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A NEW SUBSPECIES OF THE HORSESHOE BAT RHINOLOPHUS MACROTIS FROM PAKISTAN (CHIROPTERA, RHINOLOPHIDAE)

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The description of a population of the Indomalayan species *Rhinolophus macrotis* from Pakistan, as a new subspecies *R. m. topali* is given. The new taxon is characterized by its colour, the measurements of the anterior noseleaf and the position of the lower premolars.

Key words: Mammalia, Rhinolophidae, *Rhinolophus macrotis*, Pakistan, taxonomy

Rhinolophus macrotis BLYTH, 1844 (Big-eared Horseshoe bat) was described from Nepal (restricted to Kathmandu Valley, see SCULLY 1887, p. 234) on the basis of two specimens collected by HODGSON. Subsequently ANDERSEN (1907) named a new subspecies, *R. macrotis dohrni*, from Soekaranda in north-western Sumatra which he differentiated on the basis of its broader horseshoe; broader ears; longer tibia and larger skull. *R. macrotis siamensis* GYLDENSTOLPE (1917) from Doi Par Sakang in north-western Thailand was distinguished by its smaller size, the length of the forearm measuring 36.1 mm "against a minimum of 41 mm in *macrotis* and 42.7 mm in *macrotis dohrni*"; the horseshoe was also narrower. ANDERSEN (1905a) had previously described a new species, *R. hirsutus*, from Guimaras in the Central Philippine Islands which he considered to be allied to *R. macrotis* but with considerably larger ears and tail. ALLEN (1923) named *R. episcopus* from Wanshien, Sichuan Province, China and included it within the *macrotis* group. It was larger than *R. macrotis macrotis* with a forearm length of 47.5 mm and "with a peculiar terminal noseleaf, which is rounded rather than pointed". ALLEN (1923) also named a lowland race *R. episcopus caldwelli*, from a single specimen collected from Yuki, Fukien Province, China. This was similar to the nominate form but smaller (forearm 43 mm) and more brightly coloured. OSGOOD (1932) referred specimens from northern Vietnam to *R. episcopus caldwelli* and *R. macrotis siamensis*. This claim that the two taxa are sympatric in Tonkin District was subsequently rejected by CORBET and HILL (1992). TATE and ARCHBOLD (1939) listed *macrotis* and *episcopus* as separate species; both were included in the *macrotis* group. Later, TATE (1943) included *episcopus* as a synonym of *R. macrotis*. He listed six subspecies, four of which,

macrotis, *dohrni*, *episcopus*, and *caldwelli* "are very much alike and perhaps only doubtfully separable". *R. macrotis siamensis* was considered "sharply smaller" and *R. macrotis hirsutus* "a larger race, with longer tail". ELLERMAN and MORRISON-SCOTT (1951) listed four subspecies of *R. macrotis* for the Palaearctic and Indian region; *macrotis*, *siamensis*, *episcopus* and *caldwelli*. More recently, CORBET and HILL (1992) and KOOPMAN (1993) included *caldwelli*, *dohrni*, *episcopus*, *hirsutus* and *siamensis* as synonyms of *R. macrotis*. In consequence, the range of this species is currently considered to extend from India (Uttar Pradesh, West Bengal and Meghalaya [BMNH, HNHM and LAL 1976]) and Nepal (BMNH, HNHM) eastwards to southern China (ALLEN 1938), Thailand (LEKAGUL and MCNEELY 1977), Vietnam (OSGOOD 1932 and HNHM), Malaysia (LORD MEDWAY 1969 and HNHM), Sumatra (ANDERSEN 1907) and the Philippines (HEANEY *et al.* 1987). It is poorly represented in zoological collections and appears to be uncommon throughout its range.

The five specimens of *R. macrotis*, presented to the Harrison Zoological Museum by Mrs. NORA PENDLETON are the first known from Pakistan, and now are deposited in the Harrison Zoological Museum (HZM) and in the Hungarian Natural History Museum (HNHM).

Rhinolophus macrotis topali ssp. n.

Type material: holotype, adult female, Kakul Phosphate Mine, Abbotabad, Pakistan. Collected 24 October 1985, by Mrs. NORA PENDLETON. In spirit, skull extracted (HZM 5.16522).

Paratypes: four adult females, from the same locality and date as the holotype. Three in spirit, skulls extracted (HZM 3.16520; HZM 4.16521; HNHM 15297), one prepared skin and skull (HZM 1.16518).

