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MIDDLE JURASSIC OSTRACODES FROM THE FLYSCH CARPATHIANS, SOUTHERN POLAND

Abstract.—Seven ostracode species are described from the Flysch Carpathians, borehole Trzebunia 2, depths interval 3523.9–3532.5 m. The ostracods are attributed to 3 genera of 2 families. 5 species are new, viz. *Fastigatocythere crassicostata*, *F. posterosolata*, *F. gracilis*, *F. aculeata* and *F. robusta*.

INTRODUCTION

The investigated ostracods come from the borehole Trzebunia 2 situated in the western Flysch Carpathians (fig. 1). The borehole came across flysch deposits of the Magura and Sub-Silesian nappe, Miocene deposits, and Mesozoic and Paleozoic deposits of the platform substrate of the Flysch Carpathians. The Miocene deposits are underlain by the Upper Jurassic carbonates resembling those exposed in Cracow area. Below the Upper Jurassic strata, there are terrigenous sediments in the core at the depth of 3523.9 to 3532.5 m. They comprise interbedding grey calcareous and non-calcareous claystones, mudstones, and fine-grained sandstones; the sedi-



Fig. 1. Map of the Carpathian flysch zone. A—A northern, B—B southern border of the flysch zone (after M. Książkiewicz, 1977).

Warsaw University) for making available the ostracode specimens; and Dr. H. Malz (Senckenberg Museum, Frankfurt am Main) for valuable discussions. Mrs. M. Radzikowska is acknowledged for taking photographs.

The collection is housed in the Institute of Paleobiology, Polish Academy of Sciences, abbreviated as ZPAL.

STRATIGRAPHY

One has to keep firmly in mind that there are no guide species in the investigated collection. Most species described in the present paper are newly erected. They represent the genus *Fastigatocythere* Wienholz, 1967, reported insofar from the Bathonian and Callovian of England, France, Germany, and Madagascar. It appears noteworthy that no representatives of that genus have been insofar recorded in Poland eventhough the Middle Jurassic deposits are well-developed and well-documented. The other species recorded in the borehole Trzebunia 2, viz *Micropneumatocythere convexa* Bate, and *Praeschuleridae subtrigona intermedia* Bate, are known from the Bajocian and Bathonian. The present author proposes to assign the investigated deposits to the Bathonian or even more precisely — to the Lower Bathonian; this claim appears, indeed, supported by the above-mentioned studies on other organism groups.

SYSTEMATIC PART

Suborder **Podocopina** Sars, 1866

Family **Progonocytheridae** Sylvester-Bradley, 1948

Subfamily **Progonocytherinae** Sylvester-Bradley, 1948

Genus *Fastigatocythere* Wienholz, 1967

Fastigatocythere crassicostata sp.n.

(pl. 54: 1—4)

Holotype: ZPAL O.XVI/1; pl. 54: 1.

Type horizon: Bathonian.

Type locality: borehole Trzebunia 2, depth 3523.9—3524.9 m.

Derivation of the name: Lat. *crassus* — thick, *costa* — rib.

Diagnosis. — Carapace medium-sized, elongate, ribbed. Anterior rib parts thick. Hinge entomodont. Duplicature wide.

Material. — Three carapaces and five poorly-preserved valves.

Dimensions (in mm):

ZPAL Nos.	O.XVI/1 adult ♀	O.XVI/2 adult ♀	O.XVI/3 adult ♂	O.XVI/4 premature
Length of carapace	0.66	—	—	—
Height of carapace	0.38	—	—	—
Width of carapace	0.36	—	—	—
Length of left valve	—	0.40	0.76	0.56
Height of left valve	—	0.40	0.40	0.36

Description.—Carapace equivalve. In dorsal and ventral views the carapace outline is equally convex. Carapace markedly flattened both anteriorly and posteriorly. Dorsal area ornamented with ribs converging by the middle of dorsal margin. Ventral area smooth, slightly concave along contact margin. The rest of the ventral area ornamented with longitudinal ribs, 5 in number at each valve. In lateral view, carapace straight in outline along dorsal margin, and slightly convex along ventral margin. Anterior end with flattened antero-dorsal slope and rounded antero-ventral slope. Posterior end sharp and somewhat outstretched. Lateral surface ribbed. Three anterior thick ribs start from a single point in antero-ventral part of a valve, and run obliquely towards the middle of dorsal margin. Inter-rib spaces wide. There is a single row of delicate pits anteriorly to the middle rib. Posterior part of the valve is covered with 3—4 thin ribs separated by narrow spaces. These ribs run obliquely towards the middle of dorsal margin. Central and ventral parts of a valve covered with longitudinal ribs. Hinge entomodont. Duplicature wide. Sex dimorphisms distinct, with males larger and more slender than females.

