

THE SYSTEMATIC COMPOSITION OF THE MIDDLE VOLGIAN DORSOPLANITIDAE (AMMONOIDEA) FROM CENTRAL RUSSIA

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Abstract: Some genera, *Michalskia*, *Pavlovia*, *Dorsoplanites*, *Lomonossovella*, *Serbarinovella*, *Epivirgatites* and *Laugeites*, from the known representatives of the family Dorsoplanitidae from the Middle Volgian of Central Russia are revised, and the species *Laugeites aenivanovi* is described.

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The data on the composition of the Dorsoplanitidae family, which is very important for the zonal subdivision of the middle substage of the Volgian stage, have largely become obsolete and require reconsideration.

In this revision, I have used both my own collections from the Moscow Basin and the Upper and Middle Povolzh'ye region and the collections of N. P. Vishnyakov, S. N. Nikitin, A. P. Pavlov [Pavlov], A. O. Mikhal'skiy [Michalskiy], N. P. Mikhaylov [Michailov], A. N. Ivanov and P. A. Gerasimov, which are housed in the Geological Institute of the Russian Academy of Sciences, the Vernadskiy Museum (Moscow) the Museum of TsNIGRI (St. Petersburg), and the geological department of the Yaroslavl Pedagogical Institute. In addition, I saw some ammonites from the collection of N. P. Mikhaylov that had been collected some time ago by D. I. Ilovaiskiy and A. I. Rozanov.

The wide intraspecific variability of the dorsoplanitids [17] was considered in their revision.

FAMILY DORSOPLANITIDAE ARKELL, 1950

Diagnosis. Combining in this family descendants of ataxioceratids with fairly wide umbilicus and transverse section through whorls ranging from transversely to vertically oval or trapezoidal. Sculpture, developed from fourth whorl on, consisting predominantly of two- and three-part costae running across lateral surfaces with small forward inclination. Both simple and intercalary costae possibly present. In later stages of ontogenesis, sculpture sometimes smoothed out.

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Dimorphism manifested in presence or absence of dorsoplanoid character (elevation of perumbilical costae) and partly in variation of cross-sectional shape. Body chamber occupying 3/4 to 7/8 of whorl. Aperture simple, usually separated by more-or-less distinct constriction. Prosuture bi- and trilobate, primasuture five-lobed. Final suture line formula: $(V_1V_1)LUI_2 \cdot 2I_2^1 \cdot 2I_2^2 \cdot 2 : I_2^2 \cdot 2I_2^1 \cdot 2I_2^1 \cdot 2I_2 \cdot 1I_1D$.

Composition. Subfamilies Pectinatitinae Zeiss, 1968, and Dorsoplanitinae Arkell, 1950.

Comparison. Ontogenesis of suture line in this family resembles that in Ataxioceratidae, but in contrast to latter, in dorsoplanitids lobe I_2 is divided into two asymmetrical lobes.

Remarks. The family Dorsoplanitidae is understood here as consisting of the subfamilies Pectinatitinae and Dorsoplanitinae. The composition and structure of this family are subjects of disagreement among researchers. Donovan, Callomon and Howarth [26] subdivide this family into the subfamilies Pectinatitinae Zeiss, 1968, Pavloviinae Spath, 1931 and Dorsoplanitinae Arkell, 1950. Other systematics [11-13] set apart the series *Laugeites*, *Epilaugeites* and *Chetaites* into the subfamily Laugeitinae Lominadze et Kvantaliani, 1985, leaving the rest of the Devonian (and some Portlandian) genera in the subfamily Dorsoplanitinae.

I refrain from including the subfamilies Laugeitinae and Pavloviinae within the Middle Volgian Dorsoplanitidae until the ontogeny of the suture line in all genera is known.

Distribution. Lower and Middle Volgian of Eastern Europe, Northern Siberia and Northeastern Russia, and Portlandian of Northwestern Europe and Greenland.

Below is my revision of the genera and species of Middle Volgian dorsoplanitids of Central Russia.

Genus *Michalskia* Ilovaikiy, 1941

Type species. *M. miatschkoviensis* Ilovaikiy, 1941.

Small shells, with inflated whorls of rounded-trapezoidal cross section. Costae bipartite, more rarely tripartite with connected bidichotomous costae. Differs from similar genus *Pavlovia* in much lower section in early and middle whorls and in more widely spaced, sharper costae. One species from *panderi* zone in Moszoe region (pl. IV, figs. 2, 3).

KEY TO PLATE IV

Fig. 1. *Laugeites aenivanovi* Mittermeier, sp. nov., Holotype PIN No. 3990/28, side view ($\times 2/3$); Glebovo settlement; *nikitini* zone.

Figs. 2, 3. *Michalskia miatschkoviensis* Ilovaikiy ($\times 1$): 2 - Spec. No. 3990/14: 2a - side view, 2b - apertural view; Moskva River, Chagino settlement; *panderi* zone (collected by N. P. Mikhaylov); 3 - Spec. No. 3990/16: 3a - side view, 3b - transverse section through whorl; Moskva River, Troitskoye settlement *panderi* zone (collected by A. N. Rozanov).

