

Bats (Mammalia: Chiroptera) from Tabuk Province, Saudi Arabia *

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Abstract

Additional distributional data on the bats of Tabuk Province, Saudi Arabia, are given for 10 species. The Asian Barbastelle, *Barbastella leucomelas*, is recorded for the first time for Saudi Arabia and the Arabian Peninsula. Data on bats calls for four species are also given.

Key words

Chiroptera, Saudi Arabia, *Barbastella leucomelas*, distribution.

Introduction

Tabuk province is located along the most northwestern part of Saudi Arabia, bordering southern Jordan from the north and extends along the Gulf of Aqaba and the Red Sea, with a total area of 108,000 km². Different types of habitats are found within Tabuk, including coastal mountains that extend along the Red Sea, moderate coastal plains, steppes in the eastern and central area, and an extension of the Nofood (sand desert) to the south east (Fig. 1). Hara (black lava desert) lies between Red Sea mountains and the inner mountains south of Tabuk.

Several studies investigated the bats of Saudi Arabia (CHEESMAN & HINTON, 1924; HAYMAN & HARRISON, 1950; HARRISON, 1956; 1957; ATALLAH & HARRISON, 1967; NADER, 1975; 1982; NADER & KOCK, 1980; 1983a, b and c; 1986; 1990a and b; KOCK & NADER, 1984; GAUCHER, 1992; 1993; GAUCHER & BROSSET, 1990; MOESCHLER *et al.*, 1990; GAUCHER & HARRISON, 1995; SEDDON *et al.*, 1997; ALAGAILI *et al.*, 2011), however, very few listed

collections from Tabuk area (HARRISON & BATES, 1984; 1991). NADER (1990) listed the bats from Saudi Arabia and later, NADER (2000) updated the list to include 29 species.

The present study is the first attempt to identify the bats of Tabuk Province and study their echolocation calls.

Materials and methods

A total of 12 localities representing different habitats in Tabuk Province were visited (Table 1, Fig. 1). Bats were netted with mist nets (6 × 3 m) placed on cave entrances, paths among old ruins and tunnels, and open water pools. Anabat SD2 recorder was used to record bat calls from the studied sites.

* This paper is dedicated to the memory of the late Prof. Dr. Iyad Nader (1934–2015), the founder of bat studies in Saudi Arabia.

Table 1. Locations visited during the study and their coordinates.

	Locality	N	E
1	Al Bada'a	28° 26' 28"	34° 49' 26"
2	Al Disah	27° 38' 40"	36° 31' 31"
3	Al Moatham Castle	27° 44' 27"	37° 30' 31"
4	Alagan-Algtar	28° 52' 31"	35° 30' 47"
5	Albogaz tunnel	28° 06' 21"	37° 04' 02"
6	Bajdah-Alsero	28° 20' 58"	35° 48' 14"
7	Ber Bin Hermas-Alwabari far	28° 51'16"	37° 04' 02"
8	Muleh farms	28° 23' 56"	34° 44' 47"
9	Sharma-Tor Qunibi	27° 58' 21"	35°13' 14"
10	Tabuk sewage treatment ponds	28° 34' 43"	36° 36' 33"
11	Taima-Alhamra farms	27° 38' 10"	38° 32' 49"
12	That Alhaj – Sabbah farm	29° 02' 53"	36° 10' 11"

