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Middle Miocene ostracods of the Fore-Carpathian Depression (Central Paratethys, southwestern Poland)

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KEY WORDS – Ostracoda, Taxonomy, Miocene, Central Paratethys, Fore-Carpathian Depression, Poland.

ABSTRACT – The taxonomy of marine ostracod assemblages from Upper Badenian (Serravallian) sediments of Upper Silesia Basin (Fore-Carpathian Depression, southwestern Poland) has been studied. Twenty-two samples, recovered in the Gliwice 21 borehole, yielded 102 species belonging to 63 genera. Of these species, 56 have been previously described, 8 are tentatively referred to known species; 18 species and 2 subspecies are described as new; the latter are Callistocythere gliwicensis *sp. nov.,* Cytherois ruggierii *sp. nov.,* Cytheroma bonaduccii *sp. nov.,* Cytheropteron naledae *sp. nov.,* Cytheropteron sagittaeferrum *sp. nov.,* Hemiparacytheridea tuber *sp. nov.,* Kunihirella vistris *sp. nov.,* Loxoconcha quadrifenestrata *sp. nov.,* Microcythere paris *sp. nov.,* Microcytherura (Microcytherura) evericulum *sp. nov.,* Microcytherura (Tetracytherura) dianae *sp. nov.,* Paracytheridea depressa *G.W. Müller 1894* coaequata *subsp. nov.,* Paracytherois nealei *sp. nov.,* Sagmatocythere taiai *sp. nov.,* Sagmatocythere scrupea *sp. nov.,* Semicytherura aviculaecaput *sp. nov.,* Semicytherura fascilla *sp. nov.,* Semicytherura inscripta *sp. nov.,* Swainocythere minuscula *(Ruggieri, 1977)* anae *subsp. nov., and* Typhlocythere perparvula *sp. nov. Further 7 species are left in open nomenclature and 11 with affinities status. Stratigraphic and areal distributions of the taxa have been reported. Seven genera, i.e.* Hemiparacytheridea, Kunihirella, Loxoconchidea, Rimacytheropteron, Ruggieriella, Swainocythere *and* Typhlocythere *have been recorded for the first time in the Central Paratethys.*

RIASSUNTO – [Ostracodi medio-miocenici della Avanfossa Carpatica (Paratetide Centrale, Polonia meridionale)] – Vengono studiate le ostracofaune dei depositi del Badeniano superiore (Serravalliano) del bacino della Silesia settentrionale (Polonia sudoccidentale), corrispondente al settore nordoccidentale della Paratetide centrale. Ventidue campioni di sedimenti argillosi e marnoso-argillosi della Formazione di Gliwice, provenienti dal carotaggio Gl-21 realizzato nelle vicinanze di Gliwice, hanno restituito delle associazioni ad ostracodi in ottimo stato di conservazione comprendenti 102 specie appartenenti a 63 differenti generi. Di tali specie 64 sono state identificate o dubitativamente attribuite a specie note, le seguenti 18 specie e 2 sottospecie sono descritte come nuove: Callistocythere gliwicensis *sp. nov.,* Cytherois ruggierii *sp. nov.,* Cytheroma bonaduccii *sp. nov.,* Cytheropteron naledae *sp. nov.,* Cytheropteron sagittaeferrum *sp. nov.,* Hemiparacytheridea tuber *sp. nov.,* Kunihirella vistris *sp. nov.,* Loxoconcha quadrifenestrata *sp. nov.,* Microcythere paris *sp. nov.,* Microcytherura (Microcytherura) evericulum *sp. nov.,* Microcytherura (Tetracytherura) dianae *sp. nov.,* Paracytheridea depressa *G.W. Müller 1894* coaequata *subsp. nov.,* Paracytherois nealei *sp. nov.,* Sagmatocythere taiai *sp. nov.,* Sagmatocythere scrupea *sp. nov.,* Semicytherura aviculaecaput *sp. nov.,* Semicytherura fascilla *sp. nov.,* Semicytherura inscripta *sp. nov.,* Swainocythere minuscula *(Ruggieri, 1977)* anae *subsp. nov. e* Typhlocythere perparvula *sp. nov. Altre 18 specie sono lasciate in nomenclatura aperta e indicate come affini a specie conosciute a causa della scarsità del materiale a disposizione. Viene fornita la distribuzione stratigrafica e geografica dei taxa studiati. Sette generi,* Hemiparacytheridea, Kunihirella, Loxoconchidea, Rimacytheropteron, Ruggieriella, Swainocythere *e* Typhlocythere, *sono per la prima volta segnalati dal Miocene della Paratetide centrale.*

INTRODUCTION

The Middle Miocene ostracods of the Central Paratethys have been investigated since the renowned systematic monograph by August Emanuel Reuss (1850) dealing with fossil specimens collected in the then vast territories of the former Austro-Hungarian Empire, which comprised the southern part of Poland. Despite the relatively large number of publications concerning Badenian ostracods, the assemblages found in the sediments of the Polish part of the Fore-Carpathian Depression reveal that numerous taxa, especially small-sized species, have been, so far, insufficiently studied.

Modern studies on Badenian ostracods of southern Poland concern shallow water assemblages (Szczechura & Pisera, 1986; Paruch-Kulczycka, 1992; Paruch-Kulczycka & Szczechura, 1996) or selected taxa with distinctive palaeoecological or biostratigraphical meaning (Szczechura, 1986, 1994, 1995, 1996, 1998, 2000; Aiello & Szczechura, 2001b). The authors examined, in previous contributions, species pertaining to genera unexpectedly occurring in the sediments of the Gl-21 borehole, near Gliwice, i.e. *Nanana* (Aiello & Szczechura, 2001a), *Elofsonia* (Aiello & Szczechura, 2002) and *Nipponocythere* (Szczechura & Aiello, 2003).

The area of Gliwice is located in the Upper Silesia Basin, western part of the Fore-Carpathian Depression, which repesents the northwestern part of the Central Paratethys. During the Middle Miocene, in the Early Badenian (Langhian, NN5), the Fore-Carpathian Depression was flooded by marine waters and successively it was involved in a wide regression which caused the deposition of Middle Badenian evaporites in the Carpathian basins. In the Upper Badenian (Lower Serravallian, NN6/7) a brief re-establishment of marine conditions occurred (i.a. Peryt & Vozár, 1997; Cicha *et al.*, 1998; Rögl, 1998).

The present report deals with ostracod assemblages recovered in sediments deposited during the latter time interval in the Upper Silesia Basin. It is based on the

Text-fig. 1 - Extent of the Middle Miocene (Badenian) sediments in the Carpathian Foredeep (grey) and location of the sites mentioned in the text.

material of the Gl-21 borehole. This is a Middle Miocene section, nearly 290 m thick, drilled in the area of Gliwice in 1967 (Text-fig. 1). The examined samples pertain to the upper part (100-19.2 meters below surface) of the core, overlaying the Middle Badenian chemical deposits of the Krzyżanowice Formation (Alexandrowicz, 1997). The supraevaporitic grey clays and marly clays have been included by Alexandrowicz (1997, with literature) in the Gliwice Formation, a lithostratigraphic unit occurring in the Upper Silesia and corresponding to the lower portion of the Machów Formation, from the eastern part of the Fore-Carpathian Depression, referred to the Upper Badenian (Kosovian) (Jasionowski, 1995; Alexandrowicz, 1997).

The studied section has been assigned by Peryt (1997) to the calcareous nannoplankton zone NN6; benthic and planktic foraminifera (Garecka, 1997) pertain to the Assemblages III A/α (Wielician) and III B (Kosovian) distinguished by Alexandrowicz (1963). The micropaleontology of the Gl-21 sediments has been studied in some contributions on radiolaria (Barwicz-Piskorz, 1997), bolboforms (Szczechura, 1997), dinocysts (Gedl, 1997), holothurian sclerites (Górka, 1997), diatoms (Witkowski & Garecka, 1997) and foraminifers isotopic geochemistry (Durakiewicz *et al.*, 1997). Pteropods (Janssen & Zorn, 1993) and pollen flora (Sadowska, 1997) have been examined from different sections of the same area.

MATERIAL AND METHODS

The 22 samples examined in this study, belonging to the Gl-21 borehole, are the same studied by Szczechura (1997), ranging from 100 to 19.2 m.b.s. (Text-fig. 2). The material is part of Prof. S.W. Alexandrowicz's collection (Academy of Mining and Metallurgy, Cracow). The ostracods were completely or partially picked up, according to their abundance in the samples. The total number of valves and carapaces collected is about 4950.

Comparative material has been figured from the neighbouring borehole Gl-19 (Alexandrowicz, 1997) as well as from the Upper Badenian marly sediments from the outcrop of Łychów, near Węglin, in the southern extension of the Lublin Upland, southeastern Poland (Szczechura, 1982) and from the Lower Badenian marly deposits from the Posądza 10-S borehole (Działoszyce Trough, Southern Poland) at the northern margin of the Fore-Carpathian Depression (Szczechura, 2000).

The specimens are deposited in the Institute of Paleobiology, Polish Academy of Sciences, Warsaw (ZPAL).

SEM micrographs were realized at the Electronic Microscopy Laboratory of the Institute of Paleobiology of the Polish Academy of Sciences. Drawings in transmitted light were carried out by means of a visopan

Reichert in the Department of Earth Sciences of the University of Naples "Federico II".

RESULTS

The aim of this investigation is to study the taxonomy of the ostracod assemblages of Gl-21 borehole, and to define their stratigraphic and geographical distribution by means of detailed synonymies and distributive data resulting from the thorough review of pertinent literature. Palaeogeographic implications and the post-evaporitic palaeoecological evolution of the basin will be reported in a subsequent paper.

The studied samples include 102 ostracod species (see the Appendix), pertaining to 63 genera; 64 species have been tentatively or definitively identified: 7 species are left in open nomenclature and 11 with affinitive status. 18 new species and 2 new subspecies are described; they are: *Callistocythere gliwicensis* sp. nov., *Cytherois ruggierii* sp. nov., *Cytheroma bonaduceii* sp. nov., *Cytheropteron nadezdae* sp. nov., *Cytheropteron sagittaeferrum* sp. nov., *Hemiparacytheridea tuber* sp. nov., *Kunihirella viatrix* sp. nov., *Loxoconcha quadrifrontata* sp. nov., *Microcythere panis* sp. nov., *Microcytherura (Microcytherura) everriculum* sp. nov., *Microcytherura (Tetracytherura) dianae* sp. nov., *Paracytheridea depressa* G.W. Müller 1894 *coarctata* subsp. nov., *Paracytherois nealei* sp. nov., *Sagmatocythere raiai* sp. nov., *Sagmatocythere scrupea* sp. nov., *Semicytherura aviculaecaput* sp. nov., *Semicytherura furcilla* sp. nov., *Semicytherura scripta* sp. nov., *Swainocythere minicula* (Ruggieri, 1977) *anae* subsp. nov., *Typhlocythere perparvula* sp. nov.

m.b.s.	sample
19.2	G22
20.8	G21
24.8	G20
31.0	G19
35.4	G18
40.1	G17
44.3	G16
51.0	G15
51.8	G14
52.3	G13
55.0	G12
60.0	G11
66.0	G10
72.8	G9
77.0	G8
81.0	G7
82.9	G6
84.0	G5
88.7	G4
92.2	G3
95.7	G2
100.0	G1

Text-fig. 2 - List of the studied samples of Gl-21 borehole and core depths (m.b.s. = meters below surface).

We recognize these ostracods as part of mixed assemblages, consisting of autochthonous taxa and shallow-water displaced forms. The latter have been recognized as allochtonous because of comparison of the state of preservation and the presence of different moults. Transported species pertain to the following genera: *Amnicythere*, *Aurila*, *Carinocythereis*, *Cnestocythere*, *Cyamocytheridea*, *Cytheretta*, *Cytheridea*, *Eucytherura*, *Flexus*, *Graptocythere*, *Grinioneis*, *Loxoconcha*, *Neocytherideis*, *Neonesidea*, *Nonurocythereis*, *Occultocythereis*, *Olimfalunia*, *Paracytheridea*, *Paradoxostoma*, *Phlyctenophora*, *Pokornyella*, *Pontocythere*, *Pseudocytherura*, *Pterygocythereis*, *Sclerochilus*, *Sennia*, *Tenedocythere*, *Xestoleberis* (see the Appendix).

Adult specimens of some of these taxa have been figured from the coeval shallower sediments of Łychów.

Some genera found in Gl-21 sediments, along with the above-cited *Elofsonia*, *Nonana* and *Nipponocythere*, have been recorded for the first time in the Badenian of the Central Paratethys. These "exotics" (*sensu* Szczechura & Aiello, 2003) are: *Hemiparacytheridea*, *Kunihirella*, *Loxoconchidea*, *Rimacytheropteron*, *Ruggieriella*, *Swainocythere* and *Typhlocythere*. Numerous species are recorded for the first time from the Badenian deposits of southern Poland.

SYSTEMATICS

The adopted systematic scheme follows the classification of Hartmann & Puri (1974), modified after Maddocks & Steineck (1987), Athersuch *et al.* (1989) and Horne *et al.* (2002).

Class OSTRACODA Latreille, 1806
Subclass MYODOCOPA Sars, 1866
Order HALOCYPRIDA Dana, 1852
Suborder CLADOCOPINA Sars, 1866
Superfamily CLADOCOPOIDEA Sars, 1866
Family POLYCOPIDAE Sars, 1866
Genus POLYCOPE Sars, 1866

POLYCOPE sp. aff. P. DEMULDERI Sissingh, 1972
Pl. 1, fig. 1

Occurrence - One not well preserved valve has been found in Gl-21 borehole, sample G22.

POLYCOPE sp. aff. P. ORBICULARIS Sars, 1866
Pl. 2, figs 2-3

Remarks and occurrence – Few specimens occurring in sample G22, compared with *Polycope orbicularis* Sars, 1866 (SEM photos in Coles *et al.*, 1996) and *P. frequens* G.W. Müller, 1894 (figured in Bonaduce *et al.*, 1976a), show a slightly more developed marginal reticulation.

Subclass PODOCOPA Sars, 1866
Order PODOCOPIDA Sars, 1866
Suborder BAIRDIOCOPINA Sars, 1888
Superfamily BAIRDIOIDEA Sars, 1888
Family BAIRDIIDAE Sars, 1888
Genus NEONESIDEA Maddocks, 1969

NEONESIDEA MEDITERRANEA (G.W. Müller, 1894)
Pl. 1, figs 4-7

1894 *Bairdia mediterranea* G.W. MÜLLER, p. 271, pl. 13, fig. 27; pl. 14, figs 1-2, 26.
1985 *Bairdia* ex gr. *subdeltoidea* (v. Münster) – ZELENKA (*pars*), pl. 4, fig. 10 (non figs 11-12).
2001 *Bairdia mediterranea* G.W. Müller – ARBULLA *et al.*, fig. 3a.

Remarks – Both outline and dimensions of the specimens occurring in the Upper Badenian sediments fit perfectly to the Müller's original pictures. Modern figures of *Neonesidea mediterranea* (Bonaduce *et al.*, 1976a; Melis & Pugliese, 1985; Arbulla *et al.*, 2001) seem to indicate a certain intraspecific variability.

Occurrence – Gl-21 borehole: G5, G6, G7, G9, G15, G16, G17, G19, G20 (only young instars); figured from the Upper Badenian sediments of Łychów, southwestern Poland.

Distribution – Lower Badenian, southern Moravia (Zelenka, 1985). Living in the shallow waters of the Mediterranean (G.W. Müller, 1894; Arbulla *et al.*, 2001).

Family BYTHOCYPRIDIDAE Maddocks, 1969
Genus BYTHOCYPRIS Brady, 1880

BYTHOCYPRIS ? BOSQUETIANA (Brady, 1866)
Pl. 1, fig. 8

?1866 *Bairdia bosquetiana* BRADY, p. 364, pl. 57, fig. 5.
?2000 *Bythocypris bosquetiana* (Brady) – AIELLO *et al.*, p. 88, pl. 1, fig. 10; pl. 6, fig. 2 (*q.v.* for detailed synonymy).

Remarks and occurrence – The species is very rare, only three juveniles were found in Gl-21 borehole, sample G15. Lacking adult specimens, the specific assignment is doubtful. *Bythocypris bosquetiana* is present in the Mediterranean since the Lower Pliocene and in the Atlantic in the Quaternary-Recent. In Recent sediments, it occurs from 150 to 3400 meters of depth (Aiello *et al.*, 2000, with literature).

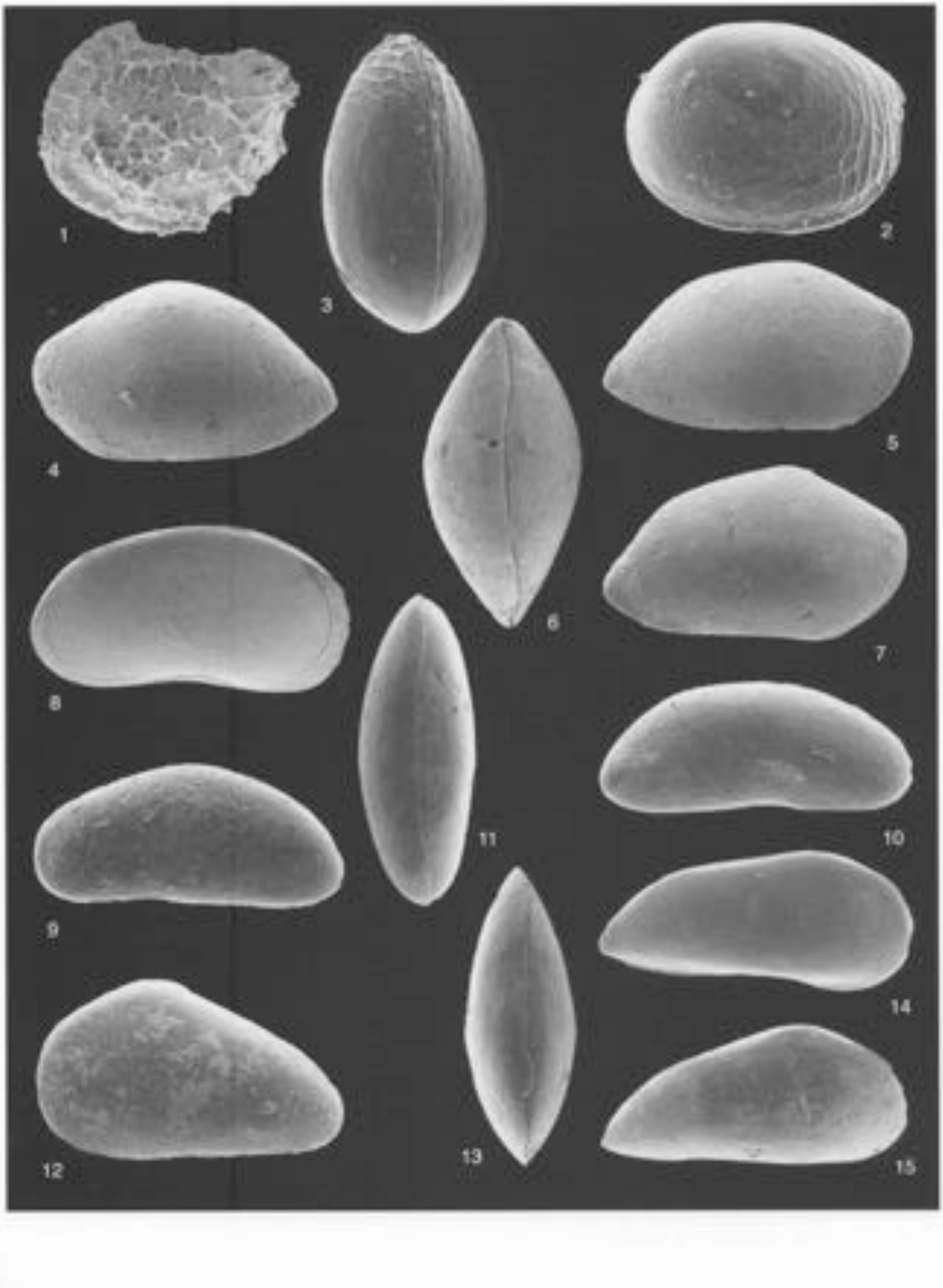
Suborder CYPRIDOCOPINA Jones, 1901
Superfamily CYPRIDOIDEA Baird, 1845
Family CANDONIDAE Kaufmann, 1900
Subfamily PARACYPRIDINAE Sars, 1923
Genus PHLYCTENOPHORA Brady, 1880

PHLYCTENOPHORA AFFINIS (Schneider, 1953)
Pl. 1, figs 9-11; Pl. 16, fig. 7

1850 *Cytherina arcuata* (von Münster) – REUSS, p. 51, pl. 8, fig. 7 (non *Cythere arcuata* von Münster, 1830).
1953 *Aglaia affinis* SCHNEIDER, p. 107, pl. 1, figs 4a-b.
1957 *Bythocypris arcuata* (von Münster) – KEIJ, p. 54, pl. 2, fig. 1.
1963 *Aglaiocypris affinis* (Schneider) – MANDELSTAM & SCHNEIDER, p. 75, text-figs 75a-d, pl. 6, figs 11a-b.
1969 *Phlyctenophora arcuata* (von Münster) – RUGGIERI, pp. 16-17, text-figs 2-4.
1971 *Bythocypris arcuata* (von Münster) – KOLLMANN, p. 610, pl. 1, figs 4-7.

EXPLANATION OF PLATE 1

Fig. 1 – *Polycope* sp. aff. *P. demaldeni* Sissingh, 1972, RV, sample G22, ZPAL 0.48/188 (x 150).
Figs 2-3 – *Polycope* sp. aff. *P. orbicularis* Sars, 1866, sample G22.
2) RV from C, ZPAL 0.48/153 (x 150).
3) C in dorsal view, same specimen as in fig. 2 (x 160).
Figs 4-7 – *Neonesidea mediterranea* (G.W. Müller, 1894).
4) LV, Łychów, ZPAL 0.48/900 (x 54).
5) RV, Łychów, ZPAL 0.48/902 (x 54).
6) C in dorsal view, Łychów, ZPAL 0.48/901 (x 54).
7) Juvenile, RV, sample G15, ZPAL 0.48/777 (x 112).
Fig. 8 – *Bythocypris* ? *bosquetiana* (Brady, 1866), juvenile, LV in internal view, sample G15, ZPAL 0.48/169 (x 75).
Figs 9-11 – *Phlyctenophora affinis* (Schneider, 1953), Łychów.
9) LV, ZPAL 0.48/896 (x 54).
10) RV, ZPAL 0.48/897 (x 60).
11) C in dorsal view, ZPAL 0.48/898 (x 60).
Fig. 12 – *Propontocypris* sp. aff. *P. declivis* (G.W. Müller, 1894), LV, sample G5, ZPAL 0.48/872 (x 226).
Figs 13-15 – *Pontocypris* sp. aff. *P. acuminata* (G.W. Müller, 1894).
13) C in dorsal view, sample G17, ZPAL 0.48/892 (x 130).
14) RV, sample G12, ZPAL 0.48/871 (x 110).
15) RV from C, same specimen as in fig. 13 (x 130).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1974 *Bythocypris arcuata* (von Münster) – CERNAJSEK, p. 480, pl. 5, fig. 8.
1978 *Phlyctenophora* aff. *affinis* (Schneider) – BRESTENSKA & JIRICEK, pl. 8, figs 1-3.
1981 *Bythocypris arcuata* (von Münster) – UFFENORDE, pp. 132-133, pl. 4, figs 8, 10.
1984 *Phlyctenophora affinis* (Schneider) – HUBER-MAHDI, p. 17, pl. 7, figs 3-5.
1985 *Phlyctenophora arcuata* (von Münster) – ZELENKA, pl. 4, figs 8-9.
1988 *Bythocypris arcuata* (von Münster) – NASCIMENTO, pp. 67-68, pl. 2, fig. 10.
2001 *Phlyctenophora arcuata* (von Münster) – DALL'ANTONIA & BOSSIO, pp. 408-410, pl. 3, figs 6-7.
2002 *Phlyctenophora arcuata* (Reuss, 1850) – GROSS, pp. 140-143, pl. 52, figs 1-10.

Remarks and distribution – The syntypes of *Cythere arquata* von Münster, 1830, from the Upper Oligocene of Osnabrück, have been studied by Malz (1987), who assigned the Münster's species to the genus *Aglaiocypris* Sylvester-Bradley, 1947. The author discussed the doubtful identification by Roemer (1838, as *Cytherina arcuata*) which generated a lengthy taxonomic uncertainty.

The Miocene species *Phlyctenophora affinis* shows branching marginal pore-canals, consequently it can't be confused with the Paleogene *Aglaiocypris arquata*.

Gross (2002) attributed to the specimens from the Badenian of the Vienna Basin the name *Phlyctenophora arcuata* (Reuss, 1850). Unfortunately, Reuss did not describe *Cytherina arcuata* as a new species. He simply inherited from Roemer the misspelling of *Cythere arquata* von Münster as *Cytherina arcuata* (von Münster). It is clear that *P. arcuata* (Reuss, 1850) does not correspond to any valid species and consequently we prefer to use the name of the Schneider's species.

Drawings and photos of *P. affinis* reported in literature seem to demonstrate a remarkable variability in the lateral outline.

The species occurs in the Miocene sediments in Portugal (Nascimento, 1988), Italy (Russo, 1969; Dall'Antonia & Bossio, 2001) as well as in northwestern (Keij, 1957; Uffenorde, 1981) and central Europe (Schneider, 1953; Mandelstam & Schneider, 1963; Kollmann, 1971; Cernajsek, 1974; Brestenská & Jiříček, 1978; Huber-Mahdi, 1984; Zelenka, 1985; Gross, 2002).

Occurrence – Gl-21 borehole: G11, G17.

Superfamily PONTOCYPRIDOIDEA G.W. Müller, 1894
Family PONTOCYPRIDIDAE G.W. Müller, 1894
Genus PONTOCYPRIS Sars, 1866

PONTOCYPRIS sp. aff. P. ACUMINATA
(G.W. Müller, 1894)
Pl. 1, figs 13-15

Remarks – The specimens present in Gliwice boreholes differ from *Pontocypris acuminata* in showing a less marked anterodorsal angle and a more regularly rounded anterior margin.

Occurrence – Gl-21 borehole: G7, G5, G10, G17, G18, G20; Gl-19 borehole, 55.0 m.b.s.

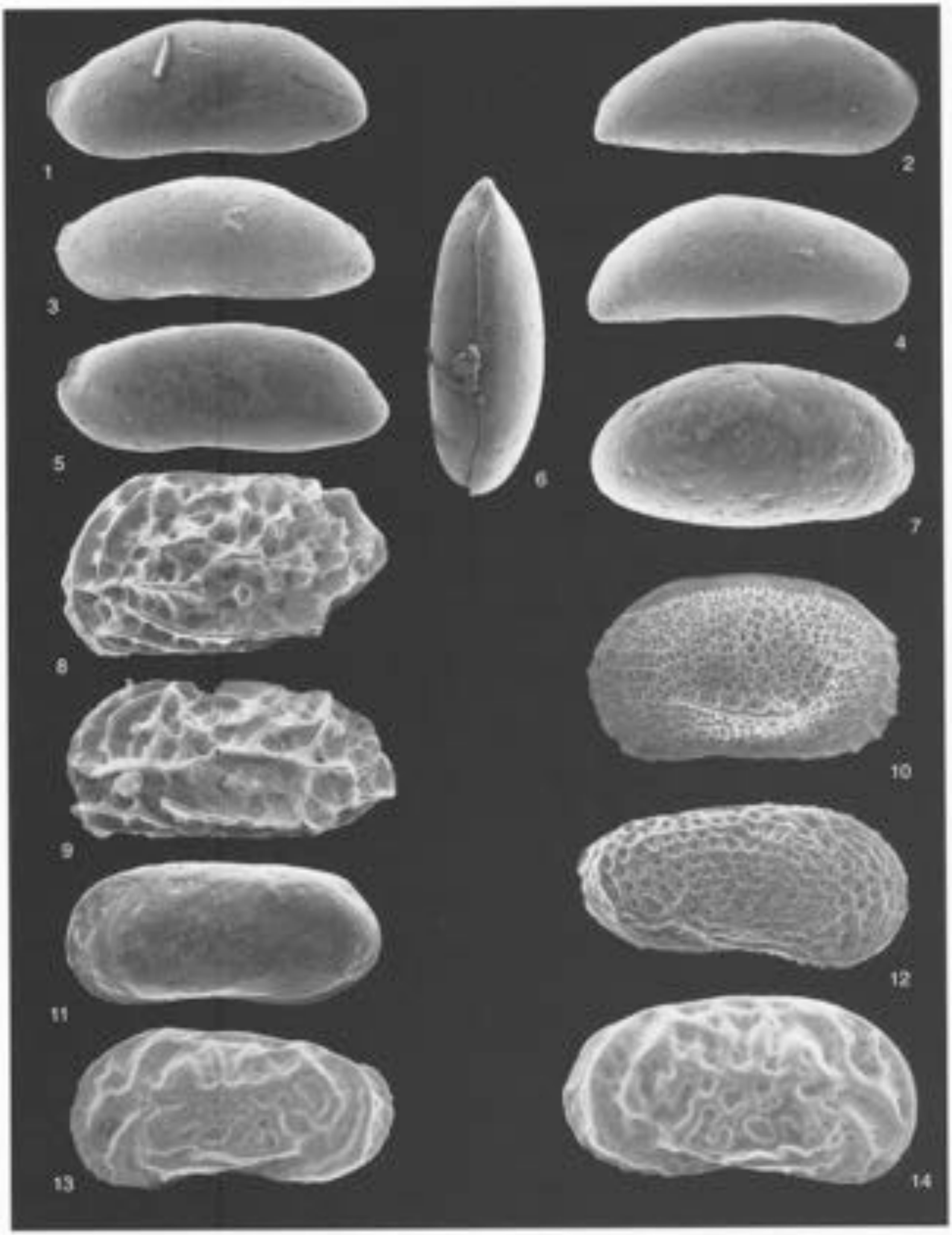
Genus ARGILLOECIA Sars, 1866

ARGILLOECIA ACUMINATA G.W. Müller, 1894
Pl. 2, fig. 2

1894 *Argilloecia acuminata* G.W. MÜLLER, p. 261, pl. 12, figs 1-2, 12-22.
1969 *Argilloecia acuminata* G.W. Müller – PURI & DICKAU, pl. 6, fig. 2.
1976a *Argilloecia acuminata* G.W. Müller – BONADUCE et al., p. 26, pl. 8, figs 1-5.
1976b *Argilloecia acuminata* G.W. Müller – BREMAN, p. 82, pl. 2, fig. 21; pl. 6, fig. 69.
1980 *Argilloecia acuminata* G.W. Müller – COLALONGO & PASINI, p. 52, pl. 1, figs 3-4.
1981 *Argilloecia acuminata* G.W. Müller – TSAPRALIS, p. 117, pl. 12, figs 5-8.
1985 *Argilloecia acuminata* G.W. Müller – BONADUCE & RUSSO, p. 428, pl. 1, fig. 1.
1985 *Argilloecia* cf. *conoidea* Sars – HARTMANN, p. 114, figs 58-64.
1987 *Argilloecia* sp. 5, WHATLEY & COLES, pl. 1, figs 19-20.

EXPLANATION OF PLATE 2

Fig. 1 – *Argilloecia fatua* Barra, Aiello & Bonaduce, 1996, LV, sample G17, ZPAL O.48/802 (x 120).
Fig. 2 – *Argilloecia acuminata* G.W. Müller, 1894, RV, sample G17, ZPAL O.48/799 (x 120).
Fig. 3 – *Argilloecia* ? *levis* G.W. Müller, 1894, LV, sample G22, ZPAL O.48/200 (x 108).
Fig. 4 – *Argilloecia* sp. A, RV, sample G22, ZPAL O.48/800 (x 112).
Figs 5-6 – *Argilloecia* ? *subtilis* Barra, Aiello & Bonaduce, 1996.
5) LV, sample G16, ZPAL O.48/804 (x 130).
6) C in dorsal view, sample G17, ZPAL O.48/803 (x 120).
Fig. 7 – *Cyamocytheridea leptostigma* (Reuss, 1850), RV, sample G11, ZPAL O.48/818 (x 85).
Fig. 8 – *Costacythere truncata* (Reuss, 1850), LV, sample G15, ZPAL O.48/724 (x 91).
Fig. 9 – *Costacythere lamellicosta* Triebel, 1950, LV, sample G17, ZPAL O.48/24 (x 88).
Fig. 10 – *Saida* sp. 1, LV, sample G16, ZPAL O.48/81 (x 132).
Fig. 11 – *Amnicythere mironovi extrema* (Stancheva, 1963), LV, sample G20, ZPAL O.48/875 (x 100).
Fig. 12 – *Leptocythere fovealata* Moyes, 1965, RV, sample G15, ZPAL O.48/224 (x 135).
Figs 13-14 – *Callistocythere daedalea* (Reuss, 1850), sample G18.
13) LV, ZPAL O.48/920 (x 115).
14) RV, ZPAL O.48/164 (x 131).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1988b *Argilloecia acuminata* G.W. Müller – BONADUCE *et al.*, pl. 1, fig. 15.
1994 *Argilloecia (Robustargilloecia) acuminata* G.W. Müller – MALZ & JELLINEK, p. 24, pl. 5, figs 27-28.
1996 *Argilloecia acuminata* G.W. Müller – BARRA *et al.*, p. 129, pl. 1, figs 1-4.
1996 *Argilloecia acuminata* G.W. Müller – COLES *et al.*, pl. 1, fig. 12.

