

PERMIAN DEEP-WATER OSTRACODS FROM SICILY (ITALY) PART 1 : TAXONOMY

Heinz Kozur

With 3 text-figures and 2 plates

Abstract:

Red, basal Upper Permian deep-water clays from Western Sicily with rich Circum-Pacific radiolarian faunas yielded also ostracods that belong exclusively to new species. One order, 2 families, 6 genera and 16 species are newly established, some other species are listed in open nomenclature.

Zusammenfassung:

Rote Tiefwassertone des tiefsten Oberperm von Westsizilien mit reichen zirkumpazifischen Radiolarienfaunen lieferten auch Ostracoden, die ausschließlich zu neuen Arten gehören. Eine Ordnung, 2 Familien, 6 Gattungen und 16 Arten werden neu aufgestellt, einige andere Arten werden in offener Nomenklatur aufgeführt.

1. INTRODUCTION

According to the present-day paleogeographic reconstructions, the Permian Western Tethys was a shallow-water gulf, extending from a pelagic, partly oceanic domain far in the east (western Iran or eastern Turkey) until the Dinarids, Southern Alps, Sicily and Tunisia in the west.

The finding of pelagic Lower and Middle Permian faunas, including Circum-Pacific Middle Permian radiolarians in the Phyllite Unit of Crete (Greece) by KOZUR & KRAHL (1987) considerably changed this view. The discovery of a pelagic Permian sequence from the Upper Artinskian up to Dzhulfian in the Sicilian paleogeographic domain of Western Sicily (CATALANO; DI STEFANO & KOZUR, 1988 a, b and in press) has than finally proven the existence of a pelagic, in large part oceanic Tethys immediately north of stable Gondwana at least since the Lower Permian. The Sicilian paleogeographic domain belongs to the passive margin of this Permian Tethys.

The here described Abadehian ostracod fauna from Western Sicily is the first Permian deep-water ostracod association from Italy and the whole Eurasian Tethys. No relations exist to contemporaneous shallow-water ostracod faunas of adjacent areas from the Western Tethys. Similar faunas, but of Lower Permian age, have been found only on Timor Island (GRÜNDEL & KOZUR, 1975, BLESS, 1987).

2. INVESTIGATED AREAS

Several sections and numerous single samples have been investigated in the Sosio Valley area near Palazzo Adriano and in the Lercara-Roccapalumba area (see text-fig. 1). Permian ostracods have been found in many localities, but rich and well preserved associations have been discovered only in the Torrente San Calogero section (locality 2 in text-fig. 1) near Pietra di Salomone (Sosio Valley area).

The geologic situation of this area is described by CATALANO; DI STEFANO & KOZUR (1988 b and in press). The Torrente San Calogero section belongs to a Upper Miocene nappe thrust over Serravallian clays. Within this nappe, the section is part of the overturned limb of a large recumbent fold, sheared into tectonic slices during younger post-Miocene movements. Two of the slices (Units A and B in text-fig. 2) consist of pelagic Permian sediments, the other two slices (Units C and D) consist of pelagic Middle Triassic rocks.

The age of the here described ostracods can be determined by accompanying radiolarians (in the red clays) and conodonts (in the Jachtashian = Kungurian flysch and in the calcarenites intercalated into the red clays). Most of the here described ostracods have been collected from red, soft clays of Unit B (see text-fig. 2). These water-dispersible clays contain in general 1,000-10,000, but sometimes several 100,000 radiolarian specimens per kg sediment. This

radiolarian fauna consists of Circum-Pacific species, mostly highly evolved Follicucullidae, like *Follicucullus* ? cf. *charveti* CARIDROIT & DE WEVER and *Ishigaconus scholasticus* (ORMISTON & BABCOCK). Last few representatives of *Pseudoalbaillella eurasiatica* KOZUR; KRAHL & MOSTLER are also present.

Ishigaconus scholasticus has been originally described from the Lamar Limestone of Texas, mostly placed into the topmost Capitanian (uppermost Middle Permian), but regarded as post-Capitanian by FURNISH (in: LOGAN & HILLS, 1973). In Japan this species occurs both in the higher Capitanian and in the Upper Permian. *Pseudoalbaillella eurasiatica* has its main occurrence in the Middle Permian, but few specimens have been found also in the lower part of Upper Permian.

Highly evolved Follicucullidae of the *F.?* *charveti* group characterize the Lower and Middle Abadehian (basal Upper Permian). Therefore the sample 655, from which the *F. charveti* group and most of the here described ostracods derived, can be placed into the basal Upper Permian, but topmost Middle Permian age cannot be excluded. The possible maximum range of sample 655 is *Follicucullus ventricosus* - *Ishigaconus scholasticus* A.Z. to *Follicucullus* ? *charveti* - *Imotoella triangularis* A.Z. sensu KOZUR & MOSTLER (1989), that means topmost Middle Permian to basal Upper Permian.

A similar age can be assumed for sample 653 with *Ishigaconus scholasticus* and *Pseudoalbaillella eurasiatica*, but without *Follicucullus* ? cf. *charveti*.

Thin calcarenites within the red clays of Unit B yielded many ostracods and different conodont faunas of Middle and Upper Permian age. Some of the ostracods in the red clays derived from the calcarenites or they were transported together with the calcarenites into the basin. These ostracods can be easily recognized by their white calcareous matrix.

Also the Jachtashian (Kungurian) flysch contains some ostracods. Resedimented limy sandstones and sandy limestones contain mostly shallow-water ostracods accompanied by other transported shallow-water faunas as well as by pelagic faunas with conodonts that allow an exact age determination.

Text-fig. 3 gives an overview on Permian-Triassic stratigraphy. (Text-figures 1–3 see pages 18–20).

3. TAXONOMIC PART

All described ostracods are deposited in the Dipartimento di Geologia e Geodesia, Università di Palermo, Italy.

Superorder Podocopamorphes KOZUR, 1972

Order Platycopida SARS, 1866

Suborder Platycopina SARS, 1866

Superfamily Cytherellacea SARS, 1866

Family Spinososioellidae n. fam.

Diagnosis: Carapax subrectangular, highest in the anterior third. RV larger than LV. Dorsal margin long, straight, ventral margin concave. Posterior swelling reticulated, remaining surface smooth. Both valves have a strong posteroventral backward and obliquely outward, often a little downward directed hollow spine. In the RV additionally a posterodorsal, obliquely backward, outward and somewhat upward directed spine is present.

Hinge undifferentiated with furrow in the RV and ridge in the LV. The furrow is distinct at the dorsal, posterior and ventral margin, but it was not yet observed at the anterior margin, where it is either missing or very indistinct. No calcified inner lamella.

Strong kloedenellid sexual dimorphism with well developed limen separating the brood pouch in the ♀♀.

Occurrence: Highest Middle Permian to basal Late Permian red deep-water clays of Western Sicily.

Remarks: According to the outline, hinge and strong kloedenellid sexual dimorphism *Spinososioella* is a typical representative of the Cytherellacea. The enigmatic spines and their arrangement is until now unknown from the Platycopina, but common among spined palaeopsychrospheric deep-water Podocopida. For instance, *Rectoplacera* BLUMENSTENGEL, 1965 has quite the same arrangement of the spines with posteroventral and posterodorsal spine in the larger valve and only posteroventral spine in the smaller valve. But in this genus the LV is the larger valve and the inner structure is typical for Pachydomellidae BERDAN & SOHN, 1961 (Bairdiocypridacea SHAVER; 1961). Kloedenellid sexual dimorphism is unknown in *Rectoplacera*.

Therefore the spinose palaeopsychrospheric ostracods have ecologically controlled similarities in their spine development and arrangement which should not be overestimated in the taxonomy of these ostracods. For this reason, the new family can be well placed into the Cytherellacea SARS, 1866.

The presence of a nearly uninterrupted hinge furrow in the RV (only on the anterior margin not yet observed, preservation reasons ?) speaks against the placement into the otherwise similar Kloedenellacea ULRICH & BASSLER; 1908.

Genus *Spinosoioella* n. gen.

Derivatio nominis: According to occurrence in the Sosio Valley and the presence of spines.

Type species: *Spinosoioella catalanoi* n. gen. n. sp.

Diagnosis and occurrence: See under the family.

Assigned species:

Spinosoioella catalanoi n. gen. n. sp.

Remarks: *Cavellina* CORYELL, 1928 is distinguished by the absence of any spines.

Paraheldia CORYELL & CUSKLEY, 1934 has in both valves posteroventral and posterodorsal spines with connecting vertical ridge, like in *Heldia*. Moreover, a distinct sulcus is present.

Spinosoioella catalanoi n. gen. n. sp.

(Pl. 1, figs. 1, 2, 9)

Derivatio nominis: In honour of Prof. Dr. R. CATALANO, Palermo.

Holotype: The specimen on pl. 1, figs. 1, 9; rep. no CK/VII-2.

Locus typicus: Torrente San Calogero section SW of Pietra di Salomone, Sosio Valley, Western Sicily.

Stratum typicum: Red deep-water radiolarian clay, Abadehian, sample 655.

Material: 24 valves, 2 carapaces.

Diagnosis: RV larger than LV. Outline subrectangular in lateral view, highest in the anterior third. Anterior margin broadly rounded, in this lower part distinctly oblique. Posterior rounded margin lower than anterior one. Dorsal margin straight, in the LV a little convex, somewhat converging against the concave ventral margin.

Both valves with large, hollow posteroventral spine, which is backward and obliquely outward, in the RV also a little downward directed. In the RV additionally a large, hollow posterodorsal spine is present, which is obliquely backward, outward and upward directed. Lateral surface along the anterior and posteroventral margin flattened and in the posterior third with distinct, large, reticulated swelling. Remaining lateral surface smooth, rarely in the anterior

or third indistinctly reticulated. Mid-dorsally a short, low, narrow indistinct ridge is present. Ventrally a broad, narrow, low swelling is present, which continues into the posterior swelling. In ♀♀ also an indistinct anterior swelling is present. In ♂♂ this swelling is either quite indistinct or not present. In front of the posterior swelling and indistinct broad sulcus is present.

Hinge simple. The furrow in the RV is distinct and broad at the dorsal margin, but also distinct (somewhat narrower) at the posterior and ventral margins. At the anterior margin it was not yet clearly observed, but may be present as well. No calcified inner lamella.

Distinct kloedenellid sexual dimorphism. The posterior swelling is larger and nearly hemicircular in ♀♀.

Measurements:

l (without spines) = 407–620 μm

h = 241–322 μm

Occurrence and remarks: As for the genus and family.

Suborder Kloedenellocopina SCOTT, 1961

Superfamily Leperditellacea ULRICH & BASSLER, 1906

Genus *Primitiella* ULRICH, 1894

Primitiella ? sp.

(Pl. 1, fig. 28)

Remarks: This small form with very shallow sulcus S 2 and weak ventral ribs corresponds in its morphology to the genus *Primitiella*, but inner features are unknown.

Suborder inc.

