

# On a new species of *Rousettus* Gray, 1821, from Sumatra and Borneo (Mammalia: Megachiroptera)

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## Synopsis

*Rousettus spinalatus* n.sp. is described, based on an adult female and a juvenile male from the vicinity of Medan, Sumatra. It has also been found at Niah, Sarawak, Borneo. Its nearest living relative, with which it is at least partly sympatric, is *Rousettus amplexicaudatus* (Geoffroy Saint-Hilaire, 1810). The most obvious external characters by which *spinalatus* differs from this and other possible relatives are the high insertion of the endopatagium on the back next to the spinal line, and the subsequent absence of a true longitudinal dorsal band of fur between both endopatagial insertions. The new species differs further from *amplexicaudatus* in the shape and relative size of certain teeth. Earlier records of *Rousettus amplexicaudatus* from Sumatra are reviewed and a third species, *R. leschenaulti* (Desmarest, 1820), is recorded from that island for the first time.

## Introduction

Recently, two fruit bats of the genus *Rousettus* Gray, 1821, were collected in northern Sumatra and were sent to the Naturhistorisches Museum in Vienna (NMW). The Curator of Mammals, Dr K. Bauer, identified them as related to *Rousettus amplexicaudatus* (Geoffroy Saint-Hilaire, 1810) but doubted this determination on the ground of the extremely high wing insertion and sent them to one of us (Bergmans) for further study.

Some years ago Hill had received a similar specimen from Sarawak, Borneo. At the time he was reluctant to attach taxonomic significance to the peculiar condition of the wing insertion, considering that even if the specimen was not an aberrant example of *amplexicaudatus* it was, as a single subadult, inadequate as a basis for a new taxon.

New and detailed study of the Sumatran specimens and of the example from Borneo lead us to believe that they represent a hitherto unnamed species of the genus *Rousettus*, for which reason it is described below. Colours have been compared with the colour plates of Ostwald (1939) and translated into Ridgway colours with the tables of Zimmermann (1952). All measurements are in mm. The illustrations are by the first author.

## *Rousettus spinalatus* n.sp.

*Rousettus amplexicaudatus*, Harrison, 1967: 229 (partim: the ♀ specimen caught 6 November in Niah Great Cave).

**HOLOTYPE.** Adult female, skin and skull, collected in December 1977 in northern Sumatra (either in or near Medan, or in or near Prapat), by natives for Dr Kern (NMW 24112).

**PARATYPE.** Juvenile male in alcohol, young of the holotype; all data as for holotype (NMW 24113).

**REFERRED MATERIAL.** Subadult female, skin and skull, collected 6 November, 1965 at Niah Great Cave, Sarawak, Borneo (3° 52' N, 113° 44' E) by T. Harrison (BM(NH) 75.589).



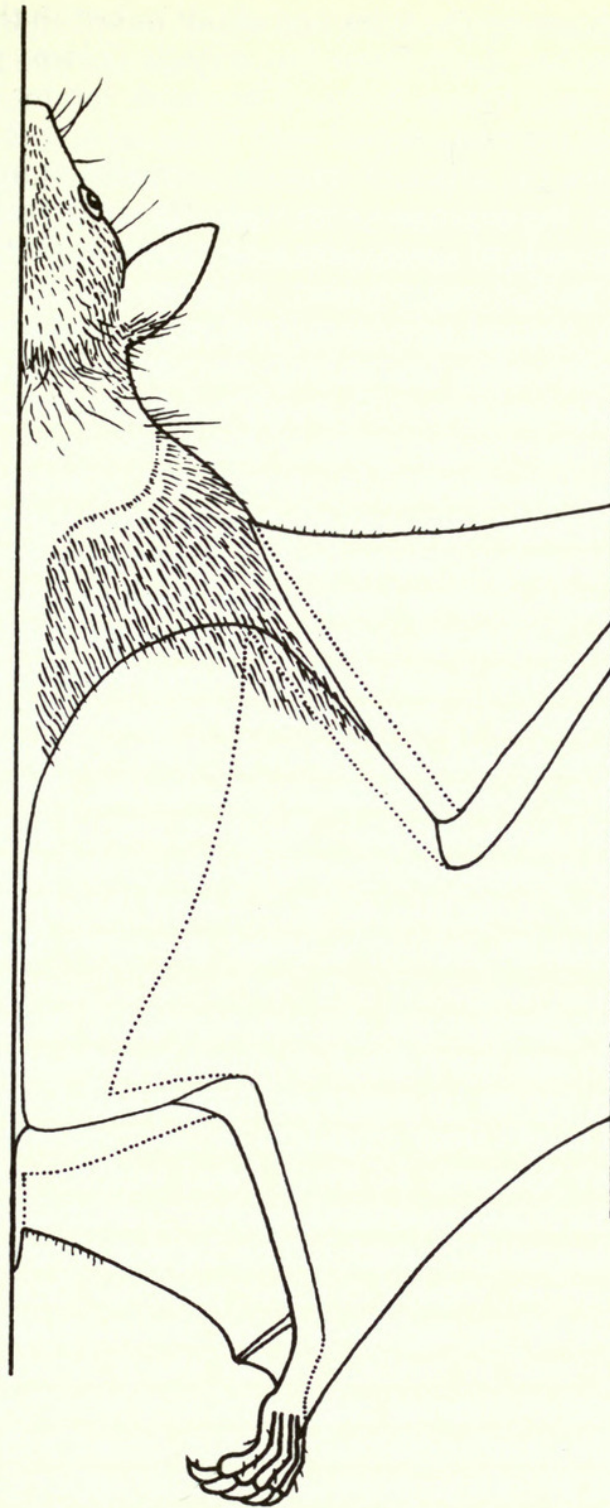
DESCRIPTION OF HOLOTYPE (remarks on paratype and on subadult from Sarawak stated as such). A rather small pteropine bat with all the characters typical of the genus *Rousettus* Gray, 1821, as diagnosed by Andersen, 1912, except for its high wing insertion. If subgenera are to be recognized within this genus, a member of the nominate subgenus with moderately deflected braincase, relatively broad cheek teeth, wings inserted at first toe, and a distinct antitragal lobe.