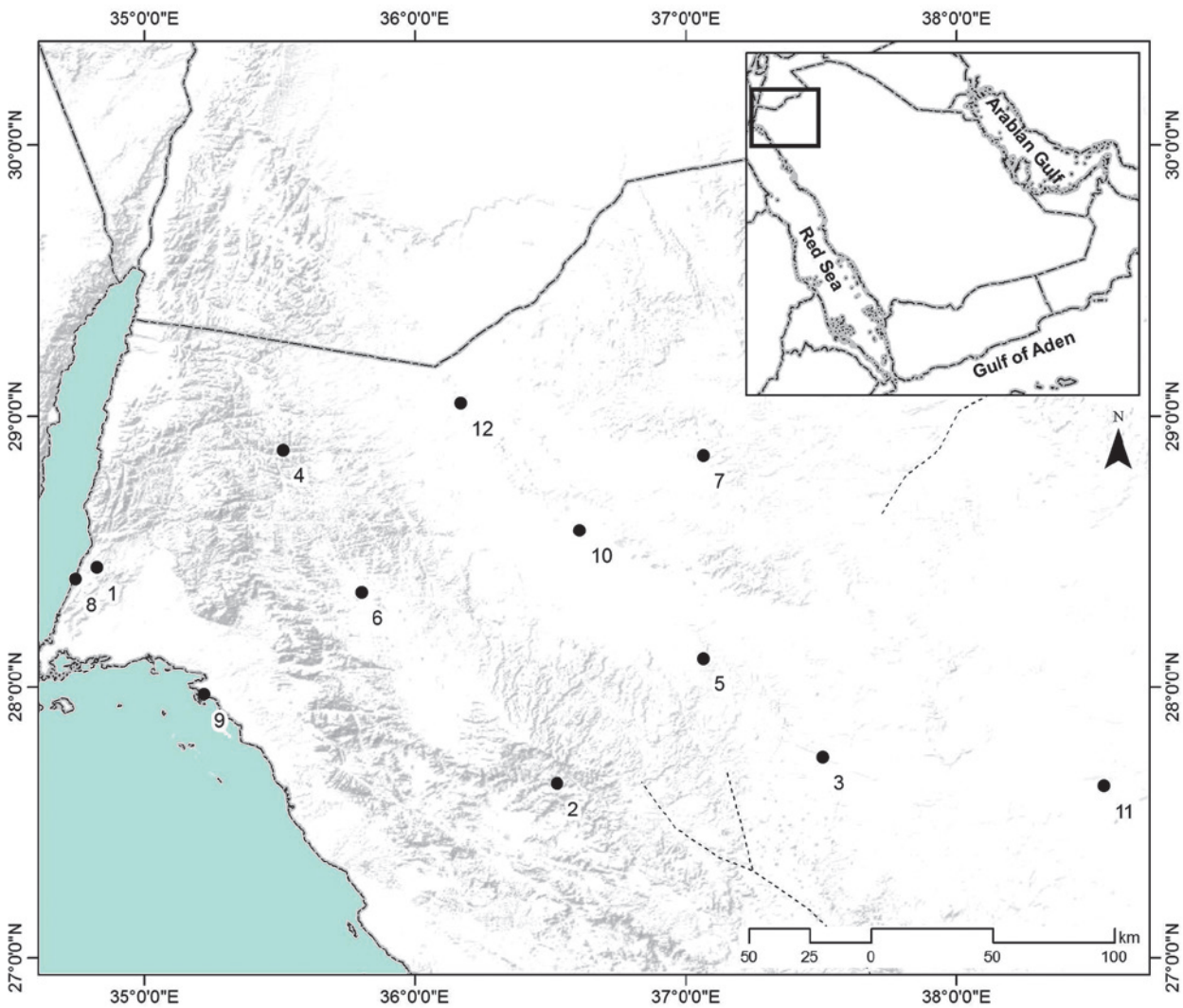


Fig. 1. Map of Tabuk Province showing visited localities.



Fig. 2. A. Taima-Alhamra farms. B. Al Moatham Castle. C. Alsero. D. Al Bogaz tunnel. E. That Al Haj.

Results

Family Pteropodidae

Rousettus aegyptiacus (GEOFFROY, 1810)

Material examined. TMC005, 1 ♀, Taima-Al Hamra farms, 4.9.2014. Observed: Al Disah, 7.5.2015; Muleh farms, 13.3.2015.

Habitat. A large colony of over 500 individuals was observed at Al Hamra farms, Taima. Hundreds of bats were seen flying over an artificial pool near the farms (Fig.

2A). They roost in deserted houses and Al Hamra Palace which is located near palm trees. The area is rich in palm plantations, figs and grapes. Similarly, large colonies were observed near Al Disah and Muleh farms. Both areas enjoy plentiful freshwater springs and are planted with palm and other fruit trees. This species is associated with agricultural areas in Saudi Arabia, feeding on a variety of fruit trees.

Remarks. Collected from near Tayif (NADER, 1975), Al Maski (KOCK & NADER, 1979), Wadi Khitan, Baha, Raydah and the vicinity of Abha (HARRISON & BATES, 1991). It was found along with *Hypsugo ariel*. Recent records came from Bisha, south Mecca, after the corona

virus outbreak (MEMISH *et al.*, 2013). Other unconfirmed records were mentioned by ABU YAMAN (1966) from Mecca, Madina and Ha'il. One of us (AA) observed fruit bats in Al Madina Al Monwarah hanging on Acacia trees. BENDA *et al.* (2008) recorded the Egyptian Fruit Bat from several localities along the eastern part of Sinai.

