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Systematic Notes on a Collection of Bats from Halmahera (Indonesia: Moluccas)

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ABSTRACT

We report on a collection of 17 species of bats from Halmahera (and two small neighboring islands) in the northern Moluccas (Gilolo group). Most *Rousettus* are *R. amplexicaudatus* but a few specimens may represent another species (possibly undescribed), since they have smaller dental and cranial dimensions than the larger series. Three species (*Eonycteris spelaea*, *Taphozous melanopogon*, *Saccolaimus saccolaimus*) are reported from the northern Moluccas for the first time. The number of bat species now known from the northern

Moluccas stands at 29, compared with 38 from the central and southern Moluccas, 62 from Sulawesi, and 45 from western New Guinea. Only two species (*Pteropus personatus* and *Syconycteris carolinae*) are endemic to the northern Moluccas and both have close relatives in the central and southern Moluccas. The northern Moluccas would seem to have a somewhat depauperate bat fauna compared with the three other areas, but, as expected, share a number of species with each of the others.

INTRODUCTION

Compared to Sulawesi to the west and New Guinea to the east, the bat fauna of the intervening Moluccas is relatively poorly known, in spite of the fact that certain islands [e.g., Ambon (= Amboina), Ternate] are the type localities of a number of species whose ranges encompass a wider area. Within the Moluccas, the northern portion (Morotai,

Halmahera, Bacan, Obi, and surrounding small islands), also known as the Gilolo group, is less well known than the southern portion (Buru, Seram, Keis, Tanimbar, and associated small islands).

The receipt of a large collection of bats from Halmahera and the neighboring small islands of Ternate and Tidore by the National

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Museum of Natural History (Smithsonian Institution) is particularly welcome. This collection was made by Dr. Paul M. Taylor from July 1978 to May 1979, from January to October of 1981, in September and December of 1982, and in December of 1984. A few other species of mammals were obtained by him: *Phalanger "orientalis"* (probably *P. ornatus*, fide Menzies and Pernetta, 1986); *Petaurus breviceps*; *Suncus murinus*; *Macaca "maurus"* (probably *M. nigra*, fide Fooden, 1969: 73); *Viverra zangara*; *Sus scrofa*; *Cervus timorensis*; *Rattus rattus*; *R. exulans*. These will not be considered further.

The following is a complete list of Taylor's bat specimens. Latitude and longitude are given where available.

Locality 1. Halmahera Id., Jailolo District, Kampung Pasir Putih, 0°53'N, 127°41'E

<i>Rousettus amplexicaudatus</i>	USNM 543149–151, 543153, 543155–165, 543500–509, 543511–667, 543669–673
<i>Rousettus</i> sp.	USNM 543152, 543154, 543510, 543668
<i>Pteropus hypomelanus</i>	USNM 543168
<i>Pteropus caniceps</i>	USNM 543693
<i>Pteropus personatus</i>	USNM 448229, 543694–698
<i>Pteropus conspicillatus</i>	USNM 543166–167
<i>Dobsonia viridis</i>	USNM 543169–177, 543184, 543699–813, 545069
<i>Nyctimene albiventer</i>	USNM 543231–262, 544149–325, 545070, 545080–084
<i>Eonycteris spelaea</i>	USNM 543185–194, 543824–945, 545071–072
<i>Macroglossus minimus</i>	USNM 543195–228, 543953–554124, 544144, 545073–079
<i>Syconycteris carolinae</i>	USNM 543230, 544147–148
<i>Mosia nigrescens</i>	USNM 544335–343, 545085
<i>Saccolaimus saccolaimus</i>	USNM 544344
<i>Rhinolophus euryotis</i>	USNM 543263–264, 544345–353
<i>Hipposideros papua</i>	USNM 544355–364
<i>Hipposideros diadema</i>	USNM 544354

<i>Myotis muricola</i>	USNM 543265, 544370–375
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Locality 2. Halmahera Id., Kao District, Kampung Gamlaha

