Paleontological Journal, Vol. 31, No. 6, 1997, pp. 583–587. Translated from Paleontologicheskii Zhurnal, No. 6, 1997, pp. 19–22.

A New Species of the Genus *Cadoceras* (Ammonoidea) from the Callovian of the Unzha River

D. N. Kiselev

Yaroslavl Pedagogical University, Kotoroslnaya nab. 46, Yaroslavl, 150000 Russia

Received August 5, 1996

Abstract—Rocks of the Lower Callovian *calloviense* Zone of the Russian Platform contain diverse ammonoid assemblages. Cardioceratids are the most poorly studied component of these assemblages. The present paper describes a new species *Cadoceras (Bryocadoceras) sokolovi.*

INTRODUCTION

The faunal content of the Callovian rocks of the Russian Platform is better studied than in any of the other stages. However, there are several horizons within the Callovian which have not received adequate study. This applies to the *Sigaloceras calloviense* Zone which is widely recorded in the Russian Plain. The local ammonoid assemblages are dominated by diverse cardioceratids, especially from the subfamily Keppleritinae. The assemblages dominated by cardioceratids are much less common and are insufficiently studied. Similar assemblages are widespread to the north of the Russian Plain, in the highly boreal regions of Siberia (Meledina, 1977), Alaska, (Imlay, 1953), Canada (Frebold, 1961), and other northern regions. Hence they may be referred to the boreal type of assemblages to distinguish them from the assemblages with keppleritins which occur mostly in Europe and more to the south.

In the Russian Plain, strata of the *calloviense* Zone dominated by cardioceratids mainly outcrop in the Upper Volga River Region and along the banks of the Unzha River. The material from the present study was collected from this region. The best outcrops of the zone under consideration are in the region of the town of Kologriv where they are represented by the light-colored micaceous sands interbedded with clays and containing large phosphorite bullions with numerous fossils. Ammonoids occur in these bullions and in the beds. The assemblage includes *Govericeras goverianum* (Sow.), *Kepplerites* cf. *crucifer* (Buckm.), *K. curtilobus* (Buckm.), *K.* cf. *trichophorus* (Buckm.), *Toricellicetes* ex. gr. *approximatus* Buckm., *Gulielmites*? aff. *corticornutus* Buckm., *Cadoceras* (Bryocadoceras) *sokolovi* sp. nov., *Pseudocadoceras (Pseudocadoceras) boreale* Buckm., *Ps. (Ps.) tsytovichae* (Parishev), *Ps. (Costacadoceras)* sp., *Chamoussetia phillipsi* Callomon et Wright, *Ch.* cf. *buckmani* Callomon et Wright, and *Proplanulites* aff. *subcuneiformis* Buckm.

This assemblage also contains the peculiar Cadoceratinae which includes two new species. Sokolov (1925, p. 35) was the first to distinguish the Lower Callovian *Cadoceras* species in this area from the typical representatives of this group: "The conch of *Cadoceras* sp. nov. which has an almost spherical shape and a very narrow umbilicus is very peculiar... The form under description is generally similar to *Cadoceras sublaeve* Sibirtz. Nowhere in this area were typical cadoceratids of the Lower Callovian of Central Russia found." Not far from the site mentioned by Sokolov, to the north of the town of Kologriv, between the villages of Kolokhta and Oktyabr'skii, I found several specimens of the new species that I assign to *Cadoceras (Bryocadoceras) sokolovi* in the present paper.

Abbreviations: Dm–conch diameter, WH–whorl height, WW–whorl width, UW–umbilical width.

SYSTEMATIC PALEONTOLOGY

Family Cadoceratidae Siemiradzki, 1881

Subfamily Cadoceratinae Hyatt, 1900

Genus *Cadoceras* Fischer, 1882

Subgenus *Bryocadoceras* Meledina, 1977

Cadoceras (Bryocadoceras) sokolovi Kiselev, sp. nov.

