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Late Bajocian and Early Bathonian Ostracods of the Russian Plate. Part II. Genera: *Procytherura* Whatley, *Pseudohutsonia* Wienholz, *Acrocythere* Neale, *Nanacythere* Herrig and *Trachycythere* Triebel et Klingler

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Abstract—This paper contains refined and extended descriptions of two ostracod genera of the family Cytheruridae: *Pseudohutsonia* Wienholz, 1967 and *Procytherura* Whatley, 1970, based on material from the Upper Bajocian (*Michalskii* ammonite Zone) and Lower Bathonian (*Besnosovi* ammonite Zone) of the Russian Plate from the Sokur composite Section (Saratov Region) and from the Obval Borehole (Penza Region). The genus *Pseudohutsonia* is revised and the evolution of two parallel lineages in the Middle Jurassic is proposed. Five stratigraphically significant ostracod species are described. For *Pseudohutsonia clivosa* (Khabarova, 1955), a neotype is designated herein; four others, *Procytherura iyae, Acrocythere sokurensis, Nanacythere octum*, and *Trachycythere peculiaris*, are described as new. For four taxa identified in open nomenclature (*Nanacythere* sp. 1, *N.* sp. 2, *Ljubimovella* sp. 1 and Gen. et sp. 8), information on the material and distribution in the studied sections is given, which will facilitate their use for stratigraphy and correlation in the future.

Keywords*:* ostracods, new species, Middle Jurassic, Bajocian, Bathonian, Central Russia, Volga Region

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INTRODUCTION

This work is a continuation of the systematic study of ostracods from the Upper Bajocian and Lower Bathonian of the Russian Plate based on materials from the sections of the Volga Region and central regions of Russia, substantiated in the first part of the article (Tesakova, 2022). It describes representatives of the genera *Plumhoffia* Brand, 1990 (family Cytheruridae) and *Aaleniella* Plumhoff, 1963 (family Eucytheridae), which can become index species of assemblages with ostracods (*C. (C.) lateres–P. tricostata–A. franzi* and *A. volganica* assemblages), the lower boundary of which is based on the first occurrence of the index taxa in the Sokur Section, which is the reference for the terminal Bajocian and the Lower Bathonian of the Volga Region (Povolzhye). For one species of *Plumhoffia*, proposed by Khabarova (1955), a neotype is designated. Three species of *Aalenella* are described as new.

This paper continues the monographic description of ostracods from the composite Sokur Section (open pit and borehole; Saratov Region) and the Obval Borehole (Penza Region), the location of which is shown in text-fig. 1 in the first part of the study (Tesakova, 2022). The choice of taxa for the study of representatives of the genera *Procytherura* Whatley, 1970, *Pseudohutsonia* Wienholz, 1967, *Acrocythere* Neale, 1960, *Nanacythere* Herrig, 1969, *Ljubimovella* Malz in Brand et Malz, 1961 and *Trachycythere* Triebel et Klingler, 1959 is not accidental. Their appearance or dominance at different levels of the section is of both stratigraphic and paleoecological significance. For example, the genus *Pseudohutsonia* is associated with regressive facies, or low sea level (Wienholz, 1967), which makes it possible to use it as a marker of the corresponding paleoenvironment and substantiate the paleoecology of the beds or assemblages of ostracods that include this genus. A small number of species, three of which are found in the Bajocian–Callovian of the Russian Plate, made it possible to revise this genus and suggest the development of two parallel lineages (see below), serving as the basis for the *Pseudohutsonia* phylozones.

The redescription of the genus *Procytherura* (extended and updated), on the contrary, showed that its taxonomy is not sufficiently substantiated and needs to be revised and subgenera corresponding to different lineages need to be introduced.

Representatives of the genera *Acrocythere, Nanacythere, Ljubimovella*, and *Trachycythere*, well known in the Jurassic of Western Europe, were first recorded on the synchronous deposits of the Central Russian Sea. These are rare or single specimens in various states of preservation, some of which have been used to describe new species (see below), while others are identified in open nomenclature.

In the genus *Nanacythere*, except for *N. octum* Tesakova, sp. nov. (see below), distinguished also *N.* sp. 1 based on two well-preserved valves from the Penza Region, Obval Borehole, depth 353.0–353.2 m, from the Lower Bathonian (Pl. 3, figs. 3, 4) and *N.* sp. 2 based on one well-preserved complete shell from the Saratov Region, Sokur Borehole, depth 47.0 m, from Upper Bajocian, *Michalskii* ammonite Zone (Pl. 3, fig. 5).

Ljubimovella? sp. 1 (Pl. 3, fig. 6). One poorly preserved specimen from the Sokur Borehole, from the Upper Bajocian (*Michalskii*), was tentatively assigned to the genus *Ljubimovella* on the basis of the characteristic pear-shaped valve with a low posterior end drooping down, complicated by a spine, and the absence of sculpture. The only specimen, filled from the inside with rock matrix, did not allow the hinge and muscle scars to be examined and consequently the generic affiliation could not be unambiguously identified. However, ostracods with such a characteristic shell shape are extremely rare in the Middle Jurassic of Europe. So far only one species of *Ljubimovella* has been described, a comparison with which showed the species independence of a specimen from Saratov Region (which in the future may give grounds for recognition of a phylostraton based on it). From the only species of this genus *L. piriformis* Malz in Brand et Malz from the Lower Bajocian of Germany (Brand and Malz, 1961, p. 165, pl. 2, figs. 15–25; Brand and Fahrion, 1962, p. 134, pl. 20, fig. 33) and England (Bate, 1965, p. 120, pl. 15, figs. 10–13, pl. 16, figs. 1, 2; 2009, pl. 2, fig. 6), and Upper Bajocian (*Niortense* Zone) of the Dnieper–Donets Depression (DDD) (Pyatkova and Permjakova, 1987, p. 133, pl. 52, fig. 6) the specimen from the Povolzhye is distinguished by a shorter shell, a less prominently overhanging anterior abdominal part of the valve, the absence of a spine at the anterior end, and a less developed posterior spine.

In the studied collection, six complete shells of satisfactory and poor state of preservation from the Upper Bajocian (*Michalskii*) of Sokur Borehole are assigned to a taxon (possibly a combined taxon), which could not be identified even to genus and which is referred to as Gen. et sp. 8 (Pl. 3, figs. 8, 9), since it has already appeared under this name in the literature (Shurupova et al., 2016, text-fig. 6/17).

The new species described in the first and second parts of this paper, as well as the redescribed taxa by T.N. Khabarova, are selected as indexes of the ostracod assemblages with *N. octum*–*A.*? *ovoidea* and with *Ps. clivosa*.

ABBREVIATIONS

The following abbreviations are used for the scientific institutions mentioned in this paper: VSU (Voronezh State University), GIN RAS (Geological Institute, Russian Academy of Sciences, Moscow), IG RAS (Institute of Geography, Russian Academy of Sciences, Moscow), IPGG SB RAS (A.A. Trofimuk Institute of Petroleum Geology and Geophysics, Siberian Branch, Russian Academy of Sciences, Novosibirsk), MSU (M.V. Lomonosov Moscow State University), PIN RAS (A.A. Borissiak Paleontological Institute, Russian Academy of Sciences, Moscow), SNIGU (N.G. Chernyshevsky Saratov National Research State University), LGRB (State Office for Geology, Raw Materials and Mining, Freiburg, Germany).

MATERIALS AND METHODS

The origin of the material and the methods of its study are described in detail in the first part of the article (Tesakova, 2022). Ostracod collections are housed at the Department of Regional Geology and Earth History, Lomonosov Moscow State University (Moscow), coll. no. MGU Sokur, MGU Sokur-Ya and MGU Sokur-LG (Sokur Section) and no. MGU Pnz-12 (Obval Borehole).

SYSTEMATIC PALEONTOLOGY

The taxonomy of suprageneric taxa was adopted from the *Prakticheskoe rukovodstvo* (1999). When measuring the parameters of complete shells or separate valves, the following abbreviations are accepted: L—length, AEH – the height of the anterior end, PEH—the height of the posterior end, W—width, L/H—length/maximum height ratio (here—to AEH), juv.—juvenile individual.

Order Podocopida

Suborder Cytherocopina

Superfamily Cytheroidea Baird, 1850

Family Cytheruridae G.W. Mueller, 1894

Genus *Procytherura* Whatley, 1970

Procytherura: Whatley, 1970, p. 323; Wakefield, 1994, p. 9; Tesakova, 2003, p. 165; Ballent and Whatley, 2009, p. 205.

Type species. *Procytherura tenuicostata* Whatley, 1970 from the Upper Oxfordian (*Plicatilis* ammonite Zone) of Scotland (Whatley, 1970, p. 324, pl. 6, figs. 1–8).