Family Rhinopomatidae

Rhinopoma cystops THOMAS, 1903

Fig. 3A

Material examined. TMC008, 1 ♂, Sharma-Tor Qunibi, 29.10.2014.

Habitat. A large colony consisting of over 100 individuals was observed in a small cave in Tor Qunibi, Sharma. The cave is about 12 m long, with rocky slopes. The amount of guano in the cave is about 15 cm in thickness, suggesting the presence of a large colony over time.

Remarks. BENDA *et al.* (2008) considered the Middle Eastern *Rhinopoma hardwickii* as *Rhinopoma cystops* based on HULVA *et al.* (2007). Hence, old records for *R. hardwickii* for Saudi Arabia should be considered as *R. cystops*. It was previously reported from Al Bad'a and Maghair Shoaib in Tabuk Province (HARRISON & BATES, 1991) based on specimens at the BNHM. Elsewhere in Saudi Arabia, it was reported from Medina, near Riyadh (NADER, 1975), Al Jowa (NADER, 1982) and from Midian in the north to the vicinity of Abha and Farasan island in the south (HARRISON & BATES, 1991). Recently recorded from Bish and Naqi (MEMISH *et al.*, 2013).

Family Rhinolophidae

Rhinolophus clivosus CRETZSCHMAR, 1828

Fig. 3B

Material examined. Al Moatham castle, 22.10.2014.

Habitat. One individual was found in the ruins of Al Moatham Castle. The castle is located near a large water pool, with some scattered trees. It was found along with *Hypsugo ariel*. NADER (1982) mistnetted a specimen near an abandoned well.

Remarks. This species was recorded from Muwailih, Mecca and Tayif (MORRISON-SCOTT, 1939), Wadi Ad Dawasir (NADER, 1975), Tuwaiq near Tayif and from Al Baha, 50 km NNE Abha and Raydah escarpment (HARRISON & BATES, 1991). According to NADER (1982), *Rhinolophus clivosus clivosus* is confined to western Ara-

bia, while *Rhinolophus clivosus acrotis*, is known from around Yemen with localities from southwestern Saudi Arabia including and was collected from Mothra, Al Hajeb Al Naji (NADER, 1982). BENDA & VALLO (2012) reported that *Rh. clivosus* consists of several lineages, representing six various morphotypes based on molecular and morphomeric data.

Family Hipposideridae

Asellia tridens (GEOFFROY, 1813)

Fig. 3C

Material examined. Al Bedea'a, April 2015.

Habitat. One specimen was caught from a house near a farming area in Al Bedea'a. The area is cultivated with several types of trees with plentiful open water pools. The farms are surrounded by rocky hills with small caves. Collected from an old Turkish lookout by NADER (1975). It was found along with *Taphozous perforates* (NADER, 1975).

Remarks. The Trident nose-leaf bat was collected from Hufuf (CHEESMAN & HINTON, 1924), Jeddah and its vicinity (MORRISON-SCOTT, 1939); near Usfan, about 80 km NW of Mecca and Durma (NADER, 1975) and Abha and near Taif and south of Riyadh (HARRISON & BATES, 1991).

Family Vespertilionidae

Barbastella leucomelas (CRETZSCHMAR, 1830)

Fig. 3D

Material examined. TMC002, 1 ♂, Alagan-Algtar, 21.6.2014.

