

New records of Microchiroptera (Rhinolophidae and Kerivoulinae) from Vietnam and Thailand

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The diversity of Rhinolophidae in Thailand and Vietnam is briefly discussed and the taxonomy of Asian Kerivoulinae, with particular reference to the genus *Phoniscus*, is reviewed. Four new country records are included: *Rhinolophus shameli* and *Kerivoula kachinensis* from Vietnam and *Phoniscus jagorii* from Vietnam and Thailand. A second record of *Phoniscus atrox* from Thailand is also discussed.

Key words: *Rhinolophus shameli*, *Phoniscus jagorii*, *P. atrox*, *Kerivoula kachinensis*, Thailand, Vietnam, systematics, distribution, ecology

INTRODUCTION

Of the 73 species of *Rhinolophus* currently described (Cotterill, 2002; Fahr *et al.*, 2002; Csorba *et al.*, 2003), 30 are known from mainland southern and South-East Asia (Bates *et al.*, 2004). Of these, 17 are recorded from Thailand, or 18 if *R. siamensis* is treated as a distinct taxon from *R. macrotis* (Simmons, 2005). Csorba *et al.* (2003) included 13 species of *Rhinolophus* from Vietnam. Borissenko and Kruskop (2003) listed 17, of which one, *R. acuminatus*, was the first country record. Five others were based on provisional or doubtful records and one, *R. sinicus*, which was

included by Csorba *et al.* (2003), was omitted. Of the others, Borissenko and Kruskop (2003) included *R. cf. rouxi*, on the basis of specimens from Phong Nha-Ke Bang National Park but the identification was 'provisional' and they stated that specimens may prove to represent another taxon. The inclusion of *R. subbadius* was based on Huynh *et al.* (1994) and Corbet and Hill (1992), which in turn was based on Osgood (1932). However, Borissenko and Kruskop (2003) and Csorba *et al.* (2003) suggest that both records may represent *R. pusillus*. Two species, *R. yunanensis* and *R. shameli*, are included on the basis of the unpublished report entitled "Preliminary report on the bats

of Pu Mat Nature Reserve. Fauna and Flora International, Indochina Programme, Ha Noi” of B. Hayes and T. Howard (in litt.). The status of such records, which have been included in the ‘grey literature’ but not in peer-reviewed publications, is problematical. It is therefore of value to include here the first published record of *R. shameli* based on specimens from the central highlands.

The taxonomy of the Kerivoulineae in Asia is also problematical. Hill (1965) noted that bats of the genera *Kerivoula* (Gray, 1842) and *Phoniscus* (Miller, 1905) are relatively uncommon in reference collections. To some extent, this is still the case today, although the advent of the harp trap has led to a recent and dramatic increase in the frequency of their collection in the field (Kingston *et al.*, 2003; Struebig *et al.*, 2005). Hill (1965) also noted that the taxonomic status of *Phoniscus* was uncertain. Some bat taxonomists treated *Phoniscus* as congeneric with *Kerivoula* (Ryan, 1965; Koopman, 1993, 1994). Others considered the differentiating characters to be inconclusive but maintained them as separate genera (Troughton, 1929) or as subgenera (Laurie and Hill, 1954) whilst others considered *Phoniscus* to be clearly separate from *Kerivoula* (Le Souef and Burrell, 1926; Miller, 1931; Tate, 1941; Hill, 1965; Medway, 1969; Lekagul and McNeely, 1988; Corbet and Hill, 1992; Flannery, 1995; Simmons, 2005).

A detailed review of the characters used to distinguish *Phoniscus* from *Kerivoula* is included in Hill (1965) and summarized in Corbet and Hill (1992). It includes for *Phoniscus*: the tragus with a deep notch near the base (it is shallow in *Kerivoula* — Fig. 1); upper canine (C^1) with longitudinal, lateral grooves on its outer face (it is smoothly rounded in *Kerivoula* — Fig. 2); second upper incisor (I^2) much reduced with its greatest (antero-posterior) diameter

