 SCARENZI-CARBONI, 1984 and in BABINOT et al. (1985) (Pl. 47, Figs 9–10)
- = “*Protocythere*” sp. 3 SCARENZI-CARBONI, 1984 and in BABINOT et al. (1985) (Pl. 47, Fig. 11)
- = *Mandocythere* ? sp. B 28, BABINOT et al., 1985 (Pl. 45, Fig. 8–11)
- = *Strigosocythere* ? *reticulata* SAUVAGNAT, 1999 (Pl., 11, Figs 205–211)
- = *Cythereis* cf. *buechlerae* OERTLI, 1963 in WILKINSON (2008) (Pl. 1, Fig. 10)

Distribution: Barremian of Azerbaijan (KUZNETSOVA 1961); lower Aptian of the Jura (SAUVAGNAT 1999); Barremian of the Paris Basin (BABINOT et al. 1985); Aptian-Barremian of SE France (OERTLI 1963; SCARENZI-CARBONI 1984; BABINOT et al. 1985; SAUVAGNAT et al. 2001); Aptian of offshore Ireland (AINSWORTH 1986a; COLIN et al. 1981) and England (WILKINSON 2008).

***Strigosocythere strigosa* (GROSDIDIER, 1964)**

(Pl. 2, Figs 7–11)

Distribution: Barremian of the Paris Basin (GROSDIDIER 1964; BABINOT et al. 1985).

Remarks: The presence in Morocco is highly doubtful (very poor illustration in MOJON et al. 2009).

Family Cytheridae BAIRD, 1850

Subfamily Cytherinae BAIRD, 1850

Genus *Dolocythere* MERTENS, 1956***Dolocythere longa* GRÜNDEL, 1966**

(Pl. 3, Figs 1–4)

- = *Dolocythere* sp. 3 SCARENZI-CARBONI, 1984 (Pl. 3, Fig. 3)

Distribution: Hauterivian of Germany (GRÜNDEL 1966); Hauterivian of the Swiss Jura (OERTLI 1989); Barremian of the Vocontian trough, SE France (SCARENZI-CARBONI 1984).

Remarks: *Cytherura qiryatshemonaensis* ROSENFELD & RAAB, 1984, from the Neocomian of Israel shows very strong affinities.

***Dolocythere* sp. 2 SCARENZI-CARBONI, 1984**

(Pl. 3, Fig. 5)

= *Dolocythere* sp. 1 CABRAL, 1995 (Pl. 6, Figs 1–2)= *Dolocythere* ? sp. SAUVAGNAT, 1999 (Pl. 6, Fig. 122)

Distribution: Barremian of the Vocontian trough, SE France (SCARENZI-CARBONI 1984; BABINOT *et al.* 1985); Lower Aptian of Portugal (CABRAL 1995); Lower Aptian of the Jura (SAUVAGNAT 1999).

***Dolocythere* sp. 1**

(Pl. 3, Fig. 6)

***Dolocythere* sp. 4 SCARENZI-CARBONI, 1984**

(Pl. 3, Figs 7, 8)

Distribution: Barremian of the Vocontian trough, SE France (SCARENZI-CARBONI 1984).

Subfamily Progonocytherinae SYLVESTER-BRADLEY, 1948

Genus *Neocythere* MERTENS, 1956

Subgenus *Centrocythere* MERTENS, 1956

***Neocythere (Centrocythere) djaffarovi* (KUZNETSOVA, 1961)**

(Pl. 3, Figs 9, 10)

Distribution: Barremian of Azerbaijan (KUZNETSOVA 1961).

Remarks: This species was originally described as belonging to the genus *Cythereis*.

***Neocythere (Centrocythere) cf. gottisi* DAMOTTE & GROSDIDIER, 1963**

(Pl. 3, Figs 11–15)

= *Neocythere* sp. 2 SCARENZI-CARBONI, 1984 (Pl. 3, Figs 22, 23) and *in* BABINOT *et al.* (1985) (Pl. 46, Fig. 10)

Distribution: Aptian of the Paris Basin (DAMOTTE & GROSDIDIER 1963; BABINOT *et al.* 1985), Jura (SAUVAGNAT 1999), Portugal (CABRAL 1995), offshore Ireland (COLIN *et al.* 1981; AINSWORTH 1986a), England (WILKINSON 2008); Barremian of the Vocontian trough, SE France (SCARENZI-CARBONI 1984; BABINOT *et al.* 1985).

Neocythere (Centrocythere) sp. 1

(Pl. 3, Figs 16, 17)

Remarks: This species has affinities with *Neocythere (Centrocythere) bordeti* DAMOTTE & GROSDIDIER, 1963, from the Aptian of the Paris Basin but much more elongate.

Genus *Trochinius* MANDELSTAM, 1957

***Trochinius consuetus* KUZNETSOVA, 1961**

(Pl. 3, Figs 18, 19)

Distribution: Barremian of Azerbaijan (KUZNETSOVA 1961).

***Trochinius cf. irobustus* KUZNETSOVA, 1961**

(Pl. 3, Fig. 20)

Remarks: Our specimen lacks the prominent eye tubercle of KUZNETSOVA's species.

Distribution: Barremian of Azerbaijan (KUZNETSOVA 1961).

Family Cytherideidae Sars, 1925

Subfamily Cytherideinae Sars, 1925

Genus *Asciocythere* SWAIN, 1952

***Asciocythere sp. 1* SCARENZI-CARBONI, 1984**

(Pl. 3, Fig. 20)

Distribution: Barremian of the Vocontian trough, SE France (SCARENZI-CARBONI 1984).

Remarks: This species have morphological affinities with *Clithrocytheridea cf. lusitanica* (DAMOTTE, RAMALHO & REY, 1988) in CABRAL (1995), Albian of Portugal.

***Asciocythere sp.* SCARENZI-CARBONI, 1984**

(Pl. 3, Fig. 21)

= *Asciocythere* sp. 1 BABINOT *et al.*, 1985 (Pl. 46, Figs 5–6)

Distribution: Barremian of the Vocontian trough, SE France (SCARENZI-CARBONI 1984; BABINOT *et al.* 1985).

Genus *Kalyptovalva* HOWE & LAURENCICH, 1958***Kalyptovalva* ? sp. 1 (SCARENZI-CARBONI, 1984)**
(Pl. 4, Figs 1, 2)

= *Bythocypris* sp. 1 SCARENZI-CARBONI, 1984 (Pl. 2, Figs 7–10)

Distribution: Barremian of the Vocontian Trough, SE France (SCARENZI-CARBONI 1984).

Remarks: This species have morphological affinities with *Kalyptovalva* ? *tifratinensis* ANDREU, 1991, from the Cenomanian of Morocco and Egypt (BASSIOUNI 2002) and with *Paracypris lusitanicus* DAMOTTE, CABRAL & BERTHOU, 1990, from the Aptian of Portugal (DAMOTTE et al. 1990).

Genus *Kentrodictyocythere* DONZE, 1968***Kentrodictyocythere* cf. *quasiconcentrica* (KUZNETSOVA, 1961)**
(Pl. 4, Figs 3–5)

= *Kentrodictyocythere* sp. SCARENZI-CARBONI, 1984 (Pl. 2, Fig. 15)

Distribution: Barremian of the Vocontian trough, SE France (SCARENZI-CARBONI 1984; BABINOT et al. 1985); Barremian of Azerbaijan (KUZNETSOVA 1961).

Genus *Dolocytheridea* TRIEBEL, 1938Subgenus *Puracytheridea* GRÜNDEL, 1971***Dolocytheridea* (*Puracytheridea*) ? sp. 1**
(Pl. 4, Figs 6–8)

Remarks: This species may be identical to Gen. indet. A of SAUVAGNAT (1999), from the Aptian of the Jura.

