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Bats (Mammalia: Chiroptera) of the Eastern Mediterranean and Middle East. Part 13. Review of distribution and ectoparasites of bats in Lebanon*

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Abstract. A complete list of bat records available from Lebanon was compiled from the literature and from new records, based on field studies and examination of museum specimens. The record review is complemented with distribution maps, summaries of distributional status of the particular species, notes of field data, and records of arthropod ectoparasites. From the territory of Lebanon, at least 418 records of 21 bat species belonging to six families are known; viz. *Rousettus aegyptiacus* (Geoffroy, 1810) (41 record sites), *Rhinopoma microphyllum* (Brünnich, 1782) (1+), *Rhinolophus ferrumequinum* (Schreber, 1774) (51), *R. hipposideros* (Borkhausen, 1797) (48), *R. euryale* Blasius, 1853 (19), *R. blasii* Peters, 1866 (5), *Myotis myotis* (Borkhausen, 1797) (7–8), *M. blythii* (Tomes, 1857) (16), *M. nattereri* (Kuhl, 1817) (16), *M. emarginatus* (Geoffroy, 1806) (12), *M. mystacinus* (Kuhl, 1817) (2), *M. capaccinii* (Bonaparte, 1837) (19), *Eptesicus serotinus* (Schreber, 1774) (14), *E. anatolicus* Felten, 1971 (4), *Hypsugo savii* (Bonaparte, 1837) (37), *Pipistrellus pipistrellus* (Schreber, 1774) (50), *P. kuhlii* (Kuhl, 1817) (40), *Nyctalus noctula* (Schreber, 1774) (5), *Plecotus macrobullaris* Kuzâkin, 1965 (2–3), *Miniopterus schreibersii* (Kuhl, 1817) (10), and *Tadarida teniotis* (Rafinesque, 1814) (19). *Plecotus macrobullaris* is here reported from the country for the first time. The occurrence of *Taphozous nudiventris* Cretzschmar, 1830 in Lebanon has not yet been definitely proven. The Levantine specimens of the *Myotis mystacinus* group were revised and the respective bats, previously referred to *M. aurascens* Kuzâkin, 1935 [= *M. davidii* (Peters, 1869)] were identified as *M. mystacinus* s.str. Arthropod ectoparasites were newly collected from twelve species of bats in Lebanon. From three other species, data on ectoparasites are available in literature. At least 32 species of ectoparasites belonging to eight families were recorded from Lebanon in total and the following taxa are here reported from the country for the first time: *Ischnopsyllus octactenus* (Kolenati, 1856) (from *Pipistrellus pipistrellus*), *I. simplex* Rothschild, 1906 s.l. (from *Myotis nattereri*), *Nycteribia pedicularia* Latreille, 1805 (from *Rousettus aegyptiacus*, *Rhinolophus ferrumequinum*, *Myotis blythii*, *M. capaccinii*, *Hypsugo savii*, and *Miniopterus schreibersii*), *N. latreillii* (Leach, 1817) (from *Myotis myotis* and *Miniopterus schreibersii*), *N. vexata* Westwood, 1835 (from *Rousettus aegyptiacus* and *Myotis blythii*), *Penicillidia dufourii* (Westwood 1834) (from *Rhinolophus ferrumequinum*, *Myotis myotis*, *M. blythii*, and *M. capaccinii*), *P. conspicua* Speiser, 1901 (from *Miniopterus schreibersii*), *Basilia nana* Theodor, 1954 (from *Rousettus aegyptiacus* and *Myotis nattereri*), *B. mongolensis* Theodor, 1966 (from a mixed collection of hosts), *Ixodes simplex* Neumann, 1906 (from a mixed collection of hosts), *I. vespertilionis* Koch, 1844 (from *Rhinolophus ferrumequinum* and *Myotis myotis*), *Ancystropus zeleborii* Kolenati, 1857 (from *Rousettus aegyptiacus*), *Meristaspis*

* Dedicated to Prof. Dr. Vladimír Hanák, one of the founders of the modern research of bats in the Mediterranean, on occasion of his 85th birthday.

lateralis Kolenati, 1857 (from *Rousettus aegyptiacus*), *Eyndhovenia euryalis* (Canestrini, 1885) (from *Rhinolophus euryale*), *Spinturnix myoti* (Kolenati, 1856) (from *Myotis blythii* and *M. capaccinii*), *S. psi* (Kolenati, 1856) (from *Myotis capaccinii* and *Hypsugo savii*), *Leptotrombidium imphalum* Vercammen-Grandjean et Langston, 1976 (from *Myotis emarginatus*), *Hirsutiella willmanni* (Wharton et Fuller, 1952) (from *Rhinolophus hipposideros*), and additionally also unidentified specimens of mites of the family Trombiculidae (from *Rhinolophus ferrumequinum*).

Key words. Distribution, ectoparasites, Pteropodidae, Rhinopomatidae, Rhinolophidae, Vespertilionidae, Miniopteridae, Molossidae, Ischnopsyllidae, Cimicidae, Nycteribiidae, Argasidae, Ixodidae, Spinturnicidae, Macronyssidae, Trombiculidae, Lebanon, Middle East, Palaearctic.

INTRODUCTION

The territory of Lebanon (10,452 km^2, see Fig. 1) represents a small section of the easternmost margin of the Mediterranean Basin; however, it comprises an important part of the Levant and the Mediterranean section of the Middle East as well. Although the most of the territory of Lebanon falls into the zone of the Mediterranean woodlands (Zohary 1973), marginal parts of the country, namely in the east and south-east, are covered by more arid habitats of the transition to the Mesopotamian steppes and semi-deserts of the Syrian Desert. Lebanon is essentially a mountainous country, uplifting within a distance of some 30 km from the sea coast and coastal hills to a continuous alpine range exceeding the altitudes of 3000 m (with Mount Qurnat As Sawda as the highest point at 3088 m a. s. l.) that is intersectioned by a series of parallel deep-cut east-west canyon valleys rich in water and dense arboreal vegetation. The range of the Lebanon Mts., with its marginal extensions passing from Hatay (Turkey) and western Syria in the north to the Galilee (Palestine) in the south, represents the southernmost offshoot of the Mediterranean arboreal zone in the western part of the Middle East.

In several respects, the area of Lebanon represents a true crossroad. The conditions of the Mediterranean arboreal zone meet the effects of the eremic realm and of the pronounced altitudinal zonality, resulting in an enormously variegated mosaic of environmental states. Due to its outstanding geological and geomorphological features and their effects upon environmental history of the region, the area of Lebanon obviously became an essential driving factor of the Levantine biodiversity. Since the beginning of the Neogene, the Lebanon Mts. steadily acted as a precipitation trap for atmospheric circulation of the eastern Mediterranean (Walley 1998). In other words, throughout the whole Neogene and Quaternary history, the western slopes of the Lebanon Mts. were instantly rich in water which promoted extensive underground karstification, an appearance of deep-cut erosion valleys and rich herb and arboreal vegetation. For taxa demanding such conditions this could provide an instant refugium and a centre of their distribution in the region.

The standard altitudinal zonality (from the matorral habitats in coastal areas, evergreen to mixed deciduous-evergreen woodlands in medium altitudes up to the deciduous oak-pine to cedar-juniper forests at the altitudes around 2000 m and alpine tragacanthic formation dominated by *Astragalus* spp.) in the western slopes of the Lebanon Mts. (Blondel & Aronson 1999) is desintegrated both by patches of anthropogenic habitats and extensive rocky exposures at slopes of the canyon-like valleys. In contrast, the eastern slopes of the Lebanon Mts. and the Anti-Lebanon Mts. imprinted by the precipitation shadow are characterised by open habitats of the sparse *Artemisia* steppe and bare rocky desert with sparse patches of riparian vegetation along local aquifers, while the El Beqaa Valley (at the altitudes of about 900 m a. s. l.) is completely impacted by extensive agricultural exploitation, except for a narrow rocky canyon of the El Litani river in the south. Under such conditions, the standard descriptors of landscape or habitat characteristics well applicable in other regions lose much of their real informative capacity. Although we use them in the present review, they do not always characterise the real distribution pattern in a proper way.

By far not all parts of the country have been easily accessible both for geomorphological and political reasons. All such kinds of obstacles accompanied naturalist investigation of the country throughout all stages of its modern history and have produced restrictive effects also upon the quality of faunal knowledge.

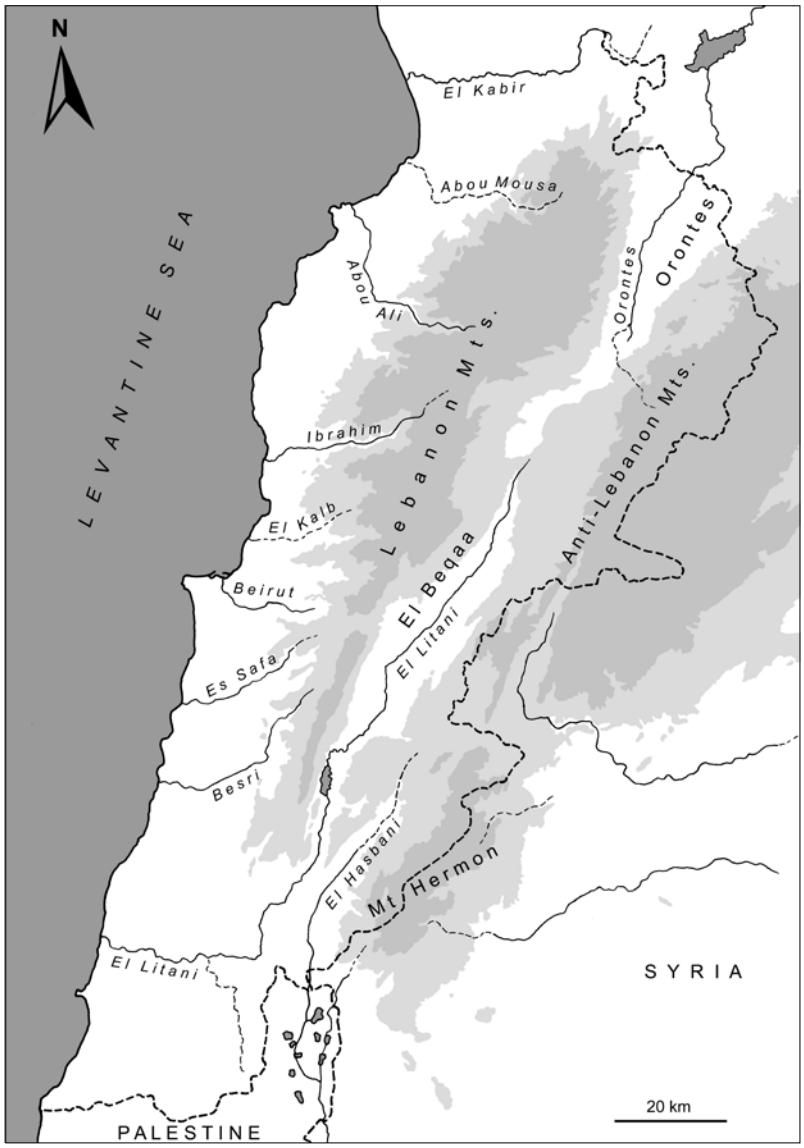


Fig. 1. General map of Lebanon showing the main geographic features (pale grey shaded = area above 1000 m a. s. l., dark grey shaded = area above 1500 m a. s. l.).

The mammal fauna of Lebanon, including bats, has never been studied thoroughly, although some records of mammals were made already a long time ago. Historically, the oldest data on bats from Lebanon were gathered by the classical explorers and naturalists of the first half of the eighteenth century, Wilhelm F. Hemprich (1796–1825) and Christian G. Ehrenberg (1795–1876). They visited the area of the present-day Lebanon in 1824 and collected a series of animals, including several bats (see Stresemann 1954, Mlíkovský & Frahnert 2011, and Benda & Engelberger 2016), and these specimens gave the first modern data on the fauna of the Levant or Syria in its broader sense. The bat specimens from this catch were later published by Temminck (1835–1841), Fitzinger (1855), and Kolenati (1856, 1860), and subsequently also by some other authors (Blasius 1857, Fitzinger 1861, 1870a, b, c, Trouessart 1879, Anderson 1902). Based (most probably) only on the specimens collected by Hemprich and Ehrenberg, Kolenati (1856, 1860) reported the occurrence of three bat species, *Rhinolophus ferrumequinum*, *M. myotis* s.l. and *Pipistrellus kuhlii* from Lebanon or from Syria s.l. Hemprich and Ehrenberg collected also a specimen of *Rousettus aegyptiacus* (see Stresemann 1954), but this record remained unpublished for a long time, although some old reports may be related to it (e.g. Fitzinger 1869, Günther 1879).

More than forty years after the Hemprich's and Ehrenberg's journey, new data on bats from Lebanon were gathered and published by canon Henry B. Tristram (1822–1906). He visited Lebanon at least two times and published records of six bat species from the country (Tristram 1866, 1884), in addition to the above species, also of *Rhinolophus euryale*, *Myotis emarginatus*, *M. mystacinus*, and *Eptesicus serotinus*. In the following period, until the 1960s, very few records of bats were made in Lebanon. Only three new bat records from two sites were published by Andersen (1912) and Allen (1915); however, no new species for the faunal list of the country was among them.

After the WWII, a group of researchers from the American University Beirut (AUB), led by Robert E. Lewis (*1929), started to investigate the fauna of Lebanon, including bats and their parasites. Their effort resulted in a series of papers (Harrison 1962, 1963, Harrison & Lewis 1961, Stencel 1961, Lewis 1962, 1964, Lewis & Harrison 1962), bringing the first more or less comprehensive review of bat fauna of Lebanon that reported fourteen species from the country (Table 1), along with some records of insect parasites of bats. Slightly later, Sana I. Atallah (1943–1970) carried out his studies at the AUB and defended the PhD thesis in 1969; the results included in this thesis were published posthumously, and the bat records were included in two papers (Atallah 1970, 1977). The latter review also presented a new list of bat records from Lebanon, giving data on 54 findings of 17 species available in total from the country (Table 1). A review of mammals of Lebanon published several years later (Tohmé & Tohmé 1985) brought an almost identical number of bat records from the country (Table 1).

A new period of bat studies in Lebanon arised in 2006 thanks to a joint research project participated by specialists from the AUB, members of the Speleo Club du Liban and a group of Czech zoologists from the Charles University and the National Museum, Prague. Within this project, a series of field trips were undertaken from 2006 to 2012. Besides collecting faunal information and monitoring abundance at diverse roost sites, systematic bat netting and detection of echolocation calls were applied. More than 750 individuals of bats were handled in total, in which standard field biometric data and tissue samples were collected. The first results of this reasearch, for the first time covering both the summer and hibernation periods, were published by Horáček et al. (2008, 2009). Despite the initial stage of this research, these results brought more than 150 new bat records of twenty species (Table 1), and three species were newly confirmed to occur in the country (*Rhinolophus blasii*, *Myotis mystacinus*, *Eptesicus anatolicus*). The records of *Rousettus aegyptiacus* from Lebanon made in this period were presented separately by Benda et al. (2011a). The project also initiated a program of regular monitoring of Lebanese bat hibernacula, which

Table 1. Composition of the bat fauna of Lebanon and the number of records of particular species according to subsequent reviews. Numbers of cases with inaccurate species identification are given in parentheses

species	Lewis & Harrison (1962)*	Atallah (1977)	Tohmé & Tohmé (1985)	Horáček et al. (2008)	this review
Rousettus aegyptiacus	+	7	11	26	41
Rhinopoma microphyllum	–	1	1	1	1 +
Rhinolophus ferrumequinum	+	7	7	23	51
Rhinolophus hipposideros	2	4	3	23	48
Rhinolophus euryale	+	4	4	10	19
Rhinolophus blasii	–	–	–	1	5
Myotis myotis	3	4	4	10	7–8
Myotis blythii	2	2	3	6	16
Myotis nattereri	–	1	1	6	16
Myotis emarginatus	(1)	2	–	6	12
Myotis mystacinus	–	–	–	(2)	2
Myotis capaccinii	–	1	1	9	19
Eptesicus serotinus	1	2	2	6	14
Eptesicus anatolicus	–	–	–	3	4
Hypsugo savii	1	1	1	18	37
Pipistrellus pipistrellus	2	2	3	23	50
Pipistrellus kuhlii	+	12	12	25	40
Nyctalus noctula	1	1	1	2	5
Plecotus macrobullaris	–	–	–	–	2–3
Miniopterus schreibersii	1	2	3	6	10
Tadarida teniotis	2	1	1	8	19
total number of records	19 +	54	58	214	418 +
total number of species	14	17	16	20	21 +
average number of records per species	1.4 +	3.2	3.6	10.7	19.9

* Lewis & Harrison (1962) reported some species "from various localities throughout the Republic of Lebanon" (marked as +)

brought, for the first in the Middle East, an array of reliable abundance data (Horáček et al. 2009, Abi-Said 2014).

A complete account of primary data on distribution of the particular species of Lebanese bat fauna presented in this review is intended to serve as a platform for further study and conservation of bats in the country. Besides a summary of new records and previously published distribution data, this review also presents the data on Lebanese bats, available from diverse other sources such as various museum collections or publications not focused on that topic (see Peters 1871, Jentink 1887, 1888, Eisentraut 1959, Harrison 1961, 1963, 1964, Neuhauser & DeBlase 1971, DeBlase 1972, 1980, Kock & Nader 1984, Ibáñez & Fernández 1989, Harrison & Bates 1991, Bergmans 1994, Spitzenberger 1996, Benda et al. 2006, 2008, 2010, 2011b, 2012a, b, 2014, Turni & Kock 2008, Šrámek et al. 2013, Benda & Gaisler 2015, Benda & Engelberger 2016), including the papers dealing with bat parasites (Aellen 1955, Lewis 1962, 1964, Theodor 1967).

Since the ectoparasites of bats were systematically collected during the recent survey, the review of bat distribution is here complemented with a review of their arthropod parasites. Data on bat ectoparasites of Lebanon available until now are rather scarce, they appear in few faunistic and/or taxonomic papers published mainly in the 1960s. They present records of ten insect species of three families and four mite species of two families. Four species of the bat flies of the family Nycteribiidae were reported by Aellen (1955), Lewis & Harrison (1962), and Theodor (1967), *Nycteribia schmidlii*, *Eucampsipoda hyrtlii* (= *E. aegyptia*), *Basilia daganiae*, and *Stylidia biarticulata* (= *Phthiridium biarticulatum*). Of the bat fleas of the family Ischnopsyllidae, four species

are known from the country (Lewis 1962, 1964, Lewis & Harrison 1962), *Araeopsylla gestroi*, *Ischnopsyllus consimilis*, *I. elongatus*, and *Rhinolophopsylla unipectinata*. Péricart (1972) and Balvín et al. (2012) reported two species of bat bugs of the family Cimicidae, *Cacodmus vicinus* and *Cimex pipistrelli*. Radovsky (1967) mentioned three mesostigmatic mites of the family Macronyssidae from Lebanon, *Ichoronyssus scutatus*, *Macronyssus granulosus*, and *Steatonysus periblepharus*. Lewis & Harrison (1962) also reported a finding of an unidentified soft tick of the genus *Argas* (Argasidae).

MATERIAL AND METHODS

Records

The lists of records (arranged in alphabetical and/or chronological orders) include, for each item, the following information: name of the locality (each record is primarily listed by a name of the nearest settlement or notable physical feature) [in brackets, serial number of the locality is given as indicated in the map], and/or description of the record site, date, number of recorded bats with indication of their sex, age, and physiological condition (for details see Abbreviations below), and a reference to collection.

Geographical terms used (in alphabetical order; cf. Benda et al. 2010)

Holy Land – Palestine, western part of Jordan and the south-westernmost part of Syria (Golan Heights); a subunit of the Levant;

Levant – a subunit of the Middle East; comprising Jordan, Palestine, Lebanon, Syria, and mostly also Cyprus and Hatay (i.e. the Levant in the broader sense);

Mesopotamia – lowland territories of middle and lower parts of the Euphrates and Tigris Rivers in southeastern Turkey, eastern Syria, Iraq, and southwestern Iran;

Middle East – region covering the countries of Arabia, Cyprus, Anatolia, and Iran;

Palestine – historical territory in the Levant south of Lebanon and west of the Rift Valley (Jordan Valley, Dead Sea and the Arava Valley), and east of the Sinai, at present covered by the State of Israel and the Palestinian Territories or Palestine Autonomy. This historical geographical term is used rather than the political term Israel, which covered various territories within the southwestern Levant in various periods of its existence;

Syria – the territory of the present Syrian Arab Republic according to the international law, i.e. including the Golan Heights.

Ectoparasites

Arthropod ectoparasites were collected directly from the captured bats and preserved in alcohol. Additional parasite individuals were gathered during examination of the alcohol preparations of the host specimens deposited in the National Museum, Prague. Individuals of the family Ischnopsyllidae were subjected to the preparation procedure following Benda et al. (2012a). Individuals of the families Nycteribiidae, Ixodidae, and Spinturnicidae were simply examined under microscope, selected specimens of these families and all of the family Trombiculidae were mounted in the 'Liquid de Swan' to permanent microscopic slides and examined under microscope in detail. The parasites were determined with the help of identification keys (Hopkins & Rothschild 1956, Rudnick 1960, Theodor 1967, Filippova 1977, Kudrâšova 1998, Stekol'nikov 2001, Stekolnikov 2013). The lists of ectoparasite records (arranged in taxonomical, alphabetical and/or chronological orders) include, for each item, the following information: name of the family, species name, number, and stage/sex of the specimens recorded, number and sex of hosts, name of the locality, and date of collection; according to these data the record is detectable in the Records paragraph, where other circumstances of the finding are available. Taxonomy and nomenclature of ectoparasites follow Hopkins & Rothschild (1956), Rudnick (1960), Maa (1965), Péricart (1996), Micherdziński (1980), Stekol'nikov (2001), Guglielmone et al. (2010), and Stekolnikov (2013).

ABBREVIATIONS

Collections

AUB = American University Beirut, Lebanon; – BMNH = Natural History Museum, London, United Kingdom; – CMŠ = Martin Ševčík private collection, Nitra, Slovakia; – EMEC = Essig Museum of Entomology, Berkeley, USA; – FMNH = Field Museum of Natural History, Chicago, USA; – HZM = Harrison Zoological Museum, Sevenoaks, United Kingdom; – MHNG = Natural History Museum, Geneva, Switzerland; – MNHN = National Museum of Natural History, Paris, France; – NMP = National Museum (Natural History), Prague, Czech Republic; – NMW = Natural History Museum, Vienna, Austria; – RLC = Robert E. Lewis Collection [partly deposited at AUB]; – RMNH = Naturalis Biodiversity Centre, Leyden, The Netherlands; – SAC = Sana Atallah Collection [partly deposited at AUB]; – ZFMK = Zoological Research

Museum Alexander Koenig, Bonn, Germany; – ZMB = Natural History Museum, Leibnitz Institute for Evolution and Biodiversity Science, Berlin, Germany.

Measurements

External dimensions. LAt = forearm length; – LPol = thumb length (without claw); – LaFE = horseshoe width.
Cranial dimensions. LCr = greatest length of skull (incl. the praemaxilla in *Rhinolophus*); – LOc = occipito-canine length; – LCb = condylobasal length of skull; – LCc = condylo-canine length of skull; – LaZ = zygomatic width; – LaI = width of interorbital constriction; – LaP = width of postorbital constriction; – LaInf = infraorbital width; – LaN = neurocranium width; LaM = mastoidal width; – AN = neurocranium height; – LBT = largest horizontal length of tympanic bulla; – CC = rostral width between canines (incl.); – M^2M^2 = rostral width between second upper molars (incl.); – M^3M^3 = rostral width between third upper molars (incl.); – CM^2 = length of upper tooth-row between CM^2 (incl.); – CM^3 = length of upper tooth-row between CM^3 (incl.); – LMd = condylar length of mandible; – ACo = height of coronoid process; – CM_3 = length of lower tooth-row between CM_3 (incl.).

Others

a = adult; – A = alcoholic preparation; – B = stuffed skin (balg); – coll. = collected; – det. = identified using by a bat detector; – f = female; – G = pregnant; – j = juvenile; – m = male; – M = mean; – max., min. = dimension range margins; – net. = netted; – obs. = observed; – P = mounted (parasite) preparation; – s = subadult; – S = skull; – SD = standard deviation.

LIST OF SPECIES

Rousettus aegyptiacus (Geoffroy, 1810)

Records. **Original data**: B e i r u t: Beirut, A.U.B. Campus [1], 18 April 2006: det. calls of several foraging inds., 22 April 2006: net. 1 fa, 1 fs, 1 ind. (cf. Horáček et al. 2008, Benda et al. 2011a). – J e b e l L u b n a n: Aamchit, Saleh Cave [2] (Fig. 26), 25 June 2006: obs. a colony of 100–200 inds., net. 5 ma, 1 ms, 5 faL, 2 fj, 28 January 2007: obs. a colony of ca. 100 inds., 22 January 2008: obs. a colony of 120–150 inds., coll. 1 fj, NMP, 8 February 2009: obs. a colony of ca. 150 inds., 14 March 2009: obs. a colony of ca. 150 inds., net. 13 ma, 1 ms, 3 faG, 2 fa, 2 fs, 9 fj, 20 March 2009: obs. 325 inds. emerging the cave, 25 March 2009: net. 23 ma, 4 mj, 10 faG, 1 fa, 1 fs, 5 fj, 29 July 2009: obs. a colony of ca. 100–150 inds., 31 May 2010: obs. a disturbed colony of ca. 200 inds., 26 October 2012: obs. a colony of ca. 150 inds., net. 20 ma, 3 mj, 16 fa, 8 fj (cf. Horáček et al. 2008, 2009, Benda et al. 2011a, 2012b, Hulva et al. 2012); – Afqa, Afqa Cave [3] (Fig. 9), 26 June 2006: net. 2 faL (cf. Horáček et al. 2008, Benda et al. 2011a); – Antelias, El Kassarat Cave [4], 1 July 2006: obs. a colony of ca. 300 ad.+40 juv. inds., 25 January 2007: obs. a colony of ca. 350 inds., coll. 1 ma, NMP, 25 January 2008: obs. a colony of 400–450 inds., coll. 1 fa, NMP, 23 February 2009: obs. a colony of ca. 400 inds., 28 March 2009: obs. 446 inds. emerging the cave, 5 August 2009: obs. a colony of 500–800 inds. in the cave and 61 inds. emerging the cave from the upper entrance, 30 October 2012: obs. 1025 inds. emerging the cave from the upper entrance (cf. Benda et al. 2008, 2010, 2011a, 2012b, Horáček et al. 2008, 2009); – Antelias, Kenaan Cave [5] (Fig. 11), 4 July 2006: obs. a colony of ca. 100 inds., net. 4 ma, 1 ms, 2 mj, 4 faG, 6 faL, 8 fj, coll. 3 fj, NMP, 25 January 2007: obs. a colony of ca. 100 inds., 25 January 2008: obs. a colony of ca. 100 inds., 23 February 2009: obs. a colony of ca. 100 inds., 5 August 2009: obs. a colony of 60–80 inds., 10 June 2010: obs. a colony of 30–40 inds., 23 October 2012: obs. a colony of. ca. 150 inds., net. 8 ma, 2 mj, 7 fa, 5 fs, 15 fj (cf. Horáček et al. 2008, 2009, Benda et al. 2011a, Hulva et al. 2012); – Antelias [6], 23 July 1952: fj, AUB (leg. J. E. Stencel), 28 February 1960: 1 ma, 2 ms, 8 mj, 1 fs, 3 fj, AUB (leg. J. E. Stencel), 19 March 1960: 1 ma, 2 ms, 4 mj, 4 fj, AUB (leg. J. E. Stencel); – Chehim [7], cave, 29 October 2012: obs. 2 inds.; – Dahr El Mghara, Aaonamie Cave [8], 19 January 2008: obs. a group of 30–50 inds., coll. 1 ma, 1 fa, NMP, 2 February 2009: obs. a group of ca. 20 inds., 28 March 2009: obs. 1 ind. (cf. Benda et al. 2008, 2010, 2011a, 2012b, Horáček et al. 2009); – Dahr El Mghara, El Watawit Cave [9], 19 January 2008: obs. a colony of ca. 850 inds., 2 February 2009: obs. a colony of ca. 820 inds., 22 March 2009: obs. a colony of ca. 800 inds., net. 26 ma, 2 mj, 16 faG, 3 fa, 5 fj, 28 March 2009: obs. a colony of ca. 800 inds., 5 August 2009: obs. a colony of ca. 850 inds. (cf. Horáček et al. 2009, Benda et al. 2011a, Hulva et al. 2012); – Jeita, Jeita Cave [10], lower entrance corridor, 26 January 2007: obs. a colony of ca. 150 inds., 20 March 2009: net. 2 mj, 14 faG, 5 fa, 5 fj, coll. 2 fa, 1 fs, 1 fj, NMP, 25 October 2012: obs. a colony of ca. 800 inds., net. 2 ma, 8 mj, 21 fa, 7 fj (cf. Horáček et al. 2008, Benda et al. 2010, 2011a, 2012b, Hulva et al. 2012); – Nahr Es Safa, above the river ca. 1 km above the junction with the Nahr Ed Damour [11], 21 April 2006: net. 1 fs (cf. Benda et al. 2007, 2011a, Horáček et al. 2008); – Nahr Es Safa, below a bridge across the river ca. 1 km below the junction with Nahr Ed Damour [12], 22 June 2006: net. 1 fj (cf. Horáček et al. 2008, Benda et al. 2011a); – Ras El Matn, El Heskan Cave [13], 22 January 2008: obs. a colony of ca. 200 inds., 31 October 2012: obs. a colony of ca. 130 inds., exam. 1 ma, 1 mj, 3 fa, 7 fj (cf. Horáček et al. 2009, Benda et al. 2011a). – L u b n a n E l J a n u b i: Aadloun, Aadloun Cave [14], 16 January 2008: bones from 5 inds. in the cave deposit, 22 March 2009: remains of 4 inds. from *Tyto alba* pellets; – Aadloun, small cave near the Aadloun Cave [15], 16 January 2008: obs. a group of 26 inds., 22 March 2009: obs. a group of 8 inds. in the cave, net. 9 ma, 4 mj, 5 fj, 29 March 2009: obs. 2 inds. in the cave, net. 9 inds. (cf. Benda et al. 2011a,

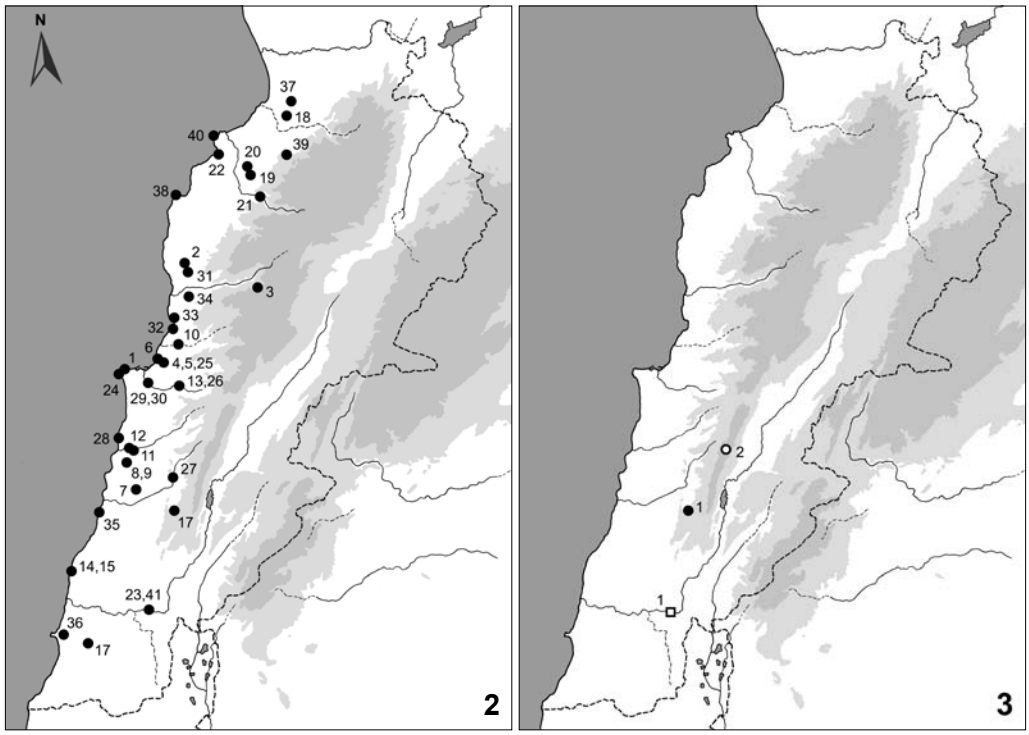


Fig. 2, 3. Records of particular bat species in Lebanon. 2 – *Rousettus aegyptiacus* (Geoffroy, 1810). 3 – *Rhinopoma microphyllum* (Brünnich, 1782) (square) and *Myotis mystacinus* (Kuhl, 1817) (circles); open symbols show approximate localisations.

Hulva et al. 2012); – Jezzine, Pont El Khalass [16], abandoned house, 23 June 2006: net. 3 faL, 1 fa, 1 fj (cf. Horáček et al. 2008, Benda et al. 2011a, Hulva et al. 2012); – Wadi Jilo, caves in a quarry ca. 1 km SE of the village [17], 22 March 2009: obs. a colony of ca. 800 inds., 29 March 2009: obs. a colony of ca. 800 inds., coll. 1 mj, NMP, 4 August 2009: obs. a colony of ca. 250 inds. (cf. Benda et al. 2011a, 2012b). – L u b n a n E s h S h a m a l i: Berqayel, Berqayel Cave [18], 30 July 2009: obs. a colony of ca. 2500 inds., exam. 12 m, 17 fa, 5 faL, 1 fs, 11 juv, 3 August 2009: obs. an emergence of 180 inds., inside the cave obs. 60–80 inds. (cf. Benda et al. 2011a, Hulva et al. 2012); – Bnechaai, cave ca. 1 km E of the village [19], 3 August 2009: obs. traces of a former colony (cf. Benda et al. 2011a); – Iäal [20], fortress ruins, 1 June 2010: obs. feeding traces (cf. Benda et al. 2011a); – Seraal, Qadisha Valley [21], 30 July 2009: net. 1 ma (cf. Benda et al. 2011a); – Trablous, Matal El Azraq Cave [22] (Figs. 4, 5), 21 January 2007: obs. a colony of ca. 200 inds., coll. 1 ma, 1 fa, NMP, 18 January 2008: obs. a colony of ca. 300 inds., coll. 1 ma, NMP, 18 February 2009: obs. a colony of ca. 300 inds., 16 March 2009: obs. a colony of ca. 500 inds., exam. 21 ma, 25 faG, 2 fa, 4 fj, 29 July 2009: obs. a colony of. ca. 300 inds., 31 May 2010: obs a colony of ca. 300 inds., 26 October 2012: obs. a colony of ca. 300 inds., exam. 12 ma, 3 mj, 5 fa, 1 fs, 8 fj (cf. Benda et al. 2008, 2010, 2011a, 2012b, Horáček et al. 2008, 2009, Hulva et al. 2012, Lučan et al. 2014). – N a b a t i y e: Aalmane, El Litani Valley [23], 21 June 2006: net. 1 fj (cf. Horáček et al. 2008, Benda et al. 2011a). – **Published data**: B e i r u t: Beirut [1], 2 March 1959: 1 fs, ZFMK (Eisentraut 1959); Beirut, [5 December 1908, 1 February 1960, February 1964] 4 inds. [2 ma, 1 ms, 1 fj], AUB, SAC (Atallah 1977); Beyrouth (Tohmé & Tohmé 1985); – Beirut, Grotta dei Colombi [24] (Festa 1894); Ras Beirut, 4 inds., SAC (Atallah 1977); Beyrouth, Raouché, Grotte aux Pigeons, [colony] (Tohmé & Tohmé 1985). – J e b e l L u b n a n: cave 2 km E Amchite [2] (Lewis & Harrison 1962); Amchite, 13 August 1960: 1 m, HZM (Harrison 1964); Mogharet Saleh cave, 2 km E Amchite, 16 August 1968: 15 inds. (Atallah 1970, 1977); Aamchit (Tohmé & Tohmé 1985); Amchit, Saleh Cave, 2004: colony (Horáček et al. 2008); Amcheet,

Saleh [Cave], 24 December 2012: obs. 150 inds. (Abi-Said 2014); – Antelias [6], near Beirut, 20 December 1908: 1 m, BMNH (Harrison 1964, Atallah 1977); Antelias, foraging inds. (Atallah 1977); Antellias, 1 ind., FMNH (DeBlase 1980); Antilyas, 1 ind., BMNH, 19 March 1960: 1 mj, FMNH (Bergmans 1994); Antelias, 19 March 1960: 1 m, AUB (Benda et al. 2006, 2008, 2010, 2012b); – Antélias, cave [4/5/25], 9 January 1985: 8 m, 4 f (Tohmé & Tohmé 1985); – Antelias, 22 April [Cave] [25], 24 December 2012: obs. 500 inds. (Abi-Said 2014); – Antelias, Al Kassarat Cave [4], 2006: colony (Horáček et al. 2008); – Antelias, Kenaan Cave [5], 2006: colony (Horáček et al. 2008); Antelias, Kenaan, 24 December 2012: obs. 150 inds. (Abi-Said 2014); – Cave, 4 km SE of Beit Meri [26], [4 October 1959:] 4 inds., AUB (Atallah 1977); Beit-Meri (Tohmé & Tohmé 1985); cave 4 km SE of Beit Meri, 4 October 1959: 1 f, AUB (Benda et al. 2006, 2008, 2010, 2012b); – Besri, Alwataweet Cave [27], 29 December 2012: obs. 1000 inds. (Abi-Said 2014); – Chehim [7], Bsayr, 14 February 2013: obs. 1 ind. (Abi-Said 2014); – Damour [28] (Tohmé & Tohmé 1985); – Ed Dibbye, Wataweet Cave [9], 2005: colony (Horáček et al. 2008); Debbayeh, Mgharet Al Wataweet, 10 February 2013: obs. 850 inds. (Abi-Said 2014); – Haska Cave [13] (Horáček et al. 2008); Abadieh, Al Heskan, 22 January 2013: obs. 100 inds. (Abi-Said 2014); – Roman Aquaduct [29], 2 km E Hazmiyeh, 2 inds., AUB (Atallah 1977); Nahr Beyrouth (Tohmé & Tohmé 1985); Beirut River cave, 1 ind., BMNH (Bergmans 1994); – Jahmour [30], [cave near Roman Aqaeduct,] 30 July 1960: 1 f, HZM (Harrison 1964); Jamhour (Tohmé & Tohmé 1985); Jamhour Cave (Horáček et al. 2008); – Jbeil, Hiba [31], 24 December 2012: obs. 150 inds. (Abi-Said 2014); – Jeita Cave [10], colony (Horáček et al. 2008); – Junieh [32], foraging inds. (Atallah 1977); – Maam el Tien Cave [33], 1955: 1 mj, 1 fa, 2 fj, FMNH (Bergmans 1994); – Zaytoun [34], 26 January 2013: obs. 150 inds. (Abi-Said 2014). – L u b n a n E l J a n u b i: Aadloun, Al Alalieh [14], 5 February 2013: obs. 200 inds. (Abi-Said 2014); – Aadloun, Em Bazzez [15], 5 February 2013: obs. 50 inds. (Abi-Said 2014); – Saida [35], foraging inds. (Atallah 1977); Saïda (Tohmé & Tohmé 1985); – hills behind Tyre [36] (Tristram 1884); – Wadi Jilo [17], 21 December 2012: obs. 20 inds. (Abi-Said 2014). – L u b n a n E s h S h a m a l i: Berquayel Cave [18], 3 December 2012: obs. 5000 inds. (Abi-Said 2014); – Bqerzia [= Bqerzala] [37], cave, colony (Horáček et al. 2008); – Ras Al Cheqa'a Cave [38], 3 December 2012: obs. 100 inds. (Abi-Said 2014); – Sir Ed Dinneih, Ksaim Sinkhole [39], 2005: colony (Horáček et al. 2008); – Tripoli [40], foraging inds. (Atallah 1977); – Tripoli, Mgheret Mtall el Azraq [22], 16 March 2003 and 2005: colony (Horáček et al. 2008); Tripoli, Mtal Azraq, 3 December 2012: obs. 250 inds. (Abi-Said 2014). – N a b a t i y e: Nahr el Litani, Zawtar Cave [41], 2005: colony (Horáček et al. 2008). – Lebanon (undef.): Syrien (Fitzinger 1869) [= Beirut (?), Lebanon (Bergmans 1994)]; – Syria [= ? Lebanon] (Günther 1879); – northern Syria [= Lebanon] (Tristram 1884); – Syria as far north as the Lebanon district (Anderson 1902); – Syria [= ? Lebanon] (Trouessart 1904, Andersen 1907); – Mount Lebanon, March 1894: 1 f, BMNH (Andersen 1912, Harrison 1964, Atallah 1977, Bergmans 1994); – Syria [= Lebanon], 1824, ZMB (Stresemann 1954 [as *Pteropus* sp. and *Pteropus syriacus*]); – various localities throughout the Republic of Lebanon, 13 m, 14 f (Lewis & Harrison 1962); – Lebanon cave (Bergmans 1994); – Lebanon (Rzebik-Kowalska & Kowalski 2001); – Lebanon, 10 locations: 438 inds. (Shehata et al. 2016).

Comments. *Rousettus aegyptiacus* is a very common and widespread bat species in the western part of Lebanon; concerning the whole country, it also belongs to very frequent bats – at least 41 record sites are known from Lebanon (Fig. 2). As the only species among the common bats of Lebanon, *R. aegyptiacus* is known solely from the areas along the sea coast and from the western slopes of the Lebanon Mts. (other two bats with such distribution pattern rank among rare species in Lebanon, *Eptesicus anatolicus* and *Nyctalus noctula*, see below). Generally, this distribution of *R. aegyptiacus* conforms to that figured by Tohmé & Tohmé (1985: 47), although these authors summarised only eleven records from Lebanon (Table 1), dispersed in the coastal belt between Trablous and Saida. The recent study was specifically focused to refine the abundance status and seasonal dynamics of *R. aegyptiacus* in Lebanon and, also for that reason, the distributional information concerning this bat is to be considered as more robustly supported than in other species. Moreover, as colonies of this highly social species could hardly be overlooked when entering a cave, it can be expected that the records obtained during extensive speleological explorations of Lebanese caves (comp. Karanouh & Bou Jaoude 2011) cover a considerable part of actually existing roosts of the species. Therefore, compared to other species, the abundance status of *R. aegyptiacus* in Lebanon can be overestimated.

In any case, its distributional pattern with absence in the El Beqaa Valley is rather unusual since in the areas south of Lebanon *R. aegyptiacus* occurs commonly not only along the Mediterranean Sea coast and in the Judean Hills of central Palestine but also in the whole Rift Valley of Palestine, Jordan, and south-western Syria, including its northernmost parts at Dan in the Hula Valley and Baniyas in the Golan Heights (see the review by Benda et al. 2011a). On the other hand, it

is understandable why no record of *R. aegyptiacus* is available from the elevated El Beqaa and Orontes Valleys of eastern Lebanon, where the rather dry continental climatic conditions do not allow this bat to survive year-round. However, *R. aegyptiacus* could be distributed in the El Hasbani Valley and adjacent areas of southern Lebanon, where the possible occurrence can continue from the northern parts of the Jordan Valley and Golan Heights (cf. Benda et al. 2011a). The lack of *R. aegyptiacus* records in south-eastern Lebanon is perhaps caused by a limited accessibility of these areas for research rather than a real absence of this bat there.

The occurrence of *R. aegyptiacus* continues from Lebanon northward to Syria and Turkey. However, this species belongs to the rarest bats in the Mediterranean part of Syria, only two records are known from the western part of the country (Shehab & Mamkhair 2004, Benda et al. 2006). In the north-eastern part of the Mediterranean, *R. aegyptiacus* is widely distributed in the Levantine part of Turkey and more densely in Cyprus (see Benda et al. 2007, 2011a). The Lebanese and Cypriot parts of the distribution range thus represent the northernmost known areas of dense occurrence of *R. aegyptiacus*.

In Lebanon, *R. aegyptiacus* is distributed in rather low altitudes (mean altitude is the lowest among the Lebanese bats, see Table 2), spread over a rather narrow range of 1254 m (altitude median 163.0 m, mean 245.9 m a. s. l.; Table 2). The highest recorded locality of this bat is the Afqa Cave (Lebanon Mts.) at 1255 m a. s. l. (Fig. 9), most probably the most elevated locality of the species in the Levant. However, all roost records and the prevailing majority of the Lebanese records (95%) come from altitudes below 1000 m a. s. l., the mean and median values of the site altitudes belong to the lowest among the Lebanese bats (the mean value is the absolutely lowest, see Table 2), the most elevated roost was found at 915 m a. s. l. (Ksaim Sinkhole at Sir Ed Dinneih). This preference of lower areas also explains the absence of *R. aegyptiacus* at localities in the valleys of eastern Lebanon that are all situated above 600 m a. s. l. (but mostly much higher than that).

As already summarised by Benda et al. (2011a), the structure of the records of *R. aegyptiacus* in Lebanon is rather unusual, as a majority of them represent the findings of bats in their roosts

Figs. 4, 5. Entrance and position of the entrance to the Matal El Azraq Cave at the southern suburb of Trablous (Lubnan Esh Shamali). During several checks, a colony of *Rousettus aegyptiacus* and individuals of *Rhinolophus ferrumequinum* and *R. blasii* were found to roost there. The area at the entrance represents a foraging habitat of *Pipistrellus kuhlii*. Photos by I. Horáček & M. Uhrin (January 2007 & June 2010).

Table 2. Altitudinal distribution of particular bat species in Lebanon (sites of osteological findings are not included)

species	n	min	max	range	median	mean
Rousettus aegyptiacus	40	1	1255	1254	163.0	245.9
Rhinopoma microphyllum	1	~120				
Rhinolophus ferrumequinum	52	5	1720	1715	800.0	790.0
Rhinolophus hipposideros	48	45	1770	1725	875.0	835.2
Rhinolophus euryale	19	35	1420	1385	316.0	562.0
Rhinolophus blasii	5	15	1268	1253	146.0	436.8
Myotis myotis	6	140	1175	1035	877.5	722.7
Myotis blythii	15	125	1780	1655	1120.0	981.9
Myotis nattereri	15	92	2170	2078	1034.0	949.9
Myotis emarginatus	12	20	1770	1750	1147.5	1047.8
Myotis mystacinus	1	1034				
Myotis capaccinii	18	42	1285	1243	622.5	617.1
Eptesicus serotinus	14	15	1494	1479	970.0	894.8
Eptesicus anatolicus	4	20	1025	1005	155.0	338.8
Hypsugo savii	37	42	2170	2128	1034.0	982.8
Pipistrellus pipistrellus	48	13	2170	2157	854.5	867.8
Pipistrellus kuhlii	38	5	1446	1441	276.0	450.3
Nyctalus noctula	4	56	1630	1574	317.5	580.3
Plecotus macrobullaris	3	695	2005	1310	1770.0	1490.0
Miniopterus schreibersii	9	45	1440	1395	720.0	748.1
Tadarida teniotis	19	92	2005	1913	1046.0	915.0
all sites	143	1	2170	2169	720.0	733.9

Fig. 6. A colony of *Rousettus aegyptiacus* in the Matal El Azraq Cave near Trablous (Lubnan Esh Shamali). Photo by I. Horáček.

(56.5%, n=23); this is the second highest percentage of roost records among the Palaearctic countries within the range of this bat (the highest was found in Cyprus – 65.2%, similarly high in Iran – 42.8%; Benda et al. 2011a: 5, Table 1). This relation remains very similar when an almost twice higher number of records from Lebanon is available (63.4%; n=41, see Records). The altitudinal range of roost sites is somewhat smaller (914 m; n=25) than of all records, the median and mean altitude values are 222.0 m and 247.5 m a. s. l., respectively (these values in large colony roosts were 180.0 m and 196.6 m a. s. l., respectively, in the range of 1–570 m a. s. l.; n=15). Hence, in Lebanon *R. aegyptiacus* prefers to roost in the hilly landscape at the altitudes around 200 m a. s. l. These altitudes are available only in the Mediterranean western and southern parts of Lebanon, i.e. along the sea coast and in the region of the lower part of the El Litani river.

R. aegyptiacus was found to roost in Lebanon only in natural caves. Colonies formed by higher numbers of this bat were documented at least in 15 caves and some of the colony roosts were checked repeatedly in various seasons of 2006–2013 (Table 3). The largest colony, numbering up to 5000 individuals of *R. aegyptiacus*, was discovered in the Berqayel Cave in northern Lebanon. However, this cave has been recently almost destroyed by the quarry activity and the large colony disappeared, only tens of bats are present there. Rough bat numbers observed in other colonies did not exceed 800–1000 individuals (Table 3). In some colonies, the numbers of roosting bats fluctuated while in others they were found to be more or less stable. Very variable numbers of individuals were documented in the cave in an active quarry near Wadi Jilo (20–800 bats), in the lower part of the Jeita Cave (0–800 bats), or two caves in the active quarry above Antelias (El Kassarat Cave, 340–1025 bats; Kenaan Cave, 30–150 bats; Fig. 11). All these caves are highly exposed to human disturbance, the changes in bat numbers are thus its natural consequence. On the other hand, the colonies of *R. aegyptiacus* roosting in rather hardly accessible caves, like the Saleh Cave near Aamchit (Fig. 26), El Watawit Cave near Dahr El Mghara or the El Heskan Cave at Ras El Matn, showed rather stable bat numbers, which fluctuated only slightly, despite the season of the roost check (Table 3). However, rather stable numbers of *R. aegyptiacus* were documented also in the Matal El Azraq Cave, situated very close to the city of Trablous (Figs. 4–6), where disturbance could be expected at least from sporadic visitors (based on findings of empty cartridges and smoke bombs on the cave floor). On the other hand, despite a rather complicated access to the El Heskan Cave, this roost is frequently visited by locals who put fire to the cave; it resulted in a decline of *R. agyptiacus*, observed in 2015.

R. aegyptiacus belongs to the bat species documented from the current territory of Lebanon since the first half of the 19th century. Stresemann (1954: 122–123) reported on a letter dated on 3 August 1824 and sent by W. F. Hemprich from Beirut to Hinrich Lichtenstein (1780–1857), then a director of the Zoological Museum Berlin (ZMB), describing the record of this bat from Lebanon: "Wir sind gestern von einer Exkursion nach Balbek u. zu Zedern glücklich zurückgekommen. Die Beute, die wir gemacht, ist nicht so bedeutend als wir hofften. Von Säugethieren: […] *Pteropus* [= *R. aegyptiacus*] 1 Exemplar. 3 andre Fledermäusearten; […]". This note represents the oldest available report of bats from Lebanon and namely of *R. aegyptiacus* from Lebanon and from Syria sensu lato as well. The respective specimen of *R. aegyptiacus* was collected by W. Hemprich and C. Ehrenberg during their expedition to "Syria" in May–August 1824. The itinerary of their "Syrian" journey was described by Stresemann (1962), Baker (1997) and in more detail by Mlíkovský & Frahnert (2011); Hemprich and Ehrenberg visited solely the northern part of the present territory of Lebanon, bordered by Beirut, Zahle, Baalbek, Bcharre, Trablous, and the Mediterranean Sea shore. Hence, their specimen of *R. aegyptiacus* originates from a section of this area adjacent to the sea shore. Perhaps, the old reports of *R. aegyptiacus* occurrence in Lebanon or "Syria" by some authors of the second half of the 19th century and beginning of 20th century (i.e. Fitzinger 1869, Günther 1879, Tristram 1884, Anderson 1902, Trouessart 1904) are linked to

Table 3. Numbers of *Rousettus aegyptiacus* in particular roosts per particular checks (only the roosts where groups/colonies of more than 30 individuals were found). W 2013 – checks during the winter 2012–2013 (Abi-Said 2014); * bats counted during evening emergence of the cave

roost	VI 2006	I 2007	I 2008	II 2009	III 2009	VIII 2009	VI 2010	X 2012	W 2013	min	max	mean	n checks
Aadloun, Al Alalieh Cave	–	–	–	–	–	–	–	–	200		200		1
Aamchit, Saleh Cave	100–200	100	120–150	150	*325	100–150	200	150	150	100	200	~165	9
Antelias, 22 April Cave	–	–	–	–	–	–	–	–	500		500		1
Antelias, El Kassarat Cave	340	350	400–450	400	*446	500–800	–	*1025	–	340	1025	~520	7
Antelias, Kenaan Cave	100	100	100	100	–	60–80	30–40	150	150	30	150	~100	8
Berqayel, Berqayel Cave	–	–	–	–	–	2500	–	–	5000	2500	5000	3750	2
Besri, El Watawit Cave	–	–	–	–	–	–	–	–	1000		1000		1
Dahr El Mghara, El Watawit Cave	–	–	850	820	800	850	–	–	850	800	850	834	5
Jbeil, Hiba Cave	–	–	–	–	–	–	–	–	150	150	150	150	1
Jeita, Jeita Cave, lower entrance	–	150	–	–	0	–	–	800	–	0	800	317	3
Ras Al Cheqa'a Cave	–	–	–	–	–	–	–	–	100		100		1
Ras El Matn, El Heskan Cave	–	–	200	–	–	–	–	130	100	100	200	143	3
Trablous, Matal El Azraq Cave	–	200	300	300	500	300	300	300	250	200	500	306	8
Wadi Jilo, caves in a quarry	–	–	–	–	800	250	–	–	20	20	800	357	3
Zaytoun, cave	–	–	–	–	–	–	–	–	150		150		1
total	~500	900	~2000	1770	2100	~4750	~540	1530	8620				
largest colony	340	350	850	820	800	2500	300	800	5000				

Roman numerals denote months, Arabic numerals denote years

this ZMB specimen. Even in the last years of the 19th century, few new records of *R. aegyptiacus* from Lebanon were added (Tristram 1884, Festa 1894, Andersen 1907, 1912, Harrison 1964).

Concerning the ZMB specimen of *R. aegyptiacus* collected by Hemprich and Ehrenberg in Lebanon, a new name appeared, *Pteropus syriacus*. According to Stresemann (1954), it was originally used by Hemprich to assign the respective specimen in his field diary and/or at the specimen label and later also by Lichtenstein in the manuscript list of the ZMB "doublette" specimens intended for sale/exchange (Benda & Engelberger 2016). For the first time, this name was published by Stresemann (1954: 172) as a quotation of Hemprich, without a species description or other details. Therefore, the name *Pteropus syriacus* Hemprich represents an unavailable manuscript name and the name *Pteropus syriacus* Stresemann is a nomen nudum.

External and cranial dimensions of the Lebanese specimens of *R. aegyptiacus* are shown in Table 4. For the material examined see below.