about one half, and its height one half or less, that of the first (I^1) (in *Kerivoula* the greatest diameter is equal or subequal to that of I^2 and the height one half or more — Fig. 3). In addition to the characters of Hill (1965), it should be noted that in *Phoniscus*, the second upper incisor (I^3) is also markedly reduced in size (both area and height) in comparison to C^1 (in *Kerivoula*, I^2 is not so reduced relative to C^1 — Figs. 2 and 3). Tate (1941) included six species in *Phoniscus* (*P. rapax*, *P. atrox*, *P. javanus*, *P. agnella*, *P. myrella* and *P. papuensis*). Hill (1965) recognized four species (*P. atrox*, *P. papuensis*, *P. jagorii* and *P. aerosa*); he treated *P. rapax* and *P. javanus* as junior synonyms of *P. jagorii* and transferred *P. agnella* and *P. myrella* to *Kerivoula*. This arrangement has been followed by Corbet and Hill (1992) and Simmons (2005).

The current paper includes further records of *Phoniscus* from mainland South-East Asia. Currently, the only records from this area (here defined as Myanmar,

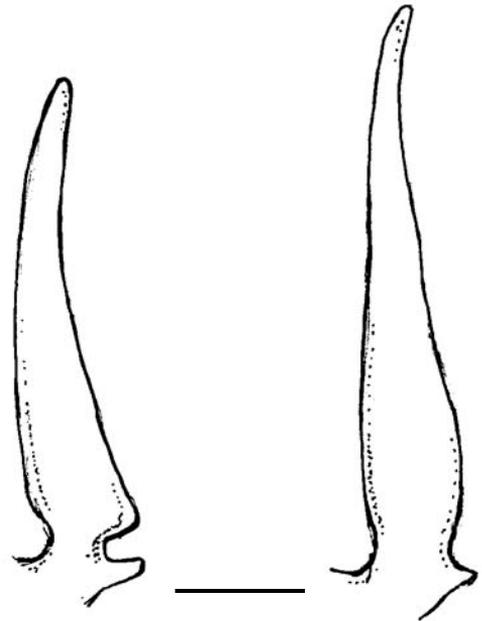


FIG. 1. Tragus of the left ear of *Phoniscus* (left) and *Kerivoula* (right); *P. jagorii*, XS.53, Vietnam and *K. kachinensis*, CMR-28, Vietnam. Scale = 2 mm

Thailand, Lao PDR, Cambodia and Thailand) are a single specimen of *P. atrox* recorded from southern Thailand by Kloss (1916) and *P. jagorii*, and possibly *P. atrox*, reported from Lao PDR (Francis *et al.*, 1999). In addition to the data on *Phoniscus*, this paper includes a significant new record of *Kerivoula kachinensis*, which is based on three specimens from Vietnam. This is only the second record of this recently described species (Bates *et al.*, 2004) and the first record of its occurrence outside Myanmar.

This paper represents one of the first outputs of a programme of studies, co-ordinated by the Harrison Institute and supported by the UK Government's Darwin Initiative programme, to promote collaborative research between bat taxonomists from different countries and institutions in mainland South-East Asia.

MATERIALS AND METHODS

Study Areas

In Vietnam, a number of field surveys was conducted at Xuan Son National Park between November 2003 and September 2004. The National Park is situated at Thanh Son District, Phu Tho Province, about 75 km north-west of Hanoi (21°03'–21°12'N, 104°51'–105°01'E). The elevation ranges from ca. 200 m to 1,386 m at the highest point, which is the mountain peak of Dinh Voi (Anon, 1995b). Limestone karst, which contains a large number of caves, covers about one third of the Park's area. Some of the caves contain river systems and many of them are diurnal roosting sites for bats that forage within the Park and/or its surrounding areas. The vegetation types comprise lowland and lower montane evergreen forest. Primary forest still covers the core zone of the Park, where there is little serious disturbance from local communities (Anon, 1995b). Prior to this study, no comprehensive bat surveys had been undertaken (Anon, 1995b; Thong, 2003).

Chu Mom Ray National Park is situated in Western Kon Tum Province in the highlands of central Vietnam (14°21'–14°36'N, 107°29'–107°47'E). Elevations range from around 200 m to the highest mountain peak, Chu Mom Ray, at 1,773 m (Anon, 1995a). The Park has several vegetation types

including lowland evergreen forest, semi-evergreen forest, and a large area of bamboo. The buffer zone of the park is covered by secondary forest with various vegetation types including shrubs and grasslands. There are also two medium-sized rivers, Dak Hodrai and Krong Po Ko, which are tributaries of the Mekong River system.

