

# MARINE TRIASSIC CYTHERACEA (OSTRACODA) FROM SOUTH PRIMORYE (SOVIET FAR EAST)

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With 1 plate and 1 figure in the text

## Abstract

Representatives of the family Bythocytheridae Sars, 1926 (Cytheracea, Ostracoda) from marine Middle Triassic deposits of Soviet Far East are reported. Seven species belonging to five genera (three new species and genera are erected) are described and figured. The adductor muscle scars of some Editiinae have been studied.

### Key words:

Middle Triassic — Ostracoda — Adductor muscle scars — Primorye — Soviet Far East.

## Zusammenfassung

Eine Bearbeitung von Ostracoden der Familie Bythocytheridae Sars, 1926 aus marinen Ablagerungen der Mitteltrias des Primorye Gebietes (Sowjetfernost) wird vorgelegt. Sieben Arten aus 5 Gattungen (drei Arten und drei Gattungen werden neu aufgestellt, 4 Arten werden in nomenclatura aperta dargestellt) werden beschrieben und abgebildet. Die Schließmuskeldrucke einiger Vertreter der Unterfamilie Editiinae werden untersucht.

### Schlüsselwörter:

Mitteltrias — Ostracoden — Schließmuskeldrucke — Primorye — Sowjetfernost.

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## A. Introduction

A few amount of small and peculiar ostracodes, belonging accordingly to their adductor muscle scar to the superfamily Cytheracea, and accompanied by representatives of Cavellinidae, Cytherellidae and Healdiidae, has been found in the marine Middle Triassic (Upper Anisian) deposits, outcropped east off Ussurijsk near the village Rakovka (western part of Primorye Territory, Soviet Far East; GRAMM & ZHARNIKOVA, 1966; GRAMM, 1968). The herein described forms are assigned to the subfamilies Bythocytherinae SARS, 1926 (*Monoceratina* sp.) and Editiinae KNÜPFER, 1967 (*Racvetina rakovkensis* n. gen. n. sp., *R. sp. 1*, *R? sp.*, *Acvocaria orientalis* n. gen. n. sp., *Covracythere kiparissovae* n. gen. n. sp., *Pseudomonoceratina* sp.) of the family Bythocytheridae SARS, 1926. The representatives of the latter form the longest-ranging group of Cytheracea (Silurian-Recent; GRÜNDEL & KOZUR, 1971). The fossil record for Bythocytheridae from Palaeozoic and Triassic strata is still inadequate. Hence the described fauna is of great importance.

### Abbreviations:

AMS	adductor muscle scar
C	carapace

The collection under No. 1103/B is deposited in the Institute of Biology and Pedology of the Far East Science Centre, USSR Academy of Sciences, Vladivostok.

## B. Some remarks on fossil bythocytherids

Of paramount importance for the elucidation of the family's Bythocytheridae antiquity was the revelation of the AMS pattern. The long discussion about the systematical position of *Monoceratina* ROTH, 1928, whose representatives first were found in Pennsylvanian deposits and are known from Devonian (for a detailed review see SZCZECURA, 1964), has been concluded by its assignment to Cytheracea after SOHN's indication that Palaeozoic species of this genus possess a duplicature and an AMS comprising five spots (TREATISE, 1961: 268). This gave reason to include *Monoceratina* into Bythocytheridae and removed all doubts about the pre-Devonian formation of the family. It should be noted that the Oligocene *M. sp.* whose AMS has been shown by TRIEBEL (1941, pl. 5, fig. 51) as comprising four spots, in fact has an AMS of five spots (MORKHOVEN, 1963: 427, verbal communication of TRIEBEL).

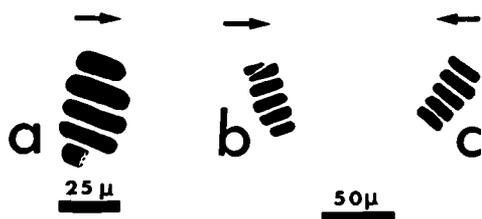
Except of *Monoceratina*, the other indubitable representative of Palaeozoic Bythocytheridae is the genus *Editia* BRAYER, 1952. Originally this genus has been referred to Kirkbyidae (BRAYER, 1952). Later it was assigned either to Palaeocopida of uncertain position, or to Amphissitidae.

