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THE GENUS *CADOCHAMOUSSETIA* IN THE PHYLOGENY OF THE JURASSIC CARDIOCERATIDAE (AMMONOIDEA)

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Abstract

The section of Callovian deposits near Uzhovka in the Nizhniy Novgorod region, central Russia, is described. The lower part of Gowerianus Zone of Lower Callovian is subdivided into following faunal horizons (from below): *Cadochamoussetia surensis*, *Cadochamoussetia subpatruus*, *Cadochamoussetia saratovensis*, *Chamoussetia chamousseti*. The first three horizons comprise the new Subpatruus Subzone.

Conclusions concerning the phyletic line *Cadoceras*–*Cadochamoussetia*–*Chamoussetia* are made on the basis of morphology and stratigraphical distribution of ammonites. The homeomorphic ammonites, earlier partly included in the genus *Chamoussetia*, are considered. Lower Callovian *Eckhardites* gen. nov., including two nominal species, *E. pavlowi* (Smorodina) (=type species), and *E. menzeli* (Moennig), is probably directly derived from Arctocephalitinae. Upper Callovian species: *patruum* d'Eichwald, *galdrinum* sensu Nikitin, *funiferum* Phillips presumably derived from Middle Callovian *Rondiceras* ex gr. *milashevici*.

1. INTRODUCTION

Over many decades the origin of Callovian genus *Chamoussetia* Douville, 1912 remained enigmatic. Different hypotheses were introduced in favour of an origin from *Arcticoceras* Spath, 1924 or *Cadoceras* Fischer, 1882 (Douville 1912; Smorodina, 1928; Callomon, 1985; Meledina, 1994; and others). In the course of a systematic study of the composition and distribution of the Cadoceratinae of the Callovian in central Russia, a genus *Cadochamoussetia* Mitta has been recognized (Gerasimov *et al.*, 1996), with type species of *Cadoceras subpatruum* Nikitin, 1885. The ammonites referring to the new genus

have not been revised since their first descriptions. At present, ample material has been accumulated, among which *Cadochamousssetia* and *Chamousssetia* are represented by dozens of specimens, often in very good preservation. The new material makes it possible to propose another interpretation of origin of *Chamousssetia*.

The genus *Cadochamousssetia* occurs in the middle part of the Lower Callovian of Russia, in the regions of Nizhniy Novgorod, Kostroma and Ryazan and in the Mordovian Republic.

2. THE "UZHOVKA" SECTION

The stratigraphical distribution of *Cadochamousssetia* and *Chamousssetia* are best represented in the quarry near the Uzhovka settlement in the Nizhniy Novgorod region. Here, in the south-eastern part of quarry (Figure 1) the following beds are found (from below):

?CALLOVIAN

- 1) 0,30m (visible) light quartz sand
- 2) 0,10m grey, fine-grained sand

LOWER CALLOVIAN

3a-d) 6,8m dark-grey clay, with marls and pyrite concretions. Ammonites, Belemnites (*Cylindroteuthis*, *Pachyteuthis*)

[+0,25m / *Cadoceras* sp.]

[+0,9m / *Cadoceras* ex gr. *elatmae* (Nikitin)]

[+2,8m / *Cadoceras* ex gr. *elatmae* (Nikitin), *Cadoceras* sp. juv.]

[+3,1m / *Cadoceras* aff. *tschernyschevi* D.Sokolov, *C. sp. aff. simulans* Spath, *Cadoceras* spp. juv., *Cadochamousssetia surensis* (Nikitin), *Pseudocadoceras* sp., *Kepplerites* (*Gowericeras*) sp. (sp. nov.), *Proplanulites* sp.]

[+3,6m / *Cadochamousssetia surensis* (Nikitin), *C. subpatruus* (Nikitin), *Kepplerites* (*Gowericeras*) sp. nov., *Anaplanulites* ? sp., *Proplanulites* sp.]

[+3,8m / *Choffatia* sp.]

