

A new species of *Otomops* (Chiroptera: Molossidae) from Alor I., Nusa Tenggara, Indonesia

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Abstract

A single specimen of *Otomops* recently collected from Alor I., Eastern Indonesia, is herein described as a new species.

Introduction

The genus *Otomops* contains five species: *O. martiensseni* (Matschie, 1897) (Djibouti to Angola and south Africa, Madagascar); *O. wroughtoni* Thomas, 1913 (S. India); *O. formosus* Chasen, 1939 (Java); *O. papuensis* Lawrence, 1948 (SE Papua New Guinea); and *O. secundus* Hayman, 1952 (NE Papua New Guinea).

Otomops was diagnosed by Thomas (1913) to be a molossid with: M³ complete; premaxillae united; basioccipital pits well defined; and a prominent vertical projection of the zygoma. However, Lawrence (1948) and Hayman (1952) pointed out inadequacies in that diagnoses, particularly related to the united premaxillae. More recently; Freeman (1981) characterised *Otomops* (and *Tadarida macrotis*) as bats with: very thin dentaries; low coronoid processes; presence of a large premolar well spaced between canine and PM⁴; M³ with full-sized posterior commissure (N-shaped); dentary condyle little elevated above toothrow; slight development of sagittal and lambdoidal crests; deep basisphenoid pits; large ears joined anteriorly over nose and lips (that are wrinkled either finely or as deep troughs).

Few specimens of the three known South East Asian species have been collected since their original description (Hill 1983, Koopman 1989, Flannery 1990, Boeadi 1990); and these descriptions were based on few (1-4) individuals. Consequently little is known of their general biology in this region apart from the observation in Chasen (1939) and Boeadi (1990) that the holotype male and three other male *O. formosus* were taken from tree holes. Chasen's (1939) specimens were probably from an old nesting hole of a barbet, or woodpecker, in a decayed branch of a rubber tree. Brass (1964) also reports that a specimen of *O. secundus* was shot from a height as it flew rapidly and directly out of a forest at dusk. All molossids are apparently fast-fliers (Fenton 1972).

Elsewhere, Mutere (1973) noted a large colony of *O. martiensseni* in a roost in Kenya, and Brosset (1966) reported a colony of 40 individual *O. wroughtoni* in India and noted that they appeared to be forest bats and have extremely powerful flight.

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From an examination of their musculature and skull, Freeman (1981) concluded that *Otomops* were capable of a very wide gape and probably eat soft bodied prey such as moths. Vaughan (1966) hypothesised that the large ears of *Otomops*, relative to other molossids, may be used as additional aerofoils to keep the head aloft in flight.

In April 1991, a specimen of *Otomops* was collected from the island of Alor, near Timor, by a team from the Western Australian Museum and Balitbang Zoologi. This island is roughly equally distant from the locality of *O. formosus* in W. Java, and the localities of *O. papuensis* and *O. secundus* in Papua New Guinea (see Figure 1).

This paper provides a morphological description of this interesting *Otomops* specimen and considers its taxonomic status.

Taxonomy

Otomops johnstonei sp. nov.

(Table 1; Figures 2 and 3)

Holotype

Western Australian Museum No. M37986, adult male, weight 19.5 gm, skull and dentaries separate, carcass fixed in 10 percent formalin and preserved in 70 percent ethanol; liver and blood stored in ultrafreeze at Western Australian Museum. Purchased alive from villagers on 26 April 1991.

Type Locality

Desa Apui, Alor Island, Nusa Tenggara, Indonesia (08° 15'S, 124° 43'E); altitude c. 700m; collected from hollow in tree.



Figure 1: Distribution of *Otomops johnstonei* sp. nov. (■); *O. formosus* (▼); *O. papuensis* (●) and *O. secundus* (★).

