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Revision of the Three-striped Dasyures, Genus *Myoictis* (Marsupialia: Dasyuridae), of New Guinea, With Description of a New Species

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ABSTRACT. The history of the discovery and naming of specimens now referred to *Myoictis* is presented. A study of virtually all known specimens of *Myoictis* deposited in Museum collections was undertaken to clarify the number of species in this genus of endemic New Guinean dasyurid marsupials. Based on a number of morphological features four species are now recognised, namely *M. melas, M. wallacei, M. wavicus* n.stat. and *Myoictis leucura* n.sp. The form of the tail readily distinguishes the four species. The distribution of each species has been mapped and no overlap found in their ranges as presently known. Field observations are recounted. Data for all specimens examined is appended to facilitate future studies.

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The first dasyurid marsupial from the island of New Guinea, now known as *Myoictis melas*, was collected in August 1828. Heinrich C. Macklot and S. Müller were among the members of the Natural Science Commission for the Netherlands Indies (Husson & Holthuis, 1955) who visited the south coast of New Guinea where the Dutch were establishing a Government post at Lobo, on Triton Bay. While there a Papuan brought a small male marsupial aboard the navy corvette "Triton" on which they were travelling. All they could learn from this and other Papuans concerning the animal was that it lives in the forest on the ground, forages mainly at night and is called "Insinsie" by the inhabitants of the region (Müller & Schlegel, 1845). It was recognized as a new species of *Phascogale*, eight of which were already known from Australia, and referred to as *Phascogale melas* by Macklot (1830), the specific name given in reference to its uniform black colour.

Müller (1840) also used this name in conjunction with a very brief, non-diagnostic "description"* in a footnote to his report on the expedition. Some years elapsed before it was redescribed in greater detail as *Phascogalea melas* (Müller & Schlegel, 1845). I follow Laurie & Hill (1954) and later authors in attributing the name *Phascogale melas* to Müller (1840).

Schlegel (1866a) described a second species of this genus based on two specimens (male and female) collected by H.A. Bernstein in February 1865 on the island of Salawati, northwest New Guinea. This species, *Phascogalea Thorbeckiana*, differed markedly from *P. melas* in being brightly coloured and having three black stripes down the back. In the same year as he described *Thorbeckiana*, Schlegel drew attention to a specimen collected by A.R. Wallace on the Aru Islands that was described by Gray (1858) as *Myoictis Wallacii* [sic]. Schlegel (1866b)

* The "description", in translation from the Dutch, reads as follows: Size of an ordinary rat (Mus rattus). Uniformly black; on the back the short soft hair has the purest colour and is slightly shiny. The underside fades into a dull rusty black. The underside of the tail and the paws and the blunt tipped ears are sparsely covered with short fine hairs. The eyes are brown.

Fig. 1. *Myoictis* from (*a*) the Aru Islands (Group 1, no. 39); (*b*) Nenei in the Arfak Mountains (Group 8, no. 34); and (*c*) Wau (Group 4, no. 27). The geographic location of each group can be seen in Fig. 2. The Nenei specimen was caught by hunters and some hair was lost on the proximal half of the tail as a result of handling. The Wau specimen was moulting when photographed, hence the line in the fur across the rump and thigh.

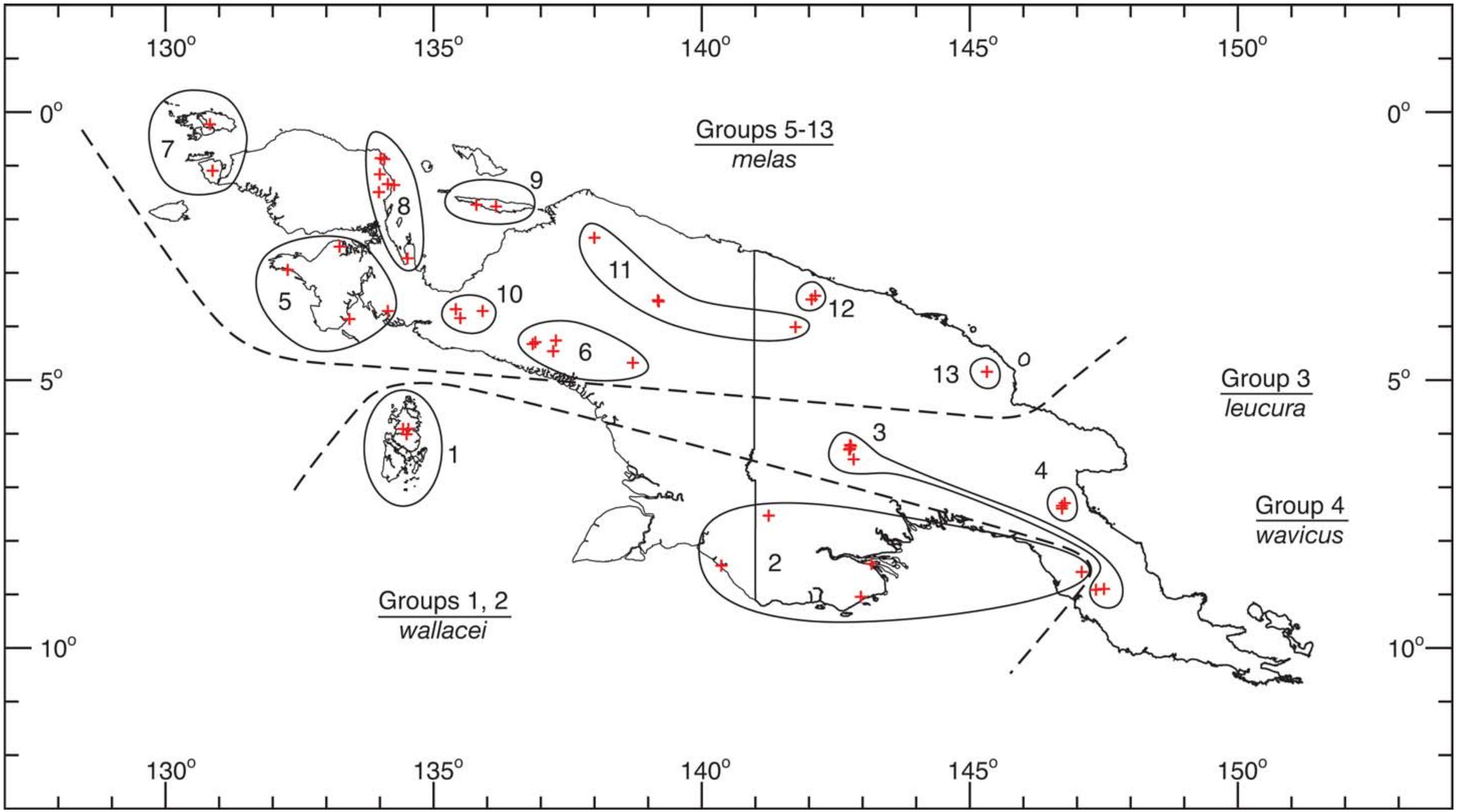

Fig. 2. Distribution of *Myoictis* specimens examined. Groupings 1–13 are based on characteristics of the tail and pelage, and on the area in which the specimens were collected. Coordinates for each specimen given in Appendix 1. Groups considered to represent a species demarcated by broken lines.

