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Revision of Some Cambrian Bradoriids (Crustacea) from the Siberian Platform

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Abstract—The species *Bradoria ordinata* Melnikova, 1983 is revised on the basis of additional material from the Cambrian of the middle reaches of the Lena River. The systematic position of the bradoriid species previously assigned to the genus *Sunella* Huo, 1965 is revised. Two new genera are established: *Sinskolutella* gen. nov. including *B. ordinata* (type species) and *Leperditia? concentrisulcata* Abushik, 1960 and *Yakutingella* gen. nov. including *Y. intricata* sp. nov. (type species) and *Sunella parva* Melnikova, 1988. The genus *Duibianella* Shu, 1990 previously known only from the Lower Cambrian of China was also discovered in the studied sequence.

INTRODUCTION

In spite of extensive studies of the Cambrian type sections in the Siberian Platform (Debrenn et al., 1989; *Kembrii Sibiri*, 1992; *Stage Division ...*, 1983; 1984), specialist studies of invertebrate fossils are lacking. During field works in 1995–1996 the expedition of the Paleontological Institute headed by A. Yu. Ivantsov studied the rocks of the Sinskoe and Kutorgina Formations (Early Cambrian, Botomian Stage) on the right bank of the Lena River (opposite the village of Sinskoe), near Achchagyi-Tuoidakh and Ulakhan-Tuoidakh creeks. Apart from trilobites, brachiopods, sponges, palaeoscolerids, and plants e.g., *Margaretia*, differently preserved bradoriids were found.

MATERIAL

The forms identified as "*Bradoria*" *ordinata* Melnikova, 1983 prevail in the collected material. Their carapaces usually occur as accumulations of deformed and squashed valves on the rock surface. The strong extent of deformation suggests that the original carapaces were thin and slightly mineralized.

The studied collection is housed in the Paleontological Institute (PIN) of the Russian Academy of Sciences, nos. 3465, 4342 and 4349.