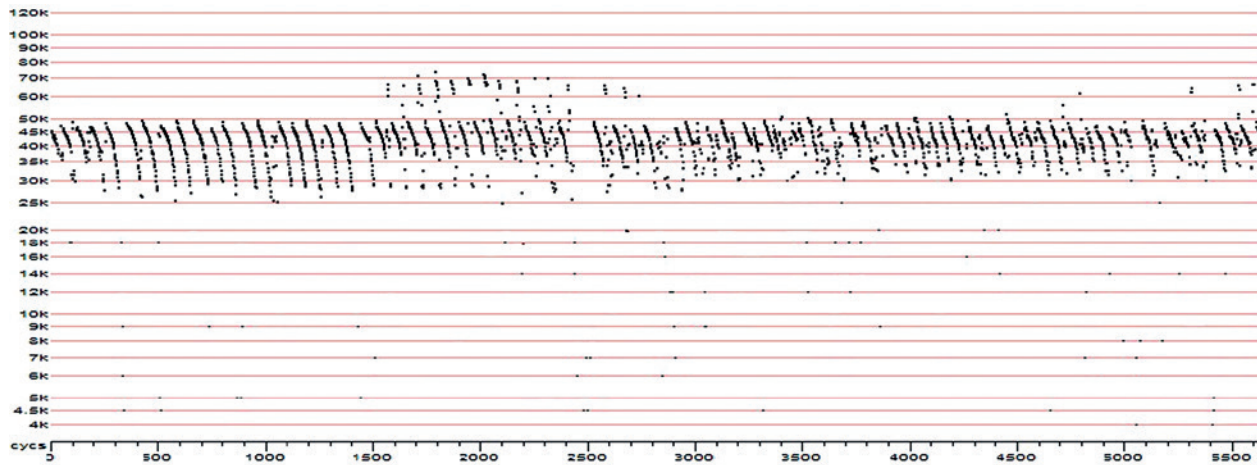
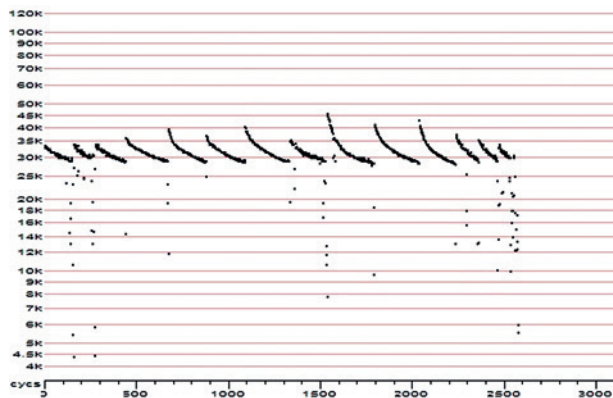
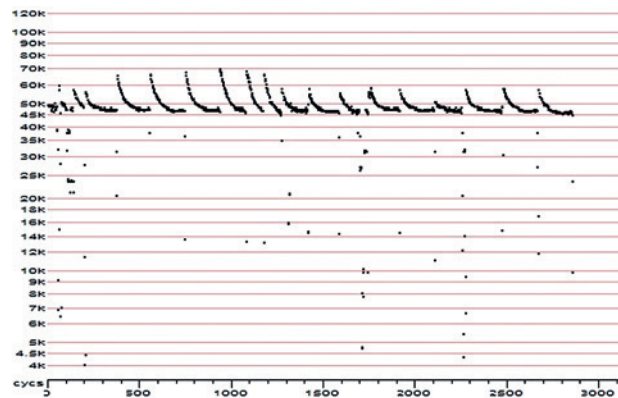
Habitat. One specimen was mistnetted near an open cave with small water pool. It was found along with *Eptesicus bottae*. Alagan consists of sand stone mountains, with sand dunes wadis.

Remarks. This is the first record for the Kingdom of Saudi Arabia and the Arabian Peninsula. No actual record of this bat is available for Saudi Arabia. The record of this species from "coast of Arabia" refers to Sinai (HARRISON & BATES, 1991). *Barbastella leucomelas* is considered as a rare species with few records from Southern Palestine and Jordan and is endemic to the arid regions around the northern edge of the Red Sea (BENDA *et al.*, 2008). It was recorded from Al Ghal, Wadi Ramm area (BENDA *et al.*, 2010), which is very close to Alagan-Algtar.

Calls recorded from Alagan have a range of 50–47 kHz for starting frequency and 30–35 kHz for end



Fig. 3. A. *Rhinopoma cystops* from Sharma-Tor Qunibi. B. *Rhinolophus clivosus* from Al Moatham castle. C. *Asellia tridens* from Al Bedea'a. D. *Barbastella leucomelas* from Alagan-Algtar. E. *Eptesicus bottae* from Alagan-Algtar. F. *Hypsugo ariel* from Al Moatham castle.

