

1-1-1999

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ÖZKURT, ŞAKİR; ÇOLAK, ERCÜMENT; YİĞİT, NURİ; SÖZEN, MUSTAFA; and ÇOLAK, REYHAN (1999) "Contributions to the Karyology and Morphology of *Arvicola terrestris* (Lin., 1758) (Mammalia: Rodentia) in Central Anatolia," *Turkish Journal of Zoology*: Vol. 23: No. 3, Article 7. Available at: <https://journals.tubitak.gov.tr/zoology/vol23/iss3/7>

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Contributions to the Karyology and Morphology of *Arvicola terrestris* (Lin., 1758) (Mammalia: Rodentia) in Central Anatolia

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Received:20.11.1998

Abstract: The bacula, phalli and karyotypes of 15 specimens of *Arvicola terrestris* were examined. The external and cranial morphology of this species were found to be the same as in previously published papers. The baculum consist of proximal and distal bacula. The phallus is covered with spines. The karyotype has karyological values of $2n= 36$, $NF= 64$ and $NFa= 60$. The X chromosome is medium-sized submetacentric and the Y chromosome is medium-sized acrocentric.

Key Words: *Arvicola terrestris*, baculum, phallus, karyotype, Central Anatolia

Orta Anadolu'daki *Arvicola terrestris* (Lin., 1758) (Mammalia: Rodentia)'in morfoloji ve Karyolojisine Katkılar

Özet: Bu çalışmada 15 *Arvicola terrestris* örneğinin bakulum, phallus ve karyotipi incelendi. Bu türün eksternal ve cranial karakterleri daha önce yayınlanmış literatürle uyumlu bulundu. Bakulum distal ve proksimal bakulumdan ibarettir. Phallus diken benzeri çıkıntılarla kaplıdır. Karyotip $2n= 36$, $NF= 64$ ve $NFa= 60$ 'lik karyolojik değerlere sahiptir. X kromozomu orta büyüklükte submetasentrik Y kromozomu ise orta büyüklükte akrosentriktir.

Anahtar Sözcükler: *Arvicola terrestris*, bakulum, phallus, karyotip, Orta Anadolu

Introduction

Arvicola terrestris occurs in Europe, Russia, Turkey, Iran and Palestine (1-5). Mursaloğlu (4) examined the subspecific status of *A. terrestris* and recorded its three subspecies from Turkey. Also, Steiner and Vauk (6) noted two specimens from Lake Beyşehir. These studies are based on recording specimens along with the morphological aspects of this species. The aim of the present study was to examine the karyological, bacular and phallic characteristics of *A. terrestris*.

Materials and Methods

This study was performed based on 15 specimens belonging to *A. terrestris*, captured in Kırşehir province. The external and cranial characters were measured according to the method of Harrison and Bates (5). The bacula and phalli were prepared in accordance with Lidicker (7). Six specimens were karyotyped from the bone marrow of the colchicined animal (8). Twelve slides were prepared from each animal, and twenty-five

metaphase cells, whose chromosomes were well separated, were examined in order to determine the diploid number of chromosomes ($2n$), the fundamental number (NF), and the number of autosomal arms (NFa) as well as the metacentric (m), submetacentric (sm), telocentric (t), acrocentric (a), and sex chromosomes (X and Y).

Results

Arvicola terrestris (Lin., 1758)

Habitat: *A. terrestris* lives in nests, which are built on *Typha* sp. in brooks, made of dry grasses and galleries in banks of dams and lakes.

Distribution: The specimens examined were collected from Kırşehir province.

