

Notes on Thai Mammals
2. Bats of the *pusillus* and *philippinensis* Groups
of the Genus *Rhinolophus*
(Mammalia, Chiroptera, Rhinolophidae)¹⁾

By

Mizuko YOSHIYUKI

Department of Zoology, National Science Museum, Tokyo

Abstract Taxonomical status and geographical variation are discussed on five species of the *Rhinolophus pusillus* and *philippinensis* groups. Of these, *R. pusillus lakkhanae* is a new subspecies; *R. marshalli* and *R. yunanensis* are rare, and the specific validity of the latter is confirmed, though it has long been regarded as a synonym of *R. pearsoni*.

The bats of Thailand may be most diversified among those of Eurasian countries. In spite of the diversity little has been known about the systematics and distribution of the Thai bats. Above all, *Rhinolophus* (Rhinolophidae) is most confused among the genera of Thai Chiroptera, containing many forms known only from a few specimens defined inadequately from the taxonomic point of view (MILLER, 1898; ANDERSEN, 1905 a–d, 1918; TATE, 1939, 1943; SHAMEL, 1942; HILL, 1972, 1974, 1983; HILL & THONGLONGYA, 1972; etc.). Recent chromosomal studies of Thai bats (HARADA *et al.*, 1982, 1985; HOOD *et al.*, 1988 etc.) do not refer to the taxonomic status at the level of species or subspecies.

In July, August and September of 1987, a zoological expedition to Thailand and the Peninsula Malaysia was made by a party of the National Science Museum, Tokyo (leader, Dr. Masatsune TAKEDA), in cooperation with the Thailand Institute of Scientific and Technological Research (chief, Dr. Niphan RATANAWOROBHAN) and Universiti Malaya (chief, Dr. Professor Yong HOI-SEN).

I took part in the project to collect many specimens by the aid of the staff of the Thailand Institute of Scientific and Technological Research and Universiti Malaya. The present paper will add a new subspecies and many new distributional records, and clarify systematic problems on several forms of the genus *Rhinolophus*.

Collecting Sites of the Specimens of Chiroptera in Thailand (Fig. 1).

1. Tham Sam Sawan, Samoeng, Chiang Mai, 18°51'N, 98°42'E.
2. Tham Luesri Cave, Doi Suthep, Muang Chiang Mai, Chiang Mai, 18°48'N, 98°55'E.

1) This study is supported by the Grants-in-aid Nos. 62041074 and 63043075 for Field Research of the Monbushō International Scientific Research Program, Japan.

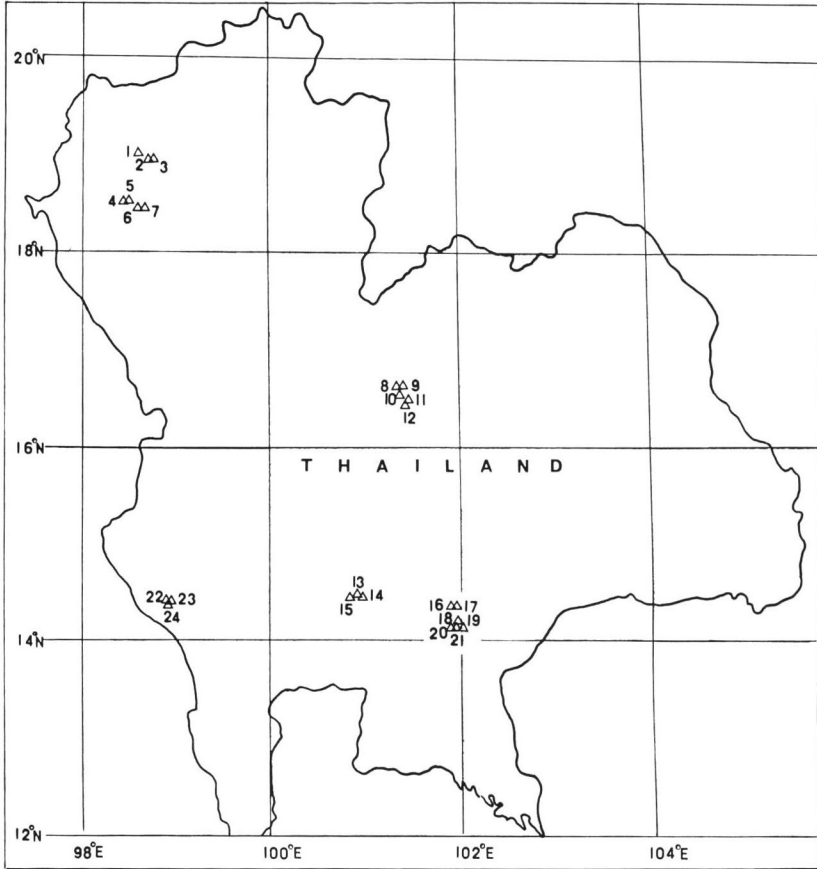


Fig. 1. Map showing the collecting sites of bats in Thailand in the summer of 1987. Numbers and localities are mentioned in the text.

3. Wat Changkhien, Ban Shangkhien, Doi Suthep, Chiang Mai, 18°48'N, 98°55'E.
4. Tham Song Phi Nong, Chom Thong, Chiang Mai, 18°35'N, 98°29'E.
5. Doi Inthanon, Chom Thong, Chiang Mai, 18°35'N, 98°29'E.
6. Bon Mae, Khan, Chang Khaoeng, Mae Cham, Chiang Mai, 18°32'N, 98°35'E.
7. Tham Pong Mae Vak, Mae Cham, Chiang Mai, 18°32'N, 98°35'E.
8. Kao Thong, Lom Sak, Phetchabun, 16°50'N, 101°34'E.
9. Tham Pha Hong, Lom Sak, Phetchabun, 16°50'N, 101°34'E.
10. Nam Nao National Park, Lom Sak, Phetchabun, 16°50'N, 101°33'E.
11. Tham Khang Khaow (Tab Ta Mee), Nakorn Thai, Phitsanulok, 16°47'N, 101°47'E.
12. Thung Salaeng Luang National Park, Lom Kao, Phitsanulok, 16°47'N, 100°46'E.
13. Tham Kho Takra, Pattana Nikom, Lop Buri, 14°48'N, 100°47'E.

14. Tham Luang Ta Put, Muang Lop Buri, Lop Buri, 14°47'N, 100°47'E.
15. Tham Wat Phra That, Kok Toom, Muang Lop Buri, Lop Buri, 14°47'N, 100°47'E.
16. Wat Po, Bang Khla, Chachaoengsao, 14°33'N, 101°59'E.
17. Ban Ba Yai, Pak Thong Chai, Nakorn Ratchasima, 14°33'N, 101°59'E.
18. Ban Ba Dan, Pak Thong Chai, Nakorn Ratchasima, 14°31'N, 101°58'E.
19. Wang Nam Khieo, Pak Thong Chai, Nakorn Ratchasima, 14°30'N, 101°58'E.
20. Salawan Water Fall, Pak Thong Chai, Nakorn Ratchasima, 14°30'N, 101°56'E.
21. Sakaerat Environmental Research Station, Pak Thong Chai, Nakorn Ratchasima, 14°30'N, 101°56'E.
22. Ban Tha Thung Na, Sai Yok, Kanchanaburi, 14°30'N, 98°45'E.
23. Tham Wang Phra, Sai Yok, Kanchanaburi, 14°30'N, 98°35'E.
24. Tham Sai Yok Noi (Tham Khang Khaow), Sai Yok, Kanchanaburi, 14°25'N, 98°55'E.

Rhinolophus pusillus lakkhanae subsp. nov.

[Japanese name: Tai-kokikugashirakoumori]

(Fig. 5-A, Table 1)

Holotype. Adult ♀ NSMT-M28600, Tham Song Phi Nong, Chom Thong, Chiang Mai, 18°35'N, 98°29'E, Thailand. Collected on 5 September 1987, by the author, Preecha LUECHA, Lakkana BOOLIANG, Punya SAENGMALA, Prasarn BANGPLUB. The type is preserved in the Mammal Section, Department of Zoology, National Science Museum, Tokyo.

Measurements (in mm) of the holotype. Forearm (FA) 38.3, head and body (HB) 43.0, tail (T) 19, tail percent (T %) 44.1%, hind foot cum unguis (HFcu) 8.0, hind foot sine unguis (HFsU) 7.0, third metacarpal 28.5, fourth metacarpal 29.5, fifth metacarpal 29.5, greatest length of skull to front of canine (GLS) 15.74, condylocanine length (CCL)=length of skull from condyle to canine 13.38, width across rostral swellings (RW) 4.12, interorbital constriction (INT) 2.25, zygomatic width (ZYG) 7.26, width of braincase (WBC) 6.69, mastoid width (MAST) 7.02, C-C 3.69, M3-M3 5.49, C-M3 5.45, c-m3 5.67, crown area of PM2 0.39 × 0.48, mandible (MAND) 9.11, noseleaf 7 × 12.0 (in mm).

Diagnosis. Belonging to the *pusillus* group (ANDERSEN, 1918; HILL & YOSHIYUKI, 1980), tail rather short, connecting process in side view erect and sharply pointed, nearly forming an equilateral triangle, fur of back dark brown or red brown below and above, and pale at base. Skull and teeth smaller in size, upper anterior premolar (PM2) in tooth row, in contact with canine and posterior premolar (PM 4), lower second premolar (pm3) very minute, out of tooth row.

