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NOTES ON MACROGLOSSINE BATS FROM SULAWESI AND THE MOLUCCAS, INDONESIA, WITH THE DESCRIPTION OF A NEW SPECIES OF *SYCONYCTERIS* MATSCHIE, 1899 FROM HALMAHERA (MAMMALIA: MEGACHIROPTERA)

by

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A recent collection of bats from northern Sulawesi (Celebes), Halmahera and Bacan (Batjan), Indonesia, contains representatives of three macroglossine genera. A specimen of *Eonycteris rosenbergii* (Jentink, 1889) from northern Sulawesi – a species previously known only from the immature type specimen – together with an additional, previously unreported specimen confirms the diagnostic value of the absence of the third lower molar. The validity of this taxon has been questioned by several authors, who suggested that *E. rosenbergii* is based on an anomalous specimen of *E. spelaea* (Dobson, 1871). Other material of *Eonycteris* from Sulawesi, referable to *spelaea*, is discussed, with the first record for the island of Muna (Moena), and comparative notes are given on populations from other parts of the species' range. An outsize *Syconycteris* Matschie, 1899 from Halmahera is described here as a new species, constituting the first record of the genus for the north Moluccas. Finally, a series of *Macroglossus minimus* (Geoffroy, 1810) from Halmahera and Bacan represents the first record of this species for these islands.

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INTRODUCTION

During fieldwork in northern Sulawesi (Celebes), Halmahera and Bacan (Batjan), Indonesia, from January to May 1983, I collected representatives of three macroglossine genera, of which two species proved to be of special interest. An adult specimen of *Eonycteris rosenbergii* (Jentink, 1889) – hitherto only known from the immature type specimen – collected in northern Sulawesi, together with a previously unreported specimen from the collections of the Zoologisches Museum der Humboldt-Universität, Berlin, confirms the diagnostic value of the absence of the third lower molar (M3). The validity of this taxon has been questioned by several authors (Miller, 1907; Andersen, 1912; Tate, 1942; Sody [see discussion under *E. spelaea glandifera* Lawrence, 1939] and Koopman [in Honacki et al., 1982]), some of whom suggested that *rosenbergii* is based on an anomalous specimen of *E. spelaea* (Dobson, 1871). Hill (1983: 133), through lack of material, left the status of *rosenbergii* indeterminate. *E. spelaea glandifera* was recently reported from the south-east peninsula of Sulawesi (Hill, 1983: 132). Amongst unregistered, unidentified material in the collections of the Rijksmuseum van Natuurlijke Historie, Leiden, I located a specimen of *Eonycteris* collected on the island of Muna (Moena), off south-east Sulawesi, by H. J. V. Sody, provisionally identified by him as *rosenbergii*. However, this specimen is referable to *spelaea*, thus constituting a slight range extension of this species in south-east Sulawesi. In this paper, notes are given on the above-mentioned specimens, with comparative notes on populations of *Eonycteris* in adjoining areas in the Indo-Australian Archipelago and the Philippines.

A large specimen of Blossom Bat, *Syconycteris* Matschie, 1899, from primary lowland forest in northwestern Halmahera — from where this genus had not previously been recorded (Laurie & Hill, 1954: 44; Van der Zon, 1979: 34; Ziegler, 1982: 1, 2) — could not be identified with any of the known forms, being significantly larger than *S. australis major* Andersen, 1911, previously the largest known member of the genus. It is therefore described here as a new species.

A fair series of Long-tongued Fruit Bats, *Macroglossus minimus* (Geoffroy, 1810), from Halmahera and Bacan apparently represents the first record of this widespread nectarivore from these islands (Laurie & Hill, 1954: 44), although Van der Zon (1979: 34) includes Halmahera in the range of *M. minimus nanus* Matschie, 1899, but I have not been able to trace the specimen or reference on which this record is based. In this paper, measurements, weights and some ecological information on this series are presented.

METHODS

Body and cranial measurements, as defined by Rookmaaker & Bergmans (1981), were taken with dial calipers; where available, body measurements were taken from specimen labels. Specimens collected by the author have been weighed in the field immediately after collection, using Pesola spring balances. Designation of teeth and tooth characteristics follow Andersen (1912), unless otherwise noted. Only those synonyms that have appeared since Andersen (1912) are listed, but for *Eonycteris rosenbergii* a complete synonymy is given.

Coordinates of collecting localities in Indonesia were taken from the "Gazetteer of Indonesia and Portuguese Timor" (2nd edition), issued by the Office of Geography, Department of the Interior, Washington, 1968, or are approximations using the coordinates of nearest localities listed in this gazetteer. Current spelling of localities in Indonesia is adopted, with the older names as appearing on some specimen labels following in brackets.

Institutional collections are abbreviated as follows:

AMNH	– American Museum of Natural History, New York;
BBM-NG	– Bernice P. Bishop Museum, Honolulu;
BM(NH)	– British Museum (Natural History), London;
MZB	– Museum Zoologicum Bogoriense, Bogor;
RMNH	– Rijksmuseum van Natuurlijke Historie, Leiden;
ROM	– Royal Ontario Museum, Toronto;
USNM	– United States National Museum, Smithsonian Institution, Washington;
ZMA	– Zoölogisch Museum, Universiteit van Amsterdam;
ZMB	– Zoologisches Museum der Humboldt-Universität, Berlin.

SPECIES ACCOUNTS

Eonycteris rosenbergii (Jentink)
(figs. 1, 2)

Eonycteris spelaea "variété insulaire" Jentink, 1888: 158.
Callinycteris rosenbergii Jentink, 1889 (nec 1899): 210, pl. 9 figs. 1-4. – Gorontalo, North Celebes.
Eonycteris rosenbergi Andersen, 1910: 625.
Eonycteris bernsteini Tate, 1942: 345 (nomen nudum, lapsus for *rosenbergii*).

Material examined. — RMNH reg. no. 27427, immature ♂ (in alcohol, skull extracted), 5.v.1864, Tulabolo, Gorontalo district, north Sulawesi (Celebes), 0° 31′ N 123° 16′ E, leg. C. B. H. von Rosenberg (type specimen of *Callinycteris rosenbergii*); for restriction of type locality, see below. RMNH reg. no. 32245, adult pregnant ♀ (in alcohol [originally in formalin], skull extracted), 22/23.i.1983, between 21.30 and 06.00 hrs, Sungei Tumokang Lama, near Doleduo, Dumoga-Bone National Park, Bolaang Mongondow district, north Sulawesi, 0° 34′ N 123° 54′ E, altitude 220 m, leg. F. G. Rozendaal; mistnetted over a river, bordered on one side by open country covered with alang-alang *Imperata*, on the other side by secondary scrub and primary forest; simultaneously, several *Rousettus celebensis* Andersen, 1907, and a single *Cheiromeles parvidens* Miller & Hollister, 1921, were collected. ZMB reg. no. 5391, immature ♂ (skin and skull), undated, Sulawesi, leg. A. B. Meyer. The exact provenance of this previously unreported specimen cannot be traced as the specimen is undated and Meyer is known to have visited various parts of the island between 1870 and 1873 (Meyer & Wiglesworth, 1898: 6).

	Eonycteris rosenbergii			*Eonycteris spelaea glandifera*		
Collection	RMNH	ZMB	RMNH	BM(NH)	BM(NH)	RMNH
Reg. no.	27427	5391	32245	81.1112	81.1111	32247
Sex/age	♂ imm	♂ imm	♀ adult	♂ adult	♀ adult	♀ adult
Locality	Tulabolo	Celebes	Doleduo	Lalonggasu	Meeta	Muna
Tail length	19.5	-	19.7	19.3	19.1	23.0
Ear length	17.2	-	17.4	19.0	19.4	17.5
Hindfoot length	17.3	18.6	18.3	19.5	20.7	17.5
Forearm length	67.1	62.5	70.2	74.3	76.1	72.0
1st digit metacarpal length	7.2	6.9	6.8	7.5	7.9	6.8
1st phalanx length	15.0	15.7	15.0	17.9	17.4	16.5
2nd digit metacarpal length	30.9	29.2	32.0	29.8	33.1	31.6
1st phalanx length	8.9	9.3	9.3	9.0	11.9	9.0
2nd phalanx length	6.8	5.7	6.2	6.0	5.7	6.5
3rd digit metacarpal length	46.2	44.0	50.9	49.2	51.6	49.3
1st phalanx length	29.5	27.6	33.2	30.5	34.2	30.9
2nd phalanx length	37.6	36.9	42.9	40.6	45.7	34.3
4th digit metacarpal length	45.9	41.8	50.6	48.3	50.0	47.1
1st phalanx length	25.6	22.8	26.7	25.0	28.8	26.8
2nd phalanx length	23.3	19.9	24.3	24.6	24.5	17.9
5th digit metacarpal length	41.4	39.3	44.6	45.2	47.2	43.6
1st phalanx length	18.8	18.0	19.8	21.2	22.0	20.1
2nd phalanx length	18.3	16.1	18.6	18.7	21.4	20.0
Greatest skull length	32.5	-	33.9	35.9	33.9	34.6
Condylobasal length	30.3	-	32.1	34.2	32.5	33.1
Palatal length	16.8	-	17.3	18.5	18.1	17.9
Cranium width	14.6	14.0	14.0	14.2	14.4	14.5
Interorbital width	6.4	6.4	7.2	6.9	7.1	6.4
Postorbital width	8.6	8.7	8.4	7.5	8.0	7.8
Zygomatic width	18.0	-	20.2	22.4	20.5	19.5
Mandible length	-	24.5	26.7	28.2	27.2	27.3
$C^1 - C^1$ width	6.7	6.2	6.7	7.8	6.8	6.6
$C^1 - M^2$ length	11.4	-	12.0	13.0	12.0	12.0
$M^2 - M^2$ width	8.2	-	8.2	8.5	8.2	8.5
$C_1 - M_2$ length	11.7	11.8	12.2	12.8	12.2	12.1
$C_1 - M_3$ length	-	-	-	14.1	13.4	13.3

