

## ***Rousettus aegyptiacus* (Pteropodidae) in the Palaearctic: list of records and revision of the distribution range\***

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**Abstract.** The populations of *Rousettus aegyptiacus* inhabiting the Palaearctic part of the species range represent the only offshoot of the family Pteropodidae beyond tropics. In this contribution, we revised distribution status of the species in different parts of its Palaearctic range, re-examined the literature data and supplemented them with an extensive set of original records obtained in the field during the last two decades. Based on that, we compiled a complete list of the records of *R. aegyptiacus* from the Palaearctic Region, covering the range delineated by 12–38° N and 26–68° E. Two distribution patterns were recognised: (1) a locally continuous range in the thermo-Mediterranean zone of S Turkey, W Syria, Lebanon, N Israel, and NW Jordan, (2a) a clearly discontinuous distribution in sub-tropical deserts of the Saharo-Sindian zone (S Levant, Egypt incl. Sinai, N Sudan, Arabian Peninsula, S Iran and S Pakistan), characterised by more or less isolated patches of distribution in desert oases and smaller areas of relatively humid habitats, and (2b) a supposedly continuous linear distribution along the Nile in Egypt, including its extensions in the El Fayum Oasis and Nile Delta. These patterns differ from the distribution characteristics of *R. aegyptiacus* in the sub-Saharan African range, where this fruit bat is reported to inhabit continuous belts of rather open habitats stretching over large parts of the continent. Detailed data from the Dakhla Oasis (less than 1,000 km<sup>2</sup>) in the Western Desert of Egypt illustrate flexibility in roosting and foraging requirements of the species and its considerable capacity for long-term survival in small (2,000–3,000 inds.) and rather isolated populations.

**Fruit bats, distribution, range, occurrence pattern, Mediterranean, Middle East, Egypt**

### **Introduction**

The Egyptian fruit bat, *Rousettus aegyptiacus* (Geoffroy, 1810), is the only member of the Pteropodidae family whose distribution range includes a large part in the Palaearctic Region, and also the only one whose type locality lies in the Palaearctic (the Great Pyramid of Giza, Egypt; Anderson 1902). Considering the whole distribution range, *R. aegyptiacus* is mostly an Afro-tropical species,

\* dedicated to Prof. Dr. Vladimír Hanák, one of the founders of the modern research of bats in the Mediterranean, on occasion of his 80th birthday.

which reaches the southwestern part of the Palaearctic (Juste & Ibañez 1993, Bergmans 1994, Kwiecinski & Griffiths 1999). In sub-Saharan Africa, it occupies areas around the Gulf of Guinea from Senegal to W Angola (including some islands in the Gulf), and savanna regions of South and East Africa from the Cape to Eritrea. In the Palaearctic, *R. aegyptiacus* occurs in various parts of Egypt as well as in broad areas along the sea coasts of the Middle East, from SW Turkey and Cyprus along the Levantine and Arabian shores up to S Iran and S Pakistan (Bergmans 1994). The Palaearctic range is reported to be isolated from the sub-Saharan African range by desert areas of northeastern Africa; in the Middle East (S Turkey), this bat reaches northern margin of its distribution range (Harrison & Bates 1991, Bergmans 1994, Benda et al. 2006).

The complete review of distribution records of *R. aegyptiacus* in the Palaearctic was first provided by Kock & Nader (1979), an updated version was presented by Bergmans (1994) along with a detailed description of the whole distribution range. The Palaearctic range of *R. aegyptiacus* covers the area of the E Mediterranean, Egypt and the Middle East, incl. S Pakistan (delineated by 12–38° N and 26–68° E), but it is obviously quite discontinuous (see also Fig. 1): resident occurrence is confirmed for (1) Cyprus, (2) central parts of the Levant (W Lebanon and N Israel), and (3) northern parts of Egypt (Nile Delta and the Cairo Region), while status of the species in S Turkey, S Egypt, S Arabia, S Iran and S Pakistan, from where isolated records are available, is unclear and in no way suggests continuous occupancy of the whole range.

In short, although *R. aegyptiacus* represents a top curiosity in the bat fauna of the western Palaearctic, the actual extent of its range, its history and character of local occurrence has not been sufficiently comprehended until recently. In response to scarcity of this information we re-examined the distributional status of the species in some of the regions least known from this point of view. During the last two decades a number of new records were obtained which refine the previous picture both in the geographical and chorological respects. Although some of these records have already been published (see the List of Records), a vast majority of them have not been reported until now and/or not surveyed in regard to the distributional status of the species under study.

The density of records and current geographical coverage of the range open a possibility of a detailed quantitative analysis of the range structure and its contextual setting to address the implicit questions on the enigmatic phenomenon of the Palaearctic offshoot of the family range. The critical re-examination and a standardised account of all available records are an essential prerequisite for such analyses and the first step to be undertaken. Just this is the aim of the present study.

## Material and Methods

The distribution data were obtained by screening of available literature reporting local bat records in the respective areas and by direct field studies in particular countries of the Middle East incl. Egypt (see List of Records). Field data were collected with the help of common techniques of field bat study, i.e. direct observations of flying bats, mist-nettings and visits of potential or already known roosts. Besides the direct findings of fruit bat individuals, also their abandoned roosts with undoubted traces of former presence were recorded (see e.g. Hadjisterkotis 2006) as well as their feeding places, i.e. accumulated remnants of food (mainly fruit stones) or the typical splodges from faeces and urine in sheltered places (such as monuments or abandoned rooms, see Figs. 2–5 and/or Benda et al. 2007: 76, Figs. 2, 3).

The complete list of distributional records of *R. aegyptiacus* in the Palaearctic, provided in the following chapter, is arranged according to particular countries and classified in three categories; (1) localities summarised by Bergmans (1994) presented as mere site names; (2) new data published after or overlooked by Bergmans (1994) presented as site names complemented with the quotation of published source of the data; and (3) original records obtained by the authors of this contribution (both new and published), complemented with province name and coordinates of the site, method of data collection and a recorded number of fruit bats as well as the name/s of the collector/s of the data. In this paper we neither report the numerous negative records nor discuss the contextual aspects of the Palaearctic range of the species. These topics will be analysed elsewhere.

The list of records is supposedly complete for the ten countries which were in focus of our field study. For Israel, where *R. aegyptiacus* has been repeatedly intensively investigated as a model species during the last decades (e.g. Korine & Arad 1993, 1999, Korine et al. 1994, 1999, 2004, Krasnov et al. 2007, Tsoar et al. 2011, etc.), the present list is to be looked upon as provisional and obviously incomplete. It summarises just the available literature data (plus some original observations by the authors), including the map records surveyed by Mendelssohn & Yom-Tov (1999). It provides reliable comparative information sufficient for purpose of the present paper (see Figs. 1 and 6).

## List of Records

Bergmans (1994) reported 123 record sites of *Rousettus aegyptiacus* from its Palaearctic range (Fig. 1). The other literature data not included in Bergmans' (1994) review, mostly those published during the last two decades, report the species from 91 localities. With further 134 new record sites, the total number of localities where *R. aegyptiacus* was recorded within the Palaearctic range rose to 348. A majority of them (57.3%) was evidenced during the last two decades (see also Table 1 and Figs. 6, 11, 17). The minimum number of records in the particular countries is as follows: Turkey – 30 sites, Cyprus – 51, Syria – 5, Lebanon – 39, Israel and the Palestinian Territories – 32, Jordan – 20, Egypt – 64 (without new records from the Dakhla Oasis, see below), North Sudan – 2, Saudi Arabia – 5, Yemen – 19, Oman – 47, United Arab Emirates – 1, Iran – 31, Pakistan – 4. The detailed list is given below.

### Turkey

*Data by Bergmans (1994)*

Alanya; Antakya; Antalya; Bedirge [= Serinyol] region; Dermustlu Koy; Gülnar; Harbiye; ? Iskenderun.

*New published data*

Adana (Albayrak 1993, Aşan Baydemir & Albayrak 2006, Albayrak et al. 2008); Alanya (Karataş et al. 2003, Albayrak et al. 2008); Anamur (Karataş et al. 2003); Anavarza Castle (Albayrak et al. 2008); Antalya (Albayrak et al. 2008); Demrek (Albayrak et al. 2008); Erdemli (Albayrak et al. 2008); Erzin (Albayrak et al. 2008); Finike (Corbet & Morris 1967, Albayrak et al. 2008); Harbiye (Aktaş & Hasbenli 1994, Hasbenli 1997, Karataş et al. 2003, Albayrak et al. 2008); Hassa (Karataş et al. 2003); Hatay (Aşan Baydemir & Al-

Table 1. Sites of recent records (1991–2011) of *Rousettus aegyptiacus* in selected countries of the Palaearctic part of the species distribution range

Tab. 1. Počty nálezových lokalit kaloně egyptského (*Rousettus aegyptiacus*) ve vybraných zemích palearktického areálu druhu zaznamenané v posledním dvacetiletí (1991–2011)

	colonies kolonie	other roosts jiné úkryty	netting sites odchyty do sítě	other records jiné lokality	total úhrnem
Turkey	7	1	2	13	23
Cyprus	11	4	3	5	23
Syria	1	–	3	–	4
Lebanon	13	1	7	2	23
Jordan	6	1	6	3	16
Egypt†	5	5*	12	6	28
Yemen	–	1	14	–	15
Oman	4	–	14	19	37
Iran	10	2	4	12	28
total / celkem	57	15	65	60	197

† incl. Sinai

\* see text and Appendix for data from the Dakhla oasis

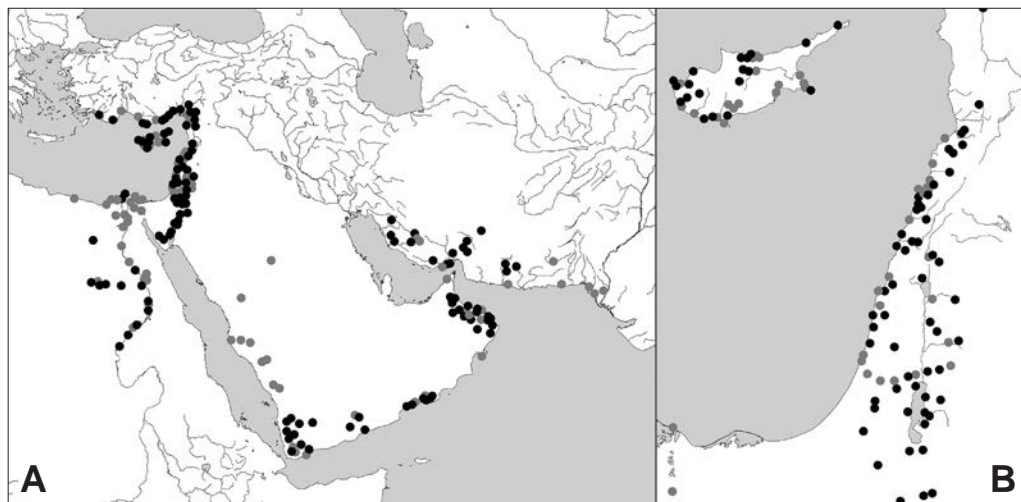


Fig. 1. Map of records of *Roussettus aegyptiacus* in the Palaearctic: grey dots – data summarised by Bergmans (1994); black dots – data published after or overlooked by Bergmans (1994) and original new data. A – whole Palaearctic range; B – records in the S Levant. Some symbols represent more than one record.

Obr. 1. Mapa nálezu kaloně egyptského (*Roussettus aegyptiacus*) v Palearktidě: šedé body – údaje shromážděné Bergmansem (1994); černé body – údaje publikované později anebo přehlédnuté Bergmansem (1994). A – celý palearktický areál; B – nálezy v jižní části Levantu. Některé body představují více než jeden nález.

bayrak 2006); Karaağaç (Albayrak et al. 2008); Kirikhan (Albayrak et al. 2008); Mersin (Aşan Baydemir & Albayrak 2006); Narlıca cave (Şadoğlu 1953); Say köyü (Albayrak 1993, Albayrak et al. 2008); Serinyol (Albayrak et al. 2008); Tarsus (Karataş et al. 2003); Taşucu (von Bülow 1997).

#### Original records

Adana, flour factory in S part of the town (Adana Prov., 37° 00' N, 35° 18' E), 2 October 2009, obs. a colony of ca. 1200 inds. (leg. T. Bartonička, R. Bilgin, I. Horáček, P. Hulva & R. Lučan);

Akbez, at a river (Hatay Prov., 36° 51' N, 36° 31' E), 29 September 2009, obs. 1 ind. (leg. T. Bartonička, R. Bilgin, I. Horáček, P. Hulva & R. Lučan);

Alanya, castle (Antalya Prov., 36° 32' N, 32° 00' E), 5 October 2009, obs. feeding traces (leg. T. Bartonička, R. Bilgin, I. Horáček, P. Hulva & R. Lučan);

→

Figs. 2–5. Examples of undirect indications of *Roussettus aegyptiacus* occurrence. Fig. 2. Dropping smudges in the interior of an abandoned school in Ferka, North Sudan (photo by P. Benda). Fig. 3. Dropping smudges in the interior of the Ar Rustaq Castle, NE Oman (photo by A. Reiter). Fig. 4. Dropping smudges on a column of the great hypostyle hall in the Precinct of Amun Re, Karnak Temple, Egypt (photo by P. Benda). Fig. 5. Fig trees in the top floor of an abandoned house in southern part of Trablous, Lebanon, most probably grown up from seeds dispersed by the fruit bat (a colony roosts in the Mtal El Azraq Cave some 1 km apart, see Fig. 10) (photo by M. Uhrin).  
 Obr. 2–5. Příklady nepřímých náznaků výskytu kaloně egyptského (*Roussettus aegyptiacus*). Obr. 2. Skvrny trusu uvnitř opuštěné školy v osadě Ferka v Severním Sudanu (foto P. Benda). Obr. 3. Skvrny trusu uvnitř pevnosti Ar Rustaq v severovýchodním Omanu (foto A. Reiter). Obr. 4. Skvrny trusu na sloupu ve velké sloupové síni okrsku Amun Re Karnackého chrámu v Egyptě (foto P. Benda). Obr. 5. Fikovníky v nejvyšším patře opuštěné budovy v jižní části Tripole v Libanonu, velmi pravděpodobně vyrostlé ze semen rozšířených kaloni (úkryt kolonie v jeskyni Mtal El Azraq je vzdálen zhruba 1 km, viz obr. 10) (foto M. Uhrin).



