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Otonycteris hemprichii.

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Otonycteris Peters, 1859

Otonycteris Peters, 1859: 223. Type species *Otonycteris hemprichii* Peters, 1859.

CONTEXT AND CONTENT. Order Chiroptera, Suborder Microchiroptera, Family Vespertilionidae, Subfamily Vespertilioninae. *Otonycteris hemprichii* is the only currently recognized species in the genus.

Otonycteris hemprichii Peters, 1859

Hemprich's long-eared bat

Otonycteris hemprichii Peters, 1859: 223. Type locality not given, but because the type was collected by Hemprich and Ehrenberg, Kock (1969) restricted it to the "Nile Valley between Aswan in Egypt and Northern Province in Sudan."

Plecotus ustus Fitzinger, 1866:546. Type locality Wadi Halfa, Northern Province, Sudan. *Nomen nudum* (Allen, 1939; Anderson and de Winton, 1902).

Plecotus auritus saharae Laurent, 1936: 408. Type locality El Golea, Algeria.

CONTEXT AND CONTENT. Context same as for genus. Five subspecies are currently recognized (Atallah, 1977; Ellerman and Morrison-Scott, 1951; Harrison and Bates, 1991):

O. h. hemprichii Peters, 1859 (see above). See above for type locality. Including *saharae* (type locality in the Algerian Sahara), *ustus* (type locality in the Sudan).

O. h. cinereus Satunin, 1909:281, 297. According to Ognev (1928), the type locality is in Zarakkuh country, near the Bamrud irrigation ditch in Khurasan (N.E. Iran) and not in Persian Baluchistan as stated in the original description.

O. h. jin Cheesman and Hinton, 1924:549. Type locality Hufuf, Hasa, Saudi Arabia. Perhaps a valid subspecies for Arabian and eastern Mediterranean specimens.

O. h. leucophaeus Severtzov, 1873:18. Type locality NW Turkestan (=Turkmania). Including *brevimanus*.

O. h. petersi Anderson and de Winton, 1902:120. Type locality Fao, Iraq. Possibly a synonym of *O. h. jin* (in that case *petersi* would have priority) based on personal observations.

DIAGNOSIS. Bats of this genus are the largest vespertilionids in their range. They have long prominent ears (up to 42 mm) that are broad with rounded tips and relatively smooth margins. Unlike those of *Plecotus* (long-eared bats), ears of *O. hemprichii* are not joined at the forehead. The tragus is long, directed upwards and outwards, simple, and has no nodules at its base as found in *Plecotus*. The pelage color is white, tinted with yellow to brown. Hairs on the dorsum have whitish-gray bases and pale purple-gray tips. Two pairs of pectoral nipples are found in this species, a condition rare among vespertilionid bats (Madkour, 1976a). The characteristic glans penis is expanded and projects forward between two lateral swellings (Harrison and Bates, 1991).

GENERAL CHARACTERS. *Otonycteris hemprichii* is a relatively large (total length 118–135 mm; length of forearm 50–70 mm) and heavily-built bat (about 20 g; Fairon, 1980; Gaisler et al., 1972). The tail is shorter than head and body (averaging 58 mm) with the tip projecting 4–5 mm beyond the margin of the uropatagium. Although size variation is apparent in available specimens (DeBlase, 1980; Harrison and Bates, 1991; Kowalski and Rzebik-Kowalski, 1991; Qumsiyeh, 1985), the extent to which this variation is geographic cannot be determined because of small sample sizes.

The forehead of this species is not raised above the level of the face, and the large ears are directed nearly horizontally (Fig. 1). The nostrils are simple, crescent-shaped, and located on the side of the snout. Wings are broad and the fifth digit is longer than the fourth. The shallow antibrachial membrane stretches from the shoulders to the base of the first digit of the manus. Each wing membrane arises from the side of the metatarsal of the first digit as in *Plecotus*. The interfemoral membrane is supported by a short calcar and the tip of the tail extends a short distance beyond the uropatagium (Roberts, 1977).

