

## Karyological and Some Biological Features of the *Microtus levis* (Miller, 1908) (Mammalia: Rodentia) at the Eleven New Localities on Taurus, West Mediterranean Region in Turkey

Mustafa YAVUZ<sup>1</sup>

Mehmet ÖZ<sup>1</sup>

İrfan ALBAYRAK<sup>2</sup>

<sup>1</sup> Akdeniz University, Faculty of Sciences, Department of Biology, Campus 07058 Antalya, TURKEY

<sup>2</sup> University of Kırkkale, Faculty of Sciences and Arts, Department of Biology, 71450 Kırkkale, TURKEY

\*Corresponding Author

e-mail: myavuz@akdeniz.edu.tr

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### Abstract

Additional records for *Microtus levis* (Miller, 1908), which were trapped from the eleven localities; Seki, Yazır, Korkuteli, Bozova, Kızılkaya, Kozan, Kocaaliler, Bozdoğan, Gebiz, Kasımlar and Derebucak on North and South of the Taurus, West Mediterranean Region of Turkey, is reported along with their morphological measurements and karyological features and some ecological characteristics of the localities. These are the first records for *M. levis* from these eleven localities. Therefore the species distributional range is extended to the South-Western of Mediterranean Region of Turkey into the Taurus Mountains.

**Keywords:** *Microtus levis*, East European Vole, new localities, distribution, Taurus

### INTRODUCTION

According to Wilson and Reeder [1]; Subgenus *Microtus*, into *arvalis* species group [2, 3, 4, 5]. Populations referable to this European species ( $2n = 54$ , FN = 56), first separated from *M. arvalis* by Meyer et al. [6], have been listed or discussed as *subarvalis* [7], *epiroticus* [8], or *rossiaemeridionalis* [9]. Nomenclatural usage reviewed by Fredga [10] and Masing [11] consolidated reports over the last 30 years spread under those epithets. Finally, the senior status of *levis* remains provisional.

*M. levis* (Miller, 1908) East European Vole is one of the *arvalis* group in the two species in Turkey. The first records of this species by Dogramacı [12] as *M. rossiaemeridionalis*. Then in 1995, in his study Kefelioğlu [13] *epiroticus* has used the species epithet. In some studies [14,15], including Turkey species, *M. rossiaemeridionalis* continues to be considered. However, revisions in recent years around the world [1] *M. rossiaemeridionalis* and *M. epiroticus* is treated as the synonym of *M. levis*. Therefore, in this study, the systematics of mammals are known to be the source of the latest and most extensive revision in 2005 by Wilson and Reeder [1], taking into account the species epithet of *Microtus* was used as *levis*.

Turkey has been very few studies are available regarding *M. levis*. Therefore, the biology and ecology of the species is not well known [16]. Doğramacı [12], then the first record, Kefelioğlu [13] the distribution of the species in his study, morphometry and gave information on the karyotype. Then, Yigit et al. [16] study conducted by the laboratory and field conditions, reproductive biology and postnatal development is written about *M. rossiaemeridionalis*. In general, *M. levis* moist high meadows, streams, lakes and plenty of clovers and vegetation are known to live at the edges [14, 15].

In this study, the acquired data extend the known distributional range of *M. levis* from North of the Taurus to the South-Western of Mediterranean Region of Turkey into the South of the Taurus Mountains. This paper reports additional records for *M. levis* which were trapped from eleven localities; Seki, Yazır, Korkuteli, Bozova, Kızılkaya, Kozan, Kocaaliler, Bozdoğan, Gebiz, Kasımlar and Derebucak on North and South of the Taurus, in the south western part of Mediterranean Region in Anatolia, Turkey (Fig.1). In addition, these localities, the first records for the given *M.levis* new biotopes. Some morphological measurements of the East European Vole samples and ecological characteristics of the localities are also presented.

