The age of the Ruscinian lower boundary

Stáří spodní hranice Ruscinia

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Abstract. Ruscinian locality Novaja Stanica (West Siberia) with the fauna of primitive *Promimomys* and *Baranomys* is placed at the boundary of Chron 5 and Gilbert Chron. Late Turolian Kalmakpai locality (Kazakhstan) is placed at the lower part of Chron 5. The position of these sites in the magnetochronological scale makes it possible to access the age of the Ruscinain lower boundary at about 6 Ma (the end of Chron 5).

INTRODUCTION

Currently there is no common opinion on the age of the lower boundary of the Ruscinian, and, respectively, that of the zone MN14. A number of authors estimate this limit at about 4.9 Ma. In the magnetic polarity time scale the boundary is placed between the Thvera and Sidufjall Subchrons (OPDYKE et al. 1997, LINDSAY et al. 1997, FEJFAR et al. 1998, STEININGER 1999). Other researchers locate the lower boundary of the Ruscinian at about 5.3 Ma, below the Thvera Subchron (STEININGER et al. 1996, AZANZA et al. 1997, MEIN 1999).

The first accession is based on the interpretation of paleomagnetic data of the Cabriel South section (Spain), the second one is substantiated by finds of Ruscinian mammals in deposits correlated to lowermost parts of the Zanclean.

Still older age of the lower boundary of the Ruscinian, at the upper part of Chron 5, was suggested on the basis of materials from the Asian part of Russia and Central Asia (PEVZNER et al. 1996).

These controversies make us to review the problem again.

POSITION OF SOME REFERENCE LOCALITIES OF TERRITORY OF THE FORMER SOVIET UNION (FSU) WITHIN THE MAGETOCHRONOLOGICAL SCALE

The fauna of the terminal Turolian is known in the Kalmakpai locality (Eastern Kazakhstan). The bone bearing bed in this site is confined to normally magnetized deposits of the Karabulak Suite correlated to the beginning of the Chron 5 (VANGENGEJM et al. 1993).

O. FEJFAR drews the lower boundary of the Ruscinian (LBR) at the base of *Promimomys insuliferus* zone (FEJFAR et al. 1998). In the magnetic polarity time scale this zone is situated between base of the Sidufjall Subchron up to the base of the Nunivak Subchron. The LBR thus has an age of 4,9 Ma.

Localities with *P. insuliferus* in the European Russia occupy the similar position (Fig. 1).

Novaja Andrjaševka locality (Moldova) with *P. insuliferus* has an age of 4.4±0.06 Ma. This age was biometrically estimated with the use of the CK 92 (CANDE & KENT 1992) scale (PEVZNER & VANGENGEIM 1994). This scale accesses the age of the Sidufjall Subchron at 4.41–4.49 Ma. The precise position of the Antipovka and Čugunovka localities (Russia, middle Don River area), which also yielded *P. insuliferus*, in relation to the Novaja Andrjaševka cannot as yet be determined without close study of dental morphology of this form. However, the *P. insuliferus* from the Novaja Andrjaševka appear to be slightly more advanced than the same form from the two Don River localities. In Fig. 1 these localities are arbitrary placed near the level of the Novaja Andrjaševka locality, but the reversed magnetization of sediments in Antipovka indicates different ages for these localities. The Antipovka locality can thus be correlated with an interval of reversed polarity above or, more likely, below the Sidufjall Subchron.

Some researches consider the localities Antipovka and Čugunovka to be synchronous and cite their forms together in a composite faunal list (AGADŽANJAN & KOWALSKI 1978). But despite the close geographic position (less than 1 km), the faunas of the two localities are somewhat different. Though mammal remains are less numerous in collection from the locality Čugunovka, its fauna is more diverse than at Antipovka: There are 16 forms in the first locality and 12 forms in the second, with 8 forms common to both faunas. Apart from this, bone-bearing bed of the Čugunovka locality has a lower hypsometric position as compared with that of the Antipovka locality (SHIK 1985).

It is worth pointing that based on hypsodonty of *P. insuliferus* the type locality of this form, Podleşice, is likely almost synchronous to the Novaja Andrjaševka. Values of HH-index (as defined by RABEDER 1981) of lower m1 are respectively 0.441±0.039, s=0.087 (n=5) and 0.436±0.025, s=0.056 (n=5).