Huai-Thab Tan-Huai Samran Wildlife Sanctuary, which is located in Surin Province along the Thailand-Cambodia border, covers an area of 48,000 ha and is predominantly a plateau with an elevation of between 200 to 500 m a.s.l. The vegetation is characterized by dry evergreen forest mixed with dry dipterocarp and deciduous forest. Most of this forest is disturbed. It is less disturbed along the border. The climate is seasonal, with a rainy season from May to September and a dry season from November to April.

Bala Forest covers an area of 17,000 ha and has an altitudinal range of about 100–963 m a.s.l. The forest is 'Malesian type' tropical rain forest (Whitmore, 1984). It is surrounded by fruit orchards and rubber plantations. Numerous small streams are found in the narrow valleys. Small patches of peat swamp forest are also present.

Specimens and Measurements

All of the recent specimens from Vietnam and Thailand, which are listed below, were collected in harp traps. Specimens were measured with digital calipers, weighed and preserved in 70% ethanol. The skulls were subsequently extracted, prepared and measured.

The following external, cranial and dental measurements were taken using digital calipers. HB: head and body length, from the tip of the snout to the base of the tail, dorsally; TAIL: tail length, from the tip of the tail to its base adjacent to the anus; HF: foot length, from the extremity of the heel behind the *os calcis* to the extremity of the longest digit, not including the claws; TIBIA: length of tibia, from the knee joint to the ankle; FA: forearm length, from the extremity of the elbow to the extremity of the carpus with the wings folded; E: ear length, from the lower border of the external auditory meatus to the tip of the pinna; GTL: greatest length of the skull, the greatest antero-posterior length of the skull, taken from the most projecting point at each extremity; SL: skull length, from the alveolus of the anterior canine to the most projecting posterior point of the skull; CBL: condylo-basal length, from an exoccipital condyle to the alveolus of the anterior incisor; CCL: condylo-canine length, from an exoccipital condyle to the alveolus of the anterior canine; ZB: zygomatic breadth, the greatest width of the skull across the

zygomatic arches; BB: breadth of braincase at the posterior roots of the zygomatic arches; GBB: greatest width of the braincase; BH: braincase height, taken from the basisphenoid to the highest part of the skull; RW: rostral width taken across the anterior lateral swellings of the rostrum; PC: post orbital constriction; C–M³: maxillary tooththrow length, from the alveolus of the upper canine to the back of the crown of the third upper molar; M³–M³: palatal width, taken across the outer borders of the third upper molar, at the widest part; C–M₃: mandibular tooththrow length, from the alveolus of the lower canine to the back of the crown of the third lower molar; MDL: mandible length, from the most posterior part of the condyle to the most anterior part of the mandible. These measurements are illustrated in Figs. i–v in Bates and Harrison (1997). Body mass (MASS) was taken using a 60 g Pesola scale. Teeth size was measured using a graticule in a Leica MZ8 stereo-microscope.

Measurements included in Tables 1 and 2 are of recent specimens collected in Vietnam and Thailand and deposited at the Institute for Ecology and Biological Resources, Hanoi and the Prince of Songkla University, Hat Yai, respectively. In addition, there is one Vietnamese specimen of *K. kachinensis*, which is deposited at the Field Museum of Natural History, Chicago.

Echolocation calls of voucher specimens were recorded with a Tranquillity II (David Bale, UK) bat detector connected to a Sony Walkman Professional (WM D6C). Calls were recorded after bats were released in a large room (6 × 8 × 3 m) and allowed to fly freely. Calls were analysed using sound analysis software (Bat Sound Pro, Pettersson Elektronik AB, Sweden) on a personal laptop. Call characteristics including call types, minimum frequency, most energy frequency, call duration and number of harmonics were examined. At least five calls from each individual were analysed.

SYSTEMATIC REVIEW OF SPECIES

Rhinolophus shameli Tate, 1943

Shamel's horseshoe bat

Rhinolophus shameli Tate, 1943: 3; Koh Chang Island, Thailand

New material, previous records and distribution

Vietnam: Chu Mom Ray National Park, Kon Tum Province (14°28'N, 107°47'E, 750 m a.s.l.), 9 June, 2005, 3 ♂♂

(VDT05005/.05006 and .05008), 1 ♀ (VDT05007) collected by Vu Dinh Thong and Pham Duc Tien.

