EWA OLEMPSKA

LOWER CARBONIFEROUS OSTRACODES OF THE HOLY CROSS MOUNTAINS, POLAND


Forty four Tournaisian and Lower Viséan ostracode species from the SW Holy Cross Mts (Góry Świętokrzyskie) have been identified, including two new ones: Graphiopholideos slowikensis sp.n. and Microchelina bushminae sp.n. Their stratigraphic importance to the Upper Devonian and Lower Carboniferous, as well as their geographical distribution have been discussed.

Key words: Ostracoda, Lower Carboniferous, Poland.

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INTRODUCTION

The Carboniferous ostracodes of Poland have so far been little known, except for the ostracodes described from the deposits referred to the Tournaisian, Viséan and Namurian of NW Poland (Blaszynk and Natusiwicz 1973). As shown, however, by studies on the conodonts and spores (Matyja 1976; Turnau 1978), a part of these deposits belongs to the Devonian, whereas the Carboniferous strata are not later than the Viséan. A description of ostracodes from the Viséan deposits of SE Poland has been just published (Woszczyńska 1981).

The presence of ostracodes in the Carboniferous deposits of the Holy Cross Mts (Góry Świętokrzyskie) was mentioned several times in papers dealing with another fauna. The present writer found Lower Carboniferous ostracodes in a trench situated near the village of Kowala and in the Jabłonna IG-1 borehole in the SW Holy Cross Mts. This assemblage includes forty four species (Table 1). Some Upper Devonian and Lower Carboniferous ostracodes from the outcrops mentioned above have been described by the present writer in an earlier paper (Olempska 1979) including also remarks on their paleoecology. Thus, the present paper is limited only to a description of twenty-one species, including two new ones, whose occurrence in the Holy Cross Mts is restricted to the Carboniferous only (Table 1).
The collections of ostracodes here studied is housed at the Institute of Paleobiology, Polish Academy of Sciences (ZPAL), Warsaw.

Acknowledgement. — The present writer's thanks are due to Dr. Halina Zakowa (Holy Cross Branch, Geological Institute, Kielce) for making available for examination her collection of ostracodes from the Jabłonna IG-1 borehole and to Dr. Hanna Matyja (Institute of Geological Sciences, Polish Academy of Sciences, Warsaw), for the identification of conodonts. The writer also feels indebted to Professor Krystyna Pożaryska and Dr. Janina Szczechura (Institute of Paleobiology, Polish Academy of Sciences, Warsaw) for their critical remarks on the text of this paper. The photographs of specimens were taken by Mrs. M. Radzikowska.

GEOLOGICAL REMARKS

Kowala. — The ostracodes of this locality come from a condensed profile of the Upper Devonian and Lower Carboniferous deposits whose stratigraphic-lithological characteristics were given first by Czarnocki (1928, 1933) and later by Żakowa (1967, 1970) who found, mostly on the basis of lithology, a gradual transition of the Devonian deposits into the Lower Carboniferous deposits. So far, only the trilobites (Osmólksa 1962) were paleontologically elaborated and they determined the Gattendorfia Stage in this profile. Judging from the lithological characteristics of the strata containing the ostracodes here described and the trilobites (Osmólksa 1962), it is most probable that they represent the same horizon.
Table 1
Ostracode stratigraphical ranges in the Upper Devonian and Lower Carboniferous of the Holy Cross Mts (Upper Devonian ostracodes after Olempska 1979)

<table>
<thead>
<tr>
<th>Species</th>
<th>SYSTEMS</th>
<th>DEVONIAN</th>
<th>LOWER CARBONIFEROUS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stages</td>
<td>Upper</td>
<td>Lower</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pemnian</td>
<td>Tournaisian</td>
</tr>
<tr>
<td></td>
<td></td>
<td>zones</td>
<td>Bispinodales</td>
</tr>
<tr>
<td>Cypellina tenuisacata OLEMPSKA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cypellina sp.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amphissites sp.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Helicostrospira sp.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kiwiria ? sp.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neidadelia antrocytidea BLUMENSTEINER</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marginohaezia rumbevii OLEMPSKA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neohaezia Blumensteiner sp.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plectronoherpetina antrocytidea BLUMENSTEINER</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plectronoherpetina beckeri OLEMPSKA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acritus (Acritus) clinae BLUMENSTEINER</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contacaracta terata BLUMENSTEINER</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neohaezia sleeve OLEMPSKA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microchelina sp.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trigonia (Bovensteinia sp.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orthochonia sundeli OLEMPSKA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cypellina nana CROUSEN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marginohaezia sp.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neohaezia (Brela) n. OLEMPSKA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acritus (Cooperina) rostrata OCHMYS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neidadelia af. bispinodales</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neidadelia sp.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vianglatina adami, sp.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neidadelia aff. bispinodales</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neidadelia sp.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

At Kowala, the Lower Carboniferous ostracodes were founds in a trench (trench II; cf. Olempska 1979) in two samples of light-green shales marked No. 113 and No. 114. They overlay deposits of limestones intercalated by shales which represent the upper part of the ostracode Maternella dichotoma — Maternella hemisphaerica Zone (samples 100 to
133, cf. Olempska 1979: Table 2) corresponding to the uppermost part of the Famennian. Conodonts of the *Siphonodella* Zone were identified by Dr. H. Matyja (oral communication) in samples 113 and 114. Unfortunately, a small number of specimens and a poor state of preservation of the conodonts precluded a possibility of determining precisely the age of the samples under study, as well as finding whether or not a complete stratigraphic continuity occurred in this profile. According to a Belgian zonation, the *Siphonodella* Zone corresponds to the Lower and Middle Tournaisian, from Tn 1b to Tn 2c (Groessens 1974).

