



A recent collection of bats from Nepal, with notes on *Eptesicus dimissus*

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Abstract

Field work in and near Royal Chitwan National Park, Nepal, conducted during March 1990, resulted in the capture of 143 specimens of bats, including the following species: *Rousettus leschenaulti*, *Cynopterus sphinx*, *Eonycteris spelaea*, *Scotophilus heathi*, *Eptesicus dimissus*, *Pipistrellus javanicus*, *Pipistrellus coromandra*, *Pipistrellus tenuis*, *Nyctalus noctula*, *Hesperoptenus tickelli*, *Miniopterus pusillus*, *Miniopterus schreibersi*, *Murina cyclotis*, and *Kerivoula picta*. Of these, *E. spelaea* and *E. dimissus* are reported for the first time from Nepal, and the presence of *M. pusillus* and *K. picta* is verified and locality records provided. Additional information is provided about the morphology and systematic status of *E. dimissus*, which is currently known only from the holotype.

Key words: *Eptesicus dimissus*, Chiroptera, mammals, systematics, Nepal

Introduction

The bats of Nepal have received surprisingly little attention. In a recent compilation of the chiropteran fauna of the Indian subcontinent, BATES and HARRISON (1997) indicated that only 47 species have been recorded from Nepal. Based on their distributions in neighboring areas, however, we suspect that at least 40 additional species might be expected to occur in that country. The aim of this study was to improve knowledge of the bat fauna of the especially poorly known lowlands of southwestern Nepal.

Material and methods

Bats were collected in the Royal Chitwan National Park, Chitwan District, Narayani, Nepal, during March 1990. A small collection was also made in Kathmandu. All collecting was done using mist nets. In total, 143 bats were collected; specimens are deposited in the University of Michigan Museum of Zoology, American Museum of Natural History, and Tribhuvan University Natural History Museum in Nepal. All specimens were preserved in formalin and later transferred to alcohol; skulls were removed from some to facilitate identification.

This report provides a brief description of collecting sites and an account of the species collected. Previous published records of each species from Nepal are noted (but only if they refer to actual specimens collected, rather than being summaries of previous work or providing lists of species “anti-ci-

pated" for Nepal). Some species clearly exhibit considerable geographic variation, but these patterns are poorly documented. For that reason, we report standard skin and forearm measurements of all bats (TL = total length, T = tail length, HF = hind foot length with claws, E = ear length from notch, TR = length of tragus, FA = forearm length) and cranial measurements for specimens for which cleaned skulls are available (CB = condylobasal length; CC = breadth across canines; MAX = maxillary tooththrow length; LPAL = length of palate, measured from the anterior border of the palatines at the midline to the anterior border of the mesopterygoid fossa; BPAL = breadth of palate, the maximum distance between right and left upper molar tooththrows measured from the labial sides; ZYGO = breadth across the zygomatic arches; BB = breadth of braincase measured at the widest point). All measurements were taken with calipers and are given as an average expressed in mm. Sample size is also reported.

Results and discussion

Collections were made at the following localities:

(1) Kathmandu 85°19.6'E, 27°43.2'N, elevation 1340 m (3 March). A net was suspended from a bridge at the mouth of a large sewage tunnel, approximately 3 m high by 5 m wide. The above-ground stream formed by the effluent was lined by a thick growth of small trees and shrubs.

(2) Sauraha, Narayani, 84°29.5'E, 27°34.2'N, elevation 200 m (5–11 March). The Nepal Conservation Research and Training Center consists of a large brick laboratory-office building and 12 wooden buildings in a clearing at the edge of Royal Chitwan National Park. It is surrounded by the town of Sauraha and agricultural fields to the north, deciduous riverine forest south and west and a government elephant camp to the east. The forest is characterized by trees up to 20 m high, a non-continuous canopy, and dense undergrowth. It is transected by many trails made by people, domestic elephants, and wild rhinos. A river, the Dungari Khola, passes 200 meters from the research station. It is approximately 20 m across and appears to average 1–1.5 m in depth. Nets were placed at the edge of a clearing and over trails entering into the clearing (10 net-nights), near buildings in which bats (pipistrelles) were observed to roost (10 net-nights), and over the river (10 net-nights).

(3) Royal Chitwan National Park, Nandon Tal 84°28.7'E, 27°32.1'N (7 March). The forest is fairly open. Sal (*Shorea robusta*) trees are dominant, and in most areas there is a heavy understory of shrubs and grasses. Nets (six total) were placed over a stream, two small ponds, and across forest trails.

