



WISSENSCHAFTLICHE KURZMITTEILUNGEN

Two new karyotypic forms of *Spalax leucodon* (Nordmann, 1840) (Mammalia: Rodentia) from Turkey

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The subterranean mole rats belonging to the family Spalacidae are distributed in southeastern Europe, Asia Minor, Caucasus, Transcaucasus, Ukraine, Armenia, Syria, Palestine, Iraq, Israel, Jordan, and northeastern Africa (OGNEV 1947; ONDRIAS 1966; LAY and NADLER 1972; CORBET 1978; GIAGA et al. 1982; NEVO 1991; HARRISON and BATES 1991). As yet, about 40 chromosomal forms of *Spalax* have been reported in the literature from these areas.

According to the most recent morphological studies there are two species (*S. leucodon* and *S. ehrenbergi*) and nine subspecies (*S. l. nehringi*, *S. l. armeniacus*, *S. l. cilicicus*, *S. l. anatolicus*, *S. l. turcicus*, *S. l. tuncelicus*, *S. e. intermedius*, *S. e. kirgisorum*, and *S. e. nevoi*) of blind mole rats in Turkey (KIVANÇ 1988; COŞKUN 1996 a, b). However, the results from karyological studies revealed seven karyological forms ($2n = 38, 40, 50, 54, 56, 60,$ and 62) of *S. leucodon* and four karyological forms ($2n = 52, 54, 56,$ and 58) of *S. ehrenbergi* in Turkey, and the number of chromosome arms (NF) for *S. leucodon* and *S. ehrenbergi* varied from 74 to 82 and from 72 to 90, respectively (SOLDATOVIC and SAVIC 1978; SAVIC and SOLDATOVIC 1979; YÜKSEL 1984; GÜLKAÇ and YÜKSEL 1989; YÜKSEL and GÜLKAÇ 1992, 1995; NEVO et al. 1994, 1995; IVANITSKAYA et al. 1997). NEVO et al. (1994, 1995) stated that each of the chromosomal forms is a separate biological species. They also examined the populations using Nei's genetic distance between populations obtained by allozyme electrophoresis and claimed that some populations having identical diploid chromosome numbers are different biological species, presumably representing about 20 such species in Turkey.

The karyotypes of 4 specimens from Sebil and 3 specimens from Gülek belonging to *Spalax leucodon* were analysed here (Fig. 1). Chromosome preparations from bone marrow were made in accordance with FORD and HAMERTON (1956), and about 30 metaphase cells of each animal were examined. The karyotype preparations and animals examined were deposited in the Department of Biology, Faculty of Science, University of Ankara.

The diploid karyotype of the Sebil population is composed of $2n = 52$, $NF = 72$, $NFa = 68$. The X chromosome is a medium sized submetacentric, and the Y chromosome is a small acrocentric. The autosomal set can be divided into three groups: 3 pairs of submetacentrics, 6 pairs of subtelocentrics and 16 pairs of acrocentrics (Fig. 2).

The Gülek population has $2n = 56$, $NF = 72$, and $NFa = 68$. The X chromosome is a medium sized metacentric, and the Y chromosome is a small acrocentric. The autosomal set has a pair of metacentrics, 2 pairs of submetacentrics, 4 pairs of subtelocentrics, and 20 pairs of acrocentrics (Fig. 2).

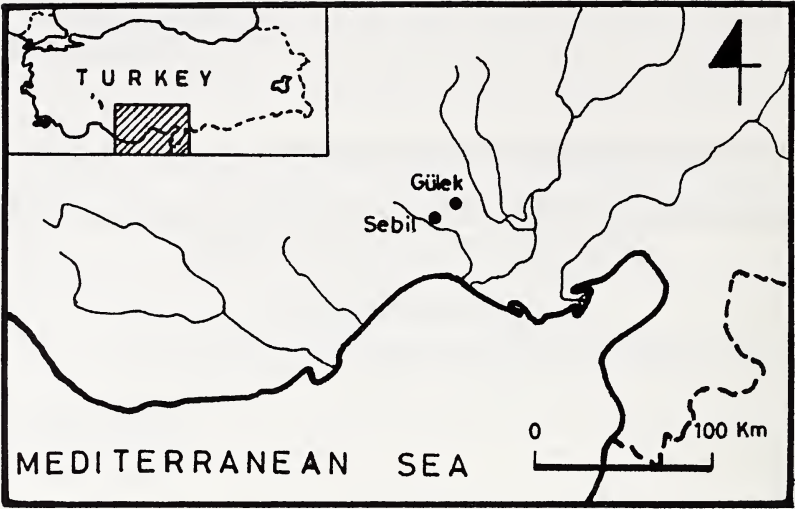


Fig. 1. The location of Gülek and Sebil in Turkey

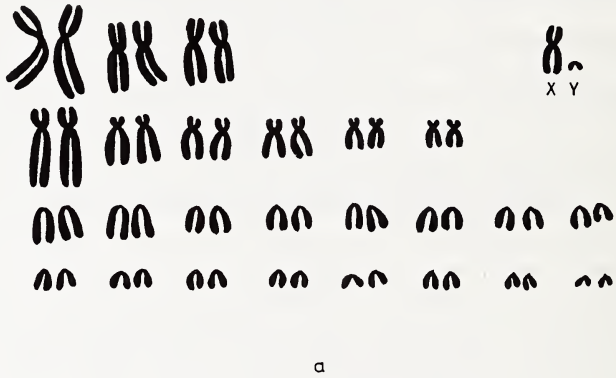


Fig. 2. The karyotype of a male *Spalax leucodon* from Sebil (a), and a male from Gülek (b)

Table 1. Chromosomal records of *Spalax leucodon* (Nordmann, 1840) and *Spalax ehrenbergi* Nehring, 1898 from Turkey.

