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The present volume compiles short papers with new data on the Jurassic-Cretaceous boundary strata and their fauna of different regions of Russia (Volga region, Siberia, Crimea, Primorye) and of North America. Most papers are devoted to problems of biostratigraphy and paleontology of marine animals and their trace fossils. Besides this, some data on magnetostratigraphy, interregional correlations, history of defining J/K boundary in the Decisions of ISC, and economic value of the interval.

For geologists, paleontologists, stratigraphers, students of geological and geographical profiles.

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REVISED AMMONITE SUCCESSION OF THE UPPER VOLGIAN OF NORDVIK SECTION: ZONAL BOUNDARIES AND UNCERTAINTIES

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Abstract: Revision of all ammonite records from the Upper Volgian Substage of the Nordvik section leads to the improvement of its zonal subdivision. For the first time presence of the Originalis Zone is proven for this section. However, due to rarity of ammonite occurrences in the upper part of the succession the position of the boundary between Okensis and Taimyrensis Zones remains unclear, and position of the Tithonian-Berriasian boundary (i.e. base of the Jacobi Zone) could be corresponding either to the uppermost part of the Originalis Subzone of the Okensis Zone or to the lower part of the Taimyrensis Zone.

Key words: ammonites, Upper Volgian, zonal boundaries, Nordvik

The Nordvik section, located at the Laptev Sea coast near Urdyuck-Khaya Cape (Fig. 1), is one of the most well-studied sections of the Jurassic/Cretaceous boundary interval over the whole Panboreal Superrealm [14], but its ammonite fauna are insufficiently investigated, and position of zonal boundaries should be revised. Since the publication of article by Basov et al. [2] this section has been subdivided into beds and members, and nearly all ammonite records were tied to members not to certain defined levels. As a result, zonal boundaries coincide with the base of members characterized by key ammonite taxa. Additional problems appear due to unclear characteristics of ammonite zones and their boundaries. Such uncertainties led to discussion on the possible problems and errors in correlation of Upper Volgian ammonite zones with paleomagnetic reversals [3,6] and thus with Submediterranean succession [9].

Here we are reviewing all the available data on precisely collected Upper Volgian ammonites from the discussed section as well as the positions of zonal boundaries and their correlation with palaeomagnetic reversals.

Upper Volgian ammonites of the Nordvik section

Ammonites from the Upper Volgian part of the Nordvik section are preserved as crushed clayey moulds, which sometimes cannot be successfully collected, and as 3D moulds in concretions. In early papers describing the Nordvik succession [2, 13] the precise stratigraphic position of figured specimens was not clearly indicated, but some of key records were lately shown on the log, published by Zakharov [12]. Additional
specimens (mainly from the lower part of the Upper Volgian) were also collected by the authors during the field works held in 2003 and 2011.

All in situ ammonite occurrences from the Upper Volgian of the Nordvik section are shown on the Fig. 2. Some of these specimens were not collected (due to their fragility) or became crushed during the transportation. Such finds are marked by open circles at the figure.

Zones and zonal boundaries of the Upper Volgian Substage of Nordvik

Boundaries of ammonite zones of the Upper Volgian of Siberia were not characterized when they were described at the first time [5]. Later updated definitions of zones, their boundaries and type sections were proposed by Casey et al. [4] and Baraboshkin [1]. Nevertheless, these new definitions also should be corrected.

Lower boundary of the Okensis Zone (and the Upper Volgian Substage, respectively) is marked by the changes in Laugeites – Craspedites lineage and established by FAD of typical Craspedites [M] [9]. As a marker of the upper boundary of the Okensis Zone, Casey et al. [4] proposed to use disappearance of C. (C.). okensis (d'Orb.) and C. (Taimyroceras) originalis Schulg. (the latter species is the index for the Originalis Subzone, determined by full range of its index). However, a contact of this zone with the overlying Taimyrensis Zone in the type section was missing, as in the section of Boyarka river above the Okensis Zone significant part of the succession was obscured by the landslides, glacial boulders and quaternary cover, and the next available units are of Ryazanian age. For the lower boundary of the Originalis Subzone the level of first appearance of C. (Taimyroceras) in the upper part
Fig. 2. Ammonite distribution in the Upper Volgian substage of the Nordvik section. Ammonites determined in the field but missing in collections are marked by open circles; specimens present in collections are marked by solid circles.
of the Okensis Zone could be used for more accurate determination. In the Nordvik section Okensis Subzone is well-recognized by numerous occurrences of *Craspedites (C.) praeokensis* Rogov (in msc) (Fig. 3.5), *C. (C.) okensis* (d’Orb.) [M], and *Praechetaites* sp. Lowermost part of the subzone is also characterized by the presence of phylloceratid ammonites *Euphylloceras knoxvillensis* (Stant.) ([15], Fig. 4e). Originalis Subzone is recognized here for the first time by the record of the *C. (Taimyroceras)* aff. *originalis* Schulg., resembling macroconchs recently figured from this subzone of Svalbard ([11], Fig. 5.2).

