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## A Study on the Morphology, Karyology and Distribution of *Ellobius* Fisher, 1814 (Mammalia: Rodentia) in Iran

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**Abstract:** In this study, 180 mole-vole specimens collected from west, central, east and southeast Iran were investigated by morphological, biometrical and karyological methods. According to our findings, 3 different species, *Ellobius fuscocapillus*, *Ellobius lutescens* and *Ellobius talpinus*, are distributed in Iran. Karyological findings showed that *E. fuscocapillus* has  $2n = 36$  (NF = 58, NFA = 54), *E. lutescens* has  $2n = 17$  (NF = 34, NFA = 32) and *E. talpinus* has  $2n = 52$  (NF = 54, NFA = 50) chromosomes.

**Key Words:** Iran, *Ellobius*, morphology, karyology, distribution.

### İran'daki *Ellobius* Fisher, 1814 (Mammalia: Rodentia)'un Morfolojisi, Karyolojisi ve Yayılışı Üzerine Bir Çalışma

**Özet:** Bu çalışmada İran'ın batı, merkez, doğu ve güneydoğu bölgelerinden toplanan 180 adet *Ellobius* örneği morfolojik, biyometrik ve karyolojik olarak araştırıldı. Elde edilen bulgulara göre İran'da üç tür; *Ellobius fuscocapillus*, *Ellobius lutescens* ve *Ellobius talpinus*, yayılış göstermektedir. Karyolojik bulgular, *E. fuscocapillus*'ta  $2n = 36$  (NF = 58, NFA = 54), *E. lutescens*'te  $2n = 17$  (NF = 34, NFA = 32), *E. talpinus*'ta  $2n = 52$  (NF = 54, NFA = 50) olduğunu teyit etti

**Anahtar Sözcükler:** İran, *Ellobius*, morfoloji, karyoloji, yayılış.

### Introduction

Blyth (1843) described the specimens collected from Quetta (West Pakistan) as *Ellobius fuscocapillus*. Thomas (1905) was the first to record *Ellobius* from Iran, describing *Ellobius woosnami*, a new specimen in Isfahan (Iran). Afterwards, Goodwin (1940) recorded *E. fuscocapillus* from Astrabad, Ellerman (1948) from Kazvin, Ognev (1950) from Central Iran, Vinogradov and Argiropulo (1941) from Mazanderan, and Misonne (1959) from Horasan, Zenjan, Senendec, Gurve and Lurestan.

Ellerman (1948) evaluated the specimens in the British Museum and stated that *E. fuscocacillus* and *E. lutescens* described by Thomas (1897) were valid species of *Ellobius*. Ellerman and Morrison-Scott (1951) pointed out that *E. fuscocapillus* (Blyth, 1843), *E. lutescens* Thomas, 1897 and *E. talpinus* (Pallas, 1770) were valid

species of *Ellobius* and of these species *E. fuscocapillus* and *E. lutescens* had a distribution in Iran. Ellerman and Morrison-Scott (1951) stated that *E. farsistani*, described by Ugarov from Kopet Mountain (Turkistan) in 1928, was a synonym of *E. fuscocapillus*; that *E. woosnami*, described by Thomas in Dumbeneh (Iran) in 1905, was *E. l. woosnami*; that *E. fusciceps*, described by Thomas from Semerkant (Turkistan) in 1909, was *E. t. fusciceps*; and that *E. f. lengendrei*, described by Goodwin in the Turkmenistan desert (Iran) in 1940, was *E. l. lengendrei*. Lay (1967) determined that *E. fuscocapillus* was a valid species in Iran along with the 4 subspecies *E. f. fuscocapillus*, *E. f. lutescens*, *E. f. lengendrei* and *E. f. woosnami*. Corbet (1978) also recorded that *Ellobius* had 2 species; (*E. fuscocapillus*, and *E. talpinus*) and 2 subspecies (*E. f. fuscocapillus* and *E. f. lutescens*).

Eitemad (1979) recorded that the 3 valid species were *E. fuscocapillus*, *E. farsistani* Ugarov, 1928 and *E.*

*fusciceps* Thomas, 1909 and the 4 subspecies were *E. f. fusciceps*, *E. f. lutescens*, *E. f. lengendrei* and *E. f. woosnami* in Iran. Harrison and Bates (1991) reported that the species in Iran was *E. fuscicapillus*, and the taxon in Van (Turkey) was *E. f. lutescens*, evaluating the *Ellobius* species belonging to Iran. Coşkun (1997) stated that *E. lutescens* has no subspecies after studies in Van (Turkey). In some morphological studies carried out in Iran, Lay (1967) and Harrison and Bates (1991) suggested that only 1 species and 4 subspecies ranged across Iran, in contrast to researchers who suggested that 3 species and 4 subspecies were distributed in Iran. Eitemad (1979) and Ellerman and Morrison-Scott (1951) claimed that the genus *Ellobius* was represented by 2 species and 3 subspecies in the Palearctic region as opposed to Corbet (1978), who stated that it was represented by 1 species and 2 subspecies.

As understood from the literature specified above, the taxonomy and distribution of the genus *Ellobius* have not yet been firmly determined in Iran, and there are a myriad of problems to be solved concerning this genus. The purpose of this study is to develop a more suitable approach for addressing these concerns as a consequence of a study to be conducted in the light of some morphological, statistical and karyological methods. In this respect, this study will also make a contribution to the Mammalia fauna in Iran.

