

Notes on a Collection of Bats (Mammalia : Chiroptera) from Bali I., Indonesia

D.J. Kitchener* and S. Foley**

Abstract

Taxonomic notes are presented on a collection of bats from Bali made in 1982. This collection includes two species not previously recorded from the island (*Dobsonia peroni*, *Macroglossus sobrinus*), and an indeterminate taxon (*?Rousettus*). Thirty-five bat species are listed for Bali in addition to this latter form.

Introduction

In 1853 Temminck described *Pteropus vampyrus pluton* from Bali (and Lombok I.). No further bats were recorded from Bali until 1927 and 1929 when Baron Victor Von Plessen visited the island to collect birds, but also collected two species of bat (Sody 1933). In 1929-31 Kuroda and Yasuda also collected two species of bat (Kuroda 1933). Sody visited the island for several months during 1931 and collected a number of mammals including 10 species of bat. In 1927 an expedition, which included Mertens and Rensch, collected two species of bat in Bali (Mertens 1936). Chasen (1940), in his handlist of Malaysian mammals, listed 12 species of bats from Bali. The largest and most representative collection of bats from Bali was made between 1937-38 by Von Plessen; this collection was probably purchased by the American Museum of Natural History where it is now located. The latter collection was reported on in the taxonomic revisionary studies of G.M.H. Tate (Tate 1941, 1941a-c, 1942a-b). Pohle (1950) produced a synopsis of the bat species known from Bali. This included 28 species, not including *Dobsonia peroni* which was known from nearby Nusa Penida I. Oei (1960) reported on bats from Bali but included no additions to its known bat fauna. Recently Honacki *et al.* (1982) and Koopman K. (pers. comm.) report several additional species to the island.

In 1982, as part of his studies on the ecology and economy of Bali, one of us (S.F.) made a collection of bats from Kabupaten Gianya and Kabupaten Klungkung regions in southern Bali. These regions are situated on a volcanic fan, from 500-2000 m above sea level. The habitat is a mosaic of rice fields, multistoried and mixed house gardens, and dry land agriculture. This collection forms the basis of this paper.

The Bat Fauna of Bali

The list of species known for the island (Table 1) is increased from the latest published census of 28 species by Pohle (1950) to 35 species as well as an additional form of doubtful taxonomic status (*?Rousettus*). These additional taxa result from those added by this study, published

* Western Australian Museum, Francis Street, Perth, Western Australia 6000

** Centre for Resource and Environmental Studies, Australian National University, Canberra ACT 2600

A Collection of Bats from Bali I., Indonesia

Table 1: List of bat species on Bali Island and the authority for the records.

