

## Effects of the Anthropogenic Threats to the Egyptian Fruit Bat in the Mediterranean Region, Turkey

Nursel AŞAN BAYDEMİR<sup>1\*</sup> Deniz ATASOY<sup>2</sup> Merve ŞİMŞEK GÜR<sup>2</sup> Ayşegül SÜPLÜN<sup>2</sup> Meryem GENÇ<sup>2</sup>

<sup>1</sup>Department of Biology, Faculty of Arts and Sciences, University of Kırıkkale, Kırıkkale, Turkey

<sup>2</sup>Department of Biology, Graduate School of Natural and Applied Science, University of Kırıkkale, Kırıkkale, Turkey

\*Corresponding author  
E-mail: nurselasan@yahoo.com

Received: June 16, 2015  
Accepted: July 20, 2015

### Abstract

An Afro-tropical species, *Rousettus aegyptiacus* (Geoffroy, 1810), is the only frugivorous bat distributed in Antalya, Mersin, Adana and Hatay provinces in Turkey. Despite various studies on taxonomy, distribution, karyology, biogeography and molecular genetics being undertaken, no recent data has been established on the latest status of the fruit bat populations in Turkey. The two largest permanent colonies from Adana and Hatay provinces were examined for this study. We determined negative anthropogenic threats on the *Rousettus aegyptiacus* colonies along with their habitats. Compared with the previous records, a serious reduction in numbers was recorded in one of the species largest colonies.

**Key words:** *Rousettus aegyptiacus*, antropogenic threat, conservation status, Palearctic region, distribution, Turkey

## INTRODUCTION

The only frugivorous bat family of the world, Pteropodidae, is represented by 182 species [1]. The Egyptian fruit bat, belonging to the genus *Rousettus*, is distributed in sub-Saharan Africa, Egypt, Cyprus, the Mediterranean coast of Turkey, the Near East, Saudi Arabia, eastern to Pakistan and northwest India [2-10] and represented by four subspecies within its range [9]. However, a detailed distribution record of the species was given by Benda et al., [7], and according to the authors, *Rousettus aegyptiacus* represents densely patched or locally continuous and clearly discontinuous distribution in the Palearctic. IUCN status of the species is at "least concern" [5]. The Mediterranean populations of *Rousettus aegyptiacus* are often regarded as a separate endemic species due to its 10% mtDNA divergence from the Sub-Saharan populations. Therefore, a special conservation and biogeography value is also required for the species [10, 11].

In Turkey, there has been a total of 39 bat species recorded, by various authors. Of these, one is frugivorous and distributed in the Mediterranean region of Turkey. Antalya, Mersin, Adana and Hatay provinces are the northern border of the distribution range of the nominate subspecies in the western Palearctic region [12-14]. As a result, of being an opportunistic forager, the diet preference of the species depends on the availability of the wild and commercial fruits in the region [10, 14].

