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A New Species of the Genus *Boreophylloceras* Alekseev et Repin, 1998 (Ammonitida) from the Berriasian *kochi* Zone of North-Central Siberia

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Abstract—Study of the shells of phylloceratids from the *kochi* Zone (Berriasian) of north-central Siberia (Boyarka River, basin of the Kheta River) allowed their assignment to the genus *Boreophylloceras* Alekseev et Repin, 1998. A new species *B. densicostatum* is described.

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INTRODUCTION

The Berriasian of northern Siberia contains few Phylloceratida. Species and genus identification is difficult because of indistinct shell morphology and the scarcity of shells found. As a result, northern Siberian members of Phylloceratida are poorly studied.

Phylloceratida are not particularly important for the stratigraphy of the Boreal Mesozoic deposits. However, the presence of members of this group at fixed stratigraphic levels allows its use in zonal Jurassic and Cretaceous stratigraphy and correlation in Siberia. A rigid confinement of particular phylloceratids to certain levels in the Lower and Middle Jurassic was noted by Meledina (1991); Repin et al., 1998; and Repin (2005). Separate levels may also be recognized in the Upper Jurassic, in the *okensis* Zone (Rogov, 2004); in the Berriasian, in the *kochi* and *mesezhnikovi* zones (Voronez, 1962; Golbert et al., 1981; Igolnikov, 2004); and in the Lower Valanginian, in the *klimovskiensis* and *michalskii* zones (Golbert et al., 1981; Bogomolov, 1989).

Phylloceratids mainly preferred deep-water basins. Therefore, their appearance among the Arctic species inhabiting the shallow-water epicontinental environment may suggest either episodes of subsidence or widening of connections with the open ocean leading to changes in currents and migrations.

Phylloceratids were first recorded from the Berriasian of northern Siberia by Pavlov (1914). Voronez (1962) continued the research on the classification of the northern Siberian phylloceratids, and she also described two new species, *Phyllopachyceras praeinfundibulum* from the Pakhsa Peninsula and *P. lenaense* from the lower reaches of the Lena River. Later Drushchits and Doguzhaeva (1981) published their detailed study of the internal structure of the initial whorls of the northern Siberian "*Phyllopachyceras*" sp. and discovered that they are significantly different from the typical southern *Phyllopachyceras*: their protoconch and caecum are unusually large for Phylloceratidae, the primary constriction is sharply defined, and the ventral-marginal position of the siphuncle is formed from the very beginning of the first whorl. The same differences were recorded by Repin and Alekseev (Repin et al., 1998). In addition, they studied the sutural ontogeny of "*Phyllopachyceras*" *praeinfundibulum*, in which the eight-lobed suture was formed suddenly, immediately following the five-lobed suture, without any intermediate changes. Based on these data, these authors recognized the new genus *Boreophylloceras*, which included the species *B. praeinfundibulum* (Voronez) and *B. lenaense* (Voronez), and was placed in a new family and superfamily within the suborder Phylloceratina.

The Berriasian phylloceratids from the Boyarka River (basin of the Kheta River) were assigned by the author of this paper to the genus *Boreophylloceras*. A new species of this genus is described below.

MATERIAL

The collection is housed in the Central Siberian Geological Museum (TsSGM), coll. no. 785.

SYSTEMATIC PALEONTOLOGY

Order Phylloceratida

Superfamily Boreophylloceratacea Alekseev et Repin, 1998

Family Boreophylloceratidae Alekseev et Repin, 1998

Genus *Boreophylloceras* Alekseev et Repin, 1998

Phylloceras: Pavlov, 1914, p. 61.

Phyllopachyceras: Voronez, 1962, p. 26.

Boreophylloceras: Repin et al., 1998, p. 30.