Species	Authority*
Pteropodidae	
<i>Pteropus vampyrus pluton</i> Temminck, 1853	1, 2, 3, 4, 12, 13
<i>Rousettus amplexicaudatus infumatus</i> (Gray, 1870)	12, 13, 16, 18
? <i>Rousettus</i>	21
<i>R. leschenaulti shortridgei</i> Thomas & Wroughton, 1909	12, 13, 17, 18, 21
<i>Cynopterus brachyotis brachyotis</i> (Muller, 1838)	1, 4, 12, 13, 21
<i>C. titthaecheluis titthaecheluis</i> (Temminck, 1825)	1, 3, 4, 12, 13, 21
<i>Dobsonia peroni grandis</i> Bergmans, 1978	12 + , 17 + , 21
<i>Eonycteris spelaea glandifera</i> Lawrence, 1939	12, 13
<i>Macroglossus minimus minimus</i> (Geoffroy, 1810)	1, 4, 12, 13
<i>M. sobrinus sobrinus</i> Andersen, 1911	21
Emballonuridae	
<i>Taphozous longimanus kâmpenii</i> Jentink, 1907	5, 13, 21
<i>T. melanopogon melanopogon</i> Temminck, 1841	5, 13
Nycteridae	
<i>Nycteris javanica</i> E. Geoffroy, 1813	10, 17
Rhinolophidae	
<i>Coelops frithii bernsteini</i> Peters, 1865	10, 13, 17
<i>Hipposideros ater saevus</i> Andersen, 1918	20
<i>H. larvatus larvatus</i> (Horsfield, 1823)	20
<i>H. diadema diadema</i> (E. Geoffroy, 1813)	6, 13, 21
<i>H. bicolor</i> Temminck, 1835	13
<i>H. galeritus</i> Cantor, 1846	13
<i>Rhinolophus acuminatus audax</i> Andersen, 1905	1, 4, 13, 17
<i>R. celebensis javanicus</i> Andersen, 1918	17, 20
<i>R. luctus luctus</i> Temminck, 1837	3, 13, 17, 20
Vespertilionidae	
<i>Kerivoula hardwickei hardwickei</i> (Horsfield, 1825)	1, 4, 9, 13, 17
<i>K. picta picta</i> (Pallas, 1867)	2, 4, 9, 13, 17
<i>Myotis formosus</i> (Hodgson, 1835)	17, 20
<i>M. horsfieldii horsfieldii</i> (Temminck, 1840)	4, 13, 17, 19, 20
<i>M. muricola muricola</i> Gray, 1846	1, 3, 4, 8, 13, 14, 19, 21
<i>Phoniscus jagori javanus</i> Thomas, 1880	9, 13, 17
<i>Pipistrellus imbricatus imbricatus</i> Horsfield, 1824	4, 13, 17
<i>P. macrotis</i> (Temminck, 1835)	11, 13, 17
<i>P. tenuis nitidus</i> Tomes, 1858	11 + + , 13, 15, 19
<i>Tylonycteris pachypus pachypus</i> (Temminck, 1835)	11, 13
<i>T. robustula</i> Thomas, 1915	1, 4, 11, 13, 21
<i>Miniopterus schreibersii blepotis</i> (Temminck, 1840)	9, 13
<i>Scotophilus kuhlii temminckii</i> Leach, 1822	1, 4, 11, 13, 14, 21
Molossidae	
<i>Chaerephon plicatus tenuis</i> (Horsfield, 1822)	7, 13, 17

+ Nusa Penida Is. near Bali

+ + as *P. imbricatus* (K. Koopman pers. comm.)

- *1. Sody (1933)
2. Kuroda (1933)
3. Mertens (1936)
4. Chasen (1940)
5. Tate. G.H.H. (1941)
6. Tate. G.H.H. (1941a)
7. Tate. G.H.H. (1941b)
8. Tate. G.H.H. (1941c)
9. Tate. G.H.H. (1941d)
10. Tate. G.H.H. (1941e)
11. Tate. G.H.H. (1942a)
12. Tate. G.H.H. (1942b)
13. Pohle (1950)
14. Oei (1960)
15. Koopman (1973)
16. Bergmans & Hill (1980)
17. Honacki *et al.* (1982)
18. Rookmaaker & Bergmans (1982)
19. Hill (1983)
20. AMNH collections not referred to in 4 to 12 above (K. Koopman pers. comm.)
21. This study.

records overlooked by, or unavailable to, Pohle (1950), and specimens lodged in the American Museum of Natural History and communicated to us for the first time by Dr. K. Koopman.

The taxonomy used herein generally follows Honacki *et al.* (1983) but with the following important exceptions:

(i) In the treatment of *Myotis* we follow Hill (1983) in separating *M. muricola* and *M. ater* and allowing that *M. niasensis* is possibly a distinct subspecies, but restricted to Nias I. We consider the specimens from Bali referred to by Tate (1941c) as *M. 'niasensis'* to be *M. muricola*.

(ii) We follow Hill (1983) in recognising that *Cynopterus titthaecheilus* is distinct from *C. sphinx*. While we have no measurements to refer to for the record of *C. sphinx* from Bali by Pohle (1950) we consider it probably *C. titthaecheilus*.

(iii) *Rhinolophus borneensis* is distinct from *R. celebensis* (Hill 1983).

The specimens referred to by Honacki *et al.* (1982) as *R. borneensis* are considered to be *R. celebensis* (K. Koopman pers. comm.).

This Collection

Taxonomic notes are provided on the specimens (all in spirit) lodged in the Western Australian Museum (WAM 16151-95) only if observations add to the published literature. Measurements are in mm. Rostrum length is from orbit to nares; mandible length, from condyle to front of premaxilla; skull length, from lambda to gnathion. Colours, if capitalised, are those of Ridgway (1912).

