

Description of a new species of *Murina* from Cambodia (Chiroptera: Vespertilionidae: Murininae)

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A new species of *Murina*, which belongs to the 'cyclotis-group', is described from Cambodia. It is characterised by the attachment point of the plagiopatagium, its large skull size, the distinctive shape of the rostrum, and the relative sizes of the upper incisors. To date, it is only known from Kirirom National Park where it was collected in disturbed semi-evergreen gallery forest, which had many immature trees.

Key words: Cambodia, taxonomy, new species, *Murina* sp. nov.

INTRODUCTION

Known from Asia and Australasia, the genus *Murina* is a taxon of forest dependent bats, whose highest diversity is found in the tropical forests of the Indomalayan Region. Relatively rare in systematic collections and seldom abundant in the field, there is disagreement over the taxonomic status of certain closely related species [for different views see Yoshiyuki (1989) versus Abe (2000), and Wallin (1969) versus Corbet and Hill (1992)]. Recently, a new species was named by Maeda and Matsumura (1998) and probable new taxa are waiting description (Francis *et al.*, 1999).

The genus has a rather uniform appearance. Externally, differences are primarily those of size, colour and ear morphology. In addition, a feature once thought to be diagnostic of the genus was the insertion point of the wing, which according to Corbet and

Hill (1992), Koopman (1994) and others is attached close to the claw of the first toe. However, in *M. hilgendorfi* (including the forms *intermedia*, *ognevi* and *sibirica* — see Simmons, In press) the plagiopatagium is attached to the base of the first toe (Peters, 1880; Ognev, 1928; Yoshiyuki, 1989). Cranially, there are differences in the rostrum and braincase morphology, in the size and position of the incisors, the size of the canines and premolars and the cusp pattern of the molars.

The genus has been divided into two species groups based on dental features (Corbet and Hill, 1992; Koopman, 1994). In the '*suilla*-group', the first upper incisor (I²) is situated anterior to the second (I³) and the crown area of the first upper premolar (P²) is half or less that of the second (P⁴). Species in the '*cyclotis*-group' have I³ situated adjacent to I², such that I² is essentially

obscured by I^3 when viewed laterally, and the crown area of P^2 is two-thirds or more that of P^3 .

During the last eight years, the Harrison Institute has collected and/or received many voucher specimens from a series of bat surveys in South-east Asia. These include a species new to science, a number of new country records, including those of a globally endangered species, and many significant geographical range extensions (Bates *et al.*, 1997, 1999, 2000, 2001, 2004a, 2004b; Hendrichsen *et al.*, 2001a, 2001b). Among the vespertilionids was a specimen of *Murina* from Cambodia, which is characterised by a plagiopatagium being attached to the base of the first toe. Based on dental characters, it belongs to the 'cyclotis-group' and represents an as yet undescribed species.

MATERIALS AND METHODS

Comparative Material

The following comparative material was used: *Murina hilgendorfi hilgendorfi*: Japan: BM(NH) 8.12.1.18, HZM 1.2974, 2.2975; *Murina hilgendorfi intermedia*: Korea: HNHM 80.8.1., 2003.37.12-13., 2003.37.21, 2003.37.46-49.; *Murina huttoni huttoni*: India: BM(NH) 79.11.21.685 (holotype), 14.7.10.32, 16.3.26.25, 20.6.24.3; *Murina huttoni rubella*: China: BM(NH) 8.8.11.6 (holotype), 8.7.25.11, 8.8.11.5, 96.12.1.1, 96.12.1.2, 97.9.3.2, 98.11.1.3; Vietnam: HZM 2.32351, 3.32352; Thailand: BM(NH) 79.1418; Malaysia: BM(NH) 67.1606; *Murina leucogaster rubex*: India: BM(NH) 16.3.25.111 (holotype); *Murina puta*: Taiwan: HNHM 98.19.4, CSOTA15; NTU FB007, FB022, FB093, KHC002, KHC005, KHC008, KHC011-013, KHC020, KHC024-026, KHC028, KHC030, KHC032; ESRI T1, T2; *Murina rozendaali*: Malaysia: BM(NH) 83.36 (holotype), 84.2025.