The assemblage of ostracodes from the Tournaisian deposits of Kowala consists of thirty-six species, including fifteen which do not occur in samples from older deposits. The stratigraphic range of the remaining species also includes part of the Famennian (cf. Olempska 1979: Table 2).

In addition to benthic ostracodes of the orders Palaeocopida, Metacopida and Podocopida, samples 113 and 114 include pelagic entomozoids, *Richterina* (*Richterina*) *striatula*, *R. (R.) latior* and *Maternella steinachensis*, of which only *R. (R.) striatula* occurs also in the Devonian deposits. The stratigraphic range of the species *Richterina* (*Richterina*) *latior* in the areas of the Rhenish Slate Mts, Thuringia, and the Kama-Kinel Depression in the USSR is limited to the deposits of the *Gattendorfia* Stage, while *R. (R.) striatula* is also known from the deposits of both the Wocklumeria and *Gattendorfia* Stages (Rabien and Rabitz 1958; Blumenstengel 1959; Rabien 1960; Gründel 1961; Groos-Uffenorde and Uffenorde 1974; Tschigova 1977; Tschigova and Bouckaert 1977). *Maternella steinachensis* was found by Gründel (1961, 1963) in the deposits of the *Gattendorfia* and *Pericyclus* (*cu I and II b'/y*) in Thuringia and the southern margin of the Ruhr Region.

The benthic ostracode species occurring in this locality (Table 1), that is, *Amphissites blumenstengeli*, *Healdia ratra*, *Bairdia* (*Rectobairdia*) *venterba*, *Bohleniatia banjensis*, *Acratia* (*Cooperuna*) *cooperi*, *Necrateria trapezoidalis* and *Aurigerites oberritzensis* occur in Thuringia, East-European Platform and Canada also only in the deposits of the *Gattendorfia* Stage (Gründel 1961, 1962; Green 1963; Bushmina 1975). The occurrence of the benthic species mentioned above and the pelagic species *Richterina* (*Richterina*) *latior* seems to document the presence of the *Richterina* (*Richterina*) *latior* Zone, corresponding approximately to the range of the *Gattendorfia* Stage (Rabien 1960; Becker and Bless 1974), in the deposits examined.

*Jablonna.* — In the Jabłonna IG-1 borehole, the Lower Carboniferous (Tournaisian and Lower Viséan) deposits, in which ostracodes have been found, occur at a depth of 59 to 22.30 m (Table 2). A detailed lithological and stratigraphic elaboration based on macrofauna and, partly, on conodonts is now being prepared (Chlebowski and Żakowa, in preparation; Szulczewski and Żakowa, in preparation).
Table 2
Ostracode distribution in the borehole Jabłonna IG-1

<table>
<thead>
<tr>
<th>Species</th>
<th>Tourmaisin Lower</th>
<th>Tourmaisin Upper</th>
<th>?Lower</th>
<th>Visean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>58,80 - 59,00</td>
<td>34,40 - 34,70</td>
<td>31,70 - 32,50</td>
<td>27,60 - 28,30</td>
</tr>
<tr>
<td>Coryellina sanctacrucensis</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Healdia ratra</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Healdiopsis thuringensis</td>
<td>+</td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Bairdia (Bairdia) hypsola</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Bairdia (Bairdia) aff. galinae</td>
<td>+</td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Bairdia (Rectobairdia) venterba</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acratia (Cooperuna) cooperi</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acratia (Cooperuna) aff. rostrata</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healdianella sp.</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gorodia weyeri</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bashkina microspina</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rectonaria inclinata</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Rectonaria muelleri</td>
<td>+</td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Rectonaria kowalensis</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rectoplacea elongata</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Necrateria sp.</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aurigerites obernitzensis</td>
<td>+</td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Shivaella sp.</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ostracode 2</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Richterina (Richterina) cf. ampla</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Lower Carboniferous deposits from Jabłonna IG-1 borehole are developed in the clayey-siliceous facies (radiolarites, claystones) with intercalations of micritic and organodetrital, marly limestones. The admixtures of tuff and tuffite intercalations in these deposits shows that they were accompanied by the volcanic activity (Chlebowski and Zakowa, in preparation). In Dr. Chlebowski's opinion (oral communication), the lithological data indicate here a sedimentary continuity of the highermost Famennian and lowermost Tournaisian. The assemblage of ostracodes described in the present paper comes mostly from calcareous intercalations. The Upper Devonian ostracodes from Jabłonna IG-1 borehole were formerly described by the present writer (Olempska 1979).
An assemblage of eleven species of ostracodes (Table 2) representing benthic forms only was found in the sample from the depth of 58.8—59 m of the deposits of the Gattendorfia Stage (Zakowa, oral communication). Four of them: Bairdia (Rectobairdia) venterba, Acratia (Cooperuna) coope-ri, Aurigerites obernitzensis and Shivaella sp.1 do not occur in older deposits of the Jablonna profile. The four species mentioned above, together with the species occurring at Kowala, are also known in Thuringia only from the deposits of the Gattendorfia Stage (Gründel 1961, 1962). A single specimen of Richterina (Richterina) cf. ampla, a species described by Gründel (1963) from the cu II β/γ Zone (Upper Tournaisian) of the southern margin of the Ruhr Region was found in a sample from the depth of 34.40—34.70 m closely underlying the Upper Tournaisian deposits containing conodonts of the Scalagnathus anchoralis Zone (Zakowa, oral communication). The stratigraphic range of this species has not so far been studied accurately. In the Rhenish Slate Mts, it was found in the deposits of the Richterina (Richterina) aff. latior Zone suggested by Becker and (Bless (1974) as an equivalent of the Middle and Upper Tournaisian and part of the Viséan. Since R. (R.) ampla occurs in the deposits of Jablonna 1G-1 borehole under those of the conodont S. anchoralis Zone, starting, according to the Belgian stratigraphic division, in the upper part of Tn 3 (the uppermost Tournaisian), we can presume that the samples from the depth of 34.40—34.70 m belong to the Upper Tournaisian.

