

Checklist of Cambodian bats (Chiroptera), with new records and remarks on taxonomy

Vitaliy A. Matveev

ABSTRACT. Thirty-one bat species have been registered in the course of two expeditions to Cambodia in January–February 2000 and July–September 2002. Eight of them, namely *Macroglossus sobrinus*, *Taphozous theobaldi*, *Hipposideros cineraceus*, *H. galeritus*, *Rhinolophus pusillus*, *Miniopterus schreibersii*, *Miniopterus* sp., and *Harpiocephalus harpia* are reported from Cambodia for the first time. Occurrence of *Rousettus leschenaulti* and *Pteropus hypomelanus* is confirmed, while that of *Saccolaimus saccolaimus*, on contrary, rejected. Specific distinctiveness of *Harpiocephalus mordax* has been rejected in the view of the latest findings, including the molecular data. It should be regarded as a synonym of *H. harpia*. One species, *Miniopterus* sp., is not identified at this stage, and is likely to represent a new species. In general, Cambodian bat fauna could be characterised as typical Indomalayan, with almost 70% of its registered species not occurring outside the region. It is lacking any species common in the neighbouring zoogeographic regions, with only one, *Miniopterus schreibersii*, occurring throughout the Old World, Australia, and Oceania. An annotated species list, with notes on taxonomy, distribution and occasionally ecology is presented. Selected measurements have been given as well. Updated checklist with 48 registered bat species is proposed.

KEY WORDS: Chiroptera, Cambodia, new records, taxonomy, checklist, *Harpiocephalus*.

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Перечень видов рукокрылых (Chiroptera) Камбоджи с указанием новых находок и комментариями по таксономии

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РЕЗЮМЕ. В ходе двух экспедиций в Камбоджу (в январе–феврале 2000 г. и июле–сентябре 2002 г.) собран материал по 31 виду рукокрылых. Восемь из них, а именно *Macroglossus sobrinus*, *Taphozous theobaldi*, *Hipposideros cineraceus*, *H. galeritus*, *Rhinolophus pusillus*, *Miniopterus schreibersii*, *Miniopterus* sp. и *Harpiocephalus harpia* отмечены для этой страны впервые. Помимо этого, зарегистрированы два других вида, *Rousettus leschenaulti* и *Pteropus hypomelanus*, достоверных сведений по обитанию которых на территории Камбоджи до сих пор не было. Вид *Saccolaimus saccolaimus*, напротив, исключен из перечня видов рукокрылых страны. Видовая самостоятельность *Harpiocephalus mordax* опровергнута. Этот таксон следует считать синонимом *H. harpia*. Один вид длиннокрылов, *Miniopterus* sp., на настоящий момент определить не удалось. Мы не исключаем, что это новый вид. В целом, фауну рукокрылых Камбоджи можно охарактеризовать как типичную Индомалайскую: около 70% всех зарегистрированных видов за пределами региона не встречаются, в то время как обычные для соседних зоогеографических областей виды не отмечены. Лишь обыкновенный длиннокрыл (*Miniopterus schreibersii*) распространен по всему Старому Свету, Австралии и Океании. Приведены развернутые описания отмеченных видов с комментариями по таксономии, распространению и в некоторых случаях — экологии. Представлены таблицы с рядом посткраниальных, краниальных и одонтологических промеров. Приведен обновленный перечень видов рукокрылых Камбоджи из 48 видов.

КЛЮЧЕВЫЕ СЛОВА: Chiroptera, Камбоджа, новые находки, таксономия, перечень видов, *Harpiocephalus*.

Introduction

Becoming more accessible for foreign researchers nowadays, Cambodia nevertheless still remains one of the least explored countries of Southeast Asia. The same applies to its bat fauna. Compared to Thailand and Vietnam, where bats are relatively well studied,

Cambodia to certain extent still remains a blank spot on the map of Indochina. Moreover, a number of species is artificially ‘assigned’ to this country as a result of extrapolation of their ranges from adjacent Thailand or Vietnam. A number of recent attempts to get rid of these uncertainties resulted in the series of field investigations (Matveev, 1999; Kock, 2000; Hendrichsen *et*

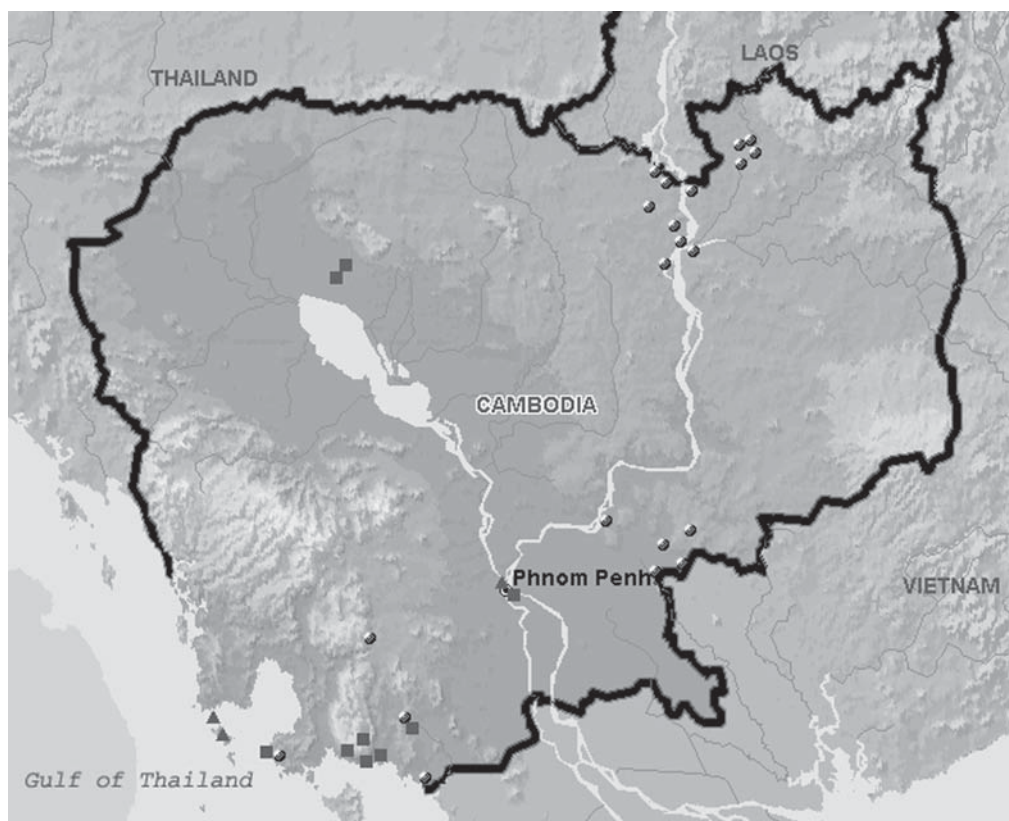


Figure 1. Map of Cambodia with location of author's working sites: triangle — 1998 (Matveev, 1999), square — 2000 (this paper), circle — 2002 (this paper).

al., 2001; Walston & Bates, 2001) and two consecutive preliminary checklists, which together had shown occurrence of 34 bat species in the country (Kock, 2000; Hendrichsen *et al.*, 2001). All these records, made in Cambodia mainly during the second part of the previous decade, have noticeably filled up the gap in our knowledge of Indochinese bats. At the same time, still much remains to be done.

The present paper is a result of the author's two latest expeditions to the Kingdom of Cambodia, conducted in January–February 2000, and July–September 2002.

Institute abbreviations. BMNH — Natural History Museum, London, Great Britain; ZMMU — Zoological Museum of Moscow State University, Moscow, Russia.

Material and methods

Studied areas

The working sites are shown on the map (Fig. 1).

Trapping methods

Two methods were mainly used to trap bats. The first one, comparatively recently invented (Borissenko, 1999), is based on capturing bats in flight by means of a mobile trap, or so called 'flap-trap'. The device repre-

sents a 2.5–3 m wide and 2 m long nylon net with 16–18 mm mesh stretched between the distal ends of 5–6 m carbon-plastic telescopic rods. It allows trapping bats in flight actively and, when possible, even selectively. The heterodyne bat detector Pettersson D-100 (Uppsala, Sweden) was used simultaneously to detect flying bats. A shorter 4 m device was used in the forested areas, in a combination with an 80W gas-lamp. Secondly, I relied on 7 m and 12 m mist-nets, set across the streams, paths and near the cave entrances.

Measurements

All caught specimens (except for some pteropodids) were weighed with digital scales to the nearest 0.1 g (W). The following external measurements were taken to the nearest 0.1 mm with vernier callipers: R — forearm length; C — tail length; A — ear length; Cr — tibia length; Pl — hind foot length excluding claws (Tab. 2). All craniodental measurements (Tab. 3) were taken under dissecting microscope with digital callipers to the nearest 0.01 mm, namely: GL — greatest length of skull; CBL — condylobasal length; CC¹L — condylocanine length; MW — mastoid width; RL — rostral length from preorbital foramen to the alveolus of the inner incisor; RW — rostral width across preorbital foramina; ZW — zygomatic width; C¹Mⁿ — length of maxillary tooththrow; C¹C¹ — external width across upper canines, MⁿMⁿ — external width across last upper molars; C₁M_n — length of mandibular tooththrow.

Table 1. Checklist of Cambodian bats. '+' — registered, '?' — provisional record, '-' — rejected.

