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On the Ammonite Succession in the Jurassic–Cretaceous Boundary Beds of the Moscow Syneclise

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Abstract—The succession of ammonite assemblages in the central regions of the Russian Platform from the *Virgatites virgatus* Zone (Middle Volgian Substage) to the *Surites tzikwinianus* Zone (Ryazanian Stage) is discussed. The analysis of the data available suggests a considerable gap between the *Craspedites nodiger* Zone, terminal in the Volgian Stage, and the *Riasanites rjasanensis* Zone, basal in the Ryazanian Stage. *Praesurites nikitini* sp. nov. and *Pseudocraspedites bogomolovi* sp. nov. from the basal beds of the Ryazanian and *Praetollia olivikorum* sp. nov. from the unnamed unit above the top of the Volgian are described. The three genera to which these species belong are recorded for the first time from the Russian Platform. They allow a better correlation of the Jurassic–Cretaceous boundary beds within the Boreal Realm.

Key words: Ammonites, Jurassic–Cretaceous boundary, Moscow Basin.

INTRODUCTION

For more than 100 years, international commissions and bodies have adopted a number of controversial decisions on the stratigraphic nomenclature of the Jurassic–Cretaceous boundary beds. The decisions adopted in 1964 (Cassis, France; Moscow, USSR) and 1996 (St. Petersburg, Russia) were particularly contradictory.

The Mediterranean Mesozoic Committee in May, 1964 in Cassis concluded that the use of the Portlandian as a global stage should be discontinued, while the Tithonian Stage is unacceptable since this stage is not geographically based and does not have a stratotype, which is required by the rules of stratigraphic nomenclature. The majority of participants in the Cassis Meeting decided that the Volgian should be used as the name for the terminal Jurassic stage (Sasonov, 1964). Somewhat earlier, the British Mesozoic Committee had rejected the Portlandian as a stage of the international scale. The bureau of the Jurassic Commission of the Interdepartmental Stratigraphic Committee of the USSR (Moscow, 1964) agreed that the names Portlandian and Tithonian could not be retained for naming the terminal stage of the Jurassic, because neither met the existing requirements. Consequently, the Volgian (including three substages and nine zones) was considered to be the only valid name for this stage (Decisions..., 1966, p. 136).

The Bureau of the Russian Interdepartmental Stratigraphic Committee (St. Petersburg, February, 1996) transferred the Volgian Stage from the category of general stratigraphic units to the category of regional units and converted it into a regional stage, while the Tithonian was considered to be the only valid name for the terminal Jurassic, including the entire territory of the Boreal Realm. It was recommended that the Jurassic–Cretaceous boundary be drawn between the Middle and Upper substages of the Volgian Stage (Decisions..., 1997).

These decisions, separated by a third of a century, completed another circle in the history of the nomenclature of the terminal Jurassic stage (and the basal stage of the Cretaceous). It is clear that the solution of this problem has reached a dead end, and that new data are required. This conclusion was clearly stated in recent publications of the working group on the Jurassic–Cretaceous boundary (Zakharov *et al.*, 1996).

There is no doubt that the discontinuation of the use of the Volgian as a global stage was a mistake. This opinion is also supported by researchers from other countries. The definition of the Jurassic–Cretaceous boundary is another problem that should logically result from the substantiated correlation of these series.

Various fossil groups have been used in attempts to solve this problem in recent decades. In addition to paleontological data, various methods for geochronological dating were applied to define the relative and absolute age of the boundary. Unfortunately, none of these approaches was successful. No reliable definition has yet been achieved.

The correlative potential of ammonites, an orthostratigraphic fossil group, has not been fully utilized. Kowalevsky (1874, p. 59), estimating their value for the Mesozoic geochronology, referred to them as "the long hand of the geological clock." This is especially true for

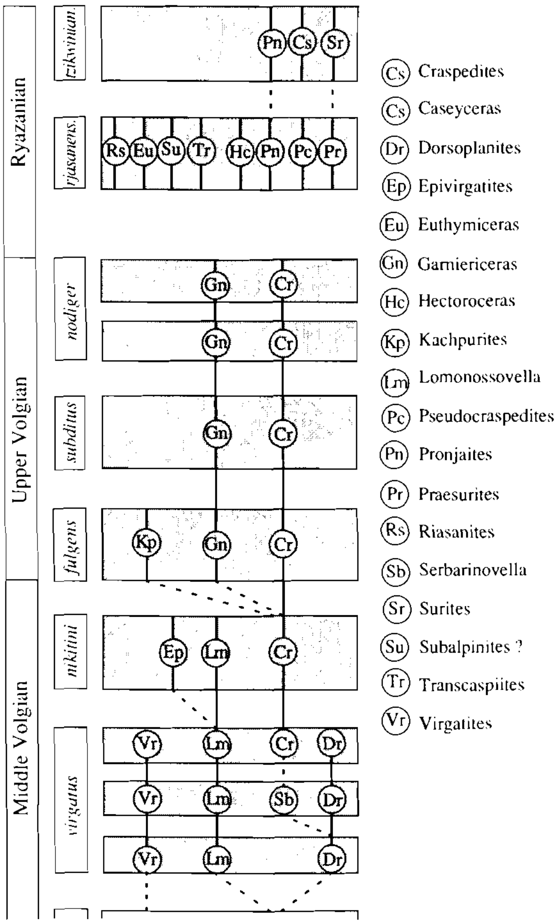


Fig. 1. Geological succession of ammonite assemblages at the Jurassic–Cretaceous boundary (Moscow Region). Abbreviations: (*rjasanens.*) *Riasanites rjasanensis* and (*tzikwinian.*) *Surites tzikwinianus*.