<i>Rousettus amplexicaudatus</i>	USM 543674–685
<i>Dobsonia viridis</i>	USNM 543814–817
<i>Nyctimene albiventer</i>	USNM 544326–327
<i>Eonycteris spelaea</i>	USNM 543946
<i>Macroglossus minimus</i>	USNM 544125–128

Locality 3. Halmahera Id., Kao District, Kampung Pediwang, 1°23'N, 128°00'E

<i>Mosia nigrescens</i>	USNM 538429–432
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Locality 4. Halmahera Id., Kao District, Kampung Tugu

<i>Dobsonia viridis</i>	USNM 543178–183
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Locality 5. Halmahera Id., Wasile District, Kampung Loleba, 0°58'N, 127°56'E

<i>Pteropus personatus</i>	USNM 538424–425
<i>Dobsonia viridis</i>	USNM 538427
<i>Nyctimene albiventer</i>	USNM 538428
<i>Mosia nigrescens</i>	USNM 538433
<i>Hipposideros papua</i>	USNM 538436
<i>Myotis muricola</i>	USNM 538437–438

Locality 6. Halmahera Id. (no further locality information)

<i>Rousettus amplexicaudatus</i>	USNM 543686–689, 543691–692
<i>Rousettus</i> sp.	USNM 543690
<i>Dobsonia viridis</i>	USNM 543819–823
<i>Nyctimene albiventer</i>	USNM 544328–334
<i>Eonycteris spelaea</i>	USNM 543947–952
<i>Macroglossus minimus</i>	USNM 543229, 544129–143, 544145–146
<i>Hipposideros papua</i>	USNM 544365–369

Locality 7. Ternate Id., Ternate City

<i>Dobsonia viridis</i>	USNM 543818
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Locality 8. Tidore Id. (no further locality information)

<i>Pteropus hypomelanus</i>	USNM 538426
<i>Pteropus personatus</i>	USNM 538421–423

Locality 9. Tetewang Id., near Kampung Tetewabgm Haukiki District, Halmahera Id.

<i>Taphozous melanopogon</i>	USNM 538434–435
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We thank, first of all, Dr. Paul M. Taylor of the Department of Anthropology, National Museum of Natural History, for making the fine collection which is reported here. Mr. David Schmidt helped process the large number of specimens that resulted from this collection. We also thank Dr. Guy Musser of the Department of Mammalogy, American Museum of Natural History, for making an independent check of the identity of the large series of *Nyctimene albiventer*. Mr. John E. Hill sent information concerning the alleged specimen of *Nyctimene celaeno* from Halmahera. Drs. T. J. Flannery, Thomas A. Griffiths, and Lawrence R. Heaney have all made useful criticisms of the manuscript.

ACCOUNTS OF SPECIES

In the following accounts, all the species which have been recorded from the northern Moluccas are mentioned, but only those that were collected by Taylor are considered in any detail. All measurements are in millimeters unless otherwise indicated.

FAMILY PTEROPODIDAE

Rousettus amplexicaudatus: Taylor collected 205 specimens from Halmahera in February, March, April, May, June, July, September, and October of 1981. Rookmaaker and Bergmans (1981) refer all specimens from Halmahera and Ternate to *R. a. amplexicaudatus*, though Hill (1983) is less certain, allocating New Guinea specimens to *R. a. stresemanni*, which Rookmaaker and Bergmans would synonymize with the nominate subspecies. Taylor also collected five *Rousettus* which have smaller teeth than the remainder. Of these, only one (♀) is adult, but when compared to adult females of the typical Halmahera series, it is clearly considerably smaller as shown by the following measurements (typical series of nine adults followed by the small form): condylobasal length (34.0–36.0, 31.9); maxillary toothrow length (12.0–13.2, 11.6); width across last molars (9.8–10.8, 9.1). While at present we are not certain of the taxonomic conclusions to be drawn from these observations, these five specimens (USNM 543152, 543154,

543510, 543668, 543690) are clearly different from the remainder.