This is the first published record for Vietnam, although B. Hayes and T. Howard (in litt.) included it in an unpublished report on Pu Mat Nature Reserve. Previously known from Myanmar, Thailand, Lao PDR, Cambodia, and peninsular Malaysia (Simmons, 2005).

Description and taxonomic notes

Externally, the four specimens from Vietnam, with a forearm length of 45.8–47.3 mm (Table 1), are large in comparison to those included in Csorba *et al.* (2003), for which the values are 42.0–46.5 mm. However, they are comparable in all morphological characters including the connecting process of the noseleaf, which is inserted into a fissure in the thickened lancet and covered with short, dense hairs. Skull length (SL) is 20.4–21.2 mm (Table 2), which is within the range (19.3–21.6 mm) given by Csorba *et al.* (2003). The rostrum is high with the anterior and median swellings prominent. The width across the lateral swellings of the rostrum (RW) is 6.0 mm (6.0–6.1 mm, *n* = 4). In the smaller, but morphologically similar *R. coelophyllus*, the width is less than 5.5 mm (Csorba *et al.*, 2003).

Ecological notes and conservation status

All four specimens were captured in a harp trap, which was set across a footpath next to a narrow stream and a small cave. The study site was located in the core zone of the Chu Mom Ray National Park in an area of essentially undisturbed, lowland evergreen forest. Light rain was falling at the time of capture. *Kerivoula kachinensis* and *Murina tubinaris* were also captured at this site. The conservation status of *R. shameli* is lower risk, near threatened (Hutson *et al.*, 2001).

TABLE 1. Six external measurements (in mm) and the body mass (in g) of 11 specimens of four bat species recently collected in Vietnam and Thailand, including the length of head and body (HB), tail (TAIL), foot (HF), tibia (TIB), forearm (FA) and ear (E). For males of *R. shameli*, the range, mean and standard deviation are given. In *K. kachinensis*, sample sizes when differing from *n* are given in parentheses

Species	Sex	HB	TAIL	HF	TIBIA	FA	E	MASS
<i>Rhinolophus shameli</i>	3♂♂	47.0–48.1	19.4–21.0	9.4–10.2	22.7–23.7	46.5–47.3	19.6–20.7	8.4–9.5
		47.5, 0.5	20.4, 0.9	9.7, 0.4	23.1, 0.5	47.0, 0.5	20.3, 0.7	8.8, 0.6
	1♀	47.7	22.4	9.2	21.9	45.8	16.9	8.6
<i>Phoniscus jagorii</i>	1♂	45.2	36.5	8.5	18.0	35.3	12.3	–
	1♀	39.8	40.2	9.1	20.3	38.0	12.5	5.8
<i>P. atrox</i>	1♂	41.3	29.5	7.6	16.3	34.3	13.3	5.0
<i>Kerivoula kachinensis</i>	2♂♂	47.0, 47.0	53.0, 59.0	8.5, 11.0	22.7, 24.0	40.4, 43.4	11.0 (1)	7.5 (1)
	2♀♀	35.5, 46.7	50.5, 56.1	8.5, 8.7	22.8, 23.5	41.6, 43.2	10.0, 12.9	7.4, 8.3

Phoniscus jagorii (Peters, 1866)

Peter's trumpet-eared bat

Vespertilio (*Kerivoula*) *jagorii* Peters, 1866: 399; Samar Island, Philippine Islands

New material, previous records and distribution

Vietnam: Xom Du study site, Xuan Son National Park, Phu Tho Province (21°06'N, 104°57'E), 24 November 2003, 1 ♀ (XS 53) collected by Vu Dinh Thong and Pham Duc Tien. Thailand: Tamearn-Thom Castle, Huai-Thab Tan-Huai Samran Wildlife Sanctuary, Surin Province, 400 m a.s.l., (14°21'N, 103°50'E), 18 January 2000, 1 ♂ (PSU-M 05.10) collected by S. Bumrungsri.

These are the first records for Vietnam and Thailand. Previously known from Lao PDR, peninsular Malaysia, Borneo, Java, Bali, Sulawesi, Lesser Sunda Islands and Samar Island in the Philippines (Simmons, 2005).