Phascogale melas	Müller, 1840	Triton Bay
Phascogalea melas	Müller & Schlegel, 1845	Triton Bay
Myoictis Wallacii [sic]	Gray, 1858	Aru Islands
Phascogalea Thorbeckiana	Schlegel, 1866	Salawati Island
Chaetocercus Bruijnii	Peters, 1875	Andai, Arfak Mountains
Phascogale pilicauda	Peters & Doria, 1881	Fly River
Phascogale melas senex	Stein, 1932	Weyland Range
Phascogale melas bürgersi	Stein, 1932	Meanderberg, April River
Myoictis melas wavicus	Tate, 1947	Wau

considered that this animal, a juvenile with incomplete dentition, showed affinity with *Phascogalea Thorbeckiana* and did not warrant placement in a separate genus. He suggested that only differences in coat colour existed between animals from Triton Bay (*melas*), Salawati (*Thorbeckiana*) and Aru (*Wallacei*). However, he conceded that lack of material prevented him from grouping them as a single species in which colours are modified according to locality and perhaps individually as a consequence of melanism, as in *melas*. In addition to these three named forms others, from various localities in the New Guinean region (Papua New Guinea, West Papua and the Aru Islands), have been described and all are listed above.

Chaetocercus Bruijnii, described by Peters (1875), was placed in the synonymy of *Thorbeckiana* by Peters & Doria (1881). Thomas (1887), in a review of the then known species of *Phascologale*, synonymized *melas, thorbeckiana* and *bruijnii* under *thorbeckiana* (which he justified on the basis that the name *melas* was misleading, being founded on a melanism), and *pilicauda* with *wallacei*. However, as Jentinck (1908) pointed out, *melas* has priority over *thorbeckiana*. Jentinck lamented, in sympathy with Thomas, that "this most splendidly coloured of the whole *Phascogale* group should be called *melas*". Later, Tate & Archbold (1937) placed these forms in a subgenus (*Myoictis*) of *Phascogale* within the Phascogalinae and, in his review of the Dasyuridae, Tate (1947) placed *Myoictis* as a genus within the Dasyurinae. He recognized two species, *Myoictis melas* (Müller & Schlegel) to which he referred *melas, thorbeckiana, bruijnii, senex* and *bürgersi*, and *Myoictis wallacei* Gray, to which he referred *pilicauda*. Within *M. melas* he recognized two subspecies, *M. melas melas* and his newly described *M. melas wavicus*. Tate & Archbold (1937) suggested that *Phascogale nouhuysii* (Jentinck, 1911) might represent an additional species of *Myoictis*, but Tate (1947) referred *nouhuysii* to the genus *Neophascogale*. Further study of the type specimen of *nouhuysii* has revealed that it is identical with *Phascolosorex doriae* (Husson, 1955; Woolley, unpublished observations). *Phascologale* and *Phascogalea* are now considered to be invalid amendments of *Phascogale* (Mahoney & Ride, 1988).

Myoictis, with the exception of a few melanistic specimens, can be distinguished from other dasyurids by its dorsal pelage pattern of three longitudinal black stripes, hence its common name of Three-striped Dasyure. Other characters that help to define the genus include the blunt rostrum and wide interorbital region; a diastema between the first and second incisor teeth; second premolar tooth large in comparison with the first and third; large, well-rounded bullae and nasal bones markedly broadened at their bases (Tate & Archbold, 1937; Tate, 1947). Tate's two species (*melas* and *wallacei*) were characterized by differences in (i) the hairiness of the tail (moderately haired and tapering in *melas* and densely long haired to the tip in *wallacei*) and (ii) the premolar teeth (upper third premolar double rooted but much smaller in *melas* than in *wallacei*; lower third premolar single rooted or absent in *melas*, double rooted in *wallacei*). He also noted differences between *melas* and *wallacei* and his new subspecies *wavicus* in the size of the skull, the posterior palatal foramina and the auditory bullae, and in the width of the talonid of the lower fourth molar (Tate, 1947). Thomas (1888) drew attention to differences in the footpads between *thorbeckiana* (i.e. *melas*) (first interdigital and thenar pads fused) and *wallacei* (pads not fused) and he illustrated the foot of *wallacei*. Jentinck (1908) has illustrated the foot of *melas*.

Uncertainty about the number of species or subspecies of *Myoictis* apparently still exists. Laurie & Hill (1954) list a single species, *Myoictis melas*, and three subspecies, *M. melas melas, M. melas wallacei* and *M. melas wavicus*. Ziegler (1982) and Menzies (1991) make reference to only *Myoictis melas*, and Flannery (1990, 1995a,b) lists two subspecies, *M. melas melas* and *M. melas wallacei*. The question of how many species constitute the genus *Myoictis* was raised in my mind in the course of making collections of New Guinean dasyurids for study of their reproductive biology. The very marked differences in coat colour (Fig. 1), together with differences in other features, seen in specimens collected in three widely separated localities suggested that they represented more than one species (in contrast to the suggestion by Schlegel above) and led to the present attempt to answer the question.

Materials and methods

One hundred and thirty one specimens (75 males, 32 females, 24 sex unknown) held in the collections of the fifteen museums listed below have been examined. The number of specimens of *Myoictis* in each museum follows the name of the museum and its abbreviated name in parentheses.

American Museum of Natural History, New York	(AMNH)	17
Australian Museum, Sydney	(AM)	8
Australian National Wildlife Collection, CSIRO Canberra	(ANWC)	16
Bernice P. Bishop Museum, Honolulu	(BBM)	6
British Museum (Natural History), London	(BM)	28
Museo Civico di Storia Naturale "Giacomo Doria", Genoa	(MCG)	5
Museum für Naturkunde an der Humboldt-Universität zu Berlin	(ZM)	9
Museum of Comparative Zoology, Harvard University	(MCZ)	1
Muséum national d'Histoire naturelle, Paris	(MNHN)	2
Museum Zoologicum Bogoriense, Bogor	(MZB)	4
Papua New Guinea National Museum, Boroko	(PNGM)	23
Queensland Museum, Brisbane	(QM)	1
Rijksmuseum van Natuurlijke Historie, Leiden	(RMNH)	9
University of Papua New Guinea Museum, Waigani	(UPNG)	1
Western Australian Museum, Perth	(WAM)	1

The museums were visited in 1985 and 1986, so any specimens added to the collections since then have not been examined except for recent additions to the AM, MZB and UPNG. The ANWC specimens were lodged after study at La Trobe University where many of them had been maintained alive for observations on reproduction.

The collector, date and locality of collection, sex, and type of material available for examination (e.g., skin, skull, spirit specimen) were noted for each specimen. The coordinates and the elevation of the locality were obtained from sources such as the collector's records, expedition reports, publications relating to particular specimens, Hydrographic Office of United States Navy Department Gazetteer of New Guinea and Nearby Islands No. 2 (1944), the gazetteer in Laurie & Hill (1954), Central Mapping Bureau Papua New Guinea Gazetteer (1974), an unpublished BBM list of New Guinea localities compiled in 1966 and, in a few cases, by calculation from topographic maps. This information, together with the museum accession number (without any prefix) forms Appendix 1. Each specimen has been assigned a number from 1–131 to simplify reference in the text to particular specimens. The distribution of the specimens was mapped with Ivenza MapPublisher using Macromedia Freehand.

