MOSCOVIAN-KASIMOVIAN TRANSITION IN DONETS BASIN: FUSULINID TAXONOMY, BIOSTRATIGRAPHY CORRELATION AND PALEOBIOGEOGRAPHY

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The Carboniferous succession in Donets Basin is famous on both diverse and abundant marine fossils and plants, including major for biostratigraphy groups (foraminifera, ammonoids, conodonts, corals) and the region is important as a link of marine and continental sections [Aizenverg et al., 1963]. Thus, the accurate and well documented taxonomies and phylogenies in Donets Basin are very critical for such correlation. Although being within Russian Platform during Carboniferous it was located within subtropical area and belongs to Tethyan realm [Davydov, 1992].

The aims of this paper are to carefully document taxonomy and distribution of fusulinid faunas in Moscovian-Kasimovian transition in Kalinovo key-section of Donets Basin and correlate this transition to the type sections in Moscow Basin.

The fusulinids in Donets Basin became known since 19th century thanks to exceptional preservation and abundance in limestones throughout Carboniferous. Since 1920th–30th fusulinids became one of the important chronostratigraphic tools and are widely utilized in Donets Basin. F.S. Putrja, M.I. Sosnina, and especially G.D. Kireeva developed fusulinid taxonomy and biostratigraphy for the Moscovian-Kasimovian transition in Donets Basin.

Following fusulinid assemblages are recognized within Moscovian-Kasimovian transition in Donets Basin.

N_1 Limestone: *Beedeina majiensis* (Sheng), *Hemifusulina graciosa* (Lee), *H. bocki* Moeller, *Neostaffella spaheroidea* (Ehrenberg emend. Moell.), *Taitzehoella perseverata* (Saf.), *Fusiella spatiosa* Sheng, *F. praelancetiformis* Saf.

N_2 Limestone — *Protritictes ovatus* Putrja, *Fusulina intermedia* Rauser and Gryzlova, *F. mosquensis* (Rauser), *Quasifusulinoides quasifusulinoides* (Rauser), *Fusiella lancetiformis* Putrja, *F. paradoxa*, Lee and Chen, *F. praelancetiformis* Safonova, *Taitzehoella* sp. nov., *Pseudostaffella distorta* Pogrebnjak.

N_3 Limestone — *Pr. manukalovae* Kireeva, *Pr. parvus* Kireeva, *Pr. variabilis* Bensh, *Pr. subovatus* Bensh, *Quasifusulinoides quasifusulinoides* (Rauser), *Q. pulchellus* (Gryzlova), *Q. intermedius* (Rauser and Gryzlova), *Q. bosbiensis* Bogush, rare *Neostaffella luganskiensis* (Pogrebnjak), *Ozawainella* sp., *Fusiella paradoxa* Lee and Chen, *Schubertella* and *Eostaffella*.

The rest of Limestone of **N_3** group contains poorly preserved *Fusiella*, *Protriticites*, *Obsoletes* (in N_5 Limestone) and *Quasifusulinoides*.

O_1 Limestone — diverse *Obsoletes* and rare *Quasifusulina* (*Q. pseudotenuissima* Lev. and Dav.), *Montiparus montiparus* (Ehrenberg emend. Moeller), *M. paramontiparus* Rosovskaya, *Fusiella sagyrdashiensis* Davydov, *F. lancetiformis* Putrja etc.

O_1^1 Limestone — *Montiparus* become dominant and *Obsoletes* are rare in this limestone; first *Schwageriniformis*, i.e. *S. rosovskyi* (Kireeva) and *S. bellus* (Rosovskaja) are also found.

O_2 Limestone — contains *Schwageriniformis calitvicus* (Putrja), *S. karavanensis* (Bensh), *S. rarus* (Shlykova), *Quasifusulina pseudotenuissima* Leven and Davydov, *Q. eleganta* Shlyk., *Montiparus rhombiformis* Rosovskaya, *M. paramontiparus* Rosovskaya, *M. umbonoplicatus* Rosovskaya, advanced *M. subcrassulus* Rosovskaya, and rare *Obsoletes paraovoides* Bensh.

O_3 Limestone — only *Quasifusulina* and *Quasifusulinoides* are found there.

O_4 Limestone — *Quasifusulina* and *Quasifusulinoides* are dominated in this limestone; one specimen of *Rauserites dictiophorus* Rosovskaya, is also found.

O_4^1 and O_4^2 Limestone — predominantly *Rauserites* occur in this limestone, such as *R. panteleevi* Rauser, *R. triangulus* Rosovskaya, *R. quasiarcticus* (Solovieva), *R. elongatissimus* Rosovskaya, *R. pseudoarcticus* (Rauser), *R. irregularis rugosus* Rosovskaya, *R. henbesti* (Igo), R. *protorossicus* Davydov.

