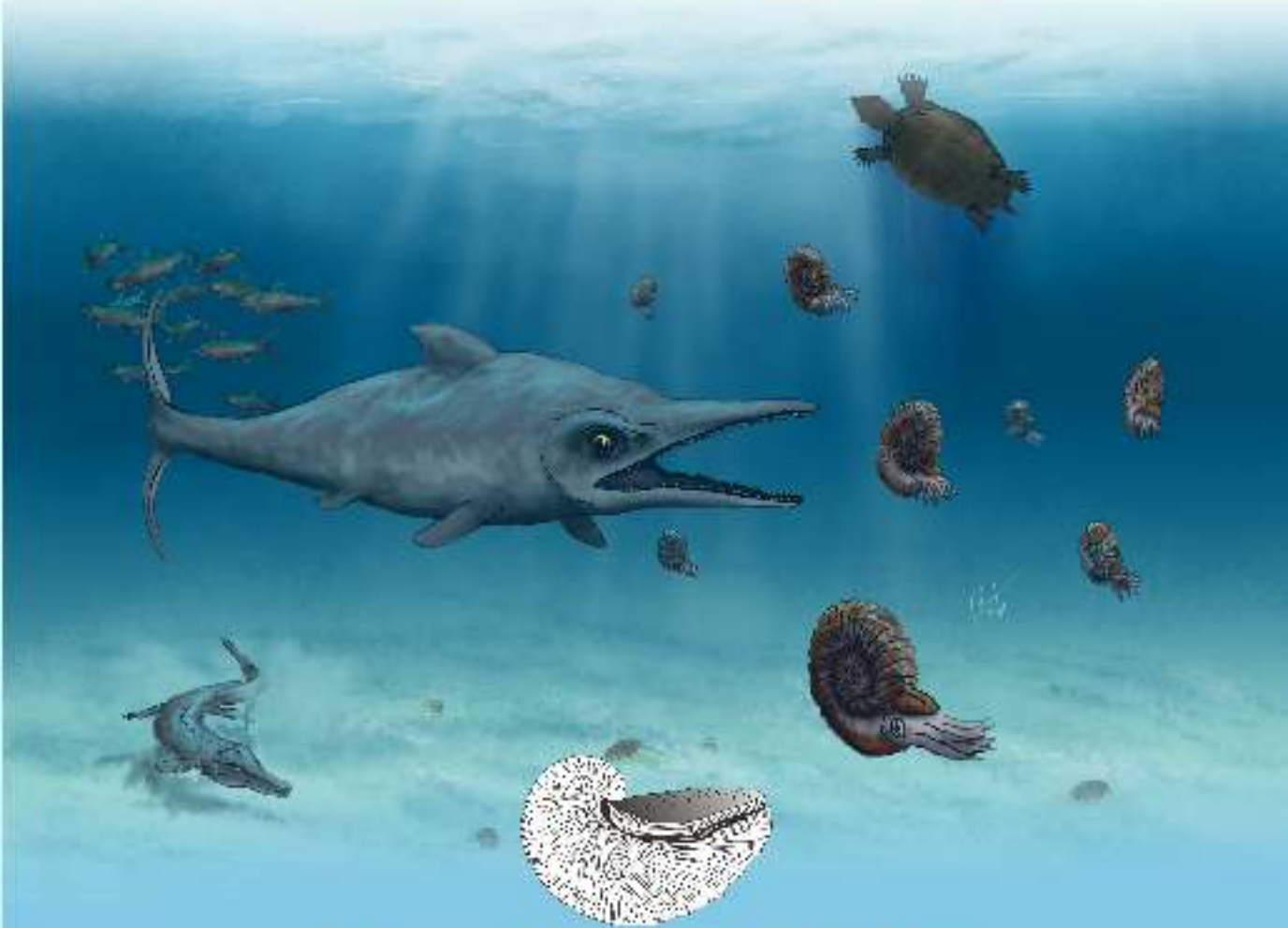
XIIth Jurassica Conference

Workshop of the ICS Berriasian Group and IGCP 632

Field Trip Guide and Abstracts Book



Smolenice, Slovakia, April 19–23, 2016

Earth Science Institute, Slovak Academy of Sciences
Bratislava
2016

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Edited by: Jozef Michalík and Kamil Fekete

Earth Science Institute, Slovak Academy of Sciences
Bratislava 2016

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The editors are grateful for the financial support: Slovak Research and Development Agency, SRDA (project No. 14-0118).