In Asian part of Russia *P. insuliferus* is known from multilayered locality in the Sarai Bay of the Ol'chon Island (Lake Baikal). This vole was found in the deposits of the Sasin Suite stratigraphically lower than Kharantsin Suite with Lower Villafranchian fauna (POKATILOV 1985).

At least two stratigraphic levels with *Promimomys* more primitive than *P. insuliferus* are known in Asian Russia between the late Turolian fauna of Kalmakpai and lower Ruscinian faunas with type *P. insuliferus*. These are faunas of Novaja Stanica and Čerlak in Irtyš River area of the Omsk region (Western Siberia). We accept the opinion of ZAŽIGIN & ZYKIN (1984) and FEJFAR et al. (1997) that these faunas also belong to the Ruscinian. Moreover they represent «new zone of the lowermost Ruscinian mammal age. The new mammal zone precedes temporally the range of *Promimomys insuliferus*...» (FEJFAR et al. 1997: 269). The faunas also include *Baranomys*. FEJFAR considers the appearance of this form as one of the markers of the beginning of Ruscinian.

The Novaja Stanica locality is associated with lacustrian deposits of the Novaja Stanica Suite uncomformably overlaying deposits of the Ishim Suite of lower part of Late Miocene. The lacustrian body contains two fossiliferous beds (ZAŽIGIN & ZYKIN 1984). The lower one is situated in normally magnetized deposits, the upper one is immediately above the inversion. According to ZAŽIGIN, faunas from both beds are identical. Geomagnetic inversion in this section is correlated with the boundary of Crhon 5 (C3An) and Gilbert Chron (ZYKIN et al. 1989, 1991, 1995).

The Čerlak locality yielded remains of *Promimomys* sp. more advanced than the form of Novaja Stanica but more primitive than *P. insuliferus*. The bone bearing layer is in reversely polarized deposits correlated to the lower part of Gilbert (C3r) (ZYKIN et al. 1991, 1995).

Thus, materials from the territory of FSU indicate that magnetochronological position of the LBR in the upper part of Chron 5. Its age is bracketed between 6.25 and 5.9 Ma.

