New Permian ostracods from Greece (Hydra Island)

SYLVIE CRASQUIN-SOLEAU1 & AYMON BAUD2

1 CNRS Université Pierre et Marie Curie, Département Géologie Sédimentaire, T.15-25, E.4, case 104, 75252 Paris cedex 05, France.
2 Musée de Géologie, UNIL, BFSH2, CH-1012 Lausanne, Switzerland.

ABSTRACT — A new Permian (Late Asselian–Dorashamian) ostracod fauna (66 species belonging to 35 genera) from Hydra Island (Greece) is described. Twelve new species are described: *Hollinella* (*P.*) *hydraensis* Crasquin-Soleau n.sp., *Bairdia episkopiensis* Crasquin-Soleau n.sp., *Bairdia rigasensis* Crasquin-Soleau n.sp., *Bairdia thikiaensis* Crasquin-Soleau n.sp., *Chamisshaella marmariensis* Crasquin-Soleau n.sp., *Cypridina gussevae* Crasquin-Soleau n.sp., *Cyathus barmariensis* Crasquin-Soleau n.sp., *Cyathus klimakiensis* Crasquin-Soleau n.sp., *Bairdiacypris bistiensis* Crasquin-Soleau n.sp., *Shishaella hellenensis* Crasquin-Soleau n.sp., *Bairdia ishikakii* Crasquin-Soleau n.sp., *Petasobairdia kozuri* Crasquin-Soleau n.sp. Forty-four other species are figured. This assemblage is characteristic of a shallow water platform. The palaeobiogeographic relationships are presented and represent significant additions to the Permian Palaeotethyan ostracod faunas. *J. Micropalaeontol.* 17(2): 131–152, December 1998.

GEOLOGICAL SETTING

Hydra Island is located off the southeast coast of the Greek Argolis Peninsula (Fig. 1). This island is about 21 km long and 3 km wide. Due to the excellent exposures of Palaeozoic and Mesozoic rocks, this island has received much attention from micropalaeontologists, stratigraphers and sedimentologists. Permian strata contain abundant algae, fusulinaceans and other micropalaeontologists. Permian rocks of Hydra are part of the giant Permian carbonate platform (Baud et al., 1993) and contain one of the most fossiliferous sequences of Western Tethys. This sequence occurs within two groups of tectonic slices (Grant et al., 1991). The Permian units are at least 500 m thick and range from Asselian to Dorashamian in age. According to the lithology and age, this sequence has been subdivided by Baud et al. (1991) into three groups and 10 formations. In stratigraphic order (Fig. 2), there are the Thikia Group (five formations), the Klimaki Group (three formations) and the Barmari Group (two formations) (Grant et al., 1991).

The Thikia Group consists of five formations: in stratigraphic order, Nisitsa, Ormos, Lehuis, Mamantos and Cape Rigas, from Late Asselian to Early Artinskian. In this group, only two levels are studied here. They are at the top of the Lehuis Formation and at the base of the Cape Rigas Formation. The Lehuis formation (50–100 m thick) consists mainly of *Tubiphytes*-algal-sponge carbonate buildups. The Cape Rigas Formation (28 m thick) is subdivided into a lower calcareous unit (Eastern part), a middle calcareous and shaly unit (Late Early Artinskian), and an upper shaly unit (no typical fauna) (Grant et al., 1991).

The Klimaki Group is subdivided into three formations: Riga, Cape Bisti and Marmari. Only the last one contains ostracods and is of Late Murgabian age. It consists of two calcaro-dolomitic cycles, 50 and 100 m thick, respectively (Grant et al., 1991).

The Barmari Group is subdivided into two formations, the Episkopi Formation which fits below the Miras Formation above. They are separated by an unconformity from the underlying Klimaki Group. We will focus our analysis on the Episkopi Formation. The thickness of the formation varies from 10 m (tectonically reduced) at Agios Nikolaos (Eastern part) to 100 m at Lehuis, and 120 m at Episkopi section in the West.

The lower part is mainly composed of conglomerate lenses with dolomitic pebbles from the underlying Marmari Formation, or of thin bedded dolomiticite. The lower 90 m of the Episkopi Formation are thickly bedded and consist of high energy bioclastic lime packstone-grainstones with silification, rich in calcareous algae, small foraminifers and fragments of brachiopods, bryozoans and corals. The following 55 m of stratified limestones are characterized by flat to round chert

* In Sohn (1978): USNM locality 9260: southern side of the Island of Hydra, just off the Argolian coast, Greece (see Grant, 1972, pp. 214, 215, for description), about 0.5 km south of the village of Episkopi. Weathered limestone blocks containing silicified fossils on stratigraphically of two benches. USNM locality 9262: same Island as above, about 3 km north-northeast of Episkopi. Limestone blocks and pieces from a bed about 1.2 m thick.
Fig. 1. Schematic geological map of Hydra Island (after Grant et al., 1991) showing localities and sections sampled (stars): CB: Cape Bisti, Ep: Episkopi, CR: Cape Rigas.

pebbles in fine bioclastic lime packstone with sponge spicules, crinoids, calcareous algae and foraminifers. The cherty limestone is overlain by 10m of grey nodular lime wackestone followed by 30m of well bedded lime packstone-wackestone with marly interbeds. Sponges, crinoids, bryozoans, foraminifers and ostracods are associated with this facies which also contains the famous brachiopods localities of Grant (1995).

The shallow carbonate Episkopi Formation ends abruptly with algal limestones. The overlying Miras Formation is c. 30–100 m thick, and consists of brown to dark red shales with various carbonate lenses or blocks. This terrigenous unit still contains Permian brachiopods and forams.

OSTRACOD OCCURRENCE

Few data are available on Permian ostracods from Greece. Two papers (Kornicker & Sohn, 1976; Sohn, 1978) document Permian ostracods from Hydra Island. There are Thaumatomma piscifrons Kornicker & Sohn, 1976 (type species of Thaumatomma Kornicker & Sohn, 1976 – USNM locality 9260), Tribolbina doescheri Sohn, 1978 (localities 9260, 9262), Tribolbina aff. T. doescheri Kornicker & Sohn (1976, p. 107) added to the description of the genus Thaumatomma the following: ‘habitat: associated brachiopods, rare trilobite fragments, fusuline and others foraminiferids, as well as benthic ostracods in families including Bairdiidae, Amphissitidae, Kellettinidae, Roundyella Bradfield, 1935 (?Scrobiculidae), Hollinellidae and the presence of growth stages in many of the species indicate a normal marine shelf habitat’. They noted therefore the presence of different families without any species identification.

The ostracods described here occur in three main sections from the NE to the SW: Cape Rigas, Episkopi and Cape Bisti sections (Fig. 1). One sample of the Lehesis section (sample 48631) provides two species.

From 183 samples processed by hot acetolysis (Lethiers & Crasquin-Soleau, 1988) belonging to the four sections, only 39 samples contained ostracods. All the studied levels are well age-calibrated by foraminifera from the Late Asselian to Dorashamian (Grant et al., 1991). The distribution of the 66 ostracod species (34 genera) is given on a general stratigraphic section of the Permian of Hydra (Fig. 3).

SYSTEMATIC DESCRIPTIONS

All the material is deposited in the collections of the Geological Museum of Lausanne, Switzerland (MGL).

L1: anterior lobe; L2: median lobe; L3: posterior lobe; S2: median sulcus; L: length; H: height.
Order Podocopa Müller, 1894
Suborder Podocopina Sars, 1866
Superfamily Bairdiacea Sars, 1888
Family Bairdiidae Sars, 1888
Genus Bairdia McCoy, 1844

Bairdia rigasensis Crasquin-Soleau n. sp.
(Pl.1, figs 1–5)

? 1982 Parurobairdia sp. Chen & Shi: 135, pl. 8, figs 16–18.