External characters: Maximum total length is 322 mm (Table 1). The fur on the dorsal aspect is the same as in the fur of the camel in coloration, the bases of hairs are dark gray, becoming lighter towards the flanks. The eyes

Characters	n	Mean	Range	±SD
Total length	15	293.9	274-322	21.33
Head and body length	15	174	151-195	11.97
Tail length	15	122.3	111-136	9.14
Hind foot length	15	35.59	34-38	1.52
Ear length	15	17.7	17-20	1.05
Weight (g)	15	130	110-144	15.0
Zygomatic breadth	15	23.0	21.9-24.1	0.6
Interorbital constriction	15	4.89	4.6-5.2	0.13
Condylobasal length	15	37.13	36.3-38.2	0.99
Occipitonasal length	15	38.84	37.2-40.2	0.99
Basal length	15	35.67	33.7-36.8	1.22
Nasal length	15	10.48	9.8-11.4	0.48
Nasal width	12	4.65	4.3-4.9	0.22
Mastoid breadth	15	12.24	11.5-13.2	0.31
Height of braincase	12	12.97	12.5-13.4	0.40
Braincase length	10	15.6	14.6-16.1	0.55
Braincase width	14	14.4	13.9-15.1	0.22
Palatal length	14	21.89	20.9-22.7	0.37
Bullae length	14	9.5	8.9-10.1	0.25
Diastema	14	13.2	12.3-13.6	0.42
Foramen incisiva	14	6.5	5.8-7.0	0.30
Occipital width	14	14.86	14.3-15.4	0.62
Mandible length	14	25.47	24.0-26.9	0.71
Upper molar alveolar length	10	9.87	9.6-10.3	0.30
Lower molar alveolar length	10	9.97	9.7-10.4	0.23

Table 1. Measurements (mm) of the external and cranial characters of *Arvicola terrestris* (n: number of specimens, SD: Standard Deviation).

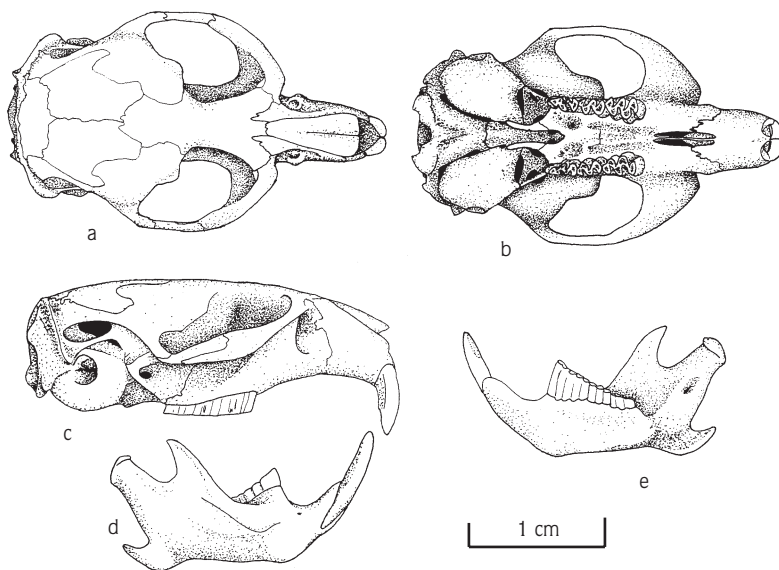


Figure 1. The skull of *Arvicola terrestris* a) Dorsal b. Ventral c. Lateral view d-e. Mandible

are small, the ears are concealed by long hairs. The underparts are gray. The tail is sparsely hairy, dorsally reddish brown, ventrally lighter brown. The hind and fore feet are dorsally covered with tiny brown hairs. The claws are naked and brown in coloration.

Cranial characters: The nasal bones are short, the anterior ends of the nasals do not extend to the alveoli of the upper incisors (Fig 1). The upper incisors are prodont without groove, dark-orange in coloration. The upper and lower molars are rootless. $M^1, M_1,$ and M^3 have five

closed enamel areas, M^2 and M_2 have 4, and M_3 has 3 (Fig. 2).

Baculum: The baculum consists of proximal and distal bacula. The median part of the distal baculum is 0.75 mm. ($n=5$) in length, it is longer than lateral ones. The proximal baculum contains a tiny shaft and a laterally expanded base. It is 2.5 mm. ($n=5$) in length, and the base is 1.6 mm. in width (Fig.3).

