

The least weasel (*Mustela nivalis*) (Mammalia, Carnivora) from Central Anatolia: an overview on some biological characteristics

İç Anadolu'da gelincik (*Mustela nivalis*)
(Mammalia, Carnivora): bazı biyolojik
özelliklerine genel bir bakış

Research Article

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ABSTRACT

In this study, we examined some biological characteristics of *Mustela nivalis* from Kırıkkale and Çorum in Central Anatolia, collected between 2011-2012. The specimens studied had "nivalis"-type coloration, by an straight demarcation line between the dorsal and ventral part of the body. The structure of the hair was "broad petal" at the proximal of shaft, while "elongate petal" at distal. Tip of the baculum was hook-shaped having two developed knobs in adults. An ectoparasite, *Haemaphysalis sulcata*, is also detected on specimens. Comparison with the previous data on body size, we conclude that specimens from Central Anatolia were bigger than the European specimens with respect to external and cranial measurements.

Key Words

Mustela nivalis, coat coloration, baculum, hair structure, Turkey

ÖZET

Bu çalışmada 2011-2012 yılları arasında İç Anadolu bölgesindeki Kırıkkale ve Çorum illerinden alınan *Mustela nivalis*'in bazı biyolojik özellikleri incelenmiştir. Çalışılan örnekler vücudun dorsal ve ventral kısımlarını birbirinden düz bir çizgiyle ayıran "nivalis"-tip kürk rengine sahiptir. Kıl yapısı gövdenin proksimal kısmında "geniş petal" distal kısmında ise "uzamış petal"dir. Erginlerde bakulumun uç kısmı kanca şeklinde olup iki tane topuz yapısına sahiptir. Bir ektoparazit, *Haemaphysalis sulcata*, ayrıca örnekler üzerinde tespit edilmiştir. Vücut büyüklüğü ile ilgili daha önce verilen veriler karşılaştırıldığında, dış ve iç ölçüleri bakımından İç Anadolu örneklerinin Avrupa örneklerinden daha büyük oldukları sonucuna varılmıştır.

Anahtar Kelimeler

Mustela nivalis. Kürk rengi, bakulum, kıl yapısı, Türkiye

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INTRODUCTION

The genus *Mustela* is one of the most speciose genera among the family Mustelidae. According to various authors the genus is composed of 14-17 species [1]. Of them, as being the smallest member of the Order Carnivora, the least weasel, *Mustela nivalis* Linnaeus, 1766, has a circumboreal range throughout the Holarctic region [2-4]. The least weasel shows individual and geographic variation with regard to body size, age, season, baculum morphology, tail and pelage color as well as the demarcation line between the dorsal and ventral colour in the distribution area of the species [2,5-7]. In addition, an increase in the length of the body from North to South on the contrary to both Bergmann and Allen's rules is also indicated by various authors [5,6].

One of the most examined characteristics of *Mustela nivalis* for the separation of subspecies, was the coloration of the coat. Frank [8] used "nivalis"-type and "vulgaris"-type for the types of coloration. The demarcation line was straight on the neck and the lateral part of the body in "nivalis"-type whereas it was irregular in "vulgaris"-type. Species with type-I or "nivalis"-type coloration is distributed in the Palearctic region including Middle Asia, Kazakhstan and Afghanistan, however, type II or "vulgaris"-type is distributed in the British Isles as well as England, Central and Southern Europe [5,9].

Kasperek [10] discussed the coat coloration of the least weasel, distributed in Turkey, according to Niethammer [11]. The author stated that both "nivalis" and "minuta" types are occurred over the whole of Anatolia, particularly in some provinces both types lived sympatrically. However, according to the author, on the contrary to Abramov & Baryshnikov [5], Zima & Cenevová [9] a zig-zag shaped demarcation line with a cheek spot was the "nivalis"-type and the straight shaped one with no cheek spot was the "minuta"-type. Hereafter, recently Çolak et al. [12] examined the ecology, biology and karyology of the species from Turkey. The authors defined the coat colour of the specimens however, did not mention the type of coloration.

In this study we examined the coat type coloration, hair morphology, baculum shape of *Mustela nivalis* from Central Anatolia, where the detailed data

was lacking. The aim of this study was also to make a contribution to the distribution and biology of the least weasel in Turkey.