the Russian Platform, which is a type region for the Volgian and Ryazanian. The progress of research in this field has been very slow, primarily because of the scarcity of well-preserved ammonites in the strongly condensed Ryazanian (Berriasian) sequences of central European Russia. The situation is complicated by the fact that many genera and species were described from this interval without a good taxonomic basis.

New data obtained by the author in the last two decades will allow better correlation of the Jurassic–Cretaceous boundary beds in the Boreal Realm. At the same time, they pose new questions concerning the basal horizons of the Cretaceous System.

RESULTS

Ammonite Assemblages at the Jurassic–Cretaceous Boundary

The succession of ammonite assemblages in the Jurassic–Cretaceous boundary beds is of special interest primarily because of the possible estimation of gaps between these units. Figure 1 shows a succession from the middle part of the Middle Volgian Substage to the Ryazanian Stage, based on the example of the Moscow Region (as the best understood region).

Observations were made from 1980 to 2002 in many natural and artificial outcrops in both Moscow and the Moscow Region (including the quarries of phosphoritic mines near the town of Voskresensk, where, according to Gerasimov and Mikhailov (1966), the hypostratotype of the Volgian Stage is located). The interval under consideration contains the following ammonite assemblages.

Middle Volgian, *Virgatites virgatus* Zone, *Virgatites gerassimovi* Subzone: *Virgatites, Lomonossovella*, and *Dorsoplanites* (represented by the later species of this genus, which are sometimes assigned to the subgenus *Vischniakovia* Gerasimov); *Virgatites virgatus* Subzone: *Virgatites, Lomonossovella, Dorsoplanites*, and *Serbarinovella; Craspedites ivanovi* Subzone: *Virgatites, Lomonossovella, Dorsoplanites*, and *Craspedites*; and *Epivirgatites nikitini* Subzone: *Epivirgatites, Lomonossovella*, and *Craspedites*.

Upper Volgian, *Kachpurites fulgens* Zone: *Kachpurites, Craspedites*, and *Garniericeras; Craspedites subditus* Zone: *Craspedites* and *Garniericeras*; and *Craspedites nodiger* Zone (subdivided into two subzones based on ammonite species): *Craspedites* and *Garniericeras*.

Ryazanian, *Riasanites rjasanensis* Zone: *Riasanites, Euthymiceras, ?Subalpinites, Transcaspiites, Praesurites, Pseudocraspedites, Pronjaites*, and *Hectoroceras*; and *Surites tzikwinianus* Zone: *Surites, Caseyceras*, and *Pronjaites*.

Zonal ammonite assemblages of the upper half of the Volgian in the remaining territory of the Russian Platform underwent small changes at the species and generic levels. For instance, in the upper reaches of the Volga River, the *nikitini* Zone still contains the last *Dorsoplanites* (species continuing from the underlying *virgatus* Zone) and newly appeared species of *Laugeites* (descendant of *Dorsoplanites*). In the middle reaches of the Volga River, *Serbarinovella* and *Craspedites* remain unknown from the Middle Volgian, whereas *Dorsoplanites* is unknown from the *virgatus* Zone.

The above data suggest an asynchronous disappearance of the Virgatitidae and Dorsoplanitidae and appearance of the Craspeditidae. The Virgatitidae became extinct at the end of the *virgatus* time, while the Dorsoplanitidae disappeared in the *nikitini* time and the first Craspeditidae appeared as early as the *ivanovi* Subzone of the *virgatus* Zone. Zonal boundaries within the Volgian are clearly recognized by the change in taxonomic composition, although no considerable gaps between the zones are likely. The assemblages from the middle and upper substages clearly differ. In this case, the stepwise nature of ammonite evolution is recognized at the family level. At the same time, all taxa are endemic, having originated and evolved in the Central Russian Basin. It is noteworthy that the Middle Volgian zones are in fact genozones, i.e., the three zones of this substage are characterized by different taxa of the genus group, while only some species, e.g., *Lomonossovella lomonossovi* (Vischniakoff), continue from one zone to another. In contrast, Upper Volgian zones are mainly characterized by taxa of the species group (except for the lower zone typified by the genus *Kachpurites* in addition to *Craspedites* and *Garniericeras*). This certainly indicates different absolute durations of the Middle and Upper Volgian. Evidently, the Upper Volgian was half as short as the Middle Volgian.