*Head.* Rostral part of head rather conical, sparsely furred with extremely short very dark brown (about Bone-Brown) hairs, with about 15 small warts bearing one longer hair each at either side between nostril, eye and upper lip, 10 to 15 such warts at either side of chin on lower lip, and about 6 at either side on area under eye behind mouth corner. Nostrils separated by a vertical cleft, slightly protruding, directed forward and outward. Chin pad widely V-shaped, with shallow groove in median plane and notched at its proximal point, and with a short (about 2 mm in paratype) and narrow offshoot at each side along lower lip. Both upper and lower lips rather thick, each with a single row of very small papillae on posterior half of inner margin. Tongue with field of toothed papillae on anterior part. Back of head rather domed. Ears moderately long, rather broad at bases and gradually narrowing to an obtuse point; margins thickened at bases. Antitragal lobe quite distinct, thick. Ears naked but for lower posterior part of outer surface; skin of conch dark brown.

*Wings and tail membrane.* Insertion of endopatagium (studied initially in the paratype because of its preservation in alcohol) along dorsal side of upper arm to a point just dorsal of axilla; from there in a weak curve backward, approximately following distal margin of scapula, toward spinal line, which is reached at the level of caudal point of scapula; following spinal line until level of the proximal part of the leg, from there further along dorsal side of the proximal part of the leg and shifting to outer side of the distal part of the leg, onto inside of proximal end of first phalanx of first toe. The wing is relatively short and broad, as is usual in *Rousettus*. Dorsally, the tail membrane or uropatagium seems a mere extension of the dorsal part of the endopatagium. It is also inserted along the dorsal side of the proximal part of the leg, along the same commissure as the endopatagium, and further along the inner side of the distal part of the leg and along the spinal line, to a point about halfway along the external tail, forming a pocket above the upper part of each leg. As a consequence, when viewed from the dorsal side, the legs seem to pierce through the membrane at the knees and the upper parts are hidden. From the tail, which is free for its last 4 mm in the paratype, the uropatagial margin runs almost straight towards the calcar, which has a length of 6.5 mm in the holotype, and from this to the inner side of the foot, slightly below the ankle. Wings and tail membrane dark brown; the propatagium, parts of the endopatagium (near the forearm and near the body), and the uropatagium except for a caudal zone are more transparent than the remaining parts of the membranes.

*Fur.* Interocular area, crown and sides of head to a line from angle of mouth to the base of the ear sparsely furred, the hairs short (up to 4 mm in length), dark brown (about Bone-Brown), somewhat longer on back of head. Nape with very few, long dark hairs (up to 10 mm in length) of the same colour. Lower cheeks and sides of chin and throat with somewhat longer, somewhat less sparse brownish white (near Light Cinnamon-Drab) hairs. Centre of chin and throat almost naked. Anterior part of back between shoulders naked, bordered laterally and posteriorly by a short mantle (total width up to 15 mm) consisting of a narrow band (4–5 mm) of brownish white, near Light Cinnamon-Drab hairs of up to 5 mm in length (some with dark brown tips), a zone of shorter dark brown, near Bone-Brown hairs with brownish white bases, and a zone of very short dark brown hairs. The subadult from Sarawak has a similar triangular naked patch between the shoulders, margined laterally by the rather long, brownish white hairs of the mantle, which towards the rear become shorter and darker brown to margin the anterior edge of the uropatagium over the back. The juvenile paratype has a relatively small triangular naked patch; the long hair on the back of its head extends further backward than in the holotype, and the sides of the neck are also furred. In the holotype there is a mid-dorsal, bald interruption of this mantle of about 5.5 mm width. In the juvenile paratype and in the subadult from Sarawak there is no such interruption: here, the