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ISBN 978-80-85754-36-0

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The Nordvik section – Boreal auxiliary section for the base of the Berriasian and candidate section for the SSSP of the Ryazanian Stage

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1. Nordvik as auxiliary section for the base of the Berriasian in the Boreal Realm

Strong faunal provincialism across the Jurassic-Cretaceous boundary leads to existence of numerous zonal scales, which sometimes cannot be applied for nearby regions, and to long-term usage of separate stages for Panboreal Superrealm (Volgian and Ryazanian) and Tethys-Pantalassa Superrealm (Tithonian and Berriasian). As the Berriasian Stage is now considered as internationally accepted for Geologic Time Scale, search for auxiliary sections providing high-resolution stratigraphic records across the J/K boundary became especially important irrespective to boundary level (which is now a matter of discussion). Among the Boreal sections, the Nordvik outcrops are without any doubts the most studied (Zakharov et al., 2014). Volgian and Ryazanian deposits are well-characterised here by many fossil groups, providing possibilities for establishing of independent zonal scales based on ammonites, belemnites, bivalves, forams and dinoflagellate cysts (Nikitenko et al., 2008, 2013; Zakharov et al., 2014). This is the single Boreal section providing full palaeomagnetic succession across the J/K boundary (Houša et al., 2007; Bragin et al., 2013). Recent advances in studying of carbon and oxygen stable isotope values of belemnite rostra, which are abundant throughout the section, providing outstanding stable isotope curve (Zak et al., 2011; Dzyuba et al., 2013). Although direct correlation of the Nordvik succession with those of the Tethys is possible only by means of palaeomagnetics, some belemnites, ammonites and bivalves permits to recognize inter-regional correlational levels between this section and Californian succession (cf. Zakharov, 1981; Dzyuba, 2012; Bragin et al., 2013; Shurygin, Dzyuba, 2015).

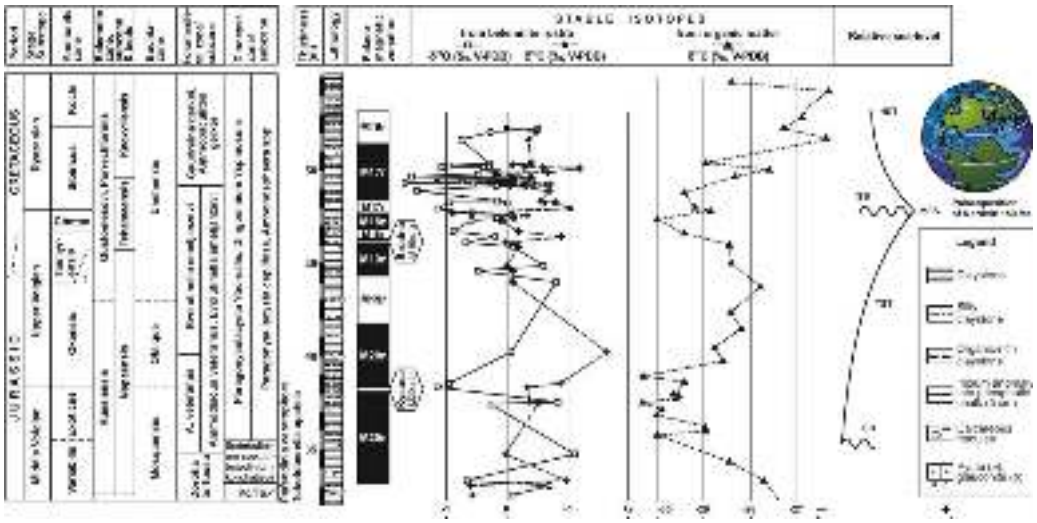

Fig. 1. Integrate stratigraphy of the J/K boundary beds of the Nordvik section, Northern Siberia

