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NEW DATA ON CONODONTS, BRACHIOPODS, AND OSTRACODES FROM THE STRATOTYPES OF THE ILMEN AND BUREGI BEDS (FRASNIAN, MAIN DEVONIAN FIELD)

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Abstract. The authors restudied biostratigraphically the stratotypes of the Ilmen Beds and Buregi Beds distinguished by R. Hecker in the Frasnian of the central part of the Main Devonian Field (Lake Ilmen region, Russian Platform). Abundant brachiopod, ostracode, and conodont associations were obtained and one new ostracode species *Milanovskya bicristata* was described. Both the Ilmen (mainly terrigenous) and Buregi (carbonate) beds correspond to relatively shallow-water facies. Conodont associations permit us to correlate these beds with the Middle–Upper *asymmetricus* Zone and to recognize two local zones (the *Polygnathus pollocki* Zone and the *P. efimovae* Zone). Ostracode, brachiopod, and conodont faunas observed in the Ilmen and Buregi beds resemble the Semilukian ones of the Central Devonian Field. Facial, taphonomical, and some palaeoecological observations allow for the reconstruction of the palaeolandscape succession which was caused by regional sea-level changes.

Key words: stratigraphy, Upper Devonian, Frasnian, conodonts, ostracodes, brachiopods.

INTRODUCTION

The area with the Devonian outcrops in the north part of the Russian Platform, the Main Devonian Field, shows extensive exposures of fossiliferous Frasnian (Upper Devonian) sediments. Geology of the region, including Devonian lithology and stratigraphy, has been investigated since the nineteenth century by numerous researchers, among others by P. Wenjukow, R. Hecker, D. Obruchev, V. Sorokin, and E. Sammet. The Frasnian fossils and biostratigraphy were studied by D. Nalivkin, N. Yakovlev, M. Batalina, E. Glebovskaya, V. Zaspelova, V. Egorov, N. Ovnatanova, L. Kononova, and V. Khalymbadzha.

Many Frasnian outcrops are situated along the Ilmen Glint (Lake Ilmen shore) and the Psizha River and the Perekhoda River banks (Fig. 1). These outcrops show the terrigenous and carbonate sequences divided into several regional

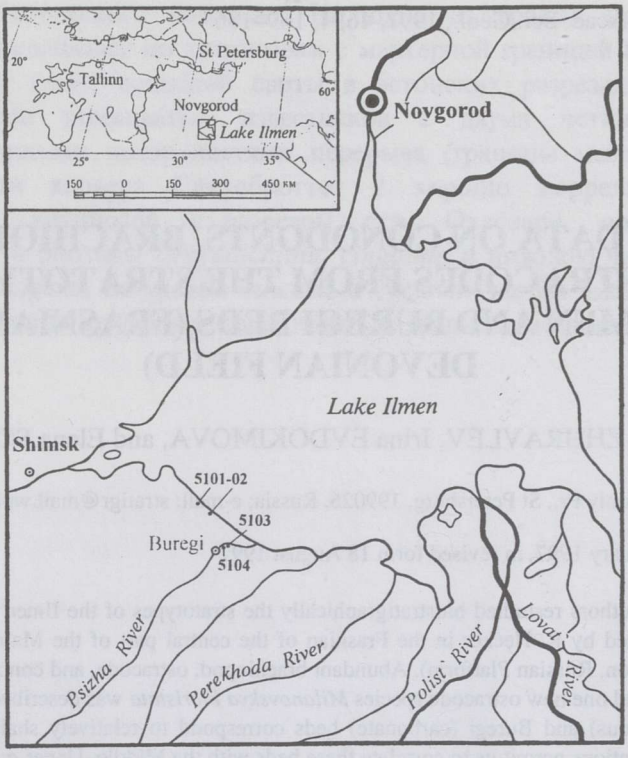

Fig. 1. Location of the sections studied.

stratons – beds. The stratotypes of the Ilmen Beds and the Buregi Beds, which were distinguished by R. Hecker, were restudied by the authors in 1994–95 for conodonts, ostracodes, and brachiopods.

The main aim of our research was to elaborate a biostratigraphic frame for the middle-scale (1 : 200 000) geological mapping.

The conodont and ostracode specimens figured are deposited in the CNIGR Museum, St Petersburg, Russia, collection No. 13 003.

LITHOLOGY AND FACIES

The Ilmen Beds

The Ilmen Beds are represented by claystone, silty claystone (mudstone), siltstone, and sandstone with lenses and layers of bioclastic limestone (pack-, wacke-, float-, and rudstone) (Fig. 2) containing brachiopods, echinoderms, bivalves, gastropods, ostracodes, tentaculites, conodonts, and fishes. Upward the sand and silt content increases, but the content of limestone decreases. The

