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NOTEWORTHY RECORDS OF BATS FROM YEMEN WITH DESCRIPTION OF A NEW SPECIES FROM SOCOTRA

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ABSTRACT - New records of some previously rarely found bat species from Yemen are presented. *Epomophorus labiatus* and *Neoromicia guineensis* were recorded in Yemen for the first time, both species occur solely in the westernmost part of the country. The most important and/or numerous records were made for *Rousettus aegyptiacus*, *Eptesicus nasutus*, *Hypsugo ariel*, *Scotophilus dinganii*, *Plecotus* cf. *balensis*, *Miniopterus natalensis*, *Tadarida aegyptiaca* and *Chaerephon nigeriae*. Additional distribution data are given also for *Hipposideros tephrus*, *Taphozous perforatus*, *Coleura afra*, *Nycticeinops schlieffenii* and *Chaerephon pumilus*. *Rousettus aegyptiacus* was found in 15 new localities throughout the Yemeni mainland. *Eptesicus nasutus*, *Plecotus* cf. *balensis* and *Chaerephon nigeriae* had been known from only one Yemeni site each. The first two species were recorded in one new locality each, while *C. nigeriae* was found in three new sites in western Yemen. Five new sites in Hadramaut and easternmost Yemen are reported for *Hypsugo ariel*. The Socotran population previously attributed to the latter species was found to be distinct in several morphological characters and is here described as a separate species, *Hypsugo lanzai* sp. nov.

Key words: Chiroptera, distribution, taxonomy, Middle East, Arabia, Afrotropics

RIASSUNTO - ***Segnalazioni degne di nota di pipistrelli yemeniti e descrizione di una nuova specie dell'isola di Socotra***. Si presentano nuove segnalazioni di rare specie di pipistrelli dello Yemen. *Epomophorus labiatus* e *Neoromicia guineensis* vengono segnalate per la prima volta, entrambi nell'estremo occidente del Paese. Le segnalazioni di maggiore consistenza e importanza riguardano *Rousettus aegyptiacus*, *Eptesicus nasutus*, *Hypsugo ariel*, *Scotophilus dinganii*, *Plecotus* cf. *balensis*, *Miniopterus natalensis*, *Tadarida aegyptiaca* e *Chaerephon nigeriae*. Inoltre si riportano dati sulla distribuzione di *Hipposideros tephrus*, *Taphozous perforatus*, *Coleura afra*, *Nycticeinops schlieffenii* e *Chaerephon pumilus*. *Rousettus aegyptiacus* viene riportato per 15 nuove località della terraferma. In precedenza, *Eptesicus nasutus*, *Plecotus* cf. *balensis* e *Chaerephon nigeriae* erano noti ciascuno per una sola località yemenita, cui si aggiungono una nuova località per le prime due specie e ben tre per *C. nigeriae*, nello Yemen occidentale. Cinque nuovi siti (Hadramaut e estremo oriente dello Yemen) vengono segnalati per *Hypsugo ariel*. Sulla base di

numerosi tratti morfologici, la popolazione dell'isola di Socotra precedentemente attribuita a *H. ariel* viene identificata come una nuova specie - *Hypsugo lanzai* sp. nov.

Parole chiave: Chiroptera, distribuzione, tassonomia, Medio Oriente, Arabia, Afrotropici

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INTRODUCTION

Although the bat fauna of the current Republic of Yemen has been relatively well studied in comparison to other Peninsular Arabian countries, it remains rather poorly known. The first published record of a bat from Yemen was that by Taschenberg (1883), who reported the finding of *Rhinopoma microphyllum* [= *R. cystops*] from Socotra island. However, there was one older report: Peters (1869) described *Vesperus* [= *Eptesicus*] *bottae* from "Arabia" and this type locality was much later identified to be situated in (and restricted to) southwestern Yemen (see Ellerman and Morrison-Scott 1951; Nader and Kock 1990a).

The first paper on bats from the Yemeni mainland was published by Monticelli (1887); his report brought data on the occurrence of five bat species and, at the same time, represented the first publication on the Yemeni mammalian fauna. Several other reports describing collections of mammals made in western Yemen and Socotra, also including bat records, were published at the break of the 20th century; Matschie (1893), Yerbury and Thomas (1895), Thomas (1900; 1913), Anderson (1902), and De Winton et al. (1903) reported altogether eleven bat species from the present Yemen. These reports represented for a long time the only available information on the Yemeni bat fauna.

Until the 1950s, when Sanborn and Hoogstraal (1953) published their extensive report concerning new findings of mammals from Yemen, including seven species of bats (three of them new for the country), only few bat records appeared in several papers (see De Beaux 1931; Morrison-Scott 1939; Hayman 1941; Hayman and Harrison 1950; Harrison 1956).

In his first comprehensive review of Arabian mammals, Harrison (1964) reported 21 bat species for the current Republic of Yemen, viz. (under the contemporary taxonomy) *Eidolon helvum* (Kerr, 1792), *Rousettus aegyptiacus* (Geoffroy, 1810), *Rhinopoma cystops* Thomas, 1903, *Rhinolophus clivosus* Cretzschmar, 1828, *R. blasii* Peters, 1867, *Hipposideros tephrus* Cabrera, 1906, *Asellia tridens* (Geoffroy, 1813), *Triaenops persicus* Dobson, 1871, *Taphozous nudiventris* Cretzschmar, 1830, *T. perforatus* Geoffroy, 1818, *Coleura afra* (Peters, 1852), *Nycteris thebaica* Geoffroy, 1818, *Myotis bocagii* (Peters, 1870), *Eptesicus bottae* (Peters, 1869), *E. nasutus* (Dobson, 1877), *Hypsugo ariel* (Thomas, 1904), *Pipistrellus* aff. *kuhlii* (Kuhl, 1817), *Nycticeinops schlieffenii* (Peters, 1859), *Scotophilus dinganii* (Smith, 1833), *Tadarida aegyptiaca* (Geoffroy, 1818), and *Chaerephon pumilus* (Cretzschmar, 1831). Although a number of reports more or less concerning bat records from Yemen were published between 1975 and 1991 (Scaramella 1975; Nader 1975; 1982;

Kock and Nader 1979; Harrison 1985; Nader and Kock 1980; 1983; 1987; Al-Safadi 1991; Harrison and Bates 1991; Wranik et al. 1991), only one species enriched the Yemeni bat fauna in this period, *Miniopterus natalensis* (Smith, 1834), (see Nader and Kock 1987).

A separate chapter of zoology in Yemen is represented by animal research (including bats) in Socotra. Although a relatively high number of papers reporting bat records from this island has been published (Taschenberg 1883; De Winton et al. 1903; Harrison 1957; Menu 1987; Wranik 1986; 1998; 1999; 2003; Wranik et al. 1991; Guichard 1992; Van Cakenberghe and De Vree 1994; Nasher and Al Jumaily 2004; Hulva et al. 2007), only Cesarini (2007) focused his research in Socotra on bats. As a consequence, although bats are considered the only autochthonous mammal group inhabiting the island and surrounding islets (Cheung et al. 2006), very few records are available for the archipelago, concerning only four species, viz. *Rhinopoma cystops*, *Rhinolophus clivosus*, *Asellia tridens*, and *Hypsugo ariel*.

New extensive research on bats in Yemen has been carried out recently; a number of reports have been published bringing new bat records as well as new taxa to the fauna of Yemen (Al-Jumaily 1998; 1999; 2002; 2003; 2004; Kock et al. 2001; 2002; Nasher and Al Jumaily 2004; Cesarini 2007). In this short period, *Rhinopoma muscatellum* Thomas, 1903, *Myotis emarginatus* (Geoffroy, 1806), *Plecotus* cf. *austriacus* (Fischer, 1829), *Chaerophon nigeriae* Thomas, 1913, and *Otomops martiensseni* (Matschie, 1897) were recorded in Yemen for the first time and the number of bat species known from the country increased to 27 (Al-Jumaily 2004). Two recent papers (Benda and Vallo 2009; Benda et al. 2009), revised the taxonomy of some bat groups and described two new endemic species, viz. *Rhinopoma hadramauticum* Benda, 2009 (the respective population had been formerly assigned to *R. muscatellum*, see Kock et al. 2001) and *Triaenops parvus* Benda et Vallo, 2009.

As recently stressed by Al-Jumaily (2004), the bat fauna of Yemen remains not fully known and the distribution pattern of the known species has been rather roughly estimated. To enlarge the knowledge on bat distribution, ecology and taxonomy, we carried out three extensive field surveys to most parts of Yemen including the Socotra Archipelago (May 2004, October-November 2005, October-November 2007). These surveys brought new data on some 25 bat species. While they did not modify the known distribution ranges of the commonest ones, such as *Eidolon helvum*, *Rhinopoma cystops*, *Nycteris thebaica*, *Rhinolophus clivosus*, *Asellia tridens*, and/or *Pipistrellus* aff. *kuhlii*, they allowed to collect new important data (> 100 records) about some species for which less than ten records from Yemen were available. Some of these species were confirmed at localities where they had been found previously (*Rhinolophus blasii*, *Otomops martiensseni*; see Al-Jumaily 1999; Kock et al. 2002). Records of several of these rarely found bats have been already published elsewhere, *i.e.* the genera *Rhinopoma* Geoffroy, 1818 and *Triaenops* Dobson, 1871 (Benda and Vallo 2009; Benda et al. 2009). Here we report about the records of 15

species that can be considered noteworthy (two of these species were found in Yemen for the first time) and describe a new species from Socotra.

MATERIALS AND METHODS

Bats were documented with the help of all common techniques for bat field-studies (mist-netting, hand-netting, collection and/or observation in caves, detection of echolocation calls by bat detectors Petterson D100 and D240x). The collected specimens should be finally deposited in two collections, National Museum (Natural History), Prague (NMP) and Natural History Museum of Yemen, Sana'a; since the latter is currently under construction (see Nasher and Al Jumaily, 2004), the final deposition of the specimens has not yet been solved. Therefore, all the newly collected specimens (with the exceptions of types) are mentioned under their field protocol numbers and in their tentative depository, the NMP collection. Taxonomy mainly followed Simmons (2005); all differences are explained under the respective species comments.

Standard measures (see Abbreviations below) were taken from museum specimens using mechanical or optical callipers, according to Benda et al. (2004). Bacula were extracted in 6% solution of KOH and coloured with alizarin red. Statistical analysis (principal component analysis, PCA) was performed using the Statistica 6.0 software.

ABBREVIATIONS

DIMENSIONS (in mm). **External**: LC = head and body length; LCd = tail length; LAt = forearm length (incl. wrist); LA = auricle (ear) length; LT = tragus length. **Cranial**: LCr = greatest length of skull; LCb = condylobasal length of skull; LaZ = zygomatic width; LaI = width of interorbital constriction; LaInf = rostral width between infraorbital foramens; LaN = neurocranium width; LaM = mastoidal width of skull; ANc = neurocranium height; ACr = skull height (incl. tympanic bullae); LBT = largest horizontal length of tympanic bulla; CC = rostral width between upper canines (incl.); PP = rostral width between upper premolars (incl.); MM = rostral width between last upper molars (incl.); I^1M^3 = length of upper tooth-row between first incisor and 3rd molar (incl.); CMs = length of upper tooth-row between canine and last molar (incl.); CM^3 = length of upper tooth-row between canine and 3rd molar (incl.); M^1M^3 = length of upper molar-row (incl.); CP^4 = length of upper tooth-row between canine and last premolar (incl.); LMd = condylar length of mandible; ACo = height of coronoid process; CMi = length of lower tooth-row between canine and last molar (incl.); CM_3 = length of lower tooth-row between canine and 3rd molar (incl.); M_1M_3 = length of lower molar-row (incl.); CP_4 = length of lower tooth-row between canine and last premolar (incl.). **Dental** (taken from bats of the genus *Hypsugo* only): LCs = mesio-distal length of upper canine; LaCs = palato-labial width of upper canine; ACn = height of the palato-mesial cingular cusp of the second upper premolar (P^4); LP^3 = mesio-distal length of third (smaller) upper premolar; LM^1 = mesio-distal length of first upper molar; LaM^1 = palato-labial width of first upper molar; LM^3 = mesio-distal length of first third molar; LaM^3 = palato-labial width of third upper molar; M^3sq = crown square of third upper molar ($LM^3 \times LaM^3$); LCi = mesio-distal length of lower canine; LP_3 = mesio-distal length of third (smaller) lower premolar; LM_1 = mesio-distal length of first lower molar; LM_3 = mesio-distal length of third lower molar.

COLLECTIONS. BCSU = Biological Collection of Sana'a University, Sana'a, Yemen; BMNH = Natural History Museum, London, United Kingdom; CDIS = Christian Dietz private collection, Herb, Germany; HUJ = Hebrew University, Jerusalem, Israel; MSNG = Civil Museum of Natural History Giacomo Doria, Genoa, Italy; NMP = National Museum, Prague, Czech Republic; TAU = Tel Aviv University, Tel Aviv, Israel.

OTHER ABBREVIATIONS. A = alcoholic preparation; B = dry skin (balg); f/♀ = female; m/♂ = male; M = mean; max., min. = range margins; S = skull; SD = standard deviation.