Derivation of name. From Cape Rigas (Hydra Island), type locality.

Diagnosis. Carapace long and tapering; anterior border with small radius of curvature with maximum convexity located high; one straight ridge along ventral margin on each valve.

Types. Holotype: carapace MGL74389 (Pl. 1, fig.1); paratype: carapace MGL74390 (Pl. 1, fig. 2).

Type level. Sample 50148, Cape Rigas section, Hydra Island (Greece), Late Asselian–Early Artinskian.

Material. Eight complete carapaces.

Geographic and stratigraphic occurrences. Hydra Island, Cape Rigas section (sample 50148), Cape Rigas Formation, ? South China, Nantong, Mianyang, Late Asselian–Early Artinskian, ?Late Permian.
**Description.** Carapace long, with anterior and posterior borders laterally flattened; left valve slightly overlaps the right one all around the carapace; dorsal border straight at the two valves; anterodorsal border straight to gently concave; anterior border with small radius of curvature, laterally flattened, maximum convexity located above mid-height, anteroventral border straight; ventral border gently concave, presence of a straight ventral ridge on each valve; posteroventral margin straight and long; posterior border tapering, strongly flattened laterally, maximum convexity located below lower third of height; posterodorsal border straight; angle between posterodorsal border and dorsal border (of right valve) 130°, between dorsal border and anterodorsal border 140°; maximum height located at 57% of length; carapace smooth.

**Dimensions.** \( L = 0.62-1.10 \text{ mm}, \quad H = 0.25-0.58 \text{ mm} \)

**Discussion.** This species has a general outline close to that of *Bairdia vyasovkensis* Khvintseva, 1969 from the Kazanian of SW Urals, but that species has no ridge. This species has similar ventral ridges as in *Bairdia praealiger* Tkatscheva, 1975 (in Ivanova et al., 1975) from the Upper Carboniferous of Russian Platform, but here the ridges are straight and the valve overlap is less obvious.

The new species is tentatively put into synonymy with *Parurobairdia* sp. in Chen & Shi (1982) from the latest Permian of South China. Indeed, this species appears to be identical, but the figures are poor and no material could be examined.
### Fig. 3. Stratigraphic ranges of Permian ostracods of Hydra Island

| Early Permian | Late Permian | Triassic |
|---------------|--------------|----------|
|               |              | Age      |
|               |              |          |
|               |              |          |
| Late Artinskian | Murgabian | Midian | Dini-Masjin |  |
|              |            |          |
| Thikia       | Klimaki     | Barmari |
|              |            |          |
|              |            |          |
| Lahunis      | Cape Rigas  | Cape Bisti | Marmari | Episokpi | Miras | Eros |
|              |            | A      | B      | C      | D      | E      |

### List of Ostracods

1. Bairdiacypris venatrix CHEN, 1982
2. Holoceras (P.) hydromantis n.sp.
3. Liddiasia symetrica KOZUR, 1985
4. Shihiaella cf. helianaensis n.sp.
5. Acraea gauveae KOZUR, 1985
6. Knoxiella cf. oblonga WANG, 1978
7. Bairdiella epigoneana n.sp.
8. Acraea cf. scheirei KOZUR, 1985
9. Bairdiella I. CRONES & THURMAN, 1939 in CHEN & BAO, 1986
10. Bairdiella ricaeosis n.sp.
11. Bairdiella sp.A
12. Cypriidea aff. stephanii GLEBOVSKAYA, 1939
13. Parzincocypriis schaffneri KOZUR, 1985
14. Microchionella sp. sensu BENZAKT-SAID & CRASQUIN-SOLEAUV, 1997
15. Bairdiella thikhaisensis n.sp.
16. Basterella sp.D
17. Saliola nanoparva KOZUR, 1985
18. Saliola superpermanae KOZUR, 1985
19. "Acraea pulchra POSNER" in CHEN & BAO, 1986
20. Amphialus sp.
21. Chantshelia miramariaensis n.sp.
22. Cyrtolidae gen. et sp. nov.
23. Parapsocides subcadensis KOTSCHETKOVA, 1972
24. Polycypriis sp.
25. Cyathia bernieriensis n.sp.
26. Cyathia klimakieni n.sp.
27. Bairdiella deducta deducta (ZALANYI, 1974)
28. Microchionella cf. hungariae KOZUR, 1985
29. Bairdiacypris bistóriensis n.sp.
30. Pseudalassia sp.1
31. Pseudalassia sp.2
32. Pavlovkikryia cf. hydromantis KOZUR, 1985
33. Shihiaella helicanaensis n.sp.
34. Bairdiella cf. fordomensis KELETT, 1934 sensu GLEBOVSKAYA, 1939
35. Bairdiella ihazkiki n.sp.
36. Bairdiella sp. KOTSCHETKOVA, 1972
37. Microchionella postpedunculata CHEN, 1958
38. Bairdiacypris delos BRADFORD, 1935
39. Knightina sp.
40. Bairdiella sp.E
41. Lebardiella sp. sensu GERBY et al., 1987
42. Bairdiacypris sp.1
43. Ohriella sp. (B. BRADFIELD & SAMPLE, 1952)
44. Basterella sp. in CHEN & BAO, 1986
45. Bairdiella sp. subcontrata CHEN, 1987
46. Acraea sp. azaniae SIIR, 1987
47. Bairdiella sp.B
48. Cavallina viaroumani KOZUR, 1985
49. Gen sp. indet.1
50. Bairdiella sp.C
51. Rishiaella sp.
52. Microchionella persi persi KOZUR, 1985
53. Pantobairdiella luni n.sp.
54. Knightinae sp. azonata (WANG, 1978)
55. Parapsocides sp.
56. Acraea sp.1
57. Basterella sp.2
58. Fabriacypris obscura (SCHNEIDER, 1966)
59. Shihiaella sp.
60. Prenastacypris subangularis KOZUR, 1985
61. Acraea sp.2
62. Bardiella cf. baurii KELETT, 1934
63. Bairdiella sp.3
64. Gen sp. indet.2
65. Kirkbhaella sp.
66. Polycypris sp.1

---

Crasquin-Soleau & Baud
**New Permian ostracods from Greece**

Explanation of Plate 1

figs 1-5. *Bairdia rigaensis* Crasquin-Soleau n.sp. (sample 50148). fig. 1: right lateral view, holotype, MGL74389, ×50. fig. 2: right lateral view, paratype, MGL74390, ×50. fig. 3: right lateral view, MGL74391, ×50. fig. 4: right lateral view, MGL74423, ×50. fig. 5: right lateral view, MGL74392, ×80. figs 6-8. *Bairdia episkopiensis* Crasquin-Soleau n.sp. fig. 6: right lateral view, holotype, MGL74393, ×50, sample 50148. fig. 7: right lateral view, paratype, MGL74394, ×50, sample 50148. fig. 8: right lateral view, paratype, MGL74395, ×70, sample 50146. figs 9-12. *Bairdia thikiaensis* Crasquin-Soleau n.sp. fig. 9: right lateral view, paratype, MGL74396, ×90, sample 50148. fig. 10: right lateral view, paratype, MGL74397, ×70, sample 50148. fig. 11: right lateral view, holotype, MGL74398, ×60, sample 50148. fig. 12: right lateral view, MGL74399, ×70, sample 40-46. fig. 13. *Bairdia* sp. A, right lateral view, MGL74400, ×70, sample 50148. fig. 14. *Bairdia* sp. B, right lateral view, MGL74401, ×50, sample 48585.
Bairdia episkopiensis Crasquin-Soleau n.sp. (Pl. 1, fig. 6–8)

Derivation of name. From the Episkopi section, SW Hydra Island.