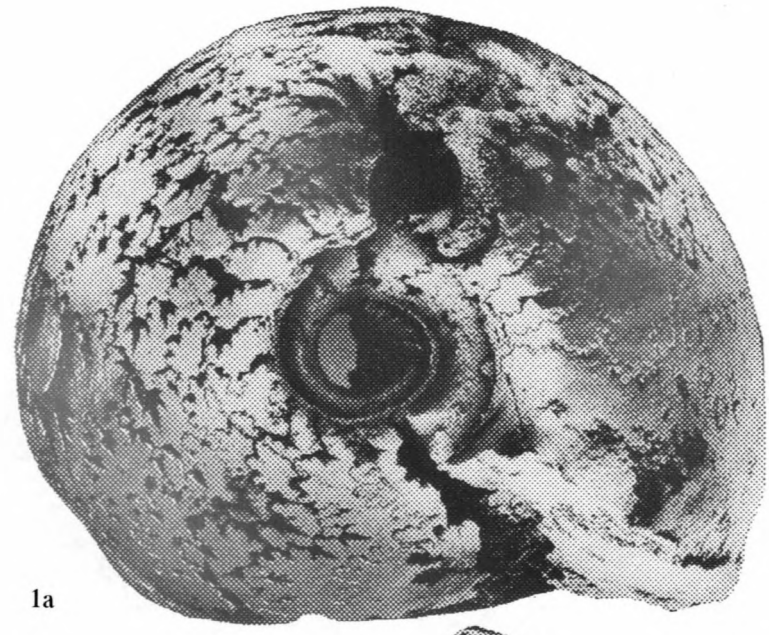
Plate 1, fig. 1

Etymology. After M.I. Sokolov.

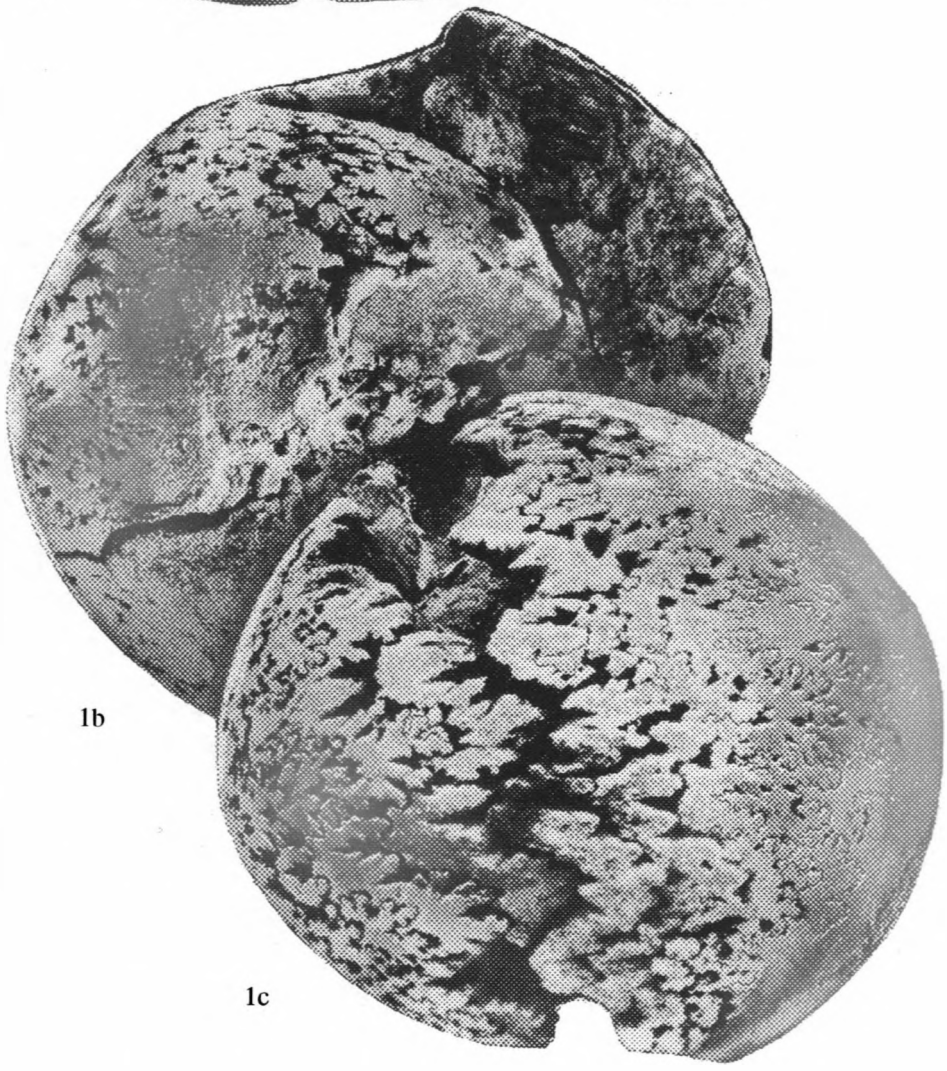
Holotype. Yaroslavl Pedagogical University, no. 3/20; Unzha River, left bank between the villages of Kolokhta and Oktyabr'skii; Lower Callovian, *calloviense* Zone, *koenigi* Subzone.