Description and taxonomic notes

The recent specimen from Vietnam is preserved in ethanol and it is difficult to determine the pelage colour with certainty. However, its hairs appear to have four distinct colour bands, namely dark brown or blackish-brown at the base, followed by buff, then brown, and finally golden or whitish-yellow tips; the paler tips are more pronounced on the ventral surface. The hairs of the wet specimen from Thailand have become 'foxed' after being stored in daylight and have no diagnostic value. The skulls have a condylo-basal length of 15.4 and 15.6 mm (Table 2). This corresponds well with measurements (in mm) for *P. j. jagorii* (15.3) and *P. j. javanus* (15.3, 15.9) included in Hill (1965). Skull shape is essentially similar to the description given in Hill (1965). Both specimens have well-defined basioccipital pits. These are deeper than those of *P. atrox*, which has a smaller skull, but this character is only useful if

TABLE 2. Eleven cranial and dental measurements (in mm) of 11 specimens of four bat species recently collected in Vietnam and Thailand, including the greatest length of skull (GTL), skull length (SL), condylo-basal length (CBL), condylo-canine length (CCL), zygomatic breadth (ZB), breadth of braincase (BB), postorbital constriction (PC), maxillary toothrow length (C-M³), palatal breadth (M³-M³), mandibular toothrow length (C-M₃) and mandibular length (MDL). In *R. shameli*, the measurements of GTL and CBL are omitted since the premaxillae are frequently damaged or missing and these measurements are consequently not reliable; in males of *R. shameli*, the range, mean and standard deviation are given. In *K. kachinensis*, sample sizes when differing from *n* are given in parentheses

Species	Sex	GTL	SL	CBL	CCL	ZB	BB	PC	C-M ³	M ³ -M ³	C-M ₃	MDL
<i>Rhinolophus shameli</i>	3♂♂	-	20.9-21.2	-	18.3-18.8	10.2-10.4	8.7-8.9	1.8-2.1	8.1-8.5	7.4-7.9	8.6-9.0	14.2-14.5
			21.1, 0.2		18.6, 0.2	10.4, 0.2	8.9, 0.1	1.9, 0.2	8.3, 0.2	7.6, 0.2	8.8, 0.2	14.4, 0.2
<i>Phoniscus jagorii</i>	1♀	-	20.4	-	18.0	9.9	8.6	2.1	8.0	7.4	8.3	13.8
	1♂	16.4	16.3	15.4	15.1	9.9	7.7	4.5	6.8	5.7	7.3	12.0
<i>P. atrox</i>	1♀	17.0	16.8	15.6	15.3	9.6	7.7	4.0	6.7	5.8	7.2	12.2
	1♂	15.4	15.1	14.0	13.6	9.0	7.2	3.9	5.9	5.2	6.4	10.6
<i>Kerivoula kachinensis</i>	2♂♂	17.9 (1)	16.9, 17.4	15.2, 16.7	15.5, 16.3	10.1, 10.7	7.6, 8.2	3.5, 3.5	6.8, 6.9	6.4, 6.4	7.4, 7.4	12.6, 12.7
	2♀♀	17.5, 17.8	16.8, 17.3	16.4, 16.6	15.6, 16.1	10.3, 10.7	7.8, 7.9	3.6, 3.7	6.6, 6.9	6.4, 6.4	7.2, 7.5	12.2, 12.5

material of both species is available for comparison at the same time. Upper toothrow length (C-M³) of 6.7 and 6.8 mm is comparable to those of 6.7, 6.7 and 7.1 mm listed by Hill (1965). The first upper incisor (I²) has a single cusp and is pointed. The second incisor (I³) is distinctly small and short (0.5-0.6 mm). The canine (C¹) has two longitudinal, lateral grooves on its outer face (Fig. 2). The first upper premolar (P²) is broader than the second (P³) but shorter antero-posteriorly (Fig. 3). P³ is approximately rectangular in shape but with an antero-internal elongation. In the lower dentition, the premolars are narrow, especially the second (P₃ — see Fig. 3).

Since so few voucher specimens are available for study, it is difficult to determine if the taxa *javanus* and *rapax* are valid subspecies, as provisionally indicated by Hill (1965), or whether they are simply synonyms of *P. j. jagorii*. For this reason, the subspecific status of both of the current specimens cannot be determined and they are referred simply to *P. jagorii*.