Pteropus hypomelanus: Taylor collected two specimens, one from Halmahera in January of 1981 and another from the neighboring islet of Tidore in July of 1978. The subspecies is *P. h. hypomelanus* which was originally described from Ternate (see Laurie and Hill, 1954).

Pteropus caniceps: Taylor obtained a single specimen from Halmahera in May of 1981. Laurie and Hill (1954) referred material from Morotai, Halmahera, and Bacan (= Batjan) to *P. c. caniceps*.

Pteropus personatus: Taylor collected eight specimens from Halmahera in August and October of 1978, also February, May, and September of 1981, and December of 1984; three from Tidore in July of 1978. Laurie and Hill (1954) also recorded this monotypic species from Morotai and Bacan (= Batjan). Ternate is the type locality.

Pteropus conspicillatus: Taylor collected two specimens from Halmahera in April of 1981. Laurie and Hill (1954) also recorded this species from Morotai, Bacan (type locality of *P. c. chrysauchen*, the subspecies of the Moluccas and western New Guinea), Obi, and other smaller islands.

Pteropus neohibernicus: This New Guinea species only reaches the island of Gebe (= Ghebi) at the eastern edge of the northern Moluccas (see Laurie and Hill, 1954).

Dobsonia moluccensis: This species was recorded by Jong and Bergmans (1981: 222) from Bacan (= Batjan).

Dobsonia viridis: Taylor collected 142 specimens from Halmahera in January of 1979 and in January, February, March, April, May, June, July, September, and October of 1981. He also obtained a single specimen from Ternate in September of 1981. Specimens from Morotai, Halmahera, Bacan, adjacent small islands, and the Sulawesi regions have usually been allocated to a separate species, *D. crenulata* (see Bergmans and Rozendaal, 1988), thus restricting *viridis* to the southern Moluccas, but we are inclined to agree with Hill (1983) in treating *crenulata* as a subspecies of *D. viridis*, since additional specimens considerably narrow the size gap between the two alleged species. Selected measurements are as follows (males followed by females):

condylobasal length (46.1–50.8, 44.6–47.7); maxillary toothrow length (17.9–20.1, 17.9–19.1); width across middle upper molars (14.2–15.5, 14.0–14.2).

Thoopterus nigrescens: Morotai is the type locality of this species, but it does not seem to have otherwise been recorded from the Moluccas.

Nyctimene albiventer: Taylor collected 225 specimens from Halmahera in November of 1978 and in January, February, April, May, June, July, September, and October of 1981, and December of 1982. Laurie and Hill (1954) referred material of this species from Morotai, Halmahera, and Ternate to the nominate subspecies. They also recorded "*Nyctimene aello celaeno*" from Halmahera. This record is taken from Dollman (1930), who recorded a juvenile from Halmahera. Hill (in litt.) assured us that this record is based on a misidentified specimen of *N. albiventer*.

Though the late Dr. Randolph L. Peterson believed (in litt., March 17, 1989, to David F. Schmidt) that Taylor's Halmahera *Nyctimene* collection was a complex of three species, Dr. Guy Musser has independently studied this series and agrees with us that there is no reason to consider the entire series as being anything but *N. albiventer*.

Eonycteris spelaea: Taylor collected 141 specimens from Halmahera in January, February, March, April, May, June, July, September, and October of 1981, and September of 1982. These are the first records of *Eonycteris* from east of Sulawesi and Timor. Rozendaal (1984) recognized two species, *E. rosenbergii* and *E. spelaea* from Sulawesi, but in a later paper (Bergmans and Rozendaal, 1988) recognized *rosenbergii* as a subspecies to which they allocated all Sulawesian populations. The compelling reason for recognition of two species (originally put in different genera) was the presence in *spelaea* and absence in *rosenbergii* of the last lower molar, a character which is variable within Sulawesi. All adult skulls from Halmahera, however, do have the third lower molar. Nevertheless, pending a thorough revision of *E. spelaea*, which is outside the scope of this paper, we tentatively refer the Halmahera population to *E. s. rosenbergii*.