## Materials and Methods

In addition to field observations, skins, skulls and karyotype preparations belonging to 180 specimens collected from 24 localities in west and east Iran between 1998 and 2000 were used. The numbers on the map and in parentheses in the distribution section show the localities. All specimens collected from each locality were skinned and their standard external measurements (total length, hindfoot, tail, weight) obtained. Additionally, the sex, testis, uterus, breast-feeding, and, if present, the embryo number, and the catching altitude for each specimen were recorded. The karyotype analysis was performed according to the cochicine-hypotonic-citrate technique of Ford and Hamerton (1956). At least 30 metaphase plates of each specimen were examined with a X100 immersion objective. Photographs of the metaphase plates were taken in order to determine 2n (diploid number of chromosome) and NF (fundamental

numbers of chromosomal arms), and NFa (autosomal chromosome numbers). On each skull, a total of 35 characters, some of which are mentioned in the literature (Thomas, 1897; Ellerman, 1948; Ognev, 1950; Eitemad, 1979; Harrison and Bates, 1991), were measured by compasses or micrometer. Some of the necessary or different measurements from these calculations are listed. The age determination of all specimens was carried out to eliminate the variations depending on age, and the specimens were divided into 2 age groups: mature and immature. The female and male specimens were used together in the assessments due to the fact that there was no remarkable statistical difference between the sexes. The findings are given in a diagnostic key, map, figures and tables.

## Results

### *Ellobius* Fischer, 1814.

1814. *Ellobius* Fischer, Zoognosia, 3: 72, *Mus talpinus* Pallas.

Fischer (1814) took into account the *Mus talpinus* described by Pallas in 1770 as a type genus while establishing the genus *Ellobius*. At the end of this study, it was observed that 3 species, namely, *Ellobius fuscicapillus* (Blyth, 1843), *Ellobius lutescens* Thomas, 1897 and *Ellobius talpinus* (Pallas, 1770), belonging to *Ellobius* had a distribution in Iran.

### Key to *Ellobius* species in Iran

1 (2) There is no laceration in the upper lip, the parietals have a protuberance in the middle part, the interparietal is absent,

2 (1) The dorsal side of the body is grayish brown, the dorsal of the tail is the same as the color of its back, the point part is flat, the prolongations formed by the premaxillar bones towards frontals pass through the posterior of the nasal bone, and in the ventral, it is the same level as the posterior of the incisive foramen. The coronoid process is rather large, and curved towards the angular process. The number of the diploid chromosome is  $2n = 17$  (NF = 34, NFa = 32)..... *E. lutescens*

3 (4) There is a laceration in the middle of the upper lip, the parietals do not have a protuberance in the middle part, and the interparietal is absent.

4 (3) The dorsal side of the body is light brown, and it forms a dark brown area towards the tail. The dorsal

colon of the tail is a little lighter than the back, and it has some long hairs towards the point. The prolongations formed by the premaxillar bones towards frontals extend beyond the posterior of the nasal bone; in the ventral, it is the same level the posterior of the incisive foramen. The coronoid process is rather large, and is sickle shaped. The number of the diploid chromosome is  $2n = 36$  (NF = 58, NFa = 54) ..... *E. fuscocapillus*.

5 (6) There is a laceration in the middle of the upper lip, the parietals do not have a protuberance in the middle side, and the interparietal is present.

6 (5) The dorsal side of the body is reddish brown, the tail is thin and long, the dorsal and ventral are white, the premaxillar bones do not extend towards the frontals and end in the alignment of the nasal bone. It continues towards the middle of the incisive foramen in the ventral. The number of the diploid chromosome is  $2n = 52$  (NF = 52, NFa = 50)..... *E. talpinus*

*Ellobius fuscocapillus* (Blyth, 1843) (Southern Mole-Vole)

1842. *Georychus fuscocapillus* Blyth, J. Asiat. Soc. Bengal, 10: 928, nom. nud., *Ellobius fuscocapillus* Asiat. Soc. Bengal, 1, 1: 887, 1843. (Southern Mole-Vole).

Type locality: Quetta, Belucistan

Distribution: The distribution in Iran is given in Fig. 1.

Number of examined specimens: 39

Gorgan (1): Allabad, 3; Gonbed Kabus, 3; Bojnord (2): Bojnord, 4; Bedranlu, 2; Shirvan (3): Bigan, 3; Kulanlu, 2; Kuçhan (4): Palpanlu, 2; Derregez (5): Chelmir, 3; Meshhed (6): Zeshak, 4; Tegiabad, 2; Seraks (8): Şurlek, 4; Torbatejam (9): Kalagek, 3; Birjend (10): Birjend, 4.

Habitat: This species is distributed in every kind of agricultural area, openlands and steppe areas (except for some places between 600 and 2200 m), sharp slopes,

