

Identification of North Caucasian mole rats (*Spalax*) based on their karyotype description

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ZAGORODNIUK, I. Identification of North Caucasian mole rats (*Spalax*) based on their karyotype description. — The data on karyotypes of marginal forms of *S. microphthalmus* (act.) were analysed in light of the distribution of some chromosomal races. The most mysterious are the statuses of *Spalax* distributed in the south of Eastern Europe. These data were analysed based on the hypothesis that the range of *S. microphthalmus* ($2n = 60$) is limited to the Dnipro and Volga rivers in the latitudinal dimension and in the south to the Azov Upland. Accordingly, the mole rats from the Ciscaucasus in general and Stavropol Krai in particular should be attributed to *S. giganteus*. This hypothesis is supported by the karyotype data of ‘*S. microphthalmus*’ from the Stavropol region, with $2n = 62$ (according to: Dzuev & Shogenov 2003). Such 62-chromosomal race can be considered as an intermediate form between the typical *S. giganteus* from the Caspian region and *S. arenarius* from the Lower Dnipro Sands.

Introduction

Genus *Spalax* is represented in the fauna of Eastern Europe by five species, four of which have restricted distribution: *S. graecus*, *S. zemni*, *S. arenarius*, and *S. giganteus*. In different times, all of them were considered as subspecies of *S. microphthalmus* (s. l.), but after the revision of this group by V. Topachevsky [1969] all the species were recognised [e.g. Wilson & Reeder 2005]. Karyological revision of this group confirmed this viewpoint in general: these species have $2n = 62$ against $2n = 60$ in *S. microphthalmus* [Lyapunova *et al.* 1974 and others].

Moreover, according to the author’s hypothesis, the pair of species *arenarius*–*giganteus* had in the recent past a single continuous geographical range stretching across the steppes of the Northern Azov and North Caucasus, and some fragmentary data indicate that some southern refugia of the ‘common’ mole rat (‘*microphthalmus*’) actually contain representatives of the ‘giganteus’ group. This, in particular, was assumed by us for the ‘common’ mole rat from the Stavropol Krai [Korobchenko & Zagorodniuk 2009]¹.

¹ This text was sent to *Vestnik zoologii* in autumn 2009 as one-page short communication, which for some unknown reason was not published, so it is reproduced here, with a slightly expanded wording and the addition of abstract, table, figure, and references.

Results

Romanian *Spalax 'microphthalmus'*. A review of cytogenetic characteristics of mole rats together with biogeographical data allows clarifying some earlier identifications of studied samples. So, *Spalax 'microphthalmus'* from the Romanian Moldavia, Suceava [Raicu *et al.* 1968], should be re-identified as *S. graecus*. This erroneous identification happened because of the earlier consideration of all *Spalax* (s. str.) as *S. microphthalmus* (s. l.). This re-identification is completely clear and can be accepted without any doubts.

North Caucasian *Spalax 'microphthalmus'*. Another more important result was obtained after the revision of data on karyotype variation in East European *S. microphthalmus* (s. str.). All studied samples of this species have $2n = 60$: from Luhansk Oblast of Ukraine, and Rostov Oblast [Lyapunova *et al.* 1971, 1974; Martynova *et al.* 1975], Saratov Oblast [Belyanin *et al.* 1976], and Kursk Oblast [Puzachenko & Baklushinskaya 1997] of Russia (Table 1).

Table 1. Chromosome numbers of mole rats from Eastern Europe and neighbouring regions

