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Research Article

Karyotype of *Nannospalax ehrenbergi* (Nehring 1898) (Rodentia: Spalacidae) in the Mosul Province, Iraq

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Abstract

The karyotypes of mole rats *Nannospalax ehrenbergi* (Nehring 1897) from two closely located populations from Mosul province, Iraq, were investigated. The karyotype of this form was $2n = 52$, $NF = 76$, $NFa = 72$ which consists of 11 pairs of metacentric/submetacentric autosomes, and 14 pairs of acrocentric autosomes. The X chromosome was large and metacentric, whereas the Y chromosome was small and acrocentric. The species occurrence in Iraq, based on literature overview and the present study, was updated. Karyotypic data for the *Nannospalax ehrenbergi* from Iraq are presented for the first time.

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Introduction

Mole rats (family Spalacidae) are subterranean rodents which occupy dry and arid grassland regions of the eastern Mediterranean and eastern Europe (Ognev, 1947; Topachevskii, 1969).

According to the different systematic views, the family Spalacidae consists of either a single genus, *Spalax*, or two genera, the nominal one and *Nannospalax* (for historical overview see Musser and Carleton 2005). According to the latter taxonomy, *Nannospalax* differs from the *Spalax* by the presence of supracondyloid foramina above the occipital condyles of the skull (Ellerman, 1940; Ellerman and Morrison-Scott,

1951). *Spalax* karyotypes have high diploid and fundamental numbers, no acrocentric chromosomes, whereas *Nannospalax* have low diploid and fundamental numbers (Lyapunova et al., 1974; Savić and Nevo, 1990; Zima and Kral, 1984). The genus name *Nannospalax* was used in this paper as a different full genus.

The Palestine mole rat *Nannospalax ehrenbergi* (*sensu lato*) (Nehring, 1897) was first described by Nehring in 1897, on the basis of specimens collected from Jaffa (the territory of modern Israel). This East Mediterranean species is distributed in the Middle East, southern Anatolia (Coşkun et al. 2006 and reference therein) and coastal North Africa (Lay and Nadler, 1972; Ranck, 1968). Although the occurrence of this species is known in Iraq (Bate, 1930), its range and biological peculiarities have

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not yet been documented in detail.

Information on the taxonomy of the family Spalacidae from Iraq is far from satisfactory. Cheesman (1920) saw mounds and tunnels of a species of mole rats in Mosul province, which does not occur in South Iraq. Bate (1930) has stated that the *Spalax* cf. *ehrenbergi* lives near Sulaimania. Reed (1958) regarded the mole rats of prehistoric Jarmo, Chemchamal Valley of eastern Kirkuk, as *Spalax leucodon*. Hatt (1959) doubted whether two species were actually found in Iraq, since he reported *S. leucodon* from northern Iraq, while Harrison (1956) identified the spalacids from the same part of the country (Ser 'Amadia and Tinn, near Bermaneh, near Amadia) as *S. ehrenbergi*. Harrison (1956) pointed out that *S. ehrenbergi* is distinguished from *S. leucodon* by the features of the third upper molar. Turnbull and Reed (1974) assigned specimen from Palegawra cave in the Baranand Dagh, part of the southwestern foothills of the Zagros Mountains, northeastern Iraq to *Spalax leucodon*. Later, Harrison and Bates (1991) considered mole-rats of Iraq as *S. leucodon*.

Mole rats from Iraq are geographically in contact with the Turkish populations and reach the southeastern limit of their range, but records of mole rats from Iraq were very scarce. Until recently in this country the species has been confused with *S. leucodon*. Until now, no karyotypic information on mole rats was available for any populations in Iraq. The aim of this study was to present karyotypes of Iraqi mole rats, in order to fill at least partly this gap in our knowledge.

Materials and Methods

Mosul is characterized by a semi-arid climate with extremely hot, almost rainless summers and cool, rainy winters. Topographically, this region is extremely flat with great alluvial plains. Mosul, although not at a particularly high elevation (ranges 200-350 m), still receives much more rain than most of Iraq. The relative humidity is usually very low, especially in summer. Average annual rainfall is about 360 mm in the Mosul province. The daily temperatures generally range between 20°C and 40°C in summer, and between 5°C and 15°C in winter.