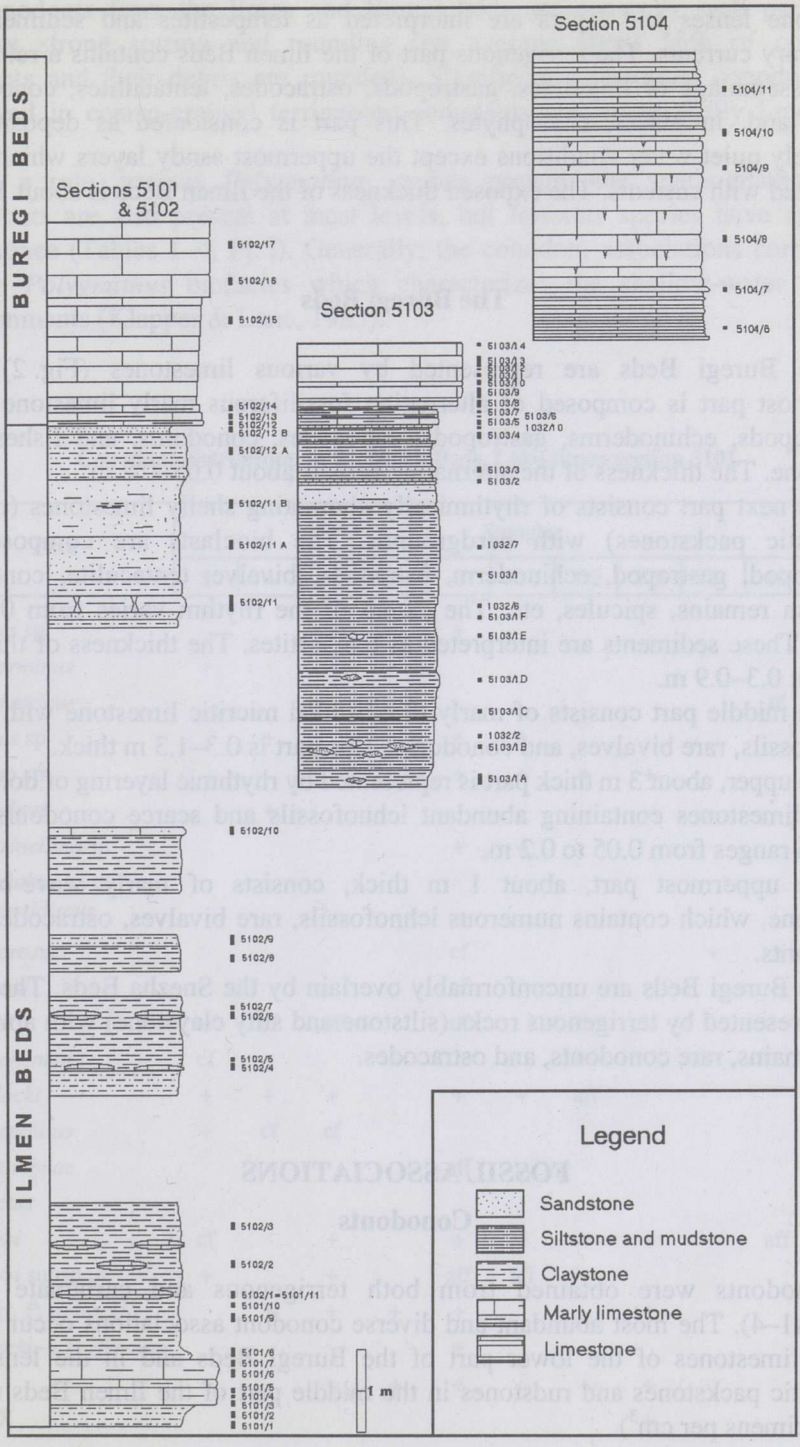

Fig. 2. Lithological columns of the studied sections and the position of the samples.

limestone lenses and layers are interpreted as tempestites and sediments of temporary currents. The terrigenous part of the Ilmen Beds contains a relatively poor assemblage of lingulates, gastropods, ostracodes, tentaculites, conodonts, fishes, and, in places, charophytes. This part is considered as deposited in relatively quiet-water conditions except the uppermost sandy layers which were deposited with currents. The exposed thickness of the Ilmen Beds is about 12 m.

The Buregi Beds

The Buregi Beds are represented by various limestones (Fig. 2). The lowermost part is composed of alternating fossiliferous marly limestone (with brachiopods, echinoderms, gastropods, ostracodes, conodonts, and fishes) and claystone. The thickness of the alternating beds is about 0.05–0.8 m.

The next part consists of rhythmically alternating shelly limestones (mainly bioclastic packstones) with hardgrounds. The bioclasts are composed of brachiopod, gastropod, echinoderm, ostracode, bivalve, tentaculite, conodont, and fish remains, spicules, etc. The extent of the rhythm varies from 0.07 to 0.2 m. These sediments are interpreted as tempestites. The thickness of this part is about 0.3–0.9 m.

The middle part consists of marly thin-bedded micritic limestone with many ichnofossils, rare bivalves, and conodonts. This part is 0.3–1.3 m thick.

The upper, about 3 m thick part is represented by rhythmic layering of dolomitic marly limestones containing abundant ichnofossils and scarce conodonts. The rhythm ranges from 0.05 to 0.2 m.

The uppermost part, about 1 m thick, consists of marly wave-bedded limestone, which contains numerous ichnofossils, rare bivalves, ostracodes, and conodonts.

The Buregi Beds are unconformably overlain by the Snezha Beds. The latter are represented by terrigenous rocks (siltstone and silty claystone) with abundant fish remains, rare conodonts, and ostracodes.

FOSSIL ASSOCIATIONS

Conodonts

Conodonts were obtained from both terrigenous and carbonate rocks (Tables1–4). The most abundant and diverse conodont associations occur in the shelly limestones of the lower part of the Buregi Beds and in the lenses of bioclastic packstones and rudstones in the middle part of the Ilmen Beds (up to 90 specimens per cm^3).

Conodonts from the Ilmen and Buregi beds are generally well preserved, without strong sorting and rounding (on average about 18% of conodont elements and their debris are rounded). Significantly reworked conodonts are observed in coarse-grained terrigenous sediments and some shelly limestones only.

As a rule, various *Polygnathus* species prevail; the spathognathodiform conodonts are also present at most levels, but *Icriodus* species have sporadic occurrence (Tables 1–4, Pl. I). Generally, the conodont associations correspond to the *Polygnathus* biofacies which characterizes the shallow-water marine environments (Klapper & Lane, 1985).

Table 1

Conodont distribution in the Ilmen Beds, Lake Ilmen section 5101

Taxa	Samples										
	3	4	5C	5L	6	7-1	7-2	7-3	8	10	11
Icriodus sp.			+	+	+						
I. subterminus	+		+								
I. symmetricus										cf	
Oulodus sp.		+			+	+					+
Mehlina sp.					+	+	+	+			+
M. gradata		+									+
Pandorinellina sp.					+	+					+
Polygnathus ex gr. *P. angustidiscus*			+		+						+
P. decorosus					cf				+		+
P. dubius					cf						aff
P. lanei	+	cf	cf		cf						+
P. ljaschenkoi	cf										+
P. pollocki	+	+	+		+	+	aff				aff
P. praepolitus	+	cf	cf								+
P. seraphimae					aff						
P. strictus											cf
P. webbi	cf		+		+	+	+	+		aff	cf
P. webbi subsp. A	+		+		aff	aff					
P. ex gr. *P. pollocki*		+	+	+	+			+			+
P. pollocki → *P. efimovae*					+						
P. spp.				+	+	+	+	+			
P. sp. X								+			cf

