

Two new locality records extend the distribution of *Microtus anatolicus* Kryštufek and Kefelioğlu, 2002 (Mammalia: Rodentia) into Antalya Province in Turkey

Mustafa YAVUZ^{1,*}, Mehmet ÖZ¹ and İrfan ALBAYRAK²

1. Akdeniz University, Faculty of Arts and Sciences, Department of Biology, Campus, 07058 Antalya, Turkey

2. University of Kırıkkale, Faculty of Sciences and Arts, Department of Biology, 71450 Kırıkkale, Turkey

* Corresponding author: M. Yavuz, E-mail: myavuz@akdeniz.edu.tr, myavuz2002plus@yahoo.com,

Tel: +90 242 227 89 00 Ext: 2336 or 2347, Fax: +90 242 227 89 11

Abstract. Additional records for *Microtus anatolicus* Kryštufek and Kefelioğlu, 2002 which were trapped from the two localities; Bozdoğan and Kozan in Antalya Province, is reported along with their morphological measurements and karyological features and some ecological characteristics of the localities. These are the first records for *M. anatolicus* from these two localities, the first records from Antalya Province. Therefore the species distributional range is extended to the south of Central Mediterranean Region of Turkey into the Taurus Mountains.

Keywords: *Microtus anatolicus*, Anatolian vole, new localities, distribution, Antalya

Introduction

When Kefelioğlu and Kryštufek (1999) first identified this population, they refrained from designating it a new species until the characterization of *M. irani* was improved. This was later accomplished by Kryštufek and Kefelioğlu (2002), who described significant morphological traits that distinguish it from their new species, *M. anatolicus* (no chromosomal data are available for *M. irani* from its type locality) (Wilson & Reeder 2005).

The first record of *Microtus anatolicus* Kryštufek and Kefelioğlu, 2002 is from Yapalı Village, Cihanbeyli, which lies in Aksaray Ovası, Konya, Turkey. This is one of the driest parts of Turkey (Kefelioğlu & Kryštufek 1999). Moreover, this is the only record for this species until our study was

established. The acquired data extend the known distributional range of *M. anatolicus* from Konya Province into the Taurus Mountains of Antalya Province, a distance of about 180 km to the south.

This paper reports additional records for *M. anatolicus* which were trapped from two localities; Bozdoğan (530m; 37°15'05.91"N, 30°55'09.95"E) and Kozan (600m; 37°13'31.55"N, 30°55'45.72"E), Antalya Province, which is in the Mediterranean Region of the south western part of Anatolia, Turkey (Fig.1). Some morphological measurements of the vole samples and ecological characteristics of the localities are also presented.

Materials and methods

This research is based on 28 (10 ♀♀; 18 ♂♂) dead individuals, taken from arid habitats found within

the Bozdoğan (19 indiv.) and Kozan regions (9 indiv.) during 12 -16 July 2007. The specimens were prepared using the standard skin and skull pre-

parations. These fixed specimens are deposited in the collection of the Faculty of Arts and Sciences, Department of Biology, Akdeniz University.



Figure 1. Map of southern Turkey showing locations of study sites.
(* : new localities, ⊕ : known localities)

Field studies and observations

The samples were taken so that densities could be calculated for the various sites in these two study areas. Fifty snaptraps and 10 Sherman live traps were placed at each site with the habitat features at each trap site being specified. Snaptraps were set at suitable locations two hours before sunset on the day of arrival in the field, and checked the following morning one hour before sunrise or at sunrise (snaptrapping). Only one trap was placed in 10 m², approximately. All of the Sherman traps were set in the morning and checked the following morning. If any live individuals were caught, they were karyotyped in accordance with the technique of Ford and Hamerton (1956). Twenty-five metaphase cells were examined from each animal karyotyped. The bait used in the traps consisted of roasted peanuts mixed with some chewed bread. Each site was surveyed for a total of three days (2 sites x 3 days x 50 snaptraps), for a total of 300 trap-nights in the study as a whole.

Laboratory studies

The voles were determined by the morphology of the cranium as described by Sözen et al. (1999), and also by the morphology of the molars according to Ognev (1947). Baculum preparations were made according to Lidicker (1968).

Body measurements were taken from each individual (total, hind foot, ear and tail length). Skulls and bacula were measured with a micrometer with

accuracy of up to 0.01 mm. Weights were recorded by using a digital scale with accuracy of up to 0.1 g. The cranial measurements used in this study are as follows (see Fig. 2): Occipital width (Ow), Zygomatic width (Zb), Braincase width (Bw), Interorbital constriction (Ic), Nasal breadth (Nb), Basal length (Bl), Palatal length (Pl), Foramen incisivum length (Fl), Tympanic bullae length (Tbl), Length of facial region of the skull (Lfcs), Condylbasal length (Cbl), Occipito-nasal length (Ol), Height of braincase with the bullae (Hbb), Height of braincase without the bullae (Hb), The maxillary tooth row (C-M3), Diastema length (DI), Nasal length (NI), Mandibular length (M).

