

## A new species of *Nyctophilus* (Chiroptera: Vespertilionidae) from Lembata Island, Nusa Tenggara, Indonesia.

D.J. Kitchener\*, R.A. How\* and Maharadatunkamsi†

### Abstract

*Nyctophilus heran* sp. nov. is described from a single specimen collected in November 1989 from Pulau Lembata. Superficially it is most similar to *N. geoffroyi*, with which it is compared.

### Introduction

Long-eared bats of the genus *Nyctophilus* are believed confined to Australia and New Guinea, where the number of species recognised ranges from 8 species (Corbet and Hill 1987) to 14 species (Parnaby 1988). Interestingly the first *Nyctophilus* named was *Vespertilio timoriensis* (Geoffroy, 1806) from specimens collected by Peron and Lesueur during the Baudin expedition of 1800-1804. The locality of these type specimens was reported to be Timor, Nusa Tenggara, Indonesia, however, it has not since been reported from Timor. Hill and Pratt (1981) consider that the exact provenance of the above specimens reported from Timor remains uncertain. Hill and Pratt (1981), however, attribute two specimens from near Wau, Morobe Province, New Guinea, to *Nyctophilus timoriensis*.

*Nyctophilus* together with the monotypic New Guinea genus *Pharotis* have been placed in the tribe Nyctophilini within the Nyctophilinae (Koopman and Jones 1970). Increasingly these two genera are considered distinct from the North American long-eared genera *Antrozous* and *Bauerus* (Antrozoini) (Hill and Harrison 1987).

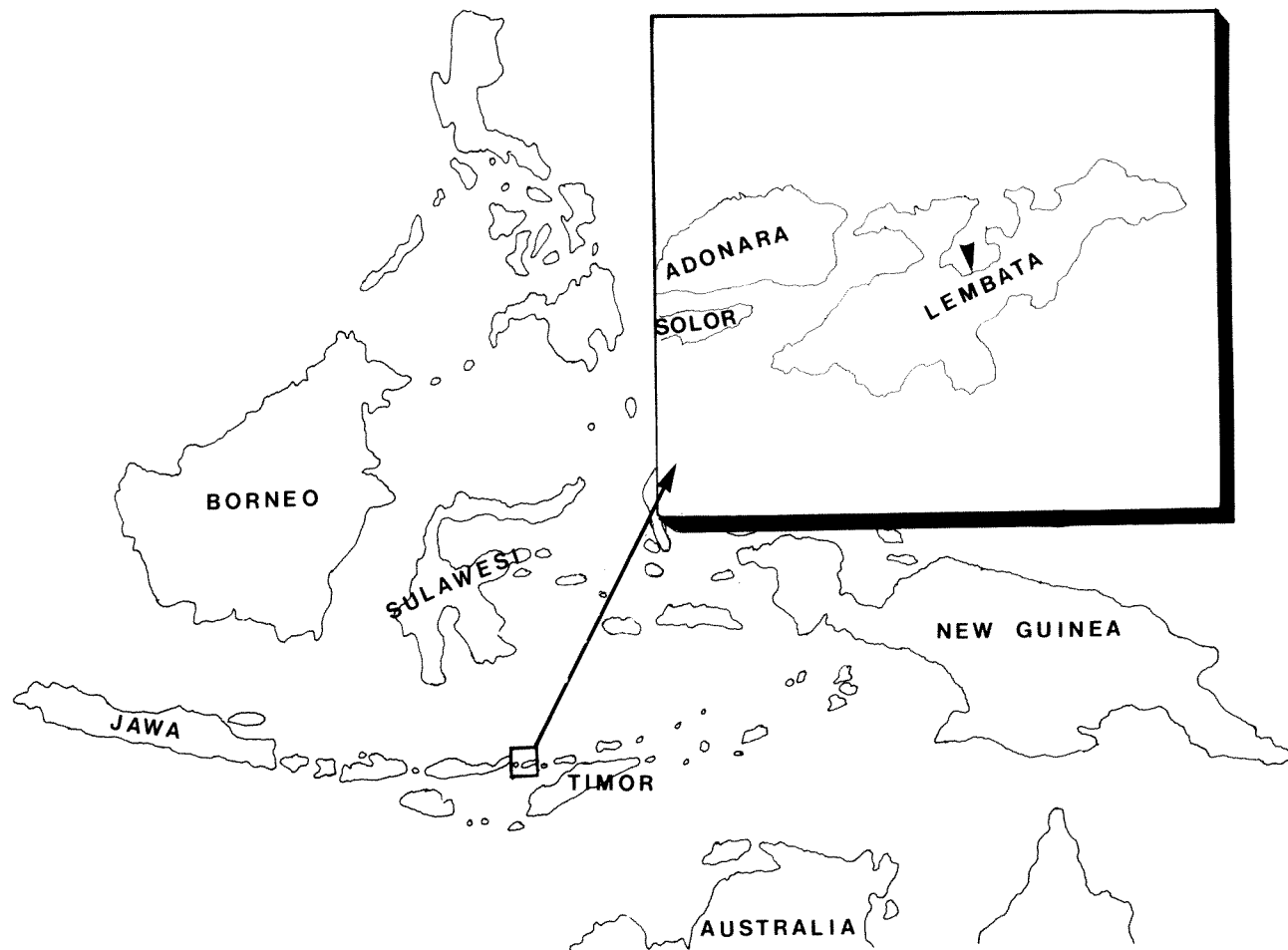
As noted by Hill and Pratt (1981) *Nyctophilus* is easily recognised by its "square, truncated muzzle, low, fleshy noseleaf and its large usually clearly conjoined ears". *Nyctophilus* may be distinguished from *Pharotis* by a much lower anterior noseleaf which has a slightly concave distal margin rather than one that is evenly convex; a convex rather than concave anterior margin of the tragus; the absence of deep pits immediately behind the posterior nasal elevation and longer rostrum (Thomas, 1914). Tate (1941) recognised four species groups of *Nyctophilus*. These were:

- (i) *timoriensis* group (including the forms *timoriensis*, *major* Gray, 1844; *sherrini* Thomas, 1915; and *gouldi* Tomes, 1858). These forms have unspecialised noseleaves (see Thomas 1915) except for *gouldi* which has moderately specialised noseleaves.
- (ii) *bifax* group (*bifax* Thomas, 1915 and *daedalus* Thomas, 1915). These have unspecialised noseleaves and M<sup>3</sup> specialised, reduced and shortened.

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

†Museum Zoologicum Bogoriense, Jl. Raya Juanda 18, Bogor, Indonesia 16122.



**Figure 1:** Map showing Pulau Lembata. Type locality of *Nyctophilus heran* sp. nov. is indicated by the arrow head.

- (iii) *microtis* group (*bicolor* Thomas, 1915; *microtis* Thomas, 1888 and possibly *walkeri* Thomas, 1892). These have slightly specialised noseleaves and in the case of *walkeri* very small ears.
- (iv) *geoffroyi* group (*geoffroyi* Leach, 1821, *unicolor* Tomes, 1858, *australis* Peters, 1861, *pacificus* Gray, 1831, *pallescens* Thomas, 1913). These have specialised noseleaves, where the posterior leaf is high, bifurcate and each lobe connected by a flexible membrane.

Parnaby (1988) recognises these above forms and additionally recognises *N. arnhemensis* Johnson, 1959, *N. microdon* Laurie and Hill, 1954 and *N. howensis* McKean, 1975 as well as a new species from Papua/New Guinea. All modern authors have synonymised *unicolor*, *australis*, *pacificus* and *pallescens* with *N. geoffroyi* (e.g. Mahoney and Walton (1988).