No	Species	Matveev (1999)	Kock (2000), Hendrichsen et al. (2001) and others	This paper	Notes
1	<i>Pteropus hypomelanus</i>	?		+	The first record for Cambodia for the period of more than 100 years. In Matveev (1999): only sight records on a small island, adjacent to Kaoh Rung
2	<i>P. lylei</i>	+			In Matveev (1999): Phnom Penh
3	<i>Rousettus leschenaulti</i>		?	+	Confirmed for Cambodia
4	<i>R. amplexicaudatus</i>		+	+	
5	<i>Cynopterus brachyotis</i>	+	+	+	In Matveev (1999): Kaoh Rung and adjacent small islands (the Gulf of Thailand) — the first record for Cambodia
6	<i>C. horsfieldii</i>		?		
7	<i>C. sphinx</i>	+	+	+	
8	<i>Megaerops ecaudatus</i>		?		
9	<i>M. niphanae</i>		+	+	
10	<i>Eonycteris spelaea</i>		+	+	
11	<i>Macroglossus minimus</i>		+		
12	<i>M. sobrinus</i>			+	The first record for Cambodia
13	<i>Taphozous melanopogon</i>	+	+	+	
14	<i>T. longimanus</i>	+	+	+	In Matveev (1999) was misidentified as <i>Saccolaimus saccolaimus</i>
15	<i>T. theobaldi</i>			+	The first record for Cambodia
16	<i>Megaderma spasma</i>	?	+	+	
17	<i>M. lyra</i>		+		
18	<i>Rhinolophus acuminatus</i>		+	+	
19	<i>Rh. pusillus</i>			+	The first record for Cambodia
20	<i>Rh. borneensis</i>		+	+	
21	<i>Rh. malayanus</i>		+	+	
22	<i>Rh. shameli</i>		+	+	
23	<i>Rh. luctus</i>		+	+	
24	<i>Hipposideros armiger</i>		+		
25	<i>H. cineraceus</i>			+	The first record for Cambodia
26	<i>H. galeritus</i>			+	The first record for Cambodia
27	<i>H. larvatus</i>	+	+	+	
28	<i>H. pomona</i>		+	+	
29	<i>Myotis annectans</i>		+		
30	<i>M. hasseltii</i>	+	+	+	
31	<i>M. muricola</i>	+		+	In Matveev (1999): Phnom Penh — the first record from the country, confirmed by the voucher specimens
32	<i>M. rosseti</i>		+		
33	<i>Arielulus circumdatus</i>		+		
34	<i>Pipistrellus coromandra</i>		+		
35	<i>P. tenuis</i>		+		
36	<i>Hesperoptenus blanfordi</i>		+	+	
37	<i>H. tickelli</i>		+	+	
38	<i>Tylonycteris pachypus</i>		+		

Table 1 (continued).

No	Species	Matveev (1999)	Kock (2000), Hendrichsen et al. (2001) and others	This paper	Notes
39	<i>T. robustula</i>		+		
40	<i>Miniopterus schreibersii</i>			+	The first record for Cambodia
41	<i>Miniopterus</i> sp.			+	Presumably new species
42	<i>Scotophilus heathi</i>		+	+	
43	<i>S. kuhlii</i>		+	+	
44	<i>Harpiocephalus harpia</i>			+	The first record for Cambodia
45	<i>Kerivoula hardwickii</i>		+		
46	<i>K. papillosa</i>		+		
47	<i>Chaerephon plicata</i>	+	+		
48	<i>Otomops wroughtoni</i>		+		Record by Walston & Bates (2001)
	<i>Harpiocephalus morlax</i>			+	Confirmed to be a synonym of <i>H. harpia</i>
	<i>Saccolaimus saccolaimus</i>	+		-	The only known record for Cambodia (Matveev, 1999) is in fact misidentified <i>T. longimanus</i>

Table 2. Selected external measurements of Cambodian bats stored at ZMMU; *Pteropus hypomelanus*, one specimen of *Roussetus leschenaulti*, and two *Cynopterus sphinx* were measured in the field alive; 'n' (or figures in parentheses) — the number of measured specimens. Abbreviations are explained in the text.

Species	n	W	R	C	A	Cr	Pl
<i>Pteropus lylei</i>	3	—	137.87* (1)	0	30.46*, 35.5–37.1	61.15* (1)	35.48*, 40.8 (2)
<i>P. hypomelanus</i>	1	—	138.0	0	31.0	67.0	40.6
<i>Roussetus amplexicaudatus</i>	2	48.5–48.7	69.4–70.0	14.0–14.2	17.4–18.5	27.7–29.5	14.5–16.5
<i>R. leschenaulti</i>	2	105.0–107.0	82.2–86.5	17.0–17.3	17.4–19.4	36.8–39.2	19.5–20.9
<i>Cynopterus brachyotis</i>	10	24.5–32.5	58.6–68.6	6.4–16.6	14.5–21.5	21.1–26.3	11.5–14.3
<i>C. sphinx</i>	13	26.7*, 35.4–49.8 (12)	60.0*, 65.7–70.0 (10)	8.4*, 6.1–12.7 (9)	16.5*, 18.1–22.2 (9)	20.4*, 25.0–28.3 (9)	13.5*, 12.2–15.6 (9)
<i>Megaerops niphanae</i>	3	21.5–23.3	55.6–56.5	0	16.0–16.6	21.2–24.2	11.5–13.5
<i>Eonycteris spelaea</i>	1	40.4	66.8	15.0	19.4	29.2	16.0
<i>Macroglossus sobrinus</i>	1	28.7	46.3	0	15.4	17.3	10.8
<i>Taphozous melanopogon</i>	5	20.3–35.1	62.5–67.2	15.5–27.4	17.0–18.4	23.7–25.5	10.0–13.1
<i>T. longimanus</i>	3	17.6–24.9	56.7–63.0	27.0–30.8	15.7–17.1	24.3–24.8	10.3–12.5
<i>T. theobaldi</i>	3	26.8–32.7	72.5–74.1	28.7–32.6	22.8–24.0	28.2–28.7	14.5–15.7
<i>Megaderma spasma</i>	2	11.6–17.7	55.3–55.9	0	35.8–37.7	31.2–31.9	13.6–14.0
<i>Hipposideros cineraceus</i>	3	3.3–4.1	34.8–36.8	24.2–25.9	15.1–16.1	15.2–15.8	5.1–5.8
<i>H. galeritus</i>	9	6.6–9.1	43.3–50.2	36.4–42.4	13.5–16.0	18.6–21.3	5.4–6.8
<i>H. pomona</i>	6	5.6–7.1	41.7–44.1	29.2–37.2	19.3–22.5	17.9–20.4	6.4–7.4
<i>H. larvatus</i>	27	11.5–20.5	57.5–65.9	24.1–37.4	19.6–23.5	21.6–25.1	8.2–11.1
<i>Rhinolophus acuminatus</i>	3	9.6–13.5	46.8–48.0	21.7–23.6	17.5–17.9	20.0–21.6	9.0–10.9
<i>Rh. pusillus</i>	1	4.3	39.6	19.2	14.2	16.1	7.0
<i>Rh. borneensis</i>	2	8.0–10.9	44.5–44.9	19.8–21.0	18.8–20.8	18.9–19.8	7.8–8.7
<i>Rh. malayanus</i>	1	5.4	40.3	24.2	16.6	17.3	8.0
<i>Rh. shameli</i>	4	7.8–10.0	46.5–47.4	19.1–20.8	19.0–22.0	21.2–22.9	9.1–9.8

* Young specimens

Table 2 (continued).

Species	n	W	R	C	A	Cr	Pl
<i>Rhinolophus luctus</i>	1	37.3	68.7	48.5	35.9	37.3	17.0
<i>Myotis hasseltii</i>	7	7.6–9.9 (4)	37.5–41.4	38.4–44.2	13.2–15.9	15.6–17.0	9.4–10.3
<i>M. muricola</i>	12	3.2–5.1	33.1–36.4	35.6–41.3	10.4–12.7	15.0–16.4	5.0–7.0
<i>Harpiocephalus harpia</i> (♂)	1	12.4	44.4	46.3	14.0	21.0	9.2
<i>H. harpia</i> (♀)	1	–	50.2	–	14.7	23.1	10.6
<i>Hesperoptenus blanfordi</i>	4	5.5–8.0	26.6–28.0	27.4–30.2	7.7–8.7	11.2–11.9	4.5–6.6
<i>H. tickelli</i>	2	13.9–17.8	49.7–53.0	47.8–49.6	14.7–15.0	20.9–22.2	9.5–9.6
<i>Scotophilus heathi</i>	1	27.8	60.5	59.2	15.6	23.4	10.7
<i>S. kuhlii</i>	1	22.4	50.8	49.4	13.3	19.4	9.2
<i>Miniopterus sp.</i>	3	6.5–7.0	41.5–42.0	49.7–57.4	8.3–8.9	17.5–18.1	7.2–8.4
<i>M. schreibersii</i>	2	8.0–8.1	42.8–43.6	47.9–50.6	9.6–9.7	17.0–17.2	8.5–9.4
<i>Chaerephon plicata</i>	11	12.0–20.8	47.9–50.8	27.2–47.5	16.9–20.5	15.9–18.1	6.6–11.6

Table 3. Selected craniodental measurements of Cambodian bats stored at ZMMU; 'n' (or figures in parentheses) — the number of measured specimens. Abbreviations are explained in the text.