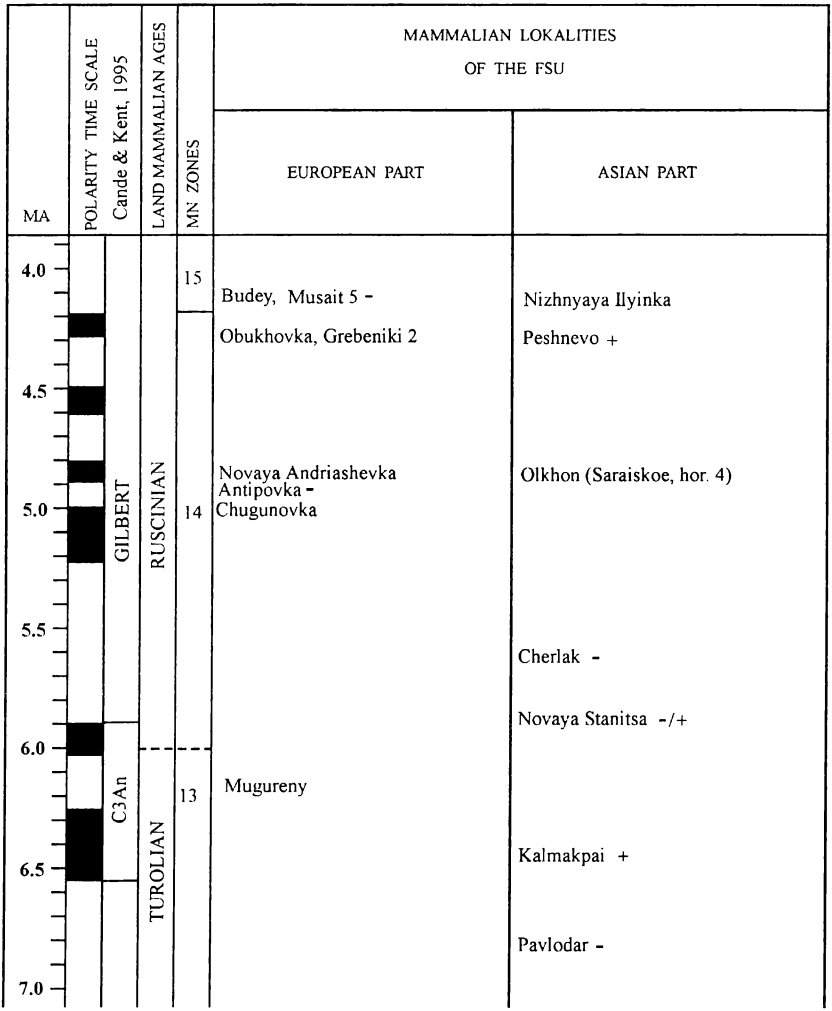

Fig. 1. Position of mammalian localities in the magnetochronologic scale: + normal polarity, – reversed polarity.

EUROPEAN LOCALITIES

Principal localities important for estimating age of LBR in Europe are La Alberca and Fuente del Viso in Spain. All investigators place La Alberca at the very end of Turolian (de BRUIJN et al. 1975, 1992). The site is associated with Messinian deposits that contains planctonic foraminiferas of zone 17 Blow scale or zone Mt10 of BERGGREN et al. (1995) scale. The age of the latter zone is estimated in the range of 7.2–5.6 Ma. Therefore, the age of La Alberca is not younger than 5.6 Ma. AGUILAR & MICHAUX (1997) place this locality into pre-evaporite part of the Messinian. Start of the Messinian salinity crisis is estimated at 5.8 Ma (BERGGREN et al. 1995). Consequently, the age of La Alberca is not younger than 5.8 Ma.

The locality Fuente del Viso (Cabriel basin) is confined to a series of lacustrian sediments and considered to be situated near the boundary of MN13 and MN14 (OPDYKE et al. 1997). Fossiliferous bed is in reversely magnetized deposits correlated to a reverse interval between the Thvera and Sidufjall Subchrons. LBR is dated to 4.9 Ma (base of the Sidufjall).

DISCUSSION

The giant age difference estimated for the otherwise faunistically similar localities of Fuente del Viso (4.9 Ma) and La Alberca (5.8 Ma) is striking. This discrepancy may be resolved if we take the initial OPDYKE's interpretation of paleomagnetic data of Cabriel (OPDYKE et al. 1989). According to it, the locality Fuente del Viso was placed in the middle part of the upper Subchron of Chron 5 (C3An1n) and its age (CK 95 scale – CANDE & KENT 1995) was estimated as 6 Ma. In paper of 1997 OPDYKE notes that «correlation to time scale requires a large change in sedimentation rate in the sedimentary basin which is not reflected in the lithologies» (OPDYKE et al. 1997: 142). However, judging the Fig. 7 of the quoted work, the lower part of the Cabriel South section is formed by predominantly fine grained sediments and the upper part of the section contains large amount of coarse material. This is a likely indication of a variable sedimentation rate.

The original interpretation of paleomagnetic data in the Cabriel section well matches the position of Ruscinian localities in the south of France (for instance, Vivès 2) in the base of the Zanclean (MPL1) and dated as 5.3 Ma and data on the localities Novaja Stanica and Čerlak (West Siberia) and Kalmakpai (East Kazakhstan).

CONCLUSIONS

The following points can be inferred from the discussion above. The date of 4.9 Ma for the LBR is disproved by date of French localities situated at the very base of the Zanclean (lower part of the Gilbert Chron). The date of 5.3 Ma for the beginning of the Ruscinian is falsified by the position of the Late Turolian (MN13) La Alberca locality (Spain) stratigraphically below the Messinian salinity crisis and age estimate of 5.8 Ma.

Data on Novaja Stanica and Čerlak with primitive *Promimomys* and *Baranomys* enable to place the LBR below inversion between Chron 5 and Gilbert. Taking the initial interpretation of the paleomagnetic data of the locality Fuente del Viso (MN13/14) (Spain within Subchron C3An1n, the lower boundary of the Ruscinian can be estimated at about 6 Ma.

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SOUHRN

Novaja Stanica, lokalita ruscinia na západní Sibiři s faunou původních rodů *Promimomys* a *Baranomys* je lokalisována na hranici epoch Chron 5 a Gilbert. Kalmakpai, lokalita pozdního Turolia v Kazachstánu je datována do spodní části epochy Chron 5. Posice těchto lokalit v magnetochronologické škále datuje spodní hranice ruscinia na zhruba 6 milionů let (konec epochy Chron 5).

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