Macrofossil Assemblages in the Ryazanian Stage (Lower Cretaceous) of the Stratotype Region

Olga S. Urman¹*, Boris N. Shurygin¹,², Oksana S. Dzyuba¹

¹Trofimuk Institute of Petroleum Geology and Geophysics, Siberian Branch, Russian Academy of Sciences, Novosibirsk, Russia
²Novosibirsk National Research State University, Novosibirsk, Russia

Email: *urmanos@ipgg.sbras.ru

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Abstract

The stratotype region of the Ryazanian stage is located in the Oka River Basin near Ryazan, Central Russia. Since ammonites are very well studied here, we investigated other groups of macrofossils. We report a large number of bivalve genera: Arctica, Astarte, Buchia, Camptonectes, Chlamys, Ctenostreon, Entolium, Gomomya, Gresslya, Hartwellia, Lima, Meleagrinella, Modiolus, Oxytoma, and Pleuromya. The belemnites are represented by two cylindroteuthidid genera, Acroteuthis and Liobelus. In addition, brachiopods (Rhynchonellidae and Terebratulidae) and unidentifiable gastropod fragments have been revealed. The highest taxonomic diversity of macrofauna is observed in the Surites spasskensis ammonite Zone.

Keywords

Fossil Mollusks, Brachiopods, Ryazanian, Central Russia

1. Introduction

The problem of correlation of the Volgian and Ryazanian stages with the standard Tithonian and Berriasian stages has not yet been unambiguously solved, but it has been proven that the upper part of the Upper Volgian substage belongs to the Cretaceous System. Nevertheless, it is still justified to recognize the Volgian and Ryazanian in the vast Boreal palaeobasins, because these regional stages reflect two different periods of geologic history, primarily that of palaeobasin in the East European Platform [1]. To some extent, this is also a tribute to the traditions, according to which most of the geological documents for Boreal regions were compiled in the XX-early XXI centuries. And the Volgian-Ryazanian
boundary is characterized by reliable bioevent markers in Boreal sections. However, it is hardly correct to treat the Volgian-Ryazanian boundary as the Jurassic-Cretaceous (J-K) boundary. The definition of the Ryazanian stage and its base largely depends on the detailed study of the stratotype region located in the Oka River Basin near Ryazan, Central Russia.

2. A Review of New Data

The precise stratigraphic position of fossil finds in the Ryazanian of the stratotype region is usually difficult to determine due to the highly condensed J-K boundary sections in Central Russia, their small thicknesses and numerous sedimentation interruptions. Therefore, the stratigraphic position of the lower horizons of the Ryazanian in Central Russia is still under discussion.

The Ryazanian deposits in the Oka River Basin contain numerous shells of mollusks, especially those of bivalves, but ammonites are the best studied group in the stratotype region [2] [3]. Following Mitta [3], we recognize three ammonite zones within the Ryazanian in the Oka River Basin, namely the Riasanites rjasanensis, Surites spasskensis and Surites tzikwinianus zones. Bivalves, belemnites, gastropods as well as brachiopods are the main objects of our research.

Representatives of the genus Buchia are most abundant among bivalves. It is noteworthy that Boreal zonal scales based on Buchiidae are successfully used for the subdivision and correlation of the J-K boundary beds in Boreal regions [4]. In addition to the beds with Buchia fischeriana, a sequence of mixed assemblages from different Buchia zones is observed in the Ryazanian stage for the Oka River sections [5]. These are beds with Buchia volgensis + Buchia okensis + Buchia jasikovi, and beds with B. volgensis + B. jasikovi + Buchia tolmatschowi. In the standard Boreal biostratigraphic scale, the B. okensis Zone, the B. jasikovi Zone and the B. tolmatschowi Zone have been distinguished as a series of zones parallel to the B. volgensis Zone [4] [6] [7]. Other bivalve taxa identified from the Ryazanian on the Oka River are members of the genera Hartwellia, Lima, Pleuromya (in the Riasanites rjasanensis Zone), Arctica, Astarte, Camptonectes, Chlamys, Ctenostreon, Entolium, Gomomya, Gresslya, Hartwellia, Meleagrinella, Modiolus, Oxytoma, and Pleuromya (in the Surites spasskensis Zone).

In all studied sections, belemnites are represented by two genera, Acroteuthis and Liobelus (Cylindroteuthididae). Cylindroteuthid belemnites are a relatively new tool for pan-Boreal correlation of the J-K boundary beds [8] [9]. Two belemnite beds can be recognized in the Ryazanian on the Oka River: an upper part of the regional beds with Liobelus russiensis and Acroteuthis mosquensis, and the beds with Acroteuthis explanatoides [5]. Belemnites are rather frequent here, especially Acroteuthis. A certain sequence in the appearance of species from the genus Acroteuthis is observed upward in the section: A. mosquensis - A. arctica - A. subquadratoides - A. explanatoides.

In addition to cephalopods and bivalves, we found brachiopods (Rhynchonellidae and Terebratulidae) and unidentifiable gastropod fragments, all in the
Surites spasskensis ammonite Zone. This zone is characterized by the highest taxonomic diversity of macrofauna.

3. Conclusion

In the Ryazanian stage of the stratotype region, the richest assemblage of macrofossils is recorded from the Subboreal Surites spasskensis ammonite Zone, which corresponds to the middle part of the Hectoroceras kochi Zone - Surites analogous Zone in the Boreal ammonite scale.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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