In the samples of Viséan deposits (probably the Lower Viséan: Chlebowsk and Zakowa, in preparation) coming from the depth of 32.50—22.30, there occurred the benthic ostracodes exclusively (Tables 1 and 2), only one form of which, described by Gründel (1971) from the Harz Mts as Ostracode 2, has so far been known only from the Viséan deposits, while the remaining species occurred in the Viséan and Tournaisian.

**SYSTEMATIC PART**

The abbreviations used: C carapace, RV right valve, LV left valve, L length, H height, W width.

Order **Palaeocopida** Hennigsmoen, 1953  
Superfamily **Primitiopsacea** Swartz, 1936  
Family **Rozhdestvenskaytidae** McGill, 1966  
Genus **Fellerites** Gründel, 1962  
**Fellerites sp.1**  
(pl. 5: 1)

*Material.* — Three poorly preserved carapaces.  
Dimensions (in mm):  

<table>
<thead>
<tr>
<th>ZPAL O.XVIII/1</th>
<th>L</th>
<th>H</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.76</td>
<td>0.51</td>
<td>0.32</td>
</tr>
</tbody>
</table>
Description. — Carapace truncate-oval in lateral outline. Dorsal margin long, straight, terminating in small auriculate processes. Ventral margin gently rounded. Maximum length halfway the height. Carapace slightly higher in the anterior than posterior part. Maximum width halfway the length. A thin, poorly visible marginal ridge stretches along the free margin. Surface of valves very finely pitted.

Remarks. — In the lateral outline of their carapaces, the specimens described are most closely related to *Fellerites bohlenensis* Gründel from the Lower Carboniferous of Thuringia (Gründel 1962: pl. 5: 1) from which they differs in smaller auriculate processes at the ends of the dorsal margin and a finely pitted surface. They also differ, in a smaller height and more elongated lateral outline of carapace, from *F. subsutus* Rozhdestvenskaya from the Lower Frasnian of Bashkiria (Rozhdestvenskaya 1972: pl. 13: 1) which is similar to them in the character of its surface.

Occurrence. — Poland (Holy Cross Mts): Kowala, Tournaisian (*Siphonodella Zone*).

Superfamily Kirkbyacea Ulrich and Bassler, 1906
Family Amphissitidae Knight, 1928
Genus Amphissites Girty, 1910
*Amphissites blumenstengeli* Gründel, 1962
(pl: 5: 2)


Material. — Twelve variously preserved carapaces.

Dimensions (in mm):

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>H</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZPAL O.XVIII/2</td>
<td>1.06</td>
<td>0.58</td>
<td>0.61</td>
</tr>
</tbody>
</table>

Remarks. — *A. blumenstengeli* Gründel belongs to the group of species described by Blumenstengel (1970) which differ from each other only in small details of ornamentation. They occur in Europe and North America from the Middle Devonian through the Viséan.


Order Metacopida Sylvester-Bradley, 1961
Superfamily Healdiacea Harlon, 1933
Family Healdiidae Harlon, 1933
Subfamily Healdiinae Harlon, 1933
Genus Healdia Roundy, 1926
*Healdia ratra* Gründel, 1961
(pl: 5: 3)


Material. — Seven variously preserved carapaces.

Dimensions (in mm):

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>H</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZPAL O.XVIII/3</td>
<td>0.56</td>
<td>0.35</td>
<td>0.26</td>
</tr>
</tbody>
</table>
Remarks. — In the specimens from the Holy Cross Mts, a spine is mostly not preserved in the anterodorsal part of the right valve.

Occurrence. — Poland (Holy Cross Mts): Kowala, Tournaisian (Siphonodella Zone), Jabłonna IG-1 borehole, depths 31.70–32.50 m and 27.60–28.30 m; ?L. Viséan. GDR: Thuringia (Gattendorfia Stage).