Table 1. Body and cranial measurements of *Eonycteris rosenbergii* and *E. spelaea glandifera* from Sulawesi. Length of head and body, tail, ear, hindfoot and forearm are collector's measurements, the remainder was taken from specimens in alcohol or dry skins. All measurements are in mm.

	Eonycteris rosenbergii			*Eonycteris spelaea glandifera*		
	holotype					
Collection	RMNH	ZMB	RMNH	BM(NH)	BM(NH)	RMNH
Reg. no.	27427	5391	32245	81.1112	81.1111	32247
Sex/age	♂ immature	♂ immature	♀ adult	♂ adult	♀ adult	♀ adult
Locality	Tulabolo	Celebes	Doleduo	Lalonggasu Meeta	Lalonggasu Meeta	Muna
I^1	0.40 x 0.45	-	0.35 x 0.35	0.50 x 0.35	0.40 x 0.40	0.25 x 0.25
I^2	0.45 x 0.50	-	0.40 x 0.45	0.55 x 0.40	0.50 x 0.40	0.45 x 0.45
C	2.20 x 1.70	2.15 x 1.00	1.90 x 1.35	2.40 x 1.40	2.10 x 1.20	1.95 x 1.90
P^1	0.75 x 0.55	0.55 x 0.40	0.55 x 0.40	0.70 x 0.60	-	0.55 x 0.45
P^3	2.10 x 1.10	1.90 x 1.00	2.10 x 0.90	2.30 x 1.10	1.90 x 1.00	2.10 x 1.00
P^4	2.05 x 1.40	2.15 x 1.35	2.10 x 1.30	2.40 x 1.50	2.10 x 1.40	2.00 x 1.35
M^1	2.10 x 1.40	2.30 x 1.40	2.20 x 1.20	2.60 x 1.40	2.40 x 1.30	2.25 x 1.35
M^2	1.10 x 0.80	-	1.00 x 0.65	1.25 x 0.75	1.10 x 0.75	1.20 x 0.75
I_1	0.60 x 0.50	0.55 x 0.70	0.40 x 0.40	-	0.50 x 0.50	0.50 x 0.50
I_2	0.65 x 0.50	0.55 x 0.50	0.50 x 0.35	0.60 x 0.45	0.50 x 0.45	0.65 x 0.45
C	1.75 x 1.50	1.45 x 1.15	1.40 x 1.20	1.10 x 1.55	1.40 x 1.20	1.40 x 1.15
P_1	1.35 x 1.00	1.30 x 0.80	1.25 x 0.80	1.30 x 0.85	1.10 x 0.80	1.15 x 0.85
P_3	1.35 x 0.90	1.50 x 0.90	1.80 x 1.10	1.75 x 1.00	1.60 x 0.95	1.75 x 1.00
P_4	2.00 x 1.20	2.10 x 1.15	1.95 x 1.10	2.15 x 1.25	1.80 x 1.20	1.75 x 1.15
M_1	2.05 x 1.20	2.10 x 1.30	2.30 x 1.20	2.30 x 1.25	2.10 x 1.30	1.90 x 1.25
M_2	1.35 x 1.00	1.55 x 1.00	1.30 x 0.90	1.50 x 1.10	1.50 x 1.15	1.30 x 1.05
M_3	-	-	-	1.00 x 0.65	0.90 x 0.75	0.85 x 0.80

Table 2. Tooth measurements (length × width in mm) of *Eonycteris rosenbergii* and *E. spelaea glandifera* from Sulawesi.

Measurements. — See tables 1 and 2. In view of a sexual dimorphism in size, males and females have been treated separately.

Weight. — The only recorded weight of *Eonycteris rosenbergii* is that of the pregnant female RMNH 32245, which weighed 63 grams, including the foetus.

Remarks. — Specimens RMNH 32245 and ZMB 5391 agree with the type specimen of *rosenbergii* in lacking the third lower molar (M_3), thereby confirming the diagnostic value of this character. Miller (1907: 70) remarked on the heavier dentition of *rosenbergii*, especially the supposedly larger width of the last upper premolar (P^4) and the first upper molar (M^1). This is likely based on a comparison with nominate *spelaea*. I have not been able to confirm these differences when studying material of *Eonycteris* from Burma, Malaysia, Indonesia and the Philippines. For tooth measurements, see table 2.

Description of pelage. — As the type specimen, which has been in alcohol for over a hundred years, is badly discoloured (see also Andersen, 1912: 737), a brief description of the fur of the newly collected specimen is given. Dorsal pelage mouse grey to drab, slightly darker on head. Ventral pelage a paler grey. Ears blackish, corresponding with blackish wing-membrane (Kornerup & Wanscher, 1967). Colour of fur not noticeably different from that of *E. spelaea glandifera.*

Soft palatum. — Hill (1983: 133) remarked that the palate ridges of *E. rosenbergii,* as illustrated by Jentink (1889: pl. 9 fig. 2) are "characteristically the same as those of *E. spelaea glandifera*". Earlier, Matschie (1899: 90) stated that *E. spelaea* from Burma and the Greater Sundas show a straight, undivided and notched ridge posterior to the third divided ridge. It is, however, likely that this ridge was present in the type specimen of *rosenbergii* but not drawn or, alternatively, damaged during the extraction of the skull. It certainly shows well in specimen RMNH 32245. The soft palatum of the type has not been preserved.

Tongue. — Matschie (1899: 90) remarked that the tongue of *E. rosenbergii,* figured by Jentink (1889: pl. 9 fig. 3) differed from that of *spelaea* in lacking the long, pointed filiform papillae (sensu Andersen, 1912: 725, fig. 65I). However, Andersen (1912: 737), who studied the type specimen in Leiden, commented on the inaccuracy of Jentink's figure, noting that in reality they are present, the only difference with *spelaea* being the slightly smaller size of all forms of papillae. This is confirmed by an examination of the tongue, which is still preserved with the type of *rosenbergii.*

Baculum. — A meaningful comparison of the baculum of *E. spelaea* and *E. rosenbergii* is not possible due to the lack of adult male material of *rosenbergii.*

