

periodic bottom currents. The dissolution of aragonite skeletons proves that the water was under saturated with respect to aragonite. It can be the result of relatively high depth of deposition or the specific water circulation.

M.G. is supported by the Foundation for Polish Science (prof. J. Kaymierczak grant for Researchers).

BIOSTRATIGRAPHY OF THE UPPER BOREAL BATHONIAN AND CALLOVIAN OF EUROPEAN RUSSIA

Gulyaev¹ D.B., Kiselev² D.N. and Rogov³ M.A.

¹Moscow State University

²Yaroslavl State Pedagogical University

³Geological Institute of the Russian Academy of Science (Moscow)

Much new information on the ammonite biostratigraphy of the Upper Boreal Bathonian and Callovian of the European Russia is reviewed (Gulyaev, Kiselev, 1999; Gulyaev, 1999, 2001; Kiselev, 1999; 2001). The 34 biohorizons, 14 subzones and 9 zones can now be recognized (see Figure). Close correlation with British Sub-Boreal Standard scale is possible from the *Koenigi* Zone to the end of Callovian. The lowermost Callovian (*Elatmae* and *Subpatruus* Zones) correlation is still only partially possible because of the poorly overlapping bioprovincialism of the ammonites/ The base of the *Elatmae* Zone and therefore - of the Russian Callovian is defined by the first appearance of *Macrocephalites jaquoti*, which indicate the beginning of steady connection of the East-European (Russian) sea with the Tethyan basins. This species is well known from the base of the *Herveyi* Zone (*Keppleri* Biohorizon) of Western Europe. In central Russia it also associated with *Kepplerites* ex gr. *keppleri*. Direct correlation between the Upper Bathonian Infimum Zone and the Western-European standard pre-Callovian zonations is impossible because of the absence overlapping bioprovincialism of the ammonites. This Zone correlated with the *Calyx* Zone of east Greenland.

Notes on Figure:

- 1) Less coarsely ribbed, than nominal subspecies
- 2) To be published, - *Cadoceras bodylevskyi* Frebold, 1964 sensu Puolton (1987).
- 3) The *Jaquoti* Biohorizon is allocated in Volga basin, the *Poultoni* and *Primaevum* Biohorizons - in Pechora basin.
- 4) To be published, = *Chamoussetia saratoviensis* Callomon et Wright, 1989 sensu Mitta (1999).
- 5) -*Chamoussetia saratoviensis* Callomon et Wright, p.812.
- 6) *Kepplerites curtilobus* (Buckman, 1922) sensu Callomon and Page (Callomon et al., 1988) correspond to *K. indigestus* (Buckman, 1922).
- 7) *Kepplerites trichoforus* (Buckman, 1922) correspond to *K. galilaeii* (Oppel, 1862).
- 8) The *Pagei* Biohorizon is precisely now allocated only in the Saratov area.
- 9) Probably, the layers 9, 10 of the *Medea* Subzone stratotype (Kidlington), which are not characterized by ammonites.
- 10) To be published, group of *Amm. fimiferus* Phillips, *Amm. patruus* Eichwald, etc.

References

- Callomon J.H. et al. (1988): 2-nd Internat. Symp. on Jurassic Stratigraphy, Lisboa. 359-376.
 Callomon J.H., Wright J.K. (1989): Palaeontology, v.22, pt.4, 799-836.
 Gulyaev D.B. (1999): Problems of the Mesozoic Stratigraphy and Paleontology. St.-Petersburg, 1999. 63-85. (in Russian)
 Gulyaev D.B. (2001): Stratigraphy and Geol. Correlation, v.9, N 1, 68-96.
 Gulyaev D.B., Kiselev D.N. (1999): Stratigraphy and Geol. Correlation, v.7, N 3, 79-94.
 Kiselev D.N. (1999): Problems of the Mesozoic Stratigraphy and Paleontology. St.-Petersburg, 1999. 87-115. (in Russian)

North-West Europe				European Russia			East Greenland (Callomon, 1993)			
SUBSTAGE	ZONE	Subzone	Biohorizon	Biohorizon	Subzone	ZONE	Biohorizon, ZONE, SUBSTAGE			
UPPER CALLOVIAN	LAMBERTI	Lamberti	<i>Paucicostatum</i>		Lamberti	LAMBERTI				
			<i>Mojarowskii</i>							
			<i>Lamberti</i>							
			<i>Praelamberti</i>							
	ATHLETA	Henrici	<i>Henrici</i>	Henrici		ATHLETA				
			<i>Messiaeni</i>							
ATHLETA	Spinosum		<i>Kuklikum</i>	Spinosum		ATHLETA				
	Proniae		<i>Funiferus</i>	Proniae						
	Phacinum		<i>Patruus</i>	Phacinum						
MIDDLE CALLOVIAN	CORONATUM	Grossouvrei	<i>Grossouvrei</i>	Grossouvrei		CORONATUM				
			<i>Posterior</i>							
	Obductum		<i>Crassum</i>	Obductum		CORONATUM				
			<i>Obductum</i>							
	JASON	Jason	<i>Jason β</i>	Jason		JASON				
			<i>Jason α</i>							
Medea		<i>Medea magnum</i>		Medea						
		<i>Medea medea</i>								
		<i>lacuna</i> ¹	<i>Enodatum aeeta</i>		JASON					
LOWER CALLOVIAN	CALLOVIENSE	Enodatum	<i>Enodatum enodatum</i>		Enodatum		CALLOVIENSE			
			<i>Enodatum crispatum</i>							
			<i>Difficilis</i>	Enodatum						
			<i>Pagei</i>							
	CALLOVIENSE	Calloviense		Calloviense		CALLOVIENSE				
		<i>Calloviense</i>		<i>Calloviense</i>						
	KOENIGI	Galilaei	Galilaei		Galilaei		KOENIGI			
		Curtolobus	<i>Trichophorus</i>	Curtolobus		Curtolobus				
			<i>"Curtolobus"</i>	Indigestus						
	Gowerianus	<i>Gowerianus</i>	Gowerianus		Gowerianus		KOENIGI			
		<i>Metorchus</i>	gowerianus							
	HERVEYI	Kamptus	<i>lacuna</i>	<i>Crobyloides</i>		Subpatruus				ELATMAE
<i>Kamptus γ</i>			<i>Uzhovkensis</i>							
<i>Kamptus β</i>			<i>Subpatruus</i>							
Terebratus		<i>Herveyi</i>	Surensis		Subpatruus					
		<i>Terebratus β</i>	Tschernischevi							
		<i>Terebratus α</i>								
KEPPLERI	Verus	<i>Elatmae elatmae</i>		Elatmae						
		<i>Elatmae anabarensis</i>								
	<i>Keppleri (Jacquoti)</i>	<i>Primaevum</i>	<i>Jacquoti</i>							
		<i>Poultoni</i>								
UPPER BATHONIAN				<i>Infimum subsp. nov.</i>	INFIMUM		CALYX			
				<i>Infimum infimum</i>						
						<i>K. vardekloeftensis</i>	CALYX			
						<i>K. peramplus</i>				

Tabl.1. The biostratigraphic subdivision of the Upper Boreal Bathonian and Callovian of European Russia, its correlation with the standard scale of North-West Europe and East Greenland.