Etymology. The new subspecies is named after Mrs. Lakkhana BOONLIANG of the Thailand Institute of Scientific and Technological Research for her kind assistance during my collecting trip in Thailand.

Table 1. External, cranial and dental measurements of the examined

NSMT-M	Sex	LOC	LAT	FA	HB	T	HFcu	Tib	E
28605	♂	Sam Sawan	18°51'N	37.42	41.0	18.0	8.0	16.0	17.0
28766	♂	Ditto	Ditto	36.72	41.0	17.0	8.0	15.0	16.5
28767	♂	Ditto	Ditto	37.60	41.0	19.0	7.0	17.0	17.0
28768	♀	Ditto	Ditto	37.45	39.0	20.0	8.8	15.0	13.2
28769	♀	Ditto	Ditto	36.95	47.0	19.0	8.0	16.0	14.0
28770	♀	Ditto	Ditto	36.55	41.0	19.0	7.0	17.0	16.0
28771	♂	Ditto	Ditto	37.60	43.0	18.0	8.0	16.5	15.0
28608	♂	Doi Suthep	18°48'N	36.90	42.0	22.0	9.0	17.0	15.0
28609	♂	Ditto	Ditto	36.91	40.0	18.0	8.0	16.0	16.0
28748	♂	Ditto	Ditto	35.75	40.0	18.0	8.0	16.5	14.0
28600	♀	Song P. Nong	18°35'N	38.30	43.0	19.0	8.0	18.2	15.0
28753	♂	Ditto	Ditto	38.00	40.0	18.0	8.0	17.0	15.0
28754	♂	Ditto	Ditto	36.25	40.0	20.0	8.0	18.0	13.0
28755	♂	Ditto	Ditto	37.00	41.0	19.0	8.0	17.0	14.0
28756	♂	Ditto	Ditto	37.84	40.0	19.0	8.0	17.0	14.0
28757	♂	Ditto	Ditto	37.55	40.0	17.0	9.0	16.8	13.0
28758	♂	Ditto	Ditto	37.90	42.0	19.0	8.5	17.0	13.5
28759	♀	Ditto	Ditto	37.95	41.0	17.0	8.0	16.2	13.0
28760	♀	Ditto	Ditto	37.84	42.0	22.0	8.0	18.0	14.0
28761	♀	Ditto	Ditto	37.10	41.0	19.0	9.0	17.0	14.0
28762	♀	Ditto	Ditto	37.92	40.0	18.0	8.0	16.5	14.0
28750	♂	Dio Int.	Ditto	35.82	38.5	19.5	8.0	17.0	13.0
28751	♂	Ditto	Ditto	36.60	36.0	20.0	8.0	18.0	16.0
28752	♂	Ditto	Ditto	35.75	39.0	19.0	8.0	17.0	13.0
28592	♂	Pong M. Vak	18°32'N	36.80	38.0	19.0	8.0	16.0	16.0
28593	♂	Ditto	Ditto	38.00	42.0	20.0	8.0	17.0	16.0
28763	♀	Ditto	Ditto	38.50	39.0	21.0	8.5	17.0	16.5
28764	♀	Ditto	Ditto	38.95	41.0	20.0	9.0	16.5	14.0
28765	♂	Ditto	Ditto	37.40	40.0	19.0	9.0	17.0	15.0
28772	♂	Khao Thong	16°50'N	36.05	40.0	20.0	8.0	17.0	15.0
28573	♀	Thun. S. Loung	16°47'N	38.15	50.0	20.0	8.0	16.5	15.0

Abbreviations: LOC, locality; LAT, latitude; FA, forearm; HB, head and body; T, tail; HFcu; front canine; CCL, condylo-canine length; RW, width rostral swelling; INT, interorbital const-across C-C (crown); M3-M3, width across M3-M3; C-M3, upper tooth row (canine to last molar); Doi Suthep, Tham Luesri Cave; Song P. Nong, Tham Song Phi Nong; Doi Int., Doi Inthanon;

Specimens examined. 3♂♂, 4♀♀, Tham Sam Sawan, Samoeng, Chiang Mai, 18°51'N, 98°55'E (in a cave); 3♂♂, Tham Luesri Cave, Doi Suthep, Chom Thong, Chiang Mai, 18°48'N, 98°55'E (in a cave); 6♂♂, 5♀♀, Tham Song Phi Nong, Chom Thong, Chiang Mai, 18°35'N, 98°29'E; 3♂♂, Doi Inthanon, Chom Thong, Chiang Mai, 18°35'N, 98°29'E; 3♂♂, 2♀♀, Tham Pong Mae Vak, Mae Chom, Chiang Mai, 18°32'N, 98°35'E; (collected by the author, Preecha LUECHA, Lakkhana BOONLIANG, Punya SAENGMALA and Prasarn BANGPLUB on 2-9 September 1987), 1♂, Khao Thong, Lom Sak, Phetchabun, 16°50'N, 101°34'E; 1♀, Thung Salaeng Luang National

specimens of *Rhinolophus pusillus lakkhanae* subsp. nov. (in mm).

Noseleaf	GLS	CCL	RW	INT	ZYG	WBC	MAST	C-C	M3-M3	C-M3	MAND	c-m3
8.0×11.5	15.52	13.52	4.31	2.41	7.51	6.72	7.45	3.77	5.91	5.78	6.02	9.81
7.5×12.0	15.31	13.55	4.24	2.11	7.74	7.40	7.46	3.61	5.81	5.68	5.98	9.81
7.0×12.0	15.31	13.39	4.27	2.40	7.99	6.56	7.61	3.85	5.62	5.55	5.81	9.84
6.9×11.5	15.33	13.40	4.20	2.09	7.78	6.78	7.62	3.61	5.64	5.50	5.83	9.58
7.8×12.0	15.50	13.58	4.16	1.94	7.77	6.56	7.69	3.64	5.68	5.58	6.05	9.78
7.0×11.5	15.28	13.22	4.03	2.16	7.65	6.28	7.17	3.67	5.60	5.58	5.83	9.65
6.5×12.0	15.40	13.41	4.19	2.13	7.73	6.72	7.42	4.13	5.76	5.66	5.94	9.70
7.5×12.5	15.36	13.40	4.12	2.15	7.66	6.67	7.55	3.54	5.70	5.67	6.14	9.51
7.5×11.5	15.43	13.45	4.10	2.20	—	6.20	7.40	3.52	5.55	5.60	6.00	9.82
8.0×13.0	15.63	13.87	4.29	2.19	7.87	6.94	7.71	3.69	5.85	5.72	6.21	9.89
7.0×12.0	15.74	13.38	4.08	2.25	7.26	6.69	7.02	3.69	5.49	5.45	5.67	9.11
7.0×11.5	15.46	13.51	4.12	2.19	7.44	6.48	7.17	3.74	5.70	5.69	5.89	9.66
7.5×11.0	15.25	13.36	4.05	2.19	7.50	6.44	7.29	3.66	5.61	5.39	5.66	9.38
7.5×11.5	15.17	13.44	4.09	2.28	7.55	6.40	7.38	3.49	5.58	5.45	6.09	9.89
6.8×13.0	16.10	14.11	4.03	2.35	7.71	6.74	7.43	3.38	5.68	5.76	5.78	9.35
6.8×11.8	15.53	13.49	4.01	2.18	7.45	6.77	7.27	—	5.56	5.56	5.77	9.58
7.0×10.8	15.30	13.10	3.90	2.16	7.25	6.00	7.14	3.39	5.32	5.55	5.65	9.55
6.5×11.0	15.18	13.42	4.04	2.31	7.45	6.55	7.30	3.91	5.71	5.62	5.81	9.53
7.0×11.0	15.16	13.34	3.95	2.05	7.37	6.61	7.30	3.76	5.49	5.37	5.69	9.26
7.0×11.5	15.19	13.37	4.02	2.17	7.70	6.63	7.55	3.56	5.93	5.79	5.89	9.48
—	15.54	13.28	4.12	2.30	7.49	6.76	7.39	3.73	5.63	5.60	5.85	9.55
7.0×11.5	15.32	13.34	3.93	2.11	7.46	6.31	7.26	3.55	5.52	5.64	6.03	9.56
6.5×11.0	15.41	13.15	4.15	2.15	7.51	6.60	7.14	3.62	5.57	5.59	5.77	9.59
6.5×11.0	15.29	13.38	4.02	2.21	7.51	6.49	7.22	3.68	5.58	5.63	5.77	9.22
7.0×11.0	15.17	13.58	3.95	2.24	7.59	6.61	7.22	3.68	5.62	5.64	5.89	9.45
8.0×12.0	15.52	13.62	4.15	2.27	7.64	6.69	7.46	3.77	5.58	5.85	5.99	9.71
7.5×12.5	15.70	13.65	4.30	2.13	7.70	6.93	7.65	5.70	5.70	5.96	5.96	9.90
7.0×11.0	15.48	13.66	4.13	1.95	7.69	6.59	7.44	3.74	5.73	5.63	5.80	9.77
7.0×11.5	15.68	13.72	4.30	2.28	7.96	6.69	7.40	3.81	6.05	5.95	6.09	10.02
—	15.40	13.50	3.95	2.15	7.28	6.30	7.25	3.65	5.40	5.52	5.56	9.42
—	15.60	13.60	4.09	2.04	7.44	6.81	7.36	3.78	5.69	5.63	5.90	9.86

hind food cum unguis; Tib, tibia; E, ear; Nose leaf (width, length); GLS, greatest length of skull to riction; ZYG, zygomatic width; WBC, width of braincase; MAST, mastoid width, C-C, width MAND, mandible; c-m3, lower tooth row (canine to last molar). Sam Sawan, Tham Sawan; Pong M. Vak, Tham Pong Mae Vak; Thung S. Luang, Tham Salaeng Luang National Park.