(4) Royal Chitwan National Park, Dudora Nala/Park rd 84°27.4'E, 27°33.6'N, 4.3 km SW Sauraha (13–15 March). At this locality, a small, slow stream, the Dudora Khola, crosses Park Road. The stream averages around 5 m wide and 30 cm deep. The surrounding mixed deciduous forest consists of large sal and simal (*Bombax ceiba*) trees, with a mid-story of vellar (*Trewia nudiflora*), *Litsea monopetala*, *Carea aborea*, *Ehretia laevis*, *Butea monosperma*, and *Bahinia malabarica*. The treetops are covered with vines and epiphytes. Trees overhang the river, creating obvious flyways for bats. Over three nights we placed a total of ten nets across the stream and five in nearby forest.

(5) Royal Chitwan National Park, Tamar Tal NS 84°20.3'E, 27°31.9'N, approx. 13 km E Sauraha on Park Rd (16 March). Bats were captured over and near a large, shallow lake, approximately 1 km long and 1–200 m across. The lake is surrounded by grassland on one side and sal forest on the other. We placed three nets extending from shore towards middle of lake, one net in the surrounding sal forest, three nets in an old clearing, and one along a nearby small stream.

(6) Royal Chitwan National Park, Tiger Tops, Dhangari Khola 84°11.5'E, 27°32.2'N, approximately 33 km west of Sauraha (17–18 March). Tiger Tops is located along the Reu River, approximately 5 km east of its junction with the Narayani River, at the base of

rugged hills that are a part of the Siwalik Range. The forests, which are dominated by large sal trees (30–65 cm dbh), are taller and more diverse than those near Sauraha. Epiphytes and lianas are abundant and the understory is dense. The Dhangari Khola is a small tributary of the Rapti. It runs over rocks and sands through a moderately deep ravine (sides up to 30 m high). In the area we netted, the stream averaged 3 m across or less. Over two nights we placed fourteen nets over the stream and ravine, plus two additional nets across the Rapti River near its junction with Dhangari Khola.

(7) Royal Chitwan National Park, Simal Ghol Tal 84°28.6'E, 27°33.9'N, 2.5 km SW Sauraha (20–21 March). Simal Ghol is a small, shallow lake lying in grassland but adjacent to a small area of riverine forest. Over two nights we set two nets over the lake, 13 over forest trails or at the edge of the forest, and one over a small stream.

(8) Royal Chitwan National Park, Bardhaha Khola 84°28.2'E, 27°30.8'N, 3 km SW Bwanipur Chauki (22–23 March). This locality, which is dominated by sal forest, is in the Churia range of the Siwalik hills, around 500 m elevation. Many trees are very large, exceeding 30 m height. The forest floor is very open, with a sparse understory of grasses and shrubs. The large trees are scattered and the canopy is not continuous. Nets were set across the bed of a river, the Bhardhaha Khola, in an area where it is around 70 m across. The banks are low, no more than a few meters above the bed. The flow was reduced to a trickle at the time of our visit. We set three nets over the river bed and three in surrounding forest. On 23 March we moved upstream approximately 1 km to the point where the Bardhaha Khola is joined by another river, the Aap Khola. We set four nets along each stream and one at the confluence. Here, both stream beds are 10–20 m in breadth with banks ranging up to 30 m in height.

(9) Royal Chitwan National Park 84°28.1'E, 27°33.7'N, 3.8 km SW Sauraha (24 March). Seven nets were set across trails through riverine forest and one across a road.

The following species of bats were collected:

Pteropodidae

Rousettus leschenaulti (Desmarest, 1820): (1 female; locality 6). This species has previously been listed for Nepal by SCULLY (1887), FRY (1925), FRICK (1969), MITCHELL (1978), and MITCHELL and PUNZO (1976). Our specimen entered a mist net set over a small stream in a forested ravine at about 9:30 pm. TL = 119, T = 11, HF = 20, E = 20, FA = 71.4.

Cynopterus sphinx (Vahl, 1797): (7 males, 12 females; localities 2, 3, 4). *Cynopterus sphinx* has been reported in Nepal by FRICK (1969), MITCHELL (1978), MITCHELL and PUNZO (1976), JOHNSON et al. (1980), and BATES and HARRISON (1997). This common species was captured near banana plants adjacent to houses, in dense riparian vegetation, over trails through forest, and over a stream. On March 17, 16 individuals entered a net set approximately 3 m above the ground (we released seven); late arrivals appeared to be attracted by the distress calls of other *Cynopterus* as we removed them from the net. External measurements (n = 19): TL = 107.2, T = 7.9, HF = 14.4, E = 22.2, FA = 67.1. Cranial measurements (n = 6): CB = 29.2, CC = 6.5, MAX = 10.1, LPAL = 13.8, BPAL = 9.0, ZYGO = 18.9, BB = 13.0.