[+5,3m / *Cadochamousssetia saratovensis* (Callomon & Wright)]

[+5,8m / *Cadochamousssetia saratovensis* (Callomon & Wright)]

4) 0,15–0,40m / grey aleurite and clayey sand with Ammonites (*Chamousssetia chamoussseti* (d'Orbigny) s.l., *Pseudocadoceras* sp., *Kepplerites* (*Gowericeras*) ex gr. *gowerianus* (Sowerby)), Belemnites (*Cylindroteuthis* cf. *beaumontiana* (d'Orbigny), *C. cf. okensis* (Nikitin), *Pachyteuthis cuneata* Gustomesov, *P. cf. tschernyschevi* (Krimholz), *Hibolites hastatus* Blainville), Bivalves (*Astarte*, *Pleuromya*, *Oxytoma*, *Entolium*, *Pinna*)

MIDDLE CALLOVIAN

5) 0,35–0,65m greyish-brown calcareous, sandy clay with lenses of grey sandy, oolitic marls at the base. Ammonites, Bivalves (*Gryphaea*), Vermes (*Serpula*)

[+0,05m / *Kepplerites* (*Gowericeras*) cf. *gowerianus* (Sowerby)] (redeposited)

[+0,45m / *Kosmoceras jason* (Reinecke) s.l.]

6) 0,10–0,25m grey sandy oolitic marls. Ammonites (*Kosmoceras jason* (Reinecke) s.l., *Anaplanulites mutatus* (Trautschold), *Anaplanulites* sp., *Cadoceras stenolobum* (Keyserling)), Bivalves (*Gryphaea*, *Lopha*, *Pleuromya*)

7) 0,12–0,20m grey and reddish-brown, calcareous oolitic sandy clay with marl concretions at the bottom. Ammonites (*Erymnoceras coronatum* (Brugiere), *Kosmoceras* sp., Belemnites (*Cylindroteuthis* cf. *puzosiana* (d'Orbigny)), Bivalves (*Gryphaea*), Vermes (*Serpula*)

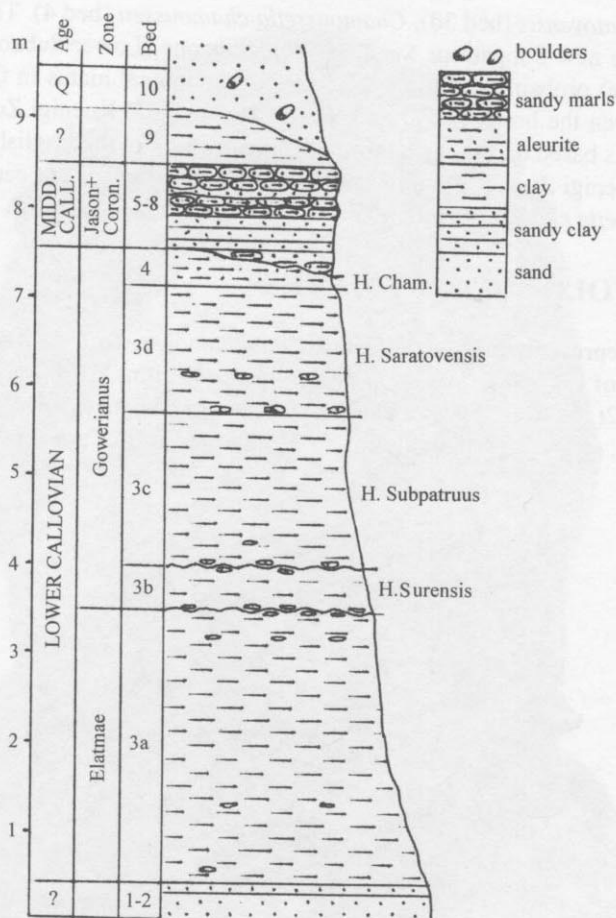


Figure 1. Callovian section in the quarry near the Uzhovka settlement in the Nizhnyi Novgorod region.

8) 0,25m yellow-grey and yellow-brown sandy marls. *Gryphaea*, *Serpula*

?TERTIARY

9) 0-0,60m varicoloured clay

QUATERNARY

10) 1,5-2,3m quartz sand with boulders of the metamorphic rocks.