The karyotypes of two male and one female speci-

mens, one male from 22 km southwest of Mosul (36° 10' N, 43° 03' E, Fig. 1) and the others from Al-Jurn village at 27 km southwest of Mosul (36° 08' N, 43° 01' E) were subjected to chromosomal analysis. Bone marrow metaphase chromosomes were obtained as described by Lee and Elder (1980). Slides were conventionally stained with 4% Giemsa solution. Well-spread metaphases were recorded using a camera attached to a microscope. Karyotypes were prepared from the best metaphases. Chromosomes were paired according to position of the centromere and chromosome size. The fundamental number of chromosome arms (NF) and autosomal number of chromosome arms (NFa) were computed by counting bi-armed autosomes as two arms and acrocentric autosomes as one arm. All slides and voucher specimens were deposited in the Department of Biology, Faculty of Science, University of Dicle, Turkey.



Figure 1 – Sampling localities and geographical range of *Nannospalax ehrenbergi* in Iraq. (▲: Old records) 1. Near Sulaimania (Bate, 1930), 2. Near Mosul (Cheesman, 1920), 3. Sarsank (Hatt, 1959), 4. Ser 'Amadia and Tinn (Harrison, 1956), 5. Jarmo, Chemchamal Valley (Reed, 1958), 6. Jarmo, Palegawra Cave (Turnbull and Reed, 1974), 7. Al-Jurn (★: This study).

Results and Discussion

All specimens had a supracondyloid foramen above both sides of the occipital condyles and two enamel islands on the chewing surface of the third upper molar, and three rooted upper molars were present. The anterior surface of the upper incisors had two longitudinal ridges. All these characters agree with the diagnosis of *N. ehrenbergi* given by Nehring (1897), Topachevskii

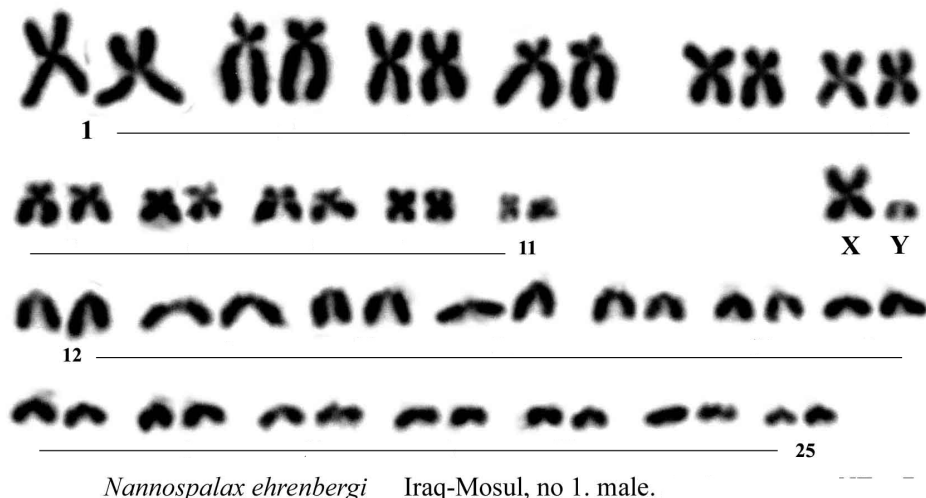


Figure 2 – Standard karyotype of *Nannospalax ehrenbergi* in Mosul province (Al-Jurn), Iraq.

(1969) and Ellerman (1940).


Karyotypes of all studied animals consist of 11 pairs of metacentric/ submetacentric autosomes (no. 1-11), and 14 pairs of acrocentric autosomes (no.12-25), $2n = 52$, $NF = 76$, $NFa = 72$. The X chromosome is large and metacentric, whereas the Y chromosome is small and acrocentric (Fig. 2). The first pairs of metacentric autosomes are the largest chromosomes in the karyotype.

This chromosomal set matches that of the most common Turkish *N. ehrenbergi*, which is known for several localities in Southeastern Anatolia (Coşkun et al., 2006, 2010).

The map in Fig. 1 is based on literature data from Bate (1930); Cheesman (1920); Harrison (1956); Hatt (1959); Reed (1958); Turnbull and Reed (1974) and on our own observations.

The report of the Lesser mole-rat, *Spalax leucodon* in Iraq (Harrison and Bates, 1991; Hatt, 1959; Reed, 1958; Turnbull and Reed, 1974) is undoubtedly an error, although this species occurs in the Balkans and East Europe. On the contrary, our findings allow us to state that all specimens from Iraq recorded by earlier authors as *leucodon*, *ehrenbergi*, etc. belong to the species *Nannospalax ehrenbergi*.

It is clear that the present state of our general knowledge on many aspects of the biology of mole rats in Iraq (including population size,

habitat preference, karyotype diversity, etc) is limited. Further researches involving the whole Iraqi population of *Nannospalax ehrenbergi* is needed to describe chromosomal forms and clarify their taxonomy. 

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