Conodont distribution in the Lake Ilmen section 5102

Taxa	Samples													
	Ilmen Beds													Buregi Beds
	1	2	3	4-1	4-3	4-4	4-5	5	6	7	8	9	12B	12
Icriodus subterminus					+		+							cf
Oulodus sp.	+	+												+
Mehlina sp.				+			+							+
M. gradata		cf			+		+		+	+	cf		+	
M. fitzroyi		+				+	+	+						
Pandorinellina sp.		+			?		+		+					
Polygnathus aequalis		+							cf					
P. alatus		cf			cf				+				+	
P. angustidiscus	+	+					aff		+			(aff)		
P. posterus		+					+							
P. ex gr. *angustidiscus*	+	+		+	+	+	+		+					
P. decorosus	+	+					+	(ex gr)			aff			ex gr,+
P. lanei	+	cf	aff				+		+					+
P. ljaschenkoi	aff	+				cf	+	+	+		aff			
P. mosquensis				aff										
P. penatus						+			cf					
P. pollocki	+	+		+			+							
P. pseudoxylus	+	+												
P. strictus							cf							
P. praepolitus		+			cf		+		+	aff				aff
P. seraphimae							aff		cf					
P. webbi	+	cf		cf	+	+	+	cf	+	aff	aff			
P. webbi subsp. A	+						+		+					
P. zinaidae						cf								
P. dubius	+	aff				aff			cf					
P. uchtensis									aff					
P. spp.		+		+			+	+	+	+		+		+
P. ex gr. *P. pollocki*		cf		+		+	+		+		+			+
P. pollocki → *P. efimovae*	+						+						+	+
P. sp. X		+		+	+	+			+					

(), reworked conodonts.

Conodont distribution in the Lake Ilmen section 5103

Taxa	Samples														
	Ilmen Beds	Buregi Beds													
	1E	5	7	8-1	8-2	8-3	8-4	8-5	8-6	8-7	9	10	12	13	14
Ancyrognathus ancyrognathoideus											+				
Icriodus sp.			+					+							
I. subterminus				+	+						+				
Mehlina sp.		+			+	+			+	+		+	+		+
M. gradata			+	+						+	+		+	+	
M. fitzroyi			+	+							+	+		+	
Oulodus sp.			+												
Pandorinellina sp.							+				+		+	+	
Polygnathus alatus												+			
P. ex gr. *angustidiscus*				+											
P. angustidiscus				aff								(aff)			
P. decorosus				aff	aff		+			aff					
P. dubius												+			
P. efimovae		+		+	+	+	+	+		+	+	+	+	+	
P. lanei		aff		+		+	+	+	+	aff, +	+	+	+	aff, +	+
P. ljaschenkoi					aff										
P. pollocki				cf									+		
P. praepolitus	+										+				
P. pseudoxylus										+					
P. seraphimae							cf					aff			
P. webbi			+	+			cf	cf	aff	cf	+			aff	
P. ex gr. *P. pollocki*		+		+			+	+		+	+	+	+	+	
P. pollocki → *P. efimovae*				+	+					+	+	+	+	+	
P. spp.		+		+	+			+			+	+		+	
P. sp. X										+					

(), reworked conodonts.

Conodont distribution in the Buregi Beds, Lake Ilmen section 5104

Taxa	Samples				
	1	4	5	9	11
Icriodus subterminus	+				
Mehlina sp.	+				
M. gradata	+	+		+	
Oulodus sp.		+			
Pandorinellina sp.	+				
Polygnathus sp.		+			
P. alatus	+				
P. angustidiscus	cf				
P. efimovae	+, (+)				+
P. lanei	cf, aff				
P. pollocki	+				
P. webbi	cf				
P. pollocki → *P. efimovae*	+		+		

(), reworked conodonts.

PLATE I

Fig. 1. *Polygnathus* cf. *P. seraphimae* Ovnatanova et Kononova, 1/13003, x 49, 5103/8-4.
Fig. 2. *Polygnathus* cf. *P. seraphimae* Ovnatanova et Kononova, 2/13003, x 74, 5102/6.
Fig. 3. *Polygnathus webbi* Stauffer, 3/13003, x 43, 5102/4-4.
Fig. 4. *Polygnathus* aff. *P. mosquensis* Litvinova, 4/13003, x 62, 5102/4-1.
Fig. 5. *Polygnathus pollocki* Druce, 5/13003, x 62, 5103/8-5.
Fig. 6. *Polygnathus pollocki* Druce, 6/13003, x 74, 5102/12.
Fig. 7. *Polygnathus praepolitus* Kononova, Alekseev, Barskov et Reimers, 7/13003, x 62, 5103/9.
Fig. 8. *Polygnathus lanei* Kuzmin, 8/13003, x 49, 5103/12.
Fig. 9. *Polygnathus* ex gr. *P. angustidiscus* Youngquist, 9/13003, x 25, 5102/2.
Fig. 10. *Polygnathus* sp. X, 10/13003, x 49, 5102/4-1.
Figs. 11, 13. *Polygnathus efimovae* Kononova, Alekseev, Barskov et Reimers, 11/13003, 5103/9; 11 – x 43, 13 – x 37.
Fig. 12. *Polygnathus ljaschenkoi* Kuzmin, 12/13003, x 74, 5102/8.
Fig. 14. *Polygnathus* aff. *P. pennatus* Hinde, 13/13003, x 62, 5102/4-4.
Fig. 15. *Mehlina gradata* Youngquist, 14/13003, x 62, 5102/7.
Fig. 16. *Icriodus subterminus* Youngquist, 15/13003, x 92.5, 5101/3.