### MATERIALS AND METHODS

This research is based on 76 (52 ♂♂; 24 ♀♀) dead individuals, taken from moist high meadows, at the edges of active and semi-dry streams and plenty of clovers habitats found within the 1-Seki (1120m, 12 (8 ♂♂; 4 ♀♀)), 2-Korkuteli (980m, 6 (5 ♂♂; 1 ♀♀)), 3-Yazır (820m, 4 (3 ♂♂; 1 ♀♀)), 4-Bozova (850m, 4 (2 ♂♂; 2 ♀♀)), 5-Kızılkaya (810m, 15 (9 ♂♂; 6 ♀♀)), 6-Kozan (630m, 6 (5 ♂♂; 1 ♀♀)), 7-Kocaaliler (600m, 14 (9 ♂♂; 5 ♀♀)), 8-Bozdoğan (400m, 1 (1 ♂♂)), 9-Gebiz (380m, 1 (1 ♂♂)), 10-Kasımlar (720m, 4 (3 ♂♂; 1 ♀♀)) and 11-Derebucak (1000m, 9 (6 ♂♂; 3 ♀♀)) during July-September 2007 (Fig. 1). The specimens were prepared using the standard skin and skull preparations. These fixed specimens are deposited in the collection of the Faculty of Sciences, Department of Biology, Akdeniz University.

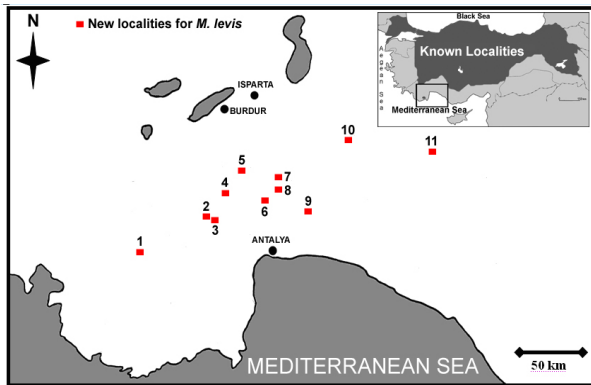


Figure 1. Map of southern Turkey showing locations of study sites.

**Field studies and observations**

The samples were taken so that densities could be calculated for the various sites in these eleven study areas. Fifty snaptraps and 10 Sherman live traps were placed at each site with the habitat features at each trapsite 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 m<sup>2</sup>, 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 [17]. 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 (11 sites x 3 days x 50 snaptraps), for a total of 1650 trap-nights in the study as a whole.

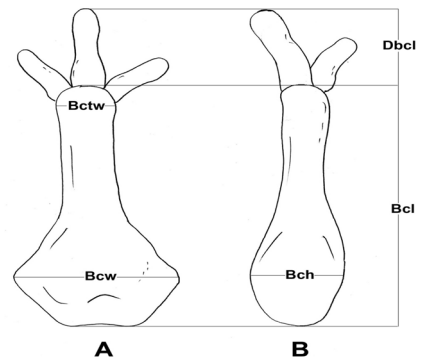


Figure 3. Bacular measurements of *M. levis* taken in this study: dorsal view (A) and Lateral view (B)

**Laboratory studies**

The voles were determined by the morphology of the cranium as described by Sözen et al. [18], and also by the morphology of the molars according to Ognev [19]. Baculum preparations were made according to Lidicker [20].

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 (BI), Palatal length (Pl), Foramen incisivum length (FI), Tympanic bullae length (Tbi), Length of facial region of the skull (Lfcs), Condylobasal length (Cbl), Occipito-nasal length (OI), Height of braincase with the bullae (Hbb), Height of braincase without the bullae (Hb),