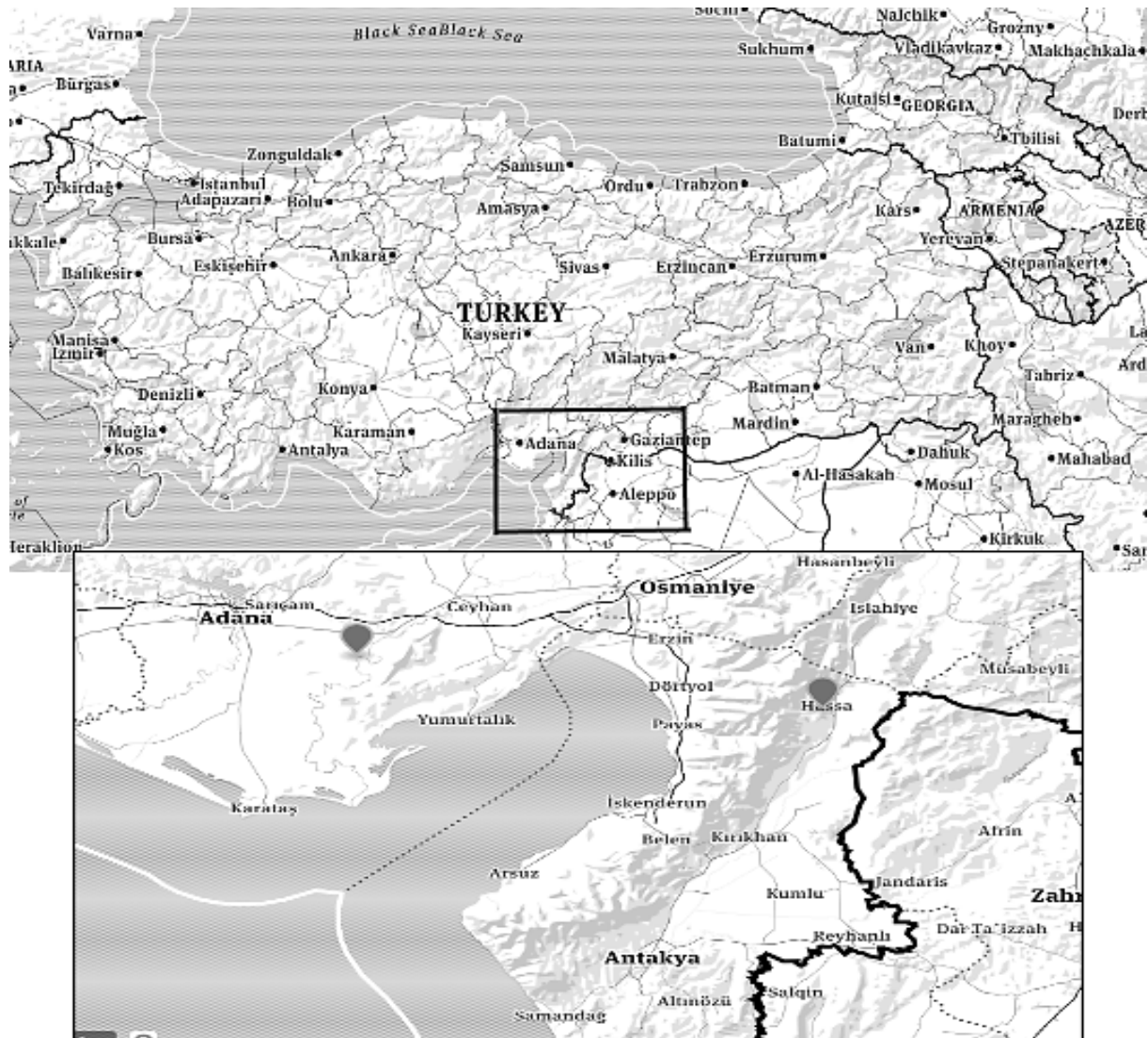
Bats are very sensitive to human disturbance, modification and degradation or destruction of their roosts, especially in the hibernacula and nursing sites, where they form large aggregations [15]. In recent years, it has been observed that bat species in Turkey are negatively affected by human-caused habitat disturbance [16]. Furman and Özgül [17, 18] indicated the importance of caves for bat conservation for the first time. Since then, many authors in various studies reported the human threat to bats in Turkey, however no data has been established on the latest status of these particular bat populations in Turkey.

In 2012, a project on the Egyptian fruit bat was conducted by Boğaziçi University Speleology Association (BUMAD) to determine the population and conservation status of the species.

The aim of this study was to investigate the abundance and latest status of the population of the Egyptian fruit bat in particular habitats in Turkey.

## MATERIALS AND METHODS

This study was conducted between 2009-2014, periodically, in Adana (abandoned flour factory, 37° 00' N, 35° 18' E) and Hatay (Hassa, Demrek, Dipsiz cave 36° 41' N, 36° 25' E) provinces in the Mediterranean region where one of the largest permanent colonies of *Rousettus aegyptiacus* occur (Figure 1).



**Figure 1.** Study area where the largest and permanent colonies of *Rousettus aegyptiacus* occurred in Adana and Hatay provinces in Turkey (www.mapbox.com)

Field data was collected through direct observation, and by visiting the already recorded roosts. Bats were photographed and counted without any disturbance to the roost and direct lighting of the colony, except for the briefest illumination. Temperature and the humidity of the cave were measured using a digital thermometer and hygrometer.

This study was undertaken with the permission granted by the Republic of Turkey's Ministry of Forestry and Water Affairs, General Directorate of Nature Conservation and National Parks and numbered: 72784983-488.04-22409.

