Araştırma Makalesi / Research Article

Bats in Southeastern Turkey (Mammalia: Chiroptera)

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Abstract
Southeastern Turkey is an important geographical region where the bat species spreading especially in Arabian Peninsula, North Africa and the Middle East enter in Turkey and have an intense population. The aim of this study was to identify the bat species in this region, which has glacial mountains, arid steppes, river valleys and vast plains. As a result of the field studies conducted between 2004 and 2017, totally 15 species belonging to Emballonuridae, Rhinolophidae, Vespertilionidae and Molossidae families of Microchiroptera suborder were identified in the study area. The habitat characteristics of the species and their locality records were presented. In this study, *Myotis nattererii*, *M. aurescens*, and *Rhinolophus mehelyi* were firstly recorded in the study area. Also, two new locations were determined for *Taphozous nudiventris* known from one location in Turkey up to the present.

Keywords: Bat, distribution, Chiroptera, Southeastern Turkey.

Güneydoğu Türkiye Yarasaları (Mammalia: Chiroptera)

Öz
Güneydoğu Türkiye özellikle Arap yarım adası, kuzey Afrika ve Ortadoğu bölgesinde yayılış gösteren yarasa türlerinin Türkiye'ye giriş yaptığı ve yoğun olarak bulunduğu önemli bir coğrafik bölgedir. Buzul dağlardan, kurak steplere, ırmak vadilerinden geniş düzlüklere sahip bu bölgedeki yarasa türlerini tespit etmek bu çalışmanın amacı oluşturmaktadır. 2004-2017 yılları arasında yapılan arazi çalışmaları sonucunda araştırma bölgesinden Microchiroptera alt takımının Emballonuridae, Rhinolophidae, Vespertilionidae ve Molossidae familyalarına mensup toplam 15 tür tespit edilmiştir. Türlere ait habitat özellikleri ve lokalite kayıtları verilmiştir. Bu çalışma ile *Myotis nattererii*, *M. aurescens* ve *Rhinolophus mehelyi*'nin araştırma bölgesinden ilk kez kaydı verilmiştir. Bununla birlikte bugüne kadar ülkemizden tek bir lokaliteden bilinen *Taphozous nudiventris* için iki yeni lokalite daha tespit edilmiştir.

Anahtar kelimeler: Yarasa, yayılış, Chiroptera, Güneydoğu Türkiye.

1. Introduction

Today, Southeastern Turkey is considered to be a part of Palearctic fauna zoogeographically; however, it has also been under the influence of Oriental (South Asia) and Ethiopia (Africa) fauna elements. Southeastern Turkey is the entrance way of Eremial (desert) and Afro-Eremial fauna elements into Anatolia [1].

In Turkey, there are 39 species belonging to the Pteropodidae, Emballonuridae, Rhinolophidae, Vespertilionidae and Molossidae families under the order Chiroptera [2]. A total of 22 bat species have

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been recorded in the study area until today. 6 of these species have been identified by indirect methods such as stool analysis or detector [3-9].

The aim of this study was to determine the bat species in Southeastern Turkey, which has an important zoogeographic region, and to contribute to their spread.

2. Material and Method

This study was conducted in the area including a part of Southeastern Anatolia Region and Eastern Anatolia Region between 2004 and 2010 (Figure 1). Records were provided from Gaziantep, Kilis, Şanlıurfa, Adıyaman, Diyarbakır, Mardin, Batman, Bitlis, Siirt, Şırnak, Van and Hakkâri provinces with the study. Also, the records obtained in several field works performed in the region from 2010 to 2017 were included in the study. The bat samples were obtained by researching caves, holes, empty buildings, roof space and similar places and using sweep nets and special bat nets (misnet) in various sizes. The habitat characteristics and international protection conditions of the determined species were presented.