Etymology: The new subspecies is named after Dr. GYÖRGY TOPÁL, Keeper of Mammals of the Hungarian Natural History Museum Budapest, in honour of his contribution to the knowledge of the Southeast Asian bats.

Comparative material: *R. macrotis macrotis* Nepal: The Natural History Museum, London [NHM] 45.1.8.416 [holotype], NHM 78.286, HNHM 15297; Uttar Pradesh: NHM 79.11.21.143–144; West Bengal: HNHM 92.89.1; Assam: HNHM 92.90.1. *R. macrotis siamensis* Thailand: NHM 78.2313. *R. macrotis dohrni* Sumatra: NHM 6.12.1.22 [holotype], NHM 7.1.9.1; Malaysia: NHM 67.1595, NHM 67.1598–1599. *R. macrotis* cf. *episcopus* Vietnam HNHM 15514–15518.

Measurements: The standard external museum measurements were taken from the spirit specimens prior to preparation, the other external and cranial measurements of the type series (Table 1) and the comparative material (Table 2) were taken by digimatic caliper with 0.01 mm accuracy. The abbreviations used in this paper along with explanations are as follows:

HEADBODY—head and body length; FOREARM—length of forearm; TAIL—tail length; EAR—length of ear conch; HSHOE—greatest width of anterior noseleaf; MET3L—length of the metacarpal of the third finger; MET4L—length of the metacarpal of the fourth finger; MET5L—length of the metacarpal of the fifth finger; SBASL—basilar length of skull from frontal edge of palate to the foremost part of ventral incision between condyles; STOTL—total length of skull, from front of canines to occiput; UCM3L—crown length of upper C–M3; UCP4L—crown length of upper C–P4; UM1M3L—crown length of upper M1–M3; PALATALL—length of palatal bridge; UCCW—width of rostrum between outer margins of crown of canines; UM3M3W—width of rostrum between

en outer crowns of M3; KNOBW—width of nasal knob; INTORBW—width of interorbital constriction; ZYGOMATW—width of skull between zygomata; MASTOIDW—mastoid width of skull; BRAINCH—height of braincase, from glenoid fossa to top with sagittal crest; KNOBH—height of nasal knob, from palate to top; MANDIBL—length of mandible, between hindermost portion of articular process and anteriormost edge of I1 alveolus; LCM3L—crown length of lower C-M3; LCP4L—crown length of lower C-P4; LM1M3L—crown length of lower M1-M3; PCORH—height of coronoid process, between its top and the sinus on ventral profile of mandibular body.

Table 1. External and cranial measurements (in mm) of the type series of *Rhinolophus macrotis topali*

NUMBER	5.16522	3.16520	4.16521	15297	1.16518
HEADBODY	41.51	—	43.1	42.51	42.7
FOREARM	45.8	45.4	44.7	44.7	46.2
TAIL	19	19	18	21	18
EAR	23.2	23.8	23.8	24.5	22.7
HSHOEW	8.69	8.89	9.29	9.68	—
MET3L	—	31.45	32.57	32.09	31.96
MET4L	—	32.56	32.83	33.26	32.39
MET5L	—	32.96	33.62	31.99	32.56
SBASL	11.8	11.81	11.69	11.83	11.93
STOTL	18.15	18.32	18.01	18.23	18.07
UCM3L	6.66	6.68	6.48	6.57	6.57
UCP4L	2.85	2.92	2.76	2.76	2.88
UM1M3L	4.12	4.13	4.07	4.09	4.11
PALATALL	3.56	3.58	3.62	—	3.72
UCCW	4.06	4.12	4.05	4.1	4.01
UM3M3W	5.95	6.21	6.03	6.06	6.06
KNOBW	4.75	4.75	4.66	4.74	4.69
INTORBW	2.51	2.63	2.17	2.41	2.42
ZYGOMATW	8.11	8.3	8.2	8.23	8.28
MASTOIDW	8.8	8.9	8.79	8.78	8.73
BRAINCH	—	5.39	5.34	5.28	5.87
KNOBH	—	3.39	3.25	—	3.21
MANDIBL	11.77	11.86	11.51	11.92	11.47
LCM3L	6.94	6.93	6.8	6.76	6.75
LCP4L	2.54	2.6	2.48	2.47	2.44
LM1M3L	4.5	4.44	4.41	4.36	4.39
PCORH	2.31	2.28	2.17	2.27	2.36

Table 2. Means of the external and cranial measurements (in mm) of the various subspecies of *Rhinolophus macrotis*