Superfamily Scrobiculacea POZNER, 1951

Family Roundyellidae GRAMM, 1976

Remarks: Until now *Roundyella* BRADFIELD, 1935, *Scrobicula* POZNER, 1951 and similar other small subelliptical to subrectangular ostracods without or with indistinct "kirkbyan pit" (never with corresponding knob on the inner side) have been placed into the Scrobiculidae POZNER, 1951. This family has been mostly regarded as kirkbyid ostracods.

GRAMM (1976) separated *Scrobicula* and *Roundyella* not only in family, but also in superfamily level. This has been rejected by BECKER (1978), who placed *Roundyella* again into the Scrobiculidae and into the Kirkbyacea.

According to KOZUR (1972) the Scrobiculidae are doubtful Kirkbyacea and he placed this family into the Podocopida because of the muscle scar with frontal spot in *Scrobicula*. Meanwhile the muscle scar is known from *Scrobicula*, *Roundyella* and *Egorovitina* GRAMM, 1977. Mandibular spots are missing in all these forms. This speaks against a placement into the Podocopida.

GRAMM (1976) figured a photo of a mesoplate calcified inner lamella in *Roundyella*. Our material has, in agreement with the observation by SOHN (1954) not shown any duplicature. But the few single valves of *Roundyella* does not show excellent preservation, necessary to recognize the presence of mesoplate duplicature. Also the presence of a mesoplate duplicature would indicate that *Roundyella* does not belong to the Podocopida.

The adductor muscle scar of *Scrobicula* shows bi-serially or triserially arranged spots, like in many muscle scars of primitive Platycopida. The adductor muscle scar of *Roundyella* consists of 3-4 central spots, surrounded by a ring of spots. Also this type of muscle scar can be found in several primitive Platycopida (Kloedenellocopina). The muscle scar of *Egorovitina* consists of radially arranged elongated spots in a semicircle and an additional large spot (sometimes subdivided into two partial spots) on the concave side of the semicircle. This muscle scar is similar to recent Punciidae, but also the muscle scar of *Roundyella* is not basically different.

As mentioned above, such types of muscle scars, especially of *Roundyella*, are typical for some Kloedenellocopina. Other Kloedenellocopina have bi- or triserially arranged muscle scars (GRAMM, 1984), similar to *Scrobicula*. The two types, on the first sight quite different, seems to be near related each other. This is also indicated by the fact that juvenile *Scrobicula* have a muscle scar, quite similar to the muscle scar of *Egorovitina* and some muscle scars of adult *Scrobicula* are similar to the muscle scar in *Roundyella*.

Scrobicula has an oval to suboval lateral outline without or with quite indistinct, rounded cardinal angles, the anterior of which is larger. The straight dorsal margin is relatively short. Sometime the dorsal margin is even slightly convex. This outline is quite different from the typical kirkbyid outline that is very constant and even unchanged in their successors, the recent punciids (KOZUR, in press). On the other hand, the *Scrobicula* outline is typical for Platycopina. Also the strong overlap of the considerable larger RV over the LV remembers to Platycopina.

The lateral outline of *Roundyella* and *Egorovitina* is not very different from the *Scrobicula* outline and also in these genera the RV is somewhat larger than the LV. The dorsal margin is long and always straight, but shorter than

in typical Punciocopina, where the dorsal margin is as long as the maximum length or only a little shorter. The cardinal angles are rounded and not so pronounced than in Punciocopina, but more distinct than in *Scrobicula*. Often the anterior cardinal angle is larger than the posterior one. In some *Roundyella* species a distinct smooth spot is present in the position of the kirkbyan pit, but it is never reflected as a knob on the inner side of the valve and it cannot be regarded therefore as a real kirkbyan pit or homologous structure. Often this smooth spot is also outside quite indistinct or missing. As a whole, *Roundyella* and *Egorovitina* are in their outline nearer related to *Scrobicula* than to typical kirkbyids (Punciocopina).

There are so much similarities between these 3 genera that they cannot be placed into 2 different superfamilies. Moreover, at least the Roundyellidae GRAMM, 1976 and the Egorovitidae GRAMM, 1977 are synonymous each other. Because of the differences in outline the Scrobiculidae POZNER, 1951 are regarded as independent family of the same superfamily (Scrobiculacea).

Maybe that also the Youngiellacea KELLETT, 1933 are related to this superfamily. But in the Youngiellacea the LV is somewhat larger than the RV and the hinge is taxodont. Moreover, the cardinal angles are more pronounced and mostly distinct lateral ribs are present, missing in the Scrobiulacea. The adductor muscle scar consists only of 3-4 large spots. But this field could be near related to the muscle scar of *Roundyella* with 3-4 large inner spots surrounded by an outer ring of spots.

Both according to their morphology and to their muscle scars the Scrobiculacea are near related to the Platycopida, distinguished only by the missing sexual dimorphism that can be absent also in some Kloedenellocopina (Leperditellacea ULRICH & BASSLER, 1906).

Genus *Roundyella* BRADFIELD, 1935

Type species: *Amphissites simplicissimus* (KNIGHT, 1928)

Roundyella sp.

(Pl. 1, fig. 27)

Remarks: A few valves of a weakly sculpturated (pitted lateral surface with some papillae) species are present which is near related to Carboniferous, weakly sculpturated forms.

Order Podocopida SARS, 1866
Suborder Bairdiomorpha KOZUR, 1972
Superfamily Bairdiacea SARS, 1888
Family Bythocyprididae MADDOCKS, 1969
Genus *Praezabythocypris* KOZUR, 1985

Type species: *Praezabythocypris pulchra* KOZUR, 1985

Praezabythocypris sp. ex gr. *pulchra* KOZUR, 1985
(Pl. 1, fig. 13)

Remarks: Only one carapace is present. The depression on the anterior margin is seemingly a preservation-controlled deformation.

Suborder Cypridocopina JONES, 1901
emend. KOZUR, 1972
Superfamily Bairdiocypridacea SHAVER, 1961
Family Bairdiocyprididae SHAVER, 1961
Subfamily Praepilatininae KOZUR, 1985
Genus *Bashkirina* ROZDESTVENSKAJA, 1959

Type species: *Bashkirina memoarbilis* ROZDESTVENSKAJA, 1959

Bashkirina ? calogeroensis n. sp.
(Pl. 2, fig. 7)

Derivatio nominis: According to its occurrence in the Torrente San Calogero section.

Holotype: The specimen on pl. 2, fig. 7; rep. no. CK/III-33

Locus typicus and stratum typicum: As for *Spinoso-sioella catalanoi* n. gen. n. sp.

Material: 21 specimens.

Diagnosis: Lateral outline subtriangular. Anterior margin broadly rounded. Ventral margin straight. Dorsal margin also straight, in posterior direction strongly converging against the ventral margin. Posterior margin posteroventrally pointed, in the RV prolonged into a short spine. The transition between posterior and dorsal margin is gradual. Inner structures unknown.

Measurements:

l = 386–414 μ m

h = 192–196 μ m

Occurrence: Middle and Late Permian deep-water sediments of Sicily.

Remarks: *Bashkirina* sp. A. BECKER & SANCHEZ DE POSADA, 1977 from the Late Devonian is similar, but the posterior end is narrowly rounded.

The Later Permian *Bashkirina* species from shallow-water deposits have quite different outline, especially the l/h ratio is considerably smaller (1.43 - 1.8, mostly 1.45–1.6 against about 2 in *Bashkirina ? calogeroensis* n. sp.

The generic assignment of the new species is not sure, because no single valve have been found. Therefore the inner structures are unknown. *Spinocypris* KOZUR, 1971 has quite the same outline, but a broad duplicature with wide vestibulum, whereas *Bashkirina* has no or only a very narrow calcified inner lamella.

Family Pachydomellidae BERDAN & SOHN, 1961
Genus *Microcheilinella* GEIS, 1933

Type species: *Microcheilus distortus* GEIS, 1932

Microcheilinella sp.

Remarks: An uncharacteristic *Microcheilinella* species, similar to many other older and younger forms, is frequent in the Middle and Late Permian of Torrente San Calogero.

Genus *Spinomicrocheilinella* KOZUR, 1985

Type species: *Spinomicrocheilinella spinosa* n. gen. n.sp.

Spinomicrocheilinella dargenioi n. sp.
(Pl. 1, figs. 11, 17)

Derivatio nominis: In honour of Prof. Dr. B. d'ARGENIO, Napoli.

Holotype: The specimen on pl. 1, fig. 11; rep. no. CK/V-42

Locus typicus: Torrente San Calogero section.

Stratum typicum: Red deep-water radiolarian clay of topmost Middle Permian to basal Late Permian age, sample 653.

Material: 12 specimens.

Dianosis: Carapace small, tumid, in lateral view elliptical, highest about in the midlength, widest about in the centre. Anterior margin a little higher than posterior one, both broadly rounded. Dorsal margin in both valves slightly convex. Ventral outline in the LV convex, in the RV straight. Inward-bent ventral margin also in the LV straight. The considerable larger LV strongly overlap the RV all around.

Surface smooth. Posteroventral a strong spine is present, obliquely backward and somewhat downward directed.

Hinge adont. Calcified inner lamella not observed.

Measurements:

l = 549–593 μm

h = 289–307 μm

Occurrence: Highest Middle Permian and basal Late Permian deep-water sediments of Western Sicily.

Remarks: Juvenile forms have the same outline than adults.

Contemporaneous or only a little younger *Spinomicrocheilinella* species from shallow-water deposits have an upward-bent posteroventral spine. Moreover, the outline is different (posterior margin more acutely rounded).

Similar spined forms from the Late Devonian and Lower Carboniferous paleopsychrospheric deep-water ostracod faunas have a dorsal shoulder (*Pachydomella* UL-RICH, 1891).

Family Rectorariidae GRÜNDEL, 1962

Genus *Pseudospinella* n. gen.

Derivatio nominis: According to the sculpture similarities with *Spinella* BLUMENSTENGEL, 1965.

Type species: *Pseudospinella ruggierii* n. gen. n. sp.

Diagnosis: Carapace subtriangular to suboval, highest behind the midlength or in the posterior third. Larger LV overlaps the RV all around, but least strongly along the dorsal margin. Anterior margin lower than posterior one. Dorsal margin long, in the RV straight, in the LV straight to slightly convex.

In both valves a distinct, obliquely backward directed spine is present in the posterior third above the midline. In the LV additionally an anterodorsal, obliquely forward directed spine is present. Lateral surface smooth.

Hinge adont. Calcified inner lamella not observed.

Occurrence: Early to Late Permian paleopsychrospheric deep-water ostracod faunas from Timor Island and Western Sicily.

Assigned species:

Pseudospinella ruggierii n. gen. n. sp.

Spinella bitauniensis BLESS, 1987

Remarks: Sexual dimorphism is seemingly present, indicated by slightly different outline of the sexes.