## RESULTS AND DISCUSSION

In December 2009, one of us (NAB) recorded a large colony, consisting 1000-1200 individuals in the hangars (32-34) of the abandoned flour factory. These are the same results as given by Benda et al., [7], Horáček et al., [11] and Albayrak et al., [14] (Figure 2).

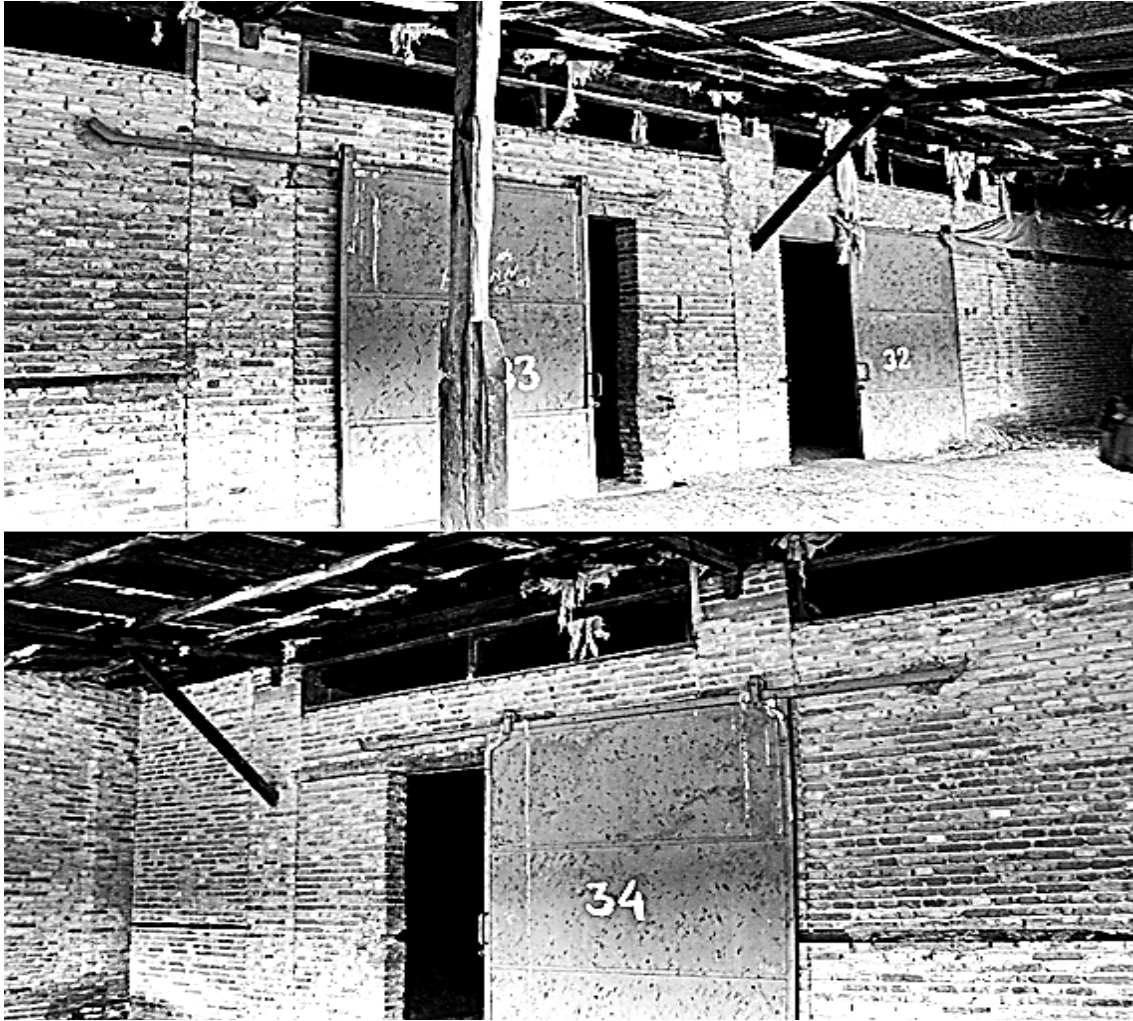
The empty hangars are used permanently throughout the year by the species, without any migration. Therefore, the colony in the factory is accepted to be one of the largest colonies in the distributional range of the species.