Species	n	GL	CBL	CC ¹ L	C ¹ M ⁿ	C ¹ C ¹	M ⁿ M ⁿ	C _i M _n
<i>Pteropus lylei</i>	1	60.07*	57.50*	53.25*	22.29*	11.36*	14.54*	24.91*
<i>Rousettus leschenaulti</i>	1	40.13	38.51	36.81	14.78	8.39	11.60	16.17
<i>R. amplexicaudatus</i>	1	32.36	30.56	29.48	11.82	6.20	9.98	13.26
<i>Cynopterus brachyotis</i>	3	28.52–29.50 (2)	26.62–28.76	25.92–27.07 (2)	9.42–9.50 (2)	6.05–6.33 (2)	8.45–8.54 (2)	10.51–10.52 (2)
<i>C. sphinx</i>	2	31.74 (1)	29.66–30.12	29.52 (1)	11.17 (1)	7.10 (1)	9.43 (1)	12.26 (1)
<i>Megaerops niphanae</i>	1	27.42	25.81	25.68	8.50	5.28	8.36	9.33
<i>Macroglossus sobrinus</i>	1	28.89	27.27	25.49	9.89	5.72	6.87	10.97
<i>Eonycteris spelaea</i>	1	32.65	30.90	29.46	12.02	6.56	8.21	13.20
<i>Taphozous melanopogon</i>	1	22.12	20.00	20.37	9.10	4.14	8.79	9.96
<i>T. longimanus</i>	1	21.28	19.07	19.78	9.05	3.93	8.32	9.83
<i>T. theobaldi</i>	1	24.80	23.22	23.30	10.89	4.93	10.37	11.89
<i>Megaderma spasma</i>	1	24.48	21.16	21.72	9.10	4.82	7.90	10.35
<i>Hipposideros cineraceus</i>	3	15.29–15.73	13.22–13.46	13.00–13.32	4.93–5.20	2.88–2.92	4.74–5.00	5.39–5.43
<i>H. pomona</i>	3	18.00–18.90	15.61–16.36	15.40–16.12	6.20–6.60	3.89–4.04	6.08–6.29	6.69–7.18
<i>H. galeritus</i>	3	17.26–17.94	14.91–15.23	14.61–14.87	5.52–5.74	3.36–3.54	5.70–5.77	5.87–6.07
<i>H. larvatus</i>	6	23.80–24.34	20.67–21.24	19.86–20.71	8.90–9.25	5.46–6.02	8.77–9.23	9.55–10.02
<i>Rhinolophus acuminatus</i>	1	21.14	17.97	17.78	7.79	5.22	8.17	8.51
<i>Rh. pusillus</i>	1	16.75	14.42	14.08	6.10	3.95	6.33	6.61
<i>Rh. borneensis</i>	2	20.16–20.60	17.63–18.06	16.91–17.79	7.46–7.74	4.91–5.02	7.23–7.51	7.86–8.42
<i>Rh. malayanus</i>	1	18.20	15.70	15.47	6.90	4.46	6.76	7.51
<i>Rh. shameli</i>	1	21.72	19.18	18.43	8.20	5.45	7.61	8.67
<i>Rh. luctus</i>	1	31.22	27.13	26.79	11.51	7.83	10.73	12.71
<i>Myotis hasseltii</i>	2	15.91–16.09	14.71–14.87	13.99–14.16	5.79–5.83	4.53–4.66	6.26	6.28–6.31
<i>M. muricola</i>	2	13.72–13.75	12.76–12.88	12.10–12.13	5.09–5.23	3.48–3.64	5.52–5.59	5.44–5.59

* Young specimens

Table 3 (continued).

Species	n	GL	CBL	CC ¹ L	C ¹ M ⁿ	C ¹ C ¹	M ⁿ M ⁿ	C _i M _n
<i>Harpiocephalus harpia</i> (♂)	1	21.24	19.12	18.61	6.55 (C ¹ M ²)	6.35	7.04	7.62
<i>H. harpia</i> (♀)	1	23.32	20.88	20.38	7.17 (C ¹ M ²)	7.11	7.66 (M ² M ²)	8.37
<i>Hesperoptenus blanfordi</i>	2	12.78–13.13	11.84–11.86	11.97–12.18	4.20–4.32	4.23–4.36	5.84–6.36	4.59–4.72
<i>H. tickelli</i>	1	18.24	17.26	17.63	7.22	6.40	8.99	8.06
<i>Scotophilus heathi</i>	1	22.26	19.66	20.07	7.22	7.00	9.40	8.21
<i>S. kuhlii</i>	1	20.13	17.74	18.06	6.51	6.53	8.48	7.38
<i>Miniopterus</i> sp.	3	14.51–14.59 (2)	13.46–13.57 (2)	12.69–12.75 (2)	5.37–5.41	4.07–4.23	5.57–5.80	5.71–5.77 (2)
<i>M. schreibersii</i>	2	15.53–15.88	14.68–14.79	13.88–13.94	6.09–6.19	4.71–4.69	6.37–6.47	6.47–6.54
<i>Chaerephon plicata</i>	2	20.25–20.52	18.28–18.70	17.53–17.82	7.43–7.73	5.27–5.30	8.78–8.95	8.23

Results

Pteropus hypomelanus Temminck, 1853

Fig. 2.

Material. One adult male was trapped by the locals at the end of 2001, presumably on one of the small islets in the Gulf of Thailand (the area of Kâmpóng Saôm Bay). Since then it has been remaining in captivity. The bat was measured and photographed, the tissue samples were taken for the genetic analysis.

Remarks on taxonomy and distribution. This species demonstrates strong adherence to small islands and is not known from the mainland. The above individual, caught by Kâmpóng Saôm locals, is likely to originate from one of those few islands in the bay known for being inhabited by flying foxes (Matveev, 1999).

This species was reported to occur in Cambodia by Andersen (1912), with reference to Dobson (1880: 173) and Trouessart (1897: 82). However, no other records appear in the later publications. This species was also listed for Cambodia by Lord Medway (1978) and in the IUCN/SSC Action Plan for Conservation of Old World Fruit Bats (Mickleburgh *et al.*, 1992) with no indication of the exact locality or any reference given. It was also not included into the latest species checklist by Kock (2000), presumably on the reason that this fruit-bat had not been reported for the country over the past century. Therefore, the present record is the first for the period of more than 100 years, confirming the presence of *P. hypomelanus* in Cambodia.

Andersen (1912) included this country into the range of the subspecies *P. h. condorensis* Peters, 1869. Indeed, the observed specimen could be characterised with the features, 'typical' of this form: mixed seal-brown and silvery grey back, somewhat hazel chest and belly, and blackish chestnut mantle, as well as short, more or less rounded ear (Fig. 2). The forearm is 138 mm (Tab. 2), which is very close to that of the type specimen (135 mm; Andersen, 1912), and is within the appropriate dimensions of several *P. h. condorensis*, stored in the BMNH collection (ca. 132–142 mm).



Figure 2. Captive male of *Pteropus hypomelanus*.

Rousettus (Rousettus) leschenaulti (Desmarest, 1820)

Fig. 3.

Material. Phnom Sila caves, 20–25 km northeast of Kâmpôt, Kâmpôt Province (10°46' N, 104°19' E), 30 January 2000, one adult male was photographed and released after external measurements and the samples of wing-membrane had been taken for DNA analysis; 11 August 2002, one adult male (ZMMU S-174743).

Remarks on taxonomy and distribution. This is the first authentic record of the species for Cambodia, which previously was mapped, but listed with a question mark for this country by Corbet & Hill (1992).

It has widely been accepted, that the most reliable diagnostic feature allowing to distinguish between *R. leschenaulti* and *R. amplexicaudatus* is the narrower last lower molar of the former, versus more or less rounded in the latter (Andersen, 1912; Corbet & Hill, 1992; Koopman, 1994). Indeed, in the caught specimens *M*₃ was almost twice as long as wide. At the same time, our measurements clearly demonstrate that these two species significantly differ in size and weight, with *R. leschenaulti* being conspicuously larger and two times heavier (Tabs. 2 and 3).



Figure 3. Male *Rousettus leschenaulti* (ZMMU S-174743), Kâmpôt Province.

Since Rookmaaker & Bergmans (1981) tentatively identified this species in Angkor Wat (north-western Cambodia) this country is listed (though with a question-mark) as a part of the species' range (Corbet & Hill, 1992; Kock, 2000), while the present record proves its occurrence in Cambodia.

Cambodian representatives of *R. leschenaulti* are characterised with pilose nape and forearm and hence should be assigned to the nominate subspecies, *R. l. leschenaulti* (Desmarest, 1820), occupying the mainland part of the species' range (Corbet & Hill, 1992; Koopman, 1994).

Ecological remarks. The above specimens were caught in the colony of ca. 120–130 individuals, sharing the same karst cave with several species of the genera *Hipposideros*, *Rhinolophus*, and *Taphozous*.

Rousettus (Rousettus) amplexicaudatus (Geoffroy, 1810)
Fig. 4.

Material. Phnom Chngouck cave, 5 km northwest of Phumĭ Khsan, Stüing Trêng Province (13°45' N, 105°45' E), 1 September 2002, one adult male, one adult female (ZMMU S-174741 and S-174742).

Remarks on taxonomy and distribution. The captured Cambodian specimens have subcircular posterior lower molars, characteristic of this species. However, their size is noticeably smaller (Tabs. 2 and 3), than reported for this species (Andersen, 1912; our data). In the only Cambodian specimen, stored at the BMNH (7.1.1.263), the forearm is conspicuously longer too: 77 mm (versus 69.4–70 mm).

Subspecific affiliation of Cambodian representatives needs further investigation, though the mainland populations (e.g. from Thailand and Malay Peninsula) are usually referred to the nominate form (Koopman, 1994).

Ecological remarks. A colony of several hundred individuals was found with another cave dweller, *Eonycteris spelaea* (see below), inside the large cave in the karst formation.



Figure 4. Female *Rousettus amplexicaudatus* (ZMMU S-174742), Stüing Trêng Province.

Cynopterus brachyotis (Müller, 1838)
Fig. 5.