***Dolocytheridea* (*Puracytheridea*) ? sp. 2**
(Pl. 4, Fig. 9)

Remarks: The outline of this is very similar to that of *Dolocytheridea* (*Puracytheridea*) *atlasica* (BASSOULET & DAMOTTE, 1969), a species very common in the Cenomanian of northern Africa and the Middle East (BASSIOUNI 2002).

Subfamily Schulerideinae MANDELSTAM, 1959

Genus Schuleridea SWARTZ & SWAIN, 1946

***Schuleridea alata* KAYE, 1965**

(Pl. 4, Fig. 10–13)

= *Schuleridea* aff. *rhomboidalis* NEALE, 1960, in SCARENZI-CARBONI (1984) (Pl. 2, Figs 22, 23)= *Schuleridea rhomboidalis* NEALE, 1960, in BABINOT *et al.* (1985) (Pl., 46, Fig. 7)= *Schuleridea* cf. *S. alata* KAYE, 1965 in AINSWORTH (1986b) (Figs 12, 5–9)

Distribution: Aptian of England (KAYE, 1965) and offshore Ireland (AINSWORTH, 1986b); Barremian of the Vocontian trough, SE France (SCARENZI-CARBONI 1984; BABINOT *et al.* 1985; SAUVAGNAT *et al.* 2001).

***Schuleridea* cf. *btaterensis* BISCHOFF, 1990**

(Pl. 4, Figs 17–19)

= *Schuleridea* IR E 1 GROSDIDIER, 1973 (Pl. 5, Figs 36 a-f).

Distribution: Aptian of Lebanon (BISCHOFF 1990) and Barremian of Iran as (GROSDIDIER 1973).

***Schuleridea* sp. 1**

(Pl. 4, Figs 14–16)

Remarks: *Schuleridea* ? *attabensis* ANDREU, 1991, from the lower Aptian of Morocco and *Schuleridea* sp. 1 ROSSI, 2006, from the Barremian of Morocco are quite similar but have a smooth ridge limited to the ventral side and therefore are very different in dorsal view.

***Schuleridea* sp. 2**

(Pl. 4, Fig. 20)

Remarks: This species shows some affinities with *Schuleridea* cf. *praethoerenensis* BARTENSTEIN & BRAND, 1959, from the Berriasian of Morocco (ROSSI 2006).

Family Cytheruridae G.W. MÜLLER, 1894

Subfamily Cytherurinae G.W. MÜLLER, 1894

Genus *Acrocythere* NEALE, 1960

“*Acrocythere*” cf. *striata* KAYE, 1965

(Pl. 5, Fig. 1)

= *Protocythere* ? sp. SCARENZI-CARBONI, 1984 (Pl. 51, Fig. 9)= *Acrocythere* ? *striata* KAYE, 1965 in AINSWORTH (1986b) (Figs 13, 14)

Distribution: Albian of England (KAYE 1965) and offshore Ireland (AINSWORTH 1986b); Barremian of the Vocontian trough, SE France (SCARENZI-CARBONI, 1984).

Remarks: This species is also quite similar to “*Leniocythere*” IR 22 GROSDIDIER, 1973, from the upper Cretaceous of Iran and Indet. Sp. B. of OERTLI (1974) from the Albian of the DSDP site west of Australia and described as *Cytherura* ? *oertlii* DINGLE, 1984 in the Albian of the Falkland Plateau (DINGLE, 1984). A related species, *Acrocythere* sp. cf. *A. striata* is known from the Albian of India (JAIN 1978). According to AINSWORTH (1986b) this species should be placed in a new genus. We agree with this statement.

***Acrocythere* sp. SCARENZI-CARBONI, 1984**

(Pl. 5, Figs 2–7)

= *Amphicytherura roemeri* (BARTENSTEIN, 1956) in OERTLI (1989) (Pl. 1, Figs 13–14).

Distribution: Barremian of the Vocontian trough, SE France (SCARENZI-CARBONI 1984); Hauterivian of the Swiss Jura (OERTLI 1989).

***Acrocythere* sp. 1**

(Pl. 5, Figs 8–9)

Genus *Cresacytheridea* GRÜNDEL, 1975***Cresacytheridea* sp. 1**

(Pl. 5, Fig. 10)

Remarks: This species has affinities with *Cresacytheridea damottae* CABRAL, 1995, from the Aptian of Portugal, but is smooth.

Genus *Eucytherura* G.W. MÜLLER, 1894***Eucytherura* sp. 1**

(Pl. 5, Fig. 11)

= *Cresacytheridea* aff. *ardescae* (DONZE, 1965) in SCARENZI-CARBONI (1984) (Pl. 6, Figs 10–11)= *Eucytherura* aff. *ardescae* DONZE, 1965 in BABINOT et al. (1985) (Pl. 47, Figs 14, 15)

Distribution: Barremian of the Vocontian trough, SE France (SCARENZI-CARBONI 1984; BABINOT et al. 1985).

Genus *Semicytherura* WAGNER, 1957

***Semicytherura* sp. 1**

(Pl. 5, Fig. 12)

Remarks: This species is closely related to *Semicytherura* sp. 1 of ANDREU (1991) from the Cenomanian of Morocco and *Semicytherura reticulosa* (CHAPMAN, 1894) from the Aptian of England (KAYE 1964).

Subfamily Cytheropterinae HANAI, 1957

Genus *Eocytheropteron* ALEXANDER, 1933

***Eocytheropteron* sp. 1**

(Pl. 5, Figs 13–14)

Remarks: This species has some affinities with *Eocytheropteron* aff. *postilum* (LJUBIMOVA, 1965) in GROSDIDIER (1973), from the Cenomanian of Iran.

Family Paracytherideidae PURI, 1957

Genus *Hemiparacytheridea* HERRIG, 1963

***Hemiparacytheridea* sp. 1**

(Pl. 5, Fig. 15)

Remarks: This species shows strong morphological affinities with *Hemiparacytheridea ewingensis* DINGLE, 1984 from the Albion of the Falkland Plateau (DINGLE, 1984).

Family Trachyleberididae SYLVESTER-BRADLEY, 1948

Subfamily Trachyleberidinae SYLVESTER-BRADLEY, 1948

Genus *Kamajcythereis* POKORNÝ & COLIN, 1976

***Kamajcythereis* sp. 1**

(Pl. 5, Figs 16, 17)

Remarks: This species is very close to the type species *Kamajcythereis kamajcensis* (POKORNÝ, 1967) from the Turonian of Bohemia (Czech Republic), from which it differs essentially by the absence of the medio-lateral ridge (POKORNÝ & COLIN 1976). Strong af-

finities are also with *Veeniacythereis ghabounensis ghabounensis* (BISCHOFF, 1963) *sensu* ROSENFELD & RAAB (1984), from the Hauterivian-Barremian of Israel.

Genus *Kingmaina* KEIJ, 1957

***Kingmaina* ? sp.**
(Pl. 5, Figs 18–21)

Remarks: This reticulate species with ventral wings it tentatively assigned to the Upper Cretaceous and Tertiary genus *Kingmaina*.

Genus *Paracaudites* DELTEL, 1963

***Paracaudites* ? sp. 1**
(Pl. 5, Fig. 22)

Remarks: Only one specimen of a not too well preserved specimen tentatively attributed to the Upper Cretaceous/Paleogene genus *Paracaudites*.

Genus *Rehacythereis* GRÜNDEL, 1973

***Rehacythereis geometrica* (DAMOTTE & GROSDIDIER, 1964)**
(Pl. 6, Figs 1–3)

Distribution: Aptian of the Paris, Jura (SAUVAGNAT 1999; WILKINSON 2008); Barremian of Great-Britain (KAYE & BARKER 1966), and of the Vocontian trough, SE France (BABINOT et al. 1985).