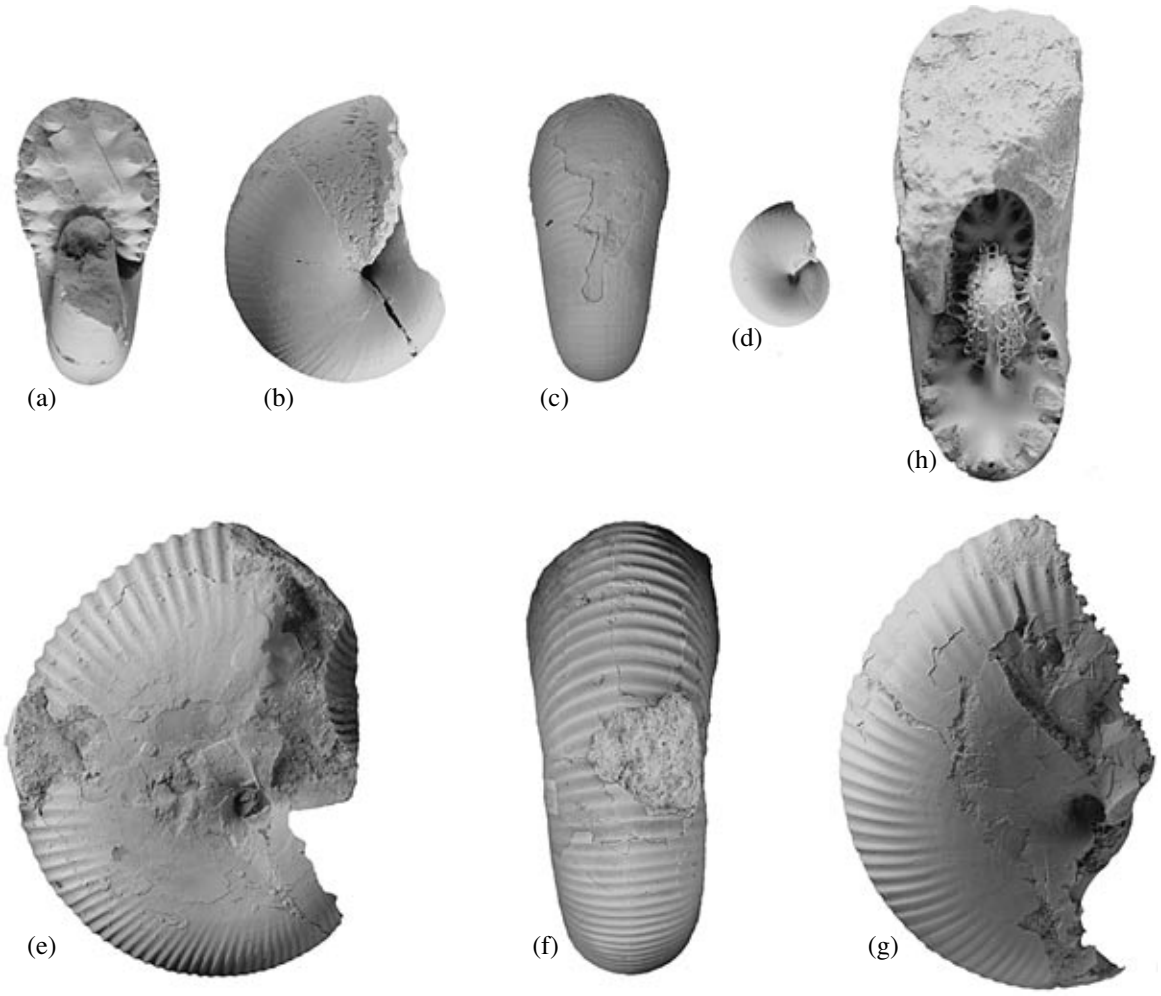

Fig. 1. *Boreophylloceras densicostatum* sp. nov., ×1; (a–c) specimen no. 785/94: (a) apertural view, (b) lateral view, (c) ventral view; (d) specimen no. 785/961, lateral view; (e, f) holotype no. 785/91: (e) lateral view, (f) ventral view; (g, h) specimen no. 785/90: (g) lateral view, (h) apertural view. All specimens from the Boyarka River; Berriasian, *kochi* Zone, *praeanalogus* Subzone, Bukatyiskaya Formation.

Type species. *Phyllopachyceras praeinfundibulum* Voronez, 1962; Berriasian, *mesezhnikovi* Zone; northern Siberia.

Diagnosis. Shell of medium width or inflated, with narrow umbilicus. Venter rounded. At early stages (Dm ~ 20–30 mm) ornamentation of finest striae, or fine ribs on venter. Later in ontogeny prominent, rounded short ribs, intersecting venter without interruption. Protoconch and ammonitella large. (Dm_1 = 1.14–1.54 mm, Dm_2 = 0.95–1.47 mm; Dm_{amm} = 2.24–2.9 mm). Siphuncle from very beginning in marginal ventral position. Sutural complexity increasing by division of inner lateral lobe and separation of umbilical lobes.

Species composition. Apart from the type species, *B. lenaense* (Voronez, 1962) and *B. densicostatum* sp. nov. from the Berriasian of northern Siberia.

***Boreophylloceras densicostatum* Igolnikov, sp. nov.**

Etymology. From the Latin *densus* (dense) and *costa* (rib).

Holotype. TsSGM, no. 785/91, body chamber with partly preserved phragmocone; Boyarka River; Berriasian, *kochi* Zone, *praeanalogus* Subzone, Bukatyiskaya Formation.

