

On the bat fauna of the Bahrain Archipelago (Chiroptera)

K fauně netopýrů Souostrovní bahrajnského (Chiroptera)

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Abstract. Only thirteen records of four bat species belonging to three families have been known from the Bahrain Archipelago until now, *Asellia tridens*, *Taphozous nudiventris*, *Pipistrellus kuhlii*, and *Vansonia rueppellii*. Here the results of a short-time systematic survey of bats in Bahrain are presented. During an acoustic survey (15 bat detector sessions, ca. 190 km of car transects, ca. 17 hours of recordings in total), 456 bat call sequences were recorded that contained 12,051 particular bat call pulses. A majority of the recorded calls was represented by the calls of *Pipistrellus kuhlii* (96.1%), followed by *Rhyneptesicus nasutus* (3.5%), *Otonycteris hemprichii* (0.06%), and *Taphozous nudiventris* (0.01%). Combining the new and published data, 63 records (species / site) of five bat species are currently available from the Kingdom of Bahrain. While the occurrence of two species was confirmed (*Taphozous nudiventris* – 3 records, *Pipistrellus kuhlii* – 46 records), two species were discovered newly in Bahrain (*Otonycteris hemprichii* – 1 record, *Rhyneptesicus nasutus* – 8 records), one species was not recorded by the recent survey although certainly present (*Asellia tridens* – 5 records), and one species was suggested to be deleted from the faunal list of the country (*Vansonia rueppellii*).

Key words. Middle East, Persian Gulf, Arabia, bats, distribution, echolocation.

INTRODUCTION

The Kingdom of Bahrain is a small island country covering an area of ca. 780 km² and situated on 33 natural and an increasing number (>10) of artificial islands in the Gulf of Bahrain, situated in the southern part of the Persian (or Arabian) Gulf (Fig. 1b). It consists of two archipelagos, the larger Bahrain Archipelago and the smaller Hawar Archipelago. The mostly uninhabited Hawar Archipelago, composed of 16 islands in the south-eastern part of the country, covers only the area of 53.5 km² (6.9% of the country area). A majority of the Bahrain Archipelago covers the Bahrain Island, representing about 81.3% of the archipelago area and 75.7% of the whole country area (see Fig. 1a). The whole country is covered mostly by barren deserts or dry steppes. Only the northern and western parts of the Bahrain Archipelago are cultivated due to a natural presence of water supply (see Figs. 2–7). These regions are also the most densely populated, hosting a majority of the 1.6 million of the country's inhabitants.

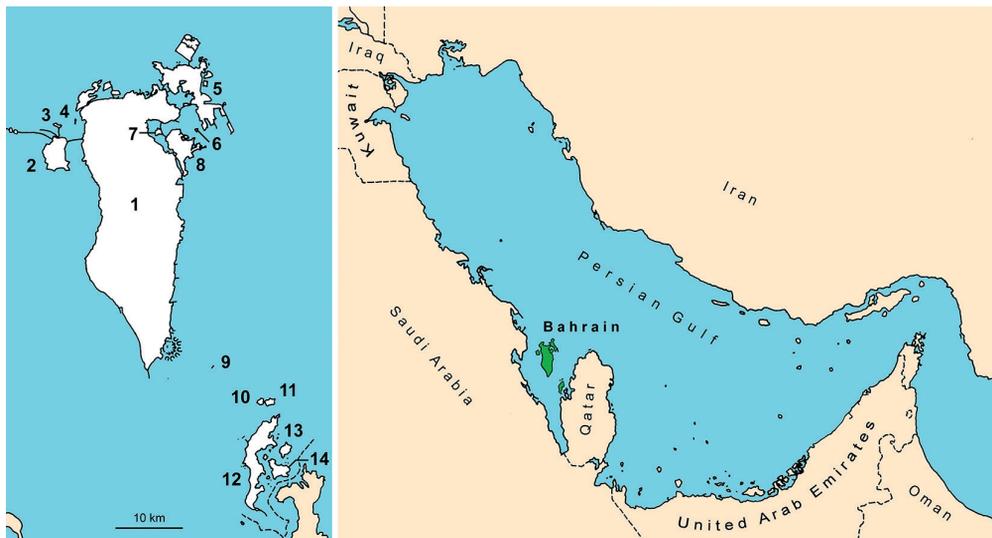


Fig. 1. Map showing the geographical composition of the Kingdom of Bahrain (a) and its localisation (marked in green) in the Persian Gulf (b).

Obr. 1. Mapa ukazující zeměpisné uspořádání Království bahrajnského (a) a jeho umístění (vyznačeno zeleně) v Perském zálivu (b).

Natural islands of Bahrain / přírodní ostrovy Bahrajnu: 1 – Bahrain, 2 – Umm Al Na'san, 3 – Jiddah, 4 – Umm As Sabaan, 5 – Al Muharraq, 6 – Qassar Al Qulay'ah, 7 – Nabih Saleh, 8 – Sitrah, 9 – Mash-tan, 10 – Rabad Al Gharbiyah, 11 – Rabad Al Sharqiyah, 12 – Hawar, 13 – Suwad Ash Shamaliyah, 14 – Suwad Al Janubiyah.

Despite the small area of the country, the biodiversity of Bahrain is relatively well studied, namely in comparison with other countries of the Persian Gulf region (HARRISON & BATES 1991). The Bahraini mammalian fauna was studied and reviewed several times (HARRISON 1964, GALLAGHER & HARRISON 1975, BERGIER 1988, AL-KHALILI 1990, HARRISON & BATES 1991, HILL 2003), it consists of at least 16 species, including five species introduced by humans (HARRISON & BATES 1991). The fauna of bats creates a quarter of this number, four species belonging to three families are reported from the country, although known just from 13 records (AL-KHALILI 1990, HARRISON & BATES 1991, HILL 2003).

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Figs. 2–4. Examples of various habitats in the northern part of the Bahrain Island. All photos by M. UHRIN. 2 – view from the Qala'at Bahrain (Portuguese fortress) to the south over a palm garden to the residential quarter of Al Musalla. 3 – Ain Umm Sujur, a marshy vegetation at the archeological site surrounded by the residential quarter of Ad Diraz. 4 – semi-arid vegetation at the Sar archeological site, skyscrapers of Al Manama in the background.

Obr. 2–4. Příklady biotopů v severní části ostrova Bahrajn. Všechna foto M. UHRIN. 2 – pohled na jih z Bahrajnského hradu (portugalské pevnosti) přes palmerii na residenční čtvrť Musala. 3 – Ajn Um Sužur, mokřadní vegetací zarostlá archeologická lokalita obklopená residenční čtvrtí Ad Diraz. 4 – polopouštní vegetace u archologické lokality Sar, v pozadí mrakodrapy Manamy.



Most of the bat species known from Bahrain belong to the common faunal elements in the Persian Gulf region (*Asellia tridens*, *Taphozous nudiventris*, *Pipistrellus kuhlii*), distributed rather densely also in the areas west, north and east of Bahrain (see HARRISON & BATES 1991, BENDA et al. 2012, JUDAS et al. 2018), and thus, comprise species well expectable in this country. However, the remaining reported species, *Pipistrellus* [= *Vansonia*] *rueppellii*, represents an exception – it is a bat distributed in Africa and south-western Asia, and the Bahrain Archipelago lies rather aside the regular range of this species. All authors who commented the record of *P. rueppellii* in Bahrain stressed extraordinariness of such an occurrence; on the other hand, until now this record was universally accepted (see HARRISON & BATES 1991, HORÁČEK et al. 2000, HUTSON et al. 2001, HILL 2003, HAPPOLD 2013, BURGİN 2019, etc.).

Nevertheless, a systematic research of bats has never been carried out in the country, all the Bahraini bat records were made rather accidentally and gathered during a long time period, from the 1920s till the present. Here we present results of a first attempt of a short-time systematic survey of bats in the Bahrain Archipelago. The survey brought not only records of new bat species for the country, but also the first view of the density and real distribution of bats across the Archipelago.

MATERIAL AND METHODS

The bats were surveyed in two ways in Bahrain, by inspections of potential roosts and by an acoustic survey. The roost inspection was focused on all available natural and artificial shelter types, such as caves, rocky overhangs, forts, ancient ruins, abandoned houses, etc. The acoustic survey was made mostly by car transects (almost 190 passed kilometres in total, giving almost 17 hours of recordings in total) in one morning and in six evenings (several tens of minutes just after the sunset, see the list below). An ultrasound detector combined with a recorder (Batlogger, Elekon AG, Switzerland) was used, with the microphone attached to the car roof when recording. The detector automatically detected and recorded ultrasound calls along with the geographical position (WGS84) and the current air temperature. Bat calls were analysed with the BatExplorer 2.1.6.0 software (Elekon AG, Switzerland); for identification of the particular bat species, call characteristics known from other parts of the Middle East were used (i.e. BENDA et al. 2008, 2010b, 2012, HACKETT et al. 2016, and own unpubl. data). The following bioacoustic characteristics were evaluated: peak frequency (F_{peak}; frequency at which the call is loudest, i.e. it has a maximum energy; in kHz), start or maximum frequency (F_{start}; in kHz), end or minimum frequency (F_{end}; in kHz), and call duration (D; in ms). Due to high variability and irregularity in general, we did not measure and analyse the interpulse intervals (time period between two consecutive calls within one call sequence).