*N. arnhemensis* is stated by Parnaby (1988) to be similar to both *N. microtis* and *N. bifax*. *N. microdon* according to Koopman (1982, 1984) has a high band connecting the ears, long ears (24-28mm) and a noseleaf that is higher and clearly divided into two parts; the condylobasal length ranges from 13.5-13.6mm. Parnaby (1988) notes that it also has a large rectangular tragus and a distinctive penile morphology and with teeth conspicuously small [ $C^1-M^3$  4.87 (4.8-5.0mm)]. In this regard, *N. microdon* could be considered somewhat intermediate between Tate's (1941) *Nyctophilus* species groups (iii) and (iv). *N. howensis* is a large robust form known only from the holotype which is a damaged skull. It is a large bat that perhaps falls in Tate's (1941) *timoriensis* group.

Between October 1987 and November 1989 five expeditions have been carried out in search of terrestrial vertebrates in Nusa Tenggara. Islands visited were Lombok, Sumbawa, Moyo, Sangiang, Sumba, Flores, Andonara, Lembata and Timor. These expeditions have recorded large numbers of bats which have greatly altered our understanding of the patterns of distribution of bats in this regions (Kitchener *et al.* 1990, a & b).

In November 1989, a single specimen of *Nyctophilus* was collected on Lembata (Lomben) I. This specimen was compared to the known species using information contained in the following publications: Thomas (1915), Tate (1941), Laurie and Hill (1954), McKean (1975), Hill and Pratt (1981), Hill and Koopman (1981), Koopman (1982, 1984) and in an unpublished thesis by H. Parnaby (1988). The present study benefited greatly from access to the latter work, particularly in regard to glans penis morphology and craniometrics.

As a result of these comparisons the Lembata *Nyctophilus* is herein described as a new species.

## Methods

Measurements (in mm) used and measurement points are detailed in Kitchener *et al.* (1986). Pelage was described using Ridgway (1912).

## Systematics

### *Nyctophilus heran* sp. nov.

#### Holotype

Western Australian Museum catalogue number (WAM) M 32252\* an adult male, skull and mandibles separate, carcass fixed in 10% formalin and preserved in 70% ethanol, liver and blood samples separately in ultrafreezer; collected in a Harp Bat Trap on 5 November 1989 by the authors.

#### Type locality

Kampong Merdeka, Desa Hadakewa, Pulau Lembata, Nusa Tenggara, Indonesia (8°22'S, 123°31'E) (Figure 1) at sea level. Collected over a small stagnant pool in a small dry stream some 200 m from mangroves. The stream was bordered on both sides by kebun (gardens) with occasional coconut and banana trees.

#### Diagnosis

*Nyctophilus heran* sp. nov. differs from all described species of *Nyctophilus*, apart from *N. geoffroyi*, by having a high postnasal foliation that bifurcates distally into a Y-shaped structure which has each arm connected by a flexible septum; by having a baculum which has its shaft thin and narrowing to a simple distal point that is not bifurcate and unexpanded.

It differs from *N. geoffroyi* in having a glans penis that lacks a pronounced dorsal crest which projects to the distal end; the distal end less rounded and does not overshoot the ventral mound — which has a median cleft (Figure 4); bulla smaller, such that bulla length/greatest skull length less (0.233 v. 0.247-0.275) and less inflated; postpalatal spine more pronounced; mesopterygoid anterior edge more sharply angled towards base of postpalatal spine; hypocone more pronounced on M<sup>1-2</sup>; a number of skull and dental measurements exceed the largest reported for male *N. geoffroyi*: e.g., greatest skull length (16.7 v. 16.4), zygomatic breadth (10.6 v. 9.9), braincase height (6.2 v. 5.8), and C<sup>1</sup>-M<sup>3</sup> length (6.1 v. 5.8).

It differs from *N. microdon*, the only other *Nyctophilus* with a moderately high postnasal foliation (which while bifurcated is not Y-shaped), by having a tragus which is not squared at its apex; narrower interorbital width (<3.9); generally broader skull: e.g., zygomatic width larger (>9.5), C<sup>1</sup>-C<sup>1</sup> breadth greater (>4.2), bulla longer (>3.5); dentition more robust: e.g., C<sup>1</sup>-M<sup>3</sup> longer (>5.5).