***Rehacythereis* aff. *glabrella* (TRIEBEL, 1940)**
(Pl. 5, Figs 23, 24)

= "*Cythereis*" aff. *geometrica* in SCARENZI-CARBONI (1984) (Pl. 4, Figs 14–16)

= *Cythereis* sp. 5 SCARENZI-CARBONI, 1984 (Pl. 4, Figs, 10–13)

= *Cythereis* sp. 7 SCARENZI-CARBONI, 1984 (Pl. 4, Figs 17–18)

Distribution: Lower Aptian and Barremian of the Jura (SAUVAGNAT 1999; SAUVAGNAT et al. 2001); Barremian of the Paris Basin (BABINOT et al. 1985) and Barremian of the Vocontian trough, SE France (SCARENZI-CARBONI 1984; BABINOT et al. 1985).

***Rehacythereis* sp. 1**

(Pl. 6, Fig. 4)

Remarks: This species has clear affinities with *Rehacythereis bernardi* (GROSDIDIER, 1964) from the Hauterivian of the Paris Basin, but with thin ridges.

***Rehacythereis* sp. 2**

(Pl. 6, Figs 5–9)

= *Cythereis* aff. *semiaperta* GROSDIDIER, 1963 in BRENNER (1976) (Pl. 17, Figs 1–3)

Distribution: Aptian of northern Spain (BRENNER, 1976).

***Rehacythereis* sp. 3**

(Pl. 6, Figs 14–15)

Remarks: This species is characterized by the presence of a very large smooth and elongate muscle tubercle.

***Rehacythereis* sp. 4**

(Pl. 6, Figs 11–13)

Remarks: This species shows affinities with *Hazelina* ? sp.1 of CABRAL (1995) from the Albian of Portugal.

***Rehacythereis* sp. 5**

(Pl. 6, Fig. 10)

***Rehacythereis* sp. 6**

(Pl. 6, Figs 16, 17)

Remarks: This species has affinities with *Rehacythereis bernardi* (GROSDIDIER, 1964) from the Hauterivian of the Paris Basin, but is much smaller.

Indet. gen. 1, sp. 1

(Pl. 7, Figs 1–3)

Remarks: The closest morphologically related species is “*Cytheretta*” sp. of BATE (1975) from the Tithonian of Tanzania. The genus *Cytheretta* being a strictly Tertiary genus, the generic assignation of this species remains highly questionable.

Indet. gen. 2, sp. 1

(Pl. 7, Fig. 4)

Family Xestoleberididae Sars, 1928

Genus *Microxestoleberis* G.W. MÜLLER, 1894

***Microxestoleberis* ? sp. 1**

(Pl. 7, Fig. 5)

Genus *Platyleberis* BONADUCE & DANIELOPOL, 1988

***Platyleberis* ? sp. 1 (BABINOT et al., 1985)**

(Pl. 7, Figs 6–8)

= *Xestoleberis* sp. 1 BABINOT et al., 1985 (Pl. 47, Figs 18–21)

Distribution: Barremian of the Vocontian trough, SE France (BABINOT et al. 1985)

Remarks: This species is characterized by a very concave ventral side of the carapace. *Cytheropteron* ? sp. 15 of ROSENFELD & RAAB (1984), from the Aptian of Israel is much more elongate.

Genus *Xestoleberis* Sars, 1866

***Xestoleberis* sp. 1**

(Pl. 7, Figs 9, 10)

Familiae incertae

Genus *Annosocythere* KUZNETSOVA, 1957

***Annosocythere costaflexuosa* KUZNETSOVA, 1957**

(Pl. 7, Figs 11, 12)

= *Annosocythere costaeuata* KUZNETSOVA, 1961 (female) (Pl. 51, Figs 4–6)

= *Hemicytherura* ? sp. 3 SCARENZI-CARBONI, 1984 (Pl. 6, Figs 19–20)

Distribution: Barremian of Azerbaijan (KUZNETSOVA in MANDELSTAM et al. 1957; KUZNETSOVA 1961) and of the Vocontian trough, SE France (SCARENZI-CARBONI 1984).

Genus *Quasihermanites* GRÜNDEL, 1964***Quasihermanites retrusa* (KUZNETSOVA, 1961)**

(Pl. 7, Figs 13, 14)

= *Quasihermanites bicarinata* GRÜNDEL, 1964 (Pl. 1, Fig. 12)= *Ranocythereis caistorensis* KAYE, 1965 (Pl. 6, Figs 1–9)

Distribution: Barremian of Azerbaijan; Hauterivian of Germany, England and the Paris Basin (GRÜNDEL 1966; KAYE 1965; BABINOT et al. 1985); Aptian of Israel (ROSENFELD & RAAB 1984).

Remarks: *Quasihermanites implicata* DONZE, 1965 from the Valanginian SE France and the Tithonian of Crimea (TESAKOVA & SAVALIEVA 2005) might be conspecific as well as *Quasihermanites bicarinatus moravicus* POKORNY, 1963 from the Tithonian of southern Moravia.

Suborder Bairdocopina SARS, 1866

Superfamily Bairdioidea SARS, 1866

Family Bairdiidae SARS, 1888

Genus *Neonesidea* MADDOCKS, 1969***Neonesidea* sp. 1**

(Pl. 7, Figs 15–16)

***Neonesidea* sp. 2**

(Pl. 8, Fig. 1)

Remarks: This elongate species is closely related to *Bairdia* sp. 2 of ROSSI (2006) from the Hauterivian of Morocco.

***Paranesidea* sp. 1**

(Pl. 8, Fig. 2)

Genus *Bairdoppilata* CORYELL, SAMPLE & JENNINGS, 1935***Bairdoppilata luminosa* KUZNETSOVA, 1961**

(Pl. 8, Figs 3–5)

Distribution: Barremian of Azerbaijan (KUZNETSOVA 1961).

***Bairdoppilata* sp. 1**

(Pl. 8, Figs 6–7)

Family Bythocyprididae MADDOCKS, 1969

Genus *Bythocypris* BRADY, 1880

***Bythocypris* ? sp. 1**

(Pl. 8, Fig. 8)

Suborder Cypridocopina BAIRD, 1845

Superfamily Pontocypridoidea G.W. MÜLLER, 1894

Family Pontocyprididae G.W. MÜLLER, 1894

Genus *Pontocyprrella* LJUBIMOVA, 1955

***Pontocyprrella* cf. *harrisiana* (JONES, 1949)**

(Pl. 8, Fig. 9)

= *Pontocyprrella* sp. ROSSI 2006 (Pl 4, Figs 10–13)

Distribution: Albian to Turonian of Western Europe (WEAVER 1982; SAUVAGNAT 1999; SLIPPER 2009); lower Aptian of SE France (BABINOT et al. 2007); Valanginian of Morocco (ROSSI 2006).

Superfamily Cypridoidea BAIRD, 1845

Family Candonidae KAUFMANN, 1900

Subfamily Paracypridinae SARS, 1923

Genus *Paracypris* SARS, 1866

***Paracypris* *levis* KUZNETSOVA, 1961**

(Pl. 8, Fig. 10)

Distribution: Barremian of Azerbaijan. Possibly in the Barremian offshore Ireland as *Paracypris* sp. A in AINSWORTH (1985).