LIST OF SPECIES

Pteropodidae

Rousettus aegyptiacus (Geoffroy, 1810)

NEW RECORDS. 2 ♀♀, Ba Tays, Wadi Bana, 8 November 2007, leg. P. Benda, A. K. Nasher and A. Reiter. – 1 ♀, Damqawt, a wadi ca. 1 km NW of the village, 16 October 2005, leg. P. Benda. – 1 ind. obs., Ghayl Ba Wazir, small hole in a karstic cave ca. 1 km N of the town, 7 November 2007, obs. P. Benda, A. K. Nasher and A. Reiter. – 1♂, 1♀ (coll. ♂, NMP pb3758 [S+A]), Halhal, ca. 10 km NE of Hajjah, 2 November

2007, leg. P. Benda and A. Reiter. – 5♂♂, 4♀♀ (coll. 5 spec., NMP pb3113, pb3115 [S+A], pb3114, 3116 [A], pb3112 [S]), 5 km W of Hammam Ali, 27 October 2005, leg. P. Benda. – 4♂♂, 4♀♀ (coll. 3 spec., NMP pb2959–2961 [S+A]), Hawf, gardens above the town, 12–14 October 2005, leg. P. Benda. – 6♀♀ (coll. 2 spec., NMP pb3118 [S+A], pb3019 [A]), Jebel Bura, 5 km W of Riqab, 30 October 2005, leg. P. Benda. – 2♂♂, 2♀♀ (NMP pb2943, 2944 [S+A], pb2945, 2946 [A]), ancient Great Dam of Ma'rib, ca. 8 km W of Ma'rib, 8 October 2005, leg. P. Benda and A. K. Nasher. – 4♂♂, 3♀♀ (NMP pb3628–3630, 3632, 3633 [S+A], pb3631, 3634 [A]), Mashgab, ca. 10 km S of Ash Shamsara, 26 October 2007, leg. P. Benda and A. Reiter. – 1♂, 1♀ (coll. ♂, NMP pb2956 [S+A]), Wadi 'Adim, palmeria 2 km N of Sah, 10 October 2005, leg. P. Benda. – 1♀ (NMP pb3159 [A]), Wadi Al Lahm, ca. 20 km W of Al Mahwit, 1 November 2005, leg. P. Benda. – 3♀♀ (coll. 2 spec., NMP pb3056, 3057 [S+A]), Wadi Daw'an, palmeria ca. 2 km S of Al Khuraybah, 19 October 2005, leg. P. Benda. – 1♂, 1♀ (NMP pb2917 [S+A], pb2918 [A]), Wadi Dhahr, 15 km NW of Sana'a, 6 October 2005, leg. P. Benda. – 3♀♀ (coll. 2 spec., NMP pb3089 [S+A], pb3090 [A]), Wadi Maytam, 12 km SE of Ibb, 26 October 2005, leg. P. Benda. – 1♂ (NMP pb3728 [S+A]), Wadi Zabid, ca. 10 km SE of Al Mawqir, 30 October 2007, leg. P. Benda and A. Reiter.

Although the Egyptian rousette, *Rousettus aegyptiacus*, is considered to be mainly an Afrotropical species (cf. Bergmans 1994), its Yemeni range belongs to the Palaearctic range. This area spreads from Egypt and the Levant through the western part of Saudi Arabia and Yemen to Oman and southern parts of Iran and Pakistan and is separated by the vast desert areas of north-eastern Africa from the sub-Saharan parts of the range (Bergmans 1994). Thus, *R. aegyptiacus* is the most widespread fruit bat of Arabia.

Published records of *R. aegyptiacus* came from two limited and mutually distant regions of Yemen (Bergmans 1994). Several findings were available from the south-westernmost corner of the country, the Lahj area. Nine bats were collected in the 'Wady Jaghur' in 1895 (Yerbury and Thomas 1895), six in 'Wadi Bilih' in 1899 (Thomas 1900), and two others in Lahj in 1971 and 1972 (Nader 1975; Bergmans 1994). The older Lahj records were mentioned by subsequent authors as from Aden (Anderson 1902; Andersen 1912; Eisentraut 1960), suggesting the possible existence of another record site. However, these authors mistook the sampled locality name for the former British protectorate in which this locality lied. Additional records from mountains of the Taizz region, southwestern Yemen, were reported by Bergmans (1994): Alturbam [= At Turbah] and Taizz. A juvenile BMNH specimen from Saiun, Wadi Hadramaut, was noted by Harrison and Bates (1991). This record constituted the only evidence of the species from the extensive bare area of central and eastern Yemen.

Our records of *R. aegyptiacus* from Yemen come from all visited areas of the country (except for Socotra), enlarging about three-folds its range in Yemen (Fig. 1). These bats were recorded by nettings (only once by observation in a roost) in coastal zones, mountainous areas of western and south-western regions as well as in large oases of the desert zone (Fig. 1). This distribution is consistent with the known occurrence in other parts of Arabia (Harrison and Bates 1991; Bergmans 1994) and conforms to the species distribution pattern in other parts of the Middle East.

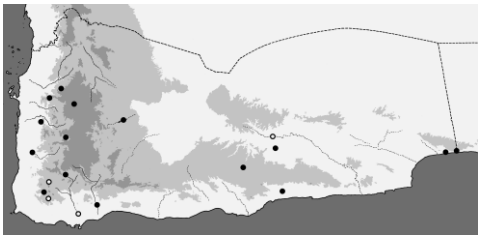

Figure 1 - Records of *Rousettus aegyptiacus* in Yemen. Closed symbols, new records; open symbols, published records.

In the period between 5 October and 9 November, all age groups were found, although adult bats predominated in the catch. While adults were netted during the whole period, juveniles were registered

between 6 and 30 October (incl.) and subadults a week later, between 13 October and 8 November (incl.). Altogether three lactating females were caught on 19 and 30 October. The average forearm length of eight volant juveniles was 77.03 mm (range 68.5–84.0). This is 85.1% of the average forearm length of the adults (mean length 90.54 mm; range 85.7–94.8; n=29). The distribution of age stages corresponds to a late summer/autumn period of parturitions in the Arabian populations of *Rousettus aegyptiacus*. In contrast, in the Lahj area, Yerbury and Thomas (1895) caught some gravid females and a female carrying a young in late March 1895. These records conform to the opinion that parturitions may occur twice a year, in spring (March/April) and at the summer/autumn break, supposedly in September. Such seasonal bimodality of reproduction was suggested by observations of this species East African (Mutere 1968; Anciaux de Faveaux 1978) and Levantine populations (Spitzenberger 1979; Benda et al. 2008).

Figure 2 - Records of *Epomophorus labiatus* (squares) and *Taphozous perforatus* (circles) in Yemen. Closed symbols, new records; open symbols, published records.

Epomophorus labiatus (Temminck, 1837)

NEW RECORDS. 1♂, 1♀ (NMP pb3756 [S+A], pb3757 [A]), Halhal, ca. 10 km NE of Hajjah, 2 November 2007, leg. P. Benda and A. Reiter. – 1♀ (NMP pb3109 [S+A]), 5 km W of Hammam Ali, 27 October 2005, leg. P. Benda. – 1♂, 1♀ (NMP pb3077 [S+A], 3078 [A]), 7 km S of Najd An Nashamah, 25 October 2005, leg. P. Benda. – 3♀♀ (NMP pb3158 [S+A], pb3156, 3157 [A]), Wadi Al Lahm, ca. 20 km W of Al Mahwit, 1 November 2005, leg. P. Benda. – 1♀ (NMP pb2919 [S+A]), Wadi Dhahr, 15 km NW of Sana'a, 6 October 2005, leg. P. Benda. – 1♀ (NMP pb3091 [A]), Wadi Maytam, 12 km SE of Ibb, 26 October 2005, leg. P. Benda.

Figure 3 - Halhal, northern part of the Sarawat range, NW Yemen (photo by A. Reiter). Foraging area of five bat species, *Eidolon helvum*, *Rousettus aegyptiacus*, *Epomophorus labiatus*, *Miniopterus natalensis*, and *Chaerephon pumilus*.

Like all *Epomophorus* species, the little epauletted fruit bat, *Epomophorus labiatus*, is an Afrotropical species. Its distribution range is centred to East Africa, although some records are available from the savanna belt spreadind from northeastern Nigeria to Eritrea and Malawi (Claessen and De Vree 1991; Simmons 2005), and it is the only epauletted fruit bat living in Arabia. Previously it had been recorded only from southwestern Saudi Arabia, from two neighbouring sites at the Raydah escarpment (Gaucher 1992).

E. labiatus is here reported from Yemen for the first time, the record reported by Horáček et al. (2000) being erroneously referred to the Saudi Arabian findings by Gaucher (1992). We recorded *E. labiatus* at six sites on the western slopes of the Sarawat range, where the most humid habitats of Yemen occur (Fig. 2, 3), in the altitudinal range 850–2245 m a.s.l. (mean 1432 m). Accordingly, in Saudi Arabia, this species has been recorded between 1500 and 2200 m a.s.l. (Gaucher 1992).

The individuals of *E. labiatus* were re-

corded in Yemen only in autumn, between 5 October and 3 November. In this period, mostly young bats were recorded (Fig. 4); out of ten individuals, five were volant juvenile females (forearm length 55.9–62.5 mm, mean 58.6 mm, i.e. 86.7% of the average forearm length of the adults), one was a subadult female, and one was a lactating female. Our captures suggest a late summer/autumn period of parturitions in the Arabian populations of *E. labiatus*. A bimodal pattern of reproduction, as that reported above for *Rousettus aegyptiacus*, has been suggested for the African populations of this species (Anciaux de Faveaux 1983).

The dimensions of the Yemeni individuals (Tab. 1) conform to those given by Bergmans (1988) and Claessen and De Vree (1991) for populations of *E. labiatus* from northeastern Africa and lie at the lower margin of their ranges, respectively.

Figure 4 - Adult male of *Epomophorus labiatus* (NMP pb3756), Halhal, NW Yemen (photo by A. Reiter).

Hipposideridae

***Hipposideros tephrus* Cabrera, 1906**

NEW RECORD. 1♂, 3♀♀ (NMP pb2911–2914 [S+A]; coll. from a colony of ca. 20 inds.), Sana village, Sana'a, small karstic cave, 5 October 2005, leg. M. Al-Jumaily and P. Benda.

The Arabian populations of the leaf-nosed bats of the *Hipposideros caffer* complex were traditionally assigned to the nomitypical species of the group, *H. caffer* (Sundevall, 1846). The complex was supposed to be composed of two species, the small-sized *H. caffer* and the large-sized *H. ruber* (Noack 1893) (see e.g. Kock 1969; Simmons 2005). However, Vallo et al. (2008) found seven distinct mtDNA lineages within the complex and the Arabian samples were found to be closely related to the samples from Morocco and Senegal. This group of populations was suggested to belong to a separate species, tentatively named *H. tephrus*, described from Mogador [= Essaouira], Morocco (Cabrera Latorre 1906). Also Nader (1982) had suggested assigning the Arabian populations of the *caffer* group to this taxon (on the subspecific level).

In Arabia, the occurrence of *H. tephrus* is restricted to the mountain ranges of the southwestern part of the peninsula (Harrison and Bates 1991). Five records were available from Saudi Arabia (Nader 1982; Harrison and Bates 1991) and as many from Yemen (Fig. 5). Hayman (1941) reported a male from Jabal Harir near Lahj in southern Yemen and Harrison (1964) two BMNH female specimens collected at Wasil (W Yemen) in 1913. Al-Jumaily (1998) mentioned the record of four females from Beni Khawli near Hajjah in NW Yemen. Sanborn and Hoogstraal (1953) reported two findings from Al'Asr and Raudha in the Sana'a area; also the new record comes from this region (see Fig. 5).

A colony of ca. 20 individuals of *H. tephrus* was found (from which two adults without any sign of reproductive activity and two subadults were examined) in a small tunnel-like cave with a spring, serving as a source of fresh water for the village of Sana, in a suburb of the capital of Sana'a. In this cave, also colonies of *Rhinolophus blasii* Peters, 1866 and *Myotis emarginatus* (Geoffroy, 1806) had been found during previous surveys (Kock et al. 2002; Al-Jumaily 2003). At the time of our visit, a colony of ca. 50 individuals of *R. blasii* was observed.

Table 1 - Basic biometric data (mean±SD and min-max in mm) on the most noteworthy species newly collected in Yemen.