Diagnosis. Shell small, from subtriangular to elongate-oval, with dorsal and ventral margins converging towards posterior end. Short shallow depression may be located in anterodorsal region. Valves nearly equal, right one slightly overlapping left along dorsal margin. Faint eye spot may be present. Shell surface from almost smooth to reticulate or pitted, wrinkled or ribbed. Hinge lophodont; in right valve it is represented by smooth narrow or rounded teeth and smooth groove. Pore-canal zone wide with narrow vestibule; radial canals straight, thin, thickened proximally. Widely spaced medium-sized sieve pores present on surface. Adductor scar shaped as four oval spots lined up in a subvertical row, with one large heart-shaped mandibular scar in front of it.

Species composition. Many species needing revision.

Comparison. *Procytherura* is considered to be the ancestor of the cosmopolitan genus *Cytherura* Sars ranging from Cretaceous to present and inhabiting shallow and brackish-water basins (Reyment et al., 1961, p. 292; Nikolaeva and Andreev, 1999, p. 55). The shape and ornamentation of the shells in these two genera are very similar, and in both the right valve overhangs the left one along the dorsal margin. *Procytherura* differs in the lophodont hinge, versus a hemimerodont one in *Cytherura*, and the presence of a vestibule, which *Cytherura* lacks. In addition, the mandibular scar in *Procytherura* is single, large, heart-shaped, differing from that of *Cytherura* (small oval, in front of which there are two more, oblique and a small round one in front of it). *Procytherura* differs from the Jurassic–Recent *Eucytherura* G.W. Mueller (see Reyment et al., 1961, p. 293), another cosmopolitan genus of the same family, similar in shell size and hinge morphology and often found in the same facies, in its elongated-oval and uniformly convex shell versus the round-rectangular one with flattened sides in *Eucytherura*, and the absence of an eye tubercle, which is well developed in *Eucytherura*. *Procytherura* has a weak, mainly longitudinally ribbed sculpture and pores not raised and not rimmed, while in contrast *Eucytherura* has well-developed longitudinal, transverse and oblique ribs and various tubercles, and pores raised and rimmed.

Procytherura iyae Tesakova, sp. nov.

Plate 2, figs. 1–8

Procytherura? sp. 1: Shurupova et al., 2016, text-fig. 6/6.

Procytherura sp. 1: Shurupova and Tesakova, 2017, text-fig. 3.

Etymology. In honor of the micropaleontologist Iya Ivanovna Molostovskaya.

Holotype. MGU Sokur-10, complete shell; Saratov Region, Sokur Borehole, depth 47.6 m; Upper Bajocian, *Michalskii* Zone (Pl. 2, fig. 4).

Description. The shell is small, elongate subtriangular, moderately convex. The right valve is slightly shorter than the left and overlaps it along the dorsal margin, while the left one overlaps the right one at the anterodorsal and posterodorsal angles (Pl. 2, fig. 8). Maximum length at the middle of the valve height, maximum height at the beginning of the anterior end. The greatest width is located in the middle of the shell; the surface of the valves converges smoothly towards the posterior end and more steeply anteriorly. The dorsal margin is straight or very slightly convex, converges towards the posterior end, passes over a ledge into the anterior end, smoothly merging with the posterior end. The ventral margin is straight, concave in the middle; right valves directly under the bend have a narrow shallow rhomboid notch receiving the protruding part of the ventral margin of the left valve when the valves close. The anterior end is high, evenly arcuately rounded; on the right valves it is slightly oblique from above; narrowly flattened along the margin. The posterior end is low, evenly arcuately rounded; slightly oblique on the right valves; narrowly flattened along margin. The posteroventral part of the valves has a hollow convexity, which externally looks like a short oblong ledge overhanging the ventral margin (Pl. 2, figs. 1, 2, 4). No eye spot is present. The valve sculpture is represented by a thin network of polygonal cells with low faces, the inner surface of which is dotted with small pits. On the ventral side, there are three or four very thin longitudinal ribs formed by merged cell faces (Pl. 2, figs. 3, 6, 7). The dorsal view shows two thin ribs in the posterior third of the shell (one on each valve), converging wedge-shaped to the posterior margin (Pl. 2, fig. 8).

Muscle scars, sieve pores and pore-canal zone as in the genus. The hinge of the right valve is represented by two smooth oval marginal teeth and a smooth groove; on the left, rounded receiving pits and a smooth ridge (Pl. 2, fig. 5).

→

Explanation of Plate 2

Abbreviations used in Plates 2 and 3: c—complete shell, rv—right valve, lv—left valve, juv.—juvenile.

All specimens from Saratov Oblast, Sokur Borehole; Upper Bajocian, *Michalskii* Zone. Scale bars (1–8, 11, 12) 30 μm; (9 and 10) 100 μm.

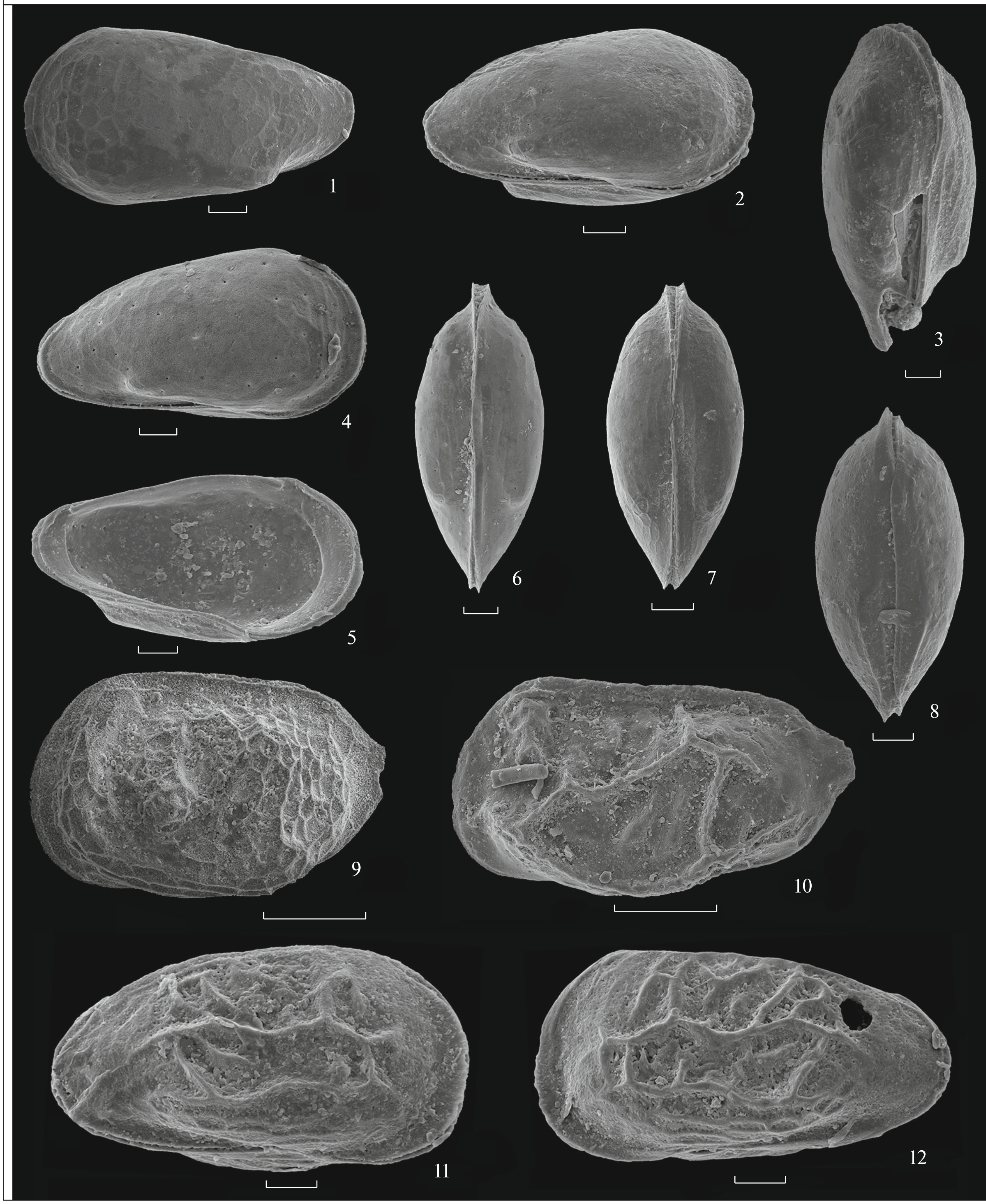
Figs. 1–8. *Procytherura iyae*, sp. nov.: (1) specimen Sokur-Ya-237 lv; depth 23.6 m; (2) specimen Sokur-104, c, from right; depth 22.7 m; (3) specimen Sokur-Ya-267 c ventral view; depth 33.0 m; (4) holotype Sokur-10, c, from right; depth 47.6 m; (5) specimen Sokur-102, lv inner view; depth 22.7 m; (6) specimen Sokur-11, c, ventral view; depth 47.6 m; (7) specimen Sokur-104, c, ventral view; depth 22.7 m; (8) specimen Sokur-100, c, dorsal view; depth 22.7 m.