Conch shape (Fig. 1). The conch is large (up to 150 mm in diameter). The whorl height and width considerably change throughout growth, but the whorl height never exceeds the whorl width. At diameter 18.6 mm (approximately at the beginning of the fourth whorl) the stage of the maximum whorl height begins, where the whorl height to width ratio is the highest (0.95). The whorl is broadly rounded in cross section, without a ventral acuity. After this stage the whorl height rapidly decreases and at the end of ontogeny the whorls become very low (whorl height to width ratio 0.38). Simultaneously whorl width increases and

Plate 1



1a



1b

1c

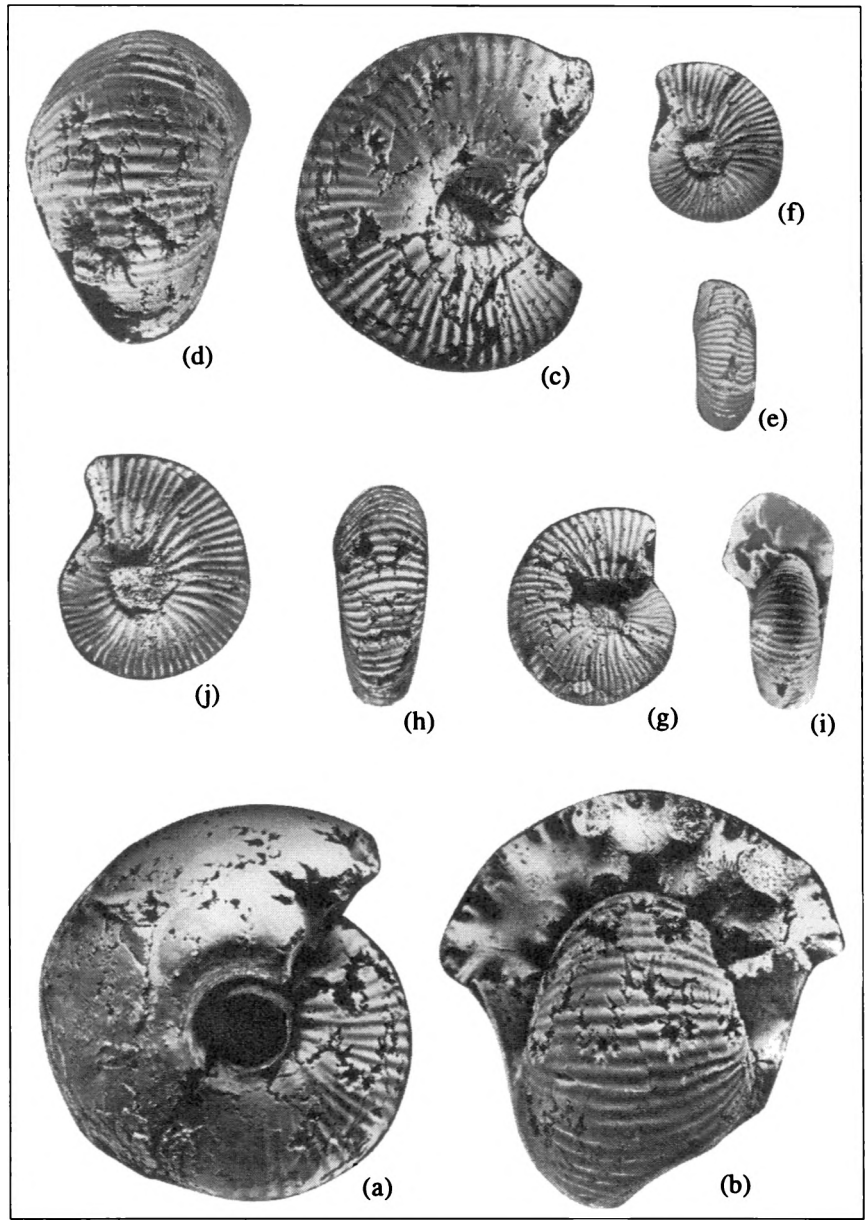


Fig. 1. *Cadoceras (Bryocadoceras) sokolovi*, holotype no. 3/20, early stages: (a–i), ×1, (j), ×1.2 (Dm = 18.2 mm); between the villages of Kolokhta and Oktyabr'skii; Lower Callovian, *calloviense* Zone.

reaches its maximum at the first one and a half volutions after the stage of high whorls (Fig. 2). Here the difference in the width of the two neighboring whorls is the greatest, whereas the difference in their height is not great. In the last whorls the conch acquires a strongly inflated spherical shape with an evenly rounded venter.