Diagnosis. Anterior border with small radius of curvature, flattened laterally; anteroventral border concave; posterior border flattened only in its ventral part.

Types. Holotype, carapace MGL74393 (Pl. 1, fig. 6); paratypes, two carapaces MGL74394 and MGL74395 (Pl. 1, fig. 7–8).

Type level. Sample 50148, Cape Rigas section, Hydra Island (Greece), Late Asselian–Early Artinskian.

Material. 10 complete carapaces

Geographic and stratigraphic occurrences. Hydra Island, Cape Rigas section, Lehusis Formation (sample 50146), Cape Rigas Formation (sample 50148), Episkopi section, Episkopi Formation, (sample 90–46); Late Asselian–Midian.

Description. Carapace smooth; left valve slightly overlaps the right one on all the borders; dorsal border gently convex on both valves; anterodorsal border nearly straight on both valves; anterior border with small radius of curvature, maximum convexity located at mid-height, flattened laterally; anteroventral border concave on both valves; ventral border concave; posterodorsal border concave; posterior border sharp, maximum convexity located at 60% of height, flattened laterally only in its ventral part; posterodorsal border straight on both valves; angle between posterodorsal border and dorsal border = 145°, between dorsal border and anterodorsal border = 135°, maximum height located just in front of mid-length.

Dimensions. L = 0.56–1.02 mm; H = 0.32–0.57 mm.

Discussion. This species can be compared to Bairdia subhassi Belousova, 1965 from the Upper Permian–Dzulihan-Dorashamian from Transcausus, which has a longer posterior border, an anterior border with a smaller radius of curvature and a maximum convexity located higher.

Bairdia thikiaensis Crasquin-Soleau n.sp. (Pl. 1, figs 9–12)

Derivation of name. From the type level of the Thikia Group.

Diagnosis. Carapace short with truncated anteroventral border, posterior border fine with maximum convexity located very low, and anterior border with maximum convexity located high.

Types. Holotype, carapace MGL74398 (Pl. 1, fig. 11); paratypes, two carapaces MGL74396 and MGL394397 (Pl. 1, figs 9–10).

Type level. Sample 50148, Cape Rigas section, Hydra Island (Greece), Late Asselian–Early Artinskian.

Material. Seven complete carapaces and some fragments.

Geographic and stratigraphic occurrences. Hydra Island, Cape Rigas section, Cape Rigas Formation (sample 50148), Cape Bisti section, Episkopi Formation (sample 90–31), Late Asselian–Midian.

Description. Carapace short (H/L = 0.61), flattened laterally in anterior and posterior parts; dorsal border straight in right valve, slightly convex in left valve; anterodorsal dorsal border almost straight in both valves; anterior border with very small radius of curvature, with maximum convexity located high (at 40% of height), anteroventral border straight to gently convex; ventral border concave on right valve, nearly straight on left one; posterodorsal border almost straight, posterior end in prolongation of it, posterior border with small radius of curvature, maximum convexity located low (at 85% of height); posterodorsal border straight on both valves; moderate overlap of left valve on right one all around the carapace; carapace slightly flattened laterally in anterior and posterior parts.

Dimensions. L = 0.54–0.86 mm; H = 0.32–0.51 mm.

Discussion. This species is similar to Bairdia alaricus Chen, 1958 from the Lower Permian of South China but is distinguished by its more truncated anteroventral border, a reduced overlap, especially dorsally and a thinner carapace.

Bairdia ishizakii Crasquin-Soleau n.sp. (Pl. 2, figs 1–6)

Derivation of name. In honor of Dr Ishizaki, Japan.

Diagnosis. Strong overlap of left valve over right one; presence of a large node in central part of each valve.

Types. Holotype, carapace MGL774403 (Pl. 2 fig. 2); paratypes, two carapaces MGL74405 and MGL74407 (Pl. 2, fig. 6).

Type level. Sample 48539, Hydra Island (Greece), Cape Rigas section, Episkopi Formation, Midian–Dorashamian.

Material. Two complete carapaces, three broken carapaces, five valves.

Geographic and stratigraphic occurrences. Hydra Island, Cape Rigas section (sample 48531), Episkopi section (sample 90–46), Episkopi Formation, Midian–Dorashamian.

Description. Carapace massive with very strong overlap of left valve over the right one all around the shell. Left valve: dorsal border convex, anterodorsal border strongly concave, anterior border with small radius of curvature (dorsal part almost horizontal and ventral part nearly vertical), maximum convexity located high; anteroventral border weakly convex to straight; ventral border straight to feebly convex; posterodorsal border straight; posterior border rounded with small radius of curvature; posterodorsal border concave. Right valve: dorsal border strongly convex; anterodorsal border nearly straight passing to anterior border which is tapering with very small radius of curvature; anteroventral border convex; ventral border

Explanation of Plate 2

figs 1–6. Bairdia ishizakii Crasquin-Soleau n.sp. fig. 1: right lateral view of broken carapace, MGL74402, ×50, sample 90–46. fig. 2: right lateral view, holotype, MGL74403, ×50, sample 48539. fig. 3: left lateral view of broken carapace, MGL74404, ×60, sample 48539. fig. 4: right lateral view of isolated valve, paratype, MGL74405, ×50, sample 48539. fig. 5: left lateral view of isolated valve, MGL74406, ×50, sample 48539. fig. 6: dorsal view, paratype, MGL74407, ×50, sample 48539. figs 7–10. Petasobairdia kozuri Crasquin-Soleau n.sp. fig. 7: right lateral view, holotype, MGL74408, ×60, sample 48587. fig. 8: right lateral view, paratype, MGL74409, ×60, sample 90–59. fig. 9: left lateral view, MGL74410, ×70, sample 90–59. fig. 10: left lateral view, MGL74411, ×60, sample 90–59. fig. 11. Bairdia sp.C, right lateral view, MGL74412, ×35, sample 50224. fig. 12. gen. sp. indet., left lateral view?, MGL74413, ×50, sample 90–59. fig. 13. Cypridella aff. stepanovi Giebovskaya, 1939, right ventro-lateral view, MGL74414, ×50, sample 50148. fig. 14–15. Bairdia? sp.D (sample 90–59). fig. 14: left lateral view, MGL74415, ×35. fig. 15: right lateral view, MGL74416, ×50.

136
New Permian ostracods from Greece
straight; posterodorsal border straight to gently convex; posterior border tapered; posterodorsal border concave. On both valves: carapace strongly flattened laterally in anterior and posterior parts; presence of large node in central part of valves; in dorsal view, carapace is very thick with strong overlap of left valve. Carapace smooth.

**Dimensions.** $L = 0.96-1.14 \text{ mm}; H = 0.56-0.62 \text{ mm}$.

**Discussion.** *Bairdia ishizakii* n.sp. is similar to *Spinobairdia* sp. described by Ishizaki (1964) from the Middle Permian Iwaizaki Limestone (NW Japan) but the latter species has a small central node and a straight dorsal border.

**Genus Petasobairdia** Chen, 1982

*Petasobairdia kozuri* Crasquin-Soleau n.sp.

(Pl. 2, figs 7–10)

**Derivation of name.** In honor of Dr Heinz Kosur, Hungary.

**Diagnosis.** Presence of three nodules on dorsal border of left valve.

**Types.** Holotype, carapace MGL74408 (Pl. 2 fig. 7); paratype carapace MGL74409 (Pl. 2, fig. 8).

**Type level.** Sample 48587, Hydra Island (Greece), Episkopi section, Episkopi Formation, Dzulfian–Dorashamian.

**Material.** Three complete carapaces, two isolated left valves, three isolated right valves and some fragments.

**Geographic and stratigraphic occurrences.** Hydra Island, Episkopi section (sample 90-46, 90-49), Cape Bisti section (sample 90-17), Episkopi Formation, Midian–Dzulfian.