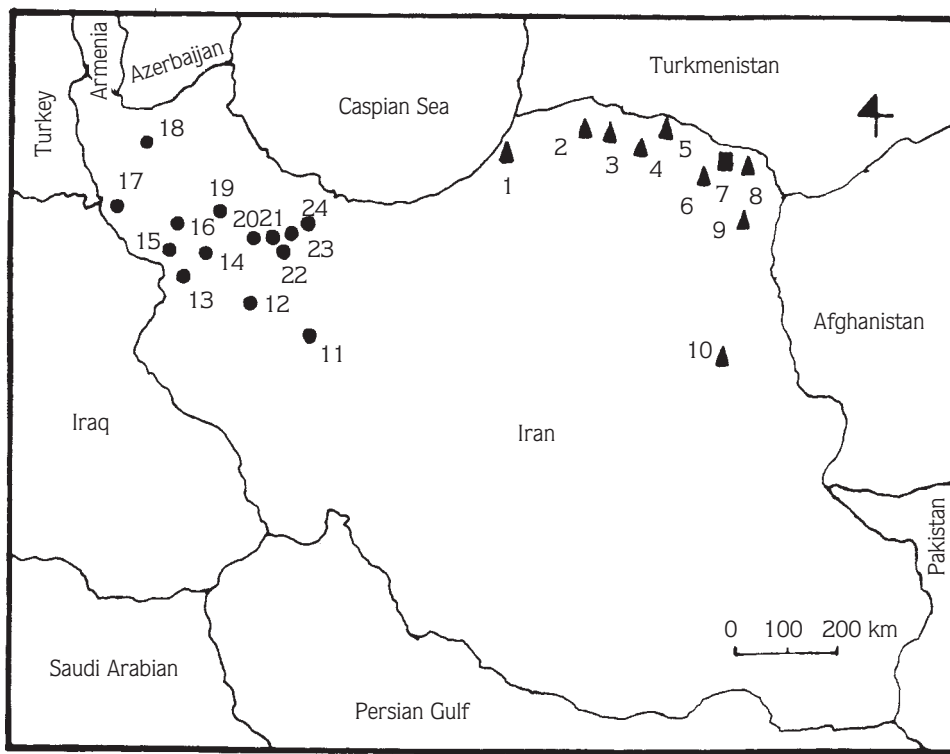


Figure 1. The distribution of *Ellobius* species in Iran. *Ellobius fuscocapillus* (▲), *Ellobius lutescens* (●), *Ellobius talpinus* (■). 1- Gordan, 2- Bojunord, 3- Şirvan, 4- Kuçhan, 5- Deregez, 6- Meşhed, 7,8- Seraks, 9- Torbatejan, 10- Birjend, 11- Isfahan, 12- Erak, 13- Hemedan, 14- Bokan, 15- Sekkız, 16- Takap, 17- Nekede, 18- Tebriz, 19- Bijar, 20- Zencan, 21- Hürremdere, 22- Abhar, 23- Takistan, 24- Kazvin.

and places subject to floods. It is observed that it has an intensive distribution in the clover fields among agricultural areas.

**The External Characteristics:** The body is rather large. There is a laceration in the middle of the upper lip. There is black shading on the face like a mask that starts from the 2 sides of the nose and goes onto the ear opening as well as continuing from the cheeks toward the upper side of the head. It is observed that the color of this mask can vary according the season. For example, it is dark gray in summer, and lighter gray in winter. The dorsal color of the adults is generally light brown, the sides are yellowish brown, and the abdomen region is off-white. This color is a little lighter in the subadult specimens. The dorsal color is a darker brown on the tail. The color of the tail is closer to that of the back in the dorsal and to that of the abdomen in the ventral. Moreover, some spots may be seen in the abdomen regions of some specimens. One fourth of the body hairs, starting from the point side, are light brown and the bottom sides are dark gray. The soles of the fore and hind feet of the specimens are naked and the upper sides are covered by white hairs. There is no color difference between the specimens in terms of their sex. The color of the young specimens is comparably lighter than that of the old ones.

**The Cranial Characteristics:** The prolongation posterior end of the premaxillar bones always extends beyond the posterior of the nasal bones in all specimens

(Fig. 2a) The prolongation of the premaxillar bones in the ventral is the same level as the posterior of the incisive foramen (Fig. 2b).

The paroccipital prolongations are rather larger than in the other 2 species. The parietal bones are longer due to the absence of the interparietal bone. The sagittal crest does not exist in the young or adult specimens. The sagittal crest is weakly developed in the older specimens. The zygomatic arch springs are thicker and broader than in the other 2 species. Its braincase is vast as well. The lamboid crest is developed in male specimens. The incisive foramen is short (Table 1).

The external and cranial characteristic measurements are given in Table 1.

**Teeth:** The upper incisors are pro-odont and white. The roots in the molars do not exist in the young specimens but do in the old ones. There are 3 triangles in the labial and lingual of the first and second upper molars. However, the lingual re-entrant among the first and second triangles of  $M^2$  is rather deep. Three triangles exist in the labial of the third upper molar and another two triangles in the lingual. However, the re-entrant among the first and the second triangles is rather superficial. An examination of the third molar of 29 specimens showed that it has variations. Four triangles exist in the labial of the first lower molars and another 3 triangles in the lingual. Both the labial and lingual of the second and third lower molars have 3 triangles (Fig. 3).

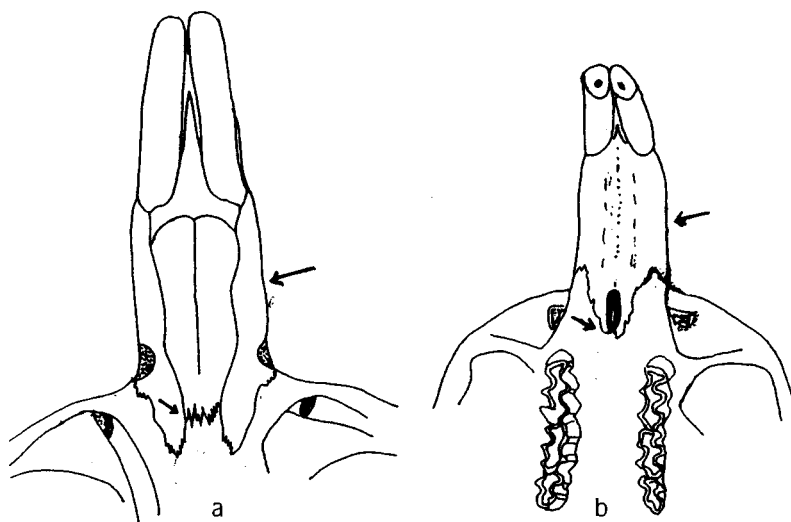


Figure 2. The posterior (a) and anterior (b) view of premaxillar bones of *E. fuscocapillus*, X 0.5 cm.