	<i>macrotis</i>	<i>caldwelli</i>	<i>siamensis</i>	<i>dohrni</i>
No. of cases	6	6	1	5
HEADBODY	44.81	44.19	—	48.31
FOREARM	42.79	44.45	—	43.82
TAIL	21.34	18.45	—	20.05
EAR	21.90	23.82	—	23.86
HSHOEW	7.57	7.51	—	9.37
MET3L	30.50	31.70	—	31.48
MET4L	31.71	33.05	—	32.75
MET5L	31.93	32.91	—	32.12
SBASL	11.50	12.14	—	11.92
STOTL	17.78	18.33	—	18.19
UCM3L	6.44	6.58	—	6.68
UCP4L	2.81	2.82	2.43	3.00
UM1M3L	3.95	4.01	3.45	3.91
PALATALL	3.68	3.65	3.04	3.42
UCCW	3.85	4.02	3.82	4.02
UM3M3W	5.77	5.92	5.29	5.81
KNOBW	4.67	4.92	4.00	4.94
INTORBW	2.40	2.48	—	2.58
ZYGOMATW	8.14	8.11	—	8.32
MASTOIDW	8.66	8.92	7.87	8.81
BRAINCH	5.24	5.25	—	5.14
KNOBH	3.24	3.14	2.96	3.43
MANDIBL	11.19	11.60	9.94	11.83
LCM3L	6.64	6.80	5.89	6.90
LCP4L	2.42	2.55	2.26	2.75
LM1M3L	4.32	4.35	3.87	4.26
PCORH	2.15	2.24	1.96	2.29

Diagnosis: A medium-sized subspecies of *Rhinolophus macrotis*. It differs from all the other subspecies by its very pale colouration, with almost white underparts. The anterior noseleaf very broad (8.69–9.68 mm). *Rhinolophus macrotis topali* is further distinguished by having extremely small second lower premolar (P₃), its tip not reaching the cingula of the P₂ and P₄, and in every cases totally extruded from the toothrow.

Description: Small-medium sized (forearm 44.7–46.2 mm) bat. The noseleaves typical for the species; anterior noseleaf covering the muzzle, secondary noseleaf present, well-visible. The connecting process rounded, originating below the apex of the sella. Sella long, tongue-shaped, thickly covered with short pale-yellowish hairs; its upper part curving downwards (Figs 1–2).

Pelage (based on the prepared skin of HZM 1.16518) from dorsal aspect: hairs in mid-dorsal region measure approximately 5.2 mm; those on the flanks and neck are longer; they are very fine in texture. Hair bases pale, almost white, tips to hairs darker, mid-buffy brown; darkest on nape of neck, shoulders and mid-dorsal region. Pale hairs present on base of ears. From ventral aspect the hairs shorter, 4.8 mm in mid-ventral region; longer on flanks and outer aspects of the throat. Hair bases white; tips pale grey, this gives a generally very pale impression.

The membranes uniform, dark brown; very short, pale hairs present on the outer border of interfemoral membrane.

The metacarpals subequal, besides the shortest third metacarpal, the fifth only slightly longer than fourth.