**Fig. 1** Diagram of insertion of endopatagium and of dorsal fur distribution in holotype specimen of *Rousettus spinalatus* n. sp. (NMW 24112).

mantle ends, caudally, in a point on the vertebral line. Along the upper arms the mantle continues in a narrow stretch to a point at about 21 mm from the elbow. The lateral borders of the mantle coincide with the insertions of the propatagium, the caudal border with the anterior insertion of the endopatagium. There is a very narrow zone of skin in between the longitudinal insertions of the endopatagium, about 2 mm wide in the dried skin of the holotype and in the subadult from Sarawak, with very few, apparently deciduous, short hairs scattered over the first two thirds of the length of the back. These hairs are very sparse in the holotype and in the subadult from Sarawak but more numerous in the paratype. The dorsal fur pattern is shown in Fig. 1.

Dorsal sides of uropatagium, tibia and toes with sparsely scattered hairs in paratype and in the subadult from Sarawak but almost naked in holotype. Chin and throat sparsely haired



with Light Cinamon-Drab hairs on the sides and about naked in the centre. Chest and belly with relatively dense but rather short Drab fur, slightly Tawny Olive in the centre, and darkening towards sides and lower belly. The back under the endopatagium and part of the adjoining sides of the body furred with fairly long (5–8 mm), slightly wavy hairs which are bi-coloured to give the effect of irregular, roughly transverse stripes, alternating dark and light brown and on the average 1 mm wide; this pattern is less obvious in the subadult from Sarawak. Ventral side of upper arm and proximal third of forearm thinly furred with Drab hairs. Proximal half of propatagium with sparse, thin, whitish to Tawny Olive hairs about 5 mm in length; ventral side of endopatagium and small area of mesopatagium near the elbow with similar fur; a few sparse hairs on mesopatagium along distal end of forearm. Ventral side of legs naked, of toes with incidental hairs; the ventral side of tail and surrounding uropatagium with a sparse scattering of thin hairs.

*Skull* (Figs 2–5). Premaxillae slender, in contact but not co-ossified anteriorly; dorsal profile of rostrum nearly a straight line, very slightly concave through weak upward curve of anterior tip of nasals and somewhat bulging frontal region; posterior part of dorsal surface of rostrum and frontal region with shallow longitudinal median groove, the area between post-orbital processes flattened. Temporal ridges separate anteriorly (about 3 mm apart in holotype), uniting at a point about 5 mm from the supra-occipital ridge. Rostrum relatively short, its lower part broad anteriorly. Interorbital constriction similar in width to postorbital constriction; braincase highly domed, and distinctly deflected from cranial axis (direction of alveolar line indicated in Fig. 2). Zygomatic arches slender, their greatest depth 1.3 mm in both holotype and subadult from Sarawak. Relative size of tympanic bullae as in other members of the genus; foramen magnum essentially hexagonal, slightly higher (5.5 mm) than wide (5 mm) in the holotype but slightly wider (5.3 mm) than high (5.1 mm) in the subadult from Sarawak. Mandible slender, relatively broad anteriorly (Fig. 5), with relatively high coronoid process (Fig. 3).

*Teeth\** (Figs 2–5) Upper incisors small, the outer tooth ( $I^2$ ) somewhat larger than the inner tooth ( $I^1$ ), curved posteriorly and inwardly;  $I^1$ – $I^1$  about as great as width of  $I^1$ ;  $I^1$  and  $I^2$  almost touching;  $I^2$  separated from canine by a narrow diastema ( $I^2$ –C about 1 mm). Upper canine rather short (reconstructed height from cingulum in holotype about 3.4 mm, its height from cingulum in subadult from Sarawak 3.5 mm); basal outline ovoid, the anterior part the widest; a very shallow vertical antero-internal groove; labial face evenly rounded; orientation of lingual slope about equally inward and backward; a narrow but distinct and nearly horizontal lingual shelf; narrow, weakly concave posterior face. Anterior upper premolar ( $P^1$ ) small, about the bulk of  $I^2$  or slightly heavier. Second upper premolar ( $P^3$ ) short and narrow, its base obliquely oval in outline; rather sharp antero-external keel; labial face relatively flat; distinct postero-external ridge; antero-internal and postero-internal slopes slightly concave, separated by a ridge-like commissure from tip to cingulum; no lingual shelf (a trace of this in the left  $P^3$  of the holotype). Third upper premolar ( $P^4$ ) low, its base obliquely rectangular in outline but with greatest width in posterior half; prominent narrow outer ridge with higher anterior cusp; inner ridge short, with lower antero-internal cusp which has a trace of a weak commissure; outer and inner cusps worn in holotype, rather blunt in paratype and in the subadult from Sarawak; postero-external corner differentiated, posteriorly, by a weak inward curve; low postero-internal lingual shelf. First upper molar ( $M^1$ ) low, rectangular but for a somewhat protruding antero-internal corner; outer ridge narrow, prominent but low, with weak cusp; inner ridge low, with a small cusp (worn in holotype, and not yet erupted in paratype and low in the subadult from Sarawak). Second upper molar ( $M^2$ ) low, more or less rectangular, anterior width the greatest; outer ridge weak, with trace of cusp; inner ridge and cusp hardly indicated; posterior side 0.3 mm in front of insertion of the lower margin of anterior zygomatic arch. Lower incisors small, the outer ( $I_2$ ) slightly longer than the inner ( $I_1$ ), both weakly bifid in the holotype, quite clearly so in the subadult from Sarawak. Lower canine short (reconstructed height from cingulum in holo-