Table 1. External and cranial measurements of *Ellobius fuscocapillus*. (n: number of specimens,  $\pm$ SD: standard deviation)

Characters (mm)	n	Mean	Range	$\pm$ SD
Total length	32	126.36	106-145	7.93
Tail	32	10.27	9-14	1.07
Hind foot	32	22.25	20-24	1.02
Weight (g)	32	52.21	32-88.2	13.34
Greatest length of skull	32	33.42	30.6-36.4	1.66
Condylonasal length	32	29.13	27.3-35.4	1.58
Condylbasal length	32	29.19	28-34.4	1.98
Nasal length	32	8.16	7-11.5	0.84
Nasal breadth	32	3.12	2.5-3.6	0.31
Length of braincase	32	11.42	10.9-12.5	0.32
Height of braincase from bulla	32	10.51	9.8-11.2	0.24
Upper tooththrow (from crown)	32	7.57	5.5-8.5	0.48
Upper tooththrow (from alveoli)	32	7.38	6.5-9.3	0.73
Diastema	32	12.4	10.2-14.78	1.52
Length of facial region	32	19.47	18.6-22.6	0.77
Zygomatic breadth	32	22.45	19.6-28.4	1.80
Occipitonasal length	32	28.15	26.7-33.4	1.34
Basilar length	32	27.81	26.2-32.8	1.31
Tympanic bulla length	32	8.31	7-9.5	0.62
Tympanic bulla breadth	32	4.82	3.8-5.9	0.66
Incisive foramen length	32	2.34	2-2.8	0.21
Incisive foramen breadth	32	0.52	0.5-0.7	0.08
Interorbital constriction	32	5.8	4.9-6.5	0.33
Rostrum breadth	32	5.18	4.4-5.9	0.42
Length of palate	32	7.09	6.4-7.9	0.36
Parietal length	32	8.82	8.2-10	0.37
Posterior breadth of parietal	32	7.37	6.8-8.5	0.37
Anterior breadth of parietal	32	4.58	4.2-5.2	0.27
Length lower tooththrow (from crown)	32	7.68	7-9	0.48
Length lower tooththrow (from alveoli)	32	8.53	7.8-9.4	0.44
Mandible height	32	4.77	3.5-5.8	0.46
Height of coronoid process	32	11.79	10.2-15.2	1.03
Angular length	32	23.44	21.4-29.4	1.94
Articular length	32	23.72	20.9-29.8	2.06
Alveolar length	32	22.86	21-26.7	1.71

**Karyology:** Diploid chromosome number is  $2n = 36$ , the number of autosomal arms is  $NFa = 54$ , and the fundamental number is  $NF = 58$ . The X chromosome is middle-sized submetacentric, and the Y chromosome is subtelocentric. The autosomal set can be divided into 3 groups: 6-pairs metacentrics, 4-pairs submetacentric, and 7-pairs subtelocentric (Fig. 4).

*Ellobius lutescens* Thomas, 1897. (Western Mole-Vole)

1897. *Ellobius lutescens* Thomas, Ann. Mag. N. H. 20: 308.

Type locality: Van, Eastern Asia Minor.

Distribution: The distribution in Iran is given in Figure 1.

Number of examined specimens: 140

Isfahan (11): Zerinşehir, 3; Necefabad, 2; Şehrikord, 2; Erak (12): Şazend, 4; Kamın, 3; Hemedan (13): Aseabad, 4; Alisedir, 2; Bokan (14): Bokan, 4; Sekkız (15): Sekkız, 4; Takap (16): Karaklu, 4; Dorbaş, 3; Oğulbey, 2; Bijar: Halep, 4; Hoşmekan, 2; Sebil, 2; Kotan, 3; Nereke (17): 4; Tebriz (18): Nezerebad, 5; Bijar (19):

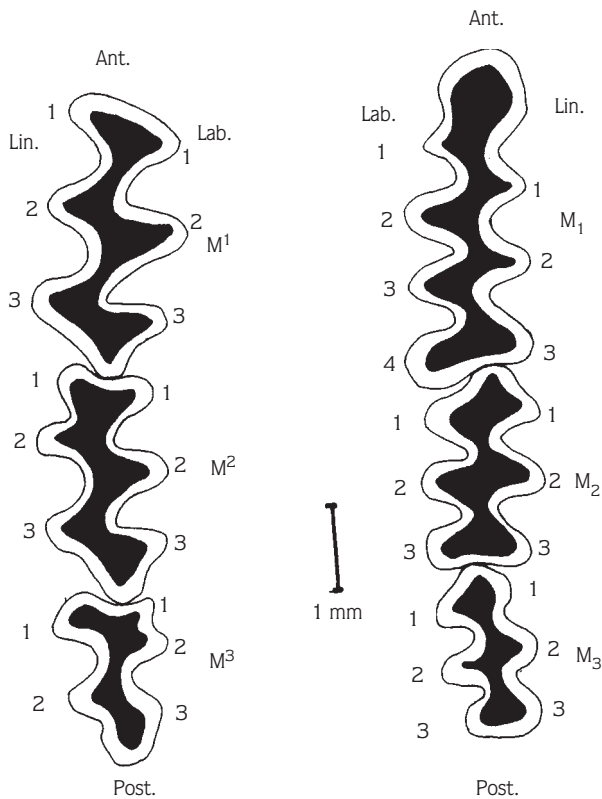


Figure 3. Upper and lower molars of *Ellobius fuscocapillus*. 1, 2, 3, 4: Triangles; Lin.: Lingual; Lab.: Labial; Ant.: Anterior; Post.: Posterior.

Karaçemen, 3; Zencan (20): Papai, 10; Dendi, 5; Icrood, 7; Yengece, 4; Zencan University campus, 18; Kidar: Kidar, 4; Sultaniye, 3; Hürremdere (21): Hürremdere, 4; Nermi, 4; Abhar (22): Abhar, 4; Sayinkala, 2; Takistan (23): Takistan, 4; Germab, 4; Kazvin (24): Elemut, 4; Hasanabad, 3.