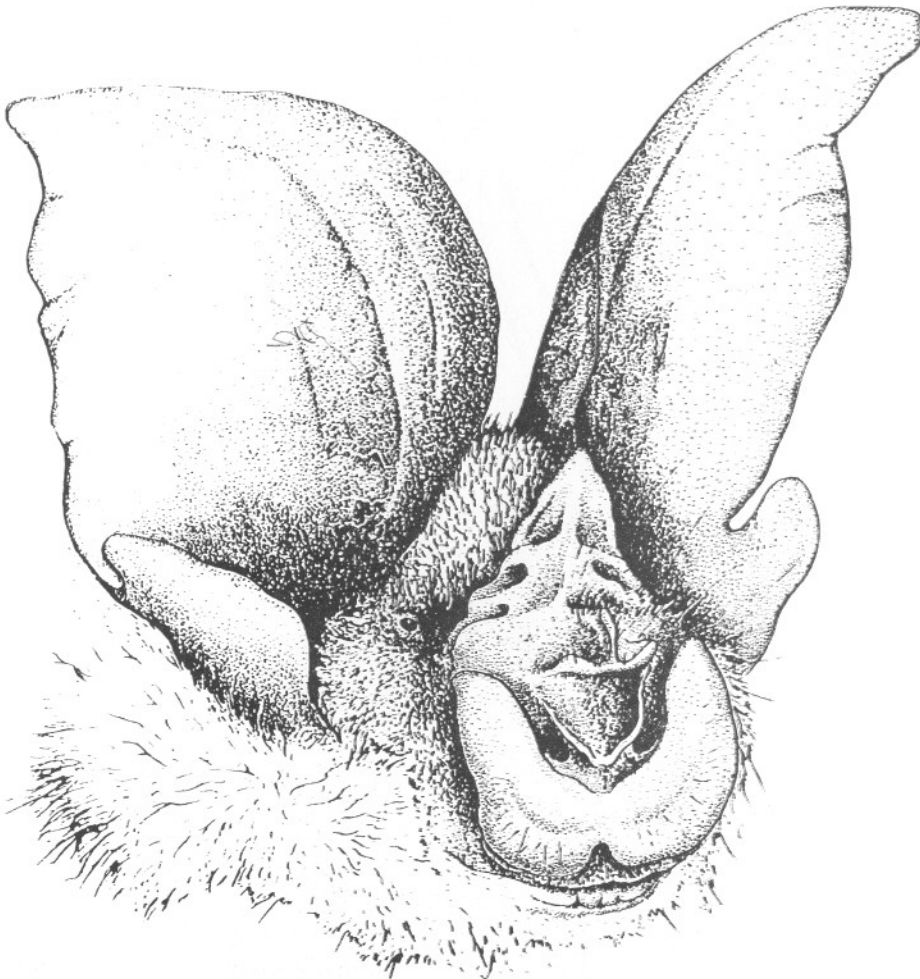


Fig. 1. Face of *Rhinolophus macrotis topali* (holotype)

The skull narrow, the mastoid width exceeding the zygomatic width. The sagittal crest low, poorly developed. Beside the anterior median swellings of the nasal knob, the lateral ones also well inflated. Palatal length more than twice as long as the maxillary toothrow (C-M₃).

The first upper premolar small but has a distinct cusp, and in the toothrow. The lower P₃ rudimentary, always extruded from the toothrow; in one case (HZM 1.16518) it displaced lingually in the right toothrow. The P₂ and P₄ usually in contact (Fig. 3).

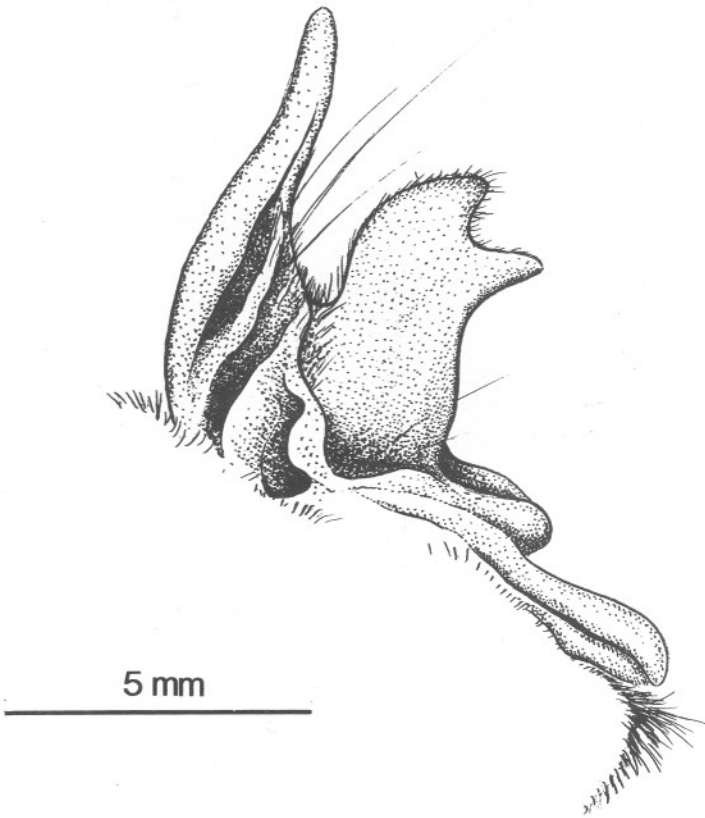


Fig. 2. Lateral view of noseleaves of *Rhinolophus macrotis topali* (paratype, HNHM 15297)