Restriction of type locality. — From Von Rosenberg's account of his travels

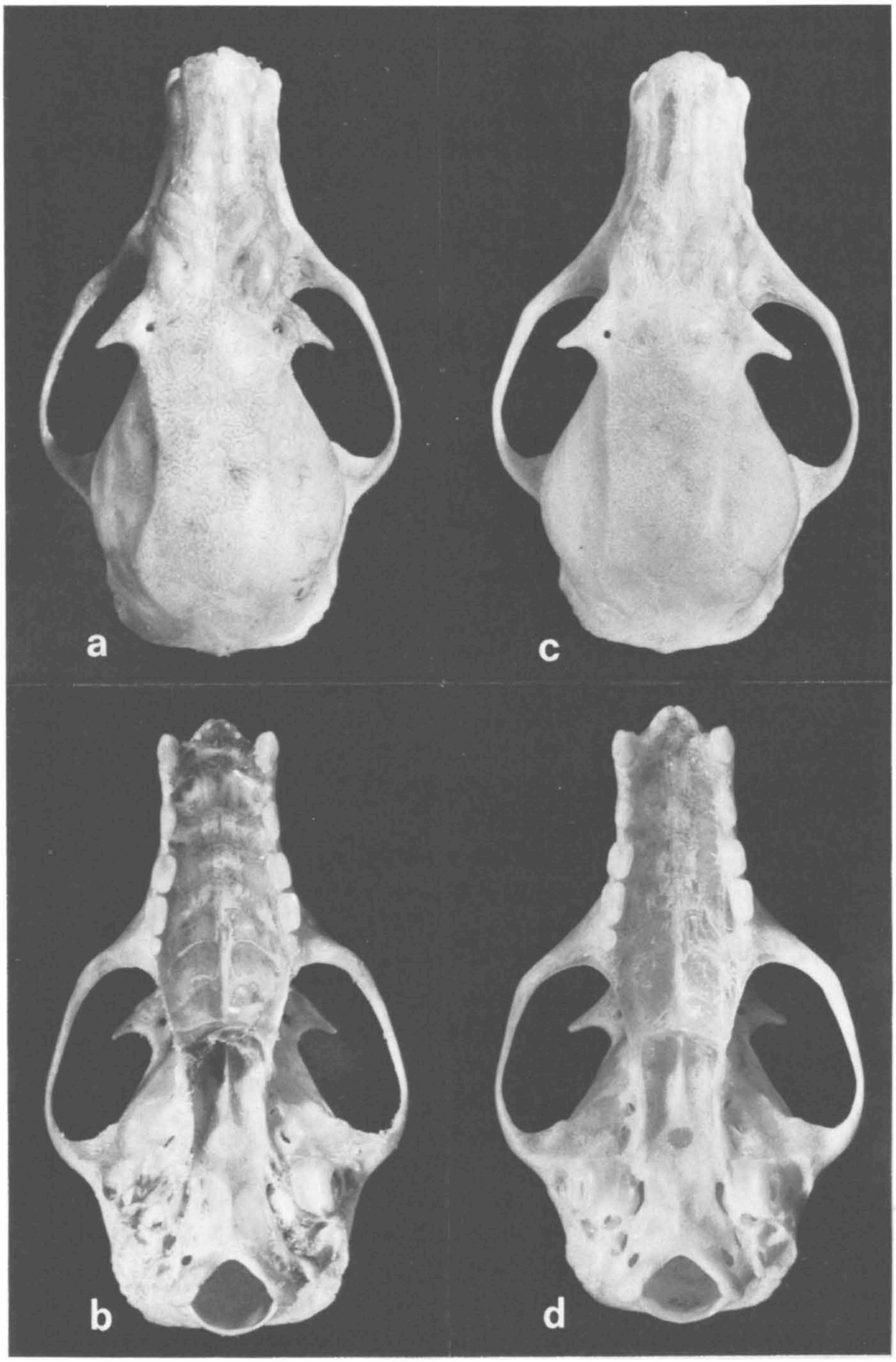


Fig. 1. Dorsal and ventral aspects of skulls of: a, b. *Eonycteris rosenbergii* (adult ♀, RMNH 32245); c, d. *E. spelaea glandifera* (adult ♀, BM(NH) 81.1111). Photographs by G. van Zonneveld (RMNH) (c.2.4 ×).

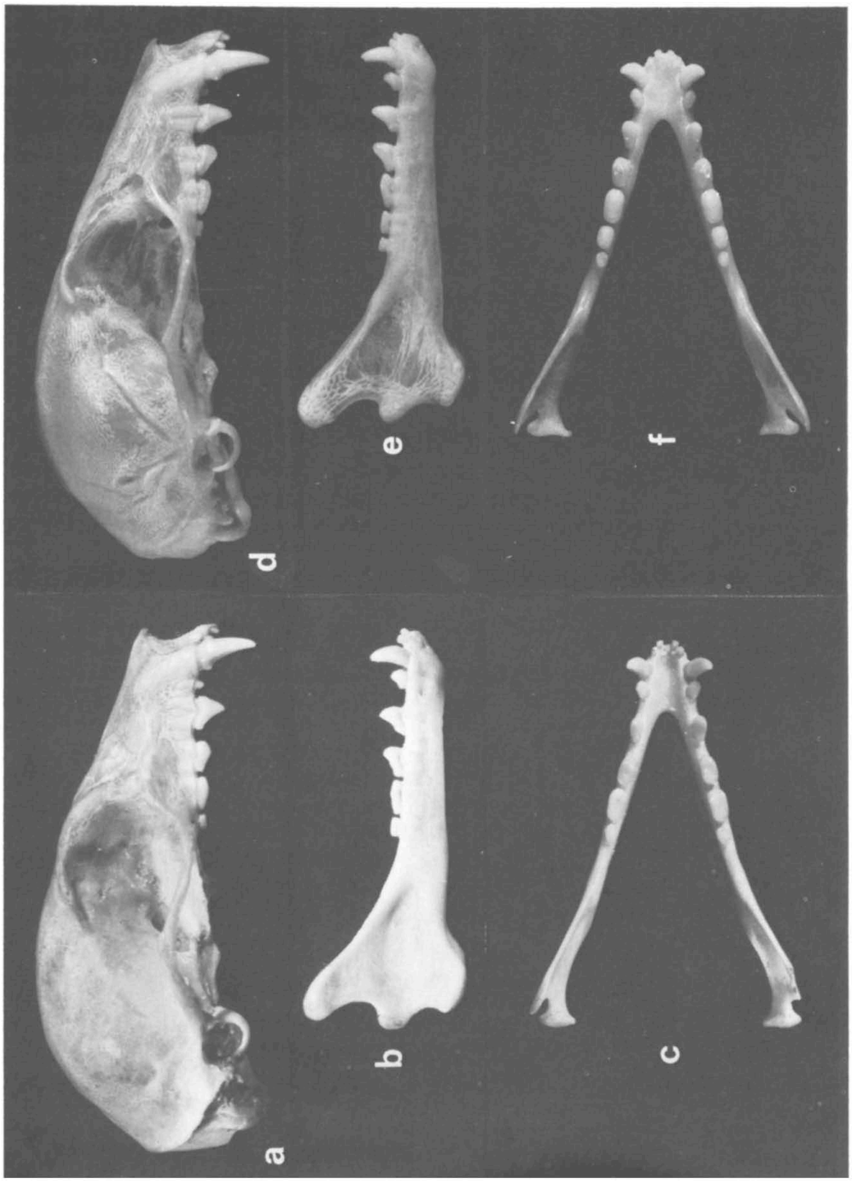


Fig. 2. Lateral aspect of maxilla and lateral and dorsal aspects of mandibula of: a-c. *Eonycteris rosenbergii* (adult ♀, RMNH 32245); d-f. *E. spelaea glandifera* (adult ♀, BM(NH) 81.1111), both from Sulawesi. Photographs by G. van Zonneveld (RMNH) and A. 't Hooft (Systematic Zoology Dept., State University of Leiden) (2.1 ×).

in the district of Gorontalo (Von Rosenberg, 1865) it is evident that on the date of collection of the type specimen of *Eonycteris rosenbergii*, 5.v.1864, he was staying at Tulabolo (Toelabolo, Tolabola, Tulabola), coordinates 0° 31′ N 123° 16′ E, a village east of Gorontalo. Birds collected by Von Rosenberg, e.g. the kingfishers *Alcedo atthis hispidoides* Lesson, 1837 and *Ceyx fallax* (Schlegel, 1866) (in collection RMNH), between 26.iii and 10.v.1864 are labeled Toula-bello. Thus the type-locality, usually quoted as Gorontalo, may be more precisely fixed to Tulabolo.

When describing mammals obtained at Gorontalo and environs, Von Rosenberg (1865: 7), out of a number of bats, only specifically mentions *Pteroptus alecto* Temminck, 1837, *P. phaiops* Temminck, 1837 (= *P. melanopogon* Peters, 1867) and *Macroglossus minimus*.

Later, in the chapter "Journey to and stay at Toelabollo" (p. 110), describing his stay from 14 April to the second half of May 1864, he merely states that "the bats and squirrels obtained were the same as those observed earlier at Gorontalo". Evidently, the importance of the find of an *Eonycteris* was not recognized at that time.

Distribution, habitat and status. — *Eonycteris rosenbergii* is at present only known from two localities in northern Sulawesi, in the districts of Bolaang Mongondow and Gorontalo; the provenance of the third specimen cannot be traced exactly. Judging from the exhaustive description of the landscape at Tulabolo and environs, located along the Bone river near the base of the Bone mountains, it agrees well with the general characters of the scenery around Doleduo, at the western edge of the Dumoga valley. Tulabolo and Doleduo are located at, respectively, the western and eastern border of the recently gazetted Dumoga-Bone National Park (Rodenburg & Palete, 1981). Despite a considerable effort in collecting bats in various parts of Sulawesi, the three specimens of *E. rosenbergii* studied remain to date the entire representation of this taxon. It is not found among the collections made by Heinrich during his extensive travels in Sulawesi (for itinerary, see Stresemann, 1940: 13, 14), preserved at AMNH, ZMB and MZB (G. G. Musser, in litt. to C. Smeenk, 4.viii.1983; R. Angermann, in litt., 26.viii.1983). No specimens of *Eonycteris* were obtained by Musser (in litt.) during extensive fieldwork in central Sulawesi.

