Research Article

Uluslararası Tarım ve Yaban Hayatı Bilimleri Dergisi

International Journal of Agriculture and Wildlife Science

2023, 9(1): 98 – 110, doi: 10.24180/ijaws. 1062281

Gerbillus dasyurus (Rodentia: Gerbillinae) Record from Hatay Province, in the South of Turkey

Türkiye'nin Güneyindeki Hatay'dan *Gerbillus dasyurus* (Rodentia: Gerbillinae) Kaydı

Mustafa Sözen[1], **Muhsin Çoğal**[2]

Geliş Tarihi (*Received*): 07.02.2022 **Kabul Tarihi (*Accepted*):** 14.09.2022 **Yayın Tarihi (*Published*):** 25.04.2023

Abstract: Wagner's gerbil, *Gerbillus dasyurus*, is present in the Middle East, Arabian Peninsula, and marginally into the eastern desert of Egypt. The only record has been taken from Kilis in Turkey. In the present study, 10 specimens were collected from three localities in the Hatay Province. These specimens were captured in rocky hills and slopes with poor soil and vegetation on blocky igneous rocks, and also in the rocky lava flow area in the northeastern part of the Hatay Province. The diploid number of chromosomes, number of chromosomes, and fundamental number of autosomal arms of the specimens were found as 2n = 60, NF = 70, and NFa = 66, respectively. The relative abundance of species was estimated to be 2.74. The mean of the entire baculum is 2.37 mm long, and 0.52 mm at the maximum width (n=3). The number of roots on molars: 3 (M^1 and M^2), 2 (M_1 and M_2), and, 1 M^3 and M_3. The tail length is markedly longer than the total length of the head and body. Morphological and karyologic characters of the samples verify that the individuals investigated belong to *Gerbillus dasyurus*. However, it is possible to show inter- and intrapopulational variations because of the differences seen in the root number of M^1, the proportion of the tail, the shape of the baculum, etc., through a detailed study that covers all distribution area. This record is the second record of the species from Turkey. The Hatay record is an important result in revealing the distribution area of the species, as it is the only record region in Turkey, except Kilis. Conservation of the new record areas in Hatay will also be important for the survival of the species in Turkey.

Keywords: Wagner's gerbil, distribution, karyotype, phallus, baculum, abundance

&

Öz: Kayalık gerbili, *Gerbillus dasyurus*, Orta Doğu'da, Arap Yarımadası'nda ve marjinal olarak Mısır'ın doğu çölünde bulunur. Türkiye'deki tek kayıt Kilis'ten alınmıştır. Bu çalışmada Hatay ilindeki üç lokaliteden 10 örnek toplanmıştır. Bu örnekler, Hatay İli'nin kuzeydoğu kesimindeki kayalık lav akıntısı alanında ve bloklu magmatik kayalar üzerinde toprak ve bitki örtüsünün zayıf olduğu kayalık tepeler ve yamaçlardan yakalanmıştır. Örneklerin diploid kromozom sayısı, kromozom kol sayısı ve temel otozomal kol sayısı sırasıyla 2n = 60, NF = 70 ve NFa = 66 olarak bulundu. Türlerin nispi bolluğu 2,74 olarak tahmin edilmiştir. Tüm baculumun ortalaması 2,37 mm uzunluğunda ve 0,52 mm maksimum genişliktedir (n=3). Azı dişlerindeki kök sayısı: 3 (M^1 ve M^2), 2 (M_1 ve M_2) ve 1 M^3 ve M_3. Kuyruk uzunluğu, baş ve gövdenin toplam uzunluğundan belirgin şekilde daha uzundur. Örneklerin morfolojik ve karyolojik özellikleri, incelenen bireylerin *Gerbillus dasyurus*'a ait olduğunu doğrulamaktadır. Ancak M^1, kuyruk oranı, bakulum şekli vb. kök sayılarında görülen farklılıklar nedeniyle tüm yayılış alanlarını kapsayan detaylı bir çalışmada populasyonlar arası ve populasyon içi varyasyonlar göstermesi mümkündür. Bu kayıt türün Türkiye'den ikinci kaydıdır. Hatay kaydı Türkiye'den Kilis haricindeki tek kayıt bölgesi olduğu için türün yayılış alanının ortaya konulmasında önemli bir sonuçtur. Hatay'daki yeni kayıt bölgelerinin korunması türün Türkiye'de varlığını sürdürebilmesi bakımından da önemli olacaktır.

Anahtar Kelimeler: Kayalık gerbili, yayılış, karyotip, fallus, bakulum, bolluk

Atıf/Cite as: Sözen M. & Çoğal M. (2023). Gerbillus dasyurus (Rodentia: Gerbillinae) Record from Hatay Province, in the South of Turkey. International Journal of Agriculture and Wildlife Science. 9(1), 98-110. doi: 10.24180/ijaws. 1062281

İntihal-Plagiarism/Etik-Ethic: Bu makale, en az iki hakem tarafından incelenmiş ve intihal içermediği, araştırma ve yayın etiğine uyulduğu teyit edilmiştir. / This article has been reviewed by at least two referees and it has been confirmed that it is plagiarism-free and complies with research and publication ethics. https://dergipark.org.tr/tr/pub/ijaws

[1] Prof. Dr. Mustafa Sözen, Zonguldak Bülent Ecevit Üniversitesi, Biyoloji Bölümü, spalaxtr@hotmail.com

[2] Dr. Muhsin Çoğal, Zonguldak Bülent Ecevit Üniversitesi, Biyoloji Bölümü, mhsncogal@gmail.com (Sorumlu Yazar / Corresponding author)

INTRODUCTION

Gerbillus dasyurus is distributed in most parts of the peripheral Arabian Peninsula, Sinai, and in the Middle East, including the southeastern part of Turkey which is on the northernmost range margin of the species (Harrison and Bates, 1972; Yiğit et al., 1997 and 2006; Krystufek and Vohralik, 2001; Wilson and Reeder, 2005).