Remarks.—The investigated specimens differ from *Fastigatocythere accessa* (Grekoff, 1963) in more elongate lateral outline of carapace, thick oblique anterior ribs starting from a single point, and equal length of both valves.

Occurrence.—Poland: Bathonian, Trzebunia 2, 3523.9—3525.9 m.

Fastigatocythere posterolata sp.n.

(pl. 54: 5—6; pl. 57: 4)

Holotype: ZPAL O.XVI/5; pl. 54: 5.

Type horizon: Bathonian.

Type locality: Poland, borehole Trzebunia 2, depth 3524.9—3525.9 m.

Derivation of the name: Lat. *posterior* — back, *latus* — broad.

Diagnosis.—Valve large. Valve height increased behind the half length. Surface ornamented with ribs and pits. Hinge entomodont. Duplicature wide.

Material.—Fifteen, mostly left, poorly preserved valves.

Dimensions (in mm):

ZPAL Nos.	O.XVI/5 adult ♀	O.XVI/6 adult ♂	O.XVI/7 juvenile
Length of left valve	0.84	0.95	0.72
Height of left valve	0.50	0.50	0.48

Description.—Lateral outline of valve elongate, straight along dorsal margin, and convex along ventral margin. Anterior end rounded, with slightly truncated antero-dorsal slope. Posterior end broad, gently outstretched. Lateral surface covered with ribs. There are 3 anterior oblique ribs separated by wide spaces; 2—3 postero-dorsal, delicate, slightly oblique ribs; and 4 ventral, fine, longitudinal ribs. There are pits on the rest of lateral surface as well as in inter-rib spaces. Hinge entomodont. Duplicature wide. Sex dimorphism distinct, with males larger than females.

Remarks.—*Fastigatocythere posterolata* sp.n. differs from its congeners in its gently outstretched posterior end and some details of the ornamentation of posterior part of valve.

Occurrence.—The same as for the holotype.

Fastigatocythere gracilis sp.n.

(pl. 55: 1—3)

Holotype: ZPAL O.XVI/8; pl. 55: 1.

Type horizon: Bathonian.

Type locality: borehole Trzebrunia 2, depth 3524.9—3525.9 m.

Derivation of the name: Lat. *gracilis* — slender.

Diagnosis. — Carapace medium-sized, markedly elongate. Lateral surface ornamented with ribs and pits. Anterior ribs thick, separated by wide spaces. Posterior ribs arched. Hinge entomodont. Duplicature wide.

Material. — Twenty poorly-preserved specimens, including carapaces, left and right valves.

Dimensions (in mm):

ZPAL Nos.	O.XVI/8 adult ♀	O.XVI/9 adult ♂	O.XVI/10 adult ♂
Length of carapace	0.72	0.78	—
Height of carapace	0.44	0.40	—
Width of carapace	0.44	0.40	—
Length of left valve	—	—	0.80
Height of left valve	—	—	0.40

Description. — Carapace equivalve. In dorsal and ventral views carapace very convex; anterior and posterior ends flattened. Dorsal area ornamented with ribs converging by the middle of dorsal margin. Hinge margin is S-shaped. Ventral area covered with longitudinal ribs, 6 in number on each valve. Antero-ventral part of contact margin concave. Anterior end rounded. Posterior end truncated in its postero-dorsal part and becoming blunt further on. In lateral view, carapace straight in outline along dorsal margin, and slightly convex along ventral margin. Lateral surface ornamented with ribs. There are 3 oblique ribs on the anterior part of the valve. The first one is fused a ventral longitudinal one, its opposite end disappearing in ocular area devoid of ocular tubercle. The second anterior rib is separated from the first one by a wide inter-rib space and starts from the middle of dorsal margin. The third anterior rib, shorter than the others, parallels with the second rib and starts in antero-medial part of valve. There are also 3—4 delicate posterior ribs bent posteriorly. Central part of valve encircled anteriorly and posteriorly by ribs fused in mid-dorsal area. Lateral inter-rib space covered with pits. Hinge entomodont. Sex dimorphism distinct, with males larger than females.

Remarks. — *Fastigatocythere gracilis* sp.n. differs from *F. posterolata* sp.n. in its smaller size, posteriorly bent posterior ribs, and posterior end truncated in postero-dorsal part and blunt further on.