**Habitat:** This species can show a distribution in every kind of agricultural area, open lands and steppe areas (except for some places between 600 and 1800 m), sharp slopes, and places subject to floods. However, some mounds can be seen in sloped surfaces in addition to flat areas due to the existence of the Zagrus, Elbroz and Kaflan mountains in the region. The plant cover is not rich owing to the fact that the distribution area is covered by snow for 5-6 months a year. It is possible to see for more mounds in the high regions in spring and summer as well as in the lower regions in winter.

**The External Characteristics:** The body size of *E. lutescens* is smaller than that of *E. fuscocapillus* and larger than that of *E. talpinus*. There is no laceration in

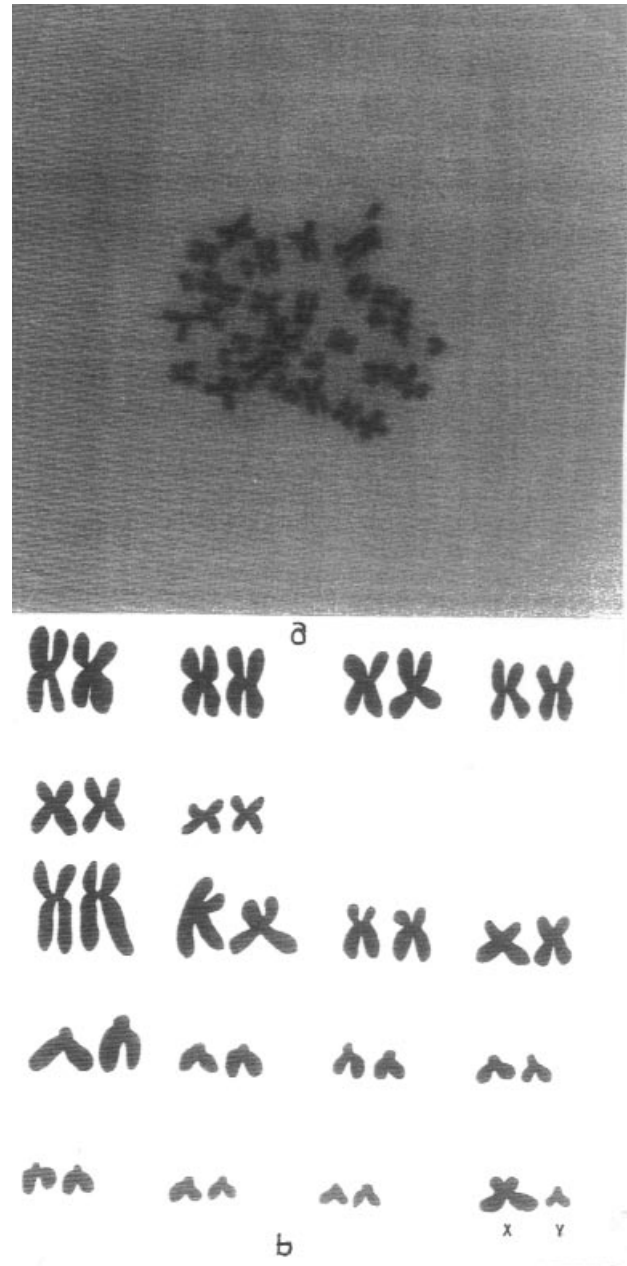


Figure 4. Metaphase plate (a) and karyotype (b) of a male specimen of *E. fuscocapillus*.

the upper lip for all specimens, and they are in an integrated position. The mask-shaped structure in the face is dark gray, showing a similarity with the structure of *talpinus*. The dorsal of the body is grayish brown, and it forms a light grayish brown area in the abdomen region by becoming gradually lighter towards the same region. There are some white and at most two 1-cm spots on the abdomen region of some of the specimens. The hairs

forming the fur are rather soft. One fourth of the hairs are gray or brown, and their bottoms are dark gray. The fore and hind feet are naked and the dorsal sides are covered by white hairs. The dorsal of the tail is similar in color to the back, the tail side is thin, and its anterior blunt. There is no sexual difference in the adult specimens. However, the color of the young specimens is lighter.

**Cranial Characteristics:** The prolongations of premaxillar bones towards the frontal ones extend beyond the posterior of the nasal bone. The prolongation of the premaxillar bones in the ventral is the same level as the posterior of the incisive foramen (Fig. 5). The parietal bones form a protuberance in the middle side. This protuberance looks like a triangle from the dorsal and looks like a dome in the old specimens. There is no sagittal crest.

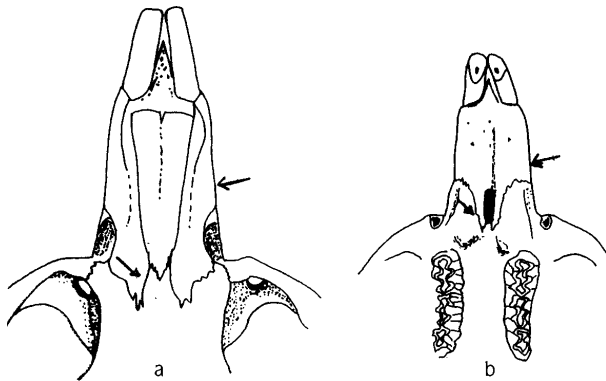


Figure 5. The posterior (a) and anterior (b) view of premaxillar bones of *E. lutescens*, X 0.5 cm.

The zygomatic arch shows a similarity with *fuscocapillus*. Angular process is larger than in the other 2 species. Coronoid process is rather large and sloped towards the angular process. The incisive foramen is larger than that of *fuscocapillus* (Fig. 2).

The external and cranial characteristic measurements are given in Table 2.