Ectoparasites. — Specimen RMNH 32245 yielded 2 ♂ and 2 ♀ of *Cyclopodia (Leptocyclopodia) simulans* Theodor, a bat-fly which was also collected from specimens of *Rousettus celebensis* obtained in the same mistnet at the same date. This Nycteribiid was previously known only from *Ptenochirus jagori* (Peters, 1861) from the Philippines. The collection of bat-flies belonging to the same species from both *Eonycteris* and *Rousettus* may indicate communal, possibly cavernicolous roosting. Roosting places of *E. rosenbergii* remain unknown; *Rousettus celebensis* was found roosting in shallow, coastal caves at Parey, Tangkoko-Batuangus reserve, near the northern tip of the northern peninsula of Sulawesi (pers. obs.) (identification of and information on parasites by Dr. P. Oosterbroek (Instituut voor Taxonomische Zoölogie, Universiteit van Amsterdam). Maa (1975: 472) described *Eucampsipoda lieftincki* from the holotype of *E. rosenbergii.*

Eonycteris spelaea glandifera Lawrence (figs. 1, 2)

Eonycteris spelaea glandifera Lawrence, 1939: 38. — Montalban Caves, Rizal Province, Luzon, Philippines.

Material examined. — Philippines: AMNH 241768, adult ♀ (in alcohol, skull extracted), i.1923, Montalban Caves, Rizal Province, Luzon, leg. Taylor, Herr & Schutz; AMNH 85187, adult ♂ (in alcohol, skull extracted), undated, Philippines, leg. L. H. Phillips. Dr. R. L. Peterson (in litt.) kindly provided measurements of the following Philippine specimens studied by him: ROM 37552, adult ♂, 22.vi.1965, Siaton, Nagoro, Negros; ROM 39732, adult ♂, 29.v.1965, Corte Carmen, Cebu; ROM 40642, adult ♂, 22.xii.1966, Lambohon, Siquijor; all leg. D. P. Empeso; ROM 37551, adult ♀, 22.vi.1965, Siaton, Nagoro, Negros; ROM 67667, adult ♀, 27.vii.1972, San Agustin, S Ugud, Tablas I.; ROM 67673, adult ♀, 5.viii.1972, San Agustin, Tablas I.; all leg. D. Empeso (all specimens in alcohol, skull extracted).

Sulawesi: BM(NH) 81.1111-1112, adult ♀, adult ♂ (in alcohol, skull extracted), 24.iv.1980, Lalonggasu Meeta (Tomba Watu Cave), 18 km from Kendari Central, SE Sulawesi, leg. B. H. Gaskell, "Operation Drake" (see Hill, 1983); RMNH 32247, adult ♀ (skin and skull), 1940, Raha, Muna (Moena), SE Sulawesi, 4° 51′ S 122° 43′ E, leg. H. J. V. Sody.

Remarks. — Specimens BM(NH) 81.1111-1112 were earlier reported by Hill (1983: 132), representing the first record of *Eonycteris spelaea* for Sulawesi. The specimen from Muna is the first record of an *Eonycteris* for that island. It was provisionally identified by Sody as *E. rosenbergii*, but a comparison with true *rosenbergii* reveals that on dentition this specimen must be referred to *spelaea.* Sody wrote the following remarks on the label (translation by the author): "new locality, check whether this really is *rosenbergii*, and if so, if *rosenbergii* has validity, even as a subspecies of *spelaea.* In any case, M3 is clearly present here!"and adds: "bear in mind an analogy with *Mus musculus*". The latter remark refers to Sody (1941: 287) where reference is made to certain populations of the House Mouse in eastern Indonesia that lack the third molar.

Measurements. — See tables 2 and 3.

Comparative material examined. — *Eonycteris spelaea* (Dobson, 1871). The subspecific allocation of populations of *E. spelaea* from several localities in

Locality	Lamany, Burma		Malaya				Philippines			
Sex/age	♂ adult	(n=5)	♂ adult	(n=4)	♀ adult	(n=7)	♂ adult	(n=3)	♀ adult	(n=3)
	range	mean	range	mean	range	mean	range	mean	range	mean
Head and body length	126-128	127	91-110	103	91-103	99	104-108	106	100-107	104
Tail length	19.0-20.0	19.2	15.0-17.0	16.3	14.0-21.0	16.6	15.0-20.0	17.3	19.0-20.0	19.3
Ear length	23.0-24.0	23.2	16.9-18.0	17.3	17.0-19.0	18.0	20.0-21.0	20.7	17.0-22.0	18.7
Hindfoot length	18.0	18.0	19.0-30.0	26.7	17.0-31.0	23.3	21.0-23.0	22.0	16.0-24.0	19.7
Forearm length	67.4-77.7	71.8	63.8-70.9	67.6	63.8-66.5	65.0	70.7-72.4	71.6	67.7-71.9	69.2
Weight	-	-	51.0-56.3	54.7	34.0-45.2	41.0	-	-	-	-
Greatest skull length	34.2-36.6	35.0	32.0-34.7	33.8	32.3-35.3	33.4	35.0-36.6	36.0	33.0-33.6	33.2
Condylobasal length	33.0-34.9	33.7	30.9-32.8	32.3	30.8-33.6	31.8	33.2-34.9	34.0	31.9-32.1	32.0
Palatal length	17.9-19.5	18.6	15.7-19.7	18.0	17.3-18.0	17.5	18.9-19.4	19.2	17.7-17.8	17.8
Cranium width	14.5-15.5	14.9	14.2-15.2	14.9	12.2-14.6	14.1	14.3-15.6	15.0	14.3-14.4	14.4
Interorbital width	6.7- 7.3	6.9	6.7- 7.2	7.0	6.6- 8.4	7.0	6.8- 7.2	7.0	6.3- 6.9	6.6
Postorbital width	7.7- 8.4	8.0	7.1- 8.6	8.0	7.5- 8.9	8.2	7.1- 7.3	7.2	7.7- 8.7	8.3
Zygomatic width	20.5-22.3	21.4	20.2-21.3	20.8	18.4-20.6	19.3	20.5-23.9	22.2	18.9-19.6	19.3
Mandible length	26.6-28.1	27.2	24.1-25.9	25.1	24.2-26.6	25.0	26.0-27.3	27.1	24.8-25.5	25.3
$C^1 - C^1$ width	7.2- 7.7	7.4	7.1- 7.6	7.4	6.5- 7.5	7.0	6.9- 8.3	7.5	6.7- 7.3	7.0
$C^1 - M^2$ length	12.1-12.8	12.4	11.8-12.6	12.2	11.1-12.3	11.9	12.4-13.3	12.9	11.6-12.2	12.1
$M^2 - M^2$ width	8.4- 9.0	8.6	8.9- 9.6	9.2	8.6-10.6	9.1	9.3- 9.9	9.5	8.9- 9.2	9.1
$C_1 - M_3$ length	13.8-14.3	14.0	11.8-13.6	12.6	11.9-13.9	12.8	14.1-14.6	14.2	13.1-14.2	13.6

Table 3. Body and cranial measurements of *Eonycteris spelaea* subspp. from Burma, Malaya and the Philippines. Length of head and body, tail, ear, hindfoot and forearm are collector's measurements, the remainder was taken from specimens in alcohol or dry skins. Measurements from Malaya and the Philippines were supplied by Dr. R. L. Peterson (in litt.). All measurements are in mm from material listed under "material examined".

South-East Asia has caused some confusion (see Hill, 1983: 133). No trinomial is applied to some of the populations studied and reported on below; those from Burma and West Malaysia belong to nominate *spelaea*.

Burma. — ZMB 90829-90833, 5 adult ♂ (skins and skulls), 9-14.i.1938, Lamany, 30 km north of Mandalay, leg. G. Heinrich.

West Malaysia. — ROM 36171-36173, 3 adult ♀, 4.viii.1965, 6 miles north of Kuala Lumpur, leg. Lim Boo Liat; ROM 39353-39354, 2 adult ♀, 24.iii.1966, Batu Caves, Selangor, leg. Bah Tera; ROM 41453-41454, 2 adult ♀, 7.xii.1966, Penang Hill, Penang, leg. Lim Boo Liat; ROM 36174, 36176, 2 adult ♂, 4.ix.1965, 6 miles north of Kuala Lumpur, leg. Lim Boo Liat;ROM 41450, 41452, 2 adult ♂, 6/7.xii.1966, Penang Hill, Penang, leg. Lim Boo Liat (all skins and skulls). Measurements provided by Dr. R. L. Peterson (in litt.).

Sumatra. — ZMB 46153, 46154, 46223, 46224, 2 adult ♀, 2 adult ♂, 2.viii.1934, Kalianda, Lampongs, 100 m, leg. J. J. Menden (collection O. Neumann); MZB unregistered, 2 adult ♀, 2 and 8.viii.1934, Kalianda, Lampongs, 100 m, leg. J. J. Menden, field numbers 116/34, 118/34 (all skins and skulls).