Occurrence. — Poland: Bathonian, Trzebrunia 2, depth 3523.9—3526.9 m.

Fastigatocythere aculeata sp.n.

(pl. 56: 1—3)

Holotype: ZPAL O.XVI/11; pl. 56: 3.

Type horizon: Bathonian.

Type locality: borehole Trzebrunia 2, depth 3524.9—3525.9 m.

Derivation of the name: Lat. *acculeata* — pointed.

Diagnosis. — Valve medium-sized. Valve height considerably increased behind the half length. Posterior end pointed. Lateral surface ornamented with ribs and pits. Hinge entomodont. Duplicature wide.

Material. — Ten female specimens, including carapaces, left and right valves.

Dimensions (in mm):

ZPAL Nos.	O.XVI/11 adult ♀	O.XVI/12 premature	O.XVI/13 premature
Length of right valve	0.78	—	—
Height of right valve	0.48	—	—
Length of left valve	—	0.68	—
Height of left valve	—	0.40	—
Length of carapace	—	—	0.66
Height of carapace	—	—	0.40
Width of carapace	—	—	0.40

Description. — Valve straight in outline along dorsal margin, and slightly convex along ventral margin. Valve height considerably increased behind the half length. Anterior end broadly rounded, posterior end pointed. Lateral surface ribbed. There are 3 thick anterior ribs, the first one terminating in ocular area. Ocular tubercle lacking. The second anterior rib separated from the first one by a wide space. It reaches the middle of dorsal margin. The third anterior rib parallels the second one and terminates in central part of valve. There is an oblique rib in central part of valve, declined downwards near dorsal margin. In postero-dorsal part of valve there are 4–5 delicate oblique ribs; the two placed centro-dorsally straight, the others slightly bent posteriorly. Ventral area ornamented with 5 delicate longitudinal ribs. Inter-rib space punctate. Hinge entomodont; there are 6 anterior teeth and 7 posterior teeth. Middle hinge sockets are larger in mid-anterior, and smaller in mid-posterior parts of hinge. Duplicature wide.

Remarks. — *Fastigatocythere aculeata* sp.n. differs from *F. gracilis* sp.n. in the lack of any ribs encircling central part of valve, and in its pointed and slightly directed upwards posterior end.

Occurrence. — Poland: Bathonian, Trzebnia 2, depths 3523.9–3525.9 m.

Fastigatocythere robusta sp.n.
(pl. 56: 4–5; pl. 55: 4)

Holotype: ZPAL O.XVI/14; pl. 56: 5.

Type horizon: Bathonian.

Type locality: borehole Trzebnia 2, depth 3524.9–3525.9 m.

Derivation of the name: Lat. *robusta* — robust.

Diagnosis. — Carapace large-sized, robust. In females, carapace height considerably increased behind the half length. Antero-ventral area extended downwards. Carapace surface ornamented with ribs and puncta. Hinge entomodont. Duplicature wide.

Material. — Eighteen specimens, including carapaces, left and right valves, and juveniles.

Dimensions (in mm):

ZPAL Nos.	O.XVI/14 adult ♀	O.XVI/15 juvenile	O.XVI/16 adult ♂
Length of carapace	0.80	—	—
Height of carapace	0.54	—	—
Width of carapace	0.40	—	—
Length of left valve	—	0.68	0.88
Height of left valve	—	0.48	0.48

Description. — Left valve slightly larger than the right one. In dorsal and ventral views carapace outlines flat-convex medially, while markedly narrowed at both ends. Dorsal margin smooth along somewhat S-shaped hinge margin. Ventral area or-

namented with longitudinal ribs, 5—6 in number on each valve. Contact margin considerably concave in the middle. In lateral view, carapace almost straight in outline along dorsal and ventral margins. Posterior end short and rounded. Anterior end blunt at dorsal margin and extended downwards in antero-ventral area. Carapace ribbed. Three anterior ribs start from antero-ventral part of valve and run towards the middle of dorsal margin. The first one disappears in ocular area. Ocular tubercle lacking. The first and second anterior ribs separated by a wide space. The third anterior rib parallels the second one but it is interrupted in central part of valve. There is also an additional rib centrally. It is twice as distant from the third anterior rib in mid-anterior part of valve as in mid-dorsal one. There are also 6 posterior ribs running obliquely towards the middle of dorsal margin: two of them, closer to central part of valve, straight, the others arched posteriorly. Ventral surface covered with longitudinal ribs. Inter-rib spaces punctate. Hinge entomodont. Sex dimorphism distinct, with females thicker, shorter, and higher than males.

