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Observations on the Mole Vole, *Ellobius lutescens* Thomas 1897, (Mammalia: Rodentia) in Turkey

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Abstract: *Ellobius lutescens* is the only species of the genus *Ellobius* living in eastern Anatolia. They are highly adapted to underground life. There is no knowledge about the ecological peculiarities, population structures or detailed range of this species in Turkey. Data were recorded during field studies and laboratory observations of 42 specimens collected from 12 different localities. The distribution area is 8 km north of Muradiye in the north, the eastern border beyond the Turkish border, 32 km north of Çatak in the south, 5-6 km east of Uysal in the west, and Yüksekova in the southeast, the eastern border beyond the Turkish border. Their tunnel system is very complex and there is no typical gallery system. The vertical and horizontal diameters of their tunnels are 5-8 and 6-9 cm, respectively. They live as a family group. The home range size of a family is about 12 x 9 m, but changes according to the abundance of food. They eat all kinds of vegetation. An individual consumes 79.66 g of food a day. There is a linear relationship between the weight of the animal and consumed food ($r = 0.63$). They give birth at least twice a year having 2-4 pups. This species is not endangered in Turkey.

Key Words: Rodentia, *Ellobius lutescens*, ecology, distribution, Turkey

Türkiye *Ellobius lutescens* Thomas 1897, (Mammalia: Rodentia) Türü Üzerine Gözlemler

Özet: Doğu Anadolu'da *Ellobius* cinsinin yalnızca *Ellobius lutescens* türü yaşar. Bunlar önemli derecede yeraltı yaşamına uyum sağlamışlardır. Türkiye'deki bu türün ekolojik özellikleri, populasyon yapısı veya ayrıntılı dağılışı hakkında bilgi yoktur. Bilgiler, 12 farklı lokaliteden toplanan 42 örnek üzerinde yapılan arazi çalışmaları ve laboratuvar gözlemlerinden elde edildi. Dağılım alanı; kuzeyde Muradiye'nin 8 km kuzeyi, doğu sınırı Türkiye'nin dışındadır. Güneyde Çatak'ın 32 km kuzeyi, batıda Uysal'ın 5-6 km doğusu ve güneydoğuda Yüksekova'dır. Bunların tünel sistemleri çok karmaşıktır ve tipik bir galeri sistemi bulunmaz. Tünellerin dikey ve yatay çapı sırasıyla 5-8 ve 6-9 cm'dir. Aile grupları halinde yaşarlar. Yaşam alanları yaklaşık 12 x 9 'dir, ancak bu besin bolluğuna bağlı olarak değişir. Her çeşit bitkisel besinleri yerler. Bir birey günde 79.66 gr besin tüketir. Hayvanın ağırlığı ile tükettiği besin miktarı arasında doğrusal bir ilişki vardır ($r = 0.63$). Yılda en az iki defa, 2-4 yavru doğururlar. Türkiye'de bu türün nesli tehlike altında değildir.

Anahtar Sözcükler: Rodentia, *Ellobius lutescens*, ekoloji, dağılışı, Türkiye

Introduction

Mole voles, genus *Ellobius*, are Palearctic region animals distributed from East Anatolia to Mongolia (1-8). Gromov and Baranova (9) stated that the genus *Ellobius* has existed since the mid-Pleistocene. Pleistocene remains of *Ellobius* spp. were found from Konya-Akşehir-Dursunlu in Turkey (10).

The species *E. fuscocapillus*, *E. lutescens*, *E. talpinus*, *E. tancrei* and *E. alaicus* exist at the present time (11). These species exhibit on allopatric distribution.

E. fuscocapillus is distributed in Iran, Afghanistan and Pakistan; *E. talpinus* in Ukraine, Kazakhstan, Turkmenia, Uzbekistan and Afghanistan; *E. tancrei* is in Kyrgyzstan, Tajikistan and Mongolia; *E. alaicus* is in Kyrgyzstan (this

species is endemic for Kyrgyzstan) and *E. lutescens* in Iran, Armenia, Azerbaijan and Anatolia (1-8,11). *Ellobius lutescens* reaches the western limit of its distribution area from Van-Hakkari province in East Anatolia (12), and was first described by Thomas in 1897, based on six specimens collected from Van-Erçek (13) (Fig. 1).