- Anazarbos Castle (Adana Prov., 37° 15' N, 35° 54' E), 1 October 2009, obs. feeding traces (leg. T. Bartonička, R. Bilgin, I. Horáček, P. Hulva & R. Lučan);
- Antalya, garden in the town (Antalya Prov., 36° 53' N, 30° 45' E), 6 October 2009, net. 34 inds. (leg. T. Bartonička, R. Bilgin, I. Horáček, P. Hulva & R. Lučan);
- Demra, Myra nekropolis (Antalya Prov., 36° 16' N, 29° 59' E), 28 July 2011, obs. feeding traces (leg. I. Horáček);
- Demrek, Dipsi cave (Hatay Prov., 36° 41' N, 36° 25' E), 30 September 2009, obs. a colony of ca. 350 inds. (leg. T. Bartonička, R. Bilgin, I. Horáček, P. Hulva & R. Lučan);
- Fethiye, house (Mugla Prov., 36° 38' N, 29° 10' E), Autumn 2009, obs. 1 ind. (leg. I. McCulloch);
- Finike, Incirli Cave (Antalya Prov., 36° 17' N, 30° 09' E), 27 July 2011, obs. 474 inds., net. 15 inds. (leg. I. Horáček);

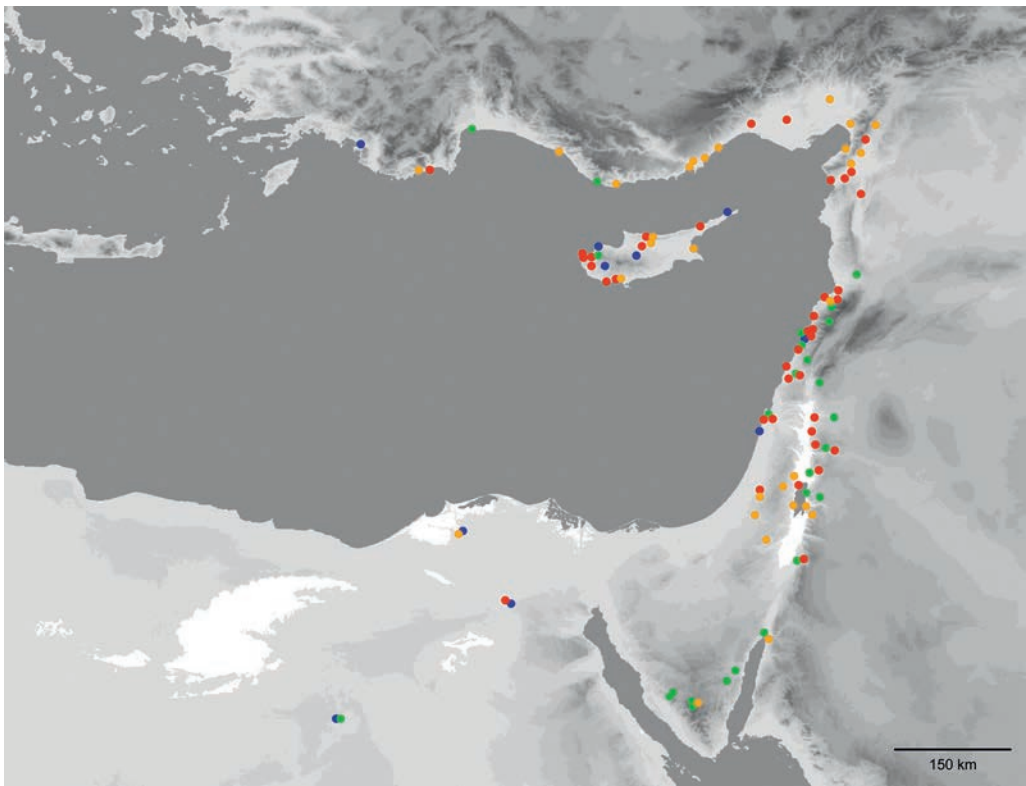


Fig. 6. Recent records (1991–2011) of *Rousettus aegyptiacus* in the eastern Mediterranean region: red dots – records of colonies; blue dots – other records of individuals in their roosts; green dots – records of foraging individuals by netting; yellow dots – unspecified records and records of occurrence signs (see Material and Methods and Figs. 2–5). Some symbols represent more than one record.

Obr. 6. Nálezové lokality kaloně egyptského (*Rousettus aegyptiacus*) ve východním Středomoří zaznamenané v posledních letech (1991–2011): červené body – nálezy kolonií; modré body – jiné nálezy jedinců v úkrytech; zelené body – nálezy odchytom do sítí; žluté body – ostatní neurčené nálezy a nálezy nepřímých známek výskytu (viz obr. 2–5). Některé body představují více než jeden nález.

- Harbiye, a cave in the village centre (Hatay Prov., 36° 09' N, 36° 08' E), 28 September 2009, obs. a colony of ca. 200 inds., 30 September 2009, obs. 7 inds. (leg. T. Bartonička, R. Bilgin, I. Horáček, P. Hulva & R. Lučan);
- Çevlik (Mağaracık), cave and its surroundings (Hatay Prov., 36° 07' N, 35° 56' E), 3 July 1998, mandible from an owl pellet, 27 September 2009, obs. a colony of ca. 65 inds. (leg. T. Bartonička, R. Bilgin, I. Horáček, P. Hulva, R. Lučan & J. Obuch; cf. Benda & Horáček 1998);
- Narlica, cave (Hatay Prov., 36° 14' N, 36° 13' E), 28 September 2009, obs. a colony of ca. 1000 inds. (leg. T. Bartonička, R. Bilgin, I. Horáček, P. Hulva & R. Lučan);
- Narlikuyu, small cave (Içel Prov., 36° 27' N, 34° 07' E), 29 October 1993, remains from owl pellets (leg. P. Benda & I. Horáček; cf. Benda & Horáček 1998);
- Sayköy, cave (Içel Prov., 36° 57' N, 34° 47' E), 26 September 2009, obs. a colony of ca. 1500 inds. (leg. T. Bartonička, R. Bilgin, I. Horáček, P. Hulva & R. Lučan);
- Silifke, castle (Içel Prov., 36° 24' N, 33° 57' E), 30 July 1996, obs. 1 ind. (leg. Z. Storchová; cf. Benda & Horáček 1998);
- Yakacık, under a bridge (Antalya Prov., 36° 06' N, 32° 34' E), 4 October 2009, net. 7 inds. (leg. T. Bartonička, R. Bilgin, I. Horáček, P. Hulva & R. Lučan).

## Cyprus

### *Data by Bergmans (1994)*

Akrotiri; Apsiou; Ayia Napa; near Ayioa Epiktitos; Bellapais; Episkopi Bay; Famagusta; between Klepini and Pentadactylos; Konktia; Ktema; Lachi [= Latsi]; S of Lachi; Larnaka; Nicosia; Paralimni; Polis; Prastiou; between Pyla and Troulli; Trozina; Yermasoyia Reservoir.

### *New published data*

Akamas (Boye et al. 1990, Hadjisterkotis 2006); Apsiou (Boye et al. 1990); Asproyia (Hadjisterkotis 2006); Cape Greco (Boye et al. 1990); Empa (Hadjisterkotis 2006); near Episkopi (Boye et al. 1990); at Famagusta (Boye et al. 1990); Kissonerga (Hadjisterkotis 2006); Kynousa (Benda et al. 2007); near Kyrenia (Boye et al. 1990); Limassol (Boye et al. 1990); Neo Horio, Petratis gorge (Benda et al. 2007); west of Nicosia (Boye et al. 1990); near Paphos (Boye et al. 1990); Paramali (Boye et al. 1990); Polemi (Hadjisterkotis 2006); Steni (Hadjisterkotis 2006, Benda et al. 2007); Stroumbi (Hadjisterkotis 2006); Vretsia (Hadjisterkotis 2006).

### *Original records*

- Afendrika, Asomatos Church ruins (Triкомо [İskele] Dist., 35° 39' N, 34° 26' E), 17 October 2005, net. 17 inds. (leg. I. Horáček, P. Hulva & R. Lučan; cf. Benda et al. 2007);
- Afendrika, Prisoner's Cave (Ammohostos [Gazimağusa] Dist., 35° 39' N, 34° 26' E), 3 March 2010, obs. 5 inds. (leg. T. Bartonička, H. Nicolaou & R. Lučan);
- Agirda [Agirdağ], cleft cave (Kyrenia [Girne] Dist., 35° 18' N, 33° 15' E), 5–6 April 2005, obs. a colony of 12 inds., net. 8 inds., 2 May 2009, obs. 2 inds., 5 August 2009, obs. 5 inds. (leg. T. Bartonička, I. Horáček, P. Hulva & R. Lučan; cf. Benda et al. 2007);
- Ammohostos [Gazimağusa], old town (Ammohostos [Gazimağusa] Dist., 35° 08' N, 33° 57' E), 19 April 2005, 25 July 2006, obs. feeding traces (leg. P. Benda & V. Hanák; cf. Benda et al. 2007);
- Bellapais [Beylerbeyi], Bellapais Abbey ruins (Kyrenia [Girne] Dist., 35° 18' N, 33° 21' E), 27 July 2006, obs. feeding traces (leg. P. Benda; cf. Benda et al. 2007);
- Episkopi, Happy Valley cave (Lemesos Dist., 34° 41' N, 32° 49' E), 26 April 2009, obs. 4 inds. (leg. T. Bartonička & R. Lučan);
- Episkopi, Katarina Travel garden (Lemesos Dist., 34° 40' N, 32° 54' E), 1 May 2009, net. 2 inds. (leg. T. Bartonička & R. Lučan);
- Episkopi, sea cave (Lemesos Dist., 34° 41' N, 32° 49' E), 7 August 2009, obs. a colony of ca. 40 inds. (leg. T. Bartonička & R. Lučan);

- Eptakomi [Yedikonuk], cave (Ammohostos [Gazimağusa] Dist., 35° 28' N, 34° 02' E), 17 October 2005, obs. a colony of ca. 800 inds., 3 May 2009, obs. 2 inds., 22 February 2010, obs. ca. 20 inds. (leg. T. Bartonička & R. Lučan; cf. Benda et al. 2007);
- Ergates, at a date palm (Lefkosia Dist., 35° 04' N, 33° 14' E), 3 March 2010, net. 7 inds., 5 March 2010, net. 13 inds. (leg. T. Bartonička & R. Lučan);
- Gerolakkos [Alaykoy], mine (Lefkosia [Lefkoşa] Dist., 35° 10' N, 33° 15' E), 6 March 2010, obs. a colony of ca. 200 inds. (leg. T. Bartonička & R. Lučan);
- Lefkosia [Lefkoşa], eastern margin of the town (Lefkosia [Lefkoşa] Dist., 35° 13' N, 33° 20' E), 6 April 2005, obs. 1 ind. (leg. I. Horáček & R. Lučan; cf. Benda et al. 2007)
- Mammari, mine 1 (Lefkosia Dist., 35° 10' N, 33° 12' E), 2 May 2009, obs. 3 inds., 24 July 2009, obs. ca. 50 inds., net. 10 inds., 21 February 2010, obs. 8 inds., 16 March 2010, obs. 5 inds.; mine 2, 2 May 2009, obs. a colony of ca. 130 inds., 22 July 2009, obs. 50 inds., 28 July 2009, obs. a colony of ca. 160 inds., 5 August 2009, obs. a colony of ca. 130 inds., 9 August 2009, net. 8 inds., 19 February 2010, obs. 60 inds., 23 February 2010, obs. a colony of ca. 55 inds., net. 26 inds., 27 February 2010, obs. a colony of ca. 55 inds., net. 6 inds., 16 March 2010, obs. a colony of ca. 50 inds. (leg. T. Bartonička, H. Nicolaou & R. Lučan);
- Mitsero, mine (Lefkosia Dist., 35° 02' N, 33° 07' E), 28 July 2009, obs. 1 ind. (leg. T. Bartonička & R. Lučan);
- Neo Horio, Loutra tis Afroditis (Pafos Dist., 35° 03' N, 32° 21' E), 9 April 2005, 1 ind. (leg. P. Benda & V. Hanák; cf. Benda et al. 2007);
- Neo Horio, Smigies Trail, Magnesia Mine (Pafos Dist., 35° 03' N, 32° 20' E), 27 March 2005, obs. a colony of ca. 20 inds., net. 4 inds., 12 October 2005, net. 7 inds. (leg. I. Horáček, P. Hulva & R. Lučan; cf. Benda et al. 2007);
- Paramali, above a stream (Lemesos Dist., 34° 41' N, 32° 50' E), 10 April 2005, obs. 1 ind. (leg. P. Benda & V. Hanák; cf. Benda et al. 2007);
- Pissouri, artificial cave (Lemesos Dist., 34° 40' N, 32° 42' E), 5 May 2009, obs. 62 inds., 7 August 2009, obs. a colony of 46 inds., 13 March 2010, obs. 50 inds., 8 June 2011, obs. 25 inds. (leg. T. Bartonička, P. Hulva, H. Nicolaou & R. Lučan);
- Pomos, tunnel in a dam (Pafos Dist., 35° 09' N, 32° 35' E), 13 March 2010, obs. 5 inds. (leg. R. Lučan);
- Prodromi, Androlikou gorge, small cave (Pafos Dist., 35° 00' N, 32° 23' E), 26 March 2005, net. 16 inds., 20 April 2005, net. 1 ind., 7 June 2011, obs. 1 ind. (leg. T. Bartonička, P. Benda, V. Hanák, I. Horáček, P. Hulva & R. Lučan; cf. Benda et al. 2006, 2007, 2008)
- St. Hilarion Castle, cave in a cliff wall below the castle (Kyrenia [Girne] Dist., 35° 19' N, 33° 17' E), 4 April 2005: obs. a colony of ca. 50 inds. (cf. I. Horáček, R. Lučan & P. Hulva; cf. Benda et al. 2007);
- Vretsia, old mine near Venetian bridge (Pafos Dist., 34° 53' N, 32° 41' E), 5 June 2011, obs. 10 inds. (leg. T. Bartonička & P. Hulva).