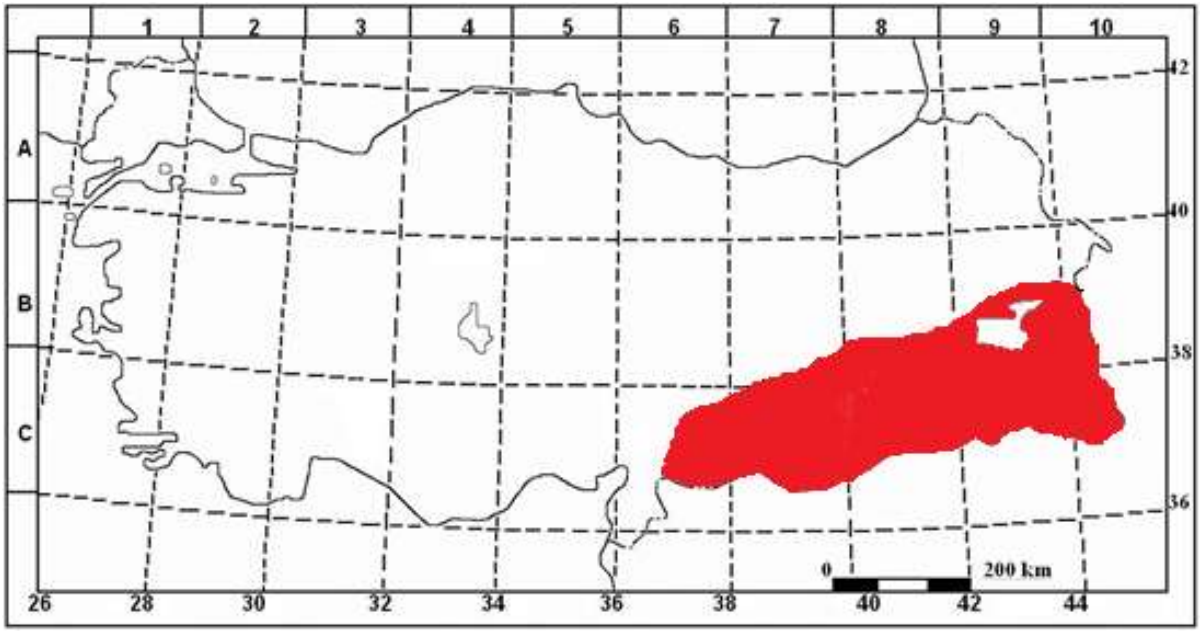

Figure 1. Study region (colored area)

3. Results

As a result of the field works performed, a total of 15 species belonging to Emballonuridae, Rhinolophidae, Vespertilionidae and Molossidae families of Microchiroptera suborder were identified.

3.1. Family: Emballonuridae

3.1.1. *Taphozous nudiventris* (Cretzschmar, 1830)

Habitat: Taphozous nudiventris is generally found between cracks in the rocky areas in valley sides from the bottom of which a river passes. The first record from Turkey was given from Nizip, Gaziantep by Sachanowicz et al. [7]. The species has not had any other record in other places from Turkey until today. In this study, two new locations were determined for *Taphozous nudiventris* in Musabeyli district of Kilis (Figure 2). The determined locations are situated in the rocky area in the valley side and the distance between them is 3 km.

Sample number (7) and locations: Gaziantep, Nizip, Mağaracık 2 (2 ♂♂, 02 September 2004), Kilis, Musabeyli, 5 (2 ♂♂, 10 July 2006; 3 ♂♂, 31 August 2007).

Figure 2. Recently determined locations of *Taphozous nudiventris*

3.2. Family: Rhinolophidae

3.2.1. *Rhinolophus ferrumequinum* (Schreber, 1771)

Habitat: Rhinolophus ferrumequinum was determined in caves, the rooms of an old castle, artificial caves used as barns, an old mine tunnel, and big artificial galleries used as stone pits in the past. Also, it was found solitarily in the ceiling of some natural caves in which *Miniopterus schreibersii*, *Myotis myotis* and *M. blythii* colonies were also found.

Sample number (26) and locations: Gaziantep, İslâhiye, Boğaziçi 4 (4♂♂, 15 April 2002); Şanlıurfa, Viranşehir, Karataş village 1 (1♂, 22 April 2003) Aslanbaba village 2 (1♂, 1♀ 17 April 2005); Diyarbakır, Çermik, Kalecik village 1 (1♂, 17 May 2005); Van, Van Castle 2 (1♂, 1♀, 17 September 2006), Kilis, Polateli, Ravanda Castle 5 (5♀♀, 26 April 2007); Musabeyli, Boğazkerim village 1 (1♂ 26 April 2007); Batman, Merkez, Oymataş village 3 (2♂, 1♀, 17 April 2005); Beşiri, Çavuşunbayırı village 3 (3 ♂♂, 15 May 2010); Siirt, Merkez, Taşbaş located 1 (1♂, 08 July 2017), Sağlarca village, Billoris cave 2 (1♂, 1♀ 18 July 2016), Eruh, Ormanardı village 1 (1♂, 13 April 2009).