Echolocation

Based on the recent Thai material, the echolocation calls (in kHz) of *P. jagorii* are characterized by a broadband FM sweep with a start frequency of 137-140 (\bar{x} = 137.55, SD = 1.66, *n* = 4) and an end frequency of 82.9 ± 3.45 (77.0-85.7). Peak frequency is 88 (87.5-88.2). Calls are of low intensity and short duration (1.41-1.58 ms). When calls are emitted in series, the interval is about 13 ms. In Malaysia, Kingston *et al.* (1999) reported a start frequency of 169.3 (154.4-184.8, *n* = 18), and end frequency of 70.4 kHz (61.6-76.0, *n* = 18), a peak frequency of 94.4 (79.2-117.6, *n* = 18), and a call duration of 2.2 ms (1.6-3.2 ms, *n* = 18).

Ecological notes and conservation status

In Vietnam, *P. jagorii* was collected in a harp trap set across a narrow path close to

the small village of Xom Lap, which is situated in Xuan Son National Park. There is considerable limestone karst and primary forest in the vicinity. *Murina cyclotis* was collected from the same locality. In Thailand, a male specimen was caught in a harp trap at 19:30 hours on the edge of a moderately disturbed, semi-evergreen forest in a flat area with an elevation of 400 m a.s.l. This forest is on a plateau that connects with a large forest patch in Cambodia. *P. jagorii* was found to be very manoeuvrable, sometimes flying close to the ground. Previously, specimens from Malaysia were recorded from the primary forest (Kingston *et al.*, 2003). Its conservation status is lower risk, least concern (Hutson *et al.*, 2001).

Phoniscus atrox Miller, 1905

Groove-toothed trumpet-eared bat

Phoniscus atrox Miller, 1905: 230; Vicinity of the Kateman River, eastern Sumatra

New material, previous records and distribution

Thailand: Wildlife Research Station, Bala Forest, Hala-Bala Wildlife Sanctuary, Wang District, Narathiwat Province

(05°48'N, 101°50'E), 21 May 2003, 1 ♂ (PSU-M 05.11) collected by S. Bumrungsri.

In Thailand, the previous locality record is Klong Bang Sai, Patiyeu District, Chumphon Province (10°43'N, 99°20'E — Kloss, 1916). It is also known from peninsular Malaysia, Sumatra and Borneo (Simmons, 2005) and possibly Lao PDR (Francis *et al.*, 1999).

Description and taxonomic notes

In general, the pelage of *P. atrox* is comparable to that of *P. jagorii* but slightly paler. Kloss (1916) noted that of his two Thai specimens, the female was duller and darker than the male. With a forearm length of 34.3 mm (Table 1), the current specimen slightly exceeds in size those (32.3, 32.6 mm) listed in Hill (1965). However, the condylobasal length of 14.0 mm (Table 2) is within the range (\bar{x} = 13.6, 13.1–14.1 mm, n = 7) of specimens of *P. atrox* in The Natural History Museum, London. The morphology of the skull is similar to that of *P. jagorii*, except that the basioccipital pits are shallower (see above). In the dentition, the upper canine is very large, with its outer side having two deep grooves. The upper