Park, Lom Kao, Phitsanulok, 16°47'N, 100°46'E (collected by the author, Tawewat POLPAKDEE, Preecha NOONPAKDI and Prasarn BANGPLUB).

Description. Connecting process in side view erect and sharply pointed. Ear fairly longer, laid forwards extending considerably beyond the end of nose; lower lip with three deep vertical grooves. Third metacarpal the shortest, fourth and fifth sub-equal. Two colour patterns, one dark brown above and pale white gray below, and the other red brown above and below. Skull small, interorbital constriction and rostrum narrow; sagittal crest high, temporal and lambdoid crests low, evi-

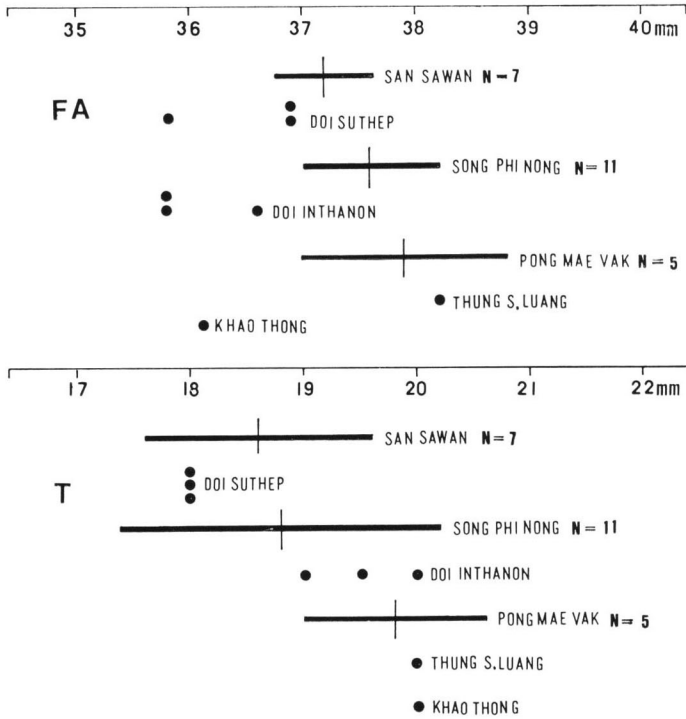


Fig. 2. Variation of forearm length (FA) and tail length (T) in the examined populations of *Rhinolophus pusillus lakhanae* subsp. nov.

dent. In profile, rostrum low and braincase relatively low, interorbital constriction low. Upper canine weak, upper anterior premolar (PM2) in tooth row, in contact with canine and posterior premolar (PM4); the lower second premolar (pm3) very minute, out of tooth row.

Variation. There are two colour patterns, one dark brown and the other reddish brown in the fur of back. Because these colour patterns appear within one population, they may fall in individual variation. Variations in the measurements of forearm (FA), tail (T), greatest length of skull (GLS) and width across the upper molars (M3-M3) of samples in the 7 examined populations are shown in Figs. 2-3. Among four measurements, the lengths of T, GLS and M3-M3 each, are included in the range of $M \pm SD$ (68.27%) of the examined populations, but in the forearm length, one specimen from Doi Suthep and two specimens from Doi Inthanon are outside of the range. As the samples from each population are not enough, those specimens may fall in the range of individual variation. I therefore conclude all specimens from the 7 populations belong to the same new subspecies (Figs. 2-3, Table 1).

Remarks. HILL and YOSHIYUKI (1980) included in *R. pusillus* the following subspecies: *blythi* ANDERSEN, 1918 (North India); *gracilis* ANDERSEN, 1905 (Malabar);

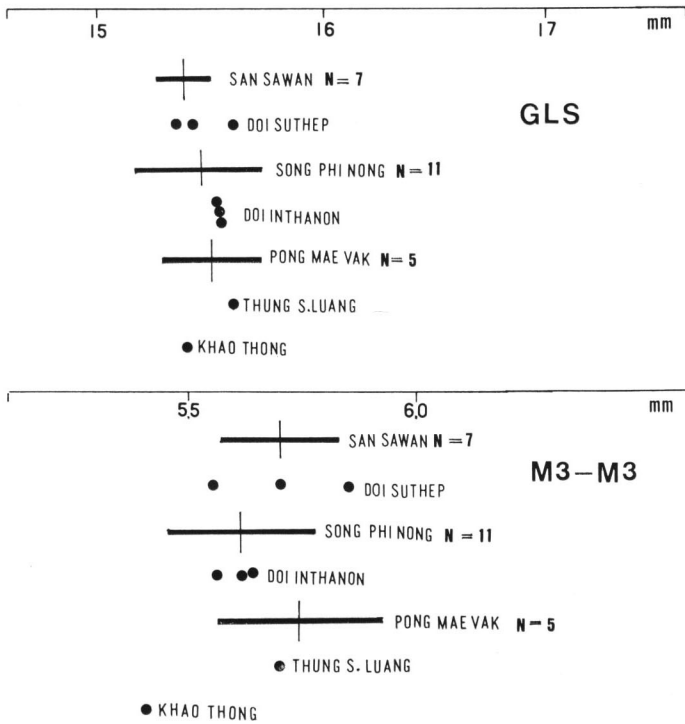


Fig. 3. Variation of greatest length of skull (GLS) and width across upper molars (M3-M3) in the examined populations of *Rhinolophus pusillus lakkhanae* subsp. nov. Horizontal broad lines indicate the range of $M \pm SD$; vertical lines indicate the mean values.

szechwanus ANDERSEN, 1918 (Szechuan); *calidus* G. M. ALLEN, 1923 (Fukien); *parcus* G. M. ALLEN, 1928 (Hainan Island); *minutillus* MILLER, 1906 (Anamba Islands); ? *pagi* TATE et ARCHBOLD, 1939 (Mentawai Islands) and *pusillus* TEMMINCK, 1834. The Chinese subspecies, *szechwanus*, *calidus*, *parcus* have longer and narrower skull, and in *szechwanus*, the tail is longer (average, 21.6 mm, N=4) and the mean value of the greatest length of the skull is 16.1 mm, (N=10), while in *lakkhanae*, the tail is shorter (average 19.1 mm, N=31) and mean value of the greatest length of the skull is 15.4 mm (N=31), the latter being not contained in the range of $M \pm SD$ of the former. Though LEKAGUL and MCNEELY (1977) regarded the Thai population of *pusillus* as *R. pusillus szechwanus*, I consider it distinct on the basis of examination of 31 samples from that region (Table 1, Figs. 4-5). On the other hand, ELLERMAN and MORRISON-SCOTT (1951, 1966) listed *szechwanus* as a subspecies of *R. cornutus*, but my examination of many Japanese populations of *cornutus* throws strong doubt on this opinion. In typical *pusillus*, the ratio of zygomatic width to the greatest length of the skull is 54% instead of 50% in *lakkhanae*, zygomatic width of *pagi* is only 7.0 mm; those of upper molar width is 6.0 (average) instead of 5.65 (average, N=31)

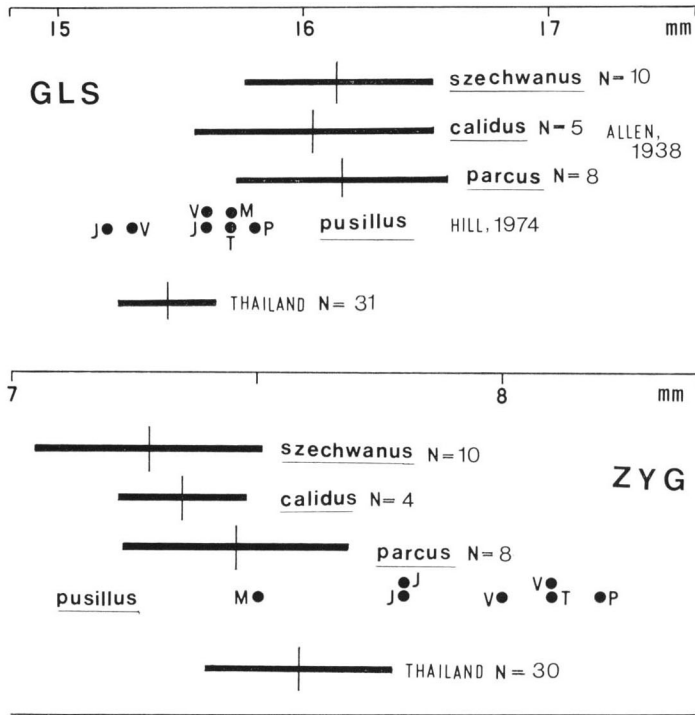


Fig. 4. Comparison of greatest length of skull and zygomatic width among *Rhinolophus pusillus pusillus*, *R. p. szechwanus*, *R. p. calidus*, *R. p. parcus* and *R. p. lakkhanae* subsp. nov. from Thailand. J, Java; M, Madura; P, Penang; T, Tioman; V, South Vietnam.

mm in this subspecies.