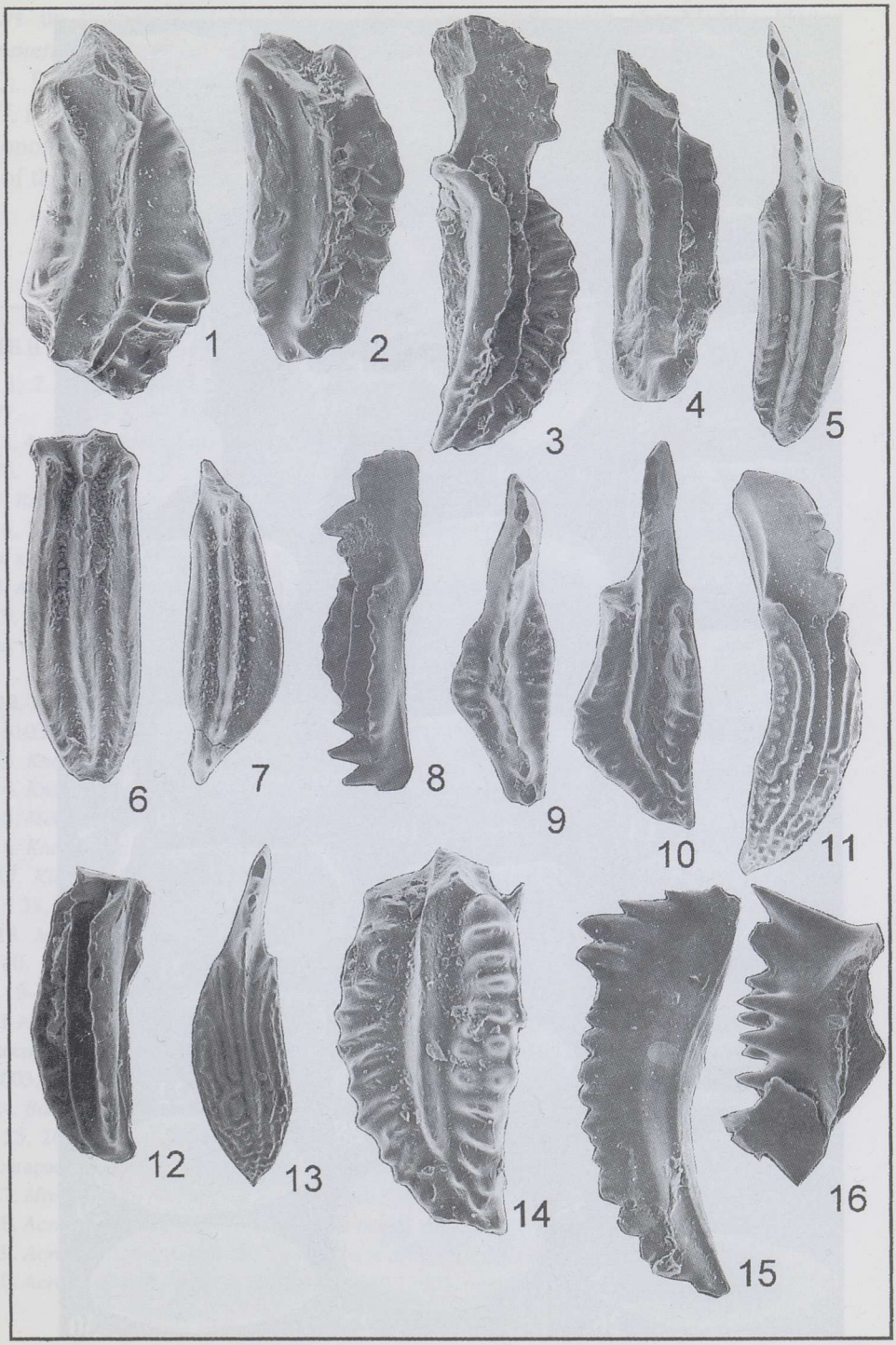
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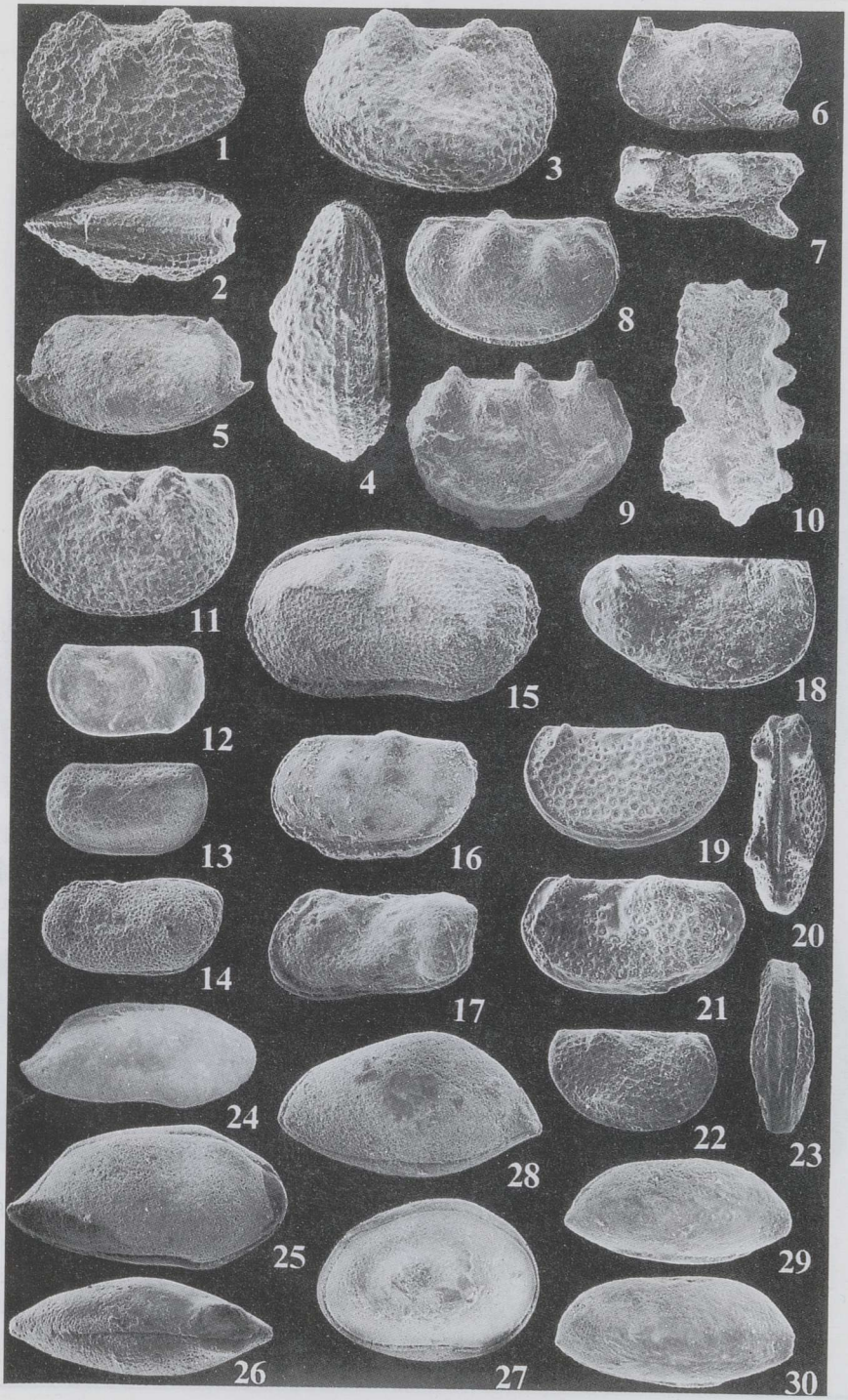
PLATE II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Co-occurrence of *Polygnathus pollocki* Druce, *P.* aff. *P. pennatus* Hinde, *P.* aff. *P. dubius* Hinde, and *P. angustidiscus* Youngquist in the sequence studied allows us to correlate the Buregi and Ilmen beds with the Middle–Upper *asymmetricus* Zone or *punctata*–Lower *hassi* interval (Ziegler & Sandberg, 1990; Druce, 1976). The occurrence of *P.* aff. *P. mosquensis* Litvinova and *P.* aff. *P. seraphimae* Ovnatanova et Kononova suggests, according to Ovnatanova & Kononova (1996), the correlation of the Ilmen and Buregi beds with the upper part of the Semilukian Regional Stage.