	Epomophorus labiatus			*Eptesicus nasutus*		*Neoromicia guineensis*			*Chaerephon nigeriae*		
	n	Mean±SD	Min-max	pb3708	pb3714	n	Mean±SD	Min-max	n	Mean±SD	Min-max
LC	4	117.0±5.831	111-122	43	43	5	40.8±1.095	39-42	13	72.4±2.022	68-76
LCd				39	42	5	31.6±2.191	29-35	13	36.7±2.136	33-41
LAt	4	67.60±1.246	66.3-68.9	35.1	35.7	5	25.78±0.665	25.2-26.9	13	45.95±0.710	44.6-46.9
LA	4	19.63±1.087	18.7-20.8	13.9	13.4	5	11.80±0.696	10.8-12.7	13	23.31±0.628	22.3-24.6
LT				4.7	5.4	5	5.06±0.647	4.2-5.7	13	4.58±0.329	3.9-5.3
LCr	4	39.71±2.345	37.12-41.96	12.47		4	11.17±0.151	10.98-11.34	10	19.31±0.481	18.63-20.08
LCb	4	39.01±2.482	36.27-41.44	11.98		4	10.79±0.130	10.65-10.96	10	18.07±0.404	17.47-18.69
LaZ	4	21.82±1.109	20.64-22.92	7.58	7.82	2		6.95-7.13	10	11.81±0.386	11.03-12.21
LaI	4	6.98±0.235	6.76-7.26	2.35	2.48	4	2.80±0.067	2.71-2.86	10	3.96±0.115	3.79-4.17
LaN	4	14.26±0.562	13.75-14.91	5.76	6.02	4	5.69±0.070	5.62-5.75	10	9.69±0.161	9.41-9.92
LaM	4	14.75±0.466	14.38-15.39	6.44	6.47	4	6.45±0.029	6.43-6.49	10	10.82±0.200	10.56-11.13
ANc	4	10.20±0.234	9.93-10.41	4.21		4	3.90±0.163	3.67-4.02	10	6.86±0.220	6.41-7.19
CC	4	7.90±0.362	7.47-8.26	3.75	3.76	4	3.32±0.083	3.21-3.41	10	5.22±0.224	4.84-5.54
MM	4	11.97±0.518	11.31-12.39	5.32	5.41	4	4.63±0.182	4.49-4.89	10	8.69±0.257	8.17-8.94
CMs	4	14.11±0.692	13.42-14.93	4.41	4.54	4	3.99±0.172	3.85-4.24	10	7.49±0.176	7.21-7.76
LMd	4	30.84±1.893	28.87-32.67	8.69	8.87	4	7.84±0.104	7.73-7.98	10	13.30±0.400	12.85-13.94
ACo	4	12.91±0.819	12.18-13.89	3.12	3.02	4	2.47±0.078	2.41-2.58	10	3.35±0.135	3.14-3.57
CMi	4	15.62±0.795	14.68-16.34	4.55	4.95	4	4.27±0.076	4.21-4.37	10	8.03±0.182	7.75-8.31

Emballonuridae

Taphozous perforatus Geoffroy, 1818

NEW RECORDS. 1♂ (NMP 92107 [S+A]; roadkill), Al Anad, 30 November 2002, leg. B. Pražan. – 4♀♀ (MSNG 42231 [A]), Moka [Mocca = Al Makha], 8 August 1906, leg. Cafiero. – 1♂, 1♀ (NMP pb3771, 3772 [S+A]; coll. from a colony of ca. 10 inds.), Shuhayr, 6 November 2007, leg. P. Benda, A. K. Nasher and A. Reiter. – 6♂♂, 12♀♀ (NMP pb3690–3695, 3700, 3701, 3703, 3705, 3706 [S+A], pb3689, 3696–3699, 3702, 3704 [A]; coll. from a colony of ca. 200 inds.), Zabid, citadel, 30 October 2007, leg. P. Benda and A. Reiter.

The Egyptian tomb bat, *Taphozous perforatus*, is an Afrotropical-Palaearctic faunal element. In Africa, it is distributed from Mauritania and Senegal in the west to Egypt and Somalia in the east and Botswana and Mozambique in the south; in Asia it lives in

Figure 5. Records of *Hipposideros tephrus* (squares) and *Chaerephon pumilus* (circles) in Yemen. Closed symbols, new records; open symbols, published records.

Arabia, in the southern parts of Iran and Pakistan and in northwestern India (Sim-

mons 2005). In Arabia, the known records are available from two distant regions, the southwest (SW Saudi Arabia and W Yemen) and the east (NE Oman) (Harrison and Bates 1991).

In Yemen, the published records originate from two regions of lowland deserts in the western part of the country (Fig. 2). In the Aden region, the records come from Bir Fuqum (Harrison 1964) and Lahj (Yerbury and Thomas 1895; Thomas 1900; Harrison 1964; Wranik et al. 1991). Two records were published from the Al Hudaydah region (Harrison 1964; 1985).

Also a new record of a large colony of *T. perforatus* from the citadel of Zabid comes from the latter region, as well as old specimens from Mocca [= Al Makha], recently discovered in the MSNG collection. The colony/ies recorded in the Zabid citadel, each consisting of ca. 100 individuals, roosted in two dark rooms localised at opposite sides of the citadel, in a bath and under the southwestern tower. Eighteen bats were examined, including only adult and subadult individuals of both sexes with no sign of reproductive activity. In an abandoned house in the centre of Shuhayr, we found some 10 individuals of *T. perforatus* roosting with ca. 30 individuals of *Rhinopoma cystops* and some 100 individuals of *Coleura afra*. Both examined specimens of *T. perforatus* were adult bats without any sign of reproductive activity. This finding represents the easternmost record of *T. perforatus* in Yemen (Fig. 2) and suggests that there is no interruption between the southwestern and eastern Arabian parts of the species distribution range.

Coleura afra (Peters, 1852)

NEW RECORDS. 1♂, 1♀ (MSNG 44397 [S+A]), presso Aden [= near Aden], 1893, leg. A. Pogliani. – 8♂♂, 7♀♀ (NMP pb3773, 3774, 3776–3781 [S+A], pb3775, 3782–3784 [A]; coll. from a colony of ca. 100 inds.), Shuhayr, 6 November 2007, leg. P. Benda, A.K. Nasher and A. Reiter.

The African sheath-tailed bat, *Coleura afra*, is an Afrotropical species, distributed in sub-Saharan Africa, from Guinea-Bissau in the west to Sudan and Somalia in the east and Angola and Mozambique in the south (Simmons 2005). Outside the African continent this bat is known only from Madagascar (Goodman et al. 2008) and Yemen. In the latter country the records come from three regions distant from each other (Fig. 6).

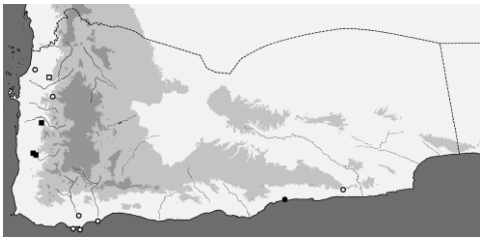

Figure 6 - Records of *Coeura afra* (circles) and *Chaerephon nigeriae* (squares) in Yemen. Closed symbols, new records, open symbols; published records.

Most record sites lie in the Aden region (SW Yemen): a cave at Aden and one in the Ras Fakum Bay island at Little Aden (Yerbury and Thomas 1895), El Kod [= Al Kawd], Lahj and Aden (Harrison 1964). Two old specimens newly discovered in the MSNG collection also originate from the vicinity of Aden. Harrison (1967) reported a peculiar record of a pregnant female on a ship at sea in the Straits of Bab el-Mandeb some 17 km from the coast of Yemen (and 24 km from the nearest African coast). Three *C. afra* were also collected in a small cave at Shikhawi, in the coastal Hadramaut, which represents the easternmost area of its distribution range in Asia (Al-Jumaily 2004). We present another record from this area; a large colony of ca. 100 individuals was discovered in an abandoned house in the centre of Shuhayr, where also colonies of two other bat species roosted (see under *Taphozous perforatus*). *C. afra* has been also reported from two sites (Al Hadhan and Al Didi) in nothwestern Yemen, in the

Hajja and Al Mahwit regions (Al-Jumaily 2004). Except for Al Didi, which is at 2000 m a.s.l., all Yemeni record sites lie in lowland deserts.

Three lactating females, eight adult males, three volant juveniles, and four subadult bats were collected from the Shuhayr colony on 6 November. Yerbury and Thomas (1895) found pregnant females in the Aden area in early April. The pregnant female found on the ship at sea was collected on 27 July. These records suggest polyestrous or seasonally bimodal reproduction in *C. afra*, rather than a monoestrous autumn period of reproduction as supposed by Kock (1969) according to the data from Sudan.

Vespertilionidae

***Eptesicus nasutus* (Dobson, 1877)**

NEW RECORD. 1♂, 1♀ (NMP pb3708, 3714 [S+A]), Wadi Zabid, ca. 10 km SE of Al Mawqir, 30 October 2007, leg. P. Benda and A. Reiter.

The Sind bat, *Eptesicus nasutus*, is endemic of the Middle East. Its records come from deserts of the southern and eastern parts of this region, from southwestern Saudi Arabia to Pakistan (Nader 1982; Simmons 2005). In southern Arabia, *E. nasutus* is one of the most rarely recorded bats; Harisson and Bates (1991) reviewed seven sites of occurrence of the southeastern Arabian subspecies *E. nasutus batinensis* Harrison, 1968 in Oman and southern and eastern Saudi Arabia. The southwestern Arabian form, *E. n. matschiei* (Thomas, 1905) is known from three localities in Saudi Arabia and Yemen; from the former country, the specimens were reported from near Jedda (Harrison 1964) and Al Jowa (Nader 1982). From Yemen, only one finding has been known so far, the type specimen [BMNH 1899.11.6.19] of *E. n. matschiei* from Jimel, ca. 80 km north of Aden, collected by W. Dodson on 16 August 1899. This individual was originally reported as *Scotophilus Schlieffeni* [= *Nycticeinops schlieffenii*] by Thomas (1900) and later on described by the same author (Thomas 1905) as a new species, *Vespertilio Matschiei*.

Figure 7 - Wadi Zabid, a shallow valley in deserts of the Tihama plain, W Yemen (photo by A. Reiter). Nine bat species were netted at two closely situated sites in this valley, *Eidolon helvum*, *Rousettus aegyptiacus*, *Triaenops persicus*, *Nycteris thebaica*, *Eptesicus nasutus*, *Nycticeinops schlieffenii*, *Scotophilus dinganii*, *Chaerephon nigeriae*, and *C. pumilus*.

Two individuals of *E. nasutus*, an adult male and a subadult female, were collected at the water pool in Wadi Zabid, ca. 270 m a.s.l. (Fig. 7), along with numerous individuals of *Eidolon helvum*, *Rousettus aegyptiacus*, *Triaenops persicus*, *Nycticeinops schlieffenii*, *Scotophilus dinganii*, and *Chaerephon pumilus*. This record represents the second finding of *E. nasutus* in Yemen (Fig. 8) and the fourth finding of *E. n. matschiei* at all. Both Yemeni records of this form come from rather desert lowland areas, as reported for Saudi Arabian findings.

***Hypsugo ariel* (Thomas, 1904)**

NEW RECORDS. 1♂ (NMP pb3058 [S+A]), Al Nueimah, 20 October 2005, leg. P. Benda. – 2 ♂♂, 2 ♀♀ (coll. 3 spec.; NMP pb3050, 3051 [S+A], 3052 [A]), Damqawt, a wadi ca. 1 km NW of the village,

16 October 2005, leg. P. Benda. – 5 ♂♂, 4 ♀♀ (NMP pb3022–3025, 3027–3030 [S+A], pb3026 [A]), Hawf, gardens above the town, 14 October 2005, leg. P. Benda. – 1 ♂, 1 ♀ (NMP pb3054 [S+A], 3055 [A]), desert ca. 25 km WSW of Sayhut, 17 October 2005, leg. P. Benda. – 2–3 inds., Wadi Daw'an, palmeria ca. 2 km S of Al Khuraybah, 19 October 2005, det. P. Benda. – 1 ♂ (NMP 92106 [S+A]), Socotra, Faka Spring, Wadi Erher, 24 November 2002, leg. B. Pražan and A. K. Nasher. – 1 ♀ (NMP 90587 [S+A]), Socotra, Wadi Es Gego, 12 May 2004, leg. P. Benda and A. Reiter.

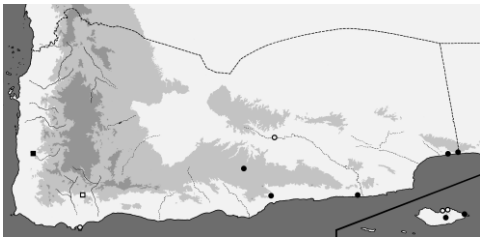

Figure 8 - Records of *Eptesicus nasutus* (squares) and *Hypsugo ariel* sensu lato (circles) in Yemen. Closed symbols, new records, open symbols; published records.

The fairy pipistrelle, *Hypsugo ariel* (some populations were formerly called *H. bodenhemeri*, see Simmons, 2005), is a bat occurring in western and southern Arabia and eastern Egypt (Benda et al. 2008). The Yemeni distribution represents the southernmost and easternmost occurrence spots of the species range. The species is relatively common in southern regions of Israel and Jordan (see Benda et al. 2008 for a review), but only one record is available from Saudi Arabia, from the Asir escarpment near Ta'if (Gaucher and Harrison 1995). In the Yemeni mainland two record sites distant from each other were available, one male having been collected in the Slave island [Jazirat al Abid = Jazirat al Ummal] at Aden (Harrison 1964) and three bats in Seiyun, Wadi Hadramaut (Harrison 1960). Two records were published from the island of Socotra (Menu 1987; Guichard 1992), but the occurrence of this bat in the island was questioned for a long time (Corbet 1978; Jones et al. 1982; Koopman 1993; Horáček et al. 2000; Cesarini 2003; Wranik 2003), although two specimens were available in the BMNH collection.

Our records come from both the mainland and Socotra (Fig. 7). In Socotra, the number of both records and specimens has doubled. In the Yemeni mainland, five new record sites are known now, all are oases surrounded by bare deserts lying in the eastern portion of the country. These records represent an extension of the species range up to the Omani border (Fig. 9).

Figure 9 - Fertile landscape at Hawf, easternmost corner of Yemen (photo by P. Benda). Seven bat species were recorded there during four nights, *Rousettus aegyptiacus*, *Rhinolophus clivosus*, *Asellia tridens*, *Triaenops persicus*, *T. parvus*, *Hypsugo ariel*, and *Tadarida aegyptiaca*.