***Rhinolophus coelophyllus* PETERS, 1866**

(Fig. 5-B, Table 2)

Rhinolophus coelophyllus PETERS, 1866, Proc. zool. Soc. London, 1866: 426, pl. 24.

Type locality. Moulmein, Tsagine, Upper Burma.

Type specimen. Preserved in the collection of the Berlin Museum.

Specimens examined. 5♂♂, 6♀♀, Tham Sam Sawan, Samoeng, Chiang Mai, 18°51'N, 98°42'E (in a cave); 1♂, Doi Inthanon, Chom Thong, Chiang Mai, 18°35'N, 98°29'E (in a cave); 16♂♂, 16♀♀, Tham Pong Mae Vak, Mae Cham, Chiang Mai, 18°32'N, 98°35'E (in a cave); collected by the author, Preecha LUECHA, Lakkhana BOONLIANG, Punya SAENGMALA and Prasarn BANGPLUB on 2-4 September 1987. 1♂,

Fig. 5. Skulls of *Rhinolophus*. A, *R. pusillus lakkhanae* subsp. nov. NSMT-M28600, ♀; B, *R. coelophyllus*, NSMT-M28811, ♀; C, *R. marshalli*, NSMT-M28582, ♀. (1, 4, 7, dorsal view; 2, 5, 8, ventral view; 3, 6, 9, lateral view. Bar indicates 0.5 mm.

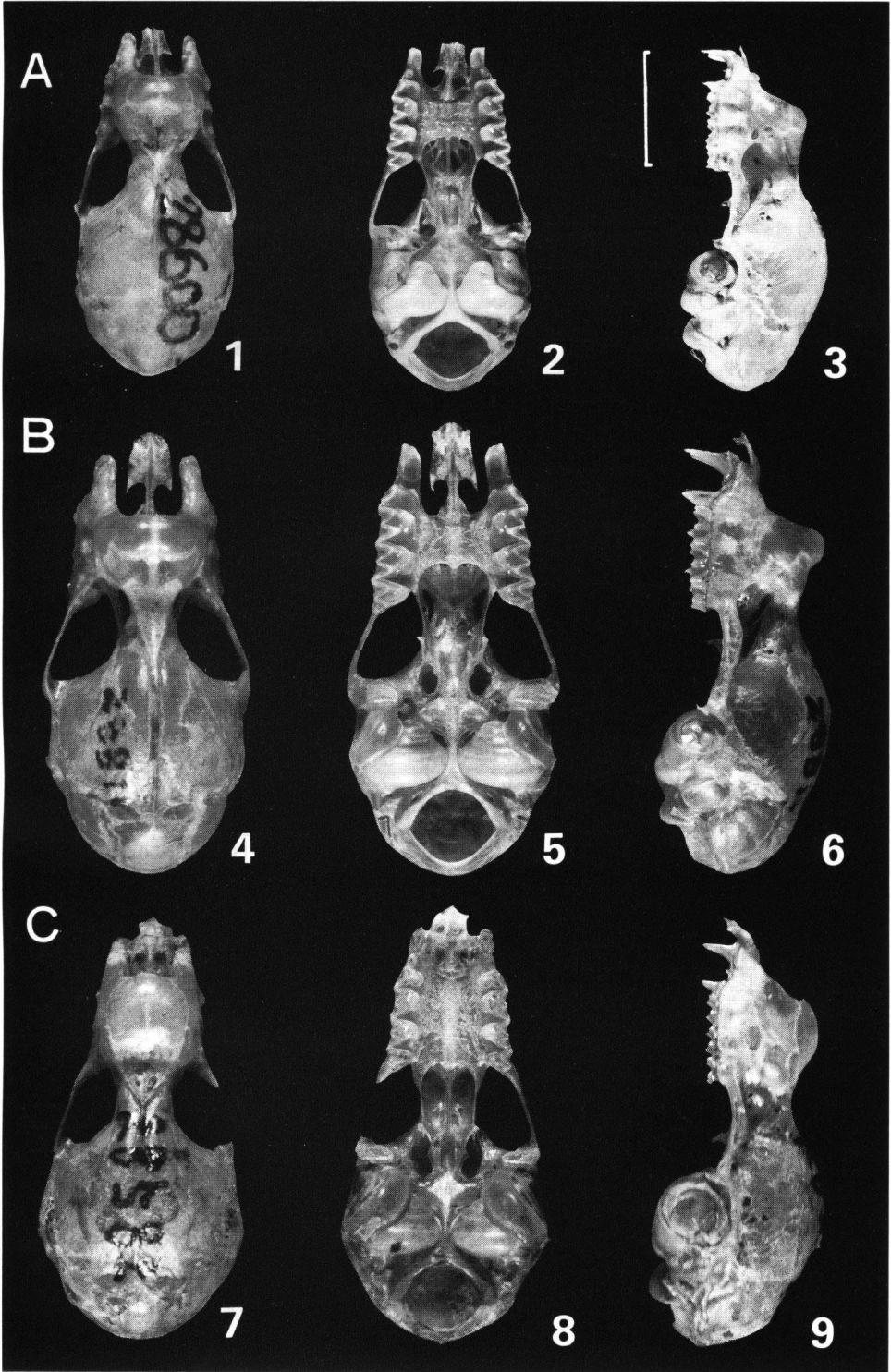


Table 2. External, cranial and dental measurements of the examined

NSMT-N	Sex	LOC	LAT	FA	HB	T	HFcu	Tib	E	Noseleaf
28807	♂	Sam Sawan	18°51'N	45.75	43.5	23.5	11.0	23.0	21.0	10.0×14.2
28808	♂	Ditto	Ditto	45.60	49.0	24.0	10.0	22.0	23.0	10.5×14.0
28809	♂	Ditto	Ditto	44.36	49.0	19.0	11.0	19.0	20.8	9.8×13.0
28810	♂	Ditto	Ditto	43.26	49.0	22.0	10.8	19.3	22.0	10.5×13.0
28811	♂	Ditto	Ditto	44.45	49.0	21.0	11.0	19.5	21.0	9.8×13.8
28812	♂	Ditto	Ditto	43.95	45.5	19.5	10.5	20.5	19.0	9.0×14.0
28813	♂	Ditto	Ditto	44.15	52.0	22.0	10.8	20.2	21.8	10.5×14.0
28814	♂	Ditto	Ditto	44.20	48.0	23.0	11.0	19.5	22.0	10.8×15.0
28815	♂	Ditto	Ditto	45.25	52.5	24.5	10.0	21.0	21.0	9.8×13.8
28816	♂	Ditto	Ditto	44.50	50.0	23.0	10.0	20.0	21.0	10.5×14.0
28817	♂	Ditto	Ditto	44.25	52.0	22.0	11.0	21.0	20.8	9.5×13.0
28806	♂	Doi Int.	18°35'N	43.80	47.0	21.0	9.2	20.8	21.0	9.8×13.0
28818	♂	T.P. Mae V.	18°32'N	44.50	48.0	20.0	11.0	19.0	21.0	9.8×13.0
28819	♂	Ditto	Ditto	44.90	48.0	24.0	11.0	20.0	19.0	9.5×14.5
28820	♂	Ditto	Ditto	46.25	47.5	22.5	11.5	19.5	21.0	9.5×14.5
28821	♂	Ditto	Ditto	46.85	48.0	22.0	12.0	20.0	21.0	10.5×14.0
28822	♂	Ditto	Ditto	44.70	46.0	23.0	12.0	20.0	20.0	9.5×14.5
28823	♂	Ditto	Ditto	45.20	47.0	23.0	11.0	21.0	19.0	9.5×15.0
28824	♂	Ditto	Ditto	—	52.0	22.0	11.0	20.0	20.5	9.5×14.5
28825	♂	Ditto	Ditto	44.50	50.0	23.0	11.0	21.0	21.0	9.5×15.0
28826	♂	Ditto	Ditto	42.90	48.0	22.0	11.0	20.0	19.0	9.5×15.5
28827	♂	Ditto	Ditto	45.10	49.0	23.0	11.8	20.2	21.5	10.0×14.8
28828	♂	Ditto	Ditto	43.80	50.0	23.0	11.0	21.0	21.5	9.5×15.5
28829	♂	Ditto	Ditto	44.65	52.0	21.0	10.5	19.5	19.5	9.5×13.5
28830	♂	Ditto	Ditto	46.55	51.5	21.0	11.0	20.0	22.0	9.0×13.0
28831	♂	Ditto	Ditto	44.90	47.0	22.0	12.0	20.0	21.0	9.0×13.0
28832	♂	Ditto	Ditto	45.25	47.0	21.0	11.0	20.0	21.0	9.0×13.5
28833	♂	Ditto	Ditto	45.10	50.5	21.5	10.5	21.5	21.0	10.0×15.5
28834	♂	Ditto	Ditto	43.55	44.0	24.0	11.5	19.5	20.5	9.5×15.5
28835	♂	Ditto	Ditto	43.82	50.0	21.0	10.0	22.0	21.0	9.5×14.0
28836	♂	Ditto	Ditto	44.05	47.0	22.0	11.5	19.5	21.0	10.5×15.5
28837	♂	Ditto	Ditto	44.50	48.0	22.0	12.5	18.5	21.5	9.5×14.5
28838	♂	Ditto	Ditto	46.00	49.5	21.5	11.0	20.0	21.0	9.5×13.5
28839	♂	Ditto	Ditto	44.85	44.5	21.5	21.5	19.0	21.0	9.5×14.0
28840	♂	Ditto	Ditto	45.00	45.0	22.0	11.5	20.5	21.0	9.5×14.5
28841	♂	Ditto	Ditto	46.35	49.0	22.0	11.0	20.0	22.0	10.5×14.0
28842	♂	Ditto	Ditto	44.22	53.0	21.5	11.0	20.0	19.5	10.0×13.5
28843	♂	Ditto	Ditto	45.05	46.0	22.0	10.5	20.5	21.0	9.5×14.5
28844	♂	Ditto	Ditto	44.05	48.0	21.0	11.0	—	21.0	9.0×13.0
28845	♂	Ditto	Ditto	45.85	50.0	19.0	11.5	19.5	21.0	9.5×13.5
28846	♂	Ditto	Ditto	44.00	49.5	19.0	11.5	19.5	22.0	9.5×15.0
28847	♂	Ditto	Ditto	44.85	48.0	22.0	11.0	20.5	20.5	10.0×14.5
28848	♂	Ditto	Ditto	44.10	48.5	23.5	11.5	19.5	21.0	9.4×14.4
28849	♂	Ditto	Ditto	44.10	47.0	21.0	11.0	20.0	20.0	9.5×14.0
28856	♂	Khao T.	16°50'N	44.46	51.0	20.0	11.0	21.0	21.0	—
28572	♂	T. S. L. N.	16°47'N	42.30	46.0	22.0	11.5	18.5	20.0	—
28850	♂	Lop Buri	14°48'N	41.51	44.0	20.5	9.5	20.5	19.0	—
28851	♂	Ditto	Ditto	42.29	46.5	21.5	9.0	20.0	18.5	—
28852	♂	Ditto	Ditto	44.53	48.0	24.0	10.5	20.5	21.0	—
28853	♂	Ditto	Ditto	43.45	48.0	24.0	10.5	21.5	19.0	—
28854	♂	Ditto	Ditto	42.24	45.0	21.0	10.5	20.5	20.0	—
28855	♂	Ditto	Ditto	43.14	48.0	21.5	11.0	19.0	19.5	—