The skull is similar to that of a large *Eptesicus* or *Myotis*, but more elongated and narrow with the interorbital region deeper and lambdoidal ridge shallower (Fig. 2). The dental formula is i 1/3, c 1/1, pm 1/2, m 3/3, total 30. The teeth are similar to those of *Eptesicus*, but are generally heavier, and the outer upper incisor is missing in *Otonycteris*. The remaining single upper incisor is a large unicuspid with a prominent postero-lateral cingulum. M^3 is greatly reduced, without a metacone or mesostyle. The lower incisors are bifid and overlap, forming an even U-shaped curve between the canines. The lower canines are robust (Harrison and Bates, 1991).

DISTRIBUTION. *Otonycteris hemprichii* is rare in collections, but is distributed over a wide range including most desert and subdesert habitats of the Palearctic region (Fig. 3). It is reported from Morocco, north Niger, Algeria, Tunisia, Libya, Egypt, north Sudan, the Arabian Peninsula, Iraq, Iran, northern Pakistan, northern Afghanistan, Turkmenia, Uzbekistan, and Tadzhikistan (Bogdanov, 1953; DeBlase, 1980; Harrison and Bates, 1991; Horacek, 1991; Roberts, 1977). No fossils are specifically reported for this genus. Solounias (1981) described a Turelian (late Miocene) bat, *Samonycteris majori*, as similar to *Otonycteris*, *Eptesicus*, and *Scotophilus*.

FORM. The pelage is dense, soft, and long (reaching 11 mm in the mid-dorsal region), but sparser on the ventral than on the dorsal surface. Ears appear to have a yellowish-brown tinge. The pinna of the ear has nine to ten transverse ridges (Fig. 1). The antitragus of each ear is small and defined by a shallow notch at its origin. The tragus is large, lanceolate, broader at its base, and roughly half the length of the ear (about 20 mm).

The calcar extends to about half the distance between the heel and the tail and has no postcalcareal lobes. Flight membranes are

FIG. 1. Hemprich's long-eared bat, *Otonycteris hemprichii*, from Jordan. Photograph by M. B. Qumsiyeh.