Subfamily Healdiopsinae Gründel, 1962
Genus Healdiopsis Gründel, 1962
Healdiopsis thuringensis Gründel, 1962
(pl. 5: 4)

1962. Healdiopsis thuringensis (Gründel); Gründel: 77, pl. 3: 1–5.

Material. — Three well preserved carapaces and two valves.
Dimensions (in mm):

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>H</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZPAL O.XVIIII4</td>
<td>1.29</td>
<td>0.69</td>
<td>0.59</td>
</tr>
</tbody>
</table>

Remarks. — The specimens of H. thuringensis from the Jabłonna IG-1 borehole have carapaces more elongated in lateral outline than those of the holotype of this species, but their dimensions are within limits of its L/H ratio presented by Gründel (1961: pl. 4: 5).


Superfamily Quasillitacea Coryell and Malkin, 1936
Family Quasiliidæ Coryell and Malkin, 1936 emend. Henningsmoen, 1953
Genus Graphiadactylloides Green, 1963
Graphiadactylloides slowikensis sp.n.
(pl. 6: 1)

Holotype: ZPAL O.XVIII/5; pl. 6: 1.
Type horizon: Tournaisian, Siphonodella Zone.
Type locality: Kowala, Holy Cross Mountains, Poland.
Derivation of the name: after the name of the locality Slowik in the Holy Cross Mts.

Diagnosis. — A Graphiadactylloides with a strongly reticulate lateral surface of carapace, distinctly visible, smooth muscle scar and well developed posteroventral and anterior spines.

Material. — Fourteen well preserved carapaces.
Dimensions (in mm):

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>H</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZPAL O.XVIII/5</td>
<td>1.26</td>
<td>0.61</td>
<td>0.51</td>
</tr>
</tbody>
</table>

Description. — Carapace subrhomboidal in lateral outline. Dorsal margin in a narrow depression. Ventral margin subrectilinear, slightly concave in its middle
part. Anterodorsal slope gently inclined, anterior margin uniformly rounded, posterior rounded in the dorsal and strongly truncate in the ventral part. Maximum length halfway the height, maximum height in the posterior part of carapace, maximum width at about two-thirds of length from the anterior end. Left, larger valve slightly overlaps the height along the free margin. A smooth muscle scar is situated in the middle part of valve. Surface most strongly reticulate in the posterior part of valve and in the middle part of the anterior end. The surface adjoining the anterior margin and the ventral part of carapace smooth. Long, posteriorly turned spines occur in the posteroventral part of valves. A narrow marginal flange surrounds the anterointerior margin reaching somewhat higher than halfway the height where it terminates in a small, erect spine present only in well preserved specimens.

Remarks. — Graphadactylloides slowikensis sp.n. displays a certain general similarity in its lateral outline and ornamentation of carapace to Graphadactylloides sp.B described by Green (1963: pl. 17: 13, not fig. 11), from which it differs, however, in an irregular ornamentation of its carapace. In the character of ornamentation, it is also related to G. sp.D (Green 1963: pl. 17: 10) and G. paucituberculatus Green (1963: pl. 17: 1—5) from which it differs in a lack of nodes along its posterodorsal and anterointerior margins.

Occurrence. — Poland (Holy Cross Mts): Kowala, Tournaisian (Siphonodella Zone).

Order Podocopida Müller, 1894
Suborder Cypridocopina Jones, 1901
Superfamily Bairdiacea Sars, 1888
Family Bairdiidae Sars, 1888
Genus Bairdia McCoy, 1844
Subgenus Bairdia (Rectobairdia) Sohn, 1960
Bairdia (Rectobairdia) venterba Gründel, 1961


Material. — Thirty-three variously preserved carapaces.

Dimensions (in mm):

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>H</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZPAL O.XVIII/6</td>
<td>1.12</td>
<td>0.53</td>
<td>0.40</td>
</tr>
<tr>
<td>ZPAL O.XVIII/7</td>
<td>0.90</td>
<td>0.48</td>
<td>0.32</td>
</tr>
</tbody>
</table>

Remarks. — In a general lateral outline of carapace and its flattening along the anterior and posterior margins, this species is related to B. (R.) dorsoconstricta Blumenstengel described from the lower and upper P. gigas Zone of the Harz Mts (Blumenstengel 1970) from which it differs in a posterodorsal part of carapace. B. (R.) venterba also displays a similarity in lateral outline to B. (R.) calceola (Kummerow) from the Calceola Schiefer Zone of the Rhenish Slate Mts (Kummerow 1953) from which it also occurs in a lower situated posterior point. B. (R.) venterba is also related in a general outline of its carapace to B. (R.) canigranulosa McGill from the Upper Givetian Slave Point Formation of Canada (Province of Alberta) (McGill 1966) and to Bairdia sp. illustrated by Lethiers (1972: pl. 23: 20). Its granulose surface and lateral outline of carapace relate it also to B. (Orthobairdia?) cf. granipteticulata Harlton (sensu Bushmina 1970), illustrated by Becker et al. (1974) from the Lower Tournaisian (Tn 1b) of the Ardeno-Rhenish Massif from which it differs in a stron-
ger flattening of carapace and a smaller sloping of hinge margin towards the posterior end.