Macroglossus minimus: Taylor collected

236 specimens from Halmahera in January, February, March, April, May, June, July, September, and October of 1981, and September and December of 1982. Rozendaal (1984) recorded this species from both Halmahera and Bacan. The species was until recently called *M. lagochilus*; see Hill (1983) for the change of name.

Syconycteris carolinae: Taylor collected three specimens from Halmahera in May of 1981. This species was recently described from Halmahera (Rozendaal, 1984) on the basis of a single specimen and is at present known only from that island. Selected measurements of single adult male and female skulls are as follows: condylobasal length (29.3, 30.6); maxillary toothrow length (10.0, 10.2); width across last molars (7.1, 7.5).

FAMILY EMBALLONURIDAE

Mosia nigrescens: (See Griffiths et al. 1991, for use of this name combination.) Taylor collected 15 specimens from Halmahera in November of 1978, also January, February, and June of 1981, and September of 1982. Laurie and Hill (1954) recorded the species from Halmahera and Ternate and the American Museum of Natural History has specimens from those two islands as well as Morotai. The subspecies in the northern Moluccas is *M. n. papuana*.

Taphozous melanopogon: Taylor collected two specimens from Halmahera in May of 1979. Laurie and Hill (1954) did not record this species from either Sulawesi or the Moluccas, but the American Museum of Natural History has a specimen from the Kei islands on the eastern edge of the southern Moluccas. The subspecific status of *T. melanopogon* populations from Sulawesi and the Moluccas is uncertain.

Saccolaimus saccolaimus: Taylor obtained a single specimen from Halmahera in June of 1981, which is the first record of *Saccolaimus* from the Moluccas. Hill (1983: 142) has summarized recent records of this species. If the Australasian *nudicluniat* is included in *S. saccolaimus*, the Halmahera record provides a geographical link between the previous records from Sulawesi and western New Guinea. The subspecific identity of all Wallacean *Saccolaimus* is in doubt.

FAMILY MEGADERMATIDAE

Megaderma spasma: Ternate is the type locality of this Linnaean species, but we know of no 20th century Moluccan records. Dobson (1878: 159), however, listed a specimen from Ternate collected by A. R. Wallace, which should, therefore, have reliable locality data.

FAMILY RHINOLOPHIDAE

Rhinolophus keyensis: Bacan (= Batjian) is the type locality of *R. k. truncatus*, the only northern Moluccan representative of the species, otherwise confined to the southern Moluccas and Lesser Sundas.

Rhinolophus euryotis: Taylor collected 11 specimens from Halmahera in February and May of 1981. Hill and Rozendaal (1989) have recorded this species from Halmahera and nearby Bacan (= Batjian), which is the type locality of *R. e. timidus*. While the senior author (Koopman, 1982) had misgivings about the validity of some of the subspecies of *R. euryotis* (e.g., the distinction of *R. e. praestans* of the Keis from *R. e. euryotis*), comparison of the Halmahera specimens with a topotype of *euryotis* from Amboina (= Ambon) in the American Museum of Natural History (AMNH 54332) would seem to show that *R. e. timidus*, as represented by material from the northern Moluccas, is distinct from *R. e. euryotis*, whatever disposition may be made of New Guinea populations.

Hipposideros ater: The American Museum of Natural History has a specimen of this species from Halmahera, which was referred by Hill (1963) to *H. a. saevus*.

Hipposideros cervinus: This widespread species, earlier included in *H. galeritus* (see Jenkins and Hill, 1981) is known in the northern Moluccas only from Bacan (= Batjian) from which the subspecies *H. c. batchianensis* was described.

Hipposideros papua: Taylor collected 15 specimens from Halmahera in 1979 and in February of 1981. The species was originally described from Biak (= Misori), an oceanic island lying north of Geelvink Bay in western New Guinea. Hill and Rozendaal (1989), however, have recorded it from the mainland of western New Guinea as well as both Bacan

and Halmahera. Selected measurements of four adult skulls are as follows: condyloca-nine length (16.8–17.2); maxillary toothrow length (7.3–7.6); width across last molars (7.8–8.1).