The ammonite assemblage from the *rjasanensis* Zone, lowermost in the Ryazanian, is very different from those of the overlying *tzikwinianus* Zone, and, especially, from the preceding *nodiger* Zone of the Volgian. A short-termed invasion from the marginal Tethyan basin to the Central Russian (Volgian) Basin led to the arrival of the family Neocomitidae sensu lato, which did not have local ancestors. Apparently, the gap between the *rjasanensis* and *tzikwinianus* zones is smaller, which is evident from the presence of the common genus *Pronjaites* and the evolutionary lineage *Praesurites* → *Surites*. In the more northern and eastern regions of the Russian Platform, both zones of the Ryazanian Stage are characterized almost exclusively by taxa of boreal origin, except indications of *Riasanites*, which are very rarely supported by collections.

Even taking into account the preliminary exclusion of clearly subjective synonyms, the number of generic names for the *rjasanensis* Zone is more than double the usual number of genera for the underlying and overlying zones. This shows the complex composition of the zone and its condensed nature, which is supported by its lithology. The rarity of finds of well-preserved ammonites in the thin bed of the Rjasanensis Zone, together with their occurrences in different localities and collections made over a considerable length of time, in most cases do not allow their positive referral to finer stratigraphic units. Nevertheless, the ammonites described below extend our knowledge on the biogeography of so-called boreal ammonites, allow the refinement of their phylogeny, and offer some new stratigraphic and correlative interpretations.

Material described is housed at the Vernadsky State Geological Museum of the Russian Academy of Sciences (GGM), collection nos. 1385 and 1386 (collected by P.A. Gerasimov), and the Paleontological Institute of the Russian Academy of Sciences (PIN), collection nos. 3990 and 4861.

SYSTEMATIC PALEONTOLOGY

Family Craspeditidae Spath, 1924

Genus *Praesurites* Mesezhnikov et Alekseev, 1983

***Praesurites nikitini* Gerasimov et Mitta sp. nov.**

Plate 2, figs. 1–4

Surites nikitini: Gerasimov, 1969, pl. 30, figs. 1 and 2 (nomen nudum).

H o l o t y p e. GGM, no. 1385; figured by Gerasimov (1969, pl. 30, fig. 1); Kostroma Region, bank of the River Unzha, near the village of Ogarkovo; phosphoritic bed at the base of the Ryazanian Stage (collected by Gerasimov in 1934).

D e s c r i p t i o n. The phragmocone is medium-sized, with inflated and depressed whorls. The flanks are weakly convex, descending to the rounded venter. The maximum whorl width is near the umbilicus. The whorls embrace the preceding whorls for three-quarters of their height. The umbilicus is shallow and moderately wide at all stages. The umbilical shoulder is rounded. The body chamber length and the shape of the aperture are unknown. The ornamentation consists of relatively thin, evenly convex ribs. The subradial primary ribs appear on the umbilical shoulder and dichotomize (more rarely trichotomize) at midflanks or slightly closer to the venter. The secondary ribs are sigmoidally curved approaching the venter and cross the venter with a weak bend orad.

D i m e n s i o n s in mm and ratios:

Specimen	Dm	Wh	WW	UW	Wh/Dm	WW/Dm	UW/Dm
PIN, no. 3990/235	74	29	31	22	0.39	0.42	0.30
Holotype							
GGM, no. 1385	61	25	28	18	0.41	0.46	0.29
	60	25	27	16	0.42	0.45	0.27
PIN, no. 3990/236	49	19	21	13	0.39	0.43	0.27
GGM, no. 1386	43	18	18	11	0.42	0.42	0.26
PIN, no. 3990/237	34	14	14	10	0.41	0.41	0.29

V a r i a b i l i t y. There are two varieties that are not strongly distinct. The first (including the holotype and paratype figured by Gerasimov) has the higher and weakly convex whorls. These ammonites more frequently have tripartite ribs, while older individuals may have intercalating ribs, and the ventral curvature of the ribs is better pronounced. The representatives of the second (apparently earlier) variety have more depressed whorls and mainly bipartite ribs (Pl. 2, figs. 1–4).

C o m p a r i s o n. This species is distinguished from the type species *P. elegans* Mesezhnikov et Alekseev, 1983 by the lower and more inflated whorls and less densely spaced ribs.

R e m a r k s. Gerasimov figured two specimens of this species, which he erroneously thought to be from the *tzikwinianus* Zone, and designated the holotype in the explanations to the plates, although he did not describe the species. The present description validates the species and brings it into accord with the International Code of Zoological Nomenclature. Apparently, this species evolved from the Late Volgian *Craspedites*, and was ancestral to *Surites* Sasonov, 1951 via *S. unshensis* (Nikitin, 1885, pl. 5, fig. 23) and *S. spasskensis* (Nikitin, 1888, pl. 1, figs. 9, 10).

O c c u r r e n c e. Ryazanian Stage, *rjasanensis* Zone of the Moscow Syneclise.