The taxonomical, karyological, morphological and some biological peculiarities were studied by Coşkun (12,14,15) and Coşkun and Ulutürk (16).

Although the presence of this species is known in East Anatolia, its exact distribution area and ecological peculiarities have not yet been documented in detail. The aim of this study was therefore to determine the distribution boundaries and some ecological peculiarities,



Figure 1. *Ellobius lutescens*.

such as reproduction, feeding and population structure, of *Ellobius lutescens* in Turkey.

Materials and Methods

This study was conducted on 42 specimens (18 females, 24 males) collected from 12 different localities (Figure 2). Trapping *Ellobius* involves the opening of a burrow system and catching the animal with a hoe when it comes to plug the opening. Ecological peculiarities were observed both in the field and in the laboratory. The present account offers information based primarily on field observations carried out during 1999-2001. Specimens are deposited at the Biology Department, Science and Art Faculty, Dicle University (Diyarbakır).

Results and Discussion

Ellobius lutescens, living in family groups, were completely adapted to underground life and feeding on the roots, tubers, bulbs and rhizomes of plants. This species is distributed in only Van and Hakkari provinces in Turkey. According to the results of our studies the detailed distribution region is as follows.

As we did not have the opportunity to study in Şemdinli, the southern border is assigned to Yüksekova. It is absent in the Şırnak, Uludere, Çukurca and Hakkari regions.

The southwestern border is north of Kayaboğaz village (32 km from Çatak), then the mountainous areas begin near the villages of Yenimahalle and Elmacı, and there are no *Ellobius* mounds in this region (Fig. 3A).

Although *Talpa* (mole) and *Spalax* (mole rat) populations live parapatrically between Tatvan and Kuskunkıran Pass, there is only *Spalax* population between Kuskunkıran Pass and Yoldöndü village. There is a gap from Yoldöndü to Uysal. Then the mounds of mole voles begin at Güzelkonak (5-6 km east of Uysal), and are especially abundant in beet fields (Fig. 3B).

The northern border of *E.lutescens* is Gönderme village, located 8 km north of Muradiye. Then *Spalax*