MATERIALS AND METHODS

A total of 9 male least weasels (5 adults and 4 juveniles) were obtained between May-December months in 2011 and 2012 via shooting by local farmers from Kırıkkale (7 ♂♂, 39°53'N 33°24'E) and Çorum (2 ♂♂, 40°30'N 34°20'E). Habitat, coat colour, hair scale form, baculum structure, and some external, cranial and bacular measurements of all specimens were recorded. The specimens were divided into two age groups (juvenile and adult), according to the criteria reported by Heidt [13]. Four standard measurements (total length (TL), tail length (T), hind foot length (HF), ear length (E)) and weight (W) were recorded. For all examined specimens, the following 14 cranial measurements were taken using a calliper with the accuracy of 0.05 mm according to Abramov and Baryshnikov [5]: greatest length (GL), condylobasal length (CBL), zygomatic breadth (ZB), interorbital breadth (IOB), posterorbital breadth (POB), mastoid breadth (MB), palatal length (PL), maxillary toothrow length (MXTL), height of braincase (HBC), breadth of rostrum (BR), length of tympanic (LT), breadth of tympanic (BT), length of mandible (LM), height of mandible (HM), and mandible toothrow length (MNTL).

The guard hairs were taken from the shoulder blades dorsally and prepared according to Hayat [14]. Hair specimens were put in acetone for 30 min, in an acetone-distilled water solution (1:1) for 15 min, and finally in distilled water for 10 min. Hairs were photographed with a JSM 5600 Scanning Electron Microscope (SEM). The determination of hair scale patterns was defined according to Teerink [15].

RESULTS

Habitat: The habitat of *Mustela nivalis* consisted of the grassy fields and farmlands along with riparian woodlands in central Anatolia. The density of small rodents and the presence of poultry attacked frequently played an important role for the habitat selection. We found that *M. nivalis* lived in sympatry with some mammalian and bird species such as *Apodemus* sp., *Microtus*

sp., *Rattus rattus*, *Erinaceus concolor*, *Lepus europaeus*, *Vulpes vulpes*, *Marmaronette angustirostris*, *Acrocephalus paludicola*, *Gallinago media*, *Limosa limosa*, *Riparia riparia* and *Asio otus*.

Ectoparasite: We reported *Haemaphysalis sulcata* on two specimens.

Coat coloration: The dorsal fur colour was brown, the ventral fur colour was dirtywhite. Demarcation line between these colours was straight. No cheek spot is detected. The tail was same colour as the dorsal colour. The fore and hind feet were white distally (Figure 1). The winter coat was not entirely white.

Hair structure: Guard hair type was long, firm and, straight with an elongated sharp tip. The structure of the hair scale type was found "broad petal" at

the proximal of shaft, "elongate petal" at the distal of shaft, "irregular wave" at the proximal of shield, "near irregular wave" at the medium of shield, and "rippled streaked" at the distal of shield (Figure 2).

Baculum: In juvenile, the baculum morphology was relatively similar to those of adults, except for absence of the proximal excrescence (Figure 3A). It was 21.10 mm in length. In adults, the baculum was 23.15 mm in length and had an excrescence at the proximal end. The proximal breadth was 3.40 mm. The shaft having a deep ventral urethral groove was slightly curved after the mid-section and its tip was hook-shaped having two developed knobs (Figure 3B and 3C).

Measurements: External and cranial measurements and weights of adult specimens was presented in Table 1.



Figure 1. Dorsal (A), ventral (B), and lateral (C) views of the skin of a male *Mustela nivalis* specimen from Kırıkkale. The bar indicates 50 mm.