Fig. 9. *Pseudohutsonia clivosa* (Khabarova, 1955), neotype Sokur-Ya-175 lv, female; depth 24.4 m.

Figs. 10. *Acrocythere sokurensis*, sp. nov., holotype Sokur-47, lv, female; depth 37.0 m.

Figs. 11, 12. *Nanacythere octum*, sp. nov., (11) specimen Sokur-107, c, female, from right; depth 22.7 m; (12) holotype Sokur-108, c, female, from left; depth 22.7 m.

Plate 2



Dimensions in mm:

	L	AEH	PEH	W	L/H
Holotype Sokur-10	0.26	0.13	0.07	–	2.00
Specimen Sokur-Ya-237	0.25	0.14	0.08	–	1.79
Specimen Sokur-104	0.23	0.11	0.07	–	2.09
Specimen Sokur-Ya-267	0.27?	–	–	0.12	–
Specimen Sokur-102	0.25	0.12	0.06	–	2.08
Specimen Sokur-11	0.27	–	–	0.11	–
Specimen Sokur-104	0.22	–	–	0.10	–
Specimen Sokur-100	0.22	–	–	0.11	–

Variability. The shell length (within 0.22–0.27 mm) and the height of the posterior end slightly vary, as well as the size of the posteroventral convexity and the prominence of the reticulate sculpture. The cells are best seen at the anterior and posterior ends, and the central part of the valve appears to be smooth (Pl. 2, figs. 2, 4), although the entire surface is covered with them (Pl. 2, fig. 1). No *sexual dimorphism* has been identified.

Comparison. In terms of characteristic reticulate sculpture with small pits inside the cells, the new species is most similar to *P. didictyon* Whatley, Ballent et Armitage from the Upper Callovian and Oxfordian of England (Whatley et al., 2001, p. 146, pl. 3, figs. 3–8, 10) and the Lower Callovian of Belorussia (Makhnach and Tesakova, 2015, pl. 1, figs. 6–9, 13), from which it differs in smaller size, a subtriangular shell versus an elongated oval one in the compared species, the absence of a small depression in the anterodorsal part, and also the presence of a posteroventral convexity and a much weaker sculpture. From *P. didictyon rossica* Tesakova, another reticulate taxon with a posterior convexity, from the Lower Callovian of Saratov Region (Tesakova and Seltser, 2013, p. 61, text-fig. 6, figs. 7–11) it is distinguished by a subtriangular rather than oblong shell, the greatest width in the middle rather than in the posterior part of the valve, and a much weaker sculpture. It differs from *P. ovaliformis* Brand from the Upper Bathonian (*Hodsoni* and *Discus* zones) of northwestern Germany (Brand, 1990, p. 164, pl. 4, figs. 18–24), which is similar in its subtriangular shell with a reticulate sculpture, in a lower posterior end, the largest width in the middle of the valve (i.e., not parallel sides), the presence of the posteroventral convexity, the absence of an anterodorsal depression, and poorly developed sculpture.

Remarks. The reticulate sculpture is distinguished only using a scanning microscope (using the light microscope, the shells appear smooth). In addition, it can be obscured (partially or completely) by micritic crust.

Occurrence. Upper Bajocian–Lower Bathonian (*Michalskii* and *Besnosovi* ammonite zones) of the Saratov Volga Region (Saratov Povolzhye).

Material. 156 well-preserved complete shells and separate valves from the Upper Bajocian, *Michalskii* Zone, and two complete shells from the Lower Bathonian, *Besnosovi* Zone, of the Sokur Section.

Subfamily Parataxodontinae Mandelstam, 1960

Genus *Pseudohutsonia* Wienholz, 1967

Pseudohutsonia: Wienholz, 1967, p. 35; Tesakova et al., 2009, p. 266.

Type species. *Pseudohutsonia tuberosa* Wienholz, 1967 from the Middle Callovian of northwestern Germany (Wienholz, 1967).

Diagnosis. Shell small, moderately convex, inequivalve (the left valve larger than the right one), with the greatest width in posteroventral part. Anterior end higher than posterior one and broadly rounded; posterior end low, pointed at mid-height and forming a caudal process. Thick, flat, and hollow rib located on the valve parallel to anterior and ventral margins, being most convex in middle part of ventral margin and widening towards the posterior end. Valve surface with large tubercles, hollow inside (nodes). Largest node located above mid-height, beyond mid-length. The second, smaller one, located in the anterior part of the valve (in a different position, which is typical of the genus). Two or three small tubercles may be present, or short ribs also hollow (Wulsts), located between or below the two obligatory large nodes. Entire surface covered with thin-walled reticulum.

No eye tubercle is present. The adductor scars in the form of a straight vertical row of four oblong imprints. The hinge is antimerodont: on the right valve it consists of notched marginal teeth and a crenulated median groove. *Sexual dimorphism* is well developed and expressed in the greater length of the shells of males (1/6 longer than those of females).

Species composition. *P. clivosa* (Khabarova, 1955) from the Upper Bajocian of the Volgograd (Khabarova, 1955) and Saratov (Shurupova et al., 2016; Shurupova and Tesakova, 2017) regions; *P. subtilis* (Oertli, 1959) from the Upper Bajocian of Saratov Region (Shurupova et al., 2016) and Bathonian of France and England (Oertli, 1959; Bate, 1969; Dépêche, 1984); *P. wienholzae* Tesakova, 2009 from the Lower Callovian of Kursk Region (Tesakova et al., 2009); *P. tuberosa* Wienholz, 1967 from the Middle Callovian of northern Germany (Wienholz, 1967) and the Netherlands (Herngreen et al., 1983); *P. prosopon* Whatley, Ballent, and Armitage, 2001 from the Lower Callovian of southern Germany (*Koenigi* Zone) (working collections of E.M. Tesakova and M. Franz, LGRB), Upper Callovian of England (Whatley et al., 2001) and the Netherlands (Herngreen et al., 1983; Witte and Lissenberg, 1994), as well as the Lower Oxfordian of Scotland (Whatley, 1970) and France (Bizon, 1958), *P. minuta* from the Middle–Upper Callovian of southern Tunisia (Mette, 1995).

C o m p a r i s o n. This genus differs from *Balowella* Wienholz, 1967, the most similar in size, shell shape, hinge morphology structure, and sculpture with hollow nodes, from the Callovian–Lower Oxfordian of Europe (Wienholz, 1967, p. 37; Nikolaeva and Andreev, 1999, p. 56; Tesakova, 2003, p. 167) in not two-divided small teeth on the marginal teeth of the hinge, the presence of two large hollow nodes, the absence of a muscle tubercle, and the absence of subvertical buttress-like ribs. These differences do not allow considering both genera as synonyms, as previously assumed (Nikolaeva and Andreev, 1999, p. 56).

This genus differs from the brackish-water genera *Looneyella* Peck, 1951 from the Lower Cretaceous of North America (Howe et al., 1961, p. 329) and *Hutsonia* Swain, 1946 from the Jurassic of North America (Howe et al., 1961, p. 328) that are similar in size, shape and nodular ornamentation the shells, in the crenulated groove of the hinge, as opposed to a smooth groove in *Looneyella* and *Hutsonia*, a significantly higher posterior end, and paleoecology. From *Otocythere* Triebel et Klingler, 1959 from the Lower-Middle Jurassic of Europe (Triebel and Klingler, 1959, p. 349; Reyment et al., 1961, p. 297), similar in shell shape and somewhat in ornamentation, differs in short terminal teeth and long middle section of the hinge. It differs from *Pseudobythocythere* Mertens, 1956 from the Cretaceous of Germany (Sylvester-Bradley and Kesling, 1961, p. 268; Nikolaeva and Andreev, 1999, p. 57), which is most similar in shell shape and hinge, in the absence of a well-developed vertical depression and corresponding convexity on the inner surface of the valve.

Non *Pseudohutsonia hebridica* Whatley, 1970 from the Lower Oxfordian of Scotland (Whatley, 1970, p. 349, pl. 15, figs. 5–10, 12–14, 16, 18), which is a junior synonym of *Balowella attendens* (Lyubimova, 1955) from Middle Callovian–Lower Oxfordian of the Volga Region and Central Russia (Lubimova, 1955; Tesakova, 2003, 2008; Tesakova and Schurupova, 2018).