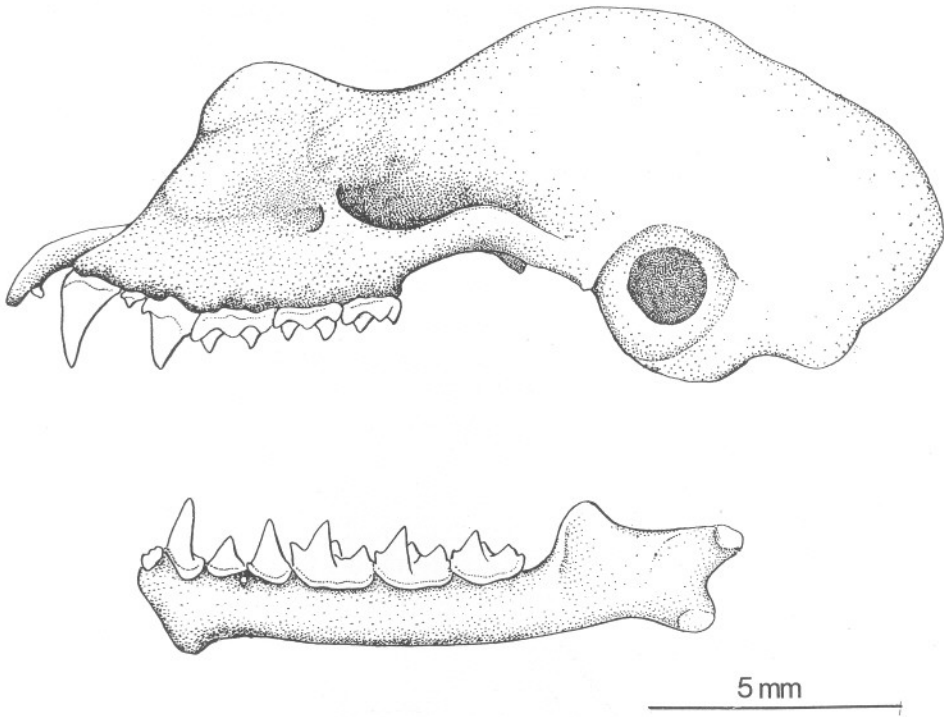


Fig. 3. Left lateral view of skull and mandible of the *Rhinolophus macrotis topali* (holotype)

DISCUSSION

The new subspecies *Rhinolophus macrotis topali* is characterized by the following character combinations: colour pattern, wide horseshoe (8.69–9.68 mm against 6.8–8.0 mm of the other subspecies) and rudimentary lower middle (P₃) premolars. These features differentiate it from all the other subspecies of *R. macrotis* except *dohrni*, which has a similarly wide anterior noseleaf (8.63–9.98 mm, respectively). However, in *dohrni* the lower middle premolar is well developed and situated in the toothrow.

The *philippinensis* group (which includes *R. macrotis*, see BOGDANOWICZ 1992, BOGDANOWICZ and OWEN 1992) has several primitive characters, including the wing structure with subequal metacarpals, long palatal bridge and P₃ often situated in the toothrow (ANDERSEN 1905*b*, 1905*c*, 1907). According to ANDERSEN (1907), *R. macrotis* is an example of “a type of low level of evolution, which has no closer relative, than the primitive forms of the *Rh. philippinensis* group” whilst TATE (1943) considered it to “represent the basic type of the *philippinensis* group”. According to WOLOSZYN (1987) the position and size of the

lower premolars are useful characters in determining microevolutionary trends. In his studies of recent and fossil material of the *ferrumequinum* group, he noted that the process involves mainly the reduction in length of the lower premolar row. It is therefore of interest to note that *R. macrotis caldwelli* from southern China and north Vietnam has a relatively large lower middle premolar (P₃) situated within the toothrow and as such can be regarded as a primitive form.

Recent phylogenetic studies suggest that the center of evolutionary origin of the rhinolophids is Southeast Asia (BOGDANOWICZ and OWEN 1992). The *philippinensis* group is thought to be one of the most primitive groups within the Rhinolophidae. It apparently originated in the area encompassing south China, north Vietnam, Laos and north Thailand since several species within the group (*R. rex*, *R. paradoxolophus*, *R. marshalli*) are endemic to this region (KOOPMAN 1989). In consequence the taxon *caldwelli* can be regarded as one of the most primitive of all rhinolophids. In contrast, the new subspecies *R. macrotis topali*, because of the displaced position and reduced size of P₃ is a more specialized form within the species. This explanation fits well with the phylogenetic-Hennigian theory of zoosystematics which states that primitive forms are found in or near the centre of origin and advanced ones at the periphery (UDVARDY 1983). This could help explain the presence of the derived characters in the geographically marginal population of *R. macrotis* in Pakistan.