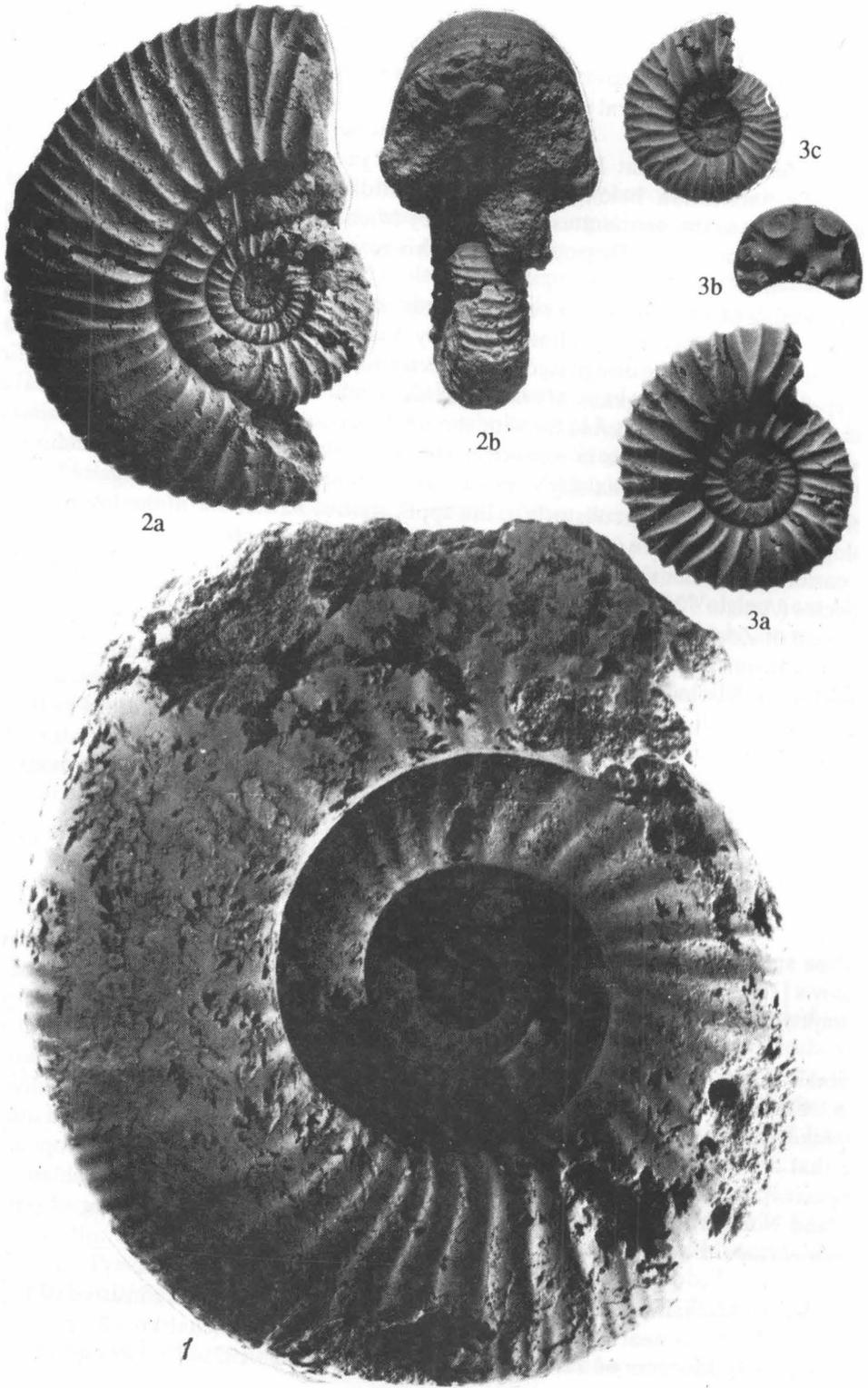


PLATE IV

In naming this genus, Ilovaitskiy [9] designated as its type a specimen illustrated by Michalskiy [20, pl. 9, fig. 9] (Vernadskiy Museum, Spec. No. VI 63/2) as *Perisphinctes miatschkoviensis* Vischniakoff. In so doing Ilovaitskiy stated that *Ammonites miatschkoviensis* Vischniakoff [33, pl. 3, fig. 7] (Vernadskiy Museum, Spec. VI 64/17) and the ammonites illustrated by Michalskiy perhaps belong to different species or even different genera. Ilovaitskiy thereby created a nomenclatural problem.

Studies have shown that Ilovaitskiy was indeed justified in his doubt. The specimen in Vischniakoff's publication belongs to the Virgatitidae (perhaps to a new genus close to *Zaraiskites*), whereas the ammonites illustrated by Michalskiy belong to one species of a genus within the composition of the Dorsoplanitidae. This genus should definitely be named *Michalskia*.

The naming of the type species of this genus is more difficult. If Ilovaitskiy had definitely written that he considers the specimens used by Vischniakoff and Michalskiy as belonging to different species and that he designated *Perisphinctes miatschkoviensis* as understood by Michalskiy as the type species of the genus *Michalskia*, one would have to consider that Ilovaitskiy had established the new genus *Michalskia* with the new species *M. miatschkoviensis* Ilovaitskiy, 1941 as its type [14, Art. 70c.]. This in essence is what Ilovaitskiy did, but he did not definitely assert that Vischniakoff's and Michalskiy's species are different—he merely suggested it. This is probably not a very important obstacle to the application of Article 70c of the International Code of Zoological Nomenclature (the deliberate use of an erroneous identification). At any rate, this will be easier than to consider that Ilovaitskiy failed to notice the erroneous identification of the type species (Article 70a, requiring mandatory reconsideration of the case by the International Commission of Zoological Nomenclature and the description of a new species for *M. miatschkoviensis* sensu Ilovaitskiy), or contrary to Ilovaitskiy's text, to consider that he designated *Ammonites miatschkoviensis* Vischniakoff as the type species. For the sake of stabilizing the nomenclature, therefore, I follow the above interpretation of *M. miatschkoviensis* Ilovaitskiy in Ilovaitskiy et Florenskiy, 1941. I am grateful to A. S. Alekseyev, who insisted that the nomenclatural questions be clarified in connection with my revision of *Michalskia*, and also to Ya. I. Starobogatov and I. M. Kerzhner for resolving these questions.