**Teeth:** The upper incisors are pro-odont and white. There is no root in the molars of the young specimens but 2 roots exist in adult ones. The first and second upper molars have 3 triangles in the lingual and labials. However, the re-entrant among the first and the second triangles in the lingual is more superficial. The third upper molar and lower molars are very similar with those of *fuscocapillus* (Fig. 6).

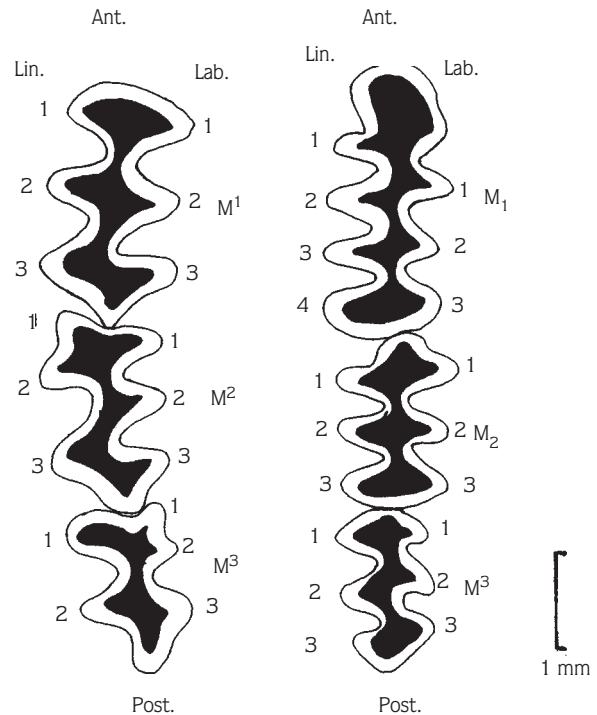


Figure 6. The upper and lower molars of *E. lutescens*. 1, 2, 3, 4: Triangles; Lin.: Lingual; Lab.: Labial; Ant.: Anterior; Post.: Posterior.

**Karyology:** Diploid chromosome number is  $2n = 17$ , the number of autosomal arms is  $NFa = 32$ , and the fundamental number is  $NF = 34$ . There is a pair of metacentric chromosomes, and the others are submetacentric. Sexual chromosomes are not clear in this species. Therefore, as stated by Vogel et al. (1988), the ninth chromosome was evaluated as an X chromosome (Fig. 7).

***Ellobius talpinus* (Pallas, 1770) (Northern Mole-Vole)**

1770. *Mus talpinus* Pallas, Nov. Comm. Acad Petrop.14, I: 568.

Type locality: West of Volga River, Kostytchi, Russia.

Distribution: The distribution in Iran is given in Figure 1.

Number of examined specimens: 1

Seraks (7): Seraks, 1.

Habitat: It is observed that this species shares the same area as *E. fuscocapillus*, i.e. it has a sympatric distribution.



Table 2. External and cranial measurements of *Ellobius lutescens*. (n: number of specimens,  $\pm$  SD: standard deviation)

Characters (mm)	n	Mean	Range	$\pm$ SD
Total length	99	125.74	100-140	7.76
Tail	99	13.37	9-19	3.63
Hind foot	99	22.31	17-26	1.71
Weight (g)	99	62.05	24.8-81	50.71
Greatest length of skull	99	33.09	28.8-35.6	1.15
Condylonasal length	99	31.24	22.1-31.6	26.27
Condylobasal length	99	28.34	22-30.9	1.15
Nasal length	99	8.84	7.5-10.2	0.51
Nasal breadth	99	3.69	2.8-3.8	3.06
Length of braincase	99	10.97	9.2-12.2	0.45
Height of braincase from bulla	99	11.03	9.2-12.2	0.48
Upper tooththrow (from crown)	99	6.89	6.2-8.8	0.42
Upper tooththrow (from alveoli)	99	7.8	6.7-8.6	0.34
Diastema	99	11.44	9.7-12.8	0.52
Length of facial region	99	18.4	15.3-20.4	0.81
Zygomatic breadth	99	22.35	19.3-22.6	1.09
Occipitonasal length	99	27.68	21.9-30.3	1.43
Basilar length	99	26.82	20.8-29.3	1.14
Tympanic bulla length	99	7.87	7.2-8.9	0.34
Tympanic bulla breadth	99	5.61	4.9-6.8	0.34
Incisive foramen length	99	2.37	1.9-3	0.17
Incisive foramen breadth	99	0.57	0.4-0.7	0.06
Interorbital constriction	99	6.74	5.7-6.9	5.99
Rostrum breadth	99	5.81	5-6.6	0.59
Length of palate	99	7.37	5.9-8.8	0.52
Parietal length	99	8.42	6-9.4	0.36
Posterior breadth of parietal	99	7.54	5.5-8.8	0.56
Anterior breadth of parietal	99	6.13	4.4-7.8	0.76
Lower tooththrow length (from crown)	99	6.78	5.6-7.8	0.34
Lower tooththrow length (from alveoli)	99	7.75	6.9-8.3	0.31
Mandible height	99	5.45	4.4-5.7	5.01
Height of coronoid process	99	11.42	7.2-13	0.82
Angular length	99	22.14	20-24.6	0.83
Articular length	99	22.76	20.4-27.8	0.93
Alveolar length	99	22.25	19.6-24.6	0.83

**The External Characteristics:** The body is rather large in comparison with the other 2 species. There is a laceration in the middle of the upper lip. There is a dark gray shading on the face like a mask that starts from the 2 sides of the nose and goes onto the ear hole as well as continuing from the cheeks towards the upper side of the head. This region is darker than *fuscocapillus*. The dorsal of the body is slightly reddish brown, the sides are yellow, and the abdomen region is off-white. The color of the back is the same as that of the dorsal in the tail. The tail is thin, long, and white in the dorsal and ventral. The soles of the fore and hind feet are naked, and the dorsal sides are covered by colored hair.