Occurrence – Gl-21 borehole: G3, G9, G11, G15, G16, G17, G18, G19, G20.

Distribution – Lower-Middle Miocene of Sardinia (Bonaduce & Russo, 1985). Pliocene and Quaternary, DSDP leg 94, Atlantic (Whatley & Coles, 1987). Plio-Pleistocene of southern Italy (Colalongo & Pasini, 1980; Barra *et al.*, 1996). Pleistocene of Greece (Tsapralis, 1981). Holocene, northeastern Atlantic, from 610 to 750 m (Coles *et al.*, 1996). Recent of the Mediterranean Sea: Gulf of Naples, in the Calcareous Algae Assemblage, depth about 50-100 m (G.W. Müller, 1894; Puri *et al.*, 1964; Puri & Dickau, 1969); Adriatic Sea, below 60 m, on silt, silty pelite and sandy pelite bottom (Bonaduce *et al.*, 1976a; Breman, 1976b); Tunisian Shelf, below 100 m (Bonaduce *et al.* 1988b); Iberian Sea, 5320 m (Hartmann, 1985); eastern Mediterranean, from 1000 to 3000 m (Malz & Jellinek, 1994).

ARGILLOECIA FATUA Barra, Aiello & Bonaduce, 1996
Pl. 2, fig. 1; Pl. 16, figs 1-2

1996 *Argilloecia fatua* BARRA, AIELLO & BONADUCE, p. 130, pl. 1, figs 9-10.

Occurrence – Gl-21 borehole: G17, G19.

Distribution – Plio-Pleistocene, M.S. Nicola, Sicily, Italy (Barra *et al.*, 1996).

ARGILLOECIA ? LEVIS G.W. Müller, 1894
Pl. 2, fig. 3

?1894 *Argilloecia levis* G.W. MÜLLER, p. 263, pl. 12: figs 5, 36-39.

Occurrence – Gl-21 borehole: G17, G22.

Remarks and distribution – This form is very similar to the Müller's species, but the scarcity of well-preserved specimens does not allow a certain assignment.

ARGILLOECIA ? SUBTILIS
Barra, Aiello & Bonaduce, 1996
Pl. 2, figs 5-6

1995 *Argilloecia* sp. 4 – SZCZECHURA pl. 2, figs 5-6.
?1996 *Argilloecia subtilis* BARRA, AIELLO & BONADUCE, p. 134, pl. 2, fig. 8; pl. 3, figs 6-7.

Remarks and occurrence – Few specimens have been recorded in Gl-21 borehole, samples G15, G16, G17, G19. They are non-transparent, consequently the attribution to the Pliocene species *A. subtilis* is doubtful.

Distribution – Upper Badenian, Jamnica borehole, southern Poland (Szczechura, 1995).

ARGILLOECIA sp. A
Pl. 2, fig. 4

Occurrence – Gl-21 borehole: G22.

Genus PROPONTOCYPRIS Sylvester-Bradley, 1947

PROPONTOCYPRIS sp. aff. P. DECLIVIS
(G.W. Müller, 1894)
Pl. 1, fig. 12

Occurrence – Gl-21 borehole: G5, G9, G15, G17.

Remarks – This species differs from *Propontocypris declivis* in the lower length/height ratio.

Suborder CYTHEROCOPINA Baird, 1850
Superfamily CYTHEROIDEA Baird, 1850
Family CYTHERIDAE Baird, 1850
Genus CNESTOCYTHERE Triebel, 1950

CNESTOCYTHERE LAMELLICOSTA Triebel, 1950
Pl. 2, fig. 9

1950 *Cnestocythere lamellicosta* TRIEBEL, pp. 317-319, pl. 1, figs 1-8 (cum syn.).
1972 *Cnestocythere lamellicosta* Triebel – SISSINGH, p. 88, pl. 5, fig. 7.
1978 *Cnestocythere lamellicosta* Triebel – BRESTENSKÁ & JIŘÍČEK, pl. 1, fig. 16.
1984 *Cnestocythere lamellicosta* Triebel – HUBER-MAHDI, pp. 25-27, pl. 9, figs 1-8; pl. 10, figs 1-3.
1986 *Cnestocythere lamellicosta* Triebel – SZCZECHURA & PISERA, pl. 6, figs 1, 4.
1987 *Cnestocythere* sp. – MOSTAFAWI, p. 229, pl. 2, fig. 28.
1992 *Cnestocythere lamellicosta* Triebel – PARUCH-KULCZYCKA, p. 263, pl. 1, fig. 3.
1996 *Cnestocythere lamellicosta* Triebel – PARUCH-KULCZYCKA & SZCZECHURA, p. 730, pl. 230, fig. 3.
2002 *Cnestocythere lamellicosta* Triebel – GROSS, pp. 31-32, pl. 6, figs 3-6, 8, pl. 7, figs 3-4.

Occurrence – Two species of *Cnestocythere*, *C. lamellicosta* and *C. truncata*, are common throughout the section. Nevertheless, just a few adults were found, mostly badly preserved, clearly derived from shallower waters.

Distribution – Paleo-Mediterranean, Serravallian/Tortonian (Sissingh, 1972; Mostafawi, 1987; Aiello, 1998). Widely distributed in the Middle Miocene (Badenian) of the Paratethys (Procházka, 1893; Triebel, 1950; Brestenská & Jiříček, 1978; Huber-Mahdi, 1984; Szczechura & Pisera, 1986; Paruch-Kulczycka, 1992;

Paruch-Kulczycka & Szczechura, 1996; Gross, 2002).

CNESTOCYTHERE TRUNCATA (Reuss, 1850)
Pl. 2, fig. 8

1850 *Cypridina truncata* REUSS, p. 79, pl. 10, fig. 15.
1986 *Cnestocythere truncata* (Reuss) – SZCZECHURA & PISERA, pl. 1, fig. 1.
1988 *Cnestocythere truncata* (Reuss) – NASCIMENTO, pp. 73-74, pl. 3, fig. 3 (cum syn.).
1992 *Cnestocythere truncata* (Reuss) – PARUCH-KULCZYCKA, p. 264, pl. 1, figs 1-2.
1998 *Cnestocythere truncata* (Reuss) – ZORN, pp. 180-181, pl. 1, fig. 6 (cum syn.).
2002 *Cnestocythere truncata* (Reuss) – GROSS, pp. 28-30, pl. 6, figs 1-2, 7, pl. 7, figs 1-2, 7-8.
2002 *Cnestocythere truncata* (Reuss) – BABINOT, p. 739, pl. 2, figs 3-4.

Occurrence – See *C. lamellicosta*.

Distribution – This species is typical of the shallow waters sediments in the Miocene of the Paratethys (Reuss, 1850; Triebel, 1950; Witt, 1967; Brestenská & Jiříček, 1978; Szczechura & Pisera, 1986; Paruch-Kulczycka, 1992; Paruch-Kulczycka & Szczechura, 1996; Zorn, 1998; Gross, 2002). Paleo-Mediterranean (Ruggieri, 1962; Dieci & Russo, 1965; Carbonnel, 1969; Babinot, 2002) and Atlantic-European area (Keij, 1955; Moyes, 1965; Nascimento, 1988).

SAIDA sp. 1
Pl. 2, fig. 10

Occurrence – Only one valve of this species, possibly pertaining to a young instar, occurs in the sample G16.

Family LEPTOCYTHERIDAE Hanai, 1957
Genus LEPTOCYTHERE Sars, 1925

LEPTOCYTHERE FOVEOLATA Moyes, 1965
Pl. 2, fig. 12

1965 *Leptocythere foveolata* MOYES, pp. 30-32, pl. 3, figs 11-13.
1988 *Leptocythere foveolata* Moyes – NASCIMENTO, pp. 80-81, pl. 3, fig. 10.

Occurrence – Gl-21 borehole: G15, G19, G20, G22.

Distribution – From the Burdigalian to the Pliocene of Portugal (Nascimento, 1988, with literature). Upper Miocene and Pliocene of the Aquitanian Basin, France (Moyes, 1965).

Genus AMNICYTHERE Devoto, 1965

AMNICYTHERE MIRONOVI (Schneider, 1939) ESTRANEA (Stancheva, 1963)
Pl. 2, fig. 11

1963 *Leptocythere mironovi estranea* STANCHEVA, pp. 25, 56, pl. 2, fig. 13.
1990 *Amnicythere mironovi estranea* (Stancheva) – STANCHEVA, pp. 56-57, pl. 19, fig. 6.

Occurrence – Gl-21 borehole: G20.

Distribution – Khersonian (Upper Sarmatian = Lower Tortonian) of northern Bulgaria (Stancheva, 1963, 1990).

Genus CALLISTOCYTHERE Ruggieri, 1953

CALLISTOCYTHERE CANALICULATA (Reuss, 1850)
Pl. 3, figs 1-5

1850 *Cypridina canaliculata* REUSS, p. 76, pl. 9, figs 12a-b.
? 1967 *Callistocythere canaliculata canaliculata* (Reuss) – WITT, pp. 25-26, pl. 1, figs 7-8.
1971 *Callistocythere canaliculata* (Reuss) – KOLLMANN, p. 629, pl. 6, figs 7-9.
1973 *Callistocythere canaliculata* (Reuss) – PIETRZENIUK, pl. 3, figs 3-4, 9.
1978 *Callistocythere canaliculata* (Reuss) – BRESTENSKÁ & JIŘÍČEK, pl. 1, fig. 11.
1986 *Callistocythere canaliculata* (Reuss) – HUBER-MAHDI, pp. 20-22, pl. 8, figs 1-6.
1992 *Callistocythere canaliculata* (Reuss) – PARUCH-KULCZYCKA, p. 267, pl. 3, figs 7-8.
1996 *Callistocythere mulrota* Bonaduce *et al.* – PARUCH-KULCZYCKA & SZCZECHURA, pp. 730-731, pl. 230, figs 4-6.
2002 *Callistocythere canaliculata* (Reuss) – GROSS, pp. 34-36, pl. 8, figs 1-4, 8-9; pl. 10, figs 1-2.

Remarks – In his paper on the Neogene ostracods of the Central Europe, Reuss (1850) described, as *Cypridina*, two species of *Callistocythere* (Zelenka, 1989). *C. canaliculata* was figured from Ruselsdorf, in Bohemia and *C. daedalea* from Wieliczka, in southern Poland. The insufficient original pictures led many authors to misinterpretate these species. Kollmann (1971) established a neotype of *C. canaliculata* from Nussdorf, but figures are of poor quality. The comparison of the SEM micrographs of specimens from Nussdorf, furnished by Pietrzeniuk (1973), with some dozens of individuals recovered in Gliwice, convinced us that we are dealing with two distinct species and that the interpretation of Pietrzeniuk was correct. Like in almost all the species pertaining to this genus, a remarkable variability in the secondary ornamentation has to be considered. *C. mulrota* Bonaduce *et al.*, 1992, differs in the ornament of the ventro-central area and in the running of the posterior ribs, and has to be regarded as a different species, possibly a Mediterranean Late Miocene descendant of the Middle Miocene species *C. canaliculata*.

Occurrence – Gl-21 borehole: G11, G15, G16, G17, G19, G20, G22.

Distribution – Although the presence of this species is also reported from the Lower Miocene, all the reliable data can be referred to the Badenian of the Central Paratethys (see synonymy). Witt (1967) mentioned the species from the Burdigalian of Bavaria, but the short quality of figures makes uncertain the specific attribution. The form figured by Keij (1955) as *Leptocythere canaliculata* from the Lower Miocene of southwestern France shows a different ornament in the central part of the valve.

CALLISTOCYTHERE DAEDALEA (Reuss, 1850)
Pl. 2, figs 13-14

1850 *Cypridina daedalea* REUSS, p. 76, pl. 9, figs 13a-b, 14.
?1967 *Callistocythere canaliculata* (Reuss) – KHEIL, p. 222, pl. 3C, fig. 6.
1969 *Callistocythere canaliculata* Reuss *canaliculata* Witt – CARBONNEL, pp. 94-96, pl. 5, figs 1-3.
1973 *Callistocythere daedalea* (Reuss) – PIETRZENIUK, pl. 3, figs 1-2.
1980 *Callistocythere canaliculata* (Reuss) – WITT, pl. 7, fig. 6.
1985 *Callistocythere canaliculata* (Reuss) – ZELENKA, pl. 3, fig. 1.
1985 *Callistocythere excanaliculata* Bonaduce, Ruggieri, Russo, Bismuth & Mascellaro – BONADUCE & RUSSO, p. 432, pl. 5, fig. 4 (*nomen nudum*).
1986 *Callistocythere aberrancata* CIAMPO, pp. 62-64, pl. 2, figs 1-2.
1988 *Callistocythere rigosensi* McKenzie, Ducasse, Dufour & Peypouquet – NASCIMENTO, p. 78, pl. 3, fig. 8 (*non* McKenzie *et al.* 1979).
1992 *Callistocythere excanaliculata* Bonaduce & Russo – BONADUCE *et al.*, pp. 14-15, pl. 3, figs 9-11.
1992 *Callistocythere excanaliculata* Bonaduce & Russo – MICULAN, pl. 1, fig. 10.
1997 *Callistocythere rigosensi* McKenzie, Ducasse, Dufour & Peypouquet – DUCASSE & CAHUZAC, pl. 1, fig. 4.
1998 *Callistocythere* aff. *canaliculata* (Reuss) – ZORN, pp. 184-185, pl. 2, figs 3-4; pl. 14, figs 2-3.
2002 *Callistocythere daedalea* (Reuss) – GROSS, pp. 36-38, pl. 8, figs 5-7, 10; pl. 10, figs 3-5, 10.

Remarks – (See also *Callistocythere canaliculata*). This species shows a wide variability, as in Bonaduce *et al.* (1992; as *C. excanaliculata*), especially in the central area, but the running of the peripheric ribs and the related ornament remains rather constant. The form figured by Kheil (1967) from the Middle Miocene of the Central Paratethys (as *C. canaliculata*) is very similar to *C. daedalea*, but the poor quality of the picture does not permit a reliable attribution.

Occurrence – Gl-21 borehole: G2, G6, G11, G14, G15, G16, G17, G18, G19, G20, G21, G22.

Distribution – Aquitanian - Upper Miocene, Rhone Basin, France (Carbonnel, 1969). Aquitanian - Serravallian, Tejo Basin, Portugal (Nascimento, 1988). Karpatian, Korneuburg Basin, Austria (Zorn, 1998). Serravallian, Aquitanian basin (Ducasse & Cahuzac, 1997). Badenian of the Central Paratethys (Reuss, 1850; Pietrzeniuk, 1973; Witt, 1980; Zelenka, 1985; Gross, 2002). Upper Miocene of the Mediterranean area (Bonaduce & Russo, 1985; Ciampo, 1986; Bonaduce *et al.*, 1992; Miculan, 1992).

CALLISTOCYTHERE GLIWICENSIS sp. nov.
Pl. 3, figs 6-8

Derivation of name – From the locality of Gliwice.

Material – 50 valves and 1 carapace.

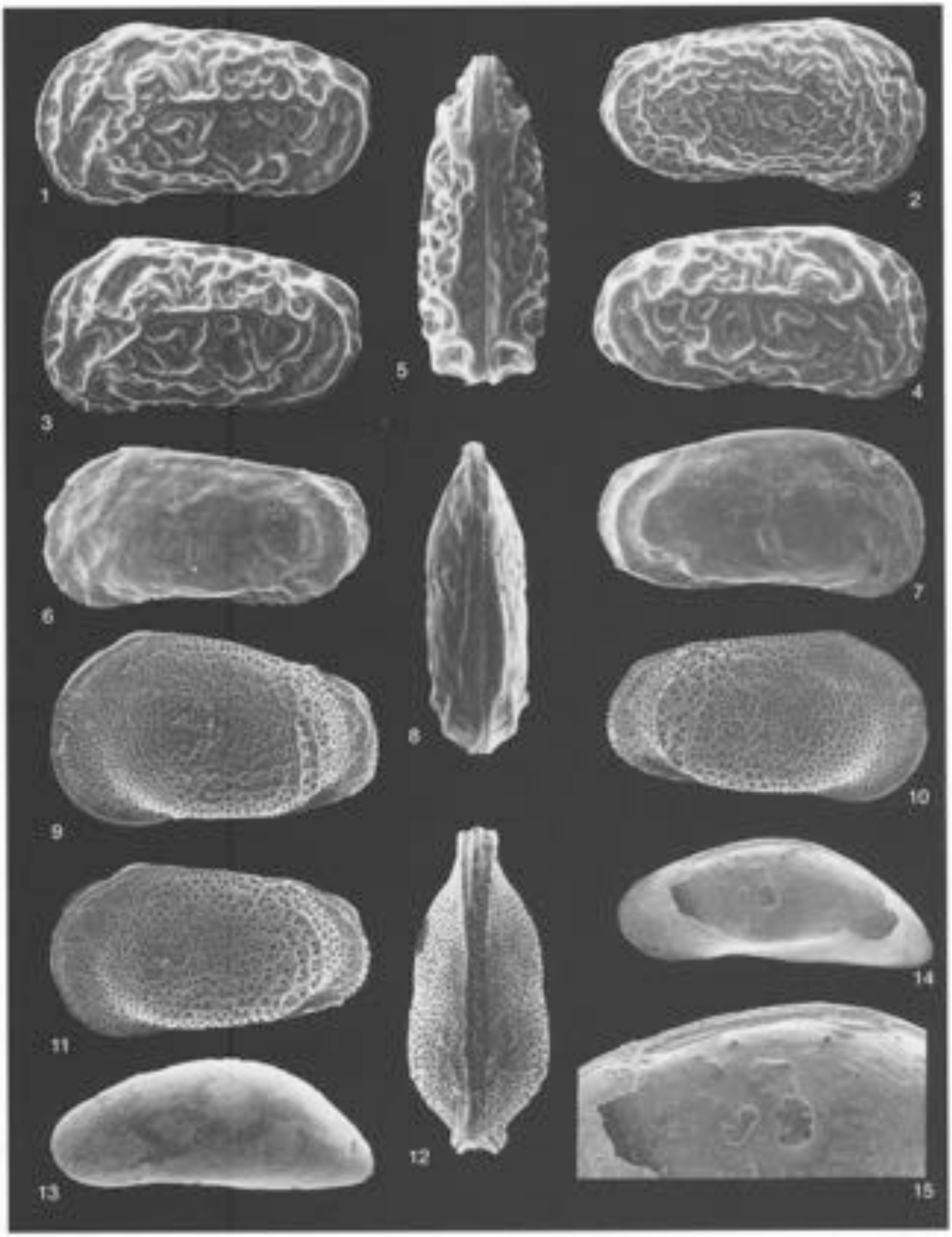
Types – Holotype ZPAL 0.48/812. Paratypes ZPAL 0.48/813, 0.48/908.

Type level – Upper Badenian (Serravallian), NN 6 biozone.

Type locality – Gliwice Gl-21 borehole, sample G17, Fore-Carpathian Depression, Upper Silesia, southern Poland.

EXPLANATION OF PLATE 3

Figs 1-5 - *Callistocythere canaliculata* (Reuss, 1850).
1) LV, sample G11, ZPAL 0.48/761 (x 105).
2) Juvenile, RV, sample G15, ZPAL 0.48/739 (x 115).
3) LV, sample G11, ZPAL 0.48/762 (x 105).
4) RV, sample G11, ZPAL 0.48/763 (x 105).
5) C in dorsal view, sample G11, ZPAL 0.48/760 (x 95).
Figs 6-8 - *Callistocythere gliwicensis* sp. nov., sample G17 (x 150).
6) Holotype, LV, ZPAL 0.48/812.
7) Paratype, RV, ZPAL 0.48/813.
8) Paratype, C in dorsal view, ZPAL 0.48/908.
Figs 9-12 - *Cluthia miocenica* Szczechura, 1986.
9) LV, female, sample G22, ZPAL 0.48/816 (x 182).
10) RV, sample G22, ZPAL 0.48/814 (x 182).
11) LV, male, sample G22, ZPAL 0.48/815 (x 182).
12) C in dorsal view, sample G18, ZPAL 0.48/789 (x 185).
Figs 13-15 - *Cytheromma bonaducei* sp. nov., sample G15.
13) Holotype, LV, ZPAL 0.48/834 (x 120).
14) Paratype, RV in internal view, ZPAL 0.48/833 (x 140).
15) Detail of RV, same specimen as in fig. 14 (x 280).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Occurrence – Gl-21 borehole: G6, G11, G15, G16, G17, G18, G19, G20, G22.

Dimensions – Holotype specimen ZPAL 0.48/812, LV, L = 0.45 mm, H = 0.24 mm (Pl. 3, fig. 6).

Diagnosis – A small (L = 0.44-0.46 mm) species of *Callistocythere*, subrectangular in lateral view; dorsal margin gently convex, almost straight in the left valves; ventral margin weakly sinuous. Subrectangular in dorsal view, posteriorly truncated, anteriorly acuminate. Ornament unusually subdued for the genus, consisting of two curved posterior ridges, one continuing into a ventral longitudinal ridge. A weakly developed dorsal ridge continuous with the eye spot, and shallow fossae in the anterior area; central area relatively smooth.

Comparisons – *Callistocythere gliwicensis* sp. nov. differs from *C. timida* Ciampo (1986) in the different running of the posterior ridges; it is very similar to *C. postvallata* Pietrzeniuk (1973), which shows a wider flattened anterior marginal area and a distinctly convex dorsal margin. *C. badia* (Norman, 1862), as figured by Athersuch & Whittaker (1977), is subreniform in lateral view and its anterior ornament is relatively well developed.

Genus CLUTHIA Neale, 1973

CLUTHIA MIOCENICA Szczechura, 1986
Pl. 3, figs 9-12

1986 *Cluthia miocenica* SZCZECHURA, p. 113, pl. 1, figs 1-7.
1995 *Cluthia miocenica* Szczechura – SZCZECHURA, pl. 1, figs 4a-b.
1996 *Cluthia miocenica* Szczechura – SZCZECHURA, pl. 1, figs 8-9.
1996 *Cluthia miocenica* Szczechura – PARUCH-KULCZYCKA & SZCZECHURA, p. 729, pl. 229, figs 2-3.

Remarks – The specimens recovered in Gliwice show some variability in the reticulation pattern of the posterior area.

Occurrence – Gl-21 borehole: G15, G16, G17, G18, G19, G20, G22.

Distribution – Upper Badenian, southern Poland (Szczechura, 1986, 1995, 1996; Paruch-Kulczycka & Szczechura, 1996).

Family CYTHEROMATIDAE Elofson, 1939
Genus CYTHEROMA G.W. Müller, 1894

CYTHEROMA BONADUCEI sp. nov.
Pl. 3, figs 13-15

Derivation of name – In honour of Gioacchino Bonaduce, an outstanding ostracodologist who published about 70 studies on the Miocene-Recent ostracods of the Mediterranean area, and was the teacher of one of us (G.A.).

Material – 3 left valves, 2 right valves.

Types – Holotype ZPAL 0.48/834, Paratype ZPAL 0.48/833.

Type level – Upper Badenian (Serravallian), NN 6 biozone.

Type locality – Gliwice Gl-21 borehole, sample G17, Fore-Carpathian Depression, Upper Silesia, southern Poland.

Occurrence – Gl-21 borehole: G15, G17.

Dimensions – Holotype specimen ZPAL 0.48/834, LV, L = 0.48 mm, H = 0.21 mm (Pl. 3, fig. 13).

Diagnosis – A small (L = 0.43-0.48 mm) species of *Cytheroma*, trigonal-elongate in lateral view, anterior end well rounded, posterior margin narrowly rounded, dorsal margin arched, ventral margin weakly sinuous. Greatest height slightly behind mid-length. Surface of the valves smooth. Fused zone relatively broad, narrow anteroventrally; anterior and posterior vestibula are present. Hinge lophodont with not well-differentiated terminal elements. Central muscle pattern consists in a vertical row of four scars and a J-shaped frontal scar.

Remarks – The specimens of *Cytheroma bonaducei* sp. nov. collected in Gl-21 are not sufficiently transparent for a detailed drawing of the inner lamella. However, under transmitted light it appears very similar to the fused zone of the type-species of *Cytheroma*, *C. variabilis* G.W. Müller, 1894, which shows a high degree of variability.

Comparisons – *Cytheroma bonaducei* sp. nov. differs from *C. variabilis* (SEM micrographs reported in Bonaduce *et al.*, 1976a) due to the more narrowly rounded anterior margin and the different outline of the dorsal margin, which is slightly more arched. Moreover, in *C. variabilis* the maximum height is at mid-length.

C. bonaducei also resembles *C. karadagiensis* Dubowsky, 1939, which shows a more convex dorsal margin, especially in the posterior part, and a broadly rounded anterior margin.

Family CYTHERIDEIDAE Sars, 1925
Genus CYTHERIDEA Bosquet, 1852

CYTHERIDEA ACUMINATA Bosquet, 1852
Pl. 4, figs 1-2

1852 *Cytheridea Mülleri* var. *acuminata* BOSQUET, p. 39, pl. 2, figs 4a-f.

1960 *Cytheridea acuminata* Bosquet – KOLLMANN, pp. 142-145, pl. 5, figs 11-16; pl. 6, figs 15-16; pl. 8, fig. 10; text-fig. 2b-c, 3c (cum syn.).
1965 *Cytheridea muelleri* (v. Münster) – DIECI & RUSSO, p. 76, pl. 12, fig. 14.
1967 *Cytheridea acuminata acuminata* Bosquet – DIECI & RUSSO, pp. 13-14, pl. 3, fig. 5.
1969 *Cytheridea acuminata* Bosquet *caumontensis* CARBONNEL, pp. 79-82, pl. 4, figs 1-6, 14.
1972 *Cytheridea acuminata acuminata* Bosquet – SISSINGH, p. 87, pl. 5, fig. 4.
1983 *Cytheridea acuminata neapolitana* Kollmann – NASCIMENTO, fig. 3.7.
1983 *Cytheridea acuminata* Bosquet – ŘÍHA, text-fig. 9; pl. 1, fig. 9.
1985 *Cytheridea acuminata* Bosquet – ZELENKA, pl. 1, figs 3-4.
1986 *Cytheridea acuminata* Bosquet – SZCZECHURA & PISERA, pl. 7, fig. 4.
1990 *Cytheridea acuminata* Bosquet – MOSTAFAWI, p. 168, pl. 1, figs 3-5.
1992 *Cytheridea acuminata acuminata* Bosquet – PARUCH-KULCZYCKA, p. 264, pl. 1, figs 6-7.
1996 *Cytheridea acuminata acuminata* Bosquet – PARUCH-KULCZYCKA & SZCZECHURA, pp. 731-732, pl. 230, figs 9-10.
2002 *Cytheridea* (*Cytheridea*) *acuminata* Bosquet – GROSS, pp. 40-43, pl. 11, figs 1-13; pl. 13, figs 9-10.
2002 *Cytheridea* (*Cytheridea*) aff. *acuminata* Bosquet – GROSS, pl. 11, figs 5-6.

Remarks – The specimens figured in the present paper show foveolae whose size is smaller than in other forms commonly attributed to *Cytheridea acuminata*. Nonetheless, the shape of the carapace and the distribution of the foveolae convinced us that the dimension of the foveolae in this species is not a feature of systematic value. Consequently, *C. acuminata caumontensis* Carbonnel is considered as synonymous of *C. acuminata*.

The valve figured by Gross (2002) as *C.* (*C.*) aff. *acuminata* falls, in our opinion, in the intraspecific variability of *C. acuminata*.

The form reported as *C. acuminata acuminata* by Carbonnel & Magné (1978, p. 350, pl. 1, figs 20-23) from the Pliocene of Spain and the specimens figured by Whatley & Maybury (1989) as *C. acuminata s.l.*, from the Pliocene of France, show an arched posterodorsal margin, which is truncated in *C. acuminata*. They appear as intermediate forms between *C. acuminata* and *C. neapolitana* Kollmann 1960.

Occurrence – Gl-21 borehole: G11, G18, G22.

Distribution – Burdigalian of the Rhone Basin (Carbonnel, 1969). Serravallian-Tortonian of the Paleo-Mediterranean (Dieci & Russo, 1965, 1967; Sissingh, 1972; Mostafawi, 1990) and Atlantic (Nascimento, 1983). Middle Miocene of the Paratethys (Goerlich, 1953; Oertli, 1956; Kollmann, 1960; Říha, 1983; Zelenka, 1985; Szczechura & Pisera, 1986; Paruch-Kulczycka, 1992; Paruch-Kulczycka & Szczechura, 1996; Gross, 2002).

This species seems to be exclusive of the Miocene sediments of Europe.

Genus CYAMOCYTHERIDEA Oertli, 1956

CYAMOCYTHERIDEA LEPTOSTIGMA (Reuss, 1850)
Pl. 2, fig. 7

1850 *Cytherina leptostigma* REUSS, p. 57, pl. 8, fig. 28.
1960 *Cyamocytheridea leptostigma leptostigma* (Reuss) – KOLLMANN, pp. 157-159, pl. 10, figs 11-12; pl. 11, figs 6-17.
1963 *Cyprideis elegantis* – STANCHEVA, p. 15, pl. 2, fig. 7.
1974 *Cyamocytheridea leptostigma leptostigma* (Reuss) – CERNAJSEK, p. 471, pl. 2, figs 3-4.
1990 *Cyamocytheridea leptostigma leptostigma* (Reuss) – STANCHEVA, pp. 36-37, pl. 10, fig. 10.
1996 *Cyamocytheridea dertonensis* Ruggieri – SZCZECHURA, pl. 2, figs 9, 11, 14.
1996 *Cyamocytheridea dertonensis* Ruggieri – PARUCH-KULCZYCKA & SZCZECHURA, p. 732, pl. 229, figs 4-5.

Remarks – The Upper Badenian specimens fit well those figured by Kollmann (1960) as *Cyamocytheridea leptostigma leptostigma*. The few adults recovered in Gliwice do not allow a subspecific assignment. *C. dertonensis* Ruggieri, 1958, described from the Tortonian of Piedmont, shows a slightly different outline, the anterior margin being narrowly rounded. It may be conspecific with *C. leptostigma*, but this statement would need a detailed study on the variability of the two species.

Occurrence – Gl-21 borehole: G6, G7, G11, G15, G16, G17, G19, G20, G21, G22, mainly young instars.

Distribution – Middle-Upper Miocene of the Central Paratethys (Kollmann, 1960; Stancheva, 1963, 1990; Cernajsek, 1974; Paruch-Kulczycka & Szczechura, 1996; Szczechura, 1996).

Family NEOCYTHERIDEIDAE Puri, 1957
Genus NEOCYTHERIDEIS Puri, 1957

NEOCYTHERIDEIS CYPRIA Athersuch, 1982
Pl. 4, fig. 3

?1953 *Cytherideis reussi* SCHNEIDER, pp. 121-122, pl. 4, fig. 3.
1982 *Neocytherideis cypria* ATHERSUCH, p. 235, pl. 2, figs 1-6, fig. 1i.
1994 *Neocytherideis linearis* Roemer – DUCASSE, p. 51, pl. 4, figs 1-2.
1996 *Neocytherideis fasciata* (Brady & Robertson) – RUIZ & GONZALEZ-REGALADO, pl. 1, fig. 15.
1998 *Neocytherideis linearis* Roemer – ZORN, p. 191, pl. 4, fig. 6.

Remarks – The original pictures of *Cytherina linearis* Roemer, 1838, from the Pliocene of Sicily, do not match the specimens figured by several authors from Oligocene and Miocene (*q.v.* for synonymy Zorn, 1998), showing a higher length/height ratio and a trapezoid outline. The species *Neocytherideis fasciata* (Brady & Robertson, 1874) is discussed by Athersuch (1982) who retains it as a junior synonym of *N. subulata* (Brady, 1868).

While Ducasse (1994) considers a very high degree of variability in different species of the genus *Neocytherideis*, we reckon that, in *N. cypria*, it is restricted to a more or less regularly rounded posterior end.

The species described by Schneider (1953) as *Cytherideis tenuis* is poorly figured, consequently the assignment to this species is doubtful.

The relationships between *N. cypria* and *N. muelleri* (Kruit, 1955) are not clear: It seems possible that the two species are distinct just on the basis of soft parts (Athersuch, 1982). The original description of *N. cypria* is very clear and the types well figured, consequently we accept the Athersuch's species with the aim to avoid a doubtful assignment.

Occurrence – Gl-21 borehole: G15, G17, G19, G22.

Distribution – Upper Oligocene, Aquitanian Basin (Ducasse, 1994). Karpatian, Austria (Zorn, 1998). Pliocene, Spain (Ruiz & Gonzalez-Regalado, 1996). Recent, eastern Mediterranean, depth 5-40 m (Athersuch, 1982).

