Самарский Государственный Технический Университет




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Trofimuk Institute of Petroleum Geology and Geophysics, SB RAS
Saint-Petersbourg State University
Geological Faculty, Lomonosov Moscow State University

The International Scientific Conference on the Jurassic/Cretaceous boundary

Proceedings volume

September 7 13, 2015
Samara, Russia

кА«АНЛРА
Togliatti

УДК: 551.762.3/763.12
ББК 26.323

The International Scientific Conference on the Jurassic/Cretaceous boundary. September 7-13, 2015, Samara (Russia). – Togliatti: Kassandra, 2015. – 96 p.

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 eoomic value of the interval.

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

Responsible editors: E.Yu. Baraboshkin, D.E. Bykov
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Международная научная конференция по проблеме границы юрской и меловой систем. 7-13 сентября 2015 г., г.Самара (Россия): Материалы совещания. – Тольятти: Издательство «Кассандра», 2015. – 96 с.

В сборнике опубликованы новые данные о пограничных отложениях юры и мела различных регионов России (Поволжье, Сибирь, Крым, Приморье) и Северной Америки. Большинство работ посвящено биостратиграфии и палеонтологии морских животных и следов их жизнедеятельности. Кроме того, приводятся сведения о магнитостратиграфии, межрегиональной корреляции, истории проведения границы юры и мела в постановлениях МСК, и экономической важности этого интервала.

Сборник представляет интерес для геологов, палеонтологов, стратиграфов, студентов геологического и географического факультетов.

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Верстка: А.П. Ипполитов
Перевод статей В.В. Ефимова, И.А. Мелешина, Е.Л. Васильевой: А.П.Ипполитов

ISBN 978-5-91687-161-6

Отпечатано в типографии «Кассандра»
445061, Тольятти, ул. Индустриальная, д. 7; тел./факс (8482) 57 00 04: kassandra1989@yandex.ru
(Адрес для корреспонденции: 445035, г.Тольятти, до востребования)
Подписано в печать с оригинал макета 25.08.2015
Формат А4. Гарнитура Ариал.
Бумага офсетная. Печать оперативная.
Тираж 70 экз. Заказ № 124

PREFACE

The Jurassic/Cretaceous is the only system boundary within the Phanerozoic, which still has debatable position. Moreover, according to different paleobiogeographical ground, International and national stratigraphic scales use different units for the boundary interval. Numerous conferences, symposiums and working group meetings has not brought the stratigraphers to any consensus on opinions yet.In addition, much new data has been accumulated, and is still being acumulating, making us taking some decision. Papers providing such data are put together in the present volume.

Important data are provided in the papers, presenting new interpretations on the Boreal-Tethyan correlation in the Pacific region. They are based on a complex magneto- and biostratigraphic (ammonites, foraminifera, palynology, ichnofossils) study of the sections located in Primorye (A.Yu. Guzhikov et al.; E.Yu. Baraboshkin, E.E. Baraboshkin) and revision of the buchiid succession in Northern California (V.A. Zakharov).

Many papers are devoted to the re-study of classic sections in the Volga area, including Kashpir and Gorodischi sections, which are planned to be visited during the field excursions. For these sections, new data on bio- and magnetostratigraphy (E.Yu. Baraboshkin et al.; V.P. Morov), and on new finds of fossil vertebrates (V.M. Efimov; I.A. Meleshin) are provided. For Kashpir section, data on belemnites and bivalves are presented (O.S. Dzyuba, O.S. Urman, B.N. Shurygin). There is some interesting information on the stratigraphy of Jurassic-Cretaceous boundary strata in the sections along the Menya river (A.Y. Berezin), and on finds of marine reptiles from the Kirov region (M.S. Arkhangelsky, N.G. Zverkov).

A number of papers is based on materials from Crimea. The boundary interval of Berriasian and Valanginian in section near Feodosya is studied using integrative approach (ammonites, foraminifera, ostracods, palynology, magnetostratigraphy; V.V. Arkadiev et al.). Unusual find of a belemnite of South American origin is described from the Berriasian of Central Crimea (A.P. Ippolitov, B. Desai, V.V. Arkadiev), and of Jurassic-like *Pliosaurus* – from the Valanginian of south-west Crimea (N.G. Zverkov).

Finally, one paper is devoted to a revision of high-Boreal Late Volgian ammonites from the Nordvik section (M.A. Rogov, A.S. Alifirov, A.E.Igolnikov).