Genus *Pavlovia* Ilovaitskiy, 1917

Type species. *P. iatriensis* var. *primaria* Ilovaitskiy, 1917 (designated by L. F. Spath, 1931). Mikhailov's [19] proposal of *Pavlovia pavlovi* (Michalskiy) as the type species must be regarded as an unjustified correction violating the principle of the first revision.

Small shells, with whorls of medium thickness or slightly inflated, round or oval cross section. Costae sharp and pointed, generally bipartite and straight. Early whorls like those of *Dorsoplanites*, from which *Pavlovia* differs in its smaller size, and its lack of tri- and quadripartite costae that are not linked to constrictions. Occurs in *panderi* zone of East European platform (one species), in synchronous deposits of Northwestern Europe, Eastern Greenland, Canadian Arctic and Northern Siberia, and also in *Dorsoplanites maximus* zone (analog of part or all of *Virgatites virgatus* zone) of Greenland and Polar Urals.

P. pavlovi Michalskiy, 1890. No holotype designated. Type series consisted of 10 specimens from Middle Volgian near Moscow, which were measured by Michalskiy [20, p. 224]. Four of these are now in Museum of TsNIGRI (Collection 300, Nos. 177, 178, 179 and 181). The only

specimen illustrated by Michalskiy [20, p. 2, fig. 6] has not been preserved. This specimen was proposed by Mikhaylov [19] as the holotype, contrary to rules [14].

Genus *Dorsoplanites* Semenov, 1898

Type species. *Ammonites dorsoplanus* Vischniakoff, 1882.

Medium-sized and large shells, with moderately or slightly involute whorls from wide- to high-oval in transverse section. Costae bi- and tripartite. Comparison with similar *Pavlovia* and *Laugaites* given in characterizations of those genera. Four species of *Dorsoplanites* occur in *panderi* and *virgatus* zone of East European platform. Representatives of this genus have also been described from Polar Urals, Northern Siberia, islands of Russian Arctic, Canadian Arctic and Greenland.

1. *D. dorsoplanus* (Vischniakoff, 1882). Arkell [1] designated as its lectotype the specimen from Middle Volgian at Mnevniki illustrated by Vischniakoff [33, pl. 1, fig. 5]. Present location of this specimen is not known. Vernadskiy Museum has only Spec. No. VI 64/9 [33, pl. 2, fig. 3] from Middle Volgian at Mnevniki, which was proposed by Mikhaylov as the lectotype [19]. However, this later designation of the lectotype is invalid. Since the lectotype has been lost, the question of choosing a neotype arises.

2. *D. panderi* (Orbigny, 1845). Lectotype is specimen from Middle Volgian near Moscow, illustrated by Orbigny [27, pl. 33, figs. 1-5]; designated by Mikhaylov [19] as holotype.

3. *D. rosanovi* Gerasimov, 1978. Holotype is Vernadskiy Museum No. VIII-1315; illustrated by Gerasimov [4, pl. 2, fig. 1]; Moscow, Mnevniki, *virgatus* zone.

4. *D. serus* Gerasimov, 1978. Holotype is Vernadskiy Museum No. VIII-1483; illustrated by Gerasimov [4, pl. 1, fig. 1]; Moscow region, Lopatinskiy mine; *virgatus* zone.

Genus *Lomonossovella* Ilovaiskiy, 1937

Type species. *Ammonites lomonosovi* Vischniakoff, 1882.

Medium-sized and large shells, with whorls of medium thickness and rounded-trapezoidal section or inflated whorls of low transversely oval section. Costae bipartite and intercalary, more rarely tripartite and simple. Differs from similar genus *Epivirgatites* chiefly in more inflated (especially in early growth stages) whorls of low cross-section and in generally thicker costae. One species, from *virgatites* and *nikitini* zones in central and southeastern parts of European platform.

L. lomonosovi (Vischniakoff, 1882). Holotype not designated. Lectotype is Vernadskiy Museum Spec. No. VI-64/10; illustrated by Vischniakoff [33, pl. 2, fig. 4]; Moscow, Mnevniki; Middle Volgian. Previously designated neotype [7, p. 64; 21, p. 19] — specimen illustrated by Michalskiy [20, pl. 10, fig. 1] — is invalid because it fails to satisfy Article 75d of ICZN [14].

The forms previously assigned to this genus as independent species are indicated below.

The variation of *L. lomonosovi* is best illustrated by Michalskiy [20, p. 181]: "...the representatives of this species can be divided according to the width of their section into two categories (morphological grouping. -V. M.)... each of these two categories can in turn be subdivided into two parts according to whether multipartite umbilical or biplicate costae predominate, and if one additionally takes into account the very substantial deviations in cross-sectional form itself, it becomes possible with equal justification to distinguish among the *L. lomonosovi* representatives as many independent forms as there are presently known specimens of this species."

Genus *Serbarinovella* Mitta, 1988

Type species. *S. serbarinovi* Mitta, 1988.

Medium-sized shells with whorls of medium thickness or slightly inflated, of rounded trapezoidal or rounded triangular section. Costae on adult whorls bi- and tripartite, bending forward markedly in ventrolateral part. Early whorls resemble those of *Craspedites* (family Craspeditidae); middle whorls are closest to those of later representatives of *Dorsoplanites*; adult whorls differ sharply from those of other Volgian ammonites. Two species from *virgatus* zone of Moscow region.