Eonycteris spelaea (Dobson, 1871): (2 males; localities 2 and 6). This is a new record for Nepal, although the species has been found in adjacent areas of India. One specimen was captured among banana plants near houses; the other, in a net set along a stream through a ravine. External measurements (n = 2): TL = 123.0, T = 10.5, HF = 18.0, E = 21.0, FA = 72.4. Cranial measurements (n = 1): CB = 32.2, CC = 7.8, MAX = 11.2, LPAL = 15.2, BPAL = 8.8, ZYGO = 24.3, BB = 14.6.

Vespertilionidae

Scotophilus heathi (Horsfield, 1831): (5 males, 7 females; localities 2, 3, 4, 6, 8). *Scotophilus* has been reported from Nepal by FRICK (1969), AGRAWAL and CHAKRABORTY (1971),

MITCHELL (1978, 1980), MITCHELL and PUNZO (1976), JOHNSON et al. (1980), and BATES and HARRISON (1997). We found this species to be common. Most captures were over water (rivers, streams, and ponds). *Scotophilus* were often the first bats caught in the evening. Females appear to be distinctively larger than males. External measurements ($n = 5$ males, 6 females): TL = 143.6, T = 54.7, HF = 13.1, E = 17.4, TR = 11.1, FA = 60.6. Cranial measurements ($n = 4$): CB = 20.2, CC = 7.3, MAX = 7.7, LPAL = 7.4, BPAL = 9.5, ZYGO = 15.3, BB = 10.1.

Eptesicus dimissus (Thomas, 1916): (4 males, 4 females; localities 4 and 6). External measurements ($n = 7$): TL = 100.0, T = 36.7, HF = 8.9, E = 14.4, TR = 6.7, FA = 39.7. Cranial measurements ($n = 2$): CB = 15.4, CC = 5.9, MAX = 5.9, LPAL = 6.4, BPAL = 7.9, ZYGO = 12.5, BB = 8.1.

Most recent authorities report this species as *Eptesicus* "*demissus*", which appears to be a misspelling. *Eptesicus dimissus* is known only from the type specimen, collected in Thailand. LEKAGUL and McNEELY (1977) include a photograph of the cranium of the holotype, which is broken, and a description of the skin. Our identification of this species is based on that photograph and the description of THOMAS (1916). Because this species is so poorly known, we include here drawings of cranium, teeth, and baculum (Fig. 1), and a brief description of the pelage and wing morphology.