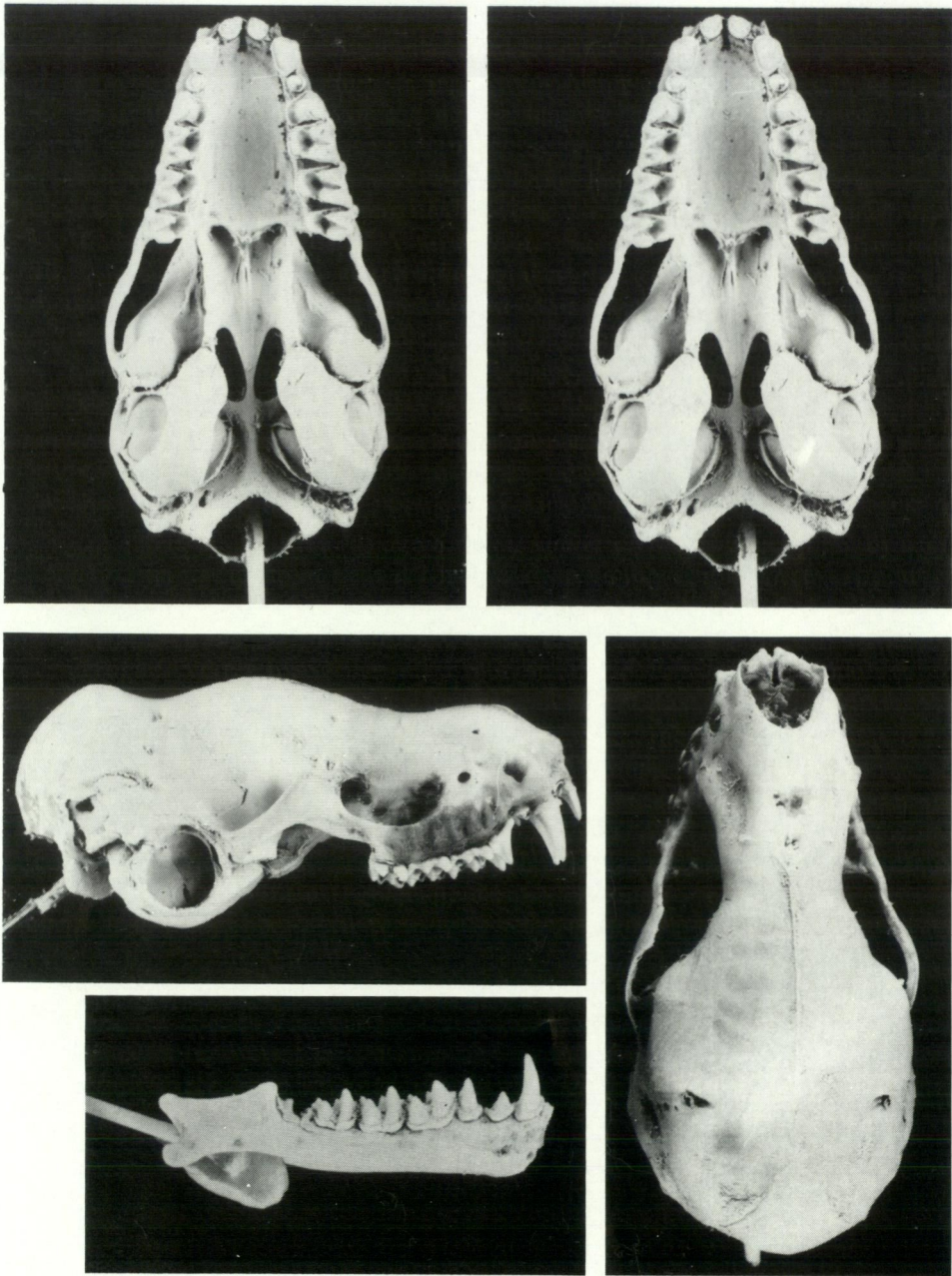


Figure 2: Skull, dentary and dentition of holotype of *Otomops johnstonei* sp. nov. in dorsal, ventral (as stereopair) and lateral view.

Diagnosis (measurements in mm)

Otomops johnstonei was compared directly to two specimens of *Otomops formosus* of similar age in the Museum Zoologicum Bogoriense (MZB 10643 and MZB 14796) It was also compared to photographs of the skull of the *O. formosus* holotype and measurements of this holotype and its paratype – provided by Dr C. Smeenk. It differs from *O. formosus* in having: the pelage at the top of its head the same dark colour as the lower back, rather than a lighter colour (see Chasen 1939); tail to vent length longer relative to head to vent length 0.550 v. 0.453-0.456; zygomatic width narrower relative to greatest skull length 0.509 v. 0.536-0.556; rostrum relatively narrow, e.g., C^1 - C^1 breadth and ML^3 - M^3 breadth narrower relative to palatal length 0.561 v. 0.600-0.650 and 1.024 v. 1.082-1.163, respectively; basial pits much larger, more elongate, much deeper with anterior roof of pit deeply excavated beneath basisphenoid shelf and not gently sloping downward to meet the edge of this shelf; anterior nasal openings much more flared laterally and narrowing more sharply dorsally; dentary angular process more flared laterally, longer; posterior upper premolar with anterolingual edge facing much more posteriorly; first lower premolar much smaller relative to second lower premolar, rounder in occlusal view.

