Ways of migrations and correlative potential of the Middle Oxfordian ammonites: new data from the Russian plate

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1. History.

Middle Oxfordian invasions of Boreal cardioceratids in the West European basins were investigated in detail, but it was not know about penetration of Submediterranean ammonites on the Russian platform at this time till now practically. In last works, where the sections of Middle Oxfordian were described (Mesezhnikov et al., 1989; Hantzpergue et al., 1998), the definitions of cardioceratids are given only, other ammonites were not mentioned.
Ammonites, which were described as *Gregoryceras* (Semenov, 1897; Ilovaisky, 1903), resembl more ancient *Rursiceras*. In essence, the only indication on presence submediterranean groups of ammonites in the Middle Oxfordian of the Russian plate was the article of D. Ilowaisky (1903), the description of a new species *Ochetoceras canaliculatoide* was given there.

2. Sections.

Two new sections, in which ammonite assemblages with mixed Boreal and Submediterranean elements are found, were studied by the author.

A). The right bank of the Raka river (near Boloshn'ovo village, Riasan area). In this section in the layer of the dark-grey clay with phosphorite nodules (around 0,2 m thickness) was collected: *Perisphinctes (Dichotomosphinctes) cf. antecedens* (Salfeld), *P. (Arisphinctes) plicatilis* (Sow.), *Gregoryceras romani (*Grossouvre), *G. tenuisculptum* Gygi, *Ochetoceras (Neoprionoceras) henrici* (Orb.) (near 20% of assemblage), *O. (N.) canaliculatoide* Ilov., *Glochiceras (Lingulaticeras) politum* (Opp.), *Cardioceras (Maltoniceras) schellwieni* Boden, *C. (Subvertebriceras) zenaidae* Ilov., *C. (Scoticardioceras) cf. laevigatum* Boden. This cardioceratid association appears to mark the boundary between *densiplicatum* and *tenuiserratum* Zones, probably the *zenaidae* Subzone.

B.). Stoylensk' Factory Pit (near Stary Oskol town, Belgorod area). In this section in the thin (5-10 cm) layer of glauconite sand with phosphorite nodules was collected Middle Oxfordian ammonites: *Cardioceras (Subvertebriceras) densiplicatum* Boden, *C. (Maltoniceras) maltonense* (Young et Bird), *C. (Subvertebriceras) zenaidae* Ilov., *C. (Maltoniceras) schellwieni* Boden, *C. (Scoticardioceras) ex gr. excavatum* (Sow.), *C. (Plasmatoceras) tenuicostatum* (Nikitin), *C. (Vertebriceras) cf. vertebrale* (Sow.), *Perisphinctes (Kranaosphinctes)* spp., *P. (Dichotomosphinctes) antecedens* Salfeld, *P. (D.)* spp., *Euaspidoceras cf. ovale* (Sow.), *E. ex gr. perarmatum* (Sow.), *Gregoryceras riazi* (Grossouvre), *Ochetoceras (Neoprionoceras) lautlingensis* (Rollier), *Glochiceras (G.) denticanaliculatum* Gygi. Overlying green alevrites with a phosphorite nodules contain the Upper Oxfordian ammonite association: *Amoeboceras damoni* Spath, *A. glosense* (Bigot et Brasil), *Larchelia cf. subschilli* (Lee), *Glochiceras (Coryceras) microdomum* (Opp.).

3. Migrations of the Submediterranean ammonites *Gregoryceras, Ochetoceras* and *Glochiceras* in the Middle Oxfordian: new paleobiogeorgaphical reconstruction.

The presence of Submediterranean ammonites in the Middle Oxfordian of the Russian plate can change our opinions on the ammonite migrations during the Middle Oxfordian. Great similarity in the ammonite assemblages of West Europe and Russian plate show to good connection of the Middle-Russian sea with the Poland sea (through Prip'at strait). During the Middle Oxfordian moments of the mass penetration of the Boreal ammonites on west and a Submediterranean ones on east (*densiplicatum* Chron and partly *tenuiserratum* Chron) coincided in time. Boreal *Amoeboceras* in the Late Oxfordian of Submediterranean province was rarely, as well as Submediterranean oppeliid's was rare on the Russian plate. That is why the Middle Oxfordian migration of ammonites most likely depend with a reduction of temperature gradient between Submediterranean and Boreal basins. In the Middle Oxfordian Arkell's "Boreal Spread" also was the "Submediterranean Spread" for the Russian plate.

At the same time the exchange between Northern Caucasus and Central Russian ammonite associations in the Middle Oxfordian was only in one direction: Boreal *Cardioceras* recorded in the Northern Caucasus (Matzkevitch et al., 1965), while the "Tethyan" Caucasian ammonites don't penetrate on the Russian plate.

4. Submediterranean ammonites in the Middle Oxfordian of the Russian plate and probable correlation of the *antecedens*-Subzone with the Boreal succession.

Ammonite assemblage in the lower part of *tenuiserratum* Zone (*zenaidae* Subzone) of the Russian plate contains numerous Submediterranean faunal elements. All this ammonites (listed *Gregoryceras, Ochetoceras, Glochiceras, Perisphinctes*) in the West Europe firstly appear in the *antecedens* Subzone (*plicatilis* Zone). This subzone also characterized by the last *Cardioceras* (*Maltoniceras, Subvertebriceras, Cawtoniceras, Miticardioceras*) (Enay, 1966; Gygi, 1977; Cariou et al., 1997). Migrations of ammonites occured at this time practically instantly (in scales of geological time). Accordingly, at least the bottom part of the Boreal *tenuiserratum* Zone is correlated with the Submediterranean *antecedens* Subzone.