The umbilicus is narrow, cylindrical, and slightly stepped. Its size changes slightly in ontogeny: from 20% of the conch diameter (in the first whorls) to 24% of the whorl diameter (in the last whorls). As the conch becomes more inflated the umbilical wall rapidly becomes steep and vertical to the coiling plane, the

Explanation of Plate I

Fig. 1. *Cadoceras (Bryocadoceras) sokolovi* sp. nov.; holotype no. 3/20, adult shell, ×0.9: (1a) lateral view, (1b) apertural view, (1c) ventral view; Unzha River, between the villages of Kolokhta and Oktyabr'skii, Lower Callovian, *calloviense* Zone, *koenigi* Subzone.

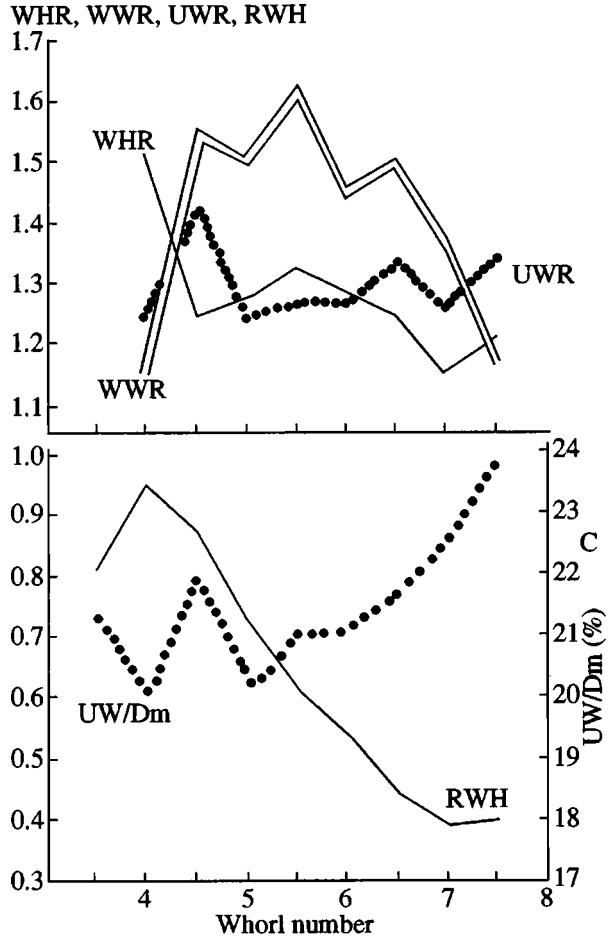


Fig. 2. Ontogenetic changes of character and growth rate of the shell of *Cadoceras (Bryocadoceras) sokolovi*. WHR—whorl height rate, WWR–whorl width rate, UWR—umbilical width rate, RWH–relative whorl height, UW/Dm—umbilical width to diameter ratio as a per cent. The rate of each character is calculated as the ratio of the succeeding value to the preceding.

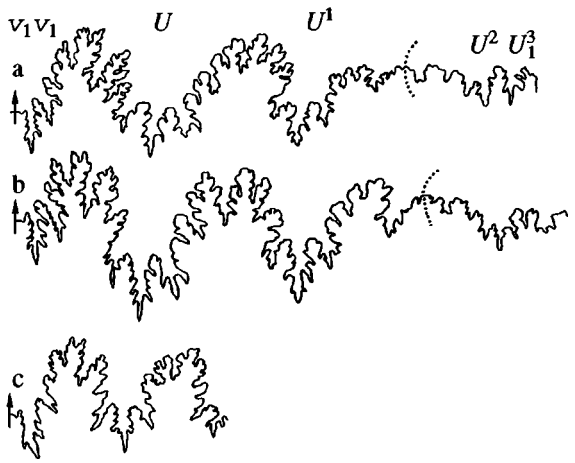


Fig. 3. Sutures of *Cadoceras (Bryocadoceras) sokolovi* holotype, no. 3/20: (a) at Dm = 100 mm, ×0.9, (b) at Dm = 68 mm, ×0.98, (c) at Dm = 38 mm, ×1.5; between the villages of Kolokhta and Otyabr'skii; Lower Callovian, *calloviense* Zone, *koenigi* Subzone.

umbilical shoulder rapidly becomes pointed and in the last whorls it is acute.

Dimensions in mm and ratios in %.