It differs from the description of *O. papuensis* in Lawrence (1948) and Hill (1983) and photograph in Flannery (1990) in having an obvious pale mantle at the back of the neck and under the throat rather than merely a distinct but narrow pale band of hair; presence of a white patch of hair on both the inner (median) and outer base of ears; presence of a line of white hairs demarking margin of dark edge of dorsal pelage on plagiopatagium; all external measurements much larger: e.g., radius length 60.0 v. 49.2-50.2; ear length 31.1 v. 20.0-22.2; greatest skull length longer 23.0 v. 19.6-19.7; zygomatic width narrower relative to greatest skull length 0.509 v. 0.533; interorbital width narrower relative to greatest skull length 0.200 v. 0.220; much longer toothrow, e.g., C^1 - M^3 length 8.6 v. 7.0-7.2.

It differs from the description of *O. secundus* in Hayman (1952) and Hill (1983) in having a patch of white hair on the base of the outer margin of the ear (also found in *O. wroughtoni* (Thomas 1913) and *O. martiensseni*); overall body measurements appear a little larger, e.g., radius length 60.0 v. 56.8-58.0; ears considerably longer 31.1 v. 23-25; tibia larger 17.3 v. 12.0-14.9; skull longer 23.0 v. 21.0-21.5; and toothrow much longer, e.g., C^1 - M^3 8.6 v. 7.5-7.8; zygomatic width smaller relative to greatest skull length 0.509 v. 0.526; braincase narrower relative to greatest skull length 0.452 v. 0.479-0.533.

Description

Skull, dentary, dentition (Table 1, Figure 2)

The holotype of *O. johnstonei* is compared directly with two specimens of *O. formosus* from Cibodas, Java, from an altitude of 1450m (see also Boeadi 1990).

The skull of *O. johnstonei* is of similar length to that of *O. formosus* but is much narrower; it shares all the diagnostic characters of *Otomops*. It has deep and large basisphenoid pits; alisphenoid bulla projects anteriorly to contact pterygoid process; basioccipital deeply excavated laterally for cochlea; cochlea with marked mesial keel;

palate similar to *O. formosus*; premaxilla separate; mesopterygoid wide, almost concealing sphenorbital fissure when viewed from vertical ventral aspect, with blunt median posterior projection; weak lambdoidal ridge (much more so than *O. formosus*) that does not reach the tall, smooth nuchal crest; sagittal crest, from anterobasal point of nuchal crest to point of greatest interorbital constriction faint (more pronounced in *O. formosus*); supraorbital crests very slight, extend only *c.* 1.5mm anterior of sagittal crest and do not surround small but noticeable depression as in *O. formosus*; rostrum slender; lachrymal foramen covered dorsally with small protuberance; zygoma robust, with dorsal squarish projection from mid point; paraoccipital process upright, projects little posteriorly, terminates close to proximal part of occipital condyle; lateral part of mastoid sharply inclined posteroventrally, tympanic bulla considerably inflated ventrally; zygoma narrow, without external lateral flanges immediately posterior of M³; dentary thin, very small ascending ramus; condyle almost in line with crowns of molar row; angular process long, distal tip well lateral of condyle, much more so than in *O. formosus*; dentition similar to *O. formosus* in overall proportions; M³ with N-shaped commissures; incisors tall (1.52), sharply pointed with slight posteroexternal and posterointernal longitudinal grooves; C¹ tall (2.73), occlusal view with marked longitudinal antero- and postero-internal lingual ridges, the corresponding buccal ridges less sharply defined, surrounded by cingulum that is well developed lingually; first premolar small compared to *O. formosus* and more rounded, in contact with canine but not with posterior premolar; premolars with prominent protocones and hypocones, and lingual cingula; lower incisors in straight line; inner incisor with inner cusp approximately twice area of outer cusp; outer incisor sharply inclined against inner incisor row with inner cusp much larger and sharply sloping mesially towards first incisor row; lower canine anterior face smoothly curved but with a marked groove on either side of a sharp posterolingual ridge, surrounded by cingulum that is more developed internally and posteriorly; anterointernal edge of this cingulum with cusplet; first premolar occlusal area subequal to that of second premolar but with its crown height only about two-thirds that of posterior premolar.