Altogether, 15 bat detector sessions (mostly car transects) were made in Bahrain over six days. Selection of the transects was based on a map evidence of vegetation spots (i.e. gardens, palm groves, public parks, fields, reserves) and fresh water bodies. Additionally, some transects or transect sections were made through residential areas, namely old towns, where roosting and foraging opportunities for bats were expected. The recording sessions were made as follows (including their characteristics; the length of transects is only approximate):

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Figs. 5–7. Examples of various habitats in the central part of the Bahrain Island. All photos by M. UHRIN. 5 – Ar Riffa, a residential quarter. 6 – Al Arin Reserve, a mosaic of desert and irrigated areas. 7 – semidesert landscape in the centre of the island, near the Tree of Life.

Obr. 5–7. Příklady biotopů ve střední části ostrova Bahrajn. Všechna foto M. UHRIN. 5 – residenční část městečka Rifa. 6 – rezervace Al Arin, mosaika pouštních a zavlažovaných ploch. 7 – polopouštní krajina ve středu ostrova, nedaleko Stromu života.



- (1) stationary recording, 28 November 2019, at the Arad Fort (26°15'12" N, 50°37'35"E), start time 02:49, end time 03:01 (duration 0:12), 13 recordings, 0 bat call sequences;
- (2) car transect, 28 November 2019, ca. 2 km along a road around Awali, between point 1 (26°05'47"N, 50°33'25"E) and point 2 (26°05'58"N, 50°32'38"E), start time 16:57, end time 17:04 (duration 0:07), 33 recordings, 0 bat call sequences;
- (3) car transect, 28 November 2019, ca. 15 km through the northern part of the Bahrain Island, between Al Qalah (26°13'57"N, 50°30'57"E) and Barbar (26°13'06"N, 50°29'10"E), start time 18:47, end time 20:44 (duration 1:57), 399 recordings, 67 bat call sequences;
- (4) walk transect, 28 November 2019, ca. 2 km through the residential area of Manama, between the Qudaibiya Ave (26°13'34"N, 50°35'01"E) and the Andalus Garden (26°13'19"N, 50°35'12"E), start time 22:19, end time 22:45 (duration 0:26), 206 recordings, 1 bat call sequence;
- (5) car transect, 29 November 2019, ca. 2 km between Al Arin (entrance to the zoological garden; 26°00'58"N, 50°29'42"E) and a palm grove NE of the zoological garden (26°01'12"N, 50°30'11"E), start time 17:04, end time 18:13 (duration 1:09), 377 recordings, 96 bat call sequences;
- (6) car transect, 29 November 2019, ca. 15 km through gardens between the old town of Az Zallaq (26°02'49"N, 50°29'10"E) and the gardens of Sadad (26°04'46"N, 50°29'23"E), start time 18:23, end time 19:22 (duration 0:59), 158 recordings, 24 bat call sequences;
- (7) car transect, 29 November 2019, ca. 5 km through gardens and residential parts of Al Malikiyah (centre ca. 26°06'18"N, 50°29'30"E), start time 19:43, end time 20:05 (duration 0:22), 92 recordings, 4 bat call sequences;
- (8) car transect, 29 November 2019, ca. 5 km among the gardens of Buri, between the southern part of the village (26°08'45"N, 50°29'35"E) and the northern part (26°09'49"N, 50°29'17"E), start time 20:39, end time 20:58 (duration 0:19), 118 recordings, 2 bat call sequences;
- (9) car transect, 30 November 2019, ca. 22 km among gardens and palm groves between southern Karzakkan (26°06'06"N, 50°28'32"E) and northern Al Jasrah (26°10'17"N, 50°27'12"E), start time 17:13, end time 18:51 (duration 1:38), 374 recordings, 113 bat call sequences;
- (10) car transect, 30 November 2019, ca. 20 km among gardens, parks and palm groves between Al Janabiyah (26°10'56"N, 50°27'55"E) and Al Maqsha (26°13'35"N, 50°31'11"E), start time 19:05, end time 20:21 (duration 1:16), 353 recordings, 49 bat call sequences;
- (11) car transect, 1 December 2019, ca. 28 km through arid habitats of the SW part of the Bahrain Island, from Jaww (25°59'49"N, 50°37'08"E), over Askar (26°03'40"N, 50°36'51"E), to the Tree of Life (25°59'42"N, 50°35'05"E), start time 17:10, end time 18:42 (duration 1:32), 239 recordings, 16 bat call sequences;
- (12) car transect, 1 December 2019, ca. 21 km through residential areas of the eastern part of the Bahrain Island, between central Riffa (26°07'40"N, 50°33'50"E) to Al Akr (26°08'44"N, 50°36'04"E), start time 19:21, end time 20:48 (duration 1:27), 290 recordings, 2 bat call sequences;
- (13) car transect, 2 December 2019, ca. 8 km throughout the old town of Al Muharraq, between western margin of the town (26°14'59"N, 50°36'29"E) and the north-eastern margin (26°16'01"N, 50°37'09"E), start time 17:29, end time 18:58 (duration 1:29), 838 recordings, 0 bat call sequences;
- (14) car transect, 3 December 2019, ca. 17 km among gardens and palm groves in the residential areas of the northern part of the Bahrain Island, from western Maqabah (26°12'53"N, 50°29'31"E) to Al Maqsha (26°13'31"N, 50°31'12"E), start time 17:42, end time 18:58 (duration 1:16), 519 recordings, 43 bat call sequences;
- (15) car transect, 3 December 2019, ca. 26 km among gardens and palm groves in the residential areas of the north-eastern part of the Bahrain Island, from the palm garden of Karbabad (26°13'37"N, 50°31'20"E) to the fields of Jamalaha (26°11'59"N, 50°33'11"E), start time 19:00, end time 21:49 (duration 2:49), 623 recordings, 39 bat call sequences.

The lists of records (arranged in alphabetical order for new records and in chronological order for published records, respectively) 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 [],

Table 1. Descriptive parameters of echolocation calls of bats from Bahrain and two bat species from the United Arab Emirates. Explanations: n seq – number of analysed call sequences containing call pulse/s; n pul – number of individual pulses analysed; Fpeak – frequency of maximum energy (peak frequency) [kHz]; Fstart – start frequency [kHz]; Fend – end frequency [kHz]; D – pulse duration [ms]; upper lines – mean±SD; lower lines – range

Tab. 1. Popisné charakteristiky echolokačních hlasů netopýřů Bahrajnu a dvou druhů netopýřů ze Spojených arabských emirátů. Vysvětlivky: n seq – počet analysovaných hlasových sekvencí; n pul – počet jednotlivých výkřiků (pulsů); Fpeak – frekvence s největší energií (vrcholová frekvence) [kHz]; Fstart – počáteční frekvence [kHz]; Fend – koncová frekvence [kHz]; D – trvání výkřiku [ms]; horní řady – průměr±SD; dolní řady – rozpětí hodnot

species / druh	n seq	n pul	Fpeak	Fstart	Fend	D
Bahrain						
<i>Taphozous nudiventris</i>	1	1	22.0	23.5	20.4	26.9
<i>Otonycteris hemprichii</i>	1	7	22.0±0.4 21.4–22.6	22.7±0.3 22.3–23.2	21.3±0.4 21.0–20.0	22.2±4.8 11.8–25.6
<i>Rhyneptesicus nasutus</i>	5	127	39.3±2.4 36.3–49.1	43.3±4.2 36.3–53.4	37.9±1.3 35.7–45.1	5.9±1.4 2.0–15.1
<i>Pipistrellus kuhlii</i>	10	323	40.6±1.5 37.8–48.2	47.3±5.6 38.4–71.1	39.9±1.4 36.3–44.5	4.7±1.6 2.6–16.4
U.A.E.						
<i>Taphozous nudiventris</i>	1	5	22.1±3.5 15.9–23.9	23.0±3.0 17.8–24.8	22.9±3.4 15.9–23.9	7.2±4.0 1.3–11.1
<i>Rhyneptesicus nasutus</i>	5	71	38.2±6.2 34.6–46.8	47.8±8.5 37.0–59.4	35.5±6.4 31.8–38.4	3.5±1.0 1.8–8.5

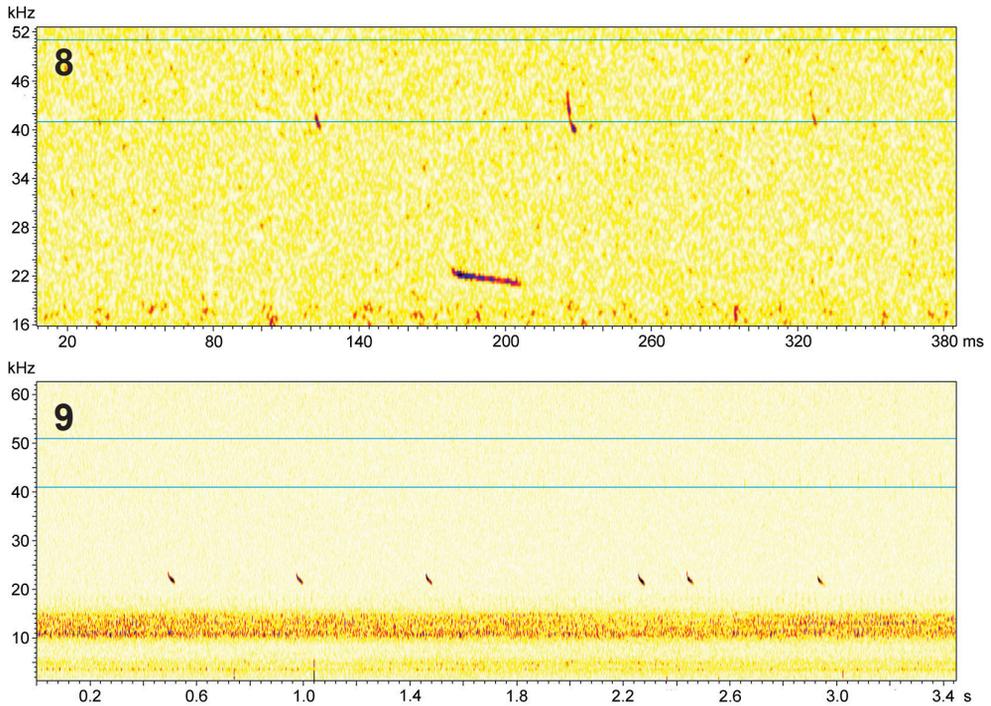
number of site is given as indicated in the respective map, and/or description of the record site (including the geographical coordinates in the new records), date, number of recorded bats with indication of their sex and age where available (♂ = male, ♀ = female, ad = adult), and in brackets [], number of recorded call sequences / number of analysed call pulses. The geographical names were adopted from the Map of Bahrain (GEOprojects UK, 1:65,000, Second Edition, 1998).