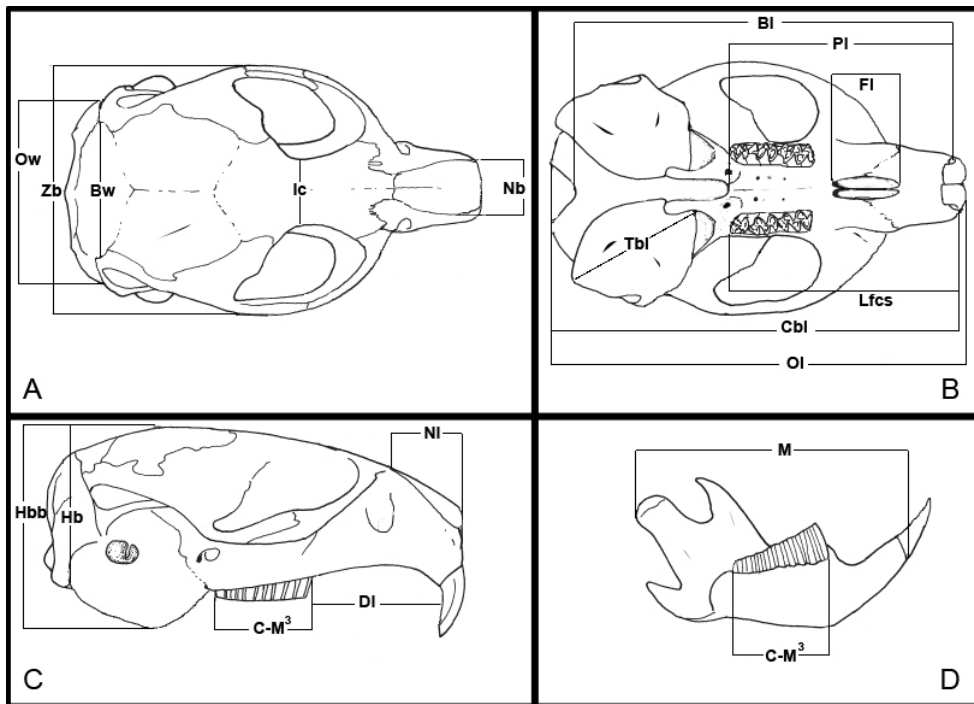
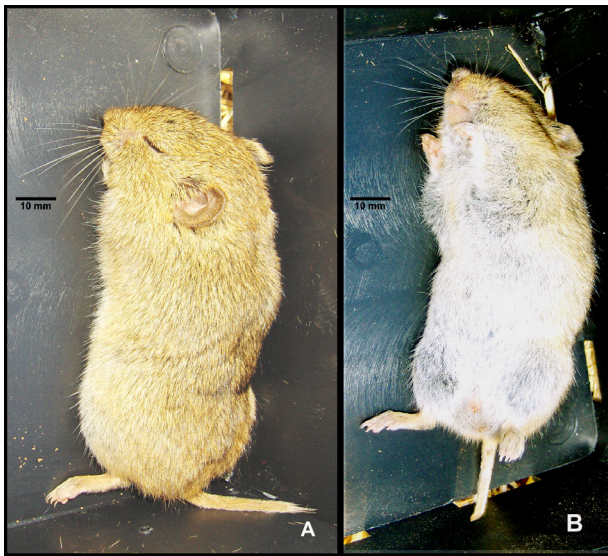


Figure 2. Cranial and mandibular measurements of *Microtus levis* taken in this study: Dorsal (A), Ventral (B), Lateral (C) view of cranium and Medial (D) view of mandible.



**Figure 4.** *M. levis*: dorsolateral (A) and ventrolateral (B) views.

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

Fur, coarse and common structure (Fig. 4). The upper parts of fur are more yellowish brown or brownish buff than in the Altai vole. The dorsal, is dark brownish yellow or dark grayish and turns to more yellowish tone towards flanks. In the ventral, gray or dirty white in color, and the intersection with the dorsal line is not clear. While there are no important differences between females and males in terms of coloration, females are more open tones and pale colored. Dorsal bristles can reach 10-11 mm. The tail is bi-color, brown or dark brown tail dorsal, ventral light brown or gray. The tail end of the bristles, the more black-brown and may take up to 5-6 mm. Tail length is about 25% of the length of head+body. Ear, is covered with short hairs and, if looked at closely is long enough to be clearly visible from the outside. Whiskers, whitish to reach up to 24 mm. But mostly 20-22 mm does not. Hindfeet length, to reach up to 1/6 of head+body length. Nipples, two pairs of inguinal and two double axillar region has a total of 4 pairs of nipples.