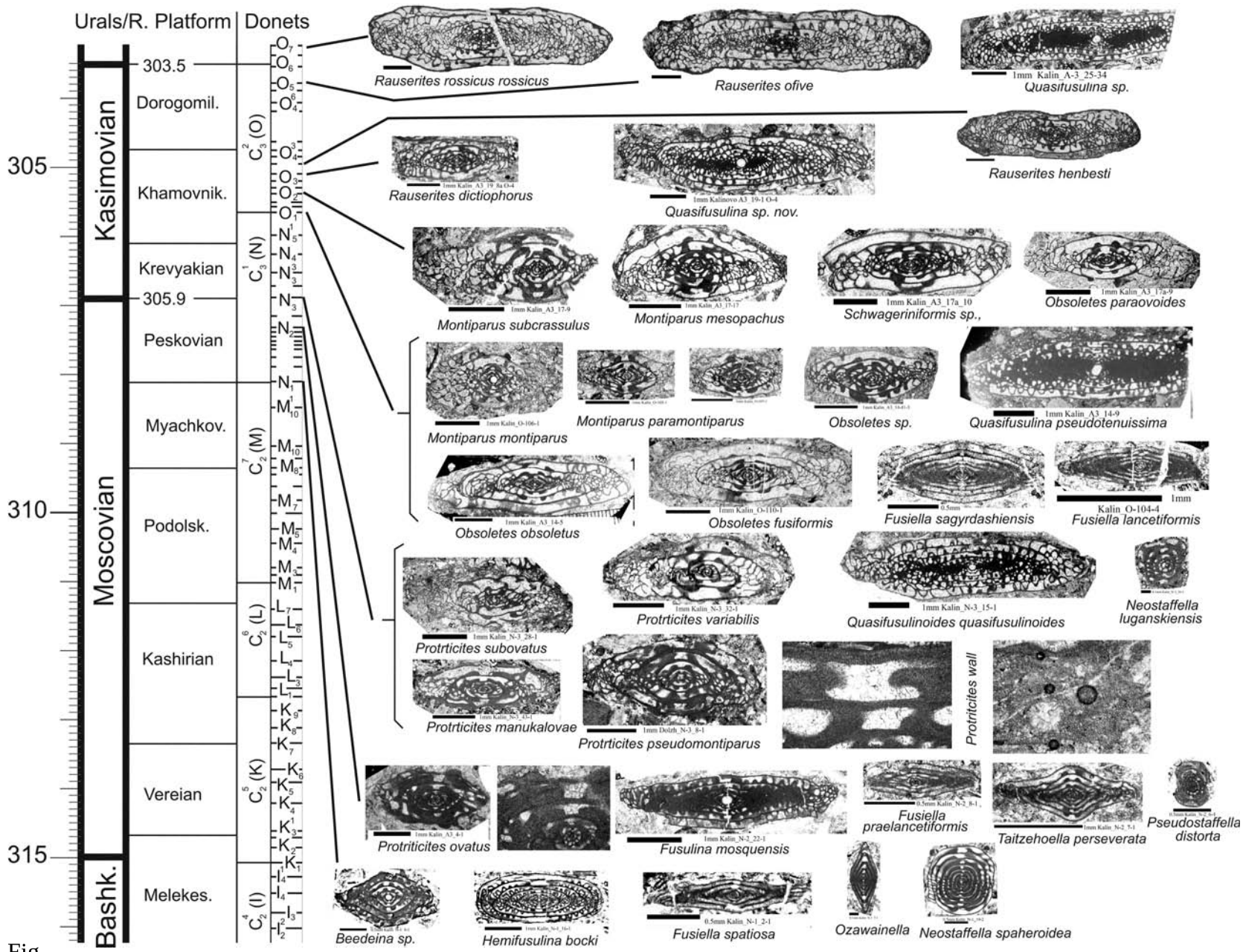
Urals/R. Platform
Donets
Kasimovian
Moscovian
Bashk.
Dorogomil.
Khamovnik.
Krevyakian
Peskovian
Myachkov.
Podolsk.
Kashirian
Vereian
Melekes.
303.5
305.9
305
310
315
Rauserites rossicus rossicus
Rauserites ofive
Quasifusulina sp.
Rauserites dictiophorus
Quasifusulina sp. nov.
Rauserites henbesti
Montiparus subcrassulus
Montiparus mesopachus
Schwageriniformis sp.,
Obsoletes paraovoides
Montiparus montiparus
Montiparus paramontiparus
Obsoletes sp.
Quasifusulina pseudotenuissima
Obsoletes obsoletus
Obsoletes fusiformis
Fusiella sagyrdashiensis
Fusiella lancetiformis
Protrticites variabilis
Quasifusulinoides quasifusulinoides
Neostaffella luganskiensis
Protrticites subovatus
Protrticites manukalovae
Protrticites pseudomontiparus
Protrticites wall
Protriticites ovatus
Fusulina mosquensis
Fusiella praelancetiformis
Taitzehoella perseverata
Pseudostaffella distorta
Beedeina sp.
Hemifusulina bocki
Fusiella spatiosa
Ozawainella
Neostaffella spaheroidea

Fig.