Fig. 4. Calls of *Barbastella leucomelas* from Alagan-Algtar.Fig. 5. Calls of *Eptesicus bottae* from Bajdah-Alsero.Fig. 6. Calls of *Hypsugo ariel* recorded from Al Moatham castle.

frequency (Fig. 4). BENDA *et al.* (2010) recognized two call patterns for *B. leucomelas* from Jordan; one with starting frequency between 34.9–40.3 kHz (average 37.1 ± 1.3), and end frequency between 27.7–31.8 kHz (average 29.2 ± 1.1), and the second with starting frequency between 43.0–45.0 kHz (average 44.1 ± 0.5) and end frequency of 29.8–38.5 kHz (average 34.3 ± 2.9). In Sinai, BENDA *et al.* (2008) obtained starting frequency for calls of type A as 35.9–41.9 (average 39.4 ± 1.1) and end frequency of 25.1–31.5 kHz (average 29.4 ± 1.2), while type B calls with starting frequency between 43.7–46.9 (average 45.2 ± 0.9) and end frequency of 25.9–40.7 kHz (average 33.8 ± 4.6).

Eptesicus bottae (PETERS, 1869)

Fig. 3E

Material examined. TMC003, 1♂, Alagan-Algtar, 21.6.2014. Calls: Bajdah-Alsero, 26.6.2014.

Habitat. A specimen was collected from a sandstone desert in Alagan-Algtar, while other animals were observed and their calls were recorded from high mountains reach-

ing up 1100 m asl with open deserts in Bajdah-Alsero. They were found to frequent water reservoirs for watering camels

Remarks. This is a rather common species. It was mist-netted at Alagan-Algtar along with *B. leucomelas*. At Bajdah-Alsero, one individual was mist-netted but managed to escape, however, calls were recorded on 26.6.2014.

Previously collected from Misfera, about 40 km north of Abha (NADER & KOCK, 1990a) and assigned as *E. b. bottae*. Other records are from Bish (MEMISH *et al.*, 2013). BATES & HARRISON (1989) recorded *Eptesicus bottae innesi* from Wadi Rum, southern Jordan.

Our data showed a starting frequency between 45–37 kHz and an end frequency between 28–30 kHz (Fig. 5). BENDA *et al.* (2010) showed starting frequency between 37.9–83.0 (average 53.6 ± 9.3) kHz and end frequency between 27.0–33.7 kHz (average 30.4 ± 1.5) for this species from Jordan. HOLDERIED *et al.* (2005) studied the call intensity for *Eptesicus bottae* using stereo videogrammetry. They reported duration of emitted calls of about 7 ms, a peak frequency of 32.5 kHz, a bandwidth of 8.7 kHz, and a mean pulse interval of 155.6 ms during search flight.



Fig. 7. *Plecotus christii* cluster from Albogaz Tunnel.

Hypsugo ariel (THOMAS, 1904)

Fig. 3F

Material examined. 1, Al Moatham castle, 22.6.2014; TMC003, 1 ♂, Taima-Al Hamra farms, 4.9.2014.

Calls. Waste Water Treatment plant at Tabuk, 22.6.2014.

Habitats. This species was found near old castles, open water systems near Tabuk and agricultural areas in Taima-Al Hamra farms. It was found in large numbers (about 20) emerging from the ruins of the castle.

Remarks. It was recorded from near Taif (GAUCHER & HARRISON, 1995). *Hypsugo ariel* was considered previously as *Pipistrellus bodenheimeri*. It was found along with *Rhinolophus clivosus* in Al Moatham castle and with *Rousettus aegyptiacus* in Taima-Al Hamra farms. This is the second record for Saudi Arabia.

Our data showed a starting frequency between 45–37 kHz and an end frequency between 28–30 kHz (Fig. 6). BENDA *et al.* (2008) showed starting frequency between 48.3–87.0 (average 62.5 ± 8.8) kHz and end frequency between 41.6–45.7 kHz (average 43.8 ± 0.8) for this species from Sinai, while BENDA *et al.* (2010) showed starting frequency between 47.7–75.0 kHz (average 58.1 ± 4.1) kHz and end frequency between 30.0–47.4 kHz (average 43.0 ± 2.1) for this species from Jordan.

Otonycteris hemprichii PETERS, 1859

Material examined. TMC006, 1 ♂, That Al Haji, 7.9.2014.

Habitats. *Otonycteris hemprichii* was collected from That Al Haj, an agricultural area with date grove and open water pools. Old deserted houses are located within the nearby farms.

Remarks. It was collected from Hufuf (CHEESMAN & HINTON, 1924), Hail and Anaiza (MORRISON-SCOTT, 1939), Taif (GAUCHER, 1988) and Riyadh (HARRISON & BATES, 1991).