An AMS characteristic for Cytheracea and namely for Bythocytheridae has been discovered by KNÜPFER (1967b) in the Early Carboniferous species *Editia germanica* KNÜPFER, 1967. The AMS consists of five elongate spots, situated in a vertical inclined forward row. In front of the structure the presence of a frontal spot is presumed. There is a merodont hinge and an inner lamella; a zone of concrescens may be seen on both ends, but only on the anterior one a vestibule and feebly discernible marginal pore canals are observed.

KNÜPFER's data are of especial importance, because they confirm the great antiquity of Cytheracea. It gives hope that subsequent detailed studies of inner structures of Palaeozoic ostracodes — central muscle scar field patterns, hingement, marginal structures — will broaden the notions about the role of Cytheracea during Palaeozoicum and the origin and development of this group. Very important are the latest works of GRÜNDEL & KOZUR (1971, 1973), in which the origin of Bythocytheridae from Tricorninidae is inferred and a new classification of bythocytherids proposed.

It may be supposed that in some places the bythocytherids were an appreciable component of Palaeozoic ostracode fauna. Rather frequently are met *Monoceratina*-like forms. During Early Carboniferous time in

various places of the Northern hemisphere existed such representatives of *Editia* as *E. elegantis* BRAYER, 1952, *E. tulensis* SAMOILOVA et SMIRNOVA, 1958, *E. kiselensis* (POSNER, 1960), *E. sp. 1*, *E. sp. 2*, *E. tichtensis* BUSHMINA, 1965, *E. germanica* KNÜPFER, 1967 (USA, Missouri — BRAYER, 1952; USSR, Kaluga region — SAMOILOVA & SMIRNOVA, 1958; Ulijanov, Kujbyshev regions — CHIGOVA, 1967; Kousnetzki Bassin — BUSHMINA, 1965; the Lower Lena — BUSHMINA, 1970; Perm region — ZANINA, 1971; DDR — KNÜPFER, 1967b). In Permian of DDR to Editinae belongs *Vallumoceratina* KNÜPFER, 1967. It is not impossible that *Monoceratina repentina* GUSSEVA from Lower Permian of the Urals (KOTCHETKOVA, GUSSEVA, 1972) may be also a representative of this subfamily.



Text-fig. 1. Adductor muscle scars (AMS) of Triassic representatives of the family Bythocytheridae (subfamily Editiinae) from Primorye; a — *Covracythere kiparissovae* n. gen., n. sp., C, holotype No. 1103/B12, left side; b, c — *Racvetina rakovkensis* n. gen., n. sp., C, holotype No. 1103/B1, b — right side, c — left side. South Primorye, village Rakovka, Anisian stage (upper part).

On several C of *Racvetina rakovkensis* n. gen. n. sp., *Acvocaria orientalis* n. gen. n. sp. and *Covracythere kiparissovae* n. gen. n. sp. we managed to study the AMS in reflected light and in some cases to obtain micrographs. The AMS consists of five elongate, subrectangular, obliquely directed spots, situated each above another and divided with narrow parallel spaces; they form a row which is inclined backward in *R. rakovkensis* n. sp. (text-fig. 1, b, c; pl. 1, fig. 32) and nearly vertical in *C. kiparissovae* n. sp. (text-fig. 1, a; pl. 1, fig. 33). As far as it may be observed the AMS of the first mentioned species is situated on the anterior slope of the transverse depression in the middle of C; the AMS of the second is disposed at the bottom of the depression, slightly below of the mid-carapace. No mandibular and frontal spots were recognized. Nothing is known about the inner lamella and hinge.

The findings of these forms add new links to the history of Editiinae. KNÜPFER (1967b) supposed that the subfamily have arisen in Devonian and became extinct during Permian. According to GRÜNDEL & KOZUR (1971) the Triassic genus *Triebacythere* GRÜNDEL et KOZUR, 1971 belongs to Editiinae (AMS unknown). This fact as well as our data (confirmed by AMS) testify that the representatives of the subfamily did not vanish on the Palaeozoic/Mesozoic Boundary and proceeded to exist in Triassic time (*Triebacythere* GRÜNDEL et KOZUR, 1971 — Middle, Upper Triassic of DDR, Austria, Slovakia; *Racvetina* n. gen., *Acvocaria* n. gen., *Covracythere* n. gen., *Pseudomonoceratina* GRÜNDEL et KOZUR, 1971 — Middle Triassic of Primorye).