Remarks.—*Fastigatocythere robusta* sp.n. differs from *F. posterolata* sp.n. in its shorter posterior end and its antero-ventral part of valve extended downwards. The investigated species differs from *F. gracilis* sp.n. in its flat-convex outline in dorsal view and much higher carapace.

Occurrence.—Poland: Bathonian, Trzebrunia 2, depth 3523.9—3526.9 m.

Genus *Micropneumatocythere* Bate, 1963
Micropneumatocythere convexa Bate, 1963
(pl. 57: 5—7)

1963. *Micropneumatocythere convexa*, Bate: 29, pl. 2: 12—13; pl. 3: 1—15.

Material.—Seventy specimens, including carapaces, left and right valves, and juveniles.

Dimensions (in mm):

ZPAL Nos.	O.XVI/17 adult ♀	O.XVI/18 adult ♀	O.XVI/19 adult ♂
Length of carapace	0.50	—	0.58
Height of carapace	0.34	—	0.32
Width of carapace	0.30	—	0.28
Length of left valve	—	0.48	—
Height of left valve	—	0.32	—

Remarks.—The investigated specimens do not differ from the holotype.

Occurrence.—Poland; Bathonian, Trzebrunia 2, depth 3523.9—3525.9 m. England; Bajocian (Hundale Point, Cloughton).

Family *Schulerideidae* Mandelstam, 1959
Subfamily *Schulerideinae* Mandelstam, 1959
Genus *Praeschuleridea* Bate, 1963
Praeschuleridea subtrigona intermedia Bate, 1965
(pl. 57: 1—3)

1965. *Praeschuleridea subtrigona intermedia* Bate: 124, pl. 17: 4—10; pl. 18: 1—9.

Material.—Fifty specimens, including carapaces, left and right valves, and juveniles.

Dimensions (in mm):

ZPAL Nos.	O.XVI/20 adult ♀	O.XVI/21 adult ♀	O.XVI/22 adult ♂
Length of carapace	0.60	—	0.68
Height of carapace	0.40	—	0.36
Width of carapace	0.32	—	0.28
Length of left valve	—	0.60	—
Height of left valve	—	0.40	—

Remarks.— The investigated specimens differ from the holotype in their more markedly convex antero-ventral margin and uniformly convex outline in dorsal view.

Occurrence.— Poland; Bathonian, Trzebrunia 2, depth 3523.9—3526.9 m. England: Bajocian (Hundale Point, Cloughton).

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JANUSZ BŁASZYK

MAŁŻORACZKI ŚRODKOWO JURAJSKIE Z KARPAT FLISZOWYCH — POLSKA

Streszczenie

W pracy opisano 7 gatunków małżoraczków, z których 5 uznano jako nowe. Pochodzą one z wiercenia Trzebudnia 2 (Karpaty fliszowe), z głębokości 3523.9—3532.5 m (fig. 1). Z tego przedziału małżoraczki występowały tylko w 3 górnych metrach rdzenia. Wyniki ich pionowego rozprzestrzenienia przedstawiono na tablicy 1. Poza małżoraczkami, z wymienionego przedziału rdzenia opracowane zostały otwornice przez Morawską (1976), małże przez Pugaczewską (Kutek *et al.* 1976) i megaspory przez Fuglewicza (*ibidem*); wnioski geologiczno-stratygraficzne opracował Kutek (*ibidem*). Autorzy ci sugerują wiek osadów z badanego przedziału wiercenia Trzebudnia 2, jako bajos-baton. Autor badając małżoraczki, skłonny jest proponowany wiek skał zażęzić do batonu, lub nawet do dolnego batonu.

ЯНУШ БЛАШИК

СРЕДНЕЮРСКИЕ ОСТРАКОДЫ ИЗ ФЛИШОВЫХ КАРПАТ — ЮЖНАЯ ПОЛЬША

Резюме

В статье описано 7 видов остракод, из которых 5 являются новыми. Они были обнаружены в керне бурения Тжебудня 2, фиг. 1 (Флишовые Карпаты — южная Польша) с глубины 3523.9—3532.5 м. Причем в скважине остракоды встречаются только в 3 верхних метрах её керна. Результаты исследования их вертикального распространения даны в табл. 1. Кроме остракод, в указанной части керна были исследованы моллюски — Пугачевской (Kutek *et al.* 1976), фораминиферы — Моравской и мегаспоры — Фуглевичем. Стратиграфическо-геологические выводы сделал Кутек (*ibidem*). Авторы, исследовавшие названные группы фауны и флоры и сделавшие стратиграфическо-геологические выводы определили возраст осадков исследованного участка бурения Тжебудня 2 как байос-бат. Автор же, исследовавший остракоды, предлагает возраст пород сузить в сторону бата или даже нижнего бата.