Java. — RMNH 15367, adult ♂, undated, Pagilaran, leg. M. Bartels; RMNH 14926, 14928, 2 adult ♂, 23.iii.1935, Pangandaran, leg. M. Bartels; MZB 1767, adult ♂, v.1928, Cikareo (Tjikareo) cave, Cineam (Tjineam), Preanger, leg. F. Kopstein; MZB 3223, adult ♂, 28.iii.1933, cave II, Babakan, Cilacap (Tjilatjap), leg. K. W. Dammerman; RMNH 14921, adult ♀, undated, Gunung Karang, leg. M. Bartels; RMNH 14922, adult ♀, undated, Pangandaran, leg. M. Bartels; RMNH 32356, 32359, 32360, 3 adult ♀, 5.ix.1928, cave at Bolang, west of Bogor (Buitenzorg), leg. H. J. V. Sody. In addition, a number of specimens has been checked for dental anomalies: RMNH 32353-32355, adult ♂, 2 adult ♀, iii.1928, Tasikmalaya; RMNH 32358, adult ♀, 5.ix.1928, Bolang; RMNH 32362-32369, 7 adult ♂, adult ♀, undated, Bolang; RMNH 32370-32372, 2 adult ♂, adult ♀, undated, Bogor; RMNH 32373, adult ♀, undated, Pangandaran; RMNH 32374-32376, 2 adult ♀, 1 unsexed, undated, Subang (Soebang), all specimens leg. H. J. V. Sody (skins and skulls).

Bali. — ZMB 90432-90434, 3 adult ♂, ZMB 90436, adult ♀, ZMB 92021, 92022, 92024, 3 adult ♂, ZMB 92023, adult ♀, 8.i.1938, Soka, leg. V. von Plessen.

Sumba. — ZMB 92149, subadult ♀, 19.vi.1932, Melolo, leg. G. Stein.

Measurements. — See tables 3 and 4.

Remarks. — Hill (1983: 133) briefly commented on the coloration of the throat ruff present in males from some populations. I have been unable to ascertain to what extent the brightness of the colour of the throat ruff is affected by a possible storage of the specimens in alcohol or formalin prior to skinning. Some specimens, e.g. those from southern Sumatra, are marked on their labels as having been stored in formalin, for an unspecified period of time. In these specimens the throat ruff is pale grey-brown, rather concolorous with the rest of the pelage. Males from Burma have a very dark brown ruff, rather uniform with the overall darker, grey pelage (in comparison with Indonesian populations); a rufous throat ruff is present in most males from Java, but most apparent in specimens from Bali, which have the ruff ranging from rufous brown to a very outstanding dark rufous, contrasting markedly with the grey underparts. Lawrence (1939: 39) described the colour of the throat ruff

Locality	Java				Soka, Bali			
Sex/age	♂ adult	(n=5)	♀ adult	(n=5)	♂ adult	(n=6)	♀ adult	(n=2)
	range	mean	range	mean	range	mean	range	mean
Head and body length	107–114	111	100–108	104	114–117	116	104–106	105
Tail length	13.5–16.0	14.8	15.0–19.0	17.0	14.0–18.0	16.4	14.0–17.0	15.5
Ear length	18.0	18.0	16.0–18.0	17.0	19.0–20.0	19.4	17.0–18.0	17.5
Hindfoot length	16.0–18.0	17.0	15.0–19.0	16.3	18.0–19.0	18.4	17.0–18.0	17.5
Forearm length	66.7–70.0	68.2	62.0–71.6	67.9	65.0–74.8	67.7	67.5–68.9	68.2
Greatest skull length	33.0–35.4	34.8	32.7–35.7	34.0	33.2–35.6	34.9	33.2–33.8	33.5
Condylobasal length	31.4–33.7	32.8	31.7–33.9	32.2	31.5–34.4	33.2	30.7–32.4	31.5
Palatal length	17.3–18.9	18.3	17.3–18.2	17.7	17.3–19.5	18.6	17.0–17.7	17.3
Cranium width	14.0–15.0	14.7	14.0–15.2	14.6	14.2–15.4	14.7	14.2–14.6	14.4
Interorbital width	6.5– 7.2	6.8	6.5– 6.9	6.6	6.6– 7.3	6.8	6.4– 6.5	6.5
Postorbital width	6.8– 8.2	7.5	7.0– 8.7	7.8	7.1– 8.2	7.6	7.4– 8.0	7.7
Zygomatic width	19.8–23.6	21.4	19.3–21.2	20.2	20.4–23.5	21.6	19.5	19.5
Mandible length	26.2–28.5	27.4	25.1–27.1	26.3	26.7–28.8	28.1	26.0–26.3	26.1
C^1 – C^1 width	6.4– 7.6	7.2	7.0– 7.1	7.1	7.1– 7.9	7.4	6.8	6.8
C^1 – M^2 length	11.8–12.3	12.0	11.4–12.2	11.8	12.4–13.0	12.6	11.3–12.0	11.6
M^2 – M^2 width	8.0– 8.8	8.3	8.5–9.6	9.0	8.7– 9.2	8.9	8.4	8.4
C_1 – M_3 length	13.3–13.8	13.5	12.6–13.6	13.0	13.6–14.4	13.8	12.6–13.5	13.1

Table 4. Body and cranial measurements of *Eonycteris spelaea* subspp. from Java and Bali. Length of head and body, tail, ear, hindfoot and forearm are collector's measurements, the remainder was taken from dry skins. All measurements are in mm from material listed under "material examined".

in Philippine *glandifera* as of variable intensity, ranging from tawny-olive in most specimens to tawny or russet, thought to vary with age. A tawny ruff is present in the single adult male of *glandifera* from Sulawesi. Both males of *E. rosenbergii* are immature. The coloration of the throat ruff is apparently too variable as to be of value in the subspecific allocation of several populations.

Dental anomalies (molars only). — Andersen (1912: 730, footnote) records dental anomalies found in 16 specimens of *E. spelaea* examined by him, and found the third lower molar (M3) and its alveolus absent on one side in two specimens. In a series of 75 specimens of *E. spelaea* from Burma, Sumatra, Java and Bali, I noted M3 and its alveolus as missing on one side in seven specimens and missing on both sides in one specimen (RMNH 32354, adult ♀, iv.1928, Tasikmalaya, Java, leg. H. J. V. Sody).

Discussion. — Jentink (1889: 209) diagnosed *Callinycteris* as differing from *Eonycteris* by having the wing-membrane attached to the base of the second toe and by its different dentition: *Callinycteris rosenbergii* lacks the third lower molar (M3), interpreted as lacking the third lower premolar (P3) by Jentink (1889: 211). For remarks on the variable insertion of the patagium, see Andersen (1912: 734). Andersen (1912: 733) synonymized *Callinycteris* with *Eonycteris*, judging the loss of M3 an invalid character for generic separation and noting the similarity in external characters as well as characters of skull, dentition and palatal ridges. The validity of *rosenbergii* as based on a single character in a single specimen, has been questioned by Tate (1942: 343), who remarked on the obsolescence of the posterior molars in many genera of fruit bats. For all practical purposes the specific status of *Eonycteris rosenbergii* is tentatively retained. What is evident is that more material of *Eonycteris* from Sulawesi is needed.

In this paper I have not attempted to give a revision of *E. spelaea*. The exact delimitation of nominate *spelaea* and *glandifera* remains obscure (Lawrence, 1939: 40; Tate, 1942: 344-345; Goodwin, 1979: 98; Hill, 1983: 132, 133).

Syconycteris carolinae spec. nov.
(figs. 3, 4, 5)

Holotype. — Rijksmuseum van Natuurlijke Historie registration number 32246, an adult ♂ in good condition (in alcohol, skull extracted), 16.iii.1983, between 18.00 and 21.00 hrs mistnetted beside a stream running through undisturbed primary forest at the southern base of Gunung (= Mount) Gamkunora, east of Baru and north of Tosoa, 1° 20′ N 127° 31′ E, northwest Halmahera, Indonesia, altitude c. 180 m, leg. F. G. Rozendaal (see fig. 3). The holotype was the only specimen of the genus taken during 990 net hours (a net has a length of nine meters) on five consecutive nights of mistnet operation at the type locality.

Fig. 3. Holotype of *Syconycteris carolinae* spec. nov., RMNH 32246, an adult ♂ from primary forest at Gunung Gamkunora, Halmahera, Indonesia, 16.iii.1983. Reproduced from a colour transparency of the live specimen taken by the author on 17.iii.1983 (c. 1,8×).

Diagnosis. — A typical *Syconycteris* Matschie, 1899, as diagnosed by Andersen (1912: 771), agreeing in all essential characters: large upper incisors, no diastema between inner lower incisors (I_1), outer lower incisor (I_2) much larger than inner lower incisor (I_1), second upper molar (M^2) and third lower molar (M_3) small; interfemoral reduced, calcar rudimentary. Body- and cranial measurements much larger than those of *S. australis major* Andersen, 1911, previously the largest known form of the genus. Coloration of fur different from that of *S. a. major* (see description of pelage).