**Cranial Characteristics:** The premaxillar bones do not form an prolongation towards the frontal bones, and its posterior end is the same level as the nasal bone (Fig. 8).

The premaxillar bones reach about the middle of the incisive foramen in the ventral. There is an interparietal bone. The zygomatic arch is slender. The incisive foramen is long (Table 3)

The external and cranial characteristic measurements are given in Table 3.

**Teeth:** The upper incisors of *talpinus* are pro-odont and white. M<sup>1</sup> of *talpinus* is similar in form to M<sup>1</sup> of

Table 3. External and cranial measurements of *Ellobius talpinus*. (n: number of specimens)

Characters (mm)	n	Measurements
Total length	1	105
Tail	1	9.0
Hind foot	1	23
Weight (g)	1	35
Greatest length of skull	1	29.5
Condylonasal length	1	25.6
Condylobasal length	1	25.0
Nasal length	1	7.85
Nasal breadth	1	3.0
Length of braincase	1	10
Height of braincase from bulla	1	10.6
Upper tooththrow (from crown)	1	6.35
Upper tooththrow (from alveoli)	1	6.5
Diastema	1	9.3
Length of facial region	1	17.4
Zygomatic breadth	1	19.94
Occipitonasal length	1	24.12
Basilar length	1	23.8
Tympanic bulla length	1	7.5
Tympanic bulla breadth	1	4.5
Incisive foramen length	1	2.7
Incisive foramen breadth	1	1.0
Interorbital constriction	1	5.34
Rostrum breadth	1	4.65
Length of palate	1	6.5
Parietal length	1	7.9
Posterior breadth of parietal	1	7.4
Anterior breadth of parietal	1	5.75
Length lower tooththrow (from crown)	1	6.05
Length lower tooththrow (from alveoli)	1	6.75
Mandible height	1	4.0
Height of coronoid process	1	10.3
Angular length	1	20.0
Articular length	1	18.5
Alveolar length	1	18.2

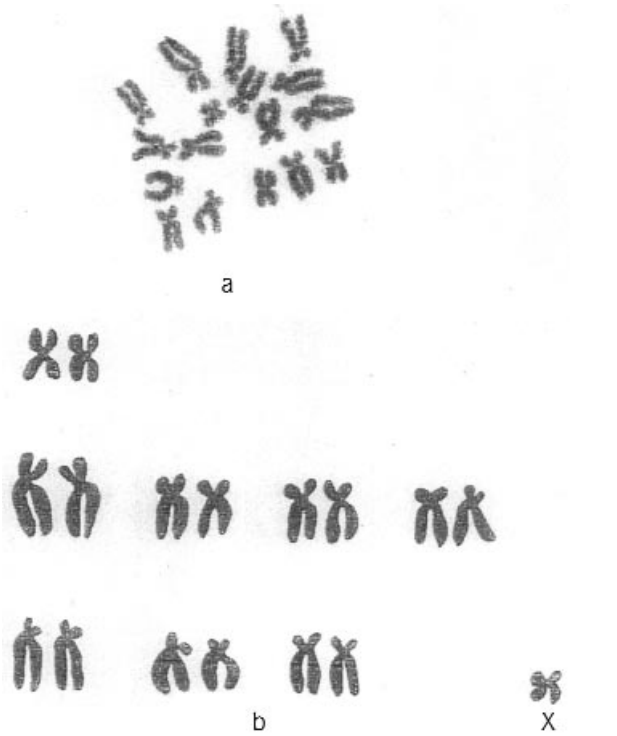


Figure 7. Metaphase plate (a) and karyotype (b) of a male specimen of *E. lutescens*.



Figure 8. The posterior (a) and anterior (b) view of premaxillar bones of *E. talpinus*, X 0.5 cm.

*fuscocapillus*. However, the re-entrant is among the first and the second triangles in M<sup>2</sup> lingual of *fuscocapillus*, whereas this re-entrant disappears in *talpinus* and there are 3 triangles in 2 labials of its lingual. There is 1 triangle in both the labial and lingual of M<sup>3</sup> of *E. talpinus*. If the region towards the posterior is not taken into account, there is 1 triangles in both the labial and lingual of M3 of *E. talpinus* (Fig. 9).

**Karyology:** Diploid chromosome number is 2n = 52, the number of autosomal arms is NFa = 50, and the fundamental number is NF = 52. All chromosomes are

completely acrocentric. Only the Y chromosome has a position that can be evaluated subtelocentrically (Fig. 10).

**Discussion**

*Ellobius fuscocapillus* (Blyth, 1843)

Blyth (1843), Ognev (1950), Lay (1967), Eitemed (1979) and Harrison and Bates (1991) stated that there is a region like a black mask reaching the upper side of the head from the cheek region that starts at the nasal pads in *E. fuscocapillus*, and the color of the dorsal part in the body is light brown, the side parts are yellowish