1. *S. ringsteadiaeformis* (Gerasimov, 1960). Holotype Vernadskiy Museum No. VII-1315; illustrated by Gerasimov [3, pl. 38, fig. 1]; Moscow region, Lobatinskiy mine; *virgatus* zone.

2. *S. serbarinovi* Mitta, 1988. Holotype PIN No. 3990/11; illustrated by Mitta [16, pl. 1, fig. 1]; Moscow region, Lopatinskiy mine; *virgatus* zone.

Genus *Epivirgatites* Spath, 1924

Type species. *Perisphinctes nikitini* Michalskiy, 1890.

Medium-sized and large shells, with fairly flat, moderately thick or slightly inflated whorls of round, oval or rounded-trapezoidal section. Costae usually bipartite, more rarely tripartite or single, subradial or oblique. Differs from similar genus *Lomonossovella* in flattish whorls of generally higher section, particularly in early whorls, and also in thinner costae. Two species from *nikitini* zone in central and southeastern parts of East European platform, and one species from synchronous deposits in north Siberia.

1. *E. bipliciformis* (Nikitin, 1881). Holotype Vernadskiy Museum No. VI-16/4; illustrated by Nikitin [22, pl. 6, fig. 50]; Yaroslavl region; *nikitini* zone. Designation of single specimen on which species is based as lectotype [7] is incorrect.

2. *E. nikitini* (Michalskiy, 1890). Lectotype Museum of TsNIGRI No. 201/300; illustrated by Michalskiy [20, pl. 1, fig. 7]; designated by Arkell [1]; Samara region, Kashpur settlement, *nikitini* zone.

The form previously identified as *E. lahuseni* (Nikitin, 1881) is regarded as one of two morphological groupings within the species *E. bipliciformis*. I assign the forms from Central Russia described earlier as various new species of the Western European genus *Paracraspedites* to *E.*

bipliciformis (from the Upper Povolzh'ye region) and *E. nikitini* (from the Middle Povolzh'ye). It is likely that *E. bipliciformis* and *E. nikitini* are geographic subspecies of one species, as A. N. Rozanov has suggested [23].

Genus *Laugeites* Spath, 1936

Type species. *Kochina groenlandica* Spath, 1936.

Medium-sized and large shells, fairly flat or of medium thickness, with whorls of oval and rounded-rectangular section. Costae on early middle whorls thin and densely clustered; with age sculpture becomes fainter and may be retained only on ventral side and in perumbilical area. This is close to late *Dorsoplanites* representatives, differing from it in flattish whorls of higher section and in costae becoming fainter or disappearing on adult whorls. Two species, from *nikitini* zone in central part of East European platform and several species from synchronous deposits of Polar Urals, Taymyr, Northern Siberia and Eastern Greenland.

1. *L. aenivanovi* Mitta sp. nov., described below.

2. *L. stschurowskii* (Nikitin, 1881). Holotype not specified. Mikhaylov [19] designated as lectotype specimens illustrated by Nikitin [22, pl. 11, figs. 54, 55] from Middle Volgian of Yaroslavl region, Glebovo settlement, on Volga River. Only one figured specimen from type species has survived (Museum of TsNIGRI, Collection 1369, No. 114). Ivanov [6] has proposed as neotype Spec. No. G/L - 45 in collection of Geological Department of Yaroslavl Pedagogical Institute, which is evidently not fully valid [14, Art. 75b] because of absence of exclusive circumstances for designation of neotype.

Laugeites aenivanovi Mitta sp. nov.

Pl. IV, fig. 1

Specific name. In honor of A. N. Ivanov, researcher and educator.

Holotype. PIN RAN No. 3990/28; Yaroslavl region. Rybinskiy district, Volga River bank at Glebovo settlement; rock debris of *nikitini* zone.

Form (fig. 1). Shell medium-sized, with moderately involute and slowly growing whorls of medium thickness. Transverse section through whorls round, with greatest thickness in lower third of sides. Ventral side rounded. Lateral surfaces slightly bulging. Umbilicus wide. Wall of umbilicus falls steeply; turn of umbilicus round. Steepness of umbilical wall increases with individual age. Body chamber not preserved.

Dimensions in mm and ratios:

Spec. No.	D	H	W	Du	H/D	W/D	Du/D
Holotype 3990/28	180	60	60	75	0.33	0.33	0.4
	50	20	20	18	0.40	0.40	0.3

Specimen with complete body chamber exceeded 250 mm in diameter.

Sculpture. At diameter of ~ 30 mm, frequent thin radial bifurcate costae can be seen. With increasing diameter, tripartite costae branching around middle of lateral sides appear. Costae become coarser with age. Beginning near umbilical seam, they incline rearward, but in periumbilical part they slant forward. Branches of costae are less prominent in relief than main costae.

Suture line. Judging by preserved parts, it is close to that of *L. groenlandicus* (Spath) and *L. stschurowskii* (Nikitin).

Comparison. This new species resembles *L. groenlandicus* [30, p. 82, pl. 36, fig. 1], but differs in more rounded lateral surfaces and more high-relief sculpture. Latter feature also sharply distinguishes this species from *L. stschurowskii*.

Material. Holotype.

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Species erroneously indicated as from Central Russia:

Olcostephanus triplicatus Blake [28, p. 56, pl. 2, figs. 1, 2] [= *Lomonossovella lomonosovi* (Vischniakoff)].