The museum acronyms are as follows: BM(NH): The Natural History Museum, London, formerly British Museum (Natural History); HNHM: Hungarian Natural History Museum, Budapest; HZM: Harrison Institute, Sevenoaks, formerly Harrison Zoological Museum; NMNS: National Museum of Natural Science, Taichung; NTU: National Taiwan

University, Taipei; ESRI: Endemic Species Research Institute, Chichi, Taiwan.

Measurements

The forearm (FA) measurements were either compiled from the literature (therefore no sample size is provided in Table 1) or taken from dry or alcohol preserved museum specimens with 0.1 mm accuracy. The following craniodental measurements were taken to the nearest 0.01 mm by the authors with digital calipers under a stereomicroscope: STOTL: total length of skull — from the anterior rim of alveolus of the first upper incisor to the most projecting point of the occipital region; CBL: condylobasal length — from the exoccipital condyle to the posterior rim of alveolus of the first upper incisor; CCW: upper canine width — taken across the outer borders of upper canines; M^3M^3W : upper molar width — taken across the outer crowns of the last upper molars; ZYW: zygomatic width — the greatest width of the skull across the zygomatic arches; MAW: mastoid width — the greatest distance across the mastoid region; IOW: interorbital width — the least width of the interorbital constriction; CM^3L : maxillary toothrow length — from the front of upper canine to the back of the crown of the third molar; CP^4L : upper canine-premolar length — from the front of the upper canine to the back of the crown of the posterior premolar; ML: length of mandible — from the anterior rim of the alveolus of the first lower incisor to the most posterior part of the condyle; CM_3L : mandibular toothrow length — from the front of the lower canine to the back of the crown of the third lower molar; CP_4L : lower canine-premolar length — from the front of the lower canine to the back of the crown of the posterior premolar; CPH: height of the coronoid process — taken perpendicularly from the extremity of the coronoid process to the indentation of the ramus mandibulae.

SYSTEMATIC DESCRIPTION

Murina harrisoni sp. nov.

Holotype — HZM 1.36316 (field number JLW 04.07), adult ♂, body in alcohol, skull extracted. Collected by Joe L. Walston on 5 February, 2000.

Type locality — O Tuk Chehn, Kirirom National Park, Kompong Speu Province, Cambodia, 11°29.611'N, 104°12.746'E.

TABLE 1. Selected external and craniodental measurements of some *Murina* species (in mm). Abbreviations: FA: forearm length; STOTL: total length of skull; CM³L: maxillary toothrow length; CP⁴L: upper canine-premolar length; ML: length of mandible; CM₃L: mandibular toothrow length — from the front of the lower canine to the back of the crown of the third lower molar; CPH: height of the coronoid process

Measurements	<i>M. harrisoni</i> n. sp. (holotype)		<i>M. hilgendorfi</i>		<i>M. huttoni</i>		<i>M. leucogaster</i>		<i>M. putta</i>		<i>M. rozendaali</i>	
	\bar{x}	n	min-max	n	min-max	n	min-max	n	min-max	n	min-max	
FA	35.90	?	40–45	?	33–37	?	40–44	?	30–37	?	32–34	
STOTL	18.39	6	18.39–19.64	13	16.39–18.15	1	18.80	20	16.63–18.09	2	15.51–15.80	
CM ³ L	6.49	9	6.16–6.59	16	5.73–6.08	1	6.08	20	5.79–6.26	2	5.21–5.34	
CP ⁴ L	3.37	9	3.04–3.37	16	2.65–2.99	1	2.93	20	2.69–3.01	2	2.44–2.54	
ML	13.03	9	12.88–13.87	14	11.17–12.54	1	12.82	17	11.43–12.45			
CM ₃ L	7.15	9	6.75–7.28	14	6.26–6.70	1	6.60	17	6.34–6.78			
CPH	5.21	9	4.61–5.21	13	3.87–4.54	1	4.29	17	3.86–4.51			

Diagnosis — This is a medium sized tube-nosed bat (FA 35.9 mm), with a large skull (total length of skull 18.39 mm; Table 1) and with the plagiopatagium attached to the base of the first toe (Fig. 1). The anterior part of the rostrum is bulbous to accommodate the large canines (Fig. 2A). The first upper incisor (I²) is rather slender, bifid and with its secondary cusp very short; the principal cusp of the robust second incisor (I³) is relatively short, only slightly exceeding half the height of I².