Material examined. 1 ♀ (NMP 91909 [A]), Aamchit, Saleh Cave, 22 January 2008, leg. P. Benda, I. Horáček, R. Lučan & M. Uhrin; – 1 ♂ (AUB M002 [S+B]), Antelias, near Beirut, 20 December 1908, leg. D. Carruthers; – 1 ♀ (AUB M003 [S+B]), Antelias, 23 July 1952, leg. J. E. Stencel; – 11 ♂♂, 4 ♀♀ (AUB M010–M012 [S+B], M730, M734–M744 [A]), Antelias, 28 February 1960, leg. J. E. Stencel; – 7 ♂♂, 4 ♀♀ (AUB M016, M017, M019–M024 [S+B], M731–M733 [A]), Antelias, 19 March 1960, leg. J. E. Stencel; – 1 ♂ (NMP 91799 [S+A]), Antelias, El Kassarat Cave, 25 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♀ (NMP 91910 [S+A]), Antelias, El Kassarat Cave, 25 January 2008, leg. P. Benda, I. Horáček, R. Lučan & M. Uhrin; – 3 ♀♀ (NMP 95852–95854 [A]), Antelias, Kenaan Cave, 4 July 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 1 ♂ (AUB M001 [S+B]), Beirut, 5 December 1908, leg. D. Carruthers; – 1 ind. (ZFMK 59.62 [S+B]), Beirut, 2 March 1959, leg. H. Kumerloeve; – 1 ♂, 1 ♀ (AUB M013, M014 [S+B]), Beirut, A.U.B. Campus, 1 February 1960, leg. J. E. Stencel; – 1 ♂ (AUB unnumbered [A]), Beirut, A.U.B. Campus, February 1964, leg. R. Bridgwoot & S. Atallah; – 2 ♀♀ (AUB M005, M006 [S+B]), 4 km SE Beit Meri, 4 October 1959, leg. R. E. Lewis; – 1 ♀ (AUB M027 [S+B]), cave near Amchite, 13 August 1960, leg. J. E. Stencel; – 1 ♂, 1 ♀ (NMP 91904, 91905 [S+A]), Dahr El Maghra, Aaonamie Cave, 19 January 2008, leg. P. Benda, I. Horáček, R. Lučan & M. Uhrin; – 1 ♀ (AUB M008 [S+B]), Jahmour, cave near Roman Aqueduct, 30 July 1960, leg. J. E. Stencel; – 4 ♀♀ (NMP 93696, 93698 [A], 93697, 93699 [S+A]), Jeita Cave, 20 March 2009, leg. T. Bartonička, P. Benda, I. Horáček & R. Lučan; – 1 ♂, 1 ♀ (NMP 91765, 91766 [S+A]), Trablous, Matal El Azraq Cave, 21 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♂ (NMP 91899 [S+A]), Trablous, Matal El Azraq Cave, 18 January 2008, leg. P. Benda, I. Horáček, R. Lučan & M. Uhrin; – 1 ♂ (NMP 93712 [A]), Wadi Jilo, 29 March 2009, leg. T. Bartonička, P. Benda, I. Horáček & R. Lučan.

Records of ectoparasites. **Original data**: N y c t e r i b i i d a e: *Nycteribia pedicularia*: 1 fa (CMŠ [A]) from 1 fa (NMP 93699), 1 ma (CMŠ [A]) from 1 fj (NMP 93696), Jeita Cave, 20 March 2009. – *Nycteribia vexata*: 1 fa (CMŠ [A]) from 1 fj (NMP 93696), Jeita Cave, 20 March 2009. – *Basilia nana*: 1 ma (CMŠ [A]) from 1 fa (NMP 93699), Jeita Cave, 20 March 2009. – *Eucampsipoda aegyptia*: 1 fa (CMŠ [A]) from 1 ma, Aamchit, Saleh Cave, 25 June 2006; – 1 ma (CMŠ [A]) from 1 fj (NMP 95852), Antelias, Kenaan Cave, 4 July 2006; – 3 ma, 1 fa (CMŠ [A]) from 1 ma, 1 fa (NMP 91765, 91766), Trablous, Matal El Azraq Cave, 21 January 2007; – 2 ma, 3 fa (CMŠ [A]) from 1 ma, 1 fa (NMP 91904, 91905), Dahr El Maghra, Aaonamie Cave, 19 January 2008. – S p i n t u r n i c i d a e: *Ancystropus zeleborii*: 22 fa, 2 nymphs (CMŠ [A, P]) from 1 fa (NMP 91766), Trablous, Matal El Azraq Cave, 21 January 2007. – *Meristaspis lateralis*: 1 ma, 5 fa (CMŠ [A]) from 1 ma (NMP 91765), Trablous, Matal El Azraq Cave, 21 January 2007; – 1 fa (CMŠ [A]) from 2 ma, 1 fa (NMP 91765, 91766, 91799), Trablous, Matal El Azraq Cave and Antelias, El Kassarat Cave, 21 & 25 January 2007. – **Published data**: N y c t e r i b i i d a e: *Eucampsipoda hyrtlii* [= *E. aegyptia*]: data unspecified (Lewis & Harrison 1962) = 7 inds. (FMNH INS 349474), Maam el Tien Cave, 23 January 1955, leg. C. A. Reed (SCAN 2015); – 2 inds. (FMNH INS 375418), Wadi Jilo, 7 July 1971, leg. H. Hoogstraal (SCAN 2015).

Comments on ectoparasites. In total, six arthropod parasite species were collected from *R. aegyptiacus* in Lebanon. It is the second largest diversity of parasites documented from any bat species in the country (after *Rhinolophus ferrumequinum*, see below).

Bat flies of the genus *Eucampsipoda* Kolenati, 1857 are adapted to parasitise mainly megabats (Theodor 1967). *Eucampsipoda aegyptia* Macquart, 1851 is the only species of the genus specialised to permanently parasitise a fruit bat, *R. aegyptiacus*, and its distribution range follows the western Palaearctic occurrence of this host species (Kock & Nader 1979, Hůrka & Soós 1986, Benda et al. 2012a). In Lebanon, *E. aegyptia* is the most frequent parasite of *R. aegyptiacus*, it was collected at least at five sites, and an unknown number of additional localities of this pa-

Table 4. Basic biometric data on the examined Lebanese samples of *Rousettus aegyptiacus* (Geoffroy, 1910), *Rhinopoma microphyllum* (Brünnich, 1782) and *Rhinolophus ferrumequinum* (Schreber, 1774). For abbreviations see p. 213

	Rousettus aegyptiacus					*Rhinopoma microphyllum*	*Rhinolophus ferrumequinum*				
	n	**M**	min	max	SD	MNHN 1983-1632	n	**M**	min	max	SD
LAt	16	**93.41**	88.6	98.1	2.823	–	48	**57.73**	47.5	60.4	2.093
LaFE	–	–	–	–	–	–	23	**9.12**	8.1	10.0	0.458
LCr	14	**43.22**	40.68	44.67	1.134	21.66	21	**24.12**	23.71	24.86	0.272
LCO	–	–	–	–	–	21.41	25	**23.46**	23.07	24.23	0.291
LCb/c	14	**40.56**	26.62	43.34	4.175	19.75	34	**20.93**	20.44	21.60	0.273
LaZ	12	**27.04**	26.18	29.26	0.897	12.90	34	**12.30**	11.87	12.88	0.229
LaI	14	**8.24**	7.83	8.93	0.299	2.67	34	**2.47**	2.22	2.98	0.155
LaPO	14	**7.68**	7.08	8.46	0.323	–	–	–	–	–	–
LaInf	9	**10.04**	9.62	10.83	0.373	5.87	25	**6.22**	5.83	6.46	0.138
LaN	14	**17.28**	16.38	17.93	0.405	8.88	34	**9.52**	9.14	9.94	0.174
LaM	9	**16.44**	15.61	17.02	0.441	–	25	**10.47**	9.55	10.81	0.257
AN	14	**13.22**	12.49	13.93	0.478	8.05	34	**7.23**	6.27	10.26	0.605
LBT	11	**4.47**	4.07	4.71	0.200	–	25	**3.49**	3.12	4.08	0.210
CC	14	**8.84**	8.28	9.68	0.457	5.77	34	**6.77**	6.39	7.02	0.140
$M^{2/3}M^{2/3}$	12	**12.87**	12.31	13.50	0.360	9.67	34	**8.79**	8.42	9.12	0.157
$CM^{2/3}$	14	**16.45**	15.15	17.37	0.589	7.95	34	**8.88**	8.59	9.20	0.134
LMd	14	**33.61**	31.98	35.32	0.955	15.48	34	**15.96**	15.62	16.44	0.218
ACo	14	**15.04**	13.27	16.63	1.052	6.33	34	**4.12**	3.72	4.37	0.140
$CM_{2/3}$	12	**18.08**	17.36	18.88	0.480	8.48	34	**9.56**	9.28	9.84	0.143

rasite was available to Lewis & Harrison (1962). Other three species of bat flies of the family Nycteribiidae collected from this host in the Jeita Cave could be regarded as obviously accidental – their occurrence on *R. aegyptiacus* is most probably caused by coexistence in a common roost with other bat species (perhaps mainly with *Miniopterus schreibersii*), which are hosts of these parasites. *Nycteribia pedicularia* Latreille, 1805 and *N. vexata* Westwood, 1835 were collected from Lebanon for the first time, they parasitise cave-dwelling bat species; see also records of these species from other hosts in Lebanon, viz. *Rhinolophus ferrumequinum*, *Myotis blythii*, *M. capaccinii*, and *Miniopterus schreibersii*. A similar parasite transfer could be assumed in Palestine, where two species of bat flies of cave-dwelling bat hosts, *N. pedicularia* and *N. schmidlii*, were collected from *R. aegyptiacus* (Theodor & Moscona 1954). The genus *Basilia* Miranda-Ribeiro, 1903 comprises parasites of tree-dwelling bats and the record of *Basila nana* Theodor et Moscona, 1954 from *R. aegyptiacus* is quite exceptional, it represents its first evidence from this host species. Anyway, such a finding should be considered accidental, as in other records of this parasite from cave-dwelling bats (e.g., *Rhinolophus ferrumequinum*, *Miniopterus schreibersii*; Aellen 1963, Theodor 1967), regarded as caused by roost switching by the principal host species, *Myotis nattereri*. *B. nana* is here reported from Lebanon for the first time, besides from *R. aegyptiacus*, it was recorded also from *M. nattereri* (see below).

The mite genus *Meristaspis* Kolenati, 1857 belongs to the parasites assumed to be phylogenetically linked to the fruit bats (Dusbábek 1969, 1971), *Meristaspis lateralis* Kolenati, 1857 is here reported from Lebanon for the first time. The distribution range of this parasite is not fully known, it seems to be a universal parasitic mite of this bat group – it was collected from various genera of fruit bats (*Cynopterus*, *Eidolon*, *Eonycteris*, *Rousettus*) in various parts of southern Asia between the Middle East and Philippines (Rudnick 1960, Baker & Delfinado 1964, Prasad 1969, Benda et al. 2012a). *Ancystropus zeleborii* Kolenati, 1857 was collected from 14 species of fruit

bats, mainly from the Oriental and Afro-tropic regions, in *R. aegyptiacus* it was already found in Cyprus and Egypt (Rudnick 1960, Hafez et al. 1994). From Lebanon, this mite is here reported for the first time. Concerning mite parasites of *R. aegyptiacus* in Lebanon, Lewis & Harrison (1962) mentioned as follows: "Numerous acarines have been collected from this species [...] and their identifications are not available at this time"; however, the collected material has never been published.

Rhinopoma microphyllum (Brünnich, 1782)

Record. **Published data**: N a b a t i y e [?]: Grotte de Litani / a cave in the Litany Valley, 30 July 1962: 1 fa, MNHN (Harrison 1963, 1964, Benda et al. 2006).

Comments. *Rhinopoma microphyllum* is the rarest bat of Lebanon, it is known from only one record. An adult female was collected in a cave in the El Litani Valley in the southern part of the country (Harrison 1963). Although the accurate site of this record was not given, it could be expected to be situated somewhere in the El Litani Valley between Marjayoun and Aalmane (Horáček et al. 2008), at the altitude of ca. 120 m a. s. l. (Fig. 3). The respective valley part is close to the Rift Valley (Hula and Jordan Valleys) of northern Palestine and south-western Syria (Golan Heights), where *R. microphyllum* occurs abundantly and several roosts of large colonies of this bat are known (Harrison 1964, Makin 1987, Mendelssohn & Yom-Tov 1999, Levin et al. 2008, etc.).

Levin et al. (2013) presented results of a telemetric study of *R. microphyllum* carried out in the northern Jordan Valley of Palestine/Syria, in the area just at the south-eastern border of Lebanon. According to the figured kernels of the polygons from the radio-tracked bats, the studied animals foraged marginally also above the Lebanese territory adjacent to the Hula Valley from west, i.e. in the hilly area between Kfar Kila in the north and Meis El Jabal in the south. These results could be considered as another (indirect) evidence of *R. microphyllum* from Lebanon after fifty years.

However, the pattern of distribution of *R. microphyllum* in northern Palestine suggests this bat could live also in the areas along the Mediterranean Sea coast in south-western Lebanon; it was recorded in the coastal plains of north-western Palestine as north as 'Akko, some 18 km south of the Lebanese border along the shore (Mendelssohn & Yom-Tov 1999).

The Lebanese locality in the El Litani Valley represents the northernmost known spot of occurrence of *R. microphyllum* in the Levant and one of the northernmost in its Palaearctic range – more to the north this bat lives only in the Kermanshah province of western Iran (Benda et al. 2012a). The Levantine distribution of *R. microphyllum* represents one of the northward directed fringes of the continuous range of this bat in the eremic zone belt at the southern margin of the Palaearctic, similarly as in Morocco, Egypt, and western Iran (Schlitter & Qumsiyeh 1996, Benda et al. 2012a).

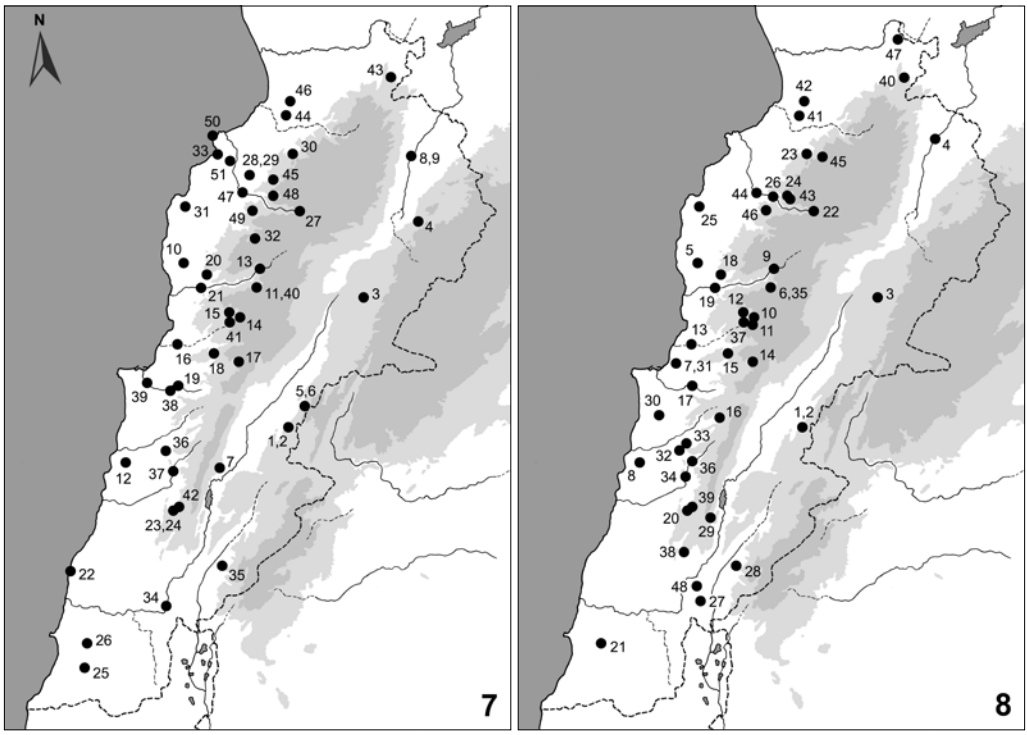
Cranial dimensions of the only available Lebanese specimen of *R. microphyllum* are shown in Table 4.

Material examined. 1 ♀ (MNHN 1983-1632 [S]), Grotte de Litani, 30 July 1962, leg. A. Khaikallah.

Rhinolophus ferrumequinum (Schreber, 1774)

Records. **Original data**: E l B e q a a: Aanjar, Aanjar Cave [1] (Fig. 33) ["Grotte de Jabal Aanjar"], September 1951: coll. 1 f, MHNG (leg. H. Coiffait & P. Strinati), 7 July 2006: obs. 1 ind., 24 January 2007: obs. 1 ind. torpid, coll. 1 ma, NMP, 5 June 2010: net. 1 ma, 1 faL, NMP (cf. Horáček et al. 2008, Benda et al. 2012a); – Aanjar, at a pool at the northern edge of the village [2], 5 June 2010: det. calls of 1–2 foraging inds.; – Baalbek [3], 10 September 1960: 1 fa, AUB (leg. J. E. Stencel & D. Baroudy); – El Laboue, unused industrial building at the road to Aarsal [4], 7 July 2006: obs. 1 ind.

(cf. Horáček et al. 2008); – Kfar Zabad, Kfar Zabad I Cave [5] (Fig. 20), 21 January 2008: obs. 1 ind. (cf. Horáček et al. 2009); – Kfar Zabad, Kfar Zabad II Cave [6], 7 July 2006: obs. 1 ind. (cf. Horáček et al. 2008); – Khirbet Qanafar, El Jaouz Cave [7], 9 June 2010: net. 1 ma, NMP (cf. Benda et al. 2012a); – Ras El Assi, Deir Mar Maroun Monastery [8] (Fig. 17), 29 June 2006: net. 2 ma, 1 ms, 6 mj, 17 faL, 2 fa, 2 fs, 7 fj, coll. 1 ma, 4 fa, NMP (cf. Horáček et al. 2008, Benda et al. 2012a); – Ras El Assi, small cave at Ein El Zarqa [9] (Fig. 18), 25 January 2007: obs. 1 ind. torpid, coll. 1 ma, NMP (cf. Horáček et al. 2008, Benda et al. 2012a). – J e b e l L u b n a n: Aamchit, Saleh Cave [10] ["Grotte d'Amchite"], 4 October 1951: coll. 1 fa, MHNG (leg. H. Coiffait & P. Strinati), Aamchit, Saleh Cave ["cave 2 km E Amchite"], 11 November 1962: coll. 20 inds., AUB (leg. R. E. Lewis), Aamchit, Saleh Cave (Fig. 26), 25 June 2006: det. calls of 1 foraging ind., 28 January 2007: obs. 3 inds. torpid, 22 January 2008: obs. 4 inds. torpid, 8 February 2009: obs. 10 inds. torpid, 14 March 2009: obs. 5 inds. torpid, net. 3 ma, coll. 1 ma, NMP, det. calls of several foraging inds., 25 March 2009: net. 1 ma, 1 faG, 1 fs, 31 May 2010: obs. 1 ind. torpid, 26 October 2012: net. 60 inds., exam. 1 ma (cf. Horáček et al. 2008, 2009, Benda et al. 2012a); – Afqa, Afqa Cave [11] (Fig. 9), 23 April 2006: obs. 60–80 inds., 26 June 2006: obs. 50 inds., net. 1 ma, NMP, 15 July 2006: obs. 15–20 inds. in a colony, net. 3 ma, NMP, 22 January 2007: obs. 83 inds. torpid (59 and 10 inds. in two colonies), coll. 1 ma, NMP, 17 January 2008: obs. 98 inds. torpid (33, 38, and 9 inds. in three colonies), coll. 1 fa, NMP, 11 February 2009: obs. 28 inds. torpid, 25 October 2012: obs. 22 inds. torpid (cf. Horáček et al. 2008, 2009, Benda & Vallo 2012, Benda et al. 2012a); – Dahr El Mghara, small cave at El Watawit Cave [12], 28 March 2009: obs. 1 ind. torpid; – El Aaqoura, Er Roueiss Cave [13] (Fig. 55), 22 January 2007: obs. 9 inds. torpid, 17 January 2008: obs. 16 inds. torpid, 11 February 2009: obs. 2 inds. torpid (cf. Horáček et al. 2008, 2009); – Faraya, El Qana Cave [14], 27 January 2007: obs. 7 inds. torpid, 20 January 2008: obs. 7 inds. torpid (cf. Horáček et al. 2008, 2009, Benda et al. 2012a); – Hrajel, Seraaya Cave [15], 27 January 2007: obs. 17 inds. torpid, coll. 1 ma, NMP, 20 January 2008: obs. 5 inds. torpid, 11 February 2009: obs. 6 inds. torpid (cf. Horáček et al. 2008, 2009); – Jeita, Jeita Cave [16], lower entrance, 25 October 2012: net. 2 ma, 2 fs; – Majdel Tarshish, Fouar Dara Cave [17], 7 June 2010: obs. 6 inds. torpid; – Marjaba, mines [18], 19 January 2007: obs. 10 inds. torpid, coll. 3 fa, NMP, 21 January 2008: obs. 4 inds. torpid, 24 February 2009: obs. a colony of ca. 700 inds. torpid, 15 March 2009: obs. 61 inds. torpid (57 inds. in a colony), 30 October 2012: obs. 1 ind. torpid (cf. Horáček et al. 2008, 2009, Benda et al. 2012a); – Ras El Matn, El Heskan Cave [19], 31 October 2012: obs. ca. 6 inds. torpid; – Tourzaiya, Mebaaj Cave [20], 23 January 2007: obs. 1 ind. torpid, coll. 1 fs, NMP (cf. Horáček et al. 2008); – Yahchouch, Nahr Ibrahim [21], tunnel, 24 October 2012: obs. 2 inds. – L u b n a n E l J a n u b i: Aadloun, Aadloun Cave [22], 21 June 2006: a mummy found (cf. Horáček et al. 2008), 22 March 2009: remains of 2 inds. from *Tyto alba* pellets; – Jezzine, Pont El Khalass, at a spring [23], 2 August 2009: det. calls of 1 foraging ind.; – Jezzine, Pont El Khalass, abandoned house [24], 23 June 2006: obs. 1 ind., 26 February 2009: obs. 1 ind. torpid, 2 August 2009: obs. 1 ind. (cf. Horáček et al. 2008, 2009); – Qana, Qana Cave [25], 29 March 2009: obs. 1 ind. (active); – Wadi Jilo, caves in a quarry ca. 1 km SE of the village [26], 22 March 2009: obs. 1 ind. torpid, coll. 1 ma, NMP (cf. Benda et al. 2012a). – L u b n a n E s h S h a m a l i: Bcharre, Qadisha Cave [27], 23 January 2007: obs. 14 inds. torpid, coll. 2 ma, NMP, 21 March 2009: obs. 1 ind. torpid (cf. Horáček et al. 2008, Benda et al. 2012a); – Bnechaai, cave ca. 1 km E of the village [28], 3 August 2009: obs. 1 ind.; – Bnechaai, water cave ca. 2 km E of the village [29], 3 August 2009: obs. 1 ind.; – Haqel El Aazime, Achou Cave [30], 21 January 2007: obs. 7 inds. torpid (exam. 1 ma, 1 fa, 1 fs), coll. 1 fa, NMP, 18 January 2008: obs. 1 ind. torpid, 18 February 2009: obs. 2 inds. torpid (cf. Horáček et al. 2008, 2009, Benda et al. 2012a); – Ras Nhach, Musailha Fort [31] (Fig. 21), 16 March 2009: obs. 1 ind. in an extension to the fort & 1 ind. in a mine near the fort, 26 October 2012: obs. 1 ind. torpid in a mine near the fort (cf. Horáček et al. 2009); – Tannourine El Faouqa [32], tomb, 1 August 2009: obs. 2 inds. torpid; – Trablous, Matal El Azraq Cave [33] (Figs. 4, 5), 21 January 2007: obs. 4 inds. torpid (exam. 1 ma, 1 ms, 2 fs), coll. 1 ma, NMP, 18 January 2008: obs. 5 inds. torpid, 16 March 2009: obs. 4 inds (cf. Horáček et al. 2008, 2009, Benda et al. 2012a). – N a b a t i y e: Arnoun, Beaufort Castle [34] (Fig. 47), 22 March 2009: obs. 1 ind., 2 August 2009: obs. 5 inds. torpid., 6 June 2010: obs. 4 inds. torpid; – Hasbaya, castle [35], 1 August 2009: obs. 2 inds. torpid. – **Published data**: E l B e q a a: Anjar, cave nr. source [1], 2 September 1968: 2 inds., SAC (Atallah 1970, 1977); – Deir Mar Maroun [8], 5 km S. Hermel, 1 ind., AUB (Atallah 1977); Hermel (Tohmé & Tohmé 1985). – J e b e l L u b n a n: Abadieh, Al Heskan [19], 22 January 2013: obs. 20 inds. (Abi-Said 2014); – Afka [11], [2 October 1960] 1 ind., RLC [= 1 f, AUB] (Atallah 1977); Afqa (Tohmé & Tohmé 1985); Afqaa, 8 February 2013: obs. 43 inds. (Abi-Said 2014); – Al Rwaiss [13], 8 February 2013: obs. 4 inds. (Abi-Said 2014); – cave 2 km E Amchite [10], winter (Lewis & Harrison 1962); 2 km E of Amchite, 14 August 1960: 1 f, HZM (Harrison 1964); Cave, 1 km. E. Amchite, 18 March 1961 (Lewis 1964); Mogharet Saleh, 2 km E Amchite, 16 August 1968: 1 ind. (Atallah 1970); Mogaret Saleh, near Amchite, 10 inds., AUB, SAC (Atallah 1977); Aamchit, Mogharet Saleh, 3 February 1985: 7 m (Tohmé & Tohmé 1985); Aamchite, 18 October 1964: 1 m, 17 April 1965: 2 f, AUB (Benda et al. 2012a); Amcheet, Saleh, 24 December 2012: obs. 1 ind. (Abi-Said 2014); – Baakleen, Howet Wadi Aldayr [36], 9 February 2013: obs. 4 inds. (Abi-Said 2014); – vallée de Nahr Barouk [37] (Tohmé & Tohmé 1985); – Chweet [38], old house, 22 January 2013: obs. 200 inds. (Abi-Said 2014); – Roman Aquaduct [39], 10 km E. of Beirut, 2 km E Hazmiyeh, 13 August 1960: 1 m, 4 f, BMNH, HZM (Harrison 1964); Roman Aquaduct, 2 km E. Hazmiyeh, 22 inds., AUB (Atallah 1977); 2 km. NE Hozmiye, 1 ind., FMNH (DeBlase 1980); l'aqueduc de Zénobie à Nahr Beyrouth (Tohmé & Tohmé 1985); Hazmiye, 5 August 1960: 2 m, 2 f, 13 August 1960: 1 f, 10 September 1960: 1 f, AUB (Benda et al. 2012a); – Hrajel, Mogharat



Figs. 7, 8. Records of particular bat species in Lebanon. 7 – *Rhinolophus ferrumequinum* (Schreber, 1774). 8 – *Rhinolophus hipposideros* (Borkhausen, 1797).

el-Tarrache [14], 10 February 1985: 2 m, 2 f (Tohmé & Tohmé 1985); Hrajel, Al Tarrash, 30 December 2012: obs. 1 ind. (Abi-Said 2014); – Hrajel, Seraya [15], 30 December 2012: obs. 15 inds. (Abi-Said 2014); – Lasa, Salem Cave [40], 8 February 2013: obs. 2 inds. (Abi-Said 2014); – Marjaba mine [18], 30 December 2012: obs. 650 inds. (Abi-Said 2014); – Naba'a Al Mghara [41], 30 December 2012: obs. 7 inds. (Abi-Said 2014). – L u b n a n E l J a n u b i: Mgharet Fakherdeen [42], 10 February 2013: obs. 5 inds. (Abi-Said 2014). – L u b n a n E s h S h a m a l i: Akroum Cave [43], 26 December 2012: obs. 1 ind. (Abi-Said 2014); – Berquayel Cave [44], 3 December 2012: obs. 1 ind. (Abi-Said 2014); – Bhairet Toula, Joulman [45], 19 February 2013: obs. 2 inds. (Abi-Said 2014); – Bqerzia [= Bqerzala] [46], cave (Horáček et al. 2008); – Chekka, Msailha gallery [31], 28 February 2013: obs. 3 inds. (Abi-Said 2014); – Koura, Deir Mahwet [47], 28 February 2013: obs. 2 inds. (Abi-Said 2014); – Qadeesha [Cave] [27], 22 February 2013: obs. 5 inds. (Abi-Said 2014); – Qezhaya, Yousef Karam [48], 19 February 2013: obs. 2 inds. (Abi-Said 2014); – Qnat Cave [49], 19 February 2013: obs. 10 inds. (Abi-Said 2014); – Tripoli [50], 1 mj, 1 f, BMNH (Harrison 1964, Theodor 1967, Atallah 1977, Harrison & Bates 1991); Tripoli (Tohmé & Tohmé 1985); – Tripoli, Alhab Cave [51], 2 February 2013: obs. 35 inds. (Abi-Said 2014). – Lebanon (undef.): [Lebanon], 1 m, 1 f, RMNH (Temminck 1835 [as *R. unihastatus*]) = Mont Liban, 2 inds., RMNH (Jentink 1887, 1888); – aus der Gegend des Libanon (Fitzinger 1855, 1861); – am Libanon [= Lebanon Mts.] (Kolenati 1856, 1860); – Syrien in der Umgegend des Libanon (Fitzinger 1870a: 147 [as *R. unihastatus*]); – Syrien [= Lebanon] (Peters 1871); – various localities throughout the Republic of Lebanon, 10 m, 20 f (Lewis & Harrison 1962); – Syria (= Lebanon), 1821/1822 [= 1824]: 3 inds., ZMB (Turni & Kock 2008); – northern Lebanon, 1824, 2 inds., NMW, ZMB (Benda & Engelberger 2016); – Lebanon, 3 inds. (Shehata et al. 2016).

Comments. *Rhinolophus ferrumequinum* is a very common bat in Lebanon, with 51 loaclities, it represents the most frequent bat species of the country (Table 1). This species belongs to the most widespread bats of Lebanon, its localities are scattered across the whole country (Fig. 7). This

conforms to the conclusion by Lewis & Harrison (1962), who considered *R. ferrumequinum* to be evenly distributed throughout the whole territory of Lebanon, although they did not specify the number of its records (Table 1). *R. ferrumequinum* is relatively common also in the eastern and southern parts of the country, where bat records are generally rather scarce. It is the most frequent bat of the Lebanese part of the Anti-Lebanon Mts.

R. ferrumequinum is one of the most common and widespread bats in the Middle East and particularly in its Mediterranean parts, where this bat reaches the southern margin of its whole distribution range (Harrison & Bates 1991, Benda et al. 2006, 2012a). The Lebanese part of the distribution range of *R. ferrumequinum* continues in dense occurrence both southward and northward. This bat is very common in the Mediterranean hilly areas of northern Palestine, northwestern Jordan, and the Golan Heights (Mendelssohn & Yom-Tov 1999, Benda et al. 2006, 2010) and also of the western part of Syria (Benda et al. 2006, Shehab & Mamkhair 2006). No records of *R. ferrumequinum* are available from the Syrian part of the Anti-Lebanon Mts.; the El Beqaa and Orontes Valleys of Lebanon thus represent the eastern margin of its known distribution in the central part of the Levant.

In Lebanon, *R. ferrumequinum* is distributed across almost the whole altitudinal gradient of the country (spread over a rather broad range of 1715 m; altitude median 800.0 m, mean 790.0 m a. s. l.; Table 2) with the exception of the upper parts of high mountain ranges. The highest recorded locality of *R. ferrumequinum* in Lebanon is the Qadisha Cave (Lebanon Mts.) at 1720 m a. s. l., which serves as a hibernation roost of this bat. The records from roosts prevail in the list of findings of *R. ferrumequinum* in Lebanon (82.4%, n=42) and the altitudinal range of roost sites conforms to the range of all records (1705 m), the median and mean altitude values are 810.0 m and 821.7 m a. s. l., respectively. The values for hibernation roosts are even higher, 892.5 m and 820.4 m a. s. l., respectively (n=33). Hence, in Lebanon *R. ferrumequinum* prefers to roost in rather elevated areas, with hibernacula being situated even in montane positions.

Table 5. Numbers of *Rhinolophus ferrumequinum* in particular roosts per particular checks; W 2013 – checks during the winter 2012–2013 (Abi-Said 2014)

roost	IV 2006	*VI 2006*	I 2007	I 2008	II 2009	III 2009	*VIII 2009*	*VI 2010*	*X 2012*	W 2013	min	max	n checks
Achou Cave	–	–	7	1	2	–	–	–	–	–	1	7	3
Afqa Cave	60–80	*50*	83	98	28	–	–	*0*	*22*	43	0	98	8
Aanjar Cave	–	*1*	1	0	–	–	–	*0*	–	–	0	2	4
Beaufort Castle	–	–	–	–	–	1	*5*	*4*	–	–	1	5	3
El Heskan Cave	–	–	–	0	–	–	–	–	*6*	20	6	20	3
El Qana Cave	–	–	7	7	0	–	–	–	–	1	0	7	4
Er Roueiss Cave	–	*0*	9	16	2	–	–	–	–	4	0	16	5
Pont El Khalass, house	–	*1*	–	0	1	–	*1*	–	–	–	0	1	4
Kfar Zabad I Cave	–	–	0	1	–	–	–	–	–	0	0	1	3
Marjaba, mines	–	–	10	4	700	61	–	–	*1*	650	1	700	6
Matal El Azraq Cave	–	–	4	5	0	4	*0*	*0*	*0*	0	0	4	8
Mebaaj Cave	–	–	1	–	–	–	–	–	*0*	–	0	1	2
Musailha Fort	–	*0*	0	0	–	1	–	*0*	–	–	0	1	5
Musailha, mine	–	*0*	0	1	–	0	–	*0*	*1*	3	0	3	7
Qadisha Cave	–	–	14	–	–	1	–	–	–	5	1	14	3
Saleh Cave	–	*0*	3	4	10	5	*0*	*1*	*0*	1	0	10	9
Seraaya Cave	–	–	17	5	6	–	–	–	–	15	5	17	4
Wadi Jilo, caves	–	–	–	–	–	1	*0*	–	–	0	0	1	3

in *italics*, checks in the summer season; Roman numerals denote months, Arabic numerals denote years

R. ferrumequinum was found to roost in Lebanon mainly in natural caves of very variable size and position (72.4%, n=30; hibernacula 75.6%, n=25), while man-made underground spaces (mines, tunnels, dark parts of abandoned buildings) represented only a minor proportion of the roost number (16.7%, n=7). Larger numbers of hibernating bats (n>10) were documented only at eight localities (Table 5; seven of them were caves), majority of these sites were situated above 1000 m a. s. l. (median 1187.5 m, mean 977.5 m, range 134–1720 m a. s. l.). The largest numbers of wintering individuals were discovered in the system of abandoned mines at Marjaba (at ca. 1120 m a. s. l.), where an aggregation of some 700 bats was found on 24 February 2009 (Horáček et al. 2009) and some 650 bats on 30 December 2012 (Abi-Said 2014). The Afqa Cave (1255 m a. s. l.; Fig. 9) represents another important hibernaculum of *R. ferrumequinum*, where the numbers of wintering bats varied between 28 nad 98 individuals (Table 5, Fig. 10). All these observations conform to the prediction by Lewis & Harrison (1962: 476) who expected seasonal migrations of the Lebanese populations of *R. ferrumequinum* along the altitudinal gradient between summer and winter roosts, the latter being situated at upper altitudes, while only "few individuals hibernate in caves at lower altitudes". A maternity aggregation of *R. ferrumequinum* was found in Lebanon only once and indirectly, on 29 June, when a number of lactating females and volant

Fig. 9. Afqa Cave, 1255 m a. s. l. (Jebel Lubnan). The cave is used as a summer roost by *Rhinolophus ferrumequinum* and *Hypsugo savii*, and as a winter roost by *Rhinolophus ferrumequinum*, *R. hipposideros*, *Myotis emarginatus*, *M. capaccinii*, *Eptesicus serotinus*, *Hypsugo savii*, and *Pipistrellus pipistrellus*. During two netting sessions in June and July 2006, *Rousettus aegyptiacus*, *Myotis blythii*, *Eptesicus serotinus*, *Hypsugo savii*, and *Pipistrellus pipistrellus* were recorded at the cave entrance. Photo by M. Uhrin (June 2010).

Fig. 10. One of the wintering groups (33 individuals) of *Rhinolophus ferrumequinum* documented in the Afqa Cave (Jebel Lubnan) on 17 January 2008. Photo by M. Uhrin.

juveniles was netted at the lower level of the cave monastery of Deir Mar Maroun at Ras El Assi (at 720 m a. s. l.; Fig. 17), emerging from the upper inaccessible level where they most probably roosted (in total, 21 adult and 13 juvenile bats were netted). A pregnant female was netted at the Saleh Cave near Aamchit on 25 March (Fig. 26); however, no colony was then observed in the cave, only a small number of torpid individuals.

R. ferrumequinum is the first bat species reported in the literature to occur in Lebanon, based on the findings made by W. Hemprich and C. Ehrenberg in 1824. A series of several specimens of *R. ferrumequinum* was collected by these classical explorers in the northern part of the present territory of Lebanon (see also Comments on *Rousettus aegyptiacus* above) and sent to the Zoological Museum Berlin (ZMB). At least three specimens of this series were immediately sent by H. Lichtenstein from the ZMB to the Natural History Museum of the Netherlands, Leyden (today Naturalis Biodiversity Centre, RMNH) and to the Natural History Museum Vienna (NMW) (for additional details see Benda & Engelberger 2016). Two RMNH specimens were mentioned by Temminck (1835: 30) in a chapter concerning *R. ferrumequinum* (under its synonym *R. unihastatus*) as follows: "Mr. Lichtenstein m'a envoyé sous le nom de *Rhinolophus libanoticus* deux sujets, mâle et femelle, que d'après tous les caractères extérieurs et ostéologiques, je dois des individus absolument semblables d'Italie, d'Égypte et du Cap de B. E.". The respective RMNH specimens were later directly reported by Jentink (1887, 1888) in the RMNH catalogue. The NMW specimen was mentioned indirectly by Fitzinger (1855: 139) who, describing the range of *R. ferrumequinum*, added the following note: "aus Asien nur aus der Gegend des Libanon". These two notes were later used as a basis for the mentions of Lebanon or Syria (s.l.) as a part of the distribution range of *R. ferrumequinum* by Kolenati (1856, 1860) and Fitzinger (1870a), and perhaps some others.

Further data on *R. ferrumequinum* from Lebanon were gathered much later, at the beginning of the 20th century (see Harrison 1964).

Concerning the specimens of *R. ferrumequinum* collected by Hemprich and Ehrenberg in Lebanon, several new names appeared. Besides *Rhinolophus libanoticus* mentioned by Temminck (1835) as a synonym of *R. unihastatus* [= *R. ferrumequinum*] (see above), Peters (1871: 310) reported "*Rh. libanoticus*, *conchifer et rufescens* Ehrbg. et Lichtst. Mspt." in the synonymy of *R. ferrumequinum*, based on the specimens still available in the ZMB (Turni & Kock 2008). However, the latter name, *R. rufescens*, was published a year earlier by Fitzinger (1870a: 135) in the synonymy of *R. clivosus* Cretzschmar, 1828, based on a specimen of *R. ferrumequinum* collected by Hemprich and Ehrenberg and sent by Lichtenstein from ZMB to NMW (see Benda & Engelberger 2016). As already noted by Benda et al. (2006: 49), Andersen (1905: 113) mentioned the names given by Peters (1871) among synonyms of his *R. ferrum-equinum typicus* (= *R. f. ferrumequinum*) and determined them as nomina nuda. Since these names are not accompanied with a description, none of them represents an available name, although type specimens exist. *Rhinolophus libanoticus* Hemprich, *Rhinolophus conchifer* Hemprich and *Rhinolophus rufescens* Hemprich are manuscript names, see Peters (1871: 310), Turni & Kock (2008: 81 [misspelled as *lebanoticus*]) and Benda & Engelberger (2016: 23), while *Rhinolophus libanoticus* Temminck and *Rhinolophus rufescens* Fitzinger are nomina nuda.

External and cranial dimensions of the Lebanese specimens of *R. ferrumequinum* are shown in Table 4. For the material examined see below.

Material examined. 1 ♂ (NMP 93683 [S+A]), Aamchit, Saleh Cave, 14 March 2009, leg. T. Bartonička, P. Benda, I. Horáček & R. Lučan; – 1 ♀ (MHNG 967.85 [A]), Grotte d'Amchite, 4 October 1951, leg. H. Coiffait & P. Strinati; – 20 inds. (AUB M729 [A]), cave 2 km E Amchite, 11 November 1962, leg. R. E. Lewis; – 2 ♀♀ (AUB M1176, M1177 [S+B]), cave 2 km E Amchite, 17 April 1965, leg. S. Atallah; – 1 ♂ (NMP 91791 [S+A]), Aanjar Cave, 24 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♂, 1 ♀ (NMP 93550, 93551 [S+A]), Aanjar Cave, 5 June 2010, leg. P. Benda & M. Uhrin; – 1 ♀ (MHNG 967.86 [A]), Grotte de Jabal Aanjar, September 1951, leg. H. Coiffait & P. Strinati; – 1 ♀ (AUB M726 [A]), Afqa Cave, 2 October 1960, leg. R. E. Lewis; – 1 ♂ (NMP 95831 [S+A]), Afqa Cave, 26 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 3 ♂♂ (NMP 90895, 90896 [S+A], 90897 [A]), Afqa Cave, 15 July 2006, leg. P. Benda; – 1 ♂ (NMP 91781 [S+A]), Afqa Cave, 22 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♀ (NMP 91892 [S+A]), Afqa Cave, 17 January 2008, leg. P. Benda, I. Horáček, R. Lučan & M. Uhrin; – 1 ♀ (AUB M155 [S]), Baalbek, 10 September 1960, leg. J. E. Stencel & D. Baroudy; – 4 ♂♂, 3 ♀♀ (AUB M144–M150 [S+B]), Roman aqueduct, 2 km NE Hazmiyeh, 5 August 1960, leg. R. E. Lewis; – 3 ♀♀ (AUB M151–M153 [S+B]), cave near Roman aqueduct, 2 km NE Hazmiyeh, 13 August 1960, leg. R. E. Lewis; – 1 ♂, 2 ♀♀ (AUB M721, M724, M725 [A]), cave near Roman aqueduct, 10 km E of Beirut, 13 August 1960, leg. R. E. Lewis; – 2 ♀♀ (AUB M722, M723 [A]), Deir Mar Maroun, 5 km S. Hermel, 13 August 1960, leg. R. E. Lewis; – 1 ♀ (AUB M728 [A]), Deir Mar Maroun, 5 km S. Hermel, 6 November 1960, leg. R. E. Lewis; – 1 ♂ (NMP 91800 [S+A]), Faraya, El Qana Cave, 27 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♀ (NMP 91768 [S+A]), Haqel El Azime, Achou Cave, 21 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♂ (NMP 93573 [S+A]), Khirbet Qanafar, El Jaouz Cave, 9 June 2010, leg. P. Benda & M. Uhrin; – 3 ♀♀ (NMP 91750, 91751 [S+A], 91752 [A]), Marjaba, mine, 19 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 2 ♂♂ (NMP 91787 [A], 91788 [S+A]), Qadisha Cave, 23 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♂ (NMP 91796 [S+A]), Ras El Assi, cave, 25 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♂, 4 ♀♀ (NMP 95834, 95837–95839, 95849 [S+A]), Ras El Assi, Deir Mar Maroun Monastery, 29 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 1 ♀ (NMP 91785 [A]), Tourzaiya, Mebaaj Cave, 23 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♂ (NMP 91767 [S+A]), Trablous, Matal El Azraq Cave, 21 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♂ (NMP 93705 [S+A]), Wadi Jilo, 22 March 2009, leg. T. Bartonička, P. Benda, I. Horáček & R. Lučan; – 1 ♀ (ZMB 555 [A], labelled as *Rhinolophus conchifer*), Syrien [= Lebanon], leg. W. Hemprich & C. Ehrenberg; – 1 ind. (NMW 19729 [B], labelled as *Rhinolophus rufescens*), Arabia [= Lebanon], 1824, leg. C. [= W] Hemprich & C. G. Ehrenberg.

Records of ectoparasites. **Original data**: N y c t e r i b i i d a e: *Nycteribia pedicularia*: 1 fa (CMŠ [A]) from 1 fa (NMP 95834), Ras El Assi, Deir Mar Maroun Monastery, 29 June 2006. – *Phthiridium biarticulatum*: 1 ma (CMŠ [A]) from 1 fa (NMP 91768), Haqel El Azime, Achou Cave, 21 January 2007. – *Penicillidia dufourii*: 1 ma (CMŠ [A]) from 1 ma (NMP 91767), Trablous, Matal Ez Azraq Cave, 21 January 2007. – I x o d i d a e: *Ixodes vespertilionis*: 2 nymphs (CMŠ [A])

from 1 ma (NMP 91781), Afqa Cave, 22 January 2007; – 1 nymph (CMŠ [A]) from 1 fa (NMP 93550), Aanjar, Aanjar Cave, 5 June 2010. – T r o m b i c u l i d a e: Trombiculidae sp.: 2 larvae (CMŠ [P]) from 1 ma (NMP 93683), Aamchit, Saleh Cave, 14 March 2009. – **Published data**: I s c h n o p s y l l i d a e: *Rhinolophopsylla unipectinata*: 1 ma, Cave, 1 km. E. Amchite, 18 March 1961 (Lewis 1964). – N y c t e r i b i i d a e: *Stylida biarticulata* [= *Phthiridium biarticulatum*]: 3 fa, Tripoli (Theodor 1967).

Comments on ectoparasites. In total, seven arthropod parasite species were collected from *R. ferrumequinum* in Lebanon. It is the largest diversity of parasites documented from any bat species in the country.

The bat flea *Rhinolophopsylla unipectinata* Taschenberg, 1880 is a parasite of bats of the genus *Rhinolophus*; they are its principal hosts, but it can be found also on other cave-dwelling bats, namely of the genera *Asellia*, *Myotis* and/or *Miniopterus*. The nominotypical subspecies, collected from *R. ferrumequinum* from Lebanon by Lewis (1964), occurs solely on *R. ferrumequinum*. This form occurs in the western Palaearctic in accordance with the distribution range of its exclusive host, from Europe to West Turkestan, including the northern part of the Middle East (Hůrka 1963, Aktaş 1987, 1990).

The bat fly *Nycteribia pedicularia* Latreille, 1805 is a typical parasite of cave-dwelling bats – it was frequently documented from *Miniopterus schreibersii*, bats of the *Myotis myotis* group and of the genus *Rhinolophus*; however, *Myotis capaccinii* is regarded as its principal host (Hůrka 1980), see below. From Lebanon, this bat fly is here reported for the first time, it was collected from *Rousettus aegyptiacus*, *Myotis blythii*, *M. capaccinii*, *Hypsugo savii*, and *Miniopterus schreibersii*. *Phthiridium biarticulatum* (Hermann, 1804) is a typical parasite of bats of the genus *Rhinolophus*, it is most often found on *R. ferrumequinum* throughout the whole range of this host, from the other *Rhinolophus* species the findings are rather less frequent (Hůrka 1964). *P. biarticulatum* is a western Palaearctic species (Hůrka 1980), from Lebanon collected also from *Rhinolophus euryale* (see below). Bat flies of the genus *Penicillidia* Kolenati, 1863 are parasites of cave-dwelling bat species. The bats of the *Myotis myotis* group are regarded as their principal hosts, and findings from other bats are considered as secondary and accidental, caused by sharing of the roosts (Hůrka 1964). *Penicillidia dufourii* (Westwood, 1834) is here reported from Lebanon for the first time, besides from *R. ferrumequinum*, it was collected also from *Myotis myotis*, *M. blythii*, and *M. capaccinii*.

Two species of the genus *Ixodes* Latreille, 1795 with a strict specificity to bats are expected to occur in the Middle East, *I. vespertilionis* Koch, 1844 and *I. simplex* Neumann, 1906 (Hoogstraal & Aeschlimann 1982). The polyxenic *I. vespertilionis* parasitises bats inhabiting caves, mostly of the genus *Rhinolophus* (Dusbábek 1972). Although the Lebanese record of this tick is not surprising, it is here reported for the first time from the country (it was collected also from *Myotis myotis*) – its distribution range covers Europe, Africa, Middle East, southern and eastern Asia, and the Pacific islands (Kolonin 2007).

Two damaged specimens of chigger mites (Trombiculidae) were collected from *R. ferrumequinum*. According to the remaining available characters, this species does not belong to any of the two genera discovered so far from Lebanese bats, viz. *Leptotrombidium* Nagayo, Miyagawa, Mitamura et Imamura, 1916 (collected from *Myotis emarginatus*) and *Hirsutiella* Schluger et Vysotzkaya, 1970 (from *Rhinolophus hipposideros*).

Rhinolophus hipposideros (Borkhausen, 1797)

Records. **Original data**: E l B e q a a: Aanjar, archaeological site [1], drainage tunnels under the ancient city, 6 July 2006: obs. 3 inds. (incl. fa+j) (cf. Horáček et al. 2008); – Aanjar, Aanjar Cave [2] (Fig. 33), 5 June 2010: net. 1 ma, 1 fs, NMP (cf. Benda et al. 2011b, Benda & Gaisler 2015); – Baalbek [3], ancient ruins, underground corridor, 19 March 2008: obs. 1 ind. torpid; – El Hermel, small cave at the road bridge over the Orontes river [4], 29 June 2006: obs. 1 ind. (cf. Horáček

et al. 2008). – J e b e l L u b n a n: Aamchit, Saleh Cave [5] (Fig. 26), 28 January 2007: obs. 3 inds. torpid, coll. 2 ma, NMP, 8 February 2009: obs. 2 inds. torpid, 14 March 2009: obs. 1 ind. torpid, 25 March 2009: net. 2 ma, coll. 1 ma, NMP, 31 May 2010: obs. (and det. calls of) 3 inds. (cf. Horáček et al. 2008, 2009, Benda et al. 2011b, Benda & Gaisler 2015); – Afqa, Afqa Cave [6] (Fig. 9), 22 January 2007: obs. 6 inds. torpid, coll. 1 fa, NMP, 17 January 2008: obs. 9 inds. torpid, 11 February 2009: obs. 4 inds. torpid (cf. Horáček et al. 2008, 2009, Benda et al. 2011b, Benda & Gaisler 2015), 2 October 2010: obs. 1 ind. torpid (photo by V. Gvoždík); – Antelias, Kenaan Cave [7] (Fig. 11), 25 January 2007: obs. 2 inds. torpid, coll. 1 ma, NMP (cf. Horáček et al. 2008, Benda et al. 2011b, Dool et al. 2013, Benda & Gaisler 2015); – Dahr El Mghara, Aaonamie Cave [8], 19 January 2008: obs. 1 ind. torpid, 28 March 2009: obs. 3 inds. torpid, coll. 1 fs, NMP (cf. Benda et al. 2011b, Benda & Gaisler 2015); – El Aaqoura, Er Roueiss Cave [9] (Fig. 55), 22 January 2007: obs. 1 ind. torpid, coll. 1 ma, NMP, 17 January 2008: obs. 2 inds. torpid, 11 February 2009: obs. 4 inds. torpid (cf. Horáček et al. 2008, 2009, Benda et al. 2011b, Dool et al. 2013, Benda & Gaisler 2015); – Faraya, El Qana Cave [10], 27 January 2007: obs. 2 inds. torpid, coll. 1 ms, NMP, 20 January 2008: obs. 2 inds. torpid (cf. Horáček et al. 2008, 2009, Benda et al. 2011b, Dool et al. 2013, Benda & Gaisler 2015); – Faraya, at Raymond Cave [11] (Fig. 51), 2 June 2010: net. 3 ma, coll. 2 ma, NMP (cf. Benda et al. 2011b, Benda & Gaisler 2015); – Hrajel, Seraaya Cave [12], 27 January 2007: obs. 3 inds. torpid, coll. 1 ms, NMP, 20 January 2008: obs. 3 inds. torpid, coll. 1 ma, NMP, 11 February 2009: obs. 4 inds. torpid (cf. Horáček et al. 2008, 2009, Benda et al. 2011b, Benda & Gaisler 2015); – Jeita, Jeita Cave [13], lower entrance, 26 January 2007: obs. 4 inds. torpid (cf. Horáček et al. 2008 [as *R. ferrumequinum*]), 25 October 2012: net. 1 fa, 1 fs; – Majdel Tarshish, Qattine Aazar Chasm [14], 15 March 2009: obs. 1 ind., 7 June 2010: obs. (and det. calls of) 1 ind.; – Marjaba, mines [15], 19 January 2007: obs. 16 inds. torpid, coll. 1 ma, 2 ms, 1 fa, NMP, 21 January 2008: obs. 7 inds. torpid, 24 February 2009: obs. 3 inds. torpid, 15 March 2009: obs. 3 inds. torpid, 30 October 2012: obs. 1 ind. torpid (cf. Horáček et al. 2008, 2009, Benda et al. 2011b, Dool et al. 2013, Benda & Gaisler 2015); – Nabaa Es Safa, mine [16], 29 January 2007: obs. 1 ind. torpid, coll. 1 ma, NMP (cf. Horáček et al. 2008, Benda et al. 2011b, Dool et al. 2013, Benda & Gaisler 2015); – Ras El Matn, El Heskan Cave [17], 31 October 2012: obs. 1 ind.; – Tourzaiya, Mebaaj Cave [18], 23 January 2007: obs. 6 inds. torpid, coll. 1 ma, NMP, 28 October 2012: obs. 4 inds. (cf. Horáček et al. 2008, Benda et al. 2011b, Dool et al. 2013, Benda & Gaisler 2015); – Yahchouch, Nahr Ibrahim [19], tunnel, 24 October 2012: obs. 1 ind. torpid inside the tunnel, 3 inds. active outside the tunnel. – L u b n a n E l J a n u b i: Jezzine, Pont El Khalass, abandoned house [20], 23 June 2006: net. 1 faL, obs. 1 foraging ind., coll. 1 fa, NMP, 24 January 2008: obs. 1 ind. torpid, 26 February 2009: obs. 4 inds. torpid, 2 August 2009: obs. 1 ind. (cf. Horáček et al. 2008, 2009, Benda et al. 2011b, Dool et al. 2013, Benda & Gaisler 2015); – Wadi Jilo, caves in a quarry ca. 1 km SE of the village [21], 22 March 2009: obs. 3 inds. torpid, coll. 1 fs, NMP, 29 March 2009: obs. 3 inds. (cf. Benda et al. 2011b, Benda & Gaisler 2015). – L u b n a n E s h S h a m a l i: Bcharre, Qadisha Cave [22], 23 January 2007: obs. 8 inds. torpid, coll. 1 ma, 1 fs, NMP, 21 March 2009: obs. 5 inds. torpid (cf. Horáček et al. 2008, Benda et al. 2011b, Dool et al. 2013, Benda & Gaisler 2015); – Haqel El Aazime, Achou Cave [23], 21 January 2007: obs. 6 inds. torpid (exam. 2 ma, 1 ms, 2 fs), coll. 1 ma, 1 fs, NMP, 18 January 2008: obs. 4 inds. torpid, 18 February 2009: obs. 1 ind. torpid (cf. Horáček et al. 2008, 2009, Benda et al. 2011b, Dool et al. 2013, Benda & Gaisler 2015); – Qezhaya, Mar Bichay Hermitage [24], cave behind a chapel, 23 April 2006: obs. 8 inds. (cf. Horáček et al. 2008); – Ras Nhach, mine near the Musailha Fort [25] (Fig. 21), 16 March 2009: obs. 2 inds. torpid (cf. Horáček et al. 2009); – Seraal, Qadisha Valley [26], small cave, 10 June 2010: obs. a colony of 23 inds. (Fig. 12), coll. 1 fa, NMP (cf. Benda et al. 2011b, Benda & Gaisler 2015). – N a b a t i y e: El Khiam, ruins of a subterranean hospital [27], 6 June 2010: obs. 1 ind. active; – Hasbaya, castle [28], 1 August 2009: obs. 1 ind. torpid. – **Published data**: E l B e q a a: Machghara [29], 9 April 1960: 1 ind., HZM (Harrison 1964). – J e b e l L u b n a n: Afqaa [5], 8 February 2013: obs. 9 inds. (Abi-Said 2014); – 1 km N.W. Ain Anoub [30], 2 inds., AUB (Atallah 1977); – Al Rwaiss [9], 8 February 2013: obs. 5 inds. (Abi-Said 2014); – Antelias, 22 April [Cave] [31], 24 December 2012: obs. 2 inds. (Abi-Said 2014); – Baakleen, Howet Wadi Aldayr [32], 9 February 2013: obs. 1 ind. (Abi-Said 2014); – Beit el Dine [33], tunnel under a house, 7 September 1960: 1 m, AUB (Lewis & Harrison 1962, Atallah 1977, Benda et al. 2011b, Benda & Gaisler 2015); Beit-Eddîne (Tohmé & Tohmé 1985); – Besri, Alwataweet Cave [34], 29 December 2012: obs. 3 inds. (Abi-Said 2014); – Hrajel, Seraya [12], 30 December 2012: obs. 5 inds. (Abi-Said 2014); – Lasa, Salem Cave [35], 8 February 2013: obs. 4 inds. (Abi-Said 2014); – Moukhtara, Mogharet el-Bzouz [36], July 1974: 1 fG (Tohmé & Tohmé 1985); – Naba'a Al Mghara [37], 30 December 2012: obs. 5 inds. (Abi-Said 2014). – L u b n a n E l J a n u b i: Al Reehan [38], 21 December 2012: obs. 1 ind. (Abi-Said 2014); – Mgharet Fakherdeen [39], 10 February 2013: obs. 1 ind. (Abi-Said 2014). – L u b n a n E s h S h a m a l i: Akroum Cave [40], 26 December 2012: obs. 5 inds. (Abi-Said 2014); – Berquayel Cave [41], 3 December 2012: obs. 2 inds. (Abi-Said 2014); – Bqerzia [= Bqerzala] [42], cave (Horáček et al. 2008); – Chekka, Msailha gallery [25], 28 February 2013: obs. 2 inds. (Abi-Said 2014); – Kfarshgab [43], church, 22 February 2013: obs. 300 inds. (Abi-Said 2014); – Koura, Deir Mahwet [44], 28 February 2013: obs. 1 ind. (Abi-Said 2014); – Nabes es Soukar [= Nabaa Es Soukkar], Ksam Cave [45], January 2003: obs. ca. 50 inds. (Horáček et al. 2008); – Qadeesha [22], 22 February 2013: obs. 15 inds. (Abi-Said 2014); – Qezhaya, Yousef Karam [24], 19 February 2013: obs. 2 inds. (Abi-Said 2014); – Qnat Cave [46], 19 February 2013: obs. 10 inds. (Abi-Said 2014); – Zebdeen Cave [47], 16 January 2013: obs. 1 ind. (Abi-Said 2014). – N a b a t i y e: Marjayoun [48], abandoned stone building, 9 April 1960: 1 m (Lewis & Harrison 1962). – Lebanon (undef.): Lebanon, 1 ind., FMNH (DeBlase 1980); – Lebanon, 4 inds. (Shehata et al. 2016).