R e m a r k s. (1) One satisfactorily preserved juvenile specimen from the Upper Bajocian of the Sokur Section, previously identified as *Pseudohutsonia* sp. 1, can be attributed to *P. subtilis* (Shurupova et al., 2016, text-fig. 6/12).

The presence of three nodes in *P. subtilis*, where the largest one is located in the posterodorsal part of the valve, and the other (smaller) ones in the anterior half of the valve are somewhat higher than the mid-height and in the posterior half between the posterodorsal node and the ventral rib, angular conjugation of the anterior and ventral marginal ribs, up to their separation (and not smooth, as in all other species of this genus), the uneven thickness of these ribs and the poorly developed reticulate microsculpture distinguish this species from all others so much that it suggests a second lineage within the genus that evolved in parallel. Other members of this lineage are not yet known.

(2) Summarizing information from literary sources, the author's own observations and M. Franz's oral communication, it can be assumed that reliable finds of *Pseudohutsonia* occur in Western Europe only starting from the Callovian. If we accept such a distribution of the genus in time and space as valid, then we can assume their first appearance in the chronicle in the Late Bajocian of the Volga Region. However, based on paleogeographic considerations, their occurrence is more likely in the Crimean-Caucasian Region or Central Asia, where they diverged into two branches (*P. subtilis* and all the others). At the end of the Bajocian or the beginning of the Bathonian, *Pseudohutsonia* migrated across the Central Russian Sea to Western Europe, where the *P. subtilis* lineage became extinct, while others developed during the Callovian and at the beginning of the Oxfordian. Minor morphological differences between the species *P. wienholzae, P. prosopon*, and *P. tuberosa*, expressed in a greater or lesser degree of development of small tubercles and reticulate microsculpture, lead to the assumption that this branch evolved by anagenesis. With a great deal of caution, the species *P. clivosa* can be considered as an ancestor for the lineage *P. wienholzae* → *P. prosopon* → *P. tuberosa*, guided mainly by its stratigraphic position. Unfortunately, it was not possible to study its ontogeny using a few valves, just as the ontogeny of Western European representatives is not covered in publications.

***Pseudohutsonia clivosa* (Khabarova, 1955)**

Plate 2, fig. 9

Protocythere clivosa: Khabarova, 1955, p. 193, pl. 1, fig. 4.

Pseudohutsonia sp.: Shurupova and Tesakova, 2017, text-fig. 3.

H o l o t y p e. TsNIL, Association "Saratovneft" no. 77, right valve of a female specimen; Volgograd Region, village of Zhirnoe; Bajocian (Khabarova, 1955, p. 193, pl. 1, fig. 4).

N e o t y p e. MGU Sokur-Ya-175, left valve of a female specimen; Saratov Region, Sokur Borehole, depth 24.4 m; Upper Bajocian, *Michalskii* Zone (Pl. 2, fig. 9).

D e s c r i p t i o n. The shell is small, rounded rectangular, moderately convex. Maximum length is at mid-height, maximum height is at the beginning of the anterior end, maximum width in the posterior third of the shell. The dorsal margin of the left valves is straight, smoothly merging with the anterior and posterior ends; on the right valves it is convex in the middle and passes to the ends through small ledges. The ventral margin is straight, concave approximately in the middle, passes smoothly into the anterior and posterior ends on both valves, slightly converges towards the posterior end. In the place of concavity of the ventral margin on the left valves, there is a small, narrow slit-like pocket, receiving the protrusion of the right valve when the valves are closed. The anterior end is high, broadly and smoothly rounded; on the right valves it is oblique from above more strongly than on the left; flattened along the margin. The posterior end is lower than the anterior, rounded triangular in shape, forming a caudal process in the middle of the height; on the right valves it is more oblique from above than on the left, therefore it is more pointed; flattened. The sculpture is represented by large hollow nodes, one of which is located in the middle of the valve, the other in the posterodorsal part. A thick convex rib smoothly curves around the valve parallel to the anterior and ventral margins, and its posterior end is expanded forming a node. The median node is separated from the rib and posterior node by an almost annular depression. The entire surface of the valves, including the nodes and rib, is covered with large irregular tetrahedral cells with fine distinct edges. On the ventral side, the merged cell walls form a longitudinal ribbing. On the flattened part of the anterior and posterior ends and at the dorsal margin, the cell faces are very thin and hardly visible. The hinge, muscle scars and *sexual dimorphism* as in the genus. The pore-canal zone is wide.

D i m e n s i o n s i n m m:

	L	AEH	PEH	W	L/H
Neotype Sokur-Ya-175	0.36?	0.2	0.15	–	1.80?

V a r i a b i l i t y. The sizes of the shells vary insignificantly within the same age stage, and the height of the cell walls may vary: mesosculpture from distinctly reticular to weak, smoothed.

C o m p a r i s o n. The most striking feature of *P. clivosa* is the position of the anterior node at mid-height, which readily distinguishes it from all other species of the genus. Its other distinguishing feature is a well-developed large-mesh reticulum with relatively high cell edges raised above the valve surface. In addition, the described species lacks two or three small (sometimes elongated) tubercles arranged in a horizontal row between the ventral rib and nodes located at the dorsal margin. All of the above distinguishes it from the group of species that are apparently members of the same lineage: *P. wienholzae* Tesakova, 2009 from the Lower Callovian, *Subpatruus* and *Koenigi* ammonite zones of Kursk Region (Tesakova et al., 2009, p. 268, pl. 2, figs. 15–18), *P. prosopon* Whatley, Ballent, and Armitage, 2001 from the Lower Callovian, *Koenigi* Zone of southern Germany (oral communication by M. Franz), Upper Callovian of England (Whatley, Ballent and Armitage, 2001, p. 156, pl. 6, figs. 1–9) and the Netherlands (Herngreen et al., 1983, pl. 5, figs. 1–3; Witte et Lissenberg, 1994, p. 27, pl. 1, figs. 10), the Lower Oxfordian of Scotland (Whatley, 1970, p. 351, pl. 15, figs. 15, 20, 21) and France (Bizon, 1958, p. 29, 3, figs. 12–14, pl. 4, figs. 16, 17), and *P. tuberosa* Wienholz, 1967 from the Middle Callovian of northeastern Germany (Wienholz, 1967, p. 36, pl. 4, figs. 45 –48a, pl. 5, figs. 48b, 51, 52) and the Netherlands (Herngreen et al., 1983, pl. 4, figs. 10–12). From *P. subtilis* (Oertli, 1959) from the Upper Bajocian of the Volga Region (Shurupova et al., 2016, text-fig. 6/12) and the Bathonian of France and England (Oertli, 1959, p. 119, pl. 3, figs. 31–35; Bate, 1969, p. 431, pl. 14, figs. 7, 8; Sheppard, 1981, pp. 126, pl. 21, figs. 1–4; Dépêche, 1984, pl. 29, figs. 6) it differs not only in the features already mentioned, but also in the absence of a third small tubercle located in the posterior half of the valve between the posterodorsal node and the ventral rib.

M a t e r i a l. Four well-preserved valves from the Upper Bajocian (*Michalskii* Zone) of the Sokur Borehole of the Saratov Region.

S u p e r f a m i l y Progonocytheroidea
Sylvester-Bradley, 1948

Family Pleurocytheridae Mandelstam, 1960

Genus *Acrocythere* Neale, 1960

***Acrocythere sokurensis* Tesakova, sp. nov.**

Plate 2, fig. 10

Cytherura sp. 1: Shurupova et al., 2016, text-fig. 6/10.

Acrocythere sp. 1: Shurupova and Tesakova, 2017, text-fig. 3.

E t y m o l o g y. From the first finding in the Sokur Borehole (Saratov Region).

H o l o t y p e. MGU Sokur-47, left valve of female; Saratov Region, Sokur Borehole, depth 37.2 m; Upper Bajocian, *Michalskii* Zone.