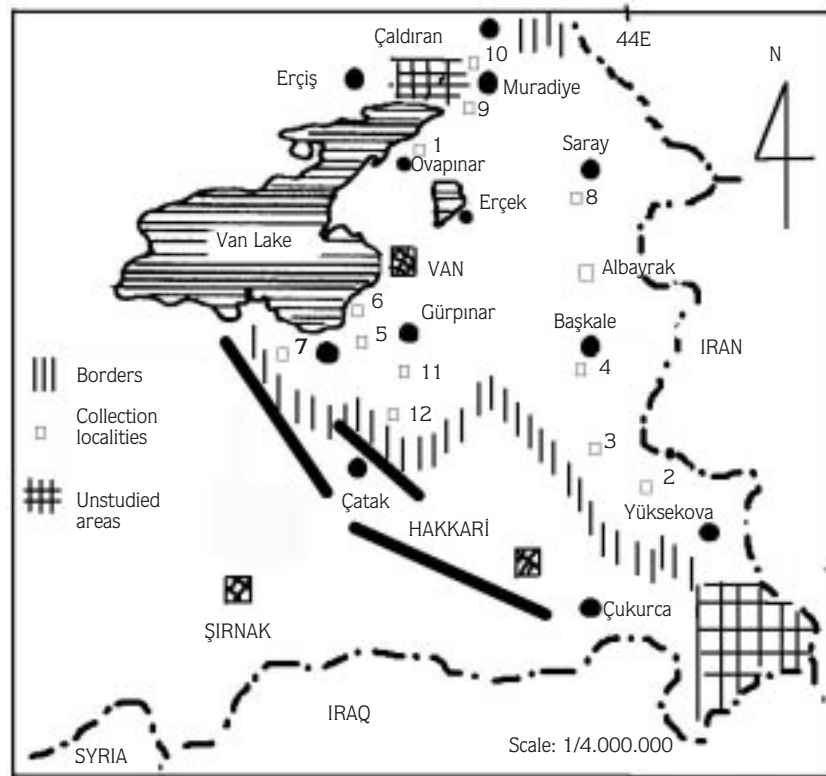


Figure 2. Distribution area of *Ellobius lutescens* in Turkey. 1. Van-Ovapınar (50 km north of Van, Coşkun 1997's material) 6 (4♀, 2♂); 2. Hakkari-Yüksekova-Suüstü village - Büyükçiftlik Bridge province, 2 (1♀, 1♂); 3. Hakkari-Yüksekova-Hanemusa village (1♂); 4. Van-Başkale (1♂); 5. 1 km south of Van-Gürpınar-Köprüler village, 5 (2♀, 3♂); 6. Van-Gevaş-Cafer's place, 6 (3♀, 3♂); 7. 2 km east of Van-Gevaş-Güzelkonak village, 4 (2♀, 2♂); 8. Van-Saray 4 (2♀, 2♂); 9. 3 km south of Van-Muradiye-Balıkli village, 6 (3♀, 3♂); 10. 2 km south of Van-Muradiye-Gönderme village, 4 (1♀, 3♂); 11. 3 km west of Van-Çatak-Köklü village, (1♂); 12. 8 km north of Van-Çatak-Kayaboğaz village, (2♂) (numbers after the localities are sample size) (*Erçek* is the type locality).

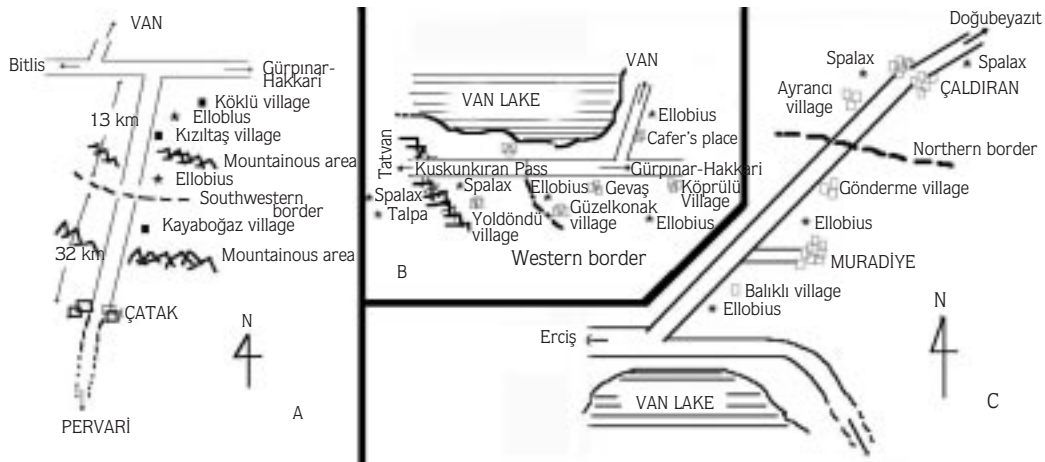


Figure 3. The detailed distribution borders of *E. lutescens* in Turkey. A. southwestern, B. western, C. northern borders.

mounds begin at the village of Ayrancı, 5 km from Çaldıran, but both of them are absent between the villages of Gönderme and Ayrancı (Fig. 3C).

The specimens were collected from Van-Saray, the most easterly part of Turkey, and mounds were observed in Albayrak (Fig. 2). According to Ognev (1) this species is distributed in Iran, Azerbaijan and Armenia. Therefore, the eastern border of this species is beyond the Turkish border.

Individuals of this species are distributed in all soil types with the exception of moving sand. The mole vole prepares its underground tunnels by scratching the soil with its incisors and pushing the loosened soil behind its body with its fore and hind limbs. Then it turns and transports the excavated soil with its head and breast, so that the mounds occur on surface (Fig. 4).