Comments. *Rhinolophus hipposideros* is a very common bat in Lebanon, it is the third most frequent bat species of the country, recorded from 48 localities (Table 1). This species belongs to the most widespread bats of Lebanon, its localities are scattered across the whole country (Fig. 8). Generally, the distribution pattern of *R. hipposideros* is very similar to that of *Rhinolophus ferrumequinum* (Fig. 7). The present picture of *R. hipposideros* occurrence is quite different from that presented by Lewis & Harrison (1962), who reported only two records of this bat from the country and considered it a rare species in Lebanon. In the south-eastern part of the country, including the El Hasbani Valley, *R. hipposideros* was found even as the most common local bat.

R. hipposideros belongs to the common and widespread bats of the Mediterranean part of the Middle East (Harrison & Bates 1991, Benda et al. 2006, 2012a). The Lebanese part of the distribution range of *R. hipposideros* continues in rather dense occurrence southward, eastward and northward. This bat is distributed in the mountains of Sinai and the hilly areas of the central and northern parts of Palestine, north-western Jordan as well as the Golan Heights (Mendelssohn & Yom-Tov 1999, Benda et al. 2006, 2008, 2010) and also of the western part of Syria (Benda et al. 2006, Shehab et al. 2006, 2007). *R. hipposideros* is known from the Syrian part of the Anti-Lebanon Mts. (Benda et al. 2006) and these records depict the eastern margin of its known distribution in the central part of the Levant.

In Lebanon, *R. hipposideros* is distributed across almost the whole altitudinal gradient of the country (spread over a rather broad range of 1725 m; altitude median 875.0 m, mean 835.2 m

Fig. 11. Entrance to the Kenaan Cave situated in a quarry wall in Antelias (Jebel Lubnan). A roost of a medium-sized colony of *Rousettus aegyptiacus* and of individuals of *Rhinolophus hipposideros* and *R. euryale*; the quarry is a foraging habitat of *Hypsugo savii* and *Tadarida teniotis*. Photo by I. Horáček (January 2007).

a. s. l.; Table 2) with the exception of the highest parts of the main mountain ranges. The highest recorded locality of *R. hipposideros* in Lebanon is the Raymond Cave near Faraya (Lebanon Mts.) at 1770 m a. s. l. (Fig. 51), where three males were netted. The records from roosts absolutely prevail among the findings of *R. hipposideros* in Lebanon (91.7%, n=44) and the altitudinal range of roost sites conforms to the range of all records (1675 m), their median and mean altitude values are 801.5 m and 809.8 m a. s. l., respectively. These values for hibernation roosts are much higher than those for the summer records, 1037.5 m and 862.4 m a. s. l., respectively (n=32). It seems thus that *R. hipposideros* prefers to roost in Lebanon in the areas of higher altitudes and to hibernate in roosts situated even in montane positions.

R. hipposideros was found to roost in Lebanon mainly in natural caves of very variable size and position (70.5%, n=31; hibernacula 77.4%, n=24; see Fig. 11), while the man-made underground spaces (mines, tunnels, dark parts of abandoned buildings) represented less than a third of the roost number (29.5%, n=13). However, most of the records of roosting bats (both in the summer and winter seasons) represent findings of individuals or a few bats only. Larger numbers of hibernating bats (n>10) in one space were documented exceptionally (Table 6), only in four sites and only above 1000 m a. s. l. – in two natural caves (Qadisha Cave, 1720 m; Ksam Cave, 1370 m), in an extensive system of abandoned mines (Marjaba, ca. 1120 m) and in a church (Kfar Sghab, 1287 m). At the latter site (Kfar Sghab), the largest winter aggregation of *R. hipposideros* in Lebanon was found, comprising around 300 individuals (Abi-Said 2014). The groups of 6–10 individuals in one hibernaculum were found only slightly more frequently – at five sites (four of them in caves) in the altitudinal range of 710–1370 m a. s. l. A maternity colony of *R. hipposideros* was documented in Lebanon only once, 23 individuals (pregnant females and adult females with attached juveniles) were found to roost in a small cave near Seraal (at 570 m a. s. l.) on 10 June (Fig. 12).

External and cranial dimensions of the Lebanese specimens of *R. hipposideros* are shown in Table 7. For the material examined see below.

Table 6. Numbers of *Rhinolophus hipposideros* in particular roosts per particular checks; W 2013 – checks during the winter 2012–2013 (Abi-Said 2014)

roost	IV 2006	*VI 2006*	I 2007	I 2008	II 2009	III 2009	*VIII 2009*	*VI 2010*	*X 2012*	W 2013	min	max	n checks
Aaonamie Cave	–	–	–	1	0	3	–	–	–	–	0	3	3
Achou Cave	–	–	6	4	1	–	–	–	–	–	1	6	3
Afqa Cave	0	*0*	6	9	4	–	–	*0*	*0*	9	0	9	8
Baalbek, ruins	0	–	0	1	–	–	–	–	–	–	0	0	3
El Heskan Cave	–	–	–	0	–	–	–	–	*1*	0	0	1	3
El Qana Cave	–	–	2	2	0	–	–	–	–	0	0	2	4
Er Roueiss Cave	–	*0*	1	2	4	–	–	–	–	5	0	5	5
Marjaba, mines	–	–	16	7	3	3	–	–	*1*	0	0	16	6
Mebaaj Cave	–	–	6	–	–	–	–	–	*4*	–	4	6	2
Musailha mine	–	*0*	0	0	–	2	–	*0*	*0*	2	0	2	7
Pont El Khalass, house	–	*0*	–	1	4	–	*1*	–	–	–	0	4	4
Qadisha Cave	–	–	8	–	–	5	–	–	–	15	5	15	3
Saleh Cave	–	*0*	3	0	2	1	*0*	*3*	*0*	0	0	3	9
Seraaya Cave	–	–	3	3	4	–	–	–	–	5	3	5	4
Wadi Jilo, caves	–	–	–	–	–	3	*0*	–	–	0	0	3	3

in *italics*, checks in the summer season; Roman numerals denote months, Arabic numerals denote years

Table 7. Basic biometric data on the examined Lebanese samples of *Rhinolophus hipposideros* (Borkhausen, 1797), *R. euryale* Blasius, 1853 and *R. blasii* Peters, 1866. For abbreviations see p. 213

	Rhinolophus hipposideros					*Rhinolophus euryale*					*Rhinolophus blasii*				
	n	**M**	min	max	SD	n	**M**	min	max	SD	n	**M**	min	max	SD
LAt	28	**37.67**	35.3	39.4	1.045	41	**45.91**	43.9	51.5	1.358	8	**47.33**	45.9	48.7	0.936
LaFE	26	**7.18**	6.7	7.7	0.223	22	**6.35**	5.2	7.4	0.714	8	**8.46**	8.1	8.8	0.239
LCr	14	**15.88**	15.46	16.14	0.242	24	**18.40**	17.67	19.38	0.333	6	**19.58**	19.32	19.77	0.182
LCO	20	**15.07**	14.61	15.34	0.200	11	**18.14**	17.69	18.82	0.330	7	**19.01**	18.74	19.22	0.183
LCc	20	**13.45**	13.02	13.74	0.176	36	**15.63**	15.17	16.51	0.266	7	**16.70**	16.49	16.87	0.138
LaZ	20	**7.25**	6.94	7.45	0.127	36	**9.07**	8.74	9.49	0.201	7	**9.08**	8.94	9.24	0.110
LaI	20	**1.53**	1.38	1.69	0.095	35	**2.25**	2.10	2.42	0.089	7	**2.28**	2.15	2.34	0.068
LaInf	20	**3.49**	3.31	3.65	0.086	11	**4.54**	4.35	4.76	0.112	7	**4.63**	4.35	4.76	0.147
LaN	20	**6.41**	6.13	6.58	0.127	36	**8.12**	7.86	8.41	0.144	7	**8.30**	8.21	8.43	0.097
LaM	20	**7.25**	7.03	7.43	0.115	11	**9.22**	9.07	9.41	0.101	7	**9.05**	8.84	9.18	0.114
AN	20	**4.56**	4.23	4.76	0.145	36	**5.81**	5.39	6.11	0.191	7	**6.13**	5.96	6.24	0.107
LBT	20	**2.33**	2.12	2.57	0.120	11	**3.03**	2.81	3.36	0.160	7	**3.15**	2.83	3.56	0.222
CC	19	**3.47**	3.34	3.72	0.095	36	**4.31**	3.94	4.63	0.175	7	**4.48**	4.34	4.69	0.116
M^3M^3	20	**5.26**	5.07	5.47	0.111	36	**6.36**	6.10	6.71	0.152	7	**6.42**	6.27	6.59	0.133
CM^3	20	**5.28**	5.04	5.47	0.098	36	**6.06**	5.84	6.58	0.138	7	**6.66**	6.46	6.82	0.115
LMd	20	**9.49**	9.13	9.83	0.166	35	**11.24**	10.83	11.84	0.189	7	**11.83**	11.75	11.91	0.075
ACo	20	**2.01**	1.81	2.19	0.103	35	**2.45**	2.27	2.62	0.086	7	**2.66**	2.57	2.76	0.061
CM_3	20	**5.42**	5.05	5.61	0.120	35	**6.41**	6.19	6.87	0.130	7	**6.96**	6.87	7.09	0.078

Material examined. 2 ♂♂ (NMP 91806 [S+A], 91807 [A]), Aamchit, Saleh Cave, 28 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♂ (NMP 93709 [S+A]), Aamchit, Saleh Cave, 25 March 2009, leg. T. Bartonička, P. Benda, I. Horáček & R. Lučan; – 1 ♂, 1 ♀ (NMP 93552 [S+A], 93553 [A]), Aanjar, Aanjar Cave, 5 June 2010, leg. P.

Fig. 12. A maternity colony of *Rhinolophus hipposideros* composed of 23 individuals, discovered in a small cave near Seraal in the terminal part of the Qadisha Valley (Lubnan Esh Shamali) on 10 June 2010. Photo by M. Uhrin.

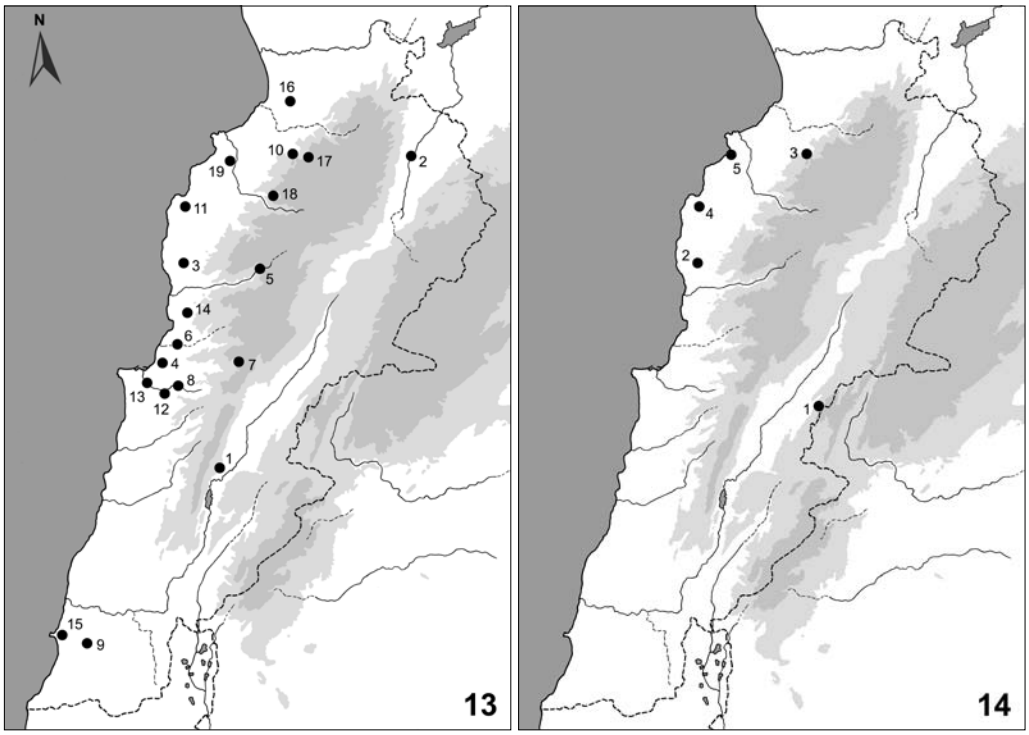
Benda & M. Uhrin; – 1 ♀ (NMP 91782 [S+A]), Afqa Cave, 22 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♂ (NMP 91798 [S+A]), Antelias, Kenaan Cave, 25 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♂ (AUB M170 [B]), Beit ed Dine, tunnel under building, 7 September 1960, leg. J. E. Stencel; – 1 ♀ (NMP 93711 [A]), Dahr El Mghara, Aaonamie Cave, 28 March 2009, leg. T. Bartonička, P. Benda, I. Horáček & R. Lučan; – 1 ♂ (NMP 91775 [S+A]), Er Roueiss Cave, 22 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♂ (NMP 91801 [A]), Faraya, El Qana Cave, 27 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 2 ♂♂ (NMP 93537, 93538 [S+A]), Faraya, Raymond Cave, 2 June 2010, leg. P. Benda & M. Uhrin; – 1 ♂, 1 ♀ (NMP 91769 [A], 91770 [S+A]), Haqel El Azime, Achou Cave, 21 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♂ (NMP 91802 [A]), Hrajel, Seraaya Cave, 27 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♂ (NMP 91906 [S+A]), Hrajel, Seraaya Cave, 20 January 2008, leg. P. Benda, I. Horáček, R. Lučan & M. Uhrin; – 1 ♀ (NMP 95792 [S+A]), Jezzine, Pont El Khalass, 23 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 3 ♂♂, 1 ♀ (NMP 91753–91755 [S+A], 91756 [A]), Marjaba, mine, 19 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♂ (NMP 91809 [S+A]), Nabaa Es Safa, mine, 29 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♂, 1 ♀ (NMP 91789, 91790 [S+A]), Qadisha Cave, 23 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♀ (NMP 93706 [S+A]), Wadi Jilo, 22 March 2009, leg. T. Bartonička, P. Benda, I. Horáček & R. Lučan; – 1 ♀ (NMP 93577 [S+A]), Seraal, 10 June 2010, leg. P. Benda & M. Uhrin; – 1 ♂ (NMP 91786 [S+A]), Tourzaiya, Mebaaj Cave, 23 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan.

Records of ectoparasites. **Original data**: T r o m b i c u l i d a e: *Hirsutiella willmanni*: 7 larvae (CMŠ [A, P]) from 1 ma (NMP 93537), Faraya, Raymond Cave, 2 June 2010 (det. S. Kalúz).

Comments on ectoparasites. A unique record of the chigger mite *Hirsutiella willmanni* (Wharton et Fuller, 1952) was made from *R. hipposideros* in Lebanon. This parasite is known only from Poland, where it parasitises rodents of the family Cricetidae; its records from other parts of central Europe are considered doubtful and records from southern Europe (cf. Kolebinova 1992) in a need of revision, see Stekol'nikov (2001). The finding reported here represents the first record of this mite from Lebanon as well as from the whole Middle East, and also its first evidence from *R. hipposideros* and most probably from a bat as well.

Rhinolophus euryale Blasius, 1853

Records. **Original data**: E l B e q a a: Khirbet Qanafar, El Jaouz Cave [1], 9 June 2010: obs. (and det. calls of) 2 active inds.; – Ras El Assi, Deir Mar Maroun Monastery [2] (Fig. 17), 29 June 2006: net. 1 fa, 1 fs, NMP (cf. Horáček et al. 2008 [as *R. blasii*], Benda et al. 2006). – J e b e l L u b n a n: Aamchit, Saleh Cave [3] ["cave 2 km E Amchite"], 13 October 1960: 3 ma, 1 ms, 9 fa, 7 fs, AUB (leg. R. E. Lewis), Aamchit, Saleh Cave (Fig. 26), 28 January 2007: obs. 6 inds. torpid, coll. 2 ma, 1 fa, NMP, 14 March 2009: obs. ~40 inds., net. 3 ma, 5 fa, det. calls of several foraging inds., coll. 5 ma, NMP, 25 March 2009: net. 3 ma, 1 faG, 31 May 2010: obs. (and det. calls of) 2 active inds., 26 October 2012: obs. 2 inds. torpid, net. 8 inds. (exam. 4 ma) (cf. Horáček et al. 2008); – Antelias, Kenaan Cave [4] (Fig. 11), 23 October 2012: obs. 3 inds.; – El Aaqoura, Er Roueiss Cave [5] (Fig. 55), 26 June 2006: net. 1 ms, NMP (cf. Benda et al. 2006, Horáček et al. 2008); – Jeita, Jeita Cave [6], 26 January 2007: bone remains of 1 ind. in the cave deposit; – Majdel Tarshish, Qattine Aazar Chasm [7], 7 June 2010: obs. (and det. calls of) 1 active ind. at the cave entrance; – Ras El Matn, El Heskan Cave [8], 31 October 2012: obs. a group of ca. 5 inds. torpid (exam. 1 fs). – L u b n a n E l J a n u b i: Wadi Jilo [9], caves in a quarry ca. 1 km SE of the village, 22 March 2009: obs. 1 active ind. – L u b n a n E s h S h a m a l i: Haqel El Aazime, Achou Cave [10], 21 January 2007: obs. 2 inds. torpid, coll. 2 fs, NMP (cf. Horáček et al. 2008); – Ras Nhach, Musailha Fort [11] (Fig. 21), 28 June 2006: net. 1 ind. (cf. Horáček et al. 2008). – **Published data**: J e b e l L u b n a n: Abadieh, Al Heskan [8], 22 January 2013: obs. 15 inds. (Abi-Said 2014); – at Amchite [3], winter months (Lewis & Harrison 1962); Mogharet Saleh, 2 km E Amchite, 16 August 1968: 1 ind. (Atallah 1970); 2 km E of Amchite, 2 inds., FMNH (DeBlase 1972); Mogharet Saleh, near Amchite, 9 inds., AUB, SAC (Atallah 1977); 2 km east of Amchite (Harrison & Bates 1991); Mogharet Saleh, 2 km E of Amchite, 18 March 1961 & 17 April 1965: 4 m, 1 f, AUB (Benda et al. 2006); – Nr. Araya [= Aaraiya] [12], 12 km ESE of Beirut, 5 August 1960: 2 m, 3 f, HZM (Harrison 1964); near Aranya (Harrison & Bates 1991); – Nr. Roman Aquaduct [13], 10 km E of Beirut, 13 August 1960: 2 m, 3 f, BMNH, HZM (Harrison 1964, DeBlase 1972); Cave, near Roman Aqueduct, 6 km E. Beirut, 16 inds., AUB (Atallah 1977); Nahr Beyrouth, l'aqueduc de Zénobie, 2 inds. (Tohmé & Tohmé 1985); cave near Roman Aquaeduct, 10 km east of Beirut (Harrison & Bates 1991); Roman Aquaduct, 2 km NE Hazmiye, 30 July & 5 August 1960: 1 m, 1 f, AUB (Benda et al. 2006); – Nammoura, Kfour [14], Kesraoune (Mogharat Biz es-Sigara), 6 March 1985: 2 f (Tohmé & Tohmé 1985). – L u b n a n E l J a n u b i: tombs behind Tyre [15] (Tristram 1884). – L u b n a n E s h S h a m a l i: Bqerzia [= Bqerzala] [16], cave (Horáček et al. 2008); – Nabes



Figs. 13, 14. Records of particular bat species in Lebanon. 13 – *Rhinolophus euryale* Blasius, 1853. 14 – *Rhinolophus blasii* Peters, 1866.

es Soukar [= Nabaa Es Soukkar] [17], Ksam Cave, January 2003: obs. ca. 50 inds. (Horáček et al. 2008); – Qezhaya, Yousef Karam [18], 19 February 2013: obs. 3 inds. (Abi-Said 2014); – Tripoli, Alhab Cave [19], 2 February 2013: obs. 15 inds. (Abi-Said 2014). – Lebanon (undef.): various localities throughout the Republic of Lebanon, 9 m, 14 f (Lewis & Harrison 1962); – Lebanon, 16 inds., BMNH, FMNH (DeBlase 1980).*

Comments. *Rhinolophus euryale* is a moderately frequent bat in Lebanon, it was recorded from 19 localities (Table 1); however, it represents one of the most widespread bats of Lebanon, its localities are scattered across a big part of the country (Fig. 13). This conforms to the conclusion by Lewis & Harrison (1962), who considered *R. euryale* to be distributed throughout the whole territory of Lebanon, albeit they did not specify the number of its records (Table 1). Although most of *R. euryale* records are available from the north-western slopes of the Lebanon Mts. and adjacent coastal plains, several findings were made also in southern Lebanon as well as in the El Beqaa and Orontes Valleys (Fig. 13).

R. euryale is broadly distributed in the Mediterranean parts of the Middle East, where this bat reaches the southern margin of its whole distribution range (Harrison & Bates 1991, Benda et al.

*Atallah (1977) included a HZM specimen of *Rhinolophus euryale* collected at Rosh HaNikra, Palestine (cf. Harrison 1964, DeBlase 1972) among the Lebanese records of this bat – he referred it to originate from Ras en Nakura, southern Lebanon. Anyway, this specimen/record was accepted and again reported as of Palestinian (Israeli) provenance by Harrison & Bates (1991) and Mendelssohn & Yom-Tov (1999).

Table 8. Numbers of *Rhinolophus euryale* in particular roosts per particular checks; W 2013 – checks during the winter 2012–2013 (Abi-Said 2014)

roost	*VI 2006*	I 2007	I 2008	II 2009	III 2009	*VIII 2009*	*VI 2010*	*X 2012*	W 2013	min	max	n checks
Achou Cave	–	2	0	0	–	–	–	–	–	0	2	3
El Heskan Cave	–	–	0	–	–	–	–	*5*	15	0	15	3
Saleh Cave	*0*	6	0	0	40	*0*	*2*	*2*	0	0	40	9
Wadi Jilo, caves	–	–	–	–	1	*0*	–	–	0	0	1	3

in *italics*, checks in the summer season; Roman numerals denote months, Arabic numerals denote years

2006, 2012a), its Lebanese range continues in scarce occurrence both southward and northward. This bat is rather rarely found in central and northern Palestine (Mendelssohn & Yom- Tov 1999), more findings are known from the north-western part of Jordan (Benda et al. 2010), while no records are available from south-western Syria, including the Golan Heights and the Anti-Lebanon Mts. (Benda et al. 2006). In the western, Mediterranean part of Syria, only three localities were published (Benda et al. 2006, Shehab & Mamkhair 2006). The small section of *R. euryale* range in the north-western part of Lebanon is thus the only area of rather dense occurrence of this bat in the Levant and the eastern Mediterranean as well (see Benda et al. 2006).

In Lebanon, *R. euryale* is distributed across a medium-wide range of altitudes (1385 m; altitude median 316.0 m, mean 562.0 m a. s. l.; Table 2), the highest record comes from the Qattine Aazar Chasm (Lebanon Mts.) at 1420 m a. s. l. (summer 2010). In comparison with the more common species of the genus, *Rhinolophus ferrumequinum* and *R. hipposideros*, distributed rather in areas of higher altitudes in Lebanon (see above and Table 2), *R. euryale* obviously favours the lower regions of the country (Table 2). The records from roosts prevail in the list of findings of *R. euryale* in Lebanon (73.7%, n=15) and the altitudinal range of roost sites is identical to the range of all records, while the median and mean altitude values are somewhat smaller, 256.0 m and 530.8 m a. s. l., respectively. However, the summer and winter roosts differ markedly in their altitudes; while the median and mean altitude values of the summer roosts are lower than those for all roosts, 146.0 m and 465.1 m a. s. l., respectively (range 35–1420 m a. s. l., n=7), these values for the hibernation roosts are higher, 513.0 m and 591.5 m a. s. l., respectively (range 134–1370 m a. s. l., n=8).

R. euryale was found to roost in Lebanon mainly in natural caves of very variable size and position (80.0%, n=12; hibernacula 100%, n=8), man-made underground spaces (mine, monument, tomb) represented only a fifth of the roost number (20.0%, n=3). Smaller winter colonies (ca. 15 inds.) were found in two caves (134 m and 316 m a. s. l.; Table 8), a larger colony of ca. 50 bats, was observed in January 2003 in the Ksam Cave near Nabaa Es Soukkar, at ca. 1370 m a. s. l. (Horáček et al. 2008). No maternity colony of *R. euryale* was documented in details in Lebanon, a colony of at least 40 individuals including pregnant females was recorded in the Saleh Cave (at 146 m a. s. l.; Fig. 26) in March 2009.

External and cranial dimensions of the Lebanese specimens of *R. euryale* are shown in Table 7, the face and nose-leaf of a Lebanese individual is shown in Figs. 15, 16. For the material examined see below.

Material examined. 2 ♂♂, 1 ♀ (NMP 91803 [A], 91804, 91805 [S+A]), Aamchit, Saleh Cave, 28 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 5 ♂♂ (NMP 93684–93687 [S+A], 93688 [A]), Aamchit, Saleh Cave, 14 March 2009, leg. T. Bartonička, P. Benda, I. Horáček & R. Lučan; – 3 ♂♂ (AUB M166, M167 [S+B], M720 [A]), cave 2 km E Amchite, 18 March 1961, leg. R. E. Lewis; – 3 ♂♂, 1 ♀ (AUB M1167–M1170 [S+B]), cave 2 km E Amchite, 17 April


Figs. 15, 16. Portraits of a female *Rhinolophus euryale* found in the Achou Cave at Haqel El Aazime (Lubnan Esh Shamali) on 21 January 2007. Photo by R. Lučan.

1965, leg. R. E. Lewis; – 4 ♂♂, 16 ♀♀ (AUB M718 [17×S+A, 3×A]), cave 2 km E Amchite, 13 October 1960, leg. R. E. Lewis; – 1 ♀ (AUB M160 [S+B]), cave near Roman aqueduct, 2 km NE Hazmiyeh, 30 July 1960, leg. J. E. Stencel; – 1 ♂ (AUB M163 [S+B]), cave near Roman aqueduct, 2 km NE Hazmiyeh, 5 August 1960, leg. R. E. Lewis; – 1 ♀ (AUB M719 [A]), cave near Roman aque duct, 10 km E of Beirut, 13 August 1960, leg. R. E. Lewis; – 1 ♂ (NMP 95813 [S+A]), Er Roueiss Cave, 26 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 2 ♀♀ (NMP 91771, 91772 [S+A]), Haqel El Azime, Achou Cave, 21 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 2 ♀♀ (NMP 95841, 95842 [S+A]), Ras El Assi, Deir Mar Maroun Monastery, 29 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec.

Records of ectoparasites. **Original data**: N y c t e r i b i i d a e: *Nycteribia schmidlii*: 1 fa (CMŠ [A]) from 1 fs (NMP 95842), Ras El Assi, Deir Mar Maroun Monastery, 29 June 2006. – *Phthiridium biarticulatum*: 1 ma (CMŠ [A]) from 1 ms (NMP 95813), El Aaqoura, Er Roueiss Cave, 26 June 2006; – 3 ma (CMŠ [A]) from 1 fs (NMP 91771), Haqel El Azime, Achou Cave, 21 January 2007. – S p i n t u r n i c i d a e: *Eyndhovenia euryalis*: 1 ma (CMŠ [P]) from 1 fs (NMP 95842), Ras El Assi, Deir Mar Maroun Monastery, 29 June 2006.

Comments on ectoparasites. *Nycteribia schmidlii* Schiner, 1853 and *Phthiridium biarticulatum* (Hermann, 1804) belong among the bat flies that parasitise cave-dwelling bats (Hůrka 1980). The principal host of *N. schmidlii* is *Miniopterus schreibersii* (for details see below), but besides from *Rhinolophus euryale* and *M. schreibersii*, this bat fly was collected in Lebanon also from *Myotis capaccinii*, *Eptesicus serotinus*, *E. anatolicus* and *Hypsugo savii*. *P. biarticulatum* is a typical parasite of bats of the genus *Rhinolophus* and its record from *R. euryale* is not unusual. From Lebanon, it was collected also from *Rhinolophus ferrumequinum* (see above and Theodor 1967).

The mite *Eyndhovenia euryalis* (Canestrini, 1884) ranks among parasites of bats of the genus *Rhinolophus* (Rudnick 1960). Two subspecies of this mite are reported from the western Palaearctic (Lanza 1999, Stanyukovich 1997); the nominotypical form is known from Europe and Transcaucasia and *E. e. oudemansi* (Eyndhoven, 1941) from a very similar geographical range – the geographical limits of the two forms are not precisely known. The respective record from Lebanon belongs to *E. e. euryalis* and represents the first finding of this species from the country as well as from the whole Middle East.

Rhinolophus blasii Peters, 1866

Records. **Original data**: El Beqaa: Kfar Zabad, Kfar Zabad I Cave [1] (Fig. 20), 24 January 2007: obs. 27 inds. torpid (7 and 16 inds. in two colonies), coll. 2 ms, 1 fa, 1 fs, NMP, 21 January 2008: obs. 17 inds. torpid (cf. Horáček et al. 2008 [as *R. euryale*], Horáček et al. 2009, Benda & Gaisler 2015). – Jebel Lubnan: Aamchit, Saleh Cave [2] (Fig. 26), 22 January 2008: obs. 3 inds. torpid, coll. 1 fs, NMP, 14 March 2009: det. calls of several foraging inds. (cf. Horáček et al. 2009, Benda & Gaisler 2015). – Lubnan Esh Shamali: Haqel El Aazime, Achou Cave [3], 18 January 2008: obs. 1 ind. torpid, coll. 1 fa, NMP, 18 February 2009: obs. 2 inds. (cf. Horáček et al. 2009, Benda & Gaisler 2015); – Ras Nhach, mine at the Musailha Fort [4] (Fig. 21), 18 January 2008: obs. 1 ind. torpid, coll. 1 fs, NMP (cf. Horáček et al. 2009, Benda & Gaisler 2015); – Trablous, Matal El Azraq Cave [5] (Figs. 4, 5), 18 January 2008: obs. 1 ind. torpid, coll. 1 ms, NMP (cf. Horáček et al. 2009, Benda & Gaisler 2015). – **Published data**: El Beqaa: Kfarzabad [1], 23 February 2013: obs. 17 inds. (Abi-Said 2014).

Comments. *Rhinolophus blasii* is a rather rare bat in Lebanon, it was recorded only from five localities (Table 1). The records are dispersed in diverse parts of the country – on the western slopes of the Lebanon Mts. and the coastal hills, but also in the eastern part of the El Beqaa Valley (Fig. 14). *R. blasii* has been documented from Lebanon even recently, a hibernating colony of 27 bats was found in a cave in the slope of the Anti-Lebanon Mts. in winter 2007 (Horáček et al. 2008) and further winter records come from four other caves (Horáček et al. 2009).

R. blasii is broadly distributed in the Mediterranean parts of the Middle East (Harrison & Bates 1991, Benda et al. 2006, 2012a), its Lebanese range continues southward, eastward and northward. This bat is rather rarely found in central Palestine, but more commonly in the Upper Galilee (Mendelssohn & Yom-Tov 1999), and particularly numerous findings were made in the western part of Jordan (Benda et al. 2010). Only one record is available from south-western Syria and other two localities are known from the western, Mediterranean part of Syria (Benda et al. 2006); however, no finding was made in the Golan Heights (Mendelssohn & Yom-Tov 1999, Benda et al. 2006). Thus, the new records from Lebanon fill the geographical gap between the rather numerous records of *R. blasii* in the Holy Land and the very scarce findings in the north-western Levant.

In Lebanon, *R. blasii* is distributed at lower altitudes (altitude median 146.0 m, mean 436.8 m a. s. l.; the median altitude is the lowest among the Lebanese bats, see Table 2), spread over a rather narrow altitude range (1253 m; Table 2), the highest recorded locality is the Kfar Zabad I Cave (Anti-Lebanon Mts.) at 1268 m a. s. l. (Fig. 20). This bat was recorded in Lebanon only from hibernacula (Table 9); besides the latter site localised at a low montane position of the Anti-Lebanon Mts., the remaining localities lie at low altitudes of north-western Lebanon (Fig. 14) in the range of 15–710 m a. s. l. (median 95.5 m, mean 229.0 m). Except for a short mine at the Musailha Fort near Ras Nhach (Fig. 21), all roosts are natural caves of rather small dimensions. Larger numbers of hibernating individuals of *R. blasii* were documented only in the Kfar Zabad I Cave, where during three winter checks (2007, 2008, 2013), 27, 17, and 17 bats were found, respectively. In all remaining hibernacula only single bats were recorded.

External and cranial dimensions of the Lebanese specimens of *R. blasii* are shown in Table 7, the face and nose-leaf of a Lebanese individual is shown in Fig. 22. For the material examined see below.

Material examined. 1 ♀ (NMP 91908 [S+A]), Aamchit, Saleh Cave, 22 January 2008, leg. P. Benda, I. Horáček, R. Lučan & M. Uhrin; – 1 ♀ (NMP 91900 [S+A]), Haqel El Azime, Achou Cave, 18 January 2008, leg. P. Benda, I. Horáček, R. Lučan & M. Uhrin; – 2 ♂♂, 2 ♀♀ (NMP 91792 [A], 91793–91795 [S+A]), Kfar Zabad, cave, 24 January 2007, leg.

←

Figs. 17–19. The Orontes (Nahr El Assi) river valley at Ras El Assi (El Beqaa), ca. 700 m a. s. l. 17 – Deir Mar Maroun (Cave) Monastery. 18 – Ein El Zarqa spring and the river valley above the spring. 19 – the river valley with the El Hermel town in background. At the Ein El Zarqa spring, at the Monastery and in the valley, a rich bat community was documented during several visits, composed of *Rhinolophus ferrumequinum*, *R. euryale*, *Myotis emarginatus*, *M. capaccinii*, *Hypsugo savii*, *Pipistrellus pipistrellus*, *P. kuhlii*, *Miniopterus schreibersii*, and *Tadarida teniotis*. Photos by M. Uhrin (June 2010).

Table 9. Numbers of *Rhinolophus blasii* in particular roosts per particular checks; W 2013 – checks during the winter 2012–2013 (Abi-Said 2014)

roost	*VI 2006*	I 2007	I 2008	II 2009	III 2009	*VIII 2009*	*VI 2010*	*X 2012*	W 2013	min	max	n checks
Saleh Cave	*0*	0	3	0	0	*0*	*0*	*0*	0	0	3	9
Achou Cave	–	0	1	2	–	–	–	–	–	0	2	3
Kfar Zabad I Cave	–	27	17	–	–	–	–	–	17	17	27	3
Musailha, mine	*0*	0	1	–	0	–	*0*	*0*	0	0	1	7
Matal El Azraq Cave	–	0	1	0	0	*0*	*0*	*0*	0	0	1	8

in *italics*, checks in the summer season; Roman numerals denote months, Arabic numerals denote years

P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♀ (NMP 91897 [S+A]), Musailha Fort, mine, 18 January 2008, leg. P. Benda, I. Horáček, R. Lučan & M. Uhrin; – 1 ♂ (NMP 91898 [S+A]), Trablous, Matal El Azraq Cave, 18 January 2008, leg. P. Benda, I. Horáček, R. Lučan & M. Uhrin.

Taphozous nudiventris Cretzschmar, 1830

Comments. Three old specimens of *Taphozous nudiventris* labelled to possibly originate from Lebanon were found in the collection of the Natural History Museum Vienna (NMW), see Material examined below and Benda & Engelberger (2016). One specimen (NMW 19112) was linked to the NMW acquisition entry concerning a series of mammal specimens obtained from the Zoo-

Fig. 20. A view of the El Beqaa Valley and the Lebanon Mts. from entrance of the Kfar Zabad I cave (in the western slope of the Anti-Lebanon Mts.), the most important hibernaculum of *Rhinolophus blasii* in Lebanon (El Beqaa). Photo by I. Horáček (January 2007).

Fig. 21. The Nahr El Jaouz river valley at Ras Nhach with the Musailha Fort (Lubnan Esh Shamali). In the fort and in a small mine nearby (on the picture, the mine entrance is hidden behind the castle cliff), roosting individuals of *Rhinolophus ferrumequinum*, *R. hipposideros*, *R. blasii*, and *Miniopterus schreibersii* were found. During a netting session inside the Fort in June 2006, *Rhinolophus euryale* and *Eptesicus anatolicus* were caught. In the valley, calls of foraging individuals of *Hypsugo savii*, *Pipistrellus pipistrellus*, and *P. kuhlii* were recorded. Photo by I. Horáček.

Fig. 22. A male *Rhinolophus blasii* found in a small mine near the Musailha Fort at Ras Nhach (Lubnan Esh Shamali) on 18 January 2008. Photo by M. Uhrin.

logical Museum Berlin (ZMB) in 1825 and collected by W. Hemprich and C. Ehrenberg during their journey across north-eastern Africa and the Middle East in 1820–1825 (see also Comments on *Rousettus aegyptiacus* and *Rhinolophus ferrumequinum*). Other two specimens (NMW 8522, 8523) were linked to the acquisition entry concerning a series of specimens obtained from Theodor Kotschy (1813–1866) in 1845, collected during his expedition to the Middle East in 1836.

Benda & Engelberger (2016) broadly discussed credibility of the aligned Lebanese provenance of these bats, but did not find any direct or even indirect evidence which could confirm the statement on their modern labels showing their (possible) origin in Lebanon. While the specimens NMW 8522 and 8523 could not be linked to the collection by Kotschy (or any other) and their origin is more likely in Egypt or Nubia but really remains unknown, the specimen NMW 19112 belongs most probably to the respective series of specimens from the ZMB, collected by Hemprich and Ehrenberg, but its origin in Lebanon is uncertain (it can possibly come also from Egypt, Nubia, Sinai, and/or north-western Arabia). Hence, any of these specimens cannot be considered as a real evidence of *T. nudiventris* occurrence in Lebanon, which thus remains questionable.

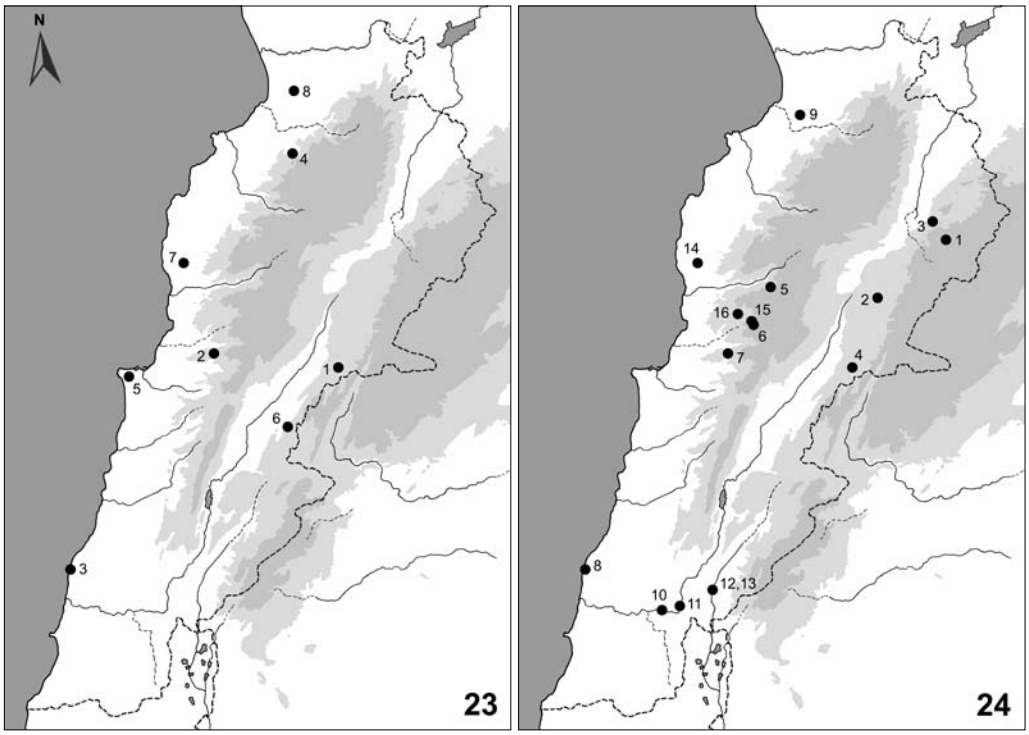
On the other hand, the presence of *T. nudiventris* in Lebanon is well possible. This bat was recorded to occur throughout the lower areas of central and northern Palestine (Mendelssohn & Yom-Tov 1999). In northern Palestine, the records are available from the Lake Tiberias region and the Yizre'el, Zevulun, and Hula Valleys (see the review by Benda et al. 2006). This range could well continue into southern Lebanon, namely to the El Hasbani Valley or to the eastern part of the El Litani Valley, where the environmental conditions are similar to the semi-arid areas of north-eastern Palestine.

Material examined. 1 ind. (NMW 19112 [S+B]), "Arabia et Syria" – zieml. sicher Baalbek, Libanon, 1824, leg. C. [= W] Hemprich & C. G. Ehrenberg; – 1 ♂, 1 ♀ (NMW 8522 [A], 8523 [S+A]), Beirut oder Baalbek, beide Libanon, October–December 1836, leg. Th. Kotschy.

Myotis myotis (Borkhausen, 1797)

Records. **Original data**: E l B e q a a: Jenta [1] (Fig. 27), mine, 5 June 2010: obs. 1 ind. roosting, at the mine entrance, 8 June 2010: net. 4 ma, coll. 2 ma, NMP. – J e b e l L u b n a n: Marjaba, mine [2], 19 January 2007: obs. 1 ind. torpid, coll. 1 ma, NMP (cf. Horáček et al. 2008). – L u b n a n E l J a n u b i: Aadloun, Aadloun Cave [3], 22 March 2009: remains of 3 inds. from *Tyto alba* pellets. – L u b n a n E s h S h a m a l i: Haqel El Aazime, Achou Cave [4], 21 January 2007: obs. 2 inds., coll. 1 ma, NMP (cf. Horáček et al. 2008). – **Published data**: B e i r u t: Beirut [?] [5], 1886: 2 f, NMW (Spitzenberger 1996). – E l B e q a a: Anjar [6], cave nr. source, 2 September 1968: obs. some 225 inds., coll. 24 inds., SAC (Atallah 1970); Cave near Anjar, 24 inds., SAC (Atallah 1977); Aanjar (Tohmé & Tohmé 1985); – [ruins of Baalbek (Lewis & Harrison 1962); Ruins of Baalbek, 2 inds., AUB (Atallah 1977); the respective AUB specimens were re-identified as *M. blythii*, see text]. – J e b e l L u b n a n: cave 2 km east of Amchite [7], 14 August 1960: 3 m, 2 f, BMNH, HZM, RLC (Harrison & Lewis 1961); 2 km E. Amchite (Lewis & Harrison 1962); 2 km E. of Amchite, 14 August 1960: 4 m, 4 f, 13 October 1960: 4 m, 4 f, BMNH, HZM (Harrison 1964, cf. Lewis & Harrison 1962); Mogharet Saleh, 2 km E Amchite, 16 August 1968: 8 inds. (Atallah 1970); Mogharet Saleh, 2 km E Amchite, 42 inds., AUB, BMNH, SAC (Atallah 1977); Aamchit (Tohmé & Tohmé 1985); Mogharet Saleh Cave, 2 km E of Amchite, 14 August 1960: 4 m, 3 f, AUB, BMNH (Benda et al. 2006). – L u b n a n E s h S h a m a l i: cave near Halba [8] [6 September 1960: 4 ma, 3 fa, AUB] (Lewis & Harrison 1962); Cave near Halba, 7 inds., AUB (Atallah 1977); Halba (Tohmé & Tohmé 1985).

Comments. *Myotis myotis* is an uncommon bat in Lebanon, it was recorded from seven to eight localities (Table 1). Although this number of records is not quite high, this species belongs to the most widespread bats of Lebanon, its localities are scattered across a relatively large part of the country (Fig. 23). This more or less conforms to the conclusion by Lewis & Harrison (1962: 480), who considered *M. myotis* a species which "doubtless occurs commonly wherever satisfactory retreats exist". The scarce records of *M. myotis* are available from the whole span of the coastal regions of Lebanon including two sites on the western slopes of the Lebanon Mts., other two records were made from the eastern part of the El Beqaa Valley (Fig. 23).



Figs. 23, 24. Records of particular bat species in Lebanon. 23 – *Myotis myotis* (Borkhausen, 1797). 24 – *Myotis blythii* (Tomes, 1857).

Lewis & Harrison (1962) and Atallah (1977) reported another record of *M. myotis* from the El Beqaa Valley, two specimens collected in the ruins of Baalbek and deposited in the collection of the American University Beirut (AUB). We examined the respective AUB specimens and revised their identification – the bats (AUB M668, M669) are prepared as alcohol specimens with extracted skulls, the skull M668 is badly damaged and only three standard dimensions could be taken from it. The forearm lengths of these bats (62.6 mm and 65.8 mm) are rather large, but both fall into the variation range of *M. blythii* from the Middle East (see Benda et al. 2006); while the smaller forearm value is below the variation range of *M. myotis* from Syria, Hatay, and Lebanon, the larger one falls into the zone of overlap of the ranges of the two species (Benda et al. 2006). The skull sizes rank both specimens between the variation ranges of the respective two species, however, much closer to (or at the upper margin of) the variation range of *M. blythii* (Fig. 25). Thus, we consider the respective bats to represent large individuals of *Myotis blythii*, rather than extremely small individuals of *M. myotis*.

Spitzenberger (1996) reported two female specimens from the Natural History Museum Vienna (NMW) to be collected in Beirut in 1886. Benda & Engelberger (2016) examined the NMW evidence concerning these bats, but did not find any direct record on their origin in Lebanon. It is clear that the specimens were collected by Austrian entomologists Franz J. Leuthner (1854–1918) and Karl M. Heller (1864–1945) in the area of the Levant between Jerusalem, Palestine, in the

south and Akbez, Turkey, in the north, in the period March–June 1885. The origin of the bats in Lebanon or even in Beirut is possible, but not certain. Here we keep their localisation in accordance with Spitzenberger (1996), but stress its preliminary status (for more details see Benda & Engelberger 2016). Anyway, the specimens conform in the body and skull sizes to other Levantine specimens of *M. myotis macrocephalicus* (cf. Fig. 25; see Benda et al. 2006), their origin in the Levant is thus indisputable.

M. myotis is a widespread but not common bat in the western part of the Middle East, where it reaches the southern and eastern margins of its whole distribution range (Harrison & Bates 1991, Spitzenberger 1996, Benda et al. 2006). The Lebanese part of the distribution range of *M. myotis* continues both southward and northward. Several records of this bat are available from the Mediterranean areas of northern Palestine (including the Upper Galilee and Hula Valley) and from the Golan Heights (Mendelssohn & Yom-Tov 1999, Benda et al. 2006) and also from the Mediterranean western part of Syria (Benda et al. 2006, Shehab et al. 2007). No records of *M. myotis* are known from the Syrian part of the Anti-Lebanon Mts. The El Beqaa Valley of Lebanon and the Golan Heights and Orontes Valley of Syria thus represent a part of the known eastern margin of *M. myotis* distribution range in Asia.

In Lebanon, *M. myotis* is distributed over a very narrow range of altitudes (1035 m), covering only a lower part of the altitudinal gradient of the country (altitude median 877.5 m, mean 722.7 m a. s. l.; Table 2). The highest recorded locality of *M. myotis* in Lebanon is the Aanjar Cave (Anti-Lebanon Mts.) at 1175 m a. s. l. (Fig. 33), which served as a summer roost of this bat in the 1960s (Atallah 1970). With the exception of a discovery of bone remains from owl pellets at Aadloun, all records of *M. myotis* from Lebanon represent findings from roosts. Most of the

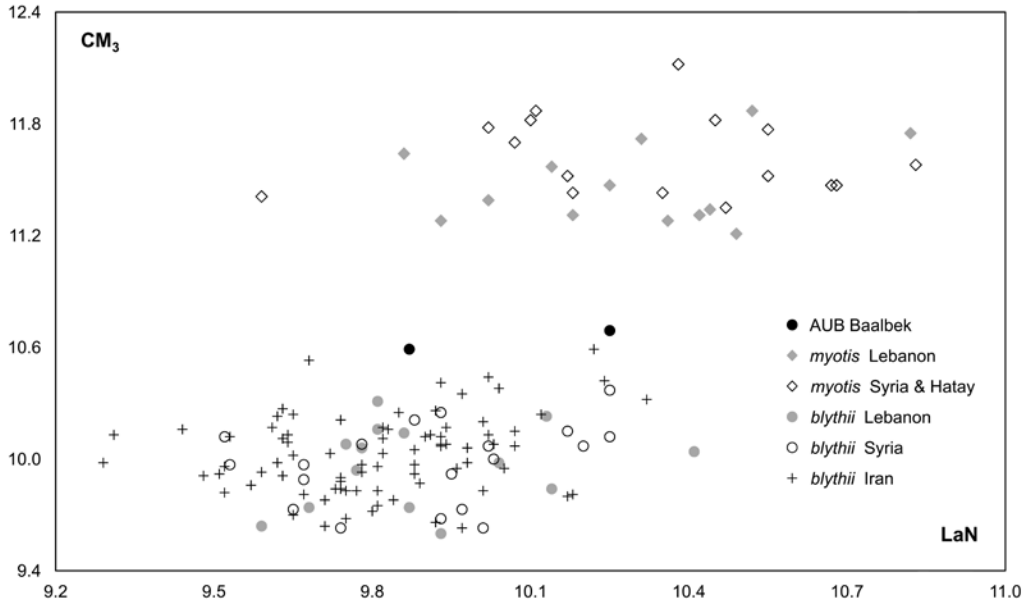


Fig. 25. Bivariate plot of the examined Levantine and Persian samples of the *Myotis myotis* group: width of braincase (LaN) against the length of lower tooth-row (CM_3).

Fig. 26. The Edde Valley east of Aamchit, where the Saleh Cave is situated at the right side of the canyon wall (Jebel Lubnan). This cave is one of the classical sites of bat research in Lebanon and the type locality of *Myotis myotis macrocephalicus* Harrison et Lewis, 1961. During numerous visits of the cave that started in the 1950s, colonies of *Rousettus aegyptiacus* and *Miniopterus schreibersii* and roosting individuals of *Rhinolophus ferrumequinum*, *R. hipposideros*, *R. euryale*, *R. blasii*, *Myotis myotis*, *M. blythii*, and *M. capaccinii* were documented there. Foraging individuals of *Myotis nattereri*, *Hypsugo savii*, *Pipistrellus kuhlii*, and *Tadarida teniotis* were netted at the cave entrance and recorded in the valley. Photo by I. Horáček.

roosts are natural caves (66.7%, n=4), only two roosts are abandoned mines. In Lebanon, *M. myotis* prefers to roost in areas situated at medium altitudes (Table 2). However, the summer and winter roosts differ markedly in their altitudes; while the median and mean altitude values of the summer roosts are lower than those of all roosts, 595.5 m and 626.5 m a. s. l., respectively (range 140–1175 m a. s. l., n=4), the altitudes of two available hibernacula are rather higher, 710 m and 1120 m a. s. l., respectively.

In the hibernation roosts, only single bats were found and no larger wintering aggregation of *M. myotis* was documented. On the other hand, the published data on the bats from summer roosts suggest possible findings of maternity aggregations – or rather their remains, respectively, since the records come from the late summer period of August–September. Atallah (1970) reported an observation of some 225 individuals of *M. myotis* in the Aanjar Cave on 2 September; Atallah (1977) mentioned 42 individuals of this species from the Saleh Cave near Aamchit (Fig. 26; at least eight of them were collected on 16 August, see Atallah 1970); and Atallah (1977) reported seven individuals from the cave near Halba, which, according to the AUB specimens, were four males and three females collected on 6 September.