However, mainland and Socotran populations of *H. ariel* differ in their external morphology. While the mainland bats are pale, their dorsal pelage coloration varying from creamy to very pale brownish-grey and wing membranes, face and ears being unpigmented to brown, the island bats are dark, their pelage being brown with rusty tinges and naked parts looking dark brownish-grey (Fig. 10 and Harrison 1964; for descriptions of *H. ariel* see also Harrison 1960; 1964; Harrison and Bates 1991; Gaucher and Harrison 1995; Riskin 2001). Such difference had been already observed by Corbet (1978: 54), who stated concern-

ing the *H. bodenheimeri* [= *H. ariel*] distribution: "A single specimen from Socotra in the British Museum is possibly referable to this species but is very dark."

Figure 10 - Coloration of three individuals of bats of the *Hypsugo ariel* group (photos by A. Reiter, P. Benda and D. Král). From top to bottom: A – female, Wadi Es Gego, Socotra (NMP 90587); B – male, Hawf, eastern Yemen (NMP pb3022); C – male, Al Nueimah, central Yemen (NMP pb3058).

Morphological comparison showed the mainland and island populations to be very similar in cranial and dental characters, even when an extensive material of the whole *ariel*-group, composed of *H. ariel* and *H. arabicus* (Harrison, 1979), from the Middle East (incl. Egypt) was compared (see the comparative material below). Nevertheless, some differences were found.

Concerning the body and skull sizes and skull massiveness, the Socotran bats were the most distinct in the whole set, while the samples of *H. arabicus* and continental *H. ariel* were much more similar to each other rather than the continental samples of *H. ariel* to the Socotran samples. On the other hand, the Socotran samples felt between *H. arabicus* and continental *H. ariel* when considering both the shape of the skull and some relative dimensions such as the width of the infraorbital constriction, braincase width, length and width of rostrum.

The Socotran bats were the largest among the compared samples; in the absolute values of most dimensions they exceeded both *H. arabicus* and continental *H. ariel* (Tab. 2). In comparison to samples of the latter forms, the skulls of the Socotran bats were very large (Fig. 11). Although the rostrum in the Socotran samples was proportionally very similar to those in *H. ariel* and *H. arabicus*, their braincases were absolutely and relatively high. The greatest differences were found in the dimensions of molars and molar-rows, the absolute and relative dimensions of the Socotran samples exceeded those of *H. ariel* and *H. arabicus* (Tab. 2, Fig. 12); the molars of the Socotran samples were absolutely and relatively longer in their mesio-distal dimensions than those of the other species, and also the third upper molars looked very large.

Results of the principal component analysis (PCA) for all skull dimensions clearly separated the Socotran samples from the samples of *H. ariel* from all three continental populations (Egypt, Holy Land, Yemen) as well as from the samples of *H. arabicus* from Oman and Iran (Fig. 13; PC1=56.84% of variance; PC2=16.18%). The PCA absolutely isolated the Socotran bats (PC1<–1.7) from the continental samples of both species (PC1>–1.7), and these samples differed from each other according to PC2: *H. arabicus* PC2>0.5, continental *H. ariel* PC2<0.1.

Table 2 - Biometry (mean±SD and min-max in mm) of the compared material of the genus *Hypsugo*.

	Hypsugo lanzai sp. nov.			*Hypsugo ariel*			*Hypsugo arabicus*		
	n	Mean±SD	Min-max	n	Mean±SD	Min-max	n	Mean±SD	Min-max
LAt	3	31.87±0.802	31.10-32.7	35	30.45±1.145	28.1-33.7	21	31.02±0.772	28.9-32.4
LCr	4	12.26±0.123	12.10-12.38	34	11.46±0.326	10.63-12.12	17	11.39±0.193	10.97-11.66
LCb	4	11.72±0.118	11.64-11.89	34	10.96±0.357	10.19-11.71	16	10.77±0.196	10.36-11.06
LaZ	2		7.31-7.55	28	6.97±0.211	6.41-7.33	14	7.18±0.195	6.93-7.52
LaI	4	2.97±0.067	2.91-3.06	34	2.64±0.121	2.42-3.04	17	2.88±0.097	2.69-3.01
LaInf	4	3.83±0.054	3.75-3.88	34	3.53±0.166	3.22-3.86	17	3.28±0.127	3.07-3.42
LaN	4	6.09±0.045	6.04-6.13	34	5.56±0.161	5.10-5.87	17	5.82±0.164	5.64-6.10
LaM	4	6.42±0.077	6.33-6.48	34	6.07±0.203	5.44-6.53	17	6.15±0.119	5.96-6.32
ANc	4	4.43±0.055	4.35-4.47	34	3.94±0.140	3.66-4.25	17	4.07±0.136	3.76-4.35
ACr	4	5.56±0.088	5.45-5.66	32	5.14±0.185	4.55-5.51	17	5.30±0.125	5.04-5.52
CC	4	3.63±0.051	3.58-3.69	34	3.41±0.146	3.20-3.73	17	3.28±0.139	3.01-3.44
MM	4	5.03±0.076	4.92-5.08	33	4.68±0.185	4.23-5.18	17	4.60±0.128	4.35-4.82
CM^3	4	4.28±0.092	4.19-4.41	33	3.92±0.162	3.62-4.28	17	3.90±0.096	3.72-4.10
M^1M^3	4	3.05±0.050	2.97-3.08	31	2.78±0.122	2.53-3.05	17	2.73±0.069	2.58-2.84
CP^4	4	1.70±0.070	1.64-1.80	32	1.70±0.082	1.50-1.84	17	1.70±0.071	1.59-1.86
LCs	4	0.87±0.000	0.87-0.87	29	0.88±0.070	0.76-1.02	16	0.84±0.039	0.76-0.89
LaCs	4	0.85±0.044	0.82-0.88	29	0.82±0.069	0.61-0.93	16	0.68±0.044	0.61-0.79
ACn	4	0.07±0.044	0.04-0.10	27	0.08±0.043	0.00-0.20	16	0.09±0.027	0.03-0.13
LP^3	4	0.18±0.052	0.15-0.22	29	0.22±0.047	0.16-0.39	15	0.23±0.032	0.18-0.29
LM^1	4	1.21±0.074	1.16-1.27	29	1.13±0.060	1.01-1.25	16	1.14±0.044	1.05-1.21
LaM^1	4	1.40±0.007	1.39-1.40	29	1.34±0.077	1.20-1.51	16	1.29±0.034	1.25-1.35
LM^3	4	0.74±0.007	0.73-0.74	29	0.67±0.035	0.61-0.75	16	0.66±0.034	0.59-0.72
LaM^3	4	1.56±0.044	1.53-1.59	29	1.39±0.078	1.27-1.57	16	1.30±0.059	1.19-1.39
M^3sq	4	1.15±0.044	1.12-1.18	29	0.93±0.087	0.77-1.17	16	0.86±0.077	0.70-0.96
LMd	4	8.32±0.252	8.02-8.63	34	7.78±0.232	7.42-8.22	17	7.64±0.165	7.38-7.88
ACo	4	2.42±0.140	2.24-2.58	34	2.32±0.100	2.12-2.57	17	2.27±0.084	2.11-2.42
CM_3	4	4.47±0.090	4.35-4.57	34	4.14±0.182	3.64-4.47	17	4.11±0.080	3.93-4.24
M_1M_3	4	3.30±0.058	3.21-3.34	32	3.03±0.143	2.66-3.29	17	2.92±0.091	2.79-3.11
CP_4	4	1.42±0.046	1.36-1.47	31	1.39±0.073	1.25-1.53	17	1.41±0.035	1.35-1.47
LCi	4	0.60±0.000	0.60-0.60	29	0.59±0.055	0.47-0.70	16	0.59±0.019	0.57-0.63
LP_3	4	0.35±0.022	0.34-0.37	28	0.36±0.046	0.27-0.46	16	0.36±0.025	0.30-0.41
LM_1	4	1.17±0.096	1.10-1.24	29	1.08±0.048	0.96-1.17	16	1.06±0.041	0.96-1.13
LM_3	4	1.13±0.037	1.10-1.15	28	1.02±0.058	0.92-1.13	16	0.96±0.041	0.89-1.03

Table 2 - Continues

	Hypsugo lanzai sp. nov.			*Hypsugo ariel*			*Hypsugo arabicus*		
	n	Mean±SD	Min-max	n	Mean±SD	Min-max	n	Mean±SD	Min-max
CM^3/LCr	4	0.349±0.007	0.343-0.358	33	0.342±0.010	0.323-0.365	17	0.343±0.006	0.332-0.353
CC/CM^3	4	0.847±0.017	0.825-0.864	33	0.868±0.026	0.820-0.916	17	0.839±0.029	0.770-0.891
LaM/LCr	4	0.523±0.002	0.521-0.526	34	0.530±0.013	0.503-0.575	17	0.540±0.008	0.524-0.554
LaN/LCb	4	0.520±0.007	0.511-0.527	34	0.507±0.015	0.483-0.550	16	0.541±0.015	0.511-0.567
ANc/LCr	4	0.361±0.002	0.360-0.363	34	0.344±0.011	0.323-0.367	17	0.357±0.011	0.343-0.383
ACr/LCr	4	0.453±0.003	0.450-0.457	31	0.449±0.014	0.421-0.485	16	0.466±0.009	0.449-0.478
CP^4/M^1M^3	4	0.557±0.023	0.533-0.588	31	0.614±0.028	0.571-0.674	17	0.624±0.037	0.588-0.699

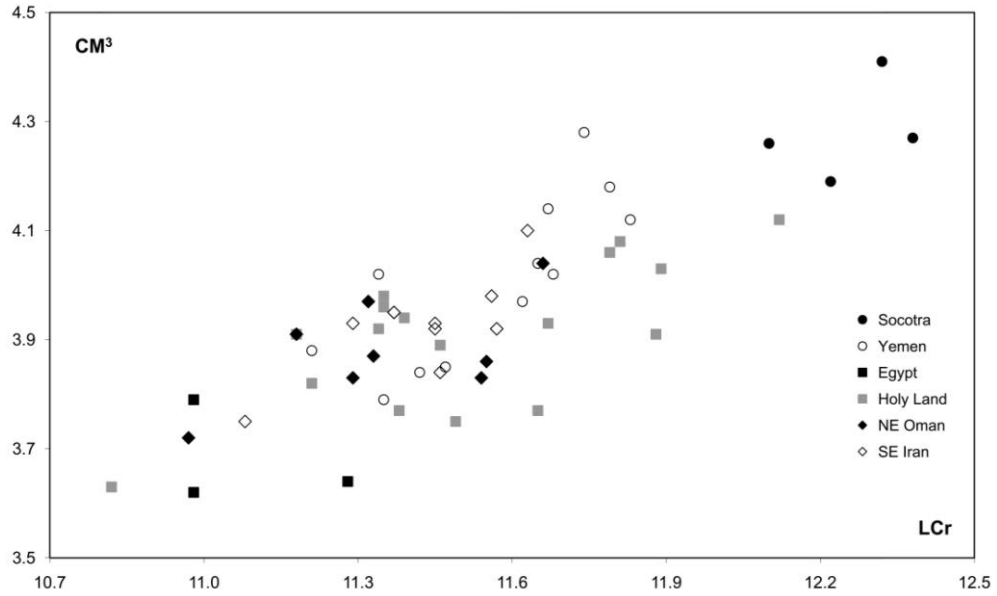

Figure 11 - Bivariate plot for the examined samples of the *Hypsugo ariel* group: greatest length of the skull (LCr) *vs.* the length of the upper tooth-row (CM^3).

The only baculum examined was an elongated, 2.14 mm long, flattened manger-like stick (Fig. 14). It was similar in size to that of *H. arabicus* (2.2–2.9 mm; Harrison 1982; Hill and Harrison 1987; Harrison and Bates 1991), but its distal epiphysis was simply pointed (while in *H. arabicus* it is tridentally divided) and its diaphysis was slightly broadened (while in *H. arabicus* it is equally wide along its whole length). The baculum of Arabian and Egyptian *H. ariel* is 1.4–1.8 mm long (Harrison 1982; Hill and Harrison 1987; Harrison and Bates 1991) and the largest width of the diaphysis represents 25–28% of its baculum length, while only 18% in the Socotran specimen.

As the Socotran populations of the genus *Hypsugo* represent a unique morphological and also geographical unit, markedly differing in their coloration, skull, dental and bacular morphology from other populations

of the *Hypsugo ariel* group, we propose to designate them as a separate species:

***Hypsugo lanzai* sp. nov.**

SYNONYMY. ***Pipistrellus bodenheimeri*** Harrison, 1960: Corbet 1978: 54; Corbet and Hill 1980: 67; Jones et al. 1982: 197; Menu 1987: 97, 126; Koopman 1993: 220; Guichard 1992: 187; Koopman 1994: 115; Al-Jumaily 1998: 484; Wranik 1998: 145; Wranik 1999: 98; Riskin 2001: 1; Wranik 2003: 88; Hoofer et al. 2006: 991; Cesarini 2007: 136. – ***Hypsugo bodenheimeri*** (Harrison, 1960): Horáček et al. 2000: 127; Simmons 2005: 490. – ***Hypsugo ariel*** (Thomas, 1904): Benda et al. 2005: 19; Benda et al. 2006: 139; Benda et al. 2008: 95.

TYPE MATERIAL. **Holotype**: ♀ (NMP 90587, field No. pb2743 [S+A],), Socotra, Wadi Es Gego, 12 May 2004, leg. P. Benda and A. Reiter. – **Paratypes**: 1 ♂ (BMNH 67.1255 [S+B]), Socotra, Suq, 16 April 1967, leg. K. M. Guichard. – 1 ind. (BMNH 54.1031 [S]), Socotra, Ghadeb [= Qadub], leg. G. B. Popov. – 1 ♂ (NMP 92106 [S+A]), Socotra, Faka Spring, Wadi Erher, 24 November 2002, leg. B. Pražan and A. K. Nasher.