The specimens were examined to collect information on the colour of the pelage, form of the tail, number of nipples in the pouch, body size, footpads and dentition. Any comments by the collector were noted. Coat colour and form of the tail was assessed by comparison of each specimen with colour photographs of skins of specimens from the BBM and AMNH that showed the range of variation. The number of nipples, if not recorded by the collector, could sometimes be determined by examination of the skin. Body size, including mass (g) and measurements (mm) of head-body length (total length minus tail length) and hind foot length (heel to base of claw of the longest digit) was obtained from the records of the collector/preparator. Foot length of some specimens was measured to the nearest 0.1 mm. In a few cases adjustments were made to foot length as recorded because the claw had been included, and in one case to head-body length, where the measurement was obviously incorrect (given as 470 mm for specimen no. 77 and reported as this by van der Feen [1962]). The number of premolar and molar teeth present in both upper and lower jaws was determined and observations made on the relative sizes of the premolars and, for P3, the number of roots. Tooth nomenclature follows Luckett (1993). The cheek teeth are designated P1, P2, dp3, P3 and M1–4, in contrast to Tate (1947) who designated the premolars differently as p1, p3, dp4 and p4. Various cranial and dental measurements were made to the nearest 0.1 mm using digital calipers. Those used in the present study include basicranial length (from the anteriormost point of the foramen magnum to the anterior base of the first pair of incisors) and length of the lower molar tooth row. Specimens were classed as adult if they had a full set of cheek teeth or, in a few cases in which the teeth could not be examined, if they had been assessed as sexually mature in a separate study on the same material (Woolley, 1994). Much of this information is contained in Appendix 2.

Photographs of several aspects of the skulls and dentaries of specimens 4, 11, 23, 36, 41, 44, 48, 77, 79, 90, 96 and 131 were prepared for reference. X-ray photographs of the dentaries of Aru Island specimens 38, 39 and 40 assisted in the assessment of the premolar teeth. The X-ray photographs have been lodged in the ANWC. The length of the tail hairs was determined from spirit specimens 26, 29, 30, 33, 35–41.

Results and discussion

Distribution, form of the tail and coat colour

The Three-striped Dasyure, *Myoictis*, is widely distributed over mainland New Guinea and it has been found on some offshore islands including Salawati and Waigeo at the western tip of the Vogelkop (Bird's Head), Japen to the north and the Aru Islands to the south (Fig. 2). For descriptive purposes thirteen groups of specimens have been delineated by area of collection together with characteristics of the tail and coat colour, which were assessed by comparison with reference specimens (Fig. 3). The individuals placed in each group (see Appendix 2) can be identified by means of the reference number given to them in Appendix 1. Given the small number of specimens in many of the groups it is not clear if any significance can be attributed to the altitudinal range seen within each group (Table 1), especially as some early collectors relied on hunters for their specimens and the recorded locality (and elevation) may not be accurate. Hunters may carry specimens considerable distances from the place of collection, and elevation may change rapidly over a short distance.

Group 1 (Aru Islands). The specimens all have tails that are densely long-haired to the tip (Figs. 1a, 3a). This gives the tail a bushy appearance, especially when the hairs are erect. The hairs on the top and sides of the tail are up to 20 mm long, while the flattened underside is almost bare (Fig. 4a). This group contains the type specimen of *Myoictis wallacei* (no. 48), the tail of which Gray (1858) described in the following words. "Tail depressed, tapering, clothed with rather elongated hairs above and on the sides, the underside flat, nakedish." The coat colour of this specimen was given by Gray as "Rusty-brown, with interspersed black longer hairs; head redder, throat, chest and belly pale reddish; side of neck at base of the ears bright reddish; ears and greater part of the tail bright red-brown; tip of tail black". Gray did not mention the dorsal stripes, which were not very obvious in the juvenile specimen upon which his description was based, but they are present in all specimens. The median stripe is faint on the head. There are only a few, if any, black hairs at the very tip of the tail but apart from this and the lack of any reference to the stripes, Gray's description of coat colour fits the specimens in this group.

Group 2 (southern mainland New Guinea). The specimens in this group also have bushy, reddish-haired tails (Fig. 3b). The dorsal stripes are perhaps a little more distinct, and the coat colour a little less reddish overall in comparison with Group I specimens. The median stripe tends to be fainter, especially on the head. This group contains the types of *pilicauda* (nos 79 and 81). Thomas (1888) synonymized *pilicauda* with *wallacei*, to which he gave the common name Red-tailed Phascologale.

Group 3 (Mt Bosavi, Mt Sisa, Mt Victoria/Vanapa River—on the southern side of the Central Cordillera in the eastern half of New Guinea). The specimens in this group have whitish hairs on the terminal portion of the tail (Fig. 3c, specimen from Mt Bosavi) and they differ from all other groups in this respect. The tail is long-haired above and on

