

Contribution to *Rousettus aegyptiacus* (Mammalia: Chiroptera) from Turkey

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Abstract. *Rousettus aegyptiacus* is active throughout the year in Turkey, where its morphology was studied collected from three localities in the south-west. The characteristics of the Turkish population were similar to those of the nominative subspecies. Moderate differences between the sexes were found in tibia length and total body length. The karyotype is $2n=36$, $FN=70$, $FNa=66$. The X chromosome is a large metacentric/submetacentric, and the Y chromosome is a dot-like acrocentric.

Key words: *Rousettus aegyptiacus*, distribution, taxonomy, karyology, Turkey

Introduction

Rousettus aegyptiacus (E. Geoffroy, 1810), the Egyptian fruit bat, ranges from the eastern Mediterranean to southern Pakistan and Africa, where seven subspecies are currently recognised (Harrison & Bates 1991, Wilson & Reeder 1993, Kwiecinski & Griffiths 1999). Of these, *Rousettus aegyptiacus aegyptiacus* and *Rousettus aegyptiacus arabicus* Anderson et de Winton, 1902 are found in the Palaearctic region. The nominative subspecies occurs in Egypt, Israel, Lebanon, Cyprus and Turkey (Koopman 1975, Corbet 1978, Spitzenberger 1979, Qumsiyeh 1980, 1985, Nadachowski 1990, Harrison & Bates 1991). In addition, one individual from Antakya (Hatay-Turkey) was included in the nominative subspecies by Eisentraut (1959). This species was also recorded from Hatay to Finike in south-eastern Turkey (Eisentraut 1959, Kahmann & Çağlar 1960, Lehmann 1966, Kumerloeve 1975, Spitzenberger 1979, Kinzelbach 1986, Albayrak 1993, Bülow 1997, Benda & Horáček 1998). There is a cline in morphological characteristics of the species, decrease in size from Egypt to Turkey (Eisentraut 1959, Lehmann 1966). Dulic & Mutere (1973) studied the karyology of *R. aegyptiacus* in Uganda, there is no such a study in the Middle East. In the present study, our aim was to contribute to our knowledge of the distribution, taxonomy and karyology of *R. aegyptiacus* in Turkey.

Material and Methods

The morphology and karyology of sixteen specimens of *R. aegyptiacus* (6 male, 10 female) from three different localities in southern Turkey were examined. The bats were caught by hand net, and 19 measurements (mm) together with weight (g) were obtained from each animal. Age determination was performed according to the criteria given by DeBlase

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(1980) and Corbet & Hill (1992). Ecological observations were also recorded in two caves over the course of one year. Furthermore, we captured specimens, noted their sexual signs, and then released them. Three individuals (two male, one female) were karyotyped using the colchicine hypotonic citrate technique of Ford & Hamerton (1956). By examining photographs of metaphase cells, the diploid number of chromosomes ($2n$), fundamental number of chromosomal arms (FN) and number of autosomal arms (FN_a) were determined together with metacentrics, submetacentrics, acrocentrics and subtelocentrics according to centromere positions. The skins, skulls and karyotype preparations were deposited at the Department of Biology, Faculty of Science and Art, Niğde University.

Results and Discussion

Distribution: *Rousettus aegyptiacus* was caught at three localities (Tarsus, Harbiye and Hassa). Also this species was observed in additional two localities (Alanya and Anamur) in the coastal parts of southern Turkey (Fig. 1). Alanya is the western border of its known distribution in southern Turkey (Kinzelbach 1986), although subfossil specimens were found further west (in Finike) by Corbet & Morris (1967) (Fig. 1). We have no specimens from Alanya, but this species was frequently observed there after late February. Although roosting caves were not found around Alanya or Anamur, this species was observed flying around fig trees and citrus gardens. Roosting caves in Tarsus (İçel) and near the Syrian border (Hatay province) were visited in order to observe the animals throughout the year. These included a colony of 200–300 individuals around Tarsus and another with 1000–1500 individuals near the Syrian border in Hatay province. The bats occupied the darkest and highest corners of caves, as has been noted by others (Atallah 1977, Harrison & Bates 1991, DeBlase 1980, Qumsiyeh 1980, 1985, Kwiecinski & Griffiths 1999). Harrison & Bates (1991) suggested that it is usually found in colonies of 50–500 individuals of both sexes and lives in where large clusters hang together

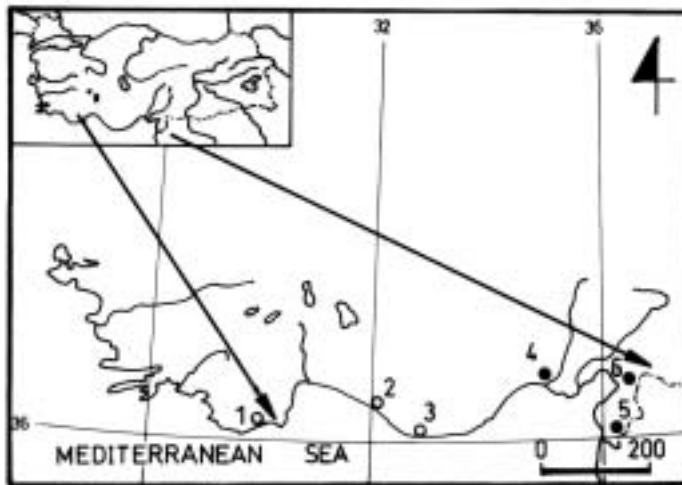


Fig. 1. Recording (●) and observing (○) localities of *Rousettus aegyptiacus*: 1: Finike (Antalya) (after Corbet & Morris 1967), 2: Alanya (Antalya), 3: Anamur (İçel), 4: Tarsus (İçel), 5: Harbiye (Hatay), 6: Hassa (Hatay).