***Paracypris* sp. 1**

(Pl. 8, Fig. 11)

Conclusions

The study of the microfaunas from the Barremian of the Serre de Bleyton, Drôme, SE France, based on several thousand specimens has yielded an exceptionally rich and diverse marine ostracode fauna with 67 species belonging to 38 genera. However, this fauna cannot bring additional arguments concerning the precise age of the Serre de Bleyton deposits. Several species are known until now to be restricted to the Barremian but many others have a much wider stratigraphic range (Hauterivian to Aptian). About one third of the species could be attributed to described species, the remaining (rare specimens, absence of loose valves) being kept in open nomenclature until further study. This study has tremendously increased the knowledge of the marine Barremian ostracods from SE France and has shown some affinities with Transcaucasia and to a lesser degree with the southern Tethyan margin (North Africa and the Middle East).

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Plate 1

(C: carapace; RV: right valve; LV: left valve)

Fig. 1: *Cytherella* IR K 22 GROSDIDIER, 1973, C, left view (BSB 1).

Fig. 2: *Cytherella* sp. 1, C, left view (BSB 2).

Figs 3–5: *Cytherelloidea* cf. *ghabounensis* BISCHOFF, 1959: 3: C, left view (BSB 3); 4: C, right view (BSB 4); 5: C, dorsal view (BSB 5).

Fig. 6: *Cytherelloidea* sp. 1, C, left view (BSB 6).

Figs 7, 8: *Patellacythere* sp. 1: 7: C, left view (BSB 7); 8: C, right view (BSB 8).

Fig. 9: *Striatojonesia* aff. *striatoides* (BONNEMA, 1941), C, left view (BSB 9).

Figs 10, 11: *Hehticythere derooi* (OERTLI, 1958): 10: C ♀, left view (BSB 10); 11: C ♂, right view (BSB 11).

Figs 12–16: *Hehticythere hehti* (TRIEBEL, 1938): 12: C ♂, left view (BSB 12); 13: C ♂, right view (BSB 13); 14: C ♀, dorsal view (BSB 14); 15: C ♀, dorsal view (BSB 15); 16: RV, internal view (BSB 16); 17: C ♀, left view (BSB 17).

Figs 17, 18: *Hehticythere pumila* (GROSDIDIER, 1964): 17: C, right view (BSB 17); 18: C, left view (BSB 18).

Fig. 19: *Protocythere bedoulensis* MOULLADE, 1963, C, left view, juvenile (BSB 19).

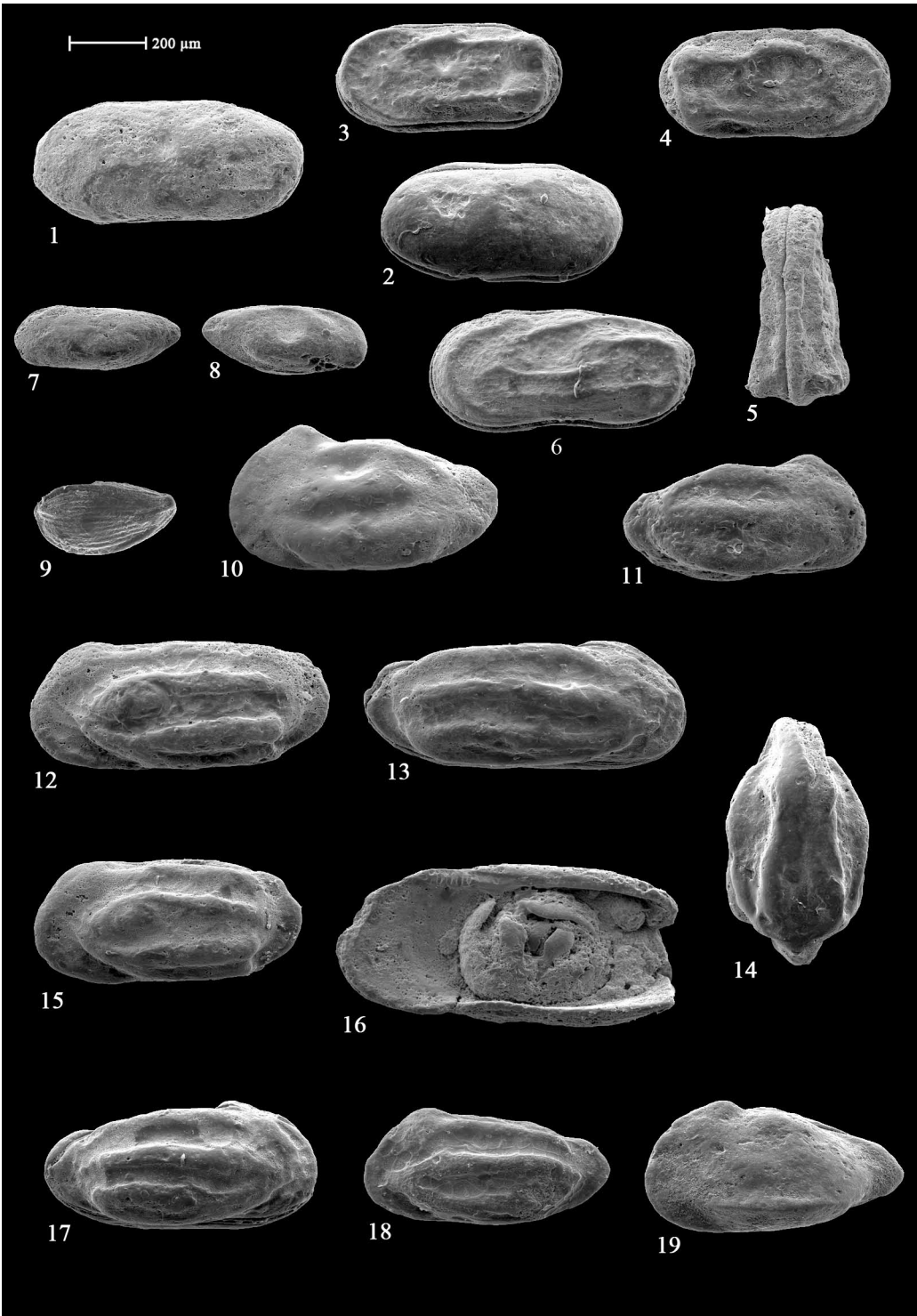


Plate 2

(C: carapace; RV: right valve; LV: left valve)

Figs 1–2. *Hechtythere* sp. 1: 1: C, right view (BSB 20); 2: C, left view (BSB 21).

Fig. 3: *Protocythere* “sp. intermédiaire” (DONZE 1976): C, right view (BSB 22).

Figs 4–6: *Strigosocythere chalilovi* (KUZNETSOVA, 1961): 4: C, left view (BSB 23); 5: C, right view (BSB 24); 6: C, dorsal view (BSB 25).

Figs 7–11: *Strigosocythere strigosa* (GROSDIDIER, 1964): 7: C, right view (BSB 26); 8: C, dorsal view (BSB 27); 9: C, left view (BSB 28); 10: C, left view (BSB 29); 11: C, right view (BSB 30).