2. Nordvik as SSSP candidate section for the Ryazanian Stage

In spite of some recent progress in the Boreal-Tethyan correlation across the J/K boundary, both the Tithonian and Berriasian stages cannot be properly used in the Panboreal Superrealm, and substage boundaries cannot be traced from Tethyan to Boreal regions. Thus, for the Boreal areas, separate Volgian and Ryazanian stages are used. In the type area of the Ryazanian stage, the Russian Platform, this stage is represented by highly condensed sandy members containing numerous concretions and pebbles and usually attains 0,5-3 m in thickness. Identification of the faunal succession here is a difficult task because even in closely located sections some lens-like units could be missing or replaced by other lenses. Nevertheless, the Ryazanian in the type areas (Russian Platform, Ryazan area) spans nearly the same time interval as "Boreal Berriasian" or Ryazanian as it used in Arctic, i.e. from the base of the Sibiricus (Maynci) Zone to the top of the Tolli Zone. It should be noted that the Volgian/Ryazanian boundary as defined herein is located significantly above the discussed boundary markers for the Berriasian Stage.

We are propose to proceed usage of the Volgian and Ryazanian stages for the Panboreal superrealm, as they are well-known to the both exploration geologists and researchers in these territories. Being studied in much precision and compared with other Boreal sites of this age, the Nordvik section seems to be the best candidate for the Secondary Stratotype Section & Point (SSSP, Cope, 1996) of the Ryazanian Stage. Its lower boundary in this section could be chosen at the base of the thin phosphatised limestone (Member 9), containing ammonite genus Praetollia, which appearance along with appearance of Chetaites sibiricus can be used as primary boundary marker.

2.1. Characteristics of the Volgian-Ryazanian transitional beds of the Nordvik section

Uppermost Middle Volgian to Lower Valanginian deposits of this section (Paksa Fm) are composed from black shales, which are gradually coarsening upwards and changing to clayey silts without sedimentary breaks. Full succession of zones by ammonites, bivalves, forams and dinocysts is represented here (Fig. 1).

2.2. Biostratigraphy

Volgian–Ryazanian transitional beds of the Nordvik section are characterised by relatively diverse and abundant micro- and macrofossils providing high-resolution biostratigraphic subdivision. These zones are generally of good correlational potential across the Panboreal Superrealm (Fig. 1).

2.3. Magnetostratigraphy

Magnetostratigraphic study of the Nordvik section permits the recognition of the full succession of magnetozones spanning from the M20n to M16r (Houša et al., 2007; Bragin et al., 2013). It should be noted, however, that Upper Volgian succession is poor in ammonites (Rogov et al., 2015), and thus position of the J/K boundary defined by palaeomagnetic remains unclear in terms of ammonite zones.

2.4. Chemostratigraphy

Oxygen stable isotope values derived from belemnite rostra are showing gradual warming trend across the Volgian–Ryazanian transition, while $\delta^{13}C$ values are showing short positive excursion near to the top of the Volgian (Dzyuba et al., 2013; Zakharov et al., 2014). Basal bed of the Ryazanian is also characterised by iridium anomaly (Zakharov et al., 1993), which could be coeval with iridium anomaly discovered in the Barents Sea shelf and Svalbard (Dypvik et al., 2010).

2.5. Sedimentology

Black shales of the Volgian-Ryazanian transition were deposited in the central part of the Yenisei-Khatanga strait with an estimated depth ca. 150-200 m (Zakharov et al., 2013).

Conclusions

1. The Nordvik section could be chosen as auxiliary section for the lower boundary of the Cretaceous Stage in the Panboreal Superrealm.

2. SSSP of the Ryazanian stage is proposed at the base of the member 9 of the Nordvik section. This section, containing full succession of zones based on different groups of micro- and macrofossils, can be also con-

sidered as parastratotype of the Ryazanian Stage.

3. Key event for the base of the Ryazanian is FAD of the ammonite genus Praetollia, which is coincides with FAD of Chetaites sibiricus.

4. High-resolution magnetostratigraphic succession recognised in the Nordvik section provides direct correlation of this section with Tethyan succession.

5. Carbon stable isotope values derived from belemnite rostra as well as iridium anomaly could provide additional boundary markers.

The Nordvik section is the most studied Boreal section of the Jurassic-Cretaceous transitional beds and it meets all requirements applied for boundary stratotypes.

This is a contribution to the IGCP608 and program 43 of the Presidium of the RAS. This paper is corresponding to the theme no. 201253186 of the Geological Institute and partially supported by RFBR grant no. 15-05-03149 and Program of the Presidium of RAS no. II.3.

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