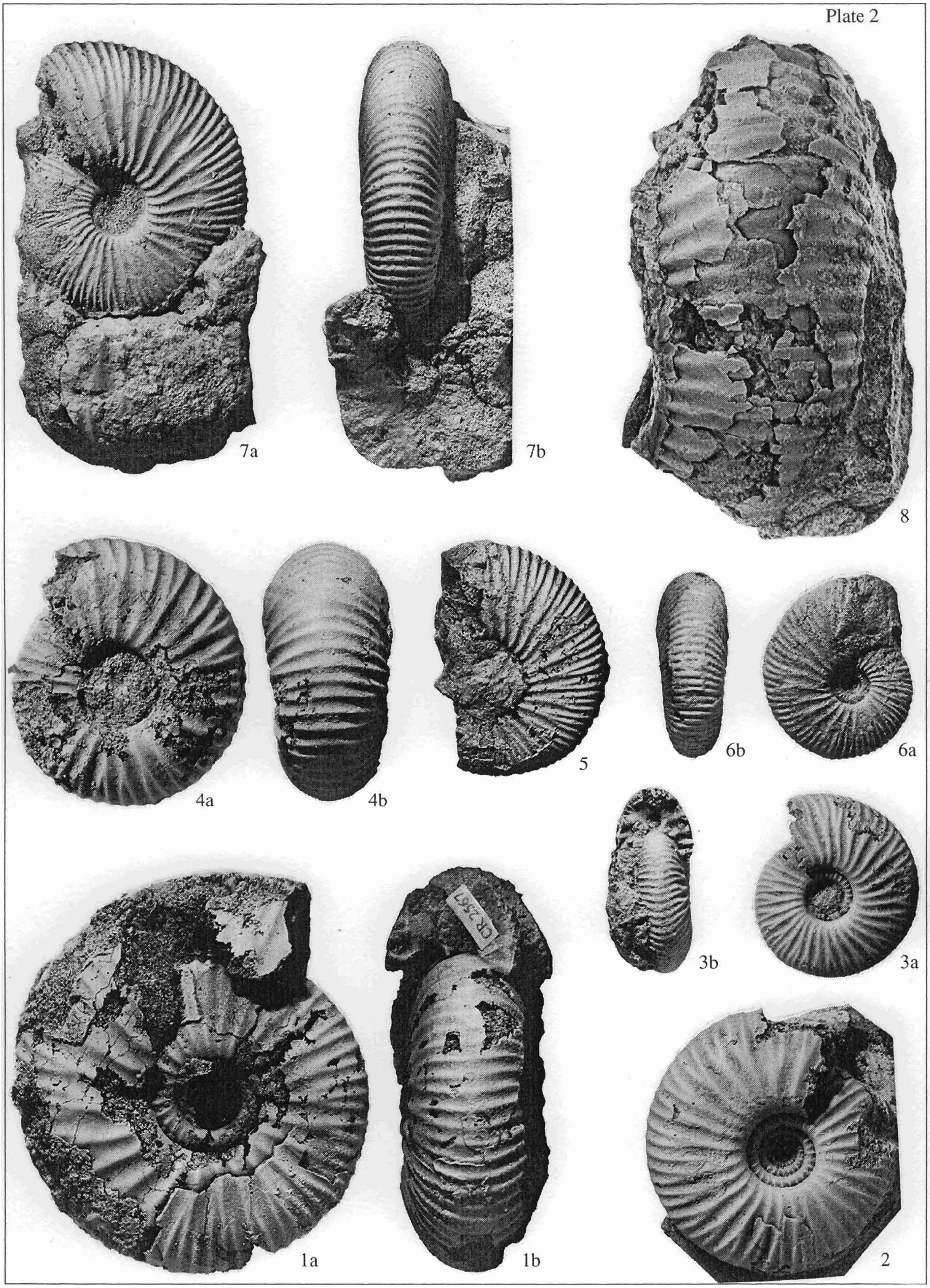


Plate 2
7a
7b
8
4a
4b
5
6b
6a
3b
3a
1a
1b
2

Material. Ten specimens from the *rjasanensis* Zone of the Lopatinskii Phosphorite Mine; four phragmocones from phosphoritic nodules in the basal part of the Ryazanian Stage; outcrop on the right bank of the Unzha River, near the village of Ogarkovo.

Genus *Pseudocraspedites* Casey, Mesezhnikov et Schulgina, 1977

Pseudocraspedites bogomolovi **Mitta, sp. nov.**

Plate 3, figs. 2–7

Etymology. In honor of Yu.I. Bogomolov, expert on Lower Cretaceous ammonites (Bogomolov, 1989; etc.)

Holotype. PIN, no. 4861/54; Moscow Region, Lopatinskii Phosphorite Mine; Ryazanian Stage, *rjasanensis* Zone (collected by Gerasimov and Mitta in 1984).