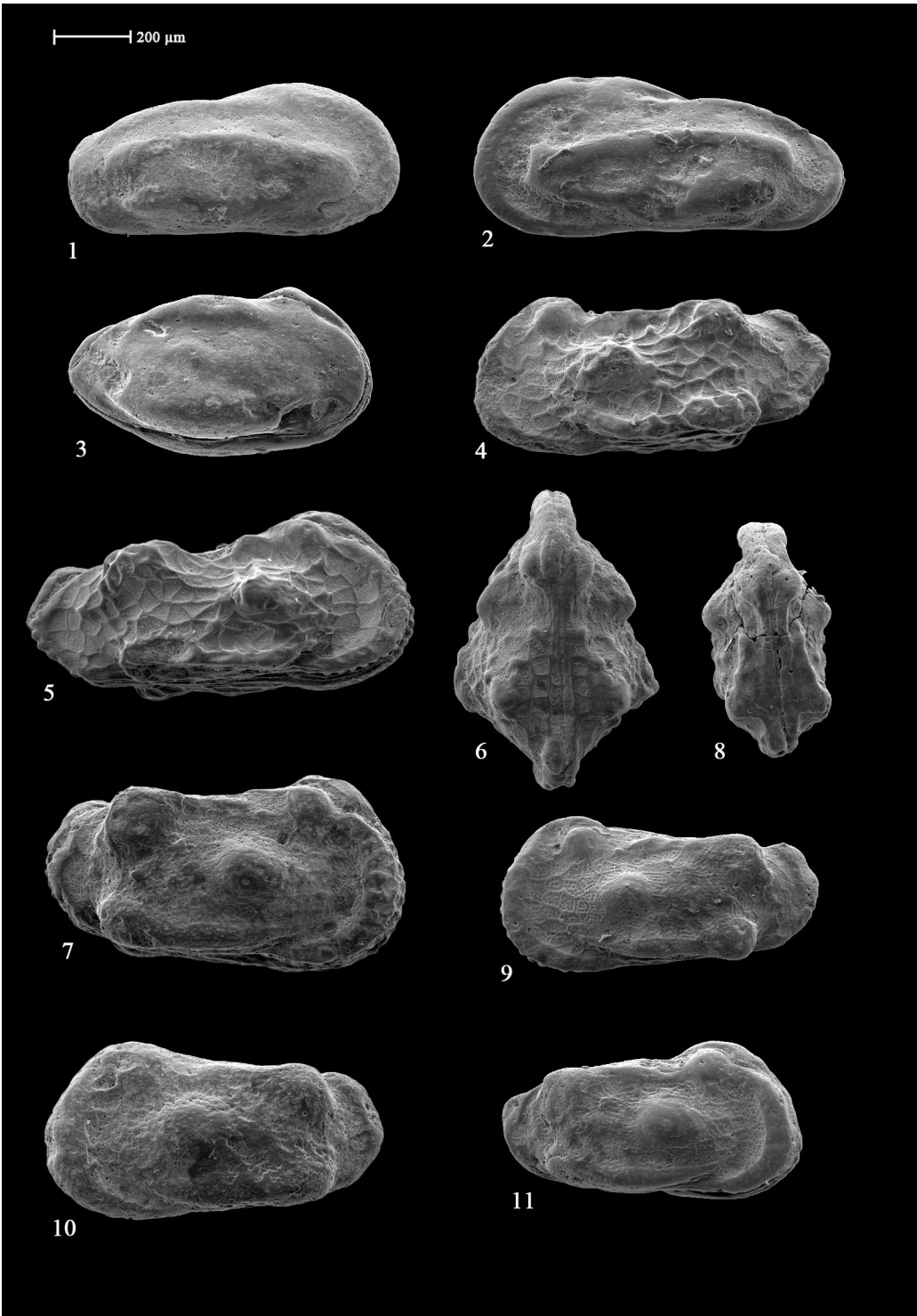


Plate 3

(C: carapace; RV: right valve; LV: left valve)

Figs 1–4: *Dolocythere longa* GRÜNDEL, 1966: 1: C, right view (BSB 31); 2: C, left view (BSB 32); 3: C, right view (BSB 33); 4: C, dorsal view (BSB 34).

Fig. 5: *Dolocythere* sp. 2 (SCARENZI-CARBONI 1984), C, left view (BSB 35).

Fig. 6: *Dolocythere* sp. 1, C, left view (BSB 36).

Figs 7, 8: *Dolocythere* sp. 4 (SCARENZI-CARBONI 1984): 7: C, right view (BSB 37); 8: C, dorsal view (BSB 38).

Figs 9–10: *Neocythere (Centrocythere) djaffarovi* (KUZNETSOVA, 1961): 9: C, right view (BSB 39); 10: C, left view (BSB 40).

Figs 11–15: *Neocythere (Centrocythere)* cf. *gottisi* DAMOTTE & GROSDIDIER, 1963: 11: C, left view (BSB 41); 12: C, right view (BSB 42); 13: C, dorsal view (BSB 43); 14: LV, internal view (BSB 44); 15: C, ventral view (BSB 45).

Figs 16, 17: *Neocythere (Centrocythere)* sp. 1: 16: C, left view (BSB 46); 17: C, right view (BSB 47).

Figs 18, 19: *Trochinius consuetus* KUZNETSOVA, 1961: 18: C, left view (BSB 48); 19: C, right view (BSB 49).

Fig. 20: *Trochinius* cf. *irobustus* KUZNETSOVA, 1961, C, left view (BSB 50).

Figs 21–23: *Asciocythere* sp. 1 (SCARENZI-CARBONI 1984): 21: C, right view (BSB 51); 22: C, right view (BSB 52); 23: LV, internal view (BSB 53).

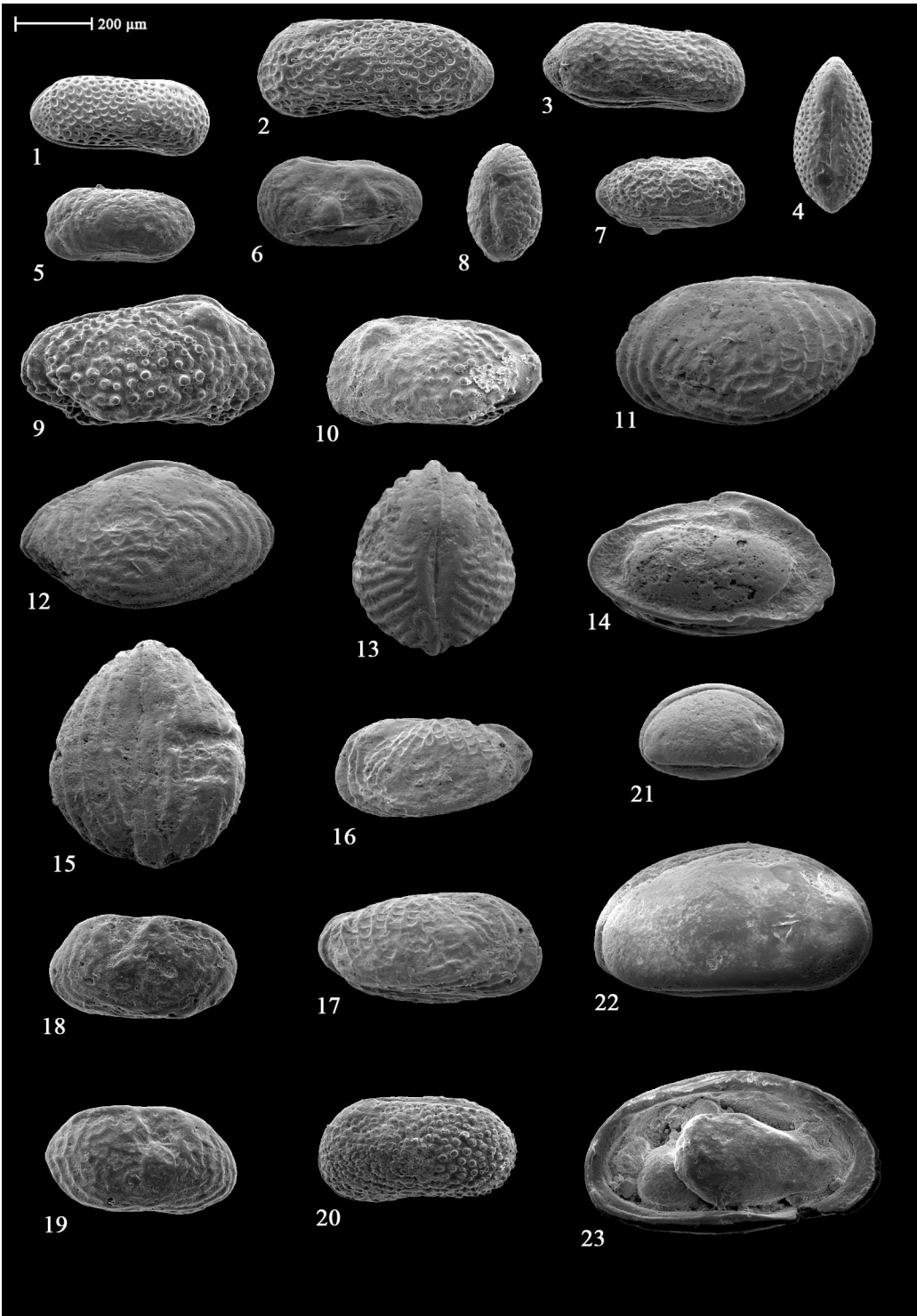


Plate 4

(C: carapace; RV: right valve; LV: left valve)