The first *Gerbillus dasyurus* record in Turkey was first acknowledged by Yiğit et al. (1997) from Kilis in the southeastern Turkey, and after that, no other record has been documented. Recently, Çoğal et al. (2016) recorded samples from three localities in Hatay Province as *Gerbillus* sp.,and indicated that they will perform karyological and morphological studies to determine the species exactly. By depending on this study, Karataş (2016) and Sözen (2021) have listed *Gerbillus dasyurus* in the mammal fauna list of Hatay Province without giving any detail about the karyological and morphological peculiarities of the samples.

The taxonomy, taxonomic and phylogenetic relationship among the species of the genus *Gerbillus* has remained ambiguous for a long time. Lataste (1881 and 1882) recorded three subgenera on the basis of molar features as *Hendecapleura*, *Dipodillus*, and *Gerbillus*. Yiğit et al. (1997) used the name *Gerbillus* (*Hendecapleura*) *dasyurus* for Wagner's gerbil in Turkey. The species of the three subgenera have been classified by the presence of hair on the feet (Ellerman, 1941; Wassif, 1956; Harrison, 1967; Wassif et al., 1969). Lay (1983) considered the presence or absence of hair on the feet as an adaptive character, and discussed the presence of a single genus, *Gerbillus*, without a subgenus. Recently, Musser and Carleton (2005), by using morphological characters, raised the subgenus *Dipodillus* to the genus rank and maintained the other two subgenera Hendecapleura and *Gerbillus* within the genus *Gerbillus*. Wilson and Reeder (2005) recorded the species dasyurus under the genus *Dipodillus* and subgenus *Petteromys*. Similarly, Kryštufek and Vohralík (2009) recorded Wagner's gerbil in Turkey as *Dipodillus dasyurus*, even though they had used the name *Gerbillus dasyurus* previously (Kryštufek and Vohralík, 2001). However, according to the molecular analyses for the subfamily Gerbillinae given by Chevret and Dobigny (2005), when *Dipodillus* is considered as a separate genus, then the genus *Gerbillus* remained as paraphyletic. Finally, Abiadh et al. (2010) showed that all the *Gerbillus* species are monophyletic, and with the molecular phylogeny given, rejected the genus rank for the taxon *Dipodillus*. Additionally, Wilson et al. (2017) and Burgin et al. (2020) have continued to use the name *Gerbillus*. For this reason, the generic name *Gerbillus* has been used in this paper.

The karyotype of *Gerbillus dasyurus* was recorded from Sinai by Wahrman and Zahavi (1955) as 2n = 60, NF = 66, 68; from Egypt by Wassif et al. (1969) as 2n = 60, FN = 69, 70; from Sinai by Lay and Nadler (1975) recorded as 2n = 60, NF = 68; from Jordan by Qunsiyeh et al. (1986) as 2n = 60 and NF = 66, 68, 70; from Turkey by Yiğit et al. (1997) as 2n = 60 and NF = 70; and from Jordan by Baker et al. (2009) as 2n = 60 and NF = 72. The reproductive biology of the species in Turkey was studied by Çolak et al. (1999).

Wagner's gerbil is one of the smallest ranged mammal species in Turkey and is known only from one locality in the southeastern part of the country. Since Wagner's gerbil is very rare in Turkey, a Species Protection Action Plan was performed in Kilis Province for the species by the Ministry of Agriculture and Forestry in 2016 to protect the species and its distribution area (Tel et al., 2016).

The aim of the study is to provide records of additional localities of this rare mammal species in Hatay province in the south of Turkey, to contribute to its taxonomy, karyology, and distribution there, and also to supply detailed morphological peculiarities as comparative data for further studies.

MATERIAL AND METHOD

During a small mammal survey in May 2016, we collected 10 *Gerbillus dasyurus* samples by Sherman traps from three localities in the Kırıkhan town in the Hatay Province, Turkey (Figure 1). Traps were set at intervals of approximately 10 meters. The Trap Night Index was calculated according to Gurnell and Flowerdew (2006). This calculation converted the number of animals caught to the number caught per trap night or per 100 trap nights (TNI). Six of the samples were karyotyped according to Ford and Hamerton (1956). The phalli were photographed from fresh material and measured with a binocular as in

Lidicker (1968). Then baculum bones were removed and measured under a binocular microscope. The cranial and external measurements were taken as in Harrison and Bates (1991). Stuffed specimens and skulls were deposited in the Biology Department at the Bülent Ecevit University.

RESULTS AND DISCUSSION

Distribution

The *Gerbillus dasyurus* samples were collected from three localities in the Kırıkhan town in the Hatay Province, Turkey. The sampling localities were 1 km east of the Aygırgölü village, 1 km east of the Kaletepe village, and 2 km northeast of the Kaletepe village. The sampling coordinates of each sample are given in Table 1, and the sampling localities are shown in Figure 1.

Table 1. The coordinates, altitudes and habitats the localities where *Gerbillus dasyurus* samples were collected.
Çizelge 1. *Gerbillus dasyurus örneklerinin toplandığı yerlerin koordinatları, rakımları ve habitatları.*

No	Locality	Coordinate	Altitude asl.	Habitat
1	1 km E of Aygırgölü	36°35'2.27"N/ 36°29'27.09"E	115 m	Rocky hills
2	1 km E of Kaletepe	36°39'8.24"N/ 36°33'55.37"E	242 m	Rocky hills
3	1 km E of Kaletepe	36°39'8.65"N/ 36°33'54.05"E	242 m	Rocky hills
4	1 km E of Kaletepe	36°39'10.70"N/ 36°33'52.81"E	240 m	Rocky hills
5	1 km E of Kaletepe	36°39'11.26"N/ 36°33'51.85"E	240 m	Rocky hills
6	1 km E of Kaletepe	36°39'11.69"N/ 36°33'57.45"E	241 m	Rocky hills
7	1 km E of Kaletepe	36°39'18.02"N/ 36°34'12.04"E	235 m	Rocky hills
8	2 km NS of Kaletepe	36°40'8.30"N/ 36°34'4.09"E	223 m	Lava flow
9	2 km NS of Kaletepe	36°40'5.10"N/ 36°34'2.38"E	235 m	Lava flow
10	2 km NS of Kaletepe	36°40'4.80"N/ 36°34'0.32"E	234 m	Lava flow