Abbreviations: T. S. L. N., Thung Salaeng Luang National Park; Doi Int., Doi Inthanon; Lop

specimens of *Rhinolophus coelophyllus* PETERS, 1866 from Thailand (in mm).

GLS	CCL	RW	INT	ZYG	BCW	MAST	C-C	M3-M3	C-M3	MAND	c-m3
—	—	—	—	—	—	—	—	—	—	—	—
19.10	16.50	5.10	1.80	9.30	8.00	8.80	4.65	6.87	7.00	11.92	7.20
18.25	15.80	4.84	1.74	8.97	7.71	8.59	4.16	6.70	6.86	11.79	7.20
18.75	16.32	5.05	1.82	9.26	8.07	8.92	4.10	6.57	7.00	12.00	7.00
18.80	16.56	5.10	1.90	9.27	7.90	8.95	4.45	7.00	7.25	12.22	7.18
—	—	—	—	—	—	—	—	—	—	—	—
19.12	16.40	5.06	1.92	8.99	8.12	8.90	4.38	6.84	7.28	11.91	7.45
18.10	15.75	4.90	1.82	9.00	8.00	8.85	4.45	6.85	6.85	11.50	6.95
18.40	16.26	4.95	1.70	9.94	7.95	8.75	4.38	6.77	7.11	11.91	7.45
18.35	16.43	4.99	2.03	8.96	8.10	8.59	4.35	6.77	7.10	11.75	7.20
19.30	16.70	5.21	1.85	9.50	8.15	9.05	4.70	7.05	7.35	12.10	7.50
—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—
18.95	16.56	5.08	1.60	9.20	7.90	8.92	4.40	6.65	7.20	12.10	7.60
—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—
18.85	16.40	5.05	1.83	9.22	8.14	9.05	4.50	7.05	7.15	12.03	7.35
—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—
18.92	16.45	5.60	1.95	9.45	8.00	9.00	4.30	7.15	7.20	12.00	7.25
18.80	16.40	4.97	1.90	9.10	8.06	8.92	4.35	6.70	7.10	12.03	7.10
18.65	16.32	4.90	2.04	9.10	8.12	8.90	—	6.95	7.17	11.98	7.35
—	—	—	—	—	—	—	—	—	—	—	—
19.00	16.44	5.01	2.10	9.30	8.12	8.82	4.38	7.09	7.19	12.13	7.40
19.36	17.00	5.15	1.90	9.30	8.20	9.10	4.32	7.12	7.50	12.20	7.65
19.10	16.60	5.15	1.96	9.10	8.10	8.95	4.40	6.95	7.36	12.20	7.40
—	—	—	—	—	—	—	—	—	—	—	—
18.60	16.81	5.16	1.71	9.29	7.82	9.04	5.13	7.04	7.38	12.20	7.50
—	—	—	—	—	—	—	—	—	—	—	—
18.60	16.27	4.95	1.70	9.20	8.60	9.30	4.50	7.13	6.95	11.85	7.10
19.35	16.90	5.16	1.75	9.43	8.25	9.20	4.80	7.08	7.40	12.36	7.65
—	—	—	—	—	—	—	—	—	—	—	—
18.80	16.50	5.10	1.80	9.30	8.90	9.00	4.55	7.05	7.15	12.10	7.40
18.70	16.45	5.10	1.75	9.20	8.75	8.90	4.60	7.01	7.25	12.00	7.38
18.92	16.68	5.16	1.77	9.47	7.99	9.00	4.67	7.08	7.28	12.05	7.40
19.30	17.01	5.12	1.58	9.10	8.17	9.11	4.61	6.91	7.39	12.50	7.50
—	—	—	—	—	—	—	—	—	—	—	—
18.90	16.63	5.11	1.74	9.27	8.00	8.78	4.61	7.11	7.31	12.16	7.40
18.80	16.34	5.22	2.00	9.16	7.95	8.00	4.46	6.98	7.20	11.92	7.20
18.50	16.12	5.04	1.96	8.92	7.98	8.85	4.31	6.94	6.86	11.87	7.35
18.30	16.18	5.03	1.83	9.27	7.88	—	4.43	6.91	7.08	12.02	7.10
19.30	16.99	5.20	1.77	9.26	8.19	9.10	4.71	6.50	7.35	12.22	7.25
19.40	16.81	5.29	1.97	9.38	7.77	9.06	4.71	7.07	7.36	12.34	7.75
18.45	16.10	5.08	2.06	9.22	8.04	9.05	4.27	7.14	—	12.08	7.35
19.05	16.55	5.34	1.93	9.08	7.93	8.92	4.95	6.84	7.22	12.30	7.60

Buri, Tham Luang Ta Put, Muang Lop Buri.

Table 3. External, cranial and dental measurements of the examined specimens

NSMT-M	Sex	LOC	LAT	FA	HB	T	HFcu	Tib	E
28582	♀	Doi Inthanon	18°35'N	44.45	50.0	22.0	11.0	17.0	27.5
28784	♂	Ditto	Ditto	44.10	46.0	24.0	9.0	18.0	30.0
28785	♀	Tham Pha Hong	16°50'N	45.80	53.0	25.0	9.5	15.5	27.5
28786	♀	Ditto	Ditto	45.00	52.0	24.0	9.0	15.0	29.0
28564	♂	Ditto	Ditto	43.96	52.5	20.5	10.0	17.0	27.0
28787	♂	Ditto	Ditto	43.12	45.0	22.0	11.0	16.0	28.0
28788	♂	Ditto	Ditto	45.05	49.0	27.0	11.0	17.0	30.0
28789	♂	Ditto	Ditto	43.85	50.0	25.0	9.0	19.0	28.0
28790	♂	Ditto	Ditto	41.35	47.0	22.0	11.0	15.0	27.0
28791	♂	Ditto	Ditto	44.60	54.0	24.0	10.5	18.5	30.0

Khao Thong, Lom Sak, Phetchabun, 16°50'N, 101°34'E (in a forest); 1♀, Thung Salaeng Luang National Park, Lom Kao, Phitsanulok, 16°47'N, 100°46'E (in a forest); 4♂♂, 2♀♀, Tham Kho Takra, Pttana Nikom, Lop Buri, 14°48'N, 100°47'E (in a cave) collected by the author, Taweewat POLPAKDEE, Preecha NOONPAKDI and Prasarn BANG-PLUB on 19–28 August 1987.

Similar to *Rhinolophus shamelli* TATE, 1943, but slightly smaller. Forearm and condylocanine lengths vary geographically, the former being slightly larger in females than in males, but the latter does not show sexual dimorphism as shown in the following line ($M \pm SD$) (in mm) (Table 2).

Variations of forearm length in different populations (in mm):

Sam Sawan (18°51'N) 44.56 ± 0.96 (N=6♀♀); 44.47 ± 0.46 (N=5♂♂)

Pong Mae Vak (18°32'N) 45.01 ± 1.00 (N=15♀♀); 44.65 ± 0.83 (N=16♂♂)

Lop Buri (14°48'N) $41.51, 42.29$ (N=2♀♀); 43.34 ± 0.95 (N=4♂♂)

Variations of condylocanine length in different populations (in mm):

Sam Sawan (18°51'N) 16.83 ± 0.29 (N=8♀+♂)

Pong Mae Vak (18°32'N) 16.59 ± 0.24 (N=15♀+♂)

Lop Buri (14°48'N) 16.46 ± 0.38 (N=6♀+♂)

Mean values of forearm and condylocanine lengths smaller than those of *R. shamelli* (after HILL & THONGLONGYA, 1972, Table 1). Ear large, extending to the posterior border of muzzle when laid forwards. Noseleaf different from that of any other examined species of *Rhinolophus* in the following respects: posterior noseleaf (lancet) with a deep concavity at the middle portion, thickly covered with hair both inside and outside, and rounded posterior margin protruding to a minute nipple at the centre.