Figs 1, 2: *Kalyptoalva* ? sp. 1 (SCARENZI-CARBONI 1984): 1: C, right view (BSB 54); 2: LV, internal view (BSB 55).

Figs 3–5: *Kentrodictyocythere* cf. *quasiconcentrica* (KUZNETSOVA, 1961): 3: C, left view (BSB 56); 4: C, right view (BSB 57); 5: LV, internal view (BSB 58).

Figs 6–8: *Doloccytheridea* (*Puracytheridea*) ? sp. 1: 6: C, left view (BSB 59); 7: RV, internal view (BSB 60); 8: C, right view (BSB 61).

Fig. 9: *Doloccytheridea* (*Puracytheridea*) ? sp. 2: C, right view (BSB 62).

Figs 10–13: *Schuleridea alata* KAYE, 1965. 10: C, dorsal view (BSB 63); 11: C, right view (BSB 64); 12: C, right view (BSB 65); 13: C, left view (BSB 66).

Figs 14–16: *Schuleridea* sp. 1: 14: C, left view (BSB 67); 15: C, right view (BSB 68); 16: C, dorsal view (BSB 69).

Figs 17–19: *Schuleridea* cf. *btaterensis* BISCHOFF, 1990: 17: C ♂, right view (BSB 70); 18: LV, internal view (BSB 71); 19: RV, internal view (BSB 72).

Fig. 20: *Schuleridea* sp. 2, C, right view (BSB 73).

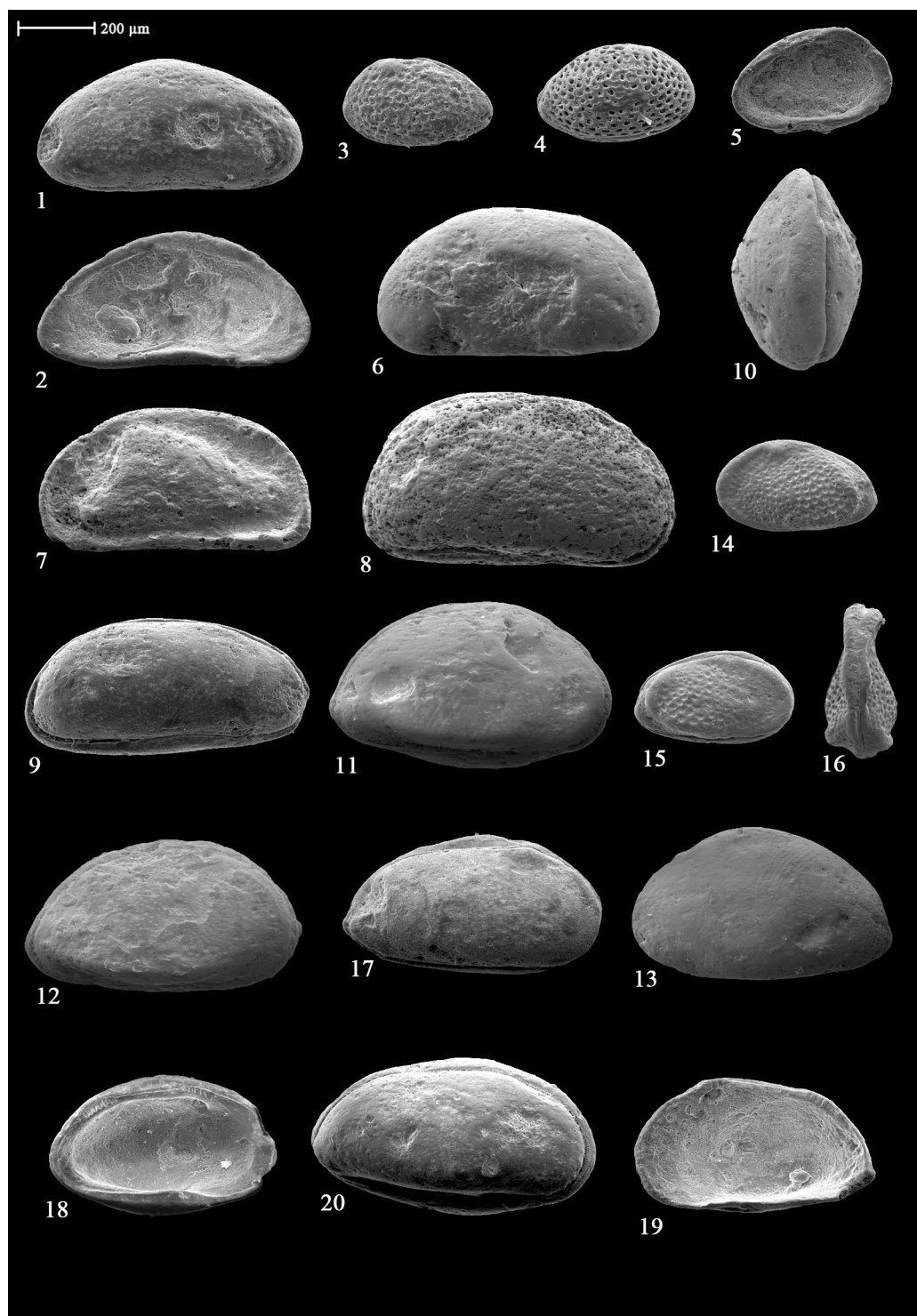


Plate 5

(C: carapace; RV: right valve; LV: left valve)

Fig. 1: “*Acrocythere*” cf. *striata* KAYE, 1965, C, right view (BSB 74)

Figs 2–7: *Acrocythere* sp. (SCARENZI-CARBONI 1984): 2: C ♀, left view (BSB 75); 3: C ♀, right view (BSB 76); 4: C ♂, left view (BSB 77); 5: C ♂, right view (BSB 78); 6: C ♀, dorsal view (BSB 79); 7: C ♂, dorsal view (BSB 80).

Figs 8, 9: *Acrocythere* sp. 1: 8: C, left view (BSB 81); 9: C, right view (BSB 82).

Fig. 10: *Cresacytheridea* sp. 1, C, left view (BSB 83).

Fig. 11: *Eucytherura* sp. 1, C, right view (BSB 84).

Fig. 12: *Semicytherura* sp. 1, C, right view (BSB 85).

Figs 13, 14: *Eocytheropteron* sp. 1: 13: C, right view (BSB 86); 14: C, left view (BSB 87).

Fig. 15: *Hemiparacytheridea* sp. 1, C, right view (BSB 88).

Figs 16, 17: *Kamajcythereis* sp. 1: 16: C, left view (BSB 89); 17: C, right view (BSB 90).