One cannot forget that any scientific research, held over the Jurassic-Cretaceous boundary interval, will be reflected on different aspects of geological practice – mapping, based on unit boundaries, validated by the Interdepartmental Stratigraphic Commitee, mineral resources exploration, qualification of young geologists. These problems are discussed by N.L. Erofeeva & V.V. Gusev and by E.L. Vasileva.

The present volume probably will not solve the problem of the Jurassic-Cretaceous boundary, but let us make a new step in this direction.

E.Yu. Baraboshkin

THE PALEONTOLOGICAL CHARACTERISTICS OF THE VALANGINIAN DEPOSITS OF THE AREA NEARBY SYZRAN

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***Abstract**: A comprehensive lists of cephalopods of the Valanginian age (Lower Cretaceous) from the Kashpir and Mar'evka reference sections are provided.*

***Key words**: cephalopods, ammonites, Valanginian, Kashpir*

The Valanginian strata of the Lower Cretaceous within the Middle Volga region have been known for ages, and the age of beds treated as Valanginian does not provide much doubts. The main factors here are both high saturation by fossil cephalopods and clear lithological boundaries with the strata above and below, marked by discontinuities.

Low interest of stratigraphers to the Valanginian strata, lying slightly above the Jurassic–Cretaceous boundary, which remains a subject of the continuous discussion for the Russian plate, may be somewhat compensated by the fact that the Ryazanian Regional Stage in the Middle Volga region is highly condensed and sometimes missing, and in such cases the Valanginian lies directly upon the Volgian.

At most reference sections of the Jurassic–Cretaceous boundary strata on the territory of the Middle Volga region – for example, in the areas nearby Ulyanovsk and Orlovka – Valanginian is not or almost not represented. At the same time, in the sections of Kashpir and Mar'evka the Valanginian strata are well characterized and their stratigraphic position was established starting from the paper by A.P. Pavlow [10].

Paradoxically, the Valanginian fossil fauna from the long-known and well-studied localities of Middle Volga region has never been thoroughly studied. There are very few data in the literature: in addition to originals figured by A.P. Pavlow, there are several images of a single ammonite species in the article [6]. The explanation of such a situation is the fact that because of the lower stratigraphic value of Valanginian fauna, extracted from the strongly condensated succession in Central Russia, the main focus of studying Valanginian in Russia shifted to the north of the European part and Siberia.

At both Kashpir and Maryevka sections the beds corresponding to Valanginian age lie horizontally at relatively thin Ryazanian regional stage. The upper part of the Ryazanian is composed of finely-grained weakly cemented sandstone, strongly calcareous, with shell detritus and phosphorite concretions, and characterized with numerous fossils. The only unit dated by the Valanginian in the Middle Volga region is Mar'evka member, corresponding to the upper (larger) part of the Lower Valanginian and, apparently, lower part of the Upper Valanginian substage. At the bottom this unit

is represented by the phosphorite broadstone, having thickness 0,2 m stable over a large area nearby Syzran Town. In Kashpir this plate is composed of a conglomerate made of black phosphorite pebbles and (especially in its lower part) belemnite rostra. The cement is represented by phosphate of later generations and calcite; a strong ferrugination often occurs. In Mar'evka the phosphorite layer has dark gray color and is significantly more stable by its thickness, as well as more sandy.

The zonal scale of the Valanginian is represented in a simplified form in the **Tab.1**.

Table 1

The zonal scale of the Valanginian

Substage	Zones of the Biostratigrafic Scheme for the North of the Russian Plate [2]	Approximate Location of Obsolete Units (boundary matching is imperfect)
Upper	Prodichotomites ivanovi	
	Dichotomites bidichotomus	
Lower	Polyptychites polyptychus	(Nikitinoceras hoplitoides)
	Polyptychites michalskii	
	Nikitinoceras syzranicum	(Polyptychites keyserlingi)
	Pseudogarnieria undulatoplicatilis	(Tollia stenomphala) (Surites simplex)