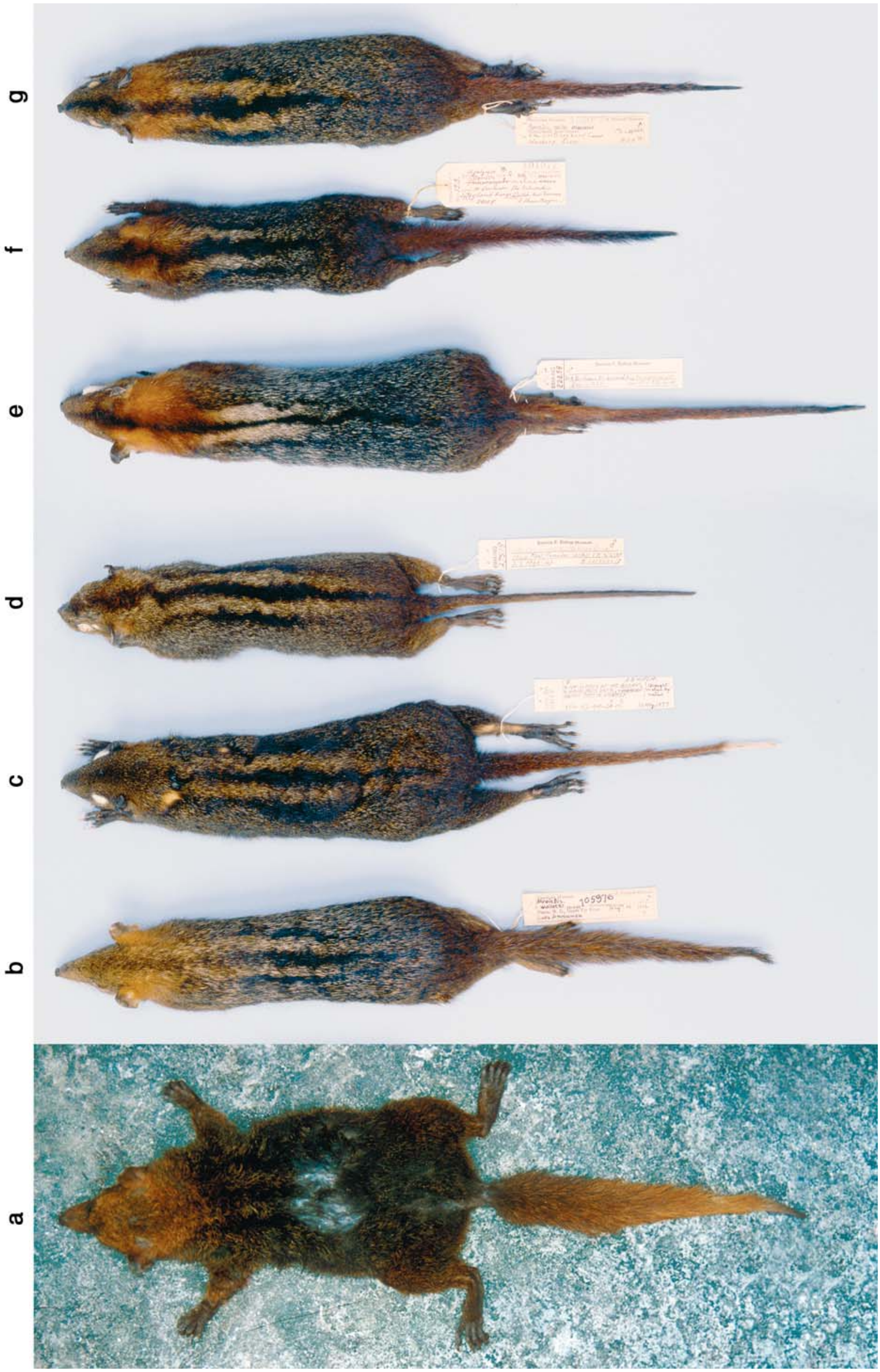

Fig. 3. Pelage of *Myoictis* specimens from various localities: (*a*) Group 1 (no. 37); (*b*) Group 2 (no. 4); (*c*) Group 3 (no. 44); (*d*) Group 4 (no. 43); (*e*) Group 8 (no. 16); (*f*) Group 10 (no. 2); and (*g*) Group 11 (no. 9). (*a*) was photographed in the field and it shows fur loss on the back from handling at capture, (*b–g*) Museum skins. (*a*) at approximately the same magnification as (*b–g*).

Fig. 4. Tail of (*a*) *wallacei* (no. 38); (*b*) *leucura* (no. 22); (*c*) *wavicus* (no. 29); (*d*) *melas* (no. 36, Group 8); (*e*) *melas* (no. 33, Group 8); (*f*) *melas* (no. 96, Group 5); and (*g*) *leucura* (no. Group 3). (*a–d*) preserved specimens, dorsal aspect above, ventral aspect below. (*e–g*) fresh specimens. (*e*) and (*f*) lateral aspect; (*g*) ventrolateral aspect.

the sides (Fig. 4b) and the hairs, which are about 10–15 mm long at the base, gradually decrease in length towards the tip. The flattish underside of the tail is sparsely covered with shorter hairs. The white-haired portion of the tail ranges in length from 9–65 mm, or 5–39% of the total length of the tail, in the eleven specimens for which this information was obtained. The black dorsolateral stripes are distinct and extend from behind the ears to the rump. The median stripe extends forward on the head. The general coat colour is a dark reddish brown above, with brighter reddish hairs between the stripes, and lighter below. Like the specimens in Group 4 (see below) they lack red patches behind the ears. It has not been possible to determine the precise locality of collection for the three Mt Victoria/Vanapa River specimens (nos 55, 80 and 120) included in this group. The coordinates given are based on information gleaned from the reports of early explorers and collectors in this region, including MacGregor (1898). This group includes the specimen (no. 55, skin only) that Tate (1947) was undecided about the placement of. Tate made no reference to the presence of white hairs on the tail of this specimen, which are clearly evident even though some of the distal portion of the tail has been lost.

Group 4 (Wau, Mt Missim—to the north of the Central Cordillera in the east). The general body colour of the specimens in this group is duller (i.e. less reddish) than in all other groups (Figs. 1c, 3d). This group includes the specimen (no. 90) that Tate (1947) described as "A non-melanistic race" (*wavicus*) "of *M. melas* in which the red patch on each side of the head, neck and shoulders is almost completely suppressed." The tail hairs are about 10 mm long at the very base of the tail, and about 5 mm along the greater part of the length of the tail (Fig. 4c). The hairs are sparser on the underside, which tends to be rounded rather than flattened.

Group 5 (Bomberai Peninsula—the southern part of the Bird's Head). The four specimens in this group include the melanistic type of *M. melas* (no.121), which is illustrated in Plate 25 accompanying the description of *Phascogalea melas* by Müller & Schlegel (1845), another two melanistic specimens (nos 96 and 128), and one (no. 56) that can be regarded as "normally" (i.e. brightly) coloured. The latter has bands of whitish fur on either side of the median dorsal stripe and is similar in appearance to the Group 8 specimen illustrated in Fig. 3e. All have well-haired, dorsally crested tails as described by Müller & Schlegel (1845) for the type specimen, which reads, in translation from the Dutch, as follows—"The tail is about the length of the body and stretched forward it reaches the ears. This part has roughly the appearance of a rat's tail, in that it tapers from the base to a point. The whole underside is so sparsely haired that the rough skin, which lacks annulations, shows through. On the upper side the hair is very dense and longer, and from about half way along the hairs are directed upwards and backwards and they form a small brush at the tip." The tail of specimen 96 (Fig. 4f) conforms to this description.

Group 6 (Snow Mountains—southern side of the Central Cordillera in the western half of New Guinea). The specimens in this group have crested, tapering tails like those in Group 5. Five (nos 62, 63, 65, 66 and 82) of the ten specimens are melanistic, and four (nos 60, 61, 64 and 67) are similar in body colour to the specimen illustrated in Fig. 3e. Only the skeletal remains of the tenth specimen (no.127) in the group, which is the specimen referred to by Jentinck (1908) as brightly coloured, were examined in the present study. Many of the specimens in this group were collected on the British Ornithologists' Union Expedition to New Guinea 1910–1911 and so far as can be determined melanistic (e.g., nos 62 and 63) and non-melanistic (e.g., nos 60, 61and 64) specimens were collected in the same locality.

Group 7 (Salawati and Waigeo Islands). These specimens also have well-haired, tapering tails and are brightly coloured like the specimen shown in Fig. 3e. The following description (translated from the French), by Schlegel (1866a) of the two specimens (nos 123 and 124) collected on Salawati by Bernstein applies to all specimens in this group. "Head, neck, feet, tail and rump of a red-brown, vivid on the occiput, the nape and the sides of the neck, dark on the tail and the rump, pale and mixed more or less with blackish on the face and the feet. Top and sides of the trunk of a grey-brown replaced, on top of the shoulders, by reddish white-grey, bordered laterally by a black stripe. Another black stripe occupies all of the mid-line of the back and extends forward as far as the forehead. Underside of the body of a pale red." This description is equally applicable to Group 8 animals (see below). Photographs of a Salawati specimen (no. 123) and a Waigeo specimen (no. 92), which shows the long hairs on the upper side of the tail, appear in Flannery (1995b, pp. 61, 62).

Group 8 (Arfak Mountains and Oransbari in the northern part of the Bird's Head, and Wasior on the Wandammen Peninsula). With the exception of specimen 77 the coat colour of the specimens in this group (Fig. 1b, specimen from the Arfak Mountains and Fig. 3e, specimen from Oransbari) is the same as in Group 7. No. 77 lacks the bands of whitish fur in the shoulder region and its coat is similar in colour to the specimen shown in Fig. 3g. The illustration of specimen 77 that appears in Peters & Doria (1881), and is reproduced in Flannery (1990, 1995a, p. 75), shows it without whitish fur between the dorsal stripes. The specimens in Group 8 have crested, tapering tails (Fig. 4d,e). The hairs are 10–15 mm long at top and sides of the base of the tail, and the hairs decrease in length along the top of the tail to the tip. The underside of the tail is covered with very short hairs.