Description. The shell is medium-sized, with medium-wide whorls embracing the preceding whorls for two-thirds of the height. The cross section is oval, widest in the lower third of the flanks. The flanks are convex, converging to the rounded venter. The umbilicus is moderately wide and shallow. The umbilical wall gently slopes at early stages, becoming steeper in adults. The umbilical shoulder is rounded. The body chamber length and apertural shape are unknown. Well-developed constrictions are usually observed at intermediate stages. The ornamentation of juveniles consists of densely spaced, thin ribs of even height. In the lower third of the flanks, primary ribs give rise to two or three secondary ribs, some of which lose connection with the primary ribs. With age, primary ribs become more prominent and are later modified into umbonal ribs (plications), which are smoother in the lower third of the flanks before reaching the midflanks. The secondary ribs become thinner and are only slightly noticeable on the mold. Their number may increase to four or five in a bunch.

Dimensions in mm and ratios:

Specimen	Dm	Wh	WW	UW	Wh/Dm	WW/Dm	UW/Dm
Holotype 4861/54	61	24	21	19	0.39	0.34	0.31
3990/241	46	19	16	13	0.41	0.35	0.28
4861/52	40	16	13	12	0.40	0.33	0.30
3990/243	37	15	12	11	0.41	0.32	0.30
3990/242	33	13	11	10	0.39	0.33	0.30

Comparison. This species is very similar to the type species *P. anglicus* (Schulgina, 1972) in the shell shape and ornamentation of juvenile whorls. It is distinguished from the latter by the shorter primary ribs (plications) in adult whorls. It is distinguished from *P. craspeditoides* (Girmounsky, 1914) (Pl. 3, fig. 1) by the more compressed shell, more strongly developed constrictions, and by the more densely spaced and thinner ribs at intermediate stages.

Remarks. *P. craspeditoides* was described by Girmounsky (1914, pl. 5, figs. 1–3, lectotype, designated here, housed at the GGM, no. VI-124/1) under the generic name *Polyptychites*; found in the basal bed of the Neocomian in the Unzha River Basin (near the village of Ogarkovo). It has never been described since. Apparently, *P. craspeditoides*, which also is rarely found in the lower horizons of the Ryazanian Stage in the Moscow Region and very closely related to *Craspedites*, was ancestral to the new species. *P. craspeditoides* apparently evolved from the Late Volgian species *Craspedites triptychus* (lectotype figured by Nikitin, 1885, pl. 6, fig. 25, designated by Gerasimov, 1969).

The early whorls of *P. bogomolovi* are similar to those of many taxa described from various localities in northern Siberia, Polar Ural Mountains, and England under different species and generic names. These are *Craspedites? arcticus* (Schulgina, 1969, pl. 33, fig. 4), *Craspedites (Taimyroceras) taimyrensis* (Schulgina, 1969, pl. 34, fig. 1b), *Craspedites originalis* (Schulgina, 1969, pl. 36, figs. 2, 4), *Subcraspedites turbinae* (Mesezhnikov *et al.*, 1983, pl. 6, fig. 9), *Subcraspedites* sp. (Casey, 1973, pl. 4, fig. 6), and *Subcraspedites (Volgidiscus) lamplughi* (Casey, 1973, pl. 4, fig. 9), which indicate close similarity of these ammonites. Morphological features of the new species and its stratigraphic range suggest that it was ancestral to the genus *Peregrinoceras* Sasonova, 1971.

The authors of the genus *Pseudocraspedites* suggested to include several species previously described under different names: by Schulgina (1972) as *Subcraspedites (Subcraspedites) anglicus, S. (S.) plicomphalus, S. (S.) subpressulus* and *S. (S.) pressulus* (all from Siberia); by Jeletzky (1964) as *Tollia* (Subcraspedites) aff. *suprasubditus*, and *T. (S.) spasskensis* from Arctic Canada. Of these ammonoids, only the first species can be considered to have been erected correctly, in accordance with the rules of the International Code of Zoological Nomenclature.