?*Rousettus*

M16159. A juvenile female with milk upper incisors. Originally thought to be *Rousettus amplexicaudatus* but its skull has several unique features. Firstly, the rostrum is intermediate in length between apparently similar aged individuals of *Cynopterus brachyotis* and *R. leschenaulti* from Bali. Secondly, it lacks a basal foramen on the dorsal surface of the post orbital process – a condition supposedly restricted to the cynopterine genera *Nyctimene*, *Balionycteris*, *Chironax*, *Thoopterus*, *Penthetor* and *Sphaerius* (Andersen 1912), but this specimen is none of these. Thirdly, it has an obvious opening of the post glenoid canal onto the lateral surface of the skull just posterior to the junction of the zygomatic and squamosal.

We have examined a number of juvenile *R. amplexicaudatus minor* of similar age in the National collections of Singapore (specimens nos. 782-7 from Bulong, Java), none of which have the above characters. K. Koopman (pers. comm.) has examined all the skulls of *R. amplexicaudatus* from Bali, in the AMNH collections. While he found no specimen that combined the unique characters referred to above, two did show a small dorsal opening of the post-glenoid canal on one side, but not on the other.

Measurements – forearm length 64.5, metacarpal III length 42.0, tibia length 27.1, ear length 14.6, skull length 31.6, rostrum length 8.4, condylobasal length 29.7, mandible length 23.5, least interorbital width 6.8, post orbital width 9.1, braincase width 13.9, zygomatic width 18.1, C¹-M² length 11.2, C₁-M₂ length 11.9. (M₃ not visible).

Rousettus leschenaulti shortridgei

M16152-4, M16157 (2 juv ♀, 2 ad. ♀).

Measurements – forearm length (73.4-90.1), metacarpal III length (46.8-57.6), tibia length (31.7-43.0), ear length (18.4-22.1), skull length (35.4-41.9), rostrum length (10.6-13.8), condylobasal length (33.7-40.5), mandible length (26.5-34.1), least interorbital width (6.1-8.2), post orbital width (8.1-9.0), braincase width (15.0-16.7), zygomatic width (20.0-24.6), C¹-M² length (13.6-15.3), C₁-M₃ (15.1-17.5), length M₃ (1.7-1.9).

Cynopterus brachyotis brachyotis

M16155, M16158, M16160-5 (5 ♂, 3 ♀).

Sody (1933) presents measurements of *C. brachyotis javanicus* for specimens from west (Djembrana) and northern (Boeeleng) Bali localities; their forearms averaged 61.3 (57-65) mm. Chasen (1940) considered *C. brachyotis javanicus* to be on Bali. Tate (1942b:341) also referred specimens from Kuta and Nusa Penida I. (near Bali) which had forearm lengths of c. 61 mm to *C. b. javanicus*.

Our measurements of adults have forearms averaging 62.3 (59.1-66.3); these and other measurements (Table 2) show them to be more consistent with *C. b. brachyotis*. Further, our measurements differ in some significant respects from those of *C. b. javanicus* from Bali (Sody 1933). For example C¹-M¹ length of our adult specimens average 9.9 which is significantly larger than Sody's average of 9.4 ($t = -4.01$, $p < 0.002$). Also there is a trend for M¹-M¹ width in our specimens to be shorter: 8.6 (8.1-8.9) versus 8.9 (8.3-9.1). Our measurements for condylobasal length are in close agreement with those of Andersen (1912:638) but are consistently longer than those presented by Sody (1933) which may have been measured from the inter-condylar basal notch.

Two specimens (M16155, M16158) have the smallest measurements for most characters, except their post orbital widths are considerably wider than the other specimens: (8.0-8.1) versus (6.3-7.0). Also, their post orbital process is smaller and more posteriorly directed, and their pelage a generally lighter colour. One of these (M16158) is obviously sub-adult in that its metacarpal and phalangeal joints have swollen epiphyses and that they have tooth wear; the other (M16155) appears to be adult. Measurements taken on a number of specimens of *C. b. brachyotis* from Singapore I., Malay Peninsula and associated east coastal islands (listed at the end of this section) show significant ($p = .01$) negative relationship between the post orbital width and skull length (Fig. 1). This relationship is of the form $y = 13.08 - 0.226x$ ($r = -.47$); it is unchanged if both variables are logged to conform with the normal allometric relationship between such measurements (Huxley 1932). These data suggest the unusual situation of a cranial measurement becoming smaller as the skull grows. Subjectively this trend could be seen in this series of *C. b. brachyotis* from Malaysia and Singapore. As the posterior cranium elongated it created a thinning immediately behind the post orbital processes; these processes also show a tendency to project more laterally as the skull enlarges.