Species	Locality	2n	NF _a	X	Y	Source
<i>giganteus</i>	Dagestan; West Kazakhstan Region; Aktobe Region, without details	62	120	St	?	[Lyapunova <i>et al.</i> 1971; 1974; Martynova <i>et al.</i> 1975; Lyapunova 2002]
<i>giganteus</i> (as ' <i>microphth.</i> ')	RF, Stavropol Region, Zheleznovodsk District; Kabardino-Balkaria, Prokhladny	62	120	M	St	[Dzuyev & Shogenov 2003]
<i>arenarius</i>	Ukraine, Kherson Oblast, Oleshky Sands; Mykolaiv Oblast, without details	62	120	M	St	[Lyapunova <i>et al.</i> 1971, 1974; Martynova <i>et al.</i> 1975; Lyapunova 2002]
<i>graecus</i>	Ukraine, Chernivtsi Oblast, Storozhynets Raion, Mykhalchi	62	120	M	St	[Lyapunova <i>et al.</i> 1971, 1974; Martynova <i>et al.</i> 1975; Lyapunova 2002]
<i>graecus</i> (as ' <i>microphth.</i> ')	Romania, Moldova, Suceava, Boia	62	116	Sm	St	[Raicu <i>et al.</i> 1968]
<i>zemni</i> (as ' <i>podolicus</i> ')	Ukraine, Kyiv Oblast, Pushcha-Vodytsia	62	120	M	St	[Martynova <i>et al.</i> 1975; Lyapunova 2002]
<i>microphthalmus</i>	Ukraine, Luhansk Oblast, Milovsky Raion; RF, Rostov region, Bataysky district*	60	116 (112)	M	St	[Lyapunova <i>et al.</i> 1971, 1974; Martynova <i>et al.</i> 1975; Martynova 1977; Lyapunova 2002]
<i>microphthalmus</i>	RF, Kursk region, Streletska-ya steppe, etc. (Kursk and Medva districts, Central Black Earth Reserve)	60	111–112	St	St	[Puzachenko & Baklushinskaya 1997]

Notes: * in Samara region $2n = 60$ with $NF = 82$ [Belyanin *et al.* 1976].

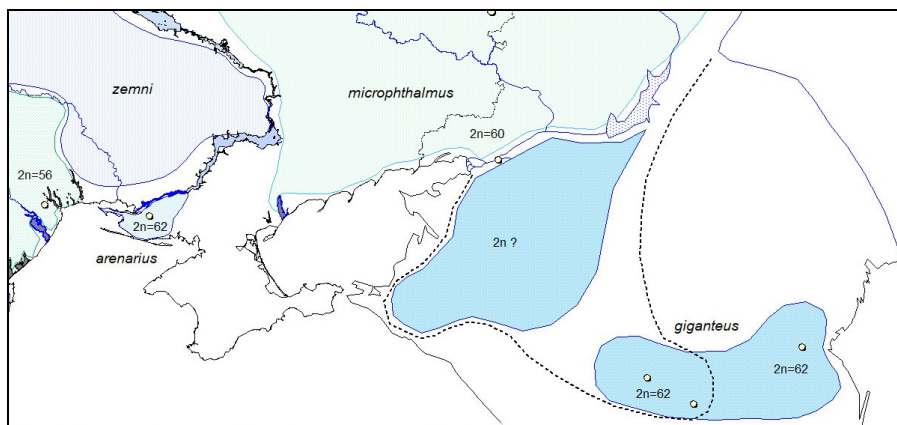


Fig. 1. Geographical ranges of the Eastern European mole rats and the place of *Spalax arenarius* and the North Caucasian '*microphthalmus*' re-identified as *S. giganteus* based on karyotype descriptions (after: [Korobchenko & Zagorodniuk 2009], with changes). The dotted line marks the south-eastern loop of the range of *S. microphthalmus* after: [Pavlinov *et al.* 2002].

Рис. 1. Географічні ареали східноєвропейських сліпаків і місце *Spalax arenarius* та північно-кавказьких '*microphthalmus*', перевизначених нами за описами як *S. giganteus* (after: [Korobchenko & Zagorodniuk 2009], зі змінами). Пунктирна лінія — південно-східна петля ареалу *S. microphthalmus* за: [Pavlinov *et al.* 2002].

A new description of the karyotype of '*S. microphthalmus*' from the North Caucasus (Stavropolsky Krai, vic. of Zheleznovodsk city; Kabardino-Balkaria, vic. of Prokhladny city) showed a karyotype of $2n = 62$ and $NF = 124$ [Dzuyev & Shogenov 2003]. These data differ from descriptions listed above, but the cited authors pointed their accordance to the karyotype of Romanian '*microphthalmus*', which is considered here as distant species, *S. graecus* (see above).

