

## Some Taxonomic Features of *Taphozous nudiventris* Cretzschmar, 1830 vel 1831 from Turkey (Chiroptera: Emballonuridae)

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Received: 07.02.2006

**Abstract:** This study was based on the records of baculum features, hair scale form, and karyotype of *Taphozous nudiventris magnus*. The baculum is a distinctive feature in separating this subspecies from *T. n. kachhensis*. The structure of the hair scale type examined by scanning electron microscope (SEM) was divaricate, dentate coronal at the tip, and varied from the tip of the hair to the base; it had a divergent, dentate coronal at the shaft and an appressed, repand coronal at the base. The diploid number (2n) and the number of autosomal arms (NFa) of *T. n. magnus* were 42 and 64, respectively.

**Key Words:** Baculum, hair scale, karyotype, *Taphozous nudiventris*, Turkey

### Türkiye'deki *Taphozous nudiventris* Cretzschmar, 1830 vel 1831'in Bazı Taksonomik Özellikleri (Chiroptera: Emballonuridae)

**Özet:** Bu çalışma *Taphozous nudiventris magnus*'un bakulum özellikleri, kıl yapısı ve karyotip kayıtlarına dayanmaktadır. Bakulum, *T. n. kachhensis*'den bu alttürü ayırmada ayırt edici bir özelliktir. SEM'de incelenen kıl yapısı uçtan tabana doğru değişerek, uçta divaricate, dentate coronal, gövdede divergent, dentate coronal ve tabanda appressed, repand coronal tiptedir. *T. n. magnus*'un diploid sayısı (2n) ve otozomal kollarının sayısı (NFa) sırasıyla 42 ve 64'dür.

**Anahtar Sözcükler:** Bakulum, kıl yapısı, karyotip, *Taphozous nudiventris*, Türkiye

### Introduction

Only 2 species of the genus *Taphozous*, *T. perforatus* E. Geoffroy, 1818 and *T. nudiventris* Cretzschmar, 1830 vel 1831, exist in the Palearctic region (Corbet, 1978; Sachanowicz et al., 1999). It was reported that *T. nudiventris* was distributed in Egypt, Sudan, Somalia, Senegal, Eritrea, Congo, Kenya, Israel, Palestine, Jordan, Syria, Iraq, Iran, Yemen, Oman, United Arab Emirates, Bahrain, Afghanistan, and India (Ellerman and Morrison-Scott, 1951; Harrison, 1964; Corbet, 1978; Harrison and Bates, 1991; Qumsiyeh et al., 1992; Darweesh et al., 1997; Benda and Horacek, 1998; Sachanowicz et al., 1999; Pearch et al., 2001).

Ellerman and Morrison-Scott (1951) reported *T. nudiventris* from Palestine, Saudi Arabia, Egypt, and Sudan; *T. kachhensis kachhensis* Dobson, 1872 from India; *T. k. magnus* Wettstein, 1913 from Iraq; and *T. k. nudaster* Thomas, 1915 from Burma. Harrison (1964) stated that *T. n. nudiventris* was distributed in South

Arabia; *T. n. magnus* in Israel, Jordan, and Iraq; and *T. n. zayidi* Harrison, 1955 in Oman. According to Harrison (1964), Felten (1962) considered *kachhensis* and *nudiventris* to be conspecific. Corbet (1978) stated that Sinha (1970) identified both *T. nudiventris* and *T. kachhensis* from India. Corbet (1978) considered *kachhensis* and *nudiventris* synonyms, and recognized the 3 subspecies given by Harrison (1964) as valid subspecies. Harrison and Bates (1991) mentioned that the nominative form was distributed in Israel, South Yemen, and United Arab Emirates, and *T. n. magnus* was found in Iraq and Bahrain. According to Harrison and Bates (1991), although having different fur color, the validity of *T. n. zayidi* was doubtful and they included Oman in the distribution area of the nominative form. The naked bellied Tomb bat, as a member of the upper Mesopotamian fauna, occurs as an immigrant in Turkey (Benda and Horacek, 1998). The first record of *T. nudiventris* from Turkey is given by Sachanowicz et al. (1999).