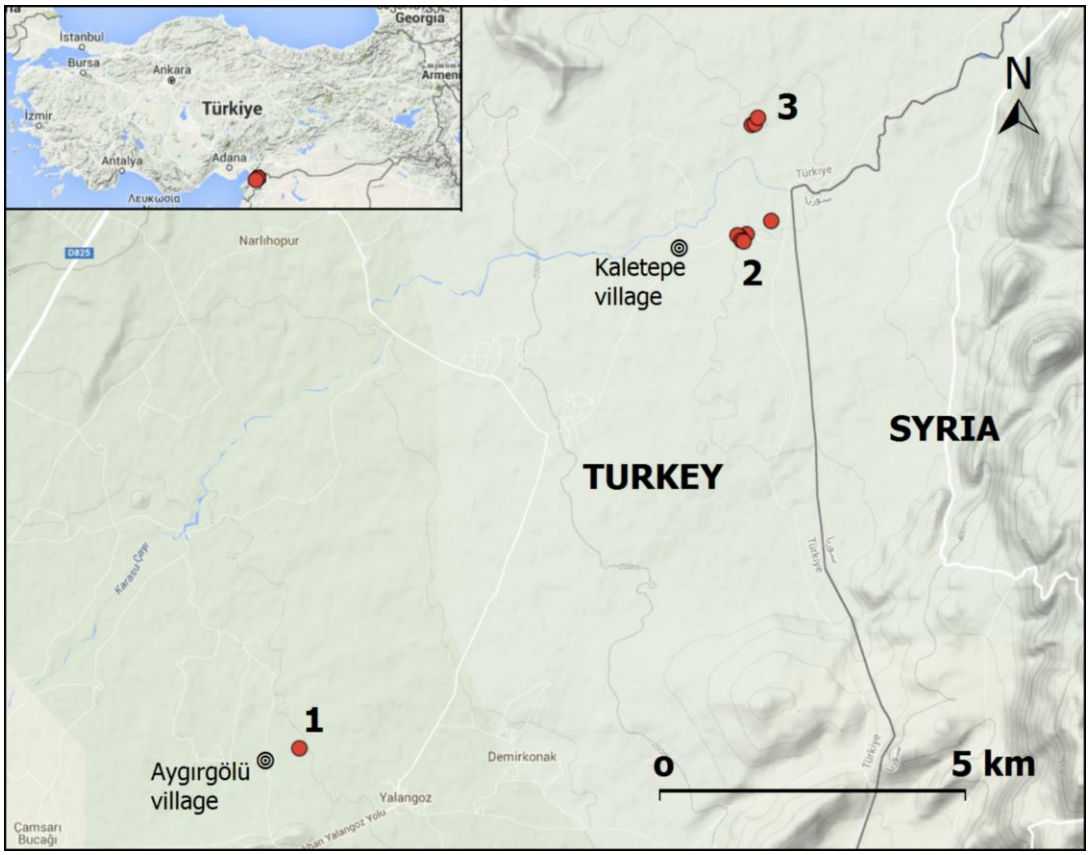

Figure 1. Sampling localities (●) of *Gerbillus dasyurus* in Kırıkhan town of Hatay Province. 1) 1 km east of Aygırgölü village, 2) 1 km east of Kaletepe village, and 3) 2 km northeast of Kaletepe village.
Şekil 1. Hatay ili Kırıkhan ilçesi Gerbillus dasyurus'un örnekleme yerleri (●). 1) Aygırgölü köyünün 1 km doğusu, 2) Kaletepe köyünün 1 km doğusu ve 3) Kaletepe köyünün 2 km kuzey doğusu.

Habitat

Specimens were collected in rocky hills and slopes on blocky igneous rocks where the soil and vegetation are poor (Figure 2), and also in a lava flow area called "Leçelik" in Turkish. The Leçelik area is dark colored, with plenty of surface alteration and fragmented ancient lava flows (Figure 3). Such areas are common between the Hassa and Kumlu towns near the border with Syria, and are a potential distribution area for Wagner's gerbil.

Population Density

During the study, the three localities around Kırıkhan were laid with by 365 traps. Totally, 10 *Gerbillus dasyurus* and 5 *Apodemus mystacinus*, one *Mus macedonicus*, and one *Crocidura* sp. samples were trapped. The *G. dasyurus* samples were trapped from three localities whereas all others from one locality, and by 132 traps in one day. By using this data, the trap night index (TNI) was calculated in all three localities and 365 traps for the *G.s dasyurus*, and one locality and 132 traps for the others. Thus, the number of record/100 trap nights (TN) was found to be 2.74 for *G. dasyurus*, 3.79 for *A. mystacinus*, 0.75 for *M.s macedonicus*, and 0.75 for *Crocidura* sp.

Figure 2. Blocky igneous rocky habitat of *Gerbillus dasyurus* around Kaletepe village.
Şekil 2. Gerbillus dasyurus'un Kaletepe köyü çevresindeki bloklu magmatik kayalık habitatı.

Figure 3. Lava flow habitat of *Gerbillus dasyurus* around Kaletepe village.
Şekil 3. Kaletepe köyü çevresinde Gerbillus dasyurus'un lav akıntısı habitatı.

Co-occurrence Rodent Species

We set a total of 365 Sherman-type traps for three days during the study and collected 10 *Gerbillus dasyurus*, 5 *Apodemus mystacinus*, 1 *Mus macedonicus*, and 1 *Crocidura* sp. samples.

Karyology

The karyotype of the Wagner's gerbil from Hatay is 2n = 60, NF = 70, NFa = 66. The autosomal test has three pairs of metacentric, one pair of submeta/subtelocentric, and 25 pairs of acrocentric chromosomes. The X chromosome is the largest submetacentric, and the Y chromosome is the smallest acrocentric (Figure 4).