3.2.2. *Rhinolophus hipposideros* (Bechstein, 1800)

Habitat: A male individual was found solitarily hanging down from the ceiling of one of the rooms of Van Castle.

Sample number (1) and locations: Van, Van Castle, 1 (1♂, 17 September 2006).

3.2.3. *Rhinolophus euryale* Blasius, 1853

Habitat: This species was found in the small caves and rock fractures in the study area. It was determined that *Rhinolophus euryale* sometimes occurred sympatry with *R. ferrumequinum*, *Myotis myotis* and *Miniopterus schreibersii*.

Sample number (3) and locations: Gaziantep, İslâhiye, Boğaziçi, 3 (1♂, 2♀♀, 28 May 2007).

3.2.4. *Rhinolophus mehelyi* Matschie, 1901

Habitat: Rhinolophus mehelyi was found in colonies on the ceiling of a cave, in which the individuals of *Myotis myotis, M. capaccinii, Miniopterus schreibersii* and *R. ferrumequinum* also inhabited.

Sample number (23) and locations: Şanlıurfa, Viranşehir Karataş village, 11 (4♂♂, April 29 2007; 1♀, 1♂ 28 May 2007; 3♀♀, 2♂♂ 09 July 2008). Diyarbakır, Bismil, Karmuşlu village, Seyhan Cave 12 (3 ♂♂, 9 ♀♀, 17 July 2016).

3.3. Family:Vespertilionidae

3.3.1. *Myotis emarginatus* (Geoffroy, 1806)

Habitat: A male *Myotis emarginatus* individual was found hanging down from the ceiling of a cave which had been used as a stone pit in the past.

Sample number (1) and locations: Mardin, Ensar neighborhood 1 (1♂, 18 May 2005).

3.3.2. *Myotis nattereri* (Kuhl, 1818)

Habitat: Myotis nattereri, which was recorded from Eastern and Southeastern Anatolia for the first time through this study, was found in a hollow in the top part of mouth of a cave in İslahiye district of Gaziantep.

Sample number (18) and locations: Gaziantep, İslâhiye, 4 (2♂♂, 2♀♀, 07 July 2008); Batman, Beşiri, Çavuşunbayırı village 14 (8♂♂, 6♀♀, 17 May 2017).

3.3.3. *Myotis myotis* (Borkhausen, 1797)

Habitat: Myotis myotis was found in the rooms of man-made caves and the ceiling of natural caves, which were relatively close to settlements during summer. It was found in a cave in Çermik district of Diyarbakır and İslahiye district of Gaziantep together with *Rhinolophus ferrumequinum, R. euryale, Myotis blythii,* and *Miniopterus schreibersii* species. Also, it was found with *M. blythii* and *Miniopterus schreibersii* species in the same colony.

Sample number (11) and locations: Diyarbakır, Ergani, Sesveren village 2 (2♂♂, 17 May 2005), Diyarbakır, Bismil, Karmuşlu village, Seyhan cave, 1 (1♀, 26 August 2016), Çermik, Kalecik village 2 (2♂♂, 17 May 2005); Kilis, headquarters 1 (1♀, 11 July 2006); Gaziantep, İslâhiye, Boğaziçi 4 (2♂♂, 10 July 2006; 2♀♀, 28 August 2007); Batman, Oymataş village 1 (1♀, 08 July 2017).

3.3.4. *Myotis blythii* (Tomes, 1857)

Habitat: Myotis blythii was found in the ceilings of natural and artificial caves solitarily or in the same cave together with *Rhinolophus ferrumequinum, R. mehelyi, Myotis myotis, M. capaccinii* and *Miniopterus schreibersii*. Additionally, they were found in large groups in the same colony with *Myotis myotis* and *Miniopterus schreibersii* species. It was also determined in small colonies hanging down from the ceiling of the rooms of old castles and inns.