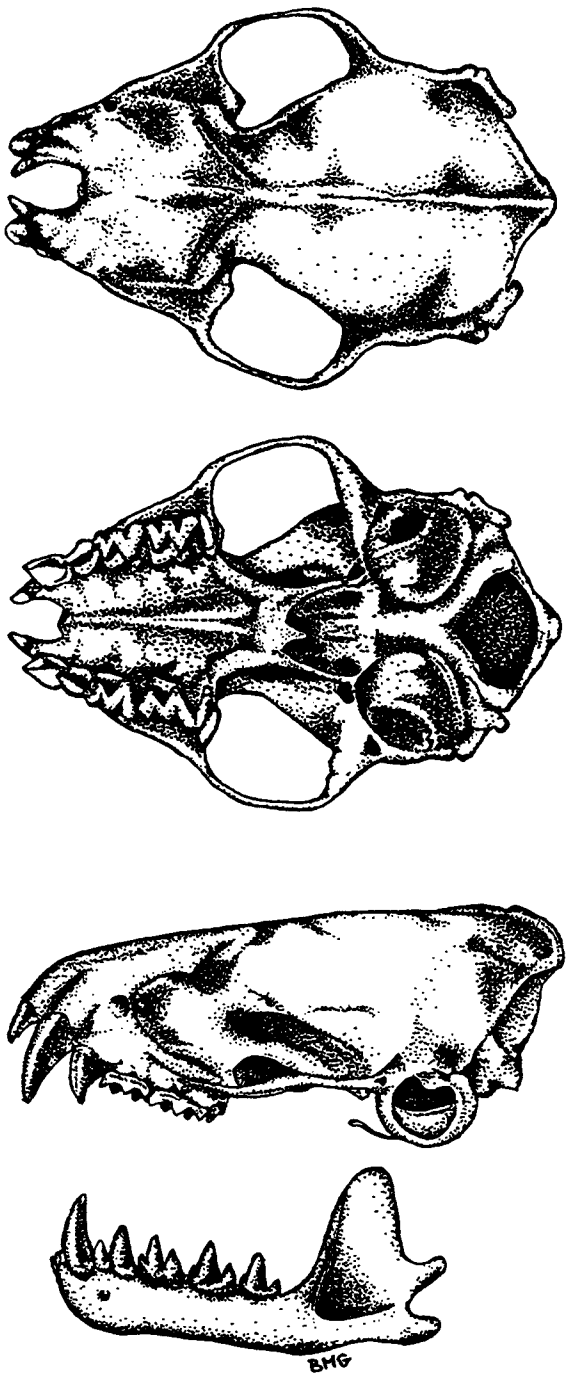

FIG. 2. Dorsal, ventral, and lateral views of cranium and lateral view of mandible of *Otonycteris hemprichii* from Jordan (female, Carnegie Museum of Natural History, 3897). Greatest length of the skull is 24.5 mm. Drawing by B. M. Gharaibeh.

thick and leathery, and almost hairless; they appear pallid and semi-translucent with a yellowish-brown color, more so near the body. Overall, the wings are pale grayish-brown distally, with their extreme tips and posterior margins whitish.

The skull of *O. hemprichii* is large and relatively elongated. The rostrum is comparatively long (greatest length of skull 22–27 mm) and narrow. Supraorbital ridges are very well defined, with prominent angular processes projecting posteriorly. Zygomatic arches are moderately flared. The braincase is elongated with the lambdoid crest forming a V-shaped posterior projection. Mastoids also have blunt angular flanges and the sagittal crest is well developed. Shallow basisphenoid pits are seen opposite to the hamulars on the ventrum of the skull. The tympanic bullae are very large, forming bulges. The mandible has a strong horizontal ramus, high coronoid process, and laterally-deflected angular process.

The following description of the alimentary canal is based on a female *O. hemprichii* from Egypt (Madkour, 1976b). The esophagus is about 28 mm long and the stomach is wide and simple. The small intestine is about 123 mm in length and the hind-gut only 6 mm in length. The tongue has three types of papillae: circumvallate, filiform and fungiform. In *O. hemprichii*, small rounded accessory rugae are found in the spaces between the third, fourth, and fifth pairs of palatal rugae (Wassif and Madkour, 1972b).

The skeletal system has 11 pairs of ribs and a sternum composed of three segments (Wassif and Madkour, 1970b). As shown by the drawing of Wassif and Madkour (1970b), the vertebral column is made up of 7 C, 11 T, 6 L, 5 S- pseudosacral, total 29 + an undetermined number of caudal vertebrae. Unlike other microchiropterans, both sexes of *O. hemprichii* lack a pubic symphysis in the pelvic bone (Wassif and Madkour, 1973). The anterior cornu of the hyoid bone is formed by the stylohyoid alone, a condition also seen in *Plecotus* and *Pipistrellus* (Wassif and Madkour, 1970a).

Otonycteris hemprichii has the largest os penis of Egyptian vespertilionids. It is pivot-shaped, with a short and cylinderical style, and an expanded base. In lateral view, the baculum appears crescent-shaped (Wassif and Madkour, 1972a).

ONTOGENY AND REPRODUCTION. Little reproductive data have been reported for *Otonycteris hemprichii*. DeBlase (1980) examined four females collected in mid-June from northeast Iran and reported no embryos. Gromov et al. (1928) reported a female with two embryos on 12 June from central Asia. Three pregnant females were obtained on 2 May from Azraq Oasis in northeast Jordan, with early June estimated as the date of birth (Atallah, 1977). Two of three females collected on 24 June 1974 in the Air Mountains (Niger) were lactating (Fairon, 1980). Six females from central Asia (no date given; Horácek, 1991), as well as the three from Jordan (Atallah, 1977) were each carrying two embryos. Two males collected from Saudi Arabia, one in August and one in October, had testes 4.2 and 4.8 mm wide, respectively (Harrison and Bates, 1991).