PLATE II

Figs. 1, 2. *Kozlowskiella*? sp. 2. Male carapace 16/13003, left lateral and ventral views, x 39, 1032/7.

Figs. 3, 4. *Kozlowskiella*? sp. 1. Female right valve 17/13003, lateral view, x 34, ventral view, x 36, 1032/6.

Fig. 5. *Buregia bispinosa* Zasp. Tecnomorphic left valve 18/13003, lateral view, x 38, 1032/6.

Figs. 6, 7. *Neodrepanella* aff. *N. tichomirovi* Zasp. Female ? left valve 19/13003, lateral and dorsal views, x 40, 1032/2.

Fig. 8. *Acantonodella lutkevichi* Zasp. Male ? carapace 20/13003, right lateral view, x 39, 1032/4.

Figs. 9, 10. *Acantonodella terciocornuta* Zasp. Female ? carapace 21/13003, left lateral view, x 38, ventral view, x 42, 1032/2.

Fig. 11. *Kozlowskiella*? sp. 1. Male left valve 22/13003, lateral view, x 35, 1032/10.

Fig. 12. *Neodrepanella* cf. *N. parva* Zasp. Tecnomorphic carapace 23/13003, left lateral view, x 46, 5103/8-3.

Fig. 13. *Knoxiella* sp. 1. Tecnomorphic carapace 24/13003, left lateral view, x 37, 5103/8-3.

Fig. 14. *Knoxiella* sp. 2. Female carapace 25/13003, left lateral view, x 40, 5103/8-3.

Fig. 15. *Mennerella* sp. Male carapace 26/13003, left lateral view, x 38, 5103/8-3.

Fig. 16. *Knoxites* sp. Male carapace 27/13003, left lateral view, x 38, 1032/10.

Fig. 17. *Kloedenellitina* cf. *Kl. pseudosygmaeformis* Eg. Female carapace 28/13003, left lateral view, x 38, 5103/8-3.

Fig. 18. *Milanovskya bicornis* Gleb. et Zasp. Female right valve 29/13003, lateral view, x 41, 1032/10.

Figs. 19–23. *Milanovskya bicristata* sp. nov. 19, 20 – male carapace, holotype 30/13003, left lateral and dorsal views, x 41; 21 – female left valve, allotype 31/13003, lateral view, x 37; 22 – tecnomorphic carapace 32/13003, right lateral view, x 39; 23 – tecnomorphic carapace 33/13003, ventral view, x 39, 5103/8-3.

Fig. 24. *Bairdia* aff. *B. raabenae* Eg. Carapace 34/13003, right lateral view, x 44, 5103/8-4.

Figs. 25, 26. *Bairdia* aff. *B. uchtaensis* Eg. 25 – carapace 35/13003, right lateral view, x 40; 26 – carapace 36/13003, dorsal view, x 40, 5103/8-3.

Fig. 27. *Mossolovella philippovae* Eg. Carapace 37/13003, right lateral view, x 40, 5103/8-3.

Fig. 28. *Acratia* sp. Carapace 38/13003, right lateral view, x 38, 5103/8-6.

Fig. 29. *Acratia* aff. *A. gassanovae* Eg. Carapace 39/13003, right lateral view, x 44, 5103/8-3.

Fig. 30. *Acratia* cf. *A. buregiana* Eg. Carapace 40/13003, right lateral view, x 44, 5103/8-3.

Aristov (1988, 1994) reported *Ancyrodella gigas* Youngquist from the Semilukian deposits of the central part of the Russian Platform. This suggests correlation of the Semilukian with the Middle–Upper *asymmetricus* Zone (Schumacher, 1976; Ziegler & Sandberg, 1990; Ovnatanova & Kuz'min, 1991). Thus, the interval studied appears to correlate with the Upper Semilukian and the Middle–Upper *asymmetricus* Zone (Fig. 3).

The main change in conodonts, marked by the first appearance of *Polygnathus efimovae* Kononova, Alekseev, Barskov et Reimers *sensu stricto*, coincides with the Ilmen–Buregi boundary. Kononova and Ovnatanova (1996, oral presentation) proposed the *P. efimovae* Zone as corresponding to the whole Semilukian Regional Stage (see also Kononova et al., 1996). The data obtained by us allow for recognition of two upper Semilukian local conodont zones: the *P. pollocki* Zone in the Ilmen Beds and the *P. efimovae* Zone in the Buregi Beds. These zones are distinguished in several sections in the Lake Ilmen region. It is possible that the difference in conodont associations of these two zones is rather due to a facies change at the Ilmen–Buregi boundary than to an evolutionary event, and the zones are ecological in nature.