Skull: Nasal swelling high and short antero-posteriorly, with a depression at the region just behind it; temporal and sagittal crests well developed, the latter extending to a level evidently posterior to interorbital constriction. Upper and lower canines slender, lower one curved forwards and outwards; upper anterior premolar in tooth row, while lower second premolar minute and external of the row; the lower incisor row almost straight (Fig. 5-B).

Remarks. TATE (1943: 2) described a subspecies, *Rhinolophus coelophyllus*

of *Rhinolophus marshalli* THONGLONGYA, 1973 from Thailand (in mm).

GLS	CCL	RW	INT	ZYG	WBC	MAST	C-C	M3-M3	C-M3	MAND	c-m3
18.30	16.38	4.85	2.50	8.61	7.76	9.11	—	5.59	6.31	11.19	6.55
18.25	16.27	4.75	2.30	8.40	7.70	9.34	3.75	5.62	6.29	11.22	6.55
—	—	—	—	—	—	—	—	—	—	—	—
17.62	16.05	4.86	2.40	8.52	7.76	9.15	3.90	5.50	6.15	10.82	6.27
18.06	15.90	4.93	2.45	8.25	7.90	8.95	3.60	5.50	6.24	10.95	6.55
18.10	15.95	4.90	2.41	8.58	7.51	9.33	3.99	5.63	6.40	10.70	6.20
18.42	16.43	4.94	2.46	8.38	7.76	9.20	3.92	5.77	6.28	10.74	6.70
18.00	16.06	4.85	2.40	8.47	7.85	9.25	4.15	5.70	6.25	10.92	6.30
17.80	15.70	4.75	2.26	8.30	7.70	8.96	3.60	6.00	6.17	10.60	6.15
18.05	16.13	4.62	2.40	8.15	7.28	9.16	3.64	5.33	6.37	10.99	6.24

shamelli based on a single specimen obtained on the Island of Chang in the Gulf of Thailand. Subsequently, HILL and THONGLONGYA (1972: 183) considered *shamelli*, not to be a subspecies of *coelophyllus* but a distinct species. I have carefully examined 51 specimens obtained from six localities in Thailand, but was unable to find any specimens to be identified as *shamelli* among them.

Rhinolophus marshalli THONGLONGYA, 1973

(Fig. 5-C, Table 3)

Rhinolophus marshalli THONGLONGYA, 1973, Mammalia, 37: 590.

Type locality. Foothills of Khao Soi Dao Thai, Amphoe Pong Nam Ron, Chanthaburi, Thailand, about lat. 12°55'N, long. 102°10'E.

Type specimen. No. 54-1669 (original number JTM 6823), adult male (in alcohol, skull extracted) collected by Joe T. MARSHALL, Jr. and Wandee NONG-NGOK on 24 August 1971.

Specimens examined. 1♂, 1♀, Doi Inthanon, Chom Thong, Chiang Mai, 18°35'N, 98°35'E (in a cave) collected on 2 September 1987, by the author, Preecha LUECHA, Lakkhana BOONLIANG, Punya SAENGMALA and Prasarn BANGPLUB; 6♂♂, 2♀♀, Tham Pha Hong, Lom Sak, Phetchabun 16°50'N, 101°34'E (in a bamboo forest near the cave) collected on 20 August 1987, by the author, Taweewat POLPAKDEE, Preecha NOONPAKDI and Prasarn BANGPLUB.

Similar to *R. rex* ALLEN, 1923 and *R. paradoxolophus* (BOURRET, 1951), but distinctly smaller (Table 3). Two populations examined slightly differ in the following dimensions (in mm):

Doi Inthanon, 18°35'N; FA, 44.45 (1♀) 44.10 (1♂); E, 27.5 (1♀), 30.0 (1♂), CCL 16.38 (1♀), 16.27 (1♂), ZYG 8.61 (1♀), MAND 11.19 (1♀), 11.22 (1♂), C-M3 6.31 (1♀), 6.29 (1♂).

Tham Pha Hong, 16°50'N; FA 45.00, 43.96 (2♀♀), 43.65±1.31 (6♂♂), HB 52.00, 52.50 (2♀♀), 49.58±3.35 (6♂♂), E 27.5, 29.00 (2♀♀), 28.33±1.37 (6♂♂); CCL 16.18±0.33 (4♂♂), ZYG 8.27±0.26 (4♂♂), MAND 11.05±0.27 (4♂♂), C-M3

Table 4. External, cranial and dental measurements of the examined specimens

NSMT-M Sex	LOC	LAT	FA	HB	T	HFcu	Tib	E	GLS
28595 ♂	T. S. P. N.	18°35'N	53.00	62.0	25.0	14.0	26.0	28.0	23.20
28792 ♂	Ditto		53.95	61.0	23.0	13.0	24.0	28.0	23.32
28793 ♂	Doi Int.	Ditto	53.85	60.0	22.0	13.0	25.0	26.0	22.66
28794 ♀	T. P. H.	16°50'N	52.20	60.0	23.0	13.5	24.5	27.5	23.00
28568 ♂	Ditto		48.70	64.0	19.0	12.5	25.5	28.0	23.00
28565 ♀	Ditto		52.50	61.0	19.0	12.0	25.0	28.0	23.00
28795 ♀	T. S. Y. N.	14°30'N	51.15	58.0	21.0	13.0	24.0	29.0	22.45
28796 ♀	T. W. P.	14°28'N	49.00	60.0	23.0	13.0	24.0	27.0	22.45

Abbreviations: T. S. P. N., Tham Song Phi Nong; Doi Int., Doi Inthanon; T. P. H., Tham Pha

6.36±0.10 (4♂♂) (Table 3).

Ear very large with a large antitragus; the anterior noseleaf broad, covering most of the upper lip. Internarial region greatly expanded to a cupshape enclosing the base of large sella. Fur long, dark brown in colour. Skull rather long, with the mastoid width exceeding the zygomatic width; palate very long, its posterior border extending beyond posterior border of M3; sagittal crest low, zygomatic arch weak; nasal bones long, nasal swellings high and oblong with a conspicuous concavity behind them; dorsal profile of rostrum strongly convex upwards. The upper and lower teeth small, especially PM2 and pm 3 minute, but in tooth row; lower incisors minute, trifold as in other *Rhinolophus*, but not imbricate, forming V-shaped row (Fig. 5-C).

Remarks. This species was named based on a specimen obtained from the foothills of Khao Soi Dao Tai, Chanthaburi, in 1971, and was only known from the type specimen at least before 1977 (LEKAGUL & MCNEELY, 1977). I obtained 10 specimens of this rare species at two localities, one in a bamboo forest near Tham Pha Hong and the other in a cave at Doi Inthanon. It seems to be a primitive and localized species in the genus *Rhinolophus*, having longer palate, comparatively small upper and lower teeth and V-shaped lower incisor row.

Rhinolophus pearsoni chinensis ANDERSEN, 1905

(Fig. 6-A, Table 4)

Rhinolophus pearsoni chinensis ANDERSEN, 1905, *Annl. Mag. nat. Hist.*, (7), 16: 289.

Type locality. Kuanton Fokien, China.

Type specimen. BM No. 98.11.1.2., ♂ ad. (skin), collected, April 16th, 1898, by J. De La Touche, deposited in the British Museum (Natural History).

Specimens examined. 2♂♂, Thang Song Phi Nong, Chom Thong, Chang Mai, 18°35'N, 98°29'E (in a cave); 1♂, Doi Inthanon, Chom Thong, Chiang Mai, 18°35'N, 98°29'E (in a cave) collected by the author, Preecha LUECHA, Lakkhana BOONLIANG, Punya SAENGMAHA and Prasarn BANGPLUB on 2-9 September 1987; 1♂, 2♀♀,

of *Rhinolophus pearsoni chinensis* ANDERSEN, 1905 from Thailand (in mm).

CCL	RW	INT	ZYG	BCW	MAST	C-C	M3-M3	C-M3	MAND	c-m3
20.85	6.20	2.11	11.30	9.20	—	5.95	8.50	9.25	15.84	9.90
20.80	6.30	2.35	11.32	9.16	10.60	6.22	8.75	9.95	15.85	10.00
20.20	6.13	2.53	11.45	9.10	10.56	5.85	8.75	9.20	15.60	9.80
20.62	6.06	2.17	11.44	9.38	10.75	5.93	8.49	9.04	15.60	9.80
20.12	6.09	2.39	11.03	8.97	10.44	5.97	8.60	9.11	15.41	9.55
20.20	5.90	2.00	11.16	9.45	10.65	5.70	8.78	9.20	15.25	9.65
19.96	5.81	2.19	10.79	8.41	10.29	5.70	8.25	8.96	15.40	9.40
19.90	5.80	1.90	11.32	9.15	10.20	5.72	8.30	8.81	15.15	9.26

Hong; T. S. Y. N., Tham Sai Yok Noi; T. W. P., Tham Wang Phra.