It also differs from *N. t. timoriensis*, *N. timoriensis sherrini*, (see Table 1) and *N. major* by being generally smaller: e.g., forearm length shorter (<40), greatest skull length shorter (<17), C<sup>1</sup>-C<sup>1</sup> breadth narrower (<4.8) and C<sup>1</sup>-M<sup>3</sup> shorter (<6.4); glans penis has no dorsal fissure such as in *major* and *sherrini*, and ventral lobe lower.

It also differs from *N. walkeri* in being substantially larger: e.g., forearm length larger (>37); ear larger (>17); greatest skull length longer (>14); zygomatic width greater (>9.1); interorbital width greater (>3.3); C<sup>1</sup>-C<sup>1</sup> wider (>40); C<sup>1</sup>-M<sup>3</sup> length greater (>5.0); bulla longer (>3.0); glans penis lacks a pronounced distal ventral groove, ventral lobe more pronounced.

\* Final deposition of this holotype, at completion of this series of expeditions, will be the Museum Zoologicum Bogoriense, Bogor, Indonesia.

**Table 1:** Skull, mandible, dentary and external measurements for the holotype of *N. heran* sp. nov., *N. timoriensis* putative cotype, a specimen from New Guinea and *N. geoffroyi* from southwest Western Australia and Tasmania.

	<i>N. heran</i> holotype ♂	<i>N. timoriensis</i>		<i>N. geoffroyi</i>
		* New Guinea ♀	** "Timor"? ♂	N = 6 (range) West Aust. Tas. ♂♂
<i>Skull &amp; dentition</i>				
greatest skull length	16.70	19.2	19.8	14.45 - 15.86
interorbital breadth	3.76		5.4	3.04 - 3.53
zygomatic breadth	10.64	11.7	11.4	8.59 - 9.47
mastoid breadth	8.89	9.4		7.55 - 8.50
braincase height	6.18			4.94 - 5.35
mesopterygoid fossa width	2.05	2.1	2.1	1.37 - 1.78
palatal length	6.02	6.5		5.13 - 5.90
distance between bullae	1.64			1.33 - 1.41
basicranial length	8.25			6.76 - 7.41
bullula length	3.90	3.9		3.74 - 3.98
antorbital foramen breadth	4.73	5.5		4.08 - 4.48
braincase width	7.85	8.6	9.0	6.93 - 7.77
dentary length (from condyle)	11.83	12.7		9.89 - 10.61
C <sup>1</sup> -C <sup>1</sup> breadth (alveoli)	4.54	5.5	5.1	3.72 - 4.36
M <sup>1</sup> -M <sup>1</sup> breadth (inside)	2.90		3.35	2.41 - 2.72
M <sup>3</sup> -M <sup>3</sup> breadth (cusp)	6.79			5.74 - 6.32
M <sup>1</sup> -M <sup>3</sup> length (cusp)	3.90	4.8	4.6	3.28 - 3.74
C <sup>1</sup> -M <sup>3</sup> length (cusp)	6.05	7.2	7.0	5.09 - 5.59
C <sub>1</sub> -M <sub>3</sub> length (cusp)	6.53	7.8		5.83 - 6.01
M <sup>3</sup> length	0.74			0.63 - 0.73
M <sup>3</sup> width	1.75		1.7	1.43 - 1.69
<i>Externals</i>				
forearm length	39.3	48.5	46.5	34.5 - 38.4
head to vent length	51.5		60	43.3 - 44.6
tail to vent length	40.7		50.5	37.7 - 40.4
pes length	6.4		10	6.8 - 7.1
ear length	23.4			21.1 - 24.0
tibia length	18.8			16.1 - 17.9
calcar length	13.6			10.1 - 10.6
tragus length	8.1			6.6 - 7.3
metacarpal I length (MCI)	6.1			5.2 - 5.6
MCII	34.7			31.4 - 33.9
MCIII	37.8			31.1 - 35.2
MCIII / phalanx I length (PI)	14.5			12.2 - 14.3
MCIII / PII	14.0			11.5 - 11.7
MCIII / PIII	9.1			6.3 - 8.9
MCIV	38.0			30.7 - 34.3
MCIV / PI	10.5			9.4 - 12.0
MCIV / PII	13.0			10.3 - 11.7
MCV	37.2			30.9 - 34.7
MCV / PI	10.4			9.1 - 10.0
MCV / PII	8.5			6.8 - 8.8