It was A.P. Pavlow who had described and figured in his works the ammonite fauna of Kashpir phosphorite conglomerates. Basing on it, he established the stratigraphic correlation of the phosphorite broadstone with the Lower Cretaceous ("Lower Neocomian") beds [10]. This fauna consists of *Tollia stenomphala* (Pavl.) [9], *Nikitinoceras syzranicum* (Pavl.), *Polyptychites* (*Euryptychites*) *gravesiformis* (Pavl.), *P. keyserlingi* Neum. et Uhl. [10]; the first three listed species were first described just from Kashpir. In subsequent studies the extended list of the Valanginian ammonite fauna from Kashpir included *N. hoplitoides* (Nik.), *P. michalskii* Bogosl. [1], *P. polyptychus* (Keys.) [3], *"Subpolyptychites" orbicularis* Sazonova, *"Surites" simplex* (Bogosl.) [12]. The new, preliminary defined species are: *N. cf. diptychum* (Keys.) [M. Rogov, pers. comm.], *Menjaites cf. elegans* (Bod.), *N. cf. rudis* (Bod.) [8]. The shells of ammonites are very unevenly distributed along the layer. All ammonite species represent the family Polyptychitidae (including Craspeditinae), which, in general, is widely spread in the East European province of the Boreal-Atlantic subrealm, to which the Russian sea belongs as well [13].

Concerning the Valanginian conglomerate in Maryevka, there is a mention of a find of *P. keyserlingi*, and in the top (i.e., at the base of clay formation) *Dichotomites bidichotomus* Leym. was recorded (from "*glauconite in unconsolidated sandstones above the main phosphorite Valanginian conglomerate*" – [11]). Both species were not figured anyhow. In phosphorite layer of Maryevka we found a single specimen of *N. hoplitoides* characterized by good preservation.

The Valanginian phosphorite broadstone, in addition to ammonite moulds of good preservation and associated bivalve fauna, is abundant in belemnite rostra (full or

fragmented) and phragmocones, but stratigraphic range of the species stretches outside the Valanginian stage. Here are recorded: *Pachyteuthis subquadratus* (Roem.)*, Simobelus lateralis* (Phil.), *Acroteuthis arctica* (Bluth.) [4, 5, 7].

In spite of the correlation of Mar'evka member to several ammonite zones of the Valanginian, more detailed subdivision of it is apparently unlikely because of the stong discontinuity and rewashing preceeding the cementation of phosphorite pebbles into a broadstone. This resulted in the co-occurrence of species indexing different zones. At the same time one must pay attention to some lithological difference in upper and lower zones of the plate: ammonite finds are confined mainly to the upper zone. This may indicate the presence of several discontinuities.

The phosphorite broadstone is overlapped with the light-gray shales containing jarosite, having full thickness of up to 4.0-4.5 m (in Mar'evka this is erosionally reduced up to 1.5-2.0 m). In Kashpir near the top they change into the sandy clay, with smears of limonite and gypsum crystals. Fossils in these clays are represents only by gipsym and badly deformed belemnite rostra, which are not determinable generally. According to our own observations, the lower 0.8 m layer of shales in Mar'evka does not contain any belemnites; however, they are not rare above. *P. subquadratus* is known from Kashpir, thus claming that the age of clays is presumably Upper Valanginian [14].

Discussion and conclusion. The discoveries of Valanginian ammonite species, previously unknown in the Middle Volga region, made over the recent years by the author, lead to the conclusion that the state of knowledge on the Valanginian strata is still far from being complete. Despite the weak stratigraphic interest, reference sections of the Jurassic/Cretaceous boundary stages located nearby Syzran can enrich the scientific knowledge in terms of both paleobiogeography and paleontology.

The author thanks M.A. Rogov (GIN RAS, Moscow) for the important comments and remarks.

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PLATE CAPTIONS

Plate I

All the specimens are from Novokashpirsky township, bank of the Volga river, Mar'evka member, collected 2013.

Fig. 1. *Menjaites* cf. *elegans* (Bodylevsky, 1949). The mould with remnants of the shell; no. 3629.

Fig. 2. *Menjaites* cf. *elegans* (Bodylevsky, 1949). no. 3630; (figured in mirror position).

Fig. 3. *Nikitinoceras* cf. *rudis* (Bodylevsky, 1949). Mould; no. 3628.

Fig. 4. *Polyptychites michalskii* Bogoslowsky, 1902. a-b – mould having preserved umbilicus, remnants of the shell on ventral side and poorly kept sculpture of lateral side; no. 3633; c – mould after the removal of the outer part of the shell; no. 3634.

Plate II

Fig. 1. *Nikitinoceras hoplitoides* (Nikitin, 1888). Novokashpirsky township, bank of the Volga river, Mar'evka member, 2013. Mould; no. 3632.