D e s c r i p t i o n. The shell is small, moderately convex, rounded-rectangular, with almost parallel dorsal and ventral margins. The left valve is slightly larger than the right one and overlaps it at the anterodorsal and posterodorsal angles. The greatest length is at mid-height, the greatest height is in the anterior third, and the greatest width is in the posteroventral part of the shell. The dorsal margin is straight on the right valves and slightly concave on the left; passes into the anterior and posterior ends through small ledges, better expressed on the left valves (more smoothly on the right valves). The ventral margin is straight, concave in the anterior third, slightly converging towards the posterior end; passes smoothly arcuately into the anterior and posterior ends, but more steeply into the anterior than to the posterior. The anterior end is high, smoothly arcuately rounded, slightly oblique dorsally, and broadly flattened. The posterior end is lower than the anterior, triangular, almost symmetrical (the upper notch above the caudal process is slightly deeper than the lower one), and widely flattened. The sculpture is represented by low, relatively thin longitudinal and transverse ribs. A long ventral rib smoothly arcuately contours the most convex part of the valve, marking its inflection, and extends from the anterior margin (at the anterior end it is expressed by a small process) to the posterior end (without crossing it). The median zigzag rib begins at the anterior end, ascends to the adductor scars, where it forms an inflection, then deviates sharply to the dorsal margin, then just descends as sharply downwards and not reaching the posterior end, ends at mid-height. In the posterior half of the valve, where the median rib is bent, there are two short transverse ribs connecting it with the ventral rib and dorsal margin. Two processes obliquely depart from the anterior extremity of the median rib, one of which reaches the anterior dorsal angle, the other connects to the ventral rib. The intercostal surface in the middle part of the valve is additionally complicated by poorly visible short transverse ribs, two of which are located above the median rib and two below it. And another short rib departs from the back of the ventral rib towards the median but does not reach it. Several very thin longitudinal ribs are present on the ventral side. The pore-canal zone, hinge and muscle scars are typical for the genus.

D i m e n s i o n s i n m m:

	L	AEH	PEH	W	L/H
Holotype Sokur-47	0.39	0.19	0.13	–	2.05

C o m p a r i s o n. This species differs from *A. pumila* Plumhoff, most similar in shell shape and arrangement of ribs, from the Lower and Middle Aalenian of Germany (Plumhoff, 1963, p. 20, pl. 1, figs. 13–16; Franz et al., 2018, p. 77, pl. 5, figs. 14, 15; Wannenmacher et al., 2021, p. 19, text-fig. 7/9) and Switzerland (Tesakova, 2017, p. 46, pl. 2, fig. 14) and from the Lower Bajocian of England (Morris, 1983, pl. 8, figs. 4–6) by a more angular shape of the posterior end, due to which the caudal process is more pronounced than in *A. pumila*; a rounded arcuately convex ventral rib, smoothly descending to the posterior end, and not forming an almost vertical pointed ledge above the posterior end, as in *A. pumila*; a shorter median rib that does not reach the posterior margin; the absence of many bridges connecting the median rib with the ventral and dorsal margins.

From *A. tricostata* Michelsen, similar in arrangement of longitudinal ribs, from the Upper Sinemurian–Upper Pliensbachian of Denmark (Michelsen, 1975, p. 158, pl. 9, figs. 131–142; pl. 11, figs. 157, 158), the Lower Pliensbachian of southern Sweden (Sivhed, 1980, p. 45, pl. 4, fig. 42), the Lower Pliensbachian–Upper Toarcian of Germany (Herrig, 1981, p. 1021, pl. 1, figs. 13, 14), and the Lower Toarcian of England (Bate and Coleman, 1975, pp. 41, pl. 6, figs. 10–12; non pp. 12, pl. 6, figs. 6–9) it is distinguished by a pronounced caudal process; lack of reticular intercostal sculpture; the absence of an arcuate subvertical rib at the posterior end; an angularly broken (rather than smoothly bending down) median rib, not reaching the ventral rib at the posterior end; smoothly convex (rather than angularly broken) ventral rib; and the presence of a vertical rib-bridge between the ventral and median ribs in the posterior third of the valve.

M a t e r i a l. One well-preserved valve from the Upper Bajocian (*Michalskii* Zone) of the Sokur Borehole.

Family Progonocytheridae Sylvester-Bradley, 1948

Subfamily Kirtonellinae Bate, 1963

Genus *Nanacythere* Herrig, 1969

Nanacythere octum Tesakova, sp. nov.

Plate 2, figs. 11, 12; Plate 3, figs. 1, 2

Cytherura? sp. 2: Shurupova et al., 2016, text-fig. 6/11.

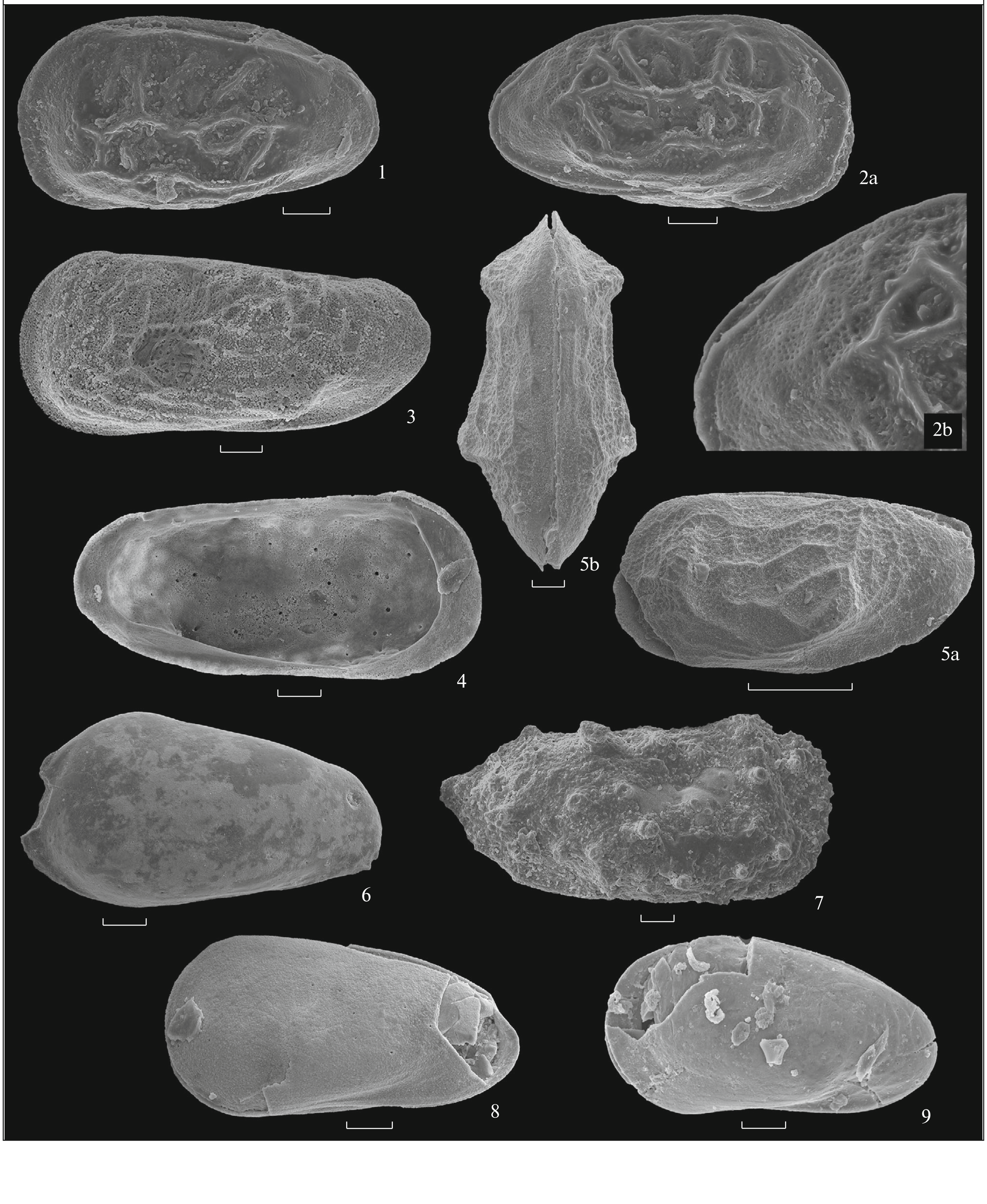
Acrocythere sp. 2: Shurupova and Tesakova, 2017, text-fig. 3.

E t y m o l o g y. The Latin *octo* (eight), name of the species comes from the characteristic figure in the middle of the valve in the form of a figure eight.

H o l o t y p e. MGU Sokur-108, entire female shell; Saratov Region, Sokur Borehole, depth 22.7 m; Upper Bajocian, *Michalskii* Zone (Pl. 2, fig. 12).