Group 9 (Japen Island). These specimens are similar in appearance to the Group 11 specimen shown in Fig. 3g. They have well-haired, tapering tails and reddish rather than the whitish bands of fur on either side of the median stripe in the shoulder region seen in specimens from Groups 5–8.

Group 10 (Weyland Range—at the western end of the Central Cordillera). Coat colour in these specimens is like that of Group 8 specimens (Fig. 3e), with the exception of two specimens (nos 1 and 2), in which the pale areas beside the median stripe show a little less white (Fig. 3f, a juvenile specimen). They have crested, tapering tails. This group contains five of the six specimens (sixth not seen) described by Stein (1932) as a new subspecies, *Myoictis melas senex* (no. 87). Stein's diagnosis was based on a colour difference from *M. melas melas*, that was not apparent to me. Tate (1947) also found the colour difference to be not so marked as claimed by Stein, and Tate placed *senex* in the synonymy of *melas*.

Group 11 (Mamberamo, Idenburg and April Rivers—to the north of the Central Cordillera). The specimens in this group have reddish fur on either side of the black median stripe (Fig. 3g, specimen from Idenburg R) and they have dorsally crested, tapering tails. The Meanderberg, April River specimen (no. 83) included in this group was described as a subspecies (*bürgersi*) by Stein (1932), again on colour differences that were not readily apparent to me or to Tate (1947), who placed *bürgersi* in the synonymy of *melas*.

Group 12 (Torricelli Mountains) and Group 13 (Adelbert Mountains). Each of these groups is represented by only two sub-adult specimens. The four are similar in appearance to those in Group 11, with reddish fur between the dorsal stripes and well-haired, crested, tapering tails. The dorsal crest of hairs was not well developed in these specimens, perhaps because they were very young.

The specimens in Groups 1 and 2 bear a strong resemblance to each other in the appearance of their tails (bushy and red-haired), and in having a faint head stripe. In these respects they differ from all other groups. Previously they have been considered to represent a single species, *wallacei* (Thomas, 1887; Tate & Archbold, 1937), a conclusion that I am in agreement with. Group 3 specimens differ from those in all other groups by having white-tipped tails and are here considered to represent a new species (described below). Group 4 specimens can be distinguished from those in all other groups by their relatively short-haired tails and lack of reddish colour. Tate (1947) gave the then single known specimen in this group subspecific status (*M. melas wavicus*). The specimens in Groups 5–13 bear a resemblance to each other in having well-haired, tapering tails with a dorsal crest but their coat colour is variable. Melanistic specimens are found in Groups 5 (including the type specimen of *melas*) and 6, and among those with brightly coloured coats, the fur between the dorsal stripes is whitish in Groups 5, 6, 7, 8 (with the exception of one specimen, no. 77) and 10; and reddish in Groups 8 (one specimen only, no. 77), 9, 11, 12 and 13. While the variability in coat colour seen in *melas* suggests that Groups 5–13 may not, on further study, represent a single entity at present I consider that four species of the genus *Myoictis* can be distinguished by the appearance of the tail; the first comprised of Groups 1 and 2; the second, Group 3; the third, Group 4 and the fourth, Groups 5–13. Henceforth these four species will be referred to, respectively, as *wallacei, leucura* (the formal description of this new species, here named in reference to the white-tipped tail, appears on p. 334 below), *wavicus* and *melas*. The distribution of the four species can be seen in Fig. 2, where the groups considered to represent a single species are demarcated by broken lines. Other attributes of the specimens in each of these groups will be examined below to identify further differences between the proposed species.

Body size

Measurements used to examine differences in body size of specimens include mass, head-body length and foot length. To allow comparisons to be made, values for adult males only are given, as the range and mean for the groups in Table 1, and the species in Table 2. There are few records of body weight at capture but Group 4 specimens (*wavicus*) are clearly about half the mean mass of those of other groups and distinguish this species from the other three (*wavicus*—122 g; *wallacei*—230 g; *leucura*—220 g, and *melas*—220g). The smaller size of *wavicus* is also reflected in a shorter mean head-body length (*wavicus*—170 mm; *wallacei*—204 mm; *leucura*—213 mm, and *melas*—209 mm) and foot length (*wavicus*—34.4 mm; *wallacei*—37.6 mm; *leucura*—40.0 mm, and *melas*—39.1 mm). In the case of *melas* there are no values for mass in Groups 6, 7 and 9–13; for head-body length in Groups 7, 12 and 13, and for foot length in Groups 12 and 13. However, comparison of other measurements of specimens in these groups with those of the groups of *melas* for which the information was available (P. A. Woolley unpublished observations) suggests that they would be comparable.

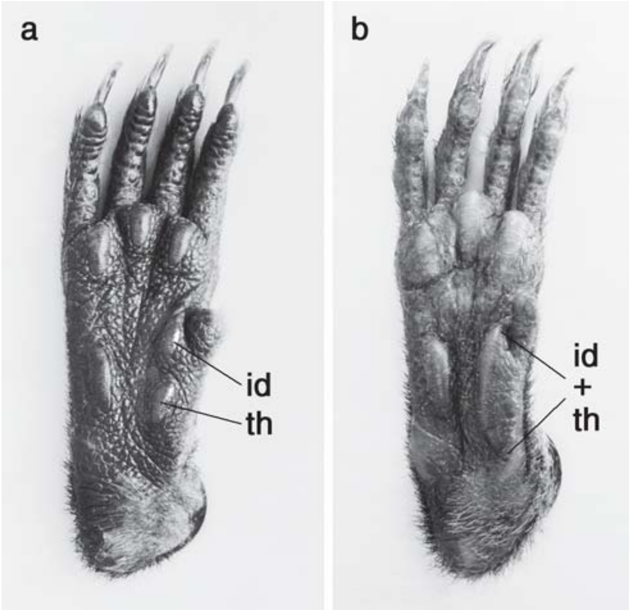

Fig. 5. (*a*) Nonfused state of the first interdigital (*id*) and thenar (*th*) footpads in a specimen from the Aru Islands (Group 1, no. 41); and (*b*) the fused state in a specimen from Wau (Group 4, no. 32). Feet photographed before preservation.

Footpads

The nonfused (NF) or fused (F) state of the first interdigital and thenar footpads (Fig. 5) has been established for some specimens from all groups with the exception of Group 12 (Table 1). Both states may be found in the one animal, i.e. pads not fused on one foot, fused on the other (NF/F). All specimens of *wavicus* show the fused state F (100%) and the majority of *wallacei* and *leucura* show the nonfused state NF (83% and 78% respectively, the remainder being NF/F). Roughly equal numbers of all *melas* show the nonfused state NF (48%) and the fused state F (40%), with the remainder being NF/F (Table 2). This was also the case in individual groups in which the number of specimens examined was greater than two. The footpads do not clearly distinguish the four species, and the findings do not support the statement by Thomas (1888), based on a smaller number of specimens, that the pads of *wallacei* are not fused whereas those of *melas* are fused.

Nipple number

The number of nipples in the pouch in different groups is either 4 or 6 (Tables 1 and 2). The lower number is seen in both *wavicus* and *leucura* and the higher number in *wallacei*, and in all groups within *melas* for which information was obtained (Table 1). In addition to the single museum specimen of *leucura* (Group 3) another two females trapped and released on Mt Sisa each had 4 nipples (P. Dwyer, unpublished observations).