In the Kheta section, where the stratotype section of the Taimyrensis Zone is located, *C. (C.) okensis* (d’Orb.) was not found in situ and rocks considered as belonging to the Originalis Subzone of the Okensis Zone were characterized by occurrence of *C. (Taimyroceras)* sp. only [5]. Thus, the position of the lower boundary of the Taimyrensis Zone in its type section is unclear. Moreover, Sachs et al. [5] suggested that in the Kheta river section this zone corresponds with members 4-6, while the index species has been recorded from the uppermost only. Later Casey et al. [4] have proposed to use first appearance of *C. (T.) taimyrensis* (Bodyl.) for the recognition of the lower boundary of the cognominal zone. However, usage of disappearance of *Craspedites (Craspedites)* as a marker for the Okensis/Taimyrensis zonal boundary makes this boundary well-traceable throughout the whole Arctic and permits to recognize the Taimyrensis Zone in those sections where *C. (T.) taimyrensis* (Bodyl.) is missing. In the Nordvik section N.I. Shulgina (in [13]) on the base of records of “*C. (Taimyroceras) canadensis* Jeletz.” ([13], pl. III, fig. 1-2) considered the member VII (4.2 m) as belonging to the Taimyrensis Zone. But lower part of this member contains *C. (C.) okensis* (d’Orb.) [14], while *C. (Taimyroceras)* were collected from the concretions located in the topmost part of the member [12]. Therefore, the position of the Okensis – Taimyrensis zonal boundary in this section should be drawn somewhere within the Member VII. It should be noted that all known specimens from Nordvik are referred to as *C. (Taimyroceras) canadensis* Jeletz. by Shulgina and are characterized by very narrow cross-section and poorly developed ribbing, being easily distinguishable from any topotypic specimens [7]. In our opinion, these ammonites (as well as “*C. (Taimyroceras) cf. canadensis*” from Svalbard, figured in [8], pl. VII, fig. 8) should be ascribed to a new species of the subgenus *Taimyroceras* (Fig. 3.2).

The Chetae Zone is determined by the full range of its index species *Chetaites chetae* Schulg. [1, 4]. In the Nordvik section crushed small-sized *Chetaites cf. chetae* Schulg. were found within the Member VIII ([13], pl. III, fig. 3-4; see also Fig. 3.3-4), along with unfigured phylloceratids and *Praechetaites*. One more ammonite, referred to as *Chetaites cf. chetae* Schulg. by Shulgina ([13], pl. IV, fig. 1, refigured herein, Fig. 3.1), by its relatively distant and coarse ribbing of the inner whorls and smoothening of the ribbing in the middle part of the outer whorls should be re-determined as *Praechetaites*. After Zakharov [12], all *Chetaites cf. chetae* Schulg. from the Nordvik section were collected from the middle part of the Member VIII, and the position of the Taimyrensis – Chetae zonal boundary in this section still cannot be precisely determined.

**Discussion and conclusion**

Subdivision of the Upper Volgian Substage of the Nordvik section by ammonites, even including data about the newly recorded specimens, remains unclear in the
Okensis – Taimyrensis transitional interval, which is lacking ammonite finds. Thus the position of the Jacobi Zone lower boundary in terms of Boreal ammonite zones is also indefinite, as this level could be either in the uppermost part of the Originalis Subzone of the Okensis Zone or in the lower part of the Taimyrensis Zone. Additional palaeomagnetic studies of ammonites-rich Boreal sections are strongly required, and the sections of the Subpolar Urals, Spitsbergen and the central part of the Russian Platform are among the most awaiting aims for further investigations.

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REFERENCES


5. Fundamental section of the Upper Jurassic of Kheta River Basin. Leningrad, Nauka, 1969. [in Russian]


10. Schnabl, P., Pruner, P. & Wimbledon, W. A. P. A review of magnetostratigraphic results from the Tithonian-Berriasian of Nordvik (Siberia) and possible biostratigraphic constraints. Geologica Carpathica (submitted)


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Fig. 3. Selected Upper Volgian ammonites from the Nordvik section (re-figured from [13]). All the specimens are kept in CNIGR Museum, Saint-Petersburg. 1. Praechetaites sp., a – lateral view, b – ventral view. Loose from beds 14-17 (loc. 33), no. 12/9843; 2. Craspedites (Taimyroceras) sp. nov., a – lateral view, b – ventral view, bed 9 (loc. 32), no. 9/9843; 3-4. Chetaites cf. chetae Schulg., lateral view, middle part of the bed 17 (loc. 32), 3 - no. 11/9843; 4 - no. 10/9843; 5. Craspedites (Craspedites) praeokensis Rogov, in litt., bed 5 (loc. 32), no. 6/9843.
hydrocarbon seep carbonate bodies from the uppermost Jurassic–lowermost Cretaceous of