\*Designation of teeth after Andersen (1912).



type about 2.2 mm, its height from cingulum in subadult from Sarawak 2.4 mm); essentially pointing slightly forward and outward, but tip recurving; roughly divisible into a vertically rather straight and horizontally rounded antero-external face and a vertically concave and horizontally rounded postero-internal face, separated labially by an obtuse ridge and lingually by a more distinct but still weak keel; lower part of postero-internal slope almost horizontal, forming an ill-defined and narrow posterior shelf. Anterior lower premolar ( $P_1$ ) low, squarish, rather small; labial face weakly rounded, lingual face a broad curve; weak but distinct outer ridge and cusp; lingual shelf a weak inward slope. Second lower premolar ( $P_3$ ) rather high (about 1.8 mm from cingulum), narrow, elongated; pointing slightly forward and outward; anterior keel weak but distinct; labial face rather flat, except anteriorly; antero-internal face rounded; postero-internal face an even slope, well-defined, slightly concave, gradually passing into a narrow, weakly sloping 'shelf'. Third lower premolar ( $P_4$ ) low, rounded anteriorly and widening into a rectangular posterior part; blunt outer and similar, somewhat lower inner ridge, both running from single medio-anterior cusp; no posterior ledge. First lower molar ( $M_1$ ) low, long, generally rectangular but slightly wider posteriorly; blunt anterior, labial and lingual ridges; no posterior ledge; surface concave. Second lower molar ( $M_2$ ) similar to  $M_1$ , but shorter, lower and at its widest anteriorly. Third lower molar ( $M_3$ ) yet smaller and lower, with blunt ridges on all sides and a concave surface.

*Palatal ridges* (Fig. 4). Formula 3 + 4 + 1 (division of the 4th ridge narrow, possibly anomalous; see Andersen, 1912 : 19); 6th to 8th ridges serrated. The 1st ridge runs between the posterior halves of  $C^1$ – $C^1$ , with a weak backward curve in the middle. The 2nd extends between the anterior halves of  $P^3$ – $P^3$ , with a slight forward curve. The 3rd starts at the anterior halves of  $P^4$ – $P^4$  and curves forward to a line joining the posterior halves of  $P^3$ – $P^3$ . The 4th begins just behind the antero-internal corners of  $M^1$ – $M^1$  and slants forward to a line joining the centres of  $P^4$ – $P^4$ . The 5th starts at the antero-internal corners of  $M^2$ – $M^2$  and reaches the level of the anterior halves of  $M^1$ . The 6th begins just behind  $M^2$ – $M^2$  and remains between these teeth. The 7th runs from a point just anterior to the middle of the lateral postdental palatal margin and remains just behind  $M^2$ – $M^2$ . The 8th ridge parallels the posterior margin of the postdental palate, increasing its distance only in the centre, where it points forward.

MEASUREMENTS OF THE HOLOTYPE AND (IN PARENTHESES) OF THE SUBADULT FROM SARAWAK. Collector's measurements of holotype: total length 105; forearm lengths 79 and 82.5; ear 17.4.

Measurements of the holotype were taken by Bergmans, of the subadult from Sarawak by Hill.