3. STRATIGRAPHIC REMARKS

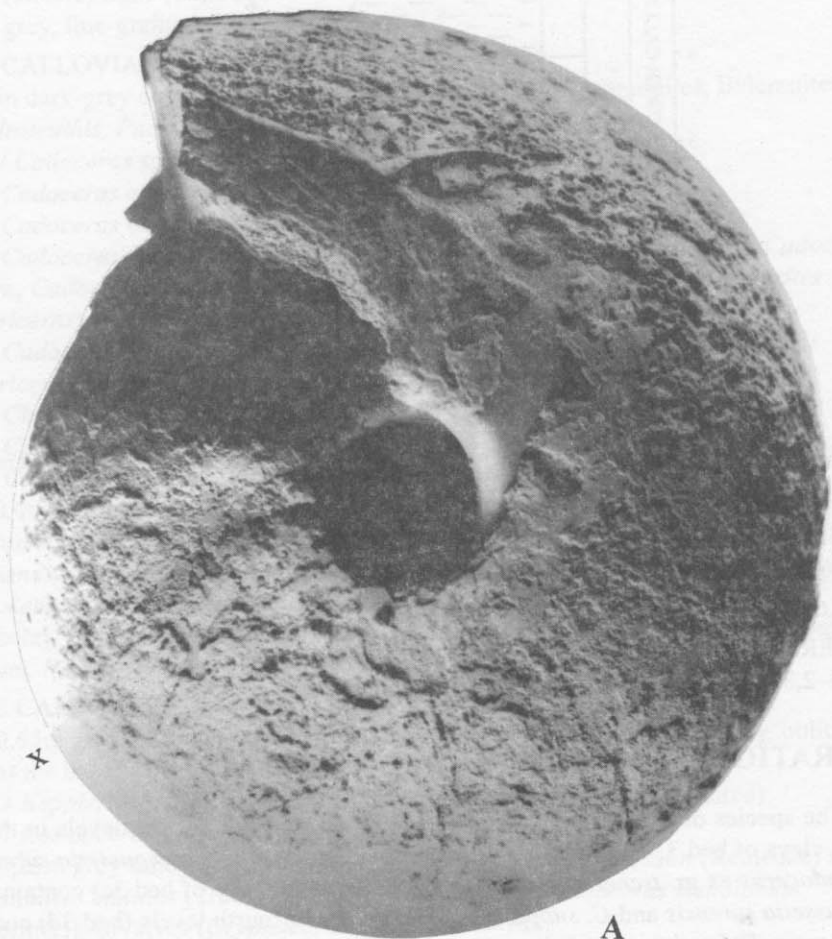
The species of *Cadochamousetia* are confined as a rule to four levels in the series of dark clays of bed 3. The first (base of bed 3b) contains *Cadochamousetia surensis* and also *Cadoceras* ex gr. *tschernyschevi* - *simulans*. Second (base of bed 3c) contains *Cadochamousetia surensis* and *C. subpatruus*. The third and fourth levels (bed 3d) contain *C. saratovensis*. The series of dark clays is overlain by grey aleurite and clayey sand of bed 4 with *Chamousetia chamouseti* (d'Orbigny) s.l.

Thus, here the Gowerianus Zone can be subdivided into the following faunal horizons: *Cadochamousetia surensis* (bed 3b), *Cadochamousetia subpatruus* (bed 3c), *Cado-*

chamoussetia saratovensis (bed 3d), *Chamoussetia chamousseti* (bed 4). The first three horizons make up the new Subpatruus Subzone. This Subzone (Lower Subzone of the Russian Gowerianus Zone) probably corresponds to the stratigraphical hiatus in the English Lower Callovian (between the horizons VII and VIII of Herveyi and Koenigi Zones accordingly). This correlation is based on the appearance of *Chamoussetia* in the English Lower Callovian at the base of Koenigi Zone (Callomon and Wright, 1989). The base of central Russian horizon of *Chamoussetia chamousseti* s.l. is correlated with the base of English Koenigi Subzone.

4. PALEONTOLOGICAL REMARKS

The first representatives of the genus *Cadochamoussetia*, *C. surensis* (Nikitin), appear at the end of the range of *Cadoceras elatmae* (Nikitin). *C. surensis* (Nikitin, 1885, text-fig. 4, pl. 12(10), figs. 53–55 (fig. 54 = lectotype, designated here); see also Gerashimov et al., 1996, pl. 42; and here, Figures 2, 3) inherited from *Cadoceras* (probably, ex gr.