Externals (Table 1, Figure 3)

Ears long (31.1), rounded, connected by band of furred skin over nose to form shallow pocket at midpoint of this connection; about 6.2 above rhinarium; antitragus prominent, *c.* 11.2 long, tragus minute, extra lobe on inner side of conch present but small, rounded inner margin of ear with 11-14 small horny excrescences and a number of smaller protuberances (*c.* 7) to apex of ear; upper lip exceeds lower lip by *c.* 7.0, lacks close wrinkling found in other molossid genera; lips drawn into several ill defined folds; a row of thickened short hairs *c.* 1.5 long from upper part of lip anterior to lower lip; tail moderately long (43.7); penis 5.5 long, finely furred but with a small tuft of hairs at its distal tip; glans penis 2.7 long, cigar shaped strongly ridged longitudinally on all surfaces; urethral opening ventral, *c.* 0.8 from its distal end, covered anterodorsally with moderately sharp fleshy part flanked on both sides at its distal end with low lateral fold.

Table 1: Skull, mandible, dentary and external measurements of the holotype of *Otomops johnstonei*. Measurement from other associated *Otomops* spp are provided from the literature.

Characters:	<i>O. johnstonei</i>	<i>O. secundus</i> *	<i>O. papuensis</i> **	<i>O. formosus</i>			
Skull, dentary and dentition	(holotype)	(including holotype)	(including holotype)	(holotype) ***	(paratype) ***	MZB 10643	MZB 14796
Sex	1 ♂	2 ♂, 4 ♀	1 ♂, 2 ♀	1 ♂	1 ♀	1 ♂	1 ♂
Greatest skull length	23.0	21.0-21.5 (21.3)	19.6-19.7	23.0(24)	23.3	23.7	23.0
Condylocanine length	21.1	19.3-19.9	17.9-20.2	20.6(21)	20.5	21.1	21.2
Basicranial length	19.4	-	16.2	19.3	19.5	19.9	9.4
Least interorbital breadth	4.6	(4.4)	4.3- 4.4	4.8	4.7	4.5	4.6
Zygomatic width	11.7	11.0-11.2 (11.2)	10.4-10.5	12.4(12.8)	12.5	12.7	12.8
Mastoid width	11.6	(11.2)	10.4-10.6	12.4	12.5	12.3	12.4
Bulla to top of braincase	10.8	9.9-10.1	9.7- 9.9	10.7	-	-	-
Mesopterygoid fossa breadth	3.3	(3.4)	3.0	3.5	3.7	3.4	3.5
Height jugal projection of zygoma	2.1		2.1	-	2.7	2.9	2.8
Palatal length	8.2	(7.5)	7.3	8.0	8.5	8.2	8.5
Distance between cochleae	1.3			2.2	2.1	1.5	1.6
Bulla length	6.6			6.0	5.7	-	6.5
Braincase breadth	10.4	10.9-11.2 (10.2)	9.4- 9.5	10.8(10.9)	10.4	10.6	10.7
Basisphenoid pit length	3.2		-		-	2.4	2.3
Dentary length, from condyle	15.0	13.1-14.0	12.2	16.1	15.4	15.7	15.4
C ¹ -C ¹ breadth (alveoli)	4.6	4.2- 4.5	4.2	5.2	-	5.0	5.1
M ³ -M ³ breadth (alveoli)	8.4	8.0	7.9	9.3	9.3	9.3	9.2
M ¹ -M ³ length (cusp)	5.0			6.0	6.9	5.3	5.2
I ³ -M ³ length (cusp)	9.4	8.6- 8.7	8.2- 8.5	10.0	9.6	9.6	9.5
L ¹ -M ³ length (cusp)	8.6	7.5- 7.8 (7.5)	7.0- 7.2	8.4(8.5)	8.5	8.7	8.6
C ¹ -M ³ length (cusp)	8.9	8.0- 8.2	7.5- 7.7	9.1	-	9.3	9.3
M ³ length	1.3	(1.2)	1.2	1.4	1.4	1.3	1.4
M ³ width	2.1	(1.6)	1.8	2.3	2.3	2.0	2.2

Table 1: cont.

Characters:	<i>O. johnstonei</i> (holotype)	<i>O. secundus</i> * (including holotype)	<i>O. papuensis</i> ** (including holotype)	<i>O. formosus</i>			
				(holotype) ***	(paratype) ***	MZB 10643	MZB 14796
Sex	1♂	2♂, 4♀	1♂, 2♀	1♂	1♀	1♂	1♂
Wt (gm)	19.5					26	27
Radius length	60.0	57 -58 (56.8)	49.2-50.2	58.3(59.7)	57.4	60.5	56.5
Head to vent length	79.4	68 -71 (72)	(86)		86+	79+	
Tail to vent length	43.7	33 -38 (35)	30	(43)		39+	36+
Ear length	31.1	23.0-24.3 (25)	20.0-22.2	(30)		28.6	28.4
Pes length (without claw)	11.9	10 (9)	10.0-10.6	‡		10.0	10.9
Tibia length	17.3	12.0-14.9 (14)	-	‡ c. (29)		16.5	16.6
Calcar length	18.1					14.6	-
MCII (metacarpal, digit II)	59.1					60.8	56.9
MCIII	60.3	- (57.4)	50.8			62.6	58.5
MCIII/phalanx I length (PI)	23.7	- (20.3)	18.8			23.6	22.1
MCIII/PII	23.2	- (20.1)	16.9			22.4	21.8
MCIII/PIII	5.4					5.5	6.8
MCIV	55.7	- (53.0)	47.2			57.8	54.6
MCIV/PI	14.6	- (12.9)	11.7			15.1	14.7
MCIV/PII	11.4	- (8.6)	8.5			11.8	10.5
MCV	29.8	- (27.8)	25.3			30.9	29.9
MCV/PI	20.4	- (17.9)	15.8			18.1	17.9
MCV/PII	8.6	- (7.8)	7.6			7.6	8.7