The fur colour of the large female specimens is: abdomen – Light Grayish Olive tinged with Deep Olive Buff; throat, chest and sides of neck – Deep Olive Buff; head and back of neck – Olive Brown; dorsum, shoulders and forearm – Drab; uropatagium and proximal

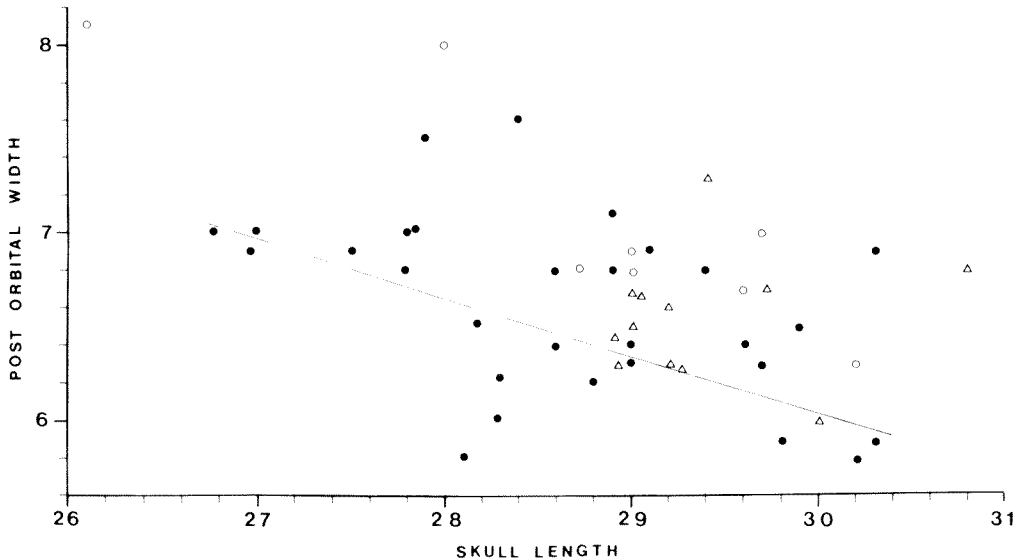


Figure 1: Relationship between postorbital width and skull length of 29 *Cynopterus brachyotis brachyotis* from the Malay Peninsula, Singapore I, and associated east coast islands (●); 8 *C. brachyotis brachyotis* from Bali, this study (○), and 11 *C. brachyotis (javanicus)* from Bali; Sody (1933) (△). The regression line fits ●—●.

edge of plagiopatagium – Drab, tipped with Ochraceous Tawny. In the large males the colour of the throat and chest and sides of neck deepened from Sanford's Brown to Cinnamon Rufous.

The fur colour of the two smaller individuals (M16155, M16158) is as follows: dorsum – Sepia, tipped with Tawny Olive on shoulders; dorsal surface of forearm, uropatagium and proximal edge of plagiopatagium – Tawny Olive; face, throat, chest and ventral plagiopatagium – Pale Olive Buff; abdomen Pale Brownish Drab.

These few specimens weaken the subspecific distinction between *brachyotis* and *javanicus*.

Other *Cynopterus brachyotis brachyotis* Measured

Singapore and associated islands.

Pulau Ayer Merbau (45.8, 2♂, 1♀ 1?sex); Pulau Merambong (35, 1♀); Pulau Senang (33 – 1♀), Singapore I. (32, 46, 49, 50, 51, 53, 54, 6252 – 3♀, 4♂, 1?).

Malay Peninsula/east coast island.

Pulau Pisang, Great Redang I. (2073/10, 2705/10, ? number – 1♀, 2?sex); Sri Buat I., off Pahang Coast (304/12, 307/12 – 2♀); Koh Kra I. (1580/CBK, 1♂); Tanjong Surat, Johore (922/11, 2548 – 1♀, 1?sex); Pulau Besar, Malacca (1192/11, 1194/11 – 1♂, 2?sex); Nyalas, Malacca (2559-62/10 – ?sex).