Description — Ear length is 14 mm and the ear conch is without an emargination on the posterior border. The tragus is typical of the genus, slightly bent backwards and 7.4 mm in length. The dorsal fur (described from the wet specimen) is a uniform reddish-brown; the individual hairs are without a well defined banding, although the terminal part is a slightly darker reddish-brown. On the ventral aspect (including the throat), the hairs are white throughout their length. The tail membrane is evenly furred above, the last vertebra is free from the uropatagium. The plagiopatagium is attached to the base of the first toe.

The skull is heavily built with the rostrum deep and massive, anteriorly rather bulbous to accommodate the large canines (Fig. 2A). The sagittal and lambdoid crests are distinct. The narial emargination is narrow, with the length considerably exceeding the width; the length of the palatal emargination also slightly exceeds the width. There is no basioccipital fissure. The first upper incisor (I²) is rather slender, its secondary cusp being only a cingular cusp; the principal cusp of the second incisor (I³) is relatively short, only slightly exceeding half the height of I². I³ is situated alongside, rather than posterior to I². I³ is less than half the height of upper canine (C¹), which greatly exceeds the height of the second upper premolar (P⁴). In lateral view, the first upper premolar (P²) is only slightly shorter

than the second (P^4) and the crown area is subequal (Fig. 3A). The mesostyle of the first (M^1) and second (M^2) upper molars are not reduced and the metacones are distinctly higher than the paracones. The angular process of the mandible is elongated, with a tall coronoid process (Fig. 3B). The lower canine (C_1) greatly exceeds the first (P_2) and second (P_4) lower premolars in height when viewed laterally; P_2 and P_4 are subequal in height; P_2 is about half the crown area of P_4 . The hypoconid and entoconid of the first (M_1) and second (M_2) lower molars are well separated from the anterior cusps and clearly form a posterior trigonid. Craniodental measurements (in mm) are as follows: STOTL 18.39; CBL 16.73; CCW 5.2; M^3M^3W 6.37; ZYW 11.33; MAW 9.61; IOW 4.51; CM^3L 6.49; CP^4L 3.37; ML 13.03; CM_3L 7.15; CP_4L 3.19; CPH 5.21.

Etymology — Named in honour of Dr. David Lakin Harrison, who as chairman of trustees has supported, encouraged and actively participated in the extensive research work of the Harrison Institute on the bats of Southern and South-East Asia.

COMPARISONS

The insertion point of the plagiopatagium (which is attached to the base of the first toe in *M. harrisoni*) differentiates this taxon from all other *Murina* species (the attachment point of which is the base of the first claw) except for *M. hilgendorfi* (including *intermedia*, *ognevi* and *sibirica*), which has a similar point of insertion.

However, unlike *M. hilgendorfi* and all other *Murina* taxa, the second upper incisor (I^3) of *M. harrisoni* is much shorter than the first (I^2), with the principal cusp of I^3 only slightly exceeding half the height of I^2 . In addition, the rostral profile of *M. harrisoni* differs markedly from that of *M. hilgendorfi*. In *M. harrisoni*, the rostrum is deep and massive and anteriorly bulbous to

accommodate the large canines; in consequence, the rostral profile is concave (Fig. 2A). In *M. hilgendorfi*, the rostrum is not enlarged and the rostral profile is straighter (Fig. 2B). *M. harrisoni* is further distinguished from *M. hilgendorfi* by the first upper premolar (P^2) which is subequal in height with the second (P^4) in *M. harrisoni* whilst in *M. hilgendorfi* it is about two-thirds the height and with a relatively smaller crown area (Fig. 3C). The pelage of *M. harrisoni* is reddish-brown rather than grey and the forearm is considerably shorter (FA = 35.9 mm) as compared to > 40 mm in *M. hilgendorfi*.