Material. Southern extremity of the Elephant Mountains, Kâmpôt Province (10°42'–10°35' N, 104°00'–104°08' E), 29 January 2000, one adult male, two adult females (ZMMU S-168322 – S-168324). 100 km southwest of Phnom Penh, Kâmpông Speu Province (11°18' N, 104°02' E), 29 July 2002, one adult female (ZMMU S-174698). Vicinities of Kâmpông Saôm, Krông Preăh Sihanouk Province, 26 July 2002, one adult male (ZMMU S-174699).



Figure 5. Male *Cynopterus brachyotis* (ZMMU S-166146), Kaôh Rüng Island, the Gulf of Thailand.



Figure 6. Male *Cynopterus sphinx* (ZMMU S-174700), Stüing Trëng Province.

Remarks on taxonomy and distribution. This species was first mapped (but not listed) for Cambodia by Corbett & Hill (1992), while the first voucher specimens were collected by Matveev (1999) on several islands (including Kaôh Rûng) off Cambodia's coast. Later it was also recorded by Hendrichsen *et al.* (2001).

There appears to be no morphological criterion, neither external, nor craniodental, by which *C. brachyotis* could be readily distinguished from *C. sphinx*, rather than relatively shorter ears in the former: a feature yet mentioned by Andersen (1912). From this point a further search for the reliable diagnostic features is quite topical. Hill & Thonglongya (1972) suggested separating *C. brachyotis* and *C. sphinx*, overlapping by forearm and ear lengths, by the combination of these two parameters. However, the ear length appears to be not convenient enough for such a purpose, as the ways different researchers take this measurement may vary.

However, in spite of the above similarities, there appears to be one parameter, allowing separating the two sibling species quite readily: it is weight (Tab. 2). The same conclusion was made by S.V. Kruskop (ZMMU), who studied Vietnamese representatives of both species (pers. comm.). This parameter even works on bats of similar size.

Cynopterus archipelagus (Philippines) and *C. minor* (Sulawesi), first mistakenly recognised by Hill (1983) as two distinct species, were later included in *C. brachyotis*: each was described from a single immature specimen of *C. b. brachyotis* (Müller, 1838) (Heaney *et al.*, 1987 and Bergmans & Rozendaal, 1988, respectively; also see Koopman, 1989; Corbet & Hill, 1992; Mickleburgh *et al.*, 1992). The mainland populations

(except those from Malayan highlands) are usually referred to the nominate subspecies (Koopman, 1994).

Cynopterus sphinx (Vahl, 1798)

Fig. 6.

Material. Southern extremity of the Elephant Mountains, Kâmpôt Province (10°42'–10°35' N, 104°00'–104°08' E), 29 January 2000, one adult male (ZMMU S-168325); 10 February 2000, one adult male (ZMMU S-168326). Siëmpang and the vicinities, Stüing Trëng Province (14°06'–14°07' N, 106°16'–106°23' E), 26 August 2002, one young male (ZMMU S-174702). Phumĭ Dân Loüng, Stüing Trëng Province (14°02'N, 106°20'E), 26 August 2002, two adult males (ZMMU S-174700 and S-174701).

Remarks on taxonomy and distribution. The subspecific structure of *C. sphinx* and *C. brachyotis* represents certain difficulties, with some forms even being shuffled between these taxa. However, based primarily on the cranial measurements (Tab. 3), the Cambodian specimens could undoubtedly be allocated as *C. s. angulatus* Miller, 1908 (also see Andersen (1912) for measurements, who treated this taxon as the largest form of *C. brachyotis*).

Megaerops niphanae Yenbutra & Felten, 1983

Fig. 7.

Material. Southern extremity of the Elephant Mountains, Kâmpôt Province (10°42'–10°35' N, 104°00'–104°08' E), 28 January 2000, one adult male (ZMMU S-168327); 10 February 2000, one adult male, one adult female pregnant with one foetus (ZMMU S-168328 and S-168329).



Figure 7. Male *Megaerops niphanae* (ZMMU S-168328), Kâmpôt Province.



Figure 8. Male *Eonycteris spelaea* (ZMMU S-174703), Stüing Trêng Province.

Remarks on taxonomy and distribution. Kock (2000) assumes *M. ecaudatus*, reported from Popork Village Forest (Klein, 1971), may pertain to *M. niphanae*, which had not been distinguished by that time. Therefore, Klein's finding could be the first record of *M. niphanae* for Cambodia. No subspecies.

Eonycteris spelaea (Dobson, 1871)
Fig. 8.

Material. Phnom Chngouck cave, 5 km northwest of Phumĭ Khsan, Stüing Trêng Province (13°45' N, 105°45' E), 1 September 2002, one adult male (ZMMU S-174703).

Remarks on taxonomy and distribution. Subspecies are poorly defined.

Macroglossus sobrinus Andersen, 1911
Fig. 9.

Material. Southern extremity of the Elephant Mountains, Kâmpôt Province (10°42' – 10°35' N, 104°00' – 104°08' E), 31 January 2000, one adult female (ZMMU S-168322).

Remarks on taxonomy and distribution. This is the first record of this species for Cambodia. Corbet & Hill (1992) mapped but not listed it for this country.

Most of the species range, excluding the Mentawais, is occupied by the nominate subspecies (Corbet & Hill, 1992; Koopman, 1994).

Taphozous melanopogon Temminck, 1841
Fig. 10.

Material. Southern extremity of the Elephant Mountains, Kâmpôt Province (10°42' – 10°35' N, 104°00' – 104°08' E), 25 January 2000, one adult male (ZMMU S-168330). Southern extremity of the Elephant Mountains, Kâmpôt Province (10°42' – 10°35' N, 104°00' – 104°08' E), 30 January 2000, one adult female, pregnant with a single embryo (ZMMU S-168332). Phnom Chngouck cave, eastward of Kâmpôt, Kâmpôt Province, 30 January 2000, one adult male (ZMMU S-168331).

Remarks on taxonomy and distribution. Ellerman & Morrison-Scott (1951) treated *T. m. bicolor*



Figure 9. Male *Macroglossus sobrinus* (ZMMU S-168339), Kâmpôt Province.

Temminck, 1841 as a synonym of the nominate subspecies, but Koopman (1994) accepted it as additional subspecies, inhabiting India and Sri Lanka east to southern China and Vietnam, including the Andaman Islands. Following this view, Cambodian specimens should pertain to *bicolor*. However, Bates & Harrison (1997) do not consider it distinct even at subspecific level, due to considerable variation in size and colour in this species.



Figure 10. Male *Taphozous melanopogon* (ZMMU S-168330), Kâmpôt Province.



Figure 11. Male *Taphozous longimanus* (ZMMU S-168304), Phnom Penh.

Taphozous longimanus Hardwicke, 1825

Fig. 11.

Material. The city of Phnom Penh, 21 January 2000, two adult males (ZMMU S-166149 and S-168304). Ponhea Kraek, Kâmpông Cham Province (11°46' N, 105°55' E), 14 September 2002, one adult male (ZMMU S-174748).

Remarks on taxonomy and distribution. Cambodian specimens belong to the nominate subspecies *T. l. longimanus* Hardwicke, 1825, occurring as far to the west as India and Sri Lanka.

The only known record of *Saccolaimus saccolaimus* (Temminck, 1838) from Cambodia (Matveev, 1999) is misidentified *T. longimanus*. Nonetheless, recent surveys by A.V. Borissenko in Vietnam (Borissenko & Kruskop, 2003) showed occurrence of this species literally 5 km away from Cambodian border (11°37' N, 105°53' E), on a narrow projection of Vietnamese territory into that of Cambodia. These records from Vietnam (the voucher specimens are deposited at the ZMMU) demonstrate that this species is rather probable to occur in Cambodia as well. However, the au-

thor's survey in the region gave no result. Meanwhile, *S. saccolaimus* should be excluded from the list of Cambodian bats.

Taphozous theobaldi Dobson, 1872

Fig. 12.

Material. Phnom Chngouck cave, 5 km northwest of Phumi Khsan, Stung Trêng Province (13°45' N, 105°45' E), 1 September 2002, one adult male, two adult females (ZMMU S-174749 – S-174751).

Remarks on taxonomy and distribution. This is the first record of *T. theobaldi* for Cambodia. The majority of the species' range, including Indochina, is occupied by the nominate subspecies (e.g. Koopman, 1994), which could be readily distinguished from *T. t. secatus* Thomas, 1915 by the throat patch of darker brown hairs present in older males (Khajuria, 1979).

Megaderma (Megaderma) spasma (Linnaeus, 1758)

Fig. 13.

Material. Vicinities of Kâmpông Saôm, Krông Preăh Sihanouk Province, 27 July 2002, one adult male (ZMMU S-174718). Siêmpang and the vicinities, Stung Trêng Province (14°06' –14°07' N, 106°16' –106°23' E), 25 August 2002, one adult female (ZMMU S-174719).

Remarks on taxonomy and distribution. Cambodian representatives belong to the form *M. s. minus* Andersen, 1918 (Andersen, 1918; Shamel, 1942; Corbet & Hill, 1992; Koopman, 1994), which has distinctly smaller size than in many other subspecies, with forearm ranging from 53.5 to 56.5 mm (Phillips, 1967; also see Tab. 2).

Hipposideros galeritus Cantor, 1846

Fig. 14.

Material. Southern extremity of the Elephant Mountains, Kâmpôt Province (10°42' –10°35' N, 104°00' –104°08' E), 24–31 January 2000, 01–07 February 2000, two adult males, six



Figure 12. Male *Taphozous theobaldi* (ZMMU S-174750), Stung Trêng Province.



Figure 13. Male *Megaderma spasma* (ZMMU S-174718), Krông Preăh Sihanouk Province.