BUMAD conducted a Project for WWF on *Rousettus aegyptiacus* in the Mediterranean region and, in 2012 researchers also confirmed the large colony in the factory (Figure 3).

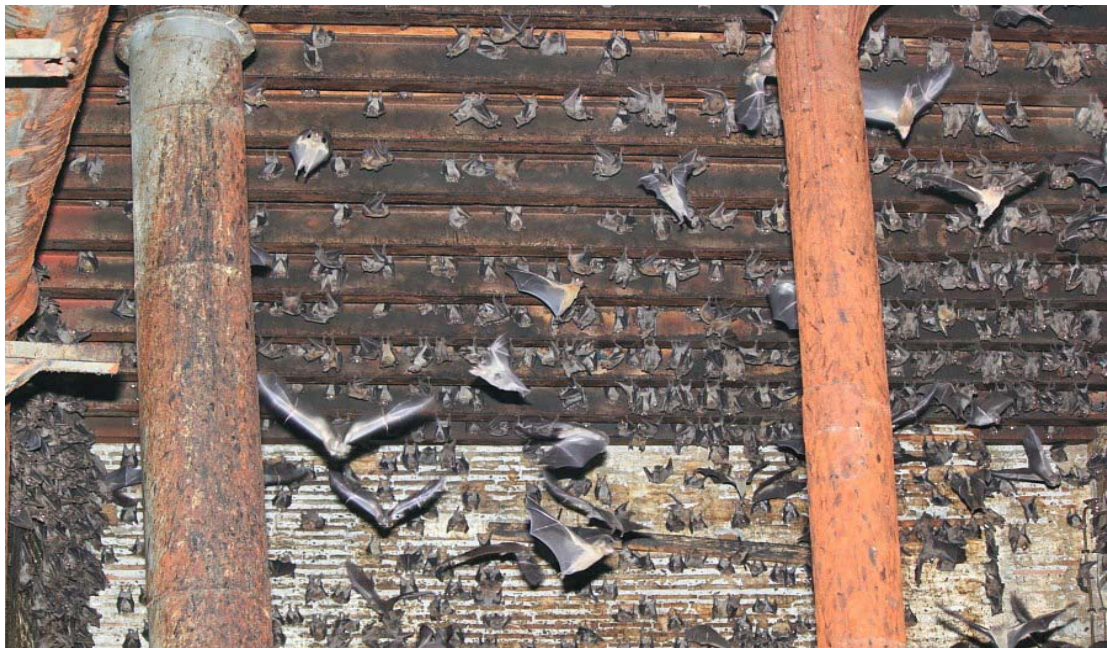
However at the end of 2014, we visited the factory again. Unfortunately, a huge construction had begun to open a new factory. No colony was detected, except for a young dead individual in one of the empty hangars (Figure 4).

We detected remnants of fruits eaten by *Rousettus aegyptiacus* from the fruit gardens near the factory in this study. However, these remnants were insufficient to indicate any existence of the species in the locality. Local people said that they had seen individuals flying around the gardens at nights, although so far we have not seen any flying individuals or urine splashes of the species.





**Figure 2.** Empty hangars used as roosts by *Rousettus aegyptiacus* with pronounced urine splodges on the doors in the abandoned flour factory in Adana province.



**Figure 3.** Egyptian fruit bat colony in the abandoned flour factory in 2012 (Photograph is used by the courtesy of Yalın Emek Çelik, www.yarasalar.org)





**Figure 4.** Construction in the factory detected at the end of 2014 (a), one of the empty hangar in the factory which once occupied by the colonies (b) and the dead individual *Roussettus aegyptiacus* specimen in one of the empty hangars (c)