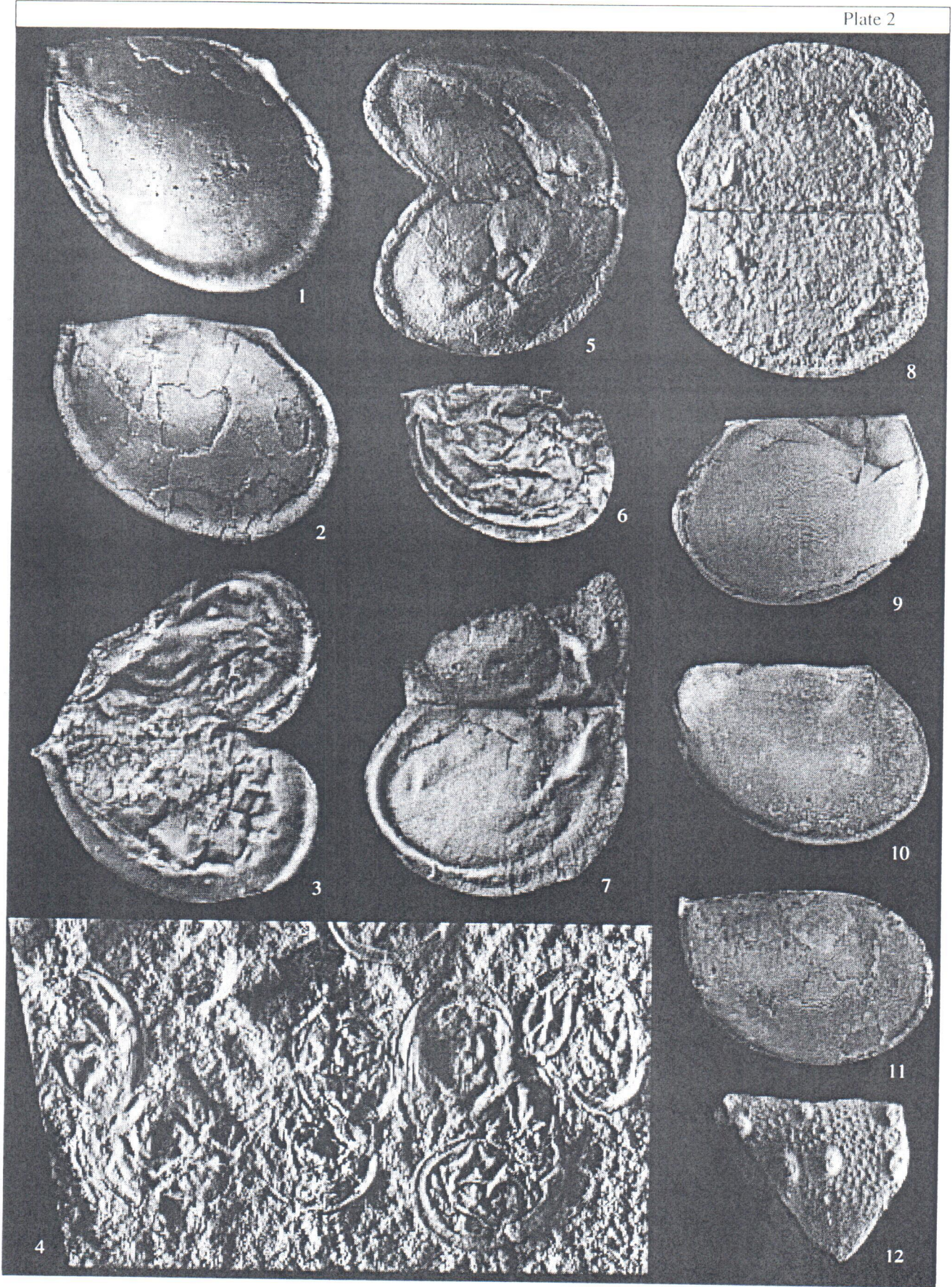
DISCUSSION

The original description of the species was based on a single specimen from the Sinskoe Formation (18 m above the base, *Bergeroniella gurarii* Zone) in the middle reaches of the Lena River, 10 km above the village of Sinskoe (Melnikova, 1983a, 1983b). Essentially, the holotype represents the internal mold of the carapace, and only anteroventral and posterodorsal parts display the small remains of the shell material. The new finds

of these forms allow a different interpretation of some morphological features. Good preservation of the specimens from the new collection allows me to specify the shape of the anterodorsal curve: it is more acute than the posterodorsal curve and ends with a small spine (Pl. 2, figs. 3 and 6), although the latter is not always preserved. Besides, in these specimens the surface of the carapace is not smooth as earlier indicated by the author, but with distinct pores. Another important uncertainty of the original description was the presence (Melnikova, 1983a, p. 56) of the node directly near the anterodorsal curve. However, new material shows that not the node but the indistinct furrow-like depression occurs just below the dorsal edge of the carapace near the anterodorsal curve.

The shape the dorsal edge of the carapace of "*Bradoria*" *ordinata* is worth mentioning. The holotype (Pl. 2, fig. 1) and few other specimens (Pl. 2, fig. 2) show, that the dorsal edge bends towards both sides of the carapace at a distance of 1/3 of its length from the anterodorsal curve. At the same time, the extent of elongation of the posteroventral side is the highest. The majority of other specimens, especially with both valves preserved in a single plane (Pl. 2, figs. 3 and 5), display the straight dorsal edge and elongation of the posteroventral side is not considerable. Supposedly, the forms with straight and bent dorsal edges should be assigned to separate species, but other features (spined anterodorsal curve, a furrow-like depression, flattening along the free margin, porous surface) indicate referral of all of the specimens to a single species. The dorsal edge of the species is actually straight, as it was indicated in the original description of "*Bradoria*" *ordinata*.

All the mentioned features distinguish "*Bradoria*" *ordinata* from the genus *Bradoria*, and also from any other known Cambrian bradoriids. Hence the species



should be assigned to a new genus *Sinskolutella* gen. nov. The genus is similar to *Alutella* Kobayashi et Kato, 1951 in carapace outlines, strong convexity, and flattening along the free margin. It is noteworthy, that *Sinskolutella ordinata* occurred not only in the Sinskoe Formation as was noted earlier (Melnikova, 1983a), but also in the Kutorgina Formation. Hence the stratigraphic range of the species is extended.