Hipposideros diadema: Taylor obtained a single specimen from Halmahera in February of 1981. The only other record from the northern Moluccas is Bacan (= Batjian), the type locality of *H. d. euotis*, to which the Halmahera specimen may be referred. However, the pattern of geographical variation in this species is complex and not easily expressed by the use of subspecies (see Koopman, 1982: 16, 29).

Aselliscus tricuspidatus: This widespread Australasian species is known in the northern Moluccas only from Morotai and Bacan (= Batjian). Specimens from these two islands have been referred to the nominate subspecies (see Schlitter et al., 1983).

FAMILY VESPERTILIONIDAE

Kervioulia picta: Ternate is the type locality of this species, although there are apparently no records from there for the last 200 years. However, Hill (1965) besides seeing the syntypes, also listed a specimen from Amboina (= Ambon) from the southern Moluccas, so the record may be valid. Although the species is widespread in Indo-Malaya, it is not known from Sulawesi, so the Moluccan records, if valid, are puzzling.

Myotis muricola: Taylor collected nine specimens from Halmahera in October and December of 1978, also April, May, August, and September of 1981. The species was earlier included in *M. mystacinus* (Laurie and Hill, 1954) with Moluccan specimens referred to *M. m. ater*, the type locality being Ternate. Hill (1983) not only removed *M. muricola*, giving it species status (with which we agree), but also separated *ater* specifically from *muricola*. He did this because he felt he could distinguish the two as sympatric species on Sulawesi. The senior author has studied a much larger series of the *muricola* group from Sulawesi (135 specimens in AMNH from various parts of the mainland and nearby islands) than was available to Hill and Rozendaal (1989) and is unable to see more than a single species on Sulawesi. We would

TABLE 1

Bats of Sulawesi, the Moluccas, and Western New Guinea

A, Sulawesi and surrounding islands; B, central and southern Moluccas; C, northern Moluccas; D, western New Guinea and surrounding islands. (+), of very limited occurrence in the area; —, not presently known from the area; ?, of doubtful occurrence in the area.

	A	B	C	D
<i>Rousettus amplexicaudatus</i>	+	+	+	+
<i>Rousettus celebensis</i>	+	—	—	—
<i>Boneia bidens</i>	+	—	—	—
<i>Pteropus hypomelanus</i>	+	—	+	(+)
<i>Pteropus griseus</i>	+	(+)	—	—
<i>Pteropus caniceps</i>	?	—	+	—
<i>Pteropus argentatus</i>	—	(+)	—	—
<i>Pteropus melanopogon</i>	—	+	—	(+)
<i>Pteropus chrysoproctus</i>	—	+	—	—
<i>Pteropus personatus</i>	—	—	+	—
<i>Pteropus temmincki</i>	—	+	—	—
<i>Pteropus alecto</i>	+	—	—	—
<i>Pteropus conspicillatus</i>	—	—	+	+
<i>Pteropus ocularis</i>	—	+	—	—
<i>Pteropus neohibericus</i>	—	—	(+)	+
<i>Pteropus macrotis</i>	—	—	—	+
<i>Pteropus pohlei</i>	—	—	—	(+)
<i>Acerodon celebensis</i>	+	—	—	—
<i>Acerodon humilis</i>	(+)	—	—	—
<i>Neopteryx frosti</i>	+	—	—	—
<i>Styloctenium wallacei</i>	+	—	—	—
<i>Dobsonia minor</i>	+	—	—	+
<i>Dobsonia exoleta</i>	+	—	—	—
<i>Dobsonia emersa</i>	—	—	—	(+)
<i>Dobsonia moluccensis</i>	—	+	+	+
<i>Dobsonia viridis</i>	+	+	+	(+)
<i>Dobsonia beauforti</i>	—	—	—	(+)
<i>Harpyionycteris whiteheadi</i>	+	—	—	—
<i>Cynopterus brachyotis</i>	+	—	—	—
<i>Chironax melanocephalus</i>	+	—	—	—
<i>Thoopterus nigrescens</i>	+	—	+	—
<i>Paranyctimene raptor</i>	—	—	—	+
<i>Nyctimene minutus</i>	+	+	—	—
<i>Nyctimene draconilla</i>	—	—	—	+
<i>Nyctimene albiventer</i>	—	—	+	+
<i>Nyctimene cephalotes</i>	+	+	—	(+)
<i>Nyctimene cyclotis</i>	—	—	—	+
<i>Nyctimene aello</i>	—	—	—	+
<i>Nyctimene celaeno</i>	—	—	—	+
<i>Eonycteris spelaea</i>	+	—	+	—
<i>Macroglossus minimus</i>	+	+	+	+
<i>Syconycteris australis</i>	—	+	—	+
<i>Syconycteris carolinae</i>	—	—	+	—
<i>Mosia nigrescens</i>	+	+	+	+
<i>Emballonura monticola</i>	+	—	—	—