## Syria

*Data by Bergmans (1994)*

No data.

*New published data*

Baniyas, Al Watta cave (Frumkin 1988); Hamama, Al Manfa Cave (Shehab & Mamkhair 2004, Shehab et al. 2007).

*Original records*

- Qala'at al Hosn, Crac des Chevaliers, under a castle bridge (Homs Prov., 34° 45' N, 36° 18' E), 10 May 2001, net. 1 ind., obs. 2 inds., 18 October 2004, net. 1 ind. (leg. R. Lučan; cf. Benda et al. 2006);
- Talsh'hab, Al Yarmuk Valley, above a stream (Der'a Prov., 32° 42' N, 35° 58' E), 25 May 2001, net. 3 inds. (leg. M. Andreas, P. Benda, A. Reiter & D. Weinfurtová; cf. Benda et al. 2006, 2008, 2010);



Ya'ar Oden, apple orchard, above a water pit (Quneitra Prov., 33° 12' N, 35° 46' E), 18 July 1999, net. 2 inds. (leg. P. Benda; cf. Benda et al. 2006, 2008, 2010).

## Lebanon

### *Data by Bergmans (1994)*

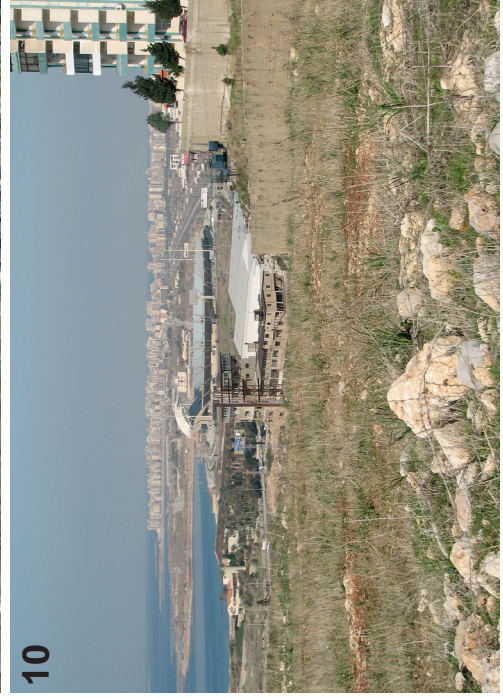
Amchîte; Antilyas; Beirut; Beirut River cave; Beit Meri; Hazmiyeh; Jahmour; Junieh; Lebanon cave; Maam el Tien Cave; Mogharet Saleh; Mount Lebanon; Ras Beirut; Roman aquaduct 2 km E of Hazmieh; Saida; Tripoli.

### *New published data*

Amchit, Saleh Cave (Horáček et al. 2008, 2009); Antelias, Al Kassarat Cave (Horáček et al. 2008, 2009); Antelias, Kanaan Cave (Horáček et al. 2008, 2009); Beirut, Grotta dei Colombi (Festa 1894); Bqerzla (Horáček et al. 2008); Damour (Tohmé & Tohmé 1985); Ed Dibbye, Wataweet Cave / Mgharet el Ouataouit (Horáček et al. 2008, 2009); Haska Cave (Horáček et al. 2008); Jamhour Cave (Horáček et al. 2008); Jeita Cave (Horáček et al. 2008); Mgharet el Aaonamine (Horáček et al. 2009); Nahr el Litani, Zawtar Cave (Horáček et al. 2008); Sir Ed Dinneih, Ksaim Sinkhole (Horáček et al. 2008); Tripoli, Mgheret Mtall el Azraq / Matal el Azrak (Horáček et al. 2008, 2009); near Tyre (Tristram 1884); Zaoutar Ech Charqie (Horáček et al. 2008).

### *Original records*

- Aalmane, Nahr El Litani Valley (Lubnan El Janubi Dist., 33° 19' N, 35° 27' E), 21 June 2006, net. 1 ind. (leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; cf. Horáček et al. 2008);
- Aamchit, Saleh Cave (Jebel Lubnan Prov., 34° 09' N, 35° 40' E; Fig. 7), 25 June 2006, obs. a colony of ca. 200 inds., net. 13 inds., 28 January 2007, obs. a colony of ca. 100 inds., 22 January 2008, obs. a colony of ca. 150 inds., 14 March 2009, obs. a colony of ca. 150 inds., 20 March 2009, obs. a colony of 325 inds., 25 March 2009, net. 44 inds., 29 July 2009, obs. a colony of ca. 150 inds., 31 May 2010, obs. a colony of ca. 200 inds. (leg. T. Bartonička, P. Benda, R. Černý, I. Horáček, P. Hulva, R. Lučan & M. Uhrin; cf. Horáček et al. 2008, 2009);
- Adloun, Grotte d'Adloun (Lubnan El Janubi Prov., 33° 25' N, 35° 16' E), 16 January 2008, obs. 26 inds. (leg. P. Benda, I. Horáček, R. Lučan & M. Uhrin; cf. Horáček et al. 2009);
- Adloun, small cave near the Grotte d'Adloun (Lubnan El Janubi Prov., 33° 25' N, 35° 16' E; Fig. 8), 22 March 2009, obs. a group of 8 inds., net. 18 inds., 29 March 2009, obs. 2 inds., net. 9 inds. (leg. T. Bartonička, P. Benda, I. Horáček & R. Lučan);
- Afqa, Afqa Cave (Jebel Lubnan Dist., 34° 04' N, 35° 54' E; Fig. 9), 26 June 2006, net. 2 inds. (leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; cf. Horáček et al. 2008);
- Antelias, El Kassarat Cave (Jebel Lubnan Prov., 33° 55' N, 35° 36' E), 1 July 2006, obs. a colony of ca. 340 inds., 25 January 2007, obs. a colony of ca. 400 inds., 25 January 2008, obs. a colony of ca. 450 inds., 28 March 2009, obs. 446 inds., 5 August 2009, obs. a colony of ca. 650 inds. (leg. T. Bartonička, P. Benda, R. Černý, I. Horáček, P. Hulva, R. Lučan, P. Němec & M. Uhrin; cf. Benda et al. 2008, 2010, Horáček et al. 2008, 2009);
- Antelias, Kanaan Cave (Jebel Lubnan Prov., 33° 55' N, 35° 36' E), 4 July 2006, obs. a colony of ca. 100 inds., net. 25 inds., 25 January 2007, obs. a colony of ca. 100 inds., 25 January 2008, obs. a colony of ca. 100 inds., 5 August 2009, obs. a colony of ca. 70 inds., 10 June 2010, obs. a colony of ca. 40 inds. (leg. T. Bartonička, P. Benda, R. Černý, I. Horáček, P. Hulva, R. Lučan, P. Němec & M. Uhrin; cf. Horáček et al. 2008, 2009);
- Beirut, A. U. B. Campus (Beirut Prov., 33° 54' N, 35° 29' E), 22 April 2006, net. 3 inds. (leg. I. Horáček; cf. Horáček et al. 2008);
- Berquayl, cave (Lubnan El Shamali Prov., 34° 29' N, 36° 02' E), 30 July 2009, obs. a colony of ca. 280 inds., 3 August 2009, obs. a colony of ca. 250 inds. (leg. I. Horáček & M. Abi-Said);
- Bnechaaï, cave (Lubnan El Shamali Prov., 34° 20' N, 35° 55' E), 3 August 2009, obs. traces of former colony (leg. I. Horáček);





Figs. 7–10. Examples of areas inhabited by *Rousettus aegyptiacus* in Lebanon (all photos by M. Uhrin). Fig. 7. Location of the Saleh Cave at Aamchit, roost of a large colony. Fig. 8. A cliff at Adloun above the sea shore; small caves in the cliff serve as roosts of small groups. Fig. 9. Afqa Cave in the Lebanon Mts. (1255 m a. s. l.), the highest localised site of (seasonal) fruit bat occurrence in the Mediterranean. Fig. 10. Landscape at the Mtal el Azraq Cave (roost of a large colony) on the southern edge of Trablous.

Obr. 7–10. Příklady území obývaných kaloněm egyptským (*Rousettus aegyptiacus*) v Libanonu (všechny foto M. Uhrin). Obr. 7. Posice Salehovy jeskyně u Amsitu, úkryt velké kolonie. Obr. 8. Skalní výstup u Adlunu nad pobřežím moře; malé jeskyně ve skalách slouží jako úkryty malých skupin. Obr. 9. Jeskyně Afka v pohorí Libanon (1255 m n. m.), nejvyšší položené místo (sezonního) výskytu kaloně ve Středomoří. Fig. 10. Krajina u jeskyně Mtal El Azraq (Modrá vyhlídka), úkrytu velké kolonie na jižním okraji Tripole.

Dahr El Mghara, Aaonamine Cave (Jebel Lubnan Prov., 33° 40' N, 35° 37' E), 19 January 2008, obs. a group of ca. 20 inds., 28 March 2009, obs. 1 ind. (leg. T. Bartonička, P. Benda, I. Horáček, R. Lučan & M. Uhrin; cf. Benda et al. 2008, 2010, Horáček et al. 2009);

Dahr El Mghara, Ouataouite Cave (Jebel Lubnan Prov., 33° 40' N, 35° 37' E), 19 January 2008, obs. a colony of ca. 850 inds., 22 March 2009, obs. a colony of ca. 800 inds., net. 52 inds., 28 March 2009, obs. a colony of ca. 800 inds., 5 August 2009, obs. a colony of ca. 850 inds. (leg. T. Bartonička, P. Benda, I. Horáček, R. Lučan & M. Uhrin; cf. Horáček et al. 2008, 2009);

Iäal, castle ruins (Lubnan El Shamali Prov., 34° 22' N, 35° 55' E), 1 June 2010, obs. feeding traces (leg. P. Benda & M. Uhrin);

Jeita, Jeita Cave (Jebel Lubnan Prov., 33° 57' N, 35° 39' E), 26 January 2007, obs. a colony of ca. 200 inds., 20 March 2009, net. 26 inds. (leg. T. Bartonička, P. Benda, R. Černý, I. Horáček & R. Lučan; cf. Horáček et al. 2008);

Jezzine, Pont El Khalass, abandoned house (Lubnan El Janubi Dist., 33° 32' N, 35° 35' E), 23 June 2006, net. 4 inds. (leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; cf. Horáček et al. 2008);

Nahr Es Safa, below a bridge ca. 1 km below the junction with Nahr Ed Damour (Jebel Lubnan Dist., 33° 42' N, 35° 28' E), 22 June 2006, net. 1 ind. (leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; cf. Horáček et al. 2008);

Nahr Es Safa, ca. 1 km above the junction with the Nahr Ed Damour, above the river (Jebel Lubnan Dist., 33° 42' N, 35° 29' E), 21 April 2006, net. 1 ind. (leg. I. Horáček; cf. Horáček et al. 2008);

Ouadi Jilo, cave in a quarry (Lubnan El Janubi Prov., 33° 14' N, 35° 19' E), 22 March 2009, obs. a colony of ca. 800 inds., 29 March 2009, obs. a colony of ca. 800 inds., 4 August 2009, obs. a colony of ca. 250 inds. (leg. T. Bartonička, P. Benda, I. Horáček & R. Lučan);

Ras El Matn, Aabadiye Cave (Jebel Lubnan Dist., 33° 51' N, 35° 38' E), 22 January 2008, obs. a colony of ca. 200 inds. (leg. M. Abi-Said, P. Benda, I. Horáček, R. Lučan & M. Uhrin; cf. Horáček et al. 2009);

Seraal, Qadicha Valley (Lubnan El Shamali Prov., 34° 17' N, 35° 56' E), 30 July 2009, net. 1 ind. (leg. I. Horáček);

Trablous, Mtal El Azraq Cave (Lubnan El Shamali Prov., 34° 25' N, 35° 50' E; Fig. 10), 21 January 2007, obs. a colony of ca. 200 inds., 18 January 2008, obs. a colony of ca. 300 inds., 16 March 2009, obs. a colony of ca. 500 inds., 29 July 2009, obs. a colony of ca. 300 inds., 31 May 2010, obs. a colony of ca. 300 inds. (leg. T. Bartonička, P. Benda, R. Černý, I. Horáček, R. Lučan & M. Uhrin; cf. Benda et al. 2008, 2010, Horáček et al. 2008, 2009).