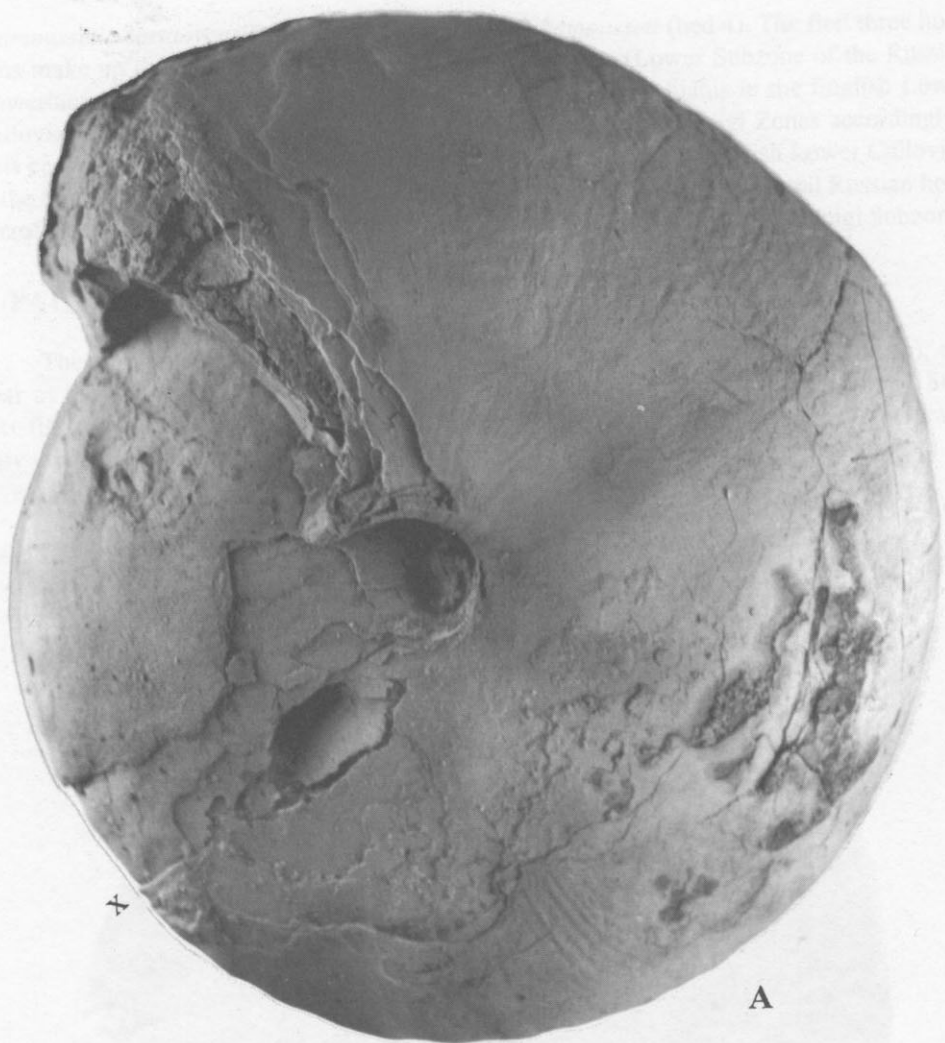
Figures 2 and 3. *Cadochamoussetia surensis* (Nikitin), N CR-482; Uzhovka quarry, base of Bed 3c (or the top of Bed 3b), Gowerianus Zone, Subpatruus Subzone (x 0,8). A cross marks the position of the last septum at the end of the phragmocone. All figured specimens are in the collection All-Russian Geological Oil Institute, Moscow.



tschernyschevi) a similar form of the section of the inner whorls and the umbilical ribs, but differing strongly in a narrower umbilicus and the form of the body chamber.

C. subpatruus (Nikitin) (1885, text-fig. 5, pl. 13(11), fig. 58 (=lectotype, designated here); see also Gerasimov et al., 1996, pl. 43; and here, Figures 4, 5) occurred somewhat later and has a more compressed section which narrows towards the venter. Also typical are a narrower umbilicus and less developed primary ribs; sometimes secondary ribs are developed on the venter.

Cadochamousssetia saratovensis (Callomon and Wright) (1989, p. 812; holotype figured by Sasonov, 1965, pl. 9, fig. 1; see also Gerasimov et al., 1996, pl. 44, figs. 1,2; and here, Figures 6, 7 and 9A) is stratigraphically higher. This species is characterized by a triangular section with narrow, sometimes sharpened venter often covered in coarse, blunt secondary ribs. It could also be referred to *Chamousssetia*. The difference from *Ch. chamoussseti* (Figure 8A,C), the later species, is mainly in the absence of the carina on a compressed section that gives the latter a cordate-shaped venter. Therefore, *Cadochamousssetia saratovensis* is a transitional link between *Cadochamousssetia* and *Chamousssetia*.