Sample number (32) and locations: Batman, Hasankeyf, 3 (3♂♂, 20 May 2005), Beşiri, Çavuşunbayırı village 2 (2♂♂, 08 July 2017); Bitlis, Eleman Hanı, 2 (2♂♂, 12 August 2007); Diyarbakır, Çermik, Kalecik village, 4 (2♂♂, 17 May 2005; 2♂♂, 12 July 2007); Ergani, Sesveren village 1 (1♂, 12 July

2007); Gaziantep, Nizip, Mağaracık 3 (2♂♂, 1♀, 03 September 2004); Kilis 4 (4♂♂, 11 July 2006); Şanlıurfa, Birecik, 1 (1♂, 02 September 2004); Viranşehir, Karataş village 5 (2♀♀, 29 April 2007; 3♂♂, 09 July 2008); Van, Van Castle, 1 (1♂, 12 August 2007); Siirt, Merkez, Sağlarca village, Billoris cave 6 (6 ♂♂, 09 July 2017).

3.3.5. *Myotis capaccinii* (Bonaparte, 1837)

Habitat: In a cave located in Viranşehir district of Şanlıurfa, a *Myotis capaccinii* colony including approximately 150 individuals was found hanging down from the ceiling. In this cave, *M. myotis*, *Miniopterus schreibersii, Rhinolophus ferrumequinum* and *R. mehelyi* species were also found together with *Myotis capaccinii* individuals.

Sample number (14) and locations: Şanlıurfa, Viranşehir, Karataş village 14 (1♂, 2♀♀, 29 April 2007; 1♀, 28 May 2007; 2♀♀, 8♂♂, 09 July 2008).

3.3.6. *Myotis aurescens* Kusjakin, 1935

Habitat: A colony of *Myotis aurescens* with babies was found in a man-made cave on the side of Garzan streamlet in the borders of Çavuşunbayırı village, Beşiri district of Batman. In this cave, the individuals of *Myotis nattereri, Myotis blythii, Rhinolophus ferrumequinum* and *Pipistrellus kuhlii* were also found.

Sample number (14) and locations: Batman, Beşiri, Çavuşunbayırı village 14 (14 ♂♂, 20 June 2016).

3.3.7. *Pipistrellus pipistrellus* (Schreber, 1774)

Habitat: Pipistrellus pipistrellus was found between the briquets of the old buildings in settlements.

Sample number (6) and locations: Adıyaman, İkidam village 4 (4♀♀, 04 July 2002); Batman, Beşiri, Çavuşunbayırı village 2 (2♂♂, 18 June 2016).

3.3.8. *Pipistrellus kuhlii* (Kuhl, 1819)

Habitat: Pipistrellus kuhlii was found between the briquets in settlements, in the spaces on mosque walls, in the spaces on the upper part of the entrance door of an old workplace, between roof tiles, between the big stones in the entrance of an old building and between billboards and wall.

Sample number (14) and locations: Kilis, Merkez, 4 (4♂♂, 4 June 2002); Şanlıurfa, Birecik 1 (1♂, 02 September 2004), Mardin, Midyat 4 (4♀♀, 20 May 2005), Diyarbakır, Ergani, 2 (2♀♀, 12 Temmuz 2007); Batman, Oymataş village 3 (3♂♂, 18 June 2016).

3.3.9. *Miniopterus schreibersii* (Kuhl, 1819)

Habitat: Miniopterus schreibersii were generally found in large colonies in big and deep natural caves. It was found in the same cave together with *Myotis myotis, Myotis blythii, Myotis capaccinii, Rhinolophus ferrumequinum, R. euryale* and *R. mehelyi* species in Çermik district of Diyarbakır, Viranşehir district of Şanlıurfa and İslahiye district of Gaziantep.