Cranial and dental features

Posterior palatal foramina—Observations on the size of the posterior palatal foramina were made for some specimens in nine of the thirteen groups. The foramina, which are very variable in shape, were not measured but assessed as either large (length a little greater than or about

Table 1. Attributes of *Myoictis* specimens grouped by locality as shown in Fig. 2, together with the total number of specimens (N) in each group and the altitudinal range of the group. Mean (bold type) and range of values are given for measurements of mass, head-body length, foot length, basicranial length and length of M_{1-4} of adult males. Figures in parentheses are the number of specimens from which data could be obtained. Footpads of R and L foot of each specimen examined. First interdigital and thenar pads of both feet not fused (NF), both fused (F), one not fused and one fused (NF/F). P3—double rooted (DR), single rooted (SR), absent (A). * SR on right in two of the seven specimens, ** SR P3 present in one of the six specimens. Data for individual specimens in Appendices 1 and 2.

Group	N	Altitudinal range (m)	Mass (g)	Head-body length (mm)	Foot length (mm)	Footpads NF	F	NF/F	No. of nipples	Basicranial length (mm)	M_{1-4} length (mm)	P3 (DR/ SR/ A) P^3	P_3
1	10	<30 (10)	**230.2** (4) 206–245	**210.7** (4) 200–222	**37.68** (6) 34.0–39.2	8	0	1 (9)	6 (1)	**44.70** (6) 42.9–46.1	**12.15** (6) 11.9–12.3	DR (8)	DR (7)*, A(1)
2	6	30–923 (3)	—	**191.5** (2) 185, 198	**37.50** (2) 36.0, 39.0	2	0	1 (3)	6 (1)	**43.60** (3) 41.4–45.0	**11.80** (4) 11.6–12.0	DR (6)	DR (5), SR(1)
3	33	650–1600 (30)	**220.0** (4) 200–230	**213.0** (5) 200–230	**40.00** (3) 39.0–41.0	7	0	2 (9)	4 (1)	**43.76** (5) 41.2–46.2	**11.82** (5) 11.2–12.2	DR (23)	SR (23)
4	10	975–1810 (10)	**122.0** (2) 110, 134	**170.0** (5) 165–175	**34.40** (5) 33.0–36.0	0	7	0 (7)	4 (5)	**40.37** (4) 39.6–41.6	**10.72** (4) 10.5–11.0	DR (8)	SR (8)
5	4	<100 (1)	**223** (1)	**207.5** (2) 200, 215	**38.00** (2) 34.0, 42.0	0	2	0 (2)	—	**47.2** (1)	**12.55** (2) 12.5, 12.6	DR (3)	A (2), SR (1)
6	10	30–762 (7)	—	**212.7** (3) 196–240	**37.33** (3) 33.0–40.0	2	4	1 (7)	6 (1)	**48.3** (1)	**13.10** (2) 12.9, 13.3	DR (5)	A (4)
7	7	—	—	—	**38.0** (1)	0	2	0 (2)	6 (1)	—	**13.03** (3) 12.8–13.4	DR (4)	A (4), SR (1)
8	17	3–1000 (13)	**219.6** (3) 172–255	**205.6** (5) 194–221	**39.80** (6) 36.5–43.0	9	5	0 (14)	6 (2)	**45.14** (5) 43.5–47.2	**12.46** (6) 12.2–12.8	DR (9)	A (9), SR (1)
9	4	609 (1)	—	**211.0** (3) 210–213	**40.66** (3) 36.0–44.0	0	0	1 (1)	6 (1)	**47.55** (2) 46.0, 49.1	**12.33** (3) 11.7–13.2	DR (3)	A (4)
10	9	213–1800 (8)	—	**201.2** (4) 189–210	**37.75** (4) 35.0–40.0	2	2	1 (5)	—	**45.57** (4) 42.5–48.3	**12.60** (4) 12.4–12.8	DR (6)	A (6)**
11	16	30–1200 (15)	—	**215.0** (7) 207–223	**40.00** (7) 39.0–43.0	5	2	3 (10)	6 (1)	**44.88** (5) 43.3–45.8	**12.35** (6) 12.0–13.0	DR (5)	A (6)*, SR (1)
12	2	457–900 (2)	—	—	—	—	—	—	—	—	—	—	—
13	2	1200 (2)	—	—	—	2	0	0 (2)	—	—	—	—	—

Table 2. Summary of the characteristics of the four species of *Myoictis*. Mean (rounded value, bold type) and range of values are given for measurements of mass, head-body length, foot length, basicranial length and length of M_{1-4} of adult males. Figures in parentheses are the number of specimens from which data could be obtained. Data for each species derived from the text, Table 1 and Appendix 2 (*wallacei* = Groups 1 and 2; *leucura* = Group 3; *wavicus* = Group 4; *melas* = Groups 5–13).

Character	Species *M. wallacei*	*M. leucura*	*M. wavicus*	*M. melas*
Tail (hair length)	bushy (20 mm)	white-tipped (10–15 mm)	short-haired (5 mm)	crested (10–15 mm)
Mass (g)	**230** (4) 206–245	**220** (4) 200–230	**122** (2) 110,134	**220** (4) 172–255
Head-body length (mm)	**204** (6) 185–222	**213** (5) 200–230	**170** (5) 165–175	**209** (24) 189–240
Foot length (mm)	**37.6** (8) 36.0–39.2	**40.0** (3) 39.0–41.0	**34.4** (5) 33.0–36.0	**39.1** (26) 33.0–44.0
Footpads (%) NF:F:NF/F	(12) 83:0:17	(9) 78:0:22	(7) 0:100:0	(43) 48:40:12
Nipple number	(2) 6	(3) 4	(5) 4	(6) 6
Posterior palatal foramina	(7) large	(6) large	(5) large	(11) small
Basicranial length (mm)	**44.3** (9) 41.4–46.1	**43.8** (5) 41.2–46.2	**40.4** (4) 39.6–41.6	**46.0** (18) 42.5– 49.1
M_{1-4} (mm)	**12.0** (10) 11.6–12.3	**11.8** (5) 11.6–12.2	**10.7** (4) 10.5–11.0	**12.5** (26) 11.7–13.4
P^3	double rooted $P^2>P^1\leq P^3$	double rooted $P^2>P^1\approx P^3$	double rooted $P^2>P^1\approx P^3$	double rooted $P^2>P^1>P^3$
P_3	double rooted $P_2>P_1$&P_3	single rooted $P_2>P_1$&P_3	single rooted $P_2>P_1$&P_3	absent P2>P1

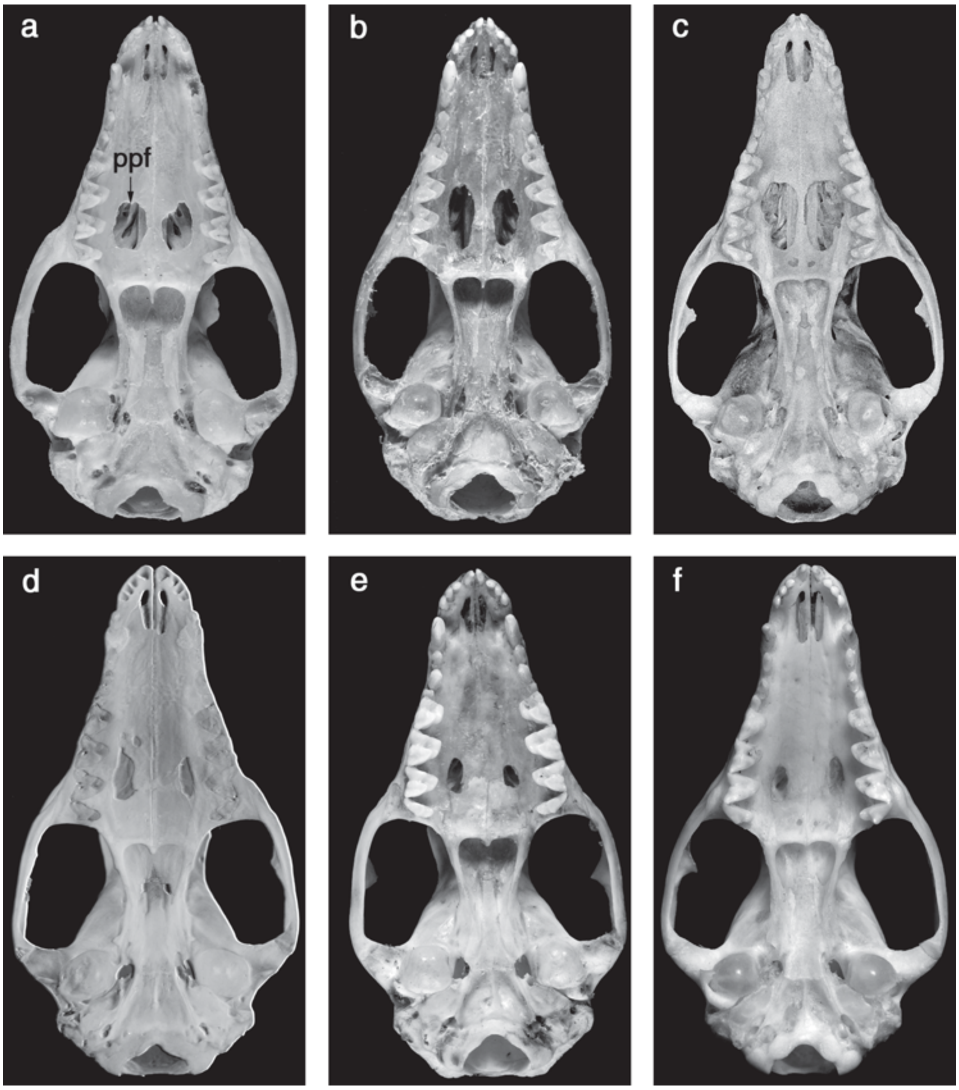

Fig. 6. Ventral aspect of the skull of representative specimens showing differences in the size of the posterior palatal foramina (ppf) in (*a*) *wallacei* (no. 41); (*b*) *leucura* (no. 23); (*c*) *wavicus* (no. 90); (*d*) *melas* (no. 96, Group 5); (*e*) *melas* (no. 36, Group 8) and (*f*) *melas* (no. 131, Group 11). All skulls shown at the same length. The basicranial length of each specimen can be found in Appendix 2.

equal to that of M^2 plus M^3 on the buccal side) or small (length about equal to that of M^2 plus M^3 on the lingual side). The large foramina were not only longer but also broader than the small foramina (see Fig. 6). The foramina were found to be large in Group 1 (n = 5) (Fig. 6a), Group 2 (n = 2), Group 3 (n = 6) (Fig. 6b) and Group 4 (n = 5) (Fig. 6c), and small in Group 5 (n = 1) (Fig. 6d), Group 7 (n = 1), Group 8 (n = 6) (Fig. 6e), Group 10 (n = 1) and Group 11 (n = 2) (Fig. 6f). The small size of the foramina seen in at least five (Groups 5, 7, 8, 10 and 11) of the nine groups within *melas* serve to distinguish this species from *wallacei* (Groups 1 and 2), *leucura* (Group 3) and *wavicus* (Group 4).

Auditory bulla—Some differences in the size and shape of the bullae were seen in the four species of *Myoictis* (see Fig. 6), but no measurements were made and it is not known if these differences are consistent in all specimens of each form. Based on a single specimen (illustrated in Fig. 6c), Tate (1947) suggested that the bullae of *wavicus* were smaller than those of *melas* and *wallacei* which, given the smaller body size of *wavicus*, might be expected.

Basicranial length and length of the lower molar tooth row ($M_{1–4}$)—Measurements of these have been used to further examine differences in size of specimens. The range and mean values for adult males only are given for each group in Table 1, and for the species in Table 2. In the case of *melas* no values were obtained for specimens in Groups 7, 12 and 13. Mean basicranial length in *wavicus* is less than in the other species (*wavicus*—40.4 mm, *wallacei*—44.3 mm, *leucura*—43.8 mm and *melas*—46.0 mm), consistent with its smaller body size as seen above. The mean length of $M_{1–4}$ also reflects the smaller size of *wavicus* (*wavicus*—10.7 mm, *wallacei*—12.0 mm, *leucura*—11.8 mm, and *melas*—12.5 mm). Tate (1947) drew attention to the smaller size of the skull and teeth of *wavicus* in comparison with *wallacei* and *melas* and the observations made here provide confirmation of this. The *wavicus* form is also smaller than *leucura*.

Premolar teeth (roots)—P^3 was found to be double rooted, and P_3 either double rooted, single rooted or absent in specimens from Groups 1–11 (Table 1). No information was obtained on the condition of P3 for the specimens in

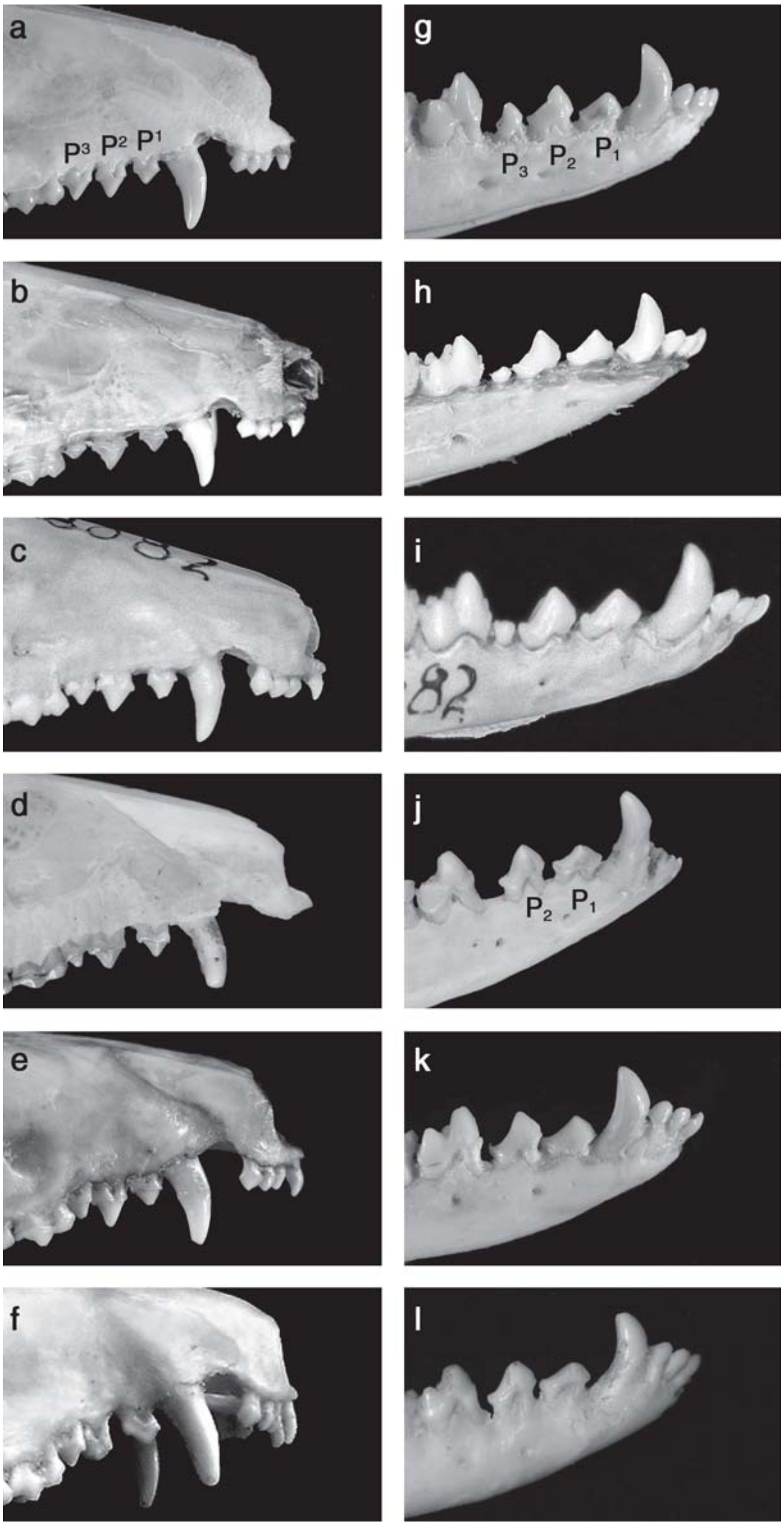

Fig. 7. Lateral aspect of the anterior part of the skull and dentary showing the premolar teeth: (*a*) and (*g*) *wallacei* (Group 1, no. 41); (*b*) and (*h*) *leucura* (Group 3, no. 23); (*c*) and (*i*) *wavicus* (Group 4, no. 90); (*d*) and (*j*) *melas* (Group 5, no. 96); (*e*) and (*k*) *melas* (Group 8, no. 36); and (*f*) and (*l*) *melas* (Group 11, no. 131). Upper premolars (P^1, P^2, P^3) identified in (*a*); lower premolars (P_1, P_2, P_3) in (*g*) and (P_1, P_2) in (*j*).

Groups 12 and 13 because, being sub-adult, they lacked a full set of cheek teeth. The double rooted condition of P^3 is apparent in representatives of *wallacei* (Groups 1 and 2) (Fig. 7a), *leucura* (Group 3) (Fig. 7b), *wavicus* (Group 4) (Fig. 7c) and *melas* (Group 5) (Fig. 7d), (Group 8) (Fig. 7e) and (Group 11) (Fig. 7f). P_3 was not invariably double rooted in specimens of *wallacei* (cf. Tate, 1947), but this was the most common condition in Groups 1 and 2 (12 of 14 specimens, Table 1) (Fig. 7g). It was single rooted in all specimens of *leucura* (Fig. 7h) and *wavicus* (Fig. 7i), and usually absent in *melas* (Group 5) (Fig. 7j), (Group 8) (Fig. 7k) and (Group 11) (Fig. 7l). The exceptional specimens of *melas* (5 in a total of 39) in which a single rooted P_3 was present include one in Group 5 (no. 121, the type of *melas*), one in Group 7 (no. 123), one in Group 8 (no. 16) and, in one jaw only, of one in Group 10 (no. 68) and one in Group 11 (no. 6).

Premolar teeth (size)—Crown lengths of the premolar teeth were not measured but the relative sizes of those present in each specimen were noted. P^2 is larger than P^1 and P^3 in all groups (representative specimens, Fig. 7a–f). P^1 is slightly smaller or equal in size to P^3 in Groups 1 and 2 (Fig. 7a). P^1 and P^3 are approximately equal in size in Group 3 (Fig. 7b) and Group 4 (Fig. 7c) but P^1 is larger than P^3 in Groups 5–11 (representative specimens from Groups 5, 8 and 11, Fig. 7d,e,f). The gradient in size of the upper premolars only clearly distinguishes *melas* from *wallacei, leucura* and *wavicus* (Table 2). P_2 is larger than P_1, and also P_3 when this tooth is present, in all groups (representative specimens, Fig. 7g-l). A progressive decrease in the size of P_3 can be seen in Groups 1 and 2 (*wallacei*), Group 3 (*leucura*) and Group 4 (*wavicus*). The specimens illustrated are all adult males, and spacing of the premolars is evident in all species including *wavicus*, in which Tate (1947) suggested they were more compressed. In some groups of *melas* there are individuals, e.g., no. 77, Group 8 (Fig. 8a) and no.11, Group 11 (Fig. 8b) in which P^3 does not appear to be fully erupted. P_3 was absent in both specimens (Fig. 8c,d). Judging by tooth wear these two were old animals in which P^3 would be expected to be fully erupted. These individuals may be abnormal, or there may be a tendency in *melas* towards loss of P^3, which occurs in some dasyurines.

Premolar teeth (deciduous)—A single rooted dp^3 was found in five individuals in Group 3, four in Group 6, three in each of Groups 8 and 10, one in each of Groups 11 and 12, and two in Group 13 (see Appendix 2). In these specimens M^4 had either not erupted or was not fully erupted. The tip of P^3 could be seen lying lingual to dp^3 in two of the specimens (nos 45 and 112) in which M^4 was not fully erupted, which suggests that P^3 erupts soon after M^4. The age at

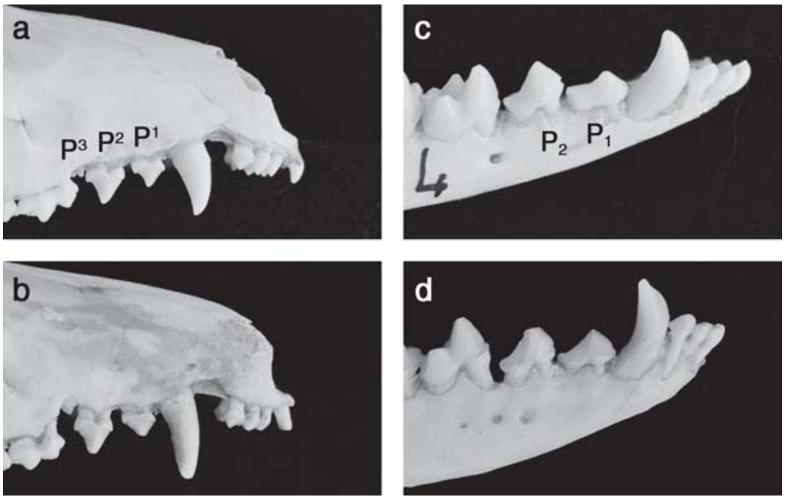

Fig. 8. Lateral aspect of the anterior part of the skull, showing the partially erupted P^3