These mounds may be confused with those of *Talpa* and *Spalax*. There are 22-35 mounds 5 m x 3.6 m in area (Fig. 4). The top diameter of these mounds is 8-21 cm, the base diameter is 24-50 cm, and the height is 9-14 cm. The distance between mounds varies from 4 to 70 cm (Fig 5A). The diameter of the tunnels is almost constant. The tunnels are a little wider than the occupant animal. The vertical and horizontal diameters of the tunnels are 5-8 and 6-9 cm, respectively (Fig. 5A).

The base depth of the tunnels from the surface is 16-48 cm (average 27 ± 5.8 cm). The tunnels in which the animal shelters in emergencies descend to a depth of 54-90 cm from the surface at an angle of 45°. The depth of the tunnels is related to the length of plant roots. The

main tunnel system is connected to feeding tunnels. This species makes its nest close to the surface (Fig. 5B), and there are many tunnels connected to it. There are soft materials (nylon, pieces of cloth, dry grass etc.) and food in the nest. The food stored in expanded rooms near the nest and there is no other food storage room. However, the gallery systems of each family differ in terms of soil structure and food; it is impossible to determine a typical gallery system.

The size of home range of each family is about 12 m x 9 m. Its size changes with the amount of food. Thirty-six family systems were counted in the area, which was 150 m x 80 m (ca. 12,000 m²). It was observed that there were eight family systems in a 1000 m² area. Each burrow system contains one male, one female and at least one pup. The population in this area has about 24 individuals. The number of the pups is generally 1-2, but it may be more. In this case it is estimated that there would be 24,000 individuals in a 1 km² area. The research area is mountainous and this species lives at the bottom of the mountains, and because of this the density of the population is decreased.

We determined that this species is not endangered, and therefore does not need any protection at present.

The specimens, which were kept in the laboratory for more than one year, did not hibernate or aestivate. When the temperature of the laboratory increases, the animals lie on their backs and try to cool down by opening their fore and hind limbs laterally. In cold conditions they huddle together in the nest.



Figure 4. The habitat and mounds of *E. lutescens*.

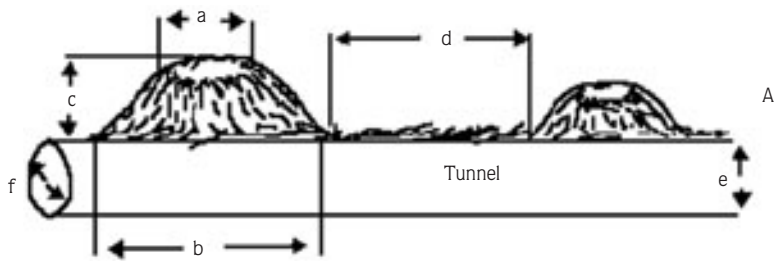
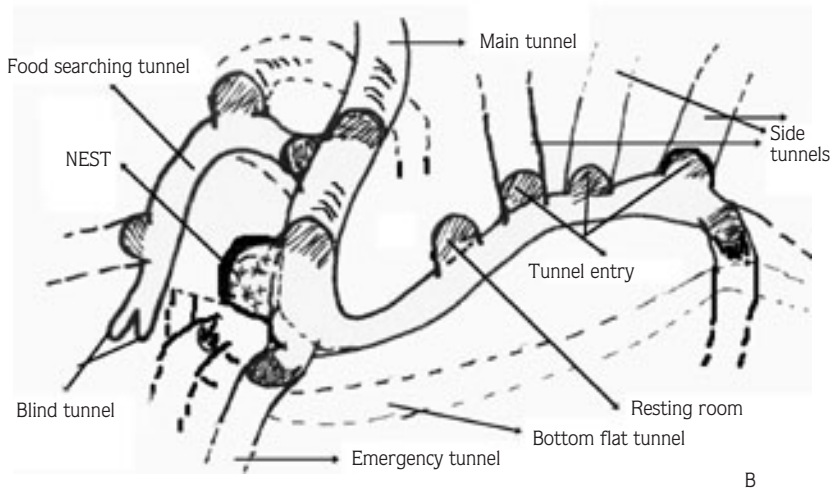


Figure 5. A. The mounds of *E. lutescens* a. top diameter, b. base diameter, c. height d. distance between the mounds e. vertical and f. horizontal diameters of tunnels. B. The gallery system of *E. lutescens*.