Sample number (15) and locations: Gaziantep, İslâhiye, Boğaziçi 2 (1♂, 15 April 2002, 1♂, 08 Temmuz 2006); Şanlıurfa, Viranşehir, Karataş village 6 (3♀♀, 22 April 2003; 1♂, 15 July 2006; 2 ♀♀, 29 April

2007); Diyarbakır, Çermik, Kalecik vilage 2 (2♂♂, 17 May 2005); Mardin, headquarters, 1 (1♂, 18 May 2005); Siirt, Merkez, Sağlarca village, Billoris cave 4 (4 ♂♂, 9 July 2017).

3.4. Family: Molossidae

3.4.1. *Tadarida teniotis* (Rafinesque, 1814)

Habitat: Tadarida teniotis was found on the joints of the bridge on the Euphrates river in Birecik district of Şanlıurfa. Solitarily perching individuals were found in the fractures in the high cliffs beside the Tigris river within borders of Şırnak province.

Sample number (10) and locations: Şanlıurfa, Birecik, Birecik bridge**,** 5 (2♂♂, 12 July 2006; 2♀♀, 1♂ 28 May 2007); Şırnak, Güçlükonak, Taşkonak village, 5 (5 ♂♂, 08 July 2017).

4. Discussion and Conclusion

The study area represents an important region in terms of bat fauna including the species spreading in Asia, Africa and Europe. 22 bat species have been recorded in the area up to the present. Among these species, *Rhinolophus ferrumequinum, Myotis myotis, M. blythii, Pipistrellus kuhlii* and *Miniopterus schreibersii* have been recorded as the common species in the area. *Vespertilio murinus, Nyctalus leisleri, N. noctula, Hypsugo savii* and *Otonycteris hemprichii* are the species determined indirectly by the help of droppings and detector [3-8].

In this study, a total of 15 species including *Taphozous nudiventris, Rhinolophus ferrumequinum, R. hipposideros, R. euryale, R. mehelyi, Myotis emarginatus, M. nattareri, M. myotis, M. blythii, M. aurescens, M. capaccinii, Pipistrellus pipistrellus, P. kuhlii, Miniopterus schreibersii* and *Tadarida teniotis* were identified in the study area. Among these species, it was observed that *Rhinolophus ferrumequinum, Myotis myotis, M. blythii, Pipistrellus kuhlii* and *Miniopterus schreibersii* were common in the study area. *R. mehelyi, Myotis capaccinii, M. nattereri, Pipistrellus pipistrellus* and *Tadarida teniotis* species were recorded in two locations and *Taphozous nudiventris* was recorded in three locations. In the study area, *Rhinolophus hipposideros, R. euryale, M. emarginatus* and *M. aurescens* were identified in only one location.

As a result of this study, *Myotis nattereri, M. aurescens* and *Rhinolophus mehelyi* were determined for the first time in the study area. Also, two new locations were determined for *Taphozous nudiventris*, known from one location since 1999.

Vespertilio murinus, Nyctalus leisleri, N. noctula, Hypsugo savii and *Otonycteris hemprichii* species, which have been recorded from their droppings from the region in the literature [5], were not found in this study.

Benda and Horácek [6] have pointed out that *Asellia tridens, Myotis schaubi, Eptesicus nilssonii* and *Eptesicus bottae ognevi* species which have been recorded in the neighbors of Turkey in south and east may enter in the fauna of Turkey. As enough field works can't be performed in the border regions due to security issues, the specified species were not found in this study. However, it will be possible to have new records for bat fauna of Turkey by performing comprehensive field works especially in the areas close to the border.

If detailed molecular analyses are performed on *Myotis nattereri* and *M. aurescens* species, which were recorded with this study, from Southeastern Turkey, the systematic locations of these species can be understood better. The presence of bat in this region should be studied in detail to reveal bat fauna of Turkey and their genetic populations in more detail.

Figure 3. *M. aurescens* (A), *M. nattereri* (B), *R. mehelyi* (C) *M. blythii* colony and *R. mehelyi* (D)

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Author' Contributions

Tarkan YORULMAZ contributed to field studies, species identification, writing of the article, data analysis, interpretation of the results and revisions in this study. Kubilay TOYRAN contributed to field studies, sample supply and article writing. İrfan ALBAYRAK is supervisor of this thesis study.

Statement of Conflicts of Interest

No potential conflict of interest was reported by the authors.

Statement of Research and Publication Ethics

The authors declare that this study complies with Research and Publication Ethics.

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