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REFERENCES

- ALLEN, G. M. (1923) New Chinese bats. *American Mus. Novit.* **85**: 1–8.
- ALLEN, G. M. (1938) The Mammals of China and Mongolia. *Natural History of Central Asia* **11**(1), 620 pp.
- ANDERSEN, K. (1905a) On the bats of the *Rhinolophus macrotis* group, with descriptions of two new forms. *Ann. Mag. Nat. Hist. (Ser. 7)* **16**: 289–292.
- ANDERSEN, K. (1905b) On the bats of the *Rhinolophus philippinensis* group, with descriptions of five new species. *Ann. Mag. Nat. Hist. (Ser. 7)* **16**: 243–257.
- ANDERSEN, K. (1905c) A list of the species and subspecies of the genus *Rhinolophus*, with some notes on their geographical distribution. *Ann. Mag. Nat. Hist. (Ser. 7)* **16**: 648–662.
- ANDERSEN, K. (1907) Chiropteran notes. *Annali Mus. civ. Stor. nat. Giacomo Doria* **3**: 5–45.
- BLYTH, E. (1844) Notices of various mammalia. *J. Asiatic. Soc. Bengal* **13**: 463–494.

- BOGDANOWICZ, W. (1992) Phenetic relationships among bats of the family Rhinolophidae. *Acta Theriol.* **37**(3): 213–240.
- BOGDANOWICZ, W. & OWEN, R. D. (1992) Phylogenetic analyses of the bat family Rhinolophidae. *Z. zool. Syst. Evolut.-forsch.* **30**: 142–160.
- CORBET, G. B. & HILL, J. E. (1992) *The Mammals of the Indomalayan Region*. Nat. Hist. Mus. Publications, Oxford University Press, 488 pp.
- ELLERMAN, J. R. & MORRISON-SCOTT, T. C. S. (1951) *Checklist of Palaearctic and Indian Mammals 1758–1946*. British Museum (Natural History), 810 pp.
- GYLDENSTOLPE, N. (1917) Zoological results of the Swedish zoological expeditions to Siam 1911–1912 & 1914–1915. V Mammals II. *Kungliga svenska Vetensk. Akad. Handl.* **57**(2), 59 pp.
- HEANEY, L. R., GONZALES, P. C. & ALCALA, A. C. (1987) An annotated checklist of the taxonomic and conservation status of land mammals in the Philippines. *Silliman Journal* **34**(1–4): 32–66.
- KOOPMAN, K. F. (1989) Distributional Patterns of Indo-Malayan Bats (Mammalia: Chiroptera). *American Mus. Novit.* **2942**: 1–19.
- KOOPMAN, K. F. (1993) Chiroptera, pp. 137–241 In: WILSON, D. E. & REEDER, D. M. (eds): *Mammal Species of the World. A taxonomic and geographic reference. 2nd ed.* Smithsonian Institution Press, Washington D. C.
- LAL, J. P. (1976) Occurrence of the large-eared horseshoe bat, *Rhinolophus macrotis macrotis* Blyth (Mammalia: Chiroptera: Rhinolophidae) in Cherrapunji, Meghalaya. *J. Bombay nat. Hist.* **74**: 343.
- LEKAGUL, B. & MCNEELY, J. A. (1977) *Mammals of Thailand*. Association Conservation Wildlife, Bangkok, 758 pp.
- LORD MEDWAY (1969) *The Wild Mammals of Malaya*. Oxford University Press, 127 pp.
- OSGOOD, W. H. (1932) Mammals of the Kelley-Roosevelt and Delacour Asiatic expeditions. *Publications Field Mus. nat. Hist. Zool.* **18**: 193–339.
- SCULLY, J. (1887) On the Chiroptera of Nepal. *J. Asiatic. Soc. Bengal* **56**: 233–259.
- TATE, G. H. H. (1943) Further notes on the *Rhinolophus philippinensis* group (Chiroptera). *American Mus. Novit.* **1219**: 1–5.
- TATE, G. H. H. & ARCHBOLD, R. (1939) Oriental *Rhinolophus*, with special reference to material from the Archbold collections. *American Mus. Novit.* **1036**: 1–12.
- UDVARDY, M. (1983) Dinamikus állatföldrajz. A szárazföldi állatok elterjedése [Dynamic Zoogeography. With Special Reference to Land Animals]. Tankönyvkiadó, Budapest, 495 pp.
- WOLOSZYN, B. W. (1987) Pliocene and Pleistocene Bats of Poland. *Acta Paleont. Pol.* **32**(3–4): 207–325.

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