\* from Hill and Pratt (1981) - BM (NH) 80.498 \*\* Tate (1941) - putative cotype, Paris Museum

It also differs from *N. b. bifax* in having band of skin connecting ears more pronounced; glans penis ventral lobe slightly more pronounced, urethral aperture with a more pronounced median groove.

It also differs from *N. bifax daedalus* in having its greatest skull length slightly smaller (<16.8); C<sup>1</sup>-C<sup>1</sup> breadth narrower (<4.9); C<sup>1</sup>-M<sup>3</sup> length shorter (<6.2) and bulla slightly longer (>3.8); glans penis distal end less globose, distal and ventral lobes less prominent.

It also differs from *N. arnhemensis* in having skull slightly larger: e.g., greatest skull length longer (>16), zygomatic width considerably larger (>10.2), bulla longer (>3.5); glans penis distal lobe from cranial surface does not overshoot ventral lobe, ventral lobe more rounded at distal end rather than squarish.

It also differs from *N. gouldi* in having zygomatic width larger (>10.6); glans penis with distal and ventral lobes more pronounced.

It also differs from *N. m. microtis* and *N. m. bicolor* in having a well developed band connecting the ears, rather than scarcely developed or absent in the midline; tragus more broadened basally; greatest skull length longer (>16.1); glans penis lacks prominent ventral lobe, urethral opening on ventral surface rather than distal, ventral lobe also with a median groove.

It differs from *N. howensis* in being smaller in all skull measurements: e.g., greatest skull length (16.8 v. 23.2), zygomatic width (10.6 v. 13.9); interorbital width (3.8 v. 4.3); C<sup>1</sup>-M<sup>3</sup> length (6.1 v. 8.0); palatal length (6.0 v. 7.6) and braincase width (7.9 v. 9.7).

### Description

(Table 1; Figures 2-5)

#### Skull, mandible and dentition (Table 1; Figure 2)

Skull shape generally similar to *N. geoffroyi*. The cranium moderately inflated; sagittal crest weak, most marked in midpoint of cranium and bifurcating anteriorly to weak supraorbital ridges, does not connect with weak lambdoidal ridges; rostrum slightly more depressed and median sulcus slightly deeper than in *N. geoffroyi*; anterorbital foramen moderate, zygomatic breadth wide (10.6), zygomatic thickness moderate; anterior nasal aperture a wide V shape, projects posteriorly to a line level with the anterior edge of anteorbital foramen. Skull measurements greater than those presented for *N. geoffroyi* (Table 1) but Parnaby (1988) presents maximum measurements for *N. geoffroyi* (usually from the Tasmanian form) which exceed the values given in Table 1. However, compared to Parnaby's (1988) measurements, *N. heran* has the following values exceeding those reported for *N. geoffroyi*: greatest skull length (16.7 v. 16.4), zygomatic breadth (10.6 v. 9.9), braincase height (6.2 v. 5.8), and C<sup>1</sup>-M<sup>3</sup> length (6.1 v. 5.8); bulla compared to *N. geoffroyi* are shorter such that the bulla length/greatest skull length is less (0.233 v. 0.247-0.275), less inflated; distance between bulla greater than in *N. geoffroyi* (1.64 v. 1.33-1.44); postpalatal spine large; angle of mesopterygoid edge to base of postpalatal spine moderately sharp; third commissure of M<sup>3</sup> slightly longer than in *N. geoffroyi* such that M<sup>3</sup> breadth greater (1.75 v. 1.43-1.69); hypocone M<sup>1</sup>-M<sup>2</sup> moderately well developed more so than in *N. geoffroyi*, palate deep, slightly more excavated than in *N. geoffroyi*.