Apart from the type species, the forms previously described by Abushik (1960) as *Leperditia? concentrisulcata* from the Amgian Stage (Middle Cambrian) of the Malaya Kuonamka River can be assigned to the genus *Sinskolutella* gen. nov. This species was found later in the Botomian of the Lena–Aldan Region on the left bank of Argaa-Salaa River, 1 km below the mouth of the Kuotaa River (Melnikova et al., 1997).

It is also important, that the rocks of the Sinskoe Formation contain scarce remains of large bradoriids that are very similar to *Kunmingella* Huo, 1956 from the Lower Cambrian of China. However, these forms differ from any known kunmingellids by the opposite location of the sculptural elements (the rib and the node) on the lateral surface of the carapace, on which the new genus *Yakutingella* gen. nov. is based. The species *Sunella parva* from the Botomian of Eastern Transbaikalia (Melnikova, 1988) should also be assigned to the new genus. By its distinctive features (the short oblique rib on the anterior part of the valves and the buttress-like rib along the posterior edge) *S. parva* is much more similar to the new bradoriids than to the type species of the genus *Sunella*, *S. grandis* Huo, 1965.

An incomplete specimen of a very small bradoriid was found in the lower part of the Kutorgina Formation of the Achchagyi-Tuoidakh section. Based on the structure of the valve surface (Pl. 2, fig. 12), the form is referred to the genus *Duibianella* Shu, 1990, which was originally described from the Middle Cambrian of China, Zhejiang Province (*L. armata*–*L. sinensis* Zones) (Shu, 1990). Later, Zhang and Pratt (1993) found *Duibianella* sp.

nov. in the rocks of Zhenping Province in the Lower Cambrian, Chiungchussu Stage of Zhenping Province in Southern China.

The fragment of *Duibianella* found in the Kutorgina Formation is evidently the right valve. It is 0.75 mm in height with the length of the dorsal edge of 1.0 mm. The length of the valve is unknown due to incomplete preservation, but the diagnosis of the genus suggests that it was a little longer than the dorsal edge. I assume that the outlines of the anterior edge were similar to the posterior edge. Relatively large tubercles were prominent near the dorsal curves, along the anterior (?) and posterior edges and also in the middle part of the valves. The surface of the valve is finely tuberculate. All the features mentioned of *Duibianella* sp. from the Kutorgina Formation distinctly separate it from any other representatives of the genus previously described from the territory of China. If additional material is found, this form may well turn out to be a new species of *Duibianella*.

SYSTEMATIC PALEONTOLOGY

Family Alutidae Huo, 1956

Genus *Sinskolutella* Melnikova, gen. nov.

Leperditia?: Abushik, 1960, p. 94;

Bradoria: Melnikova, 1983a, p. 55; 1983b, p. 145.

Etymology. From the names of the village of Sinskoe and the genus *Alutella*.

Type species. *Bradoria ordinata* Melnikova, 1983; Lower Cambrian, Botomian (Sinskoe Formation); Siberian Platform.

Diagnosis. Carapace leperditoid, high, and convex. Dorsal edge straight. Anterodorsal curve sharp, sometimes spined; posterodorsal curve approaches a right angle. Shallow, short furrow-like depression occurs near anterodorsal curve. Anterior edge slightly projects over line of dorsal edge. Posterior edge elongated posteroventrally and strongly projects over line of

Explanation of Plate 2

Figs. 1–6. *Sinskolutella ordinata* (Melnikova, 1983): (1) holotype no. 3465/11, left valve, $L = 7.4$ mm, Early Cambrian, Botomian Stage, Sinskoe Formation, *Bergeroniellus asiaticus* Zone; middle reaches of the Lena River, right bank, 1 km from the village of Sinskoe; (2) specimen no. 4349/436, left valve, $L = 6.0$ mm; (3) specimen no. 4349/414, both valves on the rock plane, $L = 7.8$ mm; (4) specimen no. 4349/412, rock sample with numerous deformed valves; (5) specimen no. 4349/417, both valves on the rock plane, $L = 8.0$ mm; (6) specimen no. 4349/409, left valve, $H = 4.2$ mm; Lower Cambrian, Botomian Stage, Sinskoe Formation; middle reaches of the Lena River, right bank, near Achchagyi-Tuoidakh Creek.

