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Taxonomic diversity of the late Famennian - early Carboniferous foraminifers of the South Urals

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The taxonomic diversity of foraminifers from the Devonian-Carboniferous boundary beds was studied based on material from the key sections of the western slope of the South Urals in Russia (Zigan, Sikaza, Ryauzyak, Usuli) and the Berchogur sections of Kazakhstan. These sections are mainly composed of marine carbonates, apparently formed in a shallow-water environment.

This boundary interval includes the *Quasiendothyra communis*, *Q. kobeitusana*, *Tournayellina pseudobeata*, *Earlandia minima*, and *Chenyshinella disputabilis* foraminiferal zones of the Russian Scale. The *T. pseudobeata* Zone in the South Urals corresponds to the beds with remnant *Quasiendothyra*. The first appearance of the conodont *Siphonodella sulcata* is fixed within these beds. More than 110 species of 26 genera are identified in the Devonian-Carboniferous boundary interval (KOCHETKOVA *et al.* 1985, 1987). Ten genera are represented by unilocular and bilocular foraminifers (orders Parathuramminida, Earlandiida and Incertae sedis). The others are endothyrids and tournayellids. 41 species are determined in the *Q. communis* Zone. The number of foraminiferal species reaches 90 in the overlying zone, where the maximum diversification of the subfamily Quasiendothyrinae is recorded (in the taxonomy of RAUSER-CHERNOUSOVA *et al.* 1996). About 30 *Quasiendothyra* species and subspecies are recorded in this zone. The assemblage also includes species of *Septatournayella*, *Septaglomospiranella*, *Septabrunsiina*, *Tournayellina* (order Tournayellida).

The minimum species diversity is observed in the *Earlandia minima* Zone, where only 26 species are determined (Fig.1). Most of them unilocular taxa (*Archaesphaera* – 3 species, *Vicinesphaera* - 3, *Parathurammina* – 5, *Parathuramminites* – 3, *Bisphaera* – 5, *Eotuberitina* - 2). Bilocular forms are represented by *Rauserina notata*, *Earlandia minima* and *Caligella antropovi*. Of multi-locular foraminifers, only *Glomospiranella rara* and *Tournayellina cf. pseudobeata* are found in the *E. minima* Zone.

Species diversity begins to increase in the *Ch. disputabilis* Zone and reaches 60 in the overlying *P. tchernyshinensis* Zone due to radiation of the family Chernyshinellidae (Order Tournayellida). The total number of genera reaches 30. At the end of the Tournaisian, due to the extinction of tournayellids and the decreasing diversity of Tournaisian endothyrids, the species diversity drops to 50, in spite of the appearance of numerous short lived taxa.

Viséan and Serpukhovian deposits are widespread in the South Urals. The taxonomic diversity is studied in the sections of the west and east subregions of the Urals. In the early Viséan the species diversity increased from 80 in the *E. simplex* Zone to 100 in the *U. rotundus* Zone due to the rapid evolution of Archaediscida, Endothyrida and Staffellida. The number of genera increased to 50.

In the Late Viséan, species diversity reached its maximum for the Early Carboniferous. This time is characterized by maximum diversification of Endothyrida, Archaediscida, Palaeotextulariida, Ozawainellida (family Eostaffellidae).

At the Viséan-Serpukhovian boundary, species diversity almost halved compared to the underlying beds. More than 60 species known from the Upper Viséan did not continue into the Serpukhovian. At the same time the number of species of encrusting foraminifers increased, and several new eostaffellid and archaediscid (family Howchiniidae) species appeared. In total 45 new taxa appeared in the Serpukhovian, and after reaching maximum diversity in the *E. paraprotvae* Zone, species diversity again decreased.

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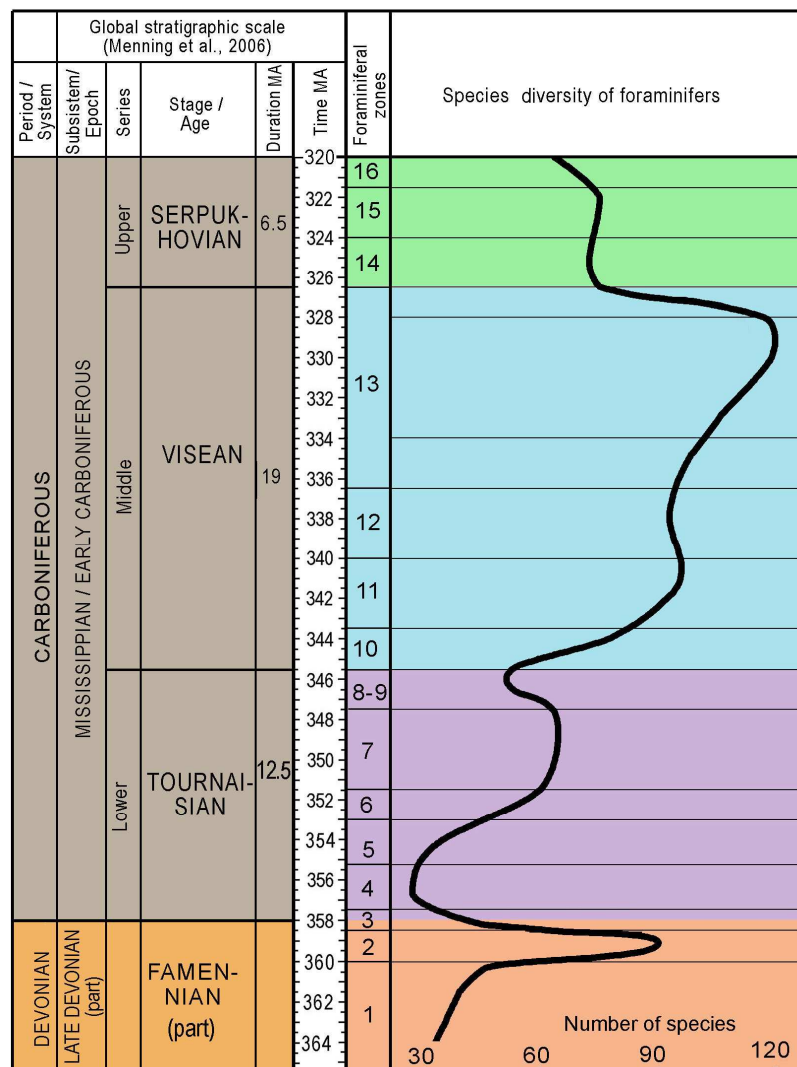


Fig. 1: The species diversity of the late Famennian - early Carboniferous foraminifers of the South Urals. 1-16 – the foraminiferal zones: 1 – *Quasiendothyra communis*, 2 – *Q. kobeitusana*, 3 – *Tourmayellina pseudobeata*; 4 – *Earlandia minima*; 5 – *Chernyshinella disputabilis*; 6 – *Palaeospiroplectamina tchernyshinensis*; 7 – *Spinoendothyra costifera*; 8 – *Eotextularia diversa*; 9 – *Eoparastaffella rotunda*; 10 – *E. simplex*; 11 – *Uralodiscus rotundus*; 12 – *Paraarchaediscus kochtjubensis*; 13 – *Endothyranopsis crassa* – *Archaediscus gigas* (3 subzones); 14 – *Neoarchaediscus postrugosus*; 15 – *Eostaffellina paraprotvae*; 16 – *Monotaxinoides transitorius*.