from the roof. In contrast, we found that the colonies contained only females and their offspring in summer, whereas males in the same cave roosted separately. Similar findings were reported by K i n g d o n (1974).

In winter months, the ambient temperature in the coastal part of south-western Turkey scarcely decreases below zero C. Therefore, it is possible to observe the nocturnal activities of these bats throughout the year, and their activities were often recorded during warm nights in winter. In winter, males in captivity had testes measuring about 5 to 6 mm. However in the mid March, we captured males with testes 12-14 mm in length, indicating the on set of sexual activity. K w i e c i n s k i & G r i f f i t h s (1999) also reported that the testis length is 13 mm during the breeding season. Females with embryos were collected in April. Adult males join the colonies in autumn, therefore winter colonies both of males and females.

It was also reported that this species often roosts with other bats including Emballonuridae, Hipposideridae, Rhinolophidae and Vespertilionidae (K i n g d o n 1974 and H e r z i g - S t r a s c h i l & R o b i n s o n 1978). H a r r i s o n (1964) stated that *Myotis capaccinii*, *Crocidura leucodon*, *Crocidura russula* and *Acomys cahirinus* were found in the same habitat with *R. aegyptiacus* in Israel. We found *Rhinolophus ferrumequinum*, *Rhinolophus euryale*, *Rhinolophus mehelyi*, *Myotis myotis*, *Myotis blythii*, *M. capaccinii* and *Miniopterus schreibersii* roosting in the some caves with *R. aegyptiacus*. However, *R. aegyptiacus* roosted separately and kept away from the other bats.

External characteristics: The dorsal colour is uniform pale brownish. The base of the dorsal hair is slightly paler than its tip. The ventral fur is almost the same colour as the dorsum, but is pale yellowish. In Turkish specimens, the fur extends to the proximal half of the forearm both dorsally and ventrally, and to about half of the ventral surface of the interfemoral membranes. Similar findings are reported by K w i e c i n s k i & G r i f f i t h s (1999). In the ventral, the hairs of the throat are sparse and longer than those of the belly, and the tip and base of hairs are the same colour. Calcars are present but were very short. Total and forearm lengths of adults ranged from 127 to 165 and 81 to 93 mm, respectively (Table 1). Secondary sexual dimorphism was reported for *R. aegyptiacus* (H a r r i s o n 1964, H a r r i s o n & B a t e s 1991, K w i e c i n s k i & G r i f f i t h s 1999). When considering the measurements given by H a r r i s o n & B a t e s (1991), only the total body length and forearm length seem to differ between males and females. Apart from these, the external measurements of the Turkish population were within the range of *R. a. aegyptiacus*, but larger than those of *R. a. arabicus*. In addition, the external characteristics of two males described by A l b a y r a k (1993) were within the range given both by H a r r i s o n & B a t e s (1991) and in the present study.

Cranial characteristics: The maximum skull length and condylobasal length were 45 and 44 mm, respectively (Table 1). The cranial measurements of the Turkish population are consistent with those of *R. a. aegyptiacus* from Lebanon and Israel (K o c k 1969, D e B l a s e 1980, H a r r i s o n & B a t e s 1991). The nasal bone extends to the anterior of the upper canine, and is parallel to the frontal bones. The rostrum is broad, and curved downwards. The postorbital projects laterally. In young individuals, the nasal bone is especially short and pointed posteriorly, and its tip does not quite reaching halfway to the end of the rostrum. The braincase is narrow and markedly curved posteriorly. The median sagittal and exoccipital ridges are well developed, except not markedly in the young. The occipital condyles are not visible from above. The zygomatic arch is robust and curved

Table 1. The external and cranial measurements (mm) and weight (g) of adult specimens of *Rousettus aegyptiacus*, N: specimen numbers, SD: standard deviation.