Spinella BLUMENSTENGEL, 1965 has similarly arranged spines, but it is equivalved and the maximum high is before the midlength. BLUMENSTENGEL (1965) placed this genus into the Tricorninidae BLUMENSTENGEL, 1965 and this taxonomic position seems to be correct.

As already mentioned by BECKER (1981), similar spine patterns occur in different taxonomic units among the Paleozoic deep-water ostracods. These spine patterns are environmental-controlled and should not be overestimated in the taxonomy. The present material has shown that similar and even the same spine patterns can occur not only in quite different podocopids, but even in platycopids (see under *Spinosioella* n. gen.). We find identical or very similar spine patterns in the following groups: Podocopida, Cypridocopina JONES, 1901 emend. KOZUR, 1972: Bairdiocypridacea SHAVER, 1961 (Pachydomellidae BERDAN & SOHN, 1961: *Rectoplacera* BLUMENSTENGEL, 1965, Rectorariidae GRÜNDEL, 1962: *Rectoraria* GRÜNDEL, 1961, *Orthonaria* BLUMENSTENGEL, 1965, pars, *Pseudospinella* n. gen.), Cypridacea BAIRD, 1845 (*Triplacera* GRÜNDEL, 1961), Healdiacea HARLTON, 1933 (e.g. *Timorhealdia* BLESS, 1987), Cytherocopina GRÜNDEL, 1967: Tricorninacea BLUMENSTENGEL, 1965 (Tricorninidae BLUMENSTENGEL, 1965: *Spinella* BLUMENSTENGEL; 1965), Bairdiomorpha KOZUR, 1972: Bairdiacea SARS, 1888 (*Processobairdia* BLUMENSTENGEL, 1965), Platycopida: Cytherellacea SARS, 1866 (Spinosioellidae n. fam.: *Spinosioella* n. gen.)

***Pseudospinella ruggierii* n. gen. n. sp.**

(Pl. 2, figs. 1-5)

Derivatio nominis: In honour of Prof. G. RUGGIERI, Palermo.

Holotype: The specimen on pl. 5, fig. 1, rep. no CK/VII-5
Locus typicus and stratum typicum: As for *Spinosioella catalanoi* n. gen. n. sp.

Material: More than 50 specimens.

Diagnosis: Lateral outline subtriangular to suboval, with maximum height behind the midlength or in the posterior third of the carapace. In dorsal view the outline is elliptical with symmetrical convexity and largest width behind the midlength. Anterior margin in its upper part rounded, in its lower part slightly rounded. Posterior margin rounded, in its upper part at adults strongly oblique. It is mostly considerably higher, in juvenile forms only a little higher than anterior margin. Ventral margin slightly convex, obliquely, in juvenile forms more symmetrically rounded. Dorsal margin long, straight, anterodorsal in the RV rounded, in the LV with indistinct cardinal angle, posterodorsal in both valves with indistinct cardinal angles. The larger LV overlap the RV all around, but dorsally only a little.

In the posterior third of both valves a distinct, obliquely backward-directed spine is present somewhat above the midline. In the LV a further, but only short spine is present anterodorsally, which is obliquely forward-directed. Lateral surface smooth.

Juvenile forms and one morphotype among the adults have a suboval lateral outline. The other morphotype is subtriangular. These differences in the outline of the adults indicate seemingly sexual dimorphism. During the ontogenesis in one morphotype both sculpture and outline remain constant, in the other morphotype the outline became increasingly subtriangular.

Measurements:

l = 418–470 µm

h = 263–278 µm

Occurrence: Frequent in highest Middle Permian to basal Late Permian deep-water clays of Western Sicily.

Remarks: *Pseudospinella bitauniensis* (BLESS, 1987) from the Lower Permian of Timor has a similar outline, but it is larger, the anterodorsal spine in the LV is considerably larger and the posterodorsal spine lies more near to the posterior, often also to the dorsal margin. Therefore fully preserved posterodorsal spines overreach in lateral view in general the posterior margin. Only in the specimen figured by BLESS (1987, fig. 3 K) the posterodorsal spine lies in the same position as in *P. ruggierii* n. sp., but it is obliquely downward directed, unlike to all other representatives of the new genus.

Superfamily Cypridacea BAIRD, 1845
Family Pontocyprididae MÜLLER, 1894
Genus *Haworthina* KELLETT, 1935
emend. KOZUR, 1985

Type species: *Bairdia bulleta* HARRIS & LALICKER, 1932

***Haworthina* spp.**

(Pl. 1, figs. 23, 24; pl. 2, fig. 8)

Remarks: Several *Haworthina* species are present in the Middle and Late Permian deep-water clays from Torrente San Calogero, which are very similar each other and show only minor differences in their outlines. The contemporaneous Late Permian *Haworthina* species from shallow-water sediments (described by KOZUR, 1985 a) have a quite different outline.

Suborder Cytherocopina GRÜNDEL, 1967
Superfamily Tricorninacea BLUMEN-
STENGEL, 1965

Family Tricorninidae BLUMENSTENGEL, 1965
Genus *Ovornina* GRÜNDEL, 1966
Subgenus *Tricornella* GRÜNDEL, 1966

Type species: *Tricornina sagittaformis* BLUMENSTENGEL, 1962

***Ovornina (Tricornella)* sp.**

(Pl. 1, fig. 30)

Remarks: Only some crushed or deformed valves have been found. The fit well into the subgenus *Tricornella* GRÜNDEL, 1966 of the genus *Ovornina* GRÜNDEL, 1966. But like in Tricorninacea from Triassic paleopsychrospheric ostracod faunas also the present Permian tricorninids have a fine reticulation arranged in delicate stripes.

Superfamily Bythocytheracea SARS, 1926
Family Bythocytheridae SARS, 1926
Subfamily Bythocytherinae SARS, 1926
Genus *Parabythocythere* KOZUR, 1981

Type species: *Parabythocythere permica* KOZUR, 1981

Parabythocythere siciliensis n. sp.
(Pl. 2, fig. 6)

Derivatio nominis: According to the occurrence in Sicily.

Holotype: The specimen on pl. 2, fig. 6; rep. no CK/III-5.

Locus typicus and stratum typicum: As for *Spinoso-sioella catalanoi* n. gen. n. sp.

Material: 4 valves.

Diagnosis: Lateral outline elongated subrectangular. Anterior margin broadly rounded. Dorsal margin long, straight. Ventral outline slightly convex by overhanging parts of the midventral swelling. Posterior margin oblique, somewhat pointed a little below the dorsal line.

Lateral surface reticulated. Reticulum arranged in a stripe pattern, subparallel to the margin. On the distinct mid-ventral swelling, but partly also in the whole middle sector of the valve, the stripes are strengthened into densely spaced narrow ribs. The intermitted reticulum is here indistinct, on the mid-ventral swelling mostly totally missing.

Hinge adont. Calcified inner lamella narrow, vestibulum present.

Measurements:

l = 297–330 µm

h = 141–163 µm

Occurrence: Highest Middle Permian to basal Late Permian of Western Sicily.

Remarks: Contemporaneous and a little younger *Parabythocythere* species from Middle and Late Permian shallow-water sediments of the Bükk Mts (Hungary) have a distinct caudal process and never a strong mid-ventral swelling. If swellings or nodes are present in these species, than they are situated in mid-posterior or posteromedian position. Moreover, the sculpture is in these species not so distinct, but in *Parabythocythere permica reticulata* KOZUR, 1985 the reticulum shows a similar pattern as in the new species. As a whole, *Parabythocythere siciliensis* n.sp. is by far more primitive than the Middle and Late Permian shallow-water species.

Subfamily Bythoceratininae GRÜNDEL &
KOZUR, 1972

Genus *Paraberounella* BLUMENSTENGEL, 1965

Type species: *Paraberounella lobella* BLUMENSTENGEL, 1965

Paraberounella ? laterospina n. sp.
(Pl. 1, figs. 6?, 29)

Derivatio nominis: According to the posteromedian spine

Holotype: The specimen on pl. 1, fig. 29; rep. no. CK/III-40

Locus typicus and stratum typicum: As for *Spinoso-sioella catalanoi* n. gen. n. sp.

Material: 11 valves.

Diagnosis: Lateral outline subtriangular, highest in the anterior third. Dorsal view suboval. Anterior margin broadly and symmetrically rounded. Dorsal margin long, straight, with anterodorsal cardinal angle. Ventral margin straight, converging against the dorsal margin in posterior direction. Posterior margin oblique, roundly pointed somewhat below the dorsal line.

Shallow sulcus S 2 reaches until the midline of the carapace or a little below it. Ventral lobus broad, semicircular. Its convex lower side reaches until the ventral margin, but it does not or only insignificantly overhang on the central part of the ventral margin. A spine with narrow base is situated on the upper part of the posterior end of this ventral lobus. It lies here in or somewhat below the midheight of the carapace and it is obliquely backward, partly also a little downward directed.

Hinge adont. Duplicature and vestibulum narrow.

Measurements:

l = 297–317 µm

h = 147–163 µm

Occurrence: Middle and Late Permian deep-water deposits of Western Sicily.

Remarks: *Paraberounella laterospina* n. sp. is distinguished from the most Paleozoic species of this genus by its posterioren end, acutely rounded somewhat below the dorsal line. In typical *Paraberounella* species the posterior end is pointed in prolongation of the dorsal margin. Only *Paraberounella saalfeldensis kahlleitensis* GRÜNDEL, 1973 from the Late Devonian is similar in the lateral outline and also in the position of the somewhat more backward directed spine, but this species has a spine on the anterior margin.

The new species shows similarities to the genus *Monoceratina* ROTH, 1928 in the development of its posterior margin, but the ventral swelling is not overhanging and the spine is not situated ventrally, like in *Monoceratina*, in which the spine has, moreover, always a very broad base. The surface sculpture of *P. ? laterospina* n. sp., especially the position of the spine and its narrow base, is quite typical for *Paraberounella*. In one specimen of the Sicilian material the spine is situated in the posteromedian-ventromedian transitional field, but even this position is still higher than in *Monoceratina*, which is also separated by the other above mentioned features. This specimen is here determined as *Paraberounella ? cf. laterospina* n.sp.

Order Reticulocopida n. ord.

Derivatio nominis: According to the nearly universally present internal reticulation of the valves.

Diagnosis: Almost exclusively non-dimorphic carapace with straight, very long dorsal margin, rounded, often nearly equal end margins and convex, straight or concave ventral margin. Anterior and posterior cardinal angles equal or subequal.

Along the free margin ribs, denticulations, hollow tubes, frill-like ("pseudofrill") and other sculptural elements are present. Lateral surface mostly strongly and coarsely reticulated ("internal reticulum", often with special fine sculpture). Kirkbyan pit or smooth field in position of the rosette-like or biserial adductor muscle scar often present. Subdorsal and central nodes or node-like elongated elements, rarely spines often present. Especially frequent are two subdorsal nodes, rarely elongated into spines. Lateral ribs and surface reticulations may be present.