Comparison of this description with others shows a close similarity of this karyotype with the group '*giganteus*', whose nearest population is distributed in Dagestan (distance is about 200 km). The latter has the same chromosome numbers: $2n = 62$ and $NF = 124$ [Lyapunova *et al.* 1971; 1974; Martynova *et al.* 1975; Lyapunova 2002]. Earlier, V. Topachevsky [1969: p. 216] supposed a separate (subspecies) status for the North Caucasian *S. 'microphthalmus'*.

Hypothesis on *Spalax giganteus* in the North Caucasus. Both traditional and modern views on the taxonomy and distribution of mole rats restrict the range of *Spalax giganteus* to NE Caucasus [Puzachenko 1993]. More recent studies have shown the presence of *S. giganteus* on sandy arenas in the Kursk district of Stavropol Krai, in particular in the vicinity of 'villages of Aga-Batyr and Yuzhanin, as well as the channel of the Terek-Kuma canal between the villages of Aga-Batyr and Irgakly' [Tsapko 2016]. Revision of chromosome data allows re-identifying the North Caucasian mole rats as a new taxonomic form that is not identical to *S. microphthalmus* and can be attributed to the '*giganteus*' group. These data relate

to much more western parts of the Stavropol Krai, in particular Zheleznovodsk and Prokhladny (Kabardino-Balkaria), leaving little scope for assumptions about the distribution of *S. microphthalmus* here. It is also noteworthy that the Stavropolian mole rats are described as the most typical for sandy habitats [Tsapko 2016], which is also very typical for the Lower Dnipro *S. arenarius* [Selyunina & Tlusta 2001].

Probably, the Kuma-Manych depression that separates the East European Plain from the North Caucasian steppes is the natural border between *S. microphthalmus* (s. str.) and *S. giganteus*. Taking into account that the ‘giganteus’ group includes two mole rat species, *S. giganteus* (North Caucasus) and *S. arenarius* (Lower Dnipro region) [Topachevsky 1969], it can be considered as a result of range fragmentation in this species, similarly to many other allospecies pairs of steppe rodents.

In particular, similar situation is observed in such pairs of taxa as *Sylvaemus falzfeini* and *S. fulvipectus* (supraspecies *Sylvaemus witherbyi*), *Sciropoda telum falzfeini* and *S. t. turovi*, *Microtus socialis nikolajevi* and *M. s. parvus*, and many other pairs. The author designates the western isolated segment of this group as DEG (Dnipro Endemic Group) [Zagorodniuk 2019].

Thus, data on chromosomal variability of mole rats allow assuming a wide distribution range of the ‘giganteus’ group in the North Caucasus, from Dagestan to Stavropol Krai, and, probably, up to the Azov Sea. Moreover, these data, including *S. arenarius* being part of the ‘giganteus’ superspecies, suggest not only a continuous, but also a much more northern distribution of this superspecies in the Northern Azov and North Caucasus regions in the recent past, after which the range was reduced and fragmented with the formation of ‘small’ species of this group, including *S. arenarius*, *S. giganteus*, and *S. uralensis*.

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Резюме

ЗАГОРОДНЮК, І. Ідентифікація північнокавказьких сліпаків (*Spalax*) на основі опису їхнього каріотипу. — Проаналізовано відомості про каріотипи маргінальних форм *S. microphthalmus* (auct.) з огляду на поширення окремих хромосомних рас. Найбільш загадковими є статуси *Spalax*, поширених на півдні Східної Європи. Такі дані проаналізовано з огляду на гіпотезу про те, що ареал *S. microphthalmus* ($2n = 60$) є обмеженим межиріччям Дніпра і Волги з широтному розрізі та на південь до Приазовської височини. Відповідно, сліпаків із Передкавказзя загалом і Ставропілля зокрема необхідно відносити до *S. giganteus*. Цю гіпотезу підтверджують дані щодо каріотипу «*S. microphthalmus*» зі Ставропілля із $2n = 62$ (за описами в: Dzuев & Shogenov 2003). Така 62-хромосомна раса може розглядатися як проміжна форма між типовими *S. giganteus* з Прикаспію та *S. arenarius* з Нижньодніпровських пісків.