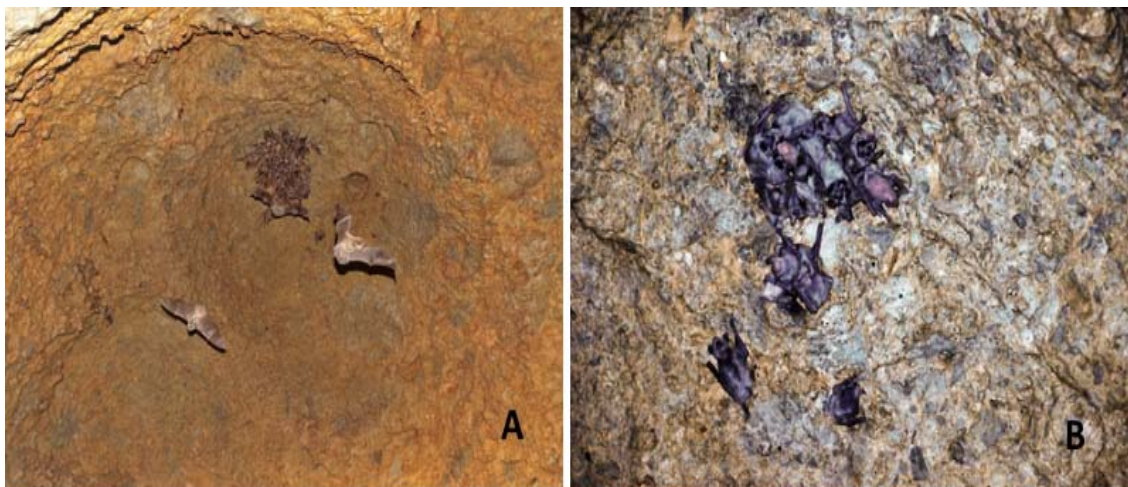
The cave in Hatay province is situated on a hill surrounded by settlements and fruit trees including fig, pomegranate, persimmon and apple trees, along with grapes.

According to Hulva et al., [1], cave dwelling strategies have affected the population structure of the *Roussettus* species. According to various authors, [9, 13, 14], Egyptian fruit bats have been reported to form continuous colonies, including both male and female individuals, year-round in this cave. We detected two colonies including of total 250-300 individuals of both sexes, hanging together with newborns, on the darkest and highest ceiling, close to the entrance of the cave, in May 2015.

Recently, Karataş et al., [13] also recorded 1000-1500 individuals of the Egyptian fruit bat while Benda et al., [7]

recorded a colony 350 individuals at different times from the cave. However, Albayrak et al., [14] did not mention any number of the species.

Karataş et al., [13] reported that the Egyptian fruit bat often roosted with several species of bats including *Rhinolophus ferrumequinum*, *R. euryale*, *R. mehelyi*, *Myotis myotis*, *M. blythii*, *M. capaccinii* and *Miniopterus schreibersii* roosted separately from the colony of *R. aegyptiacus* in this cave. In May 2015, we detected only a large colony of *Myotis myotis / blythii* consisted of 700-1000 individuals and a small colony of *M. myotis / blythii* of some 20-30 individuals with newborns at the end of the cave (Figure 5).



**Figure 5.** *Myotis myotis / blythii* colonies in the Dipsiz (Demrek cave) in Hatay province (A: one of the largest colony close to the entrance, B: the smallest colony with newborns at the end of the cave) (the second photograph is used by the courtesy of Ahmet Atasoy).

We did not detect any of the other bats species previously recorded by the authors from the cave in May. It is likely that, these species used the cave at different times or the guano harvesting done in the cave had negatively affected them. The reason will be determined by visiting the cave regularly with the scope of the project.

It is recorded that this cave has a reserve of about 50.000 tons of guano produced by the bats and for a long time has been used for guano mining for a special guano factory in Hatay province. When we visited the cave for our Project in May 2015, we did not come across any digging for the mining in the cave, however the cave was full of previously packed sacks of guano, at the entrance to the end.

Thus far, various researches have been published on bats and guano mining from the [19-21], however recently, Thet and Mya [22] mentioned about the results of guano harvesting and the population status of two bat species, *Taphozous theobaldi* and *Tadarida pl icata*, in Myanmar. The authors concluded that harvesting is carried out sustainably in a complex of four caves and to fertilize fields for cultivation of tomatoes, and the guano harvesting did not disturb the bats.