Characteristics	N	Mean \pm SD	Range
Total body length	9	140.5 \pm 11.9	127 - 165
Tail length	9	15 \pm 3.9	12 - 23
Hindfoot length	9	26 \pm 2.6	24 - 30
Ear length	8	24 \pm 1.7	22 - 27
Forearm length	11	90 \pm 4.9	81 - 93
Tibia length	7	42 \pm 2.4	38 - 44
Length of first phalange with nail	7	28 \pm 2.2	24 - 29
Wingspan length	7	605 \pm 6.4	485 - 640
Weight	9	88 \pm 2.9	71 - 150
Zygomatic breadth	8	24 \pm 1.3	23 - 27
Interorbital constriction	8	7.8 \pm 0.8	7.4 - 9.8
Greatest length of skull	8	41.8 \pm 2.8	36.6 - 45
Condylbasal length	7	38.6 \pm 3.0	35.5 - 44
Rostrum width	8	8.6 \pm 1.4	7.5 - 11.2
Mastoid breadth	8	16.4 \pm 2.0	11.1 - 17.6
Width of braincase	8	16.5 \pm 0.9	15.4 - 18.2
Height of braincase	8	17.4 \pm 2.8	16 - 23.3
Mandible length	9	31.8 \pm 2.6	28.7 - 35.4
Maxillary tooth row (C - M ²)	9	16.5 \pm 0.74	15.5 - 17.6
Mandibular tooth row (C - M ₃)	9	17.9 \pm 0.9	16.4 - 18.6

upwards. The palatine is wide and its posterior margin is gently angled wards to the anterior. As *Albaya* (1993), there are no tympanic bullae in this species. The tympanic bullae are formed as ring-shaped bone, as is characteristic for insectivore mammals. However, the posterior margins of both ring-shaped bones are covered with cartilage or highly compact membrane in this species. In this respect, tympanic bullae are structurally absent but functionally present.

Phallus and baculum: The phallus has the anterior part is slightly swollen, and there is a small depression extending ventrally on the apex (Fig. 2). The baculum is wide dorsally, and very thin laterally. The baculum length (n= 2) is 2.4 mm, and the width of the posterior end is 1.1 mm. The baculum is constricted in the median region as described by *Harrison & Bates* (1991).

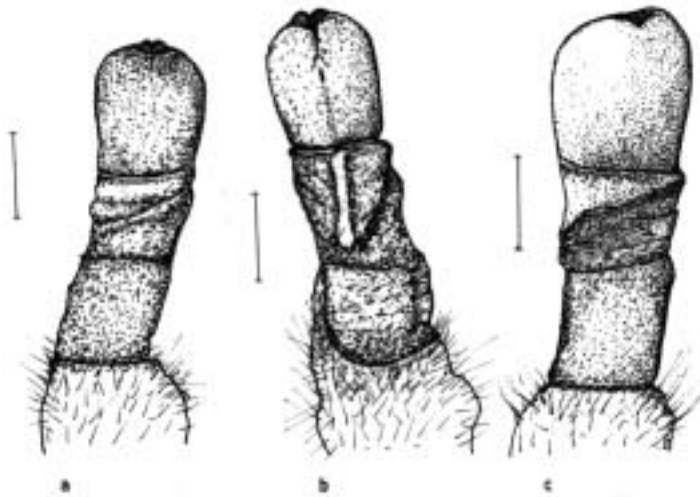


Fig. 2. The dorsal (a), ventral (b) and lateral (c) aspects of the phallus. scale: 1 cm.

Karyology: The karyotype of this species is here reported for the first time for the Middle East. The diploid number ($2n$) is 36. The autosomal set consists of 18 metacentrics (four large and 14 gradually decreasing in size), 14 submetacentrics or subtelocentrics, and two dot-like chromosomes. The fundamental number of chromosomal arms (FN) and the number of autosomal arms (FN_a) are 70 and 66, respectively. The X chromosome is large metacentric/submetacentric, and the Y chromosome is dot-like acrocentric (Fig. 3). Dulic & Mutere (1973) and Haiduk et al. (1981) also reported $2n=36$ and FN=66 for *R. aegyptiacus* from central Africa. Also the X and dot-like Y chromosomes are seen here consistent with those described by Dulic & Mutere (1973). Peterson & Nagorsen (1975) stated that the karyotypes of all megachiropteran species have an unusually long pair of metacentric chromosomes, and these were seen in the Turkish specimens.

Specimens examined: Tarsus (İçel): 2 females (September 1999), 2 males, 3 females (April 2001), 3 males, 1 female (March 2002); Harbiye (Antakya-Hatay): 1 male, 2 females (July 1998); Hassa (Hatay): 2 females (July 1998).

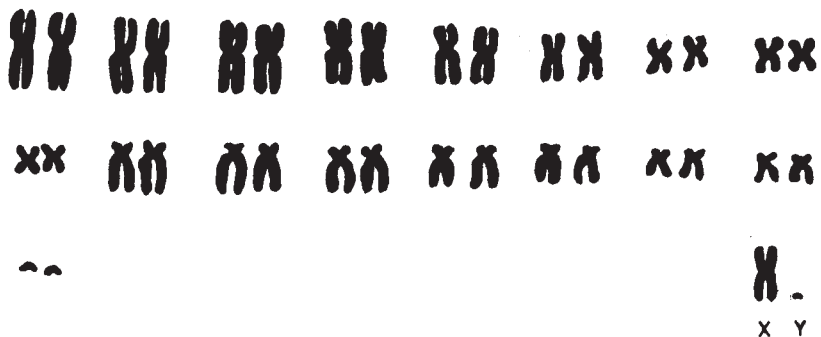


Fig. 3. Karyotype of *Rousettus aegyptiacus* (male), $2n=36$, FN=70, FN_a=66.

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