D e s c r i p t i o n. The shell is small, moderately convex, undissected, elongated oval. The valves are almost the same size. The greatest length is at mid-height, the greatest height is at the beginning of the anterior end, the maximum width is in the middle of the ventral side. The dorsal margin is slightly convex, converges towards the posterior end; on the both valves passes into the anterior and posterior margins through small ledges. The ventral margin is straight, concave almost in the middle, but closer to the anterior end; passes smoothly into the anterior and posterior ends; flattened along the margin. On the right valves, there is a wide rhomboid-shaped fossa (pocket) on it, which receives the protruding part of the ventral margin of the left valves when they close. The anterior end is high, smoothly arcuately rounded; weakly sloping from above on the left valves, stronger on the right; flattened along the margin. The posterior end is low, also smoothly arcuately rounded; on the left valves it is symmetrical, on the right valves it is slightly oblique from above; very narrowly flattened along margin. The oblique margins of the antero- and posterodorsal angles of the right valve look like gentle notches. The eye tubercle is absent. The sculpture is represented by low relatively thin longitudinal and transverse ribs, forming a large-mesh relief. The longest, zigzag-shaped rib extends in the middle of the valve from the front to the rear end but does not go into them. The second longitudinal rib is located on the ventral side, also undulates and reaches the anterior and posterior ends without reaching them. Between these ribs, two subvertical ribs-bridges are developed, connecting them with the formation of a closed figure-eight structure (infinity symbol) in the middle of the valve. In the anterior half of the figure-eight structure, there is a short vertical rib extending from the ventral rib; in the posterior half there is a short oblique rib that crosses the upper corner (Pl. 2, figs. 11, 12) and may, after bending, form a loop (Pl. 3, fig. 1, 2a). An indistinct longitudinal rib is developed along the dorsal margin

Plate 3



(better expressed on the left valves; Pl. 3, fig. 1). Five subvertical bridges connect the median rib with the dorsal margin, and between them there may be thin subhorizontal riblets; large cells are formed as a result of their intersection (Pl. 2, fig. 12). The third of the upper ribs-bridges may be bifurcated in the shape of the letter Y (Pl. 2, fig. 12; Pl. 3, fig. 2a). Between the third and fourth ribs-bridges there is a very small, Explanation of Plate 3

All illustrated ostracods, except (3) and (4) from Saratov Region, Sokur Borehole; Upper Bajocian, *Michalskii* Zone; (3) and (4) from Penza Region, Obval Borehole; Lower Bathonian; scale bars (1–4; 6–9) 30 µm; (5) 100 µm.

Figs. 1, 2. *Nanacythere octum*, sp. nov.: (1) specimen Sokur-107, c, female, from left; depth 22.7 m; (2) holotype Sokur-108, c, female; depth 22.7 m: (2a) from right, (2b) valve surface fragment with simple pores.

Figs. 3, 4. *Nanacythere* sp. 1; depth 353.0–353.2 m: (3) specimen Pnz-12-51 lv (L–0.29, AEH–0.13, PEN–0.09, L/B–2.23); (4) specimen Pnz-12-50 lv, inner view (L–0.28, AEH–0.13, PEH–0.10, L/H–2.15).

Fig. 5. *Nanacythere* sp. 2; specimen Sokur-LG-30, c, female (L–0.33, AEH–0.16, PEH–0.14, W–0.17, L/H–2.06); depth 47.0 m: (5a) from left, (5b) dorsal view.

Fig. 6. *Ljubimovella*? sp. 1, specimen Sokur-Ya-186 lv female (L–0.25, AEH–0.13, PEH–0.08, L/H–1.92); depth 24.0 m.

Fig. 7. *Trachycythere peculiaris*, sp. nov., holotype Sokur-Ya-062, rv, female; depth 37.0 m.

Figs. 8, 9. Gen. et sp. 8: (8) specimen Sokur-Ya-167, c, from left (L–0.22, AEH–0.11, PEH–0.06, L/H–0.06); depth 22.2 m; (9) specimen Sokur-111-2, c, from left (L–0.26, AEH–0.12, PEH–0.06, L/H–2.17); depth 22.7 m.

short vertical riblet resembling a tubercle (Pl. 2, fig. 12; Pl. 3, figs. 1, 2a). Below the ventral rib there are four or five more longitudinal ribs, thinning towards the ventral margin, and the bridges between them form a coarse reticulate sculpture of the ventral side (Pl. 2, figs. 11, 12). A similar reticulum covers the anterior and posterior ends (devoid of ribs), but differs very little, so the ends appear almost smooth. The entire intercostal surface, including smooth parts of anterior and posterior ends, is densely covered with small simple pores (Pl. 3, fig. 2b).

Adductor in the form of a vertical row of four oval scars are clearly visible from the outside (Pl. 2, fig. 12).

D i m e n s i o n s i n m m:

	L	AEH	PEH	W	L/H
Holotype Sokur-108	0.24	0.12	0.08	–	2.00
Specimen Sokur-107	0.24	0.12	0.08	–	2.00

V a r i a b i l i t y. Prominence of the reticulum at the ends of the valve may vary slightly. The length of the longitudinal and transverse ribs also slightly varies affecting distinctness of their contacts.

C o m p a r i s o n. This species differs from *N. zigzag* Luppold from the Upper Hettangian of northern Germany, which is most similar in shell shape and sculpture (Beutler et al., 1996, p. 132, pl. 7, figs. 15, 18, 19), in having almost smooth anterior and posterior ends (a not reticulate, as in *N. zigzag*), the absence of well-developed subvertical ribs in the posterior third of the shell, crossing the valve from the dorsal to the ventral margin, and ribs (in contrast to the ridges in *N. zigzag*), located somewhat differently. It differs from *N. elegans* (Drexler), another species from the Upper Hettangian of Germany (Beutler et al., 1996, pl. 7, figs. 17), similar in shell shape and size, smooth anterior and posterior ends, and thin ribs, in the presence of long longitudinal ribs, instead of short, arched and diagonal as in *N. elegans*.

R e m a r k s. Since it was not possible to study the structure of the hinge, muscle scars and the pore-canal zone, which were the basis for the two subgenera (the nominative *Nanacythere* (*Nanacythere*) and *N.* (*Domeria*) Herrig, 1969 (Herrig, 1969, pp. 1080, 1085), the described species was assigned so far to the genus as a whole, although the presence of three longitudinal ribs in it is characteristic of the sculpture of representatives of *N.* (*Domeria*).

M a t e r i a l. Six entire well-preserved shells from the Upper Bajocian (*Michalskii* Zone) of the Sokur Borehole.

Infraorder Incertae Sedis

S u p e r f a m i l y Incertae Sedis

Family Trachycytheridae Kozur, 1972

Genus *Trachycythere* Triebel et Klingler, 1959

***Trachycythere peculiaris* Tesakova, sp. nov.**

Plate 3, fig. 7

Gen. sp. B: Shurupova et al., 2016, text-fig. 2.

E t y m o l o g y. From the Latin *peculiaris* (peculiar).

H o l o t y p e. MGU Sokur-Ya-062, right valve of female; Saratov Region, Sokur Borehole, depth 37.0 m; Upper Bajocian, *Michalskii* Zone.

D e s c r i p t i o n. The shell is small, elongated quadrangular, slightly convex, nearly equal-valved; the left valve slightly overlaps the right one at the antero- and posterodorsal angles. A short oblique depression, flattening near the muscle scars, cuts the valve in the anterior third. The greatest length is at the middle of the height, the greatest height is at the beginning of the anterior end, the greatest width is in the posteroventral part of the valve. The dorsal margin is long, straight, passes into the anterior end through a small ear, into the posterior end through a gentle ledge. The ventral margin is slightly convex, concave in the anterior third, almost parallel to the dorsal (very weakly converges towards the posterior end), passes smoothly into the anterior and posterior ends (more gently into the posterior than to the anterior). The anterior end is high, rounded, box-shaped, broadly flattened along the margin, ornamented with small, short spines along the entire margin. The posterior end is lower than the anterior, elongated, triangularly pointed, almost symmetrical, on the right valves it is slightly more oblique from above than from below, flattened along the margin. An eye tubercle is present. The sculpture is represented by hollow cones crowned with tubercles and arranged in sub-longitudinal rows. In the lower third of the valve (at the inflection of its surface), seven to eight cones are observed, arranged in the longest row parallel to the ventral margin. Another row of four to five cones is present above it, but also in the lower half of the valve. A short row of three cones is present in the upper third of the valve, in its posterior half; on the continuation of which, directly under the eye tubercle, another cone is developed. The latter, together with the cone located in the upper half of the valve and the first cone from the lower row, can be considered as a subvertical row emphasizing the ledge on the shell surface at the transition to the anterior end. In addition to the aforementioned cones, three or four similar ones are observed in the central part of the valve and at the transition to the posterior end. The surface of the valve between the cones is smooth, not complicated by additional microsculpture.