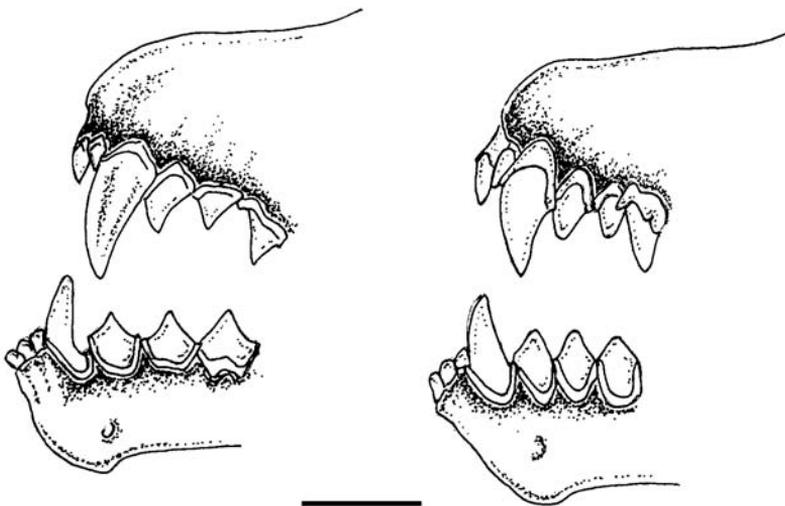


FIG. 2. Lateral view of the left anterior dentition (I^2 – P^4 and I^1 – P^4) of *Phoniscus* (left) and *Kerivoula* (right); *P. jagorii*, XS.53, Vietnam and *K. kachinensis*, VN014-S411, Vietnam. Scale = 2 mm

premolars are significantly smaller than those of *P. jagorii* (Fig. 3). This is evident in the first (P^2) and especially the second (P^3) premolar. Furthermore, in comparison to *P. jagorii*, P^3 is essentially round in outline, rather than rectangular, and without an antero-internal elongation. The second lower premolar (P_3) is particularly narrow (Fig. 3).

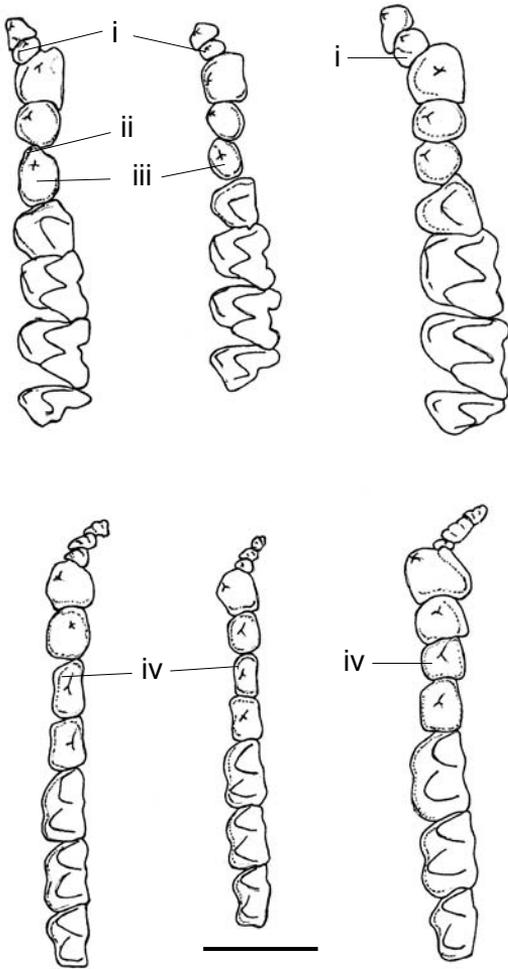


FIG. 3. Left maxillary (above) and mandibular (below) toothrows of *P. jagorii*, XS.53 (left), *P. atrox*, PSU-M 05.11 (centre), and *K. kachinensis*, CMR-28 (right). (i): I^3 , much reduced in *Phoniscus*; (ii): antero-internal elongation of P^3 in *P. jagorii*; (iii): P^3 larger and rectangular in *P. jagorii* in comparison to *P. atrox*; (iv): P_3 narrow in *Phoniscus*, broader in *Kerivoula*. Scale = 2 mm

Echolocation

Based on recent material from Thailand, like *P. jagorii*, the echolocation calls of *P. atrox* are characterized by broad FM sweeps. The initial frequency ($\bar{x} \pm SD$) is 125.53 ± 7.31 kHz ($n = 6$) and the terminal frequency is 61.80 ± 3.76 kHz. The mean peak frequency is 77.37 ± 6.55 kHz (range 64.6–83.5). Generally, energy is distributed fairly evenly throughout the emitted call. The calls have low intensity and a relatively short duration of 2.97 ± 0.79 ms. Occasionally, calls are emitted in series with an interval of 14–18 ms. In Malaysia, Kingston *et al.* (1999) reported a start frequency of 166.1 kHz (145.6–183.2, $n = 42$), an end frequency of 60.0 kHz (51.2–72.0, $n = 42$), a peak frequency of 86.9 kHz (62.4–122.4, $n = 42$), and a call duration of 2.8 ms (1.9–3.9, $n = 42$).