Perisphinctes boidini Loriol [28, pl. 3, fig. 12] [= *Epivirgatites nikitini* (Michalskiy)].

Perisphinctes devillei Loriol [28, pl. 2, fig. 7] [= *Epivirgatites bipliciformis* (Nikitin)].

Behemoth sp. (cf. *lapideus* Buckman) [18, p. 152, pl. 3, fig. 8] [= *Lomonossovella lomonosovi* (Vischniakoff)].

Paracraspedites sp. [25, pl. 1, fig. 4] [= *Epivirgatites nikitini* (Michalskiy)].

Crendonites (*Neopavlovia*) *felix* Casey et Mesezhnikov [10, pl. 1, fig. 2] [= *Epivirgatites nikitini* (Michalskiy)].

Species described from Central Russia on basis of unsatisfactory materials:

Ammonites humpresianus Rouillier et Fahrenkohl [29, pl. 50, fig. 33] [= ?*Lomonossovella lomonosovi* (Vischniakoff)]; small specimen, present location unknown; most likely lost.

Ammonites biplextruncatus Trautschold [31, pl. 8, fig. 3] [= ? *Epivirgatites bipliciformis* (Nikitin)]; present location of this ammonite, represented only by part of whorl, is unknown.

Ammonites centumgeninus Vischniakoff [33, pl. 1, bis, fig. 8] [= ? *Dorsoplanites serus* Gerasimov]; phragmocone of small size, present location unknown.

Subjective synonyms:

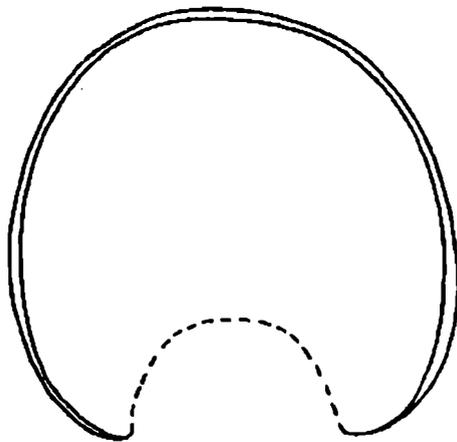


Fig. 1. *Laugeites aenivanovi* Mitta, sp. nov., Holotype PIN 3990/28, transverse section through whorl ($\times 1$); Glebovo settlement; *nikiniti* zone.

Ammonites polygyratus Trautschold [31, p. 19, pl. 3, fig. 4] [= ? *Epivirgatites bipliciformis* (Nikitin)]. Present location unknown. Exact systematic position of this specimen hard to establish only from drawing.

Perisphinctes lahuseni Nikitin [22, pl. 6, fig. 50] [= *Epivirgatites bipliciformis* (Nikitin)].

Olcostephanus blaki Pavlow [28, p. 57, pl. 2, figs. 4, 5]; one specimen was later redescribed (fig. 4) as *L. blakei* [18, pl. 1, fig. 3] [= *Lomonossovella lomonosovi* (Vischniakoff)].

Lomonossovella michalskii Michailov [18, p. 155] [= *Lomonossovella lomonosovi* (Vischniakoff)]. Holotype described by Michalskiy as *Olcostephanus lomonosovi* (Vischniakoff), later redescribed by Mikhaylov as independent species.

Pavlovia menneri Michailov [18, p. 148, pl. 2, fig. 5] [= *Pavlovia pavlovi* (Michalskiy)]. Holotype of this species is unusually large for *Pavlovia*, with inner whorls indistinguishable in size from whorls of *P. pavlovi*.

Laugeites glebovensis Ivanov [5, p. 36, figs. 6, 7] same as *Laugeites lambecki glebovensis* Ivanov [6, pl. I, figs. 1, 2; figs. 2, 3] [= *Laugeites stschurowskii* (Nikitin)].

Lomonossovella zonovi Muravin [21, p. 25, pl. 5, fig. 5; pl. 6, figs. 1-3; pl. 8, fig. 1; fig. 1] [= *Lomonossovella lomonosovi* (Vischniakoff)].

Lomonossovella sergeii Casey et Mesezhnikov [10, pl. 2, figs. 2, 3] [= *Lomonossovella lomonosovi* (Vischniakoff)].

Paracrasedites illaesus Ivanov [7, pl. 6, figs. 1-3] [= *Epivirgatites bipliciformis* (Nikitin)].

Paracraspedites latus Muravin [7, pl. 7, fig. 2] [= *Epivirgatites bipliciformis* (Nikitin)].

Because of the correlational importance of finding genera common to both the Central Russian and Anglo-Parisian basin, the information on the presence of Western European genera *Kerberites*, *Behemoth*, *Crendonites* and *Paracraspedites* in the Middle Volgian of Central Russia merits special consideration.

The specimen described by Pavlov as *Ammonites triplicatus* Blake and redescribed by Mikhaylov under the name *Kerberites mosquensis* Michailov is a fragment of a small phragmocone. There are no other specimens assignable on any basis to this species. This specimen probably belongs to the genus *Lomonossovella*, since *Kerberites* is characterized by a much coarser and sharper sculpture of widely separated perumbilical costae and branches whose connection with the main costa is not lost.

Two fragments of a large shell, described by Mikhaylov as *Behemoth* sp. (cf. *lapideus* Buckman), undoubtedly belong to *Lomonossovella lomonosovi* (Vischniakoff).

Crendonites kuncevi Michailov, described from the Moscow region on the basis of a deformed shell and a small fragment [18], is undoubtedly *Virgatites pallasianus* (Orbigny).