Bacular measurements taken (see Fig. 3) were Baculum tip width (Bctw), Baculum width (Bcw), Baculum base height (Bch), Baculum length (Bcl), Distal Baculum length (Dbcl).

Results and Discussion

Morphological Features

M. anatolicus resembles *M. guentheri* but is smaller in size. Contrary to *M. guentheri*, which is normally brown with buff, yellow, or reddish shades on the dorsum, the type series of *M. anatolicus* is pale greyish buff in colour. The venter is greyish and tinged

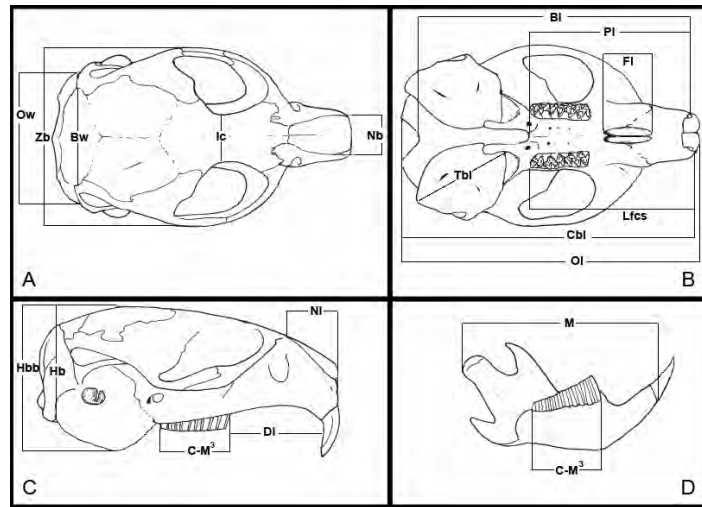


Figure 2. Cranial and mandibular measurements of *Microtus anatolicus* taken in this study: Dorsal (A), Ventral (B), Lateral (C) view of cranium and Medial (D) view of mandible.

with buff due to the slate-blackish bases of hairs. Flanks are yellowish-redish buff, and the line of demarcation along the flanks is distinct. Feet are whitish and soles of the forefeet are naked. The soles of the hind feet are sparsely covered with yellow hairs. The tail is indistinctly bi-coloured (greyish above, whitish below).

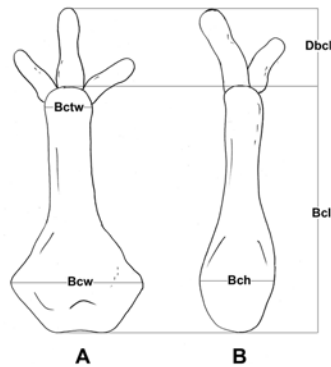


Figure 3. Bacular measurements of *M. anatolicus* taken in this study:

dorsal view (A) and Lateral view (B)

Diagnosis: Total length is min=121, max=147 mm with a mean of 138.02 ± 11.27 mm (n=28), while the tail length/total length has a mean = 0.16 ± 0.03 mm (Table 1). The braincase is very broad with enlarged mastoid part of the tympanic bullae. The nasal bones and rostrum are very short and blunt. The occipital condyles are not seen in the dorso-planar view of the skull. The skull is deep, with heavy zygomatic arches and large bullae.

Baculum: Eleven bacula of *M. anatolicus* were examined. It consists of a tapered proximal bone with a bulbous tip, its distal part connected to the proximal bone. The distal baculum was removed in preparation. The proximal bone is min=2.98, max=4.10 mm with a mean of 3.75 ± 0.28 mm (n=11) in length. The basal width has a min=1.66, max=2.12 mm and a mean of 1.79 ± 0.16 mm (n=11). There is a poorly developed concavity on the base that is pointed in lateral

view (Fig.3). All of the results of the morphological characters are given in table 1.

Ecological Observations at The Study Sites

M. anatolicus colonies are easy to spot due to large burrow entrances (diameter 4-8 cm; means: 6.3 cm) interconnected by runways (Fig. 4). The approximate density of holes was 5 per 10 m². Individuals are active all day long. Unlike *M. guentheri*, *M. anatolicus* lives in uncultivated areas and dry habitats at the study localities. It was observed that

vole burrow systems are generally made in the unplowed soft soil which is not flooded in the cultivated areas. *M. anatolicus* was found in particularly high numbers in uncultivated arid zones (Fig. 5).