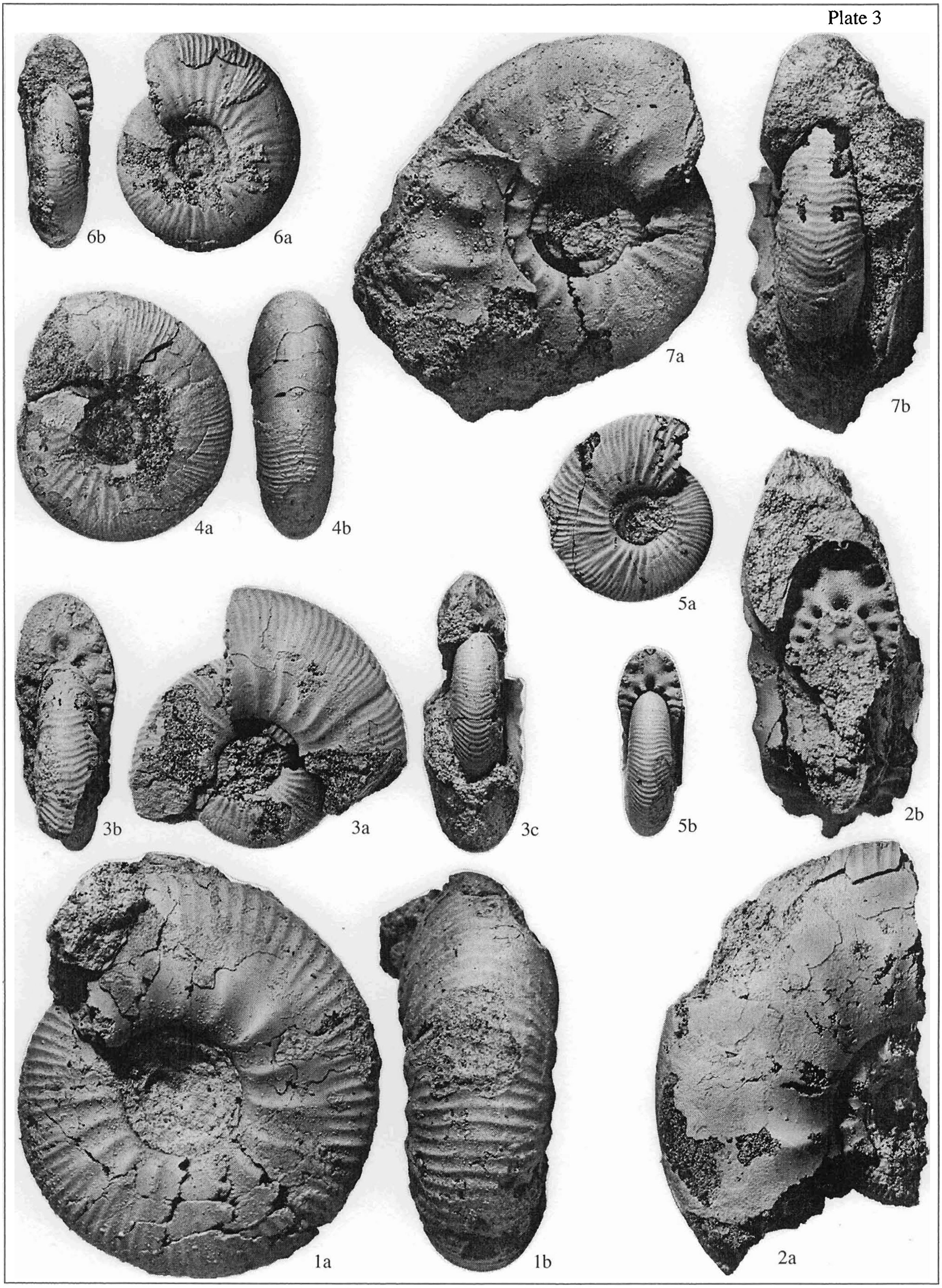
Explanation of Plate 2

All sizes are natural

Figs. 1–4. *Praesurites nikitini* sp. nov., specimens: (1) PIN, no. 3990/235, (2) PIN, no. 3990/236, (3) PIN, 3990/237, and (4) PIN, 3990/245; Lopatinskii Phosphorite Mine; Ryazanian Stage, *Riasanites rjasanensis* Zone; collected by V. Mitta, in 1983–86.

Figs. 5–8. *Praetollia olivikorum* sp. nov.: (5) GGM, unnumbered paratype, Kirov Region, Nyrmich; collected by A.A. Chetyrkina; (6) paratype PIN, no. 3990/239; (7) holotype PIN, no. 3990/238, and (8) specimen PIN, no. 3990/238a; Kostroma Region, bank of the Unzha River, between the villages of Ogarkovo and Efimovo; phosphoritic bed at the top of the Volgian; collected by V. Mitta, O. Nagel, and V. Pirkl in 2000.

Plate 3



M a t e r i a l. Eleven specimens from the *rjasanensis* Zone, Lopatinskii Phosphorite Mine.

Genus *Praetollia* Spath, 1952

Praetollia olivikorum Mitta, sp. nov.

Plate 2, figs. 5–8

E t y m o l o g y. After the names of my friends Oliver Nagel and Viktor Pirkl, who found the holotype of this species during our joint excursion in 2000.

H o l o t y p e. PIN, no. 3990/238; Kostroma Region, bank of the Unzha River, between the villages of Ogarkovo and Efimovo; phosphoritic bed at the top of the Volgian Stage.

D e s c r i p t i o n. The phragmocone is medium-sized, with moderately wide whorls, ellipsoidal in cross section. The flanks are almost flat. The venter is rounded. The umbilicus is moderately narrow. The umbilical wall is steep. The umbilical shoulder is rounded. The body chamber and apertural shape are unknown. The ornamentation consists of thin but prominent ribs dichotomizing and trichotomizing at the midflanks. The ribbing coefficient is close to 3. Intercalating ribs appear when one of the secondary ribs loses connection with a primary rib. Primary ribs become slightly thicker with age and widen as they approach the bifurcation point.