## Israel and the Palestinian Territories

*Data by Bergmans (1994)*

between Bertovia and Telk-Chai; Dan; Herzliyya cave, Mount Carmel; Jaffa; Jericho; Jerusalem; Me'arath Hateamim near Hartuv; Mount Carmel; Ofer Cave; Rehobot; Tabgha; ? Tel Aviv; Wadi Kurn at Acre.

### *New published data*

Ain Gedi / 'En Gedi (Qumsiyeh 1996, Medelssohn & Yom-Tov 1999); Beit Guvrin (Qumsiyeh 1996); Beit Sahur (Qumsiyeh 1996); Bitan Aharon (Qumsiyeh 1996, Medelssohn & Yom-Tov 1999); Eilat (Medelssohn & Yom-Tov 1999, Zelenova & Yosef 2003); Gva'ot Goral (Tsoar et al. 2011); Haifa, Abas Cave (Korine et al. 1994); Haifa, Rupin Cave (Korine et al. 2004); HaMakhtesh HaGadol (Tsoar et al. 2011); Herzelia (Qumsiyeh 1996); Mar Jiryis (Wadi Kelt) (Qumsiyeh 1996); Nachash cave, Mount Carmel NP (Korine et al. 1999); Rakefet cave, Mount Carmel NP (Korine et al. 1999); Sgafim Cave (Tsoar et al. 2011); Tel Aviv (Medelssohn & Yom-Tov 1999); several closely unspecified records mapped throughout the country by Medelssohn & Yom-Tov (1999), see Fig. 6.

### *Original records*

Beit Oren, small cave (Hefa Dist., 32° 43' N, 35° 01' E), 20 July 1999, obs. 1 ind. (leg. P. Benda);  
Ein Karmel, Nakhla Me'arot, cave (Hefa Dist., 32° 40' N, 34° 58' E), 16 July 1999, obs. a colony of ca. 50 inds. (leg. P. Benda);  
Qumran, cave 2 km to SW (West Bank, 31° 44' N, 35° 27' E), December 1999, obs. a colony of 300–400 inds. (leg. J. Obuch);  
Sdot Jam, Caesarea, ruins (Hefa Dist., 32° 31' N, 34° 54' E), 21 July 1999, obs. 4 inds. (leg. P. Benda);  
Yaffo, mosque (Tel Aviv Distr., 32° 03' N, 34° 47' E), May 2007, obs. a colony of ca. 400 inds. (leg. L. Maul).

## **Jordan**

### *Data by Bergmans (1994)*

Al-Mahhatah; Amman; El Hamma; Zerqa River.

### *New published data*

Al Hamma (Benda et al. 2010); Al Qunayya (Benda et al. 2010); Ar Raddass, S of Wadi Al Mawjib (Al-Omari et al. 2000, Benda et al. 2010); Ghur As-Safi (Amr & Disi 1988); Wadi Abu Khushabeh (Benda et al. 2010); Wadi Faynan (Qumsiyeh et al. 1998); Wadi Fidan (Amr & Disi 1988); Wadi Ibn Hamad (Qumsiyeh 1996, Qumsiyeh et al. 1998, Amr 2000).

### *Original records*

Al Mustaba, Az Zarqa' River valley (Irbid Prov., 32° 13' N, 35° 53' E), 11 October 2008, net. 1 ind. (leg. P. Benda & J. Obuch);  
An Nuzha, Wadi Al Wala, above a river ('Amman Prov., 31° 33' N, 35° 44' E), 11 July 2010, net. 1 ind., obs. 1 ind. (leg. P. Benda & A. Reiter; cf. Benda et al. 2010);  
Aqaba, Ottoman fortress (Ma'an Prov., 29° 31' N, 35° 00' E), 16 May 2009, obs. feeding traces (leg. P. Benda, J. Obuch & A. Reiter; cf. Benda et al. 2010);  
Az Zara Springs ('Amman Prov., 31° 36' N, 35° 34' E), 22 October 2004, net. 1 ind. (leg. R. Lučan; cf. Benda et al. 2010);  
Dhana, Wadi Dhana (Tafila Prov., 30° 39' N, 35° 32' E), 14 May 2009, obs. a colony of ca. 40 inds. (leg. P. Benda, J. Obuch & A. Reiter; cf. Benda et al. 2010);  
Jufat Al Qafrayn, above a fishpond (Balqa' Prov., 31° 53' N, 35° 37' E), 15 July 2010, net. 2 inds. (leg. P. Benda & A. Reiter; cf. Benda et al. 2010);  
Kufranja, Iraq Al Wahaj Cave (Irbid Prov., 32° 19' N, 35° 43' E), 25 October 2008, obs. a colony, remnants of 20 inds. found in owl pellets, 26 May 2009, obs. a colony of ca. 200 inds., net. 14 inds., 4 October 2010, obs. a colony of ca. 25 inds. (leg. P. Bačkor, P. Benda, J. Obuch & A. Reiter; cf. Benda et al. 2010);  
Nahla, above a spring (Irbid Prov., 32° 17' N, 35° 51' E), 13 July 2010, net. 1 ind. (leg. P. Benda & A. Reiter; cf. Benda et al. 2010);

Tabaqat Fahl, Roman nekropolis, cave (Irbid Prov., 32° 27' N, 35° 37' E), 5 July 1997, obs. a colony of ca. 10 inds., 24 May 2009, obs. traces of a colony (leg. P. Benda, J. Novotný & A. Reiter; cf. Benda & Šádllová 1999, Benda et al. 2010);

Wadi As Sir, Iraq Al Amir ('Amman Prov., 31° 55' N, 35° 45' E), 10 October 2008, obs. a colony of ca. 50 inds., 10 May 2009, obs. a colony of ca. 220 inds., net. 25 inds., 2 July 2010, obs. a colony of ca. 200 inds., net. 26 inds., 13 October 2010, obs. a colony of ca. 140 inds., net. 10 inds. (leg. P. Bačkor, P. Benda, J. Obuch & A. Reiter; cf. Benda et al. 2010).

## Egypt

### *Data by Bergmans (1994)*

Abu Simbel; near Assiut; Aswan; Burg el Arab; Cairo, Abbassia; Cairo, Citadel; Cairo, Maade; Cairo, Mohamed Ali Mosque; Cairo, Sultan Hassan Mosque; Cairo, Damietta; Delta Barrage Gardens; Dumyât; El Aiyat; El Faiyûm; El Giza; El Karnak; El Mansuriya; El Minya; El Tell el Kebîr; El Walidiya; El Zamalik; Fuah; Gezira Island; Ismâiliya; near Luxor (Kurna and Grand Hotel ruins); Mahallet el Kebir; Mataria; Matrûh; Medinet el Fayum; Nigm; Port Said; Q'asr; Qina; Thebe; Wâdi el Natrun.

### *New published data*

Ain Hudra, oasis (Benda et al. 2008); Aswan tombs (Dornburg et al. 2011); Baltim (Anderson 1902); Bashendi (Churcher 1991); Burg El Arab (Wassif 1995); Cairo (Dornburg et al. 2011); Cairo, Sultan Hamid Mosque (Gaisler et al. 1972); El Manashi (Qumsiyeh 1985); El Milga (Benda et al. 2008); Feiran, El Braga Garden (Benda et al. 2008); Nag Hammadi (Dornburg et al. 2011); Nag Misaw (Dornburg et al. 2011); Wadi Itfah (Benda et al. 2008); Wadi Klar (Benda et al. 2008); Wadi Nassim (Qumsiyeh 1985); Wadi Shagg (Benda et al. 2008).

### *Original records\**

Ain El Furtaga, above a pool (Janub Sina Prov., 29° 03' N, 34° 33' E), 16 September 2005, net. 9 inds., 17 September 2005, net. 7 inds. (leg. M. Andreas, P. Benda, J. Hotový & R. Lučan; cf. Benda et al. 2008);

Ain Hudra, oasis (Janub Sina Prov., 28° 54' N, 34° 25' E), 14 September 2005, net. 1 ind. (leg. M. Andreas, P. Benda, J. Hotový & R. Lučan; cf. Benda et al. 2008);

Aswan, palm garden at the N edge of the town (Aswan Prov., 24° 07' N, 32° 54' E), 24 January 2010, net. 47 inds., 10 January 2011, net. 54 inds. (leg. P. Benda, I. Horáček & R. Lučan);

Aswan, Temple of Philae (Aswan Prov., 24° 02' N, 32° 53' E), 6 December 2011, obs. feeding traces (leg. P. Benda);

Aswan, Tombs of the Nobles (Aswan Prov., 24° 06' N, 32° 53' E; Fig. 12), 9 January 2011, obs. a colony of ca. 300 inds. (in two parts) (leg. R. Lučan);

Aswan, labyrinth of old mines NE of the town (Aswan Prov., 24° 07' N, 32° 55' E), 9 January 2011, obs. a colony of ca. 70 inds. (leg. R. Lučan);

Bawiti, Bahariya Oasis, palm garden (El Giza Prov., 28° 21' N, 28° 52' E), 18 January 2010, net. 3 inds., 30 December 2010, net. 7 inds., 2 January 2011, net. 2 inds., 23 March 2011, net. 8 inds., 16 and 17 October 2011, net. 4 inds. (leg. P. Benda, I. Horáček & R. Lučan);

Bawiti, Bahariya Oasis, tomb (El Giza Prov., 28° 21' N, 28° 52' E), 19 January 2010, obs. 1 ind., 17 October 2011, obs. 1 ind. (leg. P. Benda, I. Horáček & R. Lučan);

Bawiti, Bahariya Oasis, rocky escarpment in a volcanic hill (El Giza Prov., 28° 21' N, 28° 54' E), 17 October 2011, obs. 1 ind. roosting in a rock crevice (leg. R. Lučan & M. Šálek);

Bashendi, Dakhla Oasis, mosque (El Wadi El Jadid Prov., 25° 33' N, 29° 18' E), 22 January 2010, obs. feeding traces (leg. P. Benda, I. Horáček & R. Lučan);

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\*only the data from January 2010 collected in the Dakhla oasis are mentioned here, for the complete roost evidence from this oasis see Appendix and Fig. 26.

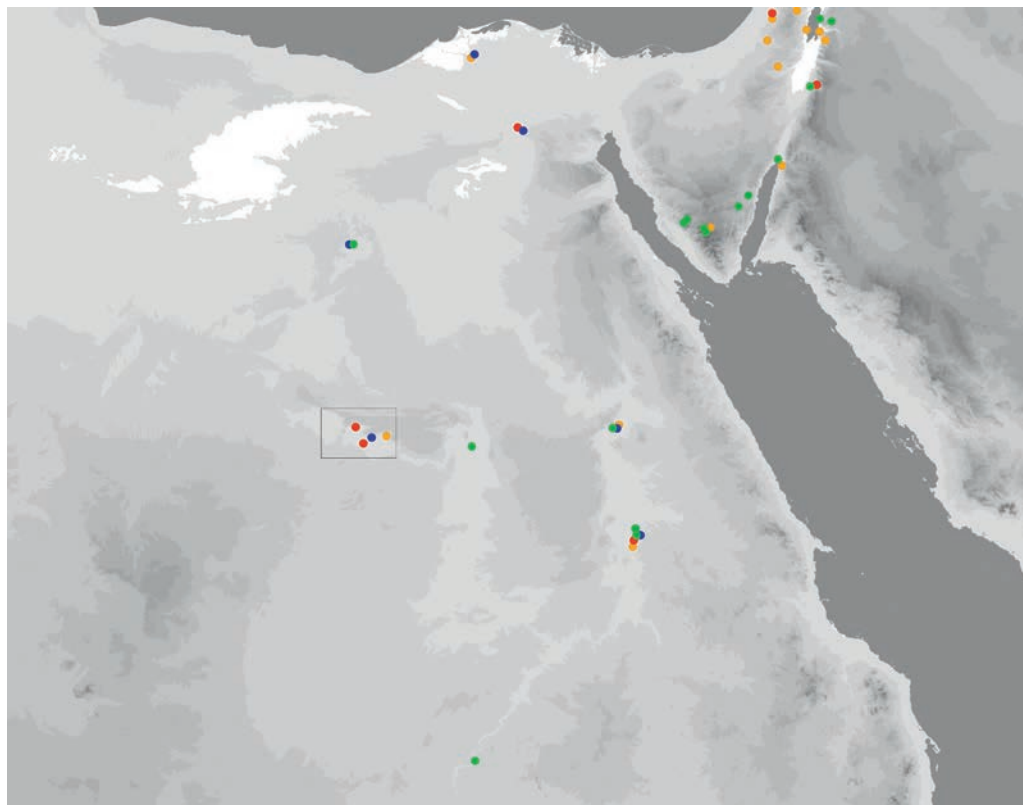


Fig. 11. Recent records (1991–2011) of *Roussetus aegyptiacus* in northeastern Africa; scale as in Figs. 6, for legend see Fig. 6. The rectangle demarcates the area in Fig. 26. Some symbols represent more than one record.

Obr. 11. Nálezové lokality kaloně egyptského (*Roussetus aegyptiacus*) v severovýchodní Africe zaznamenané v posledních letech (1991–2011); měřítko a legenda viz obr. 6. Obdélník vymezuje území zobrazené na obr. 26. Některé body představují více než jeden nález.