Ecological notes and conservation status

In Bala Forest, Thailand, a single individual was captured in the early evening (19:00 hrs) in disturbed forest interspersed with orchards and rubber plantations. This area, at an elevation of 150 m a.s.l., is adjacent to a large patch of pristine lowland evergreen forest. *Phoniscus atrox* appears to favour birds' nests, particularly those of the broad bill (*Eurylaimus* sp.) as a diurnal roost. In eastern Sumatra, the holotype and paratype, both females, were collected on 9th September, 19:03 hrs from an abandoned nest of a broad bill in dense forest on the banks of the Kateman River. Individuals belonging to this species were also captured in birds' nests in Malaysia (T. Kingston, personal comm.). The first record from Malaysia was of a subadult collected at 615 m a.s.l. from the Ulu Gombak Forest Reserve, Selangor (Medway, 1969). The first record from Thailand was an adult male and female caught in January, 1916 (Kloss, 1916). Its conservation status is lower risk, least concern (Hutson *et al.*, 2001).

Kerivoula kachinensis Bates *et al.*, 2004
Kachin woolly bat

Kerivoula kachinensis (Bates *et al.*, 2004): 220;
Namdee Forest, Bhamo Township, Kachin State,
Myanmar, 24°34'N, 97°08'E

New material, previous records and distribution

Vietnam: Chu Mom Ray National Park, Kon Tum Province (14°28'N, 107°47'E, 750 m a.s.l.), 28 June, 2005, 1 ♂ (CMR-28) and 2 ♀♀ (CMR-25, VN014-S411) collected by Vu Dinh Thong and Pham Duc Tien; Muong Mo, Lai Chau Province (22°13'N, 102°55'E, 229 m a.s.l.), 14 March, 1929, 1 ♂ (FMNH 33209) collected by R. W. Hende. These are the first published records for Vietnam. Previously, *K. kachinensis* was known only from southern Kachin State, Myanmar (Bates *et al.*, 2004).

Description and taxonomic notes

With forearm lengths of 40.4–43.4 mm (see Table 1), the four Vietnamese specimens of *K. kachinensis* compare favourably in size to the holotype (41.3 mm — Bates *et al.*, 2004). Since the holotype was a wet specimen, the pelage colour could not be determined accurately. It is therefore of interest to describe for the first time the pelage of a prepared skin (VN014-S411). The hairs on both the dorsal and ventral aspects have grey-brown roots, the mid-parts are pale whitish grey and the tips are buff to mid-brown; the ventral surface is slightly paler than the dorsal. Notably, the overall pelage coloration is darker brown than the fur of *Kerivoula papillosa*, with which *K. kachinensis* is most likely to be confused when examined in the field. Other characters such as the ears, wings and tail are as described for the Myanmar specimen by Bates *et al.* (2004). The skulls of the Vietnamese specimens, with condylo-canine lengths of 15.5–16.3 mm (see Table 2), likewise agree in size with the holotype (15.5 mm). Their most obvious feature is

the flattened braincase. This is similar to the holotype, with a relative height of braincase (BH/GBB × 100%) of 66.5% (62.9–69.6%, SD = 2.8, *n* = 4) compared to 64.0% in the holotype and 86.4% (80.6–91.6%, *n* = 22) in *K. papillosa* (Bates *et al.*, 2004). The holotype of *K. kachinensis* was an old adult with worn teeth. The current specimens agree with the description of the dentition by Bates *et al.* (2004) and in addition confirm that the upper canine has a well-defined cingulum on its internal border and that the third lower incisor (I₃) has a well-defined central cusp and lateral cusps. Additional measurements (in mm) not included in Table 2 are BH: 5.4 (5.1–5.6, *n* = 4); GBB: 8.2 (8.1–8.4, *n* = 4). The Muong Mo specimen, previously included in the Field Museum collection as *K. papillosa*, was collected more than seven decades prior to the description of *K. kachinensis* from Myanmar (Bates *et al.*, 2004) but never received critical study.

Ecological notes and conservation status

The three recent specimens were collected on 28 June, 2005 in Chu Mom Ray National Park. For further details of the study site see Methods and also Ecological notes for *R. shameli*. The conservation status of *K. kachinensis* has not been assessed (Hutson *et al.*, 2001).

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