**Description.** Carapace short with a few large punctae; left valve: outline round except in posterior part where posterior border is very fine; presence of three nodes on dorsal border; right valve: outline rounded except in anterior and posterior parts; anterior border horizontal in dorsal part and with small radius of curvature, posterior border very tapered; no nodes. On both valves: carapace strongly flattened laterally in anterior and posterior parts. Left valve overlaps the right valve all around the carapace with maximum in dorsal part.

**Dimensions.** $L = 0.72-0.88 \text{ mm}; H = 0.50-0.58 \text{ mm}$ (without nodes).

**Discussion.** This new species can be compared to *Petasobairdia bidentata* Kozur, 1985 from the Dzulfian of North Hungary which has two spines on dorsal border, but that species has a more triangular outline (probably caused by poor preservation?).

**Genus Bairdiacypris** Bradfield, 1935

*Bairdiacypris bistiensis* Crasquin-Soleau n.sp.

(Pl. 3, figs 11–12)

**Derivation of name.** From the Cape Bisti section.

**Diagnosis.** Carapace regularly convex at dorsal border of left valve, maximum height located at mid-length.

**Types.** Holotype, carapace MGL74420 (Pl. 3 Fig. 11); paratype, carapace MGL74421 (Pl. 3, Fig. 12).

**Type level.** Sample 90–49, Hydra Island (Greece), Episkopi section, Episkopi Formation, Midian–Dzulfian.

**Material.** Ten complete carapaces.

**Geographic and stratigraphic occurrences.** Hydra Island, Episkopi section (sample 90-46, 90-49), Cape Bisti section (sample 90-17), Episkopi Formation, Midian–Dzulfian.

**Description.** Dorsal outline of left valve regularly convex, at right valve dorsal, anterodorsal and posterodorsal borders straight; carapace flattened laterally in anterior and posterior parts; ventral border straight at left valve, concave at right one. Maximum height at mid-length.

**Dimensions.** $L = 0.65-1.08 \text{ mm}; H = 0.36-0.54 \text{ mm}$.

**Discussion.** This species is close to *Bairdiacypris deloi* Bradfield, 1935 from the Upper Carboniferous–Upper Permian of USA, Tunisia, South China (?), but differs in that the dorsal border of the left valve is more convex and the maximum height is located in the central part of the carapace. *Bairdiacypris bistiensis* Crasquin-Soleau n.sp. can also be compared to *Bairdiacypris haqanaensis* Gerry & Honingstein, 1987 from the Late Permian of Israel. This last species has an anterior border with a larger radius of curvature, a convex hinge line and a carapace that is not flattened laterally.

**Order Palaeocopida** Henningmøen, 1953

**Suborder Beyrichicopina** Scott, 1961

**Superfamily Aparchitacea** Jones, 1901

**Family Aparchitidae** Jones, 1901

**Genus Cyathus** Roth & Skinner, 1930

**Remark.** Guan (1978) described the genus *Sinocoelona* which is close to *Cyathus* Roth & Skinner, 1930 in outline but with lateral ridges and without a low velate structure along the free margin. Chen & Shi (1982), Chen & Bao (1986) and Shi & Chen (1987) place *Sinocoelona* Guan, 1978 in the genus *Cyathus* Roth & Skinner, 1930. Because of the nearly symmetric
New Permian ostracods from Greece
convexity of the carapace, orientation is difficult to ascertain. Kozur (1991a) published a long and very interesting discussion (pp. 16–17) about this problem and its systematic implications. The Chinese authors regard the strongly convex margin as being the ventral one. Kozur (1991a) considered that the convex margin is, in fact, the dorsal margin. After substantial observation of the specimens found here, the authors follow the Chinese procedure. Prof. F. Lethiers (Université P. et M. Curie, Paris, pers. comm.) thinks that these two genera are the same (Cyathus). In accordance with him, we consider that the lateral ornamentation is an insufficient character with which to separate the two genera because the lack of ridges is often the result of fossilization, and the velate structure is low and its observation is not always possible. The genus Sinocoeloneilla is a junior synonym of Cyathus.

**Cyathus barmariensis** Crasquin-Soleau n.sp.

(Pl. 4, figs 4–7)

**Derivation of name.** From the Barmari Group which include the type level.

**Diagnosis.** Carapace asymmetrical without ridges, very fine linear punctuation parallel to dorsal and ventral margins.

**Types.** Holotype, carapace MGL74318 (Pl. 4, fig. 4); paratype, carapace MGL74319 (Pl. 4, fig. 7).

**Type level.** Sample 90-49, Hydra Island (Greece), Episkopi section, Marmari Formation, Midian–Dzulfian.

**Material.** Ten complete carapaces.

**Geographic and stratigraphic occurrences.** Hydra Island, Episkopi section, Marmari Formation (sample 90-43), Episkopi section, Marmari Formation, Late Murgabian.

**Description.** Dorsal border convex in central part and gently concave at its two extremities; cardinal angles very obtuse; anterior border with great radius of curvature, maximum convexity located at 42–44% of height; ventral border regular convex with maximum height located at mid-length or slightly in front of mid-height; posterior border with small radius of curvature, maximum convexity located at 35–40% of height; carapace flattened laterally at anterior and posterior parts; in largest forms flattening also in ventral part; dorsal borders overhang hinge line on both valves but more strongly for the right one, right valve slightly overlaps the left one on free margins; surface with a very fine punctuation, which seems to be organized along lines parallel to dorsal and ventral borders.

**Dimensions.** $L = 0.55–0.76$ mm; $H = 0.36–0.45$ mm.

**Cyathus klimakiensis** Crasquin-Soleau n.sp.

(Pl. 4, figs 8–9)

**Derivation of name.** From the Klimaki Group which include the type level.

**Diagnosis.** Carapace symmetrical with fine ridges and organized puncte.

**Types.** Holotype, carapace MGL74322 (Pl. 4, fig. 8); paratype, carapace MGL74323 (Pl. 4, fig. 9).

**Type level.** Sample 50181, Hydra Island (Greece), Episkopi section, Marmari Formation, Late Murgabian.

**Material.** Three complete carapaces and some fragments.

**Geographic and stratigraphic occurrences.** Hydra Island, Episkopi section (sample 50181), Marmari Formation, Late Murgabian.

**Description.** Carapace almost symmetrical in lateral view, posterior border with a radius of curvature slightly smaller than anterior one; maximum height located at mid-length; anterior and posterior parts of dorsal border distinctly concave; presence of numerous fine ridges parallel to the ventral border, very fine punctuation between them.

**Dimensions.** $L = 0.55–0.58$ mm; $H = 0.32–0.35$ mm.

**Discussion.** The new species differs from **Cyathus barmariensis** Crasquin-Soleau n.sp. by the presence of fine ridges and a more symmetrical carapace in lateral view. In general outline, it is similar to **Sinocoeloneilla caperatus** Guan, 1978 from the Lower Permian of South China, but here it lacks the coarse lateral ridges. **Cyathus barmariensis** Crasquin-Soleau n.sp. is also close to **Cyathus ulrici** sensu Ivanov, 1965 from the upper part of Lower Permian of the Donetz (Ivanov, 1965) and of Guatemala (Lethiers et al., 1995). The species described by Ivanov (1965) is more elongated.