RESULTS AND DISCUSSION

Species identified

The inspection of potential roosts did not reveal any traces of bats affiliable to a particular species, only old droppings were found at some sites, mixed with droppings of rodents, birds, and synanthropic reptiles. On the other hand, the acoustic survey brought numerous records of at least four bat species.

During the acoustic survey, altogether 4,632 call (ultrasound noise) sequences were recorded and analysed, of them only 456 sequences (9.8%) contained in total 12,051 particular bat call pulses. Nevertheless, a majority of the recorded ultrasounds (90.1%) represented various other noises, both natural (insects, frogs, about 0.1%) and artificial (traffic, etc., ca. 90%).

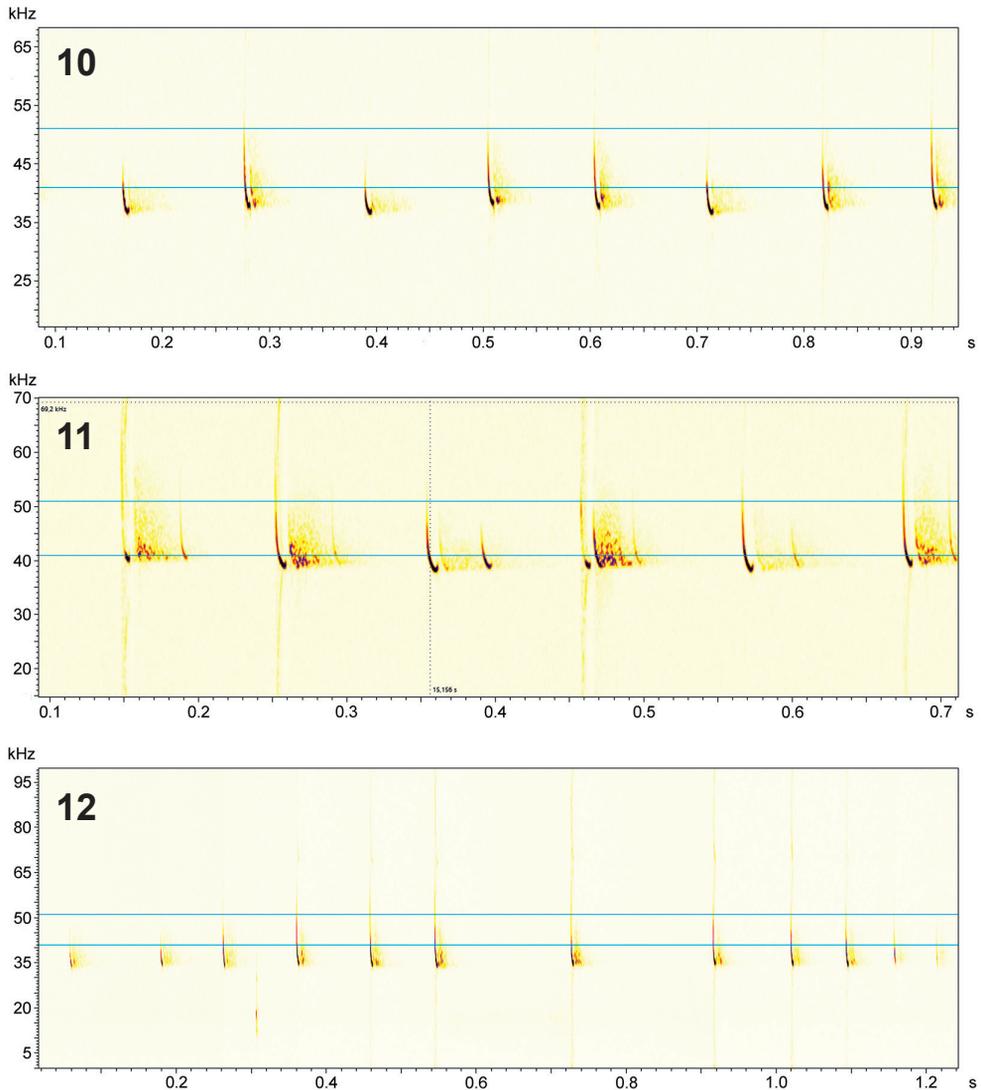


Figs. 8, 9. Spectrograms of echolocation calls of the Bahraini bats. Blue guide lines represent limits for the values of 41 kHz and 51 kHz, respectively. 8 – *Taphozous nudiventris* (in the low centre of the picture), an individual foraging in Al Hamalah on 30 November 2019; three calls of *Pipistrellus kuhlii* are also visible in the upper part of the picture. 9 – *Otonycteris hemprichii*, an individual foraging in Al Hamalah on 30 November 2019.

Obr. 8, 9. Spektrogramy echolokačních hlasů bahrajských netopýřů. Modré linky vymezují hodnoty 41 kHz a 51 kHz. 8 – hrobkovec lysobříhý (*Taphozous nudiventris*) – uprostřed v dolní části obrázku, jedinec lovící 30. listopadu 2019 v Hamale; tři výkřiky netopýra vroubeného (*Pipistrellus kuhlii*) jsou patrné v horní části obrázku. 9 – ušán pustinný (*Otonycteris hemprichii*), jedinec lovící 30. listopadu 2019 v Hamale.

Among the particular bat call pulses, a majority was represented by the calls of *Pipistrellus kuhlii* (96.1%; 11,583 pulses), followed by *Rhyneptesicus nasutus* (3.5%; 421 pulses), *Otonycteris hemprichii* (0.06%; 7 pulses), and *Taphozous nudiventris* (0.01%; 1 pulse); some bat sequences/calls were not attributed to any particular species (0.11%; 13 pulses).

The only call of *Taphozous nudiventris* (Fig. 8) is represented by a very long (26.9 ms; Table 1) narrow bandwidth pulse with the peak frequency 22.0 kHz, unfortunately further harmonic components are not measurable due to the low quality of the recording. The examined parameters are in concordance with the data on *T. nudiventris* available from the Arava valley of Israel (HACKETT et al. 2016) and with our own data obtained from the United Arab Emirates (Table 1; Shwaib, Abu Dhabi Emirate, 24°46'N, 55°48'E, 27 October 2013).



Figs. 10–12. Spectrograms of echolocation calls of *Rhynoptesicus nasutus*; for explanations see Fig. 8. 10 – an individual foraging in Al Hamalah (record 5) on 30 November 2019. 11 – an individual foraging at the entrance to the Al Arin Zoological Garden (record 3) on 29 November 2019. 12 – an individual foraging in Wadi Sahm (Fujairah Emirate, 25°07'N, 56°13'E), United Arab Emirates, on 31 October 2013. Obr. 10–12. Spektrogramy echolokačného hlasu netopýra sidského (*Rhynoptesicus nasutus*); vysvětlivky viz obr. 8. 10 – jedinec lovíci 30. listopadu 2019 v Hamale (nález 5). 11 – jedinec lovíci 29. listopadu 2019 u vchodu do zoologické zahrady Arin (nález 3). 12 – jedinec lovíci 31. října 2013 ve Wadi Sahm (Emiráť Fudžaira, 25°07'N, 56°13'E), Spojené arabské emiráty.

One call sequence was assigned to *Otonycteris hemprichii* (see Fig. 9), despite the fact that the call parameters were very similar in absolute values to those of the previous species (Table 1). The difference between the calls of these two bats lies in the width and shape of the bandwidth call. In the latter species it is a rather broader bandwidth, short frequency modulated (FM) call with the shape characterized as the *Plecotus*-type. Anyway, the descriptive parameters of the calls well resemble the data available from other regions of the species range in the Middle East, such as Israel, Jordan, Sinai, or Iran (BENDA et al. 2008, 2010b, 2012, HACKETT et al. 2016). Although we consider the respective call sequence to pertain most likely to *O. hemprichii*, the recording is only one and no all harmonic components of the calls were recorded (Fig. 9), certain possibility of misidentification thus still remains.