Based on the specimens of *M. myotis* collected in the Saleh Cave near Aamchit in 1960, Harrison & Lewis (1961) described a separate subspecies of this bat, *M. myotis macrocephalicus*. This taxon has been traditionally considered to represent a large-sized form of this bat living in a limited area at the south-eastern margin of the species range, in the Mediterranean Levant and in Turkey south-east of the Taurus Mts. (Harison & Bates 1991, Spitzenberger 1996, Benda et al.

Table 10. Basic biometric data on the examined Lebanese samples of *Myotis myotis* (Borkhausen, 1797), *M. blythii* (Tomes, 1857) and *M. nattereri* (Kuhl, 1817). For abbreviations see p. 213

	Myotis myotis					*Myotis blythii*					*Myotis nattereri*				
	n	**M**	min	max	SD	n	**M**	min	max	SD	n	**M**	min	max	SD
LAt	25	**66.01**	62.2	69.7	2.059	23	**60.04**	55.4	65.8	2.506	9	**40.58**	38.8	42.4	1.172
LCr	13	**25.23**	24.81	25.93	0.415	15	**22.09**	21.47	23.67	0.526	8	**15.66**	14.68	16.17	0.489
LCb	14	**24.03**	23.58	24.58	0.399	15	**21.11**	20.62	22.41	0.453	8	**14.68**	14.23	14.94	0.245
LaZ	13	**15.92**	15.54	16.50	0.340	14	**14.23**	13.63	15.03	0.376	8	**9.99**	9.75	10.28	0.184
LaI	14	**5.21**	4.91	5.56	0.170	15	**5.23**	4.93	5.52	0.172	8	**3.60**	3.48	3.75	0.096
LaInf	14	**6.29**	5.82	6.67	0.217	14	**5.66**	5.34	6.12	0.255	8	**3.92**	3.67	4.34	0.205
LaN	14	**10.26**	9.86	10.82	0.279	16	**9.92**	9.59	10.41	0.221	8	**7.83**	7.31	7.98	0.224
LaM	14	**11.22**	10.75	11.61	0.235	14	**10.36**	10.02	10.67	0.191	8	**7.99**	7.81	8.26	0.176
AN	14	**8.49**	8.03	8.88	0.257	15	**7.72**	7.33	8.17	0.266	8	**5.67**	5.53	5.79	0.092
LBT	6	**4.42**	4.31	4.58	0.101	13	**3.72**	3.48	3.96	0.130	8	**2.88**	2.71	3.17	0.164
CC	14	**6.39**	6.21	6.73	0.151	15	**5.97**	5.59	6.38	0.218	7	**4.10**	3.89	4.33	0.160
M^3M^3	14	**10.20**	9.74	10.62	0.285	16	**9.20**	8.59	9.73	0.314	8	**6.31**	5.98	6.49	0.179
CM^3	14	**10.65**	10.37	11.03	0.204	17	**9.32**	8.98	10.09	0.286	7	**6.15**	6.04	6.31	0.098
LMd	14	**19.34**	18.83	19.92	0.337	16	**16.86**	16.32	17.68	0.388	8	**11.39**	11.19	11.68	0.157
ACo	14	**6.65**	6.37	6.92	0.162	16	**5.52**	5.28	6.31	0.250	8	**3.43**	3.26	3.54	0.111
CM_3	14	**11.46**	11.21	11.87	0.213	17	**9.62**	2.75	10.69	1.796	8	**6.54**	6.43	6.58	0.057

2006, Evin et al. 2008, etc.). However, this view has been recently challenged by the results of molecular genetic analyses, see Furman et al. (2013, 2014).

External and cranial dimensions of the Lebanese specimens of *M. myotis* are shown in Table 10. For the material examined see below.

Material examined. 2 ♀♀ (AUB M677, M678 [A]), cave near Amchite, 14 August 1960, leg. J. E. Stencel; – 3 ♂♂, 4 ♀♀ (AUB M182–M185, M188–M190, BMNH 61.403. [S+B], incl. the holotype of *Myotis myotis macrocephalicus* Harrison et Lewis, 1961), cave 2 kms E of Amchite, 14 August 1960, leg. R. E. Lewis; – 2 ♀♀ (NMW 26357, 26358 [S+A]), Beirut, 1886, leg. F. Leuthner; – 4 ♂♂, 3 ♀♀ (AUB M670–M676 [A]), cave near Halba, 6 September 1960, leg. J. E. Stencel; – 1 ♂ (NMP 91773 [S+A]), Haqel El Azime, Achou Cave, 21 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 2 ♂♂ (NMP 93567, 93568 [S+A]), Jenta, 8 June 2010, leg. P. Benda & M. Uhrin; – 1 ♂ (NMP 91757 [S+A]), Marjaba, mine, 19 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan.

Records of ectoparasites. **Original data**: N y c t e r i b i i d a e: *Nycteribia latreillii*: 1 ma, 1 fa (CMŠ [A]) from 2 ma (NMP 93567–93568), Jenta, 8 June 2010. – *Penicillidia dufourii*: 1 ma (CMŠ [A]) from 1 ma (NMP 91773), Haqel El Azime, Achou Cave, 21 January 2007. – I x o d i d a e: *Ixodes vespertilionis*: 1 nymph (CMŠ [A]) from 1 ma (NMP 93567), Jenta, 8 June 2010. – **Published data**: M a c r o n y s s i d a e: *Ichoronyssus scutatus*: 1 ma from *Myotis myotis* or *Myotis blythii* [= *M. myotis*], cave near Amchite, 13 October 1960 (Radovsky 1967). – *Macronyssus granulosus*: 1 ma, 9 fa, 2 protonymphs from *Myotis myotis* or *Myotis blythii* [= *M. myotis*], cave near Amchite, 13 October 1960 (Radovsky 1967).

Comments on ectoparasites. The bat fly *Nycteribia latreillii* (Leach, 1817) is a parasite of bats of the *Myotis myotis* group (Hůrka 1980), it is distributed in the whole western Palaearctic up to eastern Kazakhstan, including the Middle East. From Lebanon, it is here reported for the first time, it was collected from two bat species, besides *M. myotis* also from *Miniopterus schreibersii*. *Penicillidia dufourii* (Westwood, 1834) is a Palaearctic bat fly, its principal hosts are *Myotis myotis* and *M. blythii*, but it parasitises also other species of cave-dwelling bats. The distribution range of the nominotypical subspecies of this bat fly covers continental Europe, North Africa, and western Asia, east to the Himalayas and eastern Kazakhstan (Hůrka 1980). From Lebanon, it is here reported for the first time, although it was collected also from *Rhinolophus ferrumequinum*, *Myotis blythii*, and *M. capaccinii*.

The hard tick *Ixodes vespertilionis* Koch, 1844 parasitises a variety of hosts of the families Rhinolophidae and Vespertilionidae across the western Palaearctic; its findings are most frequent from the bats of the genus *Rhinolophus* (Arthur 1956). In Lebanon, where this parasite was found for the first time, it was collected also from *R. ferrumequinum* (see above).

Two mesostigmatic mites of the family Macronyssidae from a specifically unidentified bat of the *Myotis myotis* group were reported from the Saleh Cave near Amchit by Radovsky (1967). However, according to the collection date, 13 October 1960, the host species can be identified as *M. myotis* (cf. Harrison 1964). Both macronyssid mites, *Ichoronyssus scutatus* (Kolenati, 1856) and *Macronyssus granulosus* (Kolenati, 1856) are species distributed widely across the Old World (Radovsky 1967). *I. scutatus* parasitises primarily bats of the genus *Myotis*, but it was found also on the genera *Vespertilio* and *Rhinolophus*. *M. granulosus* parasitises primarily bats of the genera *Myotis* and *Rhinolophus* (Radovsky 1967).

Myotis blythii (Tomes, 1857)

Records. **Original data**: E l B e q a a: Aarsal, Chmiss El Emjar [1], hillside cave ca. 4 km SSE of the town, 18 March 2009: obs. 1 ind. torpid, coll 1 fa, NMP (cf. Benda et al. 2011b, 2012a); – Ruins of Baalbek, 22 September 1961: 2 ma, AUB (labelled as *M. myotis macrocephalicus*; leg. R. E. Lewis); Baalbek [2], underground corridor in ancient ruins, 25 January 2007: obs. 1 ind. torpid, coll. 1 ma, NMP (cf. Horáček et al. 2008, Benda et al. 2011b, 2012a); – El Laboue [3], caverns in a rocky ridge above the road to Aarsal, 7 July 2006: net. 2 fj, NMP (cf. Horáček et al. 2008 [as *M. myotis*], Benda et al. 2011b, 2012a); – Jenta [4] (Fig. 27), at a mine entrance, 8 June 2010: net. 2 ma (cf. Benda et al. 2011b, 2012a). – J e b e l L u b n a n: Afqa, Afqa Cave [5] (Fig. 9), 26 June 2006: net. 1 ma, NMP (cf. Horáček et al. 2008 [as *M. myotis*], Benda et al. 2011b), 15 July 2006: net. 1 ma, NMP (cf. Horáček et al. 2008, Benda et al. 2011b, 2012a); – Faraya, Raymond Cave [6] (Fig. 51), 20 January 2007: obs. 17 inds. torpid, coll. 1 ma, 4 fa, NMP, 20 January 2008: obs. 7 inds. torpid, 2 June 2010: net. 1 ma, NMP (cf. Horáček et al. 2008, 2009, Benda et al. 2011b, 2012a); – Marjaba [7], mines, 21 January 2008: obs. 1 ind. torpid, coll. 1 ma, NMP, 24 February 2009: obs. 1 ind. torpid, 15 March 2009: obs. 1 ind. torpid (cf. Horáček et al. 2009, Benda et al. 2011b, 2012a). – L u b n a n E l J a n u b i: Aadloun, Aadloun Cave [8], 22 March 2009: remains of 2 inds. from *Tyto alba* pellets. – L u b n a n E s h S h a m a l i: Berqayel, Berqayel Cave [9], 30 July 2009: obs. 18 inds. in the main dome (4 pairs and 14 solitary inds.), 3 August 2009: obs. a lek group of 7 ma. – N a b a t i y e: Aalmane, El Litani Valley [10], 21 June 2006: net. 1 faL, NMP (cf. Horáček et al. 2008 [as *M. myotis*], Benda et al. 2011b, 2012a); – Arnoun, Beaufort Castle [11] (Fig. 47), 22 March 2009: obs. 2 inds. torpid, coll. 1 fs, NMP, 2 August 2009: obs. 14 inds. in two chambers of the ruin (5 pairs and 4 solitary inds.), 6 June 2010: obs. 4 inds. torpid, net. 2 ma, coll. 1 ma, NMP (cf. Benda et al. 2011b, 2012a); – Ebel Es Saqi [12], small cave S of the village, 1 August 2009: exam. 1 ma, 1 fa; – Ebel Es Saqi [13], above a reservoir at a spring S of the village, 1 August 2009: net. 1 ma. – **Published data**: E l B e q a a: ruins of Baalbek [2] (Lewis & Harrison 1962 [as *M. myotis*]); Ruins of Baalbek, 2 inds., AUB (Atallah 1977 [as *M. myotis*]); Baalbek (Tohmé & Tohmé 1985 [as *M. myotis*]). – J e b e l L u b n a n: cave 2 km east of Amchite [14], 14 August 1960: 1 m, 1 f, HZM (Harrison & Lewis 1961); cave 2 km E. Amchite (Lewis & Harrison 1962); 2 km E. of Amchite, 14 August 1960: 2 m, 1 f, HZM (Harrison 1964); Mogharet Saleh, 2 km E Amchite, 16 August 1968: 24 inds. (Atallah 1970); Mogharet Saleh, 2 km E Amchite, 30 inds., AUB, SAC (Atallah 1977); Aamchit (Tohmé & Tohmé 1985); – Natural Bridge [15] (Fig. 50), 7 km SE Faraya, 3 inds. (Lewis & Harrison 1962); Faraya (Pont naturel) (Tohmé & Tohmé 1985); Natural Bridge, 7 km E of Faraya, 21 & 29 July 1960: 1 m, 1 f, AUB (Benda et al. 2006, 2011b, 2012a); – Hrajel [16], 10 February 1985: 1 m (Tohmé & Tohmé 1985). – Lebanon, 1 ind., FMNH (DeBlase 1980).

Comments. *Myotis blythii* is a medium-frequent bat in Lebanon, it was recorded from 16 localities (Table 1); however, it represents one of the most widespread bats of Lebanon, its localities are scattered across the whole country, including areas where bat records are rather scarce (Fig. 24). The records are available also from south-eastern Lebanon, including the El Hasbani Valley, and from the eastern parts of the El Beqaa and Orontes Valleys (Baalbek and Anti-Lebanon Mts.). The currently documented distribution pattern of *M. blythii* in Lebanon is at variance with the following conclusion by Lewis & Harrison (1962: 481): "If frequency of collection is any criterion, this species is less common than *M.*[*yotis*] *m.*[*yotis*] […]" According to the available records, *M. blythii* is at least twice more frequent bat of Lebanon than *M. myotis* (see above and Table 1).

Table 11. Numbers of *Myotis blythii* in particular roosts per particular checks; W 2013 – checks during the winter 2012–2013 (Abi-Said 2014)

roost	*IV 2006*	I 2007	I 2008	II 2009	III 2009	*VII 2009*	*VIII 2009*	*VI 2010*	*X 2012*	W 2013	min	max	n checks
Baalbek, ruins	*6**	1	0	–	–	–	–	–	–	–	0	6	3
Beaufort Castle	–	–	–	–	2	–	*14*	*4*	–	–	2	14	3
Berqayel Cave	–	–	–	–	–	*18*	*7*	–	–	0	0	18	3
Raymond Cave	–	17	7	–	–	–	–	–	–	–	7	17	2
Marjaba, mines	–	0	1	1	1	–	–	–	*0*	0	0	1	6

in *italics*, checks in the summer season; Roman numerals denote months, Arabic numerals denote years; * *Myotis myotis* s.l.

M. blythii is a rather common bat in the Mediterranean parts of the Middle East, where it reaches the southern margin of its whole distribution range (Harrison & Bates 1991, Spitzenberger 1996, Benda et al. 2006). The Lebanese part of the distribution range of *M. blythii* continues southward, eastward and northward. In the south, several records of this bat are available from the Mediterranean areas of northern Palestine (including the Upper Galilee and the Yizre'el and Hula Valleys), north-western Jordan, and the Golan Heights (Mendelssohn & Yom-Tov 1999, Benda et al. 2006, 2010). In the north, *M. blythii* is distributed throughout the Jebel An Nusariyah Mts., and in the east, one record is available from the steppe zone at Jeiroud, both in western Syria (Benda et al. 2006). The Lebanese section of *M. blythii* range thus belongs to the areas of rather dense occurrence of this bat in the Levant (see Benda et al. 2006).

In Lebanon, *M. blythii* is distributed across a rather broad range of altitudes (1655 m; altitude median 1120.0 m, mean 981.9 m a. s. l.; Table 2), with the exception of the highest parts of the main mountain ranges. The highest recorded locality of *M. blythii* in Lebanon is a small cave in the Chmiss El Emjar area near Aarsal (Anti-Lebanon Mts.) at 1780 m a. s. l., which serves as a hibernation roost of this bat. Two thirds of *M. blythii* records from Lebanon were made in roosts (66.7%, n=10) and the altitudinal range of roost sites roughly conforms to the range of all records (1634 m), the median and mean altitude values are 1131.0 m and 1034.1 m a. s. l., respectively. Hence, *M. blythii* prefers to roost in the elevated areas of Lebanon. However, the summer and winter roosts differ markedly in their altitudes; while the median and mean altitude values of the summer roosts are lower than those of all roosts, 652.5 m and 744.3 m a. s. l., respectively (range 146–1630 m a. s. l., n=6), these values for the hibernation roosts are higher, 1302.0 m and 1223.5 m a. s. l., respectively (range 695–1780 m a. s. l., n=6). In Lebanon, *M. blythii* favours to hibernate in roosts situated in quite montane positions.

M. blythii was found to roost in Lebanon mainly in natural caves of very variable size and position (70.0%, n=7), man-made underground spaces (mines and dark parts of historical monuments) represented three roosts. However, only a half of the known hibernacula (n=6) were caves. A larger number of hibernating bats (n>10) was observed only at one locality, in the Raymond Cave near Faraya (at 1770 m a. s. l.; Fig. 51), where 17 individuals in deep torpidity were found in January 2007, while only seven individuals were found there in January of next year (Table 11). No maternity colony of *M. blythii* was found in Lebanon; however, a lactating female of *M. blythii* was netted in the El Litani Valley at Aalmane (125 m a. s. l.) on 21 June.

Smaller lekking assemblages (corresponding to the situation observed in other parts of the species distribution range, see e.g. Horáček & Gaisler 1985) were found in late summer at two sites, the Berqayel Cave (four pairs and 14 solitary males on 30 July; seven bats (males) on 3 August, leaving the cave at dusk but re-appearing there after 2–3 hours and performing an active acoustic

display throughhout the night, resulting in one pair and five solitary bats in torpidity at 6.00 in the next morning) and the Beaufort Castle (Fig. 47) on 2 August (ten individuals in mating pairs, four males in display). A group of 24 individuals observed by Atallah (1970) in the Saleh Cave near Aamchit (Fig. 26) on 16 August perhaps also represented such kind of aggregation.

External and cranial dimensions of the Lebanese specimens of *M. blythii* are shown in Table 10. For the material examined see below.

Material examined. 1 ♀ (NMP 95771 [S+A]), Aalmane, El Litani, 21 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 1 ♀ (NMP 93695 [S+A]), Aarsal, Chmiss El Emjar, 18 March 2009, leg. T. Bartonička, P. Benda, I. Horáček & R. Lučan; – 1 ♂ (NMP 95830 [S+A]), Afqa Cave, 26 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 1 ♂ (NMP 90898 [S+A]), Afqa Cave, 15 July 2006, leg. P. Benda; – 1 ♀ (AUB M179 [B]), cave 2 km E Amchite, 14 August 1960, leg. R. E. Lewis; – 2 ♂♂ (AUB M668, M669 [S+A], labelled as *M. myotis macrocephalicus*), Ruins of Baalbek, 22 September 1961, leg. R. E. Lewis; – 1 ♂ (NMP 91797 [S+A]), Baalbek, ruins, 25 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♀ (NMP 93707 [S+A]), Beaufort Castle, 22 March 2009, leg. T. Bartonička, P. Benda, I. Horáček & R. Lučan; – 1 ♂ (NMP 93557 [S+A]), Beaufort Castle, 6 June 2010, leg. P. Benda & M. Uhrin; – 2 ♀♀ (NMP 95855, 95856 [S+A]), El Laboue – Aarsal, 7 July 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 1 ♂, 1 ♀ (AUB M174 [S+B], M175 [B]), Faraya, Natural Bridge, 21 July 1960, leg. R. E. Lewis; – 1 ♂ (AUB M176 [S+B]), Faraya, Natural Bridge, 29 July 1960, leg. R. E. Lewis; – 1 ♂, 4 ♀♀ (NMP 91760, 91761 [A], 91762–91764 [S+A]), Faraya, Raymond Cave, 20 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♂ (NMP 93539 [S+A]), Faraya, Raymond Cave, 2 June 2010, leg. P. Benda & M. Uhrin; – 2 ♂♂ (NMP 93569 [S+A], 93570 [A]), Jenta, 8 June 2010, leg. P. Benda & M. Uhrin; – 1 ♂ (NMP 91907 [S+A]), Marjaba, mine, 21 January 2008, leg. P. Benda, I. Horáček, R. Lučan & M. Uhrin.

Fig. 27. The Bab El Mrayah Valley near Jenta, at ca. 1050 m a. s. l. in the Anti-Lebanon Mts. (El Beqaa). A foraging habitat of *Myotis myotis*, *M. blythii*, *M. nattereri*, *Hypsugo savii*, and *Pipistrellus pipistrellus* (June 2010). Photo by M. Uhrin.

Records of ectoparasites. **Original data**: N y c t e r i b i i d a e: *Nycteribia pedicularia*: 1 ma (CMŠ [A]) from 1 ma (NMP 91907), Marjaba, mine, 21 January 2008. – *Nycteribia vexata*: 2 ma, 2 fa (CMŠ [A]) from 1 fa (NMP 95771), Aalmane, El Litani, 21 June 2006; – 2 fa (CMŠ [A]) from 1 ma (NMP 95830), Afqa Cave, 26 June 2006; – 1 fa (CMŠ [A]) from 1 ma, 3 fa (NMP 91760–91764), Farhaya, Raymond Cave, 20 January 2007; – 2 fa (CMŠ [A]) from 1 ma (NMP 93539), Faraya, Raymond Cave, 2 June 2010; – 1 ma, 1 fa (CMŠ [A]) from 1 ma (NMP 93569), Jenta, 8 June 2010. – *Penicillidia dufourii*: 1 fa (CMŠ [A]) from 1 fa (NMP 95771), Aalmane, El Litani, 21 June 2006; – 4 ma, 3 fa (CMŠ [A]) from 1 ma, 3 fa (NMP 91760–91764), Farhaya, Raymond Cave, 20 January 2007; – 1 ma (CMŠ [A]) from 1 ma (NMP 91907), Marjaba, mine, 21 January 2008. – S p i n t u r n i c i d a e: *Spinturnix myoti*: 2 fa (CMŠ [P]) from 1 fa (NMP 95771), Aalmane, El Litani, 21 June 2006; – 2 fa (CMŠ [A]) from 1 fa (NMP 91762), Farhaya, Raymond Cave, 20 January 2007.

Comments on ectoparasites. Three species of bat flies plus one mite species were collected from *M. blythii* in Lebanon. The bat flies *Nycteribia vexata* Westwood, 1835, *N. pedicularia* Latreille, 1805 and *Penicillidia dufourii* (Westwood, 1834) are all parasites of cave-dwelling bats (Hůrka 1980). The nominotypical subspecies of *N. vexata* is distributed over the continental part of Europe, in North Africa and the Middle East, eastward to Iran and Turkmenistan (Hůrka 1980, Benda et al. 2012a). It is here reported for the first time from Lebanon, where it was collected also from *Rousettus aegyptiacus* (see above). Although the principal host of *N. pedicularia* seems to be *Myotis capaccinii*, this bat fly is frequently found also on *Miniopterus schreibersii* and bats of the *Myotis myotis* group and the genus *Rhinolophus* (Hůrka 1980). From Lebanon, this parasite is here reported for the first time, it was collected from *Rousettus aegyptiacus*, *Rhinolophus ferrumequinum*, *M. capaccinii*, *Hypsugo savii*, and *Miniopterus schreibersii*. The records of *P. dufourii* are reported as common from the bats of the *Myotis myotis* group; however, this bat fly is here reported for the first time from Lebanon, where it was found also on *Rhinolophus ferrumequinum*, *Myotis myotis*, and *M. capaccinii*.

The mesostigmatic mite *Spinturnix myoti* (Kolenati, 1856) is a parasite of bats of the genus *Myotis*, most frequently of the *M. myotis* group but often also of *M. nattereri* and *M. capaccinii* (Stanyukovich 1997), its record from *M. blythii* is thus not unusual. The distribution range of this mite corresponds with the ranges of these bats, but from Lebanon it is here reported for the first time (it was collected also from *Myotis capaccinii*).

Myotis myotis or *M. blythii*

Records. **Original data**: E l B e q a a: Baalbek, ancient ruins, underground corridor, 24 April 2006: obs. 6 inds. torpid (cf. Horáček et al. 2008 [as *M. myotis*]). – **Published data**: B e i r u t: Beyrout (Tristram 1866, 1884 [as *Vespertilio murinus*]). – J e b e l L u b n a n: Naba'a, Niha Cave, 9 January 2013: obs. 3 inds. (Abi-Said 2014 [as *M. myotis*]). – L u b n a n E l J a n u b i: Tyre (Tristram 1866, 1884 [as *Vespertilio murinus*]). – L u b n a n E s h S h a m a l i: Akroum Cave, 26 December 2012: obs. 2 inds. (Abi-Said 2014 [as *M. myotis*]); – Zebdeen Cave, 16 January 2013: obs. 3 inds. (Abi-Said 2014 [as *M. myotis*]). – Lebanon (undef.): Syrie [= Lebanon], 1 ind., RMNH (Temminck 1840 [as *Taphozous syriacus* and *Vespertilio murinus*]) = Syrie [= Lebanon], 1 ind., RMNH (Jentink 1887, 1888 [as *Vespertilio murinus*]); – Syrien (Blasius 1857 [as *Vespertilio murinus*]); – Syrien (Kolenati 1860 [as *Myotus murinus*]); – Syrien (Fitzinger 1871c [as *Myotis murina*]).

Comments. Several records of the large-sized species of the genus *Myotis* were made and/or published from Lebanon that are not affiliable to any of the two species known from the Levant, *M. myotis* or *M. blythii*. This is also true for the recent records by Horáček et al. (2008) and Abi-Said (2014), who observed bats in hibernacula without an examination of the respective individuals. The uncertain records were reported under various names, but most frequently as *Vespertilio murinus* and *Myotis myotis* [s.l.].

The name *Taphozous syriacus* is a rather special case, it was created by W. Hemprich and C. Ehrenberg during their expedition to the northern part of the present territory of Lebanon in 1824. It was probably used by these explorers to label the collected specimens and/or in their field diary, later it was used by H. Lichtenstein in the manuscript list of the "doublette" specimens in the

Zoological Museum Berlin (ZMB; see also Comments on *Rousettus aegyptiacus* and *Rhinolophus ferrumequinum* above and Benda & Engelberg 2016). The respective bats labelled as *Taphozous syriacus* were sent by Hemprich and Ehrenberg to the ZMB, and one of them was later sent to the Natural History Museum of the Netherlands, Leyden (today Naturalis Biodiversity Centre, RMNH). The RMNH specimen was identified as *Vespertilio murinus* (= *Myotis myotis* s.l.) by Temminck (1840: 179), who also mentioned this name in the chapter concerning *Vespertilio murinus*: "Le musée des Pays-Bas a recu de celui de Berlin un *Myotis* de Syrie sous le nom de *Taphozous syriacus*, qui ne diffère en rien par le couleurs, par les formes et par les dents de nos individus d'Europe. Plusieurs autres individus on été trouvés en Syrie, en Egypte et sur les côtes Barbarie." At a second place, this name was mentioned by Jentink (1888: 189) concerning the identical RMNH specimen in the catalogue of the respective collection.

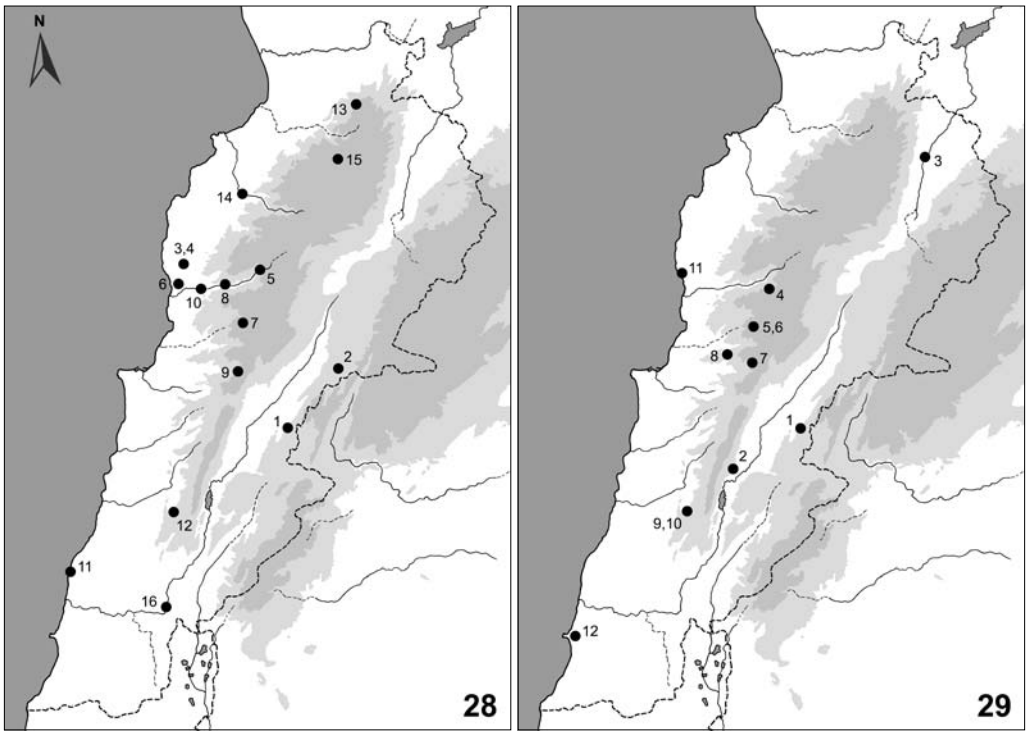
Interestingly, although the name *Taphozous syriacus* Temminck is apparently a nomen nudum, it represents the oldest name of the bats of the *Myotis myotis* complex originating from the Middle East and Asia as well. Hence, it constitutes a senior (unavailable) synonym of *Vespertilio blythii* Tomes, 1857 (= *Myotis blythii*) or a junior (unavailable) synonym of *Vespertilio myotis* Borkhausen, 1797 (= *Myotis myotis*), plus a senior synonym of *Myotis myotis macrocephalicus* Harrison et Lewis, 1961. One of these alternatives could be confirmed and the other rejected only by a revision of the RMNH specimen, a type of Temminck's name.

Myotis nattereri (Kuhl, 1817)

Records. **Original data**: El Beqaa: Aanjar [1], at a pool at the northern edge of the village, 5 June 2010: net. 1 ma, NMP (cf. Benda et al. 2010); – Jenta [2] (Fig. 27), at a mine entrance, 8 June 2010: net. 1 fs, NMP, det. calls of 1 active ind. inside the mine (cf. Benda et al. 2010). – Jebel Lubnan: Aamchit, Saleh Cave [3] (Fig. 26), 25 June 2006: net. 1 ms, NMP, 14 March 2009: net. 2 fa, NMP, 25 March 2009: net. 1 fa, 1 ind., 26 October 2012: net. 1 ma (cf. Horáček et al. 2008, Benda et al. 2010); – Aamchit, rocky overhang near the Saleh Cave [4] (Fig. 26), 25 June 2006: net. 1 ms (cf. Horáček et al. 2008); – El Aaqoura, Er Roueiss Cave [5] (Fig. 55), 26 June 2006: net. 1 faL (cf. Horáček et al. 2008, Benda et al. 2010); – El Fidar [6], garden in a residential quarter, 24 June 2006: net. 1 faL, NMP (cf. Horáček et al. 2008, Benda et al. 2010); – Faraya, at a pond under the Raymond Cave [7], 2 June 2010: det. calls of 1 foraging ind.; – Frat, Nahr Ibrahim [8] (Fig. 57), 29 May 2010: net. 1 ma, 1 faL, NMP (cf. Benda et al. 2010); – Majdel Tarshish, Qattine Aazar Chasm [9], 7 June 2010: det. calls of 1 foraging ind.; – Yahchouch, Nahr Ibrahim [10], tunnel, 24 October 2012: obs. 1 ind. torpid. – Lubnan El Janubi: Aadloun, Aadloun Cave [11], 22 March 2009: remains of 5 inds. from *Tyto alba* pellets; – Jezzine, Pont El Khalass [12], at a spring, 23 June 2006: net. 1 ms (cf. Horáček et al. 2008, Benda et al. 2010). – Lubnan Esh Shamali: Fnaydeq [13], Ein El Qammouaa, 3 June 2010: det. calls of 2 foraging inds.; – Kousba [14], cave behind Theotokos Hamatoura Monastery (Fig. 31), 25 March 2009: obs. a cluster of 12 inds. and 1 solitary ind. in ceiling niches; – Wadi Jhannam, Ein El Baaliye [15] (Fig. 30), at a water pool, 30 May 2010: det. calls of 2 foraging inds. – Nabatiye: Arnoun, Beaufort Castle [16] (Fig. 47), 6 June 2010: net. 1 ma, NMP (cf. Benda et al. 2010). – **Published data**: Jebel Lubnan: Mogharet Saleh cave [3], 2 km E Amchite, 16 August 1968: 1 m, 3 inds. (Atallah 1970); Mogharet Saleh, near Amchite, 4 inds., SAC (Atallah 1977).

Comments. *Myotis nattereri* is a moderately frequent bat in Lebanon, it was recorded from 16 localities (Table 1); however, it represents one of the most widespread bats of Lebanon, its localities are scattered across the whole country (Fig. 28). The records are available also from the southern and eastern parts of Lebanon, including the western slopes of the Anti-Lebanon Mts. in the El Beqaa Valley. This wide distribution revealed by the recent survey could be seen as somewhat surprising as previously only one record was known from the country (Atallah 1970, 1977).

M. nattereri is broadly distributed in the Mediterranean parts of the Middle East (Harrison & Bates 1991, Benda et al. 2006), its Lebanese range continues southward, eastward, and northward. This bat is rather rarely found in central Palestine, but more common in the Galilee and the Yizre'el and Hula Valleys (Mendelssohn & Yom-Tov 1999), and particularly numerous findings were made in the western part of Jordan (Benda et al. 2010). Several records are available from



Figs. 28, 29. Records of particular bat species in Lebanon. 28 – *Myotis nattereri* (Kuhl, 1817). 29 – *Myotis emarginatus* (Geoffroy, 1806).

south-western Syria, including the Anti-Lebanon Mts., the Golan Heights, and the Yarmuk Valley, and other two localities are known from the western, Mediterranean part of Syria (Benda et al. 2006). Thus, the new records from Lebanon fill the geographical gap between the rather numerous records of *M. nattereri* in the Holy Land and the scarce findings in the north-western Levant, including south-eastern coastal regions of Turkey.

M. nattereri is distributed across almost the whole altitudinal gradient of Lebanon (spread over a very broad range of 2078 m; altitude median 1034.0 m, mean 949.9 m a. s. l.; Table 2) with the only exception of the highest parts of the main mountain ranges. The highest recorded locality of *M. nattereri* in Lebanon is the Ein El Baaliye spring in the Wadi Jhannam (Lebanon Mts.) at 2170 m a. s. l. (Fig. 30), where this bat was documented to forage (by detection of its echolocation calls). The records of foraging bats prevail in the list of findings of *M. nattereri* in Lebanon (81.3%, n=13); the altitudinal range of foraging habitats conforms to the range of all records (2078 m) and the median and mean altitude values are only slightly higher compared to those of all records, 1039.5 m and 1061.8 m a. s. l., respectively. The foraging bats were recorded in most cases at or above water bodies (46.2%, n=6), the records at the entrances to subterranean spaces (caves, chasm, mine, ruined castle) were less frequent (38.5%, n=5).

No true hibernation record of *M. nattereri* is available from Lebanon. A group of 13 individuals in shalow torpidity found in a cave behind the Theotokos Hamatoura Monastery near Kousba (at

Fig. 30. Ein El Baaliye spring in the upper part of Wadi Jhannam at ca. 2170 m a. s. l. (Lubnan Esh Shamali), a foraging habitat of *Myotis nattereri*, *Hypsugo savii*, and *Pipistrellus pipistrellus* (May 2010). Photo by M. Uhrin.

Fig. 31. Rocky wall of the Qadisha river (Nahr Abou Ali) canyon with the Holy Monastery of the Dormition of Theotokos Hamatoura opposite to Kousba (Lubnan Esh Shamali). Deep in the cave in the right part of the picture, a small aggregation of *Myotis nattereri* was discovered on 25 March 2009 (Fig. 32). Photo by M. Uhrin.

Fig. 32. An aggregation of *Myotis nattereri* roosting in a ceiling niche of a cave behind the Holy Monastery of the Dormition of Theotokos Hamatoura (Lubnan Esh Shamali) discovered on 25 March 2009. Photo by I. Horáček.

1075 m a. s. l.; Fig. 31) on 25 March (a cluster of twelve bats in a small and deep niche of the cave ceiling, see Fig. 32, and a single individual in a neighbouring fissure) is to be looked upon rather as a transient colony. Two summer roosts of *M. nattereri* were found in Lebanon, both represented by underground spaces, a tunnel and a cave. Atallah (1970) collected four bats from the Saleh Cave near Aamchit (146 m a. s. l.; Fig. 26) on 16 August, and one roosting individual was found in a tunnel in the Nahr Ibrahim Valley near Yahchouch (286 m a s l.) on 24 October. No record of maternity colony of *M. nattereri* is available from Lebanon, but lactating females were netted at three sites. One lactating female was caught at Frat, above the Nahr Ibrahim river (780 m a. s. l.; Fig. 57) on 29 May, another lactating female in a garden in El Fidar (92 m a. s. l.) on 24 June, and the other lactating female at the entrance to the Er Roueiss Cave (1285 m a. s. l.; Fig. 55) on 26 June.

The distribution of *M. nattereri* in Lebanon shows a mosaic-like pattern with records coming from various vegetation zones. During the summer season this bat forages across an enormous altitude gradient, but selects summer roosts positioned at lower altitudes, while its hibernation roosts are situated at higher elevations.

External and cranial dimensions of the Lebanese specimens of *M. nattereri* are shown in Table 10. For the material examined see below.

Material examined. 1 ♂ (NMP 95806 [S+A]), Aamchit, Saleh Cave, 25 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 2 ♀♀ (NMP 93689, 93690 [S+A]), Aamchit, Saleh Cave, 14 March 2009, leg. T. Bartonička, P. Benda, I.

Horáček & R. Lučan; – 1 ♂ (NMP 93556 [S+A]), Aanjar, pool, 5 June 2010, leg. P. Benda & M. Uhrin; – 1 ♂ (NMP 93558 [S+A]), Beaufort Castle, 6 June 2010, leg. P. Benda & M. Uhrin; – 1 ♀ (NMP 95803 [S+A]), El Fidar, garden, 24 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 1 ♂, 1 ♀ (NMP 93525, 93526 [S+A]), Frat, Nahr Ibrahim, 29 May 2010, leg. P. Benda & M. Uhrin; – 1 ♀ (NMP 93571 [A]), Jenta, 8 June 2010, leg. P. Benda & M. Uhrin.

Records of ectoparasites. **Original data**: I s c h n o p s y l l i d a e: *Ischnopsyllus simplex* complex: 1 fa (CMŠ [P]) from 1 fa (NMP 95803), El Fidar, garden, 24 June 2006. – N y c t e r i b i i d a e: *Basilia nana*: 2 fa (CMŠ [P]) from 1 ma (NMP 93558), Beaufort Castle, 6 June 2010.

Comment on ectoparasites. The bat fly *Basilia nana* Theodor et Moscona, 1954 is a species from the group parasitising tree-dwelling bats. Its principal host species is *Myotis bechsteinii* (Kuhl, 1817), however, it is regularly found also on *M. nattereri*. The distribution range of this parasite covers the arboreal zone of the western Palaearctic from Sweden to Palestine, Azerbaijan, and northern Iran (Hůrka 1984, Benda et al. 2012a). *B. nana* is here reported from Lebanon for the first time. Besides from *M. nattereri*, it was recorded also from *Rousettus aegyptiacus*, but the latter finding is considered as accidental, regarding the host species (see above).

A single female of a bat flea of the *Ischnopsyllus simplex* complex was collected from *M. nattereri* at El Fidar. Considering a rather complicated taxonomy of this complex and very limited material available, the species identification of this flea should be made only when additional specimens are collected. *M. nattereri* has been reported as a primary host of the bat flea *Ischnopsyllus simplex* Rotschild, 1906, mainly in the southern part of the distribution range of this parasite (in the northern areas, its principal host is *Myotis mystacinus*), and as an occasional host of *I. mysticus* Jordan, 1942 (the principal host is *M. mystacinus*) and *I. hispanicus* Jordan, 1942 (Hůrka 1976). In all these flea species, the morphological characters of females are identical and the species identification of female specimens is impossible (Jordan 1942). Anyway, a flea specimen of the *I. simplex* complex is here reported for the first time from Lebanon and the Middle East as well (Lewis & Lewis 1990).

Myotis emarginatus (Geoffroy, 1806)

Records. **Original data**: E l B e q a a: Aanjar, Aanjar Cave [1] (Fig. 33), 5 June 2010: net. 2 faL, NMP; – Khirbet Qanafar, El Jaouz Cave [2], 9 June 2010: net. 2 ma, NMP; – Ras El Assi, Deir Mar Maroun Monastery [3] (Fig. 17), 29 June 2006: net. 2 mj, 2 faL, 3 fj (cf. Horáček et al. 2008). – J e b e l L u b n a n: Afqa, Afqa Cave [4] (Fig. 9), 17 January 2008: obs. 1 ind. torpid, coll. 1 fa, NMP; – Faraya, at Raymond Cave [5] (Fig. 51), 2 June 2010: net. 2 ma, NMP; – Faraya, at a pond under the Raymond Cave [6], 2 June 2010: net. 1 ma, NMP; – Majdel Tarshish, Qattine Aazar Chasm [7], 7 June 2010: net. 2 ma, NMP; – Marjaba [8], mines, 19 January 2007: obs. 1 ind. torpid, coll. 1 fa, NMP (cf. Horáček et al. 2008). – L u b n a n E l J a n u b i: Jezzine, Pont El Khalass [9], at a spring, 23 June 2006: net. 1 ma, NMP (cf. Horáček et al. 2008); – Jezzine, Pont El Khalass [10], abandoned house, 23 June 2006: net. 1 ma, NMP (cf. Horáček et al. 2008). – **Published data**: J e b e l L u b n a n: Jebal [11], Palestine, 2 fa, BMNH (Harrison 1964). – L u b n a n E l J a n u b i: tombs behind Tyre [12] (Tristram 1884).

Comments. *Myotis emarginatus* is a rather uncommon bat in Lebanon, it was recorded from 12 localities (Table 1). It is relatively widespread, its localities are scattered over a large part of Lebanon (Fig. 29). The records come mostly from the mountainous areas of the country, mainly from the central and eastern parts of Lebanon, including the El Beqaa and Orontes Valleys. This bat was documented from Lebanon during a survey made in the last few years (2006–2010), which were new records after some 120 years. Although Lewis & Harrison (1962) reported a record of male *M. emarginatus* from a cave 2 km E. of Amchite (= Saleh Cave), the respective specimen was later re-identified by the authors as *Myotis capaccinii* (see Atallah 1970). Previously, *M. emarginatus* was found only in the coastal areas of the country by canon H. B. Tristram during his journey to Palestine in the early 1880s (see Harrison 1964). However, Tristram (1884) reported this species only from tombs behind Tyre (Sour), another his record, based on two specimens from the Natural History Museum, London (BMNH), labelled ‘Jebal, Palestine’, was mentioned

by Harrison (1964), Atallah (1977), and Harrison & Bates (1991); Benda et al. (2006) suggested their origin in Jbail (Byblos), present-day Lebanon.

M. emarginatus is distributed in the Mediterranean parts of the Middle East (Harrison & Bates 1991, Benda et al. 2006), its Lebanese range continues both southward and northward. This bat is rather rarely found in northern Palestine – Mt. Carmel and the Galilee (Mendelssohn & Yom-Tov 1999), and numerous findings have been recently made in a limited area of north-western Jordan (Benda et al. 2010). Few records are available from the Golan Heights, some of them originally published as *M. mystacinus* by Mendelssohn & Yom-Tov (1999) (C. Dietz, in litt.). Besides the records from the Golan Heights, *M. emarginatus* was not found in south-western Syria, but several findings were made in the north-western regions of this country (Benda et al. 2006, Shehab et al. 2007). Thus, the known occurrence of *M. emarginatus* in Lebanon continues in the records from the northern Holy Land, but is separated from the Syrian localities by a remarkable gap in distribution (see Benda et al. 2006: 128, Fig. 78).

If the localities of *M. emarginatus* by Tristram are interpreted correctly (cf. Records), this bat is distributed across almost the whole altitudinal gradient of Lebanon (spread over a rather broad range of 1750 m; altitude median 1147.5 m, mean 1047.8 m a. s. l.; Table 2) with the exception of the upper parts of high mountain ranges. The highest recorded locality of *M. emarginatus* in Lebanon is the Raymond Cave near Faraya (Lebanon Mts.) at 1770 m a. s. l. (Fig. 51), where this bat was documented to forage (by netting of two males). The records of netted foraging bats

Fig. 33. Entrance to the Aanjar Cave above Aanjar, in the western slope of the Anti-Lebanon Mts. at 1175 m a. s. l. (El Beqaa); a classical site of bat research in Lebanon, where the first records were made in the early 1950s. *Rhinolophus ferrumequinum*, *Myotis myotis*, and *Miniopterus schreibersii* were found to roost in the cave, while *Rhinolophus hipposideros* and *Myotis emarginatus* were netted at the cave entrance on 5 June 2010. Photo by M. Uhrin.

Table 12. Basic biometric data on the examined Lebanese samples of *Myotis emarginatus* (Geoffroy, 1806), *M. mystacinus* (Kuhl, 1817) and *M. capaccinii* (Bonaparte, 1837). For abbreviations see p. 213

	Myotis emarginatus					*Myotis mystacinus*	*Myotis capaccinii*				
	n	**M**	min	max	SD	NMP 95791	n	**M**	min	max	SD
LAt	14	**38.99**	36.4	41.6	1.026	35.4	21	**40.84**	39.0	42.7	1.023
LCr	12	**15.56**	15.23	15.98	0.245	14.38	17	**15.05**	14.67	15.32	0.183
LCb	12	**14.61**	14.18	15.08	0.282	13.82	17	**14.00**	13.32	14.37	0.282
LaZ	11	**9.56**	9.19	9.88	0.211	8.84	14	**9.08**	8.48	9.52	0.323
LaI	12	**3.58**	3.42	3.68	0.094	4.07	17	**3.65**	3.38	3.84	0.107
LaInf	12	**3.80**	3.69	4.05	0.099	3.57	10	**3.78**	3.64	3.93	0.095
LaN	12	**7.35**	7.13	7.79	0.175	7.03	16	**7.81**	7.52	8.06	0.158
LaM	12	**7.93**	7.64	8.24	0.159	7.47	10	**7.98**	7.83	8.08	0.098
AN	12	**5.62**	5.41	5.86	0.139	5.27	16	**5.69**	5.38	5.96	0.170
LBT	12	**2.75**	2.51	2.94	0.118	2.98	10	**2.92**	2.68	3.11	0.164
CC	12	**3.97**	3.84	4.10	0.087	3.47	17	**3.79**	3.47	4.02	0.169
M^3M^3	12	**6.16**	5.87	6.46	0.196	5.59	17	**5.79**	5.17	6.16	0.276
CM^3	12	**6.35**	6.05	6.51	0.149	5.62	17	**5.56**	5.28	5.74	0.118
LMd	12	**11.46**	11.03	11.79	0.226	10.37	17	**10.47**	9.87	10.74	0.219
ACo	12	**3.38**	3.13	3.58	0.118	3.93	17	**2.91**	2.74	3.02	0.074
CM_3	12	**6.73**	6.39	6.98	0.178	5.88	17	**5.85**	5.64	6.02	0.107

prevail in the list of findings of *M. emarginatus* in Lebanon (66.7%, n=8); the altitudinal range of foraging habitats is smaller than the range of all records (720–1770 m a. s. l.) and the median and mean altitude values are higher compared to those of all records, 1179.5 m and 1249.8 m a. s. l., respectively. The foraging bats were recorded in most cases at the entrances to subterranean spaces (caves, a chasm and an abandoned building; 87.5%, n=7), *M. emarginatus* was only once netted above a water body (a pond near Faraya, 1670 m a. s. l.).

Two hibernation roosts of *M. emarginatus* were documented in Lebanon, a cave and a mine, in both cases only one bat was found (Afqa Cave, 1255 m a. s. l., Fig. 9; mine system at Marjaba, 1020 m a. s. l.). No record of maternity colony of *M. emarginatus* or a summer roost is available from Lebanon. Although most of the netted individuals were adult males, at two sites lactating females were caught, at one site accompanied by volant juveniles. Both records come from eastern Lebanon; two lactating females were netted at the entrance to the Aanjar Cave (1175 m a. s. l.; Fig. 33) on 5 June, and other two lactating females with five juveniles of the year were netted at the entrance to the cave monastery of Deir Mar Maroun at Ras El Assi (720 m a. s. l.; Fig. 17) on 29 June.

External and cranial dimensions of the Lebanese specimens of *M. emarginatus* are shown in Table 12. For the material examined see below.

Material examined. 2 ♀♀ (NMP 93554, 93555 [S+A]), Aanjar Cave, 5 June 2010, leg. P. Benda & M. Uhrin; – 1 ♀ (NMP 91893 [S+A]), Afqa Cave, 17 January 2008, leg. P. Benda, I. Horáček, R. Lučan & M. Uhrin; – 1 ♂ (NMP 93544 [S+A]), Faraya, pond, 2 June 2010, leg. P. Benda & M. Uhrin; – 2 ♂♂ (NMP 93540, 93541 [S+A]), Faraya, Raymond Cave, 2 June 2010, leg. P. Benda & M. Uhrin; – 2 ♂♂ (NMP 95793, 95794 [S+A]), Jezzine, Pont El Khalass, 23 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 2 ♂♂ (NMP 93574, 93575 [S+A]), Khirbet Qanafar, El Jaouz Cave, 9 June 2010, leg. P. Benda & M. Uhrin; – 2 ♂♂ (NMP 93562 [S+A], 93563 [A]), Majdal Tarshish, Qattine Aazar Chasm, 7 June 2010, leg. P. Benda & M. Uhrin; – 1 ♀ (NMP 91758 [S+A]), Marjaba, mine, 19 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan.

Records of ectoparasites. **Original data**: T r o m b i c u l i d a e: *Leptotrombidium imphalum*: 8 larvae (CMŠ [P]) from 1 ma (NMP 93575), Khirbet Qanafar, El Jaouz Cave, 9 June 2010 (det. S. Kalúz).

Comments on ectoparasites. Only one parasite species of *M. emarginatus* is available from Lebanon, eight larvae of the chigger mite *Leptotrombidium imphalum* Vercammen-Grandjean et Langston, 1976 were collected at Khirbet Qanafar, southern part of the El Beqaa Valley. This mite is distributed in southern and south-eastern Asia (Stekolnikov 2013), where it parasitises small mammals of the families Soricidae, Tupaidae and Muridae, or the host remains unknown (Vercammen-Grandjean & Langston 1975). This species belongs to the genus *Leptotrombidium* Nagayo, Miyagawa, Mitamura et Imamura, 1916, which is associated with rodents as a host taxon (Shatrov & Kudryashova 2006) and this record represents the first evidence from a bat. The record of *L. imphalum* from *M. emarginatus* in Lebanon represents, besides the first record from this host, also the first evidence of this mite from the country and the Middle East as well.

Myotis mystacinus (Kuhl, 1817)

Records. **Original data**: L u b n a n E l J a n u b i: Jezzine, Pont El Khalass, at a spring, 23 June 2006: net. 1 faG, NMP (cf. Horáček et al. 2008 [as *M. aurascens*]). – **Published data**: Lebanon (undef.): Syria [= ? Lebanon], 1 f, BMNH (Dobson 1878); – Syrie (Trouessart 1879); – Syria (Anderson 1881); – Southern Lebanon [2] (Tristram 1884); – Siria (Doria 1887); – Syria (Trouessart 1897, 1904); – Syriá (Mehely 1900); – Syrien (Palacký 1902).

Comments. *Myotis mystacinus* is a very rare bat in Lebanon, where it was recorded only twice and only one accurate locality is known (Table 1, Fig. 3). A pregnant female was netted at a spring near Pont El Khalass, Jezzine (1034 m a. s. l.), in the southernmost part of the massive of the Lebanon Mts., on 23 June 2006. This record came more than 120 years after the previous report by Tristram (1884: 28), who mentioned this bat to be found "In Southern Lebanon", i.e. in the southern part of the Lebanon Mts., generally the same area where also the new record was made. However, Tristram (1884) most probably repeats the report by Dobson (1878) of the female specimen coming from Syria s.l. and housed in the British Museum (BMNH, today Natural History Museum, London). Most probably, the report from 'Syria' was also only repeated by further authors (see above) without mentioning any specimen, record or the original author (see also the comments by Benda & Karataş 2005 and Benda et al. 2006). However, no later reference on the respective BMNH individual (its fate or clear origin) is available (see e.g. Harrison 1964, Kumerloeve 1975, Harrison & Bates 1991, Benda et al. 2006) and some authors considered the species identification reported by Dobson (1878) as dubious (see Harrison 1964, Qumsiyeh 1996).

Bats of the *Myotis mystacinus* group represent perhaps the rarest bats of the Levant. Only several recent records have been reported, all coming from the Golan Heights, including the Mount Hermon area (Mendelssohn & Yom-Tov 1999); moreover, some of these records were found to be erroneously identified as representatives of *M. emarginatus* (C. Dietz, in litt.). Besides the new Lebanese specimen here reported, at least one correctly determined Levantine individual of *M. mystacinus* s.l. is available from the area – a male collected at Mount Hermon on 2 September 1994 is deposited in the collection of the Tel Aviv University (TAU), see Benda & Karataş (2005) and Benda et al. (2006), see also Mendelssohn & Yom-Tov (1999: 125, Fig. 55*).

As already reviewed by Benda et al. (2006), there is an apparent gap in records of *M. mystacinus* s.l. of almost 500 km between southern Turkey, where the closest findings in the Middle East were made, and the southern Lebanon Mts. and Mount Hermon. This distribution pattern suggests existence of an isolated Levantine population restricted to higher continental areas of the Lebanon and Anti-Lebanon Ridges, similarly as in e.g. *Chionomys nivalis hermonis* (Miller, 1908) which occurs only in these ridges in Arabia (Harrison & Bates 1991).

Benda & Karataş (2005), Benda et al. (2006), and Shehab et al. (2007) referred the respective TAU specimen from Mount Hermon to *Myotis davidii* (Peters, 1869) (under its junior synonym, *M. aurascens* Kuzâkin, 1935), an Eurasian bat distributed in the steppe belt stretching from the

south-eastern parts of Europe to the Far East via the northern parts of the Middle East and mountains and steppes of Central Asia (Benda et al. 2012a, Tsytsulina et al. 2012). Benda & Karataş (2005) based their identification on the statistical comparison of cranial dimensions of the TAU bat with dimensions of the European and Caucasian samples of various species of the *Myotis mystacinus* morpho-group. This analysis showed the Mount Hermon bat to be most similar to the European (Balkan) samples of *M. davidii* (using the current taxonomy), see Benda & Karataş (2005: 19–20, Figs. 2–3). Based on these results concerning the TAU specimen from Mount Hermon, Horáček et al. (2008) assigned the Lebanese specimen from Jezzine preliminarily also to *M. aurascens*.