Plecotus christii GRAY, 1838

Fig. 7

Material examined. TMC011, 1 ♂, Albogaz Tunnel, 1.11.2014.

Habitats. Several clusters of about forty bats were observed in Al Bogaz tunnel. This tunnel was used before by the Hijaz Railway. Other, solitary, individuals were also seen.

Remarks. This species was recorded from Misfera, north of Abha (NADER & KOCK, 1990b). This is a colonial species. In Jordan clusters of over 30 individuals were observed in caves (BENDA *et al.*, 2010).

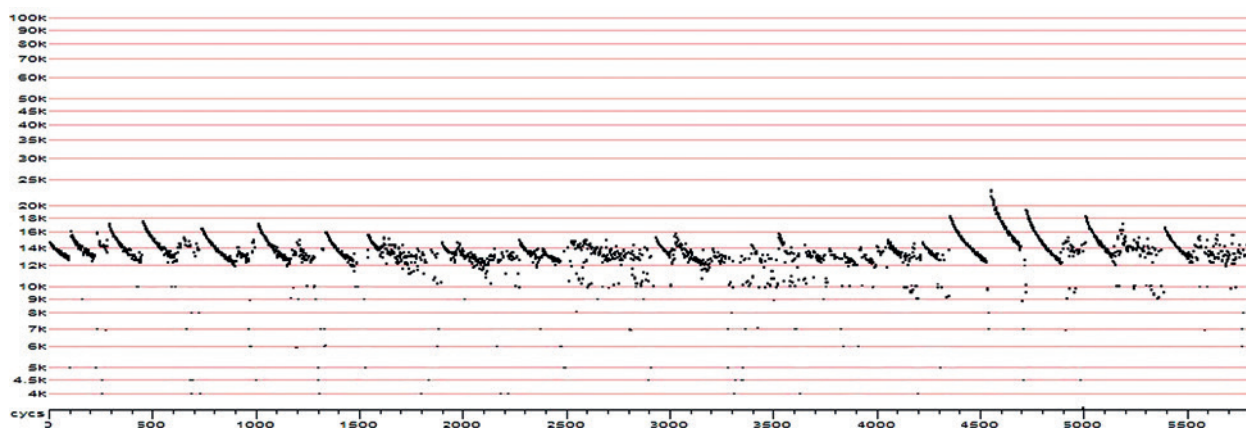


Fig. 8. Calls of *Tadarida teniotis* recorded from Tabuk sewage treatment plant.

Family Molossidae

Tadarida teniotis (RAFINESQUE, 1814)

Material examined. Calls: Tabuk sewage treatment plant, 18.6. 2014.

Habitat: This is a large area covered with *Tamarix* and *Typha* vegetation. It extends over 1 km in length and about 500m in width. Water is shallow, not exceeding 30 cm.

Remarks. Reported from Wadi Sawawin and Taif (HARRISON & BATES, 1984). Calls of *Tadarida teniotis* are typical with starting frequency between 15–23 kHz and end frequency of 12–14 kHz (Fig. 8). BENDA *et al.* (2010) obtained starting frequency of 12.4–22.6 (Average 15.7 ± 3.8) and end frequency of 9.4–10.5 (Average 9.8 ± 0.4) for *T. teniotis* from Jordan, while BENDA *et al.* (2008) showed starting frequency of 12.6–26.1 (Average 18.3 ± 4.1) and end frequency of 11.1–17.0 (Average 13.9 ± 2.0) kHz for the same species recorded from Sinai.

Discussion

The present study adds one additional species (*Barbastella leucomelas*) to the bats of the Arabian Peninsula and Saudi Arabia. Also, this study is the first attempt to provide calls recording for the bats of Saudi Arabia, where data for four species are presented.

The current study includes additional records for *R. aegyptiacus* which expand the distribution range of this bat in north western Saudi Arabia. Over the past eight decades, only eight records were published covering coastal areas and few inland localities.

It is obvious that the distribution of the bats of Saudi Arabia is still poorly known. Examining the previous records thus far, the status of records is very low for a large country as Saudi Arabia. Further studies to map the

distribution of the Saudi bats are needed. Since the last publication by NADER (2000), only two studies included data on the distribution of few bats from Saudi Arabia (ALAGAILI *et al.*, 2011; MEMISH *et al.*, 2013).

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