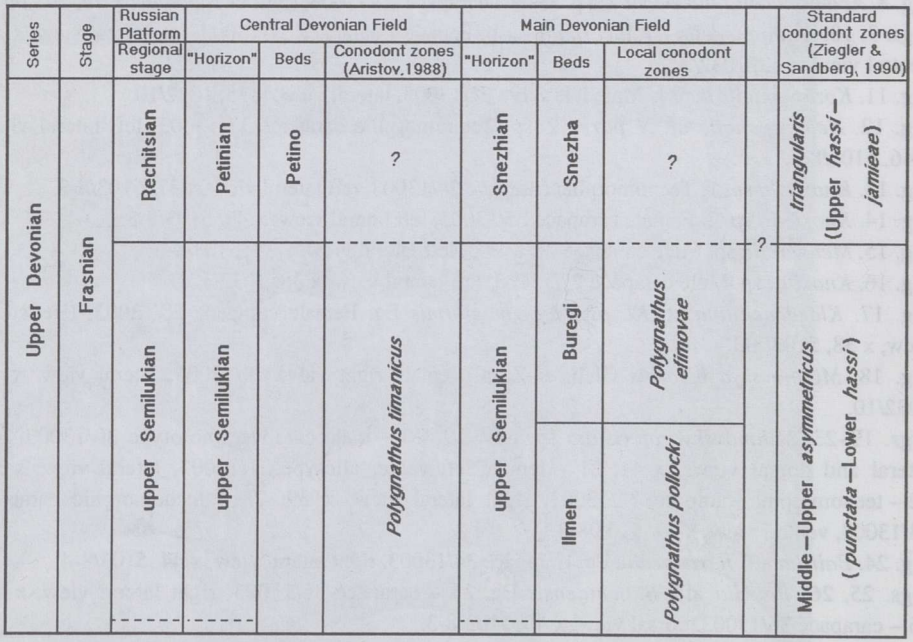

Fig. 3. Stratigraphical chart.

Ostracodes

Abundant ostracodes were obtained from the Ilmen Beds and the lower part of the Buregi Beds (Table 5, Pl. II). Ostracodes recovered from the Ilmen Beds are relatively well preserved. The presence of numerous complete carapaces (about 80%) and various instars suggests the absence of strong postmortem reworking (Fig. 4). The Buregi Beds are also characterized by well-preserved ostracode carapaces without strong disarticulation (about 65% of complete carapaces). In both the Ilmen and Buregi beds ostracode shells are sporadically recrystallized or replaced by phosphates and Fe minerals.

Table 5

Ostracode distribution in the Ilmen and Buregi beds

Taxa	Ilmen Beds								Buregi Beds				
	Section 5102		Section 5103										
	Samples												
	6	7	1032/1	1032/2	1D	1032/4	1032/6	1032/7	1032/10	8-1	8-3	8-4	8-6
Mossolovella incognita	cf	cf											
Acratia galinae			cf			cf							
Acantonodella lutkevichi			+	+		+	+						
A. terciocornuta			+	+		+	+	+					
Neodrepanella tichomirovi				aff									
Knoxiella sp.				+	+	+							
Buregia bispinosa							+						
Kozlowskiella? sp. 1							+		+				
Kozlowskiella? sp. 2								+	+				
Knoxites sp.									+				
Bairdia raabenae									aff				
Mossolovella sp.									+			+	
Milanovskya bicristata sp. nov.									+	+	+		
Cryptophyllus sp.											+		
Buregia krestovnikovi											aff		
Neodrepanella parva											cf		
Mennerella sp.											+		
Knoxiella sp. 1											+		
Knoxiella sp. 2											+		
Kloedenellitina pseudosygmaeformis											cf		
Milanovskya bicornis											+		
Cavellina sp.											+		
Bairdia uchtaensis											aff		
Mossolovella philippovae											+		
Bairdiocypris? sp.											+		
Acratia buregiana											cf		
A. gassanovae											cf	aff	aff

Two ostracode assemblages with different taxonomic compositions were distinguished in the Ilmen and Buregi beds. This taxonomical distinction possibly reflects different environments during Ilmen and Buregi times.

The first assemblage, obtained from the mudstone of the Ilmen Beds, is mainly represented by palaeocopids with ornamented carapaces (*Kozlowskiella*, *Acantonodella*, *Neodrepanella*, and also rare *Buregia*), comprising about 67% of the total number of species. This association also contains kloedenellocopids (*Knoxiella*) and podocopids (*Mossolovella* and *Acratia*), accounting to 11% and 22%, respectively (Fig. 5). The Ilmen assemblage contains some species not reported from the Ilmen Beds by previous investigators. For example, *Acantonodella terciocornuta* Zasp. and *Buregia bispinosa* Zasp. were considered as typical of the Snezha Beds only (Zaspelova, 1959).

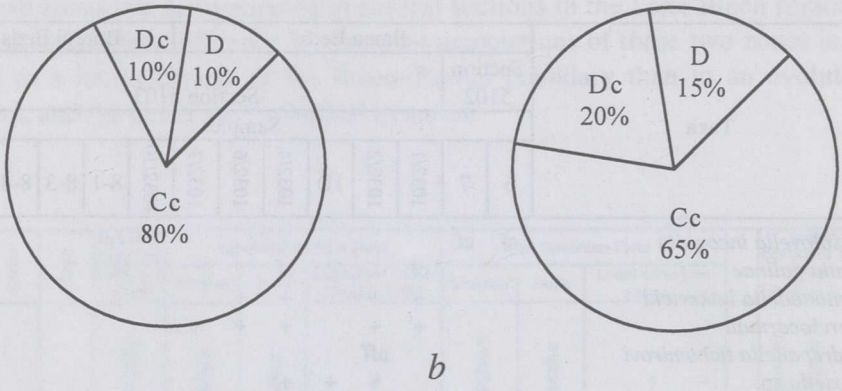

Fig. 4. Taphonomic features of the ostracode assemblages: *a*, Ilmen; *b*, Buregi. Cc, complete carapaces; Dc, disarticulated carapaces; D, detritus.

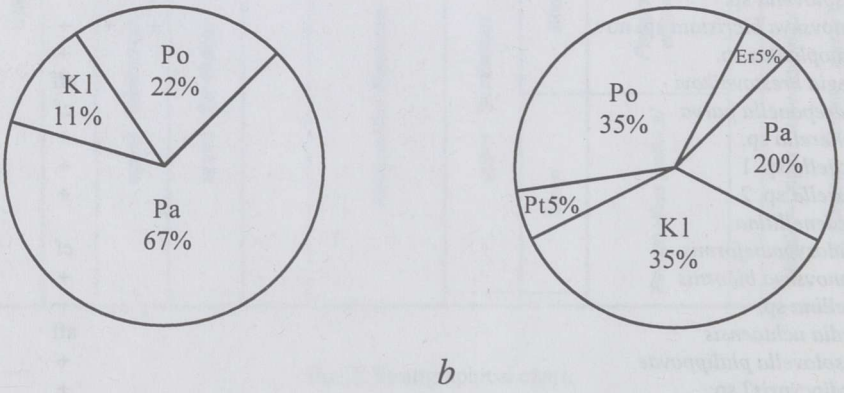

Fig. 5. Taxonomic composition of the ostracode assemblages: *a*, Ilmen; *b*, Buregi. Er, Eridocopida; Pa, Palaeocopida; Kl, Kloedenellocopida; Pt, Platycopida; Po, Podocopida.