However, Benda et al. (2012a, 2016a) revised the taxonomic status of the particular populations of the *Myotis mystacinus* morpho-group from the Caucasus region and the Middle East, with the help of a molecular genetic analysis and detailed morphological comparisons of the external and skull dimensions and dental traits. These analyses showed a quite different picture of geographical variation within the group in comparison with the results by Benda & Karataş (2005); in Europe and the northern Caucasus, the representatives of *M. davidii* are large-sized bats in comparison to *M. mystacinus* s.str. (in agreement with the results by Benda & Tsytsulina 2000 and Benda & Karataş 2005), while in the Middle East and Turkestan, *M. davidii* is a rather small-sized form (considered as a distinct species, *M. nipalensis* (Dobson, 1871), by Benda & Tsytsulina 2000) and *M. mystacinus* s.str. represents both small- and large-sized bats (the large ones erroneously considered as *M. aurascens* [= *M. davidii*] by Benda & Tsytsulina 2000 and Benda & Karataş 2005). Thus, according to the data by Benda et al. (2016a), the main difference in skull morphology between *M. mystacinus* s.str. and *M. davidii* does not lie in the skull size, but in the skull shape; *M. mystacinus* s.str. has (both absolutely and relatively) a long and narrow rostrum, while *M.*

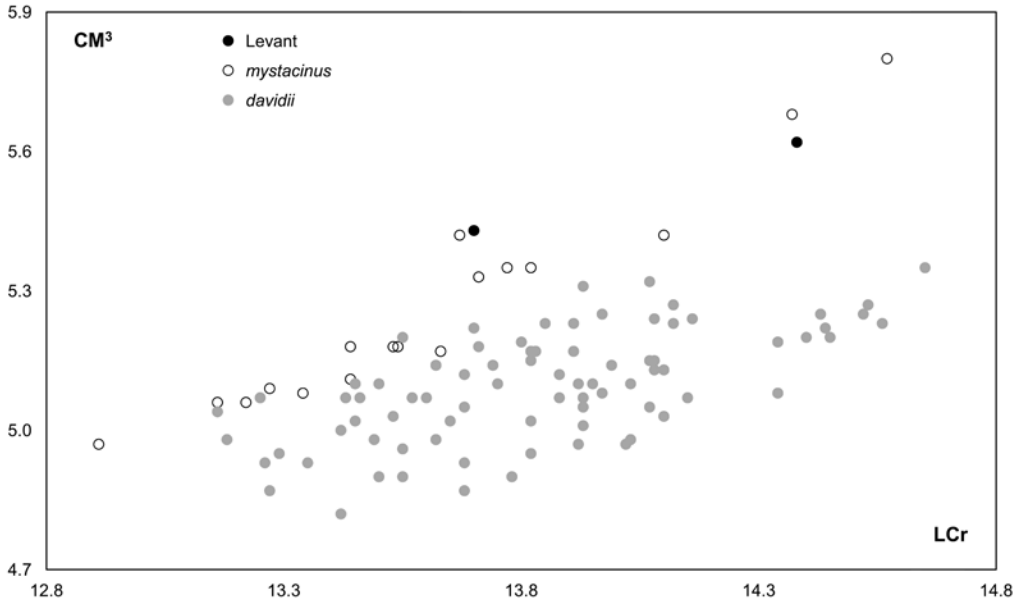


Fig. 34. Bivariate plot of the examined south-western Asian samples of the *Myotis mystacinus* group: greatest length of skull (LCr) against the length of upper tooth-row (CM^3).

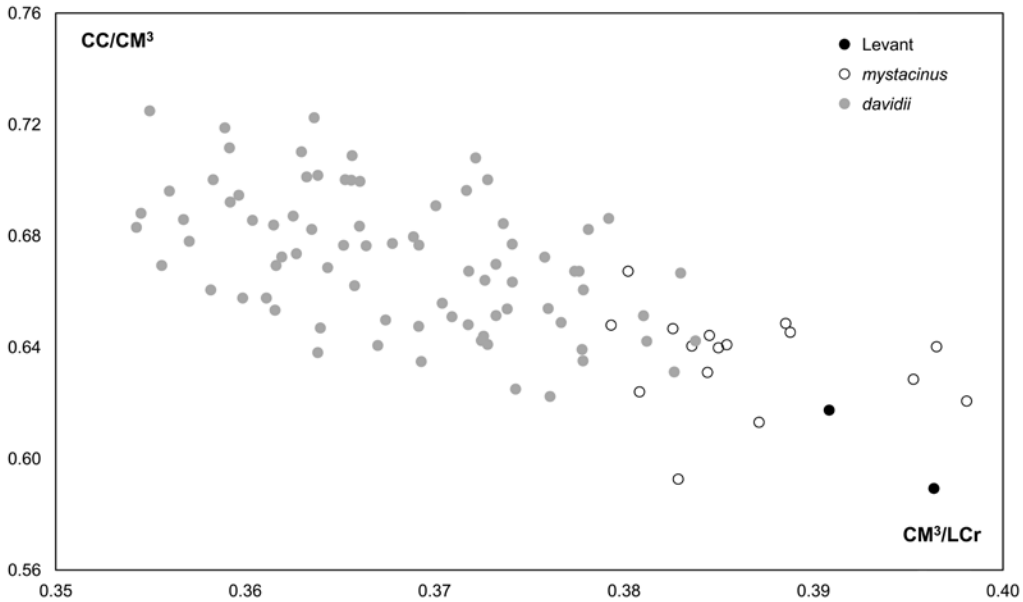


Fig. 35. Bivariate plot of the examined south-western Asian samples of the *Myotis mystacinus* group: relative length of rostrum (CM^3/LCr) against the relative width of rostrum (CC/CM^3).

davidii a rather short and broad rostrum. Besides the skull shape, these two species well differ in their dental and genetic characters. This shows that the species identification presented by Benda & Tsytsulina (2000), Benda & Karataş (2005), and Benda et al. (2006, 2011b) concerning bats of the *M. mystacinus* morpho-group from south-western Asia is rather useless, see Benda et al. (2012a, 2016a) and Dietz et al. (2016).

However, the above described and rather simple distinctness in the skull size and shape between *M. mystacinus* s.str. and *M. davidii* (conforming with the results of the molecular genetic analysis, see Benda et al. 2016a) can be used for the species identification of the two available Levantine specimens of the group (TAU M9456 from Mount Hermon and NMP 95791 from Jezzine, Lebanon). Both skulls have a rather long rostrum, both absolutely (upper tooth-row length, CM^3, is 5.43 mm and 5.62 mm, i.e. larger than 5.35 mm, the largest value known from *M. davidii*; cf. Benda et al. 2016a) and relatively (CM^3>39% of the greatest skull length, LCr), and, at the same time, they have a relatively very narrow rostrum (rostrum widths across upper canines, CC, represent less than 62% of CM^3). These values clearly show these bats as representatives of *M. mystacinus* s.str. (Figs. 34, 35). These individuals are very similar in their morphology to the series of specimens of this species from Qutur Su in north-western Iran, identified also with the help of genetic analysis (Benda et al. 2012a).

Interestingly, due to the occurrence in the Levant, *M. mystacinus* represents a more widespread species of south-western Asia than *M. davidii*, but still remains much rarer than the latter species – see the number of specimens of both species coming from the Middle East and Caucasus Region, identified by Benda et al. (2016a) and used here for comparison (Figs. 34, 35).

External and cranial dimensions of the only available Lebanese specimen of *M. mystacinus* are shown in Table 2.

Material examined. 1 ♀ (NMP 95791 [S+A]), Jezzine, Pont El Khalass, 23 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec.

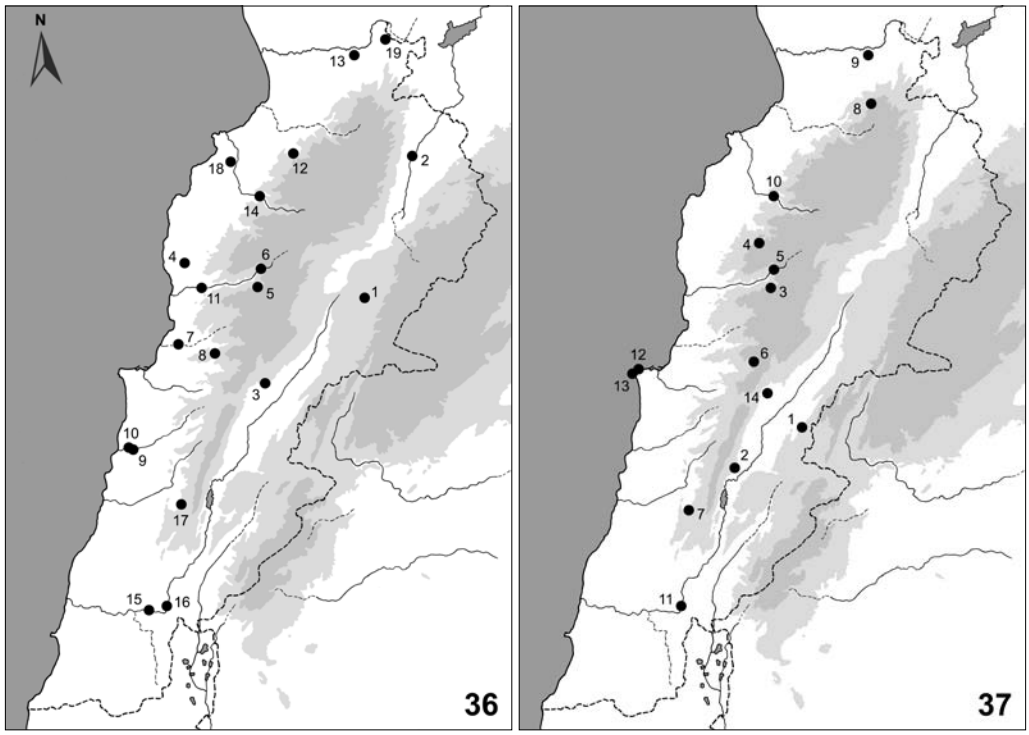
Myotis capaccinii (Bonaparte, 1837)

Records. **Original data**: E l B e q a a: Baalbek [1], ancient ruins, underground corridor, 24 April 2006: obs. 1 ind. torpid (cf. Horáček et al. 2008); – Ras El Assi [2], Ein El Zarqa and rocky habitats around (Fig. 18), 29 June 2006: det. calls of several foraging inds., 17 March 2009: det. calls of several foraging inds. (cf. Horáček et al. 2008); – Zahle [3], undergroud channel beneath the downtown, 9 July 2006: obs. 1 ms torpid (cf. Horáček et al. 2008). – J e b e l L u b n a n: Aamchit, Saleh Cave [4] (Fig. 26), 25 March 2009: net. 1 ma, NMP (cf. Benda et al. 2012a); – Afqa, Afqa Cave [5] (Fig. 9), 17 January 2008: obs. 2 inds. torpid (cf. Horáček et al. 2009); – El Aaqoura, Er Roueiss Cave [6] (Fig. 55), 26 June 2006: net. 5 ma, NMP, 11 February 2009: obs. 1 ind. torpid (cf. Horáček et al. 2008, 2009, Benda et al. 2012a); – Jeita, Jeita Cave [7], 26 January 2007: bone remains of 1 ind. found in the cave deposit; – Marjaba [8], mines, 19 January 2007: obs. 1 ind. torpid, coll. 1 fs, NMP, 15 March 2009: obs. 1 ind. torpid (cf. Horáček et al. 2008, Benda et al. 2012a); – Nahr Es Safa, above the river ca. 1 km above the junction with the Nahr Ed Damour [9], 21 April 2006: det. calls of several foraging inds. (cf. Horáček et al. 2008); – Nahr Es Safa, beneath a bridge across the river ca. 1 km below the junction with Nahr Ed Damour [10], 22 June 2006: det. calls of several foraging inds. (cf. Horáček et al. 2008); – Yahchouch, Nahr Ibrahim [11], tunnel, 24 October 2012: obs. 1 ind. torpid. – L u b n a n E s h S h a m a l i: Haqel El Aazime, Achou Cave [12], 21 January 2007: obs. 1 ind. torpid, coll. 1 fs, NMP, 18 January 2008: obs. 3 inds. torpid, coll. 1 ma, NMP (cf. Horáček et al. 2008, 2009, Benda et al. 2012a); – Mounjez [13] (Fig. 38), under a bridge, 4 June 2010: net. 1 fj, NMP; – Seraal, Qadisha Valley [14], 10 June 2010: det. calls of numerous foraging inds. – N a b a t i y e: Aalmane, El Litani Valley [15], 21 June 2006: net. 1 mj, 1 fa, NMP (cf. Horáček et al. 2008, Benda et al. 2012a); – Arnoun, Beaufort Castle [16] (Fig. 47), 22 March 2009: obs. 2 inds. torpid, coll. 1 ma, NMP (cf. Benda et al. 2012a). – **Published data**: J e b e l L u b n a n: Mogharet Saleh cave [4], 2 km E Amchite, 25 September 1961: 1 m, AUB (Lewis & Harison 1962 [as *M. emarginatus*], Atallah 1970, 1977); Mogharet Saleh, 2 km E Amchite, 16 August 1968: 4 inds. (Atallah 1970); Mogharet Saleh, near Amchite, 5 inds., SAC, AUB (Atallah 1977); Amchite, 11 November 1962: 6 m, AUB (Benda et al. 2012a); – Naba'a, Niha Cave [17], 9 February 2013: obs. 13 inds. (Abi-Said 2014). – L u b n a n E s h S h a m a l i: Tripoli, Alhab Cave [18], 2 February 2013: obs. 100 inds. (Abi-Said 2014); – Zebdeen Cave [19], 16 January 2013: obs. 10 inds. (Abi-Said 2014).

Comments. *Myotis capaccinii* is a medium-frequent bat in Lebanon, recorded from 19 localities (Table 1). This species belongs to the most widespread bats of Lebanon, its localities are scattered across the whole country (Fig. 36). *M. capaccinii* was recorded also in the southern and eastern parts of the country, including the El Beqaa and Orontes Valleys.

M. capaccinii is one of the most widely distributed bats in the northern part of the Middle East, where this bat reaches the eastern and southern margins of its whole distribution range (Harrison & Bates 1991, Benda et al. 2006, 2012a). The Lebanese part of the distribution range of *M. capaccinii* continues both southward and northward. This bat is rather common in the Mediterranean hilly areas of northern Palestine (Galilee, Yizre'el, and Hula Valleys, Carmel Ridge) and the Golan Heights (Mendelssohn & Yom-Tov 1999, Benda et al. 2006). However, *M. capaccinii* is a very rare bat in north-western Jordan and in western Syria, only one record is available in each of these country parts (Shehab et al. 2007, Benda et al. 2010), although this bat is common in the Euphrates Valley (Benda et al. 2006, Shehab et al. 2007). No records of *M. capaccinii* are known from the Syrian part of the Anti-Lebanon Mts. and the Jebel An Nusariyah Mts. The El Beqaa and Orontes Valleys of Lebanon thus represent the eastern margin of its known distribution in the central part of the Levant (Lebanon, NW Syria) and the Lebanese section of *M. capaccinii* range thus belongs to the areas of rather dense occurrence of this bat in the Levant (see Benda et al. 2006).

In Lebanon, *M. capaccinii* is distributed over a rather narrow range of altitudes (1243 m; altitude median 622.5 m, mean 617.1 m a. s. l.; Table 2) and the records come from rather low parts of the country. The highest recorded locality of this bat in Lebanon is the Er Roueiss Cave (Lebanon Mts.) at 1285 m a. s. l. (Fig. 55), which is used by *M. capaccinii* as a hibernaculum and probably also as a summer roost. Majority of records of this bat from Lebanon were made in roosts (63.2%, n=12) and the altitudinal range of the roost sites is only slightly smaller than the



Figs. 36, 37. Records of particular bat species in Lebanon. 36 – *Myotis capaccinii* (Bonaparte, 1837). 37 – *Eptesicus serotinus* (Schreber, 1774).

range of all records (1151 m), the median and mean altitude values are higher than those of all records, 843.5 m and 777.1 m a. s. l., respectively (range 134–1285 m a. s. l.). These values for the hibernation roosts are even higher, 915.0 m and 806.2 m a. s. l., respectively (n=10), although the range is identical. Hence, in Lebanon *M. capaccinii* prefers to roost in areas of medium altitudes and to hibernate in rather elevated sites. Foraging individuals of *M. capaccinii* were documented from eight localities (42.1% of the record sites), equally by nettings and detections of their echolocation calls. These sites were situated rather in lower parts of Lebanon, the median and mean altitude values are 230.0 m and 401.6 m a. s. l., respectively.

M. capaccinii was found to roost in Lebanon mainly in natural caves of very variable size and position (58.3%, n=7; hibernacula 77.8%, n=7), man-made underground spaces (mine, tunnel, channel, dark parts of abandoned ruins) represented a smaller number of the documented roosts (41.7%, n=5). In the summer roosts and in most of the hibernacula, only single bats were found (Table 13). Larger numbers of hibernating individuals of *M. capaccinii* at one site (n>10) were documented only in two localities situated in a very wide range of altitudes (Abi-Said 2014), ca. 100 bats were observed in the Alhab Cave near Trablous (134 m a. s. l.) on 2 February and 13 bats were found in the Niha Cave at Naba'a (1125 m a. s. l.) on 9 February. No maternity aggregation of *M. capaccinii* was found in Lebanon. A juvenile female of the year was netted at Mounjez on 4 June (Fig. 38) and a juvenile male at Aalmane on 21 June.

Table 13. Numbers of *Myotis capaccinii* in particular roosts per particular checks; W 2013 – checks during the winter 2012–2013 (Abi-Said 2014)

roost	*IV 2006*	*VI 2006*	I 2007	I 2008	II 2009	III 2009	*VIII 2009*	*VI 2010*	*X* 2012	W 2013	min	max	n checks
Achou Cave	–	–	1	3	0	–	–	–	–	–	0	3	3
Afqa Cave	*0*	*0*	0	2	0	–	–	*0*	*0*	0	0	2	8
Baalbek, ruins	*1*	–	0	0	–	–	–	–	–	–	0	1	3
Beaufort Castle	–	–	–	–	–	2	*0*	*0*	–	–	0	2	3
Er Roueiss Cave	–	*0*	0	0	1	–	–	–	–	0	0	1	5
Marjaba, mines	–	–	1	0	0	1	–	–	*0*	0	0	1	6

in *italics*, checks in the summer season; Roman numerals denote months, Arabic numerals denote years

External and cranial dimensions of the Lebanese specimens of *M. capaccinii* are shown in Table 12. For the material examined see below.

Material examined. 1 ♂, 1 ♀ (NMP 95772 [A], 95773 [S+A]), Aalmane, El Litani, 21 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 8 ♂♂ (AUB M664 [A], M664/1–M664/5 [S+A], labelled as *M. emarginatus*), cave 2 km E Amchite, 11 November 1962, leg. R. E. Lewis; – 1 ♂ (NMP 93710 [S+A]), Aamchit, Saleh Cave, 25 March 2009, leg. T. Bartonička, P. Benda, I. Horáček & R. Lučan; – 1 ♂ (NMP 93708 [S+A]), Beaufort Castle, 22 March 2009, leg. T. Bartonička, P. Benda, I. Horáček & R. Lučan; – 5 ♂♂ (NMP 95814 [A], 95815–95818 [S+A]), Er Roueiss Cave, 26 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 1 ♀ (NMP 91774 [S+A]), Haqel El Azime, Achou Cave, 21 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♂ (NMP 91901 [S+A]), Haqel El Azime, Achou Cave, 18 January 2008, leg. P. Benda, I. Horáček, R. Lučan & M. Uhrin; – 1 ♀ (NMP 91759 [S+A]), Marjaba, mine,

Fig. 38. A road bridge in a small stream valley at Mounjez (Lubnan Esh Shamali), a foraging habitat of *Myotis capaccinii*, *Eptesicus serotinus*, *Hypsugo savii*, *Pipistrellus pipistrellus*, and *P. kuhlii* (June 2010). Photo by M. Uhrin.

19 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♀ (NMP 93549 [A]), Mounjez, 4 June 2010, leg. P. Benda & M. Uhrin.

Records of ectoparasites. **Original data**: N y c t e r i b i i d a e: *Nycteribia pedicularia*: 5 ma, 4 fa (CMŠ [A]) from 3 ma (NMP 95815, 95817, 95818), Aaqoura, Er Roueiss Cave, 26 June 2006; – 1 ma, 1 fa (CMŠ [A]) from 1 ma (NMP 91901), Haquel El Azime, Achou Cave, 18 January 2008; – 1 ma (CMŠ [A]) from 1 ma (NMP 93708), Beaufort Castle, 22 March 2009; – 2 ma, 1 fa (CMŠ [A]) from 1 ma (NMP 93710), Aamchit, Saleh Cave, 25 March 2009; – 5 ma, 8 fa (CMŠ [A]) from 1 fj (NMP 93549), Mounjez, 4 June 2010. – *Nycteribia schmidlii*: 1 ma, 1 fa (CMŠ [A]) from 2 ma (NMP 95815, 95818), Aaqoura, Er Roueiss Cave, 26 June 2006. – *Penicillidia dufourii*: 1 fa (CMŠ [A]) from 1 ma (NMP 95815), Aaqoura, Er Roueiss Cave, 26 June 2006. – S p i n t u r n i c i d a e: *Spinturnix myoti*: 1 fa (CMŠ [A]) from 1 fj (NMP 93549), Mounjez, 4 June 2010. – *Spinturnix psi*: 2 ma, 5 fa (CMŠ [A]) from 1 fj (NMP 93549), Mounjez, 4 June 2010.

Comments on ectoparasites. *Nycteribia pedicularia* Latreille, 1805 was found as the most frequent ectoparasite of *M. capaccinii* in Lebanon, it was collected from five sites in almost thirty specimens. This bat is a principal host of *N. pedicularia* and the distribution range of this bat fly corresponds with that of *M. capaccinii*; it covers the Mediterranean Basin from southern Europe and North Africa to Iran (Hůrka 1980). Since it ranks among the parasites of cave-dwelling bats, it was found on the largest number of host bat species in Lebanon, viz. *Rousettus aegyptiacus*, *Rhinolophus ferrumequinum*, *Myotis blythii*, *Hypsugo savii*, and *Miniopterus schreibersii*. However, despite its common occurrence and the number of hosts, *N. pedicularia* is here reported from Lebanon for the first time. Another bat fly species, *Nycteribia schmidlii* Schiner, 1853 is also a parasite of cave-dwelling bats, however, its principal host is *Miniopterus schreibersii* (see below and Aellen 1955). Occurrence of the large bat fly *Penicillidia dufourii* (Westwood 1834) on *M. capaccinii*

Fig. 39. Balaa (ca. 1500 m a. s. l., Jebel Lubnan), a foraging habitat of *Eptesicus serotinus*, *Hypsugo savii*, *Pipistrellus pipistrellus*, and *Tadarida teniotis* (July 2006 & May 2010). Photo by M. Uhrin.

represents a common phenomenon, this fly parasitises widely on the cave-dwelling bats (Hůrka 1980). From Lebanon, it is here reported for the first time, it was collected also from *Rhinolophus ferrumequinum*, *Myotis myotis* and *M. blythii*.

M. capaccinii belongs to the primary hosts of the mite *Spinturnix myoti* (Kolenati, 1856), while its relative, *S. psi* (Kolenati, 1856), parasitises this bat in the case of its common roosting with the principal host of this mite, *Miniopterus schreibersii* (Deunff et al. 2004). The distribution range of *S. myoti* corresponds to the ranges of its principal hosts, the bats of the *Myotis myotis* group (Stanyukovich 1997). From Lebanon, this mite is here reported for the first time, it was also collected from its principal host, *Myotis blythii*. The range of *S. psi* also conforms to the distribution of its principal host, *M. schreibersii*, and is here reported for the first time from Lebanon, where it was collected also from *Hypsugo savii* (see below).

Eptesicus serotinus (Schreber, 1774)

Records. **Original data**: E l B e q a a: Aanjar [1], at a pool at the northern edge of the town, 5 June 2010: det. calls of 1 foraging ind.; – Khirbet Qanafar, El Jaouz Cave [2], rocky overhang near the cave, 9 June 2010: net. 1 ma, NMP, det. calls of 2 foraging inds. – J e b e l L u b n a n: Afqa, Afqa Cave [3] (Fig. 9), 26 June 2006: net. 3 ma, coll. 2 ma, NMP, 15 July 2006: net. 1 ma, NMP, 17 January 2008: obs. 1 ind. torpid, coll. 1 ms, NMP (cf. Horáček et al. 2008, 2009); – Balaa [4], above a creek (Fig. 39), 31 May 2010: det. calls of 1 foraging ind.; – El Aaqoura, Er Roueiss Cave [5] (Fig. 55), 26 June 2006: net. 1 ma, NMP (cf. Horáček et al. 2008); – Majdel Tarshish, Qattine Aazar Chasm [6], 7 June 2010: net. 1 ma, NMP, det. calls of 2 foraging inds. – L u b n a n E l J a n u b i: Jezzine, Pont El Khalass [7], abandoned house, 23 June 2006: net. 6 ma, 1 ms, coll. 5 ma, 1 ms, NMP (cf. Horáček et al. 2008). – L u b n a n E s h S h a m a l i: Fnaydeq, Ein El Qammouaa [8], 3 June 2010: det. calls of several foraging inds.; – Mounjez [9] (Fig. 38), bridge, 4 June 2010: det. calls of 2 foraging inds.; – Seraal, Qadisha Valley [10], 10 June 2010: det. calls of several foraging inds. – N a b a t i y e: Arnoun, Beaufort Castle [11] (Fig. 47), 2 August 2009: obs. 1 ind. torpid., 6 June 2010: net. 2 ma, NMP, det. calls of 1 foraging ind. – **Published data**: B e i r u t: Beirut, I.C. Field, American University of Beirut [12] 6 July 1960: 1 f, BMNH (Lewis & Harrison 1962, Harrison 1964, Atallah 1977); American University Beirut, 6 June 1960: 1 f, BMNH (Benda et al. 2006, Benda & Gaisler 2015); – Beyrouth (Grotte aux Pigeons) [13] (Tohmé & Tohmé 1985). – E l B e q a a: Shtora [14], March–June 1914: 1 ind. (Allen 1915). – Lebanon (undef.): Lebanon [Mts.] (Tristram 1884).

Comments. *Eptesicus serotinus* is a moderately frequent bat in Lebanon, recorded from 14 localities (Table 1). This species seems to belong to widespread bats in Lebanon though its sites are scattered mainly along the range of the Lebanon Mts. (Fig. 37). However, *E. serotinus* was recorded also in the southern and eastern parts of the country, one finding is available from the Anti-Lebanon Mts. Lewis & Harrison (1962) reported only one record of *E. serotinus* from Lebanon and considered this species rare.

The records of *E. serotinus* are broadly distributed in the Mediterranean parts of the Middle East (Harrison & Bates 1991, Benda et al. 2006), its Lebanese range continues southward, eastward, and northward. This bat is rather rarely found in northern Palestine, the records are known mostly from the eastern Upper Galilee and the Hula Valley (Mendelssohn & Yom-Tov 1999), but relatively numerous findings were made in the northern part of the Golan Heights (Mendelssohn & Yom-Tov 1999, Benda et al. 2006). Several records are available from western Syria, including the Anti-Lebanon Mts. and the Jebel An Nusariyah Mts. (Benda et al. 2006, Shehab et al. 2007). Thus, the new and relatively numerous records of *E. serotinus* from Lebanon correspond to the distribution pattern of this bat in other parts of the northern Levant.

E. serotinus is distributed over a medium-wide range of altitudes of Lebanon (1479 m; altitude median 970.0 m, mean 894.8 m a. s. l.; Table 2), the highest recorded locality of this bat is Balaa (Fig. 39; Lebanon Mts.) at 1494 m a. s. l. (echolocation calls of a single foraging individual were recorded along a mountain stream). The records of foraging bats prevail in the list of findings of *E. serotinus* in Lebanon (78.6%, n=11); the altitudinal range of foraging habitats is markedly smaller than the range of all records (1180 m) and the median and mean altitude values are

Table 14. Basic biometric data on the examined Lebanese samples of *Eptesicus serotinus* (Schreber, 1774), *E. anatolicus* Felten, 1971 and *Hypsugo savii* (Bonaparte, 1837). For abbreviations see p. 213

	Eptesicus serotinus					*Eptesicus anatolicus*					*Hypsugo savii*				
	n	**M**	min	max	SD	n	**M**	min	max	SD	n	**M**	min	max	SD
LAt	18	**52.96**	49.3	57.2	2.047	5	**46.82**	44.8	48.0	1.221	26	**33.62**	32.1	35.6	0.897
LCr	14	**21.07**	19.87	21.95	0.543	5	**17.72**	17.11	18.30	0.485	19	**13.46**	12.90	13.93	0.293
LCb	14	**20.30**	19.32	21.19	0.545	5	**17.36**	16.63	17.78	0.482	18	**13.10**	12.49	13.42	0.280
LaZ	14	**14.24**	13.76	15.23	0.387	5	**12.47**	12.24	12.69	0.188	19	**8.72**	8.36	9.06	0.192
LaI	14	**4.29**	4.07	4.46	0.126	5	**3.90**	3.75	3.99	0.100	19	**3.46**	3.21	3.61	0.091
LaInf	14	**6.49**	6.24	6.68	0.140	5	**5.81**	5.63	6.02	0.148	19	**4.46**	4.14	4.75	0.180
LaN	14	**9.59**	9.32	9.87	0.152	5	**8.47**	8.17	8.65	0.193	19	**6.69**	6.44	6.98	0.145
LaM	14	**11.33**	10.68	11.98	0.332	5	**9.75**	9.62	9.93	0.129	19	**7.33**	7.02	7.58	0.145
AN	14	**7.02**	6.62	7.34	0.189	5	**6.47**	6.37	6.65	0.112	19	**6.69**	6.44	6.98	0.145
LBT	12	**4.04**	3.71	4.27	0.196	5	**3.54**	3.44	3.68	0.104	19	**3.10**	2.88	3.38	0.135
CC	13	**6.75**	6.48	6.97	0.133	5	**5.82**	5.63	5.97	0.142	19	**4.28**	3.98	4.49	0.136
M^3M^3	14	**8.64**	8.13	9.02	0.250	5	**7.94**	7.77	8.07	0.122	19	**5.84**	5.66	6.13	0.130
CM^3	14	**7.90**	7.42	8.33	0.253	5	**6.72**	6.52	6.82	0.122	19	**4.62**	4.37	4.79	0.107
LMd	14	**15.54**	14.92	16.28	0.430	5	**13.19**	12.82	13.54	0.299	19	**9.44**	8.97	9.75	0.202
ACo	14	**5.80**	5.49	6.42	0.254	5	**4.85**	4.49	5.07	0.234	19	**2.83**	2.61	3.06	0.113
CM_3	14	**8.75**	8.43	9.13	0.218	5	**7.38**	7.02	7.53	0.207	19	**4.93**	4.58	5.12	0.125

markedly higher compared to those of all records, 1184.0 m and 1056.6 m a. s. l., respectively. The foraging bats were recorded in most cases in context of rocky habitats (at cave entrances, at a chasm, abandoned house, ruined castle; 54.5%, n=6), the records at or above water bodies were less frequent (45.5%, n=5). All the netted individuals were males.

In Lebanon, only one hibernation roost of *E. serotinus* was documented, one torpid male was found in the Afqa Cave (at 1255 m a. s. l.; Fig. 9) on 17 January. One to three summer roosts of this bat were found in Lebanon; one individual was found roosting in a fissure between stones in a dark corridor of the Beaufort Castle near Arnoun (695 m a. s. l.; Fig. 47), other two roosts are perhaps represented by the published records. Lewis & Harrison (1962) collected an adult female from the athletic field of the American University Beirut on 6 July and Tohmé & Tohmé (1985) reported this bat from the Pigeon Cave in Beirut. No record of maternity colony of *E. serotinus* is available from Lebanon.

External and cranial dimensions of the Lebanese specimens of *E. serotinus* are shown in Table 14. For the material examined see below.

Material examined. 2 ♂♂ (NMP 95828, 95829 [S+A]), Afqa Cave, 26 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 1 ♂ (NMP 90899 [S+A]), Afqa Cave, 15 July 2006, leg. P. Benda; – 1 ♂ (NMP 91894 [S+A]), Afqa Cave, 17 January 2008, leg. P. Benda, I. Horáček, R. Lučan & M. Uhrin; – 2 ♂♂ (NMP 93559 [S+A], 93560 [A]), Beaufort Castle, 6 June 2010, leg. P. Benda & M. Uhrin; – 1 ♀ (BMNH 61.419. [S+B]), Beirut, A.U.B., 6 June 1960, leg. R. E. Lewis; – 1 ♂ (NMP 95819 [S+A]), Er Roueiss Cave, 26 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 6 ♂♂ (NMP 95795–95797, 95799, 95800 [S+A], 95798 [A]), Jezzine, Pont El Khalass, 23 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 1 ♂ (NMP 93576 [S+A]), Khirbet Qanafar, 9 June 2010, leg. P. Benda & M. Uhrin; – 1 ♂ (NMP 93564 [S+A]), Majdal Tarshish, Qattine Aazar Chasm, 7 June 2010, leg. P. Benda & M. Uhrin.

Records of ectoparasites. **Original data**: N y c t e r i b i i d a e: *Nycteribia schmidlii*: 1 fa (CMŠ [A]) from 1 ma (NMP 95800), Jezzine, Pont El Khalass, 23 June 2006; – 1 fa (CMŠ [A]) from 1 ma (NMP 95828), Afqa Cave, 26 June 2006.

Comments on ectoparasites. One species of arthropod parasite was collected from *E. serotinus* in Lebanon, the bat fly *Nycteribia schmidlii* Schiner, 1853. However, this species parasitises cave-

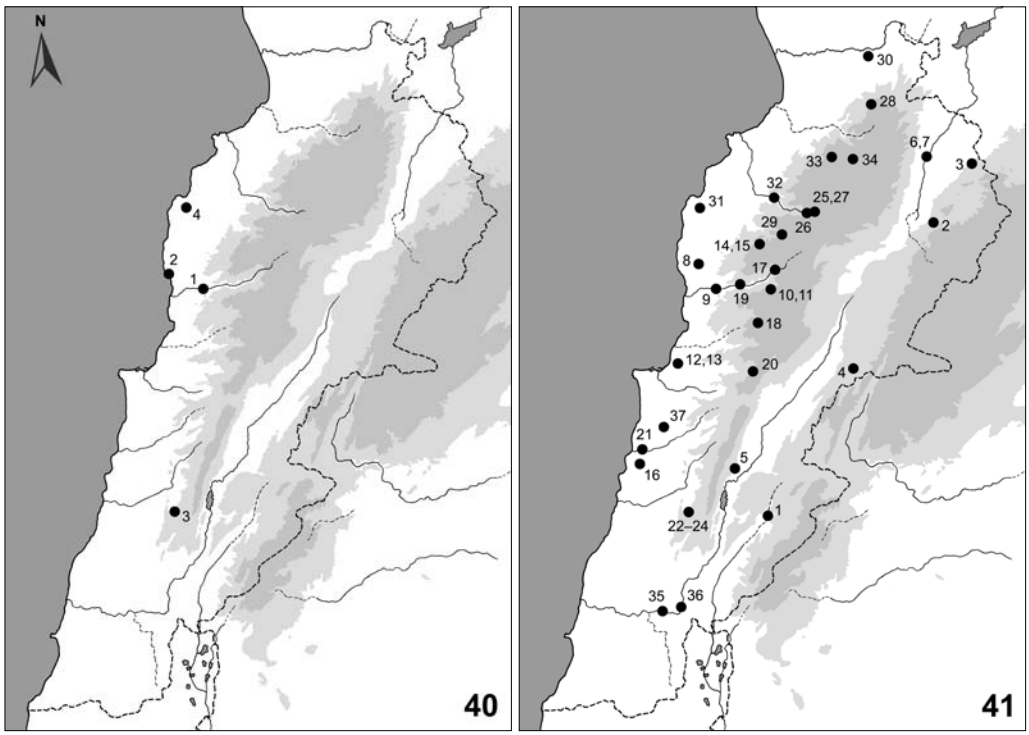
dwelling bats and its principal host is *Miniopterus schreibersii* (Hůrka 1980). Bats of the genus *Eptesicus* do not belong to the common hosts of this parasite (see below) and its record from *E. serotinus* is rather unusual and perhaps only accidental.

Eptesicus anatolicus Felten, 1971

Records. **Original data**: J e b e l L u b n a n: Adonis, Nahr Ibrahim [1] (Fig. 42), 1 June 2010: net. 1 faG, NMP; – Jbail, citadel [2], 13 July 2006: obs. 2 faL+4 juv., coll. 1 fa, NMP (cf. Horáček et al. 2008). – L u b n a n E l J a n u b i: Jezzine, Pont El Khalass [3], abandoned house, 23 June 2006: net. 2 ma, NMP (cf. Horáček et al. 2008). – L u b n a n E s h S h a m a l i: Ras Nhach, Musailha Fort [4] (Fig. 21), 28 June 2006: net. 1 ma, NMP (cf. Horáček et al. 2008).

Comments. *Eptesicus anatolicus* is a rare bat in Lebanon, recorded only from four localities (Table 1). The records are available only from the western part of the country – from the western slopes of the Lebanon Mts. and the coastal plains (Fig. 40). *E. anatolicus* has been discovered in Lebanon only recently, three records were made in 2006 (Horáček et al. 2008) and only one new finding was added in 2010.

E. anatolicus is an endemic of the Middle East, it is known to occur in a belt of the Mediterranean habitats stretching from the Dodecannese Islands, via southern Turkey, Cyprus, western Syria, and northern Iraq, to southern Iran (Benda et al. 2006, 2007, 2012a). From Syria, this bat is



Figs. 40, 41. Records of particular bat species in Lebanon. 40 – *Eptesicus anatolicus* Felten, 1971. 41 – *Hypsugo savii* (Bonaparte, 1837).

known from four sites in the southern Jebel An Nusariyah Mts., adjacent to the Lebanese northern border. The occurrence of *E. anatolicus* in Lebanon thus represents the southernmost extension of the distribution range of this bat in the Levant and the western part of the Middle East as well (see also Benda & Obuch 2009: 130, Fig. 1).

In Lebanon, *E. anatolicus* is distributed rather at lower altitudes (altitude median 155.0 m, mean 338.8 m a. s. l.; these values are the second lowest among the Lebanese bats, see Table 2), spread over a very narrow range (1005 m, the smallest value among the Lebanese bats; Table 2). The highest recorded locality of this bat in Lebanon is Pont El Khalass near Jezzine (southernmost part of the Lebanon Mts.) at 1025 m a. s. l. This site represents also the highest locality of *E. anatolicus* recorded in the whole Levant, in Syria this bat was recorded in the altitude range of 10–370 m a. s. l. (Benda et al. 2006).

E. anatolicus is known from Lebanon mostly from its foraging habitats, it was netted at three sites, two of them represented synanthropic habitats (abandoned house and castle ruin), once it was caught above a water stream in the canyon-like valley of the Nahr Ibrahim river (Fig. 42). *E. anatolicus* was once found in a roost, perhaps a remain of a nursery colony, composed of two lactating females with two juveniles each, in the citadel of Jbail (Byblos) on 13 July. The juveniles were medium- grown, with forearm length of 30–35 mm (ca. two thirds of the adult length).

Fig. 42. The middle part (ca. 260 m a. s. l.) of the Nahr Ibrahim river valley at Adonis (Jebel Lubnan), a foraging habitat of *Eptesicus anatolicus*, *Hypsugo savii*, *Pipistrellus pipistrellus*, and *P. kuhlii* (July 2006 & June 2010). Photo by M. Uhrin.

A pregnant female *E. anatolicus* was recorded at Adonis (Fig. 42) on 1 June, it contained two foeti of the crown-rump length 7.2 mm.

External and cranial dimensions of the Lebanese specimens of *E. anatolicus* are shown in Table 14. For the material examined see below.

Material examined. 1 ♀ (NMP 93533 [S+A]), Adonis, Nahr Ibrahim, 1 June 2010, leg. P. Benda & M. Uhrin; – 1 ♀ (NMP 90894 [S+A]), Jbail, citadel, 13 July 2006, leg. P. Benda; – 2 ♂♂ (NMP 95801, 95802 [S+A]), Jezzine, Pont El Khalass, 23 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 1 ♂ (NMP 95833 [S+A]), Musailha Fort, 28 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec.

Records of ectoparasites. **Original data**: N y c t e r i b i i d a e: *Nycteribia schmidlii*: 1 fa (CMŠ [A]) from 1 ma (NMP 95801), Jezzine, Pont El Khalass, 23 June 2006.

Comments on ectoparasites. Only one individual of parasite, the bat fly *Nycteribia schmidlii* Schiner, 1853 was obtained from *E. anatolicus*. Similarly as in *Eptesicus serotinus*, we consider this record as accidental.

Hypsugo savii (Bonaparte, 1837)

Records. **Original data**: E l B e q a a: Dahr El Ahmar, at bridge over a wadi [1], 5 July 2006: det. calls of 1 foraging ind. (cf. Horáček et al. 2008); – El Laboue, caverns in a rocky ridge above the road to Aarsal [2], 7 July 2006: net. 2 ma, det. calls of several foraging inds., in an unused industrial building at the road, 7 July 2006: obs. (and det. calls of) a night roost with a swarming assemblage of 10 inds. (cf. Horáček et al. 2008); – El Qaa, Jebel Haouerta ca. 5 km SE of the village [3] (Fig. 43), small hillside caves, 18 March 2009: obs. 3 inds. roosting in separate rocky fissures (exam. 2 ma), coll. 1 ma, NMP; – Jenta [4] (Fig. 27), at a mine, 8 June 2010: det. calls of 2 foraging inds.; – Khirbet Qanafar, El Jaouz Cave [5], rocky overhang near the cave, 9 June 2010: det. calls of 2 foraging inds.; – Ras El Assi, Deir Mar Maroun Monastery [6] (Fig. 17), 29 June 2006: net. 17 ma, 15 faL, 1 fs, coll. 3 ma, NMP (cf. Benda et al. 2006, 2016b, Horáček et al. 2008); – Ras El Assi, Ein El Zarqa and rocky habitats around [7] (Fig. 18), 29 June 2006: net. 1 mj, 3 faL, 1 fj (cf. Horáček et al. 2008). – J e b e l L u b n a n: Aamchit, at the Saleh Cave [8] (Fig. 26), 25 March 2009: obs. (and det. calls of) several foraging inds., 26 October 2012: det. calls of 1 foraging ind.; – Adonis, Nahr Ibrahim [9] (Fig. 42), 1 July 2006: det. calls of several foraging inds. (cf. Horáček et al. 2008); – Afqa, abandoned house [10], 2 October 2010: obs. 1 ind. (photo by V. Gvoždík); – Afqa, Afqa Cave [11] (Fig. 9), 26 June 2006: net. 4 ma, 1 faL, coll. 3 ma, NMP, 15 July 2006: net. 1 ma, NMP, 22 January 2007: obs. 2 inds. torpid, coll. 1 ma, 1 fa, NMP, 11 February 2009: obs. 1 ind. torpid, 30 May 2010: obs. 1 ind. torpid (cf. Benda et al. 2006, 2016b, Horáček et al. 2008, 2009); – Antelias, El Kassarat Cave [12], 5 August 2009: det. calls of several foraging inds.; – Antelias, Kenaan Cave [13] (Fig. 11), 4 July 2006: det. calls of several foraging inds. (cf. Horáček et al. 2008); – Balaa, rocky amphitheatre [14], 2 July 2006: det. calls of several foraging inds. (cf. Horáček et al. 2008); – Balaa, above a creek [15] (Fig. 39), 31 May 2010: net. 1 ma, NMP, det. calls of several foraging inds. (cf. Benda et al. 2016b); – Dahr El Mghara, a valley and slopes under El Watawit Cave [16], 4 August 2009: det. calls of 1 foraging ind.; – El Aaqoura, Er Roueiss Cave [17] (Fig. 55), 26 June 2006: net. 2 ma, 1 faL, coll. 2 ma, NMP (cf. Benda et al. 2006, 2016b, Horáček et al. 2008); – Faraya, at Raymond Cave (Fig. 51) and at a pond under it [18], 2 June 2010: det. calls of several foraging inds; – Frat, Nahr Ibrahim [19] (Fig. 57), 29 May 2010: det. calls of 2 foraging inds.; – Majdel Tarshish, Qattine Aazar Chasm [20], 7 June 2010: det. calls of 2 foraging inds.; – Nahr Es Safa, below a bridge across the river ca. 1 km below the junction with Nahr Ed Damour [21], 22 June 2006: det. calls of several foraging inds. (cf. Horáček et al. 2008). – L u b n a n E l J a n u b i: Jezzine, Pont El Khalass [22], at a spring, 23 June 2006: det. calls of numerous foraging inds., 2 August 2009: det. calls of several foraging inds. (cf. Horáček et al. 2008); – Jezzine, Pont El Khalass [23], abandoned house, 23 June 2006: net. 8 ma, NMP (cf. Benda et al. 2006, 2016b, Horáček et al. 2008); – Jezzine, at a tunnel [24], 23 June 2006: det. calls of several foraging inds. (cf. Horáček et al. 2008). – L u b n a n E s h S h a m a l i: Bcharre, Qadisha Cave [25], 27 June 2006: net. 1 ma (cf. Horáček et al. 2008); – Bcharre, Qadisha Valley, at the rocky wall opposite to the Mar Lichaa Monastery [26], 27 October 2012: det. calls of 1 foraging ind.; – Bcharre, a small water reservoir near the Qadisha Cave [27], 27 June 2006: net. 2 ma (cf. Horáček et al. 2008); – Fnaydeq, Ein El Qammouaa [28], 3 June 2010: det. calls of several foraging inds.; – Harissa, Nabaa El Jdid [29], at a water pool, 31 July 2009: det. calls of 1 foraging ind.; – Mounjez [30] (Fig. 38), at a bridge, 4 June 2010: det. calls of several foraging inds.; – Ras Nhach, at the Musailha Fort and at a small mine nearby [31] (Fig. 21), 28 June 2006: det. calls of several foraging inds. (cf. Horáček et al. 2008); – Seraal, Qadisha Valley [32], 30 July 2009: net. 1 fs, 10 June 2010: det. calls of several foraging inds.; – Wadi Jhannam [33], small water pool, 29 July 2009: net. 1 mj, det. calls of 1 foraging ind.; – Wadi Jhannam, Ein El Baaliye [34] (Fig. 30), at a water pool, 30 May 2010: det. calls of several foraging inds. – N a b a t i y e: Aalmane, El Litani Valley [35], 21 June 2006: det. calls of several foraging inds (cf. Horáček

et al. 2008); – Arnoun, Beaufort Castle [36] (Fig. 47), 22 March 2009: obs. 1 ind. torpid, 6 June 2010: net. 1 ma, NMP (cf. Benda et al. 2016b). – Lebanon (undef.): [Lebanon], 28 July 1952: 1 fa, AUB (leg. J. E. Stencel). – **Published data**: J e b e l L u b n a n: Ainab [37], 4 August 1952: 1 m, 12 August 1952: 1 m, 29 July 1960: 1 f, BMNH (Harrison 1961, 1964, Atallah 1977); Aïnab, BMNH (Tohmé & Tohmé 1985).

Comments. *Hypsugo savii* is a common bat in Lebanon, it was recorded from 37 localities (Table 1). This species belongs to the most widespread bats of Lebanon, its localities are scattered across the whole country (Fig. 41). *H. savii* was most frequently found in the western part of the country along the main ridge of the Lebanon Mts. and in the coastal hills, but was also recorded in the Anti-Lebanon Mts., in the El Beqaa, Orontes, and El Hasbani Valleys as well as in southern Lebanon. Since previously *H. savii* was known from Lebanon only from one site (see e.g. Lewis & Harrison 1962, Harrison & Bates 1991), the current picture of distribution of this bat in the country is completely different.

H. savii is one of the most common and widespread bats in the Middle East and particularly in its Mediterranean parts, where this bat reaches the southern margin of its whole distribution range (Harrison & Bates 1991, Benda et al. 2006, 2012a). The Lebanese part of the distribution range of *H. savii* continues eastward and northward, but in very scarce occurrence southward. This bat is a frequent species of the western parts of Syria, larger numbers of records are available from the Jebel An Nusariyah Mts., Golan Heights (including Mount Hermon), and from the Syrian part of the Anti-Lebanon Mts. (Mendelssohn & Yom-Tov 1999, Benda et al. 2006). On the other hand, *H. savii* is a very rare bat in Palestine, only two records are known from the Upper Galilee (Mendelssohn & Yom-Tov 1999). The territory of Lebanon thus represents the southernmost area of relatively dense distribution of *H. savii* within its range in the western part of the Middle East or in the eastern Mediterranean.

H. savii is distributed across almost the whole altitudinal gradient of Lebanon (spread over a very broad range of 2128 m; altitude median 1034.0 m, mean 982.8 m a. s. l.; Table 2) with the only exception of the highest parts of the main mountain ranges. The highest recorded locality of *H. savii* in Lebanon is the Ein El Baaliye spring in the Wadi Jhannam (Lebanon Mts.) at 2170 m a. s. l. (Fig. 30), where this bat was documented to forage (by detection of its echolocation calls). These values indicate a clear preference of rather higher altitudes by this lithophilous bat in Lebanon.

The records of foraging bats absolutely prevail in the list of findings of *H. savii* in Lebanon (91.9%, n=34); the altitudinal range of foraging habitats is identical to the range of all records and the median and mean altitude values are only slightly lower compared to those of all records, 1034.0 m and 974.1 m a. s. l., respectively. However, only a third of the records of foraging bats represents caught individuals, a larger part (64.7%) of the records of foraging bats are related to recordings of their echolocation calls. The detection of bat echolocation is thus an extremely effective method for documentation of *H. savii*, 59.5% of its records from Lebanon were made in this way. The foraging bats were recorded only in rocky valleys, near rocky walls, overhangs, cave entrances and in similar habitats, in a half of cases there was water in the foraging habitat, in the other half of cases the habitats were dry at the time of research (but water could be often present there during a different part of the year). Therefore, the physical structure of habitat seems to be more important for the selection of the foraging area by *H. savii* than the habitat humidity or even the presence of water surface.

In Lebanon, three hibernation roosts of *H. savii* were documented and in each case, the bats were found roosting solitarily; three roosting individuals were found in the ceiling niches of small caves/overhangs in a hillside of the Jebel Haouerta Mts. (at ca. 1200 m a. s. l.; Fig. 43) near El Qaa, east of the Orontes Valley, on 18 March, two bats were found in two ceiling fissures of the entrance to the Afqa Cave (1255 m a. s. l.; Fig. 9) on 22 January (2007), another one in a similar

position in this cave on 11 February (2009), and finally, one bat was observed in a fissure between stones of the Beaufort Castle (695 m a. s. l.; Fig. 47) on 22 March.

The Afqa Cave also serves as a summer roost of *H. savii*, one torpid individual was found there on 30 May, another individual was found to roost in an abandoned farm house ca. 850 m north of the entrance to the Afqa Cave on 2 October (1305 m a. s. l.). As in other parts of the distribution range of this bat, cave entrances are frequently visited by *H. savii* in the summer time (Afqa Cave, Er Roueiss Cave), and correspondingly also the cave-like human constructions are used in that way (Ras El Assi, Jezzine, El Laboue). On 7 June 2006, a swarming assemblage of at least 10 individuals was observed in an abandoned factory hall at El Laboue with a peak abundance of resting bats between 23.30 and 0.45.

The only published record of *H. savii* from Lebanon – three bats found in Ainab, three times in the course of July and August (Harrison 1961) – perhaps also represents a summer roost (or even a summer/maternity aggregation) since the findings were repeated three times from the same locality. However, no details are available concerning the collection circumstances of these bats. Actually, no record of a maternity colony of *H. savii* is available from Lebanon, but lactating females were documented at three sites and volant juveniles of the year at two sites. On 26 June, single lactating females were caught at entrances to the Afqa Cave (1255 m a. s. l.) and Er Roueiss Cave (1285 m a. s. l.; Fig. 55), situated ca. 5 km from each other. A larger number of lactating females (18 bats in total) was netted at two close sites near Ras El Assi in the Orontes Valley on 29 June – the cave spaces of Deir Mar Maroun Monastery (720 m a. s. l.; Fig. 17) and the Ein El Zarqa spring (675 m a. s. l.; Fig. 18), at the second site also two volant juveniles of the year were caught; all these bats perhaps originate from one maternity colony – plenty of roost opportunities are available in the rocky walls of the Orontes canyon at the site (Figs. 17–19). A volant juvenile was also netted at a small water pool in Wadi Jhannam (2005 m a. s. l.) on 29 July.

Fig. 43. Jebel Haouerta Mts., the northernmost part of the Anti-Lebanon Mts. in Lebanon (El Beqaa). In rocky overhangs and caverns in these hills, single roosting indviduals of *Hypsugo savii* were found in March 2009. Photo by I. Horáček.

External and cranial dimensions of the Lebanese specimens of *H. savii* are shown in Table 14. For the material examined see below.

Material examined. 3 ♂♂ (NMP 95826, 95827, 95840 [S+A]), Afqa Cave, 26 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 1 ♂ (NMP 90900 [A]), Afqa Cave, 15 July 2006, leg. P. Benda; – 1 ♂, 1 ♀ (NMP 91783, 91784 [S+A]), Afqa Cave, 22 July 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 1 ♂ (NMP 93527 [S+A]), Balaa, 31 May 2010, leg. P. Benda & M. Uhrin; – 1 ♂ (NMP 93561 [S+A]), Beaufort Castle, 6 June 2010, leg. P. Benda & M. Uhrin; – 2 ♂♂ (NMP 95820, 95821 [S+A]), Er Roueiss Cave, 26 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 1 ♂ (NMP 93694 [A]), Jebel Haouerta, 5 km SE El Qaa, 18 March 2009, leg. T. Bartonička, P. Benda, I. Horáček & R. Lučan; – 8 ♂♂ (NMP 95783, 95785–95789 [S+A], 95784, 95790 [A]), Jezzine, Pont El Khalass, 23 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 3 ♂♂ (NMP 95846–95848 [S+A]), Ras El Assi, Deir Mar Maroun Monastery, 29 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 1 ♀ (AUB unnumbered [B]), [Lebanon], 28 July 1952, leg. J. E. Stencel.

Records of ectoparasites. **Original data**: N y c t e r i b i i d a e: *Nycteribia pedicularia*: 1 fa (CMŠ [A]) from 1 ma (NMP 95847), Ras El Assi, Deir Mar Maroun Monastery, 29 June 2006. – *Nycteribia schmidlii*: 2 ma (CMŠ [A]) from 2 ma (NMP 95826, 95840), Afqa Cave, 26 June 2006. – S p i n t u r n i c i d a e: *Spinturnix psi*: 1 fa (CMŠ [P]) from 1 ma (NMP 95840), Afqa Cave, 26 June 2006.

Comments on ectoparasites. The bat flies *Nycteribia pedicularia* Latreille, 1805 and *N. schmidlii* Schiner, 1853 belong to the parasites of cave-dwelling bats, their occurrence on *H. savii* is most probably caused by common roosting of this bat with their principal hosts, namely *Myotis capaccinii* and *Miniopterus schreibersii* (Hůrka 1980). *N. pedicularia* is here reported from Lebanon for the first time, it was collected also from *Rousettus aegyptiacus*, *Rhinolophus ferrumequinum*, *Myotis blythii*, *M. capaccinii* and *Miniopterus schreibersii*.

The mesostigmatic mite *Spinturnix psi* (Kolenati, 1856) is a specific parasite of *Miniopterus schreibersii*, it occurs also on *Myotis capaccinii*, where these two hosts create mixed aggregations or inhabit common roosts (Deunff et al. 2004). Thus the finding on *H. savii* represents an accidental record of a transferred parasite individual and this transfer was caused by occurrence in a common roost. This assumption is supported by the records of bat flies that also parasitise almost exclusively the cave-dwelling bats, see above. *S. psi* is here reported from Lebanon for the first time, it was collected also from *Myotis capaccinii*.