Diagnosis: Total length is min=135.83 max=180.17 mm with a mean of  $156.15 \pm 1.73$  mm (n=61), while the tail length/total length has a mean =  $0.23 \pm 0.08$  mm (Table 1). The braincase is relatively narrow, with small mastoid part of the

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

Characters	Individuals (n)	Min-max	Mean± SE
Weight (g)	61	21.45-54.34	38.89±1.35
Total Length	61	135.83-180.17	156.15±1.73
Hind foot L.	61	18.21-21.81	19.96±0.14
Ear Length	61	12.01-15.97	14.07±0.15
Tail Length	61	25.35-42.56	34.17±0.66
Ow	61	9.71-12.07	10.78±0.09
Zb	61	12.81-15.85	14.37±0.12
Bw	61	6.20-7.72	6.99±0.06
Ic	61	3.30-3.87	3.60±0.02
Nb	61	3.10-3.77	3.45±0.03
Bl	61	22.12-26.54	24.31±0.18
Pl	61	11.41-14.52	12.98±0.11
Fl	61	3.41-4.60	3.98±0.04
Tbl	61	6.10-7.40	6.74±0.05
Lfcs	61	13.61-16.87	15.16±0.12
Cbl	61	22.61-28.02	25.19±0.20
OI	61	23.12-28.38	25.73±0.21
Hbb	61	8.40-10.68	9.64±0.09
Hb	61	6.90-9.30	8.08±0.08
C-M3	61	5.50-6.73	6.14±0.05
DI	61	7.00-8.54	7.71±0.06
NI	61	6.60-8.40	7.49±0.06
M	61	13.30-16.08	14.62±0.10
Bctw	28	0.31-0.42	0.36±0.01
Bcw	28	1.28-1.84	1.49±0.03
Bch	28	0.49-0.71	0.60±0.01
Bcl	28	2.24-2.80	2.51±0.03
Dbcl	-	-	-

tympenic bullae. The nasal bones and rostrum are very short. The occipital condyles are seen in the dorso-planar view of the skull. The skull is slender, with large zygomatic arches and bullae. Head skeleton and partially protruding and a very strong structure. Dorsal capsule of the brain convex in young individuals, adults are straight. Zygomatic arc, is about 55-60% of Condylbasal length. Interorbital region, partly narrow and smooth. Supratemporal protrusions evident in young people, less pronounced in adults. Neurocranium is long, incisive foramina short, but wide. Diastema's length, shorter length of Maxillary teeth. Mandibul is delicate, three-ledge built in the middle of the thick, whereas the other two sides of the weak structure.

**Baculum:** Twenty-eight bacula of *M. levis* 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=2.24, max=2.80 mm with a mean of  $2.51 \pm 0.03$  mm (n=28) in length. The basal width has a min=1.28, max=1.84 mm and a mean of  $1.49 \pm 0.03$  mm (n=28). Shaft, from the bottom portion of the proximal end and an oval or short and thick to thin out abruptly.

Basal edges rounded and smooth in young and old examples of intricate and rough. Proximal to the posterior basal generally triangular in shape is quite convex. Ventrally, basal protrusions on the sides curved inward, and more pronounced. Only a few samples (n = 5) in these areas do not protrude and are straight. All of the results of the morphological characters are given in table 1.

**Ecological Observations at The Study Sites**

Meadow mice, often with long and dense bushes, grasses and herbaceous vegetation in the edges of the inner parts of the tunnels continue their lives. They prefer nesting in moist soil and light sides of the river are found. In particular, the stream or river to nest near the edges of the *Juncus* vegetation was observed between clusters. In some cases, the water close to the edges of the strips at the edge of farmland make nests.

The average day time temperatures of the sites were recorded as 28 and 29° C respectively. In addition, *Mus musculus* was trapped in the same locality. Especially, Watery vegetation as a *Juncus sp.* and *Cyperus sp.* were observed at the study sites (Fig. 5).