ECOLOGY AND BEHAVIOR. *Otonycteris hemprichii* roosts in the fissures of rocks or in human constructions. It is mostly solitary, but occasional clusters of up to 18 females have been reported (Bogdanov, 1953). Its habitats are xeric, sparsely vegetated, and usually rocky. This bat seems to be well adapted to arid climates. During flight, Hemprich's long-eared bats appear to hover close to the ground (personal observations by MBQ in South Jordan) and have been caught in nets at heights of 10 cm to 3 m (Horácek, 1991). Norberg and Fenton (1988) showed that wing parameters in this species are similar to *Antrozous*, a carnivorous bat. Stomach contents indicate diets consisting of tenebrionids, Blattoidea, and Orthoptera (Horácek, 1991). Captive individuals have also been fed geckos (Gorelov, 1977).

Hemprich's long eared bats start their activity just before dusk, flying low along rocks. Later in the evening, they fly 4–9 m above the ground. Flight patterns include circles 20–60 m in diameter and straight flight without fluttering or quick maneuvers (Gromov et al., 1928; Horácek, 1991). Hemprich's long-eared bat emits short series of low frequency clicks with regular low repetition rate increasing when approaching a prey and terminating with feeding. Calls range from 18–40 kHz with a maximum intensity at 30–32 kHz. When flying low, this bat seems to stop echolocating suggesting that when feeding on a non-flying prey, *O. hemprichii* is a facultative echolocator. This bat emits a second regular harmonic with half the intensity of the first and a third harmonic with a rather low intensity of about 75 kHz (Horácek, 1991).

The only reported predator of these animals is the barn owl *Tyto alba*. Remains of this bat were found in barn owl pellets in Djanet, Algeria (Heim de Balsac, 1965). A helminth parasite, *Anchitrema sauguinum*, was described from several Egyptian bats including *O. hemprichii* (Saoud and Ramadan, 1977).

GENETICS. In the eastern part of its range, Hemprich's long-eared bat has a diploid number of 30 with sixteen metacentrics, four submetacentrics, six acrocentrics, two "dot-like chromosomes," a submetacentric X and a small Y (dot-like; Zima et al., 1991). Zima et al. (1992) also compared chromosomes of *Otonycteris*, *Plecotus*, and *Myotis* and proposed that *Otonycteris* chromosomes are composed of the following primitive (sensu Bickham, 1979) arm