Figs 18–21: *Kingmaina* ? sp. 18: C, left view (BSB 91); 19: C, right view (BSB 92); 20: RV, internal view (BSB 93); 21: C, dorsal view (BSB 94).

Fig. 22: *Paracaudites* ? sp. 1, C, right view (BSB 95).

Figs 23–24: *Rehacythereis* aff. *glabrella* (TRIEBEL, 1940): 23: C, left view (BSB 96); 24: C, right view (BSB 97).

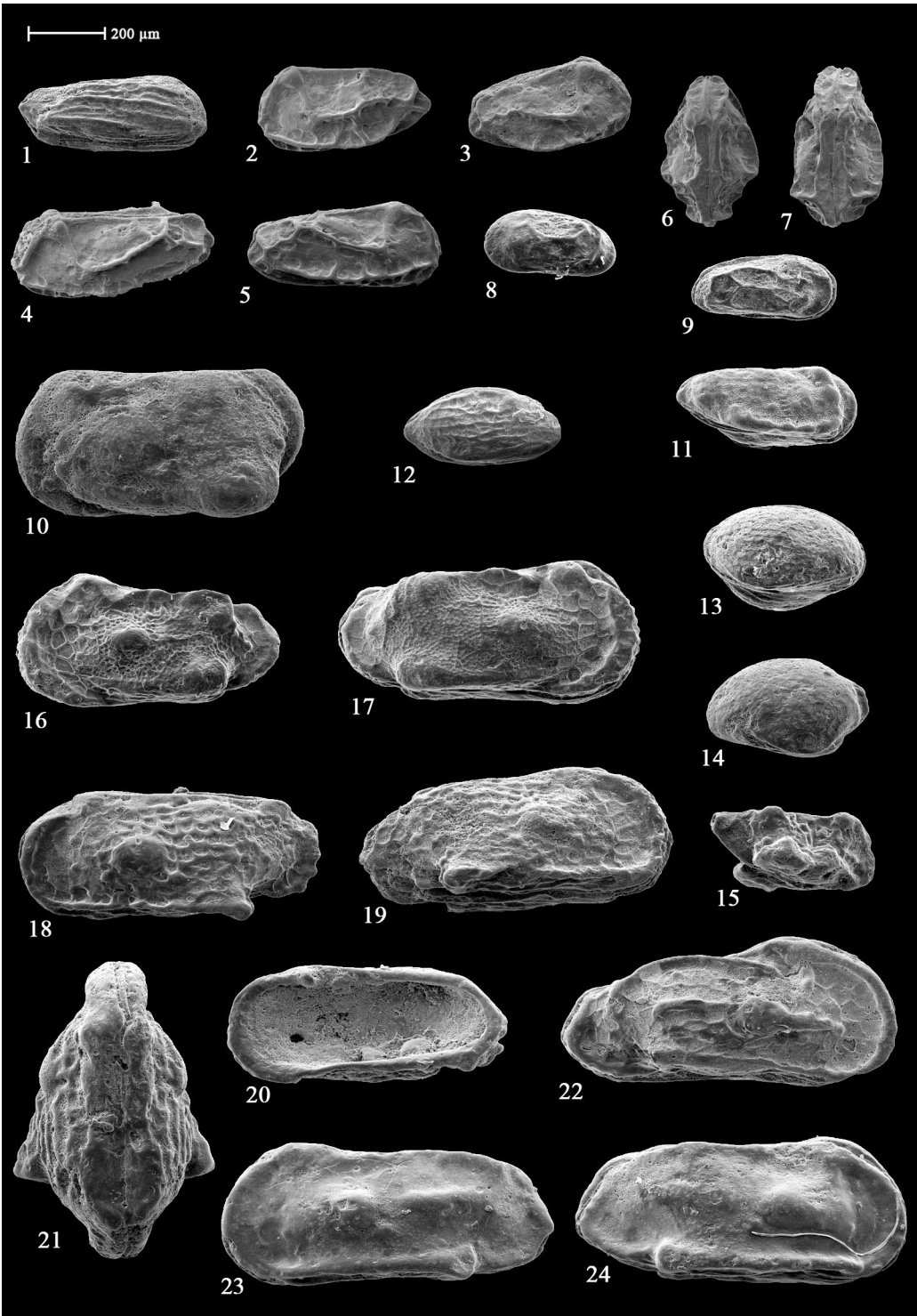


Plate 6

(C: carapace; RV: right valve; LV: left valve)

Figs 1–3: *Rehacythereis geometrica* (DAMOTTE & GROSDIDIER, 1964): 1: C, left view (BSB 98); 2: C, dorsal view (BSB 99); 3: C, right view (BSB 100).

Fig. 4: *Rehacythereis* sp. 1, C, left view (BSB 101).

Figs 5–9: *Rehacythereis* sp. 2: 5: C ♂, right view (BSB 102); 6: C ♀, left view (BSB 103); 7: C ♀ ?, dorsal view (BSB 104); 8: C ♂, right view (BSB 105); 9: C ♂, left view (BSB 106).

Fig. 10: *Rehacythereis* sp. 5, C, right view (BSB 107).

Figs 11–13: *Rehacythereis* sp. 4: 11: C, dorsal view (BSB 108); 12: C, left view (BSB 109); 13: C, right view (BSB 110).

Figs 14, 15: *Rehacythereis* sp. 3: 14: C, left view (BSB 111); 15: C, right view (BSB 112).

Figs 16, 17: *Rehacythereis* sp. 6: 16: C, right view (BSB 113); 17: C, left view (BSB 113).