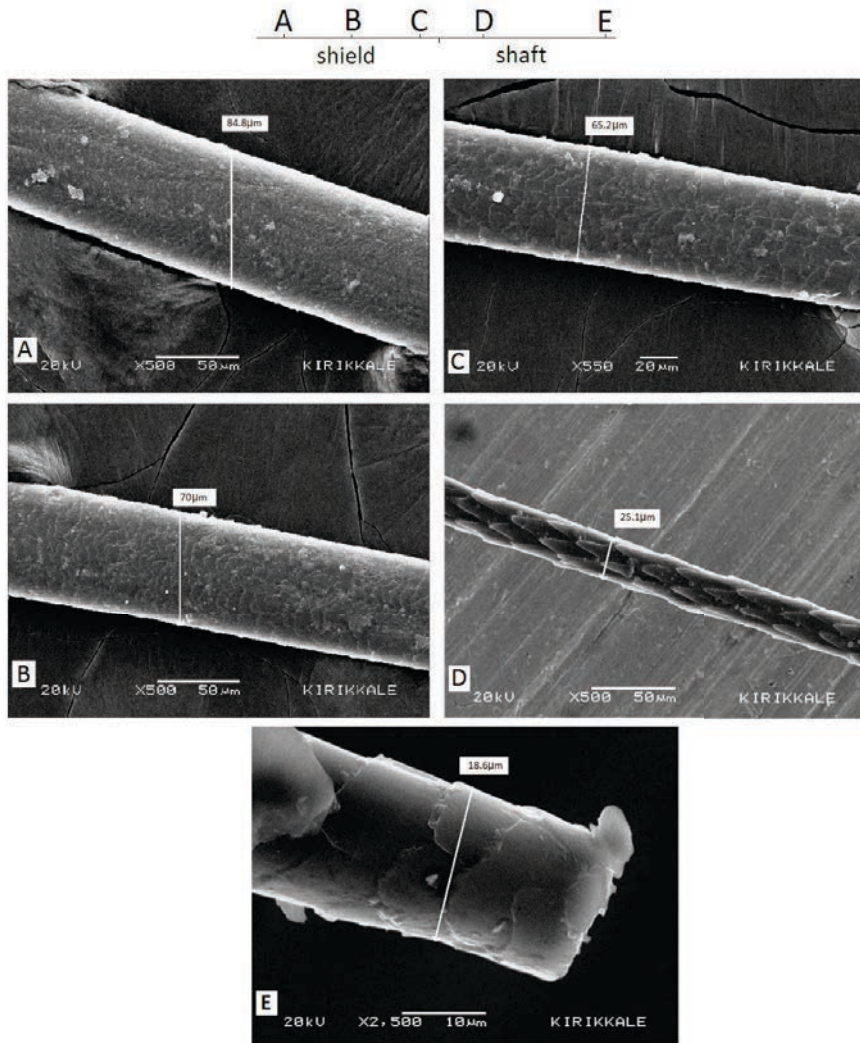


Figure 2. The hair scale pattern of *Mustela nivalis* in Kirikkale (A: rippled streaked, B: near irregular wave, C: irregular wave, D: elongate petal, E: broad petal)

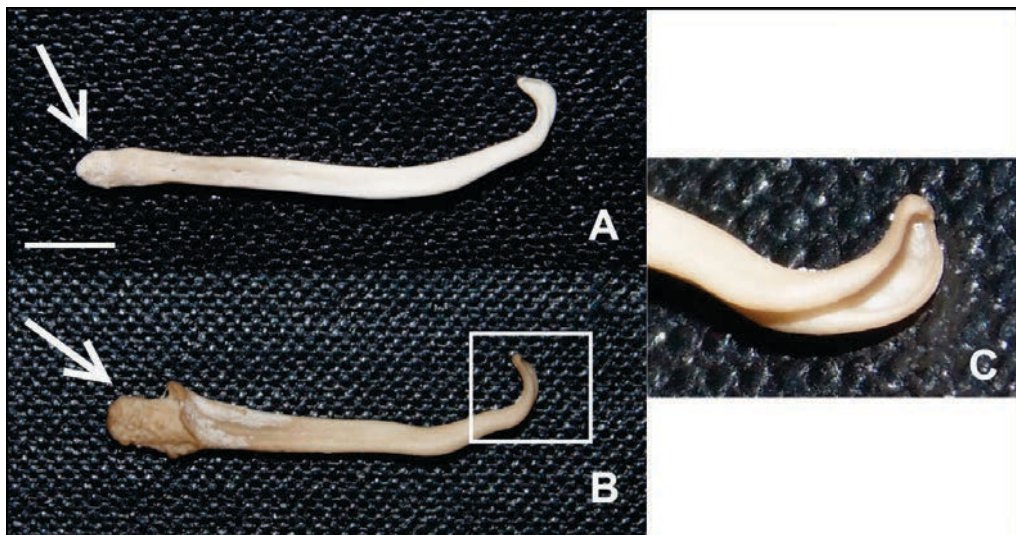


Figure 3. The structure of baculum of *Mustela nivalis* in juvenile (A) and in adult (B). The distal part of the baculum of an adult specimen (C). Arrows indicate the absence and present of the excrescence. The bar indicates 5 mm.