Cynopterus titthaechilus titthaechilus

M16151, M16156 (2♂).

Measurements of these (Table 2), and measurements presented by Sody (1933:69) for three Bali specimens, show that the Bali specimens have large skulls approximating those from Java (see Hill and Thonglongya 1972). However the ear lengths of those from Bali tend to be shorter.

Pelage colour of chest and abdomen – light Grayish Olive; dorsum and forearm – Mouse Gray; head – Dark Gray; throat – Light Grayish Olive interspersed with Warm Buff.

M16150 (adult ♂) is an old specimen with worn teeth; its fur grizzled, particularly chest and abdomen which are Hair Brown; towards centre of body tipped with Olive Buff and laterally to a point level with elbow with Cinnamon Brown. Lower dorsum and forearm Chaetura Drab. Shoulders, neck and throat – Buffy Brown to Cinnamon Brown. Hairs on propatagium and proximal edge of plagiopatagium – Olive Buff. Hair missing from head. Measurements (Table 2) are generally larger than those reported for *C. titthaechilus* by Andersen (1912:637) and Hill (1983:119); also shape of P¹ and M¹ and surface cusp on P₄ and M₁ are similar to those placed in the 'Niadius' section of *Cynopterus* (Andersen 1912:597). It is however, considered to be an aged, atypical *C. titthaechilus*.

Table 2. Measurements, in mm, of *Cynopterus brachyotis* and *C. titthaechilus* specimens from Bali.

Species	<i>C. brachyotis</i>									<i>C. titthaechilus</i>		
	M16158	M16155	M16163	M16165	M16162	M16161	M16164	M16160	M16156	M16151	M16150	
Cat. Number												
Sex	♀	♂	♂	♂	♂	♀	♀	♂	♂	♂	♂	
Age	subadult	adult	adult	adult	adult	adult	adult	adult	adult	adult	adult	
Radius length	59.1	57.6	59.1	63.6	61.0	66.3	61.9	62.0	74	77.4	81.5	
Metacarpal III length	37.4	37.0	38.2	42.7	40.0	43.5	41.6	41.1	47.5	52.5	51.6	
Ear length	15.8	14.3	14.9	16.9	15.9	16.1	15.5	14.4	18.8	18.3	19.2	
Ear width	10.0	9.7	10.2	10.3	9.7	10.0	10.7	10.6	12.2	10.7	10.6	
Pollex length (plus claw)	25.2	23.6	24.6	25.2	26.5	26.1	25.2	24.7	32.2	33.9	33.0	
Tibia length	20.6	21.2	23.7	25.4	24.0	23.7	25.6	23.8	30.7	32.1	34.7	
Skull length	26.1	28.1	28.9	30.2	29.0	28.7	29.6	29.7	35.7	36.2	39.6	
Rostrum length	6.1	6.9	6.9	7.6	7.2	7.0	7.7	6.9	9.4	9.6	10.4	
Condylobasal length	24.4	26.6	27.7	28.8	27.8	27.9	28.9	28.4	34.2	35.0	37.4	
Mandible length	19.3	20.0	22.0	22.9	21.7	21.9	21.2	22.7	28.0	27.6	30.8	
Post orbital width	8.1	8.0	6.9	6.3	6.8	6.8	6.7	7.0	7.6	7.0	6.2	
Braincase width	12.4	12.2?	12.5	12.5	12.2	12.3	12.5	12.4	14.2	15.1	15.6	
Zygomatic width	15.8	–	17.8	18.8	18.2	19.0	18.7	19.1	20.5	22.1	25.2	
C ¹ -M ¹ length (crowns)	9.0	9.5	10.1	10.4	9.4	9.6	9.9	9.9	12.9	12.4	13.5	
M ¹ -M ¹ width (crowns)	7.8	8.6	8.6	8.8	8.2	8.1	8.9	8.7	10.9	11.1	12.1	
P ¹ width (crowns)	1.5	1.6	1.5	1.6	1.2	1.4	1.6	1.5	2.1	1.9	2.1	

Dobsonia peroni grandis

M16149 (adult ♂) – not previously recorded from Bali but known from nearby Nusa Penida.