Of note is the presence of *Monoceratina* sp., similar to Palaeozoic representatives of this genus. This fact shows that *Monoceratina* s. str. existed continuously since Devonian up to Cenozoic and that an iterative occurrence of the genus during Cretaceous and Tertiary, as supposed by GRÜNDEL & KOZUR (1971: 918), is doubtful.

### C. Systematic part

Superfamily Cytheraceae BAIRD, 1850

Family Bythocytheridae SARS, 1926

Subfamily Bythocytherinae SARS, 1926

Genus *Monoceratina* ROTH, 1928

*Monoceratina* sp.

Plate 1, figs. 1, 2

The collection contains one little elongate equivalved C. In dorsal view irregular arrow-shaped, with a blunt anterior and sharp posterior end. In lateral view subrectangular; extremities rounded — anterior broad-

ly, posterior narrowly. Dorsal margin long, straight; cardinal angles equal, obtuse. Ventral margin parallel to the dorsal, in the last third gradually merges with the posterior.

Surface smooth. In the ventral part there is a wing-like, posteriorly acuminate lateral extension.

Inner details and AMS are unknown.

Dimensions (in microns):

No. 1103/B31 C

length 500

height 190

width 200

In general outlines *M. sp.* is very similar to the Pennsylvanian species *M. ventralis* (ROTH, 1928, fig. 1) and Oligocene *M. sp.* (TRIEBEL, 1941, pl. 5, fig. 51). The mentioned forms differ mainly by a more strong overhanging of the ventral wing-like extension, which is more symmetrical in dorsal view.

Geological distribution and occurrences: Middle Triassic, Anisian stage (upper part); Primorye Territory (Soviet Far East), Rakovka.

### Subfamily Editiinae KNÜPFER, 1967

#### Genus *Racvetina* n. gen.

Name: The name *Racvetina* is feminine.

Type species: *Racvetina rakovkensis* n. sp.; Middle Triassic, Primorye Territory (Soviet Far East), Rakovka.

Diagnosis: C small, nearly equivalved, elongate, subrectangular with a poorly defined transverse depression and dorsal flattening. Ends rounded, posterior more narrowly. Dorsal margin long, straight. Ventral margin parallel to dorsal margin or gently converges posteriorly; medially slightly sinuated. Surface reticulate, with swellings and depressions. AMS of five elongate spots arranged in a backward inclined row.

Assigned species: Only the type species and *R. sp. 1* belong to the genus.

Remarks: The most close related Triassic genus *Triebacynthere* GRÜNDEL et KOZUR, 1971 (type species *Monoceratina hartmanni*; KOZUR, 1968, p. 864, pl. 2, figs. 10, 11) differs by its widens posteriorly dorsal flattening and very prominent ventrolateral swelling, whereas *Racvetina* n. gen. has more parallel outlines in dorsal aspect. Found in the same locality *Covracynthere* n. gen. differs by having flat sides, rectangular outlines in dorsal view and by ornamentation.

The Permian genus *Vallumocynthere* KNÜPFER, 1967 (type species *V. rugensis*; KNÜPFER, 1967a, p. 77, pl. 1, fig. 5) is different from *Racvetina* n. gen. by not parallel dorsal and ventral margins, convex ridge along entire ventral margin and large knobs in the middle part and posterodorsal angle. There is also some resemblance to *Monoceratina repentina* GUSSEVA (KOTCHETKOVA, GUSSEVA, 1972, p. 78, pl. 22, fig. 6).

#### *Racvetina rakovkensis* n. sp.

Plate 1, figs. 1—9, 32

Derivation of name: Name derived from the village Rakovka.

Holotype: No. 1103/B1; complete C.

Geological horizon and locality: Middle Triassic, Anisian stage (upper part). Soviet Far East, Primorye Territory, east off Ussurijsk, village Rakovka.

Material: Eight C and two steinkerns.