* from Hayman (1952) and Freeman (1981), measurements in brackets are average of 1♂ and 1♀ — from Freeman (1981)

** from Lawrence (1982) and Hill (1983)

*** recorded by Dr C. Smeenk (followed in brackets by measurements from Chasen 1939)

+ from Boadi (1990)



Figure 3: Photograph of *Otomops johnstonei* sp. nov. while alive (photo R.E. Johnstone and R.A. How).

Pelage

Described from carefully dried alcohol specimen; the colours produced were those of the live specimen which is confirmed by coloured photographs taken of the live animal. Colours described following Ridgway (1912) are capitalised.

Head covered with moderately long hair (5.5), Clove Brown (dark brown) overall but with basal one-third White; wide integument that connects ears, furred with Clove Brown to its anterior margin; anteriormost contact of this integument with ear marked with small patch of White hairs; posterior external edge of ear also marked by small patch of White hair; Clove Brown of head extends to base of neck where it is sharply demarked from a narrow band of long (10.5) Tilleul Buff to Vinaceous Buff (light-greyish buff) hairs. This mantle extends to mid back region as triangle of shorter (*c.* 5.0) hairs with a Smoke Gray (light grey) — Wood Brown (grey brown) mottled effect. Lower back and flanks to distal half of tibia Clove Brown. This colour forms a sharp line with plagiopatagium from which it is sharply demarked by a thin line of Smoke Gray. A clear wide stripe of Clove Brown hairs on dorsal propatagium sharply demarked on anterior edge and weakly on posterior edge by thin line of Smoke Gray hairs; thin line of Wood Brown hairs on dactylopatagium along radius outer dorsal

edge. Upper lip of face with distal end fringed with short drab coloured hairs. Ventral surface overall a Wood Brown but tipped with Smoke Gray in region of neck and chest, basal one-quarter of these hairs White.

Etymology

Named after our colleague Mr Ronald Eric Johnstone, Western Australian Museum. In recognition of his tremendous assistance and good companionship in the field on seven expeditions to Nusa Tenggara between May 1988 and May 1991.

Remarks

We were fortunate to be able to directly examine two specimens of *O. formosus* from Java. These agree closely with the type description of that species and with measurements and photographs of the *O. formosus* holotype provided by Dr Smeenk.

Previously, when Hayman (1952) described *O. secundus* from Papua New Guinea he noted that "further collection in New Guinea and other parts of the Indo-Australian Archipelago may eventually bring to light intermediate forms and so reduce to subspecific rank some of the named species". The Alor specimen, which is geographically located roughly equidistant between the Papuan and Javan *Otomops* species, tend to reinforce the specific status of the two New Guinea species, both of which appear distinct from the Alor specimen on the basis of their quite adequate descriptions and the skull illustration in Flannery (1990) of *O. papuensis*.

Java has at some time in the Pleistocene almost certainly been joined through Nusa Tenggara to Alor by dry land connections or, at most, very narrow water gaps in the Inner Banda Arc have separated these islands (Kitchener *et al.* 1990). Thus potential recently existed for ready exchange of genes between populations of bats throughout these islands. Despite this potential, our recent taxonomic studies indicate that a number of species or subspecies are endemic to Nusa Tenggara (Kitchener *et al.* 1991, a, b, c, d, e; Kitchener and Maharadatunkamsi 1991, and unpublished data). When these recent discoveries are added to the known endemic rodent and bat fauna in Nusa Tenggara (see Kitchener *et al.* 1990), it is obvious that a number of mammal speciation events have occurred *in situ* in this region. It is not surprising, then, to find that the form of *Otomops* on Alor I. is distinct from that on W. Java.

Acknowledgments

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Mrs N. Cooper, Western Australian Museum prepared the plates.

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