**Occurrence.** — Poland (Holy Cross Mts): Kowala, Jablonna IG-1 borehole, depth 58.80—59.00 m, Tournaisian (*Siphonodella* Zone). GDR: Thuringia, L. Carboniferous (*Gattendorfia* Stage).

**Genus Bohlenatia** Gründel, 1961

*Bohlenatia banffensis* (Green, 1963)

(pl. 6: 4)

1975. *Bohlenatia banffensis* (Green); Bushmina: 71, pl. 10: 1—2.

**Material.** — Three carapaces with their posterior ends broken off.

Dimensions (in mm):

<table>
<thead>
<tr>
<th>ZPAL 0.XVIII/8</th>
<th>L</th>
<th>H</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.06</td>
<td>0.40</td>
<td>0.32</td>
</tr>
</tbody>
</table>

**Remarks.** — Specimens of *B. banffensis* illustrated by Gründel (1961) have their dorsal margins more strongly sloping towards the posterior end than those of this species from other areas. It seems, however, that this difference may be considered as an intraspecific variability.


**Subfamily Acratiinae** Gründel, 1962 emend. Kozur, 1971

**Genus Acratia** Delo, 1930

**Subgenus Acratia** (*Cooperuna*) Gründel, 1962

*Acratia* (*Cooperuna*) *cooperi* Gründel, 1962

(pl. 7: 4)


**Material.** — Seventy-five mostly well preserved carapaces.

Dimensions (in mm):

<table>
<thead>
<tr>
<th>ZPAL 0.XVIII/9</th>
<th>L</th>
<th>H</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.92</td>
<td>0.42</td>
<td>0.40</td>
</tr>
</tbody>
</table>

**Remarks.** — Specimens of *A. (C.) cooperi* from the Lower Carboniferous of Kowala differs from the holotype of this species in a smaller height in posterior part of carapace and less distinct sinus of ventral margin. The lateral outline of the carapace of *A. (C.) cooperi* is similar to that of *A. (C.) rostrata* Zanina (1956) from the Viséan of Moscow Basin from which this species differs in a lower situated maximum length of carapace.

Acratia (Cooperuna) aff. rostrata Zanina, 1956
(pl. 6: 2)

Material. — One slightly compressed carapace.
Dimensions (in mm):

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZPAL O.XVIII/10</td>
<td>1.35</td>
<td>0.53</td>
</tr>
</tbody>
</table>

Remarks. — In its lateral outline and dimensions of carapace, the specimen described is related to the largest extent to A. (C.) rostrata Zanina, from which it differs, however, considerably in its width. Due to a compression of the specimen from Jablonna, its actual width cannot be measured accurately. A. (C.) aff. rostrata also displays a certain similarity in the lateral outline and dimensions of its carapace to A. (C.) cooperi Gründel, illustrated by Gründel (1963), from the cu II β–γ Zone of the Ruhr Region, from which it differs in a larger height of the anterior part of carapace.

Occurrence. — Poland (Holy Cross Mts): Jablonna IG-1 borehole, depth 27.60—28.30 m, ? L. Viséan.

Family Pachydomellidae Berdan and Sohn, 1961
Genus Microcheilinella Geis, 1933
Microcheilinella aculeata Bushmina, 1975
(pl. 7: 2)

1975. Microcheilinella sp. no 3; Kotchetkova: pl. 3: 33.

Material. — Three well preserved carapaces.
Dimensions (in mm):

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>H</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZPAL O.XVIII/11</td>
<td>0.45</td>
<td>0.27</td>
<td>0.28</td>
</tr>
</tbody>
</table>

Remarks. — The presence of a spine in the posteroventral part of the right valve and the lateral outline of carapace relate M. aculeata Bushmina to Microcheilinella sp. 3, illustrated by Kotchetkova (1975). It is possible that they are conspecific.


Microcheilinella bushminae sp.n.
(pl. 7: 1)

Holotype: ZPAL O.XVIII/12; pl. 7: 1.
Type horizon: L. Carboniferous, Gattendorfia Stage.
Type locality: Kowala, Holy Cross Mts, Poland.
Derivation of name: In honour of Dr. Ludmila Bushmina, Soviet investigator of the Carboniferous ostracodes.

Diagnosis. — Microcheilinella with strongly convex posteroventral part of valves.
Material. — Eight well preserved carapaces.
Dimensions (in mm):

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>H</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZPAL O.XVIII/12</td>
<td>0.48</td>
<td>0.27</td>
<td>0.27</td>
</tr>
</tbody>
</table>
Description. — Carapace suboval in lateral outline. Dorsal and ventral margins straight. Hinge margin in a narrow depression. Anterior margin rounded, posterior slightly truncate in its upper part. Maximum length near the ventral margin. Maximum height halfway the length. Maximum width in the posterior end of carapace. Valves asymmetrical; the left, larger valve overlaps the right along the entire free margin, the largest extent of overlapping in the ventral part. Valves strongly convex in their posteroventral parts, the right valve more convex than left. Surface of valves smooth.

Remarks. — The species described differs from other known species of this genus in the posteroventral convexity of its valves.