Family CUSHMANIDEIDAE Puri, 1974
Genus PONTOCYTHERE Dubowsky, 1939

PONTOCYTHERE CURVATA (Bosquet, 1852)
Pl. 4, fig. 4

1852 *Bairdia curvata* BOSQUET, p. 35, pl. 2, fig. 2.
1988 *Pontocythere curvata* (Bosquet) – NASCIMENTO, p. 94, pl. 5, fig. 1 (*q.v.* for synonymy).

Occurrence – Gl-21 borehole: G11, G15, G16.

Distribution – This species is present in the Early Miocene of France and Belgium and from the Aquitanian to the Tortonian of Portugal (Nascimento, 1988, with literature).

Family KRITHIDAE Mandelstam, 1958
Genus KRITHE Brady, Crosskey & Robertson, 1874

KRITHE COMPRESSA (Seguenza, 1880)
Pl. 16, figs 8-9

1880 *Ilyobates compressa* SEGUENZA, p. 325, pl. 17, figs 30-30a.
1965 *Krithe compressa* (Seguenza) – DIECI & RUSSO, p. 79, pl. 15, fig. 6.
1967 *Krithe compressa compressa* (Seguenza) – DIECI & RUSSO, pl. 1, figs 11-12; pl. 3, figs 9.
1968 *Krithe dolichodeira* van den Bold – VAN DEN BOLD (part), p. 51, pl. 10, fig. 4c (non figs 4a-b, d).
1969 *Krithe* cfr. *citae* Oertli – RUSSO, pp. 38-39, text-fig. 5; pl. 6, fig. 3.
1972 *Krithe citae* Oertli – SISSINGH, pp. 83-84, pl. 4, fig. 4.
1972 *Krithe compressa dertonensis* Ruggieri – SISSINGH, p. 84, pl. 4, fig. 5.
1986 *Krithe aequabilis* CIAMPO, p. 87, pl. 17, figs 1-2.
1989 *Krithe* sp. C32 Peypouquet – REHA, text-fig. 7, pl. 2, figs 7, 10.
1991 *Krithe compressa* (Seguenza) – RUGGIERI, pp. 60-61, figs 5-7.
1993 *Krithe compressa* (Seguenza) – ABATE *et al.*, pp. 354, 358, pl. 3, figs 1-5; pl. 6, figs 6-8.
1993 *Krithe* sp. 5, WHATLEY & ZHAO, fig. 3.8.
1994 *Krithe aequabilis* Ciampo – COLES *et al.*, pp. 78, 80-81, pl. 1, figs 7-12; figs 3e-3k.
1995 *Krithe aequabilis* Ciampo – VAN HARTEN, fig. 11.
1996 *Krithe aequabilis* Ciampo – VAN HARTEN, fig. 3L.
1999 *Krithe compressa* (Seguenza) – AYRESS *et al.*, p. 6, figs 2a-b, 5a-d, 8a-b.

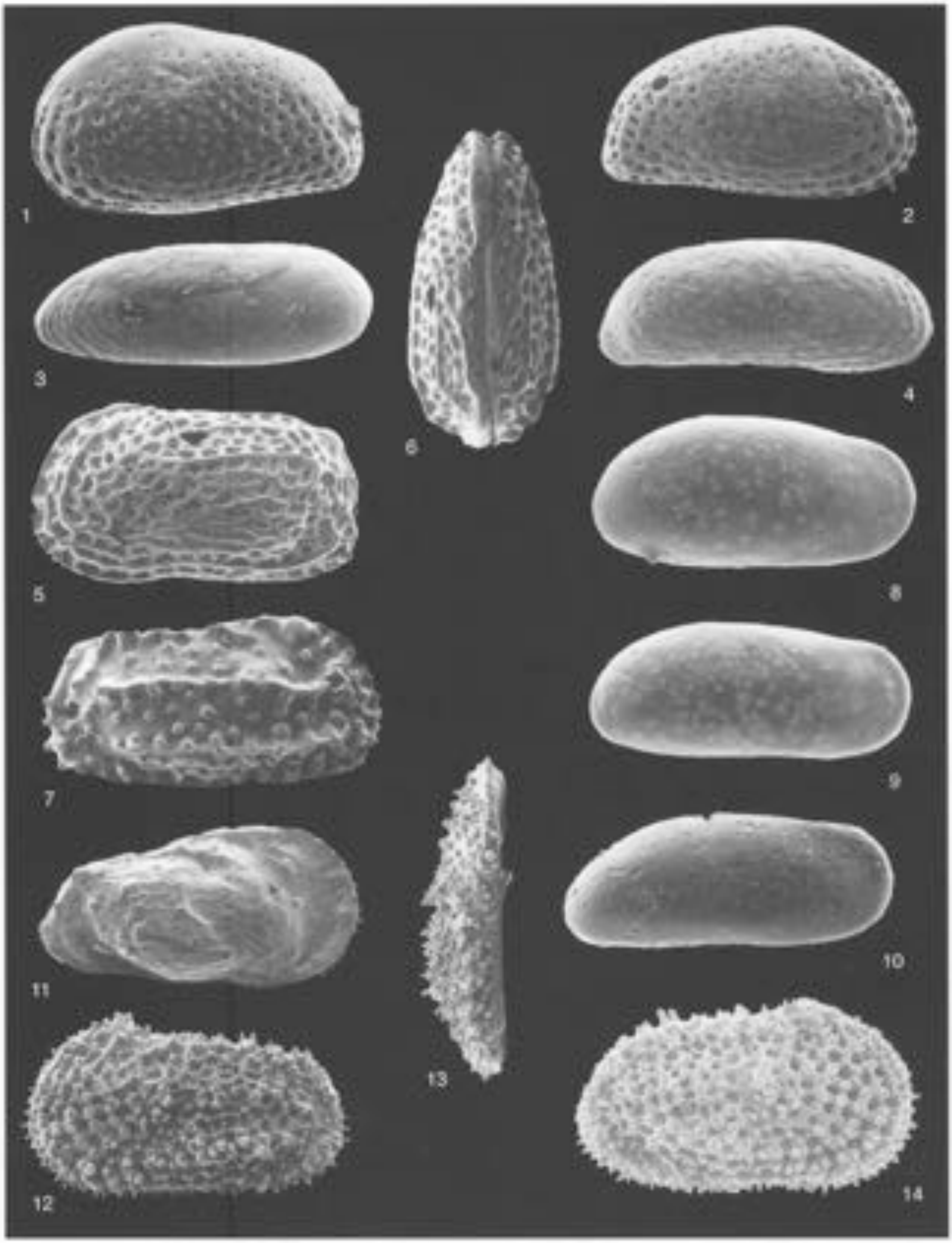
Remarks – Ruggieri (1991) clarified the features of *Krithe compressa* presenting topotypes of the Seguenza's species; the variability of this species has been showed by Abate *et al.* (1993) and Coles *et al.* (1994; as *K. aequabilis* Ciampo).

Occurrence – Gl-21 borehole: G9, G11, G14, G15, G16, G17, G18, G19, G20, G22.

Distribution – The depth range of this species in recent sediments is 160-4000 m (Whatley & Zhao,

EXPLANATION OF PLATE 4

Figs 1-2 - *Cytheridea acuminata* Bosquet, 1852.
1) LV, sample G11, ZPAL 0.48/839 (x 75).
2) RV, Łychów, ZPAL 0.48/904 (x 65).
Fig. 3 - *Neocytherideis cypria* Athersuch, 1982, LV, sample G15, ZPAL 0.48/780 (x 84).
Fig. 4 - *Pontocythere curvata* (Bosquet, 1852), RV, sample G18, ZPAL 0.48/289 (x 64).
Figs 5-6 - *Olimfalunia* ? *plicatula* (Reuss, 1850), sample G11, ZPAL 0.48/819 (x 75).
5) LV from C.
6) C in dorsal view, same specimen as in fig. 5.
Fig. 7 - *Carinocythereis galilea jiricekii* Aiello & Szczechura, 2001, Paratype, RV, Łychów, ZPAL 0.48/11 (x 68).
Figs 8-9 - *Parakrithe rotundata* Aiello, Barra, Abate & Bonaduce, 1993, sample G17.
8) LV female, ZPAL 0.48/868 (x 102).
9) RV male, ZPAL 0.48/869 (x 98).
Fig. 10 - *Parakrithe crystallina* (Reuss, 1850), RV, Posadza, Southern Poland, Lower Badenian, ZPAL V.27/733 (x 104).
Fig. 11 - *Occultocythereis bituberculata* (Reuss, 1850), juvenile, RV, sample G18, ZPAL 0.48/857 (x 120).
Figs 12-14 - *Henryhowella asperrima* (Reuss, 1850), (x 70).
12) LV, sample G19, ZPAL 0.48/715.
13) LV in dorsal view, same specimen as in fig. 12.
14) RV, sample G16, ZPAL 0.48/86.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1993; Coles *et al.*, 1994; Ayress *et al.*, 1999). *Krithe compressa* is a long range species, previously recorded in the Middle Eocene to Recent of Atlantic (Bold, 1968; Coles *et al.*, 1994, with literature; Van Harten 1995, 1996), Neogene and Quaternary sediments of the Mediterranean area (Seguenza, 1880; Ruggieri, 1991; Dieci & Russo, 1965, 1967; Russo, 1969; Sissingh, 1972; Ciampo, 1986; Abate *et al.*, 1993; Aiello *et al.*, 2000; Aiello & Barra, 2001), however known from the Lower Badenian of the Czech Republic (Říha, 1989). Miocene to Recent in the Indo-Pacific (Coles *et al.*, 1994, with literature; Ayress *et al.*, 1999).

KRITHE OERTLII Dieci & Russo, 1967
Pl. 16 figs 10-11

1965 *Krithe* cfr. *bartonensis* (Jones) – DIECI & RUSSO, p. 78, pl. 15, figs 15a-h.
1967 *Krithe oertlii* DIECI & RUSSO, p. 15, pl. 1, figs 7-8; pl. 3, figs 7-8.
?1968 *Krithe dolichodeira* van den Bold – VAN DEN BOLD (*part*), p. 51, pl. 10, figs 4a-b, d (*non* fig. 4c; *non K. dolichodeira* van den Bold 1946).
1969 *Krithe dolichodeira* van den Bold – RUSSO (*part*), pp. 37-38, pl. 6, figs 2a-b (*non* 2c); pl. 8, fig. 5.
?1969 *Krithe* sp. 1 CARBONNEL, p. 70, pl. 12, figs 3-4.
1989 *Krithe* sp. D 12 Pryporaquet – ŘÍHA, text-fig. 6, pl. 1, figs 1-3; pl. 2, figs 8-9.

Remarks – Russo (1969), accepted the vestibulum to be highly variable, and argued that *Krithe oertlii* is a younger synonym of *K. dolichodeira* Bold, 1946. The observation of two dozens of valves of *K. oertlii* recovered in Gl-21 and some hundreds of Pliocene specimens of *K. iniqua* Abate *et al.*, 1993 (Abate *et al.*, 1993; Aiello *et al.*, in prep.), lead us to consider that the general shape of the anterior vestibulum is a constant specific feature. The holotype of *K. dolichodeira* figured by Bold (1946) shows a medium sized, pocket shaped, anterior vestibulum. Later (Bold, 1968) this author figured schematically some specimens with mushroom shaped anterior vestibulum, possibly conspecific with *K. oertlii*. Coles *et al.* (1994) and Ayress *et al.* (1999) provided detailed drawings of this species, but their assignments, compared with the holotype, are not certain.

The attribution of the form reported by Carbonnel (1969) as *Krithe* sp. 1, from the Pliocene of France, is doubtful due to the poor quality of the photographs.

K. oertlii differs from *K. iniqua* in the proximal part of the vestibulum, which is narrower in the latter species. Specimens figured by Ciampo (1980, 1986), as *K.* sp. 1 and *K. pernoides* Bornemann, 1855, show intermediate features, consequently it is possible that *K. iniqua* is a "form" or a subspecies of *K. oertlii*.

Occurrence – Gl-21 borehole: G14, G16, G17, G18, G20.

Distribution – The species occurs in the Lower Badenian of the Czech Republic (Říha, 1989) and in the Tortonian of northern Italy (Dieci & Russo, 1965, 1967; Russo, 1969).

Genus PARAKRITHE van den Bold, 1958

PARAKRITHE ROTUNDATA
Aiello, Barra, Abate & Bonaduce, 1993
Pl. 4, figs 8-9; Pl. 16, figs 3-6

1993 *Parakrithe rotundata* AIELLO, BARRA, ABATE & BONADUCE, p. 284, pl. 3, figs 1-4.
1978 *Parakrithe crystallina* (Reuss) – BRESTENSKÁ & JIŘÍČEK, pl. 2, figs 3, 6.
1989 *Parakrithe* sp. A3 Pryporaquet – ŘÍHA, pl. 2, figs 11-13.

Remarks – In the Badenian of the Central Paratethys at least two species of *Parakrithe* are present. The specimens found in Gliwice corresponds with *P. rotundata*, while in the Lower Badenian of Posądza (southern Poland) a more elongated form is also present. It has a lower and more narrowly rounded posterior end (Pl. 4, fig. 10). In our opinion the latter form fits well with the Reuss' figures of *P. crystallina* (Reuss, 1850). The comparison with the original drawings of Reuss do not allow us to agree with Brestenská & Jiříček (1978), who report as *P. crystallina* specimens of *P. rotundata*. *P. crystallina* is not present in the Gl-21 borehole sediments.

Occurrence – Gl-21 borehole: G11, G15, G16, G17, G18, G19, G20.

Distribution – Badenian of the Central Paratethys (Brestenská & Jiříček, 1978; Říha, 1989). Tortonian-Lower Messinian of Calabria, Italy (Aiello, 1998). Plio-Pleistocene of Sicily (Aiello *et al.*, 1993).

Family TRACHYLEBERIDIDAE
Sylvester-Bradley, 1948
Genus CARINOCYTHEREIS Ruggieri, 1956

CARINOCYTHEREIS GALILEA Ruggieri, 1972 JIRICEKI
Aiello & Szczechura, 2001
Pl. 4, fig. 7

2001b *Carinocythereis galilea* Ruggieri *jiriceki* – AIELLO & SZCZECHURA, pp. 76, 78, pl. 1, figs 1-11 (*q.v.* for extensive synonymy).

Occurrence – Gl-21 borehole: G11, G14, G15, G17, G19, G20, G22.

Distribution – Upper Badenian of the Central Paratethys (Aiello & Szczechura, 2001, with literature).

Genus HENRYHOWELLA Puri, 1957

HENRYHOWELLA ASPERRIMA (Reuss, 1850)
Pl. 4, figs 12-14

1850 *Cypridina asperrima* REUSS, p. 74, pl. 10, figs 5a-b.
1975 *Henryhowella asperrima* (Reuss) – BRESTENSKÁ, p. 393, pl. 7, figs 1-6.
1978 *Henryhowella asperrima* (Reuss) – BRESTENSKÁ & JIŘÍČEK, pl. 8, fig. 8.
1981 *Henryhowella asperrima* (Reuss) – UFFENORDE, pp. 148-149, pl. 2, figs 14-15, 17-19.
1984 *Henryhowella asperrima* (Reuss) – MALZ & JELLINEK, pl. 5, 38-39.
1984 *Henryhowella asperrima* (Reuss) – HUBER-MAHDI, pp. 86-87, pl. 22, figs 5-7.
1985 *Henryhowella* gr. *asperrima* (Reuss) – DUCASSE *et al.*, pl. 80, figs 10-11.
1986 *Henryhowella asperrima* (Reuss) – SZCZECHURA & PISERA, pl. 5, fig. 2; pl. 7, fig. 3.
1993 *Henryhowella asperrima* (Reuss) – KEMPF & NINK, pp. 95-114, figs 1-30.
1994 *Henryhowella asperrima* (Reuss) – SZCZECHURA, p. 145, pl. 1, figs 9-12.
1995 *Henryhowella asperrima* (Reuss) – SZCZECHURA pl. 2, figs 2-3.
1996 *Henryhowella asperrima* (Reuss) – PARUCH-KULCZYCKA & SZCZECHURA, p. 735, pl. 229, fig. 1.
1999 *Henryhowella asperrima* (Reuss) – BONADUCE *et al.*, pp. 60-61, pl. 1, figs 1-2.
1999 *Henryhowella* ? *asperrima* (Reuss) – BONADUCE *et al.*, p. 61, pl. 1, figs 3-4.
2001 *Henryhowella asperrima* (Reuss) – DALL'ANTONIA & BOSSIO, p. 418, pl. 5, fig. 3.
2002 *Henryhowella asperrima* (Reuss) – GROSS, pp. 54-57, pl. 16, figs 1-11.

Remarks and distribution – Numerous authors have reported *Henryhowella asperrima* from the Badenian of the Central Paratethys showing a certain variability of the outline and ornament. It differs from *H. sarsii sarsii* G.W. Müller, 1894, and from *H. sarsii profunda* Bonaduce *et al.*, 1999 due to the regularly rounded anterior margin and reticulation. This is a constant specific feature, which can be clearly observed only in the left valve.

Dall'Antonia & Bossio (2001), figured *H. asperrima* from the Langhian of Italy. They regarded *H. s. profunda* as synonym of *H. asperrima*. It is possible that the two forms are morphotypes, but we prefer regard them as distinct taxa.

H. asperrima occurs in the Badenian of the Paratethys (Reuss, 1850; Brestenská & Jiříček, 1978; Malz & Jellinek, 1984; Szczechura & Pisera, 1986; Kempf & Nink, 1993; Szczechura, 1994; Paruch-Kulczycka & Szczechura, 1996; Bonaduce *et al.*, 1999; Gross, 2002) and from the Eocene to the Upper Miocene of various European regions (Brestenská, 1975; Uffenorde, 1981; Ducasse *et al.*, 1985; Bonaduce *et al.*, 1999).

Occurrence – Gl-21 borehole: G11, G15, G16, G17, G18, G19, G20, G21, G22.

Genus OCCULTOCYTHEREIS Howe, 1951

OCCULTOCYTHEREIS BITUBERCULATA (Reuss, 1850)
Pl. 4, fig. 11

1850 *Cypridina bituberculata* REUSS, p. 71, pl. 10, fig. 11a-b.
2002 *Occultocythereis bituberculata* (Reuss) – GROSS, pp. 66-67, pl. 19, figs 4-6, 11 (*cum syn.*).

Remarks – The degree of variability and the distribution of this species, which occurs in the Neogene European sediments, are still discussed (e.g. Aranki *et al.*, 1992; Ruggieri, 1992; Dall'Antonia & Bossio, 2001; Gross, 2002).

Occurrence – Gl-21 borehole: G5, G16, G17, G19 (only young instars).

Genus OLIMFALUNIA Ruggieri, 1976

OLIMFALUNIA ? PLICATULA (Reuss, 1850)
Pl. 4, figs 5-6

?1850 *Cypridina plicatula* REUSS, p. 84, pl. 10, fig. 23.

Remarks and occurrence – Specimens with dissimilar features have been assigned to *Olimfalunia plicatula* by some authors (e.g. Uffenorde, 1981; Zorn, 1998). Only one adult carapace and few juveniles have been found in samples G11, G14 and G19. Consequently, we are not able to evaluate the variability of this displaced form, which shows a peculiar posteroventral ornament.

Genus PTERYGOCYTHEREIS Blake, 1933

PTERYGOCYTHEREIS JONESII (Baird, 1850)
Pl. 5, fig. 8

1850 *Cythereis jonesii* BAIRD, p. 175, pl. 20, fig. 1.
1972 *Pterygocythereis jonesii* (Baird) – SISSINGH, pp. 111-112, pl. 8, fig. 2 (*cum syn.*).
1976b *Pterygocythereis (Pterygocythereis) jonesii* (Baird) – BREMAN, p. 59, pl. 8, fig. 109 (*cum syn.*).
1978 *Pterygocythereis jonesii* (Baird) – ATHERSUCH, pp. 9-16 (*cum syn.*).
1978 *Pterygocythereis jonesii* (Baird) – ROSENFELD & BEIN, p. 18, pl. 1, fig. 15 (*cum syn.*).
1981 *Pterygocythereis jonesii* (Baird) – MOSTAFAWI, pp. 149-150, pl. 7, figs 4-5 (*cum syn.*).
1983 *Pterygocythereis calcarata* (Bosquet) – RIHA, p. 60, text-fig. 7, pl. 2, fig. 7.
1984 *Pterygocythereis* cf. *calcarata* (Bosquet) – RIHA, pl. 1, figs 4-5.
1984 *Pterygocythereis jonesii* (Baird) – MALZ & JELLINEK, pl. 3, fig. 19.
1986 *Pterygocythereis jonesii* (Baird) – MCKENZIE & WARNE, figs 5f-g, i-j.
1987 *Pterygocythereis jonesii* (Baird) – ARANKI, pp. 62-63, pl. 4, fig. 3 (*cum syn.*).
1988 *Pterygocythereis jonesii* (Baird) – NASCIMENTO, pp. 111-112, pl. 5, fig. 6 (*cum syn.*).
1989 *Pterygocythereis jonesii* (Baird) – ATHERSUCH *et al.*, p. 146, figs 36, 58, pl. 4, fig. 6.
1989 *Pterygocythereis jonesii* (Baird) – LACHENAL, pp. 164-165, pl. 4, fig. 10.
1989 *Pterygocythereis jonesii* (Baird) – ZANGGER & MALZ, pl. 3, fig. 5.
1989 *Pterygocythereis jonesii* (Baird) – MCKENZIE *et al.*, pl. 1, fig. 5.
1990 *Pterygocythereis jonesii* (Baird) – GUERNET, fig. 1; pl. 2, figs 1-4.

1990 *Pterygocythereis* cf. *jonesii* (Baird) – GUERNET, pl. 2, fig. 5.
1990 *Pterygocythereis jonesii* (Baird) – NASCIMENTO, pl. 1, fig. 10.
1990 *Pterygocythereis jonesii* (Baird) – RÖMMELT-DOLL, pl. 2, fig. 34.
1992 *Pterygocythereis jonesii* (Baird) – PARUCH-KULCZYCKA, p. 264, pl. 1, figs 4-5.
1993 *Pterygocythereis jonesii* (Baird) – MCKENZIE & BONADUCE, pp. 603-604, fig. 1.C.
1993 *Pterygocythereis jonesii* (Baird) – NACHITE *et al.*, pl. 4, figs 9-10.
1996 *Pterygocythereis jonesii* (Baird) – RUIZ & GONZALEZ-REGALADO, pl. 1, fig. 15.
1996 *Pterygocythereis jonesii* (Baird) – PARUCH-KULCZYCKA & SZCZECHURA, p. 734, pl. 231, figs 2-3.
1998 *Pterygocythereis jonesii* (Baird) – CARBONNEL, pl. 1, fig. 1 (? figs 2-3).
1999 *Pterygocythereis jonesii* (Baird) – SAFAK, pl. 3, fig. 4.
2002 *Pterygocythereis* (*Pterygocythereis*) *calcarata* (Bosquet) – GROSS, pp. 60-63, pl. 17, figs 11-14; pl. 18, figs 1-10.

Remarks – Gross (2002), described some specimens as *Pterygocythereis calcarata* from the Badenian of the Vienna Basin. He stated that this species and *P. jonesii* differ in some details of the shape and ornament. Taking into account the vast iconography of *P. jonesii* available in literature, the features showed in Recent and Miocene forms demonstrate, in our opinion, that the specimens figured by Gross (2002) belong to *P. jonesii*. Probably *P. calcarata* is a synonym of *P. jonesii*.

Occurrence – Gl-21 borehole: G2, G3, G6, G7, G9, G11, G15, G16, G17, G18, G19, G20, G22.

Distribution – The species lives in the sublittoral waters of the northeastern Atlantic and the Mediterranean Sea (Breman, 1976b, with literature; Athersuch *et al.*, 1989, with literature; McKenzie *et al.*, 1989). It has been reported, probably transported, also from the upper bathyal (Guernet, 1990). In the southern part of the Mediterranean *P. jonesii* seems to live in waters deeper than 40 meters (Yassini, 1979; Bonaduce *et al.*, 1988b; Lachenal, 1989, with literature): in the Aegean Sea it has been found below 30 m, with the yearly maximum temperature lower than 16°C (Stambolidis, 1985; Safak, 1999). On the northwestern African shelf, it ranges from 154 to 301 m (Rosenfeld & Bein, 1978). The data suggest that this species does not tolerate the temperature of the warmest Mediterranean waters.

Pterygocythereis jonesii occurs in the Miocene, i.e. in the Langhian and Tortonian of the Tejo Basin, Portugal (Nascimento 1988, 1990); Lower Badenian of the Lower Silesia, Poland (Paruch-Kulczycka, 1992; Paruch-Kulczycka & Szczechura, 1996) and Vienna Basin (Říha, 1983, 1984; Gross, 2002). The assignment of the Burdigalian specimens figured by Carbonnel (1998) from the Rhone Basin, France, is doubtful, due to the poor preservation of the material: consequently, the first occurrence of this species is recorded in the Middle Miocene.

It is common in shallow-water Plio-Pleistocene sediments of the Mediterranean area (Sissingh, 1972, with literature; Yassini, 1980; Zangger & Malz, 1989; Mostafawi, 1981, with literature; Malz & Jellinek, 1984; Römmelt-Doll, 1990; Nachite *et al.*, 1993; Ruiz & Gonzalez-Regalado, 1996; Carbonnel, 1998).

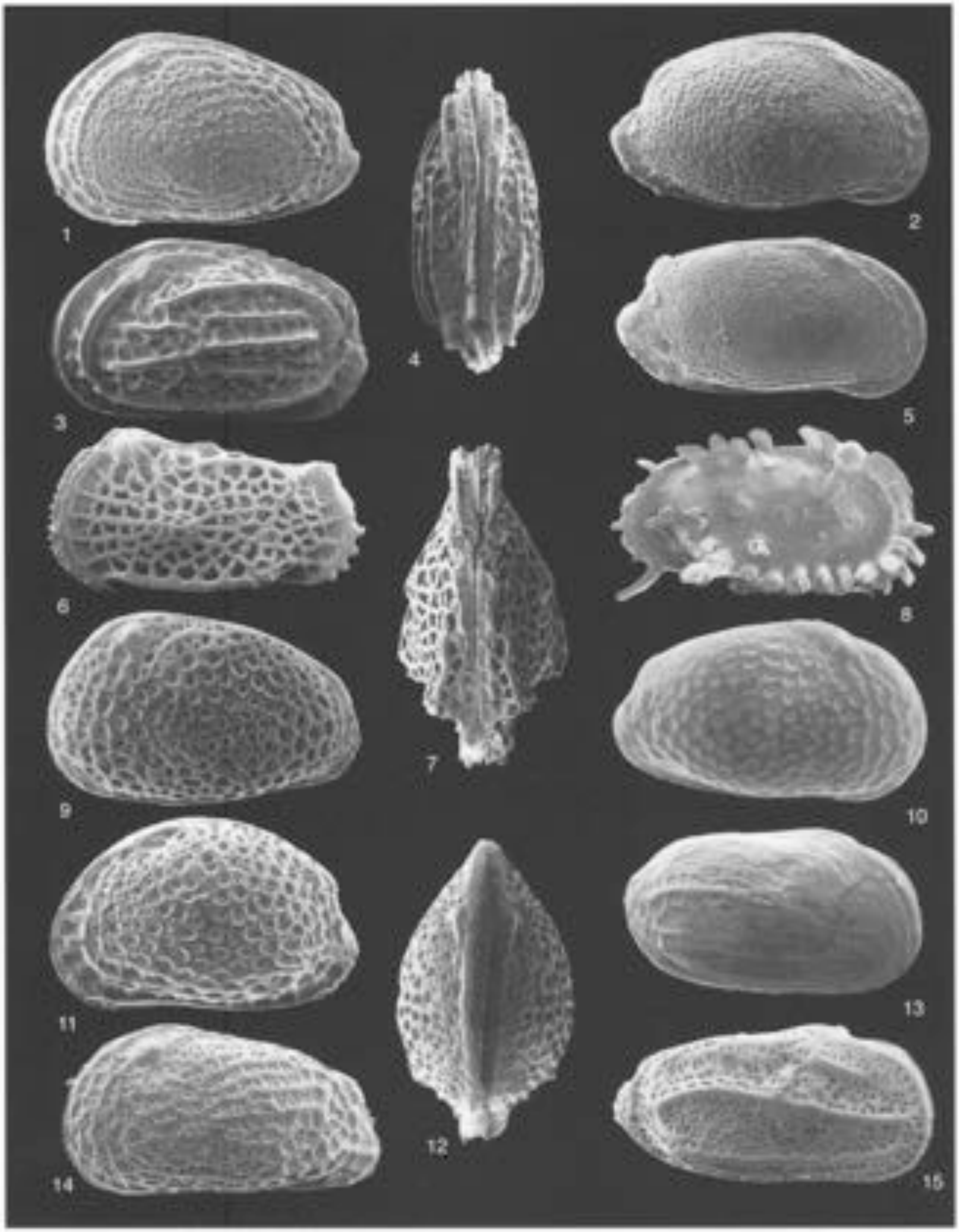
Family HEMICYTHERIDAE Puri, 1953
Genus AURILA Pokorný, 1955

AURILA CICATRICOSA (Reuss, 1850)
Pl. 5, fig. 2

1850 *Cypridina cicatricosa*, REUSS, pp. 67-68, pl. 9, fig. 21.
1962 *Mutilus* (*Aurila*) *cicatricosus* (Reuss) – RUGGIERI, pp. 38-40, pl. 4, fig. 9.
1971 *Aurila* (*Aurila*) *cicatricosa* (Reuss) – CERNAJSEK, pp. 65-69, pl. 6, figs 7-14; pl. 14, figs 7-8; pl. 17, figs 4a-b.
1971 *Mutilus* (*Aurila*) *cicatricosus* (Reuss) – OLTEANU, p. 30, pl. 3, figs 5-5a.
1978 *Aurila cicatricosa* (Reuss) – BRESTENSKÁ & JIŘÍČEK, pl. 6, fig. 1.

EXPLANATION OF PLATE 5

Fig. 1 - *Aurila* sp. 1, LV, sample G16, ZPAL 0.48/807 (x 100).
Fig. 2 - *Aurila cicatricosa* (Reuss, 1850), RV, Lychów, ZPAL 0.48/827 (x 70).
Figs 3-4 - *Graptocythere polyptycha* (Reuss, 1850), Lychów.
3) LV, ZPAL 0.48/826 (x 75).
4) C in dorsal view, ZPAL 0.48/903 (x 70).
Fig. 5 - *Aurila larieyensis* Moyes, 1965, RV, sample G11, ZPAL 0.48/806 (x 132).
Figs 6-7 - *Grinioneis haidingeri* (Reuss, 1850), Lychów (x 70).
6) LV, ZPAL 0.48/828.
7) C in dorsal view, ZPAL 0.48/829.
Fig. 8 - *Pterygocythereis jonesii* (Baird, 1850), RV, sample G18, ZPAL 0.48/716 (x 52).
Figs 9-10 - *Senesia vadaszi* (Zalanyi, 1913).
9) LV, sample G11, ZPAL 0.48/805 (x 88).
10) RV, sample G16, ZPAL 0.48/76 (x 69).
Figs 11-12 - *Pokornyella deformis* (Reuss, 1850), Lychów (x 66).
11) LV, ZPAL 0.48/896.
12) C in dorsal view, ZPAL 0.48/895.
Fig. 13 - *Cytheretta ? ornata tenuiornata* Brestenská, 1978, juvenile, RV, sample G11, ZPAL 0.48/893 (x 68).
Fig. 14 - *Nonurocythereis ? podolica* (Schneider, 1953), juvenile, LV, sample G20, ZPAL 0.48/840 (x 96).
Fig. 15 - *Flexus reussianus* Ruggieri, 1992, RV, sample G14, ZPAL 0.48/825 (x 75).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1983 *Aurila* cf. *opaca* (Reuss) – Říha, p. 62, text-fig. 17; pl. 4, fig. 20.
1986 *Aurila* cf. *opaca* (Reuss) – Szczechura & Pisera, pl. 1, fig. 10.
1992 *Aurila cicatricosa* (Reuss)? – Miculan, p. 118, pl. 4, fig. 3.
1992 *Aurila* (*Aurila*) *cicatricosa* (Reuss) – Ruggieri, p. 186.
2002 *Aurila* (*Aurila*) *cicatricosa* (Reuss) – Gross, pp. 72-73, text-fig. 9.1; pl. 21, figs 1-12; pl. 22, figs 8-10.

Remarks – Gross (2002), provided detailed SEM micrographs concerning some Badenian species of *Aurila*. They made clear the differences between *A. cicatricosa* and *A. opaca*. The shape and ornament of the specimens recovered in the Upper Badenian sediments of Łychów, fit well with *A. cicatricosa* from the Vienna Basin. The more dense pitting of the valves represents, in our opinion, an intraspecific variation of a secondary feature.