Table 1. The external and cranial measurements (mm) and weight (g) of adult specimens of *Mustela nivalis* from Kırıkkale and Çorum, Central Anatolia; number of individuals (n), range (r), mean (m), standard deviation (\pm sd). See text for other abbreviations.

Characters	n	m	r	\pm sd
TL	5	352.10	340-360	10.20
T	5	106.44	105-110	2.70
HF	5	43.28	43-45	1.05
E	5	13.22	9-18	4.36
W	5	263.42	260-290	14.16
CBL	4	47.06	45.95-48.40	1.02
ZB	4	27.05	26.50-27.70	0.5
IOB	4	11.15	11.00-11.50	0.24
POB	4	7.43	7.00-7.75	0.33
MB	4	23.07	22.60-23.70	0.46
PL	5	20.15	19.90-20.50	0.26
MXTL	5	12.73	12.00-13.15	0.53
HBC	4	17.41	17.20-17.90	0.32
BR	4	13.62	12.50-14.40	0.83
LT	4	15.02	15.00-15.05	0.02
BT	4	7.46	7.20-7.80	0.28
LM	5	25.41	24.30-26.25	0.86
HM	5	11.83	11.20-12.20	0.43
MNTL	5	14.53	14.00-15.20	0.49

DISCUSSION

Distribution of *Mustela nivalis* in Eurasia was relatively common but the species could not often seen in the areas [2]. Kasperek [10] and Çolak et al. [12] summarized the distribution of the least weasel in Turkey however, we encountered the species rarely in the studied area. This confirmed the thought of Sheffield & King [2].

Mustela nivalis has one of the largest geographical variations in body size within the genera and this situation has led to a rather confused intraspecific taxonomy of the species. The body size, skull size, tail length in relation to body length and relations between tail and hind foot length as well as the coat coloration are always used as significant criterions for the evaluation of geographic variation and the separation of the subspecies [2,5,6]. Abramov & Baryshnikov [5] stated that relatively large least weasels inhabited in Turkey with regard to craniometric features, similar in proportions to Central European, Caucasian,

Central Russia and Kirghizistan specimens. External and cranial measurements of Turkish specimens were in accordance with the ones given by Abramov & Baryshnikov [5] from Greece and the islands neighbouring to Turkey and smaller than the ones from Egypt. The situation confirmed the thought of increase in general size of the body from North to South as discussed by Sheffield & King [2], Abramov & Baryshnikov [5] and Broekhuizen et al. [6]. Although Çolak et al. [12] examined specimens from central and western part of Turkey, the external and cranial measurements were smaller than the ones recorded in this study. The dissimilarities between the measurements were probably due to the gender and age of the specimens that were not mentioned in Çolak et al. [12].

As stated in Sheffield & King [2] diet of the least weasel is composed of mainly small mammals especially microtine rodents and mice as well as birds' eggs, nestlings of lagomorphs, other rodent species, lizards, salamanders, fishes, insects and worms. However, habitat selection and diet composition are

diversified due to the abundance of small mammal species. In this study, the least weasel preferred small mammals and birds'eggs as recorded from Europe. Furthermore, according to the local farmers, the least weasels also attacked the poultries in Kırıkkale province.

The morphology of baculum was an important characteristics in the systematics of Mustelidae [5]. The shape of the baculum in this study was in accordance with Abramov [1], Abramov & Baryshnikov [5] and Çolak et al. [12]. In addition, the size of the baculum was in accordance with the ones given by Çolak et al. [12] previously given from Turkey however, the baculum size of the Turkish least weasel is bigger than the ones from Europe given by Abramov & Baryshnikov [5].