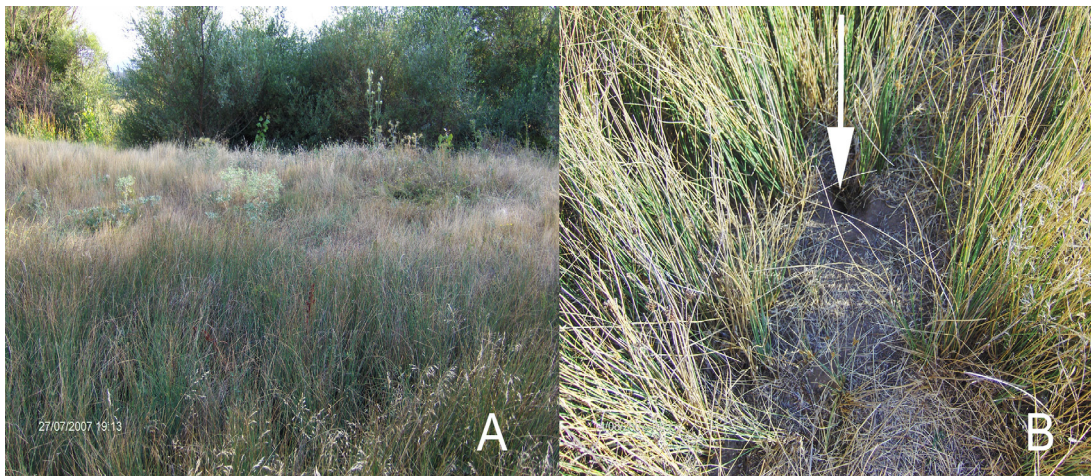


Figure 5. The habitat of *M. levis* at Bozdoğan (A:Overview, B: The entry hole in *Juncus* vegetation)

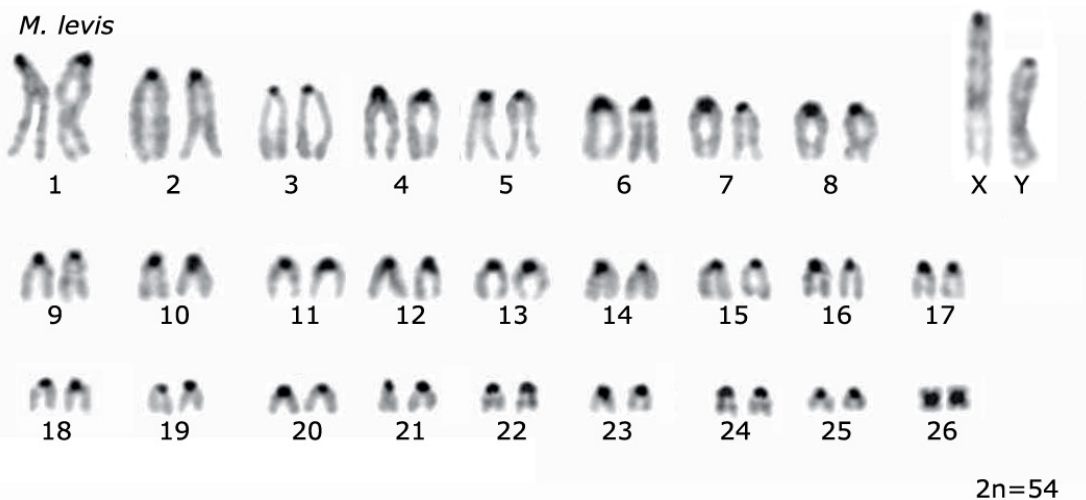


Figure 6. The karyotype of *M. levis*.

### Karyological Features

Only one different karyotypes belonging to *M. levis*, a karyotype consisting of  $2n = 54$ ,  $NFa = 54$ , and  $NF = 58$  was determined. Just a pair of autosomes chromosomes are metacentric (chromosome 26), while others are acrocentric structure. The X chromosome is a large-sized acrocentric, the Y chromosome smaller than X chromosome and medium-sized acrocentric (Fig. 6).

### CONCLUSION

According to the results, the skull and baculum morphometry, colour pattern, and body size characteristics of *M. epiroticus* or *rossiaemeridionalis* specimens are in agreement with the description of this species published by Dođramacı [12]; Kryštufek and Vohralik [14], see Fig. 4. East European Vole does not differ much from *M. obscurus* Altai vole, except that its hind foot is evidently longer and this character is of diagnostic value in Turkey [14]. Also the skull and baculum measurements are in agreement with those reported for this species by Yiđit et al. [16]; Kryštufek and Vohralik [14].

In addition, measures of *M. levis* is greater than the values given by Yavuz et al. [21, 22] for the tail length and ear length of *M. guentheri* and *M. anatolicus*. In general, Among these three species has the smallest values *M. levis* baculum. So, one type of karyotype and karyotypes were found in terms of properties of all the features Kefeliođlu [13] in similar to those given.

Consequently, this paper records an extension of the known distribution of *Microtus levis* at about 120 km South-Western of Mediterranean Region of Turkey into the Taurus Mountains. We also provide some new information on habitat characteristics.

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