TYPE LOCALITY. Yemen, Island of Socotra, Wadi Es Gego, 12° 28' N, 54° 01' E, 295 m a. s. l. (Fig. 15).

DESCRIPTION AND DIAGNOSIS. Small vespertilionid bat and a smaller representative of the genus *Hypsugo* Kolenati, 1856, but the largest member of the *ariel*-group, composed also of *H. ariel* (Thomas, 1904) from Egypt, Sudan and western Arabia and *H. arabicus* (Harrison, 1979) from eastern Arabia and Persian Baluchestan. *H. lanzai* sp. nov. resembles both closely related species in most respects, however, on average it is the largest representative of the group in most of the examined dimensions (see Tab. 2 for biometric comparison). Forearm is rather long (LAt 31–33 mm) and skull is large (LCr 12.1–12.4 mm). Rostrum of *H. lanzai* sp. nov. is proportionally very similar to *H. ariel* and *H. arabicus*, but braincase is absolutely and relatively high (ANc 4.3–4.5 mm; ANc/LCr 0.360–0.363), absolutely very wide (LaN 6.0–6.1 mm, LaM 6.3–6.5 mm), but relatively medium-wide (LaN/LCb 0.511–0.527; LaM/LCr 0.521–0.526). Unicuspid teeth are relatively small (LCs0.87 mm; LaCs 0.82–0.88 mm, LCi

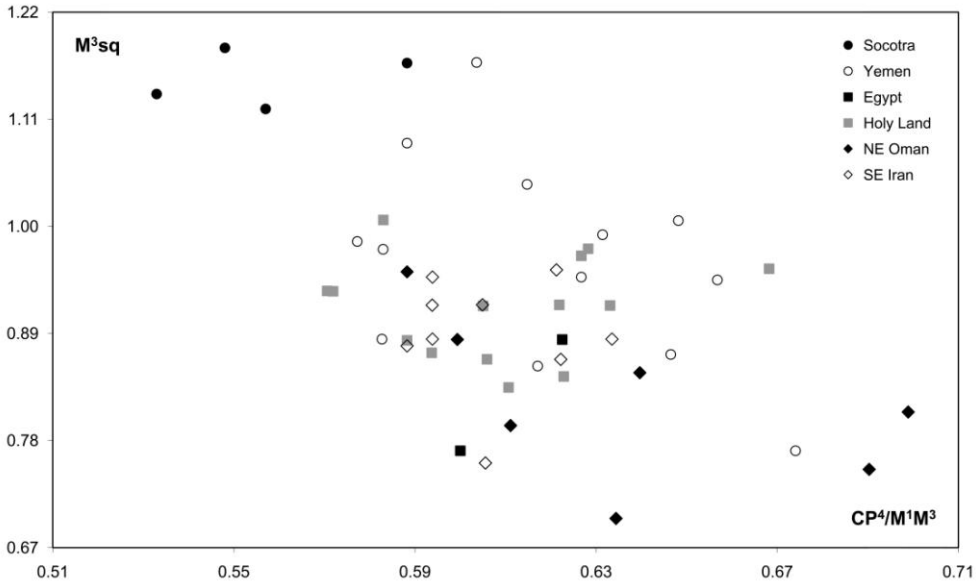

Figure 12 - Bivariate plot for the examined samples of the *Hypsugo ariel* group: relative length of the upper unicuspid- and molar-rows (CP^4/M^1M^3) *vs.* the crown square of the third upper molar (M^3sq).

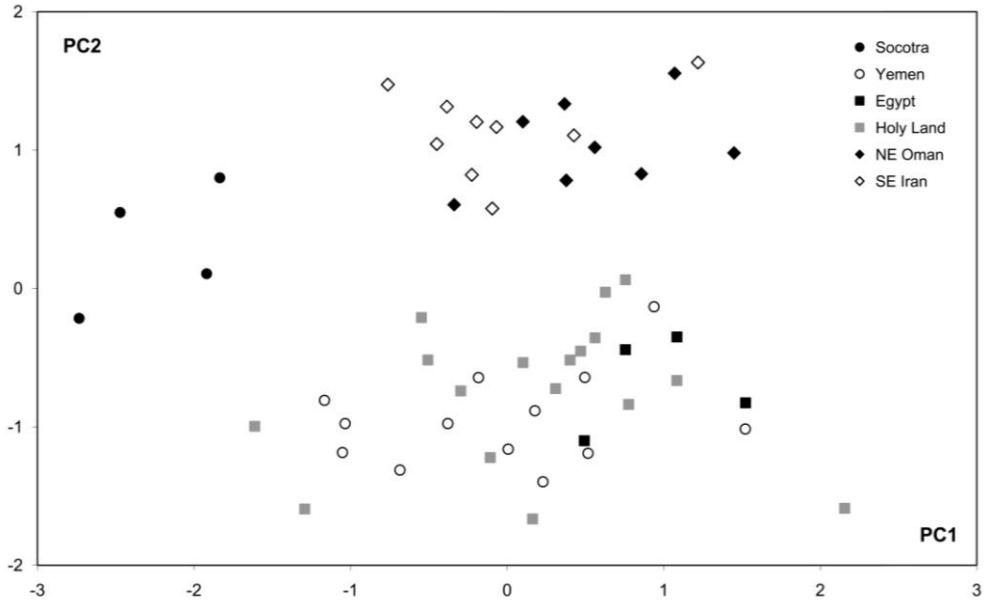

Figure 13 - Results of the principal component analysis for the examined samples of the *Hypsugo ariel* group.

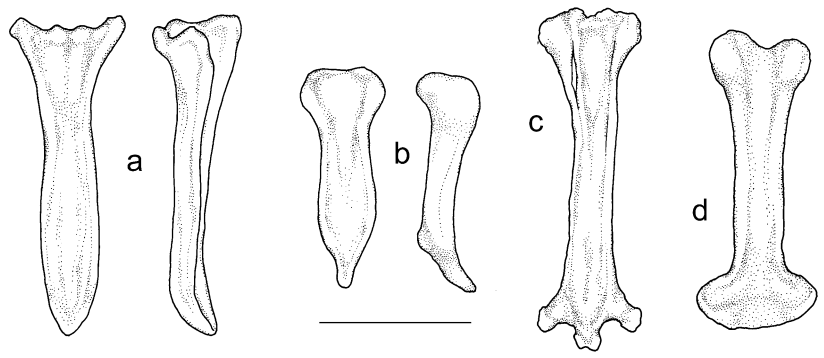

Figure 14 - Baculum preparations from bats of the genus *Hypsugo*. a – *Hypsugo lanzai* sp. nov., NMP 92106, paratype, Faka Spring, Socotra; b – *Hypsugo ariel*, TAU M8054, En Gedi, Israel; c – *Hypsugo arabicus*, NMP 48418, Pir Sohrab, Iran; d – *Hypsugo savii*, NMP 48069, Slinfeh, Syria. Scale bar = 1 mm.

0.60 mm; LP^3 0.15–0.22 mm, LP_3 0.34–0.37 mm) and unicuspid tooth-row relatively short, but molars and molar-rows absolutely and relatively long (M^1M^3 2.97–3.08 mm; M_1M_3 3.21–3.34 mm; CP^4/M^1M^3 0.533–0.588). Molars are mesio-distally long (LM^1 1.16–1.27 mm; LM^3 0.73–0.74 mm; LM_1 1.10–1.24 mm; LM_3 1.10–1.15 mm) and the third upper molars also very wide (LaM^3 1.53–1.59 mm; M^3sq 1.12–1.18 mm^2). Mandible and mandibular tooth-rows are long (LMd 8.0–8.7 mm;

CMi 4.35–4.57 mm), the coronoid process is high (ACo 2.24–2.58 mm), but relatively rather low (ACo/LMd 0.302–0.310).

Figure 15 - Wadi Es Gego, Socotra (photo by A. Reiter). Type locality of *Hypsugo lanzai* sp. nov.

Baculum of *H. lanzai* sp. nov. is in its shape similar to other representatives of the genus *Hypsugo* (see Fig. 14, and Hill and Harrison, 1987). The only examined specimen is an elongated, 2.14 mm long, flattened manger-like stick, with simply pointed distal epiphysis and slightly broadened diaphysis (the largest width of diaphysis represents 18% of the whole baculum length). External appearance of the male genitalia remains unknown.

Coloration of *H. lanzai* sp. nov. is generally much darker than in other members of the group (Fig. 10). The dorsal and ventral pelage is brown with slight rusty tinge; the ventral side is negligibly paler. Dorsal hairs are 6–7 mm long, their proximal parts are dark chestnut brown, distal parts (ca. 1/2) are brown to rusty brown; ventral hairs are ca. 5 mm long, their proximal parts are dark chestnut brown, distal parts (ca. 1/3) pale brown to ochraceous. Wing membranes are greyish-brown, without pale margin, the ventral side of the uropatagium is slightly paler than the dorsal side. Ears and naked parts of the face are greyish-brown. Tail end extends 1.5–3.0 mm from the uropatagium. For other details concerning the differential diagnosis see the comparison above and Tab. 2.

DISTRIBUTION. The island of Socotra, Yemen (Fig. 7).

ETYMOLOGY. Patronymic; named in honour of the famous Italian biologist and physician, founder of the modern Italian bat studies, Professor Benedetto Lanza, Florence.

COMPARATIVE MATERIAL. ***Hypsugo ariel*** (Thomas, 1904): **Egypt**: 2 ♀♀ (NMP 92597, 92598 [S+A]), El A'aqab, N of Aswan, 25 January 2010, leg. P. Benda, I. Horáček and R. Lučan. – 1 ♂ (CDIS 946 [S+A]), Sinai, Ain Hudra, 4 August 2005, leg. C. Dietz. – 1 ♂ (CDIS 945 [S+A]), Sinai, Wadi El Arbaein, 1 August 2005, leg. C. Dietz. – 1 ♂, 1 ♀ (NMP 90493, 90494 [S+A]), Sinai, Wadi El Feiran, 8 September 2005, leg. M. Andreas, P. Benda, J. Hotový and R. Lučan. – 1 ♂, 1 ♀ (BMNH 4.11.4.6., 4.11.4.7. [S+B], incl. holotype of *Pipistrellus ariel* Thomas, 1904), Wadi Alagy, E Desert of Egypt, 22 N, 35 E, 2000 ft. [Sudanese administrative area], 12 August 1903, leg. A. M. Mackilligin. – **Israel**: 1 ♂, 2 ♀♀ (HUJ M6182 [S+A], TAU M6866 [B], TAU M8054 [A]), En Gedi, May 1975, leg. Z. Greenberger; 11 April 1976, leg. H. Mendelssohn; 19 October 1987, leg. Y. Yom-Tov and Y. Barak. – 1 ♀ (BMNH 67.1229. [S+B], holotype of *Pipistrellus bodenheimeri* Harrison, 1960), Yotvata, Wadi Araba, 13 October 1959, leg. D. L. Harrison. – 1 ind. (TAU M8639 [S]), Yotvata, Wadi Araba, August 1989, collector unlisted. – **Jordan**: 7 ♂♂, 1 ♀ (NMP 92488–92494 [S+A], 92487 [A]), Al Ghal, 17 May 2009, leg. P. Benda and A. Reiter. – 1 ♂, 1 ♀ (NMP 92378, 92380 [S+A]), Tall Numeira, 17 October 2008, leg. P. Benda and J. Obuch. – 1 ♂ (NMP 92095 [S+A]), Wadi Rum, 24 October 2004, leg. R. Lučan. – **Oman**: 1 ♂ (NMP 92754 [S+A]), 4 km W of Jufa, 29 October 2009, leg. P. Benda, A. Reiter and M. Uhrin. – ***Hypsugo arabicus*** (Harrison, 1979): **Iran**: 4 ♂♂, 8 ♀♀ (NMP 48409, 48410, 48414–48420 [S+A], 48411–48413 [A]), Pir Sohrab, Beluchestan, 12 April 2000, leg. P. Benda and A. Reiter. – **Oman**: 1 ♂ (NMP 92624 [S+A]), Al Aqar, 2 km S of Wakan, 17 October 2009, leg. P. Benda, A. Reiter and M. Uhrin. – 2 ♂♂ (NMP 92665, 92666 [S+A]), Al Nakhar, 22 October 2009, leg. P. Benda, A. Reiter and M. Uhrin. – 1 ♂ (NMP 92779 [S+A]), wadi 7 km W of Dibab, 2 November 2009, leg. P. Benda, A. Reiter and M. Uhrin. – 2 ♂♂, 1 ♀ (NMP 92782, 92783 [S+A], 92784 [A]), Mansaft, 3 November 2009, leg. P. Benda, A. Reiter and M. Uhrin. – 1 ♀ (NMP 92774 [S+A]), Muqal, 1 November 2009, leg. P. Benda, A. Reiter and M. Uhrin. – 1 ♂ (BMNH 80.393. [S+B], holotype of *Pipistrellus arabicus* Harrison, 1979), Wadi Sahtan, 23 22'N, 57 18'E, 18 March 1979, leg. M. D. Gallagher.

Figure 16 - Male of *Neoromicia guineensis* (NMP pb3662), Wadi Bani Khawlan, SW Yemen (photo by A. Reiter).