Karataş et al., [13] stated that Alanya is the western border of the known distribution in Southern Turkey. However, Corbet and Morris [23] determined subfossil specimens from Finike, in Antalya province. Additionally, we recorded the presence of the species in the center of the town around a *Ficus benjamina* tree in June 2015. This record shows that the spread of the species extends westward in Southern Turkey. Recently, Lučan [24] also stated that populations of *Rousettus aegyptiacus* had increased and the species expanded its distribution. The last record of the number of the colonies was specified in 2013 by the author without adding the latest status of the biggest known colony. It is probable that the species may have expanded its distribution due to habitat degradation or fruit shortage. However, we observed a significant disappearance in Adana province. Regretfully, this is indicative of a considerable reduction in the number of colonies in southern Turkey.

The conservation status of *Rousettus aegyptiacus* has been replaced to "vulnerable" in Pakistan [25], therefore, the status of *Rousettus aegyptiacus* based on the recent results obtained in Turkey, should be also reviewed. For this reason, we are in collaboration with the Republic of Turkey's Ministry of Forestry and Water Affairs, General Directorate of Nature Conservation and National Parks.

#### Acknowledgement

We would like to thank Dr. Yalın Emek Çelik and Dr. Ahmet Atasoy for using their photographs in the text. This study was financially supported by University of Kırkkale, SRP Coordination Unit (No: 2015/24).

#### REFERENCES

[1] Hulva P, Marešova T, Dundarova H, Bilgin R, Benda P, Bartonička T, Horáček I. 2012. Environmental margin and island evolution in Middle Eastern populations of the Egyptian fruit bat. *Molecular Ecology*. 21: 6104-6116.

[2] Simmons NB. 2005. Order Chiroptera. In: *Mammal Species of the World. A Taxonomic and Geographic Reference 3rd ed.* Volume 1 (eds. Wilson DE, Reeder DM.), pp. 500-518. The Johns Hopkins University Press, Baltimore.

[3] Benda P, Andreas M., Kock D, Lučan RK, Munclinger P, Nova P, Obuch J, Ochman K, Reiter A, Uhrin M, Weinfurtova D. 2006. Bats (Mammalia: Chiroptera) of the Eastern Mediterranean and Middle East. Part 4. Bat fauna of Syria: distribution, systematics, ecology. *Acta Societatis Zoologicae Bohemicae*. 70: 1-329.

[4] Benda P, Dietz C, Andreas M, Hotovy J, Lučan RL, Maltby A, Meakin K, Trscott J, Vallo P. 2008a. Bats (Mammalia: Chiroptera) of the Eastern Mediterranean and Middle East. Part 6. Bats of Sinai (Egypt) with some taxonomic, ecological and echolocation data on that fauna. *Acta Societatis Zoologicae Bohemicae*. 72: 1-103.

[5] Benda P, Aulagnier S, Hutson AM, Amr ZS, Kock D, Sharifi M, Karataş A, Mickleburg S, Bergmans W, Howell K. 2008b. *Rousettus aegyptiacus*. The IUCN Red list of threatened species. Version 2014.3. [www.iucnredlist.org](http://www.iucnredlist.org).

[6] Benda P, Lučan RK, Reiter A, Andres M, Backor P, Bohnenstengel T, Eide K, Sevcik M, Vallo P, Amr ZJ. 2010. Bats (Mammalia: Chiroptera) of the Eastern Mediterranean and Middle East. Part 8. Bats of Jordan: fauna, ecology, echolocation, ectoparasites. *Acta Societatis Zoologicae Bohemicae*. 74: 185-353.

[7] Benda P, Abi-Said M, Bartonička T, Bilgin R, Faizolahi K, Lučan RK, Nicolaou H, Reiter A, Shohdi WM, Uhrin M, Horáček I. 2011. *Rousettus aegyptiacus* (Pteropodidae) in the Palaearctic list of records and revision of the distribution range. *Vespertilio*. 15: 3-36.

[8] Benda P, Faizolahi K, Andreas M, Obuch J, Reiter U, Sevcik M, Uhrin M, Vallo P, Ashrafi S. 2012a. Bats (Mammalia: Chiroptera) of the Eastern Mediterranean and Middle East. Part 10. Bat fauna of Iran. *Acta Societatis Zoologicae Bohemicae*. 76: 163-582.