A squashed ammonite from the Middle Povolzh'ye Volga region, described by Casey and Mesezhnikov as *Crendonites felix*, actually belongs to *Epivirgatites nikitini* (Michalskiy). The true *Crendonites* is characterized by a very wide umbilical and comparatively straight costae.

Unfortunately, in describing new species of "*Paracraspedites*" from Glebovo settlement, Ivanov and Muravin [7, 8] cited almost no differences from previously known *Epivirgatites* from this locality. Their only indication of differences is found to be in their description of the genus *Epivirgatites* itself [7, p. 51]: "Along with *Epivirgatites*, Glebovo has also yielded large shells of *Lomonossovella* and *Paracraspedites* (described below). They are similar not only in size, but also cross section and in sculpture. In all of them the costae may be straight, symmetrical in transverse section and run across the ventral side without discernible bend, but a smooth band or zone along the seam is typical of *Epivirgatites*, and elevated umbilical costae only of *Lomonossovella*."

According to my observation, a smooth band along the seam is present in many Middle Volgian ammonites, is often a function of individual age and, therefore, cannot serve as a specific or generic criterion. Elevated or "normal" periumbilical costae are also not characteristic of any particular taxa, and I regard them as one of the manifestations of sexual dimorphism.

Thus, at present, there is no reason to consider as proven the presence of the Western European genera *Kerberites*, *Crendonites*, *Behemoth* and *Paracraspedites* in the Middle Volgian of Central Russia.

PHYLOGENETIC RELATIONSHIPS OF MIDDLE VOLGIAN DORSOPLANITIDS OF CENTRAL RUSSIA

The first attempts to trace the phylogeny and interrelationships of the Middle Volgian ammonites were made some time ago by Michalskiy [20]. However, because of his erroneous

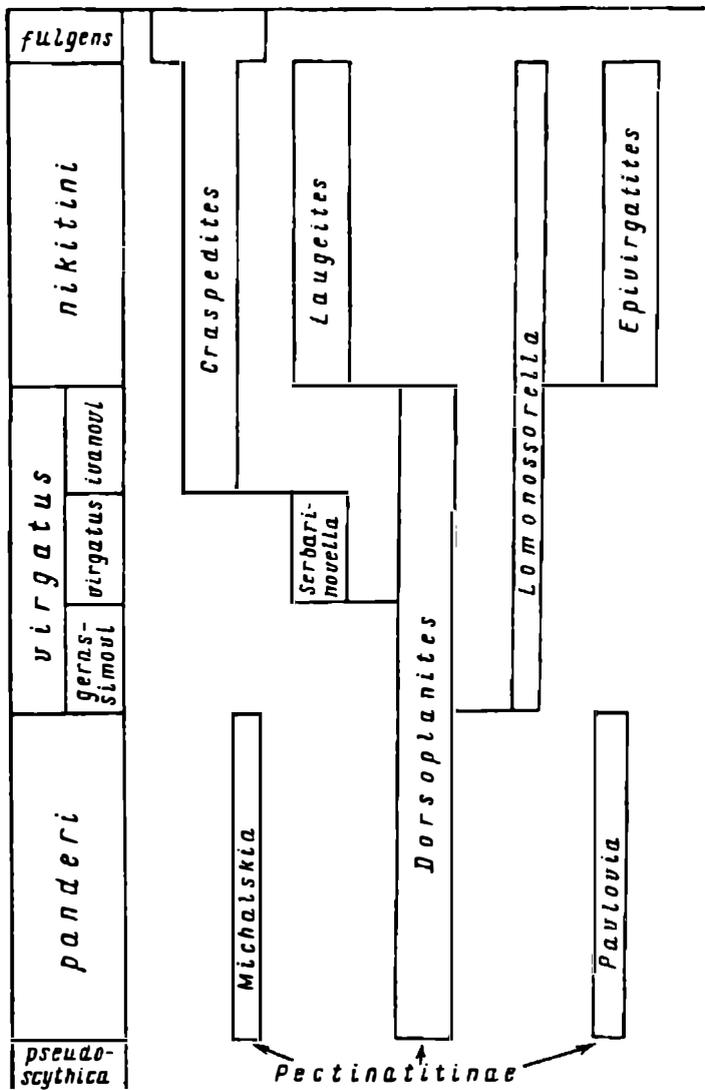


Fig. 2. Phylogenetic interrelationships of Middle Volgian dorsoplanitids from Central Russia.

zonal division of the Volgian deposits, his reconstructions are mainly of historical interest. Researches were later continued by Ilovaiskiy [9], who established the phylogenetic succession *Ilovaiskya* → *Zaraiskites* → *Virgatites*. This chain was continued by Mikhaylov [19]: *Virgatites* → *Epivirgatites* (Shul'gina [24] was the first to establish that *Epivirgatites* belongs to the dorsoplanitids). Suggestions as to the origin made by Baranov [2]: *Laugeites* → *Kachpurites* and Mesezhnikov [15]: *Virgatitinae* → *Craspeditidae*.

At the beginning of Middle Volgian time (the *panderi* zonal moment, or phase), the earlier dorsoplanitids gave rise to the genera *Michalskia* and *Pavlovia* (with small shells) and

Dorsoplanites (with medium-sized shells). A characteristic feature of all the dorsoplanitids is their comparatively thin bifurcate costae in the early stages of ontogenetic development. The genera *Michalskia* and *Pavlovia* died out at the end of the *panderi* phase in Central Russia, but *Dorsoplanites* survived to the end of the *virgatus* phase (fig. 2). The dorsoplanitids that existed during the *virgatus* phase were characterized by large size and coarser perumbilical costae on the adult whorls than those in the *panderi* phase. These features are common to the dorsoplanitids of the *maximus* group, which characterize the synchronous deposits of the Russian Arctic.