Dorsal colour of *Mustela nivalis* varied from brown to dark brown and from pure white to yellowish white on the ventral part [1,2,5,6,10,12]. The phylogenetic significance of the coloration types in the distribution area of the least weasel as stated by various authors, is summarized in Zima & Cenevová [9]. Kasperek [10], firstly mentioned the types of coloration in Turkey. According to the author, two types; the "nivalis"-type and the "minuta"-type are found sympatrically in some regions. However, the author indicated the "nivalis"-type in Abramov & Baryshnikov [5] and Zima & Cenevová [9] as "minuta"-type as well as the "vulgaris"-type as "nivalis"-type. In addition Abramov & Baryshnikov [5] also stated that the "nivalis"-type and "vulgaris"-type of coloration are distributed throughout Turkey. The coloration type and shape of the demarcation line from central Anatolia in this study, were in accordance with the "minuta (nivalis)"-type given by Kasperek [10], Abramov & Baryshnikov [5] and Zima & Cenevová [9]. Additionally, hair structure is given for the first time from Turkey with this study.

The distribution and taxonomic status of *Mustela nivalis* in Turkey- lies at the crossroads of Europe, Asia and the Middle East- have not studied in fully yet, due to the limited specimens. Hence, particularly, additional and detailed studies should be carried out in Turkey in future for contribution to distribution and taxonomy of the species in the Holarctic region.

References

1. A.V. Abramov, A taxonomic review of the genus *Mustela* (Mammalia, Carnivora). Zoosyst. Rossica., 8 (2000) 357.
2. R. Sheffield, C.M. King, *Mustela nivalis*. Mamm. Species., 454 (1994) 1.
3. W.C. Wozencraft, Order Carnivora. In D.E. Wilson and D. M. Reeder (Ed.), Mammal Species of the World: A Taxonomic and Geographic Reference (Vol. 1, pp. 532-628). Johns Hopkins University Press, Baltimore, USA, 2005.
4. The IUCN (<http://www.iucnredlist.org>).
5. A.V. Abramov, G.F. Baryshnikov, Geographic variation and intraspecific taxonomy of weasel *Mustela nivalis* (Carnivora, Mustelidae). Zoosyst. Rossica., 8 (2000) 365.
6. S. Broekhuizen, J.L. Mulder, G.J.D.M. Müskens, I.V. Popov, The least weasel (*Mustela nivalis nivalis*) in North-western Taimyr, Siberia, during a lemming cycle. Lutra, 50 (2007) 67.
7. L.K. Lin, M. Motokawa, M. Harada, A New Subspecies of the Least Weasel *Mustela nivalis* (Mammalia, Carnivora) from Taiwan. Mamm. Study., 35 (2010) 191.
8. F. Frank, Zur Evolution und Systematic der kleinen Wiesel (*Mustela nivalis* Linnaeus, 1766). Z. für Säugetierk., 50 (1985) 208.
9. J. Zima, E. Cenevová, Coat colour and chromosome variation in central European populations of the weasel (*Mustela nivalis*). Folia Zool., 51 (2002) 265.
10. M. Kasperek, On the occurrence of the Weasel, *Mustela nivalis*, in Turkey. Zool. Middle East, 2 (1988) 8.
11. G. Niethammer, Das Mauswiesel (*Mustela nivalis*) in Afghanistan. BzB., 14 (1973) 1.
12. E. Çolak, N. Yiğit, M. Sözen, Ş. Öztürk, A Study on *Mustela nivalis* Linnaeus, 1766 (Mammalia: Carnivora) in Turkey. Turk. J. Zool., 23 (1999) 119.
13. G.A. Heidt, The least weasel *Mustela nivalis* Linnaeus. Developmental biology in comparison with other North American *Mustela*. Publications of the Museum, Michigan State University Biological Series, 4 (1970) 229.
14. M.A. Hayat, Basic Electron Microscopy Techniques. Van Nostrand Reinhold Company, New York, USA, 1972.
15. B.J. Teerink, Hair of West-European mammals: Atlas and Identification Key. Cambridge University Press, Cambridge, UK, 2003.