Hinge adont, in stratigraphically younger forms often "bracket teeth" in the right valve are present that have not corresponding accommodation grooves or sockets in the left valve. Calcified inner lamella may be present in stratigraphically younger forms (since the Carboniferous, but especially since the Upper Permian). It is always of mesoplate type (almost the same width along the free margin, widest midventrally).

Soft parts of recent forms with distinctly podocopid character in the cephalic and thoracic elements (complete lack of respiratory elements) and with (more dominant) platycopid character in the abdominal region (abdominal segmentation and paired furcal lamellae).

Occurrence: Ordovician - Recent, frequent in the Paleozoic, since the Triassic very rare.

Assigned taxa:

Punciocopina SCHALLREUTER, 1968 (including kirkbyids)

Binodicopina SCHALLREUTER, 1972

Suborder inc., family Conodomiridae SCHALLREUTER, 1977

Discussions and remarks: The relations with other orders and within the new suborder, especially the derivation of the Punciacea HORNIBROOK, 1949 from the Kirkbyacea ULRICH & BASSLER, 1906, will be discussed in a separate paper (in press).

As shown by SCHALLREUTER (1968, 1978 a), the kirkbyids (and therefore also the here established Reticulocopida) derived from early Kloedenellocopina SCOTT, 1961 (primitive Platycopida SARS, 1866). But the derivation of the kirkbyids from early kloedenellids is no evidence that both groups belong to the same order, because in the Ordovician the basis differentiation of the ostracods occurred. Moreover, from the Upper Ordovician until recent the development of the Platycopida and Reticulocopida was separate and strongly divergent with increasing differences in the overall shell morphology.

Platycopida have always two different cardinal angles that became during the evolution in several lines more and more indistinct. The straight, long dorsal margin became shorter or convex. Internal shell reticulation, well developed in many early Platycopida during the Ordovician occurred later only quite exceptionally. A kirkbyan pit (or homologous smooth field in the place of adductor muscle scar) occurs only in few Platycopida, but in many Reticulocopida. Kloedenellid sexual dimorphism, very characteristic for all Platycopida, was only observed in one genus of the Reticulocopida (*Manawa*). Moreover, the ventral margin is always concave in the Platycopida, whereas many Reticulocopida have a distinctly convex ventral margin (all Binodicopina, Coronakirkbyidae, Punciacea). The adventral sculptural elements (pseudofrill, pseudovelum, hollow tubes, denticles etc.), present in all typical Punciocopina with exception of the stratigraphically oldest forms and not so pronounced also in many Binodicopina, are quite missing in Platycopida.

The Podocopida SARS, 1866 have a mesostene calcified inner lamella, with exception of some primitive forms without calcified inner lamella. A long, straight margin occurs only in some Cytherocopina, but even in these forms the two cardinal angles are quite different each other. Internal shell reticulation is rare. The adventral sculpture elements are in general not so pronounced as in the Re-

ticulocopida or quite missing. A kirkbyan pit or homologous smooth field is only quite exceptionally present in the Podocopida. The hinge is in many forms, especially in the Cytherocopina, highly differentiated.

The Beyrichiida are in their shell outline similar to many Reticulocopida, even to the recent ones, but concave ventral margin, frequent in the majority of kirkbyids is among the Beyrichiida quite exceptional (only 3 such species are known, see SCHALLREUTER, 1982). All Beyrichiida are clearly distinguished from the Reticulocopida by their specific sexual dimorphism (cruminal, antral and marginal dimorphism), never present in the Reticulocopida. Moreover, the lobation and sulcation of the most Beyrichiida is different from Reticulocopida, which are mostly non-sulcate (with exception of the early Binodicopina) and often non-lobate. A kirkbyan pit or homologous smooth field is rare in the Beyrichiida. Internal shell reticulation is only in the earlier Beyrichiida common, in later forms quite exceptionally and finally missing. The similar adventral sculptural elements are non-dimorphic in the Reticulocopida, but in general dimorphic in the Beyrichiida. Calcified inner lamella are never present in Beyrichiida.

Suborder Punciocopina SCHALLREUTER, 1968
Superfamily Kirkbyacea ULRICH & BASSLER, 1906
Family Kirkbyidae ULRICH & BASSLER, 1906

Synonym: Knightinidae SOHN, 1970

Genus *Kirkbya* JONES, 1859

Type species: *Dithyrocaris permiana* JONES, 1850

***Kirkbya* ? n. sp.**
(Pl. 1, fig. 26)

Remarks: Only one carapace of a small ($l = 270 \mu\text{m}$) resedimented new *Kirkbya* (?) species was found in sample 655. Like in *Kirkbya knuepferi* KOZUR, 1985 the carina is especially antero- and mid-ventral far away from the margin. But *K. knuepferi* is larger ($l = 453 - 478 \mu\text{m}$), has a distinct posterior shoulder and a pointed posterior end.

Quite interesting that all Kirkbyacea in the Sosio deep-water fauna are extraordinarily small, only 1/2 to 1/3 of the size of contemporaneous shallow-water Kirkbyacea (explanation see part 2 of this paper).

Genus *Knightina* KELLETT, 1933

Type species: *Amphissites allorismoides* KNIGHT, 1928

***Knightina* ? *multicarinata* n. sp.**
(Pl. 1, fig. 18)

Derivatio nominis: According to the presence of several marginal ridges.

Holotype: The specimen on pl. 1, fig. 18; rep. no. CK/V-4.

Locus typicus: Cozzo Intronata section between Lercara and Rocca Palumba, Western Sicily

Stratum typicum: Reddish silty micaceous siltstone of red Kungurian flysch.

Material: 3 carapaces.

Diagnosis: Carapace small, RV somewhat larger than LV. Outline in lateral view subtriangular, highest at the end of anterior third of carapace. Anterior margin broadly rounded, in the lower part obliquely rounded. Posterior margin considerably lower, narrowly rounded to almost straight. Dorsal margin straight, very long, only a little shorter than the maximum length of carapace. Ventral margin in its anterior half convex, in its posterior half straight to slightly convex and here strongly converging against the dorsal margin.

Along the free margin 3 marginal ribs are present, the middle one is weaker than the outer and inner ones. The outer rib continues at the dorsal margin as distinct dorsal rib. Posterior shoulder present. Whole lateral surface reticulated (fine pore-like internal shell reticulation and coarse surface reticulation). Kirkbyan pit distinct, situated a little above the valves centre.

Measurements:

$l = 224 - 238 \mu\text{m}$

$h = 118 - 122 \mu\text{m}$

Occurrence: Red Kungurian flysch ("Lercara Formation") from Western Sicily.

Remarks: The presence of 3 marginal ribs along the free margin is exceptional for the genus *Knightina*. Therefore the assignment to this genus is not quite sure. So long only one species shows this feature, it can be regarded as species character without supraspecific importance.

Genus *Nodokirkbya* n. gen.

Derivatio nominis: According to the posterodorsal conical node.

Type species: *Nodokirkbya striatoreticulata* n. gen. n. sp.

Diagnosis: Carapace small, RV a little larger than LV with slight overlap in the upper part of the anterior and posterior ends. Outline in lateral view rounded subtriangular, highest in the anterior third. Posterior shoulders in both valves elongated into long conical nodes. Lateral surface with small, pore-like internal shell reticulation and coarse, irregular surface reticulation, arranged in margin-parallel ribs. Kirkbyan pit indistinct or missing.

Occurrence: Middle and Late Permian red deep-water clay of Sicily.

Remarks: *Scutikirkbya* SHI, 1982 has additionally to the posterodorsal node also an anterodorsal node. Moreover, the lateral surface has not two different types of reticulation and the adventral rib is very pronounced.

Semipetatus SOHN, 1954 has also a strong posterodorsal node, but it continues in a broad swelling through the dorsomedian until the anterodorsal part of the valves. Its base reaches downward somewhat below the midline of the valve. Moreover, the outline of this genus is elongated subrectangular with concave ventral margin.

In spite of the distinct posterodorsal node, *Nodokirkbya* is not related to the Kellettinidae SOHN, 1954. *Nodokirkbya* has evolved from *Knightina* KELLETT, 1933 by transformation of the posterior shoulder into a distinct node.

Nodokirkbya striatoreticulata n. gen. n. sp. (Pl. 1, figs. 15, 19)

Derivatio nominis: According to the sculpture.

Holotype: The specimen on pl. 1, fig. 19; rep. no. CK/III-18.

Locus typicus and stratum typicum: As for *Spinoso-sioella catalanoi* n. gen. n. sp.

Material: 12 carapaces.

Diagnosis: Carapace small. Lateral outline rounded subtriangular, highest in the anterior third. Anterior margin broadly rounded, in its lower part obliquely rounded. Posterior end considerably lower than anterior one, in its upper part rounded, in its lower part obliquely rounded. Dorsal margin very long, straight, but distinctly shorter than maximum length of carapace. Both cardinal angles obtuse. Ventral margin straight to slightly convex, converging in posterior direction toward the dorsal margin.

Shoulders prolonged into long, conical nodes. Lateral surface, including the nodes, with complex sculpture. A very coarse, irregular outer reticulum is arranged in margin-parallel ribs. Towards the marginal parts of the shell, the rib-component becomes stronger. By this the adventral rib along the free margin is not much separated from the margin-parallel ribs of the lateral sculpture. Between the outer reticulum and the ribs the surface is densely covered with small, deep pits (internal shell reticulation), often closed by diagenetic processes. Small, smooth kirkbyan pit (rather smooth spot) indistinct, situated in the posterior part of the ventromedian sector. It is often quite missing.

Measurements:

l = 267–279 μm

h = 146–158 μm

Occurrence: Highest Middle Permian and basal Late Permian deep-water sediments of Western Sicily.

Remarks: See under the genus.

Family Amphissitidae KNIGHT, 1928 Genus *Amphissites* GIRTY, 1910

Type species: *Amphissites rugosus* GIRTY, 1910

Amphissites sosioensis n. sp. (Pl. 1, fig. 16)

Derivatio nominis: According to its occurrence in the Sosio Valley

Holotype: The specimen on pl. 1, fig. 16; rep. no. CK/III-21.

Locus typicus and stratum typicum: As for *Spinoso-sioella catalanoi* n. gen. n. sp.

Material: 3 valves.

Diagnosis: Lateral outline subrectangular. Anterior margin only a little higher than posterior one. Both end margins are rounded, but the posterior only considerably fewer than the anterior one. Dorsal margin long, straight. Cardinal angles distinct. Ventral margin straight.

Outer carina narrow, present along the whole free margin. Inner carina distinct, in the higher parts of the anterior and posterior margins indistinct or missing. Dorsal rib indistinct. Node large, situated entirely above the midline and reaching almost the dorsal margin. It has basally in its upper half a semicircular narrow rib. Its surface is reticulated. This reticulum is arranged into indistinct ribs. Kirk-

byan pit indistinct, situated just below the node. Lateral surface reticulated and with irregularly distributed small papillae. No lateral shoulder with keel or vertical carinae. Posterodorsal shoulder distinct, anterodorsal shoulder indistinct.