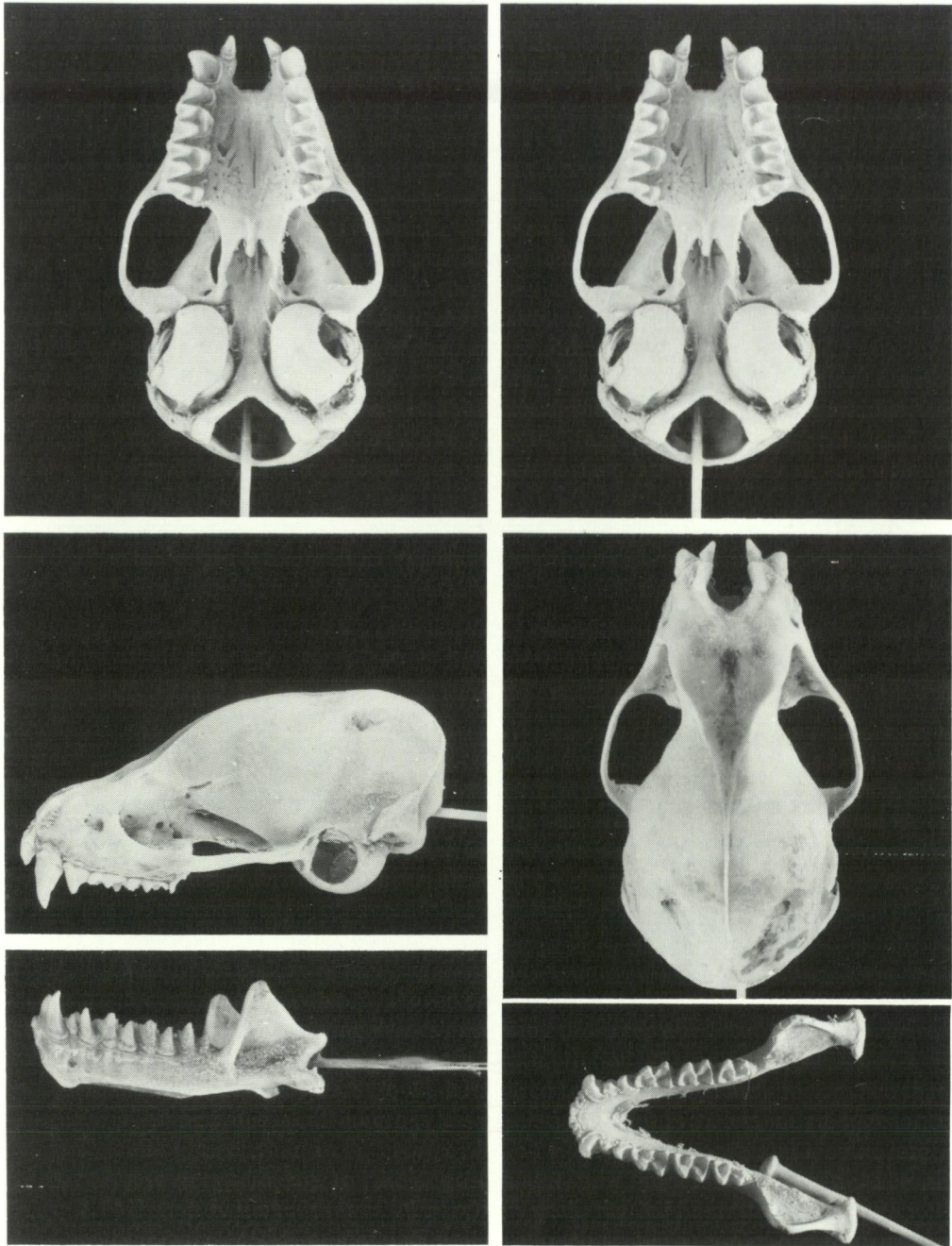


Figure 2: Skull and dentary of *Nyctophilus heran* sp. nov. holotype. Ventral view as stereopairs.