The aim of this study was to reveal the baculum features and hair scale form of *T. nudiventris* for the first time and make a contribution to its taxonomy.

## Materials and Methods

This study was based on one adult and one young male specimen caught by aerial net in the village of Mağaracık, Nizip, Gaziantep, Turkey (Figure 1).

Karyological analyses were performed according to Baker et al. (1982). The specimens were skinned, stuffed, and prepared as conventional museum specimens. The baculum was extracted according to Topal (1958) and age determination was carried out according to Anderson (1917) and Baagøe (1977). From each specimen, 6 external and 7 cranial measurements were taken. Cranial measurements were obtained with a dial caliper (accurate to 0.01 mm). The abbreviations for external and cranial measurements (mm) used in the text are as follows: L total length, HB head and body length, TL tail length, E ear length, HF hindfoot length, FA forearm length, GTL greatest skull length, CBL condylobasal length, ZB zygomatic breadth, BB braincase breadth, C-M<sup>3</sup> maxillary tooththrow length, C-M<sub>3</sub> mandibular tooththrow length, M mandible length, and W weight (g). Diagnostic characters, habitat, pelage color, measurements, and karyology, along with collection locality, were recorded. The determination of the fur color was carried out according to Ridgway (1885). The guard hairs were taken from the shoulder blades dorsally and from the belly on the ventral sides and prepared according to Hayat (1972). Hair specimens were left in acetone for 30 min, acetone-distilled water solution (1:1) for 15 min, and finally in distilled water for 10 min. Dried hairs in petri dishes were placed on stubs and coated with

gold dust for 2 min by a Polaron SC 500. The tip, middle, and basal parts of the hairs were photographed at 400x, 800x, and 1000x magnification with a JSM 5600 scanning electron microscope (SEM). Hair scale width was measured in micrometers. The hair scale forms were determined according to Benedict (1957).

The specimens were deposited at the Department of Biology, Faculty of Arts and Sciences, University of Kırıkkale.

## Results

**Diagnostic characters:** The shape of the baculum is a distinctive feature. The length and width of the baculum of the adult specimen are 0.67 and 0.30 mm, respectively (Figure 2).

**Habitat:** This species probably migrates to Turkey from the south in summer for breeding and parturition. Its breeding colonies occur in deep crevices outside of man-made caves.

**Pelage color:** The adult specimen's color is pale light brown, tinged very light gray, while ventral color is dirty white and tinged somewhat light pale brown. The mouth, nose, and ears are brown. Flight and tail membranes are light brown and tinged pale yellow (Figure 1). The young specimen's dorsal color is pale gray, tinged very light brown, whereas ventral color is dirty white and tinged somewhat pale brown. Mouth, nose, and ears are brown, tinged pale black. Flight and tail membranes are brown and tinged somewhat pale black.

**Measurements:** The external and cranial measurements of the adult specimen are as follows: L 144, HB 117, TL 27, E 19, HF 24, FA 74.7, GTL 31.4, CBL 25.2, ZB 17.5, BB 11.7, C-M<sup>3</sup> 11.5, C-M<sub>3</sub> 13.6, M 22.2, and W 90 g. Some of the external measurements of the young specimen are as follows: L 127, TL 27, E 16, HF 23, GTL 29.1, CBL 24.3, ZB 16.8, C-M<sup>3</sup> 11.2, C-M<sub>3</sub> 13.5, M 21.3, and W 46 g.

**Karyology:** In the 2 male specimens that were karyotyped, the diploid number (2n) and the number of autosomal arms (NFa) were 42 and 64, respectively. The chromosome set consisted of 9 metacentric, 3 submetacentric, and 8 acrocentric autosome pairs decreasing in size. The X chromosome was a medium-sized metacentric and the Y, the smallest chromosome of the set, was a dot-like acrocentric (Figure 3).



Figure 1. An adult *T. nudiventris* specimen caught in Nizip, Turkey.