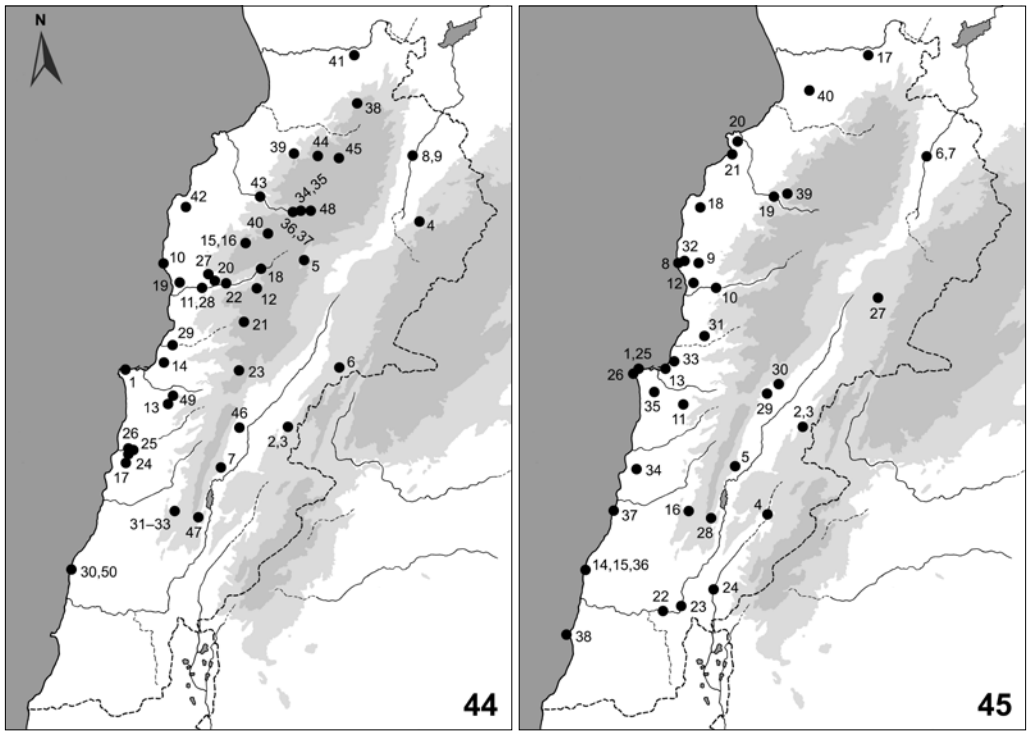
Pipistrellus pipistrellus (Schreber, 1774)

Records. **Original data**: B e i r u t: Beirut, A.U.B. Campus [1], 18 April 2006: det. calls of several foraging inds. (cf. Horáček et al. 2008). – E l B e q a a: Aanjar, at a pool at the northern edge of the village [2], 5 June 2010: det. calls of several foraging inds.; – Aanjar, pine grove at the ancient town [3], 5 June 2010: det. calls of 2 foraging inds.; – El Laboue, caverns in a rocky ridge above the road to Aarsal [4], 7 July 2006: net. 1 mj (cf. Horáček et al. 2008, Hulva et al. 2010); – El Yammoune [5], small fishpond on the southern edge of the village, 8 July 2006: det. calls of several foraging inds., 18 March 2009: obs. (and det. calls of) 2 foraging inds. (cf. Horáček et al. 2008); – Jenta [6] (Fig. 27), at a mine entrance, 8 June 2010: net. 1 faL, NMP, det. calls of numerous foraging inds. (cf. Herdina et al. 2014, Benda et al. 2016b); – Khirbet Qanafar, El Jaouz Cave [7], rocky overhang near the cave, 9 June 2010: det. calls of numerous foraging inds.; – Ras El Assi, Deir Mar Maroun Monastery [8] (Fig. 17), 29 June 2006: net. 1 ma, 1 fa, NMP, 17 March 2009: net. 1 fa, NMP (cf. Horáček et al. 2008, Herdina et al. 2014, Benda et al. 2016b); – Ras El Assi, Ein El Zarqa and rocky habitats around [9] (Fig. 18), 29 June 2006: net. 1 ma, NMP, 17 March 2009: det. calls of several foraging inds. (cf. Horáček et al. 2008, Hulva et al. 2010, Herdina et al. 2014). – J e b e l L u b n a n: Aamchit, Les Colombes camping site [10], 16 July 2006: det. calls of one 1 foraging ind. (cf. Horáček et al. 2008); – Adonis, Nahr Ibrahim [11] (Fig. 42), 1 July 2006: net. 1 faL, det. calls of several foraging inds., 1 June 2010: net. 4 faG, 1 faL, coll. 3 fa, NMP, det. calls of numerous foraging inds. (cf. Hulva et al. 2007, 2010, Horáček et al. 2008, Herdina et al. 2014, Benda et al. 2016b); – Afqa, Afqa Cave [12] (Fig. 9), 26 June 2006: net. 3 ma, 1 ms, 2 inds., coll. 2 ma, 1 ms, NMP, 15 July 2006: det. calls of several foraging inds., 17 January 2008: obs. 5 inds. torpid, coll. 1 ma, 1 fa, NMP (cf. Hulva et al. 2007, 2010, Horáček et al. 2008, 2009, Herdina et al. 2014, Benda et al. 2016b); – Aley, Animal Encounter and gardens in residential quarter with water tanks [13], 9 July 2006: det. calls of several foraging inds. (cf. Horáček et al. 2008); – Antelias, El Kassarat Cave [14], 5 August 2009: det. calls of several foraging inds.; – Balaa, rocky amphitheatre [15], 2 July 2006: det. calls of several foraging inds. (cf.

Horáček et al. 2008); – Balaa, above a creek [16] (Fig. 39), 31 May 2010: net. 24 ma, 5 ms, 4 faG, det. calls of numerous foraging inds. (cf. Herdina et al. 2014, Benda et al. 2016b); – Dahr El Mghara, a valley and slopes under El Watawit Cave [17], 4 August 2009: det. calls of 1 foraging ind.; – El Aaqoura, Er Roueiss Cave [18] (Fig. 55), 26 June 2006: net. 1 ma, NMP (cf. Horáček et al. 2008, Hulva et al. 2010, Herdina et al. 2014, Benda et al. 2016b); – El Fidar [19], garden in a residential quarter, 3 July 2006: det. calls of several foraging inds. (cf. Horáček et al. 2008); – El Machnaqa [20], 17 January 2008: det. calls of 1 foraging ind.; – Faraya, at a pond under the Raymond Cave [21], 2 June 2010: net. 6 ma, 2 fs, 2 faG, coll. 2 ma, 2 fa, NMP, det. calls of numerous foraging inds. (cf. Herdina et al. 2014, Benda et al. 2016b); – Frat, Nahr Ibrahim [22] (Fig. 57), 29 May 2010: net. 1 ma, NMP, det. calls of numerous foraging inds. (cf. Benda et al. 2016b); – Majdel Tarshish, Qattine Aazar Chasm [23], 7 June 2010: net. 2 ma, NMP, det. calls of several foraging inds. (cf. Benda et al. 2016b); – Nahr Ed Damour [24], at a stream, 29 October 2012: det. calls of 1 foraging ind.; – Nahr Es Safa, above the river ca. 1 km above the junction with the Nahr Ed Damour [25], 21 April 2006: det. calls of several foraging inds. (cf. Horáček et al. 2008); – Nahr Es Safa, below a bridge across the river ca. 1 km below the junction with Nahr Ed Damour [26], 22 June 2006: net. 3 ma, coll. 2 ma, NMP, det. calls of several foraging inds. (cf. Horáček et al. 2008, Hulva et al. 2007, 2010, Herdina et al. 2014, Benda et al. 2016b); – Tourzaiya [27], at a road bridge, 28 October 2012: det. calls of 1 foraging ind.; – Yahchouch, Nahr Ibrahim [28], at a tunnel, 24 October 2012: det. calls of 1 foraging ind.; – Zouq Mosbeh, Nahr El Kelb Valley [29], at a stream, 22 October 2012: det. calls of 1 foraging ind. – L u b n a n E l J a n u b i: Aadloun, Aadloun Cave [30], 22 March 2009: remains of 5 inds. from *Tyto alba* pellets; – Jezzine, at artifical tunnels near a bridge [31], 23 June 2006: det. calls of several foraging inds. (cf. Horáček et al. 2008); – Jezzine, Pont El Khalass, at a spring [32], 23 June 2006: det. calls of several foraging inds., 2 August 2009: det. calls of several foraging inds. (cf. Horáček et al. 2008); – Jezzine, Pont El Khalass, abandoned house [33], 23 June 2006: net. 7 ma, 1 faL, coll. 6 ma, 1 fa, NMP (cf. Horáček et al. 2008, Hulva et al. 2007, 2010, Herdina et al. 2014, Benda et al. 2016b). – L u b n a n E s h S h a m a l i: Bcharre, Qadisha Cave [34], 27 June 2006: net. 1 ma, NMP (cf. Hulva et al. 2007, 2010, Horáček et al. 2008, Herdina et al. 2014, Benda et al. 2016b); – Bcharre, a small water reservoir near the Qadisha Cave [35], 27 June 2006: net. 1 faL, 1 fa (cf. Horáček et al. 2008); – Bcharre, Qadisha Valley, Mar Lichaa Monastery [36], 20 April 2006: det. calls of several foraging inds. (cf. Horáček et al. 2008); – Bcharre, Qadisha Valley, at the rocky wall opposite to the Mar Lichaa Monastery [37], 27 October 2012: det. calls of 1 foraging ind.; – Fnaydeq, Ein El Qammouaa [38], 3 June 2010: det. calls of several foraging inds.; – Haqel El Aazime, Achou Cave [39], 18 January 2008: obs. 7 inds. torpid, coll. 1 ma, 1 fa, NMP (cf. Horáček et al. 2009, Herdina et al. 2014, Benda et al. 2016b); – Harissa, Nabaa El Jdid [40], at a water pool, 31 July 2009: det. calls of several foraging inds.; – Mounjez [41] (Fig. 38), bridge, 4 June 2010: det. calls of several foraging inds.; – Ras Nhach, at the Musailha Fort and at a small mine nearby [42] (Fig. 21), 28 June 2006: det. calls of numerous foraging inds., 18 January 2008: det. calls of several foraging inds. (cf. Horáček et al. 2008); – Seraal, Qadisha Valley [43], 30 July 2009: net. 1 fs, 10 June 2010: det. calls of numerous foraging inds.; – Wadi Jhannam, small water pool [44], 29 July 2009: det. calls of 1 foraging ind.; – Wadi Jhannam, Ein El Baaliye [45] (Fig. 30), at a water pool, 30 May 2010: det. calls of 2 foraging inds. – **Published data**: E l B e q a a: Ammik Swamp [46] (Fig. 46), Bekaa Valley, 20 August 1960: 1 m, BMNH (Lewis 1962, Lewis & Harrison 1962, Harrison 1964, Neuhauser & DeBlase 1971, Atallah 1977); – Machghara [47], 18 October 1960: 1 m, AUB (Lewis & Harrison 1962, Harrison 1964, Atallah 1977); Machgharah, 1 ind., BMNH (Neuhauser & DeBlase 1971). – J e b e l L u b n a n: Bcharré, Quadisha valley [36/37], 19 September 2005: remains of 15 inds. from *Strix aluco* pellets (Obuch 2011); – Cedar Forest [48], 19 September 2005: remains of 1 ind. from *Strix aluco* pellets (Obuch 2011); – Chweet [49], old house, 22 January 2013: obs. 1 ind. (Abi-Said 2014). – L u b n a n E l J a n u b i: Aadloun [50], Al Alalieh, 5 February 2013: obs. 3 inds. (Abi-Said 2014).

Comments. *Pipistrellus pipistrellus* is a very common bat in Lebanon, it was recorded from 50 localities, it is the second most frequent bat of the country (Table 1). This species belongs to the most widespread bats of Lebanon, its localities are scattered across the whole country (Fig. 44). *P. pipistrellus* was most frequently found in the western part of the country along the western slopes of the Lebanon Mts. and in the coastal hills and plains, but several records are available also from the Anti-Lebanon Mts. and the El Beqaa and Orontes Valleys. On the other hand, this bat is not known from the southern and south-eastern parts of Lebanon, south of the El Litani river, and from the El Hasbani Valley. This distribution pattern differs dramatically from the picture presented by Lewis & Harrison (1962: 482), who, reporting only two records of *P. pipistrellus* from Lebanon (including a male from the Ammiq Swamp; Fig. 46), concluded: "As indicated by the fact that only two specimens have been collected in the past two years, this is not a common bat in Lebanon."

P. pipistrellus is one of the most common and widespread bats in the Middle East and particularly in its Mediterranean parts, where this bat reaches the southern margin of its whole distribution



Figs. 44, 45. Records of particular bat species in Lebanon. 44 – *Pipistrellus pipistrellus* Schreber, 1774). 45 – *Pipistrellus kuhlii* (Kuhl, 1817).

range (Harrison & Bates 1991, Benda et al. 2006, 2012a). The Lebanese part of the distribution range of *P. pipistrellus* continues in dense occurrence southward, eastward, and northward. This bat is a frequent species of the western parts of Syria, numerous records are available from the Jebel An Nusariyah Mts., Golan Heights (including Mount Hermon), and from the Syrian part of the Anti-Lebanon Mts. (Mendelssohn & Yom-Tov 1999, Benda et al. 2006), it is neither a rare nor a common species in the western part of Jordan (Benda et al. 2010). On the other hand, *P. pipistrellus* is reported as a very rare bat in Palestine, only two records are available from the Upper Galilee (Mendelssohn & Yom-Tov 1999, Mayer & von Helversen 2001). The territory of Lebanon thus represents the southernmost area of very dense distribution of *P. pipistrellus* within its range in the western part of the Middle East.

P. pipistrellus is distributed across almost the whole altitudinal gradient of Lebanon (spread over a very broad range of 2157 m; Table 2), with the only exception of the highest parts of the main mountain ranges. The highest recorded locality of *P. pipistrellus* in Lebanon is the Ein El Baaliye spring in the Wadi Jhannam (Lebanon Mts.) at 2170 m a. s. l. (Fig. 30), where this bat was documented to forage (by detection of its echolocation calls). The altitude median is 854.5 m and altitude mean 867.8 m a. s. l.; these values indicate preference of areas in a very wide altitudinal range of Lebanon by *P. pipistrellus*.

The records of foraging bats absolutely prevail in the list of findings of *P. pipistrellus* in Lebanon (86.0%, n=43); the altitudinal range of foraging habitats is almost identical to the range of all records (2155 m) and the median and mean altitude values are only slightly higher compared to those of all records, 898.0 m and 895.9 m a. s. l., respectively. However, only slightly above a third of the records of foraging bats are represented by caught individuals, a larger part (62.8%) of the records of foraging bats concern the recordings of echolocation calls. Similarly as in the previous species, the detection of echolocation calls is thus an extremely effective method also for documentation of *P. pipistrellus*, 54.0% of its records from Lebanon were made in this way. The foraging bats were recorded in various habitats, in most cases at or above water bodies (springs, pools, ponds, streams, rivers; 46.5%, n=20), in various types of rocky habitats (23.3%, n=10), at entrances to subterranean spaces (caves and abandoned house; 16.3%, n=7) and in settlements of various size – in villages as well as in the Beirut downtown (14.0%, n=6).

In Lebanon, four hibernation roosts of *P. pipistrellus* were documented, three of them were natural caves and one an old house; the bats were found roosting individually or in small groups of up to three individuals. Five bats (in groups of two and three) were found in the entrance ceiling fissures of the Afqa Cave (1255 m a. s. l.; Fig. 9) on 17 January, seven bats (individually or in pairs) in the ceiling fissures of the Achou Cave at Haqel El Aazime (710 m a. s. l.) on 18 January, three bats were found in the El Alalieh Cave at Adloun (ca. 15 m a. s. l.) on 5 February (Abi-Said 2014), and one bat was observed in an old house in Chwit (ca. 550 m a. s. l.) on 22 January (Abi-Said 2014). The bat detector records obtained at several sites in coastal regions during January suggest that a smaller part of the Lebanese populations take part in a winter foraging activity.

No record of maternity colony or just of a summer roost of *P. pipistrellus* is available from Lebanon, but pregnant females were documented at three sites, lactating females at four sites and a volant juvenile of the year at one site. Four pregnant females were netted above a creek at

Fig. 46. The Ammiq Swamp in the El Beqaa Valley (El Beqaa), a classical site of bat research in Lebanon, where the first specimen of *Pipistrellus pipistrellus* in the country was collected on 20 August 1960. Photo by M. Uhrin.

Balaa on 31 May (Fig. 39; two examined females contained one foetus each, with the crown-rump length of 11.3 mm and 11.8 mm, respectively), other two pregnant females were caught at a pond close to the Raymond Cave near Faraya (Fig. 51) on 2 June, each of them contained two foeti of the crown-rump length 10.3–13.8 mm (mean 12.2 mm), and four pregnant females were netted above the Nahr Ibrahim river at Adonis (Fig. 42) on 1 June (two of them contained one foetus each, one female contained two foeti; their crown-rump length was 11.8–12.3 mm, mean 12.1 mm); at the latter site a lactating female was also caught at the occasion and another lactating female was netted at this site also on 1 July; another lactating female was netted at a mine entrance near Jenta on 8 June (Fig. 27), one lactating female was caught at an abandoned house at Pont El Khalass near Jezzine on 23 June, and one lactating female was netted above a small water reservoir near the Qadisha Cave on 27 June; a juvenile male of the year was netted at a cavern in a rocky ridge above the road from El Laboue to Aarsal on 7 July. In summary, pregnant females of *P. pipistrellus* were documented in Lebanon between 31 May and 2 June, while lactating females between 1 June and 1 July. Thus, parturitions in *P. pipistrellus* seem to occur in Lebanon at the break of May and June. The seven sites of evidence of *P. pipistrellus* reproduction lie in various parts of Lebanon, including the Lebanon and Anti-Lebanon mountain ranges, in the broad altitude range exceeding 1500 m (265–1772 m a s l.), with median and mean of these altitudes being 1260.0 m and 1218.7 m a. s. l., respectively. All these values indicate that *P. pipistrellus* selects rather elevated areas of Lebanon for reproduction, although it uses sites in a large altitudinal range, including lower parts of the country.

According to results of the analyses of echolocation call recordings and of the molecular genetic analyses (Mayer & von Helversen 2001, Benda et al. 2003, 2006, 2010, Hulva et al. 2004, 2007, 2010), the continental part of the Levant – including the area of Lebanon – is inhabited only by *P. pipistrellus* s.str., while its sister species, *P. pygmaeus* (Leach, 1825), was confirmed only in Cyprus (as well as in northern Iran and north-western Turkey, concerning the whole Middle East; Benda et al. 2007, 2012a). In Europe, the end frequencies of the calls of *P. pipistrellus* are about 45 kHz, while those of the calls of *P. pygmaeus* about 55 kHz (see e.g. Mayer & von Helversen 2001). In the Levant, the situation is more complicated as the end frequency in *P. pipistrellus* is somewhat higher, see Benda et al. (2006, 2010): in Syria, the end frequencies were found in the range 44.4–51.3 kHz (mean 47.7 kHz) and in Jordan in the range 46.8–50.5 kHz (mean 48.4 kHz). A discussion on possible occurrence of *P. pygmaeus* in Lebanon in the previous report (Horáček et al. 2008) referred to records of pipistrellus-like echolocation calls with terminal frequencies of 54–56 kHz recorded in the Qadisha Valley and El Yammoune. In the latter case, detected on 8 July, the calls were most probably produced by juvenile individuals of *P. pipistrellus*, the former (20 April) remains unclear. Of course, real presence of *P. pygmaeus* in Lebanon is quite unlikely for the reasons discussed above.

External and cranial dimensions of the Lebanese specimens of *P. pipistrellus* are shown in Table 15. For the material examined see below.

Material examined. 3 ♀♀ (NMP 93534, 93535 [S+A], 93536 [A]), Adonis, Nahr Ibrahim, 1 June 2010, leg. P. Benda & M. Uhrin; – 3 ♂♂ (NMP 95823, 95824 [S+A], 95825 [A]), Afqa Cave, 26 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 1 ♂, 1 ♀ (NMP 91895 [A], 91896 [S+A]), Afqa Cave, 17 January 2008, leg. P. Benda, I. Horáček, R. Lučan & M. Uhrin; – 3 ♂♂, 2 ♀♀ (NMP 93528, 93529, 93531, 93532 [S+A], 93530 [A]), Balaa, 31 May 2010, leg. P. Benda & M. Uhrin; – 1 ♂ (NMP 95822 [S+A]), Er Roueiss Cave, 26 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 2 ♂♂, 2 ♀♀ (NMP 93545, 93547, 93548 [S+A], 93546 [A]), Faraya, pond, 2 June 2010, leg. P. Benda & M. Uhrin; – 1 ♂ (NMP 93524 [S+A]), Frat, Nahr Ibrahim, 29 May 2010, leg. P. Benda & M. Uhrin; – 1 ♂, 1 ♀ (NMP 91902, 91903 [S+A]), Haqel El Azime, Achou Cave, 18 January 2008, leg. P. Benda, I. Horáček, R. Lučan & M. Uhrin; – 1 ♀ (NMP 93572 [S+A]), Jenta, 8 June 2010, leg. P. Benda & M. Uhrin; – 6 ♂♂, 1 ♀ (NMP 95776–95781 [S+A], 95782 [A]), Jezzine, Pont El Khalass, 23 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 1 ♂ (AUB M345 [S+B]), Machghara, 18 October 1960, leg. S. Abu Khalil; – 2 ♂♂ (NMP 93565, 93566 [S+A]), Majdal Tarshish, Qattine Aazar

Table 15. Basic biometric data on the examined Lebanese samples of *Pipistrellus pipistrellus* (Schreber, 1774), *P. kuhlii* (Kuhl, 1817) and *Nyctalus noctula* (Schreber, 1774). For abbreviations see p. 213

	Pipistrellus pipistrellus					*Pipistrellus kuhlii*					*Nyctalus noctula*
	n	**M**	min	max	SD	n	**M**	min	max	SD	BMNH 61.406.
LAt	41	**30.61**	28.6	32.5	1.004	25	**34.00**	32.4	36.8	1.052	50.3
LCr	33	**11.75**	11.27	12.38	0.257	11	**13.21**	12.91	13.66	0.245	18.41
LCb	33	**11.29**	10.75	11.78	0.254	11	**12.84**	12.51	13.47	0.263	18.39
LaZ	24	**7.51**	7.14	8.35	0.259	5	**8.68**	8.48	9.01	0.245	13.52
LaI	32	**3.14**	2.87	3.42	0.113	11	**3.32**	3.16	3.52	0.107	5.02
LaInf	32	**3.49**	3.31	3.83	0.122	4	**3.90**	3.84	3.96	0.050	7.58
LaN	33	**6.08**	5.78	6.41	0.138	11	**6.53**	6.31	6.82	0.147	9.83
LaM	32	**6.62**	6.32	7.24	0.178	4	**7.58**	7.48	7.74	0.114	11.79
AN	33	**4.23**	4.01	4.48	0.118	11	**4.71**	4.53	4.87	0.109	6.87
LBT	32	**2.85**	2.53	3.26	0.141	4	**2.98**	2.83	3.17	0.142	–
CC	29	**3.52**	3.31	3.74	0.088	12	**4.25**	4.08	4.53	0.128	7.34
M^3M^3	31	**4.85**	4.60	5.21	0.138	12	**5.77**	5.47	6.01	0.145	9.12
CM^3	33	**4.17**	3.94	4.38	0.109	12	**4.96**	4.68	5.26	0.145	7.37
LMd	32	**8.17**	7.68	8.56	0.198	12	**9.53**	9.18	10.04	0.207	13.98
ACo	32	**2.37**	2.24	2.55	0.088	12	**3.01**	2.86	3.13	0.107	4.52
CM_3	31	**4.42**	4.21	4.58	0.090	12	**5.28**	5.11	5.61	0.130	7.85

Chasm, 7 June 2010, leg. P. Benda & M. Uhrin; – 2 ♂♂ (NMP 95774, 95775 [S+A]), Nahr Es Safa, 22 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 1 ♂ (NMP 95832 [S+A]), Qadisha Cave, 27 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 1 ♂, 1 ♀ (NMP 95835, 95836 [S+A]), Ras El Assi, Deir Mar Maroun Monastery, 29 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 1 ♀ (NMP 93693 [S+A]), Ras El Assi, Deir Mar Maroun Monastery, 17 March 2009, leg. T. Bartonička, P. Benda, I. Horáček & R. Lučan; – 1 ♂ (NMP 95850 [S+A]), Ras El Assi, Ein El Zarqa, 29 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec.

Records of ectoparasites. **Original data**: I s c h n o p s y l l i d a e: *Ischnopsyllus octactenus*: 1 ma, 2 fa (CMŠ [P]) from 2 fa (NMP 93547, 93548), Faraya, pond, 2 June 2010. – **Published data**: I s c h n o p s y l l i d a e: *Ischnopsyllus consimilis*: 1 fa, Aamik Swamp, Bekaa, 20 July 1960 (Lewis 1962).

Comments on ectoparasites. *Ischnopsyllus octactenus* (Kolenati, 1856) is a bat flea distributed in the western Palaearctic, from Europe and north-western Africa to West Turkestan and Afghanistan, *P. pipistrellus* is its principal host in the whole distribution area (Hůrka 1963). From Lebanon, it is here reported for the first time, in the Middle East, it was previously known only from Iran and Turkey (Peus 1976, Lewis & Lewis 1990). *Ischnopsyllus consimilis* (Wahlgren, 1904) is a rare bat flea occurring in the eastern Meditteranean (Lewis & Lewis 1990). From Lebanon, Lewis (1962) reported a record of a female of this flea from *P. pipistrellus*, although *Pipistrellus kuhlii* is generally considered as its specific host – such records are available from Epypt and Palestine (Hopkins & Rothschild 1956, Hoogstraal & Traub 1963).

Pipistrellus kuhlii (Kuhl, 1817)

Records. **Original data**: B e i r u t: Beirut, A.U.B. Campus [1], 18 April 2006: det. calls of several foraging inds., 22 April 2006: det. calls of several foraging inds. (cf. Horáček et al. 2008). – E l B e q a a: Aanjar, at a pool at the northern edge of the village [2], 5 June 2010: det. calls of several foraging inds.; – Aanjar, pine grove at an ancient town [3], 5 June 2010: det. calls of 2 foraging inds.; – Dahr El Ahmar, bridge over a wadi [4], 5 July 2006: net. 1 faL (cf. Horáček et al. 2008); – Khirbet Qanafar, El Jaouz Cave [5], rocky overhang near the cave, 9 June 2010: det. calls of several foraging inds.; – Ras El Assi, Deir Mar Maroun Monastery [6] (Fig. 17), 29 June 2006: net. 1 ma, NMP (cf. Horáček et al. 2008); – Ras El Assi, Ein El Zarqa and rocky habitats around [7] (Fig. 18), 29 June 2006: net. 2 faL, NMP, 17 March 2009: det. calls

of several foraging inds. (cf. Horáček et al. 2008, Benda et al. 2016b). – J e b e l L u b n a n: Aamchit, Les Colombes camping site [8], 16 July 2006: det. calls of several foraging inds. (cf. Horáček et al. 2008); – Aamchit, at the Saleh Cave [9] (Fig. 26), 25 March 2009: obs. (and det. calls of) several foraging inds.; – Adonis, Nahr Ibrahim [10] (Fig. 42), 1 July 2006: det. calls of several foraging inds., 1 June 2010: det. calls of 1 foraging ind. (cf. Horáček et al. 2008); – Aley, gardens in residential quater with water tanks [11], 9 July 2006: det. calls of several foraging inds. (cf. Horáček et al. 2008); – El Fidar, garden in a residential quarter [12], 24–30 June 2006: det. calls of several foraging inds., 2 July 2006: net. 1 faL, NMP (cf. Horáček et al. 2008 [erroneously under a different date, 30 June], Benda et al. 2016b), 3 July 2006: det. calls of several foraging inds. (cf. Horáček et al. 2008); – El Jdaide [13], city, 26 March 2009: obs. calls of several foraging inds. – L u b n a n E l J a n u b i: Aadloun, Aadloun Cave [14], 22 March 2009: remains of 21 inds. from *Tyto alba* pellets; – Aadloun, around the cliff at the Aadloun Cave [15], 22 March 2009: obs. (and det. calls of) several foraging inds., 29 March 2009: obs. (and det. calls of) several foraging inds.; – Jezzine, Pont El Khalass [16], abandoned house, 23 June 2006: det. calls of several foraging inds. (cf. Horáček et al. 2008). – L u b n a n E s h S h a m a l i: Mounjez [17] (Fig. 38), bridge, 4 June 2010: det. calls of several foraging inds.; – Ras Nhach, at the Musailha Fort [18] (Fig. 21), 18 January 2008: det. calls of several foraging inds.; – Seraal, Qadisha Valley [19], 10 June 2010: det. calls of several foraging inds.; – Trablous [20], downtown, 18 January 2008: obs. (and det. calls of) 17 foraging inds. (ca. half an hour before sunset); – Trablous, at the Matal El Azraq Cave [21] (Figs. 4, 5), 16 March 2009: det. calls of 3 foraging inds. – N a b a t i y e: Aalmane, El Litani Valley [22], 21 June 2006: det. calls of several foraging inds. (cf. Horáček et al. 2008); – Arnoun, Beaufort Castle [23] (Fig. 47), 6 June 2010: det. 1–2 foraging inds.; – Ebel El Saqi [24], above a reservoir at a spring S of the village, 1 August 2009: net. 1 ma, 3 fa. – **Published data**: B e i r u t: Beirut, A.U.B. Campus [1], coll. 21 m, 20 f, February 1960: several females, American University of Beirut, an orchard near the chemistry building on the campus, obs. foraging inds. (Stencel 1961); Beirut, 9 February 1960: 1 m, 10 February 1960: 1 m, 14 February 1960: 1 f, 15 February 1960: 1 f, BMNH (Harrison 1964); Beirut, 23 inds., AUB, SAC [A.U.B. Campus, 28 February 1959: 1 ma, AUB (leg. H. Shoemaker), 9 February 1960: 1 ma, AUB (leg. R. E. Lewis), 10 February 1960: 1 ma, AUB (leg. R. E. Lewis), 14 February 1960: 1 fa, AUB (leg. R. E. Lewis), 16 February 1960: 1 ma, AUB (leg. R. E. Lewis), 17 February 1960: 1 fa, AUB (leg. R. E. Lewis), 27 February 1960: 1 f, AUB (leg. R. E. Lewis & J. H. Lewis), 4 March 1960: 1 ms, AUB (leg. R. E. Lewis & J. H. Lewis), 21 April 1960: 2 fa, AUB (leg. J. E. Stencel & R. E. Lewis), 28 June 1960: 1 mj, 2 fj, AUB (leg. R. E. Lewis), 16 July 1960: 1 fa, AUB (leg. R. E. Lewis), I.C. Athletic Field, A.U.B. Campus, 6 June 1960: 1 fa, 1 fj, AUB (leg. J. E. Stencel), 2 July 1960: 1 mj, AUB (leg. J. E. Stencel), 7 July 1960: 1 fa, AUB (leg. A. Paxton), 8 July 1960: 1 mj, 1 fa, AUB (leg. J. E. Stencel), 12 July 1960: 1 mj, AUB (leg. J. E. Stencel), 28 July 1960: 1 ma, 1 mj, AUB (leg. J. E. Stencel), 11 August 1960: 2 fa, AUB (leg. J. E. Stencel), 12 August 1960: 1 ma, AUB (leg. J. E. Stencel), 17 August 1960: 1 mj, AUB (leg. J. E. Stencel), 22 August 1960: 2 fa, AUB (leg. J. E. Stencel), 23 August 1960: 1 mj, 1 fj, AUB (leg. J. E. Stencel), 24 August 1960: 1 ma, 1 fa, AUB (leg. J. E. Stencel), 26 August 1960: 1 fa, AUB (leg. J. E. Stencel), 29 August 1960: 1 fa, AUB (leg. J. E. Stencel), 6 September 1960: 1 ma, AUB (leg. J. E. Stencel), 12 September 1960: 1 ma, AUB (leg. J. E. Stencel), 11 October 1960: 1 ma, AUB (leg. J. E. Stencel), 16 October 1960: 1 fs, AUB (leg. J. E. Stencel)] (Atallah 1977); Beyrouth (Tohmé & Tohmé 1985); – Beirut, Rue Clémenceau, Mann Building [25], a hole between the right angle beams, summer 1960: a large colony, on consecutive nights in November 1960: obs. 96, 95, 76, and 41 inds. (Stencel 1961); – Ras Beirut [26], [Rue Hamra, September 1959:] coll. 2 m [AUB] (Stencel 1961). – E l B e q a a: Baalbek [27] (Stencel 1961); – Machghara [28] (Stencel 1961); – Shtora [29], March–June 1914: 1 ind. (Allen 1915); Chtaura (Stencel 1961); – Zahlé [30], along the water courses, August 1960: obs. many foraging inds. (Stencel 1961). – J e b e l L u b n a n: Ajaltoun [31], 1 ind., SAC (Atallah 1977); – Amchite [32], crevices between the boards of a balcony, emergence at dusk (Stencel 1961); – Antelias [33], coll. 1 f (Stencel 1961); Antelias River, 7 September 1959 [1 f, AUB] (Lewis 1962); – Barja [34], [14 & 21 July 1960:] coll. 9 m, 4 f, [AUB,] crevices around old wooden window frames, obs. several fairly large colonies (Stencel 1961); – Hadath-Beyrouth [35], 13 April 1983: 1 ind., 25 January 1985: 1 m (Tohmé & Tohmé 1985). – L u b n a n E l J a n u b i: Aadloun [36], Em Bazzez, 5 February 2013: obs. 50 inds. (Abi-Said 2014); – Saïda [37] (Stencel 1961); – Tyr [38], [near St. Joseph's church, 15 September 1960:] coll. 1 m, 2 f [AUB] (Stencel 1961). – L u b n a n E s h S h a m a l i: Ehden [39] (Stencel 1961); – Halba [40], obs. fairly large colony (Stencel 1961); – Trípoli [19], 2 f (Ibáñez & Fernández 1989). – Lebanon (undef.): Syrien [= ? Lebanon] (Kolenati 1856); – am Libanon in Syrien [= Lebanon Mts.] (Kolenati 1860 [as *Nannugo marginatus*]); – in Syrien am Libanon [= Lebanon Mts.] (Fitzinger 1870b [as *Vesperugo marginatus*]); – Liban [= Lebanon Mts.] (Trouessart 1879); – various localities throughout Lebanon at all times of the year, 33 m, 28 f (Lewis & Harrison 1962); – Lebanon, 2 inds., FMNH (DeBlase 1980).

Comments. *Pipistrellus kuhlii* is a common bat in Lebanon, it was recorded from 40 localities (Table 1). This species belongs to the most widespread bats of Lebanon, its localities are scattered across the whole country (Fig. 45). *P. kuhlii* was most frequently found in the western part of the country along the sea coast and in the coastal hills, but relatively numerous records are available also from the eastern part of the country, from the El Beqaa, Orontes, and El Hasbani Valleys.

Based on the knowledge of the early 1960s (cf. Stencel 1961), Lewis & Harrison (1962: 483) concluded as follows: "*Pipistrellus kuhlii* is without question the most common bat in Lebanon and abounds in and around the cities and villages along the coast." According to the available records, this species certainly remains in the group of the most widespread bat species of Lebanon, although only as the fifth most frequent bat of the country (Table 1).

Anyway, *P. kuhlii* is one of the most common and widespread bats in the Middle East (Harrison & Bates 1991, Mendelssohn & Yom-Tov 1999, Benda et al. 2006, 2012a) and it is the most common bat of Jordan and most conspicuously, of Syria (Benda et al. 2006, 2010). The Lebanese part of the distribution range of *P. kuhlii* continues in the dense occurrence in all surrounding areas; this bat is a very frequent species of the whole territories of Syria, Jordan, and Palestine, both in the Mediterranean and desert areas of these countries (Mendelssohn & Yom-Tov 1999, Benda et al. 2006, 2010).

However, *P. kuhlii* is distributed in Lebanon across a medium-wide range of altitudes (Table 2), from the sea level to Ehden (Lebanon Mts.), the highest recorded locality of this bat in the country, at ca. 1450 m a. s. l.; this site was reported as the extremely high positioned locality of this bat already by Stencel (1961). The altitude median is 276.0 m and altitude mean 450.3 m a. s. l.; these values indicate preference of rather low areas of Lebanon by *P. kuhlii*.

While during the recent survey (2006–2012), only foraging individuals of *P. kuhlii* were recorded from Lebanon (with the exception of a finding from owl pellets), foraging bats were found in 60%

Fig. 47. Beaufort Castle at Arnoun above the El Litani river valley (ca. 700 m a. s. l.; Nabatiye). Underground chambers and corridors of the ruined castle are used as a roost by *Rhinolophus ferrumequinum*, *Myotis blythii*, *M. capaccinii*, *Eptesicus serotinus*, and *Hypsugo savii*. On 6 June 2010, individuals of *Myotis blythii*, *M. nattereri*, *Eptesicus serotinus*, and *Hypsugo savii* were netted and echolocation calls of *Pipistrellus kuhlii* and *Plecotus* cf. *macrobullaris* were detected there. Photo by M. Uhrin.

of all record sites (n=24), among the published records, the findings in roosts absolutely prevail (n=9). The altitudinal range of foraging habitats of *P. kuhlii* in Lebanon is somewhat smaller than the range of all records (1179 m) and the median and mean altitude values are more or less at the same level compared to those of all records, 314.0 m and 438.6 m a. s. l., respectively. However, only the fifth of the records (20.8%) of foraging bats is represented by the caught individuals, a larger part (75.0%) of the records of foraging bats concern the recordings of echolocation calls. Similarly as in the previous species, the detection of bat echolocation is thus an effective method also for documentation of *P. kuhlii*, 45.0% of its records from Lebanon were made in this way. The foraging bats were recorded in various habitats, in most cases in rocky valleys and at rocky walls (50.0%, n=12), and frequently also in settlements (downtowns, parks, gardens, etc.; 41.7%, n=10). Only in a few cases, a water body was present at the foraging site (29.2%, n=7).

Stencel (1961) and Lewis & Harrison (1962) reported year-round activity of *P. kuhlii* in Lebanon, interrupted only by short periods of lethargy in most adverse climatic conditions during winter, but not by a longer period of hibernation. This conforms to the recent observations, when a quarter of the records of foraging bats was documented during the winter period.

Bats in their roosts were reported only by Stencel (1961), who found several aggregations of *P. kuhlii* only in synanthropic conditions of Lebanon, in settlements of various size, in 1959–1960 (see Records). The locations of the roosts were described by Stencel (1961: 6–7) as follows: "During the summer 1960 a large colony of them was found in a hole, situated between the right angle beams of the Mann Building (Rue Clemenceau) in Beirut […]. The next building south contained a few individuals between the cracks under the window sills. In Amchite they were issuing from the crevices between the boards of a roofed balcony at dusk. In Barja several colonies were observed in crevices around old wooden window frames. […] In Halba there were great quantities of guano piled beneath the old doors of a church meeting house […]." Additional details concerning the roosting of this bat in Lebanon were given by this author as follows (Stencel 1961: 11): "*P. kuhlii* is generally gregarious although some have been reported living in small groups or singly in cracks and crevices of walls, brick houses and other cavities. On consecutive nights in November, 1960, the author observed 96, 95, 76, and 41 specimens leaving a hole in the roof of the Mann Building in Beirut. […] Small groups of 3–4 bats were noticed issuing from openings under the window sills of an apartment directly south of the Mann Building."

A maternity colony of *P. kuhlii* was documented once from Lebanon, a series of juvenile specimens is available in the AUB that were collected from the I.C. Athletic Field in the A.U.B. Campus, Beirut; in total, seven juvenile males and four juvenile females were collected there (along with numerous adults of both sexes) on eight occasions between 6 June and 23 August 1960 (see Records). At three sites, lactating females were recorded; two lactating females were netted at the Ein El Zarqa spring near Ras El Assi (675 m a. s. l.; Fig. 18) in the Orontes Valley on 29 June, another lactating female was caught in a garden at a house in El Fidar (92 m a. s. l.) on 2 July, and one lactating female was netted beneath a bridge near Dahr El Ahmar (950 m a. s. l.) in the El Hasbani Valley on 5 July.

The oldest report of *P. kuhlii* from Lebanon was given by Kolenati (1860: 71), who mentioned it to occur "am Libanon in Syrien" (= in the Lebanon Mts.), this was later repeated by Fitzinger (1870b) and Trouessart (1879). However, it is not clear to which record of this bat Kolenati refers; most probably to a specimen or specimens collected by W. Hemprich and C. Ehrenberg in the northern part of Lebanon in 1824 (for more details concerning their trip see under *Rousettus aegyptiacus* and *Rhinolophus ferrumequinum*) and later perhaps available in the Zoological Museum Berlin (ZMB) (cf. Horáček et al. 2008). However, we did not find any evidence of a possible existence of such specimen, a large part of the ZMB collection of specimens made by Hemprich and Ehrenberg was destroyed by World War II events (Stresemann 1954) and currently the ZMB

does not contain any *P. kuhlii* from Lebanon, Syria nor Arabia at all (H. Turni, in litt.). Anyway, F. Kolenati was certainly in a written contact with C. Ehrenberg and also with H. Lichtenstein, then a director of ZMB, who could have informed him about the content of the Hemprich and Ehrenberg collection in litteris. After this, another Lebanese record of *P. kuhlii* was published only by Allen (1915), who reported the finding from Chtaura made in 1914, (most probably) ninety years after that reported by Kolenati (1860).

External and cranial dimensions of the Lebanese specimens of *P. kuhlii* are shown in Table 15. For the material examined see below.

Material examined. 1 ♀ (AUB M687 [A]), Antélias, ruins, 7 September 1959, leg. L. Karamanikian; – 4 ♂♂ (AUB M045, M047, M049 [S+B], M048 [B]), Barja, 14 July 1960, leg. J. E. Stencel; – 5 ♂♂, 4 ♀♀ (AUB M028, M046, M050–M053, M057, M058 [S+B], M056 [B]), Barja, 21 July 1960, leg. J. E. Stencel & A. Paxton; – 1 ♂ (AUB M696 [A]), Beirut, A.U.B. Campus, 28 February 1959, leg. H. Shoemaker; – 1 ♂ (AUB M032 [S+B]), Beirut, A.U.B. Campus, 9 February 1960, leg. R. E. Lewis; – 1 ♂ (AUB M035 [S+B]), Beirut, A.U.B. Campus, 10 February 1960, leg. R. E. Lewis; – 1 ♀ (AUB M036 [B]), Beirut, A.U.B. Campus, 14 February 1960, leg. R. E. Lewis; – 1 ♂ (AUB M030 [S+B]), Beirut, A.U.B. Campus, 16 February 1960, leg. R. E. Lewis; – 1 ♀ (AUB M039 [S+B]), Beirut, A.U.B. Campus, 17 February 1960, leg. R. E. Lewis; – 1 ♀ (AUB M681 [A]), Beirut, A.U.B. Campus, 27 February 1960, leg. R. E. Lewis & J. H. Lewis; – 1 ♂ (AUB M682 [A]), Beirut, A.U.B. Campus, 4 March 1960, leg. R. E. Lewis & J. H. Lewis; – 2 ♀♀ (AUB M040 [B], M684 [A]), Beirut, A.U.B. Campus, 21 April 1960, leg. J. E. Stencel & R. E. Lewis; – 1 ♂, 2 ♀♀ (AUB M680, M683, M698 [A]), Beirut, A.U.B. Campus, 28 June 1960, leg. R. E. Lewis; – 1 ♀ (AUB M037 [S]), Beirut, A.U.B. Campus, 16 July 1960, leg. R. E. Lewis; – 2 ♀♀ (AUB M029 [S+B], M041 [B]), [Beirut,] I.C. Athletic Field, A.U.B. Campus, 6 June 1960, leg. J. E. Stencel; – 1 ♂ (AUB M042 [B], M693 [A]), [Beirut,] I.C. Athletic Field, A.U.B. Campus, 2 July 1960, leg. J. E. Stencel; – 1 ♀ (AUB M692 [A]), [Beirut,] I.C. Athletic Field, A.U.B. Campus, 7 July 1960, leg. A. Paxton; – 1 ♂, 1 ♀ (AUB M043, M044 [B]), [Beirut,] I.C. Athletic Field, A.U.B. Campus, 8 July 1960, leg. J. E. Stencel; – 1 ♂ (AUB M695 [A]), [Beirut,] I.C. Athletic Field, A.U.B. Campus, 12 July 1960, leg. J. E. Stencel; – 2 ♂♂ (AUB M055, M059 [S+B]), [Beirut,] I.C. Athletic Field, A.U.B. Campus, 28 July 1960, leg. J. E. Stencel; – 2 ♀♀ (AUB M054 [B], M685 [A]), [Beirut,] I.C. Athletic Field, A.U.B. Campus, 11 August 1960, leg. J. E. Stencel; – 1 ♂ (AUB M691 [A]), [Beirut,] I.C. Athletic Field, A.U.B. Campus, 12 August 1960, leg. J. E. Stencel; – 1 ♂ (AUB M060 [B]), [Beirut,] I.C. Athletic Field, A.U.B. Campus, 17 August 1960, leg. J. E. Stencel; – 2 ♀♀ (AUB M061 [B], M686 [A]), [Beirut,] I.C. Athletic Field, A.U.B. Campus, 22 August 1960, leg. J. E. Stencel; – 1 ♂, 1 ♀ (AUB M069 [S+B], M694 [A]), [Beirut,] I.C. Athletic Field, A.U.B. Campus, 23 August 1960, leg. J. E. Stencel; – 1 ♂, 1 ♀ (AUB M063 [S+B], M064 [B]), [Beirut,] I.C. Athletic Field, A.U.B. Campus, 24 August 1960, leg. J. E. Stencel; – 1 ♀ (AUB M071 [S+B]), [Beirut,] I.C. Athletic Field, A.U.B. Campus, 26 August 1960, leg. J. E. Stencel; – 1 ♀ (AUB M070 [B]), [Beirut,] I.C. Athletic Field, A.U.B. Campus, 29 August 1960, leg. J. E. Stencel; – 1 ♂ (AUB M072 [B]), [Beirut,] I.C. Athletic Field, A.U.B. Campus, 6 September 1960, leg. J. E. Stencel; – 1 ♂ (AUB M073 [B]), [Beirut,] I.C. Athletic Field, A.U.B. Campus, 12 September 1960, leg. J. E. Stencel; – 1 ♂ (AUB M697 [A]), [Beirut,] I.C. Athletic Field, A.U.B. Campus, 11 October 1960, leg. J. E. Stencel; – 1 ♀ (AUB M688 [A]), [Beirut,] I.C. Athletic Field, A.U.B. Campus, 16 October 1960, leg. J. E. Stencel; – 1 ♀ (NMP 95851 [S+A]), El Fidar, garden, 2 July 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 2 ♂♂ (AUB M689, M690 [A]), Ras Beirut, Rue Hamra, September 1959, leg. H. Tashjian; – 1 ♂ (NMP 95843 [S+A]), Ras El Assi, Deir Mar Maroun Monastery, 29 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 2 ♀♀ (NMP 95844, 95845 [S+A]), Ras El Assi, Ein El Zarqa, 29 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 1 ♂, 1 ♀ (AUB M065, M066 [S+B]), Tyre, old house near St. Joseph's church, 15 September 1960, leg. J. E. Stencel; – 1 ♂ (AUB M067 [B]), Tyre, in flight near St. Joseph's church, 15 September 1960, leg. J. E. Stencel.

Records of ectoparasites. **Published data**: I s c h n o p s y l l i d a e: *Ischnopsyllus consimilis*: 1 ma, Antelias River, 7 September 1959 (Lewis 1962). – C i m i c i d a e: *Cacodmus vicinus*: [host unspecified], Barja, coll. R. E. Lewis (Péricart 1972, 1996) = 6 inds. (EMEC 45180–45185), Barja, 21 July 1960 (SCAN 2015) . – N y c t e r i b i i d a e: *Basilia daganiae*: data unspecified (Lewis & Harrison 1962). – M a c r o n y s s i d a e: *Steatonyssus periblepharus*: specimens unspecified, "campus of the American University of Beirut, Beirut, nine collections made in February, April, August, and September of 1960" (Radovsky 1967: 197); – specimens unspecified, Tyre, 15 April 1960 (Radovsky 1967).

Comments on ectoparasites. *Ischnopsyllus consimilis* (Wahlgren, 1904) is a typical parasite of *P. kuhlii*, the prevailing number of records come from this host; except for the records from Lebanon reported by Lewis (1962), who found it on *Pipistrellus pipistrelus*, see above. This bat flea is a rare species of the eastern Mediterranean, it is known from north-eastern Africa and the Levant, and probably occurs eastward to Iraq (Theodor & Moscona 1954, Lewis 1962, Hůrka 1982).

Cacodmus vicinus Horváth, 1934 is a bat bug that parasitises mainly *Pipistrellus kuhlii*, but it was found also on bats of the *P. pipistrellus* group (Usinger 1966, Benda et al. 2010, Quetglas et al. 2012). Although Péricart (1972) did not specify the host of the bat bug specimen/s originating from Barja, at this site only one bat species was collected, *P. kuhlii* (Stencel 1961). *C. vicinus* is known to occur in Spain, Algeria, Egypt, Chad, Turkey, Cyprus, and the Levant (Péricart 1996, Quetglas et al. 2012), i.e. in the Mediterranean range of *P. kuhlii*.

The bat fly *Basilia daganiae* Theodor et Moscona, 1954 has a similar distribution range as the previous bat flea, it covers Cyprus, Turkey, Egypt, and the Levant, where it was collected almost solely from *P. kuhlii* (Theodor & Moscona 1954, Hůrka & Soós 1986). However, the only recent record of this parasite was made in Jordan, where it was collected from *Pipistrellus pipistrellus* (Benda et al. 2010).

The dendrophilic oligoxenous gamaside mite *Steatonyssus periblepharus* Kolenati, 1858 is a principal parasite of bats of the genus *Pipistrellus* (Radovsky 1967). It is distributed throughout the Palaearctic, in Europe, North Africa, central, southern and eastern Asia (Stanyukovich 1997). In the Middle East, it was collected in Egypt, Palestine, Jordan, Iraq and Iran (Radovsky 1967, Abul-Hab & Shihab 1989, Benda et al. 2010, 2012a).

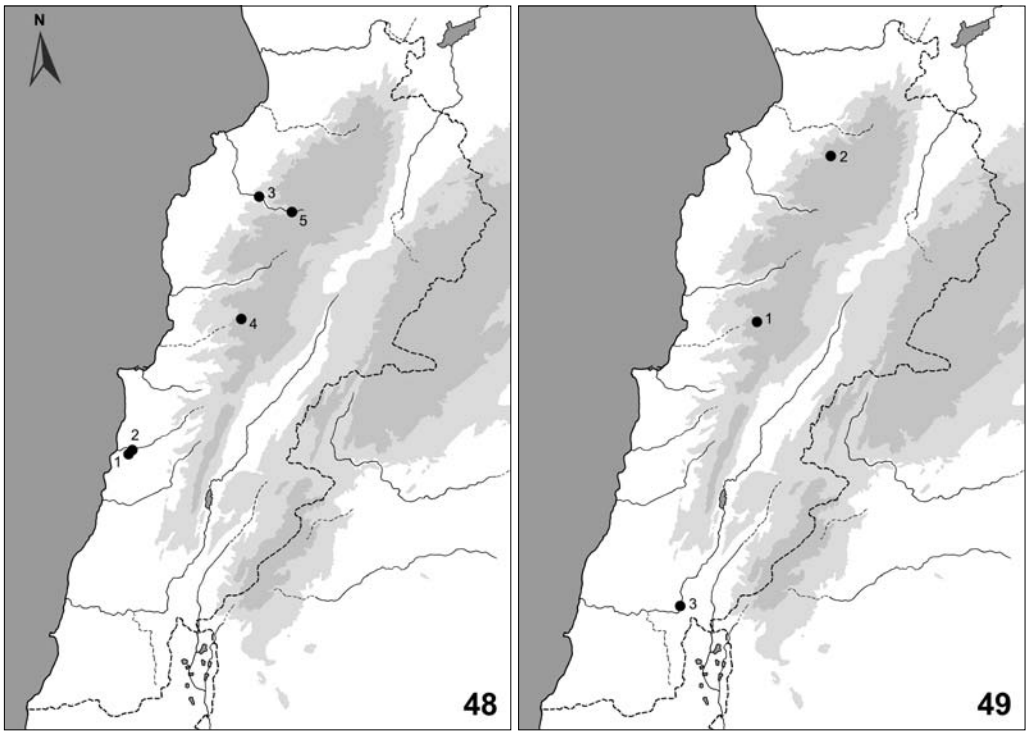
Nyctalus noctula (Schreber, 1774)

Records. **Original data**: J e b e l L u b n a n: Nahr Ed Damour [1], at a stream, 29 October 2012: det. calls of 1 foraging ind.; – Nahr Es Safa, above the river ca. 1 km above the junction with the Nahr Ed Damour [2], 21 April 2006: net. 1 ma (cf. Horáček et al. 2008, Balvín et al. 2012). – L u b n a n E s h S h a m a l i: Seraal, Qadisha Valley [3], 30 July 2009: net. 3 ma, 5 fa. – **Published data**: J e b e l L u b n a n: Natural Bridge [4] (Fig. 50), 7 km. S.E. Faraya, 29 July 1960: 3 m, 1 f, AUB, BMNH, FMNH, HZM (Harrison 1962, 1964, Lewis 1962, Lewis & Harrison 1962, Atallah 1977, DeBlase 1980, Lewis & Lewis 1990, Benda et al. 2006, 2011b, Benda & Gaisler 2015). – L u b n a n E s h S h a m a l i: Bcharré, Quadisha valley [5], 19 September 2005: remains of 2 inds. from *Strix aluco* pellets (Obuch 2011).

Comments. *Nyctalus noctula* is a rather rare bat in Lebanon, it was recorded from five localities (Table 1). The records are known only from the western part of the country, from two quite different areas of Lebanon (Fig. 48). Two records are available from the coastal hills adjacent to the lower part of the Nahr Es Safa Valley, three other findings were made in rather elevated areas of the western slopes of the Lebanon Mts. (Fig. 48).

N. noctula belongs to rather rare bats of the Middle East, it is distributed there in two widely separated areas – in the Levant and in Iran (Harrison & Bates 1991, Benda et al. 2006, 2012a). The Lebanese part of the distribution range of *N. noctula* continues in very scarce occurrence both southward and northward. Besides an old record from the West Bank (Festa 1894), the records from Palestine are very rare and available only from the Upper Galilee and Hula Valley (Mendelssohn & Yom-Tov 1999). *N. noctula* is known from two quite isolated areas of western Syria, two findings were reported from the Golan Heights and other two from the southern parts of the Jebel An Nusariyah Mts. (Mendelssohn & Yom-Tov 1999, Benda et al. 2006). The occurrence of *N. noctula* in Lebanon fills the geographical gap between the few records in the northernmost Holy Land and the findings in western Syria. However, this geographically rather limited spot of occurrence in the Levant is separated from similarly isolated records in southern Turkey by a blank space of ca. 400 km (see Benda et al. 2006).