Shell shape (Fig. 1). The shell is medium-sized (up to 70 mm), with the flanks being weakly convex on the phragmocone and flattened, almost parallel, on the body chamber. The inner whorls have a section in the shape of a low regular oval that gradually transforms into a subrectangular shape as the whorls grow. The venter is smoothly rounded in all whorls. The umbilicus is very narrow, with steep, smooth walls. The protoconch and ammonitella are large: Dm_1 = 1.14 mm, Dm_2 = 1.07 mm, and D_{amm} = 2.37 mm (Fig. 2).

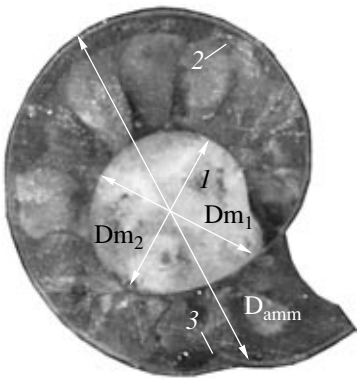

Fig. 2. *Boreophylloceras densicostatum* sp. nov.; specimen no. 785/961, protoconch and first whorl, ×20; Boyarka River; Berriasian, *kochi* Zone. Explanations: (*1*) protoconch, (*2*) siphon, (*3*) primary ridge, (Dm_1) and (Dm_2) diameters of the protoconch, (D_{amm}) diameter of the ammonitella.

Fig. 3. Fragment of the suture of *Boreophylloceras densicostatum* sp. nov.; specimen no. 785/94 at Dm = 36 mm, ×3; Boyarka River; Berriasian, *kochi* Zone.

Dimensions in mm and ratios in %:

Specimen no.	Dm	WH	WW	UW	WH/ Dm	WW/ Dm	UW/ Dm	VR[1]
785/961	17	10	9	1.5	59	52	8.8	
785/94	38	23	19	2.0	61	50	5.2	55
785/93	51	31	20		61	39		48
785/95	53	33	19	3.0	62	36	5.6	
Holotype 785/91	60	35	25	4.0	58	42	7.0	46
785/90	61	36	24	4.0	59	39	7.0	41
785/92	66	41	24	4.1	62	36	6.1	

Ornamentation. The ornamentation on the shell surface up to Dm ~ 10 mm consists of thin striae, which begin near the umbilical shoulder, run across the flanks, are sickle-shaped in the lower third of the flanks, and smoothly bend orad on the venter. As the shell diameter increases, the striae are grouped (fused) on the ventrolateral shoulder into fine slightly raised ribs, which run across the venter. From Dm ~ 20 mm, weak ribbing is noticeable on the venter and ventrolateral shoulder. Toward the body chamber (Dm ~ 30–40 mm) the height of the ribbing gradually increases. The ribs are either symmetrical in cross section or slightly oblique orad and rounded at the top. In the terminal part of the body chamber (Dm ~ 55–65 mm), the ribs become coarsest. A gradual curvature of the ventral ribs on the body chamber becomes smoother and disappears near the aperture. As the shell grows, the density of ribs gradually decreases. As the whorl increase, the density of the ribbing gradually decreases. For instance, 10-mm portion of the shell surface contains eight or nine ribs at the beginning of the body chamber and only four ribs in the apertural part. The flanks in all whorls remain smooth, only with thin sickle-shaped growth striae.

Suture (Fig. 3). The sutural ontogeny of this species has not been studied; hence. formal sutural terminology is employed. All lobes on the flanks have similar outline, i.e., they are relatively wide at the top, sharply narrowed in the middle parts, and trifid at the bottom. The saddles have narrow central parts that give rise to oval petal-shaped outgrowths deeply incised into the neighboring lobes. The saddles are tripartite at the top.

Comparison. This species is distinguished from *B. praeinfundibulum* (Voronez, 1962, p. 26, text-fig. 5; pl. 1, figs. 2, 3; pl. 2, fig. 3) by the considerably greater density of ribs at comparable diameters. For instance, Voronez noted that on the surface where Dm ~ 40 mm *B. praeinfundibulum* contains four ribs per 10 mm as compared with seven or eight in *B. densicostatum.* The species described show similar differences from another specimen of *B. praeinfundibulum* that is better preserved than the holotype figured by Repin et al. (1998, p. 31, text-fig. 4). In the apertural region, at Dm ~ 60 mm, the difference between the density of ribs in *B. densicostatum* and *B. praeinfundibulum* decreases: three instead of four ribs per 10 mm of shell length, respectively. The species differs from *B. lenaense* (Voronez, 1962, p. 26, text-fig. 6; pl. 3, fig. 1) in the greater density of the ribbing, which gradually decreases from the inner to outer whorls, whereas in *B. lenaense*, judging from the photograph, the rib density remains relatively stable (four ribs per 10 mm).

Material. Ten variously preserved specimens, represented mostly by body chambers, from the Bukatyiskaya Formation; Boyarka River.

[1] VR number of ventral ribs per half of the last whorl.

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