D i m e n s i o n s i n m m:

	L	AEH	PEH	W	L/H
Holotype Sokur-Ya-062	0.34	0.16	0.11	–	2.13

C o m p a r i s o n. This species differs from all species of the genus in the absence of reticulate microsculpture on the surface between the tubercles. In addition, it is distinguished from *T. tubulosa tubulosa* Triebel et Klingler (Triebel and Klingler, 1959, p. 344, pl. 7, figs. 22–26, pl. 8, figs. 27–29, pl. 12, figs. 62; Knitter, 1983, pp. 229, pl. 35, figs. 8; Riegraf, 1985, p. 78, pl. 2, figs. 19, 20; Harloff, 1993, p. 106, pl. 4, figs. 1, 2) and *T. tubulosa seratina* Triebel et Klingler (Triebel and Klingler, 1959, p. 346, pl. 9, figs. 30–33; Riegraf, 1985, p. 78, pl. 2, figs. 21, 22) from Pliensbachian and Toarcian of Western Europe, similar in the triangular-pointed shape of the posterior end, by a shorter shell and a higher posterior end. From *T. verrucosa* Triebel et Klingler from Toarcian of Germany (Triebel and Klingler, 1959, p. 348, pl. 10, figs. 35, 36; Riegraf, 1985, p. 79, pl. 2, figs. 23–26) and Toarcian and Lower Bajocian of England (Bate and Coleman, 1975, p. 12, pl. 3, figs. 1–8; Morris, 1983, pl. 11, figs. 17–19), similar in height to the posterior end, it differs in a pointed triangular shape (vs. smoothly rounded in *T. verrucosa*). From *T. horrida* Triebel et Klingler from the Lower Pliensbachian of southern Germany (Triebel and Klingler, 1959, p. 348, pl. 10, figs. 35, 36; Harloff, 1993, p. 106, pl. 14, figs. 1, 2) it is distinguished by a pointed shape of the posterior end, as well as a different number and arrangement of tubercles. This species differs from *T. munita* Sylvester-Bradley from the Upper Bathonian of England (Bate, 1969, p. 428, pl. 16, figs. 3; Sylvester-Bradley, 1973, pp. 257–264; Sheppard, 1981, p. 133, pl. 23, figs. 8) and the Bathonian of France (Sheppard, 1981, p. 133, pl. 23, figs. 8; Dépêche, 1984, pl. 29, figs. 5), similar in number and location of tubercles, the presence of a large eye tubercle and a longitudinal row on the ventral side, in the longer and triangular-pointed posterior end, and a wider flattened part of the anterior end.

From T. sp. (Bate, 1969) from Callovian of DDD (Pyatkova and Permjakova, 1978, p. 157; pl. 71, fig. 6), the only species with similar intertubercular surface, it differs in a smaller shell height, the low and triangular posterior end (but not high and smoothly rounded), and a substantially smaller number of cones crowned with tubercles and their larger size.

R e m a r k s. (1) The species is described based on a single specimen filled with rock matrix from the inside, which did not allow to observe the hinge morphology and muscle scars. However, the dimensions, in combination with the sculpture of hollow cones, characteristic of *Trachycythere*, made it possible to determine the generic affiliation unambiguously. The specific independence of this specimen follows from a comparison (see above) with all species of this genus.

(2) The genus *Trachycythere* originated in Western Europe in the Early Jurassic and continued to develop there in the Middle Jurassic. Its appearance on the Russian Plate is associated with the invasion into the Central Russian Sea in the late Bajocian, and if further studies facilitate recognition of a new biostraton based on its findings (for example, in the rank of Beds with fauna), then it can be considered as a migration straton.

(3) Although the ontogeny of the new species has not been studied, based on the greatest morphological similarity and stratigraphic position, *T. peculiaris* either had the same ancestor with *T. munita* (then it would have been a sister group for the latter), or could have been ancestral to it. To resolve this issue, it is not enough to study the ontogeny of these species, but data on the migrations of *Trachycythere* throughout the entire existence of the genus are also needed.

M a t e r i a l. Holotype.

CONCLUSIONS

The descriptions of two ostracod genera of the family Cytheruridae, *Pseudohutsonia* Wienholz, 1967 and *Procytherura* Whatley, 1970 were refined and emended based on material from the Upper Bajocian (*Michalskii* Zone) and Lower Bathonian (*Besnosovi* Zone) of the Sokur composite Section (Saratov Region) and the Obval Borehole (Penza Region). A small number of species in the genus *Pseudohutsonia*, three of which are found in the Bajocian–Callovian of the Russian Plate, made it possible to revise this genus and suggest the development of two parallel lineages, based on which phylozones can be recognized. The redescription of the genus *Procytherura* (extended and updated), on the contrary, showed the groundlessness of assigning a number of taxa to it and the need to revise it with the allocation of subgenera corresponding to different lineages. Five species are monographically described. For *Pseudohutsonia clivosa* (Khabarova, 1955), a neotype has been designated; four others: *Procytherura iyae, Acrocythere sokurensis, Nanacythere octum* and *Trachycythere peculiaris* are described as new. For four taxa left in open nomenclature (*Nanacythere* sp. 1, *N*. sp. 2, *Ljubimovella* sp. 1, Gen. et sp. 8), data on the material and distribution over the studied sections are given.

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CONFLICT OF INTEREST

The author declares that she has no conflicts of interest.

REFERENCES

Ballent, S. and Whatley, R.C., The distribution of the Mesozoic ostracod genus *Procytherura* Whatley: Palaeogeographical distribution with special reference to Argentina, *Alcheringa*: *Australas. J. Palaeontol.,* 2000, vol. 24, pp. 229–242.

Ballent, S. and Whatley, R.C., Taxonomy and zoogeography of the Mesozoic Cytherurid ostracoda from West-Central Argentina, *Palaeontology*, 2009, vol. 52, Pt. 1, pp. 193–218.

Bate, R.H., Middle Jurassic Ostracoda from South Yorkshire, *Bull. Brit. Mus. Nat. Hist. Geol.*, 1963, vol. 9, no. 2, pp. 21–46.

Bate, R.H., Middle Jurassic Ostracoda from the Grey Limestone Series, Yorkshire, *Bull. Brit. Mus. Nat. Hist. Geol.*, 1965, vol. 11, no. 3, pp. 75–133.

Bate, R.H., Some Bathonian Ostracoda of England with a revision of the Jones, 1884 and Jones et Sherborn, 1888 collections, *Bull. Brit. Mus. Nat. Hist. Geol.*, 1969, vol. 17, no. 8, pp. 379–437.

Bate, R.H. and Coleman, B.E., Upper Lias Ostracoda from Rutland and Huntingdonshire, *Bull. Geol. Surv. G.B.*, 1975, no. 55, pp. 1–42.

Beutler, G., Heunisch, C., Luppold, F.W., et al., Muschelkalk, Keuper und Lias am Mittellandkanal bei Sehnde (Niedersachsen) und die regionale Stellung des Keupers, *Geol. Jb.*, 1996. A 145, pp. 67–197.

Bizon, J.J., Foraminiferes et Ostracodes de l'Oxfordien de Villers-sur-Mer (Calvados), *Rev. Inst. Franç. Petrol.*, 1958, vol. 13, no. 1, pp. 3–47.

Brand, E., Biostratigraphische Untergliederung des Ober-Bathonium im Raum Hildesheim, Nordwestdeutschland mittels Ostracoden und Korrelation ihrer Vertikalreichweiten mit Ammoniten-Zonen, *Geol. Jb.*, 1990. A 121, pp. 119–273.

Brand, E. and Fahrion, H., Dogger NW-Deutschlands, in *Arbeitskreis Deutscher Mikropaläontologen: Leitfossilien der Mikropaläontologie*, 1962, pp. 123–158.

Brand, E. and Malz, H., Drei neue Procytheridea—Arten und *Ljubimovella* n. g. aus dem NW—deutschen Bajocien, *Senck. Leth.*, 1961, vol. 42, no. 1/2, pp. 157–173.

Dépêche, F. Les ostracodes d'une plate-forme continentale au Jurassique: recherches sur le bathonien du Bassin Parisien, *Mém. Sci. Terre. Univ. Pierre et Marie Curie, Paris*, no. 84 38, Paris, 1984, pp. 1–419 (unpublished).

Franz, M., Ebert, M., and Stulpinaite, R., Aalenian–Lower Bajocian (Middle Jurassic) ostracods from the Geisingen clay pit (SW Germany), *Palaeodiversity*, 2018, vol. 11, pp. 59–105.

Harloff, J., Ostracoden des Unter-Pliensbachiums in Baden-Württemberg, *Stuttg. Beitr. Naturk. Ser. B.,* 1993, no. 191, pp. 1–214.

Herngreen, G.F.W., Lissenberg, Th., de Boer, K.F., et al., Middle Callovian beds in the Achterhoek, Eastern Netherlands, *Meded. Riks Geol. Dienst*., 1983, vol. 37, no. 3, pp. 1–29.

Herrig, E., Ostracoden aus dem Ober-Domerien von Grimmen westlich Greifswald (Teil II), *Geologie*, 1969, vol. 18, no. 9, pp. 1072–1102.

Herrig, E., Ostracoden aus dem Lias von Thüringen. Die Familien Cytheruridae (II) und Gattungen *Acrocythere, Dominocythere* und *Aphelocythere, Z. Geol. Wiss.*, 1981, vol. 9, no. 9, pp. 1017–1029.