***Neoromicia guineensis* (Bocage, 1889)**

NEW RECORDS. 3 ♂♂ (NMP pb3663, 3664 [S+A], pb3662 [A]), 20 km NNW of Ash Shuqayrah, Wadi Bani Khawlan, 27 October 2007, leg. P. Benda and A. Reiter. – 2 ♂♂ (NMP pb3124, 3125 [S+A]), Jebel Bura, 5 km W of Riqab, 30 October 2005, leg. P. Benda.

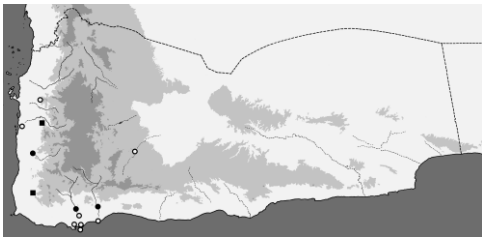

Figure 17 - Records of *Neoromicia guineensis* (squares) and *Nycticeinops schlieffenii* (circles) in Yemen. Closed symbols, new records; open symbols, published records.

Five small *Pipistrellus*-like bats (Fig. 16) collected at two sites in western and southwestern Yemen (Fig. 17) represent a new species recorded for the country as well as for Arabia and Asia as they do not conform in their morphology to any bat known from western Asia (cfr. Harrison and Bates 1991; DeBlase 1980). The bats are small, LAt 25.2–26.9 mm, LCb 10.6–11.0 mm (Tab. 1), show dark brown pelage, dark grey to blackish wing membranes, dark brown or greyish ears and face, myotodont lower molars, unicuspid or very weakly bicuspid first upper incisors, second upper incisors ca. half of the first ones in size, and lack small upper premolars.

According to these characters, the bats belong to small dark-winged serotines of the *capensis* group, formerly placed either in the genus *Eptesicus* Rafinesque, 1820 (Rosevear 1965; Largen et al. 1974; Happold 1987; Koopman 1993) or *Pipistrellus* Kaup, 1829 (Hill and Harrison 1987; Koopman 1994; Yalden et al. 1996), but recently considered a part of the genus *Neoromicia* Roberts, 1926 (Volleth et al. 2001; Kearney et al. 2002; Simmons 2005). In northern Africa, this group is composed of three species (Koopman 1975; Happold 1987), *N. capensis* (Smith, 1829), *N. somalica* (Thomas, 1901), and *N. guineensis* (Bocage, 1889) (for the gender modification of the genus name *Neoromicia* see Riccucci and Lanza 2009). Peterson et al. (1995) and Simmons (2005) suggested a fourth species occurring in East Africa, *N. zuluensis* (Roberts, 1924), otherwise mainly known for southern Africa.

The former three species differ from each other in their dimensions (Kock 1969; Vielliard 1974; Koopman 1975; Bergmans 1977; Koch-Weser 1984; Decher et al. 1997; Lavrenchenko et al. 2004). A synthesis of these data is as follows; *N. guineensis*: NE Africa (Sudan, Tchad, Ethiopia): LAt 27.0–30.0 mm, LCb 10.3–11.4 mm; W Africa (Guinea, Ghana, Burkina Faso): LAt 26.0–29.6 mm, LCb 10.5–11.2 mm; *N. somalica* NE Africa: LAt 26.0–30.0 mm, LCb 11.2–12.2 mm; *N. capensis* NE Africa: LAt 28.0–33.0 mm; LCb 12.0–12.6 mm. Dimensions of the Yemeni bats (Tab. 1) conform to those of the smallest form of the group, *N. guineensis*, therefore we here refer the newly collected bats to this species. Since the Yem-

eni specimens were males only, it is still possible that sexual dimorphism plays a role, with males being smaller than females.

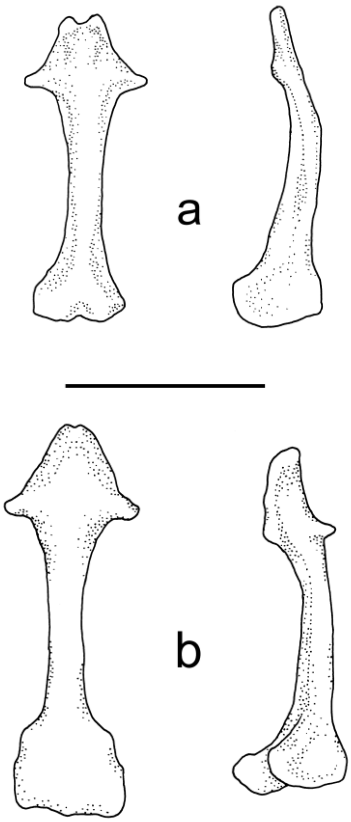

Figure 18 - Bacula of *Neoromicia guineensis* from Yemen. a – NMP pb3125, Jebel Bura, W Yemen; b – NMP pb3663, Wadi Bani Khawlan, SW Yemen. Scale bar = 1 mm.

However, since also *N. zuluensis* is reported to occur in NE Africa (Simmons, 2005), the possibility that the Yemeni bats belong to this species cannot be rejected. *N. zuluensis* bats from southern Africa have been reported to be very close in size to *N. guineensis* from western and northeastern Africa (Ansell 1969; Happold et al. 1987; Taylor 2005). Peterson et al. (1995) found *N. zuluensis* to be morphologically closest to *N. guineensis*, however, did not give any details concerning metrical or morphological characters. The mutual taxonomic positions of the (vicariant?) forms *guineensis* and *zuluensis* still remain unresolved and the taxonomy of the whole *capensis* group should be subjected to a thorough revision (see Hayman et al. 1966; Aggundey and Schlitter 1984; Happold 1987; Happold et al. 1988). The examined bacula of the Yemeni bats (Fig. 18) roughly correspond in their size and shape to those of the *Neoromicia* species (Hill and Harrison 1987), except for *N. capensis* (Kearney et al. 2002). Anyway, they do not help to resolve any possible taxonomic ambiguity.

N. guineensis occurs across the savanna belt from Senegal and Guinea to Ethiopia and northeastern DR Congo (Koopman, 1993; 1994; Simmons 2005). According to Koopman (1975), Largen et al. (1974) and Kock (1981), *N. guineensis* inhabits northeastern Africa up to 12° 02' N and 46° 19' E. However, it is much rarer in the region than the two sympatric species of the group. Hence, the records from Yemen significantly extend northeastwards the known distribution range of *N. guineenesis*.

Nycticeinops schlieffenii (Peters, 1859)

NEW RECORDS. 1 ♀ (MSNG 45840 [S+A]), Aden, 1880, leg. A. Pagliani. – 1 ♀ (NMP pb3801 [S+A]), Ba Tays, Wadi Bana, 8 November 2007, leg. P. Benda, A. K. Nasher and A. Reiter. – 3 ♀♀ (NMP pb3601, 3602 [S+A], pb3600 [A]), Kadamat Al 'Abdali, Wadi Tuban, 24 October 2007, leg. P. Benda and A. Reiter. – 5 ♂♂, 4 ♀♀ (NMP pb3707, 3709–3711, 3713, 3715, 3716 [S+A], 3712, 3717 [A]), Wadi Zabid, ca. 10 km SE of Al Mawqir, 30 October 2007, leg. P. Benda and A. Reiter.

Schlieffen's twilight bat, *Nycticeinops schlieffenii*, is an Afrotropical species, widely distributed in savannas of sub-Saharan Africa from Mauritania and Eritrea to South Africa, in Egypt, Sudan and southwestern Arabia (Simmons 2005). The centre of its Arabian range lies in western Yemen, where numerous records are avail-

able (Fig. 17); only two old findings are known from southwestern Saudi Arabia (Harrison 1964). Except for the finding by Harrison (1964) from Beihan [= Bayhan al Qisab], lying on the upper plateau of central Yemeni deserts at 1125 m a.s.l., all known record localities from Yemen are from coastal lowland deserts of the southwestern and western parts of the country, between El-Kod [= Al Kawd] in the south and Durayhimy in the northwest (Matschie 1893; Yerbury and Thomas 1895; Thomas 1900; Harrison 1985; Harrison and Bates 1991; Wranik et al. 1991). Our new findings, as well as the specimen discovered in the MSNG collection, come from the lowland desert area where most of the previous records were made (Fig. 19).

Figure 19 - Wadi Bani Khawlan, southwestern foothills of the Sarawat Mts. at a margin of lowland deserts, SW Yemen (photo by A. Reiter). Site of netting of four bat species, *Eidolon helvum*, *Nycteris thebaica*, *Neoromicia guineensis*, and *Chaerephon pumilus*.

Scotophilus dinganii (Smith, 1833)

NEW RECORDS. 1 ♀ (NMP pb3599 [A]), Kadamat Al ‘Abdali, Wadi Tuban, 24 October 2007, leg. P. Benda and A. Reiter. – 10 ♂♂, 5 ♀♀ (NMP 3643, 3647, 3649, 3651, 3652 [S+A], pb3640–3642, 3644–3646, 3648, 3650, 3653, 3654 [A]), Mashgab, ca. 10 km S of Ash Shamsara, 26 October 2007, leg. P. Benda and A. Reiter. – 2 ♂♂, 2 ♀♀ (NMP pb3086–3088 [S+A], pb3085 [A]), 7 km S of Najd An Nashamah, 25 October 2005, leg. P. Benda. – 3 ♂♂, 3 ♀♀ (NMP pb3065–3069 [S+A], pb3070 [A]), 5 km S of Suq ad Dabab, 24 October 2005, leg. P. Benda. – 1 ♂, 2 ♀♀ (coll. 2 spec., NMP pb3092, 3093 [S+A]), Wadi Maytam, 12 km SE of Ibb, 26 October 2005, leg. P. Benda. – 6 ♂♂, 16 ♀♀ (coll. 9 spec., NMP pb3718, 3819, 3722, 3725 [S+A], pb3720, 3721, 3723, 3724, 3726 [A]), Wadi Zabid, ca. 10 km SE of Al Mawqir, 30 October 2007, leg. P. Benda and A. Reiter. – 2 ♀♀ (NMP pb3677 [S+A], pb3676 [A]), Wadi Zabid, ca. 6 km W of Qaryat al Hasib, 29 October 2007, leg. P. Benda and A. Reiter. – ca. 10 foraging inds., acacia shrubbery at Al Hadr, 22 October 2005, obs. P. Benda. – ca. 10 foraging inds., sandy desert ca. 5 km NW of Lahj al Hutah, 23 October 2005, obs. P. Benda.

Arabian populations of *Scotophilus* Leach, 1821, traditionally assigned to *S. nigrita* (Schreber, 1774) or *S. leucogaster* (Cretzschmar, 1830) (see Harrison 1964; Harrison and Bates 1991; Gaucher 1993; Al-Jumaily 1998; 2004), are here ascribed to the yellow-bellied house bat, *S. dinganii* (see also Simmons 2005), in accordance with the taxonomic revision by Robbins et al. (1985). This species has the widest distribution among the African representatives of the genus (Robbins et al. 1985), occurring in the whole sub-Saharan Africa from Senegal and Sierra Leone in the west to Eritrea and Somalia in the east and to Namibia and Natal in the south.

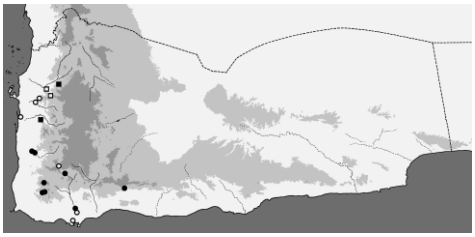

Figure 20 - Records of *Scotophilus dinganii* (circles) and *Miniopterus natalensis* (squares) in Yemen. Closed symbols, new records; open symbols, published records.

In Arabia, *S. dinganii* occurs solely in the southwestern corner of the peninsula. One record is known from Saudi Arabia: five bats were netted on the foot of the Reydah escarpment, at about 500 m a. s. l. (Harrison and Bates 1991; Gaucher 1993), and

six record sites of this bat are available from western Yemen. Harrison (1964) reported a specimen from Lahj and Wranik et al. (1991) one from Saber, both in the Aden area. Three records came from the Al Hudaydah region: Al Kadan and Wadi Qualaiah (Al-Safadi 1991) and near Al Hudaydah (Harrison and Bates 1991). Al-Jumaily (2004) mentioned a finding in the mountain region of Ibb, from the Al Thahar quarter. The new records from lowland bare deserts at 200–300 m a.s.l. (four records; Fig. 20), and from rather fertile mountain areas at 1140–1615 m a.s.l. (five records; Fig. 21). All together, the available records suggest that *S. dinganii* inhabits the whole area of southwestern Arabia, confirming the ecological plasticity of this species in the main African distribution range.

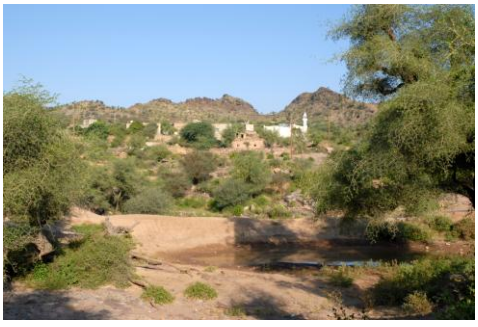

Figure 21 - Mashgab, cultural landscape in the southern part of the Sarawat Mts., SW Yemen (photo by A. Reiter). Area of evidence of *Eidolon helvum*, *Rousettus aegyptiacus*, *Pipistrellus* aff. *kuhlii*, and *Scotophilus dinganii*.

***Plecotus* cf. *balensis* Kruskop et Lavrenchenko, 2000**

NEW RECORD. 1 ♂ (BCSU 436 [S+B]), Al Ahjur, 15 June 2007, leg. M. Al-Jumaily and Bashir.