El A'aqab, palm garden (Aswan Prov., 24° 16' N, 32° 54' E), 25 January 2010, net. 44 inds. (leg. P. Benda, I. Horáček & R. Lučan);

El Kharga, El Kharga Oasis, palm garden at the S edge of the town (El Wadi El Jadid Prov., 25° 25' N, 30° 33' E), 23 January 2010, net. 27 inds. (leg. P. Benda, I. Horáček & R. Lučan);



Figs. 12–15. Examples of roost sites of *Roussetus aegyptiacus* in Egypt (all photos by R. Lučan). Fig. 12. Aswan, Tombs of the Nobles, roost of a colony of ca. 300 inds. Fig. 13. El Qahirah (= Cairo), old quarries of Muqattam, (perhaps temporary) roost of one individual. Fig. 14. Dakhla Oasis, abandoned part of the medina of El Qasr, where numerous roost sites were found. Fig. 15. Dakhla Oasis, abandoned house in the medina of Mut, roost site of a colony of ca. 260 inds. (note the dropping smudges around the door opening).

Obr. 12–15. Příklady lokalit ukrytů kaloně egyptského (*Roussetus aegyptiacus*) v Egyptě (všechna foto R. Lučan). Obr. 12. Asuán, hrobky šlechty, úkryt kolonie o asi 300 kusech. Obr. 13. Káhira, staré lomy mukatámské, (patrně nestálý) úkryt jednoho kaloně. Obr. 14. Oasa Dachla, opuštěná část starého města v El Kasru, ve kterém bylo dokumentováno 14 různých úkrytů. Obr. 15. Oasa Dachla, opuštěný dům ve starém městě v Mutu, úkryt kolonie o zhruba 260 kusech (patrný jsou též stopy trusu kolem otvoru dveří do místností s úkrytem).

12



13



14



15



- El Malaheen, Desouk, tombs (Kafr El Sheikh Prov., 31° 11' N, 30° 39' E), 8 March 2010, obs. 5 inds. (leg. W. M. Shohdi);
- El Qahirah, Zamalek, Fish Garden, artificial cave (El Qahirah Prov., 30° 03' N, 31° 13' E), 22 September 2005, obs. 2 inds., 28 January 2010, obs. a colony of ca. 30 inds., net. 6 inds., 18 November 2010, obs. a colony of ca. 120 inds., 16 December 2010, obs. a colony of ca. 650 inds., 14 January 2011, obs. a colony of ca. 500 inds. (leg. M. Andreas, P. Benda, I. Horáček, J. Hotový & R. Lučan);
- El Qahirah, Muqattam, old quarries (El Qahirah Prov., 30° 01' N, 31° 16' E; Fig. 13), 28–29 January 2010, obs. 1 ind. (leg. P. Benda, I. Horáček & R. Lučan);
- El Qasr, Dakhla Oasis, medina, abandoned house (El Wadi El Jadid Prov., 25° 42' N, 28° 53' E; Fig. 14), 17 April 2002, obs. a colony, 20–21 January 2010, obs. a colony of ca. 1200 inds., net. 54 inds. (leg. P. Benda, I. Horáček, R. Lučan, P. Munclinger & P. Schnizerová; cf. Benda et al. 2006, 2008);
- El Sawaqi, Desouk, agricultural areas (Kafr El Sheikh Prov., 31° 10' N, 30° 37' E), 7 March 2010, obs. 2 inds. (leg. W. M. Shohdi);
- El Uksur, El Karnak Temple (Qena Prov., 25° 43' N, 32° 39' E), 27 January 2010 & 8 December 2011, obs. feeding traces (Fig. 4; leg. P. Benda, I. Horáček & R. Lučan);
- El Uksur, El Gezera, lake (Qena Prov., 25° 42' N, 32° 38' E), 12 January 2011, net. 10 inds. (leg. R. Lučan);
- El Uksur, Luxor Temple, Mosque of Abu El Haggag (Qena Prov., 25° 42' N, 32° 38' E), 7 December 2011, obs. 5 inds. (leg. P. Benda);
- Feiran, E edge of the oasis (Janub Sina Prov., 28° 42' N, 33° 40' E), 10 September 2005, net. 33 inds. (leg. M. Andreas, P. Benda, J. Hotový & R. Lučan; cf. Benda et al. 2008);
- Feiran, above a pool at W edge of the oasis (Janub Sina Prov., 28° 43' N, 33° 37' E), 8 September 2005, net. 1 ind. (leg. M. Andreas, P. Benda, J. Hotový & R. Lučan; cf. Benda et al. 2008);
- Mut, Dakhla Oasis, medina, abandoned house (El Wadi El Jadid Prov., 25° 29' N, 28° 59' E; Fig. 15), 21 January 2010, obs. a colony of ca. 260 inds. (leg. P. Benda, I. Horáček & R. Lučan).

## North Sudan

*Data by Bergmans (1994)*

No data.

*New published data*

Abu Sir, at the Second Cataract (Kaisila 1992).

*Original records*

Ferka, in the ruined village (Ash Shimaliyya State, 20° 54' N, 30° 35' E, Fig. 16), 10 December 2010, obs. feeding traces (Fig. 2), net. 3 inds. (leg. P. Benda & J. Šmíd).

## Saudi Arabia

*Data by Bergmans (1994)*

Abha-Raydah escarpment; Al Baha escarpment; Al Maski; ? Hayel; ? Jeddah; ? Medina; ? Mekka; Tayif; Wadi Khaytan.

No new data.

## Yemen

*Data by Bergmans (1994)*

Aden; near Aden [= Lahej]; “Alturbam” [= At Turbah]; Lahej; Saiun; Taizz.





Fig. 16. Nile valley at Ferka, North Sudan; southernmost known locality of *Rousettus aegyptiacus* in Palaearctic Africa (photo by J. Šmíd).

Obr. 16. Údolí Nilu u osady Ferka v Severním Sudanu; nejj jižnější známá lokalita výskytu kaloně egyptského (*Rousettus aegyptiacus*) v palearktické Africe (foto J. Šmíd).

#### *Original records*

- Ba Tays, Wadi Bana, above a river (Abyan Prov., 13° 21' N, 45° 18' E), 8 November 2007, net. 2 inds. (leg. P. Benda, A. K. Nasher & A. Reiter; cf. Benda et al. 2011);
- Damqawt, a wadi ca. 1 km NW of the village, above a pool (Al Mahra Prov., 16° 35' N, 52° 50' E), 16 October 2005, net. 1 ind. (leg. P. Benda; cf. Benda et al. 2011);
- Ghayl Ba Wazir, small hole in a karstic cave ca. 1 km N of the town (Hadramawt Prov., 14° 49' N, 49° 25' E), 7 November 2007, obs. 1 ind. (leg. P. Benda, A. K. Nasher & A. Reiter; cf. Benda et al. 2011);
- Halhal, ca. 10 km NE of Hajjah, above a river (Hajjah Prov., 15° 44' N, 43° 47' E), 2 November 2007, net. 2 inds. (leg. P. Benda & A. Reiter; cf. Benda et al. 2008, 2011);
- Hammam Ali, above pools 5 km W of the town (Dhamar Prov., 14° 41' N, 44° 07' E), 27 October 2005, net. 9 inds. (leg. P. Benda; cf. Benda et al. 2006, 2008, 2011);
- Hawf, pools in gardens above the town (Al Mahra Prov., 16° 39–40' N, 53° 03–05' E), 12–14 October 2005, net. 8 inds. (leg. P. Benda; cf. Benda et al. 2006, 2008, 2011);
- Jebel Bura, 5 km W of Riqab, above a pool (Al Hudaydah Prov., 14° 52' N, 43° 25' E), 30 October 2005, net. 6 inds. (leg. P. Benda; cf. Benda et al. 2006, 2008, 2011);
- Ma'arib, at ancient Great Dam of Ma'arib (Ma'arib Prov., 15° 24' N, 45° 16' E), ca. 8 km W of the town, above a pool, 8 October 2005, net. 4 inds. (leg. P. Benda & A. K. Nasher; cf. Benda et al. 2006, 2008, 2011);
- Mashgab, ca. 10 km S of Ash Shamsara, above a pool (Taizz Prov., 13° 21' N, 43° 57' E), 26 October 2007, net. 7 inds. (leg. P. Benda & A. Reiter; cf. Benda et al. 2008, 2011);
- Wadi 'Adim, oasis 2 km N of Sah (Hadramawt Prov., 15° 41' N, 48° 52' E), 10 October 2005, net. 2 inds. (leg. P. Benda; cf. Benda et al. 2006, 2008, 2011);
- Wadi Al Lahm, ca. 20 km W of Al Mahwit, above a pool (Al Mahwit Prov., 15° 26' N, 43° 29' E), 1 November 2005, net. 1 ind. (leg. P. Benda; cf. Benda et al. 2006, 2008, 2011);
- Wadi Daw'an, palm garden ca. 2 km S of Al Khuraybah, above a pool (Hadramawt Prov., 15° 09' N, 48° 26' E), 19 October 2005, net. 3 inds. (leg. P. Benda; cf. Benda et al. 2006, 2008, 2011);
- Wadi Dhahr, 15 km NW of Sana'a, above a stream (Sana'a Prov., 15° 27' N, 44° 10' E), 6 October 2005, net. 2 inds. (leg. P. Benda; cf. Benda et al. 2006, 2008, 2011);
- Wadi Maytam, 12 km SE of Ibb, above a stream (Ibb Prov., 13° 52' N, 44° 18' E), 26 October 2005, net. 3 inds. (leg. P. Benda; cf. Benda et al. 2006, 2008, 2011);

Wadi Zabid, ca. 10 km SE of Al Mawqir, above a pool (Al Hudaydah Prov., 14° 10' N, 43° 30' E), 30 October 2007, net. 1 ind. (leg. P. Benda & A. Reiter; cf. Benda et al. 2008, 2011).

## Oman

### *Data by Bergmans (1994)*

Near Al Tabaqah, Wadi Sahtani; Jabal Dhawi; Khadafri Plateau, Jebel Qamr; Masirah Island; Muscat; 'Ulyah, Wadi Bani Karus; Wadi Darbat, Jabal Qara; Upper Wadi Halfayn, Jabal Akhdar; Wadi Sahtan; Wadi Sayq, Jabal Qamr.

### *New published data*

Arzat Farm, Salalah (Snowden et al. 2000); al-Khuwayr (Snowden et al. 2000); Seeb Zoo (Snowden et al. 2000).

### *Original records* (all records made by P. Benda, A. Reiter & M. Uhrin)

Adh Dhahir Al Fawaris, above a pool in wadi (Batinah Prov., 23° 39' N, 56° 39' E), 21 October 2009, net. 1 ind.;

Ain Jarziz, cave at a spring (Dhofar Prov., 17° 06' N, 54° 05' E), 27 October 2009, net. 3 inds.;

Ain Tabruq, above a creek below the spring (Dhofar Prov., 17° 06' N, 54° 20' E), 28 October 2009, net. 14 inds.;

Al Aqor, Wadi Tiwi, above a pool (Ash Sharqiyah Prov., 22° 47' N, 59° 14' E), 4 April 2011, net. 2 inds.;

Al Hoota Cave, at the Al Hoota (upper) entrance (Al Dakhiliyah Prov., 23° 06' N, 57° 22' E; Fig. 19), 8 April 2011, net. 8 inds.;

Al Khabbah, Wadi Khabbah, above a pool (Ash Sharqiyah Prov., 22° 56' N, 58° 51' E), 5 April 2011, net. 1 ind.;

Al Khudayrah, oasis (Adh Dhahirah Prov., 24° 29' N, 56° 04' E), 10 April 2011, obs. 1 ind. & feeding traces;

Al Khutwa, cavity between stones in a canyon (Adh Dhahirah Prov., 24° 19' N, 56° 08' E), 20 October 2009, obs. a colony of ca. 100 inds., net. 1 ind.;

Al Mamour, fortress (Adh Dhahirah Prov., 23° 25' N, 56° 15' E), 11 April 2011, obs. feeding traces;

Al Mazari, fortress ruins (Ash Sharqiyah Prov., 23° 05' N, 58° 52' E), 3 November 2009, obs. feeding traces;

Al Nakhar, Wadi Ghul, above a pool (Al Dakhiliyah Prov., 23° 12' N, 57° 13' E; Fig. 20), 22 October 2009, net. 9 inds.;

Al Zihaymi, oasis, above a pool (Batinah Prov., 24° 27' N, 56° 18' E), 14 April 2011, net. 1 ind.;

Ar Rustaq, fortress (Batinah Prov., 23° 24' N, 57° 26' E), 19 October 2009, obs. feeding traces (Fig. 3);

Barzaman, at a small mosque in a palm garden (Ash Sharqiyah Prov., 22° 18' N, 58° 04' E), 31 October 2009, obs. 3 inds. & feeding traces;

Bidbid (Al Dakhiliyah Prov., 23° 25' N, 58° 08' E), above pools in a wadi under the town, 26 March 2011, net. 4 inds.; fortress, 17 October 2009, 27 March 2011, obs. feeding traces;

Birkat Al Mawz, town (Al Dakhiliyah Prov., 23° 56' N, 57° 40' E), 27 March 2011, obs. feeding traces;

Ghab, Wadi Al Hawasina, above a pool (Batinah Prov., 23° 43' N, 56° 55' E), 7 April 2011, net. 1 ind.;

Hagarir, above a livestock haunt (Dhofar Prov., 16° 42' N, 53° 09' E), 25 October 2009, net. 1 ind.;

Harim, Wadi Ajran, above a pool (Adh Dhahirah Prov., 24° 01' N, 56° 12' E), 11 April 2011, net. 1 ind.;

Jaalan Bani Bu Ali, fortress (Ash Sharqiyah Prov., 22° 01' N, 59° 19' E), 1 November 2009, 2 April 2011, obs. feeding traces;