Superfamily **Hollinacea** Swartz, 1936

Family **Hollinellidae** Bless & Jordan, 1971

Genus **Hollinella** Coryell, 1928 emend. Kellett, 1929

Subgenus **Hollinella (Prachollinella)** Bless & Jordan, 1971

**Hollinella (Prachollinella) hydraensis** Crasquin-Soleau n.sp.

(Pl. 5, Figs 1–7)

**Derivation of name.** From Hydra Island.

---

**Explanation of Plate 4**

**figs 1–3. Sulcella superperminia** Kozur, 1985. fig. 1: right lateral view, MGL74315, × 50, sample 50176. fig. 2: left lateral view, MGL74316, × 50, sample 90-150. fig. 3: right lateral view, MGL74317, × 70, sample 48585. **figs 4–7. Cyathus barmariensis** Crasquin-Soleau n.sp. fig. 4: left lateral view, holotype, MGL74318, × 70, sample 90-49. fig. 5: left lateral view, MGL74319, × 90, sample 90-46. fig. 6: right lateral view, MGL74320, × 80, sample 90-46. fig. 7: left lateral view, paratype, MGL74321, × 90, sample 90-49. **figs 8–9. Cyathus klimakiensis** Crasquin-Soleau n.sp. (sample 50181). fig. 8: left lateral view, holotype, MGL74322, × 80. fig. 9: left lateral view, paratype, MGL74323, × 100. **fig. 10. Indivisia symmetrica** Kozur, 1985. right lateral view, MGL74324, × 100, sample 50146. **fig. 11. Shivaella cf. brazoensis** (Coryell & Sample, 1932), left lateral view, MGL74325, × 80, sample 90-49. **figs 12, 14–15. Chamisbaella marmoriensis** Crasquin-Soleau n.sp. fig. 12: right lateral view, holotype, MGL74326, × 90, sample 90-40. fig. 14: right lateral view, MGL74327, × 110, sample 48585. fig. 15: right lateral view, paratype, MGL74328, × 100, sample 90-59. **fig. 13. Shishaella cf. hellenensis** Crasquin-Soleau n.sp., right lateral view, MGL74329, × 60, sample 50146.
New Permian ostracods from Greece
Fig. 4. Size dispersion diagram (height / length) of *Hollinella (P.) hydraensis* n.sp. Lehesis formation (sample 50146), Cape Rigas section.

**Diagnosis.** Posterior cardinal angle close to 90°, ventral lobe fused with posterior lobe (L3), fringe smooth.

**Types.** Holotype, carapace MGL74301 (Pl. 5, fig. 1); paratypes, two carapaces MGL74302 and MGL74305 (Pl. 5, figs 3 and 5).

**Type level.** Sample 50146, Hydra Island (Greece), Cape Rigas section, Lehesis Formation, Late Asselian–Early Artinskian.

**Material.** Seventeen complete carapaces and three broken carapaces.

**Geographic and stratigraphic occurrences.** Hydra Island, Cape Rigas section (sample 50146), Lehesis Fomation, Late Asselian–Early Artinskian.

**Description.** Dorsal border long and straight; anterior cardinal angle = 110–120°; posterior cardinal angle 90°; anterior border with a very large radius of curvature, maximum convexity at mid-height or slightly below; L1 not visible; L2 distinct in its posterior part; S2 deep and long; L3 large and round fused with ventral lobe, the latter particulary visible in adult forms; fringe smooth in adults form, absent in instars; surface smooth; some specimens have two to five small nodes on the dorsal part of L3.

**Dimensions.** L = 0.52–0.96 mm; H = 0.32–0.52 (without L3); see Fig. 4.

**Discussion.** Our species is closed to *Hollinella (P.) emaciata* (Ulrich & Bassler, 1906) from the Lower Permian of Kansas, USA. In our species, the cardinal angles are less obtuse which tend to affect the lateral outline of the carapace.

Suborder unknown

Superfamily *Paraparachitacea* Scott, 1959
New Permian ostracods from Greece

Genus *Chamishaella* Sohn, 1971

*Chamishaella marmariensis* Crasquin-Soleau n.sp.

(Pl. 4, figs 12, 14−15)

**Derivation of name.** From the Marmari Formation, where the type level is located.

**Diagnosis.** Carapace small, shoulder of dorsal border located at mid-length, carapace flattened laterally along the free margins.

**Types.** Holotype, carapace MGL74326 (Pl. 4, fig. 12); paratype, carapace MGL74328 (Pl. 4, fig. 15).

**Type level.** Sample 90-40, Hydra Island (Greece), Episkopi section, Marmari Formation, Late Murgabian.

**Material.** Seven complete carapaces, some isolated valves.

**Geographic and stratigraphic occurrences.** Hydra Island, Episkopi section (samples 90-40, 90-59, 48585), Marmari and Episkopi Formations, Late Murgabian–Dorashamian.

**Description.** Species small for the genus; dorsal border straight at left valve, convex at right valve; anterior cardinal angle = 145−150°, posterior cardinal angle = 140°; anterior border with large radius of curvature, maximum convexity located slightly below mid-height; ventral border regularly arched, maximum height located at mid-length or slightly posteriorly; posterior border with medium radius of curvature, maximum convexity located at 47% of height; left valve overlaps right one all along free margins; carapace flattened laterally all along free margins; surface smooth.

**Dimensions.** $L = 0.46–0.53 \text{mm}; H = 0.31–0.44 \text{mm}$.

**Discussion.** This small species may be compared to *Dentopar-...*
New Permian ostracods from Greece

aparchites zalanyii Kozur, 1985 of the Lower Abadehian of Greece is close to this new species, but here the shoulder is in a more central position and the anterior border has a smaller radius of curvature.

Order Myodocopia Müller, 1894
Family Cypridinidae Baird, 1850
Genus Cypridina Milne-Edwards, 1840
Cypridina gussevae Crasquin-Soleau n.sp.

Derivation of name. In honour of Dr Ekaterina Gusseva, St. Petersburg (Russia).

Diagnosis. Carapace round with small rostral notch.

Types. Holotype, carapace MGL74347 (Pl. 4, fig. 3); paratype, carapace MGL74348 (Pl. 4, fig. 4).

Type level. Sample 90-43, Hydra Island (Greece), Episkopi section, Marmari Formation, Late Murgabian.

Material. Five carapaces

Geographic and stratigraphic occurrences. Hydra Island, Cape Bisti section (sample 90-33), Episkopi section (sample 90-43), Marmari Formation–Episkopi Formation, Late Murgabian–Dzulfian.

Description. Dorsal border regularly arched; anterior border with typical rostral notch; ventral and posterior borders regularly arched; carapace smooth, slightly laterally compressed in anterior part; right valve slightly overlaps the left one.

Dimensions. L = 0.41–0.60 mm; H = 0.31–0.43 mm.

Discussion. This species is comparable to Cypridina ovata Gusseva, 1986 (in Gusseva et al., 1986) from the Lower Permian of Russian Platform, but in our species the posterior border is round and the rostral notch is smaller.

PALAEOECOLOGY

The general composition of this marine ostracod assemblages for the entire composite section is typical of a shallow platform under tropical conditions, so characteristic of the Palaeotethys realm at this time. The Bairdiacea dominate (56% of the species) other benthic superfamilies and families, with specimens larger than 1 mm. A few pelagic species without palaeoecological significance are associated with the Pararchitaceae, Kloedenellacea, Hollinacea, etc. This is characteristic of Late Palaeozoic open platforms, with calm conditions under a warm climate. Following the discussion of Lethiers et al. (1989) on the Late Permian environments of the Marls of Merbah el Oussif (Tunisia), we can add that the encountered ostracod genera are known to be benthic, shallow-marine forms, living near the water–sediment interface or on vegetation matter. The ecological requirements of some species have already been detailed for the Lower Permian of Texas (Melnyk & Maddocks, 1988) and Kansas (Peterson & Kaesler, 1980; Costenzo & Kaesler, 1987). For example, the Bairdiacypsis group belongs to a nearshore group of species. Large Hollinella, with developed adventral structure, can characterize an environment such as an intertidal bay prodelta and interdeltaic embayment lagoons (lowermost level of the section). The Bairdia group characterizes carbonate, open-marine environments. Carapaces are often broken and most of the well-represented species show only adults and last-larval stages (except for Hollinella hydraensis Crasquin-Soleau n.sp. which yields larval stages). This is a consequence of a high-energy biocenosis or a thanatocoenosis (Whatley, 1983, 1988; Brouwers, 1988). However, transportation was limited since most individuals are represented by closed carapaces, indicating a soft substratum and a relatively high sedimentation rate (Oertli, 1971). However, some small variations are identifiable within these general characteristics along the section.