[9] Benda P, Vallo P, Hulva P, Horáček I. 2012b. The Egyptian fruit bat *Rousettus aegyptiacus* (Chiroptera: Pteropodidae) in the Palaearctic: geographical variation and taxonomic status. *Biologia*. 67: 1230-1244.

[10] Del Vaglio MA, Nicolaou H, Bosso L, Russo D. 2011. Feeding habits of the Egyptian fruit bat *Rousettus aegyptiacus* on Cyprus island: a first assessment. *Hystrix, Italian Journal of Mammalogy*. 22: 281-289.

[11] Horáček I, Benda P, Hulva P, Bilgin R, Abi-said M, Karanouh R, Aşan N, Albayrak A, Karataş A, Nicolaou H, Bartonička T, Lučan RL. 2010. The Mediterranean fruit bats, *Rousettus aegyptiacus*: distribution, chorologic status, and perspectives. pp. 174-175, in (eds. Horáček I, Benda P.). 15th International Bat Research Conference, Prague, Czech Republic, 1-357.

[12] Benda P, Horáček I. 1998. Bats (Mammalia: Chiroptera) of the Eastern Mediterranean. Part 1. Review of distribution and taxonomy of bats in Turkey. *Acta Societatis Zoologicae Bohemicae*. 62: 255-313.

[13] Karataş A, Yiğit N, Çolak E, Kankılıç T. 2003. Contribution to *Rousettus aegyptiacus* (Mammalia: Chiroptera) from Turkey. *Folia Zoologica*. 52: 137-142.

[14] Albayrak İ, Aşan N, Yorulmaz T. 2008. The natural history of the Egyptian fruit bat, *Rousettus aegyptiacus*, in Turkey (Mammalia: Chiroptera). *Turkish Journal of Zoology*. 32: 11-18.

[15] Jones G, Jacobs DS, Kunz TH, Willig MR, Racey PA. 2009. Carnivore: The importance of bats as bio indicators. *Endangered Species Research*. 8: 93-115.

[16] Aşan Baydemir N. 2014. Bat Fauna of Turkey and Northern Cyprus: Species Diversity, Anthropogenic Roost Disturbance and Conservation Status. *Journal of International Environmental Application & Science*. 9: 590-596.

- [17] Furman A, Özgül A. 2002. Distribution of cave dwelling bats and conservation status of underground habitats in Northwest Turkey. *Biological Conservation*. 120: 243-48.
- [18] Furman A, Özgül A. 2004. The distribution of cave dwelling bats and conservation status of underground habitats in the İstanbul area. *Ecological Research*. 17: 69-77.
- [19] Frank E F. 1998. History of the guano mining industry, Isla De Mona, Puerto Rico. *Journal of Cave and Karst Studies*. 60: 121-125.
- [20] Simon, JW. 1998. Guano mining in Kenyan Lava Tunnel Caves. *International Journal of Speleology*. 27: 33-51.
- [21] Hamilton-Smith E. 1998. Much Ado about very little: bat (*Miniopterus schreibersii*) guano mining at Naracorte, South Australia. *Australian Zoologist*. 30: 387-391.
- [22] Thet T, Mya KM. 2015. Harvesting the guano of insectivorous bats: Is it sustainable? *Journal of Threatened Taxa*. 7: 7296-7297.
- [23] Corbet B, Morris PA. 1967. A collection of recent and subfossil mammals from Southern Turkey (Asia Minor), including the dormouse *Myomimus persianus*. *Journal of Natural History*. 4: 561-569.
- [24] Lučan RK, Bartonička T, Jedlička P, Šimon Ř, Martin Š, Kipson M, Michal P, Wael S, Nicolaou H, Bilgin R, Horáček I. 2015. Variation of spatial activity of different populations of *Rousettus aegyptiacus* living in distribution range margins. P p. 20, in 4<sup>th</sup> International Berlin Bat Meeting: Movement Ecology of bats, abstract book (eds. Voigt C, Kramer-Schadt S). Leibniz Institute for Zoo and Wildlife Research, 13<sup>rd</sup> – 15<sup>th</sup> March 2015, Berlin, Germany.
- [25] Mahmood-Ul-Hassan M, Naim P O. 2006. Diversity, Role and Threats to the survival of bats in Pakistan. *The Journal of Animal and Plant Sciences*. 16: 38-42.