Howe, H.V., van den Bold, W.A., and Reyment, R.A., Family Progonocytheridae Sylvester-Bradley, 1948, in *Treatise on Invertebrate Paleontology. Arthropoda 3. Crustacea, Ostracoda*. Lawrence: Univ. Kansas Press, 1961, pp. 322–331.

Khabarova, T.N., Ostracods from the deposits of the Middle Jurassic of the Saratov region and the northern regions of the Stalingrad region, in *Tr. VNIGRI. Nov. Ser.* (Trans. All-Russ. Petrol. Res. Explor. Inst. New Ser.), 1955, vol. 84, pp. 192–197.

Knitter, H., Biostratigraphische Untersuchungen mit Ostracoden im Toarcien Süddeutschlands, *Facies*, 1983, vol. 8, pp. 213–262.

Lyubimova, P.S., Ostracods of the Mesozoic deposits of the Middle Volga region and the Obshchiy Syrt, in *Tr. VNIGRI.*

Nov. Ser. (Trans. All-Russ. Petrol. Res. Explor. Inst. New Ser.), 1955, vol. 84, pp. 3–190.

Makhnach. V.V. and Tesakova, E.M. Palaeogeographic reconstructions of the natural environment in Southeast Belarus during the Bathonian–Oxfordian ages, *Moscow Univ. Geol. Bull*., 2015, vol. 70, no. 2, pp. 159–170.

Mette, W., Ostracods from the Middle Jurassic of southern Tunisia, *Beringeria*, 1995, vol. 16, pp. 259–348.

Michelsen, O. Lower Jurassic biostratigraphy and ostracods of the Danish Embayment, *Geol. Surv. Denm. II. Ser.*, 1975, no. 4. 287 p.

Morris, P.H., Palaeoecology and stratigraphic distribution of Middle Jurassic ostracods from the Lower Inferior Oolite of the Cotswolds, England, *Palaeogeogr., Palaeoclimatol., Palaeoecol*., 1983, vol. 41, pp. 289–324.

Nikolaeva, I.A. and Andreev, Yu.N., Superfamily Cytheracea Baird, 1850, in *Prakticheskoye rukovodstvo po mikrofaune, 7, Ostrakody mezozoya* (Practical Guide to Microfauna, vol. 7, Ostracods of the Mesozoic), St. Petersburg: Vseross. Nauchno-Issled. Geol. Inst., 1999, pp. 53–61.

Oertli, H., Malm-Ostracoden aus dem Schweizerischen Juragebirge, *Denkschr. Schweiz. Naturforsch. Ges*., 1959, vol. 83, pp. 1–44.

Plumhoff, F., Ostracoden des Oberaalenium und tiefen Unterbajocium (Jura) des Gifhorner Troges, Nordwestdeutschland, *Abh. Senckenb. Naturforsch. Ges*., 1963, vol. 503, pp. 1–100.

Prakticheskoye rukovodstvo po mikrofaune, 7, Ostrakody mezozoya (Practical Guide to Microfauna, vol. 7, Ostracods of the Mesozoic), St. Petersburg: Vseross. Nauchno-Issled. Geol. Inst., 1999.

Pyatkova, D.M. and Permjakova, M.N., *Foraminifery i ostrakody yury Ukrainy* (Foraminifers and Ostracods from the Jurassic of Ukraine) Kyiv: Nauk. Dumka, 1978.

Reyment, R.A., Howe, H.V., and Hanai, T., Family Cytheruridae G.W. *Müller, 1894, Treatise on Invertebrate Paleontology. Arthropoda 3. Crustacea, Ostracoda*, Lawrence: Univ. Kansas Press, 1961, pp. 291–300.

Riegraf, W., Mikrofauna, Biostratigraphie und Fazies im Unteren Toarcium Südwestdeutschlands und Vergleiche mit benachbarten Gebieten, *Tübinger Mikropaläontol. Mitt.*, 1985, no. 3, pp. 1–232.

Sheppard, L.M., Middle Jurassic Ostracoda from Southern England and Northern France. *Thesis Ph.D. Univ. London*, 1981 (unpublished).

Shurupova, Ya.A. and Tesakova, E.M., Detailed biostratigraphic scales as based on the palaeobiogenetical approach (an example of the Upper Bajocian–Lower Bathonian ostracod scale of the Russian Platform), *Volumina Jurassica*, 2017, vol. 15, pp. 1–17.

Shurupova, Ya.A., Tesakova, E.M., Kolpenskaya, N.N., et al., Saratov Povolzhye in the Late Bajocian (Middle Jurassic): paleogeography reconstructed from ostracods, *Zhizn Zemli*, 2016, vol. 38, no. 1, pp. 22–37.

Sivhed, U., Lower Jurassic ostracodes and stratigraphy of western Skane, southern Sweden, *Sver. Geol. Unders., Ser. C*, 1980, no. 50, pp. 3–84.

Sylvester-Bradley, P.C. and Kesling, R.V., *Family Bythocytheridae Sars, 1926, Treatise on Invertebrate Paleontology. Arthropoda 3. Crustacea, Ostracoda*. Lawrence: Univ. Kansas Press, 1961, pp. 267–268.

Sylvester-Bradley, P.C., On *Trachycythere munita* Sylvester-Bradley sp. nov., *Stereo-Atlas of Ostracod Shells*, 1973, vol. 1, pp. 257–267.

Tesakova, E.M., Callovian and Oxfordian Ostracodes from the Central Region of the Russian Plate, *Paleontol. J.,* 2003, vol. 37, Suppl. 2, pp. 107–227.

Tesakova, E., Late Callovian and Early Oxfordian ostracods from the Dubki section (Saratov area, Russia): Implications for stratigraphy, paleoecology, eustatic cycles and palaeobiogeography, *N. Jb. Geol. Paläont. Abh*., 2008, vol. 249, no. 1, pp. 25–45.

Tesakova, E.M., Biostratigraphie du Jurassique moyen des sondages Benken et Schlattingen-1 (Nord de la Suisse) établie sur la base de la répartition des ostracodes, *NAGRA Arbeitsber. NAB*, 2017, vol. 17–41, pp. 1–77.

Tesakova, E.M., Upper Bajocian and Lower Bathonian ostracods of the Russian Plate. Part I. Genera *Plumhoffia* Brand and *Aaleniella* Plumhoff, *Paleontol. J.*, 2022, vol. 56, no. 2, pp. 173–186.

Tesakova, E.M. and Seltser, V.B., Ostracods and ammonites of the Lower Callovian of the Bartolomeevka section (Saratov Region), *Byull. Mosk. Obshch. Ispyt. Prir.*, 2013, vol. 88, no. 2, pp. 50–68.

Tesakova, E.M. and Shurupova, Ya.A., Ostracod Analysis of Callovian and Lower Oxfordian Deposits of the Mikhailovtsement Section (Ryazan Region): Methods and Results, *Paleontol. J.,* 2018, vol. 52, no. 13, pp. 1547–1568.

Tesakova, E.M., Strezh, A.S., and Gulyaev, D.B., New ostracods from the Lower Callovian of Kursk Region, *Paleontol. J.*, 2009, vol. 43, no. 3, pp. 258–271.

Triebel, E. and Klingler, W., Neue Ostracoden-Gattungen aus dem deutschen Lias, *Geol. Jb*., 1959, vol. 76, pp. 335–372.

Wakefield, M.I., Middle Jurassic (Bathonian) ostracoda from the Inner Hebrides, Scotland, *Palaeontogr. Soc. Monogr.*, 1994, Publ. no. 596, part of vol. 148, pp. 1–89.

Wannenmacher, N., Dietze, V., Franz, M., and Schweigert, G., New records of ostracods and ammonites from the Aalenian (mainly *Concavum* Zone) of the Zollernalb (Swabian Alb, SW Germany), *Zitteliana*, 2021, vol. 95, pp. 1–55.

Whatley, R.C. Scottish Callovian and Oxfordian Ostracoda, *Bull. Brit. Mus. Nat. Hist. Geol.* 1970, vol. 19, no. 6, pp. 299–358.

Whatley, R.C., Ballent, S., and Armitage, J., Callovian Ostracoda from the Oxford Clay of southern England, *Rev. Esp. Micropaleontol*., 2001, vol. 33, pp. 135–162.

Wienholz, E., Neue Ostracoden aus dem norddeutschen Callov, *Freiberg. Forschungsh. Paläontol. C*, 1967, vol. 213, pp. 23–51.

Witte, L.J. and Lissenberg, T., Ostracods from Callovian to Ryazanian strata (“Upper Jurassic”) in the Central North Sea Graben (Netherlands offshore), *Meded. Rijks Geol. Dienst*., 1994, vol. 51, pp. 1–69.

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