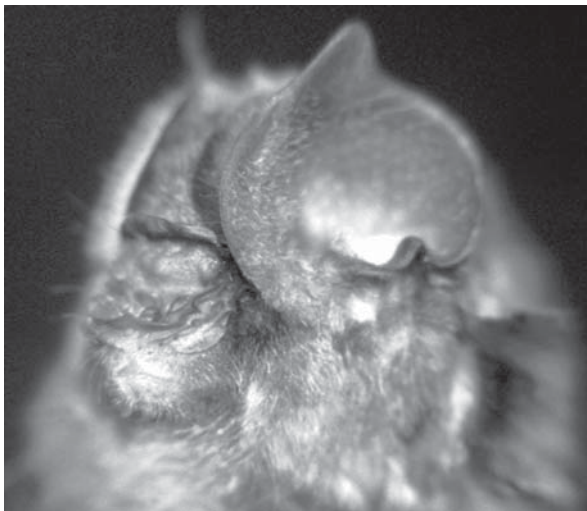


Figure 14. *Hipposideros galeritus*, Kâmpôt Province.

adult females, five of which were pregnant with a single embryo (ZMMU S-168314 – S-168321). Phnom Sila caves, 20–25 km northeast of Kâmpôt, Kâmpôt Province (10°46' N, 104°19' E), 11 August 2002, one adult female (ZMMU S-174711).

Remarks on taxonomy and distribution. This is the first record of this species for Cambodia. Hitherto it has been reported for Indochina from the southern provinces of Vietnam only (Huynh et al., 1994), though Koopman (1989) mentioned this species to occur in



Figure 15. Female *Hipposideros cineraceus* (ZMMU S-174706), Krông Preăh Sihanouk Province.

Indochina in some limited part of Thailand, but neither gave the exact locality, nor the reference. Four subspecies are currently recognised (Corbet & Hill, 1992; Koopman, 1994). The allocation of Indochinese specimens requires further investigation.

Hipposideros cineraceus Blyth, 1853

Fig. 15.

Material. Southern extremity of the Elephant Mountains, Kâmpôt Province (10°42' – 10°35' N, 104°00' – 104°08' E), 24 January 2000, one adult male (ZMMU S-168310). Vicinities of Kâmpông Saôm, Krông Preăh Sihanouk Province, 7 August 2002, one adult female (ZMMU S-174706). Phnom Chngouk cave, 5 km northwest of Phumĭ Khsan, Stung Trêng Province (13°45' N, 105°45' E), 1 September 2002, one adult male (ZMMU S-174710).

Remarks on taxonomy and distribution. This is the first record of *H. cineraceus* for Cambodia, being the southernmost point of its distribution in Indochina. The largest part of the species' range, excluding southern India and the Philippines, is occupied by the nominate subspecies (Hill & Francis, 1984).

Hipposideros pomona Andersen, 1918

Fig. 16.

Material. Southern extremity of the Elephant Mountains, Kâmpôt Province (10°42' – 10°35' N, 104°00' – 104°08' E), 24–25 January 2000, three adult males (ZMMU S-168311 – S-



Figure 16. Male *Hipposideros pomona* (ZMMU S-168312), Kâmpôt Province.

168313). Phnom Chngouck cave, 5 km northwest of Phumĭ Khsan, Stĕng Trĕng Province (13°45' N, 105°45' E), 1 September 2002, three adult males (ZMMU S-174707 – S-174709).

Remarks on taxonomy and distribution. Three subspecies are usually recognised (Hill *et al.*, 1986). Cambodian specimens should be referred to the form *sinensis*: they are conspicuously larger than the nominate form and *gentilis* (Tabs. 2 and 3), the jugal projection is lacking, while the anterior lower premolar is very large.

Hipposideros larvatus (Horsfield, 1823)

Fig. 17.

Material. Research site 4, 30 January 2000, four adult males (ZMMU S-168306–S-168309). Phnom Loang cave, 30 km east of Kâmpôt, Kâmpôt Province (10°27' N, 104°25' E), 10 August 2002, one adult male, one adult female (ZMMU S-174712 and S-174713). 3 km southeast of Phumĭ Kâmpông Sœāmeu, Preāh Vihêar Province (13°57' N, 105°52' E), 6 September 2002, three adult males, one adult female (ZMMU S-174714–S-174717).



Figure 17. Male *Hipposideros larvatus* (ZMMU S-174713), Kâmpôt Province.



Figure 18. Female *Rhinolophus acuminatus* (ZMMU S-174735), Stĕng Trĕng Province.

Remarks on taxonomy and distribution. As per Corbet & Hill (1992), Vietnamese specimens pertain to *H. l. alongensis* Bourret, 1942, whereas Koopman (1994) listed it only for the north of the country, while those from the south he referred to the form *grandis*. Individuals caught in Vietnam by S.V. Kruskop (ZMMU) are of the same size with those from the south of Cambodia (except for one specimen from Kebang, Quan Binh Province, Vietnam, with the length of the forearm as short as 51.9 mm), in which forearm ranges from 57.5 to 63.4 mm (and only in one is as long as 65.9 mm; Tab. 2), coinciding with the data from Myanmar: 57.5–63.0 mm (Bates *et al.*, 2000), inhabited by *H. l. grandis* Allen, 1936. These data agree with other records of *H. l. grandis* G.M. Allen, 1936 from Cambodia (Klein, 1969, 1971), and confirm the view, that Cambodian populations pertain to the form *grandis*.

Rhinolophus acuminatus Peters, 1871

Fig. 18.

Material. 2 km westwards of Phumĭ Krăng Cham, Stĕng Trĕng Province (13°26' N, 105°51' E), 30 August 2002, one adult male (ZMMU S-174733). Siĕmpang and the vicinities, Stĕng Trĕng Province (14°06' – 14°07' N, 106°16' – 106°23' E), 28 August 2002, two adult females (ZMMU S-174734 and S-174735).

Remarks on taxonomy and distribution. Five subspecies are currently recognised. However, the subspe-

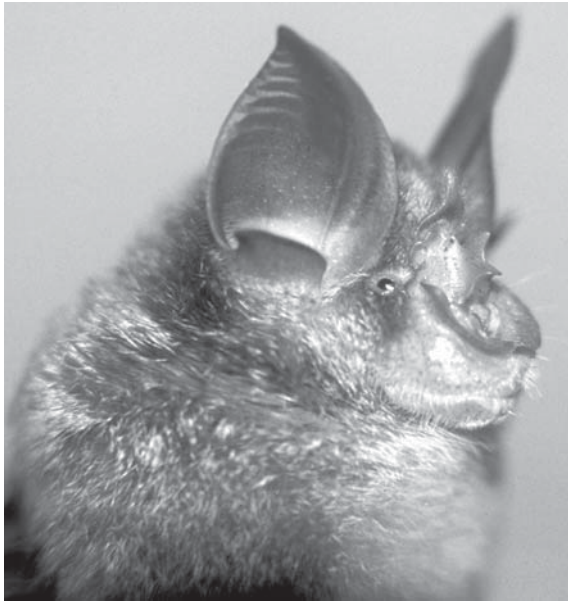


Figure 19. Female *Rhinolophus pusillus* (ZMMU S-174736), Kâmpóng Speu Province.

cific allocation of mainland populations is uncertain and requires special investigations. In general, mainland specimens resemble those from Java (the nominate form) and Lombok, inhabited by *audax* (Koopman, 1994; Csorba *et al.*, 2003).

Rhinolophus pusillus Temminck, 1834
Fig. 19.

Material. 100 km southwest of Phnom Penh, Kâmpóng Speu Province (11°18' N, 104°02' E), 29 July 2002, one adult female (ZMMU S-174736).

Remarks on taxonomy and distribution. The first record for Cambodia. This country was mapped, but not listed as a part of this species' range by Corbet & Hill (1992). Subspecific allocation of Cambodian population needs further investigations. The adjacent parts of the known species' range are occupied by *szechuanus* (including Thailand), *calidus* (including Vietnam) and *minutillus* (including Malay Peninsula) (Koopman, 1994).

Rhinolophus borneensis Peters, 1861
Fig. 20.

Material. Prey Houg Waterfalls, 25 km north of Phum-Chimoân, Kâmpóng Cham Province, between 11°53' N – 11°56' N, 105°57' E and 11°53' N – 11°56' N, 106°01' E, 15 September 2002, two adult males (ZMMU S-174731 and S-174732).

Remarks on taxonomy and distribution. In the captured specimens the male is conspicuously larger than the female. Cambodian representatives are referred to *Rh. b. chaseni* Sanborn, 1939 (Hill & Thonglongya, 1972; Koopman, 1994). The present record is the easternmost in the country.



Figure 20. Male *Rhinolophus borneensis* (ZMMU S-174731), Kâmpóng Cham Province.

Rhinolophus malayanus Bonhote, 1903
Fig. 21.

Material. Phnom Sila caves, 20–25 km northeast of Kâmpôt, Kâmpôt Province (10°46' N, 104°19' E), 11 August 2002, one adult male (ZMMU S-174730).

Remarks on taxonomy and distribution. The position of the second lower premolar in the toothrow may vary from slightly extruded to external (Csorba *et al.*, 2003). In this particular specimen it is extruded, but not external: P₂ and P₄ are not in contact. This species has no subspecies.



Figure 21. Male *Rhinolophus malayanus* (ZMMU S-174730), Kâmpôt Province.



Figure 22. Female *Rhinolophus luctus* (ZMMU S-174737), Kâmpông Cham Province.

Rhinolophus luctus Temminck, 1834
Fig. 22.

Material. Prey Houng Waterfalls, 25 km north of Phum-Chimoân, Kâmpông Cham Province, roughly between 11°53' N – 11°56' N, 105°57' E and 11°53' N – 11°56' N, 106°01' E, 15 September 2002, one adult female (ZMMU S-174737).