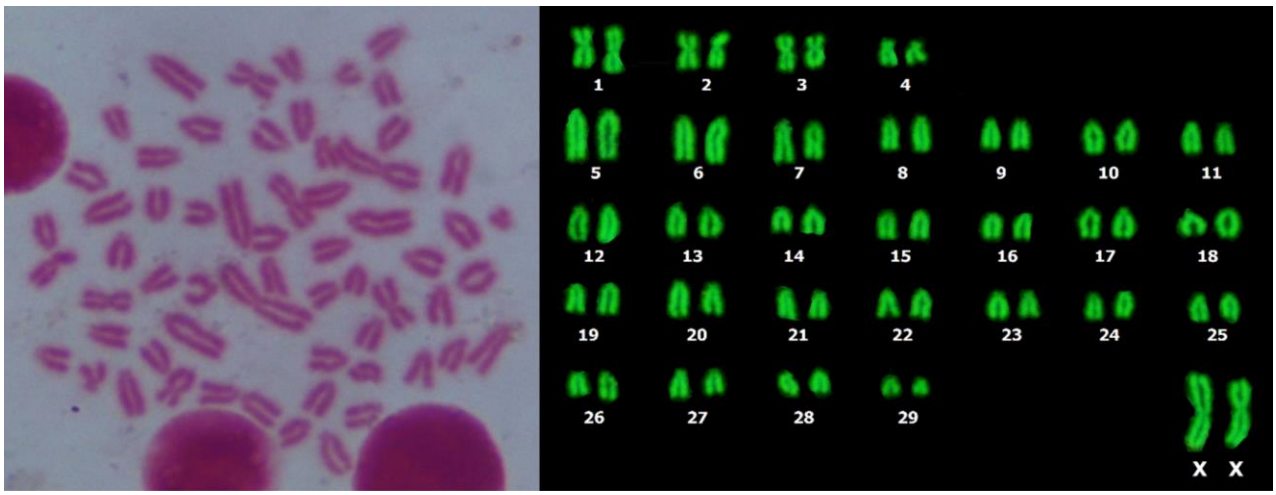

Figure 4. The karyotype of a female *Gerbillus dasyurus*. Sample no: 7830.
Şekil 4. Dişi bir Gerbillus dasyurus'un karyotipi. Örnek numarası: 7830.

Phallus and Baculum

The surface of the phallus is covered with tiny spines in small, circular pockets. The mean of the entire baculum is 2.37 mm long and 0.52 mm at the maximum width, according to the four samples studied (Figure 5, 6; Table 2).

Figure 5. The phallus of a male *Gerbillus dasyurus*. A. Dorsal, B. Ventral, C. Tip, D. Lateral view (Scale 5 mm). Sample no: 7781.

Şekil 5. Erkek bir Gerbillus dasyurus'un fallusu. A. Dorsal, B. Ventral, C. Uç, D. Yandan görünüm (Ölçek 5 mm). Örnek numarası: 7781.

Table 2. Baculum measurements of *Gerbillus dasyurus.*

Tablo 2. Gerbillus dasyurus'un bakulum ölçümleri.

Characters(mm)	n	mean	min.	max.	sd
Baculum_lenght	3	2.37	2.12	2.56	0.23
Median_width_min.	3	0.24	0.12	0.34	0.11
Median_width_max.	4	0.52	0.32	0.63	0.14
Base_width	4	1.26	0.88	1.49	0.27
Tip_witdh(dorsal)	4	0.34	0.29	0.39	0.04
Basal_width	4	1.28	0.9	1.54	0.27
Basal_height	4	0.48	0.17	0.68	0.22

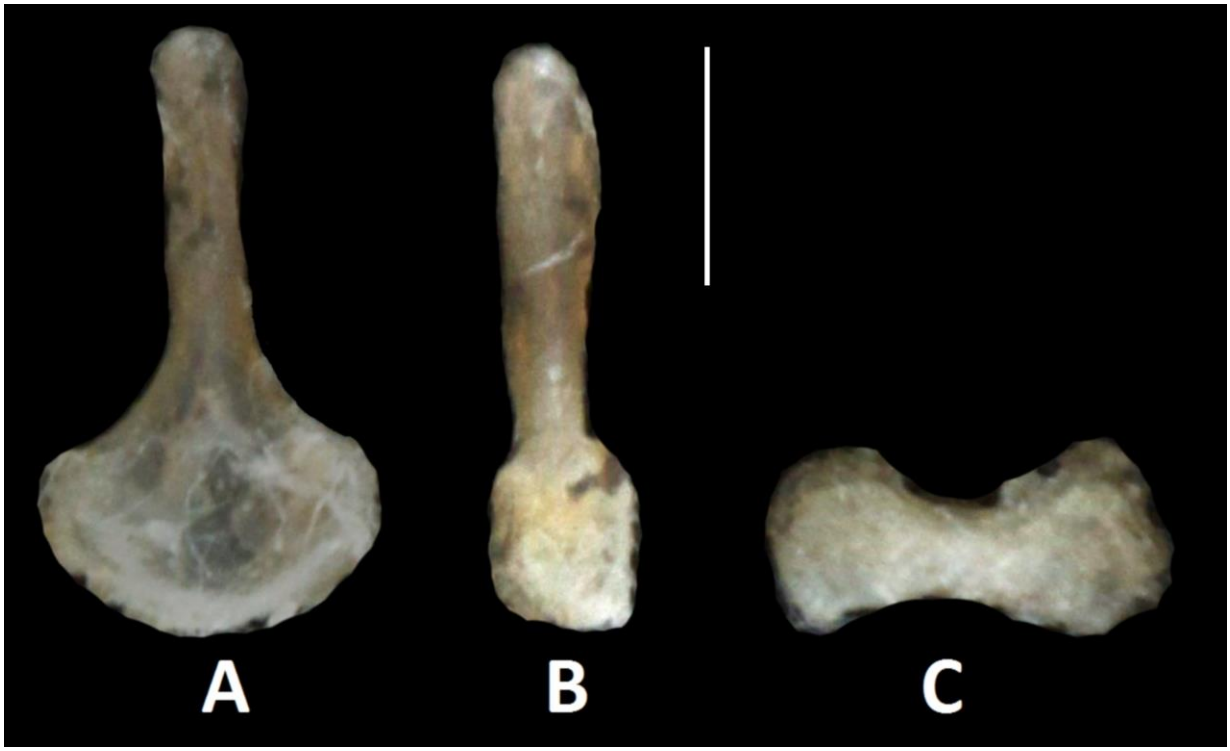

Figure 6. The baculum of a male *Gerbillus dasyurus*. A. Dorsal, B. Lateral, C. Basal view (Scale 1 mm). Sample no: 7832.
Şekil 6. Erkek bir Gerbillus dasyurus'un bakulumu. A. Dorsal, B. Lateral, C. Bazal görünüm (Ölçek 1 mm). Örnek numarası: 7832.