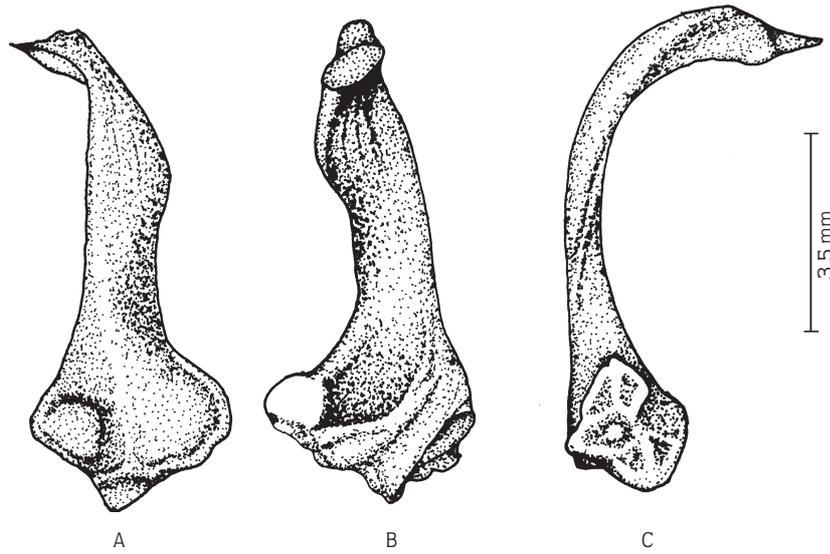


Figure 2. The shape of a baculum of *T. nudiventris* from Turkey. Dorsal view (A), ventral view (B), and lateral view (C).

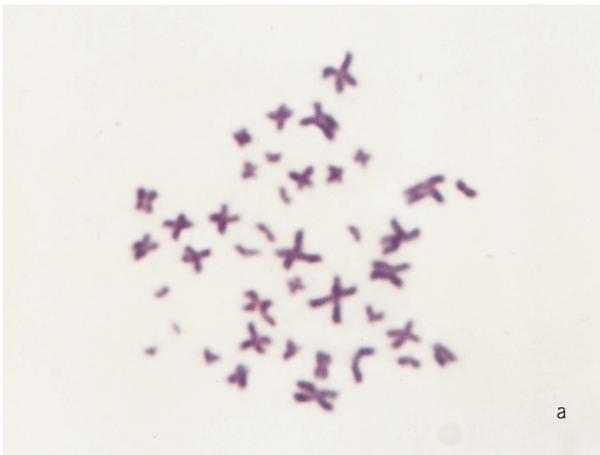


Figure 3. Conventional stained karyotype of a male *T. nudiventris* from Turkey.

Hair scale form: By examining the hairs taken from the dorsal and ventral parts of the adult and young specimens of *T. nudiventris*, it was found that the scale forms were similar in structure throughout, but different in size. The scale forms were divaricate, dentate coronal at the tip and to the base of the hair (Figure 4A), divergent, dentate coronal at the shaft (Figure 4B), and appressed, repand coronal at the basal part (Figure 4C and D). Additionally, in some hairs, hair scales became slender at the base after a broader district region (a basal bulb) (Figure 4C), but in the remaining hair specimens this broader district was not observed (Figure 4D).

### Discussion

A comparison was made between the morphometric data obtained from our adult specimen and those from Israel, South Yemen, Oman, Iraq, Bahrain, and Djibouti (Harrison and Bates, 1991; Pearch et al., 2001) (Figure 5).

According to the external measurements of 2 young specimens taken from the same locality in Turkey, Sachanowicz et al. (1999) suggested that these specimens belonged to *T. n. magnus*. The external and cranial measurements of the adult specimens from Turkey are in accord with those given for *T. n. magnus*