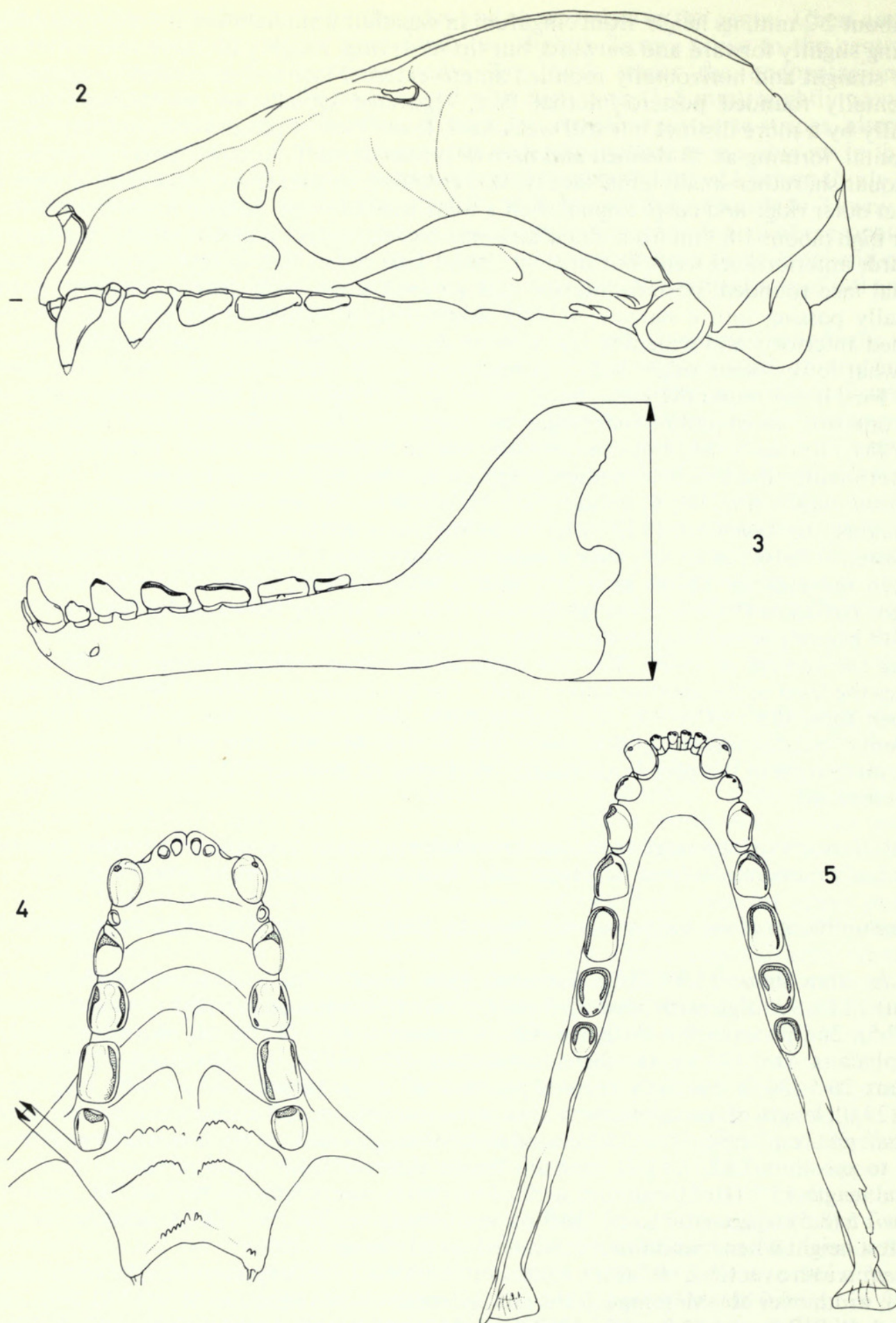
*Body*: tibia about 31.5 (27.5); foot with claw about 17 (17); forearm length (left) 80.6 ((right) 74.8); 1st digit with claw 25.5 (26.0); 2nd digit, metacarpal 32.3 (29.9), 1st phalanx 6.5 (7.5), 2nd phalanx 4.2 (4.7); 3rd digit, metacarpal 48.3 (43.2), 1st phalanx 30.6 (28.1), 2nd phalanx 41.0 (36.5); 4th digit, metacarpal 47.6 (41.8), 1st phalanx 23.2 (22.3), 2nd phalanx 26.5 (24.7); 5th digit, metacarpal 46.4 (42.2) 1st phalanx 21.6 (20.2), 2nd phalanx 23.5 (23.0); length of second phalanx always measured from end to end when unstretched.

*Skull*: greatest length 35.1 (33.2), condylobasal length 33.2 (31.0), rostrum length (front of orbit to prosthion) 12.1 (11.4), rostrum length (front of orbit to tip of nasals) 11.0 (10.3), palatal length 17.7 (16.5), cranium width 14.6 (14.2), interorbital width 7.4 (7.4), postorbital width 7.5 (8.5), zygomatic width 20.9 (-), mandibular length 26.5 (24.2), mandibular height (greatest height when mandibulum on a horizontal plane) 11.5 (-).