Description: C small, elongate-subrectangular, valves subequal, left valve slightly overreaches right valve at anterior and posterior ends; entire free margin in tight contact, forming a narrow keel. In dorsal view with a dorsal flattening, limited by thin parallel ridges slightly diverging posteriorly; subrectangular, sides nearly parallel, greatest width in the last third; anterior end blunt, posterior sharp.

In lateral view subrectangular, mainly of uniform height. Extremities rounded; anterior broadly and evenly, posterior narrowly and bevelled downwards. Dorsal margin long, straight; cardinal angles equal and obtuse. Ventral margin parallel to dorsal, nearly straight, with a slight sinuation medially; through a bold curving merges with the anterior, and gradually with the posterior. The ventral side is flattened.

Surface reticulate; pits shallow, rounded, closely packed. In the middle part there is a poorly defined transverse depression. Parallel to anterior runs a rather broad, ridge-like swelling with a crescentic depression

behind it. A short longitudinal ridge, as if consisting of three elongate knobs, the medial of which is lower and narrower, is situated slightly above middle; under the anterior knob lies another one — small, transverse stretched. Three swellings are located along the ventral margin, the medial one being the longest and curved downward. As it can be judged from the available steinkern (pl. 1, fig. 9) the described elevations and depressions are reflected on the inner surface of the valves.

No internal features are known except the AMS. The latter is on anterior slope of the depression, just behind the transverse knob; it consists of five elongate subrectangular spots, juxtaposed in a backward inclined row.

Dimensions (in microns):

	length	height	width
Holotype No. 1103/B1 C	570	255	225
No. 1103/B9 C	450	200	—
No. 1103/B16 C	450	225	—
No. 1103/B10 C	450	250	—
No. 1103/B7 C	475	205	175
No. 1103/B29 C	475	225	—
No. 1103/B8—1 C	535	235	—
No. 1103/B8—2 C	550	—	—
No. 1103/B6 Steinkern	425	200	175

Variability: Mainly expressed in fluctuations of height/length ratio, dimensions of pits and knobs.

Remarks: The close related *Racvetina* sp. 1 differs in having an obliquely rounded anterior and backward slightly converging ventral margin. *R.*? sp. is similar in surface structural features, but lateral outlines are triangular.

Geological distribution and occurrences: For the time being the species is known in the type locality only.

*Racvetina* sp. 1

Plate 1, figs. 10—13

There is only one C strongly resembling *R. rakovkensis* n. sp.; it is different however in the obliquely rounded anterior, ventral margin slightly converging to the posterior, and dorsal flattening broader in the posterior part.

Dimensions (in microns):

No. 1103/B4 C                      length 465                      height 225                      width 180

Geological horizon, locality and distribution as in *R. rakovkensis* n. sp.

*Racvetina?* sp.

Plate 1, figs. 14—16

There is in the collection only one small, elongate, irregularly triangular, equivalved C. In dorsal view subrectangular, of medium width, with a dorsal flattening limited by thin parallel ridges; anterior extremity blunt, posterior sharp. In lateral view ends sharply dissimilar; posterior more narrowly rounded and nearly acuminate. Greatest height at anterior cardinal angle. Dorsal margin straight, long, ventral straight; both margins quickly tapering to the posterior end. Surface reticulate. Main structural characters of the surface are: ridge-like swelling along the anterior and a crescentic depression behind it; poorly defined medial transverse depression, crossed by a short longitudinal ridge as if consisting of two narrow elongate knobs; a small knob in the mid-carapace in front of the transverse depression; three knobs in the ventral part, of which the extremes are more prominent and rounded.

Dimensions (in microns):

No. 1103/B15 C                      length 360                      height 200                      width 170

From above described *R. rakovkensis* n. sp. and *R. sp. 1* this form differs essentially by triangular shape and strong tapering to the posterior.

Geological horizon, locality and distribution as in *R. rakovkensis* n. sp.

Genus *Acvocaria* n. gen.

Name: The name *Acvocaria* is feminine.

Type species: *Acvocaria orientalis* n. sp.; Middle Triassic, Primorye Territory (Soviet Far East), Rakovka.