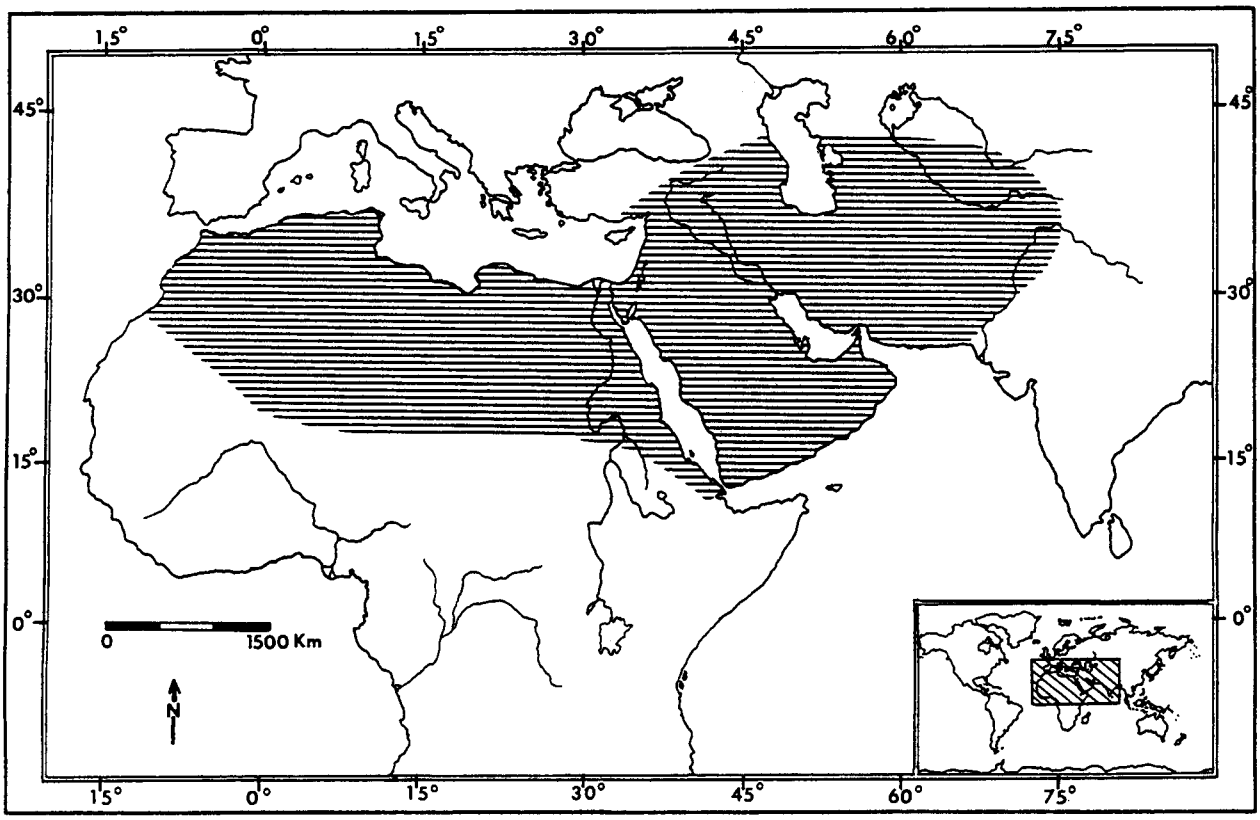

FIG. 3. Known distribution of *Otonycteris hemprichii* in Africa, the Near East, and central Asia. Subspecies ranges are not indicated because the small number of specimens in scattered museums have not permitted geographic variation to be studied.

combinations: 1/2, 3/4, 5/6, 19/7, 21/8, 12/9, 15/10, 14/11, 18/13, 16/17, 20, 22, 23, 24 (identitity uncertain), X, and Y. Qumsiyeh and Bickham (1993) reevaluated these homologies and reported the following arm combinations for one Jordanian specimen based on G-band analysis: 1/2, 3/4, 5/6, 14/11, 16/17, 21/9, 15/20-9, 21/7, 12/10, 22/8, 24-19/13, 23, X, and Y. The difference in diploid numbers between the Jordanian specimens ($2n$ = 28) and the Caucasian material ($2n$ = 30) is interesting and may reflect subspecies differences.

REMARKS. According to Koopman (1993), *Otonycteris* is a distinct genus that has no obvious relationship to other vespertilionid species. Miller (1907) suggested a relationship to *Eplesicus*, *Scoteinus*, and *Scotomanes*. Handley (1959) did not address *Otonycteris* in his revision of the American genera *Euderma* and *Plecotus* (which at that time included *Corynorhinus* and *Idionycteris* as subgenera), probably based on the view of Miller (1907) that *Otonycteris* was a distant relative of plecotine bats. Hill and Harrison (1987) included *Otonycteris* in the Plecotini but also included *Rhogeesa*, *Baedon*, and *Nycticeius* in the group. Both morphological (Bogdanowics and Owen, 1994; Hill and Harrison, 1987; Horácek, 1991) and chromosomal (Qumsiyeh and Bickham, 1993; Volleth and Heller, 1994; Zima et al., 1992) data suggest that *Otonycteris* is closely related to *Plecotus* and *Barbastella*, both of which belong to the tribe Plecotini. More studies on the relationship of *Rhogeesa* and *Nycticeius* are needed. As discussed earlier, *Otonycteris* has a striking external resemblance to *Antrozous* and other carnivorous insectivores, but this is probably the result of parallelism. *Otonycteris* is derived from the Greek *otos* meaning ear and *nycterido*, bat. Another, but uncommon, vernacular name for *Otonycteris hemprichii* is Hemprich's arrow-eared bat.

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