D i m e n s i o n s in mm and ratios:

Specimen	Dm	Wh	WW	UW	Wh/Dm	WW/Dm	UW/Dm
Holotype 3990/238	75	34	25	18	0.45	0.33	0.24
	44	20	16	10	0.45	0.36	0.23
3990/239	31	14	12	7	0.45	0.39	0.23

C o m p a r i s o n. The new species is distinguished from the type species *P. maynci* (holotype figured by Spath, 1952, pl. 3, fig. 2) by the larger proportion of tripartite ribs. This species is similar to *P. contiqua* (see Spath, 1952, pl. 3, fig. 1, the type specimen originally established by Spath as a variety of *P. maynci*). Judging from illustrations, the new species is distinguished by having fewer intercalating ribs.

Jeletzky (1984, pl. 7, fig. 10) figured an ammonite from Arctic Canada, which has juvenile whorls and ornamentation very similar to the new species, under the name "*Praetollia (Pseudocraspedites) anglicus.*" Small differences in our specimens are observed only in the more strongly flattened flanks. Unfortunately, available fragments of large whorls (Pl. 2, fig. 8) show only a venter and, partly, ventrolateral areas. Therefore, it is difficult to predict whether or not the adult whorls of the new species have inflated primary ribs.

R e m a r k s. The holotype was found in a phosphoritic bed at the top of the Volgian Stage. Further excavation of the same bed produced another three fragments of larger whorls of a phragmocone that apparently also belonged to the holotype. The paratype (Pl. 2, fig. 6) was found not *in situ* among Upper Volgian ammonites (mainly *Craspedites*), washed out from the phosphoritic bed. It is noteworthy that, among several thousand ammonites from this locality which the author studied in a number of collections (including his own and those of museums and private collectors), this species was never found.

A box containing Berriasian–Valanginian ammonites labeled as the collection of A.A. Chetyrkina from the Nyrmichskoe phosphorite deposit in the Kirov Region (housed among old collections in GGM) contained one more phosphoritic mold of an ammonite belonging to the species under description (Pl. 2, fig. 5).

The Greenland ammonites figured by Spath (1952) in their first description are completely or partly crushed. Therefore, a more thorough comparison is difficult. However, the character of rib bifurcation in the new species and the shape of the umbilicus are similar to those of typical *Praetollia*, which is sufficient to assign it to this genus.

The composition and taxonomic position of the genus *Praetollia* are debated. The above mentioned ammonite described by Jeletzky does not belong to the species *Pseudocraspedites anglicus* (Schulgina) or even to the genus (or subgenus) *Pseudocraspedites*. The inflated primary ribs repeatedly appeared in the ontogeny of various Craspeditidae genera (and their ancestral family Dorsoplanitidae) and are more useful as a character at the species level.

Ammonites from the Neocomian of Canada that were described as *Praetollia antiqua* (holotype figured by Jeletzky, 1973, p. 75, pl. 5, fig. 1) are similar in ornamentation to *Surites* sensu lato. Casey (1973) assigned them to the genus *Borealites* sensu stricto. Most probably, these ammonites suggest the Late Berriasian, because morphologically similar ammonites were found from the *tzikwinianus* Zone of the Russian Platform. In fact, Jeletzky himself later synonymized his species with *Borealites fedorovi* Klimova, 1969 (Jeletzky, 1984).

E x p l a n a t i o n of P l a t e 3

All sizes are natural

Fig. 1. *Pseudocraspedites craspeditoides* (Girmounsky, 1914), specimen PIN, no. 3990/244.

Figs. 2–7. *Pseudocraspedites bogomolovi* sp. nov.; (2) paratype PIN, no. 3990/240; (3) paratype PIN, no. 2990/243; (4) paratype PIN, no. 3990/241; (5) paratype PIN, no. 3990/242; (6) PIN, paratype no. 4861/52; and (7) holotype PIN, no. 4861/54.

All specimens are from the Lopatinskii Phosphorite Mine; Ryazanian Stage, *Riasanites rjasanensis* Zone, collected by Mitta in 1983–1986 (figs. 1–5) and Gerasimov and Mitta in 1984 (figs. 6, 7).

Ammonites from the borehole in the North Sea, which J.H. Callomon identified as *Praetolia* (Abbink *et al.*, fig. 6/O', 6/O'', 7/S), most likely belong to the genus *Hectoroceras*.

Occurrence. The unnamed zone between the Volgian *nodiger* Zone and Ryazanian *rjasanensis* Zone of the Moscow Syneclise.

Material. Five specimens at various growth stages (probably belonging to two individuals) from the phosphoritic bed at the top of the Volgian Stage; Unzha River, near the village of Ogarkovo, and one specimen from the Nyrmich River.

DISCUSSION

Representatives of three "high Boreal" genera are recorded for the first time from the Russian Platform, increasing their correlative potential.