Skull. — Essentially very similar to that of *S. australis major* as described and figured by Andersen (1912: 771, 772, fig. 73). In comparison with specimens BM(NH) 81.1126 and USNM 490107, *S. carolinae* has a slightly longer rostrum, heavier zygomatic arches and the postorbital processes more strongly developed, pointing backwards; the temporal ridges are fused into a prominent sagittal crest, but *S. carolinae* lacks the prominent lambdoid crests present in *S. australis major* specimen USNM 490107 (see figs. 4, 5).

Teeth. — Worn. Dental formula follows Ziegler (1982: 3). Dentition rather similar to that of *S. australis major*, but weaker and teeth more elongate in occlusal view; furthermore with a wider diastema between the second and third (P_2-P_3) and third and fourth (P_3-P_4) lower premolars. For tooth measurements, see table 6.

Description of pelage. — Dorsal fur close to verona-brown, darker on head and nape; ventral pelage greyer, close to dark blonde, the silvery tips of individual hairs creating a grizzled effect. Wing-membrane black. Differs in colour from *S. australis major*, which has the dorsal pelage sayal brown, slightly darkening to cinnamon brown on head, nape and upper back, and has the wing-membrane warm sepia to Van Dyke brown (Ridgway, 1912).

Measurements. — See tables 5 and 6.

Weight. — The holotype of *Syconycteris carolinae* weighed 39.0 grams.

Baculum. — The bacula of *S. carolinae* (RMNH 32246) and *S. australis major* (BM[NH] 81.1126), both adult males, are depicted for comparison in fig. 5 (d, e).

Derivatio nominis. — It gives me great pleasure to name this elegant new species after my wife Caroline, in recognition of her unfailing assistance in the field during our expeditions in Indonesia.

Ectoparasites. — Nycteribiidae: a single male of an apparently undescribed species of *Cyclopodia*, morphologically closest to *Cyclopodia tenuis* Schuurmans Stekhoven & Hardenberg, 1939, which is known from *Macroglossus minimus* from Java and the Moluccas, was found to parasitize the holotype of *Syconycteris carolinae* spec. nov. (identification of and information on batflies by Dr. P. Oosterbroek). Greig-Smith (1975: 122) records *Cyclopodia s.*

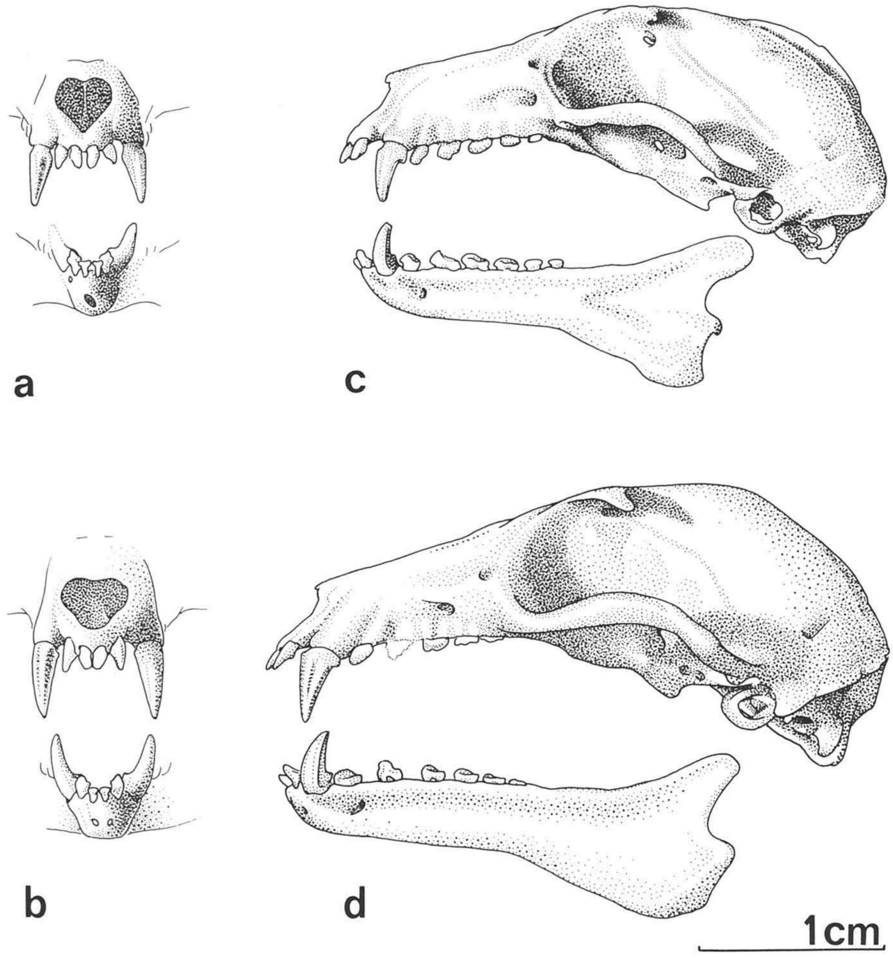
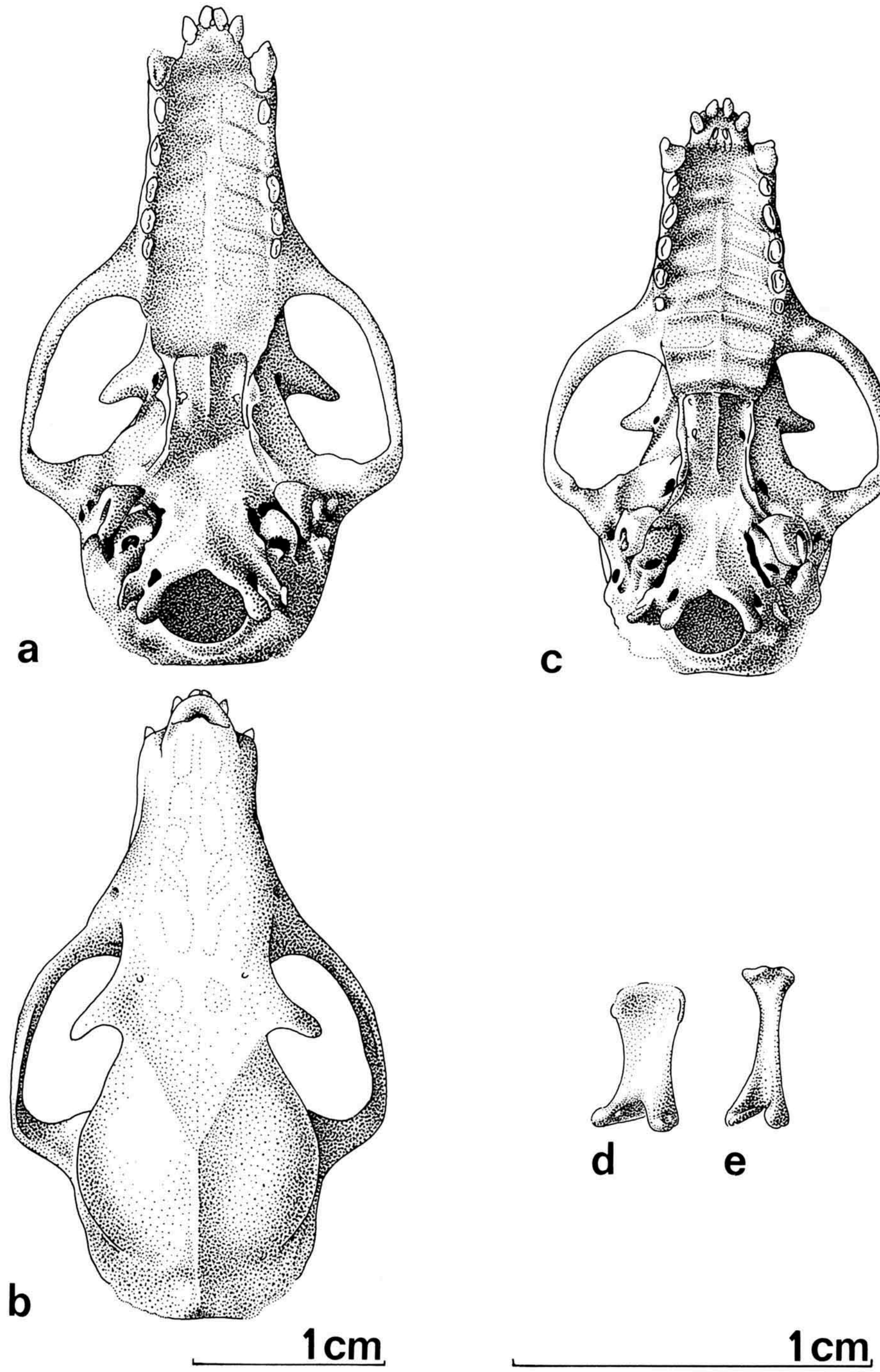


Fig. 4. Frontal and lateral aspects of maxilla and mandibula of: a, c. *Syconycteris australis major* (adult ♂, USNM 490107); b, d. holotype of *S. carolinae* spec. nov. (adult ♂, RMNH 32246). Note the size difference between the inner and outer lower incisors, characteristic of *Syconycteris*. Drawing by I. van Noortwijk (RMNH).