Remarks on taxonomy and distribution. This is the second record of this species from Cambodia. Apart from the above individual, and the first record by Hendrichsen *et al.* (2001), another specimen was visually observed and photographed by O. Shumakov in Phnom Bokor National Park, southern Cambodia. Therefore, this species is now known for the Cardamom Mountains in the south-west, for the east of the country (close to Vietnamese border), and for the Elephant Mountains in the south.

Hendrichsen *et al.* (2001) indicated that their specimen from the Cardamom Mountains was similar to *Rh. beddomei* (southern India and Sri Lanka). However, the two forms of the latter, namely *beddomei* and *sobrinus*, are more commonly treated as subspecies of *Rh. luctus* (e.g. Corbet & Hill, 1992; Koopman, 1994). The authors mentioned, that their Cambodian specimen had comparatively smaller size (R 63.1 mm, CBL 26.3 mm, C¹Mⁿ 10.6 mm), than that of *R. luctus* (i.e. than other forms, apart from *beddomei* and *sobrinus*), though still possessed some features, “more typical of *Rh. luctus*”, such as the well developed hollow above the interorbital region.

Our specimen from eastern Cambodia is larger, than the one from the Cardamom Mountains (Tabs. 2 and 3), though still could be treated as average, or even small of its kind. In many parameters it resembles Vietnamese specimens stored at ZMMU (Borissenko & Kruskop, 2003), and apparently represents the same form. However, the subspecific allocation of Indochinese populations requires further investigation. Individuals from the nearest known localities belong to the following subspecies (Koopman, 1994): *perniger* (possibly including Thailand) and *morio* (including Malay Peninsula).



Figure 23. Male *Rhinolophus shameli* (ZMMU S-174738), Kâmpôt Province.

Rhinolophus shameli Tate, 1943
Fig. 23.

Material. Southern extremity of the Elephant Mountains, Kâmpôt Province (10°42' – 10°35' N, 104°00' – 104°08' E), 6 February 2000, one adult female (ZMMU S-168305). Phnom Sila caves, 20–25 km northeast of Kâmpôt, Kâmpôt Province (10°46' N, 104°19' E), 11 August 2002, one adult male (ZMMU S-174738). Phnom Chngouck cave, 5 km northwest of Phumĭ Khsan, Stūng Trêng Province (13°45' N, 105°45' E), 1 September 2002, one adult male (ZMMU S-174739). 6 km west of Preäh Ângkoäl, Stūng Trêng Province (13°53' N, 105°54' E), 6 September 2002, one adult female (ZMMU S-174740).

Remarks on taxonomy and distribution. The species appears to be quite common and widespread in Cambodia. No subspecies.

Myotis (Leuconoe) hasseltii Temminck, 1849
Fig. 24.

Material. Vicinities of Kâmpông Saôm, Krông Preäh Sihanouk Province, 26 July 2002, two adult males (ZMMU S-174722 and S-174723). Stūng Trêng, Stūng Trêng Province, 19 August 2002, two adult females (ZMMU S-174724 and S-174725).

Remarks on taxonomy and distribution. Hill (1983) recognised four subspecies, with *continentis* occurring from Myanmar to Cambodia. Earlier it was known as *M. adversus continentis* Shamel, 1942 (Hill & Thonglongya, 1972).

Myotis (Selysius) muricola (Gray, 1846)
Fig. 25.

Material. Southern extremity of the Elephant Mountains, Kâmpôt Province (10°42' – 10°35' N, 104°00' – 104°08' E), 4 February 2000, three adult males and one female pregnant with a single foetus (ZMMU S-168335–S-168338). Vicinities of Kâmpông Saôm, Krông Preäh Sihanouk Province, 26 July 2002, two adult females, including one post-lactating (ZMMU S-174726 and S-174727); 5 August 2002, one adult male (ZMMU S-174728). Phumĭ Kâmpông Sœaëmeu, Preäh Vihêar Province (13°58' N, 105°51' E), 5 September 2002, one adult male (ZMMU S-174729).



Figure 24. Female *Myotis hasseltii* (ZMMU S-174724), Stung Trêng Province.

Remarks on taxonomy and distribution. This diverse species has a wide distribution. However, Cambodia was only mapped, but not listed by Corbet & Hill (1992) as a part of this species' range. No records, confirmed by the voucher specimens, except for those by Matveev (1999), are hitherto known for this country.

Around 10 subspecies are currently recognised. The nominate one ranges from north-eastern India and Vietnam to the Lesser Sundas and most of Borneo (Corbet & Hill, 1992; Koopman, 1994). However, Cambodian specimens presented in this study are conspicuously smaller than those from Nepal — the type locality for *Myotis muricola* (for measurements see Tate, 1941a and Csorba *et al.*, 1999). Moreover, the recent genetic analysis (Bannikova *et al.*, 2002) demonstrated that Cambodian specimens (material from other parts of Indochina was not available) are very likely to represent a distinct species. The Inter-SINE-PCR-derived genetic distances between Nepalese and Cambodian individuals were as great as between other closely related species of the family Vespertilionidae. From this perspective, more detailed study on a larger sample of bats from different localities would be extremely valuable. Meanwhile, the speculation on subspecific alloca-

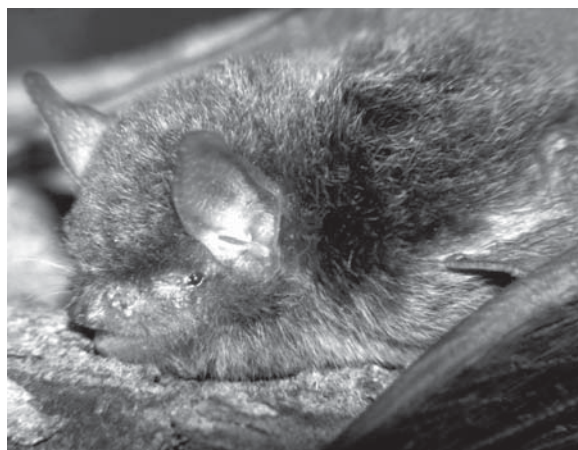


Figure 25. Male *Myotis muricola*, Kâmpôt Province.



Figure 26. Female *Harpiocephalus harpia* (ZMMU S-168334), Kâmpôt Province.

tion of Indochinese representatives appears to be premature.

Harpiocephalus harpia (Temminck, 1840)
Fig. 26.

Material. Southern extremity of the Elephant Mountains, Kâmpôt Province (10°42' – 10°35' N, 104°00' – 104°08' E), 27 January 2000, one adult male (ZMMU S-168333); 28 January 2000, one adult female ('*mordax*') (ZMMU S-168334).

Remarks on taxonomy and distribution. This is the first record of *H. harpia* for Cambodia. Tate (1941b) listed six forms of *Harpiocephalus*, mentioning that *mordax* is possibly specifically distinct (as proposed by Thomas, 1923, who, in his turn, recognised three 'races' of *harpia*), and he also suggested that *lasyurus* (north-eastern India) had to be synonymised with *harpia*. Koopman (1994) treated *lasyurus*, with three others, as a subspecies of *harpia*, allocating the specimens from Thailand and Vietnam among *rufulus*. Another subspecies, *H. h. madrassius* Thomas, 1923 from southern India, recognised by Corbet & Hill (1992), was synonymised with *lasyurus* by Das (1986).

The above female is Cambodia's first record (confirmed by the voucher specimen) of what used to be known as *Harpiocephalus mordax* Thomas, 1923, with only few specimens hitherto found in Myanmar, Thailand and Borneo (Corbet & Hill, 1992).

Harpiocephalus mordax was once considered a subspecies of *harpia* (Ellerman & Morrison-Scott, 1951), but since Hill & Francis (1984) onwards it is widely accepted that it should be regarded as a distinct species. Nevertheless, there is one remarkable circumstance: all known specimens are females.

Das (1986), who did not recognise *mordax* as a species, examined Indian specimens of *H. harpia* and revealed a wide range of individual variation in size and pelage colour, as well as sexual dimorphism. Nevertheless, Corbet & Hill (1992) stated that a small series of two males and three females of *H. harpia* from Java, deposited at the BMNH, demonstrates a lesser degree of dimorphism, than the differences in rostral and tooth

Table 4. Selected external and craniodental measurements of *Harpiocephalus* specimens, stored at ZMMU and BMNH; ‘n’ (or figures in parentheses) — the number of measured specimens. Data corresponding to the type specimens are typed with bold. Abbreviations are explained in the text.