Measurements – forearm length 114.6, metacarpal III length 75.1, tibia length 56.2, pes length 27.0, skull length 52.0, condylobasal length 49.6, least interorbital width 9.4, least postorbital width 12.9, braincase width 20.2, zygomatic width 29.7, rostrum length 13.7, mastoid width 19.4, mesopterygoid fossa width 6.5, C¹-C¹ 10.3, C¹-M² 22.2, mandible length 41.7, C₁-M₂ 23.8.

Throat and venter – Dark Olive Buff; shoulders and head – Citrine Drab; patagia – Dark Olive.

Macroglossus sobrinus sobrinus

M16166-9 (2♂, 2♀) – not previously reported from Bali.

Hill (1983:35) considers that there are two distinct forms of *Macroglossus* in Java. The larger of these has nostrils that are not raised marginally to form an incipient tubular structure, the internarial groove is represented by at most a narrow linear depression extending about halfway to upper lip and the lower jaw projects forward beneath the incisors to form a distinct sub square jaw. The smaller form has no suggestion of a tubular form to its nostrils, but the internarial groove extends as a narrow linear depression to the upper lip, which is not divided and there is no suggestion of a squarish chin.

Hill (loc. cit.) considers that the larger form corresponds to the form *sobrinus* of Andersen (1912) and the smaller to *minimus* Geoffroy, 1810 of Andersen (loc. cit.).

Our specimens confuse Hill's distinction of the forms *minimus* and *sobrinus* because they overlap several of his diagnostic measurements. Most noticeably they link the radius length differences noted for these Javanese forms which have a gap between 44.2 and 48.1 mm as well as condylobasal length (gap 25.3 to 26.4) and rostrum length (gap 9.2 to 10.4). Further, the internarial depression and shape of the dentary beneath the incisors is of *sobrinus*. Sody (1933) also noted that several measurements of the single specimen he examined fell between Andersen's separation of *sobrinus* and *minimus*. Chasen (1940) records *Macroglossus minimus minimus* from Bali but adds "(? subsp.)." He lists *sobrinus* as a subspecies of *M. minimus*. Overall, specimens of this study more typify *M. sobrinus* than *M. minimus*, indicating the probability that both species of *Macroglossus* occur in Bali. K. Koopman (pers. comm.) considers the specimens reported by Tate (1942b) from Bali, now lodged in AMNH collections, are also closer to *M. sobrinus* than to *M. minimus*, and also found them to be smaller than *sobrinus* from the mainland.

Colour of dorsum and head Cinnamon Buff; venter and throat – Pinkish Buff and patagia – Saccardo's Umber.

Measurements (N=4) – forearm length 43.1-47.4, ear length 15.5-16.5, tibia length 17.5-19.6, pes length 9.6-10.2. (N=3): skull length 27.2-27.7, condylobasal length 23.8-24.6, rostrum length 8.9-9.5 least interorbital width 4.6-5.1, post orbital width 7.3-7.7, braincase width 11.4-11.7, mastoid width 10.4-10.8, mesopterygoid fossa 3.5-3.9, C¹-C¹ 5.1-5.6, mandible length 20.7-21.5.

Taphozous longimanus kampenii

M16180-7 (4♂, 4♀).

The two females with undamaged throats have a naked throat patch and one had a slight u-shaped pouch. All four males have a deep u-shaped throat pouch. None of the males exhibit the straw-coloured nape referred to by Tate (1941:4). Our males and females are quite differently coloured and accord with Dobson's (1878:385) statement that "the colour of the fur varies very much... the darker-coloured individuals are generally females." The females from Bali have the following fur colour – dorsum, head and throat: Dusky Drab; chest and abdomen: Hair Brown; ventral proximal surface of plagiopatagium: Pale Smoke Gray. Males are – dorsum: Mummy Brown; throat: Ochraceous Tawny; Chest: Fawn Color, grading to Avellaneous on abdomen and flanks.