Measurements:

l = 359–381 μm

h = 237–241 μm

Occurrence: Latest Middle Permian to basal Late Permian. *Amphissites sosioensis* n. sp. belongs to those rare species which are resedimented in the red clay. The valves are filled with white calcareous matrix. One specimen was found on the surface of a calcarenite.

Remarks: By the absence of vertical keels (carinae) on both side of the central node this species is quite distinctly separated from all other *Amphissites* species. In this feature it resembles *Neochilina* MATERN, 1929 and *Sinessites* BECKER, 1981 that are probably identical each other. But in these forms no dorsal shoulders are present. The new species is therefore rather an *Amphissites* with totally reduced vertical carinae.

Family Kellettinidae SOHN, 1954

Genus *Kellettina* SWARTZ, 1936

Type species: *Ulrichia robusta* KELLETT, 1933

***Kellettina reticulata* n. sp.**

(Pl. 1, fig. 14)

Derivatio nominis: According to the coarse reticulation

Holotype: The specimen on pl. 1, fig. 14; rep. no. CK/III–16.

Locus typicus and stratum typicum: As for *Spinoso-sioella catalanoi* n. gen. n. sp.

Material: 2 slightly damaged valves from the red clay and several specimens on the surface of the calcarenites.

Diagnosis: Small. Lateral outline subrectangular, maximum height in the anterior third of the valves. Anterior margin in the upper part almost straight, only slightly rounded, in its lower part obliquely rounded. Posterior margin somewhat lower than anterior one, otherwise similar. Dorsal margin straight, nearly as long as the maximum length of the valve. Both cardinal angles distinct and only a little larger than 90°. Ventral margin straight, only a little converging against the dorsal margin in posterior direc-

tion. Lateral surface heavily sculptured. Subdorsal nodes widely spaced, large. Anterior subdorsal node broadly wedge-like, beginning about in the midline and overreaching clearly the dorsal margin. Posterior node very large, elongated, subconical with rounded top, strongly overreaching the dorsal margin. Its base lies also about in the midline of the valve. The whole lateral surface, including the nodes, is coarsely reticulated. Some narrow, keel-like ribs are superimposed on the reticulum. The most prominent of these ribs run from the tip of the anterior node obliquely downward, than below the midline backwards and it surrounds than the large kirkbyan pit as a ring-like rib. The kirkbyan pit is situated immediately in front of the base of the posterior node. "Velum" narrow, indistinct, in lateral view almost completely overreached by the distinct, obliquely outward directed narrow carina.

Measurements:

l about 450 μm

h (without nodes) = 181–203 μm

Occurrence: Very rarely reworked in the red clays, more frequent on the surface of the calcarenites. Highest Middle Permian to basal Late Permian.

Remarks: In spite of the fact that only two slightly damaged, but otherwise well preserved valves could be isolated, the new species can be clearly separated against other *Kellettina* species. It belongs to the *Kellettina ultima* group which is clearly different from the older *Kellettina* species by its coarse reticulation of the lateral surface (including the nodes) and by the widely spaced nodes. Moreover, both in *Kellettina reticulata* n. sp. and in *K. ultima* KOZUR, 1985 the kirkbyan pit is quite distinct.

In *Kellettina ultima* KOZUR, 1985 the nodes are not so extremely high as in *K. reticulata* n. sp. Keel-like narrow ribs, superimposed on the coarse reticulum are not present. The carina is broader.

Superfamily Punciacea HORNIBROOK, 1949

Family Coronakirkbyidae KOZUR, 1985

Remarks: KOZUR (1985 a) placed the Coronakirkbyinae into the Kirkbyidae, but the presence of two pseudofrills (large inner and smaller outer one) and the convex ventral margin are quite different from the Kirkbyidae. Moreover, in the stratigraphic younger Coronakirkbyidae, including also the nominate genus, a subcentral, mostly elongated node, like in the Amphissitidae and two subdorsal nodes have evolved. Bracket teeth in the RV are distinct. They have no corresponding sockets in the LV. Moreover, all

Coronakirkbyidae have distinct hollow antero- and posterodorsal spines in the antero- and posterodorsal corners or minimally below it. They are situated at the end of the inner pseudofrill. In their main features, the Coronakirkbyidae are more similar to the Cretaceous to recent Punciacea than to the Kirkbyacea.

Primitive Coronakirkbyacea, to which belong also the species from the Permian of Sosio, are still similar to the Kirkbyacea, from which they have evolved. The Coronakirkbyidae are here regarded as the missing link between the Kirkbyacea and the Punciacea.

Genus *Tubulikirkbya* KOZUR, 1985

Type species: *Coronakirkbya krecigrafi* BECKER, 1978

Tubulikirkbya ? oertlii n. sp.
(Pl. 1, figs. 20, 25)

Derivatio nominis: In honour of Prof. Dr. H.J. OERTLI, Pau.

Holotype: The specimen on pl. 1, fig. 20; rep. no. CK/III-51.

Locus typicus and stratum typicum: As for *Spinoso-sioella catalanoi* n. gen. n. sp.

Material: 7 valves.

Diagnosis: Carapace small, in lateral view hemielliptical, highest before the midlength. Anterior margin somewhat higher than posterior one, both are obliquely rounded and have a quite gradual transition into the convex ventral margin. Dorsal margin about as long as the maximum length of carapace, straight, with sharp cardinal angles of about 90°, posterior cardinal angle often a little smaller than 90°. Anterodorsal spine small, erect or a little forward inclined. Posterodorsal spine strong, obliquely upward and backward directed.

Outer and inner pseudofrill present along the whole free margin, consisting of widely spaced, hollow, relatively short tubuli, which are sometimes terminally connected. Thin lamella between the tubuli mostly not preserved. The low dorsal rib is distinct, but anterodorsally often indistinct and posterodorsally indistinct or even missing. Dorsomedian a distinct roundish or slightly elongated node is present. The whole lateral surface, including the node, is coarsely and irregularly reticulated, but the reticulation is sometimes for preservation reasons indistinct.

Measurements:

l = 266–300 µm

h = 141–147 µm

Occurrence: Highest Middle Permian to basal Late Permian deep-water sediments of Western Sicily.

Remarks: *Tubulikirkbya* KOZUR, 1985 is frequent in Middle and Late Carboniferous shallow-water sediments, but absent in Permian (at least Middle and Late Permian) shallow-water sediments. On the contrary, in Middle and Late Permian deep-water sediment this genus is more frequent than other Punciocopina. In contrary to the Carboniferous *Tubulikirkbya* species, the tubuli of the pseudofrills are widely spaced and the dorsomedian node is distinct. The Permian *Coronakirkbya* species have beside of a distinct subcentral node (always elongated) also two subdorsal nodes. The new species is transitional between these two genera. Compared with Carboniferous and Permian shallow-water species of *Tubulikirkbya* and *Coronakirkbya*, the deep-water species are very small (1/2 to 2/3 of the size of the shallow-water forms).

Suborder Binodicopina SCHALLREUTER, 1972

Superfamily Drepanellacea ULRICH & BASSLER, 1923

Family Bolliidae BOUCEK, 1936

Genus *Solleikope* BECKER, 1978

Type species: *Solleikope sollei* BECKER, 1978

Solleikope ? permica n. sp.
(Pl. 1, fig. 22)

Derivatio nominis: According to the occurrence in the Permian.

Holotype: The specimen on pl. 1, fig. 22; rep. no. CK/III-17.

Locus typicus and stratum typicum: As for *Spinoso-sioella catalanoi* n. gen. n. sp.

Material: 2 valves.

Diagnosis: Carapace small, in lateral view semicircular. Dorsal margin straight, very long, only a little shorter than the maximum length of carapace. Cardinal angles distinct, a little larger than 90°. End margins only a little rounded, anterior margin somewhat oblique, a little lower than the almost straight posterior margin. Ventral margin convex. Dorsomedian 2 hemispherical nodes are present. The ante-

rior (smaller one) does not reach the dorsal margin, whereas the posterior (very big one) reaches the dorsal margin. Between the 2 nodes a narrow sulcus is present which reaches from the dorsal margin until the mid of the valve.

Lateral surface granulate. "Velate" ridge narrow, antero- and posterodorsal indistinct. Carina high, distinct.

Measures:

l = 315–331 μm

h = 201–219 μm

Occurrence: Highest Middle Permian or basal Late Permian deep-water sediments of Western Sicily.

Remarks: The until now monospecific Carboniferous genus *Solleikope* BECKER, 1978 has no carina and the dorsal margin is convex above the nodes. Otherwise *Solleikope sollei* BECKER, 1978 is similar (small size, outline, arrangement of nodes, sculpture). Like in the Triassic paleopsychrospheric ostracods (where several genera are present that can be found in Permian shallow-water deposits, but never in Triassic shallow-water ostracod faunas), also in the Permian paleopsychrospheric ostracods some taxa are present that are characteristic for Late Carboniferous shallow-water ostracod faunas, but not more present in Permian shallow-water ostracod faunas.

Solleikope? permica n. sp. is very similar to the Silurian - Devonian genus *Ulrichia* JONES, 1890, which is distinguished by the mid-dorsal position of the smaller nodes and by a more distinct velum.

Lower Permian *Solleikope* from paleopsychrospheric ostracod faunas of Timor Island (BLESS, 1987, fig. 1 C-F) are very similar, but have, like the Carboniferous type species, no carina.

Superfamily and family inc.

Genus *Neofellerites* n. gen.

Derivatio nominis: According to the younger stratigraphic occurrence than the similar *Fellerites* GRÜNDEL, 1962.

Type species: *Neofellerites minimus* n. gen. n. sp.

Diagnosis: Carapace very small, symmetrically arched. Lateral outline semicircular, highest a little before the mid-length. Dorsal margin straight, very long, only a little shorter than the maximum length. Cardinal angles well defined, both of equal size, shell in the anterodorsal and posterodorsal corners somewhat thickened. The free margin built up an almost symmetrical semicircle. Shell therefore relatively to the small length very high.

Lateral surface with coarse, but low reticulum. Along the whole free margin exist (as velar structure ?) a low, flattened zone, widest ventrally. Dorsal ridge distinct, at the anterior and posterior corner thickened.

No calcified inner lamella.

Occurrence: Highest Middle Permian or basal Late Permian deep-water sediments of Western Sicily.

Remarks: *Macronotella* ULRICH, 1894 has similar outline, sculpture and mode of carapace convexity. But this genus is about 5 x larger and has a smooth velar ridge, but no dorsal rib.

Fellerites GRÜNDEL, 1962 is about 2 x larger, its lateral outline is suboval and the lateral surface is smooth. Instead of thickenings at the antero- and posterodorsal corners short spines are present in these corners. The structure along the free margin is similar.

***Neofellerites minimus* n. gen. n. sp.**

(Pl. 1, fig. 7)

Derivatio nominis: According to the small size.

Holotype: The specimen on pl. 1, fig. 7; rep. no. CK/III-55

Locus typicus and stratum typicum: As for *Spinoso-sioella catalanoi* n. gen. n. sp.