Figs. 7 and 8. *Yakutingella intricata* Melnikova, sp. nov.: (7) holotype no. 4349/440, right valve, $L = 3.9$ mm; Lower Cambrian, Botomian Stage, Sinskoe Formation; middle reaches of the Lena River, right bank, near Achchagyi-Tuoidakh Creek; (8) specimen no. 4349/441, both valves on the rock plane, $L = 10.2$; Lower Cambrian, Botomian Stage, Sinskoe Formation; middle reaches of the Lena River, right bank of the Sinyaya River (left tributary of the Lena River), 12 km above the mouth.

Figs. 9–11. *Sinskolutella concentrisulcata* (Abushik): (9) holotype no. 4342/65, right valve, $L = 7.9$ mm; Middle Cambrian, Amgian Stage, Kuonamka Formation; Malaya Kuonamka River; (10) specimen no. 4342/81, left valve, $L = 4.19$ mm; (11) specimen no. 4342/80, left valve, $L = 4.05$ mm; Lower Cambrian, Botomian Stage, Lena-Aldan Region, Argaa-Salaa River.

Fig. 12. *Duibianella* sp., specimen no. 4349/260, right valve, $L_{\text{dorsal edge}} = 1.0$ mm, $H = 0.75$ mm; Lower Cambrian, Botomian Stage, lower part of the Kutorgina Formation, *Bergeroniellus asiaticus* Zone; middle reaches of the Lena River, right bank, near Achchagyi-Tuoidakh Creek.

dorsal edge. Longitudinal axis significantly inclined. Convexity occurs along longitudinal axis. Flattening along free margin. Surface of the valves porous or resembles dactyloscopic pattern.

Species composition. Two species: *Bradoria ordinata* Melnikova, 1983 (type) and *S. concentrisulcata* Abushik, 1960.

Comparison. The genus is similar to *Alutella* Kobayashi et Kato, 1951 in the outlines of the carapace, strong convexity, and flattening along the ventral margin. However, the absence of the distinct furrow in the anterior part of the valves distinguishes *Sinskolutella* from *Alutella*.

Sinskolutella ordinata (Melnikova, 1983)

Plate 2, figs. 1-6

Bradoria ordinata: Melnikova, 1983a, p. 55, pl. 5, fig. 7; 1983b, p. 145, pl. 55, fig. 1; "*Bradoria*" *ordinata*: Melnikova, Siveter, and Williams, 1997, pl. 2, fig. 3.

Holotype. PIN, no. 3465/11, left valve; Lower Cambrian, Botomian Stage, *Bergeroniellus asiaticus* Zone (18 m above the base of the Sinskoe Formation); the middle reaches of the Lena River, right bank, 1 km above the village of Sinskoe.

Description. The carapace is large, high, strongly convex, with prominent leperditoid outlines. The dorsal edge is straight, slightly shorter than the length of the carapace. The anterodorsal curve is sharp, sometimes spined; the posterodorsal curve approaches a right angle. The anterior edge is gently bent and hardly projects over the line of the dorsal edge. The posterior edge is elongated posteroventrally and strongly projects over the line of the dorsum. The short and shallow indistinct furrow-like depression is situated just below the dorsal edge near the anterodorsal curve. The convexity of the valves is displaced from the center towards the ventral edge; maximum convexity takes place along the longitudinal axis and goes from the anterodorsal curve towards the posteroventral edge. The wide flattened area runs along the whole free margin and becomes narrower towards the dorsal curves. The surface of the carapace has a regular array of pores. The pores occasionally become smaller and more crowded towards the edges of the valves.

Measurements (mm):

	Specimen no.	Length	Height
Holotype	3465/11	7.4	5.9
	4349/409	—	4.2
	3449/414	7.8	4.9
	4349/417	8.0	4.7
	4349/436	6.0	5.01
	4349/209	6.7	4.8

Variability. The elongation of the posteroventral part of the carapace can vary to some extent. The presence or absence of the spine on the anterodorsal curve probably reflects the state of preservation of particular specimens.

Comparison. The species differs from *S. concentrisulcata* by the more convex carapace, the wide marginal flattening and the porous surface of the valves.

Occurrence. Lower Cambrian, Botomian Stage (Sinskoe and Kutorgina formations); Siberian Platform.

Material. About 60 differently preserved specimens.

Sinskolutella concentrisulcata (Abushik, 1960)

Plate 2, figs. 9-11.