The taxonomic assignation of the populations of the genus *Plecotus* Geoffroy, 1818 inhabiting the mountains of southwestern Arabia has not yet been resolved (in the sense of the revision by Spitzenberger et al. 2006). This form was first reported by Nader and Kock (1990b) on the basis of two bats collected in Misfera, Asir Mts., SW Saudi Arabia. The authors ascribed their findings to *Plecotus austriacus* (Fischer, 1829), a species then considered to be widespread in the southern Palaearctic and North Africa, but did not specify the subspecies, although they emphasised its distinction from *P. austriacus christii* Gray, 1838 [= *P. christii*] from Egypt and the Levant. The second record of this form was made in northwestern Yemen, four individuals were found by Al-Jumaily (2004) in a school building in Al Masajed, ca. 10 km from Sana'a (Fig. 22). The latter author mentioned that "these bats show the specific characters of *P. austriacus christii* as described by Nader and Kock (1990[b]) and Harrison and Bates (1991), however, the taxonomy of the genus is in need of revision" and thus relinquished to give any close species identification and determined

Figure 22 - Records of *Plecotus* cf. *balensis* (squares) and *Tadarida aegyptiaca* (circles) in Yemen. Closed symbols, new records; open symbols, published records.

the bats tentatively as *Plecotus* cf. *austriacus*. In their revisions, Benda et al. (2004) and Spitzenberger et al. (2006) did not suggest any opinion concerning the taxonomy of the southwestern Arabian populations of *Plecotus*. However, *P. austriacus* s.str. is a species occurring solely in the southern part of Europe (Juste et al. 2004; Spitzenberger et al. 2006), and it could

hardly be expected to occur in southern Arabia. The recently established species *P. christii* is a pale-coloured form distributed in lowland deserts of NE Africa and the Levant (Nader and Kock 1990b; Benda et al. 2004; 2008) and its occurrence in high mountains of southwestern Arabia is also unlikely.

To detect possible taxonomic affiliation of the South Arabian populations, we performed a simple morphological comparison of Saudi Arabian and Yemeni samples (all the above mentioned six specimens from both countries) with other forms of *Plecotus* from Africa, Europe and southwestern Asia, viz. *P. balensis* Kruskop et Lavrenchenko, 2000 from Ethiopia, *P. gaisleri* Benda, Kiefer, Hanák et Veith, 2004 from North Africa, *P. christii* Gray, 1838 from Egypt and the Levant, *P. macrobullaris* Kuzjakin, 1965 from mountains of the Middle East and South Europe, *P. austriacus* (Fischer, 1829), *P. kolombatovici* Đulić, 1980, *P. auritus* (Linnaeus, 1758), and *P.* (*auritus*) *begognae* de Paz, 1994 from Europe (for the comparative material see Benda et al. 2004; 2008). Relatively to these taxa, the South Arabian samples are small to medium-sized (LAt 39.9–41.6 mm, LCr 16.3–16.8 mm), with small to medium-sized tympanic bullae (LBT 4.1–4.6 mm), absolutely and relatively very short and narrow rostrum (CM^3 5.0–5.5; IM^3/LCr 0.35–0.38; CC 3.3–3.7 mm; CC/CM^3 0.64–0.70), medium-wide and medium-high braincase (LaN/LCr 0.48–0.50; ANc/LCr 0.30–0.32), and mesio-distally long but palato-labially narrow upper molars (length×width of M^3 0.57–0.60×1.56–1.60 mm). The South Arabian samples showed remarkable similarities in most of these characters to two closely distributed taxa, *P. christii* and *P. balensis* (see the re-descriptions by Benda et al. 2004), except for the size of the tympanic bullae, which are on average medium-sized to large in *P. christii* (LBT 4.4–4.9 mm), and the relative dimensions of the braincase, which is very narrow and rather low in *P. christii* and rather wide and high in *P. balensis*. On the other hand, the comparison showed dissimilarities of South Arabian bats from samples of all other compared species from the Mediterranean and more northern areas (see Benda et al. 2004 for their characteristics). The South Arabian populations seem to be a part of the *christii* subgroup, although characterised by relatively very short and narrow rostra (Fig. 23), narrow cheek-teeth and NE African/Arabian distribution (Benda et al. 2004; Spitzenberger et al. 2006).

The pelage coloration of the South Arabian bats is greyish-brown both dorsally and ventrally (ventral pelage is slightly paler), while wing membranes and naked parts of the face and ears are brownish-grey. This coloration is markedly darker than in the pale desert representatives of *P. christii*, while it is somewhat paler than in the Ethiopian *P. balensis* (see also Kruskop and Lavrenchenko 2000). However, such difference could reflect different habitat preferences: the Ethiopian bats are inhabitants of mountain forests, while South Arabian bats occur on semiarid mountain plateaus. Kruskop and Lavrenchenko (2000) described also the baculum of *P. balensis*, which is quite different from that of *P. christii* (Benda et al. 2004); unfortunately, no baculum is available from South Arabian specimens.

Since the South Arabian populations of *Plecotus* are morphologically, geographically (Nader and Kock 1990b) and presumably also ecologically (mountain-dwellers) very close to the Ethiopian *P. balensis*, we here tentatively assign the South Arabian population to this species.

Al Ahjur, the site of a new record of *P.* cf. *balensis* in Yemen, is a mountainous (2400 m a. s. l.), relatively humid area, very close to the locality of the previous Yemeni record (Al-Jumaily 2004; Fig. 22).

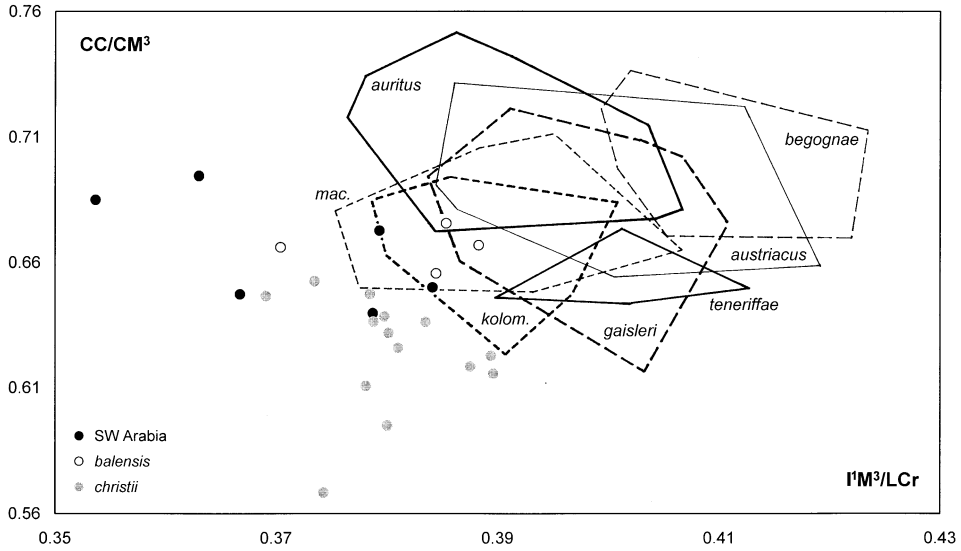

Figure 23 - Bivariate plot for the examined samples of the genus *Plecotus*: relative length of the rostrum (I^1M^3/LCr) *vs.* its relative width (CC/CM^3). Polygons include comparative samples for the following taxa: *P. auritus*: n=43; *P. austriacus*: n=67; *P. begognae*: n=15; *P. gaisleri*: n=45; *P. kolombatovici* (*kolom.*): n=22; *P. macrobullaris* (*mac.*, incl. *P. m. alpinus*): n=52; for details see text and Benda *et al*. (2004).

Miniopteridae

***Miniopterus natalensis* (Smith, 1834)**

NEW RECORDS. 1 ♂ (NMP pb3747 [S+A]), Halhal, ca. 10 km NE of Hajja, 2 November 2007, leg. P. Benda and A. Reiter. – 5 ♂♂, 2 ♀♀ (NMP pb3126–3131 [S+A], pb3132 [A]), Jebel Bura, 5 km W of Riqab, 30 October 2005, leg. P. Benda.

The Natal long-fingered bat, *Miniopterus natalensis*, was formerly considered a part of the European species of the genus, Schreiber's bat, *M. schreibersii* (Kuhl, 1817) (e.g. Koopman 1993). However, the African populations, including those living in southern Arabia, have been successively designed as a separate species, based on biogeographic and molecular genetic grounds (see Koopman 1994; Appleton et al. 2004; Miller-Butterworth et al. 2005; Simmons 2005). *M. natalensis* occurs in eastern and southern Africa, its range in Arabia being restricted to the southwestern part of the peninsula. Four records are available from Saudi Arabia; Nader (1982) reported it from Abha and Harrison and Bates (1991) from the Abha-Raydah escarpment, Ablah, and from near Ta'if. In Yemen only two very closely localised records are known from the northwestern part of the country (Fig. 20): Nader and Kock (1987) reported two bats from At Tur, 40 km W of Hajjah and Al-Jumaily (2004) two bats from the Hud Sawa Cave at Al Mahwit, in the roost of a large colony of *Otomops martiensseni*. Our two new records come from the same part of Yemen and do not much extend the known Arabian range of the species.

Molossidae

***Tadarida aegyptiaca* (Geoffroy, 1818)**

NEW RECORDS. 2 ♂♂, 1 ♀ (NMP pb3106–3108

[S+A]), 5 km W of Hammam Ali, 27 October 2005, leg. P. Benda. – 11 ♂♂, 12 ♀♀ (coll. 12 spec., NMP pb2982–2984, 2986–2990, 2995, 2996 [S+A], pb2985, 2991 [A]), Hawf, gardens above the town, 12–13 October 2005, leg. P. Benda. – 1 ♂, 3 ♀♀ (NMP pb3133–3136 [S+A]), Jebel Bura, 5 km W of Riqab, 30 October 2005, leg. P. Benda. – 3 ♂♂ (NMP pb3603, 3602 [S+A], pb3605 [A]), Kadamat Al ‘Abdali, Wadi Tuban, 24 October 2007, leg. P. Benda and A. Reiter.

The Egyptian free-tailed bat, *Tadarida aegyptiaca*, is an Afro-Indian faunal element, distributed in North, Central, East and South Africa, in the southern Middle East (southern parts of Arabia, Iran and Afghanistan), and in India and Sri Lanka (Simmons 2005). In Arabia, it occurs in two distant regions, in the southwest (SW Saudi Arabia and Yemen) and in the east (NE Oman) (Harrison and Bates 1991).

In southwestern Saudi Arabia *T. aegyptiaca* was reported twice, by Jennings (1979) from Sabikak, and by Harrison and Bates (1991) from the Al Baha escarpment. Three available records from Yemen come from as many areas; one specimen from Wadi Saghir, Lahj, i.e. from lowland deserts of the southwest, two bats from Thukmein, Hadramaut, in the oasis of the central Yemeni desert, and three specimens from the Taizz area, i.e. anthropogenic habitats in the high mountains of western Yemen (Al-Safadi 1991).

The five new records also come from various parts of Yemen (Fig. 22). Two records were made in lowland areas, below 320 m a. s. l., in a desert wadi near Lahj (Wadi Tuban) and in a hilly country adjacent to the deserts of the Tihama plain (Jebel Bura); two records come from very closely situated sites in a fertile area near Hawf, in the easternmost part of the country, at about 700 m a.s.l. The last new record was made at Hammam Ali, at 1585 m a. s. l. These records cover all main habitats and altitude zones and most of the territory of Yemen, suggesting that *T. aegyptiaca* is widespread in southwestern Arabia.

Chaerephon nigeriae Thomas, 1913

NEW RECORDS. 12 ♂♂, 6 ♀♀ (coll. 10 spec., NMP pb3139–3146 [S+A], pb3137, 3138 [A]), Jebel Bura, 5 km W of Riqab, 30 October 2005, leg. P. Benda. – 1 ♂, 1 ♀ (NMP pb3734 [S+A], pb3733 [A]), Wadi Zabid, ca. 10 km SE of Al Mawqir, 30 October 2007, leg. P. Benda and A. Reiter. – 1 ♂ (NMP pb3678 [S+A]), Wadi Zabid, ca. 6 km W of Qaryat al Hasib, 29 October 2007, leg. P. Benda and A. Reiter.

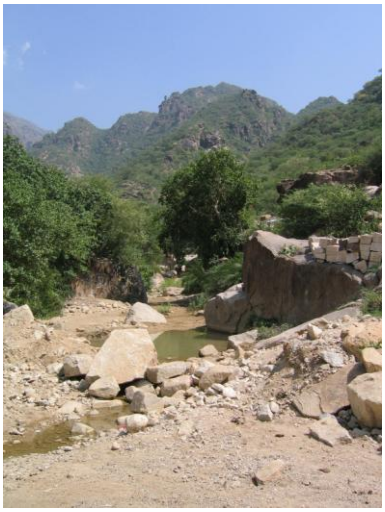

Figure 24 - Jebel Bura, foothills of the Sarawat Mts., western Yemen (photo by P. Benda). Habitat of a rich bat community; eight bat species were recorded there during one netting session, *Eidolon helvum*, *Rousettus aegyptiacus*, *Rhinolophus clivosus*, *Triaenops persicus*, *Neoromicia guineensis*, *Miniopterus natalensis*, *Tadarida aegyptiaca*, and *Chaerephon nigeriae*.