TABLE 1—(Continued)

	A	B	C	D
<i>Emballonura alecto</i>	+	+	—	—
<i>Emballonura beccarii</i>	—	(+)	—	+
<i>Emballonura raffrayana</i>	—	+	—	+
<i>Emballonura furax</i>	—	—	—	+
<i>Taphozous melanopogon</i>	+	(+)	+	—
<i>Taphozous theobaldi</i>	+	—	—	—
<i>Saccolaimus saccolaimus</i>	+	—	+	+
<i>Megaderma spasma</i>	+	—	+	—
<i>Rhinolophus keyensis</i>	—	+	+	—
<i>Rhinolophus celebensis</i>	+	—	—	—
<i>Rhinolophus philippinensis</i>	+	(+)	—	—
<i>Rhinolophus arcuatus</i>	+	+	—	—
<i>Rhinolophus euryotis</i>	+	+	+	+
<i>Hipposideros ater</i>	+	—	+	+
<i>Hipposideros macrobullatus</i>	+	+	—	—
<i>Hipposideros calcaratus</i>	—	—	—	+
<i>Hipposideros maggietaaylorae</i>	—	—	—	+
<i>Hipposideros cervinus</i>	+	(+)	+	+
<i>Hipposideros papua</i>	—	—	+	+
<i>Hipposideros muscinus</i>	—	—	—	?
<i>Hipposideros wollastoni</i>	—	—	—	+
<i>Hipposideros diadema</i>	+	+	+	+
<i>Hipposideros dinops</i>	+	—	—	—
<i>Hipposideros inexpectatus</i>	+	—	—	—
<i>Aselliscus tricuspidatus</i>	—	+	+	+
<i>K. (Kerivoula) picta</i>	—	+	+	—
<i>K. (Kerivoula) hardwickei</i>	+	—	—	—
<i>K. (Kerivoula) papillosa</i>	+	—	—	—
<i>K. (Phoniscus) jaborii</i>	+	—	—	—
<i>Myotis formosus</i>	+	—	—	—
<i>Myotis muricola</i>	+	+	+	—
<i>Myotis horsfieldi</i>	+	—	—	—
<i>Myotis adversus</i>	+	(+)	—	+
<i>Myotis stalkerii</i>	—	(+)	—	—
<i>Pipistrellus javanicus</i>	+	—	—	—
<i>Pipistrellus tenuis</i>	+	+	—	—
<i>Pipistrellus petersi</i>	+	+	—	—
<i>Pipistrellus minahassae</i>	+	—	—	—
<i>Philetor brachypterus</i>	+	—	—	+
<i>Tylonycteris robustula</i>	+	—	—	—
<i>Hesperoptenus gaskelli</i>	+	—	—	—
<i>Scotophilus kuhli</i>	+	—	—	—
<i>Scotophilus celebensis</i>	+	—	—	—
<i>Nyctophilus gouldi</i>	—	—	—	+
<i>Murina florium</i>	+	+	+	+
<i>Miniopterus australis</i>	+	+	+	+
<i>Miniopterus pusillus</i>	+	+	—	—
<i>Miniopterus fuscus</i>	+	—	—	—
<i>Miniopterus schreibersi</i>	+	+	—	—
<i>Miniopterus magnater</i>	—	+	—	+
<i>Miniopterus tristis</i>	+	—	—	+