Due to the known occurrence in two separated areas of Lebanon (see above), the few records of *N. noctula* lie in a rather broad range of altitudes (1574 m; altitude median 317.5 m, mean 580.3 m a. s. l.; Table 2), the highest recorded locality of this bat in Lebanon is the Natural Bridge near Faraya in the central Lebanon Mts. (Fig. 50), at 1630 m a. s. l. (or 5,200 feet [= 1585 m] a. s. l. according to Lewis & Harrison 1962 or 1600 m a. s. l. according to Harrison 1964), where the



Figs. 48, 49. Records of particular bat species in Lebanon. 48 – *Nyctalus noctula* (Schreber, 1774). 49 – *Plecotus macrobullaris* Kuzâkin, 1965.

only roost of this bat in the country was documented. Harrison (1964: 119) described this roost as follows: "the specimens […] were not in a cave, but rather in a fissure about 60 feet [= 18.3 m] from the floor of the passage beneath the bridge. Although this natural bridge is a large cavern, it is not dark and the bats must retreat some distance into this crack in order to get out of the light. The crevice was quite inaccessible […]". Besides a finding of osteological remains from owl pellets (Obuch 2011), the remaining three records of *N. noctula* from Lebanon represent findings of foraging bats. In all cases the bats were recorded above water streams in various types of valleys, situated at low altitudes in the range of 56–570 m a. s. l. All records of *N. noctula* from Lebanon come from summer season and no direct evidence of reproduction was documented. However, a swarming group of this species netted at Seraal on 29 July was composed of individuals in full mating condition (the length of testes in scrotal position in three males was 9.5–10.5 mm, five adult females were in post-lactation state).

Based on the series of four specimens collected from the Natural Bridge on 29 July 1960, Harrison (1962) described a new subspecies, *Nyctalus noctula lebanoticus*. However, the actual status of this taxon remains currently uncertain (see the detailed review by Benda et al. 2006), its validity could be confirmed or rejected only with the help of a molecular genetic analysis.

External and cranial dimensions of the only available Lebanese specimen of *N. noctula* (holotype of the above subspecies) are shown in Table 15.

Fig. 50. Natural Bridge near Faraya (1630 m a. s. l.; Jebel Lubnan). A classical site of bat research in Lebanon, where roosting individuals of *Myotis blythii*, *Nyctalus noctula*, and *Tadarida teniotis* were collected in the early 1960s. Type locality of *Nyctalus noctula lebanoticus* Harrison, 1962. Photo by M. Uhrin (June 2010).

Material examined. 1 ♂ (BMNH 61.406. [S+B], holotype of *Nyctalus noctula lebanoticus* Harrison, 1962), Faraya, Natural Bridge, 29 July 1960, leg. R. E. Lewis.

Records of ectoparasites. **Published data**: I s c h n o p s y l l i d a e: *Ischnopsyllus elongatus*: 2 ma, 6 fa, Natural Bridge, near Faraya, 29 July 1960 (Lewis 1962). – C i m i c i d a e: *Cimex pipistrelli*: 1 ma from 1 ma, Nahr Es Safa river, 26 April 2006 (Balvín et al. 2012, cf. Balvín et al. 2013).

Comments on ectoparasites. *Ischnopsyllus elongatus* (Curtis, 1832) is a typical parasite of bats of the genus *Nyctalus* and *N. noctula* represents the principal host species in the whole area of distribution; the range of this bat flea corresponds to that of its main host (Hůrka 1963). This bat flea was recorded also from other genera of tree-dwelling bats (*Barbastella*, *Eptesicus*, *Myotis*, *Pipistrellus*, *Vespertilio*), but these hosts are considered as accidental and secondary only (Lanza 1999).

The bat bug *Cimex pipistrelli* Jenyns, 1839 was found on male *N. noctula* at the Nahr Es Safa river (Balvín et al. 2012). In most of the distribution range of this bug, the bats of the *Pipistrellus pipistrellus* group represent its principal host group along with *N. noctula* (Usinger 1966); however, in southern Europe, *C. pipistrelli* occurs solely on bats of the genus *Nyctalus* (Lanza 1999, Simov et al. 2006). The record of *C. pipistrelli* from Lebanon represents its only evidence from the Middle East.

Plecotus macrobullaris Kuzâkin, 1965

Records. **Original data**: J e b e l L u b n a n: Faraya, at Raymond Cave [1] (Fig. 51), 2 June 2010: net. 1 ma, 1 fa, NMP. – L u b n a n E s h S h a m a l i: Wadi Jhannam, at a small water pool [2], 29 July 2009: net. 1 fa, NMP. – N a b a t i y e: Arnoun, Beaufort Castle [3] (Fig. 47), 6 June 2010: det. calls of 1 foraging ind. of *Plecotus* in the ruins.

Comments. *Plecotus macrobullaris* is obviously a rare bat in Lebanon, recorded only from two to three localities (Table 1, Fig. 49). Two records of caught bats are available only from the highest positions of the Lebanon Mts. A recording of echolocation call of a *Plecotus* bat, supposedly belonging to this species, made in the ruins of the Beaufort Castle settled on the high cliff above the El Litani Valley (Fig. 47) suggests its posible occurrence in southern Lebanon. *P. macrobullaris* has been discovered in Lebanon only recently, it is here reported from the country for the first time.

P. macrobullaris is one of the rarest bats of the Levant, although in the northern parts of the Middle East and in the Caucasus region, it belongs to rather frequent representatives of the genus (Benda et al. 2006, 2012a, Spitzenberger et al. 2006). The region of high mountains in Lebanon and south-western Syria represents – at least according to the available findings – an isolated spot of the distribution range of *P. macrobullaris* and its southernmost part. In Syria, this bat is known from the Anti-Lebanon Mts. and adjacent regions, including Mount Hermon, where five records are available (Benda et al. 2006). These records, together with the Lebanese localities, characterise the Levantine range of *P. macrobullaris* as a distributional islet confined to mountaineous

Fig. 51. Entrance to the Raymond Cave near Faraya, at 1770 m a. s. l. (Jebel Lubnan). The cave is an important hibernaculum of *Myotis blythii*; on 2 June 2010, individuals of *Rhinolophus hipposideros*, *Myotis blythii*, *Myotis emarginatus*, and *Plecotus macrobullaris* were netted and echolocation calls of *Hypsugo savii* were recorded at the cave entrance. Photo by M. Uhrin (January 2008).

Table 16. Basic biometric data on the examined Lebanese samples of *Plecotus macrobullaris* Kuzâkin, 1965, *Miniopterus schreibersii* (Kuhl, 1817) and *Tadarida teniotis* (Rafinesque, 1814). For abbreviations see p. 213

	Plecotus macrobullaris					*Miniopterus schreibersii*					*Tadarida teniotis*				
	n	**M**	min	max	SD	n	**M**	min	max	SD	n	**M**	min	max	SD
LAt	3	**42.00**	41.0	43.4	1.249	93	**45.23**	41.7	47.2	0.957	7	**60.31**	58.60	62.80	1.461
LPol	3	**6.93**	6.8	7.1	0.153	–	–	–	–	–	–	–	–	–	–
LCr	3	**17.17**	16.87	17.63	0.403	71	**15.09**	14.61	15.71	0.235	6	**23.78**	23.11	24.18	0.453
LCb	3	**15.93**	15.63	16.39	0.403	71	**14.60**	14.16	15.29	0.235	6	**23.11**	22.18	23.52	0.476
LaZ	3	**8.99**	8.74	9.49	0.433	67	**8.54**	8.29	8.92	0.158	6	**13.89**	13.24	14.28	0.397
LaI	3	**3.57**	3.51	3.69	0.101	71	**3.58**	3.42	3.76	0.082	7	**4.75**	4.50	4.93	0.164
LaInf	3	**4.18**	4.12	4.23	0.055	21	**3.99**	3.71	4.21	0.107	1	4.93	–	–	–
LaN	3	**8.57**	8.42	8.75	0.167	71	**7.94**	7.68	8.29	0.127	6	**11.56**	11.24	11.89	0.285
LaM	3	**9.36**	9.09	9.56	0.243	68	**8.71**	8.37	9.02	0.134	1	12.65	–	–	–
AN	3	**5.66**	5.55	5.81	0.135	71	**6.29**	6.03	6.51	0.118	5	**7.47**	7.37	7.74	0.155
LBT	3	**4.64**	4.56	4.73	0.085	62	**2.97**	2.64	3.19	0.111	1	5.65	–	–	–
CC	3	**3.93**	3.88	4.01	0.072	68	**4.57**	4.29	4.88	0.107	7	**5.71**	5.39	5.88	0.166
M^3M^3	3	**6.06**	5.79	6.30	0.257	70	**6.34**	6.15	6.68	0.115	6	**9.32**	8.86	9.63	0.285
CM^3	3	**5.67**	5.62	5.75	0.072	70	**5.89**	4.81	6.17	0.164	7	**8.93**	8.64	9.08	0.164
LMd	3	**10.89**	10.71	11.16	0.240	69	**10.74**	10.43	11.17	0.166	6	**16.65**	15.94	17.02	0.382
ACo	3	**3.08**	3.03	3.11	0.046	69	**2.58**	2.42	2.81	0.085	7	**3.97**	3.89	4.09	0.067
CM_3	3	**6.15**	6.01	6.27	0.132	67	**6.26**	6.07	6.53	0.102	6	**9.47**	9.24	9.68	0.150

parts of the northern Levant, separated from the continuous species range in southern Turkey by a gap of at least 400 km.

In Lebanon, *P. macrobullaris* is distributed over a medium-wide range of altitudes (1310 m) of very high positions of the Lebanon Mts. Considering the statistics of its altitudinal distribution (altitude median 1770.0 m, mean 1490.0 m a. s. l.; Table 2), *P. macrobullaris* is the most montane species among the Lebanese bats. The highest recorded locality of *P. macrobullaris* in Lebanon is the upper part of Wadi Jhannam at 2005 m a. s. l., where this bat was documented to forage by netting of an adult female at a small water pool. The remaining two records also represent findings of foraging bats, once at a cave entrance (Raymond Cave at 1770 m a. s. l.; Fig. 51) and once within castle ruins (Beaufort Castle at 695 m a. s. l.; Fig. 47). All three available records of *P. macrobullaris* were made in the summer season and no roost record is available, although the latter two sites (Raymond Cave and Beaufort Castle) may theoretically represent roosts of this bat.

External and cranial dimensions of the Lebanese specimens of *P. macrobullaris* are shown in Table 16. For the material examined see below.

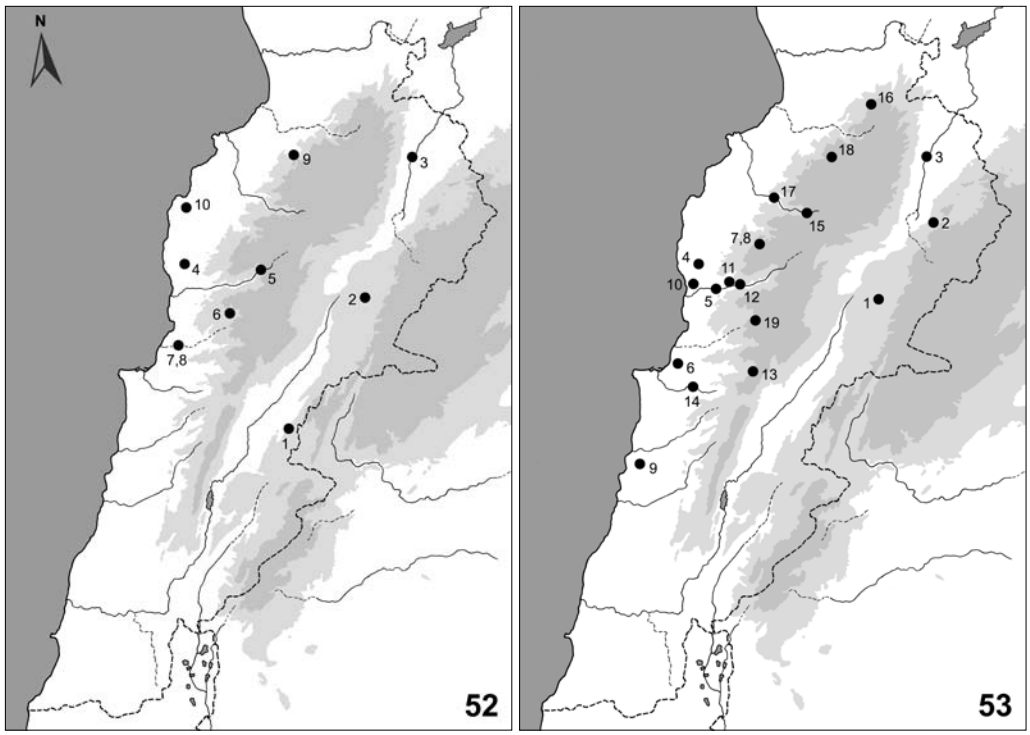
Material examined. 1 ♂, 1 ♀ (NMP 93542, 93543 [S+A]), Faraya, Raymond Cave, 2 June 2010, leg. P. Benda & M. Uhrin; – 1 ♀ (NMP 95857 [S+A]), Wadi Jhannam, 29 July 2009, leg. I. Horáček.

Miniopterus schreibersii (Kuhl, 1817)

Records. **Original data**: E l B e q a a: Aanjar, Aanjar Cave [1] ["Grotte de Birket"] (Fig. 33), September 1951: 1 f, MHNG (leg. H. Coiffait & P. Strinati); – Baalbek, field near Ras El Ein [2], 10 September 1960: coll. 1 fa, AUB (leg. D. Baroudy & J. Stencel); – Ras El Assi, Deir Mar Maroun Monastery [3] (Fig. 17), 29 June 2006: net. 1 ind. (cf. Horáček et al. 2008). – J e b e l L u b n a n: Aamchit, Saleh Cave [4] ["cave 2 km E Amchite"], 11 November 1962: coll. 9 inds., AUB (leg. R. E. Lewis); Aamchit, Saleh Cave (Fig. 26), 25 June 2006: obs. a colony of 30–40 inds., net. 10 ma, 3 faL, 1 fs, 1 fj, coll. 1 ma, 1 fs, NMP, 28 January 2007: obs. 3 inds. torpid (exam. 1 ms, 1 fa), coll. 1 fa, NMP, 8 February 2009: obs. 69 inds. torpid, 14 March 2009: obs. ca. 20 inds., net. 15 ma, 40 fa, ~20 inds., coll. 2 fa, NMP, 25 March 2009: net. 37 inds., 26 October 2012: obs. a colony of 20 inds., net. 152 inds. (cf. Horáček et al. 2008, Šrámek et al. 2013, Bilgin

et al. 2016); – El Aaqoura, Er Roueiss Cave [5] (Fig. 55), 26 June 2006: obs. a colony of 50–80 inds. torpid, net. 5 ma, 1 fa, 1 fs, coll. 5 ma, 1 fs, NMP, 22 January 2007: obs. a colony of ca. 1060 inds. torpid (exam. 2 ma, 1 ms, 25 fa, 4 fs), coll. 2 ma, 3 fa, NMP, 17 January 2008: obs. a colony of ca. 1250 inds. torpid, 11 February 2009: obs. a colony of ca. 1300 inds. (cf. Horáček et al. 2008, 2009, Šrámek et al. 2013, Bilgin et al. 2016); – Hrajel, Seraaya Cave [6], 11 February 2009: obs. 17 inds. torpid (cf. Horáček et al. 2009); – Jeita, Jeita Cave, upper entrance [7], 26 January 2007: bone remains of 1 ind. found in the cave deposit; – Jeita, Jeita Cave, lower entrance [8], 20 March 2009: net. 2 ma, 1 ms, 2 faG, NMP, 25 October 2012: net. 101 inds. (exam. 3 ma, 4 fa). – L u b n a n E s h S h a m a l i: Haqel El Aazime, Achou Cave [9], 18 February 2009: obs. 13 inds. torpid (cf. Horáček et al. 2009); – Ras Nhach, Musailha Fort [10] (Fig. 21), 28 January 2007: obs. 6 inds. torpid, 18 January 2008: obs. 1 ind. torpid (cf. Horáček et al. 2008, 2009). – **Published data**: E l B e q a a: Anjar, cave nr. source [= Aanjar Cave] [1], 2 September 1968: 1 ind., SAC (Atallah 1970, 1977). – J e b e l L u b n a n: Aakoura, grotte de Rouways [5], 27 January 1985: 10 m, 6 f (Tohmé & Tohmé 1985); Al Rwaiss, 8 February 2013: obs. ca. 600 inds. (Abi-Said 2014); – Grotte d'Amchite [4], 4 October 1951 [1 ma, MHNG] (Aellen 1955); cave 2 km. E. Amchite, 14 August & 13 October 1960, 18 March 1961: 37 m, 39 f [AUB] (Lewis & Harrison 1962); 2 km E of Amchite, 14 August 1940 [= 1960]: 2 m, 1 f, BMNH, HZM (Harrison 1964); Mogharet Saleh, 2 km E Amchite, 16 August 1968: 40 inds. (Atallah 1970); Mogharet Saleh, 2 km E. Amchite, 107 inds., AUB, BMNH, SAC (Atallah 1977); grotte de Aamchit (Tohmé & Tohmé 1985); cave 2 km E of Amchite, 18 March 1961 and 17 April 1965: 10 m, 6 f, AUB (Benda et al. 2006, Šrámek et al. 2013); Amcheet, Saleh, 24 December 2012: obs. 1 ind. (Abi-Said 2014); – Hrajel, Seraya [6], 30 December 2012: obs. 20 inds. (Abi-Said 2014). – Lebanon (undef.): Lebanon, 1 ind., FMNH (DeBlase 1980); Lebanon, 6 inds. (Shehata et al. 2016).

Comments. The records of *Miniopterus schreibersii*, a highly social and strictly cave-dwelling bat, are surprisingly rare in Lebanon – this species was recorded only from ten localities (Table 1).



Figs. 52, 53. Records of particular bat species in Lebanon. 52 – *Miniopterus schreibersii* (Kuhl, 1817). 53 – *Tadarida teniotis* (Rafinesque, 1814).

Table 17. Numbers of *Miniopterus schreibersii* in particular roosts per particular checks; W 2013 – checks during the winter 2012–2013 (Abi-Said 2014)

roost	*VI 2006*	I 2007	I 2008	II 2009	III 2009	*VIII 2009*	*VI 2010*	*X 2012*	W 2013	min	max	n checks
Achou Cave	–	0	0	13	–	–	–	–	–	0	13	4
Er Roueiss Cave	*50–80*	1060	1250	1300	–	–	–	–	600	16	1300	5
Musailha Fort	*0*	6	1	–	0	–	–	*0*	0	0	6	6
Saleh Cave	*30–40*	3	0	69	~20	*0*	*0*	*~20*	1	0	69	9
Seraaya Cave	–	0	0	17	–	–	–	–	20	0	20	3

in *italics*, checks in the summer season; Roman numerals denote months, Arabic numerals denote years

They come solely from the northern half of the country, being dispersed there in the ridges of the Lebanon and Anti-Lebanon Mts., in the coastal plains and hills, and in the El Beqaa and Orontes Valleys (Fig. 52). The southernmost known site of its occurrence in the country is the Aanjar Cave (Fig. 33) in the eastern part of the El Beqaa Valley / southern part of the Anti-Lebanon Mts.

Lewis & Harrison (1962: 485), mentioning only one site from the country, concluded as follows: "Although this species certainly occurs throughout Lebanon, it has only been collected from the cave at Amchite." Now, this sentence can be modified as follows: "Although this species certainly occurs throughout Lebanon, it has only been recorded from ten sites in the northern part of the country." Considering the distribution pattern of *M. schreibersii* in the surrounding countries of the Middle East and the physical characters of the landscape of the southern part of Lebanon, this bat is very likely distributed evenly in the whole country, despite the current picture based on real records gives a slightly different view (Fig. 52).

M. schreibersii is one of the most common and widespread bats in the western part of the Middle East and particularly in its Mediterranean parts, where this bat reaches the southern and eastern margins of its whole distribution range (Benda et al. 2012a, Šrámek et al. 2013). The Lebanese part of the distribution range of *M. schreibersii* continues both southward and northward. Records of this bat are available from the Mediterranean hilly areas of northern Palestine, from Mount Hermon, and from western Syria (Mendelssohn & Yom-Tov 1999, Benda et al. 2006, Shehab et al. 2007). No records of *M. schreibersii* are available from the Syrian part of the Anti-Lebanon Mts.; the El Beqaa and Orontes Valleys of Lebanon thus represent the eastern margin of its known distribution in the central part of the Levant.

In Lebanon, *M. schreibersii* is distributed over a medium-wide range of altitudes (1395 m; altitude median 720.0 m, mean 748.1 m a. s. l.; Table 2), the highest recorded locality of this bat in the country is the Seraaya Cave near Hrajel (Lebanon Mts.) at 1440 m a. s. l., which serves as a hibernation roost of this bat.

Most findings of *M. schreibersii* in Lebanon originate from roosts (60–70%, n=6–7) and the altitudinal range of roost sites conforms to the range of all records (1395 m), while the median and mean altitude values of the roosts are somewhat higher than those from all sites, 942.5 m and 800.2 m a. s. l., respectively. These values for the hibernacula are somewhat lower, 710.0 m and 725.2 m a. s. l., respectively (n=5). On the contrary, these values for summer roosts are higher, 1175.0 m and 868.7 m a. s. l., respectively (n=3); however, when also the Jeita Cave is included into the list of summer roosts (where no roosting bats were found, but reproductive individuals were netted and their roosting in the cave is very probable, see below), the median and mean altitude values of these roosts are even lower than those of the winter roosts, 660.5 m and 669.0 m a. s. l., respectively. Hence, in Lebanon *M. schreibersii* prefers to roost in areas of variable altitudes.

M. schreibersii was found to roost in Lebanon mainly in natural caves of very variable size and position (83–86%, n=5–6; hibernacula 80.0%, n=5), one (winter) roost site of this bat represents a man-made construction, the Musailha Fort (Figs. 20, 54). Larger numbers of hibernating bats in one site (n>10) were documented in all natural hibernacula, i.e. in four caves, that are spread across various altitudes (146 m, 710 m, 1285 m, 1440 m a. s. l.). The largest winter colony of *M. schreibersii* was repeatedly observed in the Er Roueiss Cave (Fig. 55), where an aggregation of more than 1000 hibernating bats was found in three subsequent winters (2007–2009), while in winter 2013 only roughly 600 individuals were found there (Table 17, Fig. 56). In the Saleh Cave (Fig. 26), 69 individuals were found in winter 2009, otherwise the numbers of wintering *M. schreibersii* were quite smaller (Table 17).

We did not succeed to prove hibernation in enormously large system of the Jeita Cave where, similarly as in the latter two caves, *M. schreibersii* roosts also during the summer season. In the Saleh Cave, a group of 30–40 bats was observed to roost on 25 June, 40 bats on 16 August, and 20 bats on 26 October, and a group of 50–80 individuals was found in the Er Roueiss Cave on 26 June.

Breeding of *M. schreibersii* in Lebanon was documented at three sites, in all cases rather indirectly. In the Saleh Cave near Aamchit (146 m a. s. l.; Fig. 26), when the larger aggregation of bats was observed (25 June), three lactating females and one juvenile bat of the year (together with ten males) were netted at the cave entrance in the evening of the same day. In the Jeita Cave (70 m a. s. l.) two pregnant females netted when emerging from the cave in the night of 20 March, each female contained one foetus (their crown-rump length 10.6 mm and 12.7 mm, respectively).

Although it is clear that *M. schreibersii* is quite a regular component of the Lebanese bat fauna, its distributional and abundance status is in question, however. Neither the intensive search nor

Fig. 54. A group of *Miniopterus schreibersii* wintering in the ceiling niche of a chamber in the Musailha Fort (Lubnan Esh Shamali), discovered on 28 January 2007. Photo by I. Horáček.

extensive speleological documentation of Lebanese caves (comp. Karanouh & Bou Joude 2011) revealed any mass colony, typical for this strictly cave-dwelling species, except for the above three sites. Of course, the country is enormously rich in caves and a number of roosts unrevealed as yet may exist. Nevertheless, it seems clear that *M. schreibersii* is in Lebanon much less common than one would tend to expect.

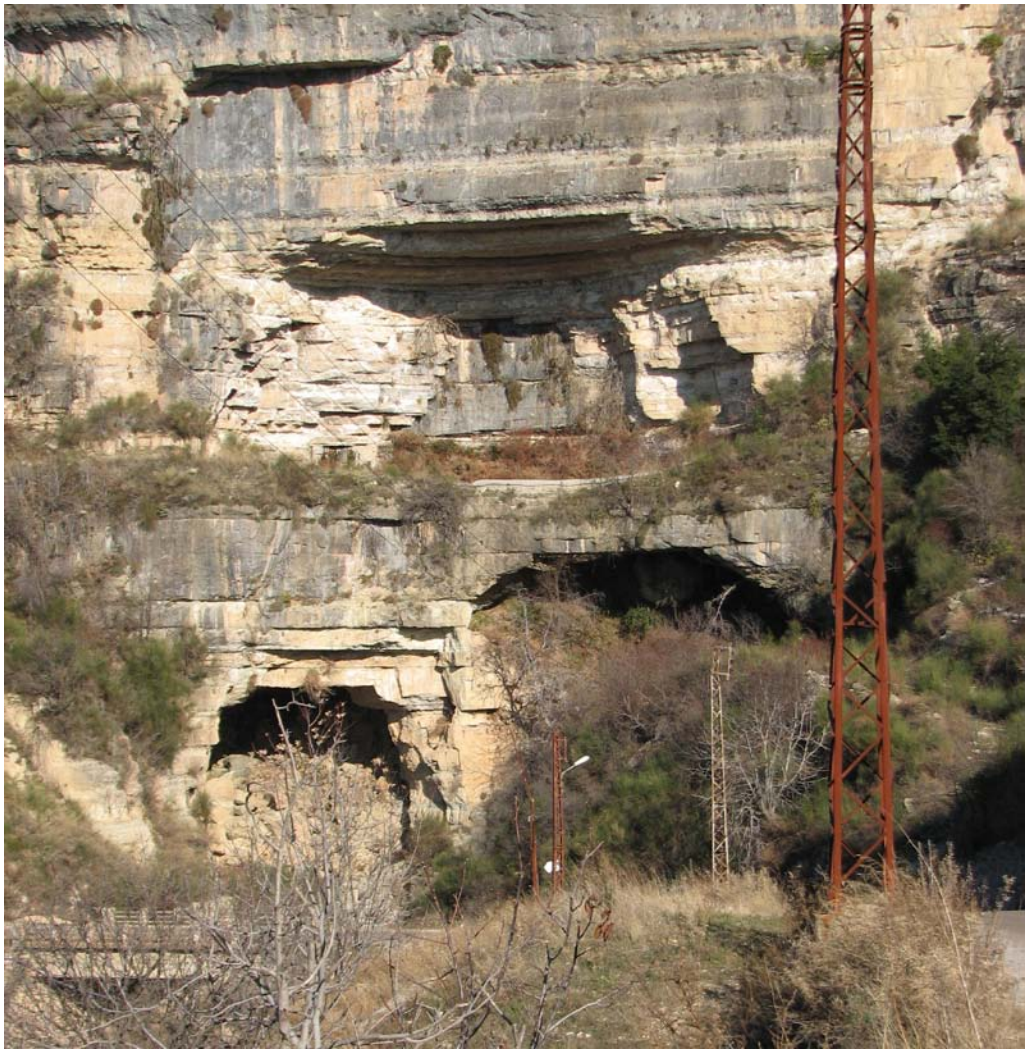


Fig. 55. Er Roueiss Cave near El Aaqoura, 1285 m a. s. l. (Jebel Lubnan). The cave is used as a year-round roost of an aggregation of *Miniopterus schreibersii*, and as a winter roost it is also used by *Rhinolophus ferrumequinum*, *R. hipposideros*, and *Myotis capaccinii*. In June 2006, individuals of *Rhinolophus euryale*, *Myotis nattereri*, *M. capaccinii*, *Eptesicus serotinus*, *Hypsugo savii*, *Pipistrellus pipistrellus*, and *Miniopterus schreibersii* were netted at the cave entrance. Photo by M. Uhrin (January 2008).

Fig. 56. A colony of *Miniopterus schreibersii* composed of ca. 1250 individuals hibernating in the Er Roueiss Cave (Jebel Lubnan) discovered on 17 January 2008. Photo by M. Uhrin.

The molecular genetic analyses by Šrámek et al. (2013) and Bilgin et al. (2016) examined the Lebanese samples of *Miniopterus* bats originating from the Saleh and Er Roueiss Caves, and identified all of them as *M. schreibersii*. However, the former analysis also proved its sister species, *M. pallidus* Thomas, 1907, to occur in the Levant. Until now, the latter species has been found in Iran, Afghanistan, Turkmenistan, Azerbaijan, Turkey, and Jordan; in Turkey, it lives in partial sympatry and in the Holy Land (Jordan and Syria) in close parapatry with *M. schreibersii* (Benda et al. 2010, Bilgin et al. 2012, Šrámek et al. 2013). Thus, the occurrence of *M. pallidus* is possible also in Lebanon, namely in the eastern and more continental areas of the country. However, due to its very similar morphology to *M. schreibersii*, it could be proven solely by a genetic analysis.

External and cranial dimensions of the Lebanese specimens of *M. schreibersii* are shown in Table 16. For the material examined see below.

Material examined. 1 ♂, 1 ♀ (NMP 95804, 95805 [S+A]), Aamchit, Saleh Cave, 25 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 1 ♀ (NMP 91808 [S+A]), Aamchit, Saleh Cave, 28 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 2 ♀♀ (NMP 93691, 93692 [S+A]), Aamchit, Saleh Cave, 14 March 2009, leg. T. Bartonička, P. Benda, I. Horáček & R. Lučan; – 1 ♀ (MHNG 967.88 [A]), Aanjar, Grotte de Birket, September 1951, leg. H. Coiffait & P. Strinati; – 1 ♀ (AUB M699 [A]), Amchite, 13 August 1960, leg. J. E. Stencel; – 5 ♂♂, 3 ♀♀ (AUB M091–M094 [S+B], M095, M096, M099, M100 [B]), cave 2 km E Amchite, 14 August 1960, leg. R. E. Lewis; – 10 ♂♂, 23 ♀♀, 22 inds. (AUB M084–M089, M097, M101–M105, M108–M112 [S+B], M113 [S], M700–M715 [A]), cave 2 km E Amchite, 13 October 1960, leg. R. E. Lewis; – 18 ♂♂, 7 ♀♀ (AUB M114 [B], M115, M119–M140, M142 [S+B]), cave 2 km E Amchite, 18 March 1961, leg. R. E. Lewis; – 9 inds. (AUB M716 [A]), cave 2 km E Amchite, 11 November 1962, leg. R. E. Lewis; – 2 ♂♂, 2 ♀♀ (AUB M1162–M1165 [S+B]), cave 2 km E Amchite, 17 April 1965, leg. S. Atallah; – 1 ♂ (MHNG 967.87 [A]), Grotte d'Amchite, 4 October 1951, leg. H. Coiffait & P. Strinati; – 1 ♀ (AUB M090 [B]), Baalbek, field near Ras Al Ain, 10 September 1960, leg. D. Baroudy & J. Stencel; – 5 ♂♂, 1 ♀ (NMP 95807–95812 [S+A]), Er Roueiss Cave, 26 June 2006, leg. I. Horáček, P. Hulva, R. Lučan & P. Němec; – 2 ♂♂, 3 ♀♀ (NMP 91776–91779 [S+A], 91780 [A]), Er

Roueiss Cave, 22 January 2007, leg. P. Benda, R. Černý, I. Horáček & R. Lučan; – 3 ♂♂, 2 ♀♀ (NMP 93701 [A], 93700, 93702–93704 [S+A]), Jeita Cave, 20 March 2009, leg. T. Bartonička, P. Benda, I. Horáček & R. Lučan.

Records of ectoparasites. **Original data**: N y c t e r i b i i d a e: *Nycteribia latreillii*: 1 fa (CMŠ [A]) from 1 fa (NMP 93691), Aamchit, Saleh Cave, 14 March 2009. – *Nycteribia pedicularia*: 1 ma, 1 fa (CMŠ [A]) from 2 ma (NMP 95811, 95812), El Aaqoura, Er Roueiss Cave, 26 June 2006. – *Nycteribia schmidlii*: 1 ma, 1 fa (CMŠ [A]) from 2 ma (NMP 95810, 95812), Aaqoura, Er Roueiss Cave, 26 June 2006; – 1 ma (CMŠ [A]) from 1 fa (NMP 91779), Aaqoura, Er Roueiss Cave, 22 January 2007; – 3 ma (CMŠ [A]) from a collection of 2 ma, 4 fa (NMP 91776–91780, 91808), Aaqoura, Er Roueiss Cave, and Aamchit, Saleh Cave, 22 & 28 January 2007. – *Penicillidia conspicua*: 2 ma, 1 fa (CMŠ [A]) from 1 fa, Aamchit, Saleh Cave, 25 June 2006; – 1 fa (CMŠ [A]) from 1 ma (NMP 95810), Aaqoura, Er Roueiss Cave, 26 June 2006; – 1 ma (CMŠ [A]) from 1 fa (NMP 91778), Aaqoura, Er Roueiss Cave, 22 January 2007. – **Published data**: N y c t e r i b i i d a e: *Nycteribia schmidlii*: 1 ma, 1 fa, Grotte d'Amchite, 4 October 1951 (Aellen 1955).

Comments on ectoparasites. Four species of bat flies were collected from *M. schreibersii* in Lebanon – it is the highest number of nycteribiids from one host species (the same number was collected also from *Rousettus aegyptiacus*, however, a secondary occurrence of most species is expected there, see above).

Nycteribia latreillii (Leach, 1817) is a species belonging to the parasites of cave-dwelling bats and in its whole distribution range, the bats of the *Myotis myotis* group are considered as its principal hosts. This bat fly is distributed in the whole western Palaearctic up to eastern Kazakhstan, including the Middle East (Hůrka 1980). From Lebanon, this bat fly is here reported for the first time, it was collected also from *M. myotis* s.str. (see above). *Nycteribia pedicularia* Latreille, 1805 is a typical parasite of cave-dwelling bats and its principal host is *Myotis capaccini*; however, it is frequently collected also from *M. schreibersii*, bats of the *M. myotis* group and of the genus *Rhinolophus* (Hůrka 1980). From Lebanon, this bat fly is here reported for the first time, it was collected from *Rousettus aegyptiacus*, *Rhinolophus ferrumequinum*, *Myotis blythii*, *M. capaccinii* and *Hypsugo savii*. *M. schreibersii* is a principal host of *Nycteribia schmidlii* Schiner, 1853 in its whole distribution range. However, this bat fly has been rather frequently found also on other cave-dwelling bats; *Myotis myotis* group, *Rhinolophus ferrumequinum*, and *R. euryale* (Hůrka 1964). The nominotypical subspecies of *N. schmidlii* occurs in southern Europe, northern Africa, and western Asia, eastwards to Afghanistan (Hůrka 1964, 1969), and it was found to be the most frequent arthropod parasite of *M. schreibersii* in Lebanon, although it was collected in the country also from *Rhinolophus euryale*, *Myotis capaccinii*, *Eptesicus serotinus*, *E. anatolicus* and *Hypsugo savii*. Similarly as in the previous bat fly, the principal host of *Penicillidia conspicua* Speiser, 1901 in its whole distribution range is *M. schreibersii*. This bat fly is a western Palaearctic species occurring roughly in the same area as the previous form (Hůrka 1964, 1980). From Lebanon, it is here reported for the first time.

Tadarida teniotis (Rafinesque, 1814)

Records. **Original data**: E l B e q a a: Baalbek, ancient ruins [1], fissure between stones, 7 October 2010: obs. several roosting inds. (photo by A. Šmídová & J. Šmíd); – El Laboue, rocks in a ridge above the road to Aarsal [2], 7 July 2006: det. calls of several foraging inds. (cf. Horáček et al. 2008); – Ras El Assi, Deir Mar Maroun Monastery [3] (Fig. 17), 29 June 2006: det. calls of 6 inds. leaving a roost (cf. Horáček et al. 2008). – J e b e l L u b n a n: Aamchit, at the Saleh Cave [4] (Fig. 26), 14 March 2009: det. calls of 1 foraging ind., 20 March 2009: obs. (and det. calls of) 1 foraging ind., 25 March 2009: obs. (and det. calls of) 1 foraging ind., 26 October 2012: det. calls of 1 foraging ind.; – Adonis, Nahr Ibrahim [5] (Fig. 42), 1 July 2006: det. calls of several foraging inds. (cf. Horáček et al. 2008); – Antelias, in the quarry with the El Kassarat and Kenaan Caves [6] (Fig. 11), 4 July 2006: obs. & det. calls of several inds. leaving a rocky fissure, 25 January 2008: det. calls of 2 foraging inds., 28 March 2009: obs. (and det. calls of) 2 foraging inds., 23 October 2012: obs. & det. calls of 3 inds. leaving a rocky fissure (cf. Horáček et al. 2008); – Balaa, rocky amphitheatre [7], 2 July 2006: obs. & det. calls of several inds. leaving a rocky fissure (cf. Horáček et al. 2008); – Balaa, above a creek [8] (Fig. 39), 31 May 2010: det. calls of 1 foraging ind.; – Dahr El Mghara, at El Watawit Cave [9], 22 March 2009: det. calls of 2 foraging inds.; – El Fidar [10], garden in a residential quarter, 24 June 2006: det. calls of 1 foraging ind. (cf. Horáček et

al. 2008); – El Machnaqa [11], 17 January 2008: det. calls of 2 foraging inds.; – Frat, Nahr Ibrahim [12] (Fig. 57), 29 May 2010: det. calls of 1 foraging ind.; – Majdel Tarshish, Qattine Aazar Chasm [13], 7 June 2010: det. calls of 1 foraging ind.; – Ras El Matn, El Heskan Cave [14], at entrance, 31 October 2012: det. calls of 1 foraging ind. – L u b n a n E s h S h a m a l i: Bcharre, Qadisha Valley [15], at the rocky wall opposite to the Mar Lichaa Monastery, 27 October 2012: det. calls of ca. 4 inds. leaving a roost; – Fnaydeq, Ein El Qammouaa [16], 3 June 2010: det. calls of 2 foraging inds.; – Seraal, Qadisha Valley [17], 30 July 2009: net. 1 ma; – Wadi Jhannam, small water pool [18], 29 July 2009: det. calls of 1 foraging ind. – **Published data**: E l B e q a a: Baalbek [1], ruins (Lewis & Harrison 1962); Ba'albek, Bekaa, August 1961: 2 f, FMNH (Kock & Nader 1984). – J e b e l L u b n a n: Natural Bridge [19] (Fig. 50), 7 km S.E. Faraya, small fissure about 80 feet above the ground, 21 and 29 July 1960, 25 September 1960, 31 May 1961, and 1 October 1961: 3 m, 10 f (Lewis & Harrison 1962, Lewis 1964, Lewis & Lewis 1990); Natural Bridge, Faraya, 29 July 1960: 1 f, BMNH (Harrison 1964); Natural Bridge, near Faraya, 10 inds., AUB (Atallah 1977); Natural Bridge, near Faraya, 25 September 1960: 1 f, FMNH (Kock & Nader 1984); Natural Bridge, 7 km E of Faraya, 29 July & 25 September 1960, 31 May 1961 & 25 May 1962: 3 m, 5 f, AUB, BMNH (Benda et al. 2008, 2012a, 2014). – Lebanon (undef.): Lebanon, 1 ind., FMNH (DeBlase 1980).

Comments. Based on number of records, *Tadarida teniotis* is with 19 localities a moderately frequent bat in Lebanon (Table 1). This bat was recorded from the central and northern parts of the country (Fig. 53); however, it is widespread across most of the Lebanon range and the coastal plains and hills, and documented also in the Anti-Lebanon Mts. and the Orontes Valley. The southernmost known site of its occurrence in the country is the valley at Dahr El Mghara as the only documented locality south of Beirut (Fig. 53).

T. teniotis is one of the most common and widespread bats in the Mediterranean parts of the Middle East, occurring also in the adjacent arid steppe areas (Harrison & Bates 1991, Mendelssohn & Yom-Tov 1999, Benda et al. 2006, 2008, 2010, 2012a). The Lebanese part of the distribution range of *T. teniotis* continues namely in the dense occurrence southward, it is very common throughout Palestine and in western Jordan (Mendelssohn & Yom-Tov 1999, Benda et al. 2010). The absence of records of this bat in southern Lebanon is thus surprising indeed. *T. teniotis* is not rare in western Syria, numerous records are available from the Golan Heights, the Syrian part of the Anti-Lebanon Mts., and the Jebel An Nusariyah Mts. (Mendelssohn & Yom-Tov 1999, Benda et al. 2006). Regarding the enormous richness of rocky habitats throughout Lebanon, the number of records of this bat is surprisingly low and compared to the neighbouring countries, *T. teniotis* is to be considered rare even in the central and northern parts of Lebanon.

The records of *T. teniotis* are distributed across almost the whole altitudinal gradient of Lebanon (spread over a very broad range of 1913 m; altitude median 1046.0 m, mean 915.0 m a. s. l.; Table 2) with the only exception of the highest parts of the main mountain ranges. The highest recorded locality of *T. teniotis* in Lebanon is the upper part of Wadi Jhannam at 2005 m a. s. l., where a flying bat was documented by detection of echolocation calls of one individual at a small water pool. The records of bats on wings absolutely prevail in the list of findings of *T. teniotis* in Lebanon (89.5%, n=17); several times the foraging bats were observed to leave their roosts in rocks. The altitudinal range of foraging habitats conforms to the range of all records (1913 m), but the median and mean altitude values are somewhat lower compared to those of all records, 780.0 m and 859.6 m a. s. l., respectively. With only one exception of the adult male that was netted above a stream in the terminal part of the canyon-like Qadisha Valley near Seraal (570 m a. s. l.), the foraging bats were registered only due to detection of their echolocation calls. The foraging bats were recorded mostly in rocky valleys (76.5%, n=13) of various width and depth. A water stream was present only in a minority of the sites. Several times, the calls of *T. teniotis* were registered in an open landscape of mountain ridges, close to rocky slopes and walls, and once above a settlement close to the sea coast (El Fidar, ca. 90 m a. s. l.).

Roosts of *T. teniotis* were found at six sites; at four sites we observed and/or detected calls of several individuals leaving their roosts. A group of bats was discovered being hidden in a fissure

between stone blocks of the Temple of Sun within the Baalbek ruins (1142 m a. s. l.) on 7 October (none of these bats was examined, the species was identified from a photograph). Two females of this bat were reported from Baalbek already by Lewis & Harrison (1962) and Kock & Nader (1984), however, there are no data on the collection circumstances other than the period of collection, August 1961. Lewis & Harrison (1962) reported on the finding of a colony of *T. teniotis* in the Natural Bridge near Faraya (1630 m a. s. l.; Fig. 50), 13 bats were collected from a fissure beneath the "bridge" (see also Comments on *Nyctalus noctula* for the description of this roost, where both species were collected simultaneously) five times during summer seasons of 1960 and 1961 (July–August and May and October, respectively). Lewis & Harrison (1962: 477–478) added the following observations of the collected bats: "Specimens taken during the summer of 1960 were collected too late in the season for the females to contain embryos and the single male taken at that time showed no testicular enlargement. Those taken on 31 May 1961 were more informative. While neither male had enlarged testes, the uterus of each female contained a single embryo. In both cases the embryo was near term and would doubtless have been born within the next week or two. This would place parturition during the middle of June, which seems rather late but may possibly be accounted for by the altitude. Three females collected on 1 October 1961 added the following information. […] Examination of the reproductive tracts revealed that in all three specimens the right uterine horn and ovary were considerably enlarged over those on the left side. Further examination showed the uterine wall to be quite thickened in relation to its diameter but none of them contained spermatozoans, ova or embryos. One specimen was still lactating slightly. All three of these specimens were in satisfactory physical condition for hibernation. In spite of this it seems inconceivable that they hibernate in such an exposed situation although the crevice is in a position which precludes investigation. Even strong lights and binoculars reveal

Fig. 57. The upper part (ca. 780 m a. s. l.) of the Nahr Ibrahim valley at Frat (Jebel Lubnan), a foraging habitat of *Myotis nattereri*, *Hypsugo savii*, *Pipistrellus pipistrellus*, and *Tadarida teniotis* (May 2010). Photo by M. Uhrin.

nothing." Repeated evening observations at the site in 2007, 2009 and 2010 provided no record of *T. teniotis*.

External and cranial dimensions of the Lebanese specimens of *T. teniotis* are shown in Table 16. For the material examined see below.

Material examined. 1 ♀ (BMNH 61.407. [S+B]), Faraya, Natural Bridge, 29 July 1960, R. E. Lewis; – 2 ♀♀ (AUB M075, M078 [S+B]), Faraya, Natural Bridge, 25 September 1960, leg. R. E. Lewis; – 1 ♂, 2 ♀♀ (AUB M079 [S+B], M665, M666 [S+A]), Faraya, Natural Bridge, 31 May 1961, leg. R. E. Lewis; – 2 ♂♂ (AUB M667/1 [S+A], M667/2 [A]), Faraya, Natural Bridge, 25 May 1962, leg. R. E. Lewis.

Records of ectoparasites. **Published data**: I s c h n o p s y l l i d a e: *Araeopsylla gestroi*: 1 fa, Natural Bridge, 7 km E. Faraya, 1 October 1961 (Lewis & Harrison 1962, Lewis 1964). – A r g a s i d a e: *Argas* sp.: 1 larva, Natural Bridge, 7 km E. Faraya (Lewis & Harrison 1962).

Comments on ectoparasites. The bat fleas of the genus *Araeopsylla* Jordan et Rotschild, 1921 have a rather wide distribution throughout the Afro-tropic and Oriental regions, but only two species *A. gestroi* (Rothschild, 1906) and *A. wassifi* Traub, 1954 were reported also from the Mediterranean Basin (Lewis 1974). *T. teniotis* is a principal host of *A. gestroi*.

A larval stage of a soft tick belonging to the genus *Argas* was collected from *T. teniotis* by Lewis & Harrison (1962). A possible affiliation of this record is *Argas vespertilionis* (Latreille, 1802), a species that was collected from this bat in Egypt (Hoogstraal 1956). *A. vespertilionis* occurs in the whole Old World south of 60° N and parasitises a variety of hosts (Kolonin 2007).

DISCUSSION AND CONCLUSIONS

Fauna

The present review summarises at least 418 records of 21 bat species from the territory of Lebanon (Table 1). In comparison with the last review of Lebanese bats by Horáček et al. (2008), the number of species in the country has increased by one species, *Plecotus macrobullaris*, which was recorded at least from two localities in high elevations of the Lebanon Mts. However, the number of bat records (localities per species) and the average number of records per species have increased almost twice in comparison with the last review (Table 1). Considering the area of the country and the number of bat records, the bat fauna of Lebanon is relatively best known from the countries of the Levant and possibly also the Middle East (comp. e.g. Benda et al. 2006, 2007, 2010, 2012a), perhaps with the exception of Palestine; however, the up-to-date statistics for the latter country are not available. Anyway, the number of bat records available from Lebanon is 1.3 times larger (128%) than such number from Syria, a country 17 times larger than Lebanon (cf. Benda et al. 2006, Shehab et al. 2007), or, the number of Lebanese bat records is almost a half (47%) of such number from Iran, which is, however, a more than 150 times larger country (cf. Benda et al. 2012a).

On the other hand, only slightly more than a quarter of the species can be considered as abundant (*Rousettus aegyptiacus*, *Rhinolophus ferrumequinum*, *R. hipposideros*, *Hypsugo savii*, *Pipistrellus pipistrellus*, *P. kuhlii*), they are known from more than 36 records each (37–51) and the sum of their records represent almost two thirds (63.7%) of the total number of the bat records from Lebanon (Table 1). Only in four of these species, however, the number of records increased significantly (more than twice) in comparison with the previous review (Horáček et al. 2008), while in *Rousettus aegyptiacus* and *Pipistrellus kuhlii*, this number increased only 1.6 times (Table 1). Fifteen species (71.4% of the whole bat fauna) are known from Lebanon from less than twenty records, and six species (28.6%) can be considered as rare, they are known only from five records or even

less. *Rhinopoma microphyllum* and *Myotis mystacinus* represent two rarest bats of Lebanon, each known from only one indubitable record from the country.

The occurrence pattern of the particular species mostly did not change significantly due to the recent survey, the new records rather conform to the ranges delineated already by Horáček et al. (2008). Two exceptions include *Rhinolophus blasii* and *Myotis nattereri*, whose occurrence area has been modified significantly, they are currently known from both the inner and coastal parts of Lebanon (in *R. blasii*, the number of records has increased most among the Lebanese bats – five times, see Table 1). In some other species, the known occurrence area has changed slightly, especially it has spread to the northern and/or southern areas of the country, see the record reviews of e.g. *Myotis capaccinii*, *Eptesicus serotinus*, *Nyctalus noctula* or *Tadarida teniotis*.

In fifteen bat species of Lebanon, i.e. more than two thirds of the fauna, their reproduction was documented from the territory of the country. However, only in two of them (*Rousettus aegyptiacus*, *Rhinolophus hipposideros*) it was evidenced by a direct observation of a nursery colony in its roost; in the remaining species, pregnant and/or lactating females were documented outside their reproduction shelters. Hibernation was documented in thirteen bat species of Lebanon, larger hibernation aggregations in six of them (*Rhinolophus ferrumequinum*, *R. hipposideros*, *R. blasii*, *Myotis nattereri*, *M. capaccinii*, *Miniopterus schreibersii*). On the other hand, hibernation is not known or expected in Lebanon at least in three species.

Horáček et al. (2008) suggested possible occurrence in Lebanon of ten bat species that are known to occur in the surrounding countries close to the Lebanese border (cf. Table 18). One of these species, *Plecotus macrobullaris* has been recently found in Lebanon indeed. However, Horáček et al. (2008) suggested also the occurrence of *Rhinopoma cystops* Thomas, 1903, *Rhinolophus mehelyi* Matschie, 1901, *Asellia tridens* (Geoffroy, 1813), *Taphozous nudiventris* Cretzschmar, 1830, *T. perforatus* Geoffroy, 1818, *Nycteris thebaica* (Geoffroy, 1818), *Eptesicus bottae* (Peters, 1869), *Vansonia rueppellii* (Fischer, 1829), and *Otonycteris hemprichii* Peters, 1859. To this list, another bat should be added, *Miniopterus pallidus* Thomas, 1907; its species status has been suggested only recently (Bilgin et al. 2012). None of these bats has been found in Lebanon, although records of some of these species are known from sites situated very close to the borders of Lebanon. Among them, four species are the hottest candidates to enrich the Lebanese bat fauna, *Rhinopoma cystops*, *Rhinolophus mehelyi*, *Asellia tridens*, and *Miniopterus pallidus*.

Rhinolophus mehelyi is a typical Mediterranean element distributed in the northern parts of the Middle East, which was rather rarely found also in Hatay, Mesopotamia, Syria, Jordan, Palestine, and northern Egypt (Harrison & Bates 1991, Benda et al. 2006). The territory of Lebanon lies within its distribution range delimited by records in the surrounding countries. Benda & Engelberger (2016) reported on a museum specimen of *R. mehelyi* that was labelled to originate from Lebanon; however, this labelling was not found to be supported by the museum evidence and is regarded inaccurate. Thus, although the occurrrence of this species in Lebanon is very likely, it remains to be proven; the nearest record of this bat was reported from the Galilee at the southern border of Lebanon (DeBlase 1972, Mendelssohn & Yom-Tov 1999). However, considering the occurrence pattern of *R. mehelyi* in the surrounding countries, it could be found anywhere in Lebanon, except the high mountain altitudes. *Miniopterus pallidus* is a similar faunal element as *R. mehelyi*; it is known from one site in north-western Jordan and from Hatay (besides a broad distribution in the northern Middle East) – if these occurrence spots are connected by a regular distribution range of this bat, it most probably stretches across the Lebanese territory (see Comments on *Miniopterus schreibersii* above).

Rhinopoma cystops and *Asellia tridens* are biogeographical elements similar to each other, both are dwellers of eremic habitats in arid steppes and deserts. In the Levant, their occurrence is most dense and common along the Rift Valley, with the northernmost records just on the sou-

Table 18. List of bat species per individual regions of the Levant showing the faunal status (+ = occurrence confirmed and published; – = occurrence unconfirmed; × = occurrence unconfirmed but possible according to the published data). Based mainly on the data summarised by Harrison & Bates (1991), Mendelssohn & Yom-Tov (1999), Benda et al. (2006, 2007, 2008), Bilgin et al. (2012), and by the present review. Syria = the Syrian territory according to the 1967 *status quo*

species \ country	Lebanon	Syria	Golan Heights	Palestine	Jordan	Hatay	Cyprus
Rousettus aegyptiacus	+	+	+	+	+	+	+
Rhinopoma microphyllum	+	+	+	+	+	–	–
Rhinopoma cystops	–	+	+	+	+	–	–
Rhinolophus ferrumequinum	+	+	+	+	+	+	+
Rhinolophus clivosus	–	–	–	+	+	–	–
Rhinolophus hipposideros	+	+	+	+	+	+	+
Rhinolophus euryale	+	+	–	+	+	+	(+)
Rhinolophus mehelyi	–	+	–	+	+	+	+
Rhinolophus blasii	+	+	–	+	+	+	+
Asellia tridens	–	+	+	+	+	–	–
Taphozous perforatus	–	–	–	+	+	–	–
Taphozous nudiventris	(–)	+	–	+	+	–	–
Nycteris thebaica	–	–	–	+	+	–	–
Myotis myotis	+	+	+	+	–	+	–
Myotis blythii	+	+	+	+	+	+	+
Myotis nattereri	+	+	+	+	+	+	+
Myotis emarginatus	+	+	+	+	+	+	+
Myotis mystacinus	+	–	+	–	–	–	–
Myotis capaccinii	+	+	+	+	+	+	(+)
Eptesicus serotinus	+	+	+	+	–	–	+
Eptesicus anatolicus	+	+	–	–	–	+	+
Eptesicus bottae	–	+	–	+	+	–	–
Hypsugo savii	+	+	+	+	–	+	+
Hypsugo ariel	–	–	–	+	+	–	–
Pipistrellus pipistrellus	+	+	+	+	+	+	+
Pipistrellus pygmaeus	–	–	–	–	–	–	+
Pipistrellus kuhlii	+	+	+	+	+	+	+
Vansonia rueppellii	–	–	–	+	–	–	–
Nyctalus noctula	+	+	+	+	–	–	(+)
Nyctalus leisleri	–	–	–	–	–	–	+
Nyctalus lasiopterus	–	–	–	–	–	–	+
Otonycteris hemprichii	–	+	–	+	+	–	–
Barbastella leucomelas	–	–	–	+	+	–	–
Plecotus christii	–	–	–	+	+	–	–
Plecotus kolombatovici	–	–	–	–	–	+	+
Plecotus macrobullaris	+	+	×	×	–	–	–
Miniopterus schreibersii	+	+	+	+	–	+	+
Miniopterus pallidus	–	×	–	–	+	+	–
Tadarida teniotis	+	+	+	+	+	+	+
total	21	26–27	19–20	31–32	26	19	19–22

thern border of Lebanon, in the Hula Valley; in the case of *R. cystops* also in the western Galilee, while in the case of *A. tridens* also in Mount Hermon (Mendelssohn & Yom-Tov 1999). These areas represent the northern currently known margins of their distribution ranges in the Levant. However, both species can occur in Lebanon, namely in the dry habitats of the El Hasbani Valley and adjacent areas of the El Litani Valley as well as the Jebel Aamel Mts. In Palestine, these two bats are similar faunal elements as *Rhinopoma microphyllum*, and they could be also similarly distributed (and similarly rare) in Lebanon as the latter species.