The Nigerian free-tailed bat, *Chaerephon nigeriae*, is an Afrotropical species, distributed in almost whole sub-Saharan Africa, from Sierra Leone and southern Mali in the west to Ethiopia and Tanzania in the east and to northern Namibia and Botswana in the south (Al-Jumaily, 2002; Simmons, 2005). About Arabia (and Asia as well), this species has been known from only three findings in the southwestern part of the peninsula. Nader and Kock (1980)

reported two individuals collected in Abha, Asir Mts., and Harrison and Bates (1991) recorded a specimen from the Abha-Raydah escarpment, both from southwestern Saudi Arabia. Al-Jumaily (2002) reported one male bat collected at Bani Khawli, Quful Shammar, Hajja region, northwestern Yemen.

Three new records from western Yemen (Fig. 6) extend the known Arabian range of the species southward. The findings were made at about 300 m a. s. l., in a belt of semi-desert habitats at the western foothills of the Sarawat range bordering the deserts of the Tihama plain, while all the published records come from ca. 2200 m a. s. l. Eighteen (both adult and subadult) out of the 21 individuals collected, were netted above a small water pool at Jebel Bura (Fig. 24), which may represent a natural foraging area for the species.

Chaerephon pumilus (Cretzschmar, 1831)

NEW RECORDS. 2 ♂♂, 5 ♀♀ (NMP pb3667, 3670 [S+A], pb3665, 3566, 3568, 3569, 3671 [A]), 20 km NNW of Ash Shuqayrah, Wadi Bani Khawlan, 27 October 2007, leg. P. Benda and A. Reiter. – 2 ♂♂ (NMP pb3626 [S+A], pb3627 [A]), Am Rija', Wadi Am Rija', 25 October 2007, leg. P. Benda and A. Reiter. – 6 ♂♂, 7 ♀♀ (coll. 8 spec., NMP pb3804, 3806 [S+A], pb3802, 3803, 3805, 3807–3809 [A]), Ba Tays, Wadi Bana, 8 November 2007, leg. P. Benda, A. K. Nasher and A. Reiter. – 24 ♂♂, 58 ♀♀ (coll. 8 spec., NMP pb3752, 3755 [S+A], pb3748–3751, 3753, 3754 [A]), Halhal, ca. 10 km NE of Hajja, 2 November 2007, leg. P. Benda and A. Reiter. – 8 ♂♂, 17 ♀♀ (coll. 16 spec., NMP pb3606, 3607, 3619 [S+A], pb3608–3618, 3620, 3621 [A]), Kadamat Al 'Abdali, Wadi Tuban, 24 October 2007, leg. P. Benda and A. Reiter. – 2 ♂♂ (NMP pb3154, 3155 [S+A]), Wadi Al Lahm, ca. 20 km W of Al Mahwit, 1 November 2005, leg. P. Benda. – 23 ♂♂, 42 ♀♀ (coll. 4 spec., NMP pb3730, 3731 [S+A], pb3729, 3732 [A]), Wadi Zabid, ca. 10 km SE of Al Mawqir, 30 October 2007, leg. P. Benda and A. Reiter. – 6 ♂♂, 7 ♀♀ (NMP pb3679, 3685, 3686 [S+A], pb3680–3684, 3687, 3688 [A]), Wadi Zabid, ca. 6 km W of Qaryat al Hasib, 29 October 2007, leg. P. Benda and A. Reiter.

The little free-tailed bat, *Chaerephon pumilus*, is an Afrotropical species, distributed in the whole sub-Saharan Africa from Senegal to Sudan and Eritrea and to South Africa; it occurs also in African islands of the Indian Ocean, incl. Madagascar (Simmons 2005). In Arabia, it occurs solely in the southwestern corner of the peninsula; two record sites are available from southwestern Saudi Arabia (Hayman and Harrison 1950; Harrison 1964) and at least eight from western Yemen (Al-Jumaily 1998; 2004). The Arabian records represent the northernmost fringe of the known distribution range of the species (Taylor 2005).

Figure 25 - Wadi Tuban near Kadamat Al 'Abdali, desert lowlands of southern Yemen (photo by A. Reiter). Foraging area of *Triaenops persicus*, *Nycticeinops schlieffenii*, *Scotophilus dinganii*, *Tadarida aegyptiaca*, and *Chaerephon pumilus*.

The published Yemeni findings of *C. pumilus* come from two rather distant regions; the Aden region in the southwest, where records are known from Aden and Sheikh Othman [= Shaykh Uthman] (Harrison 1964; Wranik et al. 1991), and the regions of Al Hudaydah and Hajjah, from an area limited by Wadi Zabid in the south and At Tur in the north (Sanborn and Hoogstraal 1953; Nader and Kock 1980; Al-Safadi 1991; Harrison and Bates 1991; Al-Jumaily 1998; 2002; 2004). Our records increase the number of *C. pumilus* occurrence sites known from Yemen almost twice; currently *C. pumilus* occurs in a broad belt of desert habitats in western

(Tihama) and southern Yemen, as far as to Wadi Bana at Ba Tays, northeast of Aden (Fig. 25). This site represents the easternmost record of this species in Asia.

Within the large amount of netted individuals of *C. pumilus* (39 adult, 32 subadult and 1 juvenile males, 104 adult, 48 subadult and 6 juvenile females, 4 females were lactating), adult females dominated. Juveniles were captured between 24 and 29 October (incl.), while lactating females were netted between 1 and 8 November (incl.), suggesting two events of reproduction in the Yemeni populations of *C. pumilus*, one parturition term could occur around the end of October (according to the presence of lactating females in early November), however, the other term might occur some two months before, around the end of August (according to the presence of juveniles but not lactating females in late October). Such pattern is in accordance with the findings by Happold and Happold (1989), who, for several populations of this bat throughout its African range, mentioned up to five parturitions in two-month intervals. It should be investigated whether such high number of cycles may occur every season or only in the years of high food availability (Happold and Happold 1989). Presumably, food supply in the desert habitats of southwestern Arabia could vary considerably between the seasons.

DISCUSSION

Two bat species, *Epomophorus labiatus* and *Neoromicia guineensis*, were recorded in Yemen for the first time, both these Afrotropical species occur solely in the westernmost part of Yemen. *N. guineensis* is recorded for the first time also from Arabia and Asia as well. The most important and/or numerous records were made for *Rousettus aegyptiacus*, *Eptesicus nasutus*, *Hypsugo ariel*, *Scotophilus dinganii*, *Plecotus* cf. *balensis*, *Miniopterus natalensis*, *Tadarida aegyptiaca*, and *Chaerephon nigeriae*. Additional distribution data are given also for *Hipposideros tephrus*, *Taphozous perforatus*, *Coleura afra*, *Nycticeinops schlieffenii*, and *Chaerephon pumilus*. *Hypsugo lanzai* sp. nov. is here described as a new taxon representing the only endemic mammal of the Socotran Archipelago.

Al-Jumaily (2004) mentioned 27 bat species in the fauna of Yemen. Later on, Benda and Vallo (2009) described another species of bat from Yemen, *Triaenops parvus*, and in the present paper three other species are reported from the country for the first time. Thus, the Yemeni bat fauna now consists of 31 species. Besides the new Socotran endemic, the two newly recorded species belong to Afrotropical faunal elements, more or less widely distributed in the sub-Saharan part of Africa. Here we can present a revised assignment of particular faunal elements within the Yemeni bat fauna:

Afrotropical Elements (13 spp.; 41.9% of the Yemeni bat fauna): *Eidolon helvum*, *Epomophorus labiatus*, *Hipposideros tephrus*, *Coleura afra*, *Myotis bocagii*, *Neoromicia guineensis*, *Nycticeinops schlieffenii*, *Scotophilus dinganii*, *Plecotus* cf. *balensis*, *Miniopterus natalensis*, *Chaerephon nigeriae*, *C. pumilus*, and *Otomops martienseni*; **Saharo-Sindian Elements** (3 spp.; 9.7%): *Rhinopoma cystops*, *Asellia tridens*, and *Hypsugo ariel*; **West-Palaearctic Elements** (2 spp.; 6.5%): *Myotis emarginatus* and *Eptesicus bottae*; **Combined Elements I** (Afrotropical-Palaearctic; 5 spp.; 16.1%): *Rousettus aegyptiacus*, *Rhinolophus clivosus*,

R. blasii, *Taphozous perforatus*, and *Nycteris thebaica*; **Combined Elements II** (Afrotropical-Palaearctic-Oriental; 3 spp.; 9.7%): *Taphozous nudiventris*, *Pipistrellus* aff. *kuhlii* s.l., and *Tadarida aegyptiaca*; **Middle East Endemics** (2 spp.; 6.5%): *Triaenops persicus* and *Eptesicus nasutus*; **Yemeni Endemics** (3 spp.; 9.7%): *Rhinopoma hadramauticum*, *Triaenops parvus*, and *Hypsugo lanzai* sp. nov.

Among the seven further bat species which could be expected to occur in Yemen, i.e. those distributed in the southwestern part of Saudi Arabia but not yet found in Yemen (see Harrison and Bates 1991), at least three are Afrotropical elements, viz. *Hipposideros megalotis* (von Heuglin, 1862), *Asellia patrizii* De Beaux, 1931, and *Mops midas* (Sundevall, 1843), while two species are rather of Palaearctic origin, viz. *Rhinolophus hipposideros* (Borkhausen, 1797) and *Tadarida teniotis* (Rafinesque, 1814), and two are Saharo-Sindian elements, viz. *Rhinopoma microphyllum* (Brünnich, 1782) and *Otonycteris hemprichii* Peters, 1859.

Within the bat fauna of Yemen, Delany (1989) mentioned only 28.6% of Afrotropical faunal elements but 33.3% of Combined Afrotropical-Palaearctic elements, then composed of 21 known species. Such relative proportion of the faunal composition is rather unlikely now when the number of species known to occur in Yemen has increased by about a half. Currently, the Afrotropical elements represent a more substantial part of the Arabian fauna. Incidentally, the African species make up 65.4% of the whole mammal Yemeni fauna (Delany 1989).

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APPENDIX
Gazetteer

Locality	**Governorate**	**Coordinates**	**~ Altitude** [m a.s.l.]
Aden	Aden	12° 48’ N, 45° 02’ E	20
Al Ahjur	Al Mahwit	15° 31’ N, 43° 52’ E	2400
Al Anad	Lahj	13° 17’ N, 44° 45’ E	385
Al Hadr, W of Lawdar	Abyan	13° 53’ N, 45° 48’ E	1143
Al Makha	Taizz	13° 19’ N, 43° 15’ E	5
Al Nueimah, WNW of Buwayash	Hadramaut	14° 36’ N, 49° 06’ E	285
Am Rija’, Wadi am Rija’	Lahj	13° 02’ N, 44° 34’ E	300
Ancient Great Dam, W of Ma’rib	Ma’rib	15° 24’ N, 45° 16’ E	1125
NNW of Ash Shuqayrah, Wadi Bani Khawlan	Taizz	13° 20’ N, 43° 43’ E	470
Ba Tays, Wadi Bana	Abyan	13° 21’ N, 45° 18’ E	175
Damqawt, wadi NW of the village	Al Mahra	16° 35’ N, 52° 50’ E	25
Ghayl Ba Wazir, karstic hole	Hadramaut	14° 48’ N, 49° 23’ E	120
Halhal, NE of Hajjah	Hajjah	15 44’ N, 43 37’ E	1060
W of Hammam Ali	Dhamar	14° 41’ N, 44° 07’ E	1585
Hawf, gardens above the town	Al Mahra	16° 39–40’ N, 53° 03-05’ E	230-735
Jebel Bura, W of Riqab	Al Hudaydah	14° 52’ N, 43° 25’ E	320
Kadamat Al ‘Abdali, Wadi Tuban	Lahj	13° 08’ N, 44° 51’ E	200
desert NW of Lahj al Hutah	Lahj	13° 10’ N, 44° 49’ E	260
Mashgab, S of Ash Shamsara	Taizz	13° 21’ N, 43° 57’ E	1170
S of Najd An Nashamah	Taizz	13° 22’ N, 44° 02’ E	1235
Sana village, Sana’a	Sana’a	15° 17’ N, 44° 10’ E	2490
desert 25 km WSW of Sayhut	Al Mahra	15° 10’ N, 51° 02’ E	20
Shuhayr	Hadramaut	14° 41’ N, 49° 24’ E	40
Socotra, Faka Spring, Wadi Erher	Hadramaut	12° 33’ N, 54° 28’ E	5
Socotra, Wadi Es Gego	Hadramaut	12° 28’ N, 54° 01’ E	295
5 km S of Suq ad Dabab	Taizz	13° 30’ N, 43° 57’ E	1305
Wadi ‘Adim, palmeria N of Sah	Hadramaut	15° 41’ N, 48° 52’ E	730
Wadi Al Lahm, W of Al Mahwit	Al Mahwit	15° 26’ N, 43° 29’ E	850
Wadi Daw’an, palmeria S of Al Khuraybah	Hadramaut	15° 09’ N, 48° 26’ E	1005
Wadi Dhahr, NW of Sana’a	Sana’a	15° 27’ N, 44° 10’ E	2245
Wadi Maytam, 12 km SE of Ibb	Ibb	13° 52’ N, 44° 18’ E	1615
Wadi Zabid, SE of Al Mawqir	Al Hudaydah	14° 10’ N, 43° 30’ E	270
Wadi Zabid, W of Qaryat al Hasib	Al Hudaydah	14° 09’ N, 43° 31’ E	300
Zabid, citadel	Al Hudaydah	14° 12’ N, 43° 19’ E	125