Occurrence. — Poland (Holy Cross Mts): Kowala, Tournaisian (Siphonodella Zone).

Superfamily Cytheracea Baird, 1850
Family Rectonariidae Gründel, 1962
Genus Necrateria Gründel, 1962
Necrateria trapezoidalis Gründel, 1962
(pl. 7: 5)


Material. — Eight variously preserved carapaces.

Dimensions (in mm):

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>H</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZPAL O.XVIII/13</td>
<td>0.70</td>
<td>0.46</td>
<td>0.35</td>
</tr>
<tr>
<td>ZPAL O.XVIII/14</td>
<td>0.92</td>
<td>0.50</td>
<td>0.38</td>
</tr>
</tbody>
</table>

Remarks. — As compared with specimens from Thuringia, those of N. trapezoidalis from the Holy Cross Mts display a smaller width of carapaces in relation to their length.

Occurrence. — Poland (Holy Cross Mts): Kowala, Tournaisian (Siphonodella Zone). GDR: Thuringia, L. Carboniferous (Gattendorfia Stage).

Necrateria sp. 1
(pl. 7: 6)

Material. — One carapace.

Dimensions (in mm):

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>H</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZPAL O.XVIII/15</td>
<td>0.79</td>
<td>0.58</td>
<td>0.38</td>
</tr>
</tbody>
</table>

Description. — Carapace subtrapezoidal in lateral outline. Dorsal and ventral margins subrectilinear. Anterior margin uniformly rounded, posterior almost vertically truncate. Hinge margin in a small depression. Maximum length somewhat below the midheight, height somewhat larger in the posterior part of carapace. The left, larger valve gently overlaps the right one along the free margin. A small spine occurs at the posterior end of carapace somewhat below the midheight on each valve. Surface smooth.

Remarks. — The form described differs from N. trapezoidalis Gründel, related to it in a similar lateral outline, in a considerably lower situated posterior spine.

Family unknown
Genus *Aurigerites* Roundy, 1926

*Aurigerites obernitzensis* Gründel, 1962
(pl. 8: 7)


*Material.* — Five carapaces.

Dimensions (in mm):

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>H</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZPAL O.XVIII/16</td>
<td>0.63</td>
<td>0.34</td>
<td>0.24</td>
</tr>
</tbody>
</table>

*Remarks.* — The specimens of *A. obernitzensis* from Jablonna differ from the holotype of this species in a somewhat more rectangular lateral outline and narrower carapace.

*Occurrence.* — Poland (Holy Cross Mts): Jablonna IG-1 borehole, depths 58.80—59.00 m and 27.60—27.30 m, Tournaisian—? L. Viséan. GDR: Thuringia, L. Carboniferous (*Gattendorfia* Stage).

*Aurigerites ? sp.*
(pl. 8: 3)

*Material.* — Two carapaces, one of them partly damaged.

Dimensions (in mm):

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>H</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZPAL O.XVIII/17</td>
<td>0.62</td>
<td>0.42</td>
<td>0.32</td>
</tr>
<tr>
<td>ZPAL O.XVIII/18</td>
<td>0.73</td>
<td>0.46</td>
<td>0.40</td>
</tr>
</tbody>
</table>

*Description.* — Carapace rectangular-rounded in lateral outline. Dorsal margin straight; hinge margin in a small depression. Ventral margin subrectilinear. Maximum length of carapace halfway the height. Height uniform over the entire length. Maximum width in the posterior part of carapace. Left, larger valve overlaps the right one along the entire free margin. Free margin of the left valve swollen. A ridge which, in the anterodorsal and posteroventral parts of carapace, is strongly swollen and forms a protruding point, occurs on valves almost parallel to the free and dorsal margins. Surface smooth.

*Remarks.* — The form described displays a certain general similarity to *A. blumenstengeli* Olempska, 1979 from which it differs in the presence of points on the concentric ridge, a more rectangular lateral outline of carapace and the lack of spine at the posterior and of the dorsal margin of the left valve.


Superfamily *Paraparchitacea* Scott, 1959
Family *Paraparchitidae* Scott, 1959
Genus *Shivaella* Sohn, 1972

*Shivaella* sp.1
(pl. 8: 8, 9)

*Material.* — Four variously preserved carapaces.

Dimensions (in mm):

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>H</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZPAL O.XVIII/19</td>
<td>1.20</td>
<td>0.87</td>
<td>0.56</td>
</tr>
<tr>
<td>ZPAL O.XVIII/20</td>
<td>1.46</td>
<td>1.06</td>
<td>0.72</td>
</tr>
</tbody>
</table>
Description. — Carapace subamplete in lateral outline. Dorsal margin long, straight; ventral rounded. Anterior margin uniformly rounded, posterior slightly truncate in the lower part. Maximum length halfway the height. Maximum height in the anterior part of carapace, close to midlength. Maximum width somewhat behind the midlength. Left, larger valve overlaps the right one along the free margin, particularly so in the ventral part. Right valve slightly projecting above the hinge margin. Carapace uniformly convex. A small spine occurs in the posterodorsal part of both valves just below the hinge margin. Surface of valves smooth.