Measurements (N = 7) – forearm length (55.0-59.1), ear length (15.5-16.8), tibia length (23.2-26.4), pes length (11.1-11.6), skull length (18.4-20.5), condylobasal length (17.4-19.2), least interorbital width (5.5-6.2), zygomatic width (11.4-12.4), braincase width (9.4-10.3), mastoid width (9.8-10.9), C¹-C¹ (3.7-4.3), M³-M³ (8.2-8.8), C¹-M³ (8.5-8.8), mandible length (15.0-15.6), C₁-M₃ (9.3-10.7).

Hipposideros diadema diadema

M16170-1 (2♀).

Measurements – forearm length 86.4, 88.7, ear length (2) 25.6, 27.8, tibia length (2) 36.4, 38.2, pes length (1) 15.9, skull length (1) 32.9, condylobasal length (1) 27.7, least interorbital width (1) 3.7, zygomatic width (1) 19.0, braincase width (1) 11.8, mastoid width (1) 15.4, C¹-C¹ (1) 8.7, M¹-M³ (1) 12.4, C¹-M³ (1) 13.3, mandible length (1) 23.1, C₁-M₃ (1) 14.2.

Myotis muricola muricola

M16188, M16190-4 (2♂, 4♀).

Pelage similar to that of specimens from Java (Hill 1983:155) but with dorsal surface a little darker (Olive Brown to Clove Brown) and with the predominant colour of the ventral surface much lighter and dominated by the Pallid Neutral Gray colour of the tips of hair with less of the basal hair colour of Blackish Brown showing.

These specimens, and those of Sody (1933) for Balinese *M. muricola*, tend to be larger than those of *muricola* from C. Sulawesi and R. Ranu reported in Hill (1983), particularly in the following measurements: least interorbital width, zygomatic width, braincase width, mandibular length and forearm length. The forearm length is much shorter than a *muricola* from Java which had a forearm length of 36 mm (Kuroda 1933).

Measurements – forearm length (32.7-34.4), ear length (12.4-13.2), tibia length (14.7-16.2), pes length (5.4-6.3), skull length (13.4-13.8), condylobasal length (12.7-13.0), least interorbital width (3.1-3.3), zygomatic width (7.9-8.8), braincase width (6.3-6.5), mastoid width (6.8-6.9), C¹-C¹ (3.0-3.5), M¹-M³ (4.9-5.6), C¹-M³ (5.0-5.3), mandible length (9.5-10.3), C₁-M₃ (5.4-5.7).

Tylonycteris robustula

M16195(♂).

Measurements – forearm length 28.5, ear length 9.0, tibia length 13.4, pes length 6.1, skull

length 12.0, condylobasal length 11.6, least interorbital width 3.7, braincase width 6.7, mastoid width 7.1, C¹-C¹ 4.1, M³-M³ 5.6, C¹-M³ 4.1, mandible length 8.8, C₁-M₃ 4.4.

These measurements fall within the range given for *T. robustula* from Djembrana, S.W. Bali, by Sody (1933) except that the braincase width is narrower than the smallest in Sody's sample (N = 12) of 6.9-7.2.

Scotophilus kuhlii temminckii

M16172-79 (5♂, 3♀).

Measurements – snout to anus 55.0-65.3, tail length 43.5-46.0, ear length 14.1-15.6, forearm length 50.2-52.9, tibia length 19.7-21.5, pes length 10.0-10.8, skull length 19.0-19.8, least interorbital width 4.9-5.4, zygomatic width 13.7-14.2, mastoid width 11.6-12.2, braincase width 9.3-10.5, palatal length 9.5-9.8, bulla length 3.4-3.9, C¹-C¹ 6.2-6.6, C¹-M³ 6.7-7.1, M³-M³ 8.7-9.0, I₁-M₃ 8.5-8.9.

These specimens agree with those of Tate (1942a) and on average are not smaller than the Javanese form.

Acknowledgements

We thank L.I.P.I., Indonesian Institute of Science, for their cooperation.

We are grateful to John Edwards Hill, British Museum of Natural History for examining the ?*Rousettus* specimen and for his critical comments during the preparation of this MS. Dr Karl Koopman, American Museum of Natural History, kindly loaned us a representative collection of bat specimens from Bali. He also provided considerable information and made constructive comments on the MS.