The general ecological changes are summarized in Fig. 5. At the top of the Lehusis Formation, the percentage of Bairdiacea is low (45%) and the Kloedenellacea, characteristic of very shallow environments where salinity conditions can be very variable, abound together with the Hollinacea (the only level of the section). At the base of the Cape Rigas formation, the percentage of Bairdiacea increases very significant (70% of species), with less Kloedenellacea, and without Hollinacea: this environment is deeper, with more stable living conditions.

After a gap (no ostracods found in the studied samples) along Cape Rigas, Riga, Cape Bisti and lower Marmari formations, we have in the Marmari a relatively homogeneous composition with low percentages of Bairdiacea, Pararchitaceae, Kloedenellacea: this represents a typical shallow platform environment. Nevertheless, a small event occurs at the boundary of the Marmari and Episkopi formations where the percentage of Bairdiacea increases together with the progressive disappearance of Kloedenellacea. This indicates a rapid deepening of the sea and the optimum marine environment for the construction of the last Permian carbonate platform. This event is correlated with the C event of Baud et al. (1991).

PALAEOBIOGEOGRAPHIC RELATIONSHIPS

The Hydra ostracod fauna contains a great number of new...
species, which is not surprising as there have been few published studies on the Permian ostracods from this area. In contrast, Permian ostracods are relatively well known in the USA and Russia (see exhaustive bibliography in Lethiers & Crasquin-Soleau, 1995). Available data on the Permian Tethys domain s.l., besides Greece (Kornicker & Sohn, 1976; Sohn, 1978) come from Hungary (Zalanyi, 1974; Kozur, 1985a, b), Sicily (Kozur, 1991a, b), Tunisia (Lethiers et al., 1989; Said-Benzarti & Crasquin-Soleau, 1997), Israel (Gerry et al., 1987), and South China (Chen, 1958; Wang, 1978; Chen & Bao, 1986; Chen & Shi, 1982). Some punctual studies were carried out in Japan by Ishizaki (1964).

Figure 6 establishes the relationships between the Hydra Island ostracod fauna and the other ones from known Permian localities. The last line presents the number of common species and the number of species compared to forms belonging to other Permian localities. For clarity, we can use the 'provincialism index' (Johnson, 1971) **PI (PI = C/2Ei)**, where **C** is the number of common species between two areas and **Ei** the number of endemic species in the area where they are at their lowest number. We observe that the relationships of the Hydra taxa are close to those of Hungary (**PI = 0.14 and 0.17 with the affine species**); this was expected as Hungary is the nearest site to Hydra palaeogeographically. After that, in decreasing order, we note the relations with South China (**PI = 0.08-0.14**), the Russian Platform (**PI = 0.05-0.10**), Tunisia (**PI = 0.02**), Israel (0.02) and the USA (**PI = 0.01-0.05**). The most interesting aspect is the significant palaeobiogeographic relationships between Hydra Island and South China during Permian time. This could be explained by the importance of surface palaeocurrents from East to West in the Palaeotethys realm (Lethiers & Crasquin-Soleau, 1995) that would have dispersed the taxa.

**CONCLUSION**

The present study of Permian ostracods from Greece recognizes 66 species and provides 12 new ones. The palaeoecological setting is typically of a shallow marine, carbonate platform environment under a tropical climate, but varying conditions were also recognized.

The palaeobiogeographical relationships point out connections between Hydra and Hungary, South China and the Russian Platform, and these emphasize the importance of the dispersal of ostracod fauna in the Tethyan realm during Permian times.

**ACKNOWLEDGEMENTS**

The authors are very grateful to Prof. Peter J. Jones (Canberra, Australia) and to Dr Heinz Kozur (Budapest, Hungary) for their accurate examination and review of the manuscript. Even though we are not always in agreement regarding several systematic determinations, the first author would like to express to them her friendship and her respect. They thank Dr Patrick De Deckker (Australian National University) for his very kind help in the last version of the manuscript.

**References**

Angiolini, L., Dragonetti, L., Muttoni, G. & Nicora, A. 1992. Triassic stratigraphy in the island of Hydra (Greece). Rivista italiana di paleontologia e stratigrafia, 98: 137–180.

Baud, A., Jenny, C., Papanikolaou, D., Sideris, C. & Stampfl, G. 1991. New observations on Permian stratigraphy in Greece and geodynamic interpretation. Bulletin of the Geological Society of Greece, 25: 187–206.

Baud, A., Marcoux, J., Giraud, R., Ricou, L. E. & Gaetani, M. 1993. Late Murghabian Palaeoenvironments (266 to 264 Ma). In Deckker, J., Ricou, L. E. & Vrielynck, B. (Eds), Tethys Atlas Palaeoenvironmental Maps. BEICIP-FRANLAB, 9–20.

Belousova, Z. D. 1965. Evolution and succession of organisms at the Paleozoic–Mesozoic boundary. Trudy Paleontologiceskogo Instituta Akademia Nauk. SSSR, 108: 245–265 (in Russian).

Bradfield, H. H. 1935. Pennsylvanian Ostracods of Ardmore Basin, Oklahoma. Bulletin of American Paleontology, 22: 1–145.

Brouwers, E. M. 1988. Sediment transport detected from the analysis of ostracod population structure: an example from the Alaskan continental shelf. In De Deckker, P., Colín, J.-P. & Peypouquet, J.-P. (Eds): Ostracoda in Earth Sciences, 231–244, Elsevier, Amsterdam.

Chen, D.-q. & Bao, H. 1986. Lower Permian ostracodes from the Chisua formation of Jurong and Longtan, Jiangsu Province. Acta Micro-paleontologica Sinica, 3: 107–132 (in Chinese).

Chen, D.-q. & Shi, C.-g. 1982. Latest Permian ostracoda from Nantong, Jiangsu and from Miannyang, Hubei. Bulletin of Nanjing Institute of Geology and Palaeontology, Academia Sinica, 4: 105–152 (in Chinese).

Chen, T. C. 1958. Permian ostracods from the Chihisia limestone of Lungtan, Nanking. Acta Palaeontologica Sinica, 6: 215–257 (in Chinese).

Costenzo, G. V. & Kaesler, R. L. 1987. Changes in Permian marine ostracod fauna during regression, Florena shale, northeastern Kansas. Journal of Paleontology, 61: 1204–1215.

Corvell, H. N. & Sample, C. H. 1952. Pennsylvanian ostracoda. A study of the ostracoda fauna of the East Mountain shale, Mineral Wells, Texas. American Midland Naturalist, 13: 245–281.

Gerry, E., Honingstein, A., Derin, B. & Flexer, A. 1987. Late Permian Ostracodes of Israel. Taxonomy, distribution and paleogeographical implications. Senckenbergiana lethaea, 68: 197–223.