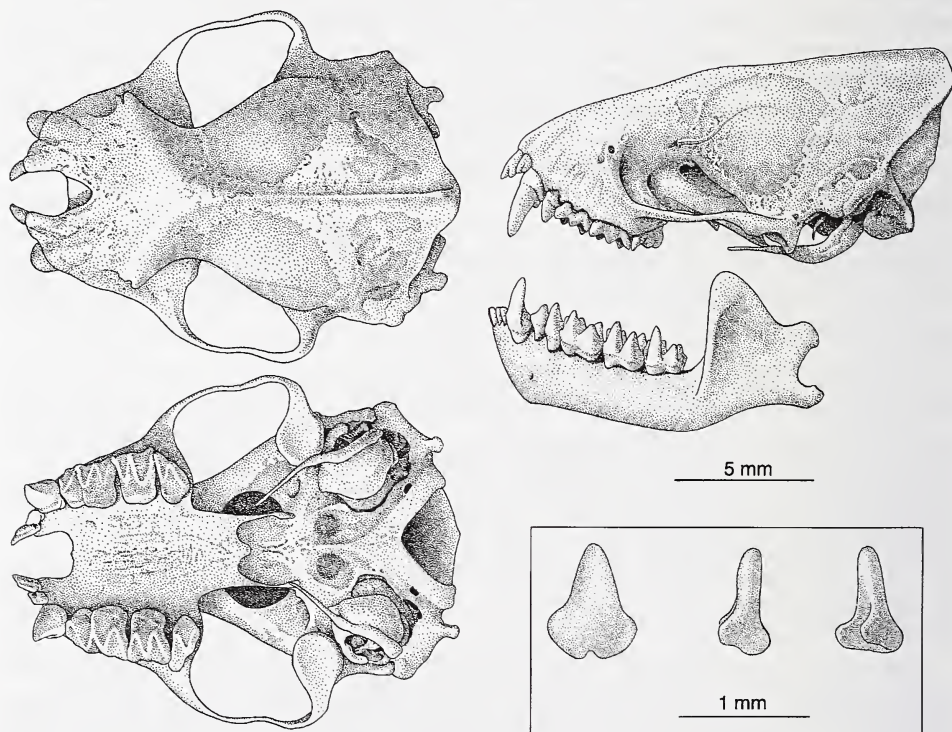


Fig. 1. *Eptesicus dimissus* Dorsal, lateral, and ventral views of cranium; dorsal, lateral, and oblique views of baculum (distal end at top). The cranium illustrated is from UMMZ 172218, a female collected at Royal Chitwan National Park, Dudora Nala/Park rd 84°27.4'E, 27°33.6'N, 4.3 km SW Sauraha on 15 March 1990 by P. MYERS and J. D. L. SMITH. The baculum is from UMMZ 172219, a male collected at Royal Chitwan National Park, Tiger Tops, Dhangari Khola 84°11.5'E, 27°32.2'N, approximately 33 km west of Sauraha, on March 17 1990 by P. MYERS and J. D. L. SMITH.

Externally, our specimens of *E. dimissus* have short, sparse pelage that is chestnut-brown dorsally and pale brown ventrally. Individual hairs on the dorsum have pale bases and brown tips, while ventral hairs are uniform pale brown in color. Ears are short and rounded, naked on the posterior surface and sparsely furry on the anterior. The anterior border of the pinna is slightly convex, while the posterior edge is nearly straight. The tragus is short and rounded, with a distinctly convex anterior margin and strongly concave posterior. The posterior margin of the tragus, and the basal part of the anterior edge of the pinna, both appear to be slightly thickened. The muzzle is exceptionally broad. The skin over the forehead is loose, and in most specimens it forms a distinctive fold running from ear to ear.

All patagial membranes appear to be nearly hairless. The wing membranes join the legs at the level of the middle of the metatarsals. The metacarpal of the third digit averages 38.6 mm in length, while the first phalanx of the same digit averages 15.3 mm ($n = 7$). The calcar has a well-developed keel. In all of our specimens, the tail extends 1–3 mm beyond the edge of the uropatagium.

The baculum is slightly less than 1 mm in length, 0.67 mm in breadth, and roughly triangular in dorsal view. The proximal end is notched while the distal end is bluntly rounded.

Compared to *Eptesicus fuscus* (Beauvois, 1796), *E. dimissus* has a relatively short and broad cranium. The rostral region is especially short. Strong sagittal and lambdoidal crests are present, and the braincase is moderately inflated. Zygomatic arches flare sharply laterally from their anterior roots. The dorsal profile of the rostrum and cranium is almost flat. The palate is moderately domed, as in *fuscus*. The basisphenoid pits are large, deep, and well defined. The glenoid fossa for the articulation of upper and lower jaws appears to be especially broad and strong compared to its condition in *fuscus*. Well-developed paroccipital processes are present.

The second upper incisor of *E. dimissus* is bifid and scarcely extends beyond the cingulum of the canine. I^3 is about $2/3$ the length of I^2 . The upper canines are notably long, extending more than twice the length of the adjacent premolar (P^4). The canine has a pronounced cingulum and a trace of a secondary cusp. P^4 is relatively narrow compared to its condition in *E. fuscus*.

The lower jaw of *E. dimissus* is short and broad relative to that of *E. fuscus*, and its angular process is stouter.

Eptesicus pachyotis (Dobson, 1871) is another poorly known species from the Indomalaysian region that may be closely related to *E. dimissus* (CORBET and HILL 1992). Based on the original and a subsequent description by DOBSON (1871, 1876), plus photographs of the skull and dentition in LEKAGUL and McNEELY (1977), our specimens resemble *pachyotis* in their flat and broad muzzle, fold of skin over the forehead, and shape of ear and tragus. They also show some thickening of the anterior edge of the ear and tragus (but probably not to the extreme described for *pachyotis*). The Nepali specimens clearly differ from *pachyotis*, however, in several respects. The basisphenoid pits of *E. pachyotis* are shallow, while those of these specimens are pronounced. *Eptesicus pachyotis* has a relatively large P^4 compared to the canine, in contrast to the condition in our specimens. (The basisphenoid pits and relative size of P^4 and canine for both species are clearly shown in photographs of the holotypes in LEKAGUL and McNEELY 1977.) The wing membranes of *pachyotis* join the legs at the level of the base of the toes; in our specimens (and in the type of *dimissus*, THOMAS 1916), they join in the middle of the metatarsals.