Ruggieri (1975) proposed the new subspecies *A. cicatricosa inornata* for the valve figured from the Tortonian of Sicily as *Mutilus* (*Aurila*) *cicatricosus* (in Ruggieri, 1962). The same author (Ruggieri, 1992) discussed the variability of the species, concluding that this Paleo-Mediterranean Miocene form has to be assigned to *A. cicatricosa*.

Actually, the examination of the SEM pictures available in literature seems to confirm the presence of *A. cicatricosa s.l.* in the Italian Miocene. It is unlikely that the different forms can raise more than a subspecific rank.

Aurila oertlii Ruggieri, 1975 (described and figured in Ruggieri, 1977a) has been considered by Ruggieri (1992) as a morphotype of *A. cicatricosa*, but this statement needs further investigations because of the variability of the species.

Occurrence – Gl-21 borehole: G2, G3, G5, G6, G7, G9, G10, G11, G13, G14, G15, G16, G17, G18, G19, G20, G21, G22 (only young instars); figured from the Upper Badenian sediments of Łychów, southern Poland.

Distribution – Badenian, Central Paratethys (Cernajsek, 1971; Olteanu, 1971; Brestenská & Jiříček, 1978; Říha, 1983; Szczechura & Pisera, 1986; Gross, 2002). Middle and Upper Miocene of Italy (Ruggieri, 1962, 1992; Miculan, 1992).

Aurila larieyensis Moyes, 1965
Pl. 5, fig. 5

1965 *Aurila larieyensis* Moyes, pp. 103-105, pl. 12, figs 8-10.
1988 *Aurila* (*Aurila*) *larieyensis* Moyes – Nascimento, pp. 127-128, pl. 7, figs 2-5.
1990 *Aurila* (*Aurila*) *larieyensis* Moyes – Nascimento, p. 182, pl. 2, fig. 24.
1998 *Aurila larieyensis* Moyes ? – Zorn, pp. 197-198, pl. 6, figs 4-9; pl. 17, fig. 5; pl. 18, fig. 1.
2002 *Aurila* (*Eucaurila*) *larieyensis* ? Moyes – Gross, p. 83, pl. 28, figs 5-6, 10.

Remarks – This species is similar to *Aurila* (*Aurila*) *abscisa* (Terquem, 1978) *sensu* Mostafawi (1989a: pl. 4, fig. 74) which differs in the scattered pitting of the central part of the valves.

Occurrence – Gl-21 borehole: G11.

Distribution – Aquitanian, Aquitanian Basin, France (Moyes, 1965). Aquitanian, Burdigalian, Tejo Basin, Portugal (Nascimento, 1988, 1990). Karpatian, Korneuburg Basin, Austria (Zorn, 1998). Badenian, Vienna Basin, Austria (Gross, 2002).

Aurila sp. 1
Pl. 5, fig. 1

Occurrence – Gl-21 borehole: G16, G18.

Genus Graptocythere Ruggieri, 1972

Graptocythere polyptycha (Reuss, 1850)
Pl. 5, figs 3-4

1850 *Cypridina polyptycha* Reuss, p. 83, pl. 10, fig. 22a-b.
1962 *Mutilus* (*Aurila*)? *pulchra* Stancheva, p. 40, pl. 4, fig. 10.
1978 *Mutilus polyptychus* (Reuss) – Brestenská & Jiříček, pl. 7, figs 5-6.
1986 *Mutilus polyptychus* (Reuss) – Szczechura & Pisera, pl. 3, fig. 1.
1988a *Graptocythere* n. sp. 1, Bonaduce *et al.*, pl. 1, fig. 6.
1989b *Graptocythere intricata* (Terquem) – Mostafawi, pl. 3, fig. 3.
1992 *Graptocythere polyptycha* (Reuss) – Bonaduce *et al.*, p. 46, pl. 13, figs 1-5.
1996 *Mutilus polyptychus* (Reuss) – Paruch-Kulczycka & Szczechura, pp. 735-736, pl. 229, figs 8-9.
2002 *Graptocythere polyptycha* (Reuss) – Gross, pl. 36, figs 1-6, 9, 11-12.

Remarks – In *Graptocythere polyptycha* (Reuss) the running of the carinae shows a certain variability. It differs from *G. h-scripta* (Capeder, 1900) due to the distinct reticulation which cover the surface of the valves, not present in *G. h-scripta* (SEM photos in Miculan, 1992).

Occurrence – Gl-21 borehole: G11, G15 (only young instars); figured from the Upper Badenian sediments of Łychów.

Distribution – Badenian of the Central Paratethys (Reuss, 1850; Stancheva, 1962; Brestenská & Jiříček, 1978; Szczechura & Pisera, 1986; Paruch-Kulczycka & Szczechura, 1996). Middle-Upper Miocene, Crete, Greece (Mostafawi, 1989b). Late Miocene, Gulf of Gabès, Mediterranean Basin (Bonaduce *et al.*, 1992).

Genus Grinioneis Liebau, 1975

Grinioneis haidingeri (Reuss, 1850)
Pl. 5, figs 6-7

1850 *Cypridina haidingeri* REUSS p. 78, pl. 10, fig. 13a-d.
1962 *Hermanites cancellata* (Lienenklaus) – STANCHEVA, p. 28, pl. 3, fig. 3.
1973 *Hermanites haidingeri* (Reuss) – OLTEANU, p. 133, pl. 5, figs 3-3b.
1978 *Hermanites haidingeri* (Reuss) – BRESTENSKÁ & JIŘÍČEK, pl. 6, fig. 14.
1978 *Clithrocytheridea? haidingeri* (Reuss) – CARBONNEL & MAGNÉ, p. 350, pl.1, fig. 27.
1981 *Clithrocytheridea haidingeri* (Reuss) – TSAPRALIS, p. 92, pl. 2, fig. 3.
1981 *Hermanites haidingeri* (Reuss) – MOSTAFAWI p. 149, pl. 6, fig. 6 (*cum syn.*).
1984 *Hermanites haidingeri* (Reuss) – HUBER-MAHDI, p. 82, pl. 21, figs 4-5; pl. 22, figs 1-4.
1984 *Grinioneis haidingeri* (Reuss) – MALZ & JELLINEK, pl. 5, fig. 40.
1985 *Hermanites haidingeri* (Reuss) – ZELENKA, pl. 4, fig. 6.
1987 *Hermanites haidingeri* (Reuss) – ARANKI, p. 69, pl. 9, figs 7-9 (*cum syn.*).
1988 *"Hermanites" haidingeri* (Reuss) – SZCZECHURA & ABD-ELSHAFY, p. 308, pl. 10, fig. 5.
1988 *Hermanites haidingeri haidingeri* (Reuss) – NASCIMENTO, pp. 141-142, pl. 8, fig. 14 (*cum syn.*).
1990 *Grinioneis haidingeri haidingeri* (Reuss) – NASCIMENTO, pl. 2, fig. 26.
1992 *Hermanites haidingeri* (Reuss) – PARUCH-KULCZYCKA, p. 269, pl. 4, figs 5-6.
1995 *Grinioneis haidingeri* (Reuss) – ZORN, fig. 4.8
1996 *Hermanites haidingeri* (Reuss) – PARUCH-KULCZYCKA & SZCZECHURA, pp. 737-738, pl. 232, fig. 1.
1997 *Hermanites haidingeri* (Reuss) – DUCASSE & CAHUZAC, pl. 2, fig. 9.
2002 *Grinioneis haidingeri* (Reuss) – GROSS, pp. 95-99, pl. 34, figs 1-13.
2002 *Grinioneis haidingeri* (Reuss) – BARBINOT, p. 739, Pl. 2, figs 8-10.

Remarks and distribution – A number of subspecies of *Grinioneis haidingeri*, and species strictly related with it, have been figured in literature. They show the high degree of variability for the species [e.g. Monostori, 1998, for *G. h. pavjenbarchiana* (Keij, 1957); see also Sissingh, 1972, p. 123].

In the Badenian of the Paratethys different forms occur (e.g. compare Paruch-Kulczycka, 1992, Malz & Jellinek, 1984, and the present paper). This makes difficult a clear separation of the different taxa belonging to the *G. haidingeri* "group", which was widely distributed in the Cenozoic of the Paratethys, Mediterranean and Atlantic.

Occurrence – Gl-21 borehole: G11, G14, G15, G17, G19, G22 (only young instars); figured from the Upper Badenian sediments of Łychów, southwestern Poland.

Genus NONUROCYTHEREIS Ruggieri & Russo, 1980

NONUROCYTHEREIS ? PODOLICA (Schneider, 1953)
Pl. 5, fig. 14

?1953 *Cythereis podolica* SCHNEIDER, pp. 113-114, pl. 3, fig. 6.

Remarks and occurrence – In Gl-21 few juveniles of this species occur in the samples G11, G18, G20. The material does not allow a certain assignment to the species of Schneider, described from the Upper Miocene of Ukraine.

Genus SENESIA Jiříček, 1974

SENESIA VADASZI (Zalányi, 1913)
Pl. 5, figs 9-10

1913 *Cythereis vadászi* ZALÁNYI, p. 139, pl. 8, figs 16-18; text-figs 30a-c, 4e.
1978 *Senesia vadászi* (Zalányi) – BRESTENSKÁ & JIŘÍČEK, pl. 8, fig. 12.
1990 *Senesia vadászi* (Zalányi) – STANCHEVA, pp. 52-53, pl. 13, figs 6-7 (q.v. for synonymy).
1991 *Senesia vadászi* (Zalányi) – JIŘÍČEK & ŘÍHA, pl. 2, fig. 2.
1998 *Senesia* ex gr. *vadászi* (Zalányi) – ZORN, pp. 199-200, pl. 7, figs 4-9; pl. 17, fig. 6; pl. 18, fig. 2.
2002 *Senesia vadászi* (Zalányi) – GROSS, pp. 90-91, pl. 32, figs 6-10.

Remarks – The variability of the reticulum in *Senesia vadaszi* has been described by Stancheva (1990).

Occurrence – Gl-21 borehole: G11, G14, G15, G16, G17, G19, G20, G22, mainly young instars.

Distribution – Karpatian (Jiříček & Říha, 1991; Zorn, 1998), Badenian (Brestenská & Jiříček, 1978; Gross, 2002) and Lower Sarmatian (Stancheva, 1990, and literature) of the Central Paratethys.

Genus POKORNYELLA Oertli, 1956

POKORNYELLA DEFORMIS (Reuss, 1850)
Pl. 5, figs 11-12

1850 *Cypridina deformis* REUSS, p. 69, pl. 9, fig. 25a-b.
1953 *Cythereis deformis* (Reuss) – SCHNEIDER, pp. 116-117, pl. 2, fig. 4.
1971 *Procytheretis deformis* (Reuss) – CERNAJSEK, pp. 166-169, pl. 13, figs 12-18; pl. 14, fig. 14.
1977 *Pokornyella deformis* (Reuss) – RUGGIERI *et al.*, text-fig. 3.1; pl. 1, figs 5-8.
1978 *Procytheretis deformis* (Reuss) – BRESTENSKÁ & JIŘÍČEK, pl. 6, fig. 3.
1985 *Pokornyella deformis* (Reuss) – ZELENKA, pl. 2, figs 4-6.
1986 *Pokornyella deformis* (Reuss) – BONADUCE *et al.*, pl. 1, fig. 3; pl. 2, figs 1-6.

Occurrence – In Gl-21 borehole a juvenile valve is present in the sample G6; the species is figured from the Upper Badenian sediments of Łychów, southwestern Poland.

Distribution – *Pokornyella deformis* occurs in the Badenian of the Paratethys (Reuss, 1850; Schneider, 1953; Ruggieri *et al.*, 1977; Brestenská & Jiříček, 1978; Zelenka, 1985; Bonaduce *et al.*, 1986).

Genus TENEDOCYTHERE Sissingh, 1972

TENEDOCYTHERE SULCATOPUNCTATA
(Reuss, 1850)
Pl. 7, fig. 13

1850 *Cypridina sulcatopunctata* REUSS, p. 75, pl. 10, figs 8-9.
1971 *Procythereis sulcatopunctata* (Reuss) – CERNAJSEK, pp. 170-173, pl. 13, figs 19-24; pl. 14, fig. 15.
1978 *Quadracythere (Tenedocythere) sulcatopunctata* (Reuss) – BRESTENSKÁ & JIŘÍČEK, pl. 8, fig. 7.
1984 *Tenedocythere sulcatopunctata* (Reuss) – HUBER-MAHDI, pp. 54-57, pl. 16, figs 1-6; pl. 17, figs 1-2.
1985 *Quadracythere (Tenedocythere) sulcatopunctata* (Reuss) – ZELENKA, pl. 4, figs 3-5.
1986 *Tenedocythere perplexa* BONADUCE, RUGGIERI & RUSSO, pp. 530, 532, pl. 7, figs 5, 7-8.
2002 *Tenedocythere sulcatopunctata* (Reuss) – GROSS, pp. 104-106, pl. 37, figs 1-12.

Remarks – Bonaduce *et al.* (1986) described, from the Badenian of Nüssdorf, *Tenedocythere perplexa* which is, according to Gross (2002), a junior synonym of *T. sulcatopunctata*. In the same paper excellent SEM micrographs demonstrate that the Badenian species and *T. mediterranea* (Ruggieri, 1962), from the Upper Miocene of the Paleo-Mediterranean, are strictly related but distinct species. Figures reported by authors (see synonymy) show a remarkable variability in ornament and shape.

Occurrence – Gl-21 borehole: G11, G14, G19; (only young instars); figured from the Upper Badenian sediments of Łychów, southwestern Poland.

Distribution – The species occurs exclusively in the Badenian of the Paratethys (Reuss, 1850; Cernajsek, 1971; Brestenská & Jiříček, 1978; Huber-Mahdi, 1984; Zelenka, 1985; Bonaduce *et al.*, 1986; Gross, 2002).

Family CYTHERETTIDAE Triebel, 1952
Genus CYTHERETTA G.W. Müller, 1894

CYTHERETTA ? ORNATA (Héjjas, 1894)
SEMIORNATA Brestenská, 1978
Pl. 5, fig. 13

?1978 *Cytheretta ornata* Héjjas *semiornata* BRESTENSKÁ, pp. 413-414, pl. 5, figs 4-8.

Remarks and occurrence – Juvenile valves of this species occur in Gl-21 borehole in the samples G11, G15, G16, G17, G18, G22. Ornament fits well with the Brestenská's Badenian subspecies, but the lack of adult specimens does not permit a certain assignment.

Genus FLEXUS Neviani, 1928

FLEXUS REUSSIANUS Ruggieri, 1992
Pl. 5, fig. 15

1978 *Flexus triebeli* Ruggieri – BRESTENSKÁ & JIŘÍČEK, pl. 7, fig. 4.
1984 *Flexus triebeli* Ruggieri – HUBER-MAHDI, pp. 97-98, pl. 24, figs 3-6.
1985 *Flexus triebeli* Ruggieri – ZELENKA, pl. 1, figs 1-2.
1992 *Flexus reussianus* RUGGIERI, pp. 180-181, fig. 12.
2002 *Flexus reussianus* Ruggieri – GROSS, pp. 109-110, pl. 38, figs 6-8, 10, 13.

Occurrence – Gl-21 borehole: G11, G14, G15, only juveniles; the figured specimen is a penultimate instar.

Distribution – According to Ruggieri (1992; see also remarks) the species is exclusive of the Badenian of the Central Paratethys.

Family MICROCYTHERIDAE Klie, 1938
Genus MICROCYTHERE G.W. Müller, 1894

MICROCYTHERE PANIS sp. nov.
Pl. 6, figs 1-6

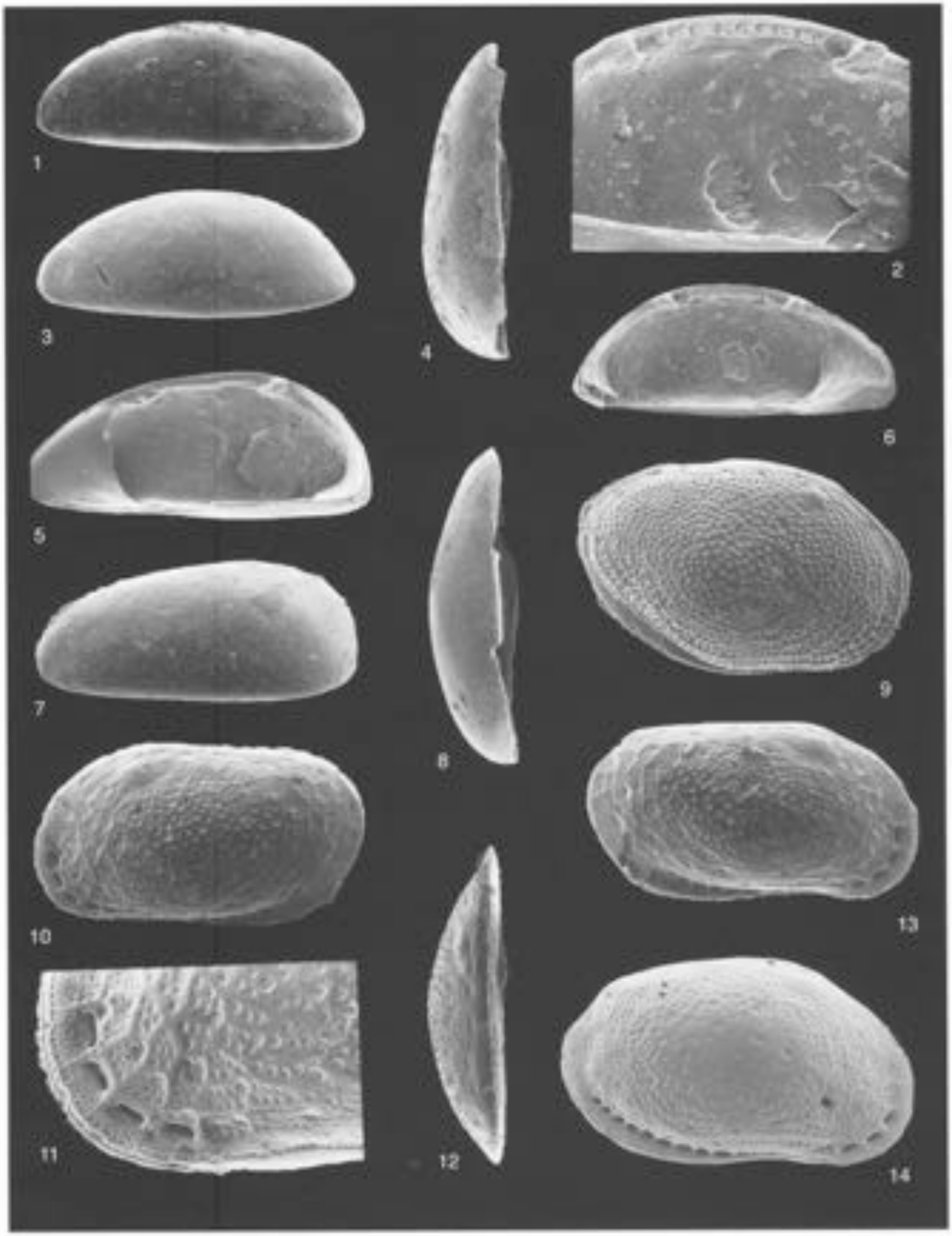
Derivation of name – from Latin *panis* = bread.

Material – 12 valves.

Types – Holotype ZPAL 0.48/845, Paratypes ZPAL 0.48/53, ZPAL 0.48/849, ZPAL 0.48/851, ZPAL 0.48/853.

EXPLANATION OF PLATE 6

Figs 1-6 – *Microcythere panis* sp. nov.
1) Holotype, LV, sample G3, ZPAL 0.48/845 (x 175).
2) Paratype, LV in internal view, sample G6, ZPAL 0.48/853 (x 365).
3) Paratype, LV, sample G6, ZPAL 0.48/851 (x 185).
4) LV in dorsal view, same specimen as in fig. 1 (x 170).
5) Paratype, RV in internal view, sample G17, ZPAL 0.48/53 (x 172).
6) Paratype, LV in internal view, sample G7, ZPAL 0.48/849 (x 180).
Figs 7-8 – *Microcythere* sp. aff. *M. subterranea* Hartmann, 1953.
7) LV, sample G22, ZPAL 0.48/846 (x 170).
8) LV in dorsal view, sample G19, ZPAL 0.48/848 (x 182).
Fig. 9 – *Loxoconcha punctatella* (Reuss, 1850), juvenile, RV, sample G19, ZPAL 0.48/742 (x 105).
Figs 10-14 – *Loxoconcha quadrifoveolata* sp. nov., sample G11.
10) Holotype, LV, ZPAL 0.48/758 (x 92).
11) LV, antero-ventral area, same specimen as in fig. 10 (x 211).
12) LV in dorsal view, same specimen as in fig. 10 (x 92).
13) Paratype, RV, ZPAL 0.48/759 (x 92).
14) Paratype, juvenile, RV, ZPAL 0.48/147 (x 122).



Type level – Upper Badenian (Serravallian), NN 6 biozone.

Type locality – Gliwice Gl-21 borehole, sample G3, Fore-Carpathian Depression, Upper Silesia, southern Poland.

Occurrence – Gl-21 borehole: G1, G3, G6, G7, G14, G20, G22.

Dimensions – Holotype specimen ZPAL 0.48/845, LV, L = 0.34 mm, H = 0.13 mm (Pl. 6, fig. 1).

Diagnosis – A small (L = 0.31-0.34 mm) species of *Microcythere*, elongate, subtrapezoidal/subtriangular in lateral view; dorsal margin arched, ventral margin weakly convex, anterior and posterior end acutely rounded; maximum height approximately central. Valves ovate in dorsal view. The greatest width is slightly behind the mid length. Carapace smooth, thin shelled. Inner lamella anteriorly well developed, with vestibulum, posteriorly very narrow; marginal pore canals few, simple. Right valve overlaps the left. In the left valve the hinge shows a subdivided median hinge element, with two sockets at the extremities and terminal teeth in the left valve, the anterior one being more prominent; complementary elements in the right valve. Central muscle pattern consists in a near-vertical row of four scars and a simple subovate frontal scar. Eye spot absent.

Remarks – The structure of the hinge of the genus *Microcythere* has been reckoned to be variable in different species (G.W. Müller, 1894) and it has been defined "anomalous" (Benson *et al.*, 1961; Van Morkhoven, 1963; McKenzie *et al.*, 1993). Due to the small dimensions and to the thin shell, specimens with well-preserved hingement are generally rare, consequently few good SEM pictures are available in literature. A careful examination of the species presently assigned to *Microcythere* would probably lead to the split of this genus on the base of the structure of the hinge.

Comparisons – The hinge of *Microcythere panis* sp. nov. is very different to that of many species of *Microcythere*, including the type species, *M. inflexa* G.W. Müller, 1894, while it is virtually identical to the hinge of two Recent species described by Müller (1894) from the Gulf of Naples, that is *M. depressa* and *M. dentata*. Both are considerably smaller (length, respectively, 0.27 and 0.28 mm) than *M. panis* sp. nov.; moreover the length/height ratios are different: 2.3 in *M. dentata*, 3.0 in *M. depressa* and 2.6 in *M. panis* sp. nov. (in males).

M. airella McKenzie *et al.*, 1993, resembles *M. panis* sp. nov., but differs due to the different outline, showing the greatest height posteromedially, and an acuminate anterior end.

M. devexa Schornikov, 1974, compared with *M. panis* sp. nov., shows a more triangular outline in the females and, in the males, the dorsal margin is more regularly arched.

MICROCYTHERE sp. aff. M. SUBTERRANEA Hartmann, 1953
Pl. 6, figs 7-8

Remarks – This species differs from *Microcythere subterranea* Hartmann, 1953a, due to the truncated posterior end, acuminate in the recent species, and in the very larger size (length = 0.34 mm *vs* 0.19 mm in *M. subterranea*). *M. frigida* G.W. Müller, 1908 (SEM micrograph in Whatley *et al.*, 1998, pl. 4, fig. 14) differs from *M.* sp. aff. *M. subterranea* due to the distinctly converging ventral and dorsal margins. The species is probably new, but the material is not sufficient for a description.

Occurrence – Gl-21 borehole: G 19, G22.

Family LOXOCONCHIDAE Sars, 1925
Genus LOXOCONCHA Sars, 1866

LOXOCONCHA PUNCTATELLA (Reuss, 1850)
Pl. 6, fig. 9

1850 *Cypridina punctatella* REUSS, p. 65, pl. 9, figs 15a-b.
1998 *Loxoconcha punctatella* (Reuss) – ZORN, pp. 204-205, pl. 10, fig. 12 (*q.v.* for synonymy).
2002 *Loxoconcha punctatella* (Reuss) – GROSS, pp. 114-115, pl. 40, fig. 8, 11; pl. 41, figs 1-10.

Remarks, occurrence and distribution – *Loxoconcha punctatella* has been generally considered a species showing high variability in shape and ornament (e.g. Nascimento, 1988; Ducasse *et al.*, 1991; Zorn 1998), with a wide distribution in the Neogene of the Atlantic, Mediterranean and Paratethys (Zorn, 1998 and literature). In Gl-21 borehole young instars occur in the samples G10, G11, G14, G15, G16, G19, G20, G21, G22. Gross (2002) figured young instars, allowing the assignment of the specimens recovered in Gliwice.

LOXOCONCHA QUADRIFENESTRATA sp. nov.
Pl. 6, figs 10-14

Derivation of name – From Latin *quadri* + *fenestratus* = four windowed.

Material – 6 valves.

Types – Holotype ZPAL 0.48/758, Paratypes ZPAL 0.48/147, ZPAL 0.48/759.

Type level – Upper Badenian (Serravallian), NN 6 biozone.

Type locality – Gliwice Gl-21 borehole, sample G11, Fore-Carpathian Depression, Upper Silesia, southern Poland.

Occurrence – Gl-21 borehole: G11, G12.

Dimensions – Holotype specimen ZPAL 0.48/758, RV, L = 0.66 mm, H = 0.36 mm (Pl. 6, fig. 10).

Diagnosis – Carapace of medium size (L = 0.65-0.66 mm), subrectangular/ovate in lateral view; dorsal margin almost straight; ventral margin weakly sinuous; lenticular in dorsal view, with greatest width in the middle. Greatest height behind mid-length. Anteroventral and posterior marginal areas compressed, the latter forming a subdorsal caudal process. Valves ornamented, in the central area, with small fossae. The marginal areas are faintly reticulated, with small pits concentrically arranged; on the anteroventral area four well distinct fossae are present, parallel to the margin, separated by radial muri.

Remarks – In juvenile specimens marginal fossae are present in the posteroventral area, too (Pl. 6, fig. 14).

Comparisons – *Loxoconcha quadrifenestrata* sp. nov. differs from *L. pauciornata* Mostafawi, 1996 in the number of the anterior fossae (four in the former, six in the latter), in lacking, in adult specimens, of the posteroventral fossae and in the subdued ornament.

LOXOCONCHA sp. aff. L. RHOMBOIDEA (Fischer, 1855)
Pl. 7, fig. 12

Remarks and distribution – Very similar to the phytal, shallow water species *Loxoconcha rhomboidea* (Fischer, 1855), this form differs due to the fine sized puncta, which are fine to medium in *L. rhomboidea* (e.g. Athersuch & Whittaker, 1976).

Occurrence – Gl-21 borehole: G15, G19, G22.

Genus ELOFSONIA Wagner, 1957

ELOFSONIA HORNEI Aiello & Szczechura, 2002

2002 *Elofsonia hornei* AIELLO & SZCZECHURA, pp. 4, 6-7, pl. 1, figs 1-17.

Occurrence and distribution – Gl-21 borehole: G15, G16, G17, G18, G19, G20, G21, G22.

Genus LOXOCONCHIDEA Bonaduce, Ciampo & Masoli, 1976

LOXOCONCHIDEA MINIMA Bonaduce, Ciampo & Masoli, 1976
Pl. 7, figs 1-3

1976a *Loxoconchidea minima* BONADUCE, CIAMPO & MASOLI, pp. 112-113, pl. 59, figs 1-7; tf. 43.
1985 *Loxoconchidea minima* Bonaduce *et al.* – BONADUCE & MASCELLARO, pl. 1, fig. 12.
2000 *Loxoconchidea minima* Bonaduce *et al.* – AIELLO *et al.*, p. 97, pl. 3, fig. 10.

Occurrence – Gl-21 borehole: G15, G16, G17, G20, G22.

Distribution – Bathyal Upper Pliocene and Lower Pleistocene, M.S. Nicola (Sicily, Italy) (Aiello *et al.*, 2000). Gulf of Taranto (Ionian Basin), Late Pleistocene-Holocene (Bonaduce & Mascellaro, 1985). Adriatic Sea below 56 m; Gulf of Naples (Mediterranean Sea), Recent (Bonaduce *et al.*, 1976a).

Genus LOXOCORNICULUM Benson & Coleman, 1963

LOXOCORNICULUM HASTATUM (Reuss, 1850)
Pl. 7, figs 4-5

1850 *Cypridina hastata* REUSS, p. 69, pl. 9, figs 26a-b.
1941 *Loxoconcha hastata* (Reuss) – TRIEBEL, pl. 8, figs 83-84.
1971 *Loxoconcha hastata* (Reuss) – KOLLMANN, pl. 15, figs 4-7.
1974 *Loxoconcha hastata* (Reuss) – CERNAJSEK, pl. 3, figs 1-2.
1988 *Loxoconcha (Loxocorniculum) hastata* (Reuss) – NASCIMENTO, pp. 176-177, pl. 12, figs 1-2 (*cum syn.*).
1991 *Loxocorniculum hastata* (Reuss) – BEKAERT *et al.*, pl. 2, fig. 9.
1992 *Loxoconcha hastata* (Reuss) – PARUCH-KULCZYCKA, p. 268, pl. 4, fig. 1.
1992 «*Loxoconcha*» *hastata* (Reuss) – MICULAN, pp. 124, 126, pl. 6, figs 7-10.
1998 *Loxocorniculum hastata* (Reuss) – ZORN, pp. 206-207, pl. 9, figs 9-11 (*cum syn.*).
2002 *Loxocorniculum hastata* (Reuss) – GROSS, pp. 115-118, pl. 42, figs 1-10; pl. 43, figs 7, 10-11.

Remarks – *Loxocorniculum hastatum* is a long-range species, which shows a certain variability regarding the size of the fossae and the development of the posterodorsal ridge. Ducasse *et al.* (1991) recognized two morphotypes, with and without "crest".

Occurrence – In Gl-21 borehole *Loxocorniculum hastatum* is present in almost all samples, throughout the entire section.

Distribution – Upper Oligocene-Lower Miocene, Aquitanian Basin, France (Moyes, 1965; Bekaert *et al.*, 1991; Ducasse *et al.*, 1991). Lower Miocene, Tejo Basin, Portugal (Nascimento, 1988). Karpatian and Badenian of the Central Paratethys: (Reuss, 1850; Triebel, 1941; Kheil, 1967; Kollmann, 1971; Cernajsek, 1974; Brestenská & Jiříček, 1978; Zelenka, 1985; Paruch-Kulczycka, 1992; Paruch-Kulczycka & Szczechura, 1996; Zorn, 1998; Gross, 2002). Miocene, Rhone Basin (Carbonnel, 1969). Lower Messinian, northern Italy (Miculan, 1992).

Genus NIPPONOCYTHERE Ishizaki, 1971

NIPPONOCYTHERE SILESIENSIS Szczechura & Aiello, 2003
Pl. 7, figs 6-10

2003 *Nipponocythere silesiensis* SZCZECHURA & AIELLO, pp. 15, 17, fig. 2.6; figs 3.1-8.

Occurrence and distribution – Gl-21 borehole: G15, G16, G17, G18, G19.

Genus SAGMATOCYTHERE Athersuch, 1976

SAGMATOCYTHERE CAELATA (Ciampo, 1976)
Pl. 7, fig. 11

1976 *Loxoconcha caelata* CIAMPO, p. 18, 20, pl. 6, fig. 1-7.
1992 *Sagmatocythere caelata* (Ciampo) – BONADUCE *et al.*, p. 84, pl. 25, fig. 12.

Occurrence – Gl-21 borehole: G22.

Distribution – This species has been reported from the Pleistocene of southern Italy (Ciampo, 1976) and from the Upper Miocene of the Gulf of Gabès (Bonaduce *et al.*, 1992).

SAGMATOCYTHERE RAIAI sp. nov.
Pl. 8, figs 9-11

Derivation of name – For Pasquale Raia, in acknowledgement for the patient review of the manuscript.

Material – 6 valves, 1 carapace.

Types – Holotype ZPAL 0.48/746, Paratypes ZPAL 0.48/753.

Type level – Upper Badenian (Serravallian), NN 6 biozone.

Type locality – Gliwice Gl-21 borehole, sample G17, Fore-Carpathian Depression, Upper Silesia, southern Poland.

Occurrence – Gl-21 borehole: G11, G15, G17, G20.

Dimensions – Holotype specimen ZPAL 0.48/746, LV, L = 0.45 mm, H = 0.25 mm (Pl. 8, fig. 9).