Cranial Characters

The skull and mandible shape is given in Figure 7 and cranial measurements are given in Table 3. Wagner's gerbil has a small and delicately built skull. The general shape of the skull in the dorsal and ventral view is triangular. The greatest length of the skull of the biggest sample is 28.10 mm. Incisors are opisthodont and have a remarkable groove on the outer anterior surface extending from the base up to the tip. The color of the enamel on the incisors is yellow. Slender-built zygomatic arches are curved below and do not make a convex curve toward lateral sides. The tympanic bullae are swollen and connected to the paramastoid processes. The posterior part of the tympanic bullae does not exceed the supraoccipitals, so is not seen from the dorsal view. The maxillary tooth row is longer than the mandibular tooth row (Table 3). The number of roots on molars: 3 (M^1 and M^2), 2 (M_1 and M_2), and 1 M^3 and M_3 (Figure 8, 9).

Table 3. Baculum measurements of *Gerbillus dasyurus*.
Tablo 3. Gerbillus dasyurus'un bakulum ölçümleri.

Characters(mm)	n	mean	min.	max.	sd
Total length	8	209.13	204.00	215.00	4.70
Head and body	8	93.13	85.00	106.00	6.92
Tail length	8	116.00	104.00	122.00	6.41
Hind foot	9	23.67	22.00	25.00	1.12
Ear	9	13.00	12.00	15.00	1.12
Weight (gr)	9	23.11	21.00	28.00	2.03
Zygomatic breadth	5	14.35	14	15	0.49
Interorbital constriction	9	5.12	4.60	6	0.47
Condylobasal length	8	24,08	21,05	28,46	2,07
Occipitonasal length	7	26.74	26.00	28.10	0.76
Basal length	8	21.97	20.25	25.00	1.42
Nasal length	7	10.00	9.50	10.75	0.46
Occipital width	7	11.59	10.25	13.40	0.95
Braincase width	8	13.39	12.75	15.60	0.93
Diastema length	9	6.36	5.75	7.50	0.59
Palatal length	9	12.70	11.59	14.63	0.84
Foramen incisiva	9	4.84	4.45	6.07	0.47
Length of tympanic bullae	9	8.95	8.41	10.77	0.70
Mandible length	9	12.90	12.09	15.36	1.02
Maxillary tooth row	9	3.50	3.25	4.25	0.31
Mandibular tooth row	9	3.42	2.75	4.75	0.59

Figure 7. The skull and mandible of a male *Gerbillus dasyurus*. A. Dorsal, B. Ventral, C. Lateral view, and D. Mandible (Scale 10 mm). Sample no: 7831.
Şekil 7. Erkek bir Gerbillus dasyurus'un kafatası ve çene kemiği. A. Dorsal, B. Ventral, C. Lateral görünüm ve D. Mandibula (Ölçek 10 mm). Örnek numarası: 7831.

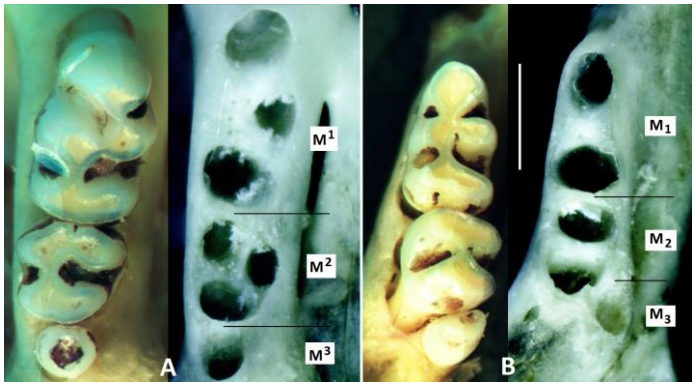

Figure 8. Upper molars (A) and alveoli (B), and Lower molars (C) and alveoli (D) (Scale = 1 mm). Sample no: 7913.
Şekil 8. Üst azı dişleri (A) ve alveoller (B) ve Alt azı dişleri (C) ve alveoller (D) (Ölçek = 1 mm). Örnek numarası: 7913.

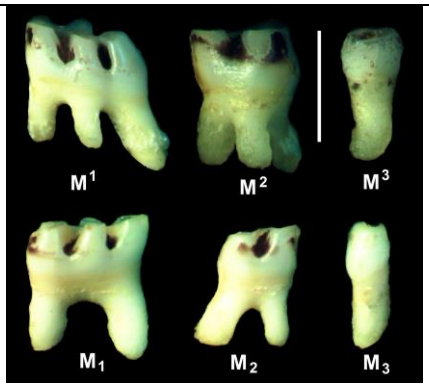

Figure 9. The molar roots of *Gerbillus dasyurus* (Scale 1 mm). Sample no: 7913.
Şekil 9. Gerbillus dasyurus'un molar kökleri (Ölçek 1 mm). Örnek numarası: 7913.