Figures 4 and 5. *Cadochamousetia subpatruus* (Nikitin), N CR-127; Uzhovka quarry, base of Bed 3c, Gowerianus Zone, Subpatruus Subzone (x 0,8).

5. DISCUSSION

Callomon and Wright (1989) included in the genus *Chamousetia*: *Ch. phillipsi* nom. nov. [= *lenticularis* sensu Phillips], *Ch. buckmani* sp. nov., *Ch. chamouseti* (d'Orbigny), *Ch. saratovens* sp. nov. from middle part of Lower Callovian; and *Ch. crobyloides* (Quenstedt), *Ch. funifera* (Phillips) [= *galdrinus* d'Orbigny] from Athleta Zone of Upper Callovian.

As is evident from the above, I include the species *saratovens* in the genus *Cadochamousetia*. I am not certain about the independence of the species *buckmani* and *phillipsi*; probably they characterize the variability of the type species of the genus *Ch. chamouseti* (d'Orbigny). The younger (after Callomon and Wright, 1989) *phillipsi* morphologically is nearer to *saratovens* than to *buckmani*. This is probably a mistake of English colleagues.



I can not agree with these authors on another aspect. As microconchs of *Chamousetia* Callomon and Wright (*ibid.*, pl. 88, fig. 3; pl. 89, figs. 2–5) illustrated young specimens. According to their involute whorls with narrow umbilicus and ribs starting to smooth these specimens are undoubtedly macroconchs of *Chamousetia*. The microconchs of *Chamousetia* and *Cadochamousetia* are common to all Cadoceratinae and grouped together as *Pseudocadoceras*. The associated microconchs of good preservation were found together with *Cadochamousetia saratoviensis* in the Kostroma region (Figures 9A,C); and with *Chamousetia chamouseti* s.l. in the Kostroma and Ryazan regions (*Pseudocadoceras* spp. ex gr. *boreale* Buckman).

D. Marchand (Dommergues *et al.*, 1989) assumed polyphyletic origin of species *Chamousetia*: *Cadoceras nordenskjöldi* → *Chamousetia chamouseti*; *Longaeviceras nikitianum* (?= *L. nikitini* (D. Sokolov)) → *Chamousetia galdrinus*. According to the hypothesis by Callomon and Wright (1989), *Chamousetia* is most likely directly derived from *Arcticoceras*. Unfortunately, the last version does not explain the absence of intermediate species in the lower part of Lower Callovian and in the Middle Callovian.



Figures 6 and 7. *Cadochamousetia saratovensis* (Callomon and Wright), N CR-889, Uzhovka quarry, base of Bed 3d, Gowerianus Zone, Subpatruus Subzone (x 0,8).

Chamousetia menzeli sp. nov, described by E.Monnig (1995), came from the Herveyi Zone (*hoyeri* horizon), equivalent to the Elatmae Zone of Russia. Another species, "*Macrocephalites*" *pavlowi* (Smorodina, 1928), from Elatmae Zone of Russia, is very similar and possibly identical to "*Chamousetia*" *menzeli*. These two species are characterized by a triangular section with narrow, rounded venter, a narrow umbilicus and comparatively long, thin, straight secondary ribs. I believe that these ammonites deserve to be classified as the separate genus *Eckhardites* gen. nov. with type species *Macrocephalites pavlowi* Smorodina, 1928, pl. 3, figs. 1–3 (fig. 1,2 =lectotype, designated here; named in honour of Eckhard Monnig). *Eckhardites* is a homeomorphic genus in relation to *Chamousetia* and *Cadochamousetia* and most probably originates from Arctocephalitinae.

There is one more group of Callovian (Upper Callovian Athleta Zone) Cardioceratiidae that is morphologic similar to *Chamousetia*. This group includes such species as *pa-*



truum d'Eichwald, 1868 (earlier this name was wrongly used to *Cadochamousetia saratovensis* (Mitta in Gerasimov *et al.*, 1996; Mitta, 1996); *galdrinum* sensu Nikitin, 1885; *funiferum* Phillips, 1829. The latest investigations indicate the common origin of this species from Middle Callovian *Rondiceras* ex gr. *milaschewici* (Nikitin).

Therefore, Callovian Cardioceratidae attempted to acquire an oxycone appearance for many times. One of such attempts is the phyletic line *Cadoceras* → *Cadochamousetia* → *Chamousetia*.

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Figure 8. *Chamoussetia chamousseti* (d'Orbigny) s.l.; (A, B)- N CR-900; (C) N CR-839; Uzhovka quarry, Bed 4; Gowerianus Zone, Chamousseti Subzone (x 1).