<i>Spalax leucodon</i> (Nordmann, 1840)						
Locality	2n	NF	NFa	X	Y	Reference
Çorlu and Karaevli (in Thrace)	56	78	74	sm*	a*	SOLDATOVIC and SAVIC (1978)
Havran and Selçuk	38	74	70	st*	a	SAVIC and SOLDATOVIC (1979)
Malatya	60	78	74	sm		IVANITSKAYA et al. (1997)
Malatya	60	80	76	sm	st	YÜKSEL (1984)
Malatya and Yazihan	60	80	76	sm	st	GÜLKAÇ and YÜKSEL (1989)
Arguvan	60	82	78	sm	–	GÜLKAÇ and YÜKSEL (1989)
Kırşehir, Nevşehir and Kayseri	60	80	76	sm	st	YÜKSEL and GÜLKAÇ (1995)
Yozgat	54	74	70	sm	st	YÜKSEL and GÜLKAÇ (1995)
Balıkesir and İzmir	38					NEVO et al. (1994, 1995)
Beysehir	40					NEVO et al. (1994, 1995)
Aydın, Erzurum and Sankamış	50					NEVO et al. (1994, 1995)
Bolu and Bingöl	54					NEVO et al. (1994, 1995)
Denizli, Pınarbaşı and Malatya	60					NEVO et al. (1994, 1995)
Kütahya, Afyon, Konya, Sivas, Ankara, Kayseri, Havza, Suşehri	62					NEVO et al. (1994, 1995)
Gülek	56	72	68	sm	a	this study
Sebil	52	72	68	sm	a	this study
<i>Spalax ehrenbergi</i> Nehring, 1898						
Locality	2n	NF	NFa	X	Y	Reference
Elazığ	52	76	72	sm	st	YÜKSEL (1984)
Adıyaman and Hilvan	52	76	72	m*	st	YÜKSEL and GÜLKAÇ (1992)
Suruç	54	76	72	m	st	YÜKSEL and GÜLKAÇ (1992)
Gaziantep	56	90	86	m	st	YÜKSEL and GÜLKAÇ (1992)
Diyarbakır and Urfa	52	76	72			NEVO et al. (1994, 1995)
Gaziantep	58	82	78			NEVO et al. (1994, 1995)
Tarsus	56	72	68			NEVO et al. (1994, 1995)
Tarsus	56	72	68	m	–	IVANITSKAYA et al. (1997)
Gaziantep	56	82	78	sm	–	IVANITSKAYA et al. (1997)
Birecik, Siverek, Diyarbakır, Elazığ	52	76	72	sm	–	IVANITSKAYA et al. (1997)
Urfa	52	80	76	sm	–	IVANITSKAYA et al. (1997)

* m: metacentric, sm: submetacentric, st: subtelocentric, a: acrocentric

The diploid karyotype of *Spalax leucodon* in Turkey varies between $2n = 38$ and 62 , $NF = 72$ and 82 , and $NFa = 68$ and 78 . *Spalax ehrenbergi*'s diploid karyotype also varies between $2n = 52$ and 58 , $NF = 72$ and 90 , and $NFa = 68$ and 86 (Tab. 1).

The sex chromosomes are variable in both *S. leucodon* and *S. ehrenbergi*. In most populations of *S. leucodon* in Turkey, the X chromosome was described as submetacentric (SOLDATOVIC and SAVIC 1978; YÜKSEL 1984; GÜLKAÇ and YÜKSEL 1989; YÜKSEL and GÜLKAÇ 1992, 1995; IVANITSKAYA et al. 1997), and only in two populations of western Turkey as subtelocentric (SAVIC and SOLDATOVIC 1979). The Y chromosome is acrocentric (SOLDATOVIC and SAVIC 1978; SAVIC and SOLDATOVIC 1979), or subtelocentric (YÜKSEL 1984; GÜLKAÇ and YÜKSEL 1989; YÜKSEL and GÜLKAÇ 1992, 1995). We found the X chromosome to be submetacentric in the Sebil population, and metacentric in the Gülek population. The Y chromosome is acrocentric in both populations. In *S. ehrenbergi* populations, the X chromosome is submetacentric (YÜKSEL 1984; IVANITSKAYA et al. 1997) or metacentric (YÜKSEL and GÜLKAÇ 1992; IVANITSKAYA et al. 1997), and the Y chromosome is subtelocentric (YÜKSEL 1984; YÜKSEL and GÜLKAÇ 1992).

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