External Characters

Wagner's gerbil is the smallest in the Turkish fauna, so is easy to recognize when captured. The general form of the body is slender and elegant (Figure 10, 11). The head is remarkable and relatively large, the eyes are large and attractive, and the ears are moderate in size, with almost no hair internally, and only a very few tiny white hairs externally. The rostrum has relatively long and generally white, but some with black vibrissae. The mystacial vibrissae are long (mean = 41.76 mm, n = 6) and mainly white. The pelage of the Wagner's gerbil is dense, silky, and has an average length (mean = 9.39 mm, n = 6, on mid-back).

The tail is markedly longer than the head and body (mean = 125.46%) (Table 3). The tail is covered with hair, and the length of the hair is longer towards the tip forming a distinct terminal brush in the last quarter of the tail. The dorsal side of the tail has more hair than the ventral side. The color of the hair is paler ventrally giving a bicolored vision. The length of the hind feet is prominently longer than the forearms. The plantar surface of the hind feet is hairless and has five pads. The front plantar surface is hairless, with five pads (the two proximal pads are the largest) and the hind plantar surface has six tubercles (they are about the same size). They have four fingers on the forearms and five on the hind foot. The first finger on the forearms is like a tubercle. The claws are definite on both forearms and hind feet, and the hind foot claws darker than the forearms in color.

The dorsal fur of these specimens is pale yellowish-brown with a fine agouti pattern, the flanks are bright yellow and the belly is white; the demarcation line along the flanks is distinct. Dorsal hairs are slate grey on the proximal two-thirds of their length; those on the belly are pure white to the base. The ear is buff-grey at the base, grey towards the tip, and covered with short white hairs on the outer surface. The tip of the inner surface of the ear also has very tiny short white hairs. The color of the fur in the dorsal superior and posterior side of the ear base is markedly white. Indistinct facial markings include a pale white supra-postorbital region. The tail hairs are short at the tail base, then getting longer and forming a distinct terminal brush, bicolored, greyish-brown above, paler below. Its terminal one-quarter is blackish brown on the dorsal side and white to grey below. The feet are creamy white.

Figure 10. General view of *Gerbillus dasyurus* from Hatay. Photo: Mustafa Sözen.
Şekil 10. Hatay'dan Gerbillus dasyurus'un genel görünümü. Fotoğraf: Mustafa Sözen.

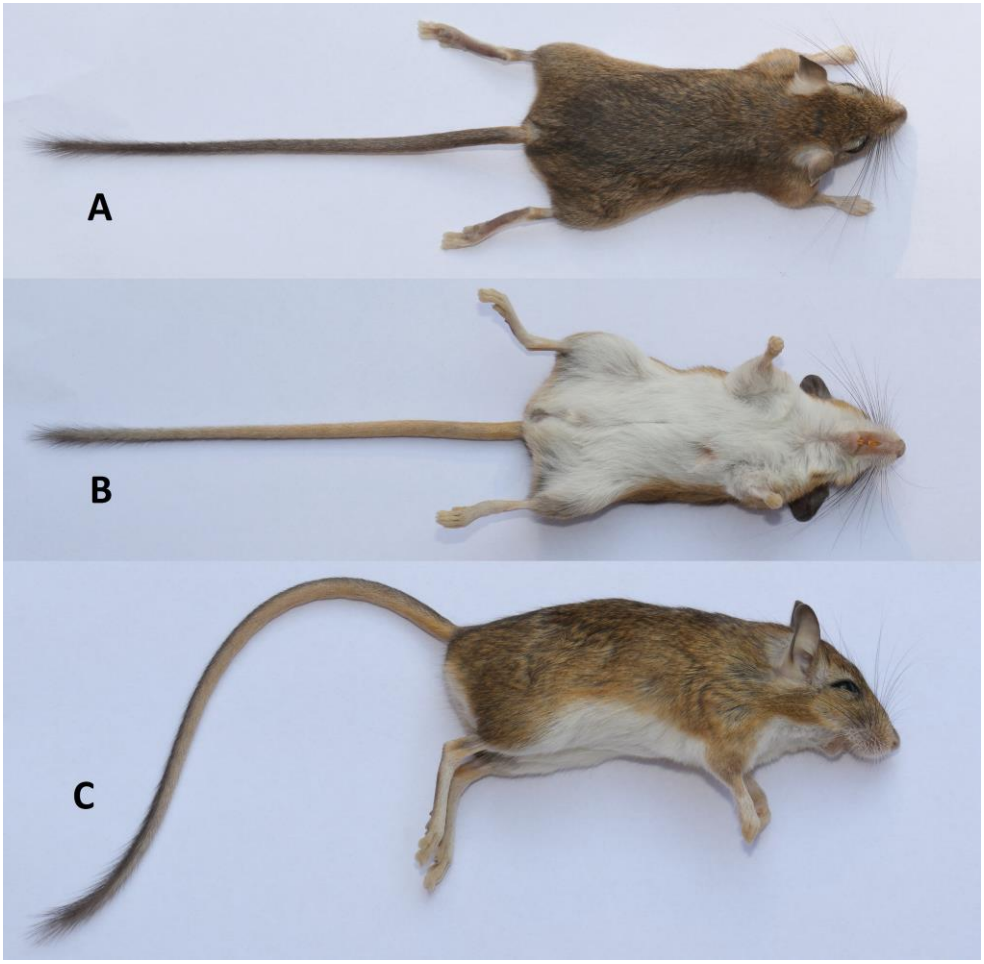

Figure 11. The morphology of a female *Gerbillus dasyurus*. A. Dorsal, B. Ventral, C. Lateral view. Total length of the body is 205 mm. Sample no: 7912.
Şekil 11. Dişi bir Gerbillus dasyurus'un morfolojisi. A. Dorsal, B. Ventral, C. Yandan görünüm. Vücut toplam uzunluğu 205 mm'dir. Örnek numarası: 7912.