Praesurites elegans is recorded from the *Chetaites sibiricus* Zone of the Polar Ural Mountains. *P. nikitini* typifies the *rjasanensis* Zone (or, more precisely, its lower part) of the Russian Platform. Differences between these species are minimal, and may be attributed to geography, i.e., these zones are probably (may be partly) synchronous.

Pseudocraspedites anglicus is found in the middle–upper part of the *Hectoroceras kochi* Zone (Casey *et al.*, 1988), i.e., above the *Chetaites sibiricus* Zone, although this also falls within the *rjasanensis* Zone (central Russian equivalent of these two Siberian zones).

Thus, the finds of *Praesurites* and *Pseudocraspedites* in the Russian Platform support the correlation scheme proposed by M.S. Mesezhnikov and his colleagues in the 1980s.

The finds of *Praetollia* and especially their stratigraphic position suggest more interesting conclusions.

As mentioned above, the holotype of *P. olivikorum* was found in the upper part of the phosphoritic bed at the top of the Volgian Stage. It is represented by a phosphoritic mold lacking the nacreous layer. Numerous ammonites of the genera *Craspedites* and (more rarely) *Garniericeras*, characterizing the *nodiger* Zone, are found in abundance in the lower part of this bed and vary somewhat in preservation (these are phosphoritic or calcite molds with a nacreous layer). The nodules of clayey–calcareous oolitic sandstone of Ryazanian Age occur above the phosphoritic bed and are sometimes separated from it by a layer of the glauconite sand. *Praesurites unshensis* (Nikitin), *P. nikitini* sp. nov., and *Pseudocraspedites craspeditoides* (Girmounsky) are described from this level. This bed also contained occasional unpublished records of *Hectoroceras* cf. *kochi* Spath. On the other hand, rare, but documented finds of *Chetaites* sp. recorded as "*Perisphinctes* aff. *Stschurovskii* Nik." by Nikitin (1885) and as "*Craspedites* sp. nov. = *Ammonites* aff. *Stschurovskii* Nik." by Sokolov (1929) come from a Volgian phosphoritic bed.

Casey *et al.* (1977, pl. 2, figs. 8, 9) figured specimens of *Praetollia* cf. *contigua* Spath from the *sibiricus* Zone of northern Siberia. These specimens were found below the finds of *Chetaites sibiricus* and are similar to the central Russian species. Later, Alekseev (1984) recognized the lower part of the *sibiricus* Zone as the *Praetollia maynci* Subzone. In addition to *Praetollia*, this subzone contains *Chetaites, Praesurites*, and *Schulginites* (Casey *et al.*, 1988). *Schulginites* is most likely a synonym for *Hectoroceras*. A comparison of the taxonomic composition of ammonites from the *sibiricus* and *kochi* zones of Siberia and *rjasanensis* Zone of the Moscow Syneclise allows a conclusion of their almost complete correspondence: in the Oka River Basin and in the Ryazan–Saratov Depression, the *rjasanensis* Zone is overlain by the beds with the first *Surites* (*S.* ex gr. *spasskensis*), which are equivalent to the beds with *S. analogus* in Siberia.

The correlation of the so-called *Craspedites* zones of the Russian Platform and Siberia is not debated and is apparently correct. Thus, there is a clear gap in the stratigraphic scheme of the Russian Platform, corresponding to the interval of *Chetaites* chetae–Praetollia *maynci* strata in Siberia. In this context, it is remarkable that *Chetaites* and *Praetollia* are found in the phosphoritic bed (condensation horizon) at the top of the Volgian Stage in the outcrop near the village of Ogarkovo on the Unzha River. I have no doubt that these ammonites typify a new, as yet unnamed, stratigraphic unit (or units), the closest to the Jurassic–Cretaceous boundary in the Boreal Realm.

Back to the history of the study of the Jurassic–Cretaceous boundary stages, it is important to take into account the problems that followed the ill-advised decision of the Interdepartmental Stratigraphic Committee in 1996 (see Mitta, 2001). Correlation of the entire Upper Volgian Substage with the Berriasian, or a part of it, immediately causes a nomenclatural problem. In this case, the Khoroshovian Stage introduced by Trautschold (1861) and Shchurovsky (1867) take priority over the Berriasian (Coquand, 1871). The Moscovian Stage proposed by Romanovsky (1856) (non the Carboniferous [!] Moscovian of Nikitin [1890]) is equivalent to the Middle Volgian Substage and has priority over the Tithonian (Oppel, 1865). The Lower Volgian Substage is easily included into the Kimmeridgian *sensu anglico*, or is recognized as the Vetlyanian Stage (Sokolov, 1901).

This is a vicious circle. The international and national committees and commissions eradicated in succession the names Portlandian, Tithonian, and, now, Volgian. Apparently, now it is time to use all the available information for the solution of the primary question, i.e., the Boreal–Tethyan correlation of boundary beds of the Jurassic and -Cretaceous. At the same time, although this boundary is significant for resolving important questions in geology and other fields, it remains only a boundary between two successive zones.

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