Material: 3 specimens.

Diagnosis, occurrence and remarks: See under the genus.

Measurements:

l = 249–265 μm

h = 175–186 μm

Genus *Parvicyathus* n. gen.

Derivatio nominis: According to the small size and the similarity with *Cyathus* ROTH & SKINNER, 1930.

Type species: *Parvicyathus semicircularis* n. gen. n. sp.

Diagnosis: Carapace very small, with semicircular outline. Dorsal margin very long, somewhat shorter than maximum length, straight, a little depressed. The dorsal outline is slightly convex. Lateral surface smooth, but with small central pit. Along the free margin an indistinct low ridge is present.

No calcified inner lamella.

Occurrence: Highest Middle Permian or basal Late Permian deep-water sediments of Western Sicily.

Remarks: *Cyathus* ROTH & SKINNER, 1930 is similar, but 2 x larger, the outline is more elongated and no central pit is present.

The central pit indicates perhaps relations to kirkbyids, but the semicircular outline cannot be found in any Punciocopina. Even if the ventral margin is convex, the outline is more elongated and therefore different.

***Parvicyathus semicircularis* n. gen. n. sp.**
(Pl. 1, fig. 6)

Derivatio nominis: According to the semicircular lateral outline.

Holotype: The specimen on pl. 1, fig 6; rep. no. CK/III-54

Locus typicus and stratum typicum: As for *Spinoso-sioella catalanoi* n. gen. n. sp.

Material: 4 specimens.

Diagnosis: Very small, lateral outline semicircular, highest in the middle part. Anterior margin broadly rounded. Ventral margin strongly convex. Posterior margin somewhat lower than anterior one and in its lower part somewhat obliquely rounded. Dorsal margin very long, a little shorter than maximum length of carapace, straight, somewhat depressed; dorsal outline in the middle part slightly convex. Anterior cardinal angle distinct. Posterior cardinal angle about of the same size, but more indistinct and rounded.

Lateral surface smooth, but with small central pit. Shell marginally somewhat flattened. Along the free margin a very indistinct low ridge is present.

Measurements:

l = 278–290 µm

h = 191–195 µm

Occurrence and remarks: See under the genus.

Order inc.

? Suborder Leiocopina SCHALLREUTER, 1973

? Synonym: Paraparchitocopa GRAMM, 1975

Remarks: SCHALLREUTER (1973) introduced for the Aparchitacea the suborder Leiocopa SCHALLREUTER, 1973 which he placed into the Beyrichiida (Palaeocopa). But he pointed out that the Leiocopina are basically different from the Beyrichiida by absence of antral- and cruminal dimorphism, by missing lobation and sulcation as well as by the unequalled carapaces (mostly RV larger, rarely LV larger).

GRAMM (1975) introduced the suborder Paraparchitocopina for the Paraparchitacea SCOTT, 1959. They are morphologically similar to the Aparchitacea JONES, 1901, but the LV is larger than the RV and the l/h ratio is generally higher. According to the podocopid muscle scars in the Paraparchitacea (with adductor, frontal and mandibular fields) and an indistinct calcified inner lamella, the Paraparchitocopina were placed into the Podocopida by GRAMM (1975).

GRAMM (1984) stated that no calcified inner lamella is present in the Paraparchitocopina and he left now open the assignment of this suborder to any order. Well preserved material of Paraparchitacea shows marginal thickening at the free margin. The same thickening is known from the Aparchitacea as well. SCHALLREUTER (1973) regarded this thickening as possible calcified inner lamella or as an element preceding a calcified inner lamella.

No definitive possibility for the recognition of two different suborders for the Aparchitacea and Paraparchitacea, both poor in characteristic morphologic features, can be found in the present stage of our knowledge about these two ostracod groups.

The systematic position of the Leiocopina is not yet clear. If the thickening on the free margin is really a calcified inner lamella (or a structure, preceding it), than the Leiocopina cannot be placed into the Podocopida, because this structure is vertically broadest or of nearly the same width throughout the free margin, like in *Dentoparaparchites* KOZUR, 1985 (mesoplate calcified inner lamella).

On the other hand, the well defined mandibular muscle spots in the Paraparchitacea excludes this group from the Platycopida and Beyrichiida, where mandibular muscle spots do not occur.

Ordovician, high-oval to almost circular representatives of the Aparchitacea with short, straight dorsal margin are similar to some Myodocopamorphes (Cladocopida). Morphologically similar are also the Leperditiida PO-KORNÝ, 1953, but both similarities may be homoeomorphies.

Most nearly related are perhaps the Binodicopina SCHALLREUTER, 1972, distinguished by the two subdorsal nodes in typical representatives (missing in some forms or only one node is present) and by the internal shell reticulation (but some forms are smooth as well). Most of the Leiocopina are smooth, but some have punctate surface. A posterodorsal node is often present in the Leiocopina (both in Aparchitacea and in Paraparchitacea), in *Nodoparaparchites* this node is even coarsely reticulated.

In stratigraphically younger Parapachitacea the cardinal angles, especially the anterior one, became more and more rounded and indistinct. Moreover, the anterior angle is in general larger than the posterior one. Even in the stratigraphically youngest Binodicopia, in turn, the straight dorsal margin is very long, the dorsal angles are always distinct and nearly of the same size.

Family Pseudoparaparchitidae SOHN, 1983

Genus *Nodoparaparchites* n. gen.

Derivatio nominis: According to the distinct posterodorsal node.

Type species: *Nodoparaparchites reticulonodosa* n. gen. n. sp.

Diagnosis: Lateral outline suboval. Anterior and posterior margins about of the same height, both broadly rounded. Ventral margin convex. Dorsal margin moderately long, straight, with obtuse, indistinct cardinal angles. Lateral surface smooth, but with large posterodorsal reticulated node. No calcified inner lamella.

Occurrence: Highest Middle Permian to basal Late Permian of Western Sicily.

Assigned species:

Nodoparaparchites reticulonodosa n. gen. n. sp.

Remarks: *Pseudoparaparchites* KELLETT, 1933 and *Microparaparchites* CHRONEIS & GALE, 1939 have more pronounced cardinal angles and a posterodorsal spine is present instead of a reticulated node.

Nodoparaparchites reticulonodosa n. gen. n. sp.

(Pl. 1, fig. 3)

Derivatio nominis: According to the reticulated node.

Holotype: The specimen on pl. 1, fig. 3; rep. no. CK/V-43

Locus typicus: Torrente San Calogero section near Pietra di Salomone.

Stratum typicum: Sample 653, red deep-water clay of highest Middle Permian to basal Late Permian age. The species is resedimented from shallower, but also pelagic environments.

Material: 2 specimens.

Diagnosis, occurrence and remarks: See under the genus.

Measurements:

l = 291–309 μm

h = 185–96 μm

Superorder, order, suborder, superfamily inc.

Family Sinocoelonellidae n. fam.

Diagnosis: Tumid to moderately convex equivalved carapaces. Outline in dorsal view broadly oval to oval, in lateral view suboval to elongated suboval. The carapace is highest in or behind the midlength and broadest in its middle part. Dorsal margin convex. Ventral margin mostly hidden by overhanging parts of the carapace, straight, but ventral outline in the middle part mostly slightly convex. End margins rounded.

Surface with numerous striae. Along the whole margin a narrow sharp ridge is present that is not much more pronounced than the striae. No calcified inner lamella could be observed.

Occurrence: Permian of China and Sicily.

Assigned genera:

Sinocoelonella GUAN, 1978

Remarks: Because of the nearly symmetric convexity of the carapace, the orientation is difficult. GUAN (1978) CHEN & SHI (1982), CHEN & BAO (1986) and SHI & CHEN (1987) regarded the strongly convex margin as ventral. The straight margin, mostly hidden in its middle part by overhanging parts of the carapace was regarded as dorsal margin by these authors. Here the convex margin is regarded as dorsal margin.

Independent from this orientation also the anterior-posterior orientation is difficult to decide, because the maximum width of the carapace is just in its centre.

CHEN & SHI (1982), CHEN & BAO (1986) and SHI & CHEN (1987) placed *Sinocoelonella* GUAN, 1978 into *Cyathus* ROTH & SKINNER, 1930. But this genus is unsculptured and has a low velate structure along the free margin. Both genera are not related each other.

Seemingly, *Sinocoelonella* does not belong to the Beyrichiida. The outer morphology is similar to some groups of Podocopida. But there is also considerable similarity to some elongated Entomozocopina GRÜNDEL, 1969 (oder Cladocopida SARS, 1866 emend. KOZUR, 1972, superorder Myodocopamorphes KOZUR, 1972), especially *Richterina* GÜRICH, 1896. This genus has partly not only a similar outline, but also quite similar sculpture (striae) and along the whole margin a narrow rib may be present like in *Sinocoelonella* (compare OLEMPKA, 1979, pl. 31, figs. 6 b, c). If *Sinocoelonella* would be an entomozoid ostracod, than the orientation used by the Chinese authors would be correct.

The oldest known (Lower Permian) representatives of the Sinocoelonellidae are short, high, tumid, and their ventral outline is rather strongly convex by overhanging mid-ventral parts of the carapace. Among the Podocopida

these forms are most similar to Cypridocopina JONES, 1901 emend. KOZUR; 1972, but contemporaneous or older Paleozoic Cypridocopina have mostly a different outline and are mostly smooth. Above all, they are strongly inequivalved with larger LV. Some Paleozoic Cypridocopina are striated. But none of these forms are really related to the Sinocoelonellidae.

Genus *Sinocoelonella* GUAN, 1978

Type species: *Sinocoelonella caperatus* GUAN, 1978

Sinocoelonella densistriata n. sp.

(Pl. 1, figs. 4, 5)

Derivatio nominis: According to the numerous, densely spaced striae.

Holotype: The specimen on pl. 1, fig. 5; rep. no. CK/III-20

Locus typicus and stratum typicum: As for *Spinoso-sioella catalanoi* n. gen. n. sp.

Material: 28 specimens.

Diagnosis: Carapace equivalved. Outline in dorsal view oval, in lateral view elongated suboval, highest somewhat behind the midlength. Anterior margin somewhat lower than posterior one. Dorsal margin convex, with quite gradual transitions into the end margins. Ventral margin straight, but mid-ventral outline slightly convex because of overhanging parts of carapace.

Along the whole margin a marginal rib is present which is narrow, sharp-edged, and not much higher than the striae. 13-17 sharp, densely spaced striae are present. In the upper half of the valves they are convex (convex side above) and about parallel to the dorsal margin. In the median and ventromedian field the striae are in their middle parts more or less straight, and in the ventral part they are slightly concave (convex side below), about parallel to the ventral margin. In the upper half of the valves the striae reach in general from the anterior to the posterior margin. In the central and partly also in the ventral parts of the carapace they are shorter.

Measurements:

l = 293–328 μm

h = 148–163 μm

Occurrence: Higher Middle Permian and basal Late Permian of Western Sicily. Both in the red deep-water clays and in the pelagic calcarenites frequent.