The calls of *Rhyneptesicus nasutus* were the second most frequently identified among the analysed call sequences; however, in comparison with the density of occurrence of *Pipistrellus kuhlii* (see below), *R. nasutus* still represents an accessory element within the foraging bat communities. We recorded twelve sequences of the latter species, with typical pipistrelle-like calls of the FM-QCF shape differing from other similar bats of the region by relatively low values of the peak frequencies (Table 1, Figs. 10, 11). The parameters of the calls obtained in Bahrain are similar to those we reported previously from Iran (BENDA et al. 2012) and/or we recorded in the United Arab Emirates (Table 1, Fig. 12) and Oman (BENDA et al. 2012); the species identification for the U.A.E. and Omani recordings was confirmed by a catch of *R. nasutus* at the respective sites. The mean values of the peak frequencies, as the most specific parameter, were 39.3 kHz, 39.2 kHz, 38.2 kHz and 38.9 kHz, respectively, in the Bahraini, Irani, U.A.E., and Omani bats.

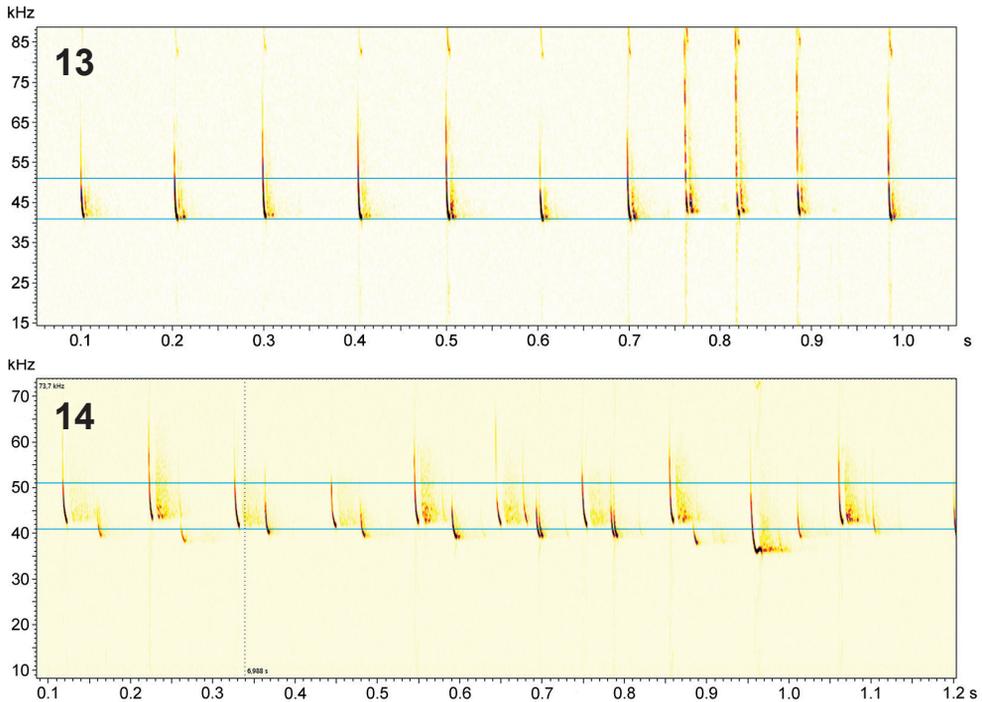
The most abundant bat species recorded by the acoustic survey across the Bahrain archipelago was *Pipistrellus kuhlii*, calls of foraging bats of this species were recorded in all transects that yielded any bat call sequence. The measured values of the calls of *P. kuhlii* in Bahrain are generally in concordance with the parameters reported from other parts of its Middle Eastern range (see BENDA et al. 2008, 2010b, 2012, HACKETT et al. 2016; Table 1, Fig. 13). At some sites, we recorded this bat to forage together with *Rhyneptesicus nasutus* (see e.g. Fig. 14), these situations usefully enabled us to classify accurately the calls of the two species.

Review of records

Asellia tridens (Geoffroy, 1813)

RECORDS. **Published data:** near the village of Malichya [1], subterranean aqueduct, 5 July 1970: 20 inds., coll. 4 ♂♂, 6 ♀♀ (GALLAGHER & HARRISON 1975); – near Amar [2], south face of the historic fortified hill, series of caves, 17 November 1970: about a hundred bats, coll. 4 ♂♂, 3 ♀♀ (GALLAGHER & HARRISON 1975); – 2 km S to Askar [3], limestone cave (perhaps former cistern), 15 January 1971: 60 inds., coll. 2 ♂♂, 2 ♀♀, 27 May 1971: 6 inds. (GALLAGHER & HARRISON 1975); – Jerdab fresh water pond [4], 20 January 1984: 1 ♂ sad (AL-KHALILI 1990); – Duraz [5], building under construction, 14 September 2015: obs. ca. 100 inds. (ANONYMOUS 2015).

COMMENTS. The trident leaf-nosed bat, *Asellia tridens*, until now represented the most frequently recorded bat species of the Kingdom (Fig. 15). At least four records from roosts were reported, both natural and artificial (GALLAGHER & HARRISON 1975, ANONYMOUS 2015) and one specimen was collected at a pond, perhaps when it foraged on wings (AL-KHALILI 1990). However, it was not recorded during the recent survey. No trace of a roosting bat of this species was found



Figs. 13, 14. Spectrograms of echolocation calls of *Pipistrellus kuhlii*; for explanations see Fig. 8. 13 – an individual foraging in a palm garden at Al Qalah (record 18) on 28 November 2019. 14 – *Pipistrellus kuhlii* (upper pulse line) and *Rhyneptesicus nasutus* (lower pulse line); individuals foraging together at the entrance to the Al Arin Zoological Garden on 29 November 2019.

Obr. 13, 14. Spektrogramy echolokačního hlasu netopýra vroubeného (*Pipistrellus kuhlii*); vysvětlivky viz obr. 8. 13 – jedinec loví 28. listopadu 2019 v palmerii u mysu Kala (nález 18). 14 – netopýr vroubený (*Pipistrellus kuhlii*) – horní řada výkřiků a netopýr sidský (*Rhyneptesicus nasutus*) – dolní řada výkřiků; jedinci společně loví 29. listopadu 2019 u vchodu do zoologické zahrady Arin.

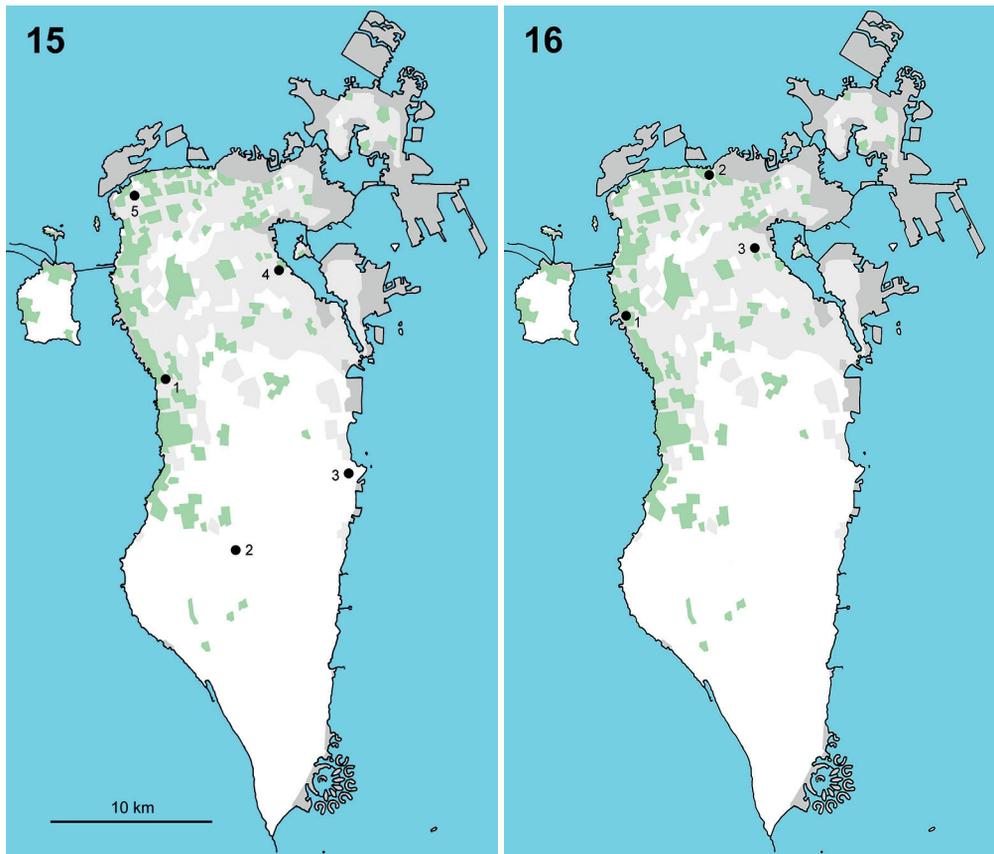
during the checks of potential roosts throughout Bahrain, and, most probably due to its very fine echolocation calls, it was not registered in the search for foraging bats. AS AL-KHALILI (1990) stated, some of the known roosts inhabited by this bat were destroyed, and the presence of this species is limited to various ruins and similar types of shelters where it could be revealed only accidentally.

Anyway, *A. tridens* is a common bat of the Persian Gulf region (HARRISON & BATES 1991, BENDA et al. 2012, JUDAS et al. 2018, own unpubl. data); it was frequently found also in the mainland areas around the Gulf of Bahrain (CHEESMAN & HINTON 1924, HARRISON 1964, MADKOUR 1986, HARRISON & BATES 1991). Thus, it could be expected that the occurrence of *A. tridens* in Bahrain was only accidentally overlooked during the recent survey and this bat remains a regular member of the fauna of the country (see also e.g. ANONYMOUS 2015).