References

- Andersen, K. (1912). Catalogue of the Chiroptera in the collection of the British Museum. 2nd ed. I. Megachiroptera. London.
- Bergmans, W. and Hill, J.E. (1980). on a new species of *Rousettus* Gray, 1821, from Sumatra and Borneo (Mammalia: Megachiroptera). *Bull. Br. Mus. nat. Hist. (Zool.)* 38:95-104.
- Chasen, F.N. (1940). A handlist of Malaysian mammals. *Bull. Raffles Mus.* 15:1-209.
- Dobson, G.E. (1878). Catalogue of the Chiroptera in the collection of the British Museum. London.
- Hill, J.E. (1983). Bats (Mammalia: Chiroptera) from Indo-Australia. *Bull. Br. Mus. nat. Hist. (Zool.)* 45:103-208.
- Hill, J.E. and Thonglongya, K. (1972). Bats from Thailand and Cambodia. *Bull. Br. Mus. nat. Hist. (Zool.)* 22:171-196.
- Honacki, J.H., Kinman, K.E. and Koepl, J.W. (1982). Mammal species of the world. A taxonomic and geographical reference. Lawrence, Kansas.
- Huxley, J.S. (1932). Problems of relative growth. Methuen, London.
- Koopman, K. (1973). Systematics of Indo-Australian *Pipistrellus*. *Periodicum biol.* 75:113-116.
- Kuroda, N. (1933). Mammals collected in Java, Bali and Lombok. *J. Mammal.* 14:339-342.
- Mertens, R. (1936). Die Säugetiere der Inseln Bali, Lombok, Sumbawa und Flores. *Zool. Jahrb. Jena (Syst.)* 68:273-324.
- Oei (= Oey), H.P. (1960). Notes on bats from Bali, Lombok and Sumba. *Hemera Zoa* 67:23-32.
- Pohle, H. (1950). Zur Säugetiergeographie der Kleinen Sundainseln. *Kleinschmidt Syllegomena Biologica, Leipzig*. Festschrift um 80 Geburtstag von Herrn. Pastor Dr Med. H.C. Otto Kleinschmidt.
- Rookmaaker, L.C. and Bergmans, W. (1981). Taxonomy and geography of *Rousettus amplexicaudatus* (Geoffroy, 1810) with comparative notes on sympatric congeners (Mammalia, Megachiroptera). *Beaufortia* 31:1-29.

A Collection of Bats from Bali I., Indonesia

- Ridgway, R. (1912). Color standards and color nomenclature. (Ridgway: Washington, D.C.).
- Sody, H.J.V. (1933). On the mammals of Bali (with a note on the races of *Callosciurus notatus* of Java). *Natuurk. Tijdschr. Ned. Ind.* **93**:56-95.
- Tate, G.H.H. (1941). Results of the Archbold Expeditions No. 37. Notes on Oriental *Taphozous* and allies. *Am. Mus. Novit.* **1141**:1-5.
- Tate, G.H.H. (1941a). Result of the Archbold Expeditions No. 35. A review of the genus *Hipposideros* with special reference to Indo-Australian species. *Bull. Am. Mus. nat. Hist.* **78**:353-393.
- Tate, G.H.H. (1941b). Results of the Archbold Expeditions No. 38. Molossid bats of the Archbold Collections. *Am. Mus. Novit.* **1142**:1-42.
- Tate, G.H.H. (1941c). Results of the Archbold Expeditions No. 39. Review of *Myotis* of Eurasia. *Bull. Am. Mus. Nat. Hist.* **78**:537-565.
- Tate, G.H.H. (1941d). Results of the Archbold Expeditions No. 40. Notes on vespertilionid bats. *Bull. Am. Mus. nat. Hist.* **78**:567-597.
- Tate, G.H.H. (1941e). Results of the Archbold Expeditions No. 36. Remarks on some old world leaf-nosed bats. *Am. Mus. Novit.* **1140**:1-11.
- Tate, G.H.H. (1942a). Results of the Archbold Expeditions No. 47. Review of the vespertilionine bats, with special attention to genera and species of the Archbold Collections. *Bull. Am. Mus. nat. Hist.* **80**:221-297.
- Tate, G.H.H. (1942b). Results of the Archbold Expeditions No. 48. Pteropodidae (Chiroptera) of the Archbold Collections. *Bull. Am. Mus. nat. Hist.* **80**:331-347.