Laja Shalyon, at a livestock haunt (Dhofar Prov., 17° 09' N, 55° 01' E), 29 October 2009, obs. feeding traces under a fig tree;

Manakhir, village (Al Dakhiliyah Prov., 23° 06' N, 57° 44' E), 27 March 2011, obs. feeding traces;

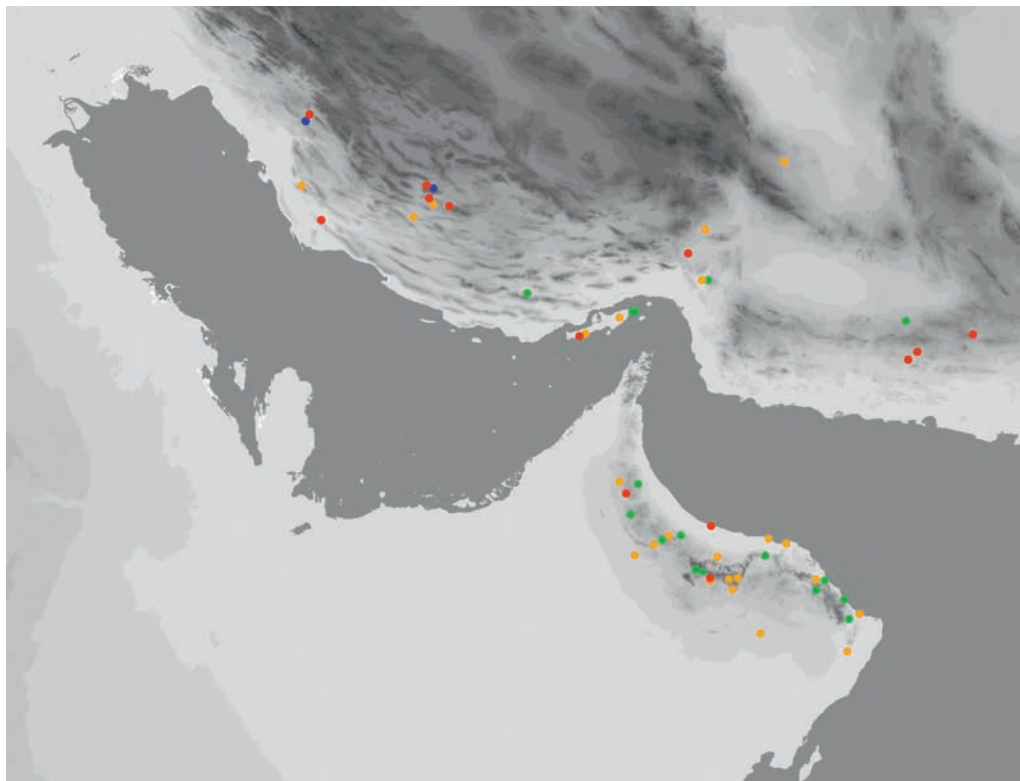


Fig. 17. Recent records (1991–2011) of *Rousettus aegyptiacus* in the areas around the Persian Gulf; scale as in Figs. 6, for legend see Fig. 6. Some symbols represent more than one record.

Obr. 17. Nálezové lokality kaloně egyptského (*Rousettus aegyptiacus*) v oblasti Perského zálivu zaznamenané v posledních letech (1991–2011); měřítko a legenda viz obr. 6. Některé body představují více než jeden nález.

- Mansaf, small cave in wadi above the village (Ash Sharqiyah Prov., 23° 04' N, 58° 52' E), 3 November 2009, obs. 1 ind.;
- Misfat Al Khawater, oasis, above a pool (Al Dakhiliyah Prov., 23° 14' N, 57° 08' E), 9 April 2011, net. 5 inds.;
- Rahbah, small oasis in a wadi ca. 10 km to NW (Batinah Prov., 23° 42' N, 56° 45' E), 8 April 2011, obs. feeding traces;
- Rawdah, Ain Ghubrat Cave, at a pool (Al Dakhiliyah Prov., 23° 04' N, 57° 22' E), 8 April 2011, obs. 1 ind. & feeding traces;
- Sur, residential area (Ash Sharqiyah Prov., 22° 35' N, 59° 30' E), 4 April 2011, obs. feeding traces;
- Sur Al Helal, fortress (Batinah Prov., 23° 51' N, 57° 21' E), 15 April 2011, obs. a colony;
- Taiq Cave, two caves in a huge sink hole (Dhofar Prov., 17° 09' N, 54° 37' E; Fig. 21), 30 October 2009, obs. a colony (at least 50 inds. observable in two parts of the cave), net. 28 inds.;
- Taqah, fortress (Dhofar Prov., 17° 02' N, 54° 24' E), 28 October 2009, obs. feeding traces;
- Wadd, wadi under the village, above pools (Ash Sharqiyah Prov., 22° 31' N, 59° 20' E; Fig. 18), 3 April 2011, net. 12 inds.;



Figs. 18–21. Examples of record sites of *Rousettus aegyptiacus* in Oman (all photos by A. Reiter). Fig. 18. Oasis of Wadd; above pools in the oasis 12 inds. were netted. Fig. 19. The Al Hoota (i.e. the northern and upper) entrance of the Al Hoota Cave, a roost site of a colony. Fig. 20. Wadi Ghul at Al Nakhar, netting site of 9 inds. Fig. 21. View from the Taiq Cave, roost of a colony (ca. 50 inds. observed).

Obr. 18–21. Příklady lokalit výskytu kaloně egyptského (*Rousettus aegyptiacus*) v Omanu (všechna foto A. Reiter).

Obr. 18. Oasa Wadd; nad tůněmi v oase bylo 12 kusů odchyceno do sítě. Obr. 19. Severní a horní vchod do jeskyně Al Huta, zvaný též Al Huta, představuje také přístup k úkrytu kolonie. Obr. 20. Údolí Ghul u Al Nacharu, místo odchyty 9 kusů do sítě. Obr. 21. Pohled z jeskyně Taik, úkrytu kolonie o nejméně 50 kusech.

Wadi Bani Habib, wadi (Al Dakhiliyah Prov., 23° 05' N, 57° 37' E), 28 March 2011, obs. 1 ind.;

Wadi Dibab, above pool in a wadi ca. 7 km to E (Masqat Prov., 23° 04' N, 58° 59' E), 2 November 2009, net. 2 inds.;

Yangul, fortress (Adh Dhahirah Prov., 23° 35' N, 56° 32' E), 22 October 2009, obs. feeding traces.

## United Arab Emirates

*Data by Bergmans (1994)*

Ras el Khaimah.

No new data.

## Iran

*Data by Bergmans (1994)*

Irani Baluchistan; Ahmad Mahmoudi Juyum; 4 km WSW of Jahrom; 3.3 miles SW of Jahrom; Namakdun at S coast of Qeshm Island; Tiss.

*New published data*

Abgarm, Qir (Akmali et al. 2011); Bushigan Deilami (Akmali et al. 2011); Chazan, Sarbaz, Iranshahr (Zohoori 2007); Hur Pasefid, Fariab, Jiroft (Sepahi-Rad 2005); Kaboli Orchard, Qeshm Island (Zohoori 2002, Zohoori et al. 2005); Khayeez Mts., SE of Ahram (Abdoli et al. 2010); Maniyan Cave (Akmali et al. 2011); Qeshm, Qeshm Island (Zohoori 2002, Zohoori et al. 2005, 2007); Ramkan, Qeshm Island (Zohoori 2002, 2007, Zohoori et al. 2005); Sang Eshkan Mine, Jahrom (Akmali et al. 2011); Sisan, Simakan, Jahrom (Zohoori et al. 2004, Zohoori 2007); Turgan Orchard, Qeshm Island (Zohoori 2002, Zohoori et al. 2005).

*Original records*

Arg Bam, Bam, ruined fortress town (Kerman Prov., 29° 06' N, 58° 24' E), 8 April 2000, a mummy found (leg. P. Benda & A. Reiter);

Bishapur, 19 km NW of Kazerun, large cave above the Sasanian spring (Fars Prov., 29° 47' N, 51° 35' E; Fig. 22), 21 April 2000, obs. colony of ca. 500 inds., remnants of 2 inds. found in owl pellets, 6 October 2011, obs. a colony of ca. 300 inds., net. 10 inds. in the cave (leg. M. Andreas, S. Ashrafi, P. Benda, K. Faizolahi, J. Obuch, A. Reiter & M. Uhrin);

Bongaru, 16 km W of Dehbarz, space between crashed rocks (Hormozgan Prov., 27° 27' N, 57° 02' E; Fig. 25), Spring 2011, obs. a colony (leg. G. H. Yusefi & H. Fahimi), 11 October 2011, obs. a colony of ca. 40 inds. (leg. M. Andreas, P. Benda, K. Faizolahi, A. Reiter & M. Uhrin);

Bushigan Deilami, 15 km NW of Kazerun, small cave (Fars Prov., 29° 41' N, 51° 31' E), 7 October 2011, obs. 3 inds. (leg. M. Andreas, S. Ashrafi, P. Benda, K. Faizolahi, A. Reiter & M. Uhrin);

Chahar Dahane, river valley (Hormozgan Prov., 27° 28' N, 57° 19' E), 17 April 2000, remnants of 1 ind. from an owl pellet (leg. J. Obuch);

18



19

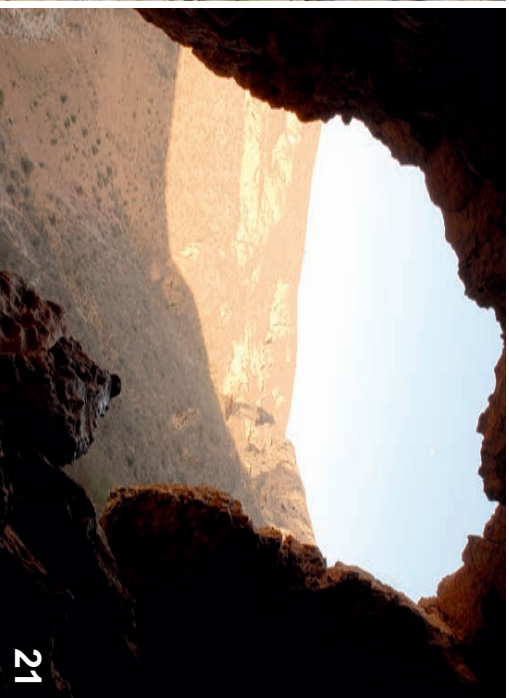


23

20



21







Figs. 22–25. Examples of record sites of *Rousettus aegyptiacus* in Iran (all photos by A. Reiter). Fig. 22. Large cave above the Sasanian spring at Bishapur (large entrance partially covered by a [carob] tree in centre of the picture), roost of a large colony of some 300–500 inds. Fig. 23. Small cave in the Tang Tekhe Valley, roost of a small group of inds. Fig. 24. Small oasis at Zangard, a site of netting of 5 inds. Fig. 25. Rocks at Bongaru, spaces between rocks serve as roosting places of a small colony (ca. 40 inds).

Obr. 22–25. Příklady lokalit nálezů kaloně egyptského (*Rousettus aegyptiacus*) v Iranu (všechna foto A. Reiter).

Obr. 22. Velká jeskyně nad Sasanovským pramenem u Bišapuru (velký vchod zakrytý stromem [rohovníkem] u středu obrázku), úkryt velké kolonie o zhruba 300–500 kusech. Obr. 23. Malá jeskyně v údolí Tang Teche, úkryt malé skupiny. Obr. 24. Malá oasa u Zangardu, lokalita odchytu 5 kusů do sítě. Obr. 25. Skály v oblasti Bongaru; mezery mezi skalami slouží jako úkryt malé kolonie asi o 40 kusech.