Diagnosis – A small (0.45-0.46 mm) species of *Sagmatocythere*, valves subrectangular in side view, trapezoidal in dorsal view, anterior and posterior marginal areas compressed; dorsal margin slightly concave, ventral margin weakly sinuous. Carapace strongly reticulated; the shape of the fossae is mainly quadrangular or pentagonal. The reticulum is not completely developed on the compressed anterior area, which is mainly smooth; the posterior compressed area is ornamented only by minute radial muri. A distinct, small posterocentral ala is present. Eye tubercle evident.

Remarks – Different specimens show slightly more or less developed alar processes.

Comparisons – *Sagmatocythere raiai* sp. nov. differs from *S. multifora* (Norman, 1865), in the presence of a partially smooth anterior area; moreover the latter species, well figured by Guillaume *et al.* (1985) and by Athersuch *et al.* (1989), shows, in the antero-central part of the valves, components of the reticulation running parallel to the anterior margin, which are lacking in *S. raiai* sp. nov.

S. raiai sp. nov. resembles *S. pseudomultifora* Maybury & Whatley, 1984, in general shape and or-

EXPLANATION OF PLATE 7

Figs 1-3 – *Loxoconchidea minima* Bonaduce, Ciampo & Masoli, 1976.
1) LV, sample G22, ZPAL 0.48/93 (x 195).
2) RV in internal view, sample G22, ZPAL 0.48/94 (x 190).
3) C in dorsal view, sample G17, ZPAL 0.48/838 (x 182).

Figs 4-5 – *Loxocorniculum hastatum* (Reuss, 1850), sample G2 (x 82).
4) LV, ZPAL 0.48/747.
5) RV, ZPAL 0.48/767.

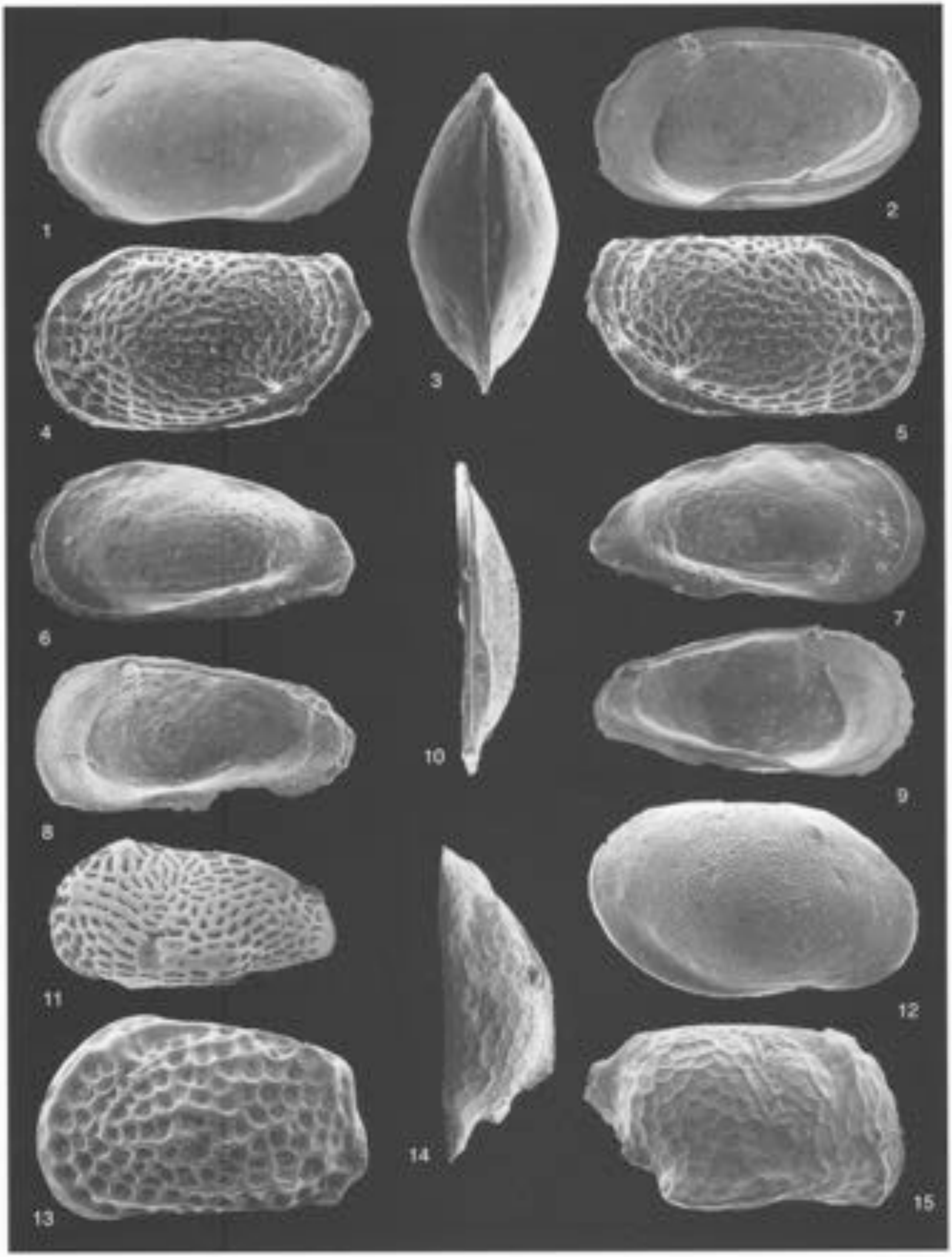
Figs 6-10 – *Nipponocythere silesiensis* Szczechura & Aiello, 2003, sample G17 (x 150).
6) Paratype, LV, ZPAL 0.48/62.
7) Holotype, RV, ZPAL 0.48/60.
8) Paratype, RV in internal view, ZPAL 0.48/554.
9) Paratype, LV in internal view, ZPAL 0.48/61.
10) RV in dorsal view, same specimen as in fig. 8.

Fig. 11 – *Sagmatocythere caelata* (Ciampo, 1976), LV, sample G22, ZPAL 0.48/131 (x 132).

Fig. 12 – *Loxoconcha* sp. aff. *L. rhomboidea* (Fischer, 1855), RV, sample G19, ZPAL 0.48/741 (x 102).

Fig. 13 – *Tenedocythere sulcatopunctata* (Reuss, 1850), LV, Lychów, ZPAL 0.48/885 (x 69).

Figs 14-15 – *Pseudocytherura* sp. aff. *P. calcarata* (Seguenza, 1880), sample G15.
14) RV in dorsal view, ZPAL 0.48/874 (x 79).
15) RV, ZPAL 0.48/873 (x 66).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nament, but differs in the more developed compressed areas, and in some details of the shape of the ala and of the reticulation pattern.

SAGMATOCYTHERE SCRUPEA sp. nov.
Pl. 8, figs 4-8

Derivation of name – From Latin *scrupeus* = rugged.

Material – 42 valves (10 adults and 32 juveniles).

Types – Holotype ZPAL 0.48/189, Paratypes ZPAL 0.48/44, ZPAL 0.48/186, ZPAL 0.48/197, ZPAL 0.48/879.

Type level – Upper Badenian (Serravallian), NN 6 biozone.

Type locality – Gliwice Gl-21 borehole, sample G22, Fore-Carpathian Depression, Upper Silesia, southern Poland.

Occurrence – Gl-21 borehole: G15, G16, G17, G19, G20, G22.

Dimensions – Holotype specimen ZPAL 0.48/189, LV, L = 0.53 mm, H = 0.31 mm (Pl. 8, fig. 4).

Diagnosis – Carapace of medium size (L = 0.50-0.57 mm), subrectangular in lateral view, anterior and posterior margin compressed, dorsal and ventral margin slightly converging backwards. Greatest height corresponding with the anterodorsal angle. Valves ornamented with a strong and irregular reticulation, with some prominent muri forming sub-carinae; a sub-carina overreaches the posterodorsal outer margin; a ventromedian sub-carina terminates in a posteroventral well-defined alar expansion; in dorsal view the extremities of the alae appear orthogonal to the commissural plane. Eye tubercles distinct.

Remarks – The males are more elongate than females; in juvenile specimens (Pl. 8, fig. 7) the reticulation and the shape of the polygonal fossae are more regular than in adults.

Comparisons – The species pertains to the group of the type-species of the genus, *Sagmatocythere napoliana* (Puri, 1963). As numerous SEM micrographs of *S. napoliana* demonstrate (e.g. Athersuch, 1976; Bonaduce *et al.*, 1976a; Yassini, 1979; Stambolidis, 1985) the running of the muri-carinae is a feature showing a high variability in this group. Conversely, the shape of the alar process in dorsal view allows to easily separate *S. scrupea* sp. nov., and *S. napoliana*, the latter species showing weakly developed alae.

S. cristatissima (Ruggieri, 1967) differs from *S. scrupea* sp. nov. in the rectangular outline, with parallel dorsal and ventral margins, and in the very different pattern of the reticulation (see Bonaduce *et al.*, 1992 for SEM micrographs of *S. cristatissima*).

S. scrupea sp. nov. resembles *S. crispa* (Ciampo, 1984) in shape and ornament, but differs in the distinct alar expansion and in the presence of a prominent posterodorsal sub-carina.

SAGMATOCYTHERE TENUIS (Ciampo, 1980)
Pl. 8, figs 1-3

1980 *Leuroconcha moncharmonti tenuis* CIAMPO, p. 19, pl. 3, fig. 1.
1983 *Leuroconcha moncharmonti tenuis* Ciampo – ARUTA, p. 117, pl. 4, fig. 8.
1995 *Sagmatocythere* cf. *moncharmonti* (Ciampo) – SZCZECHURA, pl. 2, figs 1a-1c.
2001 *Sagmatocythere tenuis* (Ciampo) – DALL'ANTONIA & BOSSIO, p. 410, pl. 3, fig. 1.

Remarks – *S. tenuis*, in spite of a certain variability in shape and reticulation, has always a well distinct alar process. As a consequence we consider the specimen figured by Mostafawi (1990) from the Tortonian of Kythira, Greece, as pertaining to a different species, possibly *S. variesculpta* (Ruggieri, 1962).

Occurrence – Gl-21 borehole: G3, G6, G7, G8, G9, G14, G16, G17, G18, G19, G20, G22.

Distribution – Langhian-Serravallian, Apulia (Dall'Antonia & Bossio, 2001). Upper Badenian, Jamnica borehole, southern Poland (Szczechura, 1995). Upper Tortonian-Lower Messinian, Sicily (Ciampo, 1980; Aruta, 1983).

Family PARACYTHERIDEIDAE Puri, 1957
Genus PARACYTHERIDEA G.W. Müller, 1894

PARACYTHERIDEA DEPRESSA G.W. Müller, 1894
COAEQUATA subsp. nov.
Pl. 8, figs 12-14

Derivation of name – From Latin *coaequatus* = levelled.

Material – 8 valves.

Types – Holotype ZPAL 0.48/909, Paratypes ZPAL 0.48/941.

Type level – Upper Badenian (Serravallian).

Type locality – Łychów, Węglin, Roztocze Region, southeastern Poland.

Occurrence – Łychów, Roztocze Region (outcrop); Gl-21 borehole: G2, G5, G6, G7, G9, G11, G14, G15, G16, G17, G18, G19, G20, G22, mostly juveniles, indistinguishable from *Paracytheridea triquetra*; G-19 borehole: depth 55.0 m.

Distribution – The subspecies is reported exclusively from the Upper Badenian (Serravallian) of southern and southeastern Poland.

Dimensions – Holotype specimen ZPAL 0.48/909, RV, L = 0.70 mm, H = 0.30 mm (Pl. 8, fig. 13).

Diagnosis – A subspecies of *Paracytheridea depressa* G.W. Müller, 1894, characterized by the shape of the anterodorsal margin, regularly rounded in the right valve, not prominent in the left valve. In dorsal view the outline of valves is trapezoidal, the leading edge of the ala is sinuate, terminating in a blunt spine turned upwards.

Remarks and comparisons – Ruggieri (1975, 1991) discussed the variability of some species pertaining to the genus *Paracytheridea*, shedding light onto the diagnostic value of the outline of the valves in dorsal view. The comparison with Recent (G.W. Müller, 1894; Uffenorde, 1972, as *P.* sp. A), Pleistocene (Ciampo, 1976) and Pliocene (Danatsas, 1994, as *P.* cf. *depressa*) well figured specimens, evidenced some minor dissimilarities between the Mediterranean subspecies and the valves recovered in the Badenian of southern Poland. In *P. depressa depressa*, the anterior cardinal angle is protruding while in *P. depressa coaequata* subsp. nov. the dorsal margin is almost straight; in dorsal view the subspecies differ due the outline of the ala, slightly sinuate and acuminate in *P. depressa depressa*, distinctly sinuate and posteriorly blunt in *P. depressa coaequata* subsp. nov. In our opinion, these features allow the separation of these forms only at subspecific rank.

PARACYTHERIDEA TRIQUETRA (Reuss, 1850)
Pl. 8, fig. 16

1850 *Cypridina triquetra* REUSS, p. 82, pl. 10, fig. 19.
1962 *Paracytheridea bovettensis* (Seguenza) – RUGGIERI, p. 16, pl. 11, figs 11-11a.
1972 *Paracytheridea* aff. *P. depressa* Müller – UFFENORDE, pp. 86-87, pl. 9, fig. 8; pl. 12, fig. 8.
1975 *Paracytheridea triquetra* (Reuss) – RUGGIERI, fig. 10a.
1976 *Paracytheridea triquetra* (Reuss) – CIAMPO, p. 18, pl. 5, figs 8-11.
1978 *Paracytheridea triquetra* (Reuss) – BRESTENSKÁ & JIŘÍČEK, pl. 3, fig. 7.
1981 *Paracytheridea depressa* Müller – MOSTAFAWI, pp. 165-166, pl. 14, fig. 2.
1985 *Paracytheridea triquetra* (Reuss) – ZELENKA, pl. 1, figs 7-8.
1988 *Paracytheridea* (*Paracytheridea*) *triquetra* (Reuss) – NASCIMENTO, p. 185, pl. 13, figs 2-3.
1989b *Paracytheridea* sp. – MOSTAFAWI, p. 196, pl. 4, fig. 14.
1992 *Paracytheridea triquetra* (Reuss) – PARUCH-KULCZYCKA, p. 265, pl. 2, fig. 5.
1996 *Paracytheridea triquetra* (Reuss) – PARUCH-KULCZYCKA & SZCZECHURA, pp. 739-740, pl. 232, fig. 6.
1997 *Paracytheridea triquetra* (Reuss) – DUCASSE & CAHUZAC, pl. 2, fig. 10.
1998 *Paracytheridea triquetra* (Reuss) – BABINOT & BOUKLI-HACENE, pl. 1, fig. 20.
2002 *Paracytheridea triquetra* (Reuss) – GROSS, pp. 123-125, pl. 47, figs 1-6.
2002 *Paracytheridea* aff. *triquetra* (Reuss) – BABINOT, p. 743, pl. 3, figs 8-9.

Occurrence – See *Paracytheridea depressa coaequata* subsp. nov.; adult specimens present in G-19 borehole, depth 55.0 m.

Distribution – Aquitanian and Serravallian of Portugal (Nascimento, 1988). Serravallian, Aquitanian basin (Ducasse & Cahuzac, 1997). Badenian, Central Paratethys (Reuss, 1850; Ruggieri, 1975; Brestenská & Jiříček, 1978; Zelenka, 1985; Paruch-Kulczycka, 1992; Paruch-Kulczycka & Szczechura, 1996; Gross, 2002). Middle-Upper Miocene of Mediterranean area (Ruggieri, 1962; Mostafawi, 1989b; Babinot & Boukli-Hacene, 1998; Babinot, 2002). Upper Pliocene, Kos, Greece (Mostafawi, 1981). Pleistocene, Campania, Italy (Ciampo, 1976). Recent shallow waters, Adriatic Sea (Uffenorde, 1972).

Family PARACYTHERIDAE Puri, 1974
Genus NUNANA McKenzie, Reyment & Reyment, 1993

NUNANA CARPATHICA Aiello & Szczechura, 2001

2001a *Nunana carpathica* AIELLO & SZCZECHURA, p. 73, pl. 1, figs 1-12, text-fig. 1.

Occurrence and distribution – Gl-21 borehole; G17, G18, G19.

Family CYTHERURIDAE G.W. Müller, 1894
Subfamily CYTHERURINAE G.W. Müller, 1894
Genus HEMICYTHERURA Elofson, 1941

HEMICYTHERURA DEFIOREI Ruggieri, 1953
Pl. 9, figs 3-4

1953 *Hemicytherura defiorei* RUGGIERI, pp. 50-51, text-figs 8-8a, 11-13.
1965 *Hemicytherura defiorei* Ruggieri – DIECI & RUSSO, p. 84, pl. 13, fig. 5.
1965 *Hemicytherura defiorei* Ruggieri – MOYES, p. 57, pl. 8, fig. 8.
1967 *Hemicytherura defiorei* Ruggieri – ARUTA, figs 7.1-7.2; pl. 1, fig. 9.
1967 *Hemicytherura defiorei* Ruggieri – MISTRETTA, p. 9, pl. 1, figs 7-8.
1971 *Hemicytherura defiorei* Ruggieri – BARBETTO-GONZALEZ, p. 306, pl. 26, figs 1c-3c.
1972 *Hemicytherura defiorei* Ruggieri – CIAMPO, pl. 6, figs 3-4.
1976a *Hemicytherura defiorei* Ruggieri – BONADUCE *et al.*, pp. 83-84, pl. 47, figs 8-9.
1976b *Hemicytherura defiorei* Ruggieri – BREMAN, p. 68, pl. 10, fig. 140.
1978 *Hemicytherura videns* (G.W. Müller) – BRESTENSKÁ & JIŘÍČEK, pl. 9, fig. 8.
1980 *Hemicytherura videns* (G.W. Müller) – YASSINI, pl. 9, figs 9-10.
1981 *Hemicytherura defiorei* Ruggieri – MOSTAFAWI, p. 167, pl. 14, figs 12-13.

1983 *Hemicytherura defiorei* Ruggieri – ARUTA, p. 117, pl. 3, figs 11-12.
1988 *Hemicytherura defiorei* Ruggieri – NASCIMENTO, pp. 188-189, pl. 13, fig. 7.
1997 *Hemicytherura defiorei* Ruggieri – DUCASSE & CAHUZAC, pl. 2, fig. 9.
1998 *Hemicytherura defiorei* Ruggieri – HAJJAJI *et al.*, pl. 3, fig. 3.
1998 *Hemicytherura defiorei* Ruggieri – BABINOT & BOUKLI-HACENE, pl. 1, fig. 9.

Occurrence – Gl-21 borehole: G5, G6, G7, G11, G14, G15, G16, G17, G18, G19, G20, G22.

Distribution and remarks – The species is living in the shallow waters of the Mediterranean, at depths shallower than 108 m (Puri *et al.*, 1964, 1969; Barbeito-Gonzalez, 1971; Uffenorde, 1972; Bonaduce *et al.*, 1976c; Breman, 1976b; Bonaduce *et al.*, 1977, 1979; Melis & Pugliese, 1985; Lachenal, 1989); in the Mediterranean area is reported from the Middle-Upper Miocene (Ruggieri, 1953; Dieci & Russo, 1965; Aruta, 1967, 1983; Babinot & Boukli-Hacene, 1998) and Plio-Pleistocene (Ruggieri, 1953; Mistretta, 1967; Ciampo, 1972; Yassini, 1980; Mostafawi, 1981; Hajjaji *et al.*, 1998). The oldest findings are from the Middle Miocene of the Central Paratethys (Brestenská & Jiříček, 1978), Portugal (Nascimento, 1988) and France (Ducasse & Cahuzac, 1997).

In the Aquitanian Basin, France, *Hemicytherura defiorei* has been found in Pliocene sediments (Moyes, 1965).

The poor quality of the figures of specimens reported in Carbonnel (1969, p. 191, pl. 9, figs 22-23) from the Burdigalian of the Rhone Basin, do not allow the attribution to *H. defiorei*.

HEMICYTHERURA VIDENS (G.W. Müller, 1894)
Pl. 9, figs 1-2

1894 *Cytheropteron videns* G.W. MÜLLER, p. 303, pl. 20, figs 2, 8; pl. 21, figs 15-16, 18.
1965 *Hemicytherura videns* (G.W. Müller) – DIECI & RUSSO, pp. 81-82, pl. 13, fig. 6.
1965 *Hemicytherura videns* (G.W. Müller) – MOYES, pp. 57-58, pl. 8, fig. 9.
1967 *Hemicytherura videns* (G.W. Müller) – MISTRETTA, p. 8, pl. 1, figs 9-10.
1968 *Hemicytherura videns* (G.W. Müller) – MASOLI, pp. 47-48, pl. 3, fig. 32; pl. 11, figs 162-164.
1979 *Hemicytherura videns* (G.W. Müller) – ATHERSUCH, pl. 2, fig. 12.
1981 *Hemicytherura videns* (G.W. Müller) – TSAPRALIS, p. 106, pl. 9, fig. 5.
1981 *Hemicytherura videns* (G.W. Müller) – ATHERSUCH, pp. 19-26 (*cum syn.*).
1986 *Hemicytherura videns* (G.W. Müller) – CIAMPO, pl. 15, fig. 9.
1988 *Hemicytherura videns* (G.W. Müller) – NASCIMENTO, p. 189, pl. 13, fig. 8.
1995 *Hemicytherura videns* (G.W. Müller) – RUIZ MUÑOZ, pp. 250-252, fig. 96.
1997 *Hemicytherura videns* (G.W. Müller) – DUCASSE & CAHUZAC, pl. 2, fig. 8.

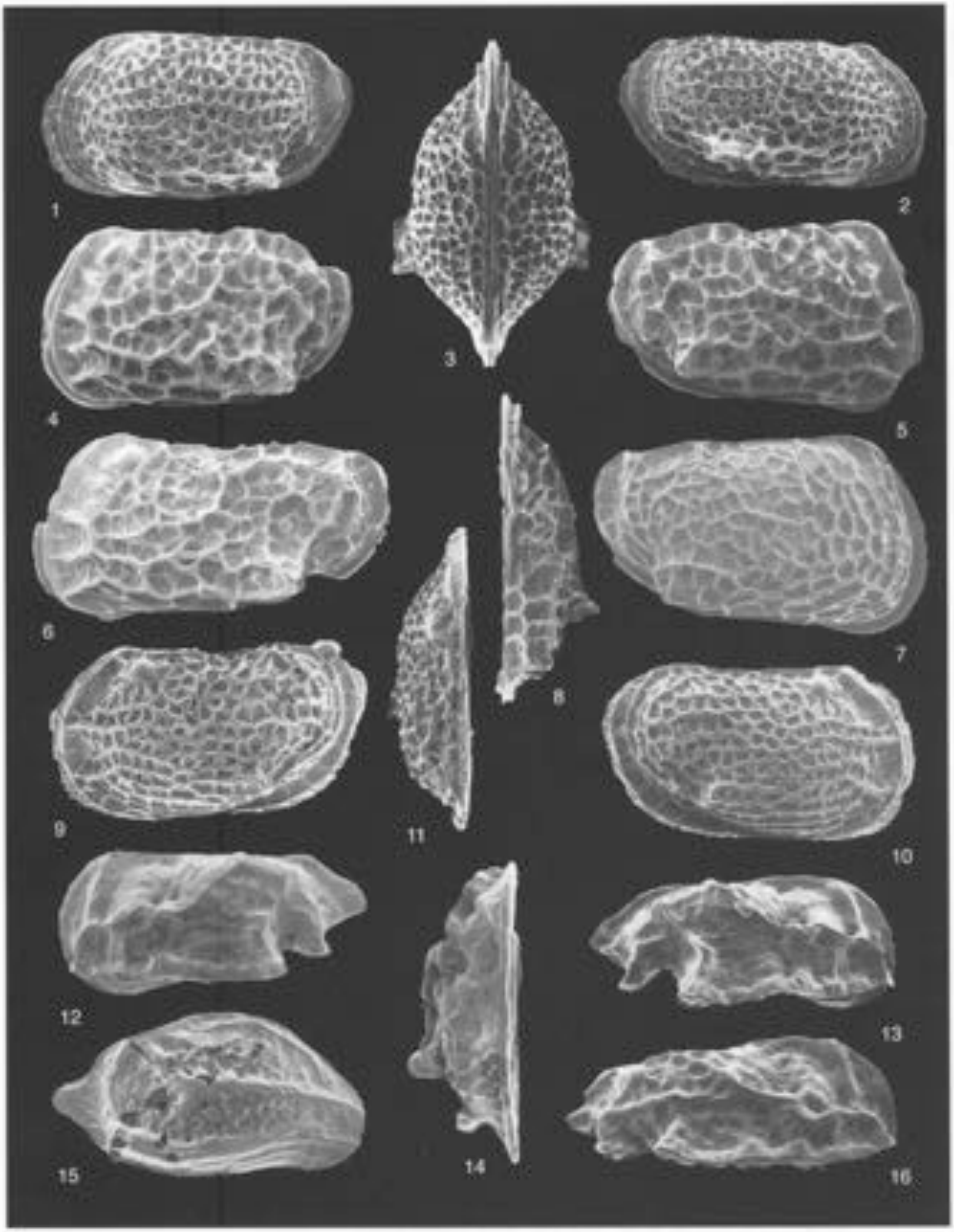
Occurrence – Gl-21 borehole: G1, G3, G6, G7, G9, G15, G16, G17, G18, G19, G20, G22.

Distribution – This shallow-water phytal species lives in the Mediterranean (Müller, 1894; Masoli, 1968; Uffenorde, 1972; Athersuch, 1979, 1981) and in the near Atlantic waters (Ruiz Muñoz, 1995); it is reported from the Aquitanian to the Upper Miocene of peri-Atlantic European area (Moyes, 1965; Nascimento, 1988; Ducasse & Cahuzac, 1997) and from the Tortonian to the Pleistocene of the Mediterranean area (Dieci & Russo, 1965; Mistretta, 1967; Tsapralis, 1981; Ciampo, 1986).

Genus MICROCYTHERURA G.W. Müller, 1894
Subgenus MICROCYTHERURA G.W. Müller, 1894

EXPLANATION OF PLATE 8

Figs 1-3 – *Sagmatocythere tenuis* (Ciampo, 1980), sample G17.
1) LV, ZPAL 0.48/882 (x 130).
2) RV, ZPAL 0.48/881 (x 130).
3) C in dorsal view, ZPAL 0.48/745 (x 138).
Figs 4-8 – *Sagmatocythere scrupea* sp. nov.
4) Holotype, LV, female, sample G22, ZPAL 0.48/189 (x 112).
5) Paratype, RV, female, sample G22, ZPAL 0.48/197 (x 116).
6) Paratype, LV, male, sample G22, ZPAL 0.48/186 (x 116).
7) Paratype, juvenile, RV, sample G17, ZPAL 0.48/44 (x 132).
8) Paratype, RV in dorsal view, sample G17, ZPAL 0.48/879 (x 112).
Figs 9-11 – *Sagmatocythere nitai* sp. nov., sample G17 (x 130)
9) Holotype, LV, ZPAL 0.48/746.
10) Paratype, RV, ZPAL 0.48/753.
11) LV in dorsal view, same specimen as in fig. 9.
Figs 12-14 – *Paracytheridea depressa compacta* subsp. nov.
12) LV in sample G16, ZPAL 0.48/110 (x 89).
13) Holotype, RV, Lychów, ZPAL 0.48/909 (x 81).
14) LV in dorsal view, sample G12, ZPAL 0.48/891 (x 76).
Fig. 15 – *Kangarina ? abyssicola* (G.W. Müller, 1894), RV, sample G18, ZPAL 0.48/244 (x 150).
Fig. 16 – *Paracytheridea triquetra* (Reuss, 1850), RV, borehole Gliwice 19, sample 55.0 mbs, ZPAL 0.48/919 (x 115).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MICROCYTHERURA (MICROCYTHERURA) EVERRICULUM sp. nov.
Pl. 9, figs 5-13

Derivation of name – From Latin *everriculum* = a fishing net.

Material – 145 valves, 1 carapace.

Types – Holotype ZPAL 0.48/690, Paratypes ZPAL 0.48/160, ZPAL 0.48/691-695, ZPAL 0.48/814.

Type level – Upper Badenian (Serravallian), NN 6 biozone.

Type *locality* – Gliwice Gl-21 borehole, sample G22, Fore-Carpathian Depression, Upper Silesia, southern Poland.

Occurrence – Gl-21 borehole: G2, G3, G9, G11, G14, G15, G16, G17, G18, G19, G20, G22.

Dimensions – Holotype specimen ZPAL 0.48/690, LV, L = 0.42 mm, H = 0.21 mm (Pl. 9, fig. 7).

Diagnosis – A small (L = 0.38-0.44 mm) species of *Microcytherura* (*Microcytherura*), subtrapezoid in lateral view, dorsal and ventral margins slightly convex, converging posteriorly in the left valves; greatest height at about mid-length in the right valve; anterior margin regularly rounded, caudal process at about mid-height. Carapace ventrally flattened, ovate in dorsal view. Surface of the valves irregularly reticulate. Hinge merodont; inner lamella moderately developed, without vestibula; marginal pore canals few and simple; normal pore canals sieve-type. Muscle scars pattern: subvertical row of four scars and two anterodorsal scars. Female valves are moderately larger (0.42-0.43 mm) than male valves (0.38-0.39 mm). The L/H ratio of the right valves is lower in females (2.0) than in males (2.2).

Comparisons – *Microcytherura* (*M.*) *everriculum* sp. nov. differs from *M. nigrescens* G.W. Müller, 1894, in the very well defined reticulum, which in the central part of the valves shows a different arrangement.

Microcytherura fulva (Brady & Robertson, 1874) may be distinguished from *M.* (*M.*) *everriculum* sp. nov. due to the less pointed posterior end and the more regular reticulation (SEM micrographs in Bonaduce *et al.*, 1976a).

M. lienenklausi Moos, 1971 (SEM micrographs in Faupel, 1975; Mostafawi, 1999) differs from *M.* (*M.*) *everriculum* sp. nov. due to the delicate reticulation and the less developed caudal process.

Subgenus TETRACYTHERURA Ruggieri, 1952

MICROCYTHERURA (TETRACYTHERURA) DIANAE sp. nov.
Pl. 10, figs 1-9

Derivation of name – For Diana Barra, in acknowledgement for the numerous scientific suggestions and the remarkable help during the preparation of this study.

Material – 113 valves.

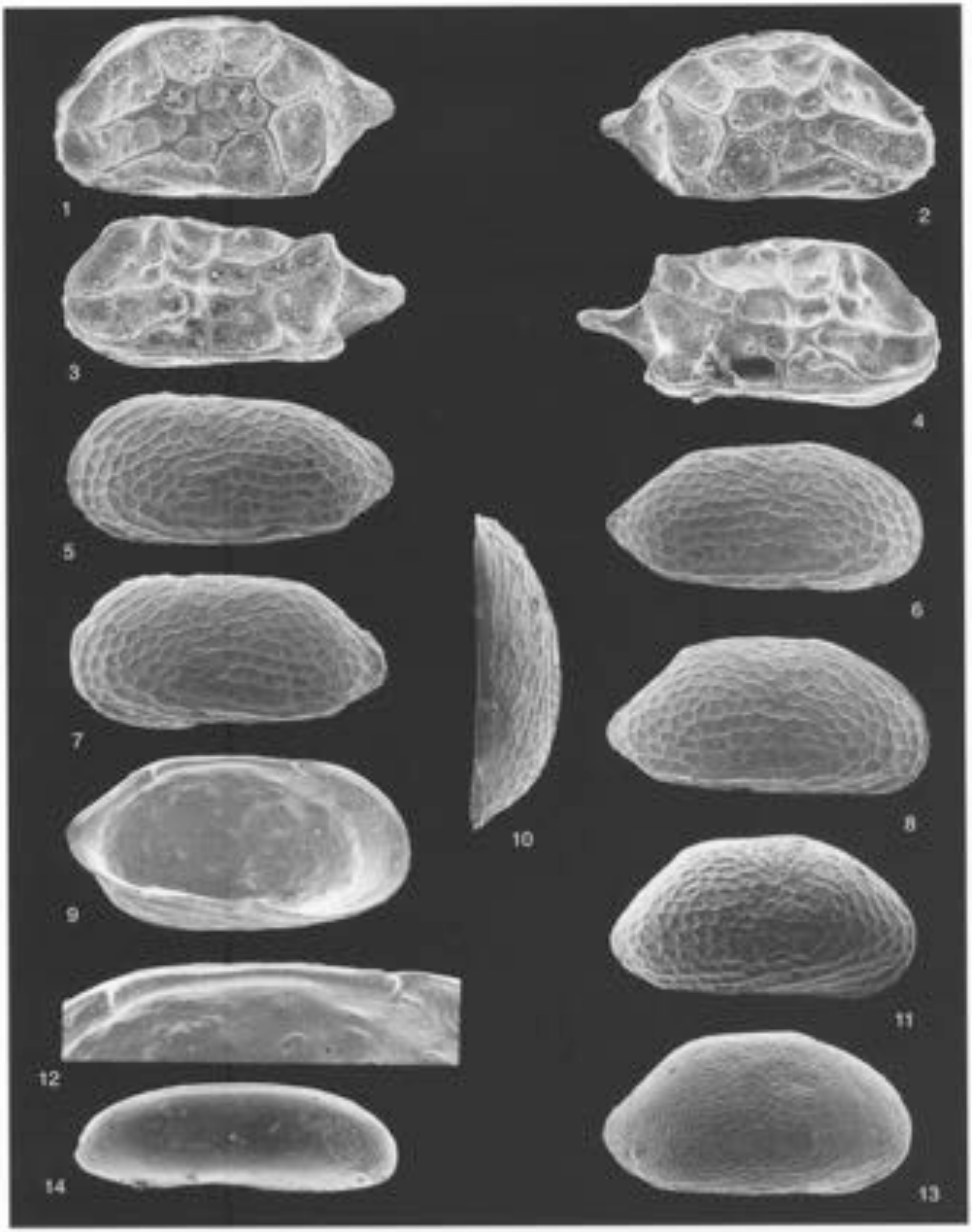
Types – Holotype ZPAL 0.48/886, Paratypes ZPAL 0.48/730, ZPAL 0.48/732, ZPAL 0.48/734, ZPAL 0.48/887.