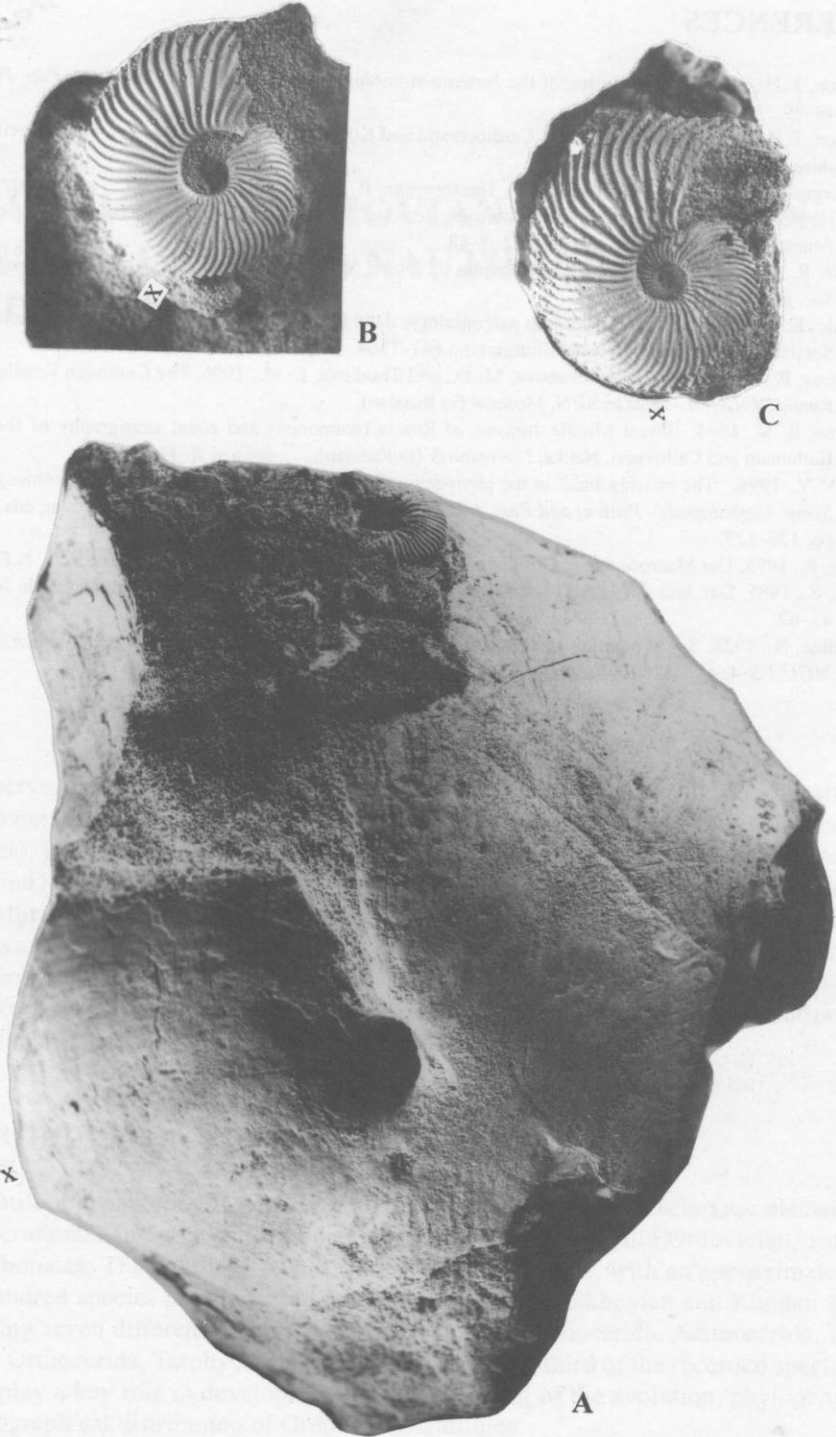


Figure 9. *Cadochamousetia saratovensis* (Callomon and Wright); (A) macroconch N CR-846; (B) microconch [= *Pseudocadoceras* sp. nov.] N CR-815; (C) microconch [= *Pseudocadoceras* sp. nov.] N CR-818. Bank of the river Unzha the town of Makariev; Gowerianus Zone, Subpatruus Subzone (x 1).

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