*Teeth*: width over  $C^1$ – $C^1$  6.7 (6.5), width between  $C^1$ – $C^1$  3.8 (3.8), length  $C^1$ – $M^2$  (cingula) 12.8 (12.4), width over  $M^2$ – $M^2$  (cingula) 9.9 (10.2), length  $C_1$ – $M_3$  (cingula) 14.1 (13.6).  $P^3$  2.2 × 1.2 (2.1 × 1.4),  $P^4$  2.3 × 1.8 (2.3 × 2.0),  $M^1$  2.8 × 1.8 (2.9 × 2.1),  $M^2$  1.9 × 1.5 (2.0 × 1.8),  $P_3$  2.0 × 1.1 (2.0 × 1.3),  $P_4$  2.2 × 1.5 (2.2 × 1.6),  $M_1$  2.4 × 1.5 (2.5 × 1.7),  $M_2$  2.2 × 1.4 (2.3 × 1.6),  $M_3$  1.7 × 1.1 (1.8 × 1.3).

ETYMOLOGY. The name *spinalatus* has been derived from the Latin words *spina* (= spine) and





**Figs 2–5** Skull and dentition of holotype specimen of *Rousettus spinalatus* n.sp. (NMW 24112). (2) Left aspect of skull; alveolar line indicated. (3) Left side of mandible; height indicated. (4) Ventral view of upper dentition and palatal ridges; shortest distance between M<sup>2</sup> and palate margin indicated. (5) Dorsal view of mandible with lower dentition. In the figs 3–5 worn areas on the teeth have been stippled.



*ala* (= wing) and refers to the insertion of the endopatagium along the spinal line, a unique condition within the genus *Rousettus*.

**DISTRIBUTION.** *Rousettus spinalatus* is known from the type locality (near Medan or Prapat, Northern Sumatra), and from Niah Great Cave, Sarawak, Borneo.

**BIOLOGY.** The juvenile paratype has a forearm length of 54.0 mm and was in the process of shedding its milk dentition. It still has its  $i^1$ ,  $i^2$ ,  $c^1$  (just behind the emerging tip of  $C^1$ ), all narrow cylindrical spicules with recurved tips,  $i^2$  somewhat bulkier than  $i^1$ , and  $p_1$  or  $p_2$ , a slightly heavier tooth in between the tips of  $P_1$  and  $P_3$ . The tips of  $C^1$ ,  $P^3$  and outer ridges of  $M^1$  and  $M^2$  have emerged, and also a large part of  $I_1$ , with the tips of  $I_2$ ,  $C_1$ ,  $P_1$ ,  $P_3$ , and  $P_4$ . Its ears are lying flat back against its head. It was caught in December together with the mother and apparently still an exclusive suckling. There is no accurate way yet to determine the age of specimens like this juvenile. There are strong indications that fruit bats of various species, among which *Rousettus aegyptiacus* (Geoffroy Saint-Hilaire, 1810), are weaned at an age of at least four months (see Bergmans, 1979), but our paratype is most certainly younger than that. Data on *Lissonycteris angolensis* (Bocage, 1898), a fruit bat of nearly the same size as *Rousettus spinalatus*, suggest that while at birth young ones have forearm lengths of about 40% of that of the mother, they may still be exclusive sucklings when this has increased to about 75% (Bergmans, 1979, and unpublished notes). If, with a forearm of about 67.5% the length of its mother's forearm, the paratype may be assumed to have been in its second or third month, birth will have occurred in September or October.

**ECOLOGY.** The specimen of *Rousettus spinalatus* from Niah Great Cave, Sarawak, Borneo, was caught in the cave mouth. Like other *Rousettus* species, *spinalatus* may be expected to roost in caves.

**PARASITES.** A spinturnicid *Meristaspis lateralis* (Kolenati, 1856) (Acari) was collected from one of the axillar endopatagium pockets of the paratype. This mite is known from several other species of *Rousettus* and also from a number of the other genera of the Pteropodidae.

## Discussion

**Type locality.** The holotype and its young were collected by natives working for a German dealer residing in Medan. Most of their specimens are from in or around this city, but some of their material was reported to originate from Prapat (or Prabat) at Lake Toba, at an altitude of about 2000 m. As none of their specimens bears a field label, all are from 'Medan or Prapat' (Dr K. Bauer, *in lit.*, 28 July, 1978). Most mammal collecting on Sumatra has been done in lowland areas, which until now have yielded few specimens of *Rousettus*. One might therefore seriously consider Prapat as potential type locality, and subsequently the species as possibly montane. However, this would be contradicted by the sparse fur of the two Sumatran specimens, and by the collection of the specimen from Niah Great Cave, a lowland site near the coast of Sarawak, Borneo. Incidentally, lowland fruit bat species do penetrate mountain forests, and the matter of the type locality cannot yet be decisively settled. (Our reason for not using the Sarawak specimen as type is that this is only subadult).