Type level – Upper Badenian (Serravallian), NN 6 biozone.

Type locality – Gliwice Gl-21 borehole, sample G22, Fore-Carpathian Depression, Upper Silesia, southern Poland.

EXPLANATION OF PLATE 9

Figs 1-2 – *Hemicytherura videns* (G.W. Müller, 1894), sample G18 (x 172).
1) LV, ZPAL 0.48/204.
2) RV, ZPAL 0.48/198.
Figs 3-4 – *Hemicytherura defiorei* Ruggieri, 1953, sample G18 (x 145).
3) LV, ZPAL 0.48/203.
4) RV, ZPAL 0.48/200.
Figs 5-13 – *Microcytherura* (*Microcytherura*) *everriculum* sp. nov.
5) Paratype, LV, male, sample G22, ZPAL 0.48/693 (x 150).
6) Paratype, RV, male, sample G22, ZPAL 0.48/694 (x 150).
7) Holotype, LV, female, sample G22, ZPAL 0.48/690 (x 136).
8) Paratype, RV, female, sample G22, ZPAL 0.48/692 (x 136).
9) Paratype, LV in internal view, sample G22, ZPAL 0.48/160 (x 140).
10) Paratype, RV in dorsal view, sample G22, ZPAL 0.48/695 (x 136).
11) Paratype, juvenile, RV, sample G19, ZPAL 0.48/691 (x 170).
12) LV in internal view, hinge, same specimen as fig. 9 (x 280).
13) Paratype, juvenile, RV, female, sample G22, ZPAL 0.48/814 (x 140).
Fig. 14 – *Cytherois* (?) sp. 1, RV from C, sample G17, ZPAL 0.48/822 (x 120).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Occurrence – Gl-21 borehole: G9, G10, G15, G16, G17, G18, G19, G20, G22.

Dimensions – Holotype specimen ZPAL 0.48/886, LV, L = 0.47 mm, H = 0.24 mm (Pl. 10, fig. 1).

Diagnosis – A small (0.44-0.49 mm) species of *Microcytherura* (*Tetracytherura*), rectangular in side view, dorsal margin weakly convex, ventral margin slightly sinuate, anterior end regularly rounded; upper part of the posterior margin slightly concave, forming a weak, obtuse posterodorsal caudal process. Carapace posteriorly inflated, ventrally flattened, pear-shaped in dorsal view. The posteroventral inflation ventrally overhangs the outer margin. Surface of the valves delicately reticulated and finely pitted. Hinge merodont, with terminal teeth distinctly trilobate; inner lamella moderately developed, with a small anterior vestibulum. Muscle scars pattern consists of a vertical row of four scars and a v-shaped frontal scar.

Remarks – Internal and external features of this species confirm that the taxon *Tetracytherura* has to be regarded as a subgenus of *Microcytherura* (Moos, 1971), due to the intrageneric variability of the structure of the hinge, muscle scars pattern and shape of the carapace. The assignment of this species to the subgenus *Tetracytherura* comes out from the presence of the anterior vestibulum.

Comparisons – *Microcytherura* (*T.*) *dianae* sp. nov. differs from *M.* (*T.*) *mundula* (Ciampo, 1986) due to the presence of a marked posterodorsal angle, to the shape of the posteroventral inflation and the more delicate pitting of the valves surface.

Genus PSEUDOCYTHERURA Dubowsky, 1939

PSEUDOCYTHERURA sp. aff. P. CALCARATA (Seguenza, 1880)
Pl. 7, figs 14-15

1978 *Pseudocytherura calcarata* (Seguenza) – BRESTENSKÁ & JIŘÍČEK, pl. 5, fig. 10.

Remarks – Ruggieri (1991) figured and discussed topotypes of *Pseudocytherura calcarata* (Seguenza, 1880), describing two related species, *P. inermis* and *P. strangulata* from Italian Plio/Quaternary sediments. The Miocene specimens seem to differ from all these forms, in lateral and dorsal outline and in some details of the ornament, but the scarcity of the material does not permit to evaluate the variability, and consequently the description of a new species.

Occurrence – Gl-21 borehole: G6, G7, G11, G15, G16, G17, G18, G19, G20, G21, G22, mainly young instars.

Distribution – Badenian, Central Paratethys (Brestenská & Jiříček, 1978).

Genus SEMICYTHERURA Wagner, 1957

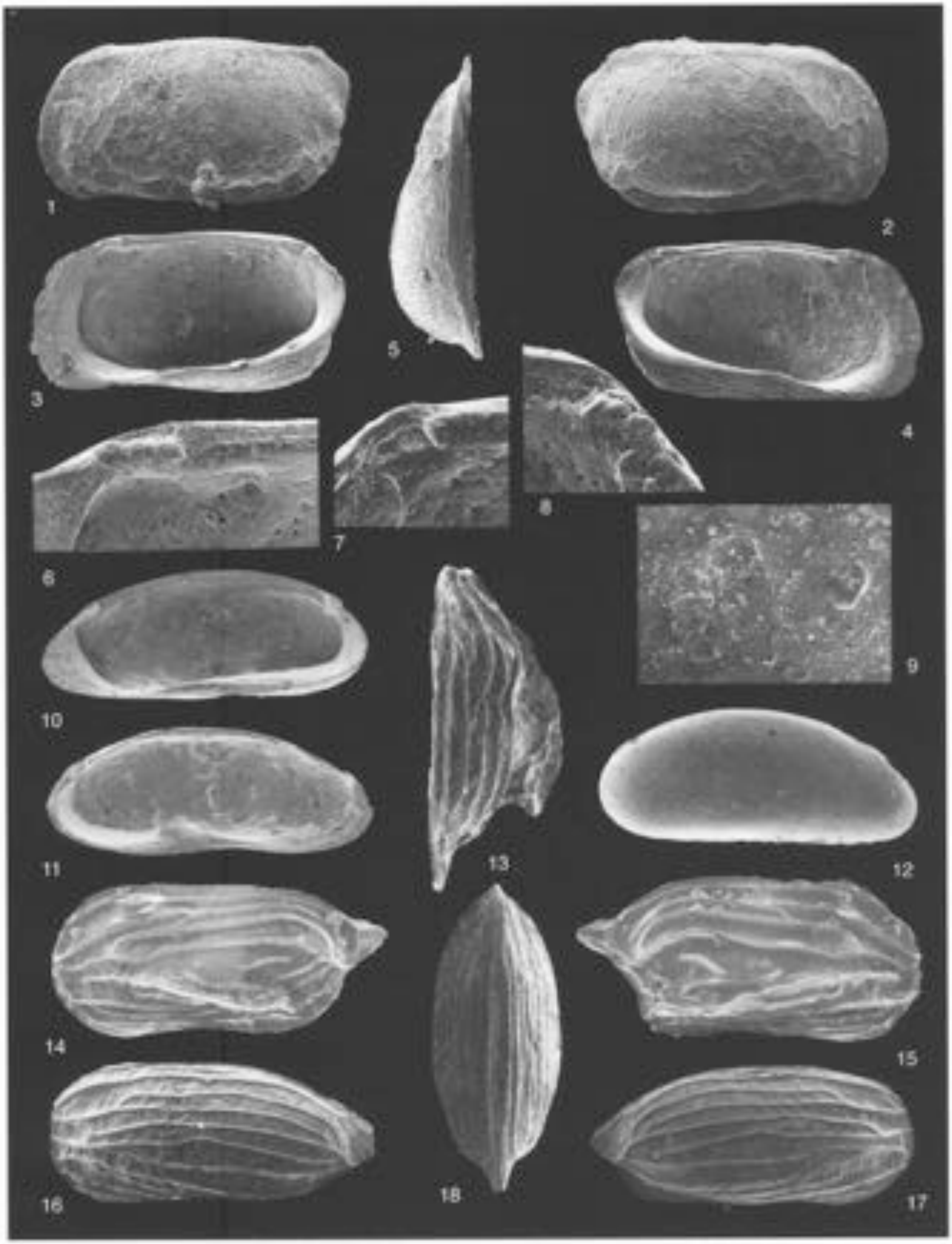
SEMICYTHERURA AVICULAECAPUT sp. nov.
Pl. 11, figs 11-13

1983 *Semicytherura* aff. *danonica* Krstić – KRSTIĆ (part), p. 198, pl. 2, fig. 5 (non figs 24-26, pl. 2, figs 3-4).

Derivation of name – From Latin *avicula* + *caput* = small bird's head

EXPLANATION OF PLATE 10

Figs 1-9 – *Microcytherura (Tetracytherura) dianae*, sp. nov., sample G22.
1) Holotype, LV, ZPAL 0.48/886 (x 125).
2) Paratype, RV, ZPAL 0.48/730 (x 125).
3) Paratype, RV in internal view, ZPAL 0.48/732 (x 120).
4) Paratype, LV in internal view, ZPAL 0.48/734 (x 130).
5) LV in dorsal view, ZPAL 0.48/887 (x 125).
6) RV in internal view, anterior part of hinge, same specimen as in fig. 3 (x 530).
7) LV in internal view, posterior part of hinge, same specimen as in fig. 4 (x 520).
8) RV in internal view, posterior part of hinge, same specimen as in fig. 3 (x 530).
9) LV in internal view, muscle scars, same specimen as in fig. 4 (x 520).
Figs 10-12 – *Cytheridea ruggierii* sp. nov.
10) Holotype, RV in internal view, sample G18, ZPAL 0.48/272 (x 138).
11) Paratype, LV in internal view, sample G22, ZPAL 0.48/129 (x 130).
12) Paratype, RV, sample G22, ZPAL 0.48/786 (x 152).
Figs 13-15 – *Semicytherura galea* (Stancheva, 1962) (x 100).
13) RV in dorsal view, sample G15, ZPAL 0.48/729.
14) LV, sample G17, ZPAL 0.48/63.
15) RV, sample G17, ZPAL 0.48/69.
Figs 16-18 – *Semicytherura quadridentata* (Hartmann, 1953) (x 130).
16) LV, sample G15, ZPAL 0.48/877.
17) RV, sample G22, ZPAL 0.48/262.
18) C in dorsal view, sample G15, ZPAL 0.48/720.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Material – 118 valves.

Types – Holotype ZPAL 0.48/65, Paratypes ZPAL 0.48/113, ZPAL 0.48/705.

Type level – Upper Badenian (Serravallian), NN 6 biozone.

Type locality – Gliwice Gl-21 borehole, sample G17, Fore-Carpathian Depression, Upper Silesia, southern Poland.

Occurrence – Gl-21 borehole: G2, G6, G7, G11, G14, G15, G16, G17, G18, G19, G20, G21, G22.

Distribution – Badenian (*Bolivina dilatata* zone), Borovik, Slavonia (Krstić, 1983).

Dimensions – Holotype specimen ZPAL 0.48/65, LV, L = 0.50 mm, H = 0.25 mm (Pl. 11, fig. 11).

Diagnosis – A small-middle (L = 0.45-0.50 mm) species of *Semicytherura*, subrectangular in lateral view, dorsal and ventral margins subparallel, anterior end rounded; caudal process above the mid-height. Ovate, posteriorly compressed, in dorsal view. Ornament consists of longitudinal ribs, surface of the valves between the ribs being reticulate with quadrate or polygonal meshes. The pattern of the four subdorsal ribs is distinctive. The first (i.e. the uppermost) rib connects the anterior end with the caudal process; the second is placed in the posterodorsal part of valves; the third and the fourth ribs, running parallel in the posterior and central area, join together anteriorly with an acute angle, forming a characteristic bird-head silhouette. Alar process very reduced.

Comparisons – *S. aviculaecaput* sp. nov. is very similar to *S. turbulenta* Ciampo 1986 (= *S. acuticostata* Guillaume *et al.*, 1985, pl. 100, figs 9-10), but differs in the outline of the right valve anterior margin: it is acutely rounded in the former species and widely rounded in the latter species. Moreover, in *S. turbulenta* the reticulum is very well defined and the anterodorsal flattened area is less developed than in *S. aviculaecaput*.

Pliocene-Recent specimens attributed to *Semicytherura acuticostata* (Sars, 1866) show a high degree of variability (e.g. Barbeito-Gonzalez, 1971; Bonaduce *et al.*, 1976a; Rosenfeld, 1977; Athersuch *et al.*, 1989; Hajjaji *et al.*, 1998; Uffenorde, 1972, as *S. a. ventricosa*), differing in any case from *S. aviculaecaput* sp. nov. in subdorsal ribs pattern.

The original pictures of *S. ventricosa* (G.W. Müller, 1894) show, especially in dorsal view, a different outline due to the presence of well developed alae.

SEMICYTHERURA FURCILLA sp. nov.
Pl. 11, figs 4-5

1992 «*Cytheropteron*» *rarum* G.W. Müller – BONADUCE *et al.*, p. 74, pl. 21, fig. 13.

Derivation of name – From Latin *furcilla* = fork.

Material – 4 valves.

Types – Holotype ZPAL 0.48/163, Paratypes ZPAL 0.48/135.

Type level – Upper Badenian (Serravallian), NN 6 biozone.

Type locality – Gliwice Gl-21 borehole, sample G22, Fore-Carpathian Depression, Upper Silesia, southern Poland.

Occurrence – Gl-21 borehole: G22.

Distribution – Late Miocene, Gulf of Gabès, Mediterranean Basin (Bonaduce *et al.*, 1992).

Dimensions – Holotype specimen ZPAL 0.48/163, RV, L = 0.32 mm, H = 0.15 mm (Pl. 11, fig. 5).

Diagnosis – A small (L = 0.31-0.33 mm) species of *Semicytherura*, subrectangular in side view, arrowhead shaped in dorsal view. Anterior margin regularly rounded in the left valve, subtruncated in the right valve. Caudal process above the mid-height. The surface of valves is covered with small foveolae. In the posterior area two straight subvertical oblique carinae form an upside-down v-shaped structure with the apex placed in the posterodorsal angle; the alar carina trifurcates in the anterior area in two parallel ribs reaching the anterior margin and one short, thin, intermediate rib, forming an asymmetrical fork shaped structure; posteriorly it is terminated by a distinct spine.

Comparisons – *Semicytherura furcilla* sp. nov. differs from *S. janinae* Aiello, Barra & Bonaduce, 2001 (= *Cytheropteron rarum* G.W. Müller, 1894) in the different running of the anterior ribs: in the latter species two straight anteroventral ribs are joined at an acute angle, while in *S. furcilla* sp. nov. the alar rib separates in to two ribs, which become parallel after an abrupt change of course of the upper rib, with a short third rib in the middle.

SEMICYTHERURA GALEA (Stancheva, 1962)
Pl. 10, figs 13-15

1956 *Cytherura acuticostata* Sars – CHOCZEWSKI, pl. 3, fig. 11.
1962 *Cytherura galea* STANCHEVA, pp. 47, 58-59, 63-64, pl. 3, fig. 6.
1983 *Semicytherura* cf. *acuticostata* (Sars) – KRSTIĆ, pp. 200-201, pl. 2, fig. 8.
2002 *Semicytherura galea* (Stancheva) – GROSS, pp. 128-129, pl. 45, figs 5-6, pl. 46, figs 1, 5.

Occurrence – Borehole Gl-21: G3, G5, G11, G14, G15, G16, G17, G18, G19, G20, G22.

Distribution – *Semicytherura galea* has been recorded in the Badenian of the Central Paratethys (Stancheva, 1962; Krstić, 1983; Gross, 2002) and in the Lower Sarmatian of southern Poland (Choczewski, 1956).

SEMICYTHERURA QUADRIDENTATA
(Hartmann, 1953)
Pl. 10, figs 16-18

1953b *Cytherura quadridentata* HARTMANN, pp. 652-653, tf. 2a-d.
1969 *Cytherura* n. sp. E – PURI, BONADUCE & GERVASIO, pl. 1, fig. 3.
1971 *Semicytherura* sp. E Bonaduce – BARBEITO-GONZALEZ, p. 296, pl. 24, figs 1c-2c.
1972 *Semicytherura quadridentata* (Hartmann) – UFFENORDE, p. 92, pl. 12, fig. 5.
1976a *Semicytherura quadridentata* (Hartmann) – BONADUCE *et al.*, pp. 75-76, pl. 44, figs 14-15.
1980 *Semicytherura quadridentata* (Hartmann) – COLALONGO & PASINI, p. 66, pl. 19, fig.9.
1989a *Semicytherura quadridentata* (Hartmann) – MOSTAFAWI, pl. 2, fig. 40.
1989 *Semicytherura quadridentata* (Hartmann) – LACHENAL, pl. 2, fig. 17.
1992 *Semicytherura* aff. *perlucida* Ruggieri – BONADUCE *et al.*, p. 80, pl. 23, Fig. 7.
1995 *Semicytherura quadridentata* (Hartmann) – RUIZ MUÑOZ, pp. 264-265, fig. 109.
1998 *Semicytherura perlucida* Ruggieri – BABINOT & BOUKLI-HACENE, pl. 1, fig. 11.

Remarks – *Semicytherura favorum*, described by Bonaduce, Masoli & Pugliese (1976b) from the Gulf of Aqaba, differs from *S. quadridentata* solely in the "more evident ornamentation", a feature which is never shown in the Mediterranean specimens.

Occurrence – Gl-21 borehole: G6, G15, G16, G17, G18, G20, G22.

Distribution – Sahelian, Gulf of Gabès, Mediterranean Basin (Bonaduce *et al.*, 1992). Lower Messinian, Bou Seter, Orania, Algeria (Babinot & Boukli-Hacene, 1998). Pleistocene, Vrica, Calabria, Italy (Colalongo & Pasini, 1980); Rhodes, Greece (Mostafawi, 1989a). Living in the Mediterranean Sea at depths exceeding 35 m (Hartmann, 1953b; Puri *et al.*, 1969; Barbeito-Gonzalez, 1971; Uffenorde, 1972; Bonaduce *et al.*, 1976a; Lachenal, 1989) and in eastern Atlantic, Huelva province littoral, depth 5-11 m (Ruiz Muñoz, 1995).

SEMICYTHERURA sp. aff. S. SELLA (Sars, 1866)
Pl. 11, fig. 14

Remarks and occurrence – This very rare species, occurring only in the sample G17 (Gl-21 borehole), differs from *Semicytherura sella* (Sars, 1866) *sensu* Bonaduce *et al.*, 1976a, in the lack of anterior reticulation. The few valves recovered do not allow the description of this probably new species.

SEMICYTHERURA sp. aff. S. SIMPLEX
(Brady & Norman, 1889)
Pl. 11, fig. 15

Remarks and occurrence – Only two specimens of this species have been found in the borehole Gl-21, sample G3. The species differs from *Semicytherura simplex* (Brady & Norman, 1889), also figured by Athersuch *et al.* (1989), because of the presence of some delicate striae in the anteroventral area.

SEMICYTHERURA SLAVONICA Krstić, 1983
Pl. 11, figs 6-9

1983 *Semicytherura slavonica* KRSTIĆ, pp. 196-198, tfs. 17-23, pl. 2, figs 1-2, pl. 4, figs 4-6.

Remarks – *Semicytherura slavonica* is possibly the Miocene ancestor of *S. diafora* Barbeito-Gonzalez, 1971 (SEM micrographs in Bonaduce *et al.* 1976a; Beeman, 1976b), living in the Mediterranean between 25 and 200 m.

Occurrence – Gl-21 borehole: G15, G17, G19, G20, G22.

Distribution – Badenian (*Bolivina dilatata* zone), Borovik, Slavonia (Krstić, 1983).

SEMICYTHERURA VENTROCONVEXA Krstić, 1983
Pl. 11, figs 1-3

1983 *Semicytherura ventroconvexa* KRSTIĆ, pp. 203-205, text-figs 36-41, pl. 3, figs 1-2.
1986 *Semicytherura* aff. *sanmarinensis* Ruggieri – CIAMPO, pl. 8, fig. 14.

Remarks – Ruggieri (1967) described *Semicytherura sanmarinensis*, which shows a well-developed alar process and a marked posterodorsal rib. These features are lacking, or very reduced, in *S. ventroconvexa*, consequently we regard this as a valid species. Nonetheless, it is possible that a study on the variability of these two species would demonstrate that we are dealing with morphotypes.

Occurrence – Borehole Gl-21: G11, G15, G17, G20, G22.

Distribution – Badenian (*Bolivina dilatata* zone), Nebojsa Tower, Yugoslavia (Krstić, 1983). Upper Tortonian - Lower Messinian, Piedmont, Italy (Ciampo, 1986).

SEMICYTHERURA XSCRIPTA sp. nov.
Pl. 11, fig. 10

Derivation of name – from the letter x + Latin *scriptus* = written.

Material – 3 valves.

Types – Holotype ZPAL 0.48/116, Paratypes ZPAL 0.48/942.

Type level – Upper Badenian (Serravallian), NN 6 biozone.

Type locality – Gliwice Gl-21 borehole, sample G16, Fore-Carpathian Depression, Upper Silesia, southern Poland.

Occurrence – Gl-21 borehole: G16.

Dimensions – Holotype specimen ZPAL 0.48/116, LV, L = 0.48 mm, H = 0.23 mm (Pl. 11, fig. 10).

Diagnosis – A small species of *Semicytherura*, subrectangular in lateral view with a narrow caudal process above mid-height. Carapace distinctly reticulate in the posterior area, the rest of the valves being ornamented with irregular blade-like longitudinal ribs, connected with thin, sparse subvertical muri. The dorsal rib is fused anteriorly with the eye-spot; the ventral rib forms posteroventrally an inconspicuous alar protuberance. Two median ribs intersect in the central area forming a singular feature, i.e. a x-shaped cross.

Comparisons – *Semicytherura xscripta* sp. nov. differs from all other species assigned to this genus by virtue of the peculiar running of the median longitudinal ribs.

SEMICYTHERURA gr. S. GERDI Krstić, 1983
Pl. 12, figs 8-9

Remarks – The examination of some hundreds of specimens and about 40 SEM micrographs was, in our opinion, not sufficient to establish a clear distinction among the three species *Semicytherura gerdi* Krstić, 1973, *S. bifurca* Ciampo, 1986, and *S. resecta* Ciampo, 1986. The high variability of ornament of valves in species of *Semicytherura* related with *S. gerdi* has been shown by some authors (e.g. *S. alifera* Ruggieri, 1959, in Bonaduce *et al.*, 1976a; *S. variabilis* Ciampo, 1988). The outline of the ala in dorsal view, which is generally considered to be a stable specific character, seems not sufficient to establish the rank, if species or morphotypes, of these forms. The presence of specimens assignable to the above-mentioned species, in the same samples, does not permit to consider the different forms as subspecies. In order to avoid confusion and maintain difference among morphotypes, we keep distinct *S. gerdi*, *S. bifurca* and *S. resecta*. In the Gl-21 sediments are also present specimens with ornament slightly different from these three species.

Occurrence – G-21 borehole: G2, G6, G7, G11, G14, G15, G16, G17, G18, G19, G20 G21, G22.

SEMICYTHERURA GERDI Krstić, 1983
Pl. 12, figs 10-12

1983 *Semicytherura gerdi* KRSTIĆ, pp. 192-194, text-figs 7-13, pl. 1, figs 5-7, 10; pl. 2, figs 9-10; pl. 4, figs 1-3.
1984 *Semicytherura alata* (Lienenklaus) – HUBER-MAHDI (*part*), pp. 133-134, pl. 29, fig. 5 (*non* pl. 29, fig. 4).
2002 *Semicytherura* cf. *alata* (Lienenklaus) – GROSS, pp. 126-128, pl. 45, figs 5-6; pl. 46, figs 1, 5.

Remarks and occurrence – See *Semicytherura* gr. *S. gerdi*.

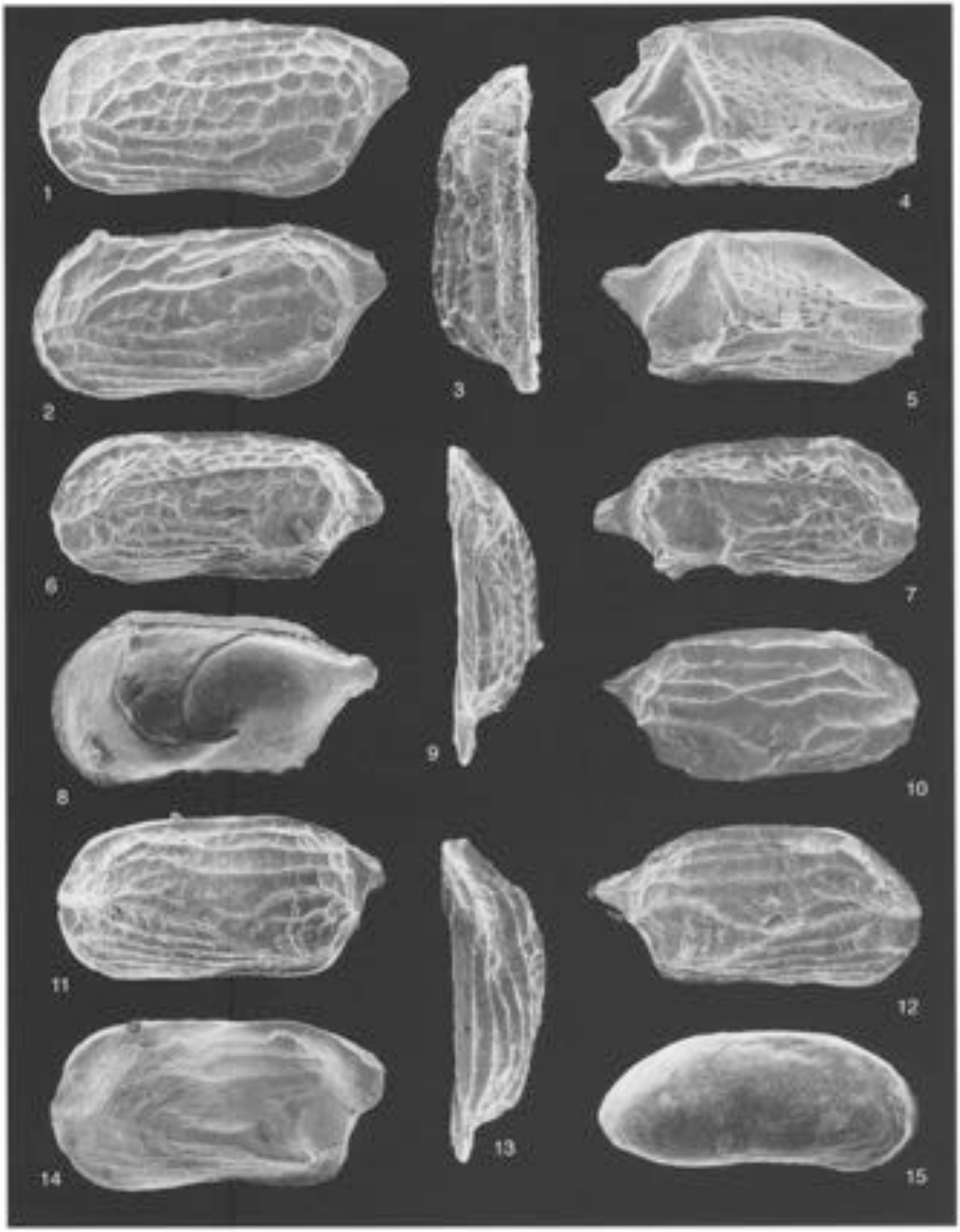
Distribution – Badenian of the Central Paratethys (Krstić, 1983; Huber-Mahdi, 1984; Gross, 2002).

SEMICYTHERURA BIFURCA Ciampo, 1986
Pl. 12, figs 13-14

1986 *Semicytherura bifurca* CIAMPO, p. 94, pl. 9, figs 5-6.

EXPLANATION OF PLATE 11

Figs 1-3 – *Semicytherura costataconstricta* Krstić, 1983.
1) LV, sample G17, ZPAL 0.48/193 (x 150).
2) LV, sample G17, ZPAL 0.48/68 (x 142).
3) LV in dorsal view, sample G22, ZPAL 0.48/711 (x 160).
Figs 4-5 – *Semicytherura fiorella* sp. nov.
4) Paratype, RV, sample G22, ZPAL 0.48/135 (x 190).
5) Holotype, RV, sample G22, ZPAL 0.48/163 (x 180).
Figs 6-9 – *Semicytherura slavonica* Krstić, 1983.
6) LV, sample G22, ZPAL 0.48/183 (x 138).
7) RV, sample G18, ZPAL 0.48/256 (x 132).
8) RV in internal view, sample G22, ZPAL 0.48/712 (x 140).
9) RV in dorsal view, same specimen as in fig. 8 (x 140).
Fig. 10 – *Semicytherura xscripta* sp. nov., holotype, RV, sample G16, ZPAL 0.48/116 (x 120).
Figs 11-13 – *Semicytherura auriculatacaput* sp. nov.
11) Holotype, LV, sample G17, ZPAL 0.48/65 (x 120).
12) Paratype, RV, sample G16, ZPAL 0.48/113 (x 128).
13) Paratype, RV in dorsal view, sample G22, ZPAL 0.48/705 (x 130).
Fig. 14 – *Semicytherura* sp. aff. *S. sella* (Sars, 1866), LV, sample G17, ZPAL 0.48/72 (x 160).
Fig. 15 – *Semicytherura* aff. *S. simplex* (Brady & Norman, 1889), RV, sample G3, ZPAL 0.48/883 (x 143).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1992 *Semicytherura* cf. *alifera* Ruggieri – PARUCH-KULCZYCKA, pp. 265-266, pl. 2, fig. 6.

Remarks and occurrence – See *Semicytherura* gr. *S. gerdi*.

Distribution – Badenian of southern Poland (Paruch-Kulczycka, 1992); Upper Tortonian-Lower Messinian, Piedmont, Italy (Ciampo, 1986).

SEMICYTHERURA RESECTA Ciampo, 1986
Pl. 12, figs 1-7

1983 *Semicytherura* aff. *slavonica* Krstić – KRSTIĆ (*part*), p. 198, pl. 2, figs 3-4 (*non* pl. 2, fig. 5).
1984 *Semicytherura alata* (Lienenklaus) – HUBER-MAHDI (*part*), pp. 133-134, pl. 29, fig. 4 (*non* pl. 29, fig. 5).
1986 *Semicytherura resecta* CIAMPO, pp. 100-101, pl. 9, fig. 4.

Remarks and occurrence – See *Semicytherura* gr. *S. gerdi*.

Distribution – Badenian of the Central Paratethys (Krstić, 1983; Huber-Mahdi, 1984). Upper Tortonian - Lower Messinian, Italy (Ciampo, 1986).

Subfamily CYTHEROPTERINAE Hanai, 1957
Genus CYTHEROPTERON Sars, 1866

CYTHEROPTERON ASCOLII Carbonnel, 1969
Pl. 12, figs 15-17

1969 *Cytheropteron ascolii* CARBONNEL pp. 198-199, pl. 10, figs 10-11.
1976a *Cytheropteron rotundatum* Müller – BONADUCE *et al.*, pp. 96, 138, pl. 53, fig. 5.
1979 *Cytheropteron rotundatum* Müller – YASSINI, p. 386, pl. 10, figs 19-21.
1982 *Cytheropteron ascolii* Carbonnel – CARBONNEL, p. 34, pl. 4, fig. 16.

Remarks – It differs from *Cytheropteron ruggierii* Pucci, 1955, *C. garganicum* Bonaduce *et al.*, 1976a and *C. fraudulentum* Aiello *et al.*, 1996, because of lack of ribs on the alar extension. *C. ascolii* differs from *C. rotundatum* G.W. Müller, 1894, in the different shape of the ala, which is also provided with a terminal spine.

Bonaduce *et al.* (1976a) figured as *C. rotundatum* two different species, as they noted in an additional remark (p. 138). The dorsal view of specimen presented on pl. 53, fig. 5 does not correspond to *C. rotundatum* and pertain to *C. ascolii*. The slight differences in the outline of the ala, seen in dorsal view, straight in Miocene form and faintly rounded in Recent specimens, seem insufficient to separate them as different species.