Tham Pha Hong, Lom Sak, Phetchabun, 16°50'N, 101°34'E (in caves) 1♂, Khao Thong, Lom Sak, Phetchabun, 16°50'N, 101°34'E (in a forest); collected by the author, Taweewat POLPAKDEE, Preecha NOONPAKDI and Prasarn BANGPLUB on 19–28 August of 1987; 1♀. Tham wang Phra, Sai Yok, Kanchanaburi, 14°28'N, 98°54'E (in a cave), Tham Wang Pha, Sai Yok, Kanchanaburi, 14°30'N, 98°35'E (in a cave) collected by the author, Lakkhana BOONLIANG, Taweewat POLPAKDEE, Preecha NOONPAKDI and Prasarn BANGPLUB on 13 September 1987.

Similar to typical *Rhinolophus pearsoni pearsoni* HORSFIELD, 1851, from Darjeeling and Masuri, but smaller in FA and HB, with longer ear. As in the other examined species of *Rhinolophus* from Thailand, specimens from high latitude are larger than those from low latitude, especially in forearm length (Table 4).

Variations of lengths of FA, E and CCL in different populations are as follows (in mm) (Table 4).

Doi Inthanon, Chom Thong, Chiang Mai (1♂), Thang Song Phi Nong, Chong Thong, Chiang Mai (2♂♂) (18°35'N).

FA 53.53 ± 0.46 (N=3♂♂), E 27.33 ± 1.15 (N=3♂♂).

Tham Pha Hong, Lom Sak, Phetchabun and Khao Thong, Lom Sak Phetchabun (16°50'N).

FA 51.21 ± 1.58 (N=4♀♀), E 27.88 ± 0.85 (N=4♀♀).

CCL 20.62, 20.20 (N=2♀♀), 20.12 (N=1♂).

Tham Wang Phra, Sai Yok, Kanchanaburi (14°28'N).

FA 51.15 (N=1♀), E 29.00 (N=1♀), CCL 19.96 (N=1♂).

The forearm length in the respective populations is shorter than that of nominotypical form (55 mm), but the ear is evidently longer than in the nominotypical one (25 mm). Horseshoe broad; sella large, with parallel sides, lancet short and broadly triangular. Lower lip with a single groove. Fur silky, dense and long, but shorter than in *R. yunanensis* DOBSON, 1872, the dorsal colour brown, the ventral lighter. Skull slightly smaller than in the nominotypical form, maxillar width narrower, with shorter mandible and tooth row; the sagittal crest higher, temporal and lambdoid crests well developed, and posterior portion of narial swelling slightly concave. Dorsal

Table 5. External, cranial and dental measurements of the examined specimens

NSMT-M	Sex	LOC	LAT	FA	HB	T	HFcu	Tib	E	Noseleaf
28797	♀	Doi Inthanon	18°35'N	59.22	67.0	19.0	15.0	28.0	32.0	13.5×22.5
28798	♀	Ditto	Ditio	59.90	69.0	21.0	15.5	29.5	31.0	12.5×22.0
28799	♀	Ditto	Ditto	59.90	63.0	24.0	15.0	29.0	30.0	12.5×21.0
28800	♂	Ditto	Ditto	57.20	67.0	21.0	15.0	27.0	32.0	13.0×21.0
28801	♂	Ditto	Ditto	56.22	68.0	19.0	14.0	27.0	31.0	13.0×21.0
28802	♂	Ditto	Ditto	61.16	67.0	23.0	15.0	29.0	31.0	14.0×22.0
28803	♂	Ditto	Ditto	58.30	72.0	20.0	14.0	28.0	30.0	14.0×21.0
28804	♂	Ditto	Ditto	59.20	66.0	23.0	14.0	27.0	31.0	13.0×21.0
28805	♂	Ditto	Ditto	57.22	66.0	18.0	14.5	26.0	31.0	13.0×20.5

Abbreviations: See Table 1.

profile with higher rostral and anterior portion of frontal regions and lower interorbital constriction. Dentition as in the nomino typical form, anterior premolar, PM2, in the toothrow, the crown area subequal to that of *R. yunanensis* which has longer skull; lower second premolar, pm3, external, very small, sometimes missing, so that the anterior premolar, pm2 is in contact with posterior premolar, pm4.

Remarks. *Rhinolophus yunanensis* is usually regarded as a synonym of *Rhinolophus pearsoni*, but *R. yunanensis* from Doi Inthanon, Thailand (N=8), and *R. pearsoni chinensis* from the aboved collecting sites in Thailand are clearly different in dimensions of external, cranial and dental measurements. Mean values in dimensions of the examined populations of *R. p. chinensis* vary by sex and latitude of localities. It is therefore necessary to compare samples of the same sex from similar latitudes. The coefficients of differences (CD) in external measurements, FA, HB and E, between *yunanensis* and *chinensis* are 2.103, 2.26 and 2.06, respectively, much higher than the conventional level of taxonomic difference. On the other hand, dimensions of CCL, RW, ZYG, BCW, MAST, C-C, M3-M3, C-M3 and MAND of *chinensis* are outside the range of $M \pm 3SD$ of the *yunanensis* population from Doi Inthanon. It is therefore evident that the former is distinctly smaller than the latter.

On Doi Inthanon, *yunanensis* and *chinensis* were found in the same cave, which means that they are sympatric. Consequently, *yunanensis* and *R. pearsoni* are considered specifically different in the present paper.

TATE (1943) provisionally treated *pearsoni* as a race of *R. luctus* TEMMINCK, 1835. However, the former is different from the latter in size, fur coloration, and several characters of sella and skull. They can be regarded as being specifically distinct.

Rhinolophus yunanensis DOBSON, 1872

(Fig. 6-B, Table 5)

Rhinolophus yunanensis DOBSON, 1872, J. Asiat. Soc. Bengal, 41: 336.

Type locality. Hotha, Yunnan, China.

of *Rhinolophus yunanensis* DOBSON, 1872 from Thailand (in mm).

GLS	CCL	RW	INT	ZYG	BCW	MAST	C-C	M3-M3	C-M3	MAND	c-m3
—	—	—	—	—	—	—	—	—	—	—	—
26.26	23.30	6.60	3.10	13.59	10.26	11.74	6.97	9.61	10.61	18.07	11.10
26.20	23.17	6.67	3.36	13.09	10.35	11.64	6.70	9.94	10.98	18.22	11.40
26.05	23.35	6.90	2.66	13.44	10.38	12.00	6.98	9.79	10.75	18.10	11.06
26.70	23.31	6.87	2.82	13.77	10.63	11.78	7.48	9.91	11.07	18.85	11.95
25.90	23.94	6.97	2.80	13.73	10.46	11.79	7.16	9.86	10.69	18.26	11.40
26.65	23.54	6.92	2.81	13.64	10.66	11.96	7.04	9.82	10.78	18.44	11.50
25.60	22.86	6.99	2.93	13.63	10.27	11.81	6.89	9.53	10.41	17.68	11.10

Specimens examined. 6♂♂, 3♀♀, Doi Inthanon, Chom Thong, Chiang Mai, 18°35'N, 98°29'E (in a cave), collected by the author, Preecha LUECHA, Lakkhana BOONLIANG, Punya SAENGMALA and Prasarn BANGPLUB, 2 September 1987.

Similar to *Rhinolophus pearsoni chinensis* ANDERSEN, 1905, but exceedingly large and with very long silky fur as in *R. luctus* (Table 5). FA 59.67 ± 0.39 (3♀♀) mm, 58.22 ± 1.77 (6♂♂) mm; HB 66.33 ± 3.06 (3♀♀) mm, 67.50 ± 1.87 (6♂♂); E 31.0 ± 1.00 (3♀♀) mm, 31.0 ± 0.63 (6♂♂) mm; CCL 23.00 (1♀) mm, 23.36 ± 0.36 (6♂♂) mm, ZYG 13.59 (1♀) mm, 13.55 ± 0.25 (6♂♂) mm; MAND 18.07 (1♀) mm, 18.26 ± 0.39 (6♂♂) mm (Fig. 6–E).

Ear very large, with high antitragus. Noseleaf large, with high pandulated sella, low and roundish connecting process, and short and triangular lancet. Lower lip thick, consisting of two leaves separated by a single groove. Fur dense, silky and glossy, and slightly wavy; dorsal colour light greyish brown, the ventral lighter. Skull strong, general outline similar to that of *R. p. chinensis* but longer and broader. Sagittal and temporal crests strong, the former well developed, the anterior portion higher, though the lambdoid crest rather low, posterior portion of nasal swelling deeply concaved. In dorsal profile, rostral and anterior portion of frontals higher than that of *chinensis*, and interorbital constriction lower than that of *chinensis*. Dentition as in *R. p. chinensis*, upper bifid incisor, upper anterior premolar and lower second premolar similar in the crown areas to those in *chinensis*, while the skull and the other teeth larger; upper anterior premolar in the tooth row, but lower second premolar external or sometimes missing as found on the right side in a specimen, NSMT-M 28802.

Remarks. This species has long been treated as a synonym of *R. pearsoni* (DOBSON, 1878; ANDERSEN, 1905; ALLEN, 1938; ELLERMAN and MORRISON-SCOTT, 1950, 1966). However, they are sympatric in a cave at Doi Inthanon, northwestern Thailand, and are specifically different as shown in the remarks of *R. pearsoni chinensis*.