Remarks. — In the very small dimensions of its posterodorsal spines, the form described is related to *S. microphtalma* (Eichwald) from the Tournaisian of the Russian Platform (Eichwald 1860) from which it differs in a smaller carapace and a larger distance of the spines from the posterior than dorsal margin. Its lateral outline and distribution of its spines also relate *Shivaella* sp.1 to *S. niclesi* (Ulrich) from the Carboniferous of the USA from which it differs, however, in the situation of maximum height near the midlength of carapace.

Occurrence. — Poland (Holy Cross Mts): Kowala, Jablonna IG-1 borehole, depth 58.80—59.00 m, Tournaisian (*Siphonodella* zone).

Ostracode indet.

(pl. 8: 4)

Material. — Three poorly preserved carapaces.

Dimensions (in mm):

<table>
<thead>
<tr>
<th>L</th>
<th>H</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.73</td>
<td>0.37</td>
<td>0.33</td>
</tr>
</tbody>
</table>

Description. — Carapace rectangular-rounded in lateral outline. Dorsal margin long, straight, ventral very slightly rounded. Maximum length halfway the height which is nearly uniform over the entire length. Maximum width halfway the length. A ridge forming a ringlike structure occurs along the free and dorsal margins. Surface of valves smooth.

Remarks. — The presence of a ridge which surrounds the whole valve makes the specimens described similar to the representatives of the genus *Nezamystia* Pfibyl, from which they differ, however, in a smooth surface of valves and in their ridge situated closer to the free margin.


Ostracode 2 Gründel, 1971

(pl. 8: 5)

Material. — Three carapaces.

Dimensions (in mm):

<table>
<thead>
<tr>
<th>L</th>
<th>H</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.67</td>
<td>0.40</td>
<td>0.32</td>
</tr>
</tbody>
</table>

Description. — Carapace subtrapezoidal in lateral outline. Dorsal and ventral margins straight. Anterior margin rounded, posterior strongly truncate in the upper part. Maximum length slightly below the midheight, height somewhat larger in the posterior part of carapace. Left, larger valve overlaps the right one along the entire free margin, to the largest extent in the ventral part. A small anterodorsal spine occurs on the margin of the left valve. Also small spines, situated symmetrically
on both valves, occur in the posterior part near the dorsal margin. Surface of valves smooth.

Remarks.—The presence of a ridge which surrounds the whole valve makes dorsal spine occurs only on the left valve which has not been mentioned in Gründel's (1971) description.

Occurrence.—Poland (Holy Cross Mts): Jablonna IG-1 borehole, depths 27.50—27.60 m and 22.30—23.80 m, ? L. Viséan. GDR.: Harz Mts, L. Viséan (cu II γ).

Order Myodocopida Sars, 1866
Suborder Entomozocopina Gründel, 1969
Superfamily Entomozoacea Přibyl, 1951
Family Entomozoidae Přibyl, 1951
Genus Richterina Gürich, 1896
Subgenus Richterina (Richterina) Gürich, 1896
Richterina (Richterina) latior Rabien, 1960
(pl. 8: 1)

1974. Richterina (Richterina) latior Rabien; Groos-Uffenorde und Uffenorde: 80, pl. 4: 5.
1977. Richterina (Richterina) latior Rabien; Tschigova: 105, pl. 14: 3.

Material. — Two valves.
Dimensions (in mm):

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>0.50</td>
</tr>
<tr>
<td>H</td>
<td>0.43</td>
</tr>
</tbody>
</table>

Occurrence.—Poland (Holy Cross Mts): Kowala, Tournaisian (Siphonodella Zone). GDR: Thuringia, L. Carboniferous (Gattendorfia Stage). FRG: Rhenish Slate Mts, L. Carboniferous (Gattendorfia Stage). USSR: Kam'k-Kinel Depression, L. Carboniferous (Gattendorfia Stage).

Richterina (Richterina) cf. ampla Gründel, 1963
(pl. 8: 6)

Material. — One partly damaged carapace.
Dimensions (in mm):

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>1.05</td>
</tr>
<tr>
<td>H</td>
<td>0.64</td>
</tr>
</tbody>
</table>

Remarks.—The deformation of carapace precludes the possibility of its unequivocal identification, but a similarity to R. (R.) ampla is suggested by its taxonomic characters.

Occurrence.—Poland (Holy Cross Mts): Jablonna IG-1 borehole, depth 34.40—34.70 m, Tournaisian.
Genus *Maternella* Rabien, 1954

*Maternella steinachensis* Gründel, 1961

(pl. 8: 2)


**Material** — Fifteen variously preserved valves.

Dimensions (in mm): 

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ZPAL O.XVIII/25</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>L</strong></td>
<td>0.50</td>
</tr>
<tr>
<td><strong>H</strong></td>
<td>0.41</td>
</tr>
</tbody>
</table>

**Remarks.** — In the character of the ornamentation of its valves this species is related to *M. rotundata* Tschigova from the Upper Famennian of the Russian Platform (Tschigova 1977). According to Tschigova, *M. rotundata* is marked by a more rounded lateral outline of its carapace. It seems, however, that these differences are very small and, in fact, *M. steinachensis* and *M. rotundata* may belong to the same species.