EXPLANATIONS OF PLATES 54—57

Abbreviations used: C = Carapace, RV = right valve, LV = left valve, A = adult, PR = premature, JS = juvenile stage.

Dimensions (in mm) of the individuals are given in paranthesis. Magnifications of all figures approximately $\times 70$.

All specimens are described from borehole Trzebunia 2, Bathonian.

Plate 54

Fastigatocythere crassicostata sp.n.

1. C. ♀ (0.66) A: a RV lateral view, b LV lateral view, c dorsal view, d ventral view; ZPAL XVI/1, holotype, 3523.9—3524.9 m.
2. ♀ (0.40) A: a LV lateral view, b LV lateral view; ZPAL O.XVI/2, 3523.9—3524.9 m.
3. ♀ (0.56) PR: a LV lateral view, b LV internal view; ZPAL O.XVI/4, 3524.9—3525.9 m.
4. ♂ (0.76) A: a LV lateral view, b LV internal view; ZPAL O.XVI/3, 3524.9—3525.9 m.

Fastigatocythere posterolata sp.n.

5. ♀ (0.84) A: a LV lateral view, b LV internal view; ZPAL O.XVI/5, holotype, 3524.9—3525.9 m.
6. ♂ (0.95) A: a LV internal view; ZPAL O.XVI/6, 3524.9—3525.9 m.

Plate 55

Fastigatocythere gracilis sp.n.

1. C. ♀ (0.72) A: a RV lateral view, b LV lateral view, c dorsal view, d ventral view; ZPAL O.XVI/8, holotype, 3524.9—3525.9 m.
2. C. ♂ (0.78) A: a RV lateral view, b LV lateral view, c dorsal view, d ventral view; ZPAL O.XVI/9, 3524.9—3525.9 m.
3. ♂ (0.80) A: a RV lateral view, b RV internal view; ZPAL O.XVI/10, 3524.9—3525.9 m.

Fastigatocythere robusta sp.n.

4. ♂ (0.88) A: a LV lateral view, b LV internal view; ZPAL O.XVI/16, 3524.9—3525.9 m.

Plate 56

Fastigatocythere aculeata sp.n.

1. C. (0.66) PR: a RV lateral view, b LV lateral view, c dorsal view, d ventral view; ZPAL O.XVI/13, 3523.9—3524.9 m.
2. (0.68) PR: left valve; ZPAL O.XVI/12, 3524.9—3525.9 m.
3. ♀ (0.78) A: a RV lateral view, b RV internal view; ZPAL O.XVI/11, holotype, 3524.9—3525.9 m.

Fastigatocythere robusta sp.n.

4. (0.68) JS: a LV lateral view, b LV internal view; ZPAL O.XVI/15, 3524.9—3525.9 m.
5. C. ♀ (0.80) A: a RV lateral view, b LV lateral view, c dorsal view, d ventral view; ZPAL O.XVI/14, holotype, 3524.9—3525.9 m.

Plate 57

Praeschuleridea subtrigona intermedia Bate, 1965

1. C. ♀ (0.80) A: a RV lateral view, b LV lateral view, c dorsal view, d ventral view; ZPAL O. XVI/20, 3524.9—3525.9 m.
2. ♀ (0.60) A: a LV internal view, b LV lateral view; ZPAL O.XVI/21, 3524.9—3525.9 m.
3. C. ♂ (0.68) A: a RV lateral view, b LV lateral view, c dorsal view, d ventral view; ZPAL O.XVI/22, 3524.9—3525.9 m.

Fastigatocythere posterolata sp.n.

4. (0.72) JS: a LV lateral view, b LV internal view; ZPAL O.XVI/7, 3524.9—3525.9 m.

Micropneumatocythere convexa Bate, 1963

5. ♀ (0.48) A: a LV lateral view, b LV internal view; ZPAL O.XVI/18, 3523.9—3524.9 m.
6. C. ♀ (0.50) A: a LV lateral view, b RV lateral view, c ventral view, d dorsal view; ZPAL O.XVI/17, 3523.9—3524.9 m.
7. C. ♂ (0.58) A: a RV lateral view, b LV lateral view, c ventral view, d dorsal view; ZPAL O.XVI/19, 3523.9—3524.9 m.