O_5 Limestone with *Rauserites ofive* Davydov, *R. henbesti* (Igo), *R. macilentus* Leven and Davydov, *Quasifusulina eleganta* Shlykova.

O_6 Limestone — the environmental conditions there were not favorable for fusulinids and only small *Schwageriniformis* and rare Rauserites such as *R. elongatissimus* Rosovskaya, *R. triangulus* Rosovskaya, and *Quasifusulina elongate* Shlyk., are found.

O_6^1 Limestone with silicified *Rauserites* and *Quasifusulina elongate* Shlykova, also contained one incomplete specimen of *Rauserites rossicus rossicus* (Schellwien)

O_7 Limestone — *Rauserites rossicus rossicus* (Schellwien), *R. jucundus* Leven and Davydov, *R. fortissimus* (Rauser), *R. postarcticus* (Rauser) etc.

Limestone N_1 contains typical Moscovian forms that in Moscow Basin characterized upper Myachkovian Domodedovo Fm [Davydov, 1997; Makhlina et al., 2001]. In N_2 Limestone rare *Quasifusulinoides* and yet primitive *Protriticites*, the first elements of Kasimovian fauna, appear along with typical Moscovian forms such as *Fusulina mosquensis* Rauser, *Taitzehoella perseverate* (Rauser) and single specimen of *Pseudostaffella distorta* (Pogrebnjak). Presence of *Quasifusulinoides* and primitive *Protriticites* suggest correlation of this limestone with Peskovian Horizon in Moscow Basin [Davydov, 1997, 2003]. Fusulinids in N_3 Limestone changed dramatically. Advanced *Protriticites* with thick wall penetrated with coarse pores (see Fig.) and *Quasifusulinoides* are dominated there. Only one specimen of *Neostaffella luganskiensis* (Pogrebnjak) has been found. In Moscow Basin similar assemblage of advanced *Protritcites* found starting from "lyska" local unit at the top of Peski Fm and extended into the Lower Krevyakian Suvorovo Fm [Davydov, 1997; Goreva et al., 2007]. Abundant *Obsoletes* that are found in O_1 Limestone suggest its correlation with the Upper Krevyakian Voskresensk Fm where *Obsoletes* first occur. However, *Montiparus montiparus* and *M. paramontiparus* that are also found in O_1 Lm of Donets Basin, in Moscow Basin occur only in top of Ratmirovo Fm [Davydov, 1997] or basal Nevero Fm [Goreva et al., 2007] of Khamovnikian Horizon. It seems that analogue of Voskresensk Fm in Donets Basin is he upper part of Isaevskaya (N) Fm (N_5 and N_5^1). O_1 Limestone correlates in Moscow Basin with basal and lower Neverovo Fm. Middle Neverovo of Moscow Basin where *M. subcrassulus* is found [Goreva et al., 2007] can be correlated with O_2 Limestone. The correlation of O_3 Limestone is uncertain because no characteristic faunas are found there. O_4 Limestone with first *Rauserites* definitely correlates in Moscow Basin with lower Dorogomilovian Perkhurovo Fm where *Rauserites* first occur [Makhlina et al., 1979]. O_4^1 through O_4^6 and O_5 Limestone correlate with middle and part of Dorogomilovian Horizon in Moscow Basin although fusulinids there are not well studied. Correlation of O_6 Limestone is not clear. Based on occurrence of *Rauserites rossicus,* O_6^1 and O_7 Limestone correlate with the Lower Gzhelian Upper Rusovkian Fm in Moscow Basin [Davydov et al., 2008], O_6 Limestone conventionally correlates with the Lower Rusovkian Fm.

Conclusions

1. Within the Donets Basin succession, the traditional base of Krevyakian can be placed at N_3 Limestone in Kalinovo section; the upper part of Krevyakian Horizon, Suvorovo Fm, correlates with N_5 and N_5^1 interval; Ratmirovo and Lower Neverovo of Khamovnikian Horizon correlate with O_1 and O_1^1 Limestone; Middle and Upper Neverovo — with O_2 and O_3 Limestone.

2. Only advanced *Protriticites* can be used to define the traditional base of Kasimovian Stage. The FAD of *Obsoletes* is higher at the base of Voskresensk Fm. Thus, Krevyakian Horizon in Moscow Basin can be divided into two fusulinid zones: *Protriticites pseudomontiparus* (Suvorovo Fm) and *Obsoletes obsoletus* (Voskresenk Fm). Consequently, in Donets Basin these two zones correspond to N_3–N_4 (*Protriticites pseudomontiparus*) and N_5–N_5^1 (*Obsoletes obsoletus*) intervals.

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