Nycteris thebaica, *Taphozous nudiventris*, *T. perforatus*, and *Vansonia rueppellii* represent a group of bats distributed widely but rarely across Palestine and reach its northernmost Levantine occurrence at Lake Tiberias or in the Haifa region, none of these bats was found in the Upper Galilee, Golan Heights or in the Hula Valley (Harrison & Bates 1991, Mendelssohn & Yom-Tov 1999). Their occurrence in Lebanon is much less probable than that of the previous group of species; however, if it is possible, perhaps only in the same areas as suggested above for *Rhinopoma cystops* and *Asellia tridens*. A possible record of *Taphozous nudiventris* from Lebanon is discussed in details above (see Comments on this species); an old specimen of this bat labelled as originating from Lebanon was discovered in a museum collection, however, its Lebanese (or any other) origin has not been identified for sure.

Two other species, *Eptesicus bottae* and *Otonycteris hemprichii*, are inhabitants of dry steppes and semi-deserts of the southern part of the Middle East (Harrison & Bates 1991, Benda et al. 2006). Their northernmost areas of regular occurrence lie in central Syria; the westernmost Syrian records of *E. bottae* were reported from Balis in the Euphrates Valley and from Tadmor Oasis, and those of *O. hemprichii* from the dry lowlands adjacent to the Anti-Lebanon Mts. from the east (Benda et al. 2006, Shehab et al. 2007). Both species (and namely the latter species) can be awaited in the eastern and north-eastern parts of Lebanon (eastern parts of the Orontes Valley, northern foothils of the Anti-Lebanon Mts., etc.), where the dry steppe habitats well resemble and more or less continue those of central Syria.

Several bat species occur in the Mediterranean arboreal habitats of the north-eastern part of the Mediterranean Basin, i.e. in Cyprus and Anatolia (Table 18), but they have not been recorded in Lebanon (nor in western Syria or Palestine). Among these bats, *Plecotus kolombatovici* Đulić, 1980 shows the widest distribution range in the Middle East – its records are available from the southern part of Anatolia including Hatay, from Cyprus and some Greek islands (Karataş & Sözen 2006, Spitzenberger et al. 2006, Benda et al. 2007). This bat is typical by its occurrence on sea islands of various size throughout the Mediterranean as well as the island-like pattern of distribution in the mainland (Spitzenberger et al. 2006). Hence, its overlooked occurrence in the Mediterranean woodlands of the northern Levant including Lebanon cannot be completely excluded. Other two bats of this group are *Nyctalus leisleri* (Kuhl, 1817) and *N. lasiopterus* (Schreber, 1780); both species were found in Cyprus, southern Anatolia and Cyreniaca, *N. leisleri* also in Crete (Benda et al. 2007, 2009, 2014, Arslan et al. 2015). Since both species are considered migratory, at least stray individuals may be found in forested regions of the Levant, including Lebanon.

In conclusion, the number of 21 species in the Lebanese bat fauna is probably not yet final. On the other hand, the current number of bat species known from Lebanon corresponds to the situation in the neighbouring countries of the eastern Mediterranean (Table 18). In the countries/regions where the habitats of the Mediterranean woodlands dominate (Lebanon, Golan Heights, Hatay, Cyprus), the numbers of bat species in their faunas are around 20 (19–22); only in the countries, where dry steppes/deserts are combined with the woodlands (Palestine, Jordan, Syria), the number of bat species is higher, up to 32. The number of bat species in Lebanon could be enlarged more or less when such beta diversity is considered – mainly by the species biogeographically similar to *Rhinopoma microphyllum*, currently the only bat of the eremic zone known to interfere to Lebanon.

Zoogeography

It would seem to be rather pointless to assess zoogeographical relations of the fauna of such a small country as Lebanon is. Nevertheless, the exceptional physiographic structuration of this small area also influences the distribution of bats. As already stressed, most of the territory of Lebanon falls into the zone of the Mediterranean woodlands (Zohary 1973). The particular bat species of

the Lebanese fauna could be simply characterised by a type of their distribution in this biome. The prevailing part of the bat fauna (57.1% of the total number of species) is composed of the species typical for the Mediterranean woodlands, and they reach the southern margins of their distribution ranges in Lebanon or in the Holy Lands not far from the Lebanese southern border (*Rhinolophus euryale*, *Myotis myotis*, *M. blythii*, *M. nattereri*, *M. mystacinus*, *Eptesicus serotinus*, *E. anatolicus*, *Hypsugo savii*, *Pipistrellus pipistrellus*, *Nyctalus noctula*, *Plecotus macrobullaris*, *Miniopterus schreibersii*); the second group of bats (38.1%) comprises the species that show rather broad ecological affinities, besides the arboreal zone, they live also in steppes of the eremic zone – although some of them reach the southern margins of their distribution ranges in the Levant, they occur in the dry habitats of the Syrian Desert and/or in Arabia (*Rousettus aegyptiacus*, *Rhinolophus ferrumequinum*, *R. hipposideros*, *R. blasii*, *Myotis emarginatus*, *M. capaccinii*, *Pipistrellus kuhlii*, *Tadarida teniotis*). One remaining species, *Rhinopoma microphyllum*, is the only bat of Lebanon typical for the eremic zone of the Palaearctic (4.8% of the fauna) and its record in Lebanon marks the northern margin of its distribution in the Levant.

The dispersal of species records within the territory of Lebanon, suggests a widespread distribution throughout the country, apart from the highest levels of mountain ranges for at least 15 species (71.4%). An exception are three bats that have limited ranges in the Levant and are known only from western Lebanon (coastal hills and plains, and the western slopes of the Lebanon Mts.) – *Rousettus aegyptiacus*, *Eptesicus anatolicus*, *Nyctalus noctula*. Naturally, an exception are also the bats known from a minimum number of records, which do not allow to fully assess their pattern of distribution in Lebanon – *Rhinopoma microphyllum*, *Myotis mystacinus*, and *Plecotus macrobullaris*. The latter two species are perhaps restricted just to upper positions of the high mountain ranges of Lebanon (see below). The only Lebanese record of *R. microphyllum* most probably represents only an (irregular?) fringe of its continuous range in the Holy Lands (see above).

Due to the enormous altitudinal gradient within the limited area of Lebanon, marked between-species differences in the altitudinal distribution of bat records are apparent (Table 2). Most species were found in a span from lowland/coastal areas up to the altitudes of more than 1000 m a. s. l., with only two exceptions, *Myotis mystacinus* and *Plecotus macrobullaris*. These bats were found only in high altitudes (mostly above 1000 m a. s. l.), the latter species is the most montane bat of Lebanon, the median and mean altitudes of its localities are above 1200 m a. s. l., as in the only Lebanese bat (Table 2). The high altitude records prevail also in several other species whose altitude ranges are much wider and include even the low positions (*Myotis blythii*, *M. nattereri*, *M. emarginatus*, *Hypsugo savii*, *Tadarida teniotis*); the median and mean altitudes of the localities of these bats in Lebanon lie above 1000 m and 900 m a. s. l., respectively (Table 2). In contrast, several other species show clear preferences for low areas (*Rousettus aegyptiacus*, *Rhinolophus euryale*, *R. blasii*, *Eptesicus anatolicus*, *Pipistrellus kuhlii*); the median and mean altitudes of their localities lie below 350 m and 600 m a. s. l., respectively. *Myotis myotis*, *M. capaccinii*, *Eptesicus serotinus*, and *Miniopterus schreibersii* create a group of species preferring the medium-positioned sites of the altitudinal gradient. The records of three most common bats of Lebanon (*Rhinolophus ferrumequinum*, *R. hipposideros*, *Pipistrellus pipistrellus*) are almost equally dispersed throughout the whole altitudinal range.

However, the altitudinal distribution of the particular species is not linked to their general zoogeographical affinities, it rather reflects partitioning of local sources among ecologically similar species. For example, all three pipistrelle-like bats of Lebanon, *Hypsugo savii*, *Pipistrellus pipistrellus*, and *P. kuhlii*, are typical species of the Mediterranean arboreal zone and forage in a similar way, by aerial hawking. While *P. pipistrellus* occurs across the whole altitudinal gradient of Lebanon, *P. kuhlii* prefers lowland and *H. savii* elevated areas of the country. Similarly,

bats foraging by foliage gleaning, such as *Rhinolophus euryale* and *Myotis emarginatus*, are also separated by their preferred altitudes (Table 2).

Anyway, compared to the situation in the neighbouring countries of the Middle East (see Table 18 and Benda & Horáček 1998, Mendelsohn & Yom-Tov 1999, Benda et al. 2006, 2007, 2010, Shehab et al. 2007, Karataş & Sachanowicz 2008), the bat fauna of Lebanon shows certain specifics. (1) The eremic elements which make up an indispensable component of the bat fauna of Palestine, Jordan, Syria, and Turkey, are restricted to a single marginal record of *Rhinopoma microphylum* and they thus do not contribute to the Lebanese fauna in a significant degree. (2) With an almost complete range of species typical for the eastern Mediterranean arboreal communities, the bat fauna of Lebanon shows identical features with the neighbouring regions of northern Palestine, north-western Jordan, western Syria, Hatay and Cyprus. (3) Corresponding to unique geomorphological, environmental and historical conditions, the Lebanese bat fauna provides, despite the absence of some taxa, an essential piece completing the mosaic of the biogeographic dynamics of bats of the eastern Mediterranean.

Ectoparasites

Along with the review of distribution of bats of Lebanon, we also present the review of arthropod ectoparasites of bats of the country. Altogether, at least 32 parasite species (18 of them new for the country) belonging to eight families were recorded; viz. Ischnopsyllidae, Cimicidae, Nycteribiidae, Argasidae, Ixodidae, Spinturnicidae, Macronyssidae, and Trombiculidae. Occurrence of three of them, Ixodidae, Spinturnicidae, and Trombiculidae, is here reported from bats of Lebanon for the first time, records of representatives of the other families were published previously (Aellen 1955, Lewis 1962, 1964, Lewis & Harrison 1962, Radovsky 1967, Theodor 1967, Péricart 1972, Balvín et al. 2012). From the insect families of bat parasites, occurring in the Middle East (cf. Marshall 1982), only the family Streblidae has not yet been proven from the territory of Lebanon.

According to Lewis & Lewis (1990), nine bat flea species of the family Ischnopsyllidae occur in the western part of the Middle East. Five of them were found in Lebanon, one of them as new for the country, and one bat flea was found as a completely new faunal element of the region. Four species of three genera were reported by previous authors, viz. *Araeopsylla gestroi* collected from *Tadarida teniotis* (Lewis & Harrison 1962, Lewis 1964), *Ischnopsyllus consimilis* from *Pipistrelus pipistrellus* and *P. kuhlii* (Lewis 1962), *Ischnopsyllus elongatus* from *Nyctalus noctula* (Lewis 1962), and *Rhinolophopsylla unipectinata* from *Rhinolophus ferrumequinum* (Lewis 1964). These findings were complemented with two bat flea species of the *Ischnopsyllus octactenus* group new for Lebanon: *I. octactenus* collected from *Pipistrellus pipistrellus* and *I. simplex* s.l. from *Myotis nattereri*; the latter two flea species were found also in mixed collections of host bats*. *I. octactenus* is a western Palaearctic species, its principal host is *P. pipistrellus* in its whole range, although it was often recorded also from *P. kuhlii* (Hůrka 1963). The respective record represents the southernmost evidence from the Middle East – previously it was reported from western and north-eastern Turkey, in both cases from *P. pipistrellus* (Lewis & Lewis 1990). On the other hand, distribution of the particular species of the *I. simplex* complex is not completely known; the principal host of *I. simplex* s.str. is *M. nattereri* in most of the species range, only in the northern and western parts of the range it is substituted by *Myotis mystacinus* (Hůrka 1976). A bat flea of the *I. simplex* complex is here reported for the first time also from the whole Middle East. On the other hand, from the north-western part of the Middle East, Lewis & Lewis (1990) also reported the occurrence of *Chiropteropsylla brockmani* Rothschild 1915, *Ischnopsyllus hexactenus* (Kolenati, 1856), *I. peridolius* Peus, 1977, and *Nycteridopsylla longiceps* Rothschild, 1908, and these taxa could be complemented with *Ischnopsyllus intermedius* (Rothschild, 1898), *I. variabilis* (Wagner, 1898), *Nycteridopsylla eusarca* Dampf, 1908, and *N. pentactena* (Kolenati, 1856) known from

Turkey (Peus 1978, Aktaş 1987), and *Ischnopsyllus dolosus* Dampf, 1912, known from Turkey and Iran (Aktaş 1987, Benda et al. 2012a). All these species could be expected to parasitise bats also in Lebanon.

Two representatives of the family Cimicidae that parasitise bats were collected in Lebanon, *Cacodmus vicinus* collected (most probably) from *Pipistrellus kuhlii* (Péricart 1972) and *Cimex pipistrelli* from *Nyctalus noctula* (Balvín et al. 2012). The former bat bug species is a parasite mostly of *Pipistrellus kuhlii*, additionally also of the *P. pipistrellus* group; however, the distribution range of *C. vicinus* follows rather that of the former host species (Quetglas et al. 2012). *Cimex pipistrelli* is a common and widespread ectoparasite of bats, its principal hosts are bats of the genus *Nyctalus* (Balvín et al. 2012, 2013), although in the neighbouring Palestine it was collected from *Pipistrellus kuhlii* (Theodor & Moscona 1954) and in Jordan from *Pipistrellus pipistrellus* (Benda et al. 2010). Another bat bug species was reported from the Middle East and Egypt, *Stricticimex namru* Usinger, 1960 (Usinger 1966, Benda et al. 2012a); however, since its ecology and distribution remain largely unknown, the possibility of its occurrence in Lebanon is rather questionable.

Eleven species of bat flies of the family Nycteribiidae were recorded from Lebanon, seven of them as new species for the Lebanese fauna. Four species of four genera were reported by previous authors, viz. *Nycteribia schmidlii* collected from *Miniopterus schreibersii* (Aellen 1955),

*Records of ectoparasites from unspecified hosts. **Original data**: I s c h n o p s y l l i d a e: *Ischnopsyllus simplex* complex: 1 fa (CMŠ [P]) from a jar containing 25 bats (*Rhinolophus hipposideros*, *Myotis blythii*, *M. nattereri*, *M. emarginatus*, *M. mystacinus*, *Eptesicus serotinus*, *E. anatolicus*, *Hypsugo savii*, *Pipistrellus pipistrellus*, *Miniopterus schreibersii*; NMP 95780, 95783, 95785–95806, 95855). – *Ischnopsyllus octactenus*: 1 fa (CMŠ [P]) from a jar containing four bats (*Myotis capaccinii*, *Pipistrellus pipistrellus*; NMP 95772–95775). – N y c t e r i b i i d a e: *Nycteribia pedicularia*: 2 ma (CMŠ [A]) from a jar containing 27 bats (*Rhinolophus ferrumequinum*, *Myotis capaccinii*, *Hypsugo savii*, *Pipistrellus pipistrellus*, *P. kuhlii*, *Miniopterus schreibersii*; NMP 95784, 95807–95808, 95810, 95812, 95814–95816, 95818, 95820–95821, 95824, 95831, 95834–95838, 95840, 95843–95849, 95851); – 1 ma (CMŠ [A]) from a jar containing eight bats (*Rhinolophus euryale*, *R. blasii*; NMP 91771–91772, 91792–91795, 91803–91805); – 1 fa (CMŠ [A]) from a jar containing 14 bats (*Rhinolophus ferrumequinum*, *R. hipposideros*, *R. blasii*, *Myotis blythii*, *M. emarginatus*, *M. capaccinii*, *Eptesicus serotinus*, *Pipistrellus pipistrellus*; NMP 91892–91898, 9190091903, 91906–91908); – 1 ma (CMŠ [A]) from a jar containing 23 bats (*Rhinolophus ferrumequinum*, *R. hipposideros*, *R. euryale*, *Myotis blythii*, *M. nattereri*, *M. capaccinii*, *Hypsugo savii*, *Pipistrellus pipistrellus*, *Miniopterus schreibersii*; NMP 93683–93690, 93692–93695, 93700–93709, 93711). – *Nycteribia schmidlii*: 1 fa (CMŠ [A]) from a jar containg two bats (*Myotis blythii*, *Eptesicus anatolicus*; NMP 95802, 95855); – 2 ma (CMŠ [A]) from a jar containing 12 bats (*Rhinolophus ferrumequinum*, *R. euryale*, *Myotis blythii*, *Eptesicus serotinus*, *E. anatolicus*, *Hypsugo savii*, *Miniopterus schreibersii*; NMP 95809, 95811, 95813, 95819, 95826, 95828–95830, 95833, 95839, 95841–95842); – 1 fa (CMŠ [A]) from a jar containing 23 bats (*Rhinolophus ferrumequinum*, *R. hipposideros*, *R. euryale*, *Myotis blythii*, *M. nattereri*, *M. capaccinii*, *Hypsugo savii*, *Pipistrellus pipistrellus*, *Miniopterus schreibersii*; NMP 93683–93690, 93692–93695, 93700–93709, 93711). – *Nycteribia vexata*: 1 ma (CMŠ [A]) from a jar containing 23 bats (*Rhinolophus ferrumequinum*, *R. hipposideros*, *R. euryale*, *Myotis blythii*, *Myotis nattereri*, *M. capaccinii*, *Hypsugo savii*, *Pipistrellus pipistrellus*, *Miniopterus schreibersii*; NMP 93683–93690, 93692–93695, 93700–93709, 93711). – *Phthiridium biarticulatum*: 1 ma (CMŠ [A]) from a jar containing 27 bats (*Rhinolophus ferrumequinum*, *Myotis capaccinii*, *Hypsugo savii*, *Pipistrellus pipistrellus*, *P. kuhlii*, *Miniopterus schreibersii*; NMP 95784, 95807–95808, 95810, 95812, 95814–95816, 95818, 95820–95821, 95824, 95831, 95834–95838, 95840, 95843–95849, 95851); – 2 ma (CMŠ [A]) from a jar containing eight bats (*Rhinolophus euryale*, *R. blasii*; NMP 91771–91772, 91792–91795, 91803–91805); – 2 ma (CMŠ [A]) from a jar containing 23 bats (*Rhinolophus ferrumequinum*, *R. hipposideros*, *R. euryale*, *Myotis blythii*, *M. nattereri*, *M. capaccinii*, *Hypsugo savii*, *Pipistrellus pipistrellus*, *Miniopterus schreibersii*; NMP 93683–93690, 93692–93695, 93700–93709, 93711). – *Basilia mongolensis*: 1 fa (CMŠ [A]) from a jar containing 25 bats (*Rhinolophus hipposideros*, *Myotis blythii*, *M. nattereri*, *M. emarginatus*, *M. mystacinus*, *Eptesicus serotinus*, *E. anatolicus*, *Hypsugo savii*, *Pipistrellus pipistrellus*, *Miniopterus schreibersii*; NMP 95780, 95783, 95785–95806, 95855). – *Penicillidia dufourii*: 1 ma (CMŠ [A]) from a jar containing two bats (*Myotis blythii*, *Eptesicus anatolicus*; NMP 95802, 95855). – I x o d i d a e: *Ixodes simplex*: 1 nymph (CMŠ [A]) from a jar containing 12 bats (*Rhinolophus ferrumequinum*, *R. euryale*, *Myotis blythii*, *Eptesicus serotinus*, *E. anatolicus*, *Hypsugo savii*, *Miniopterus schreibersii*; NMP 95809, 95811, 95813, 95819, 95826, 95828–95830, 95833, 95839, 95841–95842); – 2 nymphs (CMŠ [A]) from a jar containing 23 bats (*Rhinolophus ferrumequinum*, *R. hipposideros*, *R. euryale*, *Myotis blythii*, *M. nattereri*, *M. capaccinii*, *Hypsugo savii*, *Pipistrellus pipistrellus*, *Miniopterus schreibersii*; NMP 93683–93690, 93692–93695, 93700–93709, 93711).

Phthiridium biarticulatum from *Rhinolophus ferrumequinum* (Theodor 1967), *Basilia daganiae* from *Pipistrellus kuhlii* (Lewis & Harrison 1962), and *Eucampsipoda aegyptia* from *Rousettus aegyptiacus* (Lewis & Harrison 1962). *Nycteribia schmidlii* was newly collected also from *Rhinolophus euryale*, *Myotis capaccinii*, *Eptesicus serotinus*, *E. anatolicus* and *Hypsugo savii*, and *Phthiridium biarticulatum* from *Rhinolophus euryale*. Presence of these four species of bat flies was complemented with records of seven additional species of three genera, viz. *Nycteribia pedicularia* collected from six species of bats, *Rousettus aegyptiacus*, *Rhinolophus ferrumequinum*, *Myotis blythii*, *M. capaccinii*, *Hypsugo savii*, and *Miniopterus schreibersii*, *Nycteribia vexata* collected from *Rousettus aegyptiacus* and *Myotis blythii*, *Nycteribia latreillii* from *Myotis myotis* and *Miniopterus schreibersii*, *Basilia nana* from *Rousettus aegyptiacus* and *Myotis nattereri*, *Penicillidia dufourii* from *Rhinolophus ferrumequinum*, *Myotis myotis*, *M. blythii*, and *M. capaccinii*, and *Penicillidia conspicua* from *Miniopterus schreibersii*; *Basilia mongolensis* Theodor, 1966 was found only in a mixed collection of host bats (its accurate host is thus unknown, but its principal host is *Myotis mystacinus*, present in the collection; see Ševčík et al. 2013), where also additional specimens of *Nycteribia pedicularia*, *N. schmidlii*, *Phthiridium biarticulatum*, and *Penicillidia dufourii* were discovered. The genus *Eucampsipoda* is the only representative of the subfamily Cyclopodinae in the western Palaearctic and is a permanent parasite of *Rousettus aegyptiacus*. The remaining bat fly species belong to the subfamily Nycteribiinae; they represent two ecological groups, species parasitising cave-dwelling bats (collected from at least eight bat species of this roost preference), viz. *Nycteribia pedicularia*, *N. vexata*, *N. schmidlii*, *N. latreillii*, *Phthiridium biarticulatum*, *Penicillidia dufourii*, and *P. conspicua*, and species parasitising tree-dwelling bats, *Basilia nana*, *B. daganiae*, and *B. mongolensis*. Of thirteen bat fly species known from the Levant (Theodor 1975, Kock & Nader 1979), two additional could be found in Lebanon that were documented from the neighbouring Palestine and Jordan, *Phthiridium bilobum* (Theodor et Moscona, 1954) and *P. integrum* (Theodor et Moscona, 1954).

Of twenty-one families of mites parasitising bats (Szubert- Kruszyńska & Postawa 2008), representatives of five families were recorded from Lebanon, viz. Argasidae, Ixodidae, Spinturnicidae, Macronyssidae, Trombiculidae. Although Lewis & Harrison (1962) mentioned records of mites from several bat species, their species identification remains unpublished (with the exception of three macronyssid species below).

Only one tick of the Argasidae family was found to parasitise a bat in Lebanon, Lewis & Harrison (1962) reported a finding of a larva of *Argas* sp. from *Tadarida teniotis*. *Argas vespertilionis* was reported from Egypt being collected from this bat (Hoogstraal 1956). This soft tick is known as a common parasite of bats in the Middle East, see e.g. Benda et al. (2010, 2012a), its record from Lebanon is thus very probable. However, from the eastern Mediterranean, three other *Argas* species could be expected to occur in Lebanon, *A. transgariepinus* White, 1846, *A. boueti* Roubaud et Colas-Belcour, 1933, and *A. confusus* Hoogstraal, 1955 (Hoogstraal 1955, 1956, 1957). Besides the species of the genus *Argas*, another argasid species could occur in Lebanon, *Ornithodoros salahi* Hoogstraal, 1953, known only from the countries of the south-eastern Mediterranean, Egypt, Palestine, and Jordan (Theodor & Costa 1967, Benda et al. 2010).

Two species of the Ixodidae family with a strict specificity to parasitise bats (cf. Hoogstraal & Aeschlimann 1982) were collected from Lebanon and both of them for the first time, viz. *Ixodes vespertilionis* collected from *Rhinolophus ferrumequinum* and *Myotis myotis*, and *Ixodes simplex* Neumann, 1906, found in a mixed collection of host bats. The principal host of the latter species of tick in the western Palaearctic is *Miniopterus schreibersii*, other known hosts are bats of the genera *Myotis* and *Rhinolophus* (Yamaguti et al. 1971); all these taxa are present in the respective mixed collection.

Five species of four genera of epizoic obligatory haemato- or lymphophagous mites of the family Spinturnicidae were found on bats in Lebanon, all of them are here reported from the country for the first time. Two species, *Ancystropus zeleborii* and *Meristaspis lateralis*, are adapted to parasitise fruit bats of the family Pteropodidae and both were collected from *Rousettus aegytiacus*, the only representative of this group in the continental Levant. From the latter region, these records represent the first evidence of both species, their geographically nearest records are available from Egypt and Cyprus (Rudnick 1960). The Old World species *Eyndhovenia euryalis*, a parasite of bats of the genus *Rhinolophus*, was collected from *R. euryale*, although it regularly parasitises also other species of the genus. *Spinturnix myoti* was collected from *Myotis blythii* and *M. capaccinii*, and from a mixed collection of hosts, *S. psi* was found on *Myotis capaccinii* and *Hypsugo savii*. These two species are the most common mites of the family in the Levant, only these species were collected from Jordan (Benda et al. 2010). The mite genera *Ancystropus* Kolenati, 1857, *Meristaspis* Kolenati, 1857, and *Eyndhovenia* Rudnick, 1960 are in Lebanon represented by all species expected to occur in the Middle East (Rudnick 1960, Hafez et al. 1994, Cicek et al. 2007). Concerning the species-rich genus *Spinturnix* von Heyden, 1826, perhaps only one other species could be expected in the country with certainty, *S. acuminatus* (Koch, 1836) that was collected from *Pipistrellus kuhlii* in Palestine (Shulov 1957). Bat hosts of other mites of the genus *Spinturnix* (e.g. *Eptesicus serotinus* or *Plecotus macrobullaris*) are distributed rather marginally in Lebanon. However, from the eastern part of the Mediterranean Basin (Egypt and Crete), another spinturnicid mite species is known to occur, *Paraperiglischrus rhinolophinus* (Koch, 1844) (Kolenati 1857, Beron 1970); it can potentially be discovered also in Lebanon and other parts of the Levant.

Three species of mesostigmatic mites of the family Macronyssidae were reported by Radovsky (1967) from Lebanon, *Ichoronyssus scutatus* and *Macronyssus granulosus* being collected from *Myotis myotis* group (= *M. myotis* s.str., see above), and *Steatonyssus periblepharus* collected from *Pipistrellus kuhlii*. All these mites are widespread Old World species, with a relatively wide spectrum of hosts (Radovsky 1967). From Egypt and Palestine, other six species of the Macronyssidae parasites of bats were reported (Radovsky 1967), viz. *Ichoronyssus granulosus* (Kolenati, 1856), *Macronyssus kolenatii* Oudemans, 1910, *M. rhinolophi* (Oudemans, 1902), *Parasteatonyssus cornutus* Keegan, 1956, *P. hoogstraali* (Keegan, 1951), *Steatonyssus longipes* Radovsky et Yunker, 1963. All these species could be expected to occur also in Lebanon.

Three species of chigger mites of the family Trombiculidae were documented from Lebanon, all of them for the first time. *Leptotrombidium imphalum* was collected from *Myotis emarginatus* and *Hirsutiella willmanni* from *Rhinolophus hipposideros*; one unspecified genus other than the latter two was found to parasitise *Rhinolophus ferrumequinum*. The Lebanese records of *L. imphalum* and *H. willmanni* represent new host evidences for both species. However, most of the chigger mites exploiting bats appear to be host-specific and distributed in restricted ranges (Shatrov & Kudryashova 2006, Daniel et al. 2010). Thus, it seems rather untimely to expect other known species of these mites to parasitise bats in Lebanon.

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APPENDIX I
Gazetteer

Coordinates and altitudes of particular sites were determined mostly by the GPS receiver in the field or localised with help of Google Earth web application; in some cases the data were taken from literature; alt. = altitude [m a. s. l.]

site	province	coordinates	alt.
1 km N.W. Ain Anoub … see Ain Anoub, 1 km N.W.			
2 km E of Amchite … see Aamchit, Saleh Cave			
2 km. NE Hozmiye … see Roman Aquaduct, 2 km E Hazmiyeh			
22 April [Cave] … see Antelias, 22 April			
Aadloun, Adloun Cave	Lubnan El Janubi	33° 25’ N, 35° 16’ E	13
Aadloun, Al Alalieh	Lubnan El Janubi	33° 24’ N, 35° 16’ E	40
Aadloun, Em Bazzez	Lubnan El Janubi	33° 25’ N, 35° 16’ E	30
Aakoura, grotte de Rouways … El Aaqoura, Er Roueiss Cave			
Aalmane, El Litani Valley	Nabatiye	33° 19’ N, 35° 27’ E	100
Aamchit … see Aamchit, Saleh Cave			
Aamchit, Les Colombes camping site	Jebel Lubnan	34° 08’ N, 35° 38’ E	51
Aamchit, Mogharet Saleh … see Aamchit, Saleh Cave			
Aamchit, Saleh Cave	Jebel Lubnan	34° 09’ N, 35° 40’ E	146
Aamchit, overhang	Jebel Lubnan	34° 08’ N, 35° 39’ E	135
Aamchit	Jebel Lubnan	34° 09’ N, 35° 38’ E	95
Aamchite … see Aamchit, Saleh Cave			
Aanjar, Aanjar Cave	El Beqaa	33° 44’ N, 35° 57’ E	1175
Aanjar, archaeological site	El Beqaa	33° 44’ N, 35° 56’ E	898
Aanjar, pool	El Beqaa	33° 45’ N, 35° 57’ E	845
Aaonamie Cave … see Dahr El Mghara, El Watawit and Aaonamie Caves			
Aaraiya, 12 km ESE of Beirut	Jebel Lubnan	33° 50’ N, 35° 36’ E	605
Aarsal … see El Laboue, at the road to Aarsal			
Aarsal, Chmiss El Emjar	El Beqaa	34° 09’ N, 36° 26’ E	~1780
Abadi Cave … see Ras El Matn, El Heskan Cave			
Abadieh, Al Heskan … see Ras El Matn, El Heskan Cave			
Achou Cave … see Haqel El Aazime, Achou Cave			
Adloun Cave … see Aadloun, Adloun Cave			
Adonis, Nahr Ibrahim	Jebel Lubnan	34° 05’ N, 35° 44’ E	265
Afka … see Afqa, Afqa Cave			
Afqa, Afqa Cave	Jebel Lubnan	34° 04’ N, 35° 54’ E	1255
Afqa, house	Jebel Lubnan	34° 05’ N, 35° 53’ E	1302
Afqaa … see Afqa, Afqa Cave			
Ainab	Jebel Lubnan	33° 46’ N, 35° 33’ E	755
Ain Anoub, 1 km N.W.	Jebel Lubnan	33° 47’ N, 35° 32’ E	390

site	province	coordinates	alt.
Ajaltoun	Jebel Lubnan	33° 58’ N, 35° 41’ E	880
Akroum Cave	Lubnan Esh Shamali	34° 33’ N, 36° 22’ E	810
Al Alalieh … see Aadloun, Al Alalieh			
Al Heskan … see Ras El Matn, El Heskan Cave			
Al Kassarat Cave … see Antelias, El Kassarat and Kenaan Caves			
Al Reehan	Lubnan El Janubi	33° 27’ N, 35° 34’ E	1060
Al Rwaiss … see El Aaqoura, Er Roueiss Cave			
Al Tarrash … see Hrajel, Al Tarrash			
Aley, gardens	Jebel Lubnan	33° 48’ N, 35° 36’ E	750
Alhab Cave … see Tripoli, Alhab Cave			
Alwataweet Cave … Besri, Alwataweet Cave			
Amcheet, Saleh … see Aamchit, Saleh Cave			
Amchit, Saleh Cave … see Aamchit, Saleh Cave			
Amchite … see Aamchit			
Amchite … see Aamchit, Saleh Cave			
American University Beirut … see Beirut, A.U.B. Campus			
Ammik Swamp, Bekaa Valley	El Beqaa	33° 44’ N, 35° 47’ E	862
Animal Encounter … see Aley, gardens			
Anjar, cave nr. source … see Aanjar, Aanjar Cave			
Antelias	Jebel Lubnan	33° 55’ N, 35° 35’ E	15
Antelias, 22 April	Jebel Lubnan	33° 55’ N, 35° 36’ E	211
Antelias, Al Kassarat Cave … see Antelias, El Kassarat and Kenaan Caves			
Antelias, El Kassarat and Kenaan Caves	Jebel Lubnan	33° 55’ N, 35° 36’ E	110
Antelias, Kenaan Cave … see Antelias, El Kassarat and Kenaan Caves			
Antilyas … see Antelias			
aqueduc de Zénobie à Nahr Beyrouth … see Roman Aquaduct, 2 km E Hazmiyeh			
Arafa Cave … see Haqel El Aazime, Achou Cave			
Aranya … Aaraiya, 12 km ESE of Beirut			
Araya … see Aaraiya, 12 km ESE of Beirut			
Arnoun, Beaufort Castle	Nabatiye	33° 19’ N, 35° 32’ E	695
A.U.B. Campus … see Beirut, A.U.B. Campus			
Ba’albek, Bekaa … see Baalbek, ancient ruins			
Baakleen, Howet Wadi Aldayr	Jebel Lubnan	33° 41’ N, 35° 34’ E	975
Baalbek	El Beqaa	34° 00’ N, 36° 13’ E	1165
Baalbek … see Baalbek, ancient ruins			
Baalbek, ancient ruins	El Beqaa	34° 00’ N, 36° 12’ E	1142
Baalbek, Ras El Ein	El Beqaa	34° 00’ N, 36° 13’ E	1160
Balaa, amphitheatre	Jebel Lubnan	34° 10’ N, 35° 52’ E	1514
Balaa, creek	Jebel Lubnan	34° 10’ N, 35° 52’ E	1494
Barja	Jebel Lubnan	33° 39’ N, 35° 27’ E	285
Bcharre, Qadisha Cave	Lubnan Esh Shamali	34° 15’ N, 36° 02’ E	1720
Bcharre, Qadisha Valley, Mar Lichaa Monastery	Lubnan Esh Shamali	34° 15’ N, 36° 00’ E	1157
Bcharré, Quadisha valley … see Bcharre, Qadisha Valley, Mar Lichaa Monastery			
Bcharre, reservoir at the Qadisha Cave	Lubnan Esh Shamali	34° 16’ N, 36° 01’ E	1772
Beaufort Castle … see Arnoun, Beaufort Castle			
Beirut	Beirut	33° 53’ N, 35° 30’ E	85
Beirut, A.U.B. Campus	Beirut	33° 54’ N, 35° 29’ E	15
Beirut, Grotta dei Colombi … see Beirut, Pigeon Cave			
Beirut, I.C. Field … see Beirut, A.U.B. Campus			
Beirut, Pigeon Cave	Beirut	33° 53’ N, 35° 28’ E	1
Beirut, Rue Clémenceau, Mann Building	Beirut	33° 54’ N, 35° 29’ E	55
Beirut River cave … see Roman Aqueduct, 2 km E Hazmiyeh			
Beit el Dine, tunnel	Jebel Lubnan	33° 42’ N, 35° 35’ E	875
Beit-Meri … see cave 4 km SE of Beit Meri			
Berqayel, Berqayel Cave	Lubnan Esh Shamali	34° 29’ N, 36° 02’ E	243
Berquayel Cave … Berqayel, Berqayel Cave			

site	province	coordinates	alt.
Besri, Alwataweet Cave	Jebel Lubnan	33° 37’ N, 35° 36’ E	570
Beyrout … see Beirut			
Beyrouth … see Beirut			
Beyrouth, Grotte aux Pigeons … see Beirut, Pigeon Cave			
Beyrouth, Raouché, Grotte aux Pigeons … see Beirut, Pigeon Cave			
Bhairet Toula, Joulman	Lubnan Esh Shamali	34° 19’ N, 35° 59’ E	1030
Bnechaai, caves E of the village	Lubnan Esh Shamali	34° 20’ N, 35° 55’ E	~430
Bsayr … see Chehim, cave			
Bqerzia … see Bqerzala			
Bqerzala	Lubnan Esh Shamali	34° 31’ N, 36° 03’ E	256
Cave, 1 km. E. Amchite … see Aamchit, Saleh Cave			
cave 2 km E Amchite … see Aamchit, Saleh Cave			
cave 4 km SE of Beit Meri	Jebel Lubnan	33° 51’ N, 35° 38’ E	230
cave in the Litany Valley	Nabatiye	33° 18’ N, 35° 30’ E	~120
Cave near Anjar … see Aanjar, Aanjar Cave			
cave near Halba	Lubnan Esh Shamali	34° 33’ N, 36° 05’ E	140
cave near Roman Aqaeduct … see Roman Aqueduct, 2 km E Hazmiyeh			
Cedar Forest	Lubnan Esh Shamali	34° 15’ N, 36° 03’ E	1935
Celis Cave … see Aanjar, Aanjar Cave			
Chehim, cave	Jebel Lubnan	33° 37’ N, 35° 30’ E	600
Chehim, Bsayr … see Chehim, cave			
Chekka, Msailha gallery … see Ras Nhach, Musailha Fort			
Chtaura	El Beqaa	33° 49’ N, 35° 51’ E	910
Chweet, old house	Jebel Lubnan	33° 50’ N, 35° 36’ E	550
Dahr El Ahmar, bridge	El Beqaa	33° 31’ N, 35° 49’ E	950
Dahr El Mghara, El Watawit and Aaonamie Caves	Jebel Lubnan	33° 40’ N, 35° 37’ E	255
Damour	Jebel Lubnan	33° 44’ N, 35° 27’ E	65
Debbayeh, Mgharet Al Wataweet … Dahr El Mghara, El Watawit and Aaonamie Caves			
Deir Mahwet … see Koura, Deir Mahwet			
Deir Mar Maroun, 5 km S. Hermel … see Ras El Assi, Deir Mar Maroun Monastery			
Deir Mar Maroun Monastery … see Ras El Assi, Deir Mar Maroun Monastery			
Ebel Es Saqi, cave and spring	Nabatiye	33° 21’ N, 35° 37’ E	602
Ed Dibbye, Wataweet Cave … Dahr El Mghara, El Watawit and Aaonamie Caves			
Ehden … see Ehden, Mar Bichay Monastery			
Ehden, Mar Bichay Monastery	Lubnan Esh Shamali	34° 17’ N, 35° 57’ E	1403
Ein El Baaliye … see Wadi Jhannam, Ein El Baaliye			
Ein El Qammouaa … see Fnaydeq, Ein El Qammouaa			
El Aaqoura, Er Roueiss Cave	Jebel Lubnan	34° 07’ N, 35° 55’ E	1285
El Fidar, garden	Jebel Lubnan	34° 06’ N, 35° 39’ E	92
El Hermel, at the road bridge over the Orontes river	El Beqaa	34° 23’ N, 36° 24’ E	793
El Heskan Cave … see Ras El Matn, El Heskan Cave			
El Jaouz Cave … see Khirbet Qanafar, El Jaouz Cave			
El Jdaide, city	Jebel Lubnan	33° 53’ N, 35° 34’ E	10
El Kassarat Cave … see Antelias, El Kassarat and Kenaan Caves			
El Khiam, hospital ruins	Nabatiye	33° 20’ N, 35° 36’ E	555
El Laboue, at the road to Aarsal	El Beqaa	34° 11’ N, 36° 24’ E	1260
El Litani Valley … see Aalmane, El Litani Valley			
El Machnaqa	Jebel Lubnan	34° 05’ N, 35° 46’ E	1046
El Mrouj, mines …. see Marjaba, mines			
El Qaa, Jebel Haouerta	El Beqaa	34° 18’ N, 36° 31’ E,	~1200
El Qana Cave … see Faraya, El Qana Cave			
El Watawit Cave … see Dahr El Mghara, El Watawit and Aaonamie Caves			
El Yammoune, pond	El Beqaa	34° 07’ N, 36° 01’ E	1368
Em Bazzez … see Aadloun, Em Bazzez			
Er Roueiss Cave … see El Aaqoura, Er Roueiss Cave			
Faraya, El Qana Cave	Jebel Lubnan	34° 03’ N, 35° 49’ E	1602

site	province	coordinates	alt.
Faraya, Natural Bridge	Jebel Lubnan	34° 00’ N, 35° 50’ E	1630
Faraya, pond … see Faraya, Raymond Cave			
Faraya, Raymond Cave	Jebel Lubnan	33° 59’ N, 35° 49’ E	1770
Faraya (Pont naturel) … see Faraya, Natural Bridge			
Fidar … see El Fidar, garden			
Fnaydeq, Ein El Qammouaa	Lubnan Esh Shamali	34° 30’ N, 36° 14’ E	~1470
Fouar Dara Cave … see Majdel Tarshish, Fouar Dara Cave			
Frat, Nahr Ibrahim	Jebel Lubnan	34° 05’ N, 35° 50’ E	~780
Grotte d’Amchite … see Aamchit, Saleh Cave			
grotte de Aamchit … see Aamchit, Saleh Cave			
Grotte de Birket … see Aanjar, Aanjar Cave			
Grotte de Jabal Aanjar … see Aanjar, Aanjar Cave			
Grotte de Litani … see cave in the Litany Valley			
grotte de Rouways … El Aaqoura, Er Roueiss Cave			
Hadath-Beyrouth	Jebel Lubnan	33° 51’ N, 35° 32’ E	46
Halba	Lubnan Esh Shamali	34° 33’ N, 36° 05’ E	140
Halba … see cave near Halba			
Haqel El Aazime, Achou Cave	Lubnan Esh Shamali	34° 24’ N, 36° 01’ E	710
Harissa, Nabaa El Jdid	Lubnan Esh Shamali	34° 12’ N, 35° 58’ E	1850
Hasbaya, castle	Nabatiye	33° 24’ N, 35° 41’ E	660
Haska Cave … see Ras El Matn, El Heskan Cave			
Hazmiye … see Roman Aquaduct, 2 km E Hazmiyeh			
Hermel … see El Hermel, at the road bridge over the Orontes river			
Hermel … see Ras El Assi, Deir Mar Maroun Monastery			
Heskan Cave … see Ras El Matn, El Heskan Cave			
Hiba … see Jbeil, Hiba			
Holy Monastery of Theotokos Hamatoura … see Kousba, Holy Monastery of the Dormition of Theotokos Hamatoura			
Howet Wadi Aldayr … see Baakleen, Howet Wadi Aldayr			
Hrajel	Jebel Lubnan	34° 01’ N, 35° 48’ E	1305
Hrajel, Al Tarrash	Jebel Lubnan	34° 03’ N, 35° 49’ E	1620
Hrajel, Seraaya Cave	Jebel Lubnan	34° 01’ N, 35° 48’ E	1440
Hrajel, Seraya … see Hrajel, Seraaya Cave			
Hrajel, Mogharat el-Tarrache … see Hrajel, Al Tarrash			
Iäal, fortress ruins	Lubnan Esh Shamali	34° 22’ N, 35° 55’ E	267
Jahmour … see Roman Aqueduct, 2 km E Hazmiyeh			
Jamhour Cave … see Roman Aqueduct, 2 km E Hazmiyeh			
Jbail, citadel	Jebel Lubnan	34° 07’ N, 35° 39’ E	50
Jbeil, Hiba	Jebel Lubnan	34° 08’ N, 35° 40’ E	180
Jebal, Palestine … see Jbail, citadel			
Jebel Haouerta … see El Qaa, Jebel Haouerta			
Jeita, Jeita Cave	Jebel Lubnan	33° 57’ N, 35° 39’ E	70
Jenta, mine	El Beqaa	33° 51’ N, 36° 05’ E	1045
Jezzine, tunnels	Lubnan El Janubi	33° 33’ N, 35° 35’ E	643
Jezzine, Pont El Khalass, house	Lubnan El Janubi	33° 32’ N, 35° 35’ E	1025
Jezzine, Pont El Khalass, spring	Lubnan El Janubi	33° 33’ N, 35° 36’ E	1034
Joulman … see Bhairet Toula, Joulman			
Junieh	Jebel Lubnan	33° 59’ N, 35° 38’ E	7
Kassarat Cave … see Antelias, El Kassarat and Kenaan Caves			
Kenaan Cave … see Antelias, El Kassarat and Kenaan Caves			
Kfar Zabad, Kfar Zabad I & II Caves	El Beqaa	33° 47’ N, 36° 01’ E	1275
Kfarshgab, church	Lubnan Esh Shamali	34° 17’ N, 35° 58’ E	1287
Kfarzabad … see Kfar Zabad, Kfar Zabad I & II Caves			
Khirbet Qanafar, El Jaouz Cave	El Beqaa	33° 39’ N, 35° 43’ E	1184
Koura, Deir Mahwet	Lubnan Esh Shamali	34° 18’ N, 35° 52’ E	490
Kousba, Holy Monastery of the Dormition of Theotokos Hamatoura	Lubnan Esh Shamali	34° 18’ N, 35° 52’ E	1075

site	province	coordinates	alt.
Ksaim Sinkhole … see Nabaa Es Soukkar, Ksam Cave			
Ksam Cave … see Nabaa Es Soukkar, Ksam Cave			
Lasa, Salem Cave	Jebel Lubnan	34° 04’ N, 35° 53’ E	1280
Les Colombes … see Aamchit, Les Colombes camping site			
Maam el Tien Cave	Jebel Lubnan	34° 01’ N, 35° 39’ E	90
Machghara	El Beqaa	33° 32’ N, 35° 39’ E	995
Machgharah … see Machghara			
Majdel Tarshish, Fouar Dara Cave	Jebel Lubnan	33° 54’ N, 35° 50’ E	1663
Majdel Tarshish, Qattine Aazar Chasm	Jebel Lubnan	33° 54’ N, 35° 48’ E	1420
Mar Bichay Hermitage … see Qezhaya, Mar Bichay Hermitage, cave			
Marjaba, mines	Jebel Lubnan	33° 55’ N, 35° 45’ E	1120
Marjayoun, building	Nabatiye	33° 22’ N, 35° 35’ E	720
Matal El Azraq Cave … see Trablous, Matal El Azraq Cave			
Mebaaj Cave … see Tourzaiya, Mebaaj Cave			
Mgharet Al Wataweet … Dahr El Mghara, El Watawit and Aaonamie Caves			
Mgharet Fakherdeen	Lubnan El Janubi	33° 33’ N, 35° 35’ E	1130
Mgheret Mtall el Azraq … see Trablous, Matal El Azraq Cave			
Mogharat Biz es-Sigara … see Nammoura, Kfour, Kesraoune			
Mogharat el-Tarrache … see Hrajel, Al Tarrash			
Mogharet el-Bzouz … see Moukhtara, Mogharet el-Bzouz			
Mogharet Saleh, 2 km E Amchite… see Aamchit, Saleh Cave			
Mogharet Saleh cave … see Aamchit, Saleh Cave			
Moukhtara, Mogharet el-Bzouz	Jebel Lubnan	33° 40’ N, 35° 37’ E	735
Mounjez, bridge	Lubnan Esh Shamali	34° 37’ N, 36° 15’ E	314
Msailha gallery … see Ras Nhach, Musailha Fort			
Mrouj, mines …. see Marjaba, mines			
Mtal Azraq … see Trablous, Matal El Azraq Cave			
Mtal El Azraq Cave … see Trablous, Matal El Azraq Cave			
Musailha Fort … see Ras Nhach, Musailha Fort			
Naba’a, Niha Cave	Jebel Lubnan	33° 35’ N, 35° 38’ E	1125
Naba’a Al Mghara	Jebel Lubnan	34° 01’ N, 35° 48’ E	1226
Nabaa El Jdid … see Harissa, Nabaa El Jdid			
Nabaa Es Safa, mines	Jebel Lubnan	33° 45’ N, 35° 41’ E	987
Nabaa Es Soqia Cave … see Faraya, Raymond Cave			
Nabaa Es Soukkar, Ksam Cave	Lubnan Esh Shamali	34° 22’ N, 36° 04’ E	1370
Nabes es Soukar … see Nabaa Es Soukkar, Ksam Cave			
Nahr Beyrouth … see Roman Aqueduct, 2 km E Hazmiyeh			
Nahr Ed Damour, stream	Jebel Lubnan	33° 42’ N, 35° 28’ E	60
Nahr El Kelb … see Zouq Mosbeh, Nahr El Kelb			
Nahr el Litani, Zawtar Cave … see Zawtar Cave			
Nahr Es Safa, above the junction with Nahr Ed Damour	Jebel Lubnan	33° 42’ N, 35° 29’ E	46
Nahr Es Safa, below the junction with Nahr Ed Damour	Jebel Lubnan	33° 42’ N, 35° 28’ E	42
Nahr Ibrahim … Adonis, Nahr Ibrahim			
Nahr Ibrahim … Frat, Nahr Ibrahim			
Nahr Ibrahim … Yahchouch, Nahr Ibrahim, tunnel			
Nammoura, Kfour, Kesraoune	Jebel Lubnan	34° 02’ N, 35° 42’ E	784
Natural Bridge, 7 km SE Faraya … see Faraya, Natural Bridge			
Natural Bridge, Faraya … see Faraya, Natural Bridge			
Niha Cave … see Naba’a, Niha Cave			
Pigeon Cave… see Beirut, Pigeon Cave			
Pont El Khalass … Jezzine, Pont El Khalass			
Pont naturel … see Faraya, Natural Bridge			
Qadeesha … see Bcharre, Qadisha Cave			
Qadisha Cave … see Bcharre, Qadisha Cave			
Qadisha Valley … see Bcharre, Qadisha Valley, Mar Lichaa Monastery			
Qadisha Valley … see Seraal, Qadisha Valley			

site	province	coordinates	alt.
Qana, Qana Cave	Lubnan El Janubi	33° 13’ N, 35° 17’ E	267
Qattine Aazar Chasm … see Majdel Tarshish, Qattine Aazar Chasm			
Qezhaya, Mar Bichay Hermitage, cave	Lubnan Esh Shamali	34° 18’ N, 35° 56’ E	1370
Qezhaya, Yousef Karam	Lubnan Esh Shamali	34° 17’ N, 35° 57’ E	1050
Qnat Cave	Lubnan Esh Shamali	34° 15’ N, 35° 53’ E	1075
Quadisha valley … see Bcharre, Qadisha Valley, Mar Lichaa Monastery			
Raouché … see Beirut, Pigeon Cave			
Ras Al Cheqa’a Cave	Lubnan Esh Shamali	34° 19’ N, 35° 41’ E	1
Ras Beirut … see Beirut, Pigeon Cave			
Ras Beirut, Rue Hamra	Beirut	33° 55’ N, 35° 29’ E	70
Ras El Assi, Deir Mar Maroun Monastery	El Beqaa	34° 21’ N, 36° 22’ E	720
Ras El Assi, Ein El Zarqa and habitats around	El Beqaa	34° 21’ N, 36° 22’ E	675
Ras El Ein … see Baalbek, Ras El Ein			
Ras El Matn, Abadi Cave … see Ras El Matn, El Heskan Cave			
Ras El Matn, El Heskan Cave	Jebel Lubnan	33° 51’ N, 35° 38’ E	316
Ras Nhach, Musailha Fort	Lubnan Esh Shamali	34° 16’ N, 35° 41’ E	45
Raymond Cave … see Faraya, Raymond Cave			
Roman Aqueduct, 2 km E Hazmiyeh	Jebel Lubnan	33° 51’ N, 35° 34’ E	35
Roman Aquaduct, 10 km E. of Beirut … see Roman Aquaduct, 2 km E Hazmiyeh			
Roueiss Cave … see El Aaqoura, Er Roueiss Cave			
ruins of Baalbek … see Baalbek, ancient ruins			
Rwaiss … see El Aaqoura, Er Roueiss Cave			
Saida	Lubnan El Janubi	33° 34’ N, 35° 22’ E	20
Saleh Cave … see Aamchit, Saleh Cave			
Salem Cave … see Lasa, Salem Cave			
Seraal, Qadisha Valley	Lubnan Esh Shamali	34° 17’ N, 35° 56’ E	570
Seraaya Cave … see Hrajel, Seraaya Cave			
Seraya … see Hrajel, Seraaya Cave			
Shtora … see Chtaura			
Sir Ed Dinneih, Ksaim Sinkhole … see Nabaa Es Soukkar, Ksam Cave			
Tannourine El Faouqa, tomb	Lubnan Esh Shamali	34° 11’ N, 35° 54’ E	1393
Theotokos Hamatoura Monastery … see Kousba, Holy Monastery of the Dormition of Theotokos Hamatoura			
Tourzaiya, bridge	Jebel Lubnan	34° 07’ N, 35° 47’ E	860
Tourzaiya, Mebaaj Cave	Jebel Lubnan	34° 06’ N, 35° 46’ E	790
Trablous, city	Lubnan Esh Shamali	34° 26’ N, 35° 51’ E	5
Trablous, Matal El Azraq Cave	Lubnan Esh Shamali	34° 25’ N, 35° 50’ E	15
Tripoli … Trablous, city			
Tripoli, Alhab Cave	Lubnan Esh Shamali	34° 23’ N, 35° 51’ E	134
Tripoli, Mgheret Mtall el Azraq … see Trablous, Matal El Azraq Cave			
Tripoli, Mtal Azraq … see Trablous, Matal El Azraq Cave			
Tyr … see Tyre			
Tyre	Lubnan El Janubi	33° 16’ N, 35° 12’ E	10
vallée de Nahr Barouk	Jebel Lubnan	33° 38’ N, 35° 36’ E	735
Wadi Jhannam, Ein El Baaliye	Lubnan Esh Shamali	34° 21’ N, 36° 11’ E	~2170
Wadi Jhannam, pool	Lubnan Esh Shamali	34° 23’ N, 36° 07’ E	2005
Wadi Jilo … Wadi Jilo, quarry			
Wadi Jilo, quarry	Lubnan El Janubi	33° 14’ N, 35° 19’ E	222
Wataweet Cave … Dahr El Mghara, El Watawit and Aaonamie Caves			
Watawit Cave … Dahr El Mghara, El Watawit and Aaonamie Caves			
Yahchouch, Nahr Ibrahim, tunnel	Jebel Lubnan	34° 04’ N, 35° 44’ E	360
Yousef Karam … see Qezhaya, Yousef Karam			
Zahle, town	El Beqaa	33° 51’ N, 35° 54’ E	977
Zawtar Cave	Lubnan El Janubi	33° 19’ N, 35° 28’ E	150
Zaytoun	Jebel Lubnan	34° 04’ N, 35° 41’ E	480
Zebdeen Cave	Lubnan Esh Shamali	34° 38’ N, 36° 21’ E	450
Zouq Mosbeh, Nahr El Kelb	Jebel Lubnan	33° 57’ N, 35° 37’ E	45