**Relationships.** Of all the known recent species of *Rousettus* only *R. amplexicaudatus* sensu lato shows a degree of morphological and dimensional similarity to *R. spinalatus*, and may well be regarded as its closest living relative in a phylogenetic sense. At the same time, the differences between the two species are distinct and constant, and independent evolution over a considerable stretch of geological time may be assumed. The holotype specimen of *spinalatus* has been compared directly with specimens of *amplexicaudatus* from Timor (its type locality; efforts to trace the actual type specimen in the Muséum National d'Histoire Naturelle in Paris, late in 1978, have failed), Sumatra, Enggano, Lang Island, Java, Nusa Penida, Pulau Peleng, Talisai (or Talise), New Guinea and the Philippines, all from the collections of the Museum Zoologicum Bogoriense at Bogor, the Rijksmuseum van



Natuurlijke Historie at Leiden, and Zoölogisch Museum in Amsterdam. Moreover, some alcoholic specimens from Cambodja in the Muséum National d'Histoire Naturelle in Paris and some dry specimens from Bangkok, Java, Bali, Nusa Penida and Timor in the Zoologisches Museum in Berlin have been studied. Additional specimens from Alor and Savu Islands, Sumatra, Enggano, Borneo, the Philippines and from Thailand in the collections of the British Museum (Natural History) have also been examined and measured.

The most useful distinguishing characters of *spinalatus* are the high wing insertion, the backward position of  $M^2$  (possibly related to an average greater relative length of the upper tooth row), and the morphology of a number of teeth. All specimens of *amplexicaudatus* have a distinct band of dorsal fur in between both endopatagial insertions, varying in width from 15 to 35.5 in the dry skins of the specimens examined (Table 1), whereas in *spinalatus* there is no such band (Fig. 1). The shortest distance between  $M^2$  and the margin of the palate where it passes into the rear of the zygomatic arch insertion (Figs 5a, b) is 0.7 in the holotype of *spinalatus*, and varies from 1.3 to 2.5 in *amplexicaudatus* (Table 1). The dentition of *spinalatus* shows the following differences (Figs 2–5): its upper incisors are more delicate;  $C^1$  is distinctly shorter, not as laterally compressed, with an egg-shaped instead of subelliptical outline, and has much more of a lingual shelf;  $P^3$  is slightly shorter, anteriorly not as laterally compressed, with its greatest width in the middle instead of in the anterior part, not as strongly tapering toward its posterior end, and without an inward curve in the back half of its outer ridge profile; the antero-internal corner of  $P^4$  scarcely protrudes forward, its postero-internal corner not reaching as far back as its postero-external corner, and its outer ridge is lower, with a more simple profile;  $M^1$  is slightly narrower, with a somewhat more salient antero-internal corner and also a lower and simpler outer ridge;  $M^2$  is somewhat longer and wider, with a lower and simpler outer ridge; its lower incisors are smaller;  $C_1$  is also less bulky, and lacks a vertical anterior keel;  $P_1$  is shorter and narrower;  $P_3$  is shorter and has a less sharp, more vertical anterior keel;  $P_4$  is shorter, without a distinct anterior vertical keel, and with the postero-external corner extending further backward than the postero-internal corner;  $M_1$  is somewhat shorter;  $M_2$  is either slightly shorter, equal in length, or somewhat longer;  $M_3$  is longer and wider.

Larger series of *spinalatus* may reveal other distinctive features. For instance, its mandibular height, measured as indicated in Fig. 3, may average higher than in most *amplexicaudatus* populations (see Table 1).

**Sympatric *Rousettus* species.** Hitherto, few Sumatran representatives of the genus *Rousettus* have been recorded. Temminck (1825) recorded *Pteropus amplexicaudatus* Geoffroy Saint-Hilaire (= *Rousettus*) from 'Sumatra', but does not specify the material on which this was based. From his text it may be inferred that this must have been either the adult female or the young specimen which he stated to be in the collection of the Rijksmuseum van Natuurlijke Historie at Leiden. Jentink (1887) listed, as specimen d, an adult skeleton as the sole Sumatran representative of *Rousettus amplexicaudatus* in this collection, which may have belonged to Temminck's specimen. Another reference to Sumatran *R. amplexicaudatus* appeared in Dobson (1878) under *Cynonycteris amplexicaudata*. This was based on a specimen from 'Sumatra' in the British Museum (Natural History) (38.3.13.36), which Andersen later (1912: 43 and 812) referred to the nominate subspecies. (As is obvious from his hand-writing on the label of the Leiden specimen mentioned above, Andersen had also seen this example, and identified it likewise.) In the course of the present study, both specimens have been re-examined, and both were found to represent *amplexicaudatus*. We are not aware of any published record of Sumatran *Rousettus* other than the ones mentioned, and it seems useful to mention here other species and specimens which have recently come to our knowledge.

*Rousettus leschenaulti* (Desmarest, 1820)

Kalianda, South Sumatra: 1 ♂, skin and skull, 2 August 1934, leg. J. J. Menden (Zoologisches Museum Berlin 39608); forearm length 90.9, greatest skull length 42.1, condylobasal length 40.9. Its teeth are too worn to allow measuring.