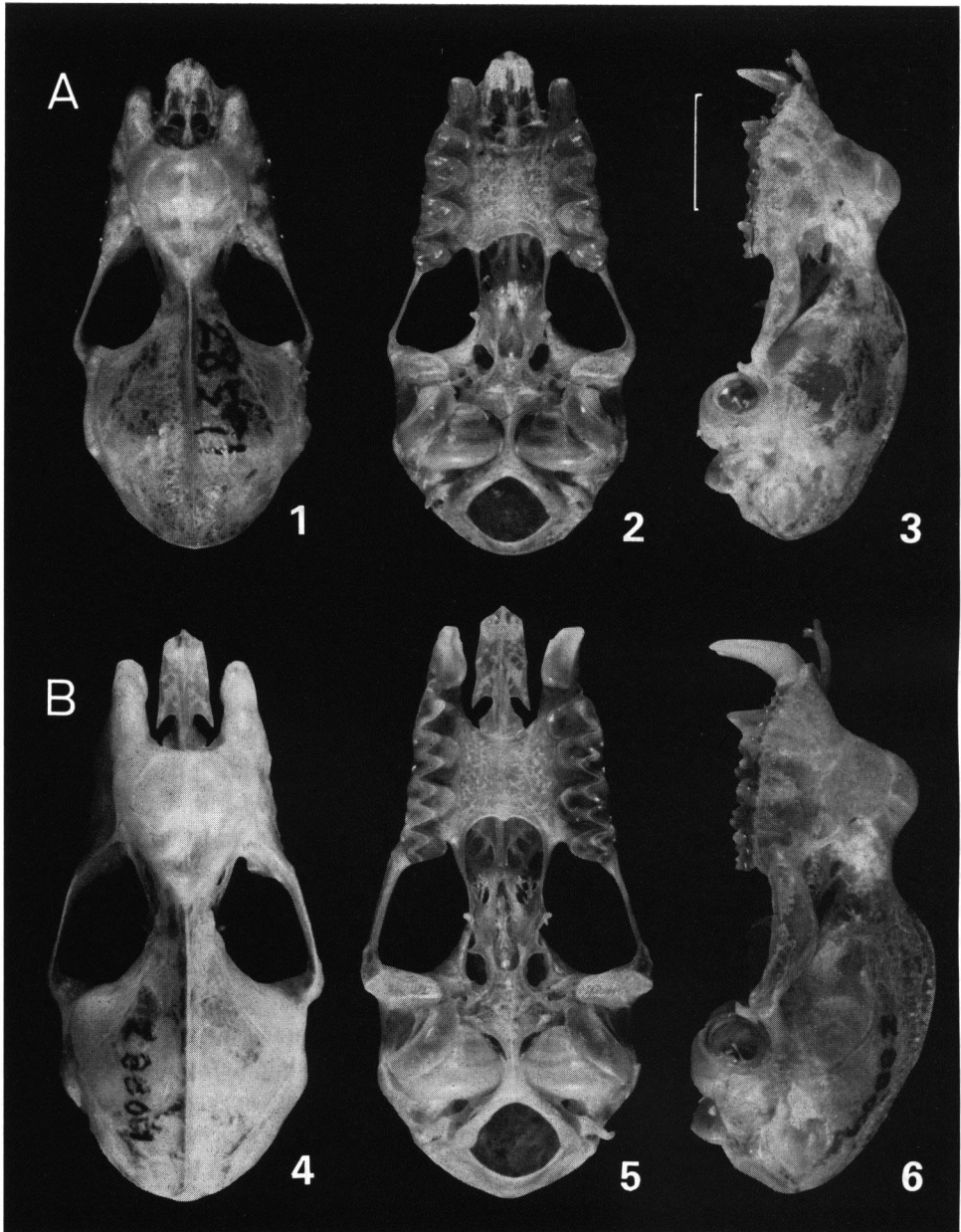


Fig. 6. Skulls of *Rhinolophus*. A, *R. pearsoni chinensis*, NSMT-M28596, ♀; B, *R. yunanensis*, NSMT-M28801, ♂. 1, 4, dorsal view; 2, 5, ventral view; 3, 6, lateral view. Bar indicates 0.5 mm.

Acknowledgements

I wish to express my deep thanks to Dr. Niphan RATANAWOROBHAN, the director of the Ecological Research Division, Thailand Institute of Scientific and Technological Research, for her kind consideration to the mammalian survey in Thailand. I also express my gratitude to Mr. Preecha LUECHA, Mrs. Lakkhana BOONLIANG, Messrs. Taweewat POLPAKDEE, Preecha NOONPAKDI, Punya SAENGMALA, Prasit RAKSACHAT and Prasarn BANGPLUB of the Institute for assistance in collecting small mammalian specimens and preparing study skins. Finally, I am deeply indebted to Drs. Masatsune TAKEDA, Shigemitsu SHOKITA, Masataka SATO, Tsukane YAMASAKI, Mamoru OWADA and Hirotsugu ONO for their kind help and encouragement extended to me in various ways during the expedition.

References

- ALLEN, G., 1938. The Mammals of China and Mongolia. xxv+620 pp., 9 pls. American Museum of Natural History, New York.
- ANDERSEN, K., 1905 a. On some bats of the genus *Rhinolophus*, with remarks on their mutual affinities, and descriptions of twenty-six new forms. *Proc. zool. Soc. Lond.*, 1905, (2): 75-145, 2 pls.
- 1905 b. On the bats of the *Rhinolophus philippinensis* group, with descriptions of five new species. *Annl. Mag. nat. Hist.*, (7), 16: 243-256.
- 1905 c. On the bats of the *Rhinolophus arcuatus* group, with description of five new forms. *Ibid.*, (7), 16: 281-288.
- 1905 d. A list of the species and subspecies of the genus *Rhinolophus*, with some notes on their geographical distribution. *Ibid.*, (7), 16: 648-662.
- 1918. Diagnoses of new bats of the families Rhinolophidae and Megadermatidae. *Ibid.*, (9), 2: 373-384.
- DOBSON, G. E. 1878. Catalogue of the Chiroptera in the Collection of the British Museum, xlii+567 pp., pls. 30. British Museum (Natural History), London.
- ELLERMAN, J. R., & T. C. S. MORRISON-SCOTT, 1951. Checklist of Palearctic and Indian Mammals 1758 to 1946. 810 pp., British Museum (Natural History), London.
- 1966. *Idem*, 2nd ed. 810 pp.
- HARADA, M., M. MINEZAWA, S. TAKADA, S. YENBUTRA, P. NUNPAKDEE & S. OHTANI, 1982. Karyological analysis of 12 species of bats from Thailand. *Caryologia*, 35: 269-278.
- , S. YENBUTRA, T. H. YOSIDA & S. TAKADA, 1985. Cytogenetical study of *Rhinolophus* bats (Chiroptera, Mammalia) from Thailand. *Proc. Japan Acad.*, 61 (B): 455-458.
- , S. YENBUTRA, K. TSUCHIYA and S. TAKADA, 1985. Karyotypes of seven species of bats from Thailand (Chiroptera: Mammalia). *Experientia*, 41: 1610-1611.
- HILL, J. E., 1972. A note on *Rhinolophus rex* Allen, 1923 and *Rhinomegalophus parzadoxolophus* Bourret, 1951 (Chiroptera; Rhinolophidae). *Mammalia*, 36: 428-434.
- 1974. New records of bats from south-eastern Asia, with taxonomic notes. *Bull. Br. Mus. nat. Hist.*, (Zool.), 27: 127-138.
- 1983. Bats (Mammalia: Chiroptera) from Indo-Australia. *Ibid.*, 45: 103-208.
- & K. THONGLONGYA, 1972. Bats from Thailand and Cambodia. *Ibid.*, 22: 173-196.
- & M. YOSHIYUKI, 1980. A new species of *Rhinolophus* (Chiroptera, Rhinolophidae) from Iriomote Island, Ryukyu Islands, with notes on the Asiatic members of the *Rhinolophus pusillus* group. *Bull. natn. Sci. Mus. Tokyo*, (A), 6: 179-189.
- HOOD, C. S., D. A. SCHLITZER, J. I. GEORGUDAKI, S. YENBUTRA & R. J. BAKER, 1988. Chromosomal

- studies of bats (Mammalia; Chiroptera). *Annl. Carnegie Mus.*, **57**: 99–109.
- HUTTON, C. T., 1872. On the bats of the north-western Himalayas. *Proc. zool. Soc. Lond.*, **1872**: 690–714.
- LEKAGUL, B., & J. A. MCNEELY, 1977. Mammals of Thailand. li+758 pp, 722 pls. Bangkok.
- MILLER, G. S., 1899. List of bats collected by Dr. W. L. ABBOTT in Siam. *Proc. Acad. nat. Sci. Phila.*, **1898**: 316–325.
- PHILLIPS, C. J., 1967. A collection of bats from Laos. *J. Mamm.*, **48**: 633–636.
- SHAMEL, H. H., 1942. A collection of bats from Thailand (Siam). *Ibid.*, **23**: 317–328.
- SINHA, Y. P., 1973. Taxonomic studies on the Indian horseshoe bats of the genus *Rhinolophus* Lacepede. *Mammalia*, **37**: 603–630.
- TATE, G. H. H., & R. ARCHBOLD, 1939. Oriental *Rhinolophus*, with special reference to material from the Archbold collections. *Amer. Mus. Novit.*, (1036): 1–21.
- 1943. Results of the Archbold expeditions. No. 49. Further notes on the *Rhinolophus philippinensis* group (Chiroptera). *Ibid.*, (1219): 1–7.