When another couple is put in the cage, these families live together in peace, and all individuals guarded the pups.

Mole voles feed primarily on large subterranean edible parts of plants (i.e. corns, bulbs, tubers and rosettes), which they collect while burrowing through the ground and hoard in nest-mound stores (Fig. 6A). Their food is

composed of potatoes, carrots, beet, clover roots and onions. About 298 g of stored food was removed from a burrow that included one pup, one male and one female. These animals do not drink free water: they obtain it from food.

This species cuts the roots of plants while scratching tunnels in agricultural areas. In clover fields, they rend

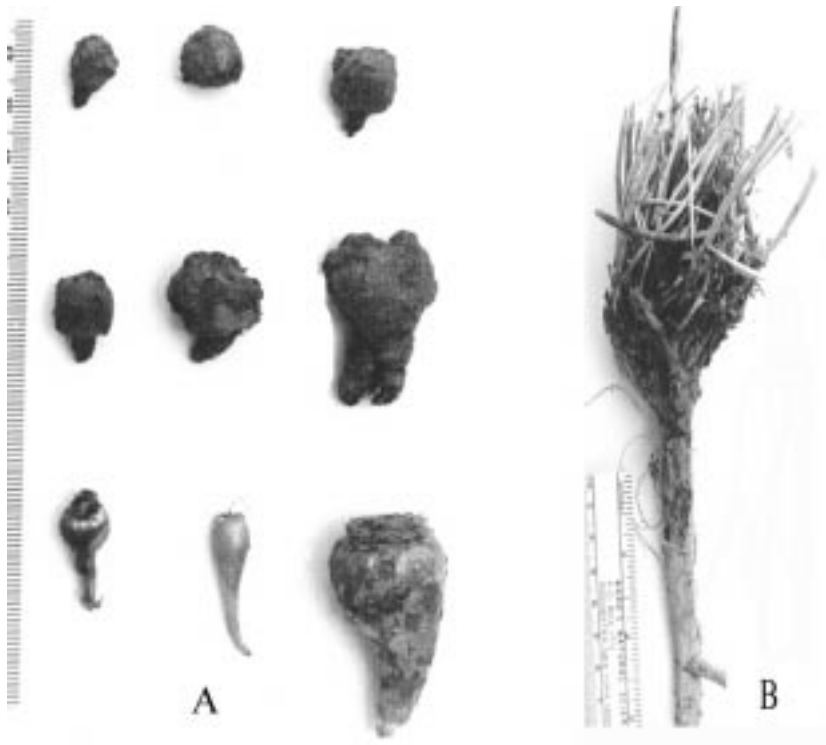


Figure 6. The stored food removed from burrow (A), and the clover root rendered (B) by *E. lutescens*.

clover roots at 10-12 cm depth from the surface (Fig. 6B).

The amount of food consumed is 0.57-0.74-1.08 g per gram of the animal's weight (Table 1). The animals, when kept together in a cage, consume less food than when kept alone. As the single animal consumes 0.91 g food per gram of weight, couples consume 0.68 g. They eat all kinds of plants given to them.

It is observed that *E. lutescens*, when kept in a cage, consumes 79.66 ± 2.89 (19-166) g of food daily. There is a linear relationship between the weight of the animal and consumed food ($r = 0.63$). When the weight of the animal increases, the amount of food consumed is also increased (Fig. 7). They eat all kinds of vegetation.

During the observations, these animals primarily preferred carrots to potato, beet, radish and onion (Fig. 8). The consumption of carrot is higher than that of potato (Table 2). The females consume more food than males.

Walker (3) stated that *E. lutescens* can bear one to seven pups (usually three to five) twice a year. During field studies, we caught pups in May, showing that they can give birth in early May or late April. We also caught a pregnant female in October, showing that they can give

Table 1. Animal weight and daily food consumption (in g).

Weight	Food
64	58.2
70	72.4
68	40.4
76	82.0
131	96.
137	101.5
136	94.3
144	120.8
121	75.6
128	74.4
128	50.6
123	87.6
141	84.6
133	75.8
138	91.0
139	87.6

birth in Autumn secondly. We observed five individuals in a burrow. Therefore, at least three pups live in this burrow system.