Protection

Since Wagner's gerbil is very rare in Turkey, a Species Protection Action Plan was performed in Kilis Province for the species by the Ministry of Agriculture and Forestry in 2016 (Tel et al., 2016). However, we understood by examining the report that the study team could not get any *Gerbillus dasyurus* samples from Kilis Province during the study. On the other hand, Çolak and Yiğit mentioned that they also could not get any samples from the first record locality area in Kilis Province and close surroundings (pers. com). These results and observations have made the Hatay record more important for the existence and protection of the species in Turkey. It is very clear that, to can protect the species in Turkey, it is necessary to protect the distribution localities and suitable habitat areas around records localities in Hatay. These habitat types are especially common in the Mountain Gazelle distribution area and lava flow area "Leçelik" around Hassa, Kırıkhan, and Kumlu towns in Hatay Province. Mountain Gazelle distribution area is protected as Wildlife Development Area, however, the lava flow area does not have any official protection status. That is why a kind of official protection status should be attained to the lava flow area "Leçelik" to protect Wagner's gerbil and a lot of other species that inhabit the area.

DISCUSSION

Sözen et al. (1997) and Yiğit et al. (1998) are the first studies about Wagner's gerbil in Turkey, and the distribution of this species was recorded from rocky hills located 10 km east of Kilis. The record given by Yiğit et al. (2003) from Ceylanpınar was a mistake (Yiğit per. comm.). The localities recorded here from Hatay are new for this species in Turkey and extend the distribution of the species in the country about 60 kilometers westward.

The range of this species extends to the Eastern Desert in Egypt and covers Sinai, Arabia, Israel, Lebanon, Jordan, Syria, Iraq (Kryštufek and Vohralík, 2009), and Turkey (Yiğit et al., 1997). Wagner's gerbil was reported mostly from rocky steppes (Zahavi and Wahrman, 1957; Haim and Tchernov, 1974; Harrison and Bates, 1991; Shenbrot et al., 1997; Yiğit et al., 1997; Scott and Dunstone, 2000; Abu Baker and Amr, 2003) as we found in Hatay. Unlike other studies on this species, we also determined the species in the lava flow area called "Leçelik" in the Hatay Province.

Cranial and external characters coincide with the characters given in the literature for Wagner's gerbil. The number of alveoli was given as 4, 3, 1 (maxillary row); 2, 2, 1 (mandibular row) by Yiğit et al. (1997). However, the alveoli number of M^1 was determined as 3 in all the specimens from Hatay. This showed that the alveoli number in the specimens from Kilis and Hatay show regional differences.

The karyotype of Wagner's gerbil from Hatay is found as 2n = 60, NF = 70, NFa = 66. The same karyotype also was given from Kilis (Yiğit et al., 1997). On the other hand, although the diploid number is stable as 2n= 60, a fundamental number of chromosomal arms varies in Jordan as NF = 68, 70 (Qumsiyeh et al., 1986), in Sinai as NF= 69, 70 (Wassif et al., 1969), in the Sinai specimens as NF= 68 (Lay and Nadler, 1975), and again in the Sinai as 66 and 68 (Wahrman and Zahavi, 1955).

The phallic and bacular characteristics of the specimens from Hatay are generally similar to other records given by Yiğit et al. (1997) from Kilis and by Abu Baker and Amr (2003) from Jordan. However, some differences also could be seen. The differences in the Jordanian sample are definite, especially in the middle part of the long proximal stalk. This portion is wider and shows a bomber aspect in the specimens from Jordan. This area is straight in the Turkish specimens (Yiğit et al., 1997, this study). On the other hand, the size of the baculum given by Yiğit et al. (1997) from Kilis is smaller and may belong to a young sample. All these differences imply that some shape and size differences in different populations of *Gerbillus dasyurus* may be seen and a detailed study that covers more populations and the sample may be useful to show all kinds of variations (Figure 12).

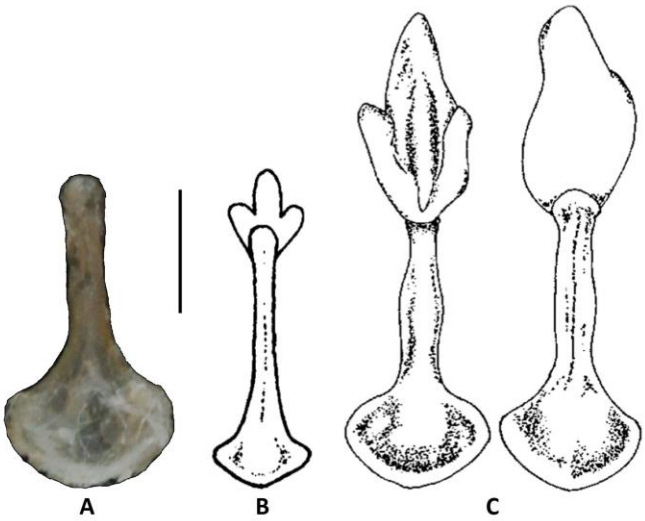

Figure 12. Comparative morphology of baculum in A. Hatay (this study), B. Kilis (Yiğit et al., 1997), and C. Jordan (Abu Baker and Amr 2003) samples (Scale = 1 mm).
Şekil 12. A. Hatay (bu çalışma), B. Kilis (Yiğit et al., 1997) ve C. Ürdün (Abu Baker and Amr, 2003) örneklerinde backulum'un karşılaştırmalı morfolojisi (Ölçek = 1 mm).

CONCLUSION

Wagner's gerbil, *Gerbillus dasyurus*, is distributed in the Middle East, Arabian Peninsula, and eastern desert of Egypt. Turkish records are given in the south of Turkey which is on the northern range margin of the world. Taxonomic literature mentions some subspecies in this area and a detailed study that includes molecular, genetic, morphologic, biometric, and zoogeographic data is needed to clarify the subspecific status of samples collected from all parts of the distribution area of the species. Such a study will be useful to find out intra- and interpopulational variations in morphological peculiarities such as bacular morphology, the alveoli number, etc. This study supplied some comparative data for further studies in the future, and also contributed to the knowledge of the distribution of the species.

CONFLICT OF INTEREST

There is no conflict of interest between the authors.