Glebovskaja, E. M. 1939. Upper Palaeozoic ostracods from Northern
Fig. 6. Table identifying the palaeobiorelationships between Hydra Island ostracod taxa and those from other known localities for Permian time. 1 - from Kozur (1985a, b), Zalanyi (1974); 2 - from Chen & Bao (1986), Shi (1987), Shi & Chen (1987), Wang (1978), Chen (1958); 3 - from Lethiers et al. (1989), Sád-Benártzi & Crasquin-Soleau (1997); 4 - from Ulrich & Bassler (1906), Kellett (1934), Harris & Lalicker (1932), Coryell & Sample (1952); 5 - from Gerry et al. (1987); 6 - from Glebovskaya (1939), Kotschetkova (1972), Schneider (1966).

| Species | Endemic | Hungary | South China | Tunisia | USA | Israel | Russian PF |
|---------|----------|---------|-------------|---------|-----|--------|------------|
| Acratia pulchra | ✓ | | | | | | |
| Acratia cf. schreter | Kozur, 1985 | | | | | | |
| Acratia sp. 1 | | | | | | | |
| Acratia sp. 2 | | | | | | | |
| Acratia cf. australis | Shi, 1987 | | | | | | |
| Acratia gautieri | Kozur, 1985 | | | | | | |
| Amphistegina | | | | | | | |
| Bairdia cf. feutigera | Kellett, 1934 | | | | | | |
| Bairdia cf. foraminifer | Kellett, 1934; GLEBOVS., 1939 | | | | | | |
| Bairdia cf. subconstricta | Chen, 1987 | | | | | | |
| Bairdia deducta | deducta (Zalanyi, 1974) | | | | | | |
| Bairdia sp. | | | | | | | |
| Bairdia galei CHON & THUR., 1939 in CHEN & BAO, 1986 | | | | | | | |
| Bairdia ishikazaki n.sp. | | | | | | | |
| Bairdia magna | KOCHETKOV, 1972 | | | | | | |
| Bairdia sp. A | | | | | | | |
| Bairdia sp. B | | | | | | | |
| Bairdia sp. C | | | | | | | |
| Bairdia indica | n.sp. | | | | | | |
| Bairdia sp. D | | | | | | | |
| Bairdia hystricis | n.sp. | | | | | | |
| Bairdia cyprischla BRADFORD, 1935 | | | | | | | |
| Bairdia cypris | sp. 1 | | | | | | |
| Bairdia cypris variata | CHEN, 1987 | | | | | | |
| Bairdiella cf. acuta | KOCHETKOV, 1972 | | | | | | |
| Bairdiella sp. 1 | | | | | | | |
| Bairdiella sp. 2 | | | | | | | |
| Bairdiella nana | CHEN & BAO, 1986 | | | | | | |
| Caudolina strigosa | KOZUR, 1985 | | | | | | |
| Chamshaella marmaroeana | n.sp. | | | | | | |
| Citharites harmonics | n.sp. | | | | | | |
| Citharites klimatkienzi | n.sp. | | | | | | |
| Cypredella aff. sputorni | GLEBOVS., 1939 | | | | | | |
| Cypredella sp. 1 | | | | | | | |
| Cyclocypris olivacea | SCHNEIDER, 1966 | | | | | | |
| Cyclocypris sp. | | | | | | | |
| Gen sp. indet. 1 | | | | | | | |
| Gen sp. indet. 2 | | | | | | | |
| Hyalomma (P.) hydrazensis | n.sp. | | | | | | |
| Indirenia symmetricalis | KOZUR, 1985 | | | | | | |
| Kirkbiella | sp. | | | | | | |
| Kruplena cf. unicolor | WANG, 1978 | | | | | | |
| Kruplena? sp. | | | | | | | |
| Kretula cf. oblonga | WANG, 1978 | | | | | | |
| Microcheilina cf. hungarica | KOZUR, 1985 | | | | | | |
| Microcheilina parva | KOZUR, 1985 | | | | | | |
| Microcheilina paracentra | CHEN, 1958 | | | | | | |
| Microcheilina sp. | | | | | | | |
| Pyramidohastra | sp. 1 | | | | | | |
| Paramacrocypris | schaffneri | KOZUR, 1985 | | | | | |
| Paracypriinae | solutaliensis | KOSCHETKOV, 1972 | | | | | |
| Paracypriopsis sp. | | | | | | | |
| Pararhabdenia | cf. acuta | KOZUR, 1985 | | | | | |
| Pytaxobius | kustri | n.sp. | | | | | |
| Pseudocypris | sp. 1 | | | | | | |
| Pseudocypris | sp. 2 | | | | | | |
| Pseudocypris | subtriorugulosa | KOZUR, 1985 | | | | | |
| Richarzinia | sp. | | | | | | |
| Richarzinia | sp. 1 | | | | | | |
| Richarzinia | sp. 2 | | | | | | |
| Shishamella | sp. | | | | | | |
| Shishamella cf. helmenensis | n.sp. | | | | | | |
| Shishamella helmenensis | n.sp. | | | | | | |
| Shishamella | cf. brevicaudata (COYELL & SAMPLE, 1952) | | | | | | |
| Scolocellina | megaspina | KOZUR, 1985 | | | | | |
| Scolocellina | superga | KOZUR, 1985 | | | | | |
| Urocypris | sp. s.str. | GERRY et al., 1987 | | | | | |
| Total | 34 | 10±2 | 6±4 | 2 | 1±3 | 1±1 | 4±3 |

| | 1P= C/2E, | 0.14 | 0.08 | 0.02 | 0.01 | 0.01 | 0.05 | 0.10 |

* This is the species figured by Chen & Bao (1986), but this is not Acratia pulchra Posner
** This is the species figured by Chen & Bao (1986), but this is not Bairdia galei Croneis & Thurman, 1939.
*** Only pl. 12, figs 25, 26, 29 in Chen (1982).
New Permian ostracods from Greece

part of Ural. *Trydi NIGRA*, A, 115: 165–176 (in Russian)

Grant, R. E. 1995. Upper Permian brachiopods of the superfamily Orthopectoidea from Hydra Island, Greece. *Journal of Paleontology*, 69: 655–670.

Grant, R. E., Nestell, K., Baud, A. & Jenny, C. 1991. Permian stratigraphy of Hydra Island, Greece. *Palaios*, 6: 479–497.

Guan, S-Z. 1985. Late Permian Ostracods from the Western border of Tarim Basin, Xinjiang. *Acta Micropalaeontologica sinica*, 2: 237–247 (in Chinese).

Gusseva, E. A., Kashevarova, N. P. & Molostovskaja, I. I. 1986. Ostracods. *In The Atlas of Characteristic Complexes of the Permian Fauna and Flora of the Urals and Russian Platform*. NEDRA, Moscow, 331: 15–28 (in Russian).

Harris, R. W. & Lalicker, C. G. 1932. New Upper Carboniferous Ostracoda from Oklahoma and Kansas. *American Midland Naturalist*, 13: 396–409.

Ishizaki, K. 1964. Middle Permian Ostracods from the Iwaizaki Fauna and Flora of the Urals and Russian Platform. *Science report of the Tohoku University*, Sendai, 36: 139–160.

Ivanova N. O., Kotschetkova N. M., Stepnait, N. E. & Tkatscheva, I. D. 1975. Ostracoda. *In Palaeontological atlas of coal sediments of Ural* 131–145. (in Russian).

Jenny-Deshusses, C. & Baud, A., 1989. *Colaniella*, foraminifère index du Permien tardif tethysien: propositions pour une taxonomie simplifiée, répartition géographique et environnements. *Eclogae Geologicae Helvetiae*, 82: 869–901.

Johnson, J. G. 1971. A quantitative approach to faunal province analysis. *American Journal of Science*, 270: 257–280.

Kellett, B. 1934. Ostracods from the Upper Pennsylvania and the Lower Permian strata of Kansas: II. the genus *Bairdia*. *Journal of Paleontology*, 8: 120–138.

Khvintseva, E. A. 1969. New ostracods from the Kazanian deposits of Orenburg province. *Paleontological Journal*, 3: 85–94.