Taphozous nudiventris Cretzschmar, 1830

RECORDS. **Original data:** Al Hamalah [1], at a field (26°08'19"N, 50°27'40"E), 30 November 2019: det. call of 1 foraging ind. [1/1]. – **Published data:** Qala'at al Bahrain [2], roof of a tower, 10 June 1970: 5 ♂♂, 1 ♀ ad, April 1974: few inds. (HARRISON 1972, GALLAGHER & HARRISON 1975); – near Tubli [3], 12 July 1971: 1 ♀ (GALLAGHER & HARRISON 1975).

COMMENTS. The naked-bellied tomb bat, *Taphozous nudiventris*, was previously found at two sites in Bahrain (GALLAGHER & HARRISON 1975); a roost of this bat was repeatedly documented in the Qala'at Bahrain (Portuguese fortress) at the northern shore of the Bahrain island and



Figs. 15, 16. Records of bats in the Bahrain Archipelago; colour explanations: dark grey = artificial parts of the islands, pale grey = built-up area, green = tree vegetated area, white = open area. 15 – *Asellia tridens*. 16 – *Taphozous nudiventris*.

Obr. 15, 16. Nález netopýřů na Souostroví bahrajnském; vysvětlení barev: tmavě šedá = uměle vytvořené části ostrovů, světle šedá = zastavěné území, zelená = stromy zarostlé území, bílá = otevřená krajina. 15 – pavrápeneč trojzubcový (*Asellia tridens*). 16 – hrobkovec lysobřichý (*Taphozous nudiventris*).

another bat was collected (? on wings) near Tubli at the eastern shore of this island. A new record of the echolocation call of this bat was obtained near Al Hamalah at the western shore of the Bahrain island (Fig. 16). Inspection of the Qala'at Bahrain Castle did not bring any finding of a bat; however, this fortress has been recently completely reconstructed and become a very frequented tourist attraction of Bahrain. Anyway, the call recording confirmed scarce but permanent presence of *T. nudiventris* in Bahrain.

GALLAGHER & HARRISON (1975) referred the specimens collected from Bahrain (5 ♂♂, 2 ♀♀) to the large-sized subspecies *T. nudiventris magnus* von Wettstein, 1913, distributed in Mesopotamia from Turkey to Iraq and in western Iran (BENDA et al. 2006). However, the authors did not give any measurements of the collected bats or other data supporting this taxonomic conclusion. Similar lack of data is present concerning the record of this subspecies reported from the Das Island, U.A.E. (HELLYER 1988, 1989, HARRISON & BATES 1991). The occurrence of *T. n. magnus* in Bahrain and Das islands is rather out of the continuous range limits of this form, while from the biogeographic point of view, this region could be inhabited by the small-sized subspecies, *T. n. nudiventris* (sensu UVIZL et al. 2019), broadly distributed in eastern Arabia (U.A.E., Oman). The taxonomic affiliation of the *T. nudiventris* populations from the central parts of the southern shore of the Persian Gulf seems to be in a need of revision to confirm or disprove the suggestions by the previous authors (GALLAGHER & HARRISON 1975, HARRISON & BATES 1991).

***Otonycteris hemprichii* Peters, 1859**

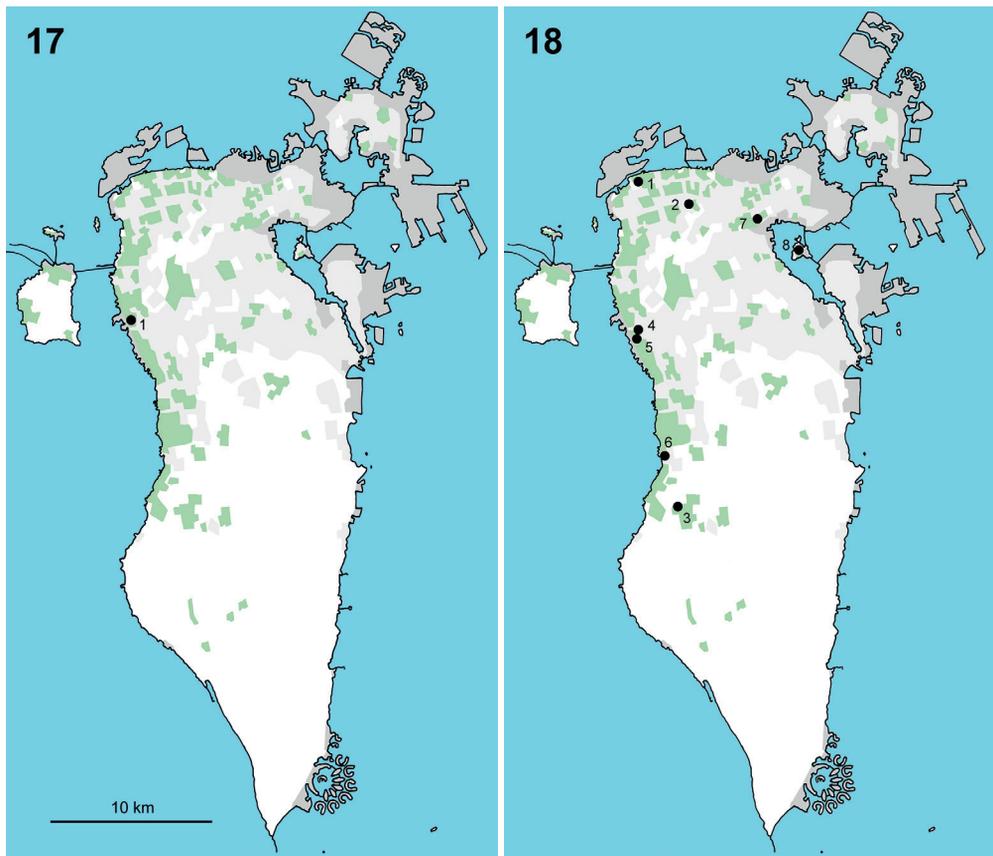
RECORDS. **Original data:** Al Hamalah [1], at a small palm grove (26°08'11"N, 50°27'49"E), 30 November 2019: det. calls of 1 foraging ind. [1/13].

COMMENTS. The Hemprich's long-eared bat, *Otonycteris hemprichii*, is here reported from the Kingdom of Bahrain for the first time. A record of its typical calls is available from the western part of the Bahrain Island (Figs. 9, 17); suspect recordings possibly containing the calls of *O. hemprichii* were made also in other parts of the western Bahrain Island, however, the quality of the record did not allow thorough analysis and affiliation to this bat. Although the north-western part of the island could be considered relatively very fertile, the only available record site is an open area with scattered steppe vegetation, ruderal fields and residential blocks.

Otonycteris hemprichii is found widely but rather patchily throughout the Middle East, including the areas around the Persian Gulf. Although in the Arabian areas south of the Gulf this species reaches the southern limits of its distribution range, its records in the territories adjacent to Bahrain are not quite scarce (Fig. 19). *Otonycteris hemprichii* was found in Qatar (Dahal El Hamam at Doha; MADKOUR 1986) and in the close region of mainland Saudi Arabia (Hufuf; CHEESMAN & HINTON 1924). The Bahrain Archipelago thus represents a natural and expected part of the species distribution range. Although the calls recorded at Al Hamalah correspond in their parameters with the calls recorded in other parts of the distribution range of *O. hemprichii* (see above), the presence of this bat in Bahrain should be confirmed by a collection of a specimen.

***Rhynptesicus nasutus* (Dobson, 1877)**

RECORDS. **Original data:** Ad Diraz [1], among gardens (26°13'37"N, 50°27'58"E), 28 November 2019: det. calls of 1 foraging ind. [1/1], 30 November 2019: det. calls of 1 foraging ind. [1/8]; – Abu Saybi [2],



Figs. 17, 18. Records of bats in the Bahrain Archipelago; for explanations of the map colours see Figs. 15, 16. 17 – *Otonycteris hemprichii*. 18 – *Rhyneptesicus nasutus*.
 Obr. 17, 18. Nálezny netopýrů na Souostroví bahrajnském; vysvětlivky mapových barev viz obr. 15, 16. 17 – ušán pustinný (*Otonycteris hemprichii*). 18 – netopýr sinský (*Rhyneptesicus nasutus*).

garden (26°15'50"N, 50°30'22"E), 3 December 2019: det. calls of 1 foraging ind. [1/11]; – Al Arin [3], zoological garden (26°00'58"N, 50°29'42"E), 29 November 2019: det. calls of at least 2 foraging inds. [3/310]; – Al Hamalah [4], at a garden (26°07'48"N, 50°28'05"E), 30 November 2019: det. calls of 1 foraging ind. [1/11]; – Al Hamalah [5], between gardens in the village (26°07'26"N, 50°27'54"E), 30 November 2019: det. calls of 2 foraging inds. [2/63]; – Az Zallaq [6], old town (26°02'49"N, 50°29'10"E), 29 November 2019: det. calls of 1 foraging ind. [1/13]; – Halat As Suq [7], palm grove (26°12'11"N, 50°33'22"E), 3 December 2019: det. calls of 1–2 foraging inds. [2/15].