Fig. 2. *Nikitinoceras hoplitoides* (Nikitin, 1888). Kashpir, Kashpirka river, Mar'evka member, 2012. Mould; no. 3489.

Fig. 3. *Nikitinoceras hoplitoides* (Nikitin, 1888). Mar'evka, Kamenny gully, Mar'evka member, 2015. Mould with remnants of the shell; no. 3589.

Fig. 4. *Nikitinoceras syzranicum* (Pavlow, 1899). Novokashpirsky township, bank of the Volga river, Mar'evka member, 2013. Mould; no. 3627.

Plate I

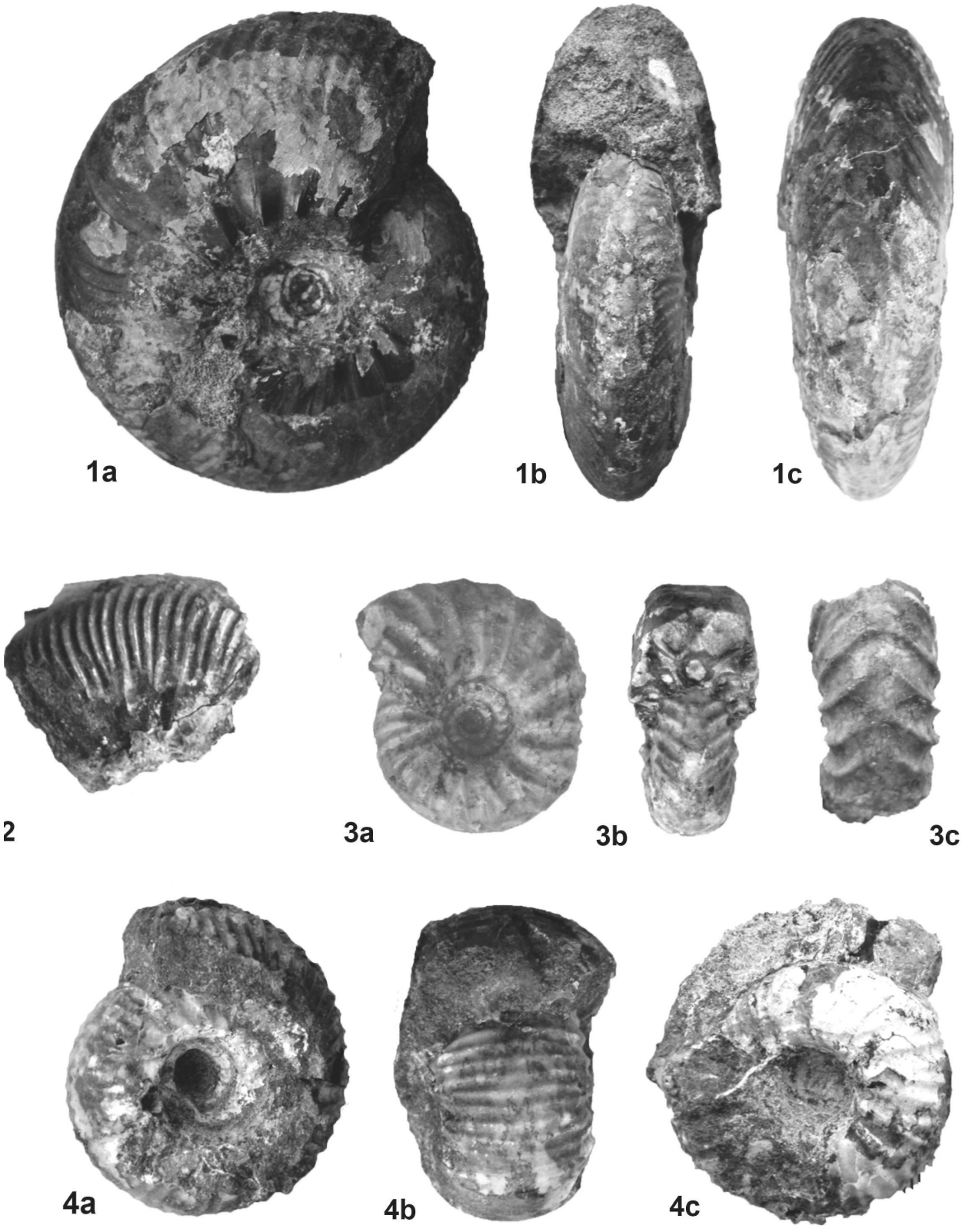

Plate II