Taxon	Depository number	Sex	Locality	n	R	CBL	RL	RW	ZW	C ¹ M ²	M ² M ²	C ₁ M ₃
<i>lasyurus</i>	BMNH 79.11.21.119	♂	India	1	43.7	–	–	–	–	–	–	–
<i>lasyurus</i>	BMNH 16.7.29.42	♂	Bhutan	1	45.7	–	3.91	6.22	–	6.62	7.14	7.71
<i>lasyurus</i>	BMNH 79.11.21.118	♀	India	1	49.2	–	4.12	6.40	13.56	6.68	7.23	7.75
<i>madrassius</i>	BMNH 73.4.16.4, 23.1.8.1	♀	India	2	53 (1)	–	4.11 (1)	6.63 (1)	13.86 (1)	6.97 (1)	6.94 (1)	8.17 (1)
<i>mordax</i>	BMNH 4.4.27.1 , 4.4.27.2	♀	Myanmar	2	50.9– 54.5	20.22– 21.11	4.15– 4.36	7.18 – 7.21	14.22 – 14.88	7.11 – 7.24	7.63 – 7.64	8.25 – 8.37
<i>mordax</i>	BMNH 84.2026	♀	Borneo	1	48.4	20.20	4.38	7.65	14.51	6.91	7.57	8.24
<i>mordax</i>	ZMMU S-168334	♀	Cambodia	1	50.2	20.88	4.61	6.94	14.40	7.17	7.66	8.37
<i>harpia</i>	ZMMU S-168333	♂	Cambodia	1	44.4	19.12	3.80	6.30	13.11	6.55	7.04	7.62
<i>harpia</i>	BMNH 7.1.1.484, 9.1.5.355, 9.1.5.356, 79.11.15.18	♂	Java	4	45.3– 47.4	18.37– 19.12	3.50– 3.90	6.02– 6.14	12.35– 12.76 (3)	6.42– 6.66	6.78– 6.88	7.25– 7.59
<i>harpia</i>	BMNH 9.1.5.357, 9.1.5.358, 9.1.5.359	♀	Java	3	48.9– 49.8	22.33– 22.55	3.85– 4.04	6.46– 6.72	13.57– 13.70	6.54– 6.76	7.02– 7.27	7.63– 7.92
<i>harpia</i>	BMNH 45.9.18.3	♀	Amboina	1	49.4	–	3.97	6.59	13.50	6.98	7.58	8.21

size between *harpia* and *mordax*, and therefore proves the latter is a valid species. On this basis they suggest, that three specimens from north-eastern India (remarkably females, too), described by Das, with characteristically expanded zygomatic arches and wide rostra (ZW is 14.4–14.5 mm, and C¹C¹ — 6.9–7.1 mm), may also pertain to *H. mordax* (see also Bates & Harrison, 1997). Eventually, it appears that the above specimens from Java in fact serve as the only justification for the species distinctiveness of *mordax*. At the same time, their measurements (Tab. 4), including those of two more males from this island, still clearly demonstrate, that the sexual dimorphism in Javanese representatives is as strong as in the rest of available individuals from different localities. Indeed, there is a small overlap between the males and the females from Java in some dimensions, such as rostral length and (to a greater extent) length of the maxillary tooththrow, mainly because these are shorter in the females from Java, compared to those from other localities (except Amboina). However, in the rest of the populations the difference between males and females is less pronounced in case of the same dimensions (Tab. 4), too. The forearm in Javanese males is the longest among all studied males, while in the females — the shortest (exceeding only that of one specimen from Borneo, identified as *mordax*). However, there is still no overlap. Moreover, the condylobasal length is at its maximum in these females (exceeding even that of the type specimen of *mordax*). Hence, we

observe the strongest sexual dimorphism among the Javanese specimens in case of this parameter. Both males and females from the island have comparatively narrow zygomatic width, though the difference between the sexes is still great.

Based on the above, we conclude, that the argument by Corbet & Hill (1992), justifying species distinctiveness of *mordax*, is not substantiated. Therefore, the whole subspecific composition of *Harpiocephalus harpia* requires reassessment.

Cambodian male and female, described in this study (the *harpia*-like and the *mordax*-like, correspondingly), considerably differ in size (Tabs. 2–4): ZW in the male is 13.11 mm, while in the female — 14.40 mm. The female skull has conspicuously longer rostrum, the front teeth (incisors and canines) are enlarged, and the sagittal crest is better developed, while the braincase is not as convex as in the male. At the same time, no external differences (such as pelage colour) are evident. They purely fit the view of Hill & Francis (1984) on *H. harpia* (the male) and *H. mordax* (the female). However, the recent molecular analysis of Cambodian specimens by means of Inter-SINE-PCR has clearly demonstrated, that they both belong to the same species (Matveev, 2004), which strongly supports the above conclusion on the status of *mordax*.

In the similar situation, when two *Harpiocephalus* specimens were recently caught in Phong Nha-Ke Bang Proposed National Park in Vietnam (Timmins *et al.*,

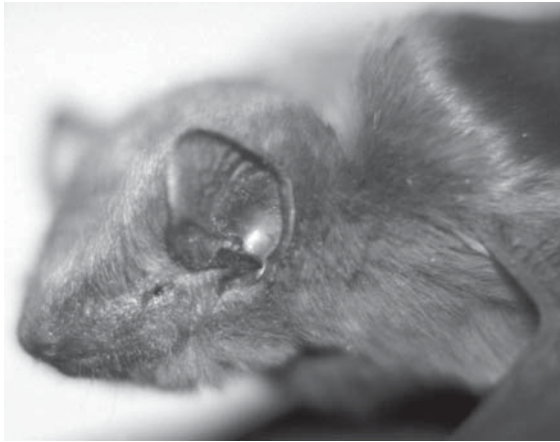


Figure 27. Female *Hesperoptenus blanfordi*, Kâmpôt Province.

1999), the smaller male was preliminarily identified by P.J.J. Bates as *harpia*, while the bigger female as *mordax*. Such repetitive occurrence of male *harpia* together with female ‘*mordax*’ may also prove our views on the status of the latter.

Ecological remarks. Both specimens were caught at the same spot: in the vicinity of the pineapple plantation, above the small manmade pond, surrounded by secondary vegetation.

Hesperoptenus (Milithronycteris) blanfordi (Dobson, 1877)

Fig. 27.

Material. Southern extremity of the Elephant Mountains, Kâmpôt Province (10°42′ – 10°35′ N, 104°00′ – 104°08′ E), 29–30 January 2000, one adult male, three adult females, each pregnant with a single foetus (ZMMU S-168300 – S-168303).

Remarks on distribution. Our record is the second for Cambodia. The species was reported previously from the Cardamom Mountains by Hendrichsen *et al.* (2001). No subspecies.

Hesperoptenus (Milithronycteris) tickelli (Blyth, 1851)

Fig. 28.

Material. Siêmpang and the vicinities, Stung Trêng Province (14°06′ – 14°07′ N, 106°16′ – 106°23′ E), 27 August 2002, one adult female (ZMMU S-174704). 15 km north of Phumĭ Thalabârĭvât, Stung Trêng Province (13°40′ N, 105°53′ E), 31 August 2002, one adult male (ZMMU S-174705).

Remarks on taxonomy and distribution. Our record is the second for Cambodia. The species was reported previously from the Cardamom Mountains by Hendrichsen *et al.* (2001). No subspecies.

Scotophilus heathi Horsfield, 1831

Fig. 29.

Material. 15 km north of Phumĭ Thalabârĭvât, Stung Trêng Province (13°40′ N, 105°53′ E), 31 August 2002, one adult female (ZMMU S-174745).



Figure 28. Female *Hesperoptenus tickelli* (ZMMU S-174704), Stung Trêng Province.

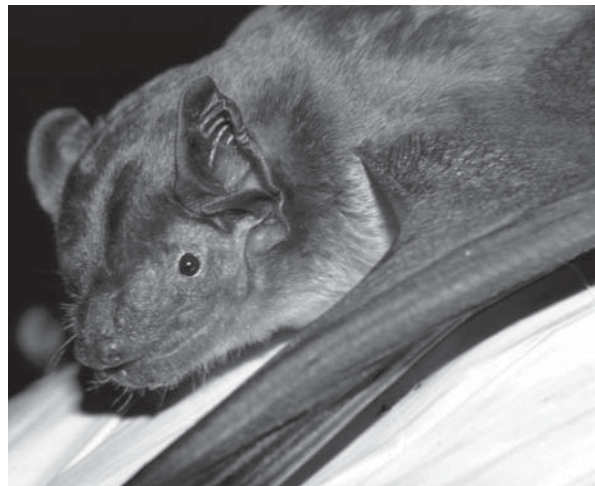


Figure 29. Female *Scotophilus heathi* (ZMMU S-174745), Stung Trêng Province.

Remarks on taxonomy and distribution. This record is the second for the country confirmed by the voucher specimens. *S. heathi* is quite common throughout its range; however Cambodia was only mapped, but not listed as a part of its range by Corbet & Hill (1992). Our observations show, that it is widely distributed in this country from the south (e.g. Kâmpôt Province) to the north. The species was first recorded in Cambodia by Hendrichsen *et al.* (2001) in the Cardamom Mountains.

The recognition of subspecies is somewhat preliminary. Thus, Vietnamese populations have not been allocated subspecifically so far. However, Cambodian representatives are extremely similar (both in size and colour) to the specimen from the south of Thailand (ZMMU S-174744), occupied by the form *watkinsi* (Koopman, 1994), and should likely be referred to the same subspecies.

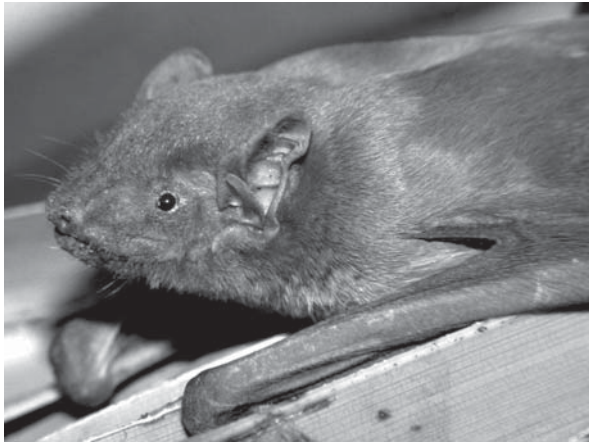


Figure 30. Female *Scotophilus kuhlii* (ZMMU S-174746), Stung Trêng Province.

Scotophilus kuhlii Leach, 1821
Fig. 30.

Material. Siêmpang and the vicinities, Stung Trêng Province (14°06' – 14°07' N, 106°16' – 106°23' E), 28 August 2002, one adult female (ZMMU S-174746).