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Darukhan, 25 km NNE of Nikshahr, small cave (Sistan va Baluchestan Prov., 26° 27' N, 60° 17' E), 4 October 2011, obs. a colony of ca. 300 inds. (leg. M. Chalani);

Espakeh, an oasis 4 km to S, 68 km SW of Iranshahr, date palm garden (Sistan va Baluchestan Prov., 26° 48' N, 60° 10' E), 10 April 2000, net. 10 inds. (leg. P. Benda & A. Reiter; cf. Benda et al. 2006, 2008);

Isin, 15 km N of Bandar Abbas (Hormozgan Prov., 27° 19' N, 56° 17' E), 29 April 1977, shot 6 inds., 2 May 1977, shot 4 inds. (leg. B. Pražan; cf. Hůrka 1984, Benda et al. 2006, 2008);

Jahrom, artificial caves (Fars Prov., 28° 29' N, 53° 35' E), 8 October 2011, obs. a colony of ca. 50 inds., net. 10 inds. (leg. M. Andreas, S. Ashrafi, P. Benda, K. Faizolahi, A. Reiter & M. Uhrin);

Jahrom, Sang Eshkan Mine (Fars Prov., 28° 29' N, 53° 33' E), 21 November 2009, obs. a colony (leg. K. Faizolahi & B. Musavi);

Kuh Namak, 8 km S of Esmail Masmudi, 52 km SE of Khormuj (Bushehr Prov., 28° 17' N, 51° 44' E), 28 March 2009, obs. a group of ca. 20 inds. (leg. M. Filippi), 14 October 2011, obs. traces of a colony (leg. M. Andreas, P. Benda, A. Reiter & M. Uhrin);

Maniyan, 33 km WNW of Jahrom, cave (Fars Prov., 28° 35' N, 53° 14' E), 20 November 2009, obs. a colony (leg. K. Faizolahi & B. Musavi), 8 October 2011, obs. traces of a colony (leg. M. Andreas, S. Ashrafi, P. Benda, K. Faizolahi, A. Reiter & M. Uhrin);

SE Namakdam, 12 km ENE of Kani, SW Qeshm Island, 3 N salt cave (Hormozgan Prov., 26° 36' N, 55° 27' E), Spring 2005, obs. a colony of ca. 10 inds. (leg. M. Filippi);

Nikshahr, W edge of the town, crevice (Sistan va Baluchestan Prov., 26° 14' N, 60° 13' E), 23 November 2011, obs. a colony of ca. 50 inds. (leg. M. Chalani);

Pasorkhi Gorge, 4 km E of Dehbaraz, rocky overhangs (Hormozgan Prov., 27° 24' N, 57° 17' E), 11 October 2011, obs. feeding traces (leg. M. Andreas, P. Benda, K. Faizolahi, A. Reiter & M. Uhrin);

Podonu, 10 km E of Dehbaraz, oasis, palm garden (Hormozgan Prov., 27° 24' N, 57° 19' E), 10 October 2011, net. 4 inds. (leg. M. Andreas, P. Benda, K. Faizolahi, A. Reiter & M. Uhrin);

Tang Tekhe, 34 km NW of Jahrom, small cave (Fars Prov., 28° 44' N, 53° 19' E; Fig. 23), 8 October 2011, obs. 7 inds. (leg. M. Andreas, S. Ashrafi, P. Benda, K. Faizolahi, A. Reiter & M. Uhrin);

Tang Zorok, 40 km NW of Jahrom, small cave (Fars Prov., ca. 28° 46' N, 53° 15' E), 22 November 2009, obs. a colony of ca. 100 inds., net. 2 inds. (leg. K. Faizolahi & B. Musavi);

Zangard, 25 km E of Bastak, palm oasis (Hormozgan Prov., 27° 13' N, 54° 38' E; Fig. 24), 9 October 2011, net. 5 inds. (leg. M. Andreas, P. Benda, K. Faizolahi, A. Reiter & M. Uhrin).

## Pakistan

*Data by Bergmans (1994)*

Karachi; Lak Bidok; ? Makli Hills or Clifton; Panjgur.

No new data.

## Comments

### *Distribution Range and Patterns of Occurrence*

The new records obtained during the last years considerably refined the knowledge on distribution of *Rousettus aegyptiacus* in its Palaearctic range but they did not change substantially the general picture of the range as summarised by Harrison & Bates (1991) and Bergmans (1994) (see Fig. 1, Table 1). This range is clearly delineated by shores of the eastern Mediterranean Sea and the northwestern edge of the Indian Ocean; however, the records are not restricted only to the (relatively) fertile coastal areas. Geographically, the most extensive volume of new records has been documented from Turkey, Sinai, W Egypt, Sudan, Yemen and Iran.

In the Mediterranean Region s.str., the occurrence of *R. aegyptiacus* is restricted to a narrow belt with Mediterranean climate and vegetation (i.e., the Mediterranean Arboreal Zone, MAZ) along the sea shore from SW Turkey (29° 10' E) to its southern border in central Israel (ca. 31° 30' N), including Cyprus. Within that limited area (about 40 km in width at maximum), the density of records is very high and the distribution of the species can be locally almost continuous. In Turkey, *R. aegyptiacus* reached the northernmost known point of its whole distribution range at the Anazarbos (Anavarza) Castle (37° 15' N; cf. Karataş et al. 2003) in the Cilician lowland (Adana Province). Where the slopes of mountain ranges stretch even to the coast (e.g., the Taurus Mts. in Turkey or the Lebanon Mts. in Lebanon), the fruit bat inhabits only the littoral slope belt and does not cross the range. The most inland area in the Levant, where *R. aegyptiacus* was evidenced, was recorded in NW Jordan at Al Qunayya (Benda et al. 2010); the MAZ stretches there up to 120 km (to ca. 36° E) from the sea shore. At Akbez (Turkey), *R. aegyptiacus* reaches the easternmost occurrence spot (36° 31' E) in the Levant and Mediterranean as well.

The MAZ belt seems to be rather discontinuous along the southern sea shore of Anatolia and similarly, the known range of the fruit bat is obviously discontinuous there despite very high population densities in the colonised spots. These are mostly restricted to urban habitats (including both towns and seaside resorts) and this is also the case of the westernmost N Mediterranean marginal point at Fethyie (29° 10' E).

In the southern Holy Lands, the fruit bat occurs mainly in the Rift Valley regions, i.e., in a relatively narrow belt of desert habitats (oases) from the Dead Sea Valley of Israel and Jordan through the Wadi Araba / Arava Valley, Negev Desert and Eilat region to the Sinaitic mountains. In the latter areas the species was documented in the last one or two decades only (Zelenova & Yosef 2003, Benda et al. 2008, 2010). South of 31° N, *R. aegyptiacus* is rather an inhabitant of desert oases, both in the shore and continental parts of seaside countries, while north of this latitude it occurs only in the coastal MAZ areas.

In Egypt and North Sudan, *R. aegyptiacus* was found mainly in relatively humid areas along the Nile including the Delta, but in the last decades, it was also documented in several oases situated deep in deserts. In the Libyan or Western Desert of Egypt, the species was recorded in all large oases (Bahariya, Dakhla, El Fayum, Kharga) except for the extremely distant and most isolated Siwa Oasis; surprisingly, no records are available from the Arabian or Eastern Desert of Egypt until now. The historical record in NW Egypt (Marsa Matruh; Flower 1932) represents the westernmost marginal point of the Palaearctic range of *R. aegyptiacus* (27° 15' E). The species was found in many places along the Nile from El Fayum to Abu Simbel in Egypt and also in the northernmost part of North Sudan, in the very narrow streak of riverside habitats (including date palm gardens) having a character of linear oasis (Fig. 16). However, *R. aegyptiacus* is also common in extensive fertile area of the whole Nile Delta and Cairo Region.



In Saudi Arabia, Yemen, Oman, Iran, and Pakistan, *R. aegyptiacus* was found both in relatively humid coastal and/or mountain areas and in isolated desert oases. In Saudi Arabia and Yemen, most records of the species come from humid western slopes of the Hijaz and Sarawat mountain ranges; however, the bat was also reported from several isolated oases of the Arabian Desert (Hayel, Medina, Ma'arib). The uncertain record from the Hayel Oasis in Saudi Arabia (Abu Yaman 1966; see below) possibly represents the most inland occurrence spot within the whole Asian range being situated some 520 km from the sea shore; however the most inland confirmed spot in western Arabia comes from the Ma'arib Oasis, SW Yemen, representing the distance of 250 km from the shore of the Red Sea (see the map by Benda et al. 2011: 27, Fig. 1).

A similar pattern is known also from S Iran and S Pakistan, where records of *R. aegyptiacus* come from the coast of the Oman Sea and Persian Gulf mouth (Kuh Namak, Qeshm, Isin, Tiss, Karachi, Lak Bidok) and from oases in the interior deserts (Bam, Espakeh, Jahrom, Maniyan, Podonu, Sarbaz, Zangard) and mountains (Bishapur, Jiroft, Panjgur) up to almost 280 km from the sea coast at Bam (Kerman Province, SE Iran). The records from the Karachi Region (SW Pakistan) represent the easternmost reach of the whole range of *R. aegyptiacus* (ca. 68° E).

*R. aegyptiacus* remains unknown from the southern, western and northwestern shore areas of the Persian Gulf. Its absence in the desert areas along the Gulf shore of Saudi Arabia and Gulf States is not too surprising, considering the extremely harsh arid conditions of this region. However, it is also absent from the fertile Mesopotamian lowland of Iraq and Iran. On the northern shore of the Gulf, the western margin of the species range lies in the eastern part of the Bushehr Province of S Iran (Fig. 17), whereas in more western fertile lowlands of the Khuzestan Province (SW Iran) *R. aegyptiacus* does not occur according to the available knowledge. In this context it should be remembered that bat fauna of some of the largest countries of the region is quite poorly known and, hence, also the current status of *R. aegyptiacus* in these countries cannot be assessed properly. This is particularly true for Syria, Saudi Arabia, Gulf States, North Sudan, and Pakistan. Considering a limited extent of suitable habitats in these countries it seems probable that the respective regions are populated by the fruit bat in certain value. Yet, the presence of isolated relic populations cannot be excluded and a specialised field study focused on distribution of the Egyptian fruit bat is needed there.

In several areas of its Palaearctic range, *R. aegyptiacus* shows denser occurrence and/or its range borders are identified more accurately (Turkey, Cyprus, N Levant, Yemen, Oman). However, such a change of the picture is caused solely by more intensive bat research in these territories. In other regions the Egyptian fruit bat was found as a completely new faunal element (SW Turkey, S Levant, Sinai, W Egypt, N North Sudan, inland Iran). In the Rift Valley of S Israel and S Jordan or in Sinai, presence of the species can be expected (considering the pattern of distribution in the nearby regions – mainly in Egypt), as the spreading of human settlements in these areas creates food opportunities for fruit bats by cultivation of fruit orchards (Zelenova & Yosef 2003, Benda et al. 2008, 2010).

However, the evidence of *R. aegyptiacus* at the SW edge of the Dasht-e Lut Desert (Kerman Province of Iran) is rather surprising as the continental deserts in mountain plateaus represent very harsh environment with very low winter temperatures; these areas seem to represent climatic/geographical limits for the fruit bats' physiological ability to survive (as well as for other non-hibernating bat taxa) and thus a sharp natural margin of the range. It is very probable that occurrence of fruit bats in these areas is restricted to the vegetation season and the life cycle of the respective populations is characterised by seasonal migrations which have not yet been observed in other populations of the species, despite its well pronounced capability to cover quite large distances in a short time (cf. Tsoar et al. 2011).

Based on Kock's (1969) review of uncertain literature data (cf. Hartmann 1863), Bergmans (1994) discussed a possibility of occurrence of the Egyptian fruit bat in Nubia of North Sudan; he concluded that this occurrence could be real although it remains to be proven. The new Nubian finding from Ferka in the Upper Nile Valley above Lake Aswan (i.e., the southernmost record in Palaearctic Africa), where several hundred kilometres of the river (Kom Ombo – Khartoum) are bordered by only a very narrow strip of cultivated land (dominated by date palms and acacias; Fig. 16) and surrounded by sandy deserts, shows the ability of *R. aegyptiacus* to survive in this limited environment. The closest records to Ferka come from Abu Sir (Kaisila 1992), some 120 km to the northeast, however, natural character of this site was destroyed by the construction of Lake Aswan some 40 years ago – as it was in other former fruit bat localities in this part of the Valley, Abu Simbel and Nag Misaw (Bergmans 1994, Dornburg et al. 2011). The new Nubian spot of occurrence nowadays remains isolated from the Upper Egyptian range (southernmost spots in the Aswan Region) by some 500 km of this water body. The North Sudanese records also indicate the (former?) possibility of natural connection between Egyptian and South Sudanese populations, i.e., the populations of the Palaearctic and Afro-tropics, via the fertile areas along the Nile course. The known records in North and South Sudan are situated more than 1500 km apart (Koopman 1975, 1986).

The newly documented Nubian record from Ferka, coming from the territory between the two large biogeographic regions (as well as the character of the whole distribution range in the Palaearctic), gives a certain credit to the doubted mentions by Abu Yaman (1966) on possible existence of *Rousettus* sp. in oases in W Saudi Arabia (see Kock 1969 and Bergmans 1994). In the light of the presented picture of distribution (see the occurrence in Western Oases of Egypt at the same longitude), the Abu Yaman's mentions seem to refer rather to *R. aegyptiacus* (cf. Bergmans 1994, although they still need to be confirmed) than to *Eidolon helvum* (Kerr, 1792) to which they were also tentatively attributed (Kock 1969). The latter species is a strictly Afro-tropical element in Arabia, occurring solely in southwesternmost Saudi Arabia, westernmost Oman and in Yemen (Bergmans 1990, Snowden et al. 2000, own unpublished data).

Perhaps the only real mainland gap in occurrence of *R. aegyptiacus* in the Palaearctic, which is not caused by absence of available records only, exists between the Hajjar Mts. of NE Oman and the Dhofar Region of SW Oman (Fig. 1). Harsh desert habitats of the Rub' Al Khali (Empty Quarter) in eastern Arabia represents at least 1000 km long interruption in continuous distribution along the Arabian shore. The absence of *R. aegyptiacus* in other large areas (mainly in W Saudi Arabia) can be a tentative result of insufficient effort in faunal studies (frequently caused by inaccessibility of the respective regions for researches).

In conclusion, the distribution of *R. aegyptiacus* in the Palaearctic generally shows two different patterns: (1) densely patched (or locally continuous) distribution in the thermo-Mediterranean arboreal zone (in the sense by Blondel & Aronson 1999), in S Turkey, Cyprus, N Levant, and in NW part of the Iranian range, where the species can reach quite high local population densities; and (2) clearly discontinuous distribution in sub-tropical deserts of the Saharo-Sindian zone (S Levant, Egypt, N Sudan, Arabian Peninsula, S Iran, S Pakistan), characterised by more or less isolated patches of occurrence in desert oases and smaller areas of relatively humid habitats (Western Oases of Egypt, western slopes of the Hijaz and Sarawat Ranges of SW Arabia, Hajjar Mts. of NE Oman, southern slopes of the Zagros Range in Iran and of the Mekran Range in Pakistan). Somewhat separate position within the distribution pattern (2) is shown by the linear and supposedly continuous occurrence along the Nile of Egypt. The Nile Valley between Aswan and Cairo represents a less than 20 km wide strip of suitable habitats (mostly date palm and fruit tree plantations), very narrow in the southern part between Aswan and Khnum (sometimes 1 km

wide only), while the Nile Delta is a wide area of massive crop production, supposedly areally covered by fruit bat occurrence. The distribution pattern of *R. aegyptiacus* in the Palaearctic part of its range, clearly delimited by appearance of the above mentioned arboreal habitats, differs from the distribution characteristics of the species in the sub-Saharan African range, where this fruit bat is reported to be an inhabitant of continuous belts of rather open habitats (savannas and forest savannas) stretching over large parts of the continent (see Bergmans 1994, Kwiecinski & Griffiths 1999).