Diagnosis: C of medium size, ovate, with tapering toward posterior, with a transverse depression and dorsal flattening; medium width. Dorsal margin long and straight; ventral straight. Both extremities rounded; the anterior evenly, posterior narrowly rounded. Greatest height at anterior cardinal angle. Surface very faintly pitted; along the anterior end runs a ridge; in the middle part there is a short longitudinal ridge. Two large knobs are situated in the ventral part; the posterior one acuminate, inclined backward and by a narrow obliquely directed crest connected with the anterior part of the longitudinal ridge.

AMS comprises five spots.

Assigned species: Only the type species.

Remarks: From *Racvetina* n. gen. this genus differs much by its large prominent knobs and obliquely directed crest.

*Acvocaria orientalis* n. sp.

Plate 1, figs. 17—22

Derivation of name: From the latin *orientalis* eastern.

Holotype: No. 1103/B26; complete C (slightly damaged). Paratype: One damaged C.

Geological horizon and locality: Middle Triassic, Anisian stage (upper part). Soviet Far East, Primorye Territory, east off Ussurijsk, village Rakovka.

Material: Holotype and paratype.

Description: C medium-sized, elongate, equivalved. In dorsal view irregularly hexagonal with a blunt anterior and sharp posterior; greatest width in the last third; there is a dorsal flattening limited by nearly parallel thin ridges, slightly diverging backward.

In lateral view ovate with tapering toward posterior; greatest height at anterior cardinal angle. Ends rounded — the anterior broadly and evenly, the posterior narrowly. Dorsal margin straight; cardinal angles well marked, obtuse. Ventral margin straight; boldly curving merges with the anterior, and gently with the posterior.

Surface very faintly pitted, with a medial transverse depression, ridges and knobs. The transverse depression is shallow, starts at the dorsum and terminates below the middle in a form of a round fossula. Along the anterior runs a ridge. A longitudinal thin ridge, thickened anteriorly, crosses the depression slightly above middle. In the ventral part two large knobs: anteroventrally and on the border of second and last third. The back knob acuminate, inclined backward (preserved only on the right side of the holotype, pl. 1, fig. 17); from its top a thin obliquely directed crest stretches towards the anterior part of longitudinal ridge.

No internal features are known except AMS.

The AMS comprises five subrectangular spots.

Dimensions (in microns):

	length	height	width
Holotype No. 1103/B26 C	630	310	275
Paratype No. 1103/B2 C	> 600	285	270

Remarks: For the time being no other species of this genus are known.

Geological distribution and occurrences: The species is known in type locality only.

Genus *Covracythere* n. gen.

Derivation of name: *Covra* — an arbitrary combination + *cythere*.

Type species: *Covracythere kiparissovae* GRAMM, n. sp.; Middle Triassic, Primorye Territory (Soviet Far East), Rakovka.

Diagnosis: C small, nearly rectangular, with dorsal and ventral flattenings, and poorly defined transverse depression. Extremities rounded, the posterior narrower. Dorsal and ventral margins straight and parallel. Surface faintly pitted; a thin loop-like ridge stretches along the anterior and ventral margins and the middle of the surface (parallel to dorsal margin). AMS comprises five elongate, obliquely directed spots juxtaposed in a vertical row.

Assigned species: Only the type species.

Remarks: From the above described *Racvetina* n. gen. this genus differs by having very flat sides, loop-like ridge and nearly vertical position of AMS.

*Covracythere kiparissovae* n. sp.

Plate 1, figs. 23—27, 33

Derivation of name: The name is given in honour of the distinguished investigator of Triassic fauna and biostratigraphy — Dr. LIUBOV DMITRIEVNA KIPARISSOVA.

Holotype: No. 1103/B12; complete C.

Geological horizon and locality: Middle Triassic, Anisian stage (upper part). Soviet Far East, Primorye Territory, east off Ussurijsk, village Rakovka.

Material: Ten C.

Description: C small, elongate, bar-like, equivalved; entire margin in tight contact, forming a narrow keel. In dorsal view rectangular, with parallel sides, blunt anterior and acuminate posterior, dorsal and ventral flattenings, the dorsal limited by thin nearly parallel ridges.