Remarks: *Sinocoelonella caperata* GUAN, 1978 and *Sinocoelonella formosa* (SHI, 1982) from the higher Lower and Middle/Late Permian of China have strongly inflated shells and their ventral outline is more convex. Moreover, only the short innermost striae are straight, the others parallel to either the dorsal or ventral margins.

Sinocoelonella elliptica (SHI, 1987) from the Changxingian stage has a similar outline as *S. densistriata* n. sp., but also in this species the valves are more inflated. Moreover, a flattened anterior part adjacent to the anterior margin is present in both valves. The striae are similar as in *S. densistriata* n. sp., but in the anterior and posterior parts of the valves the striae are enclosed into a reticulation.

Sinocoelonella n. sp.

(Pl. 1, fig. 8)

Remarks: Only one RV of a new, distinct *Sinocoelonella* species was found (sample 655), which has a quite straight ventral outline and fewer, in the lower half of the valve straight, striae.

References

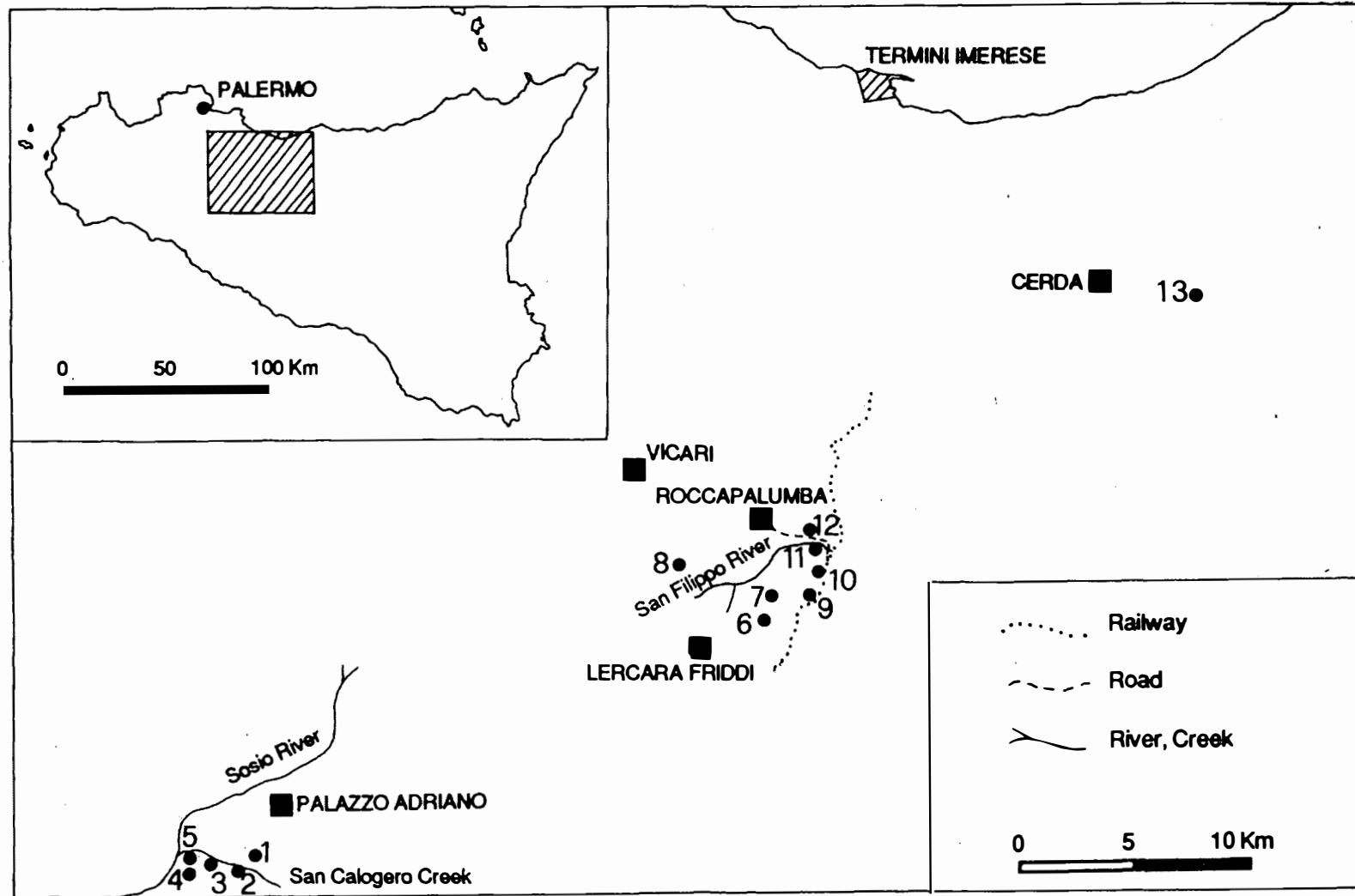
KOZUR, H. (1990): Permian deep-water ostracods from Sicily (Italy). Part 2: Biofacial evaluation and remarks to the Silurian to Triassic paleopsychrospheric ostracods. - Geol.-Paläont. Mitt. Innsbruck, this volume. The other references are listed in part 2.

Author's address:

Dr. sc. Heinz Kozur, Rézsű út 83, H-1029 Budapest, Hungary

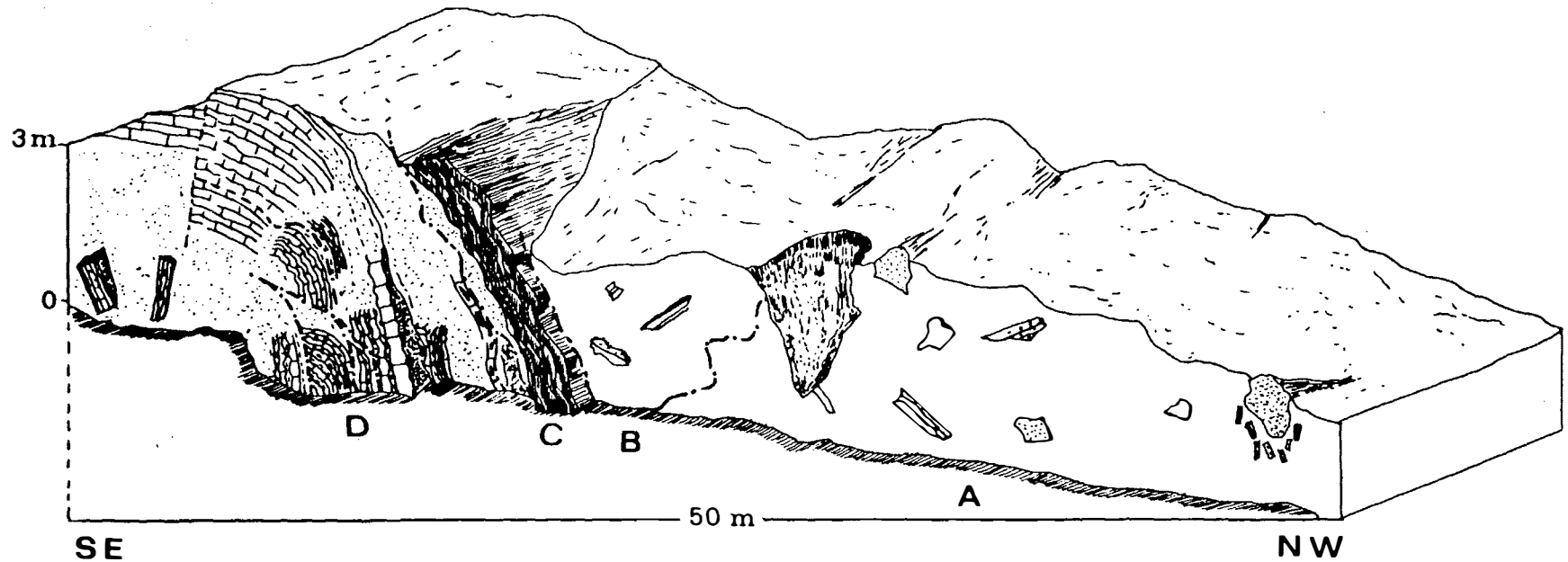
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Text-fig. 1: Map of studied areas in Western Sicily (from CATALANO; DI STEFANO & KOZUR, in press).

1: Pietra di Salomone, 2: Torrente San Calogero section, 3: Rupe del Passo di Burgio, 4: Pietra dei Saracini, 5: Rupe di San Calogero, 6: Cozzo Intronata, 7: Contrada Balatelle, 8: La Montagnola, 9-10: Red flysch outcrops along the Roccapalumba railway, 11: San Filippo River section, 12: Red flysch outcrop along the road Roccapalumba-Alia, 13: Case Tabbarani outcrop, near Cerda. With exception of the last locality (Tertiary with olistoliths) in all other outcrops pelagic Permian or Permian and Triassic sequences are present.



Text-fig. 2: Geological sketch of the Torrente San Calogero section WSW of Pietra di Salomone, Sosio Valley area (from CATALANO; DI SETEFANO & KOZUR, 1988 b).

Unit A: Olistostrome Unit, gray, soft, sandy clays with olistoliths of rocks from the underlying Kungurian flysch and olistoliths of calcarenites, biogenic limestones, radiolarian marls or marly limestones, radiolarian-bearing slightly siliceous calcilutites. Lowermost Middle Permian (Kubergandinian) age of the matrix. Age of the olistoliths: topmost Artinskian, Kungurian and Chihstian.

Unit B: Soft, predominantly red, in the lower part also light-gray clays with some thin, broken calcarenites. Wordian - Dzhulfian.

Unit C: Greenish, siliceous marls, tuffites, gray, greenish-gray and red radiolarites, siliceous, partly cherty limestones. Lower Ladinian.

Unit D: Greenish-gray and reddish nodular limestones and clayey marls, clays, thin red radiolarites. Highest Lower Ladinian, Upper Ladinian, basal Cordevolian (basal Carnian).