Occurrence – Gl-21 borehole: G6, G9, G15, G16, G17, G18, G19, G20, G22.

Distribution – Tortonian, Rhone Basin (Carbonnel, 1969). Middle-Upper Pliocene, southeastern France (Carbonnel, 1982). Recent, Mediterranean Sea, beyond 30 m (Bonaduce *et al.*, 1976a; Yassini, 1979).

CYTHEROPTERON NADEZDAE sp. nov.
Pl. 13, figs 1-4

1978 *Cytheropteron vespertilio* (Reuss) – BRESTENSKÁ & JIŘÍČEK, pl. 9, fig. 4.

Derivation of name – In honour of Nadezda Krstić, who published some important papers on Badenian ostracod assemblages.

Material – 47 valves.

EXPLANATION OF PLATE 12

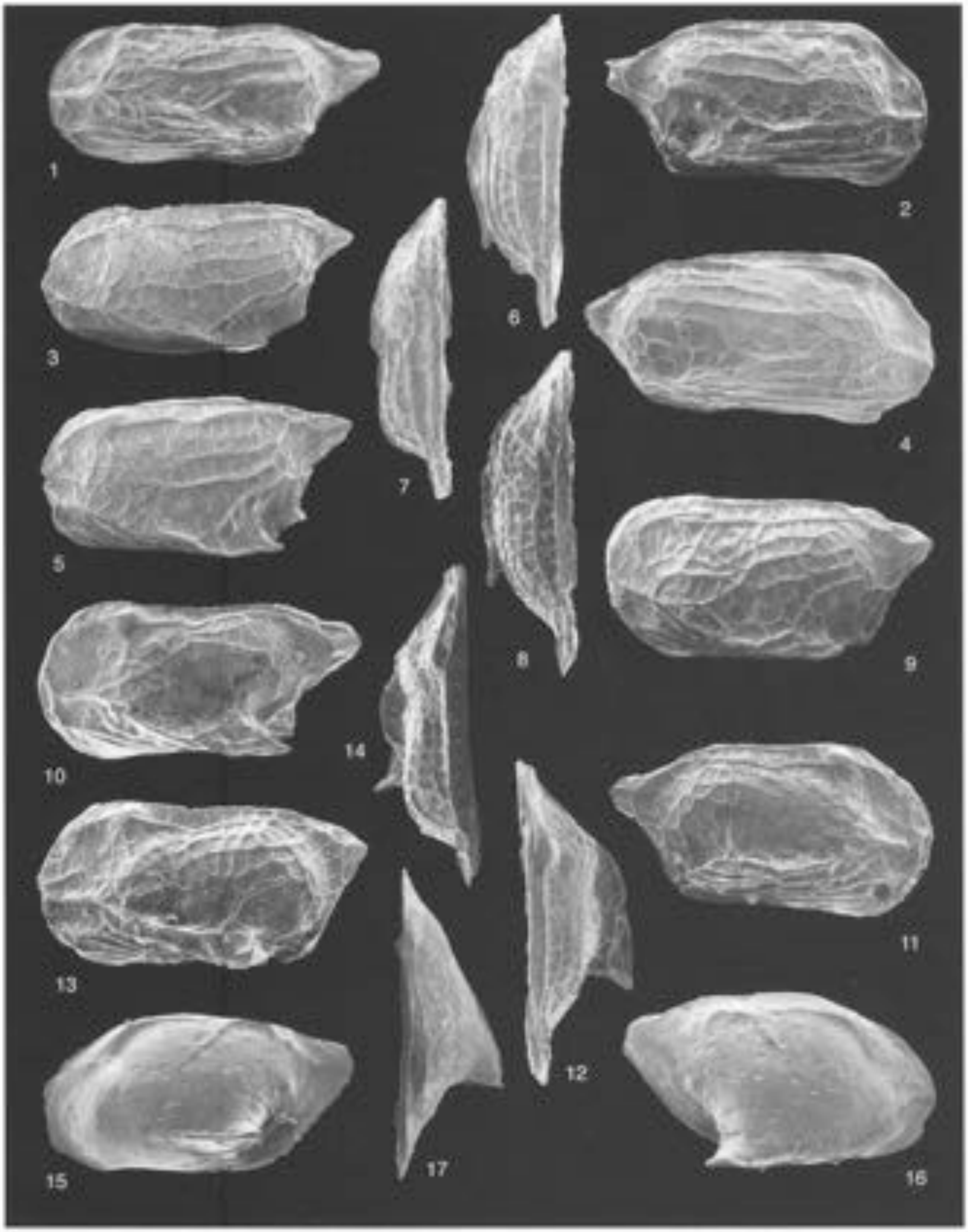
Figs 1-7 – *Semicytherura resecta* Ciampo, 1986.
1) LV, sample G16, ZPAL 0.48/126 (x 132).
2) RV, sample G17, ZPAL 0.48/213 (x 130).
3) LV, sample G22, ZPAL 0.48/707 (x 118).
4) RV, sample G17, ZPAL 0.48/74 (x 139).
5) LV, sample G22, ZPAL 0.48/709 (x 139).
6) LV in dorsal view, same specimen as in fig. 5 (x 126).
7) LV in dorsal view, same specimen as in fig. 3 (x 118).

Figs 8-9 – *Semicytherura* gr. *S. gerdi* Krstić, 1983, sample G17 (x 110).
8) LV in dorsal view, ZPAL 0.48/721
9) LV, same specimen as in fig. 8.

Figs 10-12 – *Semicytherura gerdi* Krstić, 1983 (x 120).
10) LV, sample G15, ZPAL 0.48/728.
11) RV, sample G22, ZPAL 0.48/713.
12) RV in dorsal view, same specimen as in fig. 11.

Figs 13-14 – *Semicytherura bifurca* Ciampo, 1986, sample G15 (x 112).
13) LV, ZPAL 0.48/727.
14) LV in dorsal view, same specimen as fig. 13.

Figs 15-17 – *Cytheropteron ascolii* Carbonnel, 1969.
15) LV, sample G18, ZPAL 0.48/253 (x 128).
16) RV, sample G15, ZPAL 0.48/726 (x 132).
17) RV in dorsal view, sample G22, ZPAL 0.48/704 (x 132).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Types – Holotype ZPAL 0.48/749, Paratypes ZPAL 0.48/46, ZPAL 0.48/735, ZPAL 0.48/743.

Type level – Upper Badenian (Serravallian), NN 6 biozone.

Type locality – Gliwice Gl-21 borehole, sample G15, Fore-Carpathian Depression, Upper Silesia, southern Poland.

Occurrence – Gl-21 borehole: G11, G15, G16, G17, G18, G19, G20, G22.

Distribution – Lower Badenian, Central Paratethys (Brestenská & Jiříček, 1978).

Dimensions – Holotype specimen ZPAL 0.48/749, LV, L = 0.55 mm, H = 0.28 mm (Pl. 13, fig. 1).

Diagnosis – A medium-sized (L = 0.53-0.58 mm) species of *Cytheropteron*, sub-rhomboidal in lateral view, dorsal margin convex in left valve, strongly arched in right valve, posteroventral margin compressed; anterior end regularly rounded, posterior margin caudate; caudal process approximately at mid-height, posterodorsal slope of caudal process straight in left valve, concave in right valve. Greatest height at the mid-length. Alar process well developed, terminating in a spine; leading edge of the ala distinctly ridged, straight in dorsal view; trailing edge with a row of denticles, larger in its internal part, smaller in the external. Dorsal surface of the ala with two more or less evident delicate ribs. Anterior part of the valves smooth, central area finely punctate, posterior area ornamented with a fine reticulum. Small ribs can be present in the posterodorsal area, forming, in some specimens, an irregular tubercle. Inner lamella moderately developed, with small anterior vestibulum; marginal pore canals simple and straight.

Remarks – The ornament is somewhat variable: punctation of valves, posterodorsal ribs and reticulation are more or less evident in different specimens.

Comparisons – The species is very similar to *Cytheropteron solantium* Whatley & Masson, 1979, but differs from that species in having more regularly rounded anterior margin and in the ridge on the leading edge of the ala, which is rounded. Moreover in *C. nadezdae* sp. nov. the ornament is generally more developed.

C. ionicum Colalongo & Pasini, 1980 differs from the new species in having the surface of the valves coarsely punctate.

C. nadezdae sp. nov. is easily distinguished from *C. vespertilio*, which has smooth valves.

CYTHEROPTERON SAGITTAEFERRUM sp. nov.
Pl. 13, figs 5-8

1986 *Cytheropteron* sp. – SZCZECHURA & PISERA, pl. 7, fig. 6.

1996 *Cytheropteron latum* (Müller) – PARUCH-KULCZYCKA & SZCZECHURA, pp. 740-741, pl. 29, figs 6-7.

Derivation of name – From Latin *sagittae ferrum* = arrowhead

Material – 69 valves.

Types – Holotype ZPAL 0.48/702, Paratypes ZPAL 0.48/696, ZPAL 0.48/703, ZPAL 0.48/717.

Type level – Upper Badenian (Serravallian), NN 6 biozone.

Type locality – Gliwice Gl-21 borehole, sample G22, Fore-Carpathian Depression, Upper Silesia, southern Poland.

Occurrence – Gl-21 borehole: G1, G3, G5, G6, G7, G9, G11, G14, G15, G16, G17, G18, G19, G20, G22.

Distribution – Lower Badenian, Korytnica, southeastern Poland (Paruch-Kulczycka & Szczechura, 1996). Upper Badenian, Węglin, southern Poland (Szczechura & Pisera, 1986).

Dimensions – Holotype specimen ZPAL 0.48/702, LV, L = 0.47 mm, H = 0.26 mm (Pl. 13, fig. 6).

Diagnosis – A small (L = 0.45-0.47 mm) species of *Cytheropteron*, sub-rhomboidal in side view, dorsal margin convex, ventral margin slightly sinuate; greatest height at mid-length. Anterior end well rounded, posterior end caudate. Anterior and posterior areas compressed; caudal process approximately at mid-height. Surfaces of carapace ornamented with small punctae; in the posterior half of valves the punctae are aligned in diagonal rows; delicate reticulum present on the posteroventral area. Alar expansion wide; in dorsal view the ala is triangular in shape and the carapace appears arrowhead shaped; leading edge of the ala straight, continuous with the outline of the anterior area; trailing edge arched, irregular due to the presence of two very small blunt spines. A dorsal rib is evident in the right valve, weak in the left valve; a parallel, thin subdorsal rib is present in each valve. A prominent tubercle is situated in the posterodorsal area. Inner lamella well developed, anterior vestibulum present, marginal pore canals simple and straight.

Comparisons – *Cytheropteron sagittaeferrum* sp. nov. is up to now the oldest representative of the "*C. crassipinnatum* group" (Whatley & Masson, 1979). The most similar species is *C. latum* G.W. Müller, 1894, which shows some variability in ornament (for extensive synonymy see Aiello *et al.*, 1996). SEM micrographs in lateral view do not allow a clear distinction between *C. sagittaeferrum* sp. nov. and the Müller's species (cfr. Bonaduce *et al.*, 1976a, pl. 53, figs 9-10). Conversely, *C. sagittaeferrum* sp. nov. is distinguished from other species of the "*C. crassipinnatum* group", including *C. latum*, by its peculiar shape as seen in dorsal view: in the Badenian species, the outline of the alar process and the anterior part of the valve is straight and continuous, forming with the commissural plane an angle of about 30 degrees.

CYTHEROPTERON VESPERTILIO (Reuss, 1850)
Pl. 13, figs 9-10

1850 *Cypridina vespertilio* REUSS, p. 81, pl. 11, figs 10a-c.
1967 *Cytheropteron vespertilio* (Reuss) – RUGGIERI, pp. 368-369, pl. 37, fig. 10.
1976a *Cytheropteron vespertilio* (Reuss) – BONADUCE *et al.*, p. 101, pl. 52, figs 7-12.
1979 *Cytheropteron vespertilio* (Reuss) – WHATLEY & MASSON, pp. 254-255, pl. 4, figs 12-17.
1976b *Cytheropteron vespertilio* (Reuss) – BREMAN, p. 74, pl. 12, fig. 176.
1980 *Cytheropteron vespertilio* (Reuss) – YASSINI, p. 116, pl. 1, fig. 20.
1984 *Cytheropteron* cf. *vespertilio* (Reuss) – MALZ & JELLINEK, p. 125, pl. 1, fig. 4.
1997 *Cytheropteron* sp. A – DUCASSE & CAHUZAC, pl. 2, fig. 15.

Remarks – The specimens found in Gl-21 borehole fit very well with the drawings of Reuss, especially in dorsal view (fig. 10b in Reuss, 1850). We accept a relatively wide variability of the ornament of the trailing edge of the alae, as shown in the literature concerning the Mediterranean area. The species figured as *Cytheropteron vespertilio* by Coles *et al.* (1996; pl. 3, fig. 9) differs in the higher caudal process and in the presence of a posterodorsal rib.

Occurrence – Gl-21 borehole: G15, G17, G18, G19, G22.

Distribution – Miocene of the Central Paratethys (Reuss, 1850). Serravallian, Aquitanian basin (Ducasse & Cahuzac, 1997). Tortonian to Pleistocene of the Mediterranean area (Ruggieri, 1967; Yassini, 1980; Malz & Jellinek, 1984). Recent of the Mediterranean Sea, from 30 to 1000 m (Bonaduce *et al.*, 1976a; Breman, 1976b). Recent of the eastern Atlantic, at depths greater than 60 m (Whatley & Masson, 1979).

Genus HEMIPARACYTHERIDEA Herrig, 1963

HEMIPARACYTHERIDEA TUBER sp. nov.
Pl. 13, figs 11-14

1981 *Cytheropteron*? *infelix* Bonaduce, Ciampo & Masoli – CIAMPO, pl. 4, fig. 12.

Derivation of name – From Latin *tuber* = camel's hump.

Material – 24 valves.

Types – Holotype ZPAL 0.48/768, Paratypes ZPAL 0.48/770-772.

Type level – Upper Badenian (Serravallian), NN 6 biozone.

Type locality – Gliwice Gl-21 borehole, sample G22, Fore-Carpathian Depression, Upper Silesia, southern Poland.

Occurrence – Gl-21 borehole: G19, G20, G22.

Distribution – Serravallian, Tellaro Formation, Sicily (Ciampo, 1981).

Dimensions – Holotype specimen ZPAL 0.48/768, LV, L = 0.30 mm, H = 0.16 mm (Pl. 13, fig. 11).

Diagnosis – A small (L = 0.29-0.32 mm) species of *Hemiparacytheridea*, with subtriangular lateral outline. Anterior end well rounded, ventral and dorsal margin weakly sinuous, posteriorly converging in a subdorsal, compressed, blunt caudal process. In dorsal view the carapace appears sub-rhombic and the tubercles outline two "camel's humps", ventrally and dorsally. Anterior and posterior marginal areas ornamented with an irregular reticulum; central area covered with rounded or elongate fossae. Eye tubercle present; posterodorsal tubercle conspicuous; two subventral tubercles, partly fused, form an alar expansion. Hinge, in left valve, consists of two terminal sockets and a sinuous median bar, large and strongly crenulate at the extremities, narrow and weakly crenulate in the middle. Anterior and posterior inner lamella moderately wide, very narrow ventrally. Muscle scars not observed.

Remarks – We agree with the statement of Ayress *et al.* (1995), who recognize the genus *Tuberculocythere* Colalongo & Pasini, 1980, as a younger synonym of *Hemiparacytheridea*. As observed by Maddocks & Steineck (1987) taxa not showing the diagnostic pore clusters of Eucytherinae can't be assigned to this subfamily. The structure of the hingement suggests us to place the genus *Hemiparacytheridea* into Cytheropterinae.

Comparisons – *Hemiparacytheridea infelix* (Bonaduce, Ciampo & Masoli, 1976a) differs from *H. tuber* sp. nov. in having the central part of the valves almost smooth and a not well developed alar process.

Genus KANGARINA Coryell & Fields, 1937

KANGARINA ? ABYSSICOLA (G.W. Müller, 1894)
Pl. 8, fig. 15

? 1894 *Cytheropteron abyssicolum* G.W. MÜLLER, p. 302, pl. 20, figs 5, 11.

Occurrence and remarks – Only two specimens were found in the Gl-21 Borehole, sample G18. The poor state of preservation does not allow a certain attribution to the Müller's species, which has been previously found in the Badenian of the Central Paratethys by Szczechura & Pisera (1986) and by Říha & Odehnal (1988), as *Kangarina abyssicola coarctata* Ruggieri 1953. These authors provided fairly clear pictures of *K. abyssicola* which seem to confirm its presence in the Miocene of the Paratethys.

Genus KUNIHIRELLA Bonaduce, Abate & Barra, 1994

KUNIHIRELLA ERACLEAENSIS Bonaduce, Abate & Barra, 1994
Pl. 14, figs 1-3

1994 *Kunihirella eracleaensis* BONADUCE, ABATE & BARRA, pp. 409-412, pl. 1, figs 1-11, text-fig. 2.
1996 *Paijenborchella* sp., WHATLEY *et al.*, pl. 4, figs 7, 9.

Remarks – The specimens figured by Bonaduce *et al.* (1994) show a certain variability in ornament of the valves. The slight differences in outline and ornament among the Badenian as well as the Pliocene and Recent specimens (cfr. Whatley *et al.* 1996) are due, in our opinion, to intraspecific variability.

Occurrence – Gl-21 borehole: G15, G22.

Distribution – Lowermost Pliocene, Sicily, Italy (Bonaduce *et al.*, 1994; Barra *et al.*, 1998). Recent, Greenland Sea, at a depth of 1262 m (Whatley *et al.*, 1996).

KUNIHIRELLA VIATRIX sp. nov.
Pl. 14, figs 4-6

1992 *Swainocythere nanseni* (Joy & Clark) – CORRÈGE *et al.*, pp. 107-110, pl. 19, figs 1-5 (non *Cytheropteron nanseni* Joy & Clark, 1981).

Derivation of name – from Latin *viator* = wayfarer.

Material – 6 valves.

Types – Holotype ZPAL 0.48/87, Paratypes ZPAL 0.48/90, 0.48/166.

Type level – Upper Badenian (Serravallian), NN 6 biozone.

Type locality – Gliwice Gl-21 borehole, sample 22, Fore-Carpathian Depression, Upper Silesia, southern Poland.

Occurrence – Gl-21 borehole: G17, G18, G22.

Distribution – Pleistocene - Recent of Arctic, Pacific and Indian Oceans, from 950 to 2793 m (Corrège *et al.*, 1992).

Dimensions – Holotype specimen ZPAL 0.48/87, RV, L = 0.28 mm, H = 0.10 mm (Pl. 14, fig. 7-8).

Diagnosis – A small (L = 0.27 - 0.31 mm) species of *Kunihirella*, subtriangular in lateral view with greatest height well in front of mid-length, with adventral caudal process. Dorsal margin slightly convex, except the posterodorsal slope of caudal process, which is concave. Ventral margin weakly sinuous. Anterior and

EXPLANATION OF PLATE 13

Figs 1-4 – *Cytheropteron nadezdae* sp. nov.
1) Holotype, LV, sample G15, ZPAL 0.48/749 (x 110).
2) Paratype, RV, sample G17, ZPAL 0.48/46 (x 110).
3) Paratype, RV, sample G22, ZPAL 0.48/735 (x 125).
4) Paratype, LV in dorsal view, sample G17, ZPAL 0.48/743 (x 105).
Figs 5-8 – *Cytheropteron sagittaeforme* sp. nov.
5) Paratype, RV in dorsal view, sample G6, ZPAL 0.48/696 (x 128).
6) Holotype, LV, sample G22, ZPAL 0.48/702 (x 128).
7) Paratype, RV, sample G22, ZPAL 0.48/703 (x 130).
8) Paratype, C in dorsal view, sample G17, ZPAL 0.48/717 (x 115).
Figs 9-10 – *Cytheropteron vespertilio* (Reuss, 1850).
9) RV in sample G16, ZPAL 0.48/82 (x 98).
10) RV in dorsal view, sample G15, ZPAL 0.48/725 (x 110).
Figs 11-14 – *Hemiparacytheridea tuber* sp. nov., sample G22 (x 200).
11) Holotype, LV, ZPAL 0.48/768.
12) Paratype, RV, ZPAL 0.48/771.
13) Paratype, LV in internal view, ZPAL 0.48/772.
14) Paratype, LV in dorsal view, ZPAL 0.48/770.
Fig. 15 – *Pseudocythere (Dopsocythere) ? kraspedon* (Malz & Jellinek, 1994), LV, sample G22, ZPAL 0.48/156 (x 88).
Figs 16-17 – *Ruggieriella decemcostata* Colalongo & Pasini, 1980, sample G15 (x 135).
16) LV, ZPAL 0.48/877.
17) RV in dorsal view, ZPAL 0.48/878.


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posterior areas compressed; a lateral inflation occupies the lateroventral area. Surface of the valves smooth, except for the posterodorsal part of the valves, which is coarsely punctate. Fused zone well developed, with small anterior vestibulum; marginal pore canals few, simple. Muscle scars pattern: subvertical row of four scars with a single elongated frontal scar. Hinge consisting of a bar, smooth in the middle and denticulate at the extremities, and two terminal sockets in the left valve. Right valve with complementary elements.

Remarks and comparisons – Correge *et al.* (1992) assigned specimens from Coral Sea and Tasman Sea to *Swainocythere nanseni* (Joy & Clark, 1981). Bonaduce *et al.* (1994), which attributed to *Kunibirella* the Joy & Clark's species, accepted the specific assignment of Correge *et al.* (1992). In our opinion the differences in ornament and length to height ratio, are such that the two forms have to be regarded as different species. Actually in *Kunibirella nanseni*, described and figured by Joy & Clark (1977) as *Cytheropteron* ? *nealei*, the punctation cover a large part of the valves and the L/H ratio is 2.5 (2.8 in *Kunibirella viatrix* sp. nov.).

Genus RIMACYTHEROPTERON Whatley & Coles, 1987

RIMACYTHEROPTERON LONGIPUNCTATUM (Breman, 1976)
Pl. 14, fig. 7-8

1976a *Monoceratina longipunctata* BREMAN, pp. 15-16, pl. 1, figs 4 a-b; pl. 2, figs 4 c-i.

2000 *Rimacytheropteron longipunctatum* (Breman) – AIELLO *et al.*, p. 97, pl. 3, fig. 11 (*q.v.* for complete synonymy)

Occurrence – Gl-21 borehole: G15, G20, G22.

Distribution – This is the first Miocene record of this pandemic species, previously found in Pliocene to Recent circalittoral and bathyal sediments (Aiello *et al.*, 2000, with literature).

Genus SWAINOCYTHERE Ishizaki, 1981

SWAINOCYTHERE MINISCULA (Ruggieri, 1977) ANAE subsp. nov.
Pl. 14, figs 9-12

Derivation of name – For Ana Sokač, author of significant studies on European Neogene and Quaternary ostracod assemblages.

Material – 6 valves.

Types – Holotype ZPAL 0.48/240, Paratypes ZPAL 0.48/169, ZPAL 0.48/774.

Type level – Upper Badenian (Serravallian), NN 6 biozone.

Type locality – Gliwice Gl-21 borehole, sample G22, Fore-Carpathian Depression, Upper Silesia, southern Poland.

Occurrence – Gl-21 borehole, sample G22.

EXPLANATION OF PLATE 14

Figs 1-3 – *Kunibirella machianii* Bonaduce, Abate & Barra, 1994, sample G22.
1) LV, ZPAL 0.48/842 (x 220).
2) RV, ZPAL 0.48/775 (x 230).
3) LV in dorsal view, ZPAL 0.48/921 (x 202).

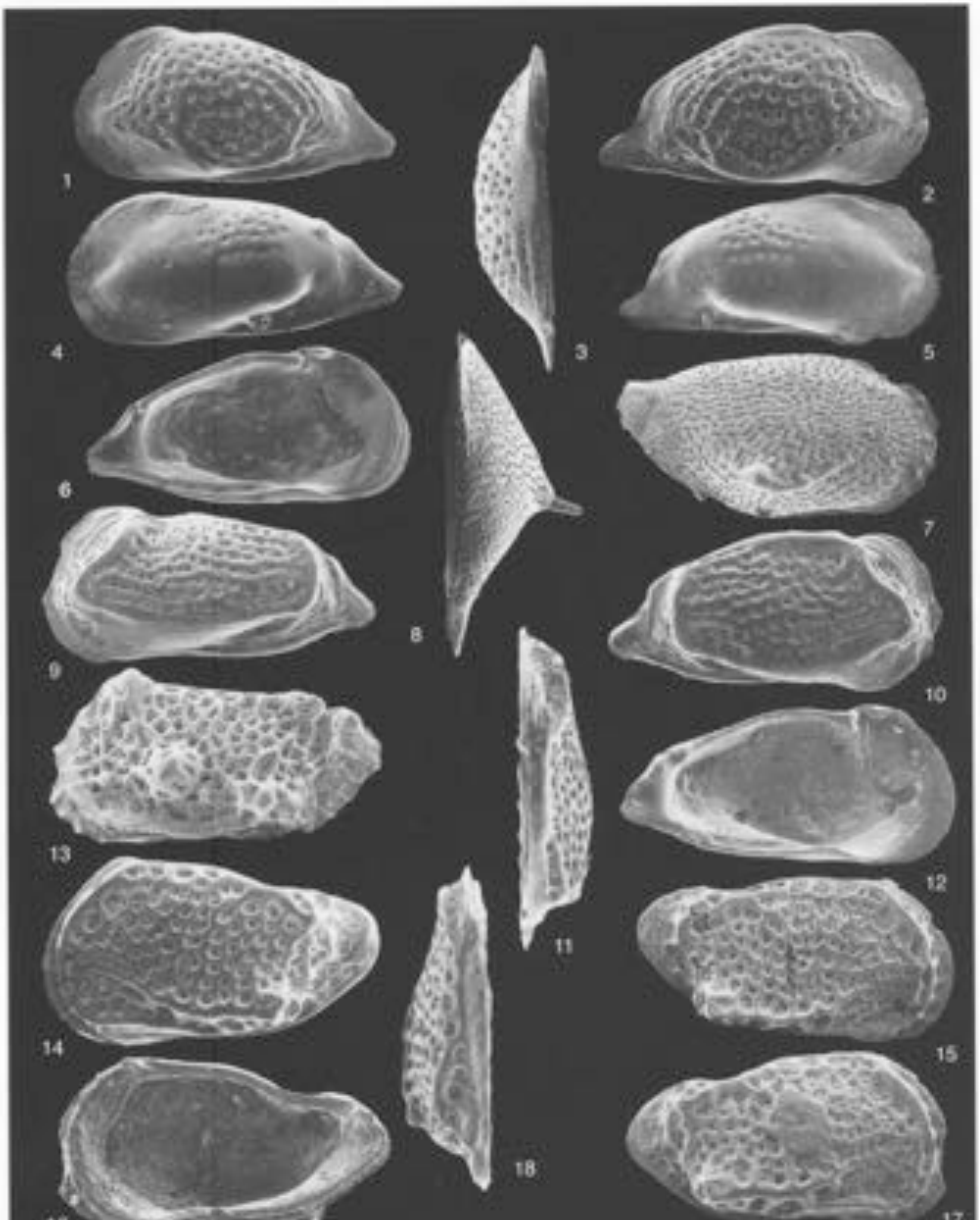
Figs 4-6 – *Kunibirella viatrix* sp. nov., sample G22 (x 210).
4) Paratype, LV, ZPAL 0.48/166.
5) Holotype, RV, ZPAL 0.48/87.
6) Paratype, LV in internal view, ZPAL 0.48/90.

Figs 7-8 – *Rimacytheropteron longipunctatum* (Breman, 1976).
7) RV, sample G18, ZPAL 0.48/220 (x 112).
8) RV in dorsal view, sample G15, ZPAL 0.48/876 (x 120).

Figs 9-12 – *Swainocythere miniscula anae* subsp. nov., sample G22 (x 220).
9) Holotype, LV, ZPAL 0.48/240.
10) Paratype, RV, ZPAL 0.48/774.
11) RV in dorsal view, same specimen as in fig. 10.
12) Paratype, LV in internal view, ZPAL 0.48/169.

Fig. 13 – *Eucytherura* sp. aff. *E. complexa* (Brady, 1867), LV, sample G22, ZPAL 0.48/185 (x 156).

Figs 14-18 – *Typhlocythere perparvula* sp. nov.
14) Holotype, LV, sample G22, ZPAL 0.48/773 (x 255).
15) Paratype, RV, sample G15, ZPAL 0.48/866 (x 240).
16) Paratype, RV in internal view, sample G22, ZPAL 0.48/143 (x 260).
17) RV, same specimen as in fig. 16 (x 260).
18) LV in dorsal view, same specimen as in fig. 14 (x 255).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Dimensions – Holotype specimen ZPAL 0.48/240, LV, L = 0.27 mm, H = 0.13 mm (Pl. 14, fig. 9).

Diagnosis – A small (L = 0.27 - 0.28 mm) subspecies of *Sucainocythere miniscula*, subtriangular in side view, dorsal and ventral margins weakly sinuous, posteriorly converging. Anterior end well rounded, posterior end caudate; caudal process well below the mid-height. Anterior and posterior marginal areas compressed. Carapace subrectangular in dorsal view, with tapered extremities. Surface of the valves covered of punctae aligned in subhorizontal rows. Anterior and posterior compressed areas ornamented with an irregular reticulum, characterized by muri nearly parallel to the margin. A not well defined marginal rib separates central punctate area and marginal compressed zones. Inner lamella moderately well developed. Central muscle scars pattern consists of a vertical row of four scars plus one frontal scar. Hinge with median element crenulate at the extremities, with terminal sockets in the left valve; right valve complementary.

Remarks – The state of preservation of the valves of *Sucainocythere miniscula anae* subsp. nov. recovered in the sediments of Gl-21 borehole did not allow the observation of the structure of the inner lamella. The absence of anterior vestibulum is a feature considered by Bonaduce *et al.* (1994) as sufficient to distinguish the genera *Sucainocythere* and *Kangarina*. Nonetheless, inner lamella of *Sucainocythere* has not been, so far, thoroughly figured.

Comparisons – *Sucainocythere miniscula anae* subsp. nov. differs from *S. miniscula miniscula* (Ruggieri, 1977b) in the slightly more elongated caudal process, in the running of submarginal rib and in details of the ornament, especially on the anterodorsal flattened area. It has to be noted that *S. miniscula miniscula* is a Quaternary subspecies with rather constant features of carapace, as showed, in addition to the original description, by Bonaduce *et al.* (1979, as ?*Caniella* sp. 1), Barra (1995, as *S.* aff. *chejudoensis*) and Dickson (1996). Consequently, the fine differences between the Quaternary and the Miocene form lead us to separate them at a subspecific level.

Subfamily EUCYTHERURINAE Puri, 1974
Genus EUCYTHERURA G.W. Müller, 1894

EUCYTHERURA sp. aff. E. COMPLEXA (Brady, 1867)
Pl. 14, fig. 13

Remarks – This form is very similar to *Eucytherura complexa* (Brady, 1867a), but it shows a more developed caudal process and a more elongated lateral outline. The Badenian specimens probably pertain to a new species but the material is insufficient for a description.

Occurrence – Gl-21 borehole: G19, G22.

Genus TYPHLOCYTHERE Bonaduce, Ciampo & Masoli, 1976

TYPHLOCYTHERE PERPARVULA sp. nov.
Pl. 14, figs 14-18

Derivation of name – From Latin *perparvulus* = very small.

Material – 8 valves.

Types – Holotype ZPAL 0.48/773, Paratypes ZPAL 0.48/143, ZPAL 0.48/866.

Type level – Upper Badenian (Serravallian), NN 6 biozone.

Type locality – Gliwice Gl-21 borehole, sample G22, Fore-Carpathian Depression, Upper Silesia, southern Poland.

Occurrence – Gl-21 borehole: G15, G17, G22.

Distribution – The species is reported exclusively from the Upper Badenian (Serravallian), NN 6 biozone, borehole Gl-21.

Dimensions – Holotype specimen ZPAL 0.48/773, LV, L = 0.23 mm, H = 0.14 mm (Pl. 14, fig. 14).

Diagnosis – A small (0.23-0.25 mm) species of *Typhlocythere*, subtriangular in lateral view, cuneate in dorsal view; anterior margin asymmetrically rounded, dorsal and ventral margins gently sinuous, posteriorly converging in a subdorsal, blunt caudal process. Surface of the valves coarsely reticulate with subrounded fossae. A submarginal rib runs parallel to dorsal, anterior and ventral margins, while in the posterior area it is subvertical, irregular and not well defined. Alar process weakly developed bearing a distinct ridge on the leading edge. Inner lamella moderately developed, very narrow ventrally; vestibula absent; marginal pore canals few, simple. Hinge consisting, in the right valve, of two elongated tooth at the extremities and finely crenulate, sinuous, median element. Left valve complementary.

Remarks – Ayress *et al.* (1995) considered *Typhlocythere* as synonym of *Eucytherura*. In our opinion, the intrageneric degree of variability accepted by these authors is extremely wide; we prefer the systematic approach of Maddocks & Steineck (1987) which seems more appropriate for the subfamily Eucytherurinae, reckoning *Typhlocythere* as a valid genus.