**Table 1** Comparative measurement ranges (in millimetres) of the holotype of *Rousettus spinalatus* n.sp. and of *Rousettus amplexicaudatus* (Geoffroy Saint-Hilaire, 1810).

Width of dorsal fur band at level of elbows when pressed against body		Shortest distance of M <sup>2</sup> to margin of lateral palate/zygomatic arch		C <sup>1</sup> -M <sup>2</sup> length as percentage of condylobasal length		Height of mandibulum as percentage of its length	
♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀
n	min.-max.	n	min.-max.	n	min.-max.	n	min.-max.
<i>R. spinalatus</i>							
holotype	1 0		1 0.7		1 38.6		1 43.4
subadult from Sarawak	1 0		1 0.6		1 40.0		
<i>R. amplexicaudatus</i>							
Sumatra	1 31		2 1.3-1.3		1 ± 35.3		2 37.1-38.6
Thailand		1 1.3	1 1.3			1 43.0	
Cambodia	1 21						
Enggano	1 22.5	1 2.1	2 1.7-1.8		1 36.1	1 40.5	2 39.9-40.9
	1* 20						
Lang Island	2 19-23		2 1.6-1.6				
Java	6 17-35.5	6 1.4-1.9	2 1.6-1.9	1 37.2	2 36.5-38.5	2 39.0-41.6	2 41.7-43.0
Bali	14 12.5-33.5	9 1.4-2.0	5 35.1-38.3	8 35.3-37.7			6 38.5-41.3
	1 18						
Nusa Penida	2 26-29.5	1 2.4	1 1.6	1 36.9	1 35.0		
Alor Island	1 15.5	1 1.8	1 1.3	1 35.9	1 35.3	1 39.4	1 42.0
Savu Island	1* 18		1 1.5	1 36.7			1 39.4
Timor	8 20.5-29.5	2 2.0-2.4	5 1.6-2.0	2 35.9-36.2	5 34.7-38.1	1 40.2	4 37.9-40.4
Borneo	3 27.5-30	1 2.0		1 34.8		1 44.1	
	1* 23	1 1.4		1 36.5		1 42.2	
Talisai	1 20.5	1 2.5					
Pulau Peleng	1 15	1 1.6				1 42.8	
New Guinea							
Philippines	3 15-23.5	3 1.6-2.3	4 1.6-1.9	2 34.0-35.6	1 35.9	2 43.3-43.9	3 39.7-41.6
	1* 20.5						
	3 16-19						
	1* 17						

\*Specimens in alcohol (all others: dry skins)



From its measurements, this specimen, which is the first of this species recorded for Sumatra, seems to link the western nominate race with the larger, eastern subspecies *shortridgei* Thomas & Wroughton, 1909, from Java.

#### *Rousettus* species

According to Boeadi (*in lit.*, 22 March, 1979) there are in the Museum Zoologicum Bogoriense at Bogor about 27 Sumatran *Rousettus* specimens from Lampong, South Sumatra, and upper Siak-Kampar rivers, Central Sumatra, of which the specific identity has not yet been determined.

Of course, actual sympatry of *spinalatus* with either *amplexicaudatus* or *leschenaulti* on Sumatra has yet to be proven.

The specimen of *Rousettus spinalatus* from Sarawak, Borneo was first recorded as *R. amplexicaudatus* by Harrisson (1967: 229). This specimen, taken 'low off floor' in the West Mouth of Niah Great Cave, is now BM(NH) 75.589. The other specimen that he records, a male, taken about six weeks previously on the same spot and now BM(NH) 69.221, actually represents *R. amplexicaudatus*. Thus, at Niah at least both species occur sympatrically. *R. amplexicaudatus* has also been recorded from Sabah and West Kalimantan (Medway, 1977: 39).

### Acknowledgements

We thank Dr K. Bauer, Vienna, for drawing our attention to the Sumatran specimens of *Rousettus spinalatus* and allowing us to study these. We gratefully acknowledge the help of Ms Dr A. Zuiderwijk of the Instituut voor Taxonomische Zoölogie in Amsterdam, who, with the assistance of Mr Tranier of the Muséum National d'Histoire Naturelle in Paris, tried to locate the holotype specimen of *Rousettus amplexicaudatus*. Dr C. Smeenk of the Rijksmuseum van Natuurlijke Historie at Leiden was helpful in giving access to the important collections of Indonesian *Rousettus* in that museum. Dr H. Hackethal of the Zoologisches Museum in Berlin kindly allowed us to study the *Rousettus* specimens in his care. We are also indebted to Dr F. Dusbábek of the Parasitologický Ústav, Československá Akademie Věd, Praha, who identified the mite from the paratype of *Rousettus spinalatus*.

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<https://doi.org/10.5962/p.12608>.

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