COMMENTS. The Sind bat, *Rhyneptesicus nasutus*, is here reported from the Kingdom of Bahrain for the first time. According to the echolocation data, it is the second most frequent bat of the islands. At least seven sites of occurrence were recorded in the northern and western

parts of the Bahrain Island, while no evidence is available from the southern and eastern areas of this island and the country as well (Fig. 18). However, to *R. nasutus* we also assign the bat finding from the Nabih Saleh Island, reported by AL-KHALILI (1990) and identified originally as *Pipistrellus* [= *Vansonia*] *rueppellii* (see below). Along with *Pipistrellus kuhlii* (see below), *R. nasutus* is the only bat species known from another island than only the main island of the Bahrain Archipelago.

The relatively dense occurrence of *R. nasutus* in Bahrain conforms with its distribution pattern in the adjacent parts of the Middle East (Fig. 19). This species is one of the most widespread

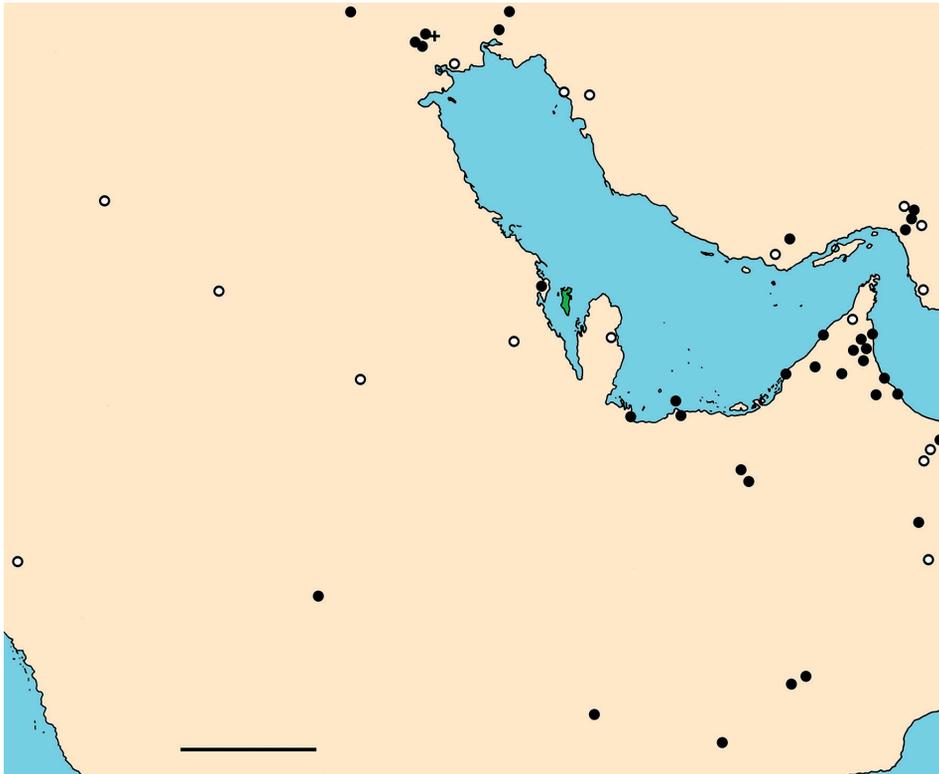


Fig. 19. Records of *Rhyneptesicus nasutus* (closed circles), *Otonycteris hemprichii* (open circles) and *Vansonia rueppellii* (cross) in the Persian Gulf region and some adjacent areas (the area of Bahrain in green). Scale bar = 250 km. Based on the data by HARRISON & BATES (1991), BENDA & GVOŽDÍK (2010), BENDA et al. (2012), BENDA & GAISLER (2015), JUDAS et al. (2018), and on own unpublished data.

Obr. 19. Nález netopýra síndského (*Rhyneptesicus nasutus*) – plné kroužky, ušana pustinného (*Otonycteris hemprichii*) – prázdné kroužky, a netopýra Rüppellova (*Vansonia rueppellii*) – křížek, v oblasti Perského zálivu a navazujících územích (území Bahrajnu zeleně). Měřítko = 250 km. Podle údajů HARRISONA & BATESE (1991), BENDY & GVOŽDÍKA (2010), BENDY et al. (2012), BENDY & GAISLERA (2015), JUDASE et al. (2018) a vlastních nepublikovaných údajů.

bats in the United Arab Emirates (JUDAS et al. 2018, own unpubl. data), and certainly the most widespread bat in the driest parts of this country. The species shows a similar picture of distribution in Oman (HARRISON & BATES 1991, BENDA & GAISLER 2015, own unpubl. data). From Saudi Arabia, *R. nasutus* is known from Dhahran (besides other findings), an area lying just at the Gulf of Bahrain (HARRISON & BATES 1991; Fig. 19).

According to the distribution pattern in other parts of the Middle East, *R. nasutus* could be more expectable in the arid central and southern parts of the Bahrain Island, or e.g., in the Hawar Islands, rather than in the most fertile parts of the archipelago. However, a very limited research effort was made in the arid parts of the islands during the recent survey and the foraging calls of *R. nasutus* were registered only as an accessory element at the sites where more numerous calls of *Pipistrellus kuhlii* were recorded (see below). Records of the latter species are very scarce and rather accidental in the arid areas of the Bahrain island, and without an admixture of other species. When a sufficiently extensive survey is made in the southern arid parts of the archipelago, foraging activity of *R. nasutus* will be certainly confirmed also in these areas.

***Vansonia rueppellii* (Fischer, 1829)**

RECORDS. **Published data:** Nabeeh Saleh Island [8], 25 March 1984: 1 ♂ ad (AL-KHALILI 1990).

COMMENTS. Rüppell's pipistrelle, *Vansonia rueppellii*, was reported from Bahrain only once, AL-KHALILI (1990) assigned a male bat specimen found in the Nabih Saleh Island in 1984 to this species. AL-KHALILI (1990: 98) described this bat as follows: "The specimen [...] was distinguished from *P. kuhlii* by its paler sandy buff colour on the back and pure white hair on the abdominal region. The body measurements were: weight, 17 [sic!]; TL [= total length], 79 [mm]; T [= tail length], 31 [mm]; HF [= hind foot length], 6.5 [mm]; FA [= forearm length], 30.5 [mm]; E, 6.7; wing span, 220 [mm]; testes, 3 [mm]." This description, however, does not meet the characters of *V. rueppellii*, but rather those of *Rhynepetes nasutus*. AL-KHALILI (1990) mentioned the sandy buff coloured dorsal pelage in the Bahraini bat, while in *V. rueppellii* the dorsal colouration is ash-greyish to greyish-brown, sometimes with a silverish or creamy tint (see e.g. BENDA et al. 2010a: 150, Fig. 15; BENDA et al. 2014a: 48, Fig. 4; BENDA et al. 2014b: 83, Fig. 67), but it never is sandy buff. In *R. nasutus*, the overall pelage colouration is sandy yellowish, buff or beige, with a somewhat paler tinge on the venter (BENDA et al. 2012: 393, Figs. 135, 136; JUDAS et al. 2018: 11386, Fig. 5). However, only in the subspecies distributed in the eastern part of the Arabian peninsula (U.A.E., Oman, E Saudi Arabia), *R. nasutus batinensis* (Harrison, 1968), the ventral pelage is pure white with a sharp bordering of the dorsal colouration (Figs. 20, 21). This subspecies is (along with *R. n. matschiei* (Thomas, 1905) from SW Arabia) the smallest form of the species (BENDA & GAISLER 2015), in size comparable with the pipistrelle species of the region (see also HARRISON & BATES 1991). The body size and the ventral colouration of *R. n. batinensis* thus can resemble *V. rueppellii*; moreover, both species could have a blackish brown face and ears (see Fig. 21). Hence, a person without a proper experience with the two species could make an identification error.

Vansonia rueppellii is an African bat, distributed patchily in savannahs and deserts of almost the whole continent (HAPPOLD 2013), but in Asia it occurs only marginally, in the southern Levant and in Mesopotamia (HARRISON & BATES 1991). Its record closest to Bahrain is known from Makina, Basra, eastern Iraq (CHEESMAN 1920; Fig. 19), which also represents the easternmost record of the whole distribution range. The occurrence of *V. rueppellii* in Bahrain thus seems to be not fully probable. On the other hand, *R. nasutus* occurs widely in eastern Arabia (Fig. 19),