Kohn, P. A. & Dewey, C. P. 1990. Permian ostracods from the upper Hueco Formation, Robledo Mountains, New Mexico. *The Compass, the earth-Science journal of Sigma Gamma Epsilon*, 67: 217–224.

Kornicker, L. F. & Sohn, I. G. 1976. Phylogeny, ontogeny and morphology of living and fossil Thaumatomycladidae (Mysidacea: Ostracoda). *Smithsonian Contributions to Zoology*, 219: 1–214.

Kotschetkova, N. M. 1972. Ostracods form the stratotypic section of Asselain, Tciransk level (Bashkiria, Pre-Ural). *Systemic Boundaries in China; Permian and Triassic Boundary*, 5: 137–151. (in Russian).

Kozur, H. 1985a. Biostratigraphical evaluation of the Upper Paleozoic conodonts, ostracods and holothurian sclerites of the Bük at Mesopotamian (Upper Pennsylvanian, Bashkirian) Series of Mesopotamia. *New Ostracoden Arten aus dem Oberen Mittelkarbon Helvetiae*, 19: 211–313.

Kozur, H. 1985b. Neue Ostracoden Arten aus dem Oberen Mittelkarbon Helvetiae, 19: 211–313.

Kozur, H. 1991a. Permian deep water ostracods from Sicily (Italy). *Geology von Hydra (Griechenland). Geologica und Palaeontologica, Marburg*, 2: 163–171.

Kozur, H. 1991b. *Permian ostracods from the Hamlin Shale and the Americus Limestone (Permian, Wolfcampian) in Northeastern Kansas*. University of Kansas Paleontological Contributions, 100: 1–26.

Lethiers, F. 1998. Comment extraire des microfossiles à tests calciteux de roches calcaires dures. *Revue de Micropaléontologie*, 31: 56–61.

Lethiers, F. & Crasquin-Soleau, S. 1988. Distribution des ostracodes et paléocourantologie au Carbonifère terminal-Permien. *Geobios*, 21: 93–108 (in Russian).

Lethiers, F. & Crasquin-Soleau, S. 1995. *New ostracods from the Iwaizaki* (in Chinese).

Maddocks, R. F. 1988. Ostracode biostratigraphy of the Permo-Carboniferous of Central and North-Central Texas, Part I: Paleoenvironmental framework. *Micropaleontology*, 34: 1–20.

Meadow, D. H. & Maddocks, R. F. 1988. Ostracode biostratigraphy of the Permo-Carboniferous of Central and North-Central Texas, Part I: Paleoenvironmental framework. *Micropaleontology*, 34: 1–20.

Meyn, D. H. & Maddocks, R. F. 1988. Ostracode biostratigraphy of the Permo-Carboniferous of Central and North-Central Texas, Part I: Paleoenvironmental framework. *Micropaleontology*, 34: 1–20.

Nestell, M. K. & Grant, R. E. 1987. Permian fusulinid succession on Hydra, Greece. *11th International Congress on Carboniferous Stratigraphy and Geology, Beijing, Abstracts with Papers, Symposium and Miscellaneous*, 2: 471–472.

Nestell, M. K. & Wardlaw, B. R. 1987. Upper Permian conodonts from Hydra, Greece. *Journal of Paleontology*, 61: 758–772.

Oerli, H. J. 1971. The aspects of ostracode faunas - a possible new tool in petroleum sedimentology. *Bulletin Centre de Recherche Pau-SNPA*, 5: 137–151.

Peterson, R. M. & Kaesler, R. L. 1980. Distribution and diversity of ostracode assemblages from the Hamlin Shale and the Americas Lime stone (Permian, Wolfcampian) in Northeastern Kansas. *University of Kansas Paleontological Contributions*, 100: 1–26.

Renz, C. & Reichel, M. 1946. Beitrag zum Problem der Stratigraphie und Palaeonologie des ostmediterranen Jungpalaeozoikums und dessen Einordnung im griechischen Gebirgsystem. *Eclogae Geologicae Helvetiae*, 38: 211–313.

Römermann, H. 1968. Geologie von Hydra (Griechenland). *Geologica und Palaeontologica, Marburg*, 2: 163–171.

Römermann, H. 1969. *Geologie von Hydra (Griechenland). Inaugural Dissertation, Phillips Universität, Marburg*, 62 pp.

Römermann, H., Graf, W., Huckriede, P., Jacobshagen, F., Walliser, H., Zapfe, H. & Borbovs, J. 1981. Hydra: *In Collection of Geologic Maps 1: 50000, Geological Survey of Greece, Institute for Geology and Subsurface Research (I.G.M.E.)*, Athens.

Said-Benzarti, R. & Crasquin-Soleau, S. 1998. Les ostracodes du Permien supérieur de Tunisie reconnu en subsurface. In Crasquin-Soleau, S., Braccini, E. & Lethiers, F. (Eds): “What about Ostracod?”. *Bulletin des Centres de Recherches Exploration-Produktion Elf-Aquitaine*, 120 (in press).

Schneider, G. F. 1966. Ostracods from the Upper Permian sediments of the Russian Platform and their stratigraphic significance. *Naukova Dumka*, 93–108 (in Russian).

Shi, C.-g. 1987. Ostracods from the Taiyuan Formation of South-eastern Shanxi. *Late Paleozoic Coal Bearing Strata and Biota from Southeastern Shanxi, China*. 291–306, Nanjing University Press.

Shi, C.-g. & Chen, D.-q. 1987. The Changhsingian ostracods from Meishan Changxing, Zhejiang. *Systemic Boundaries in China; Permian and Triassic Boundary*, 5: 23–80 (in Chinese).

Sohn, I. G. 1971. New Late Mississippian Ostracode genera and species from Northern Alaska. A review of the Pararaparitacea. *United States Geological Survey Professional Paper*, 711A: 1–24.

Sohn, I. G. 1972. Late Paleozoic Ostracode species from the continuous United States. *United States Geological Survey Professional Paper*, 711B: 1–13.

Sohn, I. G. 1978. *Triobolina Latham, 1932, an early Carboniferous through Permian Palaeocopid ostracode genus*. *Journal Research United States Geological Survey*, 6: 633–676.

Stow, D. A. V. 1975. New fusulinid evidence for the Permian age of the Palaeozoic rocks of Hydra, Greece. *Gecological Magazine*, 112: 71–76.

Ulrich, E. O. & Bassler, R.S. 1906. New American Paleozoic Ostracoda. *Proceedings of the United States National Museum*, 30: 149–164.

Vachard, D., Martini, R. & Zannetti, L. 1995. Le Murgabiens à fusulinoides des îles d’Hydra, Cretè et Mytilène (Permien supérieur de Grèce). *Geobios*, 28: 395–406.

Wang, S.-q. 1978. Late Permian and Early Triassic ostracods of Western Guizhou and Northeastern Yunnan. *Acta Palaeontologica Sinica*, 17: 277–312 (in Chinese).

Whatley, R. C. 1983. The application of ostracoda to paleoenvironmental analysis. *In: Maddocks R. F. (Ed.), Applications of Ostracoda*, 51–77, University of Houston Department Geosciences.
Whatley, R. C. 1988. Population structure of ostracods: some general principles for the recognition of palaeoenvironments. In De Deckker, P., Colin, J.-P. & Peypouquet, J.-P. (Eds), Ostracoda in Earth Sciences, 244–256, Elsevier, Amsterdam.

Zalanyi, B. 1974. Die oberpermischen Ostracoden des Bükkgebirges. In Sido, M., Zalanyi, B. & Schreter, Z. (Eds), Neue paläontologische Ergebnisse aus dem Oberpäleozoikum des Bükkgebirges. 96–251, Akadémiai Kiadó, Budapest.