At the beginning of the *virgatus* phase the dorsoplanitids with inflated whorls and costae standing out prominently in relief gave rise to the endemic genus *Lomonossovella*, whose last representatives, gradually increasing to gigantic size, died out at the end of the *nikitini* phase. The species *L. lomonossovi*, which on the whole had inflated whorls of low section, at the beginning of the *nikitini* phase then gave rise to *Epivirgatites* with a flatter shell and similar type of costation, but with less coarse costae. These also became extinct at the end of Middle Volgian.

In the middle of the Middle Volgian (the *virgatus* subphase) *Serbarinovella*, with a shell having flatter whorls and a less coarse sculpture, especially in the initial and middle states of ontogenetic development, branched off from the *Dorsoplanites*. *Serbarinovella* died out before the beginning of the *nikitini* phase, but in the *ivanovi* subphase gave rise to the first *Craspedites*, which then flourished in the Late Volgian. The first *Craspedites* had initial whorls like those of *Serbarinovella*, with a high section and a fine low-relief sculpture. *Craspedites* in turn gave rise to many genera, including the Late Volgian *Kachpurites* and *Garniericeras*.

At the end of the *virgatus* and beginning of the *nikitini* phase, *Dorsoplanites*, as a result of bradygenesis ("prolongation" of the stage of thin bifurcate costae extending partly to the adult whorls), gave rise to *Laugeites* with juvenile whorls of similar structure. This last genus died out before the beginning of the Late Volgian.

Thus, the dorsoplanitids endemic to Central Russia and the East European platform include *Michalskia*, *Lomonossovella* and *Serbarinovella*. The genera *Pavlovia*, *Dorsoplanites* and *Laugeites* are characteristic of the entire Boreal belt as a whole; the area of their initial appearance is not clear. The genus *Epivirgatites* penetrated eastward to the north of Siberia (*E. variabilis* Shulgina). *Craspedites* representatives spread out during the Late Volgian over the entire Boreal belt.

REFERENCES

1. Arkell, W. J., 1961, Yurskiye otlozheniya zemnogo shara (Jurassic Geology of the World). Inostr. lit. Press, Moscow, 801 pp. [Russian translation].
2. Baranov, V. N., 1984, The ontogenetic development of ammonites of the genus *Kachpurites* in relation to the questions of their phylogeny. Byul. MOIP, Otd. geol., Vol. 59, No. 3, p. 137.
3. Gerasimov, P. A., 1960, New Late Jurassic ammonites of the Russian platform. In: Novyye vidy drevnikh rasteniy i bespozvonochnykh SSSR (New species of Old Plants and Invertebrates of the USSR). Gosgeoltekhizdat, Moscow, Pt. 2, pp. 168-172.
4. Gerasimov, P. A., 1978, Two new ammonite species from the Volgian stage of the Moscow and Yaroslavl regions. Byul. MOIP, Otd. geol., Vol. 53, No. 6, pp. 108-114.
5. Ivanov, A. N., 1975, The later ontogenesis of the ammonites and its distinctive features