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EWA OLEMPSKA

MALZORACZKI DOLNEGO KARBONU SW GÓR ŚWIĘTOKRZYSKICH

Streszczenie

Oznaczono 44 gatunki malżoraczków z turneju i dolnego wizenu SW Gór Świętokrzyskich. Dwa spośród nich są nowe, Graphiadaactyloides slowikensis sp.n. i Microcheilinella bushminae sp.n. W niniejszym opracowaniu ograniczono się do opisu 21 gatunków, których okres występowania na obszarze Gór Świętokrzyskich ograniczony jest do utworów karbonu, pozostałe były opisane przez autorkę wcześniej (Olempska 1979). Opracowany materiał pochodzi z szurfów z Kowali i wiercenia Jablonna IG-1.

Obecność szeregu gatunków bentonicznych oraz malżoraczków pelagicznych z rodziny Entomozoidea dokumentuje (1) w Kowali i Jablonnie malżoraczkowy poziom Richterina (Richterina) latior, w przybliżeniu odpowiadający piętru Gattendorfia, oraz (2) w utworach karbonu w Jablonnie — poziom Richterina (Richterina) aff. latior, odpowiadający środkowemu i górnemu turnejowi oraz części wizenu.

EXPLANATION OF THE PLATES 5—8

Abbreviations used: RV right valve, LV left valve

Plate 5

1. Fellerites sp.1: a RV lateral view, b dorsal view, c ventral view; ZPAL O.XVIII/1; X45.

2. Amphissites blumenstengeli Gründel: a RV lateral view, b dorsal view, c ventral view; ZPAL O.XVIII/2; X45.
3. **Healdia ratra** Gründel: a RV lateral view, b ventral view; ZPAL O.XVIII/3; ×45.  
   1—3 Kowala, Tournaisian (Siphonodella Zone)

4. **Healdiopsis thuringensis** Gründel: a RV lateral view, b dorsal view; ZPAL O.XVIII/4; ×45, Jablonna—borehole IG-1, depth 27.60–28.30 m, ? L. Viséan.

---

**Plate 6**

1. **Graphiadactylloides slowikensis** sp.n.: a RV lateral view, b LV lateral view, c dorsal view, d ventral view; holotype ZPAL O.XVIII/5; ×45, Kowala, Tournaisian (Siphonodella Zone).

2. **Acratia** (Cooperuna) aff. rostrata Zanina: RV lateral view; ZPAL O.XVIII/10; ×45, Jablonna—borehole IG-1, depth 27.60–28.30 m, ? L. Viséan.

3. **Bairdia** (Rectobairdia) venterba Gründel: RV lateral view; ZPAL O.XVIII/6; ×45.

4. **Bohlenatia banffensis** (Green): RV lateral view; ZPAL O.XVIII/8; ×45.

---

**Plate 7**

1. **Microcheilinella bushminae** sp.n.: a LV lateral view, b RV lateral view, c dorsal view, d ventral view; holotype ZPAL O.XVIII/12; ×45.

2. **Microcheilinella aculeata** Bushmina: a RV lateral view, b dorsal view, c ventral view; ZPAL O.XVIII/11; ×45.

3. **Bairdia** (Rectobairdia) venterba Gründel: a RV lateral view, b dorsal view, c ventral view; ZPAL O.XVIII/7; ×45.

4. **Acratia** (Cooperuna) cooperi Gründel: a RV lateral view, b dorsal view, c ventral view; ZPAL O.XVIII/9; ×45.

5. **Necrateria trapezoidalis** Gründel: a RV lateral view, b dorsal view, c ventral view; ZPAL O.XVIII/14; ×45.

---

6. Necrateria sp.1: a LV lateral view, b ventral view; ZPAL O.XVIII/15; ×45, Jablonna—borehole IG-1, depth 27.60–28.30 m, ? L. Viséan.

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**Plate 8**

1. **Richterina** (Richterina) latior Rabien: lateral view; ZPAL O.XVIII/23; ×45.

2. **Maternella steinachensis** Gründel: lateral view; ZPAL O.XVIII/25; ×45.

3. **Aurigerites** sp.1: a RV lateral view, b ventral view; ZPAL O.XVIII/17; ×45.

4. Ostracode indet.: a lateral view, b dorsal view, c ventral view; ZPAL O.XVIII/21; ×45.

---

5. Ostracode 2 Gründel: a RV lateral view, b dorsal view; ZPAL O.XVIII/22; ×45, Jablonna—borehole IG-1, depth 27.60–28.30 m, ? L. Viséan.

6. **Richterina** (Richterina) cf. ampla Gründel: RV lateral view; ZPAL O.XVIII/24; ×37.5, Jablonna—borehole IG-1, depth 34.40–34.70 m, Tournaisian.

7. **Aurigerites obernitzensis** Gründel: a RV lateral view, b dorsal view; ZPAL O.XVIII/16; ×45, Jablonna—borehole IG-1, depth 27.60–28.30 m, ? L. Viséan.

8. **Shivaella** sp.1: a RV lateral view, b dorsal view; ZPAL O.XVIII/20; ×37.5.

9. **Shivaella** sp.1: a LV lateral view; ZPAL O.XVIII/19; ×37.5 Kowala, Tournaisian (Siphonodella Zone).