By its geographic characteristics the NE African and Middle Eastern ranges of *R. aegyptiacus* resemble those of three other unrelated Afro-tropical bat species (see e.g. Hayman & Hill 1971 and Simmons 2005): *Nycteris thebaica* (Geoffroy, 1813), *Pipistrellus rueppellii* (Fischer, 1829) and *Tadarida aegyptiaca* (Geoffroy, 1818) – besides some non-volant mammals, such as the hyrax, *Procavia capensis* (Pallas, 1766). All these bats are inhabitants of the sub-Saharan savannas whose ranges stretch from southern Africa across edges of the Sahara to northern Africa and also to Arabia or even to India. However, while northern margins of the ranges of the latter three species lie in the desert zone of N Egypt or the S Levant, respectively, the range of *R. aegyptiacus* extends to the considerable part of the MAZ. On the other hand, the three bat species which do not reach the MAZ of the Levant, extend to the northern margins of the Sahara in the Maghreb or just the Maghrebian MAZ, from where *R. aegyptiacus* apparently absent (as well as from the whole NW Africa west of Egypt and north of 16° 30' N). This suggests a crucial role of the Nile (and the adjacent habitats, respectively) for spreading and/or surviving of the Egyptian fruit bat in NE Africa and the eastern part of the Mediterranean.

#### *Distributional Specificities of Vicariant Isolates*

The above data suggest that in a vast majority of the Palaearctic range the distribution of *Rousettus aegyptiacus* is characterised by considerable discontinuity and the prevailing pattern of the range is a split of the population into a series of multiple vicariant isolates which colonise small-sized spots of suitable habitats covering from ca. 1,000 to 10,000 km<sup>2</sup>. Details of such a kind of local isolates were summarised for the territory of Cyprus (50 record sites) and for the species range in Sinai (10 sites) and Jordan (21 sites), see also Fig. 6 (Benda et al. 2007, 2008, 2010). However, all these regions are relatively large and the scale of the geographic analyses was quite rough, as the number of available records was limited (3–7 record sites per 1000 km<sup>2</sup> of the range part).

In the recent years we have focused our attention to the vicariant ranges of *R. aegyptiacus* of a very small extent – about 1000 km<sup>2</sup> or less – to reveal patterns of fine-scale distribution and biological specificities of isolated populations. Typically it is the case with larger desert oases where the spots of the fruit bat occurrence are surrounded by vast areas of virtually unpenetrable habitats. A detailed survey was conducted in the Dakhla Oasis of the Western Desert of Egypt throughout two seasons, 2010 and 2011. The Oasis has a more or less similar character as all Western Desert oases, it is a chain of larger or smaller rural settlements surrounded by fields, fruit orchards and date groves situated in three shallow depressions. The total length of the Oasis is some 95 km and approximate width 5–13 km (Fig. 26). Hence, the Oasis is an almost unbroken series of roost and foraging opportunities separated by at least 100 km of deserts from other oases, also well separated from the continuous range of the species in the Nile Valley or Delta. Due to its linear character, flat terrain, and obvious transparency concerning the presence of available habitats for the fruit bats, the Oasis provided an extremely interesting site for the study of *R. aegyptiacus* in a small-scale range.



Fig. 26. Distribution of roosts of *Roussettus aegyptiacus* (black dots) within the Dakhla Oasis documented in 2010 and 2011 (see text and Appendix). Some symbols can represent more than one record.

Obr. 26. Nálezů úkrytů kaloně egyptského (*Roussettus aegyptiacus*) na území oasy Dachla (černé body) zjištěné v letech 2010 a 2011 (souřadnice jednotlivých úkrytů viz Appendix). Některé body mohou představovat více než jeden úkryt.

Preliminary results of this survey – screening of roosts (see Appendix) – showed areal distribution of the species in almost the whole Oasis (Fig. 26). Altogether 47 roost sites in 18 settlements were found, the maximum number of roosts (14) was recorded in the extensive (partly abandoned) medina (old town) of El Qasr of a total area of ca. 2.5 hectares (Fig. 14); in other visited settlements, 1–4 (mean 1.83) roosts were found. Only anthropogenic above-ground shelters were documented as the roosts and all of them were located in abandoned or ruined houses situated mostly in historical uninhabited centres (medinas) of villages and small towns but also in abandoned solitary houses on the Oasis edges or in palm groves as well as in tombs.

Although the spatial distribution of the roosts within the Oasis was obviously constrained by the presence of suitable roosting places (i.e. abandoned buildings or similar structures), it also well corresponded with the distribution of food resources. The greatest density of roosts and most numerous colonies were always located close to the largest plantations of date palms and other fruits (Fig. 26). A detailed year-round monitoring of all major roosts in the Oasis (25 sites) yielded a relatively stable estimate of ca. 2,500 fruit bats, where the highest numbers were recorded in January and April 2011 (2,462–2,647 and 2,512–2,617 inds., respectively) and lowest numbers in October 2011 (1,923–2,028 inds.). The average number of bats in a single roost was 88 (median 20) but it varied throughout season. The largest colony counting ca. 1200 inds. was

observed in an abandoned house in the centre of the El Qasr medina in January 2010 (the size of the colony was much smaller during other checks). Given the detailed knowledge of all roosts and potential roosting sites in the Oasis, we estimated the maximum size of the whole population at 2,500–3,000 fruit bats. The results of the detailed survey and monitoring of the population in Dakhla provides a case example for considerable flexibility in roosting and foraging requirements of the Egyptian fruit bat and its capability to exploit quite effectively even very small islets of suitable habitats isolated from the nearest neighbouring populations by hundreds of kilometres of uninhabitable desert.

## Souhrn

**Kaloň egyptský (*Rousettus aegyptiacus*; čeleď Pteropodidae) v Palearktidě: soupis nálezů a revise areálu rozšíření.** Populace kaloně egyptského obývající část jihozápadní Palearktidy představují jediný areálový výběžek čeledi kaloňovitých (Pteropodidae) mimo tropické pásmo. V tomto příspěvku přinášíme výsledky revise rozšíření dotyčného druhu v různých oblastech jeho palearktické části areálu rozšíření s pomocí revise literárních údajů, které jsme doplnili rozsáhlým souborem původních (vesměs vlastních) nálezů získaných během posledního dvacetiletí. Na tomto základě jsme sestavili úplný soupis nálezů kaloně egyptského v palearktické oblasti, pokrývající území vymezené 12–38° s. š. a 26–68° v. d.

Nálezy jsou uvedeny ve třech kategoriích: (1) lokality summarisované Bergmansem (1994), autorem vyčerpávající revise rozšíření a taxonomie druhu, jako pouhá jména míst; (2) nálezy publikované v období po zveřejnění revise Bergmansovy (1994) anebo tímto autorem přehlednuté jakožto jména míst doplněná o citace zdrojů údajů; (3) původní nálezy získané autory tohoto příspěvku (nové i publikované).

Bergmans (1994) uvedl celkem 123 nálezových lokalit kaloně egyptského z palearktické části jeho areálu (obr. 1). Nálezy uváděné v literatuře a nezahrnuté do Bergmansova (1994) přehledu – většinou publikované během posledních dvaceti let – pocházejí z dalších 91 míst. Původní nálezy kaloně shromážděné autory představují 134 nových lokalit a navyšují celkový počet lokalit nálezů na 348. Většina známých nálezů (57.3 %) byla zjištěna během posledních dvou dekád (tab. 1 a obr. 6, 11 a 17). Minimální počty nálezů v jednotlivých zemích palearktického areálu jsou následující: Turecko – 30 lokalit, Kypr – 51, Syrie – 5, Libanon – 39, Israel a Palestinská území – 32, Jordánsko – 20, Egypt – 64 (bez nálezů zjištěných detailním výzkumem oasy Dachla, kdy bylo nalezeno dalších 46 úkrytů), Severní Sudan – 2, Saudská Arabie – 5, Jemen – 19, Oman – 47, Spojené arabské emiráty – 1, Iran – 31, Pakistan – 4.

V palearktickém areálu rozšíření kaloně egyptského byly zjištěny dva základní modely výskytu: (1) sout vislý (či místně souvislý) výskyt v thermomediterranní zóně (jižní Turecko, západní Syrie, Libanon, severní Israel, severozápadní Jordánsko, jihozápadní Iran), (2a) zjevně nesouvislý výskyt v subtropických pouštích saharo-síndské zony (jižní Levanta, Egypt včetně Sinaje, Severní Sudan, Arabský poloostrov, jižní Iran a jižní Pakistan), typický víceméně izolovanými centry výskytu v pouštních oasách a menších územích relativně vlhkých biotopů (zejména v horských údolích), a (2b) předpokládaně souvislý lineární výskyt podél Nilu v Egyptě (pochopitelný jako výskyt v dlouhé oase) a v deltě Nilu. Tyto modely výskytu se dosti odlišují od rozšíření v hlavním areálu druhu, v subsaharské Africe, kde tento kaloň obývá souvislá pásma otevřených biotopů (savany a lesní savany) táhnoucí se velkými částmi kontinentu. Podrobný výzkum úkrytových možností kaloně v oase Dachla (isolované území menší než 1000 km<sup>2</sup>) v Libyjské (Západní) poušti Egypta poukázal na pružnost tohoto druhu v úkrytové a potravní strategii a jeho schopnost dlouhodobého přežívání v malých (2000–3000 kusů) a izolovaných populacích. Celkem bylo v oase nalezeno 47 úkrytů v 18 sídlech (průměrně 1,83 úkrytu v osídlené osadě, maximum 14 úkrytů). Jako ukryty byly dokumentovány výhradně anthropogenní nadzemní prostory, většinou v opuštěných centrálních částech osad.

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## Appendix

Roost sites of *Rousettus aegyptiacus* documented in the Dakhla Oasis, Egypt (data collected by M. Abi-Said, T. Bartonička, P. Benda, I. Horáček, R. Lučan, M. Porteš, Š. Řeřucha, M. Šálek & W. M. Shohdi). Capital letters in parentheses denote internal labelling of particular roost sites for future processings.

roost site	latitude	longitude
El Qasr, medina, 14 roost sites in abandoned houses	25° 41' 59"	28° 53' 01"
El Qasr, abandoned house in a palm garden	25° 41' 54"	28° 53' 04"
Balat, old abandoned house	25° 33' 42"	29° 15' 52"
Bir El Gabal, abandoned house	25° 43' 50"	28° 54' 48"
Bir El Nokta, abandoned house	25° 41' 17"	28° 47' 16"
Bir el Wastani, abandoned house	25° 41' 09"	28° 49' 06"
Budukhla, ruin of a house (A)	25° 38' 07"	28° 54' 58"
Budukhla, abandoned house (B)	25° 37' 53"	28° 54' 47"
Budukhla, abandoned house at a mosque (C)	25° 38' 05"	28° 55' 01"
El Awaina, tombs	25° 33' 39"	28° 58' 09"
Ezab El Qasr, roofed street underpass	25° 41' 41"	28° 55' 20"
Ezab El Qasr (Giza), house ruin	25° 40' 57"	28° 55' 13"
Gedida, stable, onion storage (D)	25° 35' 41"	28° 52' 37"
Gedida, ruin (E)	25° 34' 52"	28° 52' 00"
Gedida, abandoned house (F)	25° 34' 33"	28° 51' 31"
Gharghur, tombs (C)	25° 35' 49"	28° 52' 03"
Gharghur, ruin at a mosque	25° 35' 56"	28° 51' 58"
Hindaw, abandoned house (A)	25° 32' 47"	28° 59' 36"
Hindaw, abandoned house ["barn"] (B)	25° 32' 47"	28° 59' 34"
Ismant, ruin of an abandoned house (A)	25° 31' 33"	29° 04' 09"
Ismant, abandoned house (B)	25° 31' 35"	29° 04' 09"
Kalamoun, ruin of an abandoned house (A)	25° 33' 08"	28° 54' 29"
Kalamoun, abandoned house (B)	25° 33' 07"	28° 54' 29"
Kalamoun, abandoned house in a palm garden (C)	25° 33' 51"	28° 53' 12"
Mushyie, abandoned house (A)	25° 36' 14"	28° 52' 14"
Mushyie, ruin of an abandoned house (B)	25° 36' 53"	28° 52' 13"
Mushyie, abandoned part of a house (C)	25° 36' 56"	28° 52' 13"
Mushyie, abandoned house (D)	25° 36' 47"	28° 52' 13"
Mut, medina, ruin of an abandoned house	25° 29' 11"	28° 58' 43"
Rashda, ruin of an abandoned house (A)	25° 35' 05"	28° 56' 11"
Rashda, ruin of an abandoned house (B)	25° 35' 08"	28° 56' 12"
Rashda, ruin of an abandoned house (C)	25° 35' 08"	28° 56' 14"
Rashda, abandoned house (D)	25° 35' 06"	28° 56' 13"
Zakhir, ruin of an abandoned house	25° 31' 34"	29° 16' 38"