- in micro-, macro- and megaconchs. In: Vopr. evolyutsii, ekologii i tafonomii pozdnemezozoyk. ammonitov (Problems of the Evolution, Ecology and Taphnomy of the Late Mesozoic Ammonites). Sb. Nauchn tr. Yarosl. ped. in-ta, Yaroslavl, Vol. 142, pp. 5-58.
6. Ivanov, A. N., 1979, The results of a revision of the species *Laugeites stschurowskii* (Nikitin). In: Poznemezozosk. golovonogiye mollyuski Verkh. Povolzh'ya (Late Mesozoic Cephalopods of the Upper Povolzh'ye Region). Uch. zap. Yarosl. ped. in-ta, Vol. 183, Yaroslavl, pp. 3-16.
 7. Ivanov, A. N., V. N. Baranov and Ye. S. Muravin, 1988, Pamyatniki prirody v izuchenii letopisi Zemli (s. Glebovo i yego okrestnosti: Uchebnoye posobiye) (Landmarks of Nature in the Study of the Earth's Record (Glebovo and Its Environs)). Textbook, Yaroslavl, 84 pp.
 8. Ivanov, A. N. and Ye. S. Muravin, 1986, Stratigraphy of the Middle Volgian at Glebovo settlement in the Yaroslavl region. In: Yurskiye otlozheniya Russk. platformy (Jurassic Deposits of the Russian Platform). VNIGRI Press, Leningrad, pp. 62-71.
 9. Ilovaiskiy, L. N. and K. P. Florenskiy, 1941, Upper Jurassic ammonites of the Ural and Ilek River basins. In: Materialy k poznan. geol. stroyeniya SSSR (Materials on the Geologic Structure of the USSR), Nov. ser. No. 1(5), pp. 3-196.
 10. Casey, R. and M. S. Mesezhnikov, 1986, The upper horizons of the Middle Volgian substage and their English equivalents. Izvestiya AN SSSR, Ser. geol., No. 10, pp. 69-81.
 11. Lominadze, T. A. and I. V. Kvantaliani, 1982, The morphogenesis of some Late Jurassic perisphinctoid genera. In: Tez. dokl. In-ta paleobiol. AN GSSR (Abstracts of Papers of the Institute of Paleobiology, Acad. Sci. USSR), Tbilisi, pp. 17-19.
 12. Lominadze, T. A. and I. V. Kvantaliani, 1985, On the systematics of the family Dorsoplanitidae (Ammonoidea). In: Soobshch. AN GSSR (Communications of the Acad. Sci. Georgian SSR), Vol. 119, No. 2, pp. 337-340.
 13. Lominadze, T. A., I. V. Kvantaliani and M. Z. Sharikadze, 1985, The morphogenesis of the shell in the two Volgian ammonite genera *Pavlovia* Ilovaiskiy and *Laugeites* Spath (Ammonoidea, Cephalopoda). In: Iskop. golovonogiye mollyuski (Fossil Cephalopod Mollusks). Nauka Press, Moscow, pp. 121-131.
 14. 1988, Mezhdunar. kodeks zool. nomenklatury (International Code of Zoological Nomenclature). Nauka Press, Leningrad, 205 pp.
 15. Mesezhnikov, M. S., S. V. Meledina, T. I. Nal'nyayeva and N. I. Shulgina, 1983, The Jurassic and Cretaceous zoogeography of the Boreal belt according to the cephalopods. In: Mezozoy Sov. Arktiki (The Mesozoic in the Soviet Arctic). Nauka Press, Novosibirsk, pp. 28-37.
 16. Mitta, V. V., 1988, A new ammonite genus from the Volgian stage of the Moscow region. Byul. MOIP, Otd. geol., Vol. 63, No. 2, pp. 96-99.
 17. Mitta, V. V., 1990, Intraspecific variability in the Volgian ammonites. Paleont. zhur., No. 2, pp. 49-54; (Eng. 10-15).
 18. Mikhaylov, N. P., 1957, The Portlandian zone of the Moscow Basin. Byul. MOIP, Otd. geol., Vol. 32, No. 5, pp. 143-159.
 19. Mikhaylov, N. P., 1966, Boreal'nyye yurskiye ammonity (Dorsoplanitinae) i zonal'noye raschleneniye volzhskogo yarusa (Jurassic Boreal Ammonites (Dorsoplanitinae) and the Zonal Division of the Volgian state). Tr. Geol. In-ta (GIN) AN SSSR, No. 151, Nauka Press, Moscow, 117 pp.
 20. Michalskiy, A. O., 1890, Ammonites of the Lower Volgian stage. Tr. geol. kom-ta, Vol. 8, No. 2, pp. 1-330.
 21. Muravin, Ye. S., 1979, Ammonites of the genus *Lomonossovella* from the Middle Volgian

- beds at Glebovo settlement in the Yaroslavl region. In: Pozdnemezozoyk. golovonogiye mollyuski Verkh. Povolzh'ya (Mesozoic Cephalopods of the Upper Povolzh'ye Region). Sb. nauchn. tr. Yarosl. ped. in-ta, No. 1979, pp. 17-28.
22. Nikitin, S. N., 1881, The Jurassic formations between Rybinsk, Mologaya and Myshkin. In: Mat-ly dlya geol. Rossii (Materials for a Geology of Russia), Vol. 10, pp. 1-194.
 23. Rozanov, A. N., 1913, On the Portlandian zones in the Moscow region and the probable origin of the Portlandian phosphorite beds near Moscow. In: Mat-ly poznan. geol. stroyeniya Ross. imperii (Materials for a Knowledge of the Geologic Structure of the Russian Empire), No. 4, pp. 17-103.
 24. Shulgina, N. I., 1969, The Volgian ammonites. In: Opornyy razrez verkhn.-yursk. otlozheniy bass. r. Khety (Khatangskaya vpadina) (The Reference Section Through the Upper Jurassic Deposits in the Kheta River Basin (Khatanga Depression)). Nauka Press, Leningrad, pp. 125- 162.
 25. Casey, R., 1973, The ammonite succession at the Jurassic-Cretaceous boundary in Eastern England. Geol. J. Spec. issue, Vol. 5, pp. 193-266.
 26. Donovan, D. T., J. H. Callomon and M. K. Howarth, 1980, Classification of the Jurassic Ammonitina. In: The Ammonoidea (Syst. Assoc. Spec. Pap.). Acad. Press, London, No. 18, pp. 101-155.
 27. Orbigny, A., 1845, d'Mollusques. In: Géologie de la Russie d'Europe et des Montagnes de l'Oural. London; Paris, Vol. 2, pp. 419-498.
 28. Pavlow, A, 1890, Études sur les couches jurassiques et crétacées de la Russie. 1. Jurassique supérieur et Crétacé inférieur de la Russie et d'Angleterre. Bull. Soc. Natur. Moscou, Vol. 3, pp. 61-127.
 29. Rouillier, Ch., 1849, Études progressives sur la géologie de Moscou. Cinqième Étude. Bull. Soc. Natur. Moscou, Vol. 22, No. 11, pp. 356-399.
 30. Spath, L. F., 1936, The Upper Jurassic Invertebrate Faunas of Cape Leslie, Milne Land; 2. Upper Kimmeridgian and Portlandian. Meddl. Grønland, Vol. 99, No. 3, pp. 1-180.
 31. Trautschold, H., 1861, Recherches géologiques aux environs de Moscou. Couche jurassique de Mniovniki. Bull. Soc. Natur. Moscou, No. 1, pp. 64-94.
 32. Trautschold, H., 1866, Zur Fauna des Russischen Jura. Bull. Soc. Natur. Moscou, No. 1, pp. 1-24.
 33. Vischniakoff, N. P., 1882, Description des Planulati (Perisphinctes) jurassiques de Moscou. Moscou, Pt. 1 (Atlas). 8 pl.