Pipistrellus javanicus (Gray, 1838): (8 males, 25 females; localities 2, 4, 5, 6, 7). Nepali specimens of this species are often reported under the name *Pipistrellus babu* Thomas, 1915 (HINTON and FRY 1923; FRICK 1969; MITCHELL 1978; MITCHELL and PUNZO 1976; KOCK 1996). BATES and HARRISON (1997) also list localities in Nepal. This species was common around houses (locality 2), where it tended to be captured earlier than other pi-

pipistrelles. It was also sometimes abundant over water; over 50 individuals were captured at locality 4.

The identification of this and the other pipistrelles reported below is controversial. We identify this species as *javanicus* based on its relatively large size, broad interorbital region (3.6–3.9 mm), bicuspid I^2 , relatively large I^1 , P^2 intruded from tooththrow, canine with a posterior cusp, relatively strongly domed palate, and nearly straight baculum ca. 7 mm in length. External measurements ($n = 33$): TL = 88.8, T = 33.6, HF = 7.0, E = 12.4, TR = 6.6, FA = 34.0. Cranial measurements ($n = 9$): CB = 13.1, CC = 4.6, MAX = 5.0, LPAL = 4.8, BPAL = 6.0, ZYGO = 9.1, BB = 6.7.

Pipistrellus coromandra (Gray, 1838): (13 males, 11 females; localities 4, 5, 6, 7, 8). This species was reported for Nepal by HINTON and FRY (1923), FRICK (1969), MITCHELL (1978), and BATES and HARRISON (1997). Unlike the other pipistrelles reported here, this species was not seen near houses; most individuals were captured over streams. This species is intermediate in size among the three pipistrelles we collected. It has a bicuspid I^2 , relatively large I^1 , P^2 intruded from tooththrow, and canine with a posterior cusp. Compared to *javanicus*, these specimens have only a moderately broad supraorbital region (3.2–3.5 mm), a rostrum that is slightly less flattened dorsally, a less strongly domed palate, and a shorter baculum (ca. 6 mm). The distal end of the baculum is not strongly deflected. External measurements ($n = 24$): TL = 81.9, T = 31.7, HF = 6.5, E = 12.0, TR = 6.1, FA = 30.8. Cranial measurements ($n = 13$): CB = 12.0, CC = 4.2, MAX = 4.4, LPAL = 4.4, BPAL = 5.4, ZYGO = 7.9, BB = 6.4.

Pipistrellus tenuis (Temminck, 1840): (11 males, 10 females; localities 2, 4, 5, 6, 7). HINTON and FRY (1923), FRICK (1969) and MITCHELL (1978, 1980) list this species for Nepal (as *Pipistrellus mimus* Wroughton, 1899). It was a common inhabitant of the buildings at locality 2, where it roosted under roofs made of galvanized metal sheets. Several specimens were also captured over streams, ponds, and forest trails. These specimens stand out due to their very small size. Like members of the other two species, they have a bicuspid I^2 , relatively large I^1 , and P^2 intruded from tooththrow. Their interorbital region is relatively narrow (3.1–3.3 mm), their rostrum is not flattened dorsally, and their palate is weakly domed. External measurements ($n = 21$): TL = 72.4, T = 28.6, HF = 5.4, E = 9.8, TR = 5.4, FA = 27.8. Cranial measurements ($n = 6$): CB = 10.4, CC = 3.5, MAX = 3.7, LPAL = 3.5, BPAL = 4.8, ZYGO = 7.1, BB = 6.0.

Nyctalus noctula (Schreber, 1774): (2 males; localities 3 and 7). *Nyctalus noctula* was listed as occurring in Nepal by FRICK (1969) and BATES and HARRISON (1997). Both individuals were captured several hours after dark in nets set over small ponds. External measurements ($n = 2$): TL = 132.0, T = 48.5, HF = 11.5, E = 18.0, TR = 10.5, FA = 53.1. Cranial measurements ($n = 1$): CB = 18.2, CC = 7.1, MAX = 6.9, LPAL = 6.1, BPAL = 8.8, ZYGO = 13.0, BB = 9.4.