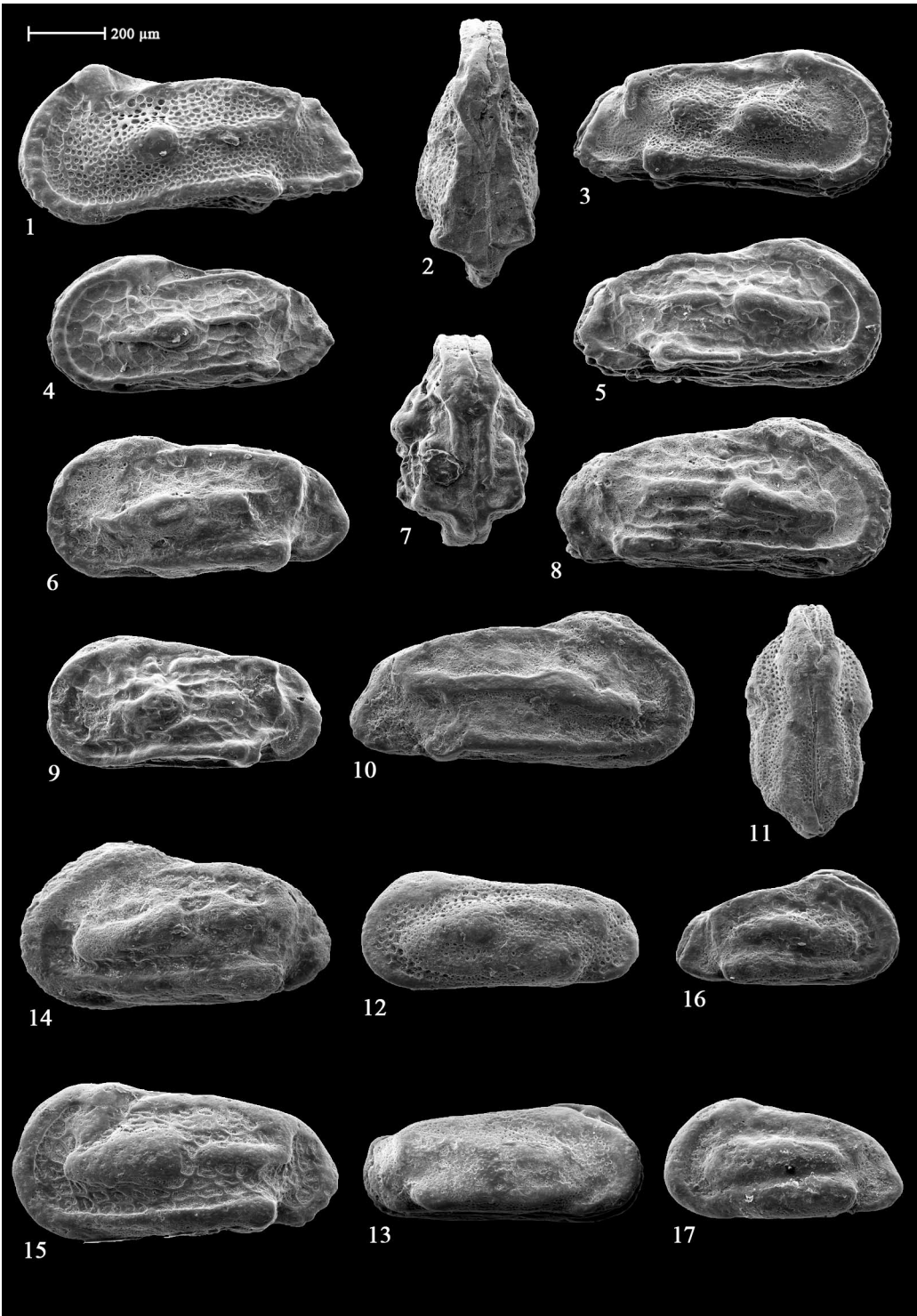


Plate 7

(C: carapace; RV: right valve; LV: left valve)

Fig. 1–3: Indet. gen. 1, sp. 1: 1: C, left view (BSB 115); 2: C, right view (BSB 116); 3: C, dorsal view (BSB 117).

Fig. 4: Indet. gen. 2, sp. 1, C, left view (BSB 118).

Fig. 5: *Microxestoleberis* ? sp. 1, C, right view (BSB 119).

Figs 6–8: *Platyleberis* ? sp. 1 (BABINOT et al. 1985): 6: C, right view (BSB 120); 7: C, right view (BSB 121); 8: C, left view (BSB 122).

Figs 9, 10: *Xestoleberis* sp. 1: 9: C, left view (BSB 123); 10: C, dorsal view (BSB 124).

Figs 11, 12: *Annosocythere costaflexuosa* KUZNETSOVA, 1957: 11: C, left view (BSB 125); 12: C, right view (BSB 126).

Figs 13, 14: *Quasihermanites retrusa* (KUZNETSOVA, 1961): 13: C, left view (BSB 127); 14: C, right view (BSB 128).

Figs 15, 16: *Neonesidea* sp. 1: 15: C, left view (BSB 129); 16: RV, internal view (BSB 130).

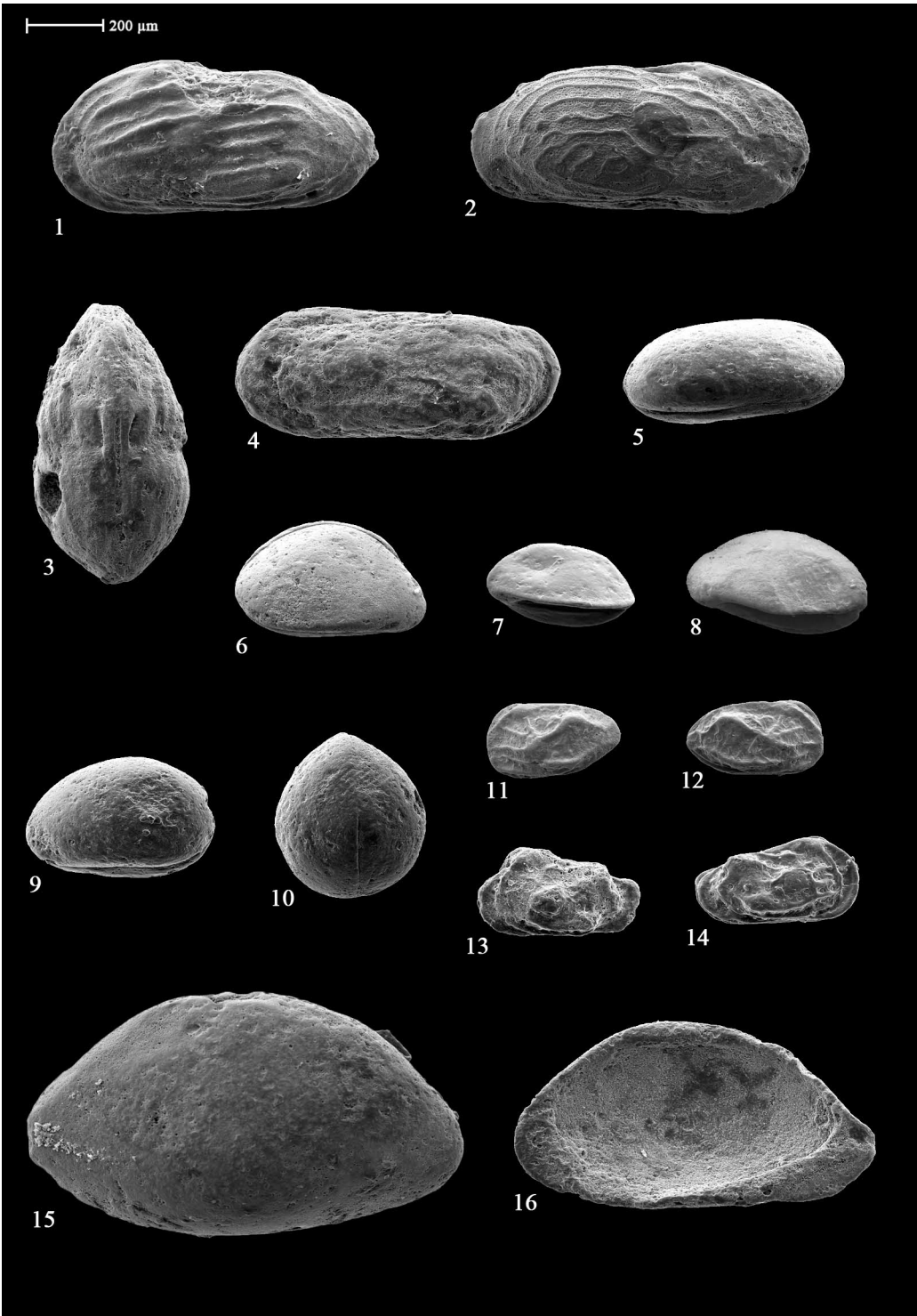


Plate 8

(C: carapace; RV: right valve; LV: left valve)

Fig. 1: *Neonesidea* sp. 2, C, right view (BSB 131).

Fig. 2: *Paranesidea* sp. 1, C, left view (BSB 132).

Figs 3–5: *Bairdoppilata luminosa* KUZNETSOVA, 1961. 3: C, left view (BSB 133) ; 4: RV (BSB 134); 5: RV, internal view (BSB 135).

Figs 6–7: *Bairdoppilata* sp. 1: 6: C, right view (BSB 136); 7: LV, internal view (BSB 137).

Fig. 8: *Bythocypris* ? sp. 1, C, right view (BSB 138).

Fig. 9: *Pontocyprilla* cf. *harrisiana* (JONES, 1949), C, right view (BSB 139).

Fig. 10: *Paracypris levis* KUZNETSOVA, 1961, C, left view (BSB 140).

Fig. 11: *Paracypris* sp. 1, C, right view (BSB 141).