SYSTEM		STAGE	LITHOLOGY - FOSSILS	
T R I A S S I C	Late	Rhaetian	Pelagic gray bedded cherty calcilitites with intercalations of calcarenites. <i>Halobia</i> , <i>Monotis</i> , ammonoids, conodonts, radiolarians.	
		Norian		
		Carnian		Late
	Middle	Carnian	Middle	Pelagic gray cherty calcilitites with intercalations of brown calcarenites and, at places, calcirudites, gray shales. <i>Halobia</i> , conodonts, radiolarians, ostracods, trace fossils.
			Lower	
			Ladinian	Late
	Lower	Ladinian	Lower	Pelagic reddish to greenish gray nodular cherty or siliceous limestones, greenish tuffites, greenish to gray radiolarites. Conodonts, radiolarians.
			Anisian	
	Early (Scythian)	Olenekian	Until now unknown.	
		Brahmanian		
P E R M I A N	Late	Changxingian		
		Dzhulfian		
		Abadehian		
	Middle	Capitanian	Pelagic red soft shales. Radiolarians, ostracods, foraminifers, sponge spicules, conodonts. Pelagic red and light-gray soft shales and calcareous shales. Radiolarians, ostracods, foraminifers.	
		Wordian	White reef and reef-slope biogenic limestones. Sponges, bryozoans, conodonts, holothurians, ammonoids, crinoids.	
		Kubergandian		Olistostrome unit: gray soft shales with reworked sand grains. Conodonts, ostracods, radiolarians, sporomorphs. Olistoliths from the underlying rocks.
				Dark gray conglomeratic limestones. Resedimented calcarenites and biogenic limestones. Conodonts, sponge spicules. (Olistoliths). Brachiopods, ammonoids, echinoderms, conodonts (rare), scolecodonts, radiolarians, sporomorphs. (Olistoliths).
Lower	Chihshian	Gray and red flysch: graded bedded sandstones, partly fine-conglomeratic, siltstone, shales. Echinoderms, agglutinated foraminifers, ostracods, conodonts, numerous trace fossils. (Olistoliths and sequences)	Gray micritic siliceous limestones, dark gray silty marls, marly limestones. Radiolarians, conodonts. (Mostly olistoliths).	
	Kungurian			
	Artinskian	unknown		
	Sakmarian			
	Asselian			

Text-fig. 3: Stratigraphic column of Permian and Triassic in the Sicanian paleogeographic domain (reconstructed from sequences and olistoliths). Vertical distances not time- or thickness-related. From CATALANO; DI STEFANO & KOZUR (in press).

Explanation of plates

Plate 1

If not otherwise indicated, the figured specimens are from the Torrente San Calogero section (see text-figs. 1, 2) WSW of Pietra di Salomone, Sosio Valley area, Western Sicily, taken from red, soft deep-water clays with mass occurrences of Circum-Pacific radiolarians of basal Late Permian (or highest Middle Permian) age. Samples 655 (figs. 1, 2, 4–10, 12–30) and 653 (figs. 3, 11). Figs. 3, 14, 16, 26, 28 represent specimens transported into the basin from somewhat shallower, but also pelagic and rather deep-water environments.

- Figs. 1, 2, 9: *Spinosoella catalano* n. gen. n. sp., fig. 1: RV, ♂, holotype, rep.-no. CK/VII-2, a) outer view, x 85, b) inner view, x 78; fig. 2: LV, ♀, rep. no. CK/VII-4, a) outer view, x 90, b) inner view, x 40; fig. 9: detail of fig. 1 a, x 150
- Fig. 3: *Nodoparaparchites reticulonodosa* n. gen. n. sp., RV, holotype, x 160, rep. no. CK/V-43
- Figs. 4, 5: *Sinocoelonella densistriata* n. sp., x 150, fig. 4: ventral view of carapace, rep. no. CK/III-37; fig. 5: holotype, right lateral view of carapace, rep. no. CK/III-20
- Fig. 6: *Arvicyathus semicircularis* n. gen. n. sp., LV, holotype, x 150, rep. no. CK/III-54
- Fig. 7: *Neofellerites minimus* n. gen. n. sp., LV, holotype, x 150, rep. no. CK/III-55
- Fig. 8: *Sinocoelonella* n. sp., RV, x 160, rep. no. CK/III-53
- Fig. 10: Bairdiocypridacea or Bairdiacea, gen. et spec. indet., left lateral view of carapace, x 75, rep. no. CK/III-11
- Figs. 11, 17: *Spinomicrocheilinella dargenioi* n. sp., fig. 11: holotype, right lateral view of carapace, x 85, rep. no. CK/V-42; fig. 17: juvenile carapace, x 80, rep. no. CK/VII-3, a) right lateral view, b) dorsal view
- Fig. 12: *Paraberounella* ? cf. *laterospina* n. sp., RV, x 145, rep. no. CK/III-23
- Fig. 13: *Præzabythocypris* sp. ex gr. *pulchra* KOZUR, 1985, left lateral view of carapace, x 150, rep. no. CK/III-79
- Fig. 14: *Kelletina reticulata* n. sp., LV, holotype, x 80, rep. no. CK/III-16
- Figs. 15, 19: *Nodokirkbya striatoreticulata* n. gen. n. sp., fig. 15: right lateral view of carapace, x 150, rep.-no. CK/III-8; fig. 19: holotype, left lateral view of carapace, x 145, rep. no. CK/III-18
- Fig. 16: *Amphissites sosioensis* n. sp., LV, holotype, x 155, rep. no. CK/III-21
- Fig. 18: *Knightina* ? *multicarinata* n. sp., holotype, left lateral view of carapace, x 150, rep. no. CK/V-4. Sample 574. Cozzo Intronata section between Lercara and Roccapalumba, red silty, micaceous shales, Kungurian flysch.
- Figs. 20, 25: *Tubulikirkbya oertlii* n. sp., RV, x 160, fig. 20: holotype, rep. no. CK/III-51; fig. 25: rep. no. CK/III-30
- Fig. 21: Kirkbyid ostracod, gen. et spec. indet., RV, x 160, rep. no. CK/III-48
- Fig. 22: *Solleikope* ? *permica* n. sp., RV, holotype, x 150, rep. no. CK/III-17
- Fig. 23: *Haworthina* ? sp. 3, left lateral view of carapace, x 150, rep. no. CK/III-38
- Fig. 24: *Haworthina* ? sp. 2, right lateral view of carapace, x 150, rep. no. CK/III-36
- Fig. 26: *Kirkbya* ? sp. 2, right lateral view of carapace, x 150, rep. no. CK/III-57
- Fig. 27: *Roundyella* sp., RV, x 150, rep. no. CK/III-56
- Fig. 28: *Primitiella* ? sp., RV, x 150, rep. no. CK/III-42
- Fig. 29: *Paraberounella laterospina* n. sp., LV, holotype, x 150, rep. no. CK/III-40
- Fig. 30: *Ovornina (Tricornella)* sp., x 80, rep. no. CK/III-25

Plate 2

All figured specimens are from sample 655 (see pl. 1). Fig. 6 is a resedimented specimen from shallower, but also pelagic and rather deep environment.

- Figs. 1-5: *Pseudospinella ruggierii* n. gen. n. sp., fig. 1: holotype, x 160, rep. no. CK/VII-5, a) right lateral view of carapace, b) dorsal view of carapace; fig. 2: x 160, rep. no. CK/VII-6, a) right lateral view of carapace, b) ventral view of carapace; fig. 3: subadult carapace, right lateral view, x 300, rep. no. CK/III-28; fig. 4: dorsal view of carapace, x 300, rep. no. CK/III-58; fig. 5: juvenile carapace, left lateral view, x 280, rep. no. CK/III-43
- Fig. 6: *Parabythocythere siciliensis* n. sp. RV, holotype, x 160, rep. no. CK/III-5
- Fig. 7: *Bashkirina ? calogeroensis* n. sp., holotype, right lateral view of carapace, x 160, rep. no. CK/III-33
- Fig. 8: *Haworthina* sp. 1, x 160, rep. no. CK/III-46

Plate 1

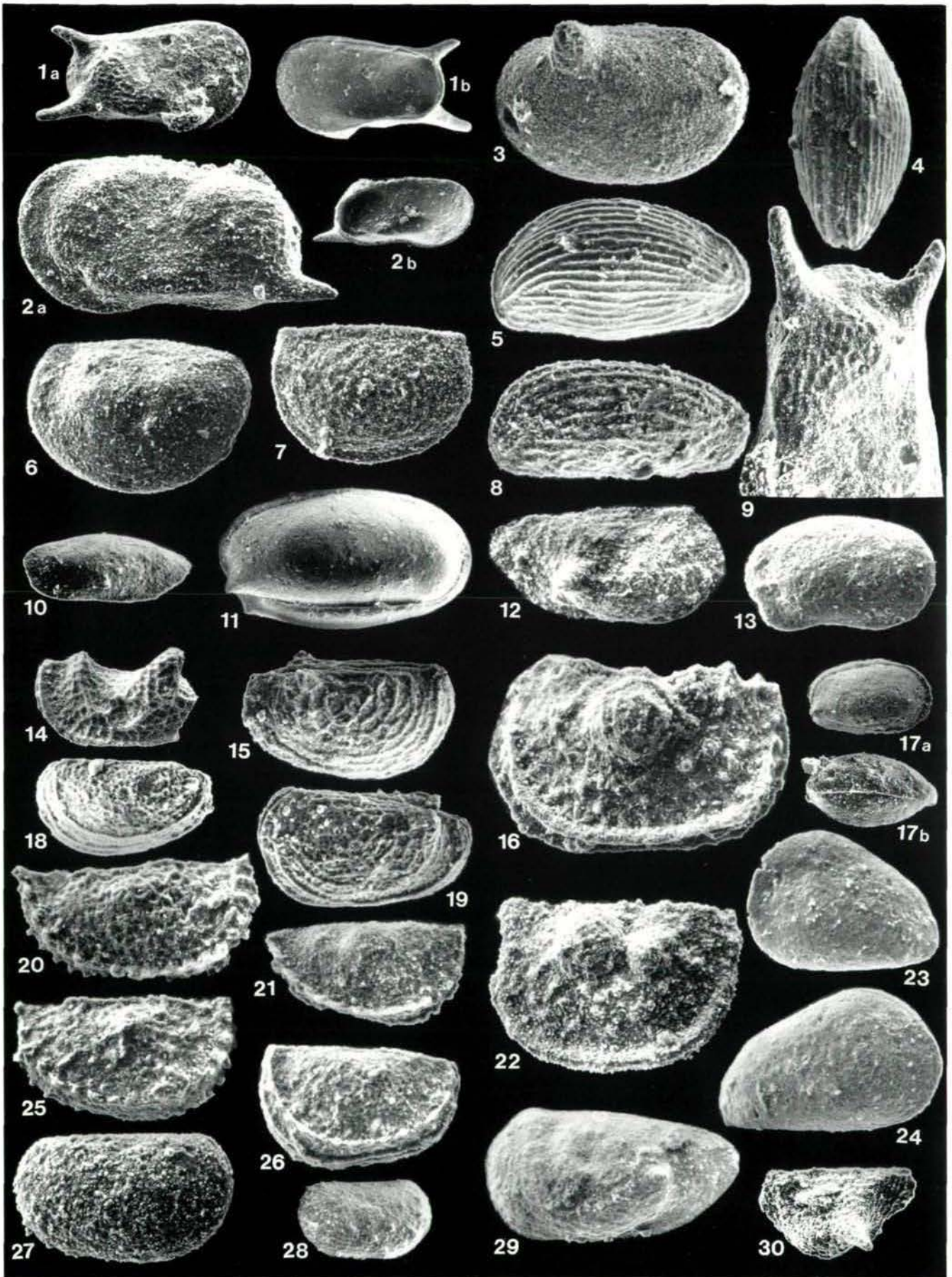


Plate 2