Specimen no.	Dm	WH	WW	UW	WH/Dm	WW/Dm	UW/Dm
Holotype 3/20	107	42	107	27	39.2	100	25.2
	84	33	84	20	39.3	100	23.8
	67	30	64	14	44.7	95.5	20.8
	52	24	46	11	46.1	88.5	21.1
	42	18.2	29.2	8.5	43.3	69.5	20.2
	23.6	10.3	10.3	5.8	43.6	43.6	24.6
	18.2	9	9	4	49.5	49.5	21.9

Ornamentation. At Dm = 14 mm the ribbing is well developed (Fig. 1). The whorls possess low ribs. The primary ribs are inclined orad, whereas secondary double ribs slant backward. In the venter they are again inclined toward the aperture. Thus, on the flanks the ribs are bent twice, which gives the appearance of radial ribbing. The primary ribs are short (1/3 whorl height). As the shell grows the ribs bifurcate closer to the umbilicus, up to the umbilical nodes. Hence the fascicles of the secondary ribs start almost from the umbilical shoulder and are inclined backward forming the rectiradial ribbing. The ribbing coefficient is high (2.75). Ribbing disappears early in ontogeny. At Dm = 40 mm the umbilical nodes disappear, at Dm = 55 mm the ribbing completely disappears remaining only for a short time as a weak ventral undulation.

Suture. The suture is observed at all growth stages. The shape and position of U and U^1 lobes change in ontogeny. At the middle growth stages (at Dm = 38 mm) they are in the same line with V_1 (Fig. 3c). The same position is observed in the final whorls (Fig. 3a). In between these two stages the U and U^1 lobes become considerably deeper, and becoming much deeper than V_1 (Fig. 3b). The saddle U^1/U^2, divided by the four small lobes, is very broad. This saddle goes across the umbilical shoulder.

Comparison. The inner whorls of this species are similar to the latest species of the subgenus *Bryocadoceras*, e.g., *C. (B.) bathomphalum* Iml., *C. (B.) laetum* Gul., and *C. (B.) proniense* Sas., which are most closely related to the species under description. However, from the middle whorls this species acquires characters typical of the subgenus *Cadoceras*. These include the extremely inflated spherical shell and very narrow umbilicus. In the group *C. (Cadoceras) sublaeve* (Sow.) these features become pronounced. *Cadoceras (Bryocadoceras) sokolovi* is closely similar to this group in the final whorls. The difference is observed in the inner whorls. For instance, low, rounded whorls with radial and rectiradial ribbing are not typical of the *Cadoceras* s. str. shells which possess high subacute whorls with a prosradial ribbing that forms a fairly deep sinus on the venter. This species differs from *Cadoceras* s. str. in the early disappearance of the ornament, while in *C. (C.) tolype* (Buckm.) the

ornament remains as nodes up to the terminal living chamber. From the above species of *C. (Bryocadoceras)* which are closely related to the species under study, the described species differs in the highly involute shell at almost all growth stages except for the inner whorls, in the very inflated shell, and in the early disappearance of the ornament (from the middle stages). It is also distinguished by the very high U^1/U^2.

Remarks. *C. (B.) sokolovi* shows some characters which are similar to those in the species of the subgenus *Cadoceras*. This resemblance is apparently due to convergence. Both subgenera during their evolution developed similar cadyconic morphotypes which evolved with an increase of the specific cadiconic features. The terminal stage of these two morphogenetic lineages were the groups *C. (C.) sublaeve* in the subgenus *Cadoceras* and *C. (B.). sokolovi* in the subgenus *Bryocadoceras* and closely related species. The probable descendant of the species under study was possibly *C. (B.) proniense* Sas., replacing it in the Middle Callovian.

Occurrence. Lower Callovian, *calloviense* zone, *koenigi* Subzone of the Unzha River Basin.

Material. Seven differently preserved specimens from outcrops upstream of the town of Kologriv, from the village of Kolokhta to the village of Burdovo.

REFERENCES

Frebold, H., The Jurassic Fauna of the Canadian Arctic. Middle and Upper Jurassic Ammonites, *Bull. Geol. Surv. Can.*, 1961, no. 74, pp. 1–43.

Imlay, R.W., Callovian (Jurassic) Ammonites from the United States and Alaska, Pt. 2. Alaska Peninsula and Cook Inlet Regions, *Geol. Surv. Prof. Pap. B.*, 1953, no. 249, pp. 41–108.

Meledina, S.V., *Ammonity i zonal'naya stratigrafiya kelloveya Sibiri* (Ammonites and Zonal Stratigraphy of the Callovian of Siberia), Moscow: Nauka, 1977.

Sokolov, M.I., Geological Studies along the Unzha River in 1925, *Izv. Assoc. Nauch.-Issled. Inst. pri Fiz.-Mat. fakul'tete MGU* (Moscow), 1929, vol. 2, no. 2, pp. 5–31.