In lateral view subrectangular. Ends dissimilar — the anterior broadly and uniformly rounded, the posterior obtusely pointed. Dorsal margin long and straight; cardinal angles equal, obtuse. Ventral margin straight, in most of the length parallel to dorsal, in last fourth converges posteriorly; through a rounded right angle merges with the anterior and gently with the posterior.

Surface faintly pitted. Slightly in front of the middle there is a poorly defined transverse depression. The main element of ornamentation is a thin loop-like ridge; it runs continuously along the anterior, ventral margin (in first third of the latter producing an undulation), then turns near the posterior and stretches parallel to dorsum slightly above the mid-height and terminates between the depression and anterior. The area outlined by the ridge is flattened and slightly elevated.

No internal features are known except the AMS.

The AMS is located at the bottom of the depression, slightly below of the mid-height of C; it consists of five obliquely stretched subrectangular spots, juxtaposed in a nearly vertical row; the lowermost spot is the shortest, the following three equal and long, the uppermost slightly shorter.

Dimensions (in microns):

		length	height	width
Holotype No. 1103/B12	C	500	225	150
No. 1103/B21—2	C	475	212	165
No. 1103/B3	C	500	225	150
No. 1103/B21—1	C	500	225	170
No. 1103/B22	C	530	220	175
No. 1103/B28	C	550	210	175

Variability: Mainly expressed in fluctuations of height/length ratio and width.

Sexual dimorphism: Not observed.

Remarks: This is the only species of the genus.

Geological distribution and occurrences: For the time being the species is known from the type-locality only.

Genus *Pseudomonoceratina* GRÜNDEL & KOZUR, 1971

*Pseudomonoceratina* sp.

Plate 1, figs. 28—31

The collection contains three small elongate C. In dorsal view elongate arrow-shaped, greatest width ventrally. In lateral view ovate, both extremities rounded, the posterior narrower; dorsal and ventral margins straight and parallel. Surface smooth with a poorly defined transverse depression. The flattened ventral part produces a wing-like extension, obtusely terminating at the beginning of the last third. Inner details and AMS are unknown.

Dimensions (in microns):

	length	height	width
No. 1103/B27 C	300	135	125
No. 1103/B23 C	307	135	150
No. 1103/B24 C	397	187	172

Remarks: The studied specimens correspond in general to generic diagnosis. Comparing with the type species *Ps. celsalobata* (COOPER, 1941: 23, pl. 1, fig. 23—27) they are smaller, more elongate, and the wing-like extension is disposed lower.

Geological horizon, locality and distribution: Middle Triassic, Anisian stage; Primorye Territory, Rakovka.

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## Explanation of Plates

### Plate 1

Magnification: 1—31, x 60; 32, x 285; 33, x 490

In all cases locality and geological distribution are the same, viz.: South Primorye, village Rakovka, Middle Triassic, Anisian stage (upper part).

- Figs. 1, 2. *Monoceratina* sp.; C, No. 1103/B31, left view, ventral view.
- Figs. 3—9. *Racvetina rakovkensis* n. gen., n. sp.; 3—6, 32 — C, holotype No. 1103/B1, 3—6 — right, left, dorsal and ventral view, 32 — AMS, right side of C; 7, 8 — C, No. 1103/B7, right and ventral view; 9 — steinkern, No. 1103/B6, left view.
- Figs. 10—13. *Racvetina* sp. 1; No. 1103/B4, right, left, dorsal and ventral view.
- Figs. 14—16. *Racvetina?* sp.; C, No. 1103/B15, right, dorsal and ventral view.
- Figs. 17—22. *Acvocaria orientalis* n. gen., n. sp.; 17—20 — C, holotype No. 1103/B26, right, left, dorsal and ventral view (figs. 18 and 20 demonstrate distinctly that the left side back knob is broken off); 21, 22 — C, No. 1103/B2, right and dorsal view.
- Figs. 23—27, 33. *Covracythere kiparissovae* n. gen., n. sp.; 23—25, 33 — C, holotype No. 1103/B12, 23—25 — right, left and dorsal view, 33 — AMS, left side of C; 26, 27 — C, No. 1103/B21—1, ventral and left view.
- Figs. 28—31. *Pseudomonoceratina* sp.; 28, 29 — C, No. 1103/B27, right and ventral view; 30, 31 — C, No. 1103/B23, right and dorsal view.