The cranial dimensions of *M. harrisoni* are superficially similar to those of *M. leucogaster rubex*. However, in addition to the difference in the insertion point of the plagiopatagium and the relative size of the upper incisor (as outlined above), the canine of *M. harrisoni* exceeds that of *rubex* in length, the narial and palatal emarginations are narrower, the rostral profile is more concave, the rostrum distinctly more

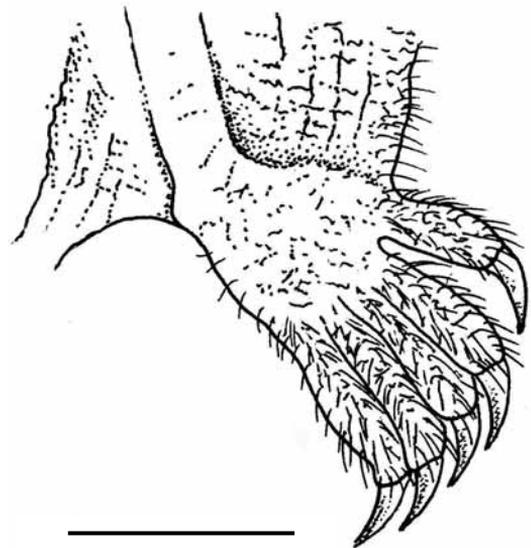


FIG. 1. Dorsal view of the insertion point of plagiopatagium on the right hind foot of *M. harrisoni* sp. nov. (holotype, HZM.1.36316) from Cambodia. Scale = 5 mm

bulbous and the crown area of P^2 is larger relative to that of P^4 ; in *M. harrisoni*, P^2 and P^4 are subequal in size, in *M. l. rubex*, the crown area of P^2 is less than half that of the second premolar.

Within the 'cyclotis-group', *M. harrisoni* has a similar development of the mesostyle of the first (M^1) and second (M^2) upper molars and the posterior trigonid of the first (M_1) and second (M_2) lower molars to those of *M. rozendaali*, *M. huttoni* and *M. puta*. However, in addition to the diagnostic characters of *M. harrisoni* listed above,

these latter taxa are also smaller in all cranial and dental measurements (Table 1).

Habitat — The single specimen was collected at 22:50 hours in a mist net which was set across a river in disturbed semi-evergreen gallery forest with many immature trees. The area had been selectively logged in the past. The river was about 5 metres wide with medium-fast flowing water (Joe Walston, pers. comm.).

Distribution — Currently this species is only known from a single specimen collected in Kirirom National Park, Cambodia