Phallus: The phallus is fist-shaped and covered with spines (Fig. 4).

Karyology: The diploid number of chromosomes is $2n=36$, the fundamental number is $NF=64$, the number of autosomal arms in $NFa=60$. The autosomal set has 18 metacentrics, 8 submetacentrics and 8 acrocentric chromosomes. The X chromosome is medium-sized submetacentric, and the Y chromosome is medium-sized acrocentric (Fig 5).

Discussion

We did not examine the subspecific status of the specimens because 19 specimens belonging to a single locality were evaluated. Comparison showed that the morphological and cranial characteristics of Turkish specimens are consistent with those of specimens examined by Ognev (2) from Russia, 75 specimens by Mursaloğlu (4) from Anatolia and a few specimens by Harrison and Bates (5) from Iraq. Ognev (2) described the baculum and phallus of *A. terrestris* from Russia. It was determined that the baculum given by Ognev (2) is different from that of Turkish specimens. According to Ognev (2) the phallus of specimens from Russia is naked, whereas that of Turkish specimens is completely covered with spines. Kuliev et al. (9) examined the karyology of *A. terrestris* from Novosibirsk and Azerbaijan and found $NF=72$ in the Novosibirsk population and $NF=66$ in the

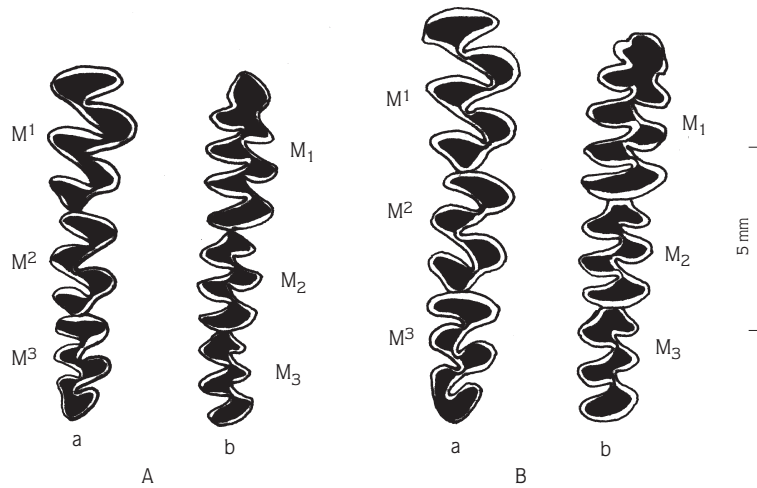


Figure 2. Upper (a) lower (b) tooth row of *Arvicola terrestris*
A. Young B. Adult

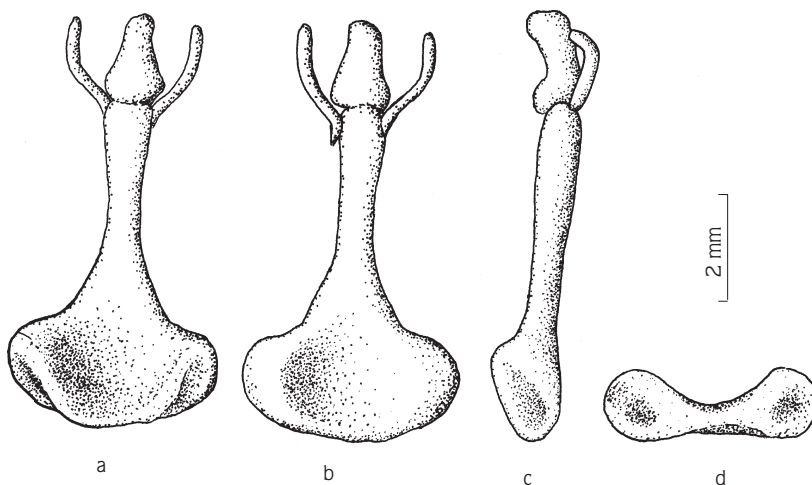


Figure 3. Baculum of *Arvicola terrestris*
a. Dorsal b. Ventral c. Lateral
d. Basal view