DECLARATION OF AUTHOR CONTRIBUTION

Both author**;** field studies**,** collecting materials, lab work, statical analysis and writing of the manuscript**.**

ACKNOWLEDGMENT

We thank Abdullah Öğünç and Arifsami İğde (Hatay Protection of Nature Association) for their guidance in the field. The specimens used in this study were collected during field trips supported by the TUBİTAK (The Scientific and Technological Research Council of Turkey) (SBAG 214S276).

REFERENCES

Abu-Baker, M. A., & Amr, Z. (2003). A morphometric and taxonomic revision of the genus *Gerbillus* (Mammalia, Rodentia, Gerbillidae) in Jordan with notes on its current distribution. *Zoologische Abhandlungen*, *53*, 177-204.

Amori, G., Hutterer, R., Kryštufek, B., Yigit, N., Mitsainas, G., Palomo, L., & Aulagnier, S. (2021). *Gerbillus dasyurus* (amended version of 2016 assessment). The IUCN Red List of Threatened Species 2021: e.T9116A197509063. https://dx.doi.org/10.2305/IUCN.UK.2021-1.RLTS.T9116A197509063.en.

Burgin, C. J., Wilson D. E., Mittermeier, R. A., Rylands, A. B., Lacher, T. E., & Sechrest, W. (2020). *Illustrated Checklist of the Mammals of the World. Volume 1. Monotremata to Rodentia.* Lynx Editions, Barcelona.

Çoğal, M., Ünal, M., Öktem, İ. M. A., & Sözen, M. (2016). A Preliminary Study to Determine Distribution and Ecology of Striped Hyaena (*Hyaena hyaena*) in the Area between Hassa and Reyhanli (Hatay). *Nature and Man*, *50*, 24-37.

Çolak, E., Sözen, M., & Yiğit, N. (1999). Observations on the Reproductive Biology of *Gerbillus dasyurus* (Wagner, 1842) (Mammalia: Rodentia) in Turkey. *Turkish Journal of Zoology*, *23*, 243-246.

Corbet, G. B. (1978). *The Mammals of the Palaearctic Region: A Taxonomic Review. Vol. 2.* London and Ithaca, British Museum (Natural History) and Cornell University Press, United Kingdom.

Haim, A., & Tchemov, E. (1974). The distribution of myomorph rodents in the Sinai Peninsula. *Mammalia*, *38*, 201-223.

Harrison, D. L., & Bates, P. J. J. (1991). *The Mammals of Arabia. Vol. 25.* Harrison Zoological Museum. Kent, United Kingdom.

Karataş, A. (2016). Mammalian (Mammalia) of Hatay Province. *Nature and Man*, *50*, 17-23.

Kryštufek, B., & Vohralík, V. (2001). *Mammals of Turkey and Cyprus. Introduction, Checklist, Insectivora. Vol. 1.* Slovenia, Koper.

Kryštufek, B., & Vohralík, V. (2009). *Mammals of Turkey and Cyprus. Rodentia II: Cricetinae, Muridae, Spalacidae, Calomyscidae, Capromyidae, Hystricidae, Castoridae.* Slovenia, Koper.

Lay, D. M., & Nadler, C. F. (1975). A study of *Gerbillus* (Rodentia: Gerbillinae) east of Euphrates River. *Mammalia*, *39(3)*, 423-445.

Qumsiyeh, M. B., Schlitter, D., & Disi, A. (1986). New records and karyotypes of mammals from Jordan. *Mammalian Biology*, *51*, 139–146.

Scott, D. M., & Dunstone, N. (2000). Environmental determinants of the composition of desert-living rodent communities in the north-east Badia region of Jordan. *Zoological Society of London*, *251*, 481-494. https://doi.org/10.1111/j.1469-7998.2000.tb00804.x

Shenbrot, G. I., Krasnov, B. R., & Khokhlova, I. S. (1997). Biology of Wagner's gerbil *Gerbillus dasyurus* (Wagner, 1842) (Rodentia: Gerbillinae) in the Negev Highlands, Israel. *Mammalia*, *61*, 467- 486.

Sözen, M. (2021). Mammal Diversity of Hatay Province and Conservation Suggestions. *Doğanın Sesi*, *4*, 40-53.

Tel, M., Temizer, A., Öner, A., Karacan, H., & Veldet, E. (2016). *Kilis İli Kayalık Gerbili (Gerbillus dasyurus) Tür Eylem Planı 2016 – 2020*. Aktel Mühendislik, Ankara.

Wahrman, J., & Zahavi, A. (1955). Cytological contributions to the phylogeny and Classification of the rodent genus *Gerbillus*. *Nature*, *175*, 600-602.

Wassif, K., Lutfy, R. G., & Wassif, S. (1969). Morphological cytological and taxonomical studies of the rodent genera *Gerbillus* and *Dipodillus* from Egypt. *Proceedings of the Egyptian Academy of Sciences*, *22*, 77-97.

Wilson, D. E., & Reeder, D. M. (2005). *Mammal Species of the World. A Taxonomic and Geographic Reference. Vol. 3.* John Hopkins Univ. Press, Baltimore, United States.

Wilson, D. E., Lacher, T. E., & Mittermeier, R. A. (2017). *Handbook of the Mammals of the World. Vol. 7. Rodents II. Lynx Edicions*. Barcelona.

Yiğit, N., Çolak, E., Sözen, M., & Karataş, A. (2006). *Rodents of Türkiye. Vol. 1.* Ankara, Turkey, Meteksan Company.

Yiğit, N., Çolak, E., Sözen, M., & Özkurt, Ş. (2003). A study on geographical distribution along with habitat aspects of rodent species in Turkey. *Bonner Zoologische Beiträge*, *50*, 355-368.

Yiğit, N., Kıvanç, E., Çolak, E., & Sözen, M. (1997). Gerbil record from Turkey: *Gerbillus* (*Hendecapleura*) *dasyurus* (Wagner, 1842) (Rodentia: Gerbillinae). *Israel Journal of Zoology*, *43*, 13-18.

Zahavi, A., & Wahrman, J. (1957). The cytotaxonomy, ecology and evolution of the gerbils and jirds of Israel (Rodentia: Gerbillinae). *Mammalia*, *21*, 341-380.