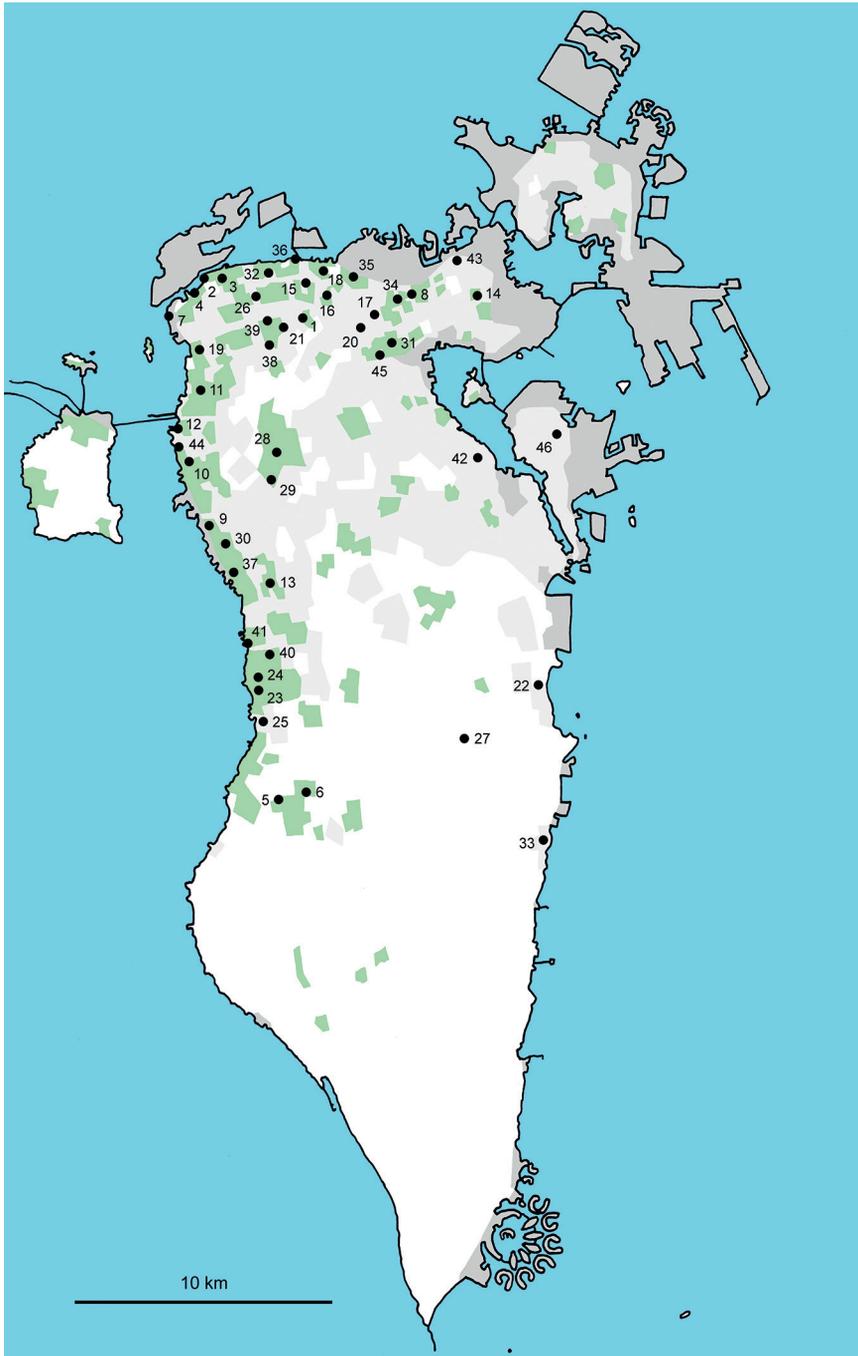
Figs. 20, 21. Individuals of *Rhyneptesicus nasutus batinensis* from Oman (cf. BENDA & GAISLER 2015). Both photos by A. REITER. 20 – adult male, Muntasar oasis, 30 March 2011. 21 – adult female, Uwayfiyah oasis, 3 April 2012.

Obr. 20, 21. Jedinci netopýra sinského (*Rhyneptesicus nasutus batinensis* Harrison, 1968) z Omanu (cf. BENDA & GAISLER 2015). Obě foto A. REITER. 20 – dospělý samec odchycený 30. března 2011 v oase Muntasar. 21 – dospělá samice odchycená 3. dubna 2012 v oase Uwayfija.

and its echolocation records are available even from Bahrain (see above). Thus, in accordance with the description given and with the biogeographical affinities, we suggest the bat reported by AL-KHALILI (1990) to be referred rather to *Rhyneptesicus nasutus* than *Vansonia rueppellii*.

Pipistrellus kuhlii (Kuhl, 1817)

RECORDS. **Original data:** Abu Saybi [1], garden (26°12'56"N, 50°30'25"E), 3 December 2019: det. calls of 1 foraging ind. [1/2]; – Ad Diraz [2], garden (26°13'42"N, 50°27'43"E), 28 November 2019: det. calls of 1 foraging ind. [1/11]; – Ad Diraz [3], palm grove (26°13'37"N, 50°28'12"E), 28 November 2019: det. calls of several foraging inds. [8/97]; – Ad Diraz [4], shore vegetation (26°13'16"N, 50°27'26"E), 30 November 2019: det. calls of 1 foraging ind. [1/6]; – Al Arin [5], zoological garden (26°00'58"N, 50°29'42"E), 29 November 2019: det. calls of numerous foraging inds. [88/5026]; – Al Arin [6], a palm grove NE of the zoological garden (26°01'12"N, 50°30'11"E), 29 November 2019: det. calls of several foraging inds. [5/90]; – Al Budaiya [7], corniche park (26°12'42"N, 50°26'48"E), 30 November 2019: det. calls of 1 foraging ind. [1/33]; – Al Burhama [8], at a palm grove (26°13'11"N, 50°33'24"E), 3 December 2019: det. calls of several foraging inds. [8/143]; – Al Hamalah [9], palm garden (26°08'04"N, 50°27'43"E), 30 November 2019: det. calls of 1 foraging ind. [1/36]; – Al Hamalah [10], palm grove (26°09'09"N, 50°27'19"E), 30 November 2019: det. calls of 2 foraging inds. [2/17]; – Al Janabiyah [11], among gardens (26°10'56"N, 50°27'55"E), 30 November 2019: det. calls of numerous foraging inds. [37/394]; – Al Jasrah [12], among gardens (26°09'55"N, 50°27'01"E), 30 November 2019: det. calls of numerous foraging inds. [10/138]; – Al Malikiyah [13], gardens (26°06'18"N, 50°29'30"E), 29 November 2019: det. calls of several foraging inds. [4/47]; – Al Manama [14], Andalus Garden (26°13'19"N, 50°35'12"E), 28 November 2019: det. calls of 1 foraging ind. [1/5]; – Al Maqsha [15], residential area (26°13'29"N, 50°30'51"E), 3 December 2019: det. calls of several foraging inds. [5/25]; – Al Maqsha [16], palm garden (26°13'27"N, 50°30'57"E), 3 December 2019: det. calls of 1 foraging ind. [1/25]; – Al Musalla [17], palm grove (26°12'43"N, 50°32'21"E), 3 December 2019: det. calls of 1 foraging ind. [1/32]; – Al Qalah [18], palm garden (26°13'57"N, 50°30'57"E), 28 November 2019: det. calls of numerous foraging inds. [41/1176]; – Al Quraiyan [19], garden (26°11'56"N, 50°27'35"E), 30 November



2019: det. calls of several foraging inds. [23/82]; – As Sahlat Al Fawqiyah [20], at a garden (26°12'28"N, 50°32'00"E), 3 December 2019: det. calls of 1 foraging ind. [1/41]; – Ash Shakhurah [21], palm grove (26°12'40"N, 50°30'07"E), 3 December 2019: det. calls of numerous foraging inds. [25/1173]; – Askar [22], residential area (26°03'40"N, 50°36'51"E), 1 December 2019: det. calls of 1 foraging ind. [1/21]; – Az Zallaq [23], a palm garden N of the town (26°03'38"N, 50°29'03"E), 29 November 2019: det. calls of several foraging inds. [10/94]; – Az Zallaq [24], gardens N of the town (26°03'56"N, 50°29'03"E), 29 November 2019: det. calls of 1 foraging ind. [1/37]; – Az Zallaq [25], old town (26°02'51"N, 50°29'16"E), 29 November 2019: det. calls of several foraging inds. [3/48]; – Barbar [26], at a garden in a residential area (26°13'36"N, 50°29'08"E), 28 November 2019: det. calls of several foraging inds. [4/54]; – Bramco Campus SW of Askar [27], above road (26°02'19"N, 50°34'50"E), 1 December 2019: det. calls of 1 foraging ind. [1/12]; – Buri, central part [28], among gardens (26°09'27"N, 50°29'44"E), 29 November 2019: det. calls of 1 foraging ind. [1/5]; – Buri, southern part [29], among gardens (26°08'45"N, 50°29'35"E), 29 November 2019: det. calls of 1 foraging ind. [1/1]; – Dumistan [30], among gardens (26°07'03"N, 50°28'22"E), 30 November 2019: det. calls of numerous foraging inds. [76/1734]; – Jamalal [31], palm grove (26°12'05"N, 50°33'00"E), 3 December 2019: det. calls of 1–2 foraging inds. [2/5]; – Jannusan [32], residential area (26°13'51"N, 50°29'36"E), 30 November 2019: det. calls of 1–2 foraging inds. [3/9]; – Jaww [33], village (26°00'02"N, 50°37'08"E), 1 December 2019: det. calls of numerous foraging inds. [14/145]; – Jidd Hafis [34], palm garden (26°12'55"N, 50°33'00"E), 3 December 2019: det. calls of numerous foraging inds. [21/362]; – Karbabad [35], palm garden (26°13'45"N, 50°31'41"E), 3 December 2019: det. calls of several foraging inds. [5/60]; – Karranah [36], at a garden (26°14'06"N, 50°30'10"E), 28 November 2019: det. calls of several foraging inds. [12/243]; – Karzakkan [37], garden (26°06'46"N, 50°28'29"E), 30 November 2019: det. calls of 1 foraging ind. [1/4]; – Maqabah [38], palm garden (26°12'28"N, 50°29'40"E), 3 December 2019: det. calls of 1 foraging ind. [1/4]; – Maqabah [39], palm grove (26°12'54"N, 50°29'40"E), 3 December 2019: det. calls of several foraging inds. [9/87]; – Sadad [40], among gardens (26°04'46"N, 50°29'23"E), 29 November 2019: det. calls of several foraging inds. [6/115]; – Sadad [41], palm grove (26°04'41"N, 50°28'58"E), 29 November 2019: det. calls of 1 foraging ind. [1/9]; – Sanad [42], garden (26°09'10"N, 50°35'14"E), 1 December 2019: det. calls of 1–2 foraging inds. [2/20]. – **Published data:** Bahrain, 2 inds. (CHEESMAN & HINTON 1924); Bahrain, 9 April 1921: 1 ♀ ad (BMNH 36.4.14.17. [S+B]) (HARRISON 1964); – near Manama [43], edge of marshes, 4 May 1971: 1 ♀ (GALLAGHER & HARRISON 1975); – Al Mana'ai Gardens near Al-Jasra [44], swimming pool, 10 May 1984: 1 ♀ ad (AL-KHALILI 1990); – Adhari Park [45], over an artificial pond, July 1988: obs. foraging inds. (AL-KHALILI 1990); – Sitra [46], 18 April 1986: 1 ♂ ad (AL-KHALILI 1990).