Comparisons – The species is very similar to *Eucytherura* (?) sp. 1 Bonaduce *et al.*, 1983, found at 1245 m depth in the eastern Atlantic. The ornamental pattern of the latter species differs in having a median rib, which is not present in *Typhlocythere perparvula* sp. nov.

Eucytherura sp. 2 Ayress *et al.*, 1995, is also somewhat similar, but in that species the caudal process is less developed and the leading edge of the ala is rounded, without ridge.

T. carinata Colalongo & Pasini, 1980, differs from *T. perparvula* sp. nov. in the slightly upturned, situated above mid-height of the valve, caudal process and in the straight dorsal margin.

Genus XYLOCYTHERE Maddocks & Steineck, 1987

XYLOCYTHERE CARPATHICA Szczechura, 1995
Pl. 15, figs 1-4

1995 *Xylocythere carpathica*, SZCZECHURA, pp. 29-30, pl. 1, figs 1-3.

Remarks – The species is very similar to *Xylocythere producta* (Colalongo & Pasini, 1980). *X. carpathica* differs from the Mediterranean species in having the anterior marginal area regularly reticulated, while in the latter species the reticulum seems anteriorly absent (Colalongo & Pasini, 1980) or very irregular (Ciampo, 1986; Aiello *et al.*, 2000).

Occurrence – Gl-21 borehole: G15, G16, G17, G20, G22.

Distribution – The species occurs in the Upper Badenian of southern Poland (Szczechura, 1995).

Family XESTOLEBERIDIDAE Sars, 1928
Genus XESTOLEBERIS Sars, 1866

XESTOLEBERIS GLABRESCENS (Reuss, 1850)
Pl. 15, fig. 5

1850 *Cytherina glabrescens* REUSS, p. 59, pl. 10, fig. 27.
1965 *Xestoleberis glabrescens* (Reuss) – MOYES, pp. 74-75, pl. 8, figs 15-16.
1974 *Xestoleberis* cf. *glabrescens* (Reuss) – CERNAJSEK, p. 497, pl. 3, figs 5-6.
1984 *Xestoleberis* sp. – GUERNET *et al.*, pl. 2, fig. 13.
1988 *Xestoleberis glabrescens* (Reuss) – BONADUCE & DANIELOPOL, p. 382, pl. 5, figs A-B.
2002 *Xestoleberis* sp. 2 – BABINOT, p. 743, pl. 4, figs 11-13.

Occurrence – Gl-21 borehole: G2, G6, G9, G14, G15, G16, G17, G18, G19, G20, G21, G22 (juveniles); the species is figured from the Upper Badenian sediments of Łychów.

Distribution – *Xestoleberis glabrescens* occurs in the Miocene of the Paratethys (Reuss, 1850; Cernajsek, 1974; Bonaduce & Danielopol, 1988), Aquitanian Basin (Moyes, 1965) and Paleo-Mediterranean (Guernet *et al.*, 1984; Babinot, 2002).

XESTOLEBERIS TUMIDA (Reuss, 1850)
Pl. 15, figs 7-8

1850 *Cytherina tumida* REUSS, pp. 57-58, pl. 8, figs 29a-b.
? 1998 *Xestoleberis tumida* (Reuss) – ZORN, pp. 210-211, pl.12, fig. 8.
? 2002 *Xestoleberis tumida* (Reuss) – GROSS, pp. 134-137, pl. 48, figs 1-10, pl. 49, figs 1-5, pl. 51, fig. 7.

Remarks – The specimens recovered in Gliwice fit exactly with the Reuss' drawings, both in lateral and in dorsal view, while the forms figured by Zorn (1998) and Gross (2002) show slight differences in lateral outline which suggest a doubtful assignment.

Occurrences – G2, G3, G5, G6, G7, G9, G10, G11, G14, G15, G16, G17, G18, G19, G20, G21, G22 (juveniles); the species is figured from the Upper Badenian sediments of Łychów, southeastern Poland.

Distribution – Middle Miocene of the Central Paratethys (Reuss, 1850).

XESTOLEBERIS sp. 1
Pl. 15, fig. 6

Occurrence and remarks – Young instars of various species of *Xestoleberis* have been found, as shallow-water contaminants, in Gl-21 borehole, samples G16, G18, G20, G22. Some of these forms probably pertain to undescribed species from the Badenian of the Central Paratethys (e.g. Gross, 2002).

Family BYTHOCYTHERIDAE Sars, 1866
Genus PSEUDOCYTHERE Sars, 1866
Subgenus DOPSEUCYTHERE Malz & Jellinek, 1994

PSEUDOCYTHERE (DOPSEUCYTHERE)? KRASPEDON (Malz & Jellinek, 1994)
Pl. 13, fig. 15

? 1994 *Dopseucythere kraspedon* MALZ & JELLINEK, p. 20, pl. 3, fig. 7; pl. 4, figs 9-13.
1996 *Pseudocythere caudata* Sars – SZCZECHURA, pl. 2, fig. 10.

Remarks – The specimens found in Gliwice are striking similar to *Pseudocythere* (*D.*) *kraspedon*, but their delicate shells are not well preserved and the features of the inner lamella have not been observed. Consequently, the specific assignment, which in *Pseudocythere* is partly based on the structure of the fused zone, is doubtful. It has to be noted that *P.* (*D.*) *kraspedon* (Malz & Jellinek, 1994) is possibly a morphotype of *P.* (*D.*) *mediterranea* Bonaduce, Masoli, Pugliese & McKenzie, 1980, due to the variability of this Mediterranean species (Aiello *et al.*, 2000).

Occurrence – Gl-21 borehole: G15, G17, G22.

Distribution – Upper Badenian, Roztocze Region, southeastern Poland (Szczechura, 1996).

Genus RUGGIERIELLA Colalongo & Pasini, 1980

RUGGIERIELLA DECEMCOSTATA Colalongo & Pasini, 1980
Pl. 13, figs 16-17

1980 *Ruggieriella decemcostata* COLALONGO & PASINI, pp. 110, 112, pl. 32, figs 3-6.
1983 *Ruggieriella? decemcostata* Colalongo & Pasini – BONADUCE *et al.*, pl. 2, figs 10-11.
2000 *Ruggieriella decemcostata* Colalongo & Pasini – AIELLO *et al.*, pl. 2, fig. 9.

Occurrence – Gl-21 borehole: G7, G15, G17, G18, G19.

Distribution – *Ruggieriella decemcostata* is present in bathyal environment of the Mediterranean area from Tortonian to Recent and in the Recent of the Atlantic (Colalongo & Pasini, 1980; Bonaduce *et al.*, 1983; Aiello, 1998; Aiello *et al.*, 2000).

Genus SCLEROCHILUS Sars, 1866

SCLEROCHILUS sp. 1
Pl. 15, fig. 10

Occurrence – Juveniles specimens occur in Gl-21 borehole, samples G9, G15, G22.

SCLEROCHILUS sp. 2
Pl. 15, fig. 11

Occurrence – Gl-21 borehole: G9, G20, G22.

Family PARADOXOSTOMATIDAE Brady & Norman, 1889
Genus PARADOXOSTOMA Fischer, 1855

PARADOXOSTOMA sp. aff. P. ANGUSTUM G.W. Müller, 1894
Pl. 15, fig. 9

Remarks – This form resembles *Paradoxostoma angustum* described by G.W. Müller (1894) from the Gulf of Naples. The Badenian specimens differ from the Recent species in having a more developed caudal process.

Occurrence – Gl-21 borehole: G17, G20.

Genus CYTHEROIS G.W. Müller, 1884

CYTHEROIS RUGGIERII sp. nov.
Pl. 10, figs 10-12

Derivation of name – In honour of Giuliano Ruggieri, in recognition of his huge contribution to micropaleontology, with the description of about 140 species and 30 genera of ostracods.

Material – 45 valves.

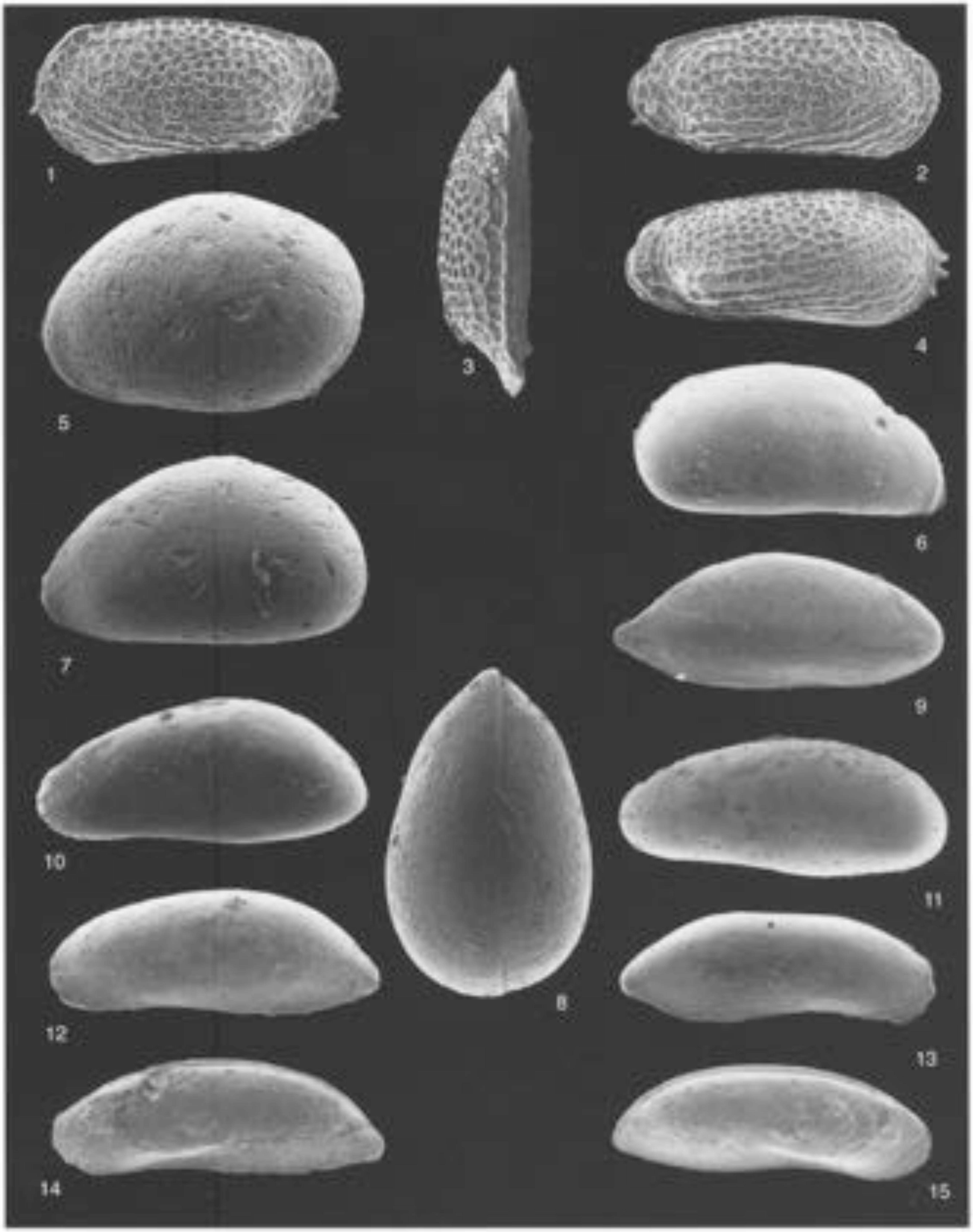
Types – Holotype ZPAL 0.48/272, Paratypes ZPAL 0.48/129, ZPAL 0.48/786.

Type level – Upper Badenian (Serravallian), NN 6 biozone.

Type locality – Gliwice Gl-21 borehole, sample G18, Fore-Carpathian Depression, Upper Silesia, southern Poland.

EXPLANATION OF PLATE 15

Figs 1-4 - *Xylocythere carpathica* Szczechura, 1995.
1) LV, sample G20, ZPAL 0.48/791 (x 130).
2) RV, sample G20, ZPAL 0.48/906 (x 135).
3) LV, dorsal view, sample G16, ZPAL 0.48/791 (x 126).
4) RV, sample G22, ZPAL 0.48/150 (x 145).
Fig. 5 - *Xestoleberis glabrescens* (Reuss, 1850), Łychów, ZPAL 0.48/830, LV (x 92).
Fig. 6 - *Xestoleberis* sp. 1, RV, sample G22, ZPAL 0.48/847 (x 138).
Figs 7-8 - *Xestoleberis tumida* (Reuss, 1850), Łychów.
7) LV, ZPAL 0.48/831 (x 87).
8) C in dorsal view, ZPAL 0.48/832 (x 100).
Fig. 9 - *Paradoxostoma* sp. aff. *P. angustum* G.W. Müller, 1894, RV from C, sample G20 (x 90).
Fig. 10 - *Sclerochilus* sp. 1, LV, sample G22, ZPAL 0.48/787 (x 112).
Fig. 11 - *Sclerochilus* sp. 2, LV, sample G22, ZPAL 0.48/788 (x 120).
Figs 12-15 - *Paracytherois nealei* sp. nov.
12) Holotype, LV, sample G17, ZPAL 0.48/821 (x 140).
13) Paratype, RV, sample G17, ZPAL 0.48/820 (x 140).
14) Paratype, RV in internal view, sample G18, ZPAL 0.48/264 (x 126).
15) Paratype, LV in internal view, sample G18, ZPAL 0.48/265 (x 126).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Occurrence – Gl-21 borehole: G6, G7, G15, G16, G17, G18, G19, G20, G22.

Dimensions – Holotype specimen ZPAL 0.48/272, RV, L = 0.44 mm, H = 0.25 mm (Pl. 10, fig. 10).

Diagnosis – A small (L = 0.39 - 0.46 mm) species of *Cytherois*, elongate, dorsal margin gently arched, ventral margin weakly sinuous; anterior end narrowly rounded, below mid-height, posterior margin well rounded. Inner lamella anteriorly well developed, with relatively large vestibulum, posteriorly moderately developed, with narrow vestibulum. Surface of the valves smooth. Central muscle scars pattern consisting of four adductor muscle scars in a vertical row. Hinge lophodont.

Comparisons – *Cytherois ruggierii* sp. nov. differs from *C. uffenordei* Ruggieri, 1975 due to the less developed inner lamella and to the posterior outline of the right valve, which is more widely rounded.

CYTHEROIS (?) sp. 1
Pl. 9, fig. 14

Remarks – This rare form is almost certainly a new species of *Cytherois*. The paucity of the material, and especially the lack of specimens with well preserved internal features, allow neither the description of a new species, nor a certain generic assignment.

Occurrence – Gl-21 borehole: G9, G15, G17, G18.

Genus PARACYTHEROIS G.W. Müller, 1894

PARACYTHEROIS NEALEI sp. nov.
Pl. 15, figs 12-15

Derivation of name – In honour of John Neale, in recognition of his remarkable contribution to the knowledge of fossil and living ostracods.

Material – 34 valves, 2 carapaces.

Types – Holotype ZPAL 0.48/821, Paratypes ZPAL 0.48/264-265, ZPAL 0.48/820.

Type level – Upper Badenian (Serravallian), NN 6 biozone.

Type locality – Gliwice Gl-21 borehole, G17, Fore-Carpathian Depression, Upper Silesia, southern Poland.

Occurrence – Gl-21 borehole: G1, G5, G6, G7, G9, G11, G12, G15, G16, G17, G18, G19, G20, G22.

Dimensions – Holotype specimen ZPAL 0.48/821, LV, L = 0.43 mm, H = 0.17 mm (Pl. 15, fig. 12).

Diagnosis – Carapace small (L = 0.41-0.43 mm), elongate. Dorsal margin evenly arched, ventral margin sinuous; greatest height behind mid-length. Anterior end rounded, posterior extremity with an inconspicuous, blunt caudal process below mid-height. Surface of the valves smooth. Inner lamella well developed, with anterior vestibulum. Marginal pore canals simple, few. Muscle scars pattern consisting of an oblique row of four adductor muscle scars. Hinge lophodont.

Comparisons – The species strongly resembles *Paracytherois oblonga* G.W. Müller, 1894. *P. nealei* sp. nov. differs in having the maximum height, which in the Recent species is approximately in the middle, well behind the mid-length. Moreover, in *P. oblonga* the anteroventral margin is more widely rounded than in *P. nealei* sp. nov.

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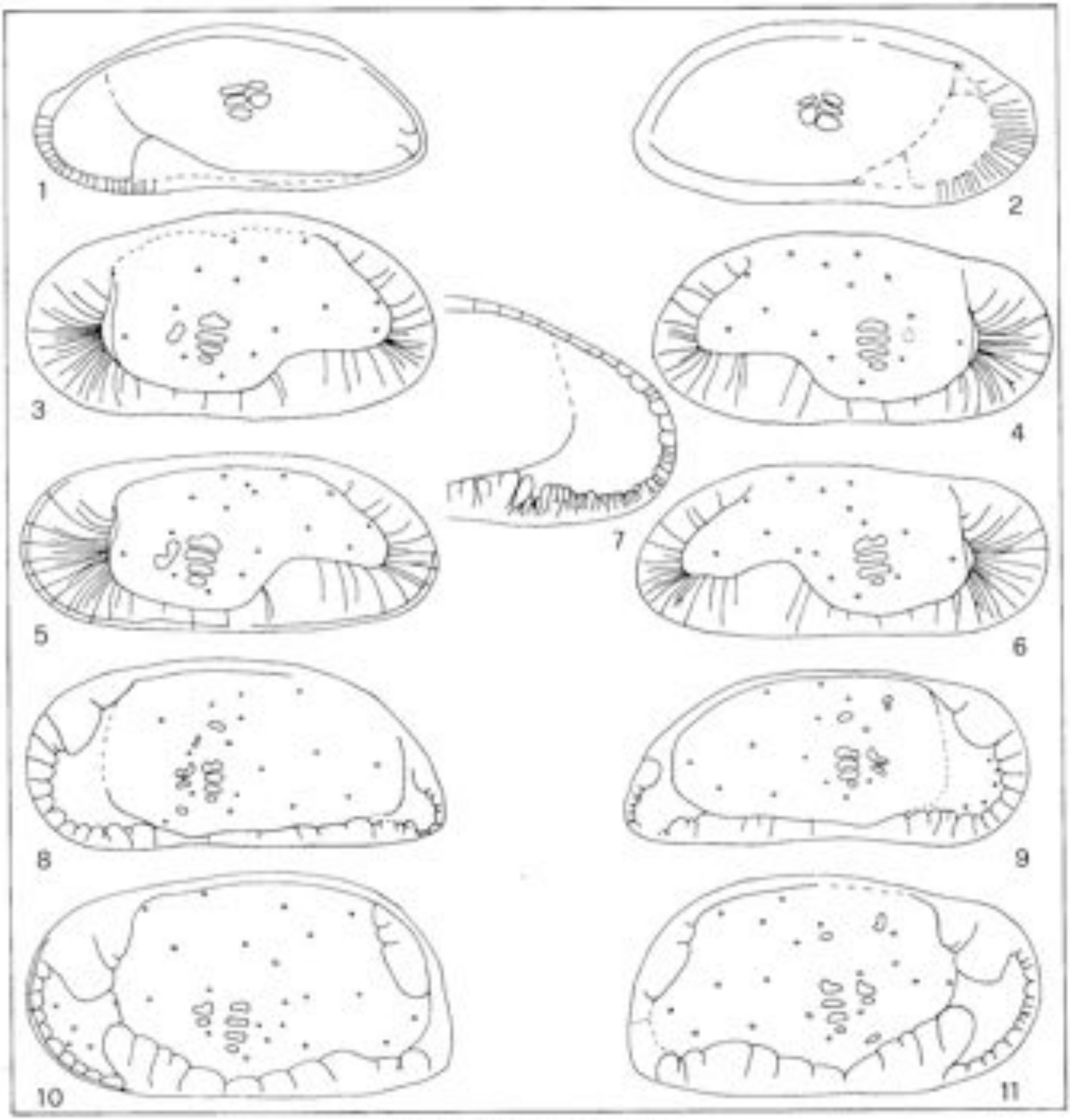
APPENDIX

LIST OF DESCRIBED SPECIES

Shallow-water displaced forms are marked with an asterisk.

1. *Amnicythere mironovi estonica* (Stancheva, 1963)* - p. 19, Pl. 2, fig. 11.
2. *Argilloecia acuminata* G.W. Müller, 1894 - p. 16, Pl. 2, fig. 2.
3. *Argilloecia fatua* Barra, Aiello & Bonaduce, 1996 - p. 18, Pl. 2, fig. 1; Pl. 16, figs 1-2.
4. *Argilloecia* ? *levis* G.W. Müller, 1894 - p. 18, Pl. 2, fig. 3.
5. *Argilloecia* ? *subtilis* Barra, Aiello & Bonaduce, 1996 - p. 18, Pl. 2, figs 5-6.
6. *Argilloecia* sp. A - p. 18, Pl. 2, fig. 4.
7. *Aurila cicatricosa* (Reuss, 1850)* - p. 28, Pl. 5, fig. 2.
8. *Aurila lariopensis* Moyes, 1965* - p. 30, Pl. 5, fig. 5.
9. *Aurila* sp. 1* - p. 30, Pl. 5, fig. 1.
10. *Bythocypris* ? *bosquetiana* (Brady, 1866) - p. 14, Pl. 1, fig. 8.
11. *Callistocythere canaliculata* (Reuss, 1850) - p. 19, Pl. 3, figs 1-5.
12. *Callistocythere daedalea* (Reuss, 1850) - p. 20, Pl. 2, figs 13-14.
13. *Callistocythere gliwicensis* sp. nov. - p. 20, Pl. 3, figs 6-8.
14. *Carinocythereis galilea jiricekii* Aiello & Szczechura, 2001* - p. 26, Pl. 4, fig. 7.
15. *Cluthia miocenica* Szczechura, 1986 - p. 22, Pl. 3, figs 9-12.
16. *Cnestocythere lamellicosta* Triebel, 1950* - p. 18, Pl. 2, fig. 9.



EXPLANATION OF PLATE 16

Figs 1-2 – *Argilloecia fatua* Barra, Aiello & Bonaduce, 1996.
1) LV, sample G19, ZPAL 0.48/930 (x 130).
2) RV, sample G19, ZPAL 0.48/931 (x 130).
Figs 3-6 – *Parakrithe rotundata* Aiello, Barra, Abate & Bonaduce, 1993.
3) LV, female, sample G19, ZPAL 0.48/932 (x 108).
4) RV, female, sample G19, ZPAL 0.48/933 (x 112).
5) LV, male, sample G19, ZPAL 0.48/934 (x 103).
6) RV, male, sample G19, ZPAL 0.48/935 (x 104).
Fig. 7 – *Phlyctenophora affinis* (Schneider, 1953), RV, sample G11, ZPAL 0.48/936 (x 83).
Figs 8-9 – *Krithe compressa* (Seguenza, 1880).
8) LV, sample G15, ZPAL 0.48/937 (x 75).
9) RV, sample G15, ZPAL 0.48/938 (x 75).
Figs 10-11 – *Krithe sertilis* Dieci & Russo, 1967.
10) LV, sample G15, ZPAL 0.48/939 (x 103).
11) RV, sample G16, ZPAL 0.48/940 (x 100).

17. *Cnestocythere truncata* (Reuss, 1850)* - p. 19, Pl. 2, fig. 8.
18. *Cyamocytheridea leptostigma* (Reuss, 1850)* - p. 23, Pl. 2, fig. 7.
19. *Cytheretta ? ornata semiornata* Brestenská, 1975* - p. 32, Pl. 5, fig. 13.
20. *Cytheridea acuminata* Bosquet, 1852* - p. 22, Pl. 4, figs 1-2.
21. *Cytherois ruggierii* sp. nov. - p. 60, Pl. 10, figs 10-12.
22. *Cytherois (?)* sp. 1 - p. 62, Pl. 9, fig. 14.
23. *Cytheroma bonaducei* sp. nov. - p. 22, Pl. 3, figs 13-15.
24. *Cytheropteron ascolii* Carbonnel, 1969 - p. 50, Pl. 12, figs 15-17.
25. *Cytheropteron nadezdae* sp. nov. - p. 50, Pl. 13, figs 1-4.
26. *Cytheropteron sagittaeferrum* - p. 52, Pl. 13, figs 5-8.
27. *Cytheropteron vespertilio* (Reuss, 1850) - p. 53, Pl. 13, figs 9-10.
28. *Elofsonia borowi* Aiello & Szczechura, 2002 - p. 35.
29. *Eucytherura* sp. aff. *E. complexa* (Brady, 1866)* - p. 58, Pl. 14, fig. 13.
30. *Flexus reussianus* Ruggieri, 1992* - p. 32, Pl. 5, fig. 15.
31. *Graptocythere polyptycha* (Reuss, 1850)* - p. 30, Pl. 5, figs 3-4.
32. *Grinioneis haidingeri* (Reuss, 1850)* - p. 30, Pl. 5, figs 6-7.
33. *Hemicytherura defiorei* Ruggieri, 1953 - p. 39, Pl. 9, figs 3-4.
34. *Hemicytherura videns* (G.W. Müller, 1894) - p. 40, Pl. 9, figs 1-2.
35. *Hemiparacytheridea tuber* sp. nov. - p. 53, Pl. 13, figs 11-14.
36. *Henryhowella asperrima* (Reuss, 1850) - p. 26, Pl. 4, figs 12-14.
37. *Kangarina ? abyssicola* (G.W. Müller, 1894) - p. 53, Pl. 8, fig. 15.
38. *Krithe compressa* (Seguenza, 1880) - p. 24, Pl. 16, figs 8-9.
39. *Krithe sertilii* Dieci & Russo, 1967 - p. 26, Pl. 16, figs 10-11.
40. *Kunihirella eraclearensis* Bonaduce, Abate & Barra, 1994 - p. 54, Pl. 14, figs 1-3.
41. *Kunihirella viatrix* sp. nov. - p. 54, Pl. 14, figs 4-6.
42. *Leptocythere foveolata* Moyes, 1965 - p. 19, Pl. 2, fig. 12.
43. *Loxoconcha punctatella* (Reuss, 1850)* - p. 34, Pl. 6, fig. 9.
44. *Loxoconcha quadrifenestrata* sp. nov. - p. 34, Pl. 6, figs 10-14.
45. *Loxoconcha* sp. aff. *L. rhomboidea* (Fischer, 1855)* - p. 35, Pl. 7, fig. 12.
46. *Loxoconchidea minima* Bonaduce, Ciampo & Masoli, 1976 - p. 35, Pl. 7, figs 1-3.
47. *Loxocorniculum hastatum* (Reuss, 1850) - p. 35, Pl. 7, figs 4-5.
48. *Microcythere panis* sp. nov. - p. 32, Pl. 6, figs 1-6.
49. *Microcythere* sp. aff. *M. subterranea* Hartmann, 1953 - p. 34, Pl. 6, figs 7-8.
50. *Microcytherura (Microcytherura) everriculum* sp. nov. - p. 42, Pl. 9, figs 5-13.
51. *Microcytherura (Tetracytherura) dianae* sp. nov. - p. 42, Pl. 10, figs 1-9.
52. *Neocytherideis cypria* Athersuch, 1982* - p. 23, Pl. 4, fig. 3.
53. *Neonesidea mediterranea* G.W. Müller, 1894* - p. 14, Pl. 1, figs 4-7.
54. *Nipponocythere silesiensis* Szczechura & Aiello, 2003 - p. 36, Pl. 7, figs 6-10.
55. *Nonurocythereis ? podolica* Schneider, 1953* - p. 31, Pl. 5, fig. 14.
56. *Nunana carpathica* Aiello & Szczechura, 2001 - p. 39.
57. *Occultocythereis bituberculata* (Reuss, 1850)* - p. 21, Pl. 4, fig. 11.
58. *Olimfalunia ? plicatula* (Reuss, 1850)* - p. 27, Pl. 4, figs 5-6.
59. *Paracytheridea depressa cnarquata* subsp. nov.* - p. 58, Pl. 8, figs 12-14.
60. *Paracytheridea triquetra* (Reuss, 1850)* - p. 39, Pl. 8, fig. 16.
61. *Paracytherois sealei* sp. nov. - p. 62, Pl. 15, figs 12-15.
62. *Paradoxostoma* sp. aff. *P. angustum* G.W. Müller, 1894* - p. 60, Pl. 15, fig. 9.
63. *Parakrithe rotundata* Aiello, Barra, Abate & Bonaduce, 1993 - p. 26, Pl. 4, figs 8-9; Pl. 16, figs 3-6.
64. *Polycopsaphera affinis* (Schneider, 1953)* - p. 14, Pl. 1, figs 9-11; Pl. 16, fig. 7.
65. *Pokornyella deformis* (Reuss, 1850)* - p. 31, Pl. 5, figs 11-12.
66. *Polycope* sp. aff. *P. demulderi* Sissingh, 1972 - p. 13, Pl. 1, fig. 1.
67. *Polycope* sp. aff. *P. orbicularis* Sars, 1866 - p. 14, Pl. 2, figs 2-3.
68. *Pontocypris* sp. aff. *P. acuminata* (Bonaduce, Ciampo & Masoli, 1976) - p. 16, Pl. 1, figs 13-15.
69. *Pontocythere curvata* (Bosquet, 1852)* - p. 24, Pl. 4, fig. 4.
70. *Propontocypris* sp. aff. *P. declivis* (G.W. Müller, 1894) - p. 18, Pl. 1, fig. 12.
71. *Pseudocythere (Dopsacythere) ? knopodon* (Malz & Jellinek, 1994) - p. 59, Pl. 13, fig. 15.
72. *Pseudocytherura* sp. aff. *P. calcarata* (Seguenza, 1880)* - p. 44, Pl. 7, figs 14-15.
73. *Pterygocythereis jonesii* (Baird, 1850)* - p. 27, Pl. 5, fig. 8.
74. *Rimacytheropteron longipunctatum* (Breman, 1976) - p. 56, Pl. 14, figs 7-8.
75. *Ruggieriella decemcostata* Colalongo & Pasini, 1980 - p. 60, Pl. 13, figs 16-17.
76. *Sagmatocythere caelata* (Ciampo, 1976) - p. 36, Pl. 7, fig. 11.
77. *Sagmatocythere naiat* sp. nov. - p. 36, Pl. 8, figs 9-11.
78. *Sagmatocythere scrupea* sp. nov. - p. 38, Pl. 8, figs 4-8.
79. *Sagmatocythere tenuis* (Ciampo, 1980) - p. 38, Pl. 8, figs 1-3.
80. *Saida* sp. 1 - p. 19, Pl. 2, fig. 10.
81. *Sclerochilus* sp. 1* - p. 60, Pl. 15, fig. 10.
82. *Sclerochilus* sp. 2* - p. 60, Pl. 15, fig. 11.
83. *Semicytherura aviculacaput* sp. nov. - p. 44, Pl. 11, figs 11-13.
84. *Semicytherura bifosca* Ciampo, 1986 - p. 48, Pl. 12, figs 13-14.
85. *Semicytherura furcilla* sp. nov. - p. 46, Pl. 11, figs 4-5.
86. *Semicytherura galea* (Stancheva, 1962) - p. 46, Pl. 10, figs 13-15.
87. *Semicytherura gruli* Krstić, 1983 - p. 48, Pl. 12, figs 10-12.
88. *Semicytherura quadridentata* (Hartmann, 1953) - p. 47, Pl. 10, figs 16-18.
89. *Semicytherura mesta* Ciampo, 1986 - p. 50, Pl. 12, figs 1-7.
90. *Semicytherura* sp. aff. *S. sella* (Sars, 1866) - p. 47, Pl. 11, fig. 14.
91. *Semicytherura* sp. aff. *S. simplex* (Brady & Norman, 1889) - p. 47, Pl. 11, fig. 15.
92. *Semicytherura slavonica* Krstić, 1983 - p. 47, Pl. 11, figs 6-9.
93. *Semicytherura tetracostata* Krstić, 1983 - p. 47, Pl. 11, figs 1-3.
94. *Semicytherura varipes* sp. nov. - p. 47, Pl. 11, fig. 10.
95. *Senesia vadaszi* (Zalányi, 1913)* - p. 31, Pl. 5, figs 9-10.
96. *Swainocythere miniscula anae* subsp. nov. - p. 56, Pl. 14, figs 9-12.
97. *Tenedocythere sulcatopunctata* (Reuss, 1850)* - p. 31, Pl. 7, fig. 13.
98. *Typhlocythere perparvula* sp. nov. - p. 58, Pl. 14, figs 14-18.
99. *Xestoleberis glabrescens* (Reuss, 1850)* - p. 59, Pl. 15, fig. 5.
100. *Xestoleberis tumida* (Reuss, 1850)* - p. 59, Pl. 15, figs 7-8.
101. *Xestoleberis* sp. 1* - p. 59, Pl. 15, fig. 6.
102. *Xylocythere carpathica* Szczechura, 1995 - p. 59, Pl. 15, figs 1-4.

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