We obtained only one pup in March from a couple of *E. lutescens* kept in a cage for more than one year. However, we observed four embryos in the uterus,

Table 2. The amount of daily food consumption of *E.lutescens* (in g.). (N = observation number, Range = minimum and maximum, X = average, SE = standart error).

Food	N	Range	X	±SE
Potato	53	12-75	34.34	1.74
Carrot	75	18-124	54.81	2.60
Onion	2	6-10	8.00	2.00
Bett	14	3-76	20.64	5.85
Radish	2	18-18	18.00	--

showing that this species can bear four pups (Fig. 9).

The presence of fossil remains in Konya-Akşehir-Dursunlu shows that the genus *Ellobius* is distributed over a wide area especially in the Iranid zone (17) during the Pleistocene periods; both the geological changes and the distribution of *Spalax* forced them to the east, and so nowadays they only exist in Van-Hakkari province.

There is no relationship between the distribution of *Ellobius* and the temperature, rainfall, humidity or

vegetation of the region, because they do not live in the same ecological areas. Distribution seems to be more related to the geological structure of the region. The distribution area is located in the Iranid zone. Furthermore, the other species, especially *Spalax*, restricted the distribution of *Ellobius*. It is observed that there is a 3-8 km gap between these species.

There is only one species (*E.lutescens* Thomas 1897) of the genus *Ellobius* existing in Turkey. *E.lutescens* and *E. fuscocapillus* are different species due to their morphological and karyological peculiarities, and so the distribution conception of *E. fuscocapillus* in Turkey is wrong. Individuals of *E.lutescens* live as a family society, not in groups. They bear one to three pups twice a year, in March-April and October-November.

Acknowledgments

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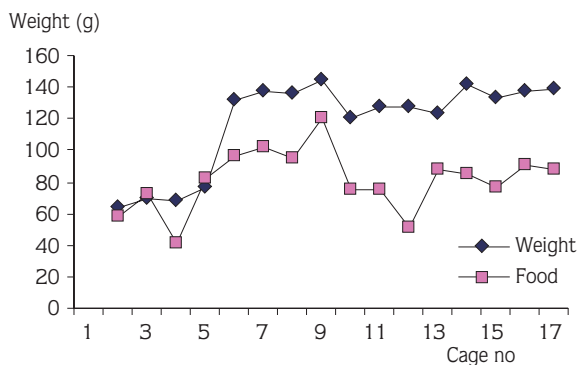


Figure 7. The relationship between the animal weight and amount of consumed food of *E.lutescens* (in g).

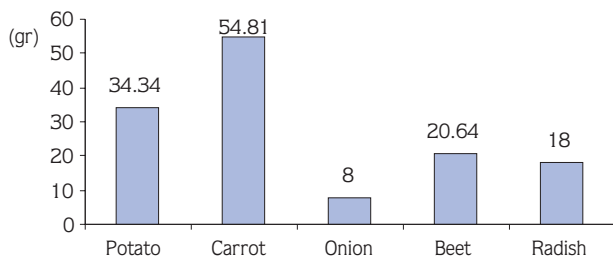


Figure 8. Daily food consumption of *E.lutescens*.

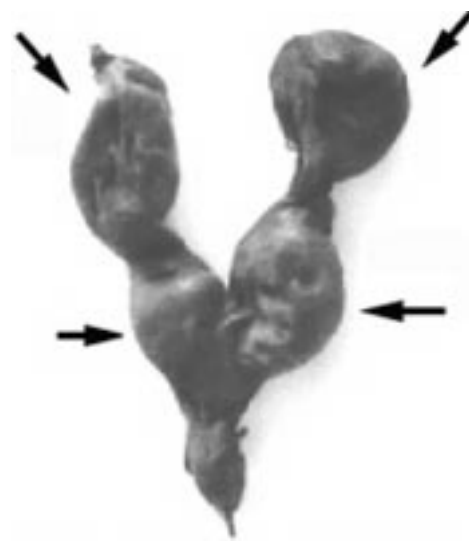


Figure 9. The uterus of *E.lutescens* with embryos. 1-4: embryos.

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