COMMENTS. The Kuhl's pipistrelle, *Pipistrellus kuhlii*, is a very common bat of the Kingdom of Bahrain, the number of its records is almost three times higher than the total number of records of all other bat species. Along with *Asellia tridens*, *P. kuhlii* is the only bat that was recorded in arid parts of the Bahrain Island, even though solely in anthropogenic conditions (seaport villages, oil extraction facility). In the fertile northern and western parts of the Bahrain Island it is an ubiquitous bat, present in all available types of environment, in gardens, fields, palm groves, city parks, shore vegetation, village and town streets, residential areas, or market neighbourhoods, in places overilluminated by street lamps or in dark sites. With very few exceptions, foraging *P. kuhlii* bats were found in all parts of the archipelago, where the acoustic survey was made (Fig. 22).

←

Fig. 22. Records of *Pipistrellus kuhlii* in the Bahrain Archipelago; for explanations of the map colours see Figs. 15, 16.

Obr. 22. Nálezny netopýra vroubeného (*Pipistrellus kuhlii*) na Souostroví bahrajnském; vysvětlivky mapových barev viz obr. 15, 16.

The extensive urbanisation of the northern regions of the Kingdom contributes positively to the mass occurrence of *P. kuhlii*, apparently due to its preference for roosts in buildings and other artificial structures in combination with successful foraging in the anthropogenically modified environments. Nevertheless, such an extremely high level of synanthropy in this bat was observed frequently also in other parts of its distribution range (e.g., MENDELSSOHN & YOM-TOV 1999, ANCILLOTTO et al. 2015, 2016, MAXINOVÁ et al. 2016).

Conclusions

According to the present review, the bat fauna of the Kingdom of Bahrain comprises only five species and their records come solely from the Bahrain Archipelago. While the occurrence of two previously known species was confirmed (*Taphozous nudiventris*, *Pipistrellus kuhlii*), two species are newly reported from Bahrain (*Otonycteris hemprichii*, *Rhyneptesicus nasutus*), one species was not recorded by the recent survey although certainly present (*Asellia tridens*), and one species is suggested to be deleted from the faunal list of the country (*Vansonia rueppellii*).

Considering the contemporary knowledge of the composition of bat fauna of the Persian Gulf region (HARRISON & BATES 1991, BENDA et al. 2006, 2012, JUDAS et al. 2018), the bat fauna of Bahrain seems to be complete. The south-western shoreland of the Gulf, between Kuwait and the lowland western part of the United Arab Emirates (mostly the Abu Dhabi, Dubai, and Sharjah emirates), represents a peculiar biogeographical area of a relatively poor biodiversity. This desert area does not host any other bat species than the five already known from Bahrain. The only exception is *Rousettus aegyptiacus*, its population has been recently discovered in Abu Dhabi (HELLYER 1999, ASPINALL et al. 2005), but this occurrence spot is most probably related to the new development of the city including well cultivated vegetation areas at this island, and the species presence further in the west, if possible, is perhaps a question of its future spreading.

Anyway, concerning the bat fauna, the Bahrain Archipelago represents one of the best explored areas of the south-western shoreland of the Persian Gulf (cf. HARRISON & BATES 1991, JUDAS et al. 2018). One to four bat species are known from other countries of the region, viz. one from Kuwait, two from Qatar, four from the western Abu Dhabi Emirate, and four from the adjacent part of Saudi Arabia.

HARRISON (1981) suggested a possible occurrence of three other bat species in the southern areas of the Persian (Arabian) Gulf region, viz. *Rhinopoma cystops* Thomas, 1903, *Rhinolophus clivosus* Cretzschmar, 1828, *Nycteris thebaica* Geoffroy, 1818. However, all these species are African eremial faunal elements that reach the eastern limits of their Arabian distribution in the Riyadh escarpment of the Najd Plateau in central Saudi Arabia (see HARRISON & BATES 1991), similarly as some other African mammals, e.g. rock hyrax, *Procavia capensis* (Pallas, 1766). The occurrence of these bats has not been proven in any part of eastern Arabia and it is not too expectable in the Persian Gulf or even in Bahrain.

The presented results of our bat survey showed *Pipistrellus kuhlii* to be the most abundant and densely distributed bat across the area of the Bahrain Archipelago, the ratio of the number of its recorded calls to the calls of all other bats was approximately 24:1. Concerning all record sites of bat occurrence in Bahrain as listed above (representing a slightly simplified geographical expression of the recorded occurrence), the records of *P. kuhlii* cover 73% of bat records in the Kingdom. Such a pattern of bat occurrence is similar to the situation in other countries of the Middle East and North Africa (see e.g. BENDA et al. 2006, 2010b, 2012, 2014a), however, the records of *P. kuhlii* represent only between 11.4% and 32.6% of bat records within the faunas of

four countries of a belt on the Mediterranean arboreal-desert eremial transition (Libya, Jordan, Syria, Iran). In all these countries, the open arid steppes and deserts are combined with more humid vegetated environments as well as with extensive areas of anthropogenic habitats. Such a combination is present also in Bahrain, being a minute representative of this environment mixture. However, among the relatively poor bat fauna of the Archipelago, only one bat species was able to benefit from this mosaic, now dominated by the anthropogenic habitats. Other bat species, despite their ability to occur in the modified environment, apparently survive only in low population densities.

SOUHRN

Ze Souostroví bahrajnského, představující severní a větší část Království bahrajnského (o zhruba 780 km² na 33 přírodních a vzrůstajícím počtu umělých ostrovů nalézajících se v jihozápadní části Perského zálivu, obr. 1), bylo do současné doby známo jen 13 nálezů netopýřů, náležejících čtyřem druhům ze tří čeledí, totiž pavrápenci trojzubcovému (*Asellia tridens*), hrobkovci lysobřichému (*Taphozous nudiventris*), netopýru vroubenému (*Pipistrellus kuhlii*) a netopýru Rüppellovu (*Vansonia rueppellii*). V předloženém spisu jsou prezentovány výsledky krátkodobého (týden), avšak soustavného průzkumu netopýřů dotyčného souostroví. Důkladné a systematické prohlídky potenciálních úkrytů nepřinesly žádného nálezu netopýra, oproti tomu akustický průzkum souostroví za pomoci detektoru echolokačních hlasů byl úspěšný. Během celkem 15 detektorovacích kampaní, konaných především za pomoci automobilových transektů, kdy bylo najeto zhruba 190 km a v součtu nahráváno téměř 17 hodin, bylo získáno 4.632 ultrazvukových nahrávek (zvukových sekvencí), z nichž bylo analýzou vyřídněno 456 nahrávek obsahujících úhrnem 12.051 jednotlivých echolokačních výkřiků netopýřů. Vysoce převažující většinu těchto nahrávek zaplňovaly hlasy netopýra vroubeného (*Pipistrellus kuhlii*), celkem 96.1 % všech netopýřích výkřiků, následoval netopýr sidský (*Rhyneptesicus nasutus*) – 3.5 %, ušán pustinný (*Otonycteris hemprichii*) – 0.06 % (jediná nahrávka) a hrobkovec lysobřichý (*Taphozous nudiventris*) – 0.01 % (jediný výkřik). Z kombinace nových a publikovaných údajů lze shrnout, že ze Souostroví bahrajnského (jako jediné části celého království) je nyní k dispozici celkem 63 nálezů (druh / lokalita) netopýřů pěti druhů. Výskyt dvou druhů již dříve z ostrovů hlášených byl průzkumem potvrzen – jde o hrobkovce lysobřichého (*Taphozous nudiventris*), známého ze tří nálezů, a netopýra vroubeného (*Pipistrellus kuhlii*) ze 46 nálezů; dva druhy netopýřů byly nově v království objeveny – ušán pustinný (*Otonycteris hemprichii*), jehož je k dispozici jediný nález a netopýr sidský (*Rhyneptesicus nasutus*), známý z osmi nálezů; jeden dříve uváděný druh nebyl průzkumem potvrzen (i když se nepochybně na ostrovech vyskytuje), totiž pavrápenc trojzubcový (*Asellia tridens*), známý z pěti publikovaných nálezů; jeden dříve uváděný druh (známý z jediného nálezu) je zde odůvodněně považován za chybně určený a tedy na ostrovech se nevyskytující – netopýr Rüppelův (*Vansonia rueppellii*) – jenž byl s největší pravděpodobností zaměněn za netopýra sidského a tedy je doporučeno jej napříště nepovažovat za člena fauny Království bahrajnského.

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