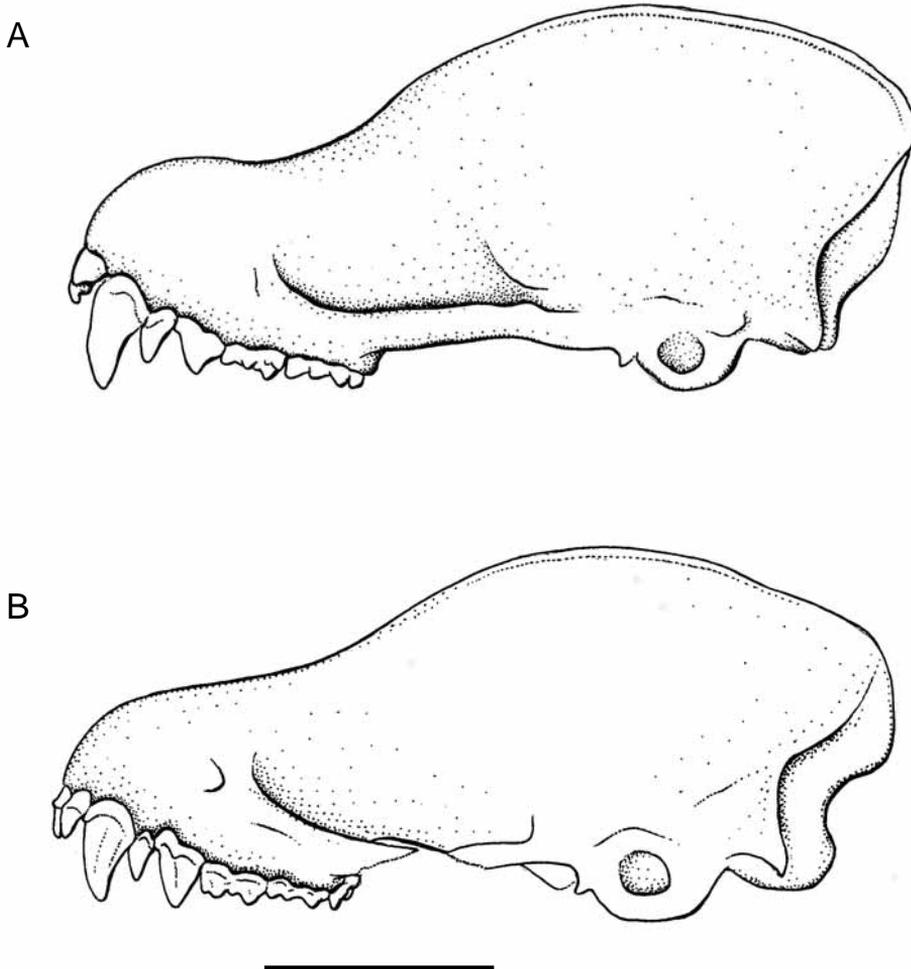


FIG. 2. Lateral view of the skulls of: A — *M. harrisoni* sp. nov. (holotype, HZM.1.36316) from Cambodia and B — *M. hilgendorfi* (HNHM 2003.37.47) from South Korea. Scale = 5 mm

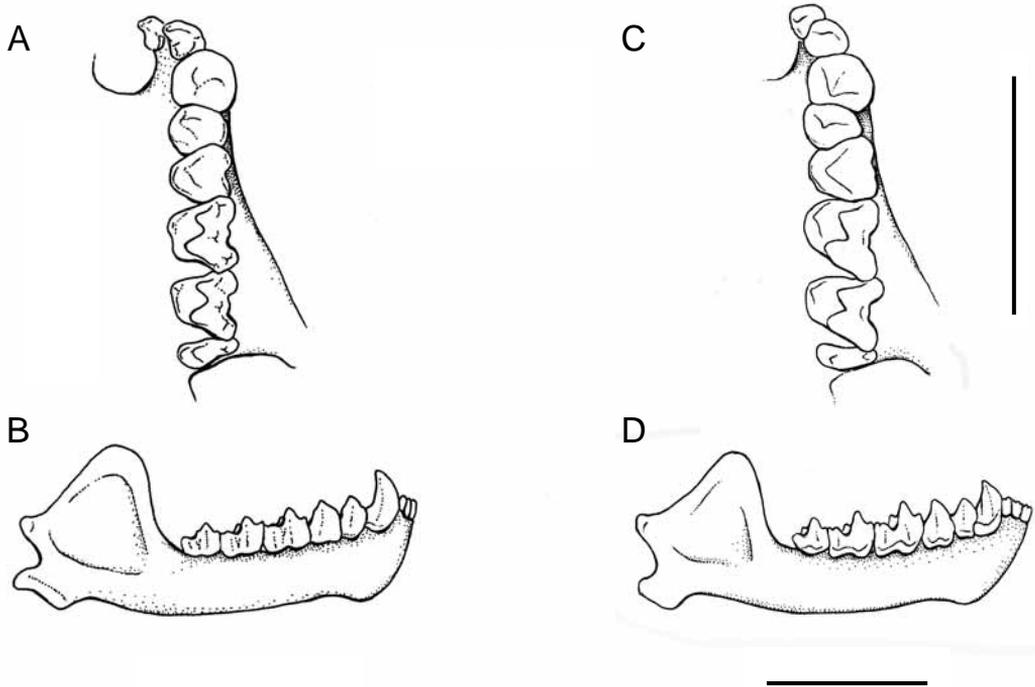


FIG. 3. Occlusal views of left upper dentition (above) and lateral views of right mandible (below) of: A and B — *M. harrisoni* sp. nov. (holotype, HZM.1.36316) from Cambodia and C and D — *M. hilgendorfi* (HNHM 2003.37.47) from South Korea. Scale = 5 mm

(11°29.611'N, 104°12.746'E). However, future studies may show it to be more widespread in the forests of South-east Asia.