The second assemblage, derived from the shelly limestones in the lower part of the Buregi Beds, is the most abundant and diverse. It is characterized by numerous sculptured kloedenellocopids (*Knoxites*, *Knoxiella*, *Mennerella*, *Kloedenellitina*, and *Milanovskya*) and smooth-shelled podocopids (*Bairdia*, *Mossolovella*, *Acratia*, and *Bairdiocypris*), each making up 35%. This association contains also palaeocopids (*Buregia, Kozlowskiella*, and *Neodrepanella*), which form about 20%. Eridocopids (*Cryptophyllus*) and platycopids (*Cavellina*) are scarce (about 5% of the total number of species each) (Fig. 5).

It should be noted that we obtained so rich ostracode association from the Buregi limestones using the acetolysis method. Many species, except *Kloedenellitina* cf. *K. pseudosygmaeformis* Eg. and *Acratia* cf. *A. buregiana* Eg., had not been found in these deposits before. Ostracodes of the genus *Kozlowskiella*, occurring both in the Ilmen and Buregi beds, have earlier been reported from the Middle Devonian and Famennian. However, from the Frasnian of the Russian Platform these ostracodes were first recorded by us.

The age determination for the Ilmen and Buregi assemblages is mainly based on the presence of some species, such as *Neodrepanella* cf. *N. parva* Zasp., *Milanovskya bicornis* Gleb. et Zasp., *Bairdia* aff. *B. uchtaensis* Eg., and *Acratia* aff. *A. gassanovae* Eg. This allows us to correlate these beds with the Semilukian of the Central Devonian Field.

Brachiopods

Brachiopods (Articulata) occur in bioclastic carbonate layers and lenses in the lower exposed part of the Ilmen Beds and in shelly limestones in the lowermost part of the Buregi Beds. Brachiopod shells in the bioclastic limestones of the Ilmen Beds are mostly disarticulated and disoriented; some shells are partly dissolved or corroded. Brachiopods of the shelly limestones of the Buregi Beds are better preserved, probably due to different hydrodynamic conditions.

Two reference levels with abundant brachiopod associations can be observed in the stratotypes of the Ilmen and Buregi beds.

The first level coincides with the lowermost exposed part of the Ilmen Beds. It is characterized by a brachiopod association predominated by *Cyrtospirifer schelonicus tenticuliformis* Rzhon. Scarce shells of *Anathyris* sp. and disarticulated valves of *Cyrtina demarlii* Bouch. occur as well. This association is accompanied by numerous crinoids *Glyphidocrinus singularis* (Dubat.), *Wenjukowicrinus* sp. nov., and *Blandicrinus*? sp. nov. (determinations by G. Stukalina).

The crinoidal limestone layer in the middle part of the Ilmen Beds contains brachiopods of a possibly new genus that is close to *Cyrtina*. Crinoids are represented by *Blandicrinus*? sp. nov., *Glyphidocrinus singularis* (Dubat.),

G. infimus (Dubat.), *Wenjukowicrinus* sp. nov., and *Hexacrinites argutus* Yelt. (determinations by G. Stukalina).

The second level coincides with the lowermost part of the Buregi Beds. It is characterized by a more diverse brachiopod association. This association is dominated by *Pseudoatrypa uralica* (Nal.), *Tenticospirifer tenticulum* (Vern.), and accompanied by *Anathyris helmersenii* (Bouch.) and *Chonetipustula petini* (Nal.). Scarce valves of *Cyrtospirifer* sp. occur as well. According to Nalivkin (1941) and Hecker (1983), *Ps. uralica* appears first and has the acme in the Buregi Beds, possibly due to the Buregian transgression. The second brachiopod level is reliably traced laterally and has a relatively uniform taxonomic composition.

The brachiopods reported permit us to correlate the Buregi and Ilmen beds with the Semilukian of the central part of the Russian Platform.

PALAEOECOLOGY

Satisfactory preservation of the fossil communities of both the benthic (ostracodes and brachiopods) and nekto-benthic and nekto-planktic (conodonts) fauna allows us to reconstruct some parameters of the palaeoecosystem. The Ilmen Beds are characterized by the dominance of *Polygnathus* species among the conodonts, the presence of palaeocopid and kloedenellocopid ostracodes with few podocopids, and the brachiopod association *Cyrtospirifer schelonicus tenticuliformis*. These faunal associations suggest the shallow-water nearshore marine environments.

Echinoderms, conodonts of the *Polygnathus* biofacies, the *Pseudoatrypa uralica–Tenticospirifer tenticulum* brachiopod association, and palaeocopid–eridocopid–kloedenellocopid ostracode biofacies with abundant bairdiaceans occur in the lower part of the Buregi Beds. This suggests the shallow-water offshore marine environments with normal salinity and near-bottom aeration.

The absence of abundant benthic fauna in the middle and upper parts of the Buregi Beds indicates abnormal near-bottom salinity and aeration. The presence of conodonts in these sediments allows us to suggest good aeration and normal salinity for the upper part of the water column. Probably the halocline occurred there.

CONCLUSIONS

The present work is the first comprehensive study of conodonts, ostracodes, and brachiopods from the Frasnian sequence of the Main Devonian Field. However, the data presented are tentative. The stratotypes of the Ilmen and Buregi beds show abundant and diverse shallow-water faunas of conodonts,

ostracodes, and brachiopods. The fossils are mostly well preserved and allow not only for biostratigraphic interpretations but also for palaeoecosystem analysis. The latter is one of the items for future investigations.

In general, the age determination on brachiopods and ostracodes agrees with that on conodonts. Thus, in the type sections the Ilmen and Buregi beds correspond to the upper Semilukian or to the upper part of the *asymmetricus* Zone (Fig. 3).