Figure 3: Photographs of *Nyctophilus heran* sp. nov. taken while alive.

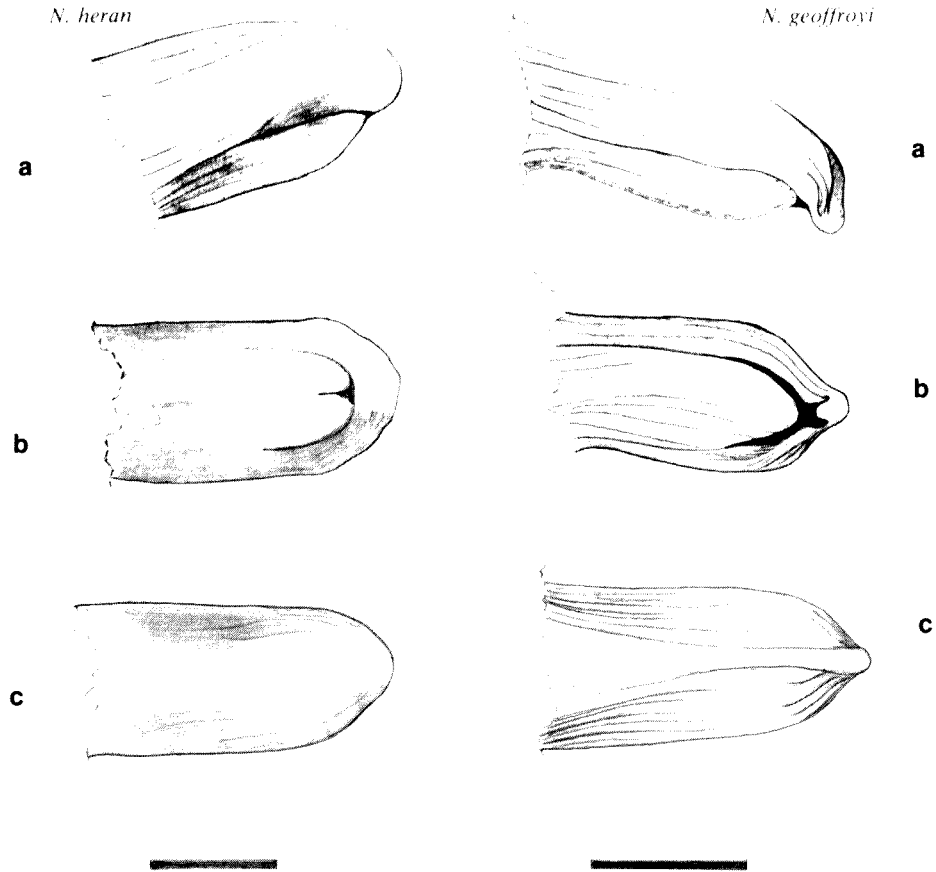
**Externals** (Table 1; Figures 3, 4, 5)

Ears moderately long (23.4), joined by band of skin that is approximately 3 mm high at midpoint; tragus moderately long (8.1), anterior edge from apex straight, or very slightly concave, for one-third length then gently concave to base, posterior edge from apex very gently convex for half length then considerably convex towards base where margin has several protuberances, apex a rounded point, slightly narrower than in *N. geoffroyi*, lobe on inner edge at midpoint of posterior margin moderate; antitragus both moderately wide and high; anterior noseleaf moderately high; upper margin gently concave; postnasal foliation high (*c.* 1.9), bifurcating distally to a Y-shape with a central stout membrane connecting these distal arms — the general shape is similar to *N. geoffroyi*; weight (7.6 g); forearm length (39.3), head to body length (51.5) and tail to vent length (40.7); calcar (13.6) reaches approximately to midpoint of posterior margin of uropatagium. These values show *N. heran* to be an intermediate sized *Nyctophilus*.