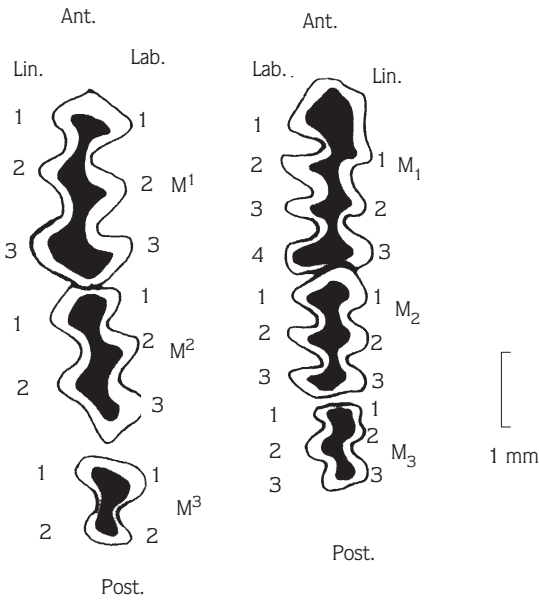
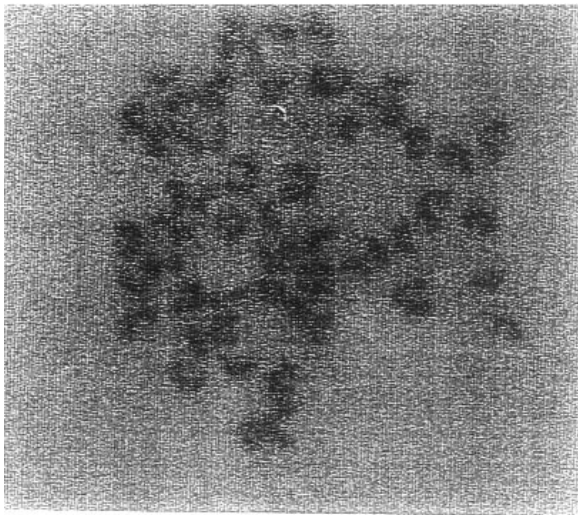
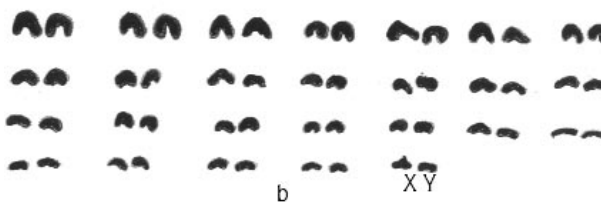


Figure 9. The upper and lower molars of *E. talpinus*. 1, 2, 3, 4: Triangles; Lin.: Lingual; Lab.: Labial; Ant.: Anterior; Post.: Posterior.



a



b

Figure 10. Metaphase plate (a) and karyotype (b) of a male specimen of *E. talpinus*.

brown, and the abdomen region is off-white. Our findings are consistent with those of the authors mentioned above except for the different color description we observed. Ellerman (1948) gave some measurements in his study on specimens of *fuscocapillus* in Baluchistan, and Karatkana (Afghanistan), such as occipitonasal length 30.7-33.2 mm, lower molar length 7.6-8 mm (7.7 mm), total length 118-143 mm (130 mm), tail 12-13 mm (12 mm), and hind foot 20-21 mm (20 mm). Comparing these measurements with those of *fuscocapillus* specimens in Iran, it was observed that they were not different from each other. Ognev (1950) gave the diastema length as 10.2-14.9 mm (12.55 mm). In contrast, Eitemad (1979) gave the same length as 11-14.6 mm (12.8 mm). Storch (1980) gave the length of the lower molars as 8.2-9.3 mm (8.75 mm), and the length of the diastema as 10.7-14.9 mm (12.2 mm). Harrison and Bates (1991) recorded the length of the lower molars as 6.6-8.2 mm (7.6 mm). Comparing these measurements recorded with those from specimens collected in this study, it is observed that these measurements are consistent (Table 1), but the lower molar length stated by Harrison and Bates (1991) is slightly smaller. Harrison and Bates (1991) did not record which measures based on specimens from 10 localities belonged to which age group, and did not mention the locality of the specimens. Harrison and Bates (1991) recorded that only one specimen, *E. fuscocapillus*, showed a distribution all over Iran. However, this study proves that 3 specimens have a distribution all over Iran. For this reason, it may be thought that the reason for the differences in measurements is the vagueness of the age group and a probable mistake in the diagnosis of the specimens evaluated by Harrison and Bates. Borisov et al. (1991) recorded the diploid chromosome number in *fuscocapillus* as  $2n = 36$ . In the first karyological study on the specimens in Iran in connection with this study, it is observed that the diploid chromosome number from 9 localities in eastern Iran is  $2n = 36$ . Therefore, the fact that *E. fuscocapillus* has a distribution in the eastern regions of Iran (Fig. 1) is also proved from the karyological point of view. Although the difference observed between *lutescens* and *talpinus* does not show a certain distinction according to the measurements, it is a scientific reality that there will be a coincidence in the different measurements belonging to various groups in the specimen population, ecological differences etc. Considering these scientific realities, all the

measurements obtained distinguish the 2 specimens generally (Tables 1,2,3).

### *Ellobius lutescens* Thomas, 1897

Ellerman (1948), Thomas (1897), Ellerman and Morrison-Scott (1951), Eitemad (1979) and Coşkun (1997) recorded that there is a black mask in the facial region of *lutescens*, the color of the dorsal region of the body is gray brown, the sides are light brown, one fourth of the hairs are gray or brown, and the bottom sides are light in color. It is observed that 99 adult specimens collected from 14 localities in central and western Iran are consistent with the characteristics mentioned by these researchers. It is also observed that there are some white spots in the breast region of some specimens, and no laceration on the upper lip. Vinogradov and Argiropulo (1914), and Ellerman and Morrison-Scott (1951) recorded that the interparietal bone does not exist in *lutescens*, there is no sagittal crest, and there are 3 triangles in the M<sup>3</sup> labial and in the lingual. These recorded characteristics have been found in all *lutescens* specimens examined in this study. Coşkun (1997) and Borisov et al. (1991) found that the diploid chromosome number in *lutescens* is  $2n = 17$  and the arm number of autosomal chromosomes is  $NFa = 34$ . It is observed that the karyological characteristics found as a result of the karyological studies in the specimens collected from 14 localities in central and western Iran are consistent with the karyological characteristics given in the literature.

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