sycophanta Maa from *S. australis papuana* (Matschie, 1899) collected in Papua New Guinea; Maa (1966: 657) lists New Guinean *Syconycteris* as host of *Cyclopodia inflatipes* Speiser, 1900, and possibly of *Cyclopodia aspinosa* Maa, 1966.


a
c
b
d
e
1 cm
1 cm

Syconycteris carolinae spec. nov.		*Syconycteris australis major*			
	holotype				
Collection	RMNH	USNM		USNM	
Reg. no.	32246				
Sex/age	♂ adult	♂ adult	(n=9)	♀ adult	(n=4)
Locality	Halmahera	Ceram & Ambon		Ceram & Ambon	
		range	mean	range	mean
Head and body length	-	71-85	77.9	75	75
Ear length	15.1	12-18	15.8	15-16	15.8
Hindfoot length	15.4	12-14	12.3	12-14	12.8
Forearm length	60.0	45.5-48.7	47.3	44.0-47.9	46.3
1st digit metacarpal length	6.7	4.8- 6.3	5.6	5.2- 6.2	5.7
1st phalanx length	15.7	12.0-13.9	13.5	12.8-14.1	13.5
2nd digit metacarpal length	31.9	24.0-26.5	22.4	23.9-25.6	24.5
1st phalanx length	5.7	3.5- 5.0	4.1	3.7- 4.9	4.3
2nd phalanx length	7.3	5.3- 6.4	5.9	5.3- 7.0	6.1
3rd digit metacarpal length	43.5	34.4-37.3	35.5	32.6-36.7	35.3
1st phalanx length	32.0	24.1-27.3	25.4	24.3-25.3	24.8
2nd phalanx length	30.8	24.6-29.2	27.3	24.4-27.9	26.0
4th digit metacarpal length	44.2	34.2-36.4	35.1	34.0-35.3	34.6
1st phalanx length	32.0	17.2-19.8	18.6	17.6-19.0	18.3
2nd phalanx length	21.4	17.4-20.0	18.3	16.9-17.5	17.3
5th digit metacarpal length	44.8	33.9-36.8	35.6	34.4-36.6	35.1
1st phalanx length	19.5	13.6-16.1	14.7	14.4-15.5	14.9
2nd phalanx length	18.1	15.2-18.3	16.9	15.4-17.0	16.1

Table 5. Body measurements of adult males of *Syconycteris carolinae* spec. nov. and *S. australis major* from the Moluccas. Length of head and body, ear, hindfoot and forearm are collector's measurements, the remainder was taken from specimens in alcohol. All measurements are in mm from USNM material listed under "material examined", except USNM 490129.

Fig. 5. a, b. Ventral and dorsal aspects of maxilla of the holotype of *Syconycteris carolinae* spec. nov. (adult ♂, RMNH 32246); c. ventral aspect of maxilla of *S. australis major* (adult ♂, USNM 490107); dorso-lateral aspect of bacula of: d. *S. carolinae* (RMNH 32246), e. *S. a. major* (adult ♂, BM(NH) 81.1126); distal part orientated upward. Drawing by I. van Noortwijk (RMNH).

	Syconycteris carolinae spec. nov.	*Syconycteris australis major*			
Collection	RMNH	USNM	BM(NH)	RMNH	BM(NH)
Reg. no.	32246	490107	7.1.1.272	32847	81.1126
Sex/age	♂ adult	♂ adult	♂ adult	♂ adult	♂ adult
Locality	Halmahera	Ceram	Ceram	Ambon	Ambon
Greatest skull length	33.7	29.6	-	-	28.2
Condylobasal length	31.9	27.5	-	-	26.6
Palatal length	17.5	15.0	14.1	13.7	13.8
Cranium width	13.4	12.0	11.4	-	11.7
Interorbital width	7.5	6.5	6.2	5.3	6.0
Postorbital width	7.6	6.8	7.4	6.4	7.1
Zygomatic width	20.0	18.5	16.8	-	17.4
Mandible length	26.3	23.7	22.8	-	22.2
C^1- C^1 width	6.8	6.2	5.7	5.6	6.2
C^1- M^2 length	11.1	9.1	9.3	8.4	8.8
C_1- M_3 length	12.6	11.0	11.3	9.7	10.0
Length x width of P^1	1.3 x 0.7	1.0 x 0.7	1.2 x 0.7	1.2 x 0.7	1.0 x 0.7
P^3	1.4 x 0.7	1.4 x 0.7	1.3 x 0.7	1.4 x 0.7	1.2 x 0.7
P^4	1.3 x 0.7	1.4 x 0.9	1.3 x 0.8	1.2 x 0.8	1.2 x 0.9
M^1	1.4 x 0.7	1.2 x 0.9	1.1 x 0.9	1.0 x 0.9	1.1 x 0.8
M^2	1.1 x 0.6	0.7 x 0.5	0.9 x 0.7	0.8 x 0.7	0.7 x 0.6
P_1	1.3 x 0.7	1.0 x 0.8	1.2 x 0.8	1.3 x 0.8	1.2 x 0.7
P_3	1.4 x 0.6	1.5 x 0.9	1.6 x 0.8	1.5 x 0.8	1.4 x 0.9
P_4	1.3 x 0.6	1.5 x 1.0	1.5 x 0.8	1.4 x 0.9	1.4 x 1.0
M_1	1.4 x 0.7	1.3 x 0.9	1.4 x 0.9	1.4 x 0.9	1.5 x 0.9
M_2	1.2 x 0.6	1.0 x 0.8	1.1 x 0.8	1.1 x 0.8	1.1 x 1.0
M_3	0.9 x 0.5	0.7 x 0.6	1.0 x 0.8	0.9 x 0.7	0.9 x 0.7

Table 6. Cranial and tooth measurements of *Syconycteris carolinae* spec. nov. and *S. australis major* from the Moluccas. All measurements are in mm.

COMPARATIVE MATERIAL EXAMINED

Syconycteris australis (Peters)

Macroglossus minimus var. *australis* Peters, 1867: 13. – Rockhampton.

Taxonomy. — Several authors have shown that the treatment of the genus *Syconycteris* as adopted by Andersen (1912), Tate (1942) and Laurie & Hill (1954) could not be upheld and that the taxa *naias* Andersen, 1911, *crassa* (Thomas, 1895) and *australis* (Peters, 1867) should be considered to belong to a single taxon under the oldest name available, *australis* (Hill in Greig-Smith, 1975; Hill, 1983; Koopman, 1982; Lidicker & Ziegler, 1968; McKean, 1972;

Ziegler, 1982). In this paper, I have focused attention on the Moluccan populations of *Syconycteris australis* and have not investigated the subspecific affinities of the New Guinean populations. Koopman (1982: 9, 10) is followed in tentatively retaining *australis* and *papuana* (Matschie, 1899) as subspecifically distinct, and I have therefore listed the material examined from New Guinea under the latter name (see also Hill, 1983: 139). The montane species *S. hobbit* Ziegler, 1982 from eastern Papua New Guinea has not been included in this study. As material of *S. australis papuana* from Irian Jaya is comparatively scarce in collections (see the sections on material examined in Ziegler (1982: 19) and Hill (1983: 137)), I have listed the specimens available in the collections of RMNH and BM(NH).

Syconycteris australis major Andersen (figs. 4, 5)

Syconycteris crassa major Andersen, 1911: 643. – Amboina.

Material examined. — RMNH 32844, adult ♂ (mounted skin, skull in situ), xi.1827, Ambon, leg. S. Müller and H. C. Macklot; RMNH 32845, adult ♂ (mounted skin, skull in situ), undated, Ambon, leg. E. A. Forsten; RMNH 32846, adult ♂ (mounted skin, skull in situ), undated, Ambon, leg. J. E. Teysmann; RMNH 32847, adult ♂ (mounted skin, skull extracted), date, locality and collector unknown, but stated by Jentink (1902: 135) to originate from Ambon; these specimens were catalogued as *Macroglossus minimus* by Jentink (1888: 159) under numbers k, l, m and o, respectively, with the skull of RMNH 32847 listed as cat. no. j in Jentink (1887: 269). BM(NH) 7.1.1.272, adult ♂ (skin and skull), 1859, Ceram, leg. A. R. Wallace (Thomes collection); BM(NH) 81.1126, 81.1127, 2 adult ♂ (in alcohol, skull and baculum of BM(NH) 81.1126 extracted), 17.i.1980, Kaiteto, Ambon, leg. B. H. Gaskell ("Operation Drake", see Hill, 1983); USNM 490105, 490107, 490113, 490114, 4 ♂, 2.iv.1971, Kairatu, Ceram, leg. P. F. D. Van Peenen; USNM 490116, 490118, 490119, 490120, 490122, 490124, 490126, 490128, 490129, 4 ♂, 5 ♀, 4 and 7.iv.1971, Waai, Ambon, leg. P. F. D. Van Peenen; USNM 501494, ♀, 2.iv.1971, Waai, Ambon, leg. NAMRU-2, Jakarta Detachment (all specimens in alcohol, skull of USNM 490107 extracted); ZMA 3086, adult ♂ (in alcohol, skull extracted), 1913, Ambon, leg. Willemsz. Geerooms; ZMA 21455, adult ♂ (in alcohol, skull in situ), 25.xi.1980, Bka, inner Bay, Ambon, leg. H. Moll.