Remarks on taxonomy and distribution. This is the second record of the species for Cambodia confirmed by the voucher specimen. The captured bat is very similar in size and colour to those from southern Thailand (ZMMU S-174747) and Vietnam (Borissenko & Kruskop, 2003), recognised as *S. k. gairdneri* Kloss, 1917, and should be referred to the same subspecies.

Miniopterus schreibersii Kuhl, 1819
Fig. 31.

Material. Southern extremity of the Elephant Mountains, Kâmpôt Province (10°42' – 10°35' N, 104°00' – 104°08' E), 29 January 2000, 4 February 2000, two adult males (ZMMU S-168295 and S-168299).

Remarks on taxonomy and distribution. This is the first record of *M. schreibersii* for Cambodia, confirmed by the voucher specimens. Previously mapped, but not listed for this country by Corbet & Hill (1992).



Figure 31. Male *Miniopterus schreibersii* (ZMMU S-168295), Kâmpôt Province.

The classification of the whole genus is poorly worked out. It is not quite clear how many species comprise it. The recognition of subspecies is hence uncertain as well.

The taxonomy of *M. schreibersii* — a variable, widely distributed throughout the Old World species — remains uncertain. Koopman (1994) recognised 15 subspecies, Corbet & Hill (1992) listed seven for the Indomalayan region, including *parvipes* (occurring in southern China and Vietnam) and *harardai* (Thailand). The subspecific allocation of Cambodian representatives requires additional investigation.

Miniopterus sp.

Material. Southern extremity of the Elephant Mountains, Kâmpôt Province (10°42' – 10°35' N, 104°00' – 104°08' E), 29 January 2000, three adult males (ZMMU S-168296–S-168298).

Remarks on taxonomy and distribution. Specific allocation is not clear. May represents a new species. The above three specimens, collected in Cambodia, could not be assigned with certainty to any *Miniopterus* species known from the region. In some respects they do resemble *M. pusillus*. However, most of their cranial and dental measurements exceed those known for this species. Some other peculiarities, as shown below, distinguish it from *M. pusillus* as well.

Dobson (1876) described *pusillus* as a subspecies of *schreibersii*, with terra typica in Madras, India. According to him, it resembles the latter in all respects except size (the head and forearm are conspicuously shorter) and distribution of fur, which extends upon the upper surface of interfemoral membrane in *pusillus* as far as the end of the third caudal vertebra, while in *schreibersii* — as far as the end of the first one. In *australis* more than three fourth of the upper surface of interfemoral membrane are covered. Cambodian *M. schreibersii* and *Miniopterus* sp. can be easily distinguished by their external, cranial and dental measurements (Tabs. 2 and 3). In addition, ZW in the two specimens of *Miniopterus* sp. is 7.88–8.08 mm, while in the two *M. schreibersii* — 8.50–8.59 mm; braincase width — 7.74–7.78 mm and 7.88–7.94 mm, respectively. It is quite noticeable, that regardless to the generally smaller size, all individuals of *Miniopterus* sp. had longer tibiae, than those of both *M. schreibersii*. The distribution of fur upon interfemoral membrane in *schreibersii* meets Dobson's description. However, in the examined specimens of *Miniopterus* sp. it does not extend beyond the end of the second caudal vertebra, and therefore differs from the pattern typical of *pusillus*. At the same time, the fur is intensely black throughout, as in *M. pusillus*. The status of these specimens is subject to the ongoing analysis, including the molecular investigation.

Discussion

The first expedition to Cambodia was undertaken by the author in July–August 1998, when only nine species were registered (Matveev, 1999). Two of them were recorded there for the first time (their occurrence was confirmed by the voucher specimens): *Cynopterus brachyotis* and *Myotis muricola*. Two others, namely

Pteropus hypomelanus and *Megaderma spasma*, were mentioned with a question mark, and their occurrence in Cambodia was confirmed in the course of the later expeditions. One species, *Taphozous longimanus*, was misidentified as *Saccolaimus saccolaimus*, and hence the presence of the latter in Cambodia is rejected here. However, its occurrence in the country is possible from the point of recent records from Vietnam, in immediate proximity to Cambodian border.

In the course of the author's further expeditions in January–February 2000 and July–September 2002 eight more species, new to Cambodian bat fauna, were found in the country. These are *Macroglossus sobrinus*, *Taphozous theobaldi*, *Hipposideros cineraceus*, *H. galeritus*, *Rhinolophus pusillus*, *Miniopterus pusillus*, *Miniopterus* sp., and *Harpiocephalus harpia* (including *H. mordax*, which was proved to be a synonym of *harpia*). Occurrence of *Rousettus leschenaulti* and *Pteropus hypomelanus* was confirmed by the voucher specimen and photographs, respectively. Therefore, this study expands the list of Cambodian bat species to 48, including one species of long-fingered bats, *Miniopterus* sp., which may represent a new species (the matter of ongoing research). Occurrence of two species from the list, namely *Cynopterus horsfieldii* and *Megaerops ecaudatus*, is still questionable and needs more reliable data.

The latest field investigations undertaken in Cambodia provide essential information on bat fauna of this part of Indochina. However, some parts of the country, such as its centre, east and north, remain almost completely unexplored. In this view, separate investigations to assess the bat fauna of these areas and to determine the conservation status of individual species is needed, for more and more territories are now turned over for economic operation.

The Kingdom of Cambodia is situated close to the geographic centre of the Indomalayan Region. Forty percent of its known bat fauna is predominantly formed by the species more or less widely distributed throughout the region, but not spreading outside. These are *Cynopterus sphinx*, *C. brachyotis*, *Eonycteris spelaea*, *Macroglossus sobrinus*, *Taphozous longimanus*, *T. melanopogon*, *T. theobaldi*, *Megaderma spasma*, *Rhinolophus luctus*, *Hipposideros galeritus*, *H. larvatus*, *Myotis hasseltii*, *Tylonycteris pachypus*, *T. robustula*, *Scotophilus kuhlii*, *Hesperoptenus tickelli*, *Harpiocephalus harpia*, *Kerivoula papillosa*, and *Chaerephon plicata*. Several others, being of the Indomalayan origin, marginally occur in the Palaearctic: *Rousettus leschenaulti*, *Megaderma lyra*, *Hipposideros cineraceus* (Cambodian record extends the species' range deep into Indochina, being the southernmost point of its distribution in there), *H. pomona*, *Rhinolophus pusillus*, *Myotis muricola*, and *Kerivoula hardwickii*, or Australasia: *Pteropus hypomelanus*. Only the range of *Pipistrellus tenuis* extends outside Indomalaya both to the Palaearctic and simultaneously quite far to the Australasia (occurrence of *Myotis muricola* in the second region is possible, but not proven).

One polymorphic species, *Miniopterus schreibersii*, found in Cambodia, is widespread throughout the Old World, Australia and Oceania.

Lesser number of species, known at present from Cambodia and spreading either to the Palaearctic or Australasia, have more limited distribution within the Indomalayan region itself. Some of them have wider range in the continental part of the region. These are *Hipposideros armiger* and *Pipistrellus coromandra* (both marginally occur in the Palaearctic), *Scotophilus heathi*. In case of *P. coromandra* Cambodian record is the extreme south-eastern point of its distribution in Indochina. Other species are more or less confined to the islands of Indomalaya: *Rousettus amplexicaudatus* and *Macroglossus minimus*. Cambodia here, on contrary, lies close to the north-western boundaries of both species' ranges.

The rest of species, which make together more than one quarter of Cambodia's known bat fauna, do not occur outside the Indomalayan Region and are either characterised by limited distribution within it, and/or by limited number of records as a whole. One of these, *Myotis rosseti*, is confined to Indochinese Subregion only. Others are also known from elsewhere in the region: *Pteropus lylei*, *Cynopterus horsfieldii*, *Megaerops ecaudatus* (occurrence of the latter two in Cambodia is not evident), *Megaerops niphanae*, *Rhinolophus acuminatus*, *Rh. borneensis*, *Rh. malayanus*, *Rh. shameli*, *Arielulus circumdatus*, *Hesperoptenus blanfordi*, *Myotis annectans* (Cambodia is extreme south-eastern part of its range) and *Otomops wroughtoni*. The latter till recently was known from southern India only. Cambodian records prove it is much wider distributed in the region.

No endemics are known (the status of *Miniopterus* sp. is a subject to additional analysis), though a number of species reported for this country are rare as a whole.

Despite the fact that quite a few Indomalayan bat species known from Cambodia are also known from the neighbouring zoogeographic regions as, none of truly Palaearctic or Australian taxa have been recorded in the country so far, not counting *Miniopterus schreibersii*, with its wide distribution. In this regard, Cambodian bat fauna could be characterised as typical Indomalayan, with ca. 70% of its known species not occurring outside the region.

ACKNOWLEDGEMENTS. The author would like to express his gratitude to the directorate of Joint Russian-Vietnamese Science and Technology Research Centre, especially Dr. Yuri Prischepo, for their incredible help. I thank Nikolay Doroshenko for all his support and readiness to assist with what ever was needed. I appreciate the organisational aid and useful advices of Alexander Andrianov and especially Oleg Shumakov, who also provided the photographs and video materials on *Rhinolophus luctus*. In particular, I would like to thank Dr. Anna Vassilieva (Faculty of Biology, Moscow State University) for her patience and incredible support during our teamwork in Cambodia in 2000. I thank Dr. Paulina Jenkins and Daphne Hills for the permit to carry out a comparative research in the Natural History Museum, London, and all their incredible support and understanding. I am grateful to Dr. David Harrison and Dr. Paul Bates (Harrison Zoological Museum, Sevenoaks, UK) for allowing me to examine some *Miniopterus* specimens from their collection, to Mr. Malcolm Peach from the same institution for his assistance during my travel to Sevenoaks. I would also like to thank Dr. Dmitry Musolin for his infotainment.

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