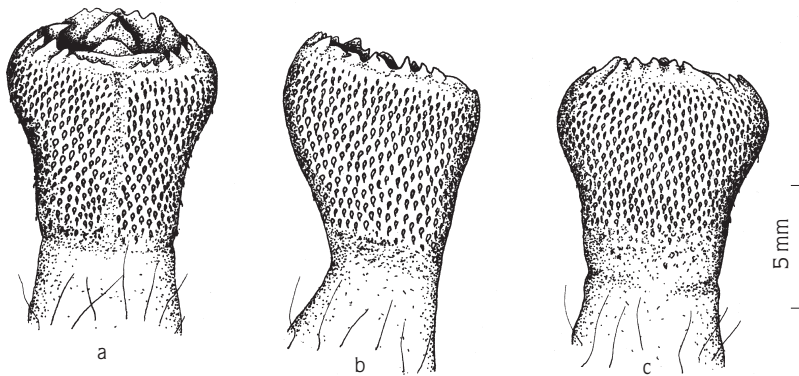


Figure 4. Phallus of *Arvicola terrestris*
a. Ventral b. Lateral c. Dorsal view

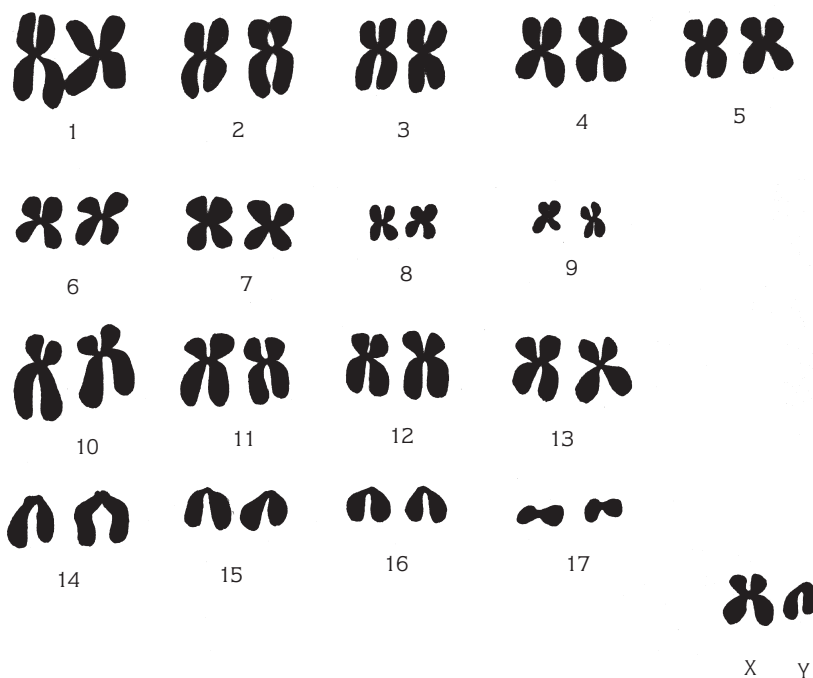


Figure 5. Karyotype of male *Arvicola terrestris*

Azerbaijan population. Zima and Kral (10) described the karyotypes of European populations as $2n=36$ chromosomes, $NFa=60-68$, 13 pairs of meta-submetacentrics and 4 pairs of subtelo-acrocentrics, the X chromosome is submetacentric and the Y chromosome is acrocentric. The karyotype with four acrocentric pairs

was described in Romania (11), and in one locality in Caucasia (9). These findings show that there are variations in the karyotype of *A. terrestris*. Also, the karyotype of the Turkish population seems to be similar to both that of the European and that of Caucasian population.

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