The drilling data suggest that the lowermost part of the Ilmen Beds (as a lithological unit) is not exposed in the type section. That is why it is necessary to find a new stratotype with the complete Ilmenian succession and to study its faunal associations. It is also planned to investigate in detail the Buregi–Snezha boundary beds and to trace the lateral changes in the faunal associations in both the Ilmen and Buregi beds.

SYSTEMATIC PALAEONTOLOGY

Order KLOEDENELLOCOPIDA Scott, 1961

Superfamily BEYRICHIOPSACEA Henningsmoen, 1953

Family MILANOVSKYIDAE Abushik, 1990

Genus *Milanovskya* Egorov, 1950

Milanovskya bicristata Evdokimova, sp. nov.

Pl. II, figs. 19–23

Name. Latin *crista*, crest; referring to shape of lobes L1 and L3.

Holotype. 30/13003 CNIGR Museum, St Petersburg; male carapace; Pl. II, figs. 19, 20. Frasnian, lower part of the Buregi Beds; Main Devonian Field, Novgorod region, the right bank of the Psizha River, near the village of Buregi.

Material. Over 50 well-preserved female and tecnomorphic carapaces and valves from the type locality.

Diagnosis. Species of *Milanovskya* with distinct S2; L1 and L3 crested, both extending slightly higher above hinge line; ventral ridge thin and rather short.

Description. Carapace subelliptical in lateral view, dorsally truncated, flattened laterally; adductorial sulcus distinct, sometimes pit-like; L1 narrow, crested; L3 forms a broad crest turned backward; both L1 and L3 extend slightly higher above hinge line; marginal ridge narrow, roller-like; ventral ridge thin, comparatively short, keel-like, situated near marginal ridge; surface reticulate. Females longer and lower than males, rounded-rectangular in outline; ventral ridge long, filament-like; posterior part of valves with distinct swelling.

Changeability. Young specimens have all features of males, but they are smaller and have shorter ventral ridge.

Measurements, mm (Fig. 6). Holotype: L–0.69, H–0.42.

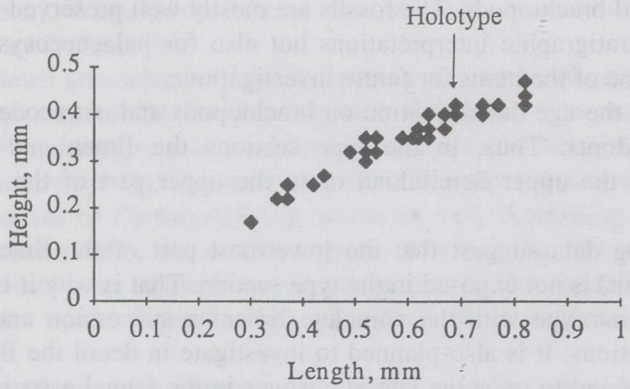

Fig. 6. Size variation of *Milanovskya bicristata* sp. nov.

Comparison. *M. bicristata* is similar to *M. bicornis* Gleb. et Zasp. and *M. ventricristata* Zasp., but it is distinguished by the presence of two crests but not spines at the dorsal margin. In addition, the absence of selvage along the ventral margin and posterior end, and also the presence of ventral ridge differentiate *M. bicristata* from *M. ventricristata*.

Distribution. Frasnian, lower part of the Buregi Beds; Main Devonian Field.

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UUSI ANDMEID KONODONTIDE, BRAHHIOPOODIDE JA OSTRAKOODIDE ESINEMISE KOHTA ILMENI JA BUREGI KIHTIDE STRATOTÜÜPIDES (FRASNE, PEADEVONIVÄLI)

Andrei ŽURAVLJOV, Irina JEVDOKIMOVA ja Jelena SOKIRAN

Biostratigraafiliselt on uuritud Ilmeni ja Buregi kihtide (Frasne) stratotüüpe, mille eraldas Peadevoniväljal (Ilmeni järve ümbruses) välja R. Hecker 1932. aastal. On kindlaks tehtud rikkalikud brahhiopoodide, ostrakoodide ja konodontide assotsiatsioonid ning kirjeldatud uut ostrakoodiliiki *Milanovskya bicristata*. Nii karbonaatsed Buregi kui ka valdavalt terrigeensed Ilmeni kihid on tekkinud suhteliselt madalaveelistes tingimustes. Konodontide alusel korreleeritakse neid kihte *asymmetricus*'e tsooni kesk- ja ülemosaga. On püstitatud kaks kohalikku konodonditsooni (*Polygnathus pollocki* ja *P. efimovae*). Nimetatud assotsiatsioonide poolest on Ilmeni ja Buregi kihid sarnased Semiluki lademe omadega Tsentraaldevoniväljal. Fatsiaalsete, tafonoomiliste ja paleoökoloogiliste vaatluste alusel on rekonstrueeritud uuritava ala maastikuline suktsessioon, mille peapõhjuseks olid meretaseme regionaalsed muutused.

НОВЫЕ ДАННЫЕ О КОНОДОНТАХ, БРАХИОПОДАХ И ОСТРАКОДАХ ИЗ СТРАТОТИПОВ ИЛЬМЕНСКИХ И БУРЕГСКИХ СЛОЕВ (ФРАН, ГЛАВНОЕ ДЕВОНСКОЕ ПОЛЕ)

Андрей ЖУРАВЛЕВ, Ирина ЕВДОКИМОВА и Елена СОКИРАН

Биостратиграфически изучены стратотипы ильменских и бурегских слоев, выделенных Р. Ф. Геккером во фране Главного девонского поля (Русская платформа, район оз. Ильмень). Выявлены обильные комплексы брахиопод, остракод и конодонтов и описан один новый вид остракод – *Milanovskya bicristata*. Как бурегские (карбонатные), так и ильменские (преимущественно терригенные) отложения соответствуют относительно мелководным фациям. Комплексы конодонтов позволяют скоррелировать эти отложения с зонами средняя–верхняя *asymmetricus* и установить две местные зоны (*Polygnathus pollocki* и *P. efimovae*). Остракодовые, брахиоподовые и конодонтовые комплексы из ильменских и бурегских слоев сходны с таковыми из семилукских отложений Центрального девонского поля. Фациальные, тафономические и некоторые палеоэкологические наблюдения позволили реконструировать палеоландшафтную сукцессию, обусловленную региональными изменениями уровня моря.