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LITERATURE CITED

- ABE, H. 2000. Illustrated skull of Japanese mammals. Hokkaido University Press, Sapporo, 279 pp. [in Japanese]
- BATES, P. J. J., D. L. HARRISON, P. D. JENKINS, and J. L. WALSTON. 1997. Three rare species of *Pipistrellus* (Chiroptera: Vespertilionidae) new to Vietnam. *Acta Zoologica Academiae Scientiarum Hungaricae*, 43: 359–374.
- BATES, P. J. J., D. HENDRICHSEN, J. L. WALSTON, and B. D. HAYES. 1999. A review of the mouse-eared bats (Chiroptera: Vespertilionidae: *Myotis*) from Vietnam with significant new records. *Acta Chiropterologica*, 1: 47–74.
- BATES, P. J. J., TIN NWE, M. J. PEARCH, KHIN MAUNG SWE, SI SI HLA BU, and THANDA TUN. 2000. A review of bat research in Myanmar (Burma) and results of a recent survey. *Acta Chiropterologica*, 2: 53–82.
- BATES, P. J. J., TIN NWE, KHIN MAUNG SWE, and SI SI HLA BU. 2001. Further new records of bats from Myanmar (Burma), including *Craseonycteris thonglongyai* Hill 1974 (Chiroptera: Craseonycteridae). *Acta Chiropterologica*, 3: 33–41.

- BATES, P. J. J., MAR MAR THI, TIN NWE, SI SI HLA BU, KHIN MIE MIE, NYO NYO, AYE AYE KHAING, NU NU AYE, THIDA OO, and I. MACKIE. 2004a. A review of *Rhinolophus* (Chiroptera: Rhinolophidae) from Myanmar, including three species new to the country. *Acta Chiropterologica*, 6: 23–48.
- BATES, P. J. J., M. J. STRUEBIG, S. J. ROSSITER, T. KINGSTON, SAI SEIN LIN OO, and KHIN MYA MYA. 2004b. A new species of *Kerivoula* (Chiroptera: Vespertilionidae) from Myanmar (Burma). *Acta Chiropterologica*, 6: 219–226.
- CORBET, G. B., and J. E. HILL. 1992. The mammals of the Indomalayan Region. Natural History Museum and Oxford University Press, Oxford, 488 pp.
- FRANCIS, C. M., A. GUILLEN, and M. F. ROBINSON. 1999. Order Chiroptera: Bats. Pp. 225–235, in *Wildlife in Lao PDR: 1999 Status Report* (J. W. DUCKWORTH, R. E. SALTER and K. KHOUNBOLINE, eds.). IUCN, Vientiane, 275 pp.
- HENDRICHSEN, D., P. J. J. BATES, and B. D. HAYES. 2001a. Recent records of bats (Chiroptera) from Cambodia. *Acta Chiropterologica*, 3: 21–32.
- HENDRICHSEN, D., P. J. J. BATES, B. D. HAYES, and J. L. WALSTON. 2001b. Recent records of bats (Mammalia: Chiroptera) from Vietnam with six species new to the country. *Myotis*, 39: 35–122.
- KOOPMAN, K. F. 1994. Chiroptera: systematics. Handbook of zoology. Mammalia, part 60. Walter de Gruyter, Berlin, 217 pp.
- MAEDA, K., and S. MATSUMURA. 1998. Two new species of vespertilionid bats, *Myotis* and *Murina* (Vespertilionidae: Chiroptera) from Yanbaru, Okinawa Island, Okinawa Prefecture, Japan. *Zoological Science*, 15: 301–307.
- OGNEV, S. I. 1928. Mammals of Eastern Europe and Northern Asia. Vol. 1. Insectivora and Chiroptera. Glavnauka, Moscow, 487 pp.
- PETERS, W. 1880. Mittheilung über die von Hr. Dr. F. Hilgendorf in Japan gesammelten Chiropteren. *Monatsberichte der Königlich Preussischen Akademie der Wissenschaften*, (1880): 23–25.
- SIMMONS, N. B. In press. Order Chiroptera. In *Mammal species of the world: a taxonomic and geographic reference*. Third ed. (D. E. WILSON and D. M. REEDER, eds.). Smithsonian Institution Press, Washington D.C.
- WALLIN, L. 1969. The Japanese bat fauna. *Zoologiska Bidrag fran Uppsala*, 37: 223–440.
- YOSHIYUKI, M. 1989. A systematic study of the Japanese Chiroptera. National Science Museum, Tokyo, 242 pp.

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