TABLE 1—(Continued)

	A	B	C	D
<i>Mormopterus beccarii</i>	—	+	+	+
<i>Chaerephon jobensis</i>	—	—	—	+
<i>Mops sarasinorum</i>	+	—	—	—
<i>Cheiromeles torquatus</i>	+	—	—	—
Total number	62	38	29	45

therefore regard *ater* as a subspecies of *M. muricola*, to which we would refer Taylor's Halmahera series as well as the type from Ternate.

Murina florium: Until recently, there was no recent specimen of this genus from the northern Moluccas. However, Hill and Rozendaal (1989) have a record from Bacan. Hill and Rozendaal referred all Moluccan specimens to *M. f. lanosa*.

Miniopterus australis: Hill (1983: 173) recorded this species from Bacan (= Batjjan) and referred all Moluccan populations to *M. a. tibialis*. It should be mentioned, however, that the taxonomy of this genus is in a very confused state (see Hill, 1983, and references therein).

FAMILY MOLOSSIDAE

Mormopterus beccarii: Hill and Rozendaal (1989) have recorded a specimen from Halmahera and referred it to *M. b. beccarii*, previously known only from Ambon.

DISCUSSION

Some 29 species of bats are now known from the northern Moluccas (which represents a slight change from former figures), three of them being new records based on Taylor's collections. This compares with 38 from the southern Moluccas, 45 from western New Guinea and its islands, and 62 from Sulawesi and its islands (including the Talauds, contra Bergmans and Rozendaal, 1988). The species from all four areas are listed in table 1. These records are mostly based on Laurie and Hill (1954), supplemented and updated by references mentioned in the text under various species. See also Koopman (1989) and Hill et al. (1990) for Sulawesi, and Flannery (1990) for New Guinea. We have not incorporated the changes made by Kitch-

ener and Maharadatunkamsi (1991), since we have not been able to evaluate them. Of the 29 species, only two, *Pteropus personatus* and *Syconycteris carolinae* are endemic to the northern Moluccas. Both have close relatives in the southern Moluccas: *P. personatus* with *P. temmincki*, which also probably occurs in the Bismarcks, but not in New Guinea; and *S. carolinae* with *S. australis* which also occurs in New Guinea, the Bismarcks, and Australia.

Most of the remaining species are rather widespread: 15 species are shared with the southern Moluccas, but 13 of these also occur in Sulawesi and/or New Guinea, and of the remaining two, *Rhinolophus keyensis* also occurs on Wetar island in the Lesser Sundas while *Kerivoula picta* is widely distributed in the Indo-Malayan region. Of the 19 northern Moluccan species shared with western New Guinea, only seven (*Pteropus conspicillatus*, *P. neohibernicus*, *Dobsonia moluccensis*, *Nyctimene albiventer*, *Hipposideros papua*, *Aselliscus tricuspidatus*, *Mormopterus beccarii*) are not also shared with Sulawesi. Of the 17 species shared with Sulawesi, only five (*Thoopterus nigrescens*, *Eonycteris spelaea*, *Taphozous melanopogon*, *Megaderma spasma*, *Myotis muricola*) are not shared with western New Guinea.

While it seems highly probable that more species will be found in the northern Moluccas with a resulting change in the detailed distributional pattern, the major features will probably remain the same. The northern Moluccas have a bat fauna which is depauperate and more or less intermediate between the richer faunas of Sulawesi and New Guinea. It seems likely, however, that at least *Nyctimene cephalotes*, *Myotis adversus*, and *Pipistrellus tenuis*, all of which are known from Sulawesi, the southern Moluccas, and New Guinea, will eventually be found in the northern Moluccas.

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