Measurements. — See tables 5 and 6.

Syconycteris australis papuana (Matschie)

Macroglossus (Syconycteris) papuanus Matschie, 1899: 99. – Andai, Nordwest Neu-Guinea.

Material examined. — Irian Jaya: RMNH 12582, ♀ (skin and skull), 9.iii.1955, Djitmaoe, Vogelkop, leg. M. Boeseman; RMNH 32785, ♂ (skin and skull), 10.xi.1939, Enarotali, Wisselmeren, 1765 m, leg. New Guinea Expedition KNAG 1939; RMNH 32786, ♂ (skeleton), 29.xi.1939, Araboe bivak, Wisselmeren, 1750 m, leg. New Guinea Expedition KNAG 1939;

RMNH 16940, ♂ (skin and skull), 3.viii.1959, Sibil, Sterrengebergte (Star Mountains), leg. Expeditie Sterrengebergte; RMNH 16941, ♀ (skin and skull), 4.viii.1959, Digoel, Bivak 34, leg. Expeditie Sterrengebergte; RMNH 24377, ♀ (skin and skull), 25.i.1962, Kebar Valley, Vogelkop, 550 m, leg. L. and S. Quate, BBM-NG 851; BM(NH) 98.11.3.22, ♂ (skin and skull), undated, Mount Moari, Geelvink Bay, 3000 feet, leg. J. M. Dumas; BM(NH) 33.6.1.1, ♀ (skin and skull), 16.viii.1930, De Gebroeders, Weyland Range, 5000 feet, leg. F. Shaw-Mayer.

Aru Islands: RMNH 27786, 32848, 2 ♀ (in alcohol, skull in situ), 25.iii.1865, Wokam, leg. C. B. H. von Rosenberg (listed as *Macroglossus minimus*, specimens u and v, by Jentink (1888: 159).

Macroglossus minimus nanus Matschie

M(acroglossus) nanus Matschie, 1899: 98. — Lamellana, Neu-Pommern.

Material examined. — Halmahera: RMNH 33046-33060, 12 ♂, 3 ♀ (in alcohol, skulls of RMNH 33049 and RMNH 33060 extracted), ZMA 22.114-22.121, 6 ♂, 2 ♀ (in alcohol, skull in situ), 3/4.iii.1983, mistnetted in and along the seaside edge of mangroves, between the villages of Bataka and Gamkunora, NW Halmahera, approximate coordinates 1° 24′ N 127 ° 30′ E, leg. F. G. Rozendaal.

Bacan: RMNH 33061-33063, 2 ♂, 1 pregnant ♀ (in alcohol, skull in situ), 27/28.iv.1983, mistnetted in a narrow fringe of mangroves on the seaside edge of coconut groves, Wayaua, 0° 47′ S 127° 38′ E, leg. F. G. Rozendaal; RMNH 33064-33065, ZMA 22.193, 2 ♂, 1 ♀ (in alcohol, skull of RMNH 33064-33065 extracted), 9.v.1983, 11/12.v.1983, mistnetted in primary forest at the base of Gunung (= Mount) Sibela range, NW of Wayaua, NNE of Ngame, approximate coordinates 0° 47′ S 127° 35′ E, altitude 150 m, leg F. G. Rozendaal.

Remarks. — Although taken in small numbers within undisturbed primary forest, this species was most commonly netted in and along the edges of mangroves, probably attracted in large numbers to the flowering *Bruguiera* trees.

Measurements. — Forearm length in 22 males: 37.2-39.2 mm (mean 38.5 mm), in seven females: 37.5-40.5 mm (mean 39.0 mm). For tooth measurements, see table 7.

Weight. — 18 males weighed 10.0-14.2 grams (mean 12.8); three females weighed 10.3-12.7 grams (mean 11.8). A single pregnant female weighed 15.0 grams.

Discussion. — For a summary of the taxonomic and nomenclatural history of *Macroglossus minimus*, see Hill (1983: 134, 135). This author (1983: 136) summarizes the subspecies and their respective ranges, including Sulawesi, Peleng and Sangihe (Sanghir) islands and the Moluccas in the range of *M. m. lagochilus* Matschie, 1899. Laurie & Hill (1954: 54) do not list this species for the north Moluccas and Hill (1983: 136) does not specify the Moluccan distribution quoted for *lagochilus*. Thus, the series from Halmahera and Bacan apparently represents the first record of this widespread nectarivore from the north Moluccas and the subspecific identity had to be determined. Van der Zon (1979: 34) includes Halmahera in the range of *M. m. nanus* but I have not

Collection	RMNH	RMNH	RMNH	RMNH
Reg. no.	33064	33049	33060	33065
Sex/age	♂ adult	♂ adult	♀ adult	♀ adult
Locality	Bacan	Halmahera	Halmahera	Bacan
Greatest length of skull	25.2	24.9	25.0	25.2
Condylobasal length	24.2	23.4	23.5	23.4
Palatal length	12.9	12.9	13.2	13.3
Cranium width	10.7	11.2	11.2	11.0
Interorbital width	4.6	4.6	4.3	4.7
Postorbital width	7.2	7.3	7.3	7.3
Zygomatic width	14.5	14.3	13.0	13.5
Mandible length	18.8	19.7	19.5	18.9
$C^1 - C^1$ width	4.9	4.7	4.4	4.8
$C^1 - M^2$ length	7.4	7.7	7.7	7.3
$M^2 - M^2$ width	5.6	5.3	5.4	5.6
$C_1 - M_3$ length	9.1	9.0	9.0	9.2
length x width of P^1	0.8 x 0.4	1.0 x 0.4	0.9 x 0.4	0.9 x 0.4
P^3	1.0 x 0.5	1.2 x 0.5	1.0 x 0.5	1.1 x 0.5
P^4	1.0 x 0.5	1.0 x 0.4	1.0 x 0.5	1.1 x 0.5
M^1	1.0 x 0.5	1.1 x 0.5	1.1 x 0.5	1.4 x 0.6
M^2	1.1 x 0.5	1.0 x 0.5	0.9 x 0.4	1.2 x 0.4
P_1	0.9 x 0.35	0.9 x 0.5	0.9 x 0.3	0.9 x 0.3
P_3	1.0 x 0.35	0.8 x 0.5	1.0 x 0.4	1.0 x 0.4
P_4	0.9 x 0.35	1.0 x 0.4	1.0 x 0.35	0.8 x 0.4
M_1	1.1 x 0.45	1.1 x 0.5	1.1 x 0.45	1.3 x 0.5
M_2	1.0 x 0.5	1.0 x 0.5	1.0 x 0.45	1.0 x 0.5
M_3	1.0 x 0.4	1.0 x 0.5	0.9 x 0.4	1.0 x 0.5

Table 7. Cranial and tooth measurements of *Macroglossus minimus nanus* from Halmahera and Bacan (all measurements are in mm).

been able to trace the reference and specimen(s) on which this record is based. Earlier, Andersen (1912: 765) had merely made the trivial statement that "If a *Macroglossus* occurs in the Gilolo [= Halmahera] group, it is likely to be either the present form [= *lagochilus*] or *M. l. nanus.*". The subspecies *lagochilus* and *nanus* (the latter ranging from the Aru islands and Misool (Mysol) through New Guinea to Australia) are differentiated by Andersen (1912: 763) on account of tooth measurements, which average slightly smaller (narrower) in *nanus* (Andersen, 1912: 770), as well as slightly smaller body measurements of *nanus* (Andersen, 1912: 769). Hill (1983: 136) quotes a forearm length of 36.2-42.8 mm in 13 specimens of *nanus* against 38.0-44.0 mm in 32 *lagochilus* specimens. The forearm measurements of my series fall within the area of overlap between the subspecies, but the cranial and tooth measurements (see table 7) identify the series with *nanus*. The weights of the series from Halmahera and Bacan are rather similar to those of a small sample of Sulawesian *lagochilus*, in which two males (ZMA 22140, RMNH 33045) weigh 13.3 and 13.8 grams respectively and a single female (RMNH 33417) weighs 14.4 grams (pers. obs.). Greig-Smith (1975: 119) records a weight of 15.5 grams for a single specimen (sex not given) of *M. m. nanus* from eastern Papua New Guinea.

The allocation of the series from Halmahera and Bacan to *nanus* was to be expected on zoogeographic grounds, as the affinities of the north Moluccan megachiropteran fauna are predominantly Papuan (Rozendaal & Bergmans, in prep.).

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