The average day time temperatures of the sites were recorded as 31 and 29° C respectively. In addition, *Mus musculus* and *Apodemus sylvaticus* were trapped in the same locality. Shrubs such as *Prunus domestica*, *Pyrus communis*, and *Crataegus sp.* were observed at the study sites.

Table 1. Body, skull, and baculum measurements used in this study of *M. anatolicus*

Characters	Individuals (n)	Min - Max	Mean ± SE
Weight (g)	28	29.60-46.20	36.51±2.78
Total Length	28	121.04-147.22	138.02±11.27
Hind foot L.	28	18.77-23.36	20.40±2.25
Ear Length	28	09.77-13.68	11.43±1.18
Tail Length	28	19.66-24.73	22.04±2.01
Ow	28	12.71-14.89	13.08±0.66
Zb	28	13.22-16.86	14.78±0.28
Bw	28	5.89-8.02	6.94±0.26
Ic	28	3.35-4.40	3.75±0.26
Nb	28	2.96-3.72	3.21±0.24
Bl	28	22.98-26.82	24.28±0.73
Pl	28	12.25-14.02	13.05±0.57
Fl	28	4.02-4.89	4.44±0.32
Tbl	28	6.91-10.72	8.42±0.51
Lfcs	28	17.00-18.76	17.54±0.72
Cbl	28	25.78-29.92	27.01±0.82
OI	28	25.11-28.57	26.53±0.71
Hbb	28	9.82-12.08	11.87±0.33
Hb	28	9.33-10.55	9.48±0.23
C-M3	28	5.38-6.83	6.14±0.11
DI	28	7.33-8.54	8.05±0.19
NI	28	6.87-7.94	7.49±0.30
M	28	14.80-16.64	15.03±0.78
Bctw	11	0.28-0.43	0.38±0.18
Bcw	11	1.66-2.12	1.79±0.16
Bch	11	0.46-0.88	0.67±0.12
Bcl	11	2.98-4.10	3.75±0.28
Dbcl	-	-	-



Figure 4. Burrow entrances interconnected by runways.



Figure 5. A view of the habitat of *M. anatolicus* at Bozdoğan 17.07.2007.

Karyological Features

Only one different karyotypes belonging to *M. anatolicus*, a karyotype consisting of $2n = 60$, $NFa = 58$, and $NF = 62$ was determined. A total of 29 autosomes pairs are acrocentrics. The X chromosome is a large-sized acrocentric and the Y chromosome is a medium-sized acrocentric (Fig. 6).

Conclusions

According to the results, the skull and baculum morphometry, colour pattern, and body size characteristics of *M. anatolicus* specimen are in agreement with the description of this species published by Kryštufek and Kefelioğlu (2002); see Fig. 7. Also the



Figure 7. *M. anatolicus*: dorsal (A) and ventral (B) views.

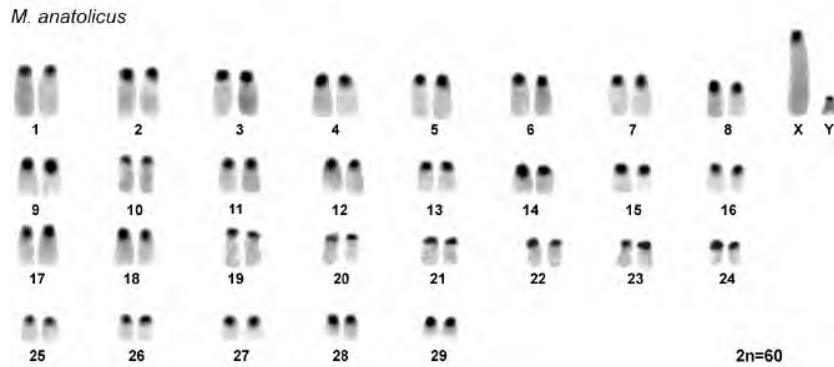


Figure 6. The karyotype of *M. anatolicus*.

skull and baculum measurements are in agreement with those reported for this species by Kefelioğlu and Kryštufek (1999) and Kryštufek and Vohralik (2005).

Consequently, this paper records an extension of the known distribution of *Microtus anatolicus* at about 180 km south-west of the Taurus Mountains in south-central Turkey. We also provide new information on habitat features, population sizes, and burrow characteristics.

Acknowledgements. This work is a part of the Doktora Thesis by Mustafa Yavuz, which was supported by the Akdeniz University Research Fund (Project No: 2005.03.0121.012).

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Submitted: 04 August 2008

/ Accepted: 21 September 2009

Published Online: 22 November 2009