Glans penis (Figure 4) slender, without a very prominent distal lobe, urethral groove ventral U-shaped, supported by a bifurcated low ventral lobe. It differs from *N. geoffroyi* in lacking a pronounced dorsal crest and a distal lobe that overshoots the ventral mound, and the presence of a median cleft in the ventral mound.

Baculum (Figure 5) bifurcated basal part with a gently curving thin shaft tapering to a thin distal point which is not bifurcate and has no other modifications. It is similar to *N. geoffroyi*.





**Figure 4:** Drawings of glans penis, assisted by use of camera lucida, of *Nyctophilus heran* sp. nov. and *N. geoffroyi*. (a) lateral, (b) ventral and (c) dorsal views.

### **Pelage**

Dominant colour of pelage Light Drab, which is from distal one-third of hairs on dorsum and venter. Basal two-thirds of hairs on dorsum ( $\pm 6.5$  long) and head ( $\pm 4$  long) Mouse Grey — on venter Mummy Brown ( $\pm 6$  long). Hair at base of ears and on band of skin connecting ears, face and chin shorter ( $< 4$ ), Light Buff. Skin of basal one-quarter of ear, chin and lips, Light Ochraceous-Buff.

### **Etymology**

*Nyctophilus heran* is named after the Bahasa Indonesian word for surprise (heran), which was our prevailing emotion at capturing a nyctophiline bat in Nusa Tenggara.

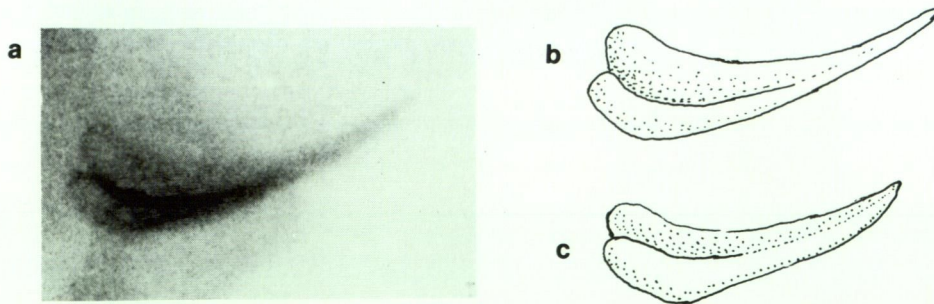


Figure 5. Bacula of: (a), *Nyctophilus heran* sp. nov. holotype. X-ray photograph; (b), outline from (a) and (c) of *N. g. geoffroyi* (WAM M 15950) for comparison.

### Remarks

The capture of a *Nyctophilus* in Nusa Tenggara has biogeographic implications and increases the number of bat genera confirmed to be in common between these islands and Australia to 12. It is perhaps not surprising that, superficially at least, *N. heran* appears most similar to *N. geoffroyi*, which is the most widespread of the Australian *Nyctophilus* species.

The collection of *N. heran* perhaps adds support to Timor as the type locality of *N. timoriensis* — a view not supported by most modern authors, for example, Goodwin (1979) did not collect it on Timor, and commented that on distributional grounds it was unlikely to occur there. We have briefly collected on Timor Barat; the first bat we collected was unrecorded for Timor, indicating that much more collecting is required on that island before a complete inventory of its bat species is available, and before *N. timoriensis* can be excluded from its bat fauna.

### Acknowledgements

We are indebted to Ron Johnstone, Western Australian Museum, for his support and companionship in the field. We are particularly grateful to Harry Parnaby who kindly allowed us access to his PhD thesis and commented on the manuscript.

Gerry Allen instructed us on the use of the X-ray machine; Norah Cooper took the skull photographs. Anne Nevin typed the manuscript.

### Other specimens measured

*Nyctophilus geoffroyi* (all ♂♂, WAM specimens) M 856, Tambellup, W.A.; M 3207, Woodanilling, W.A.; M 6022, Katanning, W.A.; M 8970, Dwellingup, W.A.; M 15950, Gingin, W.A.; M 18356, Augusta, W.A.; M 16586, Orford, Tasmania; M 25684, Plenty, Tasmania.

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