Hesperoptenus tickelli (Blyth, 1851): (2 males, 4 females; localities 3, 4, 5, 6). FRICK (1969) and MITCHELL (1978, 1980) noted the presence of this species in Nepal. These bats entered nets set over a ravine (3 individuals), a stream (1 individual), a pond (1 individual), and extending from forest edge into grassland (1 individual). External measurements ($n = 5$): TL = 133.8, T = 50.2, HF = 12.0, E = 18.8, TR = 10.0, FA = 58.1. Cranial measurements ($n = 1$): CB = 19.2, CC = 6.9, MAX = 7.7, LPAL = 9.1, BPAL = 9.8, ZYGO = 14.4, BB = 9.5.

Miniopterus pusillus Dobson, 1876: (1 male, 1 female; locality 6). MAEDA (1982) reported this species in Nepal; however, this record has been questioned by CORBETT and HILL (1992). We captured this species in nets spanning a ravine. External measurements ($n = 2$): TL = 100.5, T = 43.0, HF = 9.0, E = 11.0, TR = 6.5, FA = 41.6. Cranial measurements ($n = 1$): CB = 13.5, CC = 4.0, MAX = 5.2, LPAL = 5.8, BPAL = 5.4, ZYGO = 8.0, BB = 7.3.

Miniopterus schreibersi (Kuhl, 1817): (6 males, 5 females; locality 1). The occurrence

of this species in Nepal has been noted by SCULLY (1887), FRICK (1969), MITCHELL (1978), KOCK (1996), and BATES and HARRISON (1997). Our specimens were captured as they exited a large sewer tunnel (approximately 3 m × 5 m at the entrance) in Kathmandu. External measurements (n = 11): TL = 117.8, T = 52.2, HF = 11.2, E = 11.8, TR = 7.0, FA = 48.43. Cranial measurements (n = 2): CB = 15.4, CC = 4.9, MAX = 6.2, LPAL = 6.3, BPAL = 6.8, ZYGO = 9.0, BB = 8.2.

Murina cyclotis Dobson, 1872: (1 female; locality 9). This species was listed as occurring in Nepal by FRICK (1969) and BATES and HARRISON (1997). Our single specimen was caught in a net set across a road through dense riverine forest; it entered the net at around 7:30 pm. This individual is slightly larger in several cranial dimensions than the series reported by BATES and HARRISON (1997), but its color and the relative sizes of the talonids and trigonids of the lower molars suggest that it should be assigned to this species. External measurements (n = 1): TL = 83, T = 31, HF = 8, E = 17, TR = 9, FA = 33.8. Cranial measurements (n = 1): CB = 15.6, CC = 4.2, MAX = 5.7, LPAL = 8.1, BPAL = 5.8, ZYGO = 10.0, BB = 7.8.

Kerivoula picta (Pallas, 1767): (1 female; locality 6). *Kerivoula picta* was listed as occurring in Nepal by FRICK (1969) but without citation of records. Our specimen was captured at around 9 PM in a net set over a stream running through a steep-sided ravine. External measurements (n = 1): TL = 86, T = 37, HF = 7, E = 14, TR = 11, FA = 35.2.

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Zusammenfassung

Eine neue Sammlung von Fledermäusen aus Nepal mit Bemerkungen über Eptesicus dimissus

Freilandstudien an 9 Lokalitäten im und nahe des Royal Chitwan National Park in Nepal, die im März 1990 durchgeführt wurden, ergaben eine Sammlung von 143 Exemplaren von Fledermäusen folgender 14 Arten: *Rousettus leschenaulti*, *Cynopterus sphinx*, *Eonycteris spelaea*, *Scotophilus heathi*, *Eptesicus dimissus*, *Pipistrellus javanicus*, *Pipistrellus coromandra*, *Pipistrellus tenuis*, *Nyctalus noctula*, *Hesperoptenus tickelli*, *Miniopterus pusillus*, *Miniopterus schreibersi*, *Murina cyclotis*, *Kerivoula picta*.

Von diesen Arten konnten *E. spelaea* und *E. dimissus* erstmalig für Nepal nachgewiesen und ferner das unsichere Vorkommen von *M. pusillus* und *K. picta* bestätigt werden. Den knapp gekennzeichneten Fangorten werden die Arten zugeordnet und einige mittlere Körper- und Schädelmaße werden angegeben. Zusätzlich wird etwas detaillierter über morphologische Besonderheiten und systematische Stellung von *E. dimissus* informiert, da diese Art bislang nur vom Holotyp aus Thailand bekannt war.

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