Leperditia? concentrisulcata: Abushik, 1960, p. 94, fig. 1; Melnikova et al., 1997, pl. 2, figs. 1, 2, 5.

Holotype. PIN, no. 4342/65 (no. 1 of Abushik, 1960), the right valve; Middle Cambrian, Amgian Stage (lower part), Kuonamka Formation; Eastern Siberia, Malaya Kuonamka River (basin of the Anabar River).

Description. The carapace is large, high, moderately convex, with leperditoid outlines. The dorsal edge is straight, shorter than the maximum height of the valves occurring behind the midline of the carapace. The dorsal curves are prominent, the posterodorsal one approaches a right angle. The anterior edge is gently rounded and slightly projects over the line of the dorsal edge. The posterior edge is elongated posteroventrally and sharply rounded. The furrow-like depression is not prominent. The maximum convexity lies behind the midline of the carapace. The narrow flattening extends along the whole margin of the valves and is distinctly observed near the dorsal curves. The surface of the valves bears narrow threads forming a dactyloscopic pattern. Small thread-like hatches can be observed on the anterodorsal area of the valves.

Measurements (mm):

	Specimen no.	Length	Height
Holotype	4342/65	7.9	5.4
	4342/80	4.05	2.9
	4342/81	4.19	3.15

Variability. The height of the anterior edge is slightly variable.

Comparison. See the description of *S. ordinata*.

Occurrence. Lower Cambrian, Botomian Stage (the formation is unknown); Middle Cambrian, Amgian Stage, Kuonamka Formation; Siberian Platform.

Material. About ten differently preserved valves.

Family Kunmingellidae Huo, 1965

Genus *Yakutingella* Melnikova, gen. nov.

Sunella: Melnikova, 1988, p. 116; Melnikova et al., 1997, p. 185.

Etymology. From the Republic of Yakutia.

Type species. *Yakutingella intricata* sp. nov.

Diagnosis. Carapace postplete, slightly leperditoid, high and moderately convex. Dorsal edge very long. Dorsal curves prominent, rostrum-like or spined. Anterior part of valves bears oblique rib with indistinct furrow or depression behind it. Posterior part of valves bears buttress-like or nodular rib. Flattening goes along whole margin. Surface of valves porous or finely shagreen.

Composition. Two species: *Yakutingella intricata* sp. nov. (type) and *Yakutingella parva* (Melnikova, 1988) from the Lower Cambrian (Botomian Stage, Bystrinskaya Formation) of Eastern Transbaikalia.

Comparison. The genus differs from all known kunmingellids in the different location of the rib and node.

Yakutingella intricata Melnikova, sp. nov.

Plate 2, figs. 7 and 8

Etymology. From Latin *intricata* (intricate).

Holotype. PIN, no. 4349/440, the right valve; Lower Cambrian, Botomian Stage, *Bergeroniellus asiaticus* Zone; Siberian Platform, the middle reaches of the Lena River, right bank, near the Achchagyi-Tuoidakh Creek.

Description. The carapace is large, postplete, high and moderately convex. The dorsal edge is long, almost equal to the length of the carapace. The dorsal curves are prominent and spined. Anterior and posterior edges are widely rounded, the posterior edge projects more over the line of the dorsum than does the anterior one. Maximum convexity is slightly displaced posteriorly from the middle part of the valves. The anterior oblique rib is moderately long, low and thin. It widens anteriorly in its middle part as a triangle. The rib restricts the shallow depression that lies closer to the dorsal edge. The short and low, oblong nodular rib lies parallel to the posterior margin and just above the midline of the valves, near the posterior edge. The wide flatted area narrows toward the dorsal curves and extends along the whole free margin. The surface of the carapace is delicately porous.

Measurements (mm):

	Specimen no.	Length	Height
Holotype	4349/440	3.9	2.95
	4349/441	10.2	6.5
	4349/442	7.6	5.9
	4349/443	4.0	3.2
	4342/444	11.5	—

Variability. The length and the form of the ribs may slightly vary.

Comparison. The species differs from *Yakutingella parva* (Melnikova, 1988) by the low anterior and nodular posterior ribs.

Material. Six differently preserved valves from the type locality.

ACKNOWLEDGMENTS

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