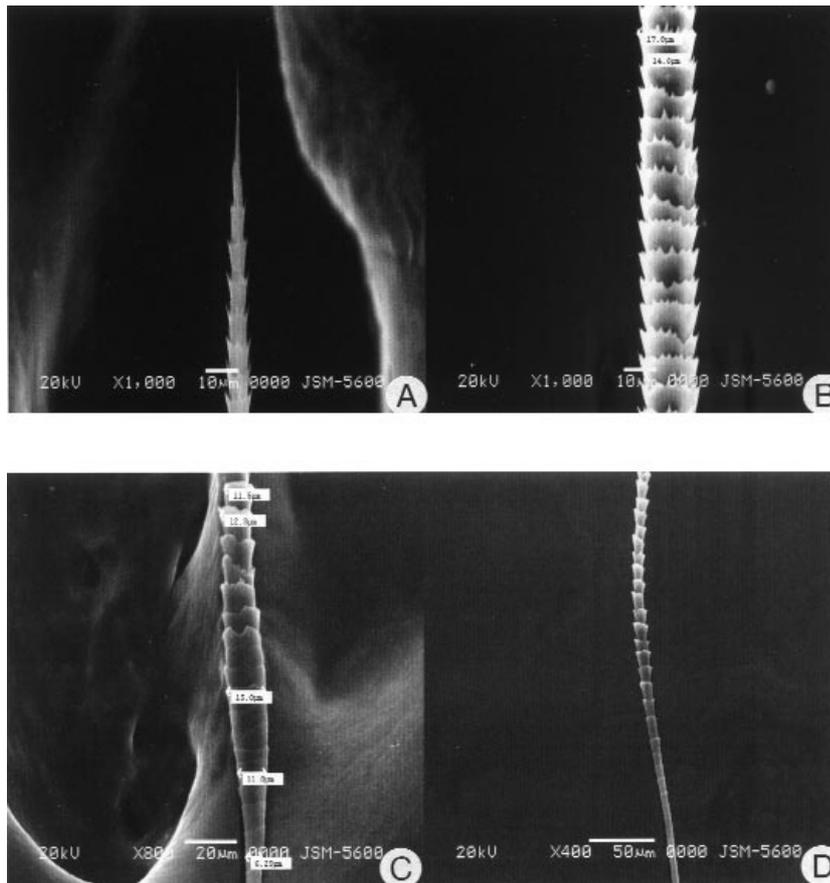


Figure 4. The scale forms in the dorsal hair of *T. nudiventris*. Tip (A), shaft (B), and base in 2 forms (C and D).

by Harrison and Bates (1991), thus we confirmed that the subspecies showing distribution in Turkey is *T. n. magnus*.

Our karyological data were compared to data obtained from Egypt (Hood and Baker, 1986; El-Dawy and Ibrahim, 1994; Yaseen et al., 1994) and Turkey (Karataş and Sözen, 2002). The chromosome morphologies of the subspecies *T. n. nudiventris*, *T. n. magnus*, and *T. n. kachhensis* were reported to be different (Karataş and Sözen, 2002) without comparing the shapes of chromosomes. Our study showed that our specimens were karyologically similar to the ones represented in Egypt, although Hood and Baker (1986), and Karataş and Sözen (2002) determined that the X chromosome is submetacentric. The dissimilarities between the data could be due to the heterochromatin amount in chromosomes, or to differences in author interpretations of chromosome morphologies.

The fur color of the adult Turkish specimen is in accord with that given by Harrison (1964).

Sinha (1987) examined the bacula of *T. perforatus*, *T. longimanus*, and *T. kachhensis* distributed in India. The baculum of *T. kachhensis* given by Sinha (1987) differs from that of *T. n. magnus* in shape and measurement, only if *T. n. kachhensis* is accepted as a valid subspecies.

Benedict (1957) examined the hair of *T. nudiventris* with a light microscope and stated that the dorsal hair scale forms in *T. mauritanus*, *T. melanopogon*, and *T. longimanus* were divaricate, dentate coronal, whereas in *T. nudiventris* they were both divaricate and divergent, dentate coronal, and in *T. peli* they were divergent, dentate coronal. The dorsal and ventral hair scale forms of *T. n. magnus* we examined in Turkey were in accord with those given for this species by Benedict (1957).

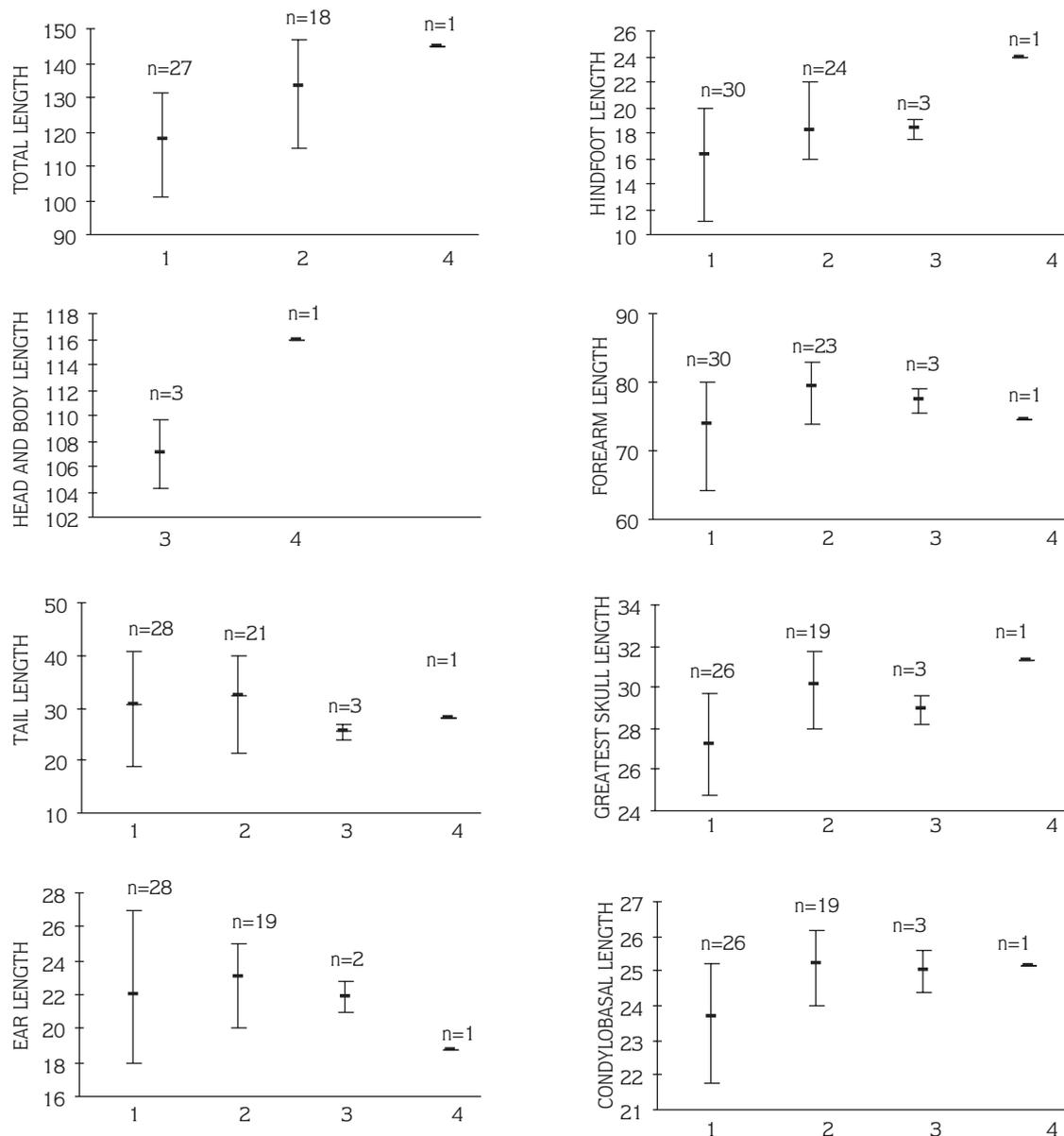


Figure 5. Comparison of the external and cranial measurements of *T. nudiventris* from Israel, South Yemen, Oman, Iraq, Bahrain (Harrison and Bates, 1991); Djibouti (Pearch et al., 2001); and Turkey (this study). 1: *T. n. nudiventris*, Harrison and Bates, 1991; 2: *T. n. magnus*, Harrison and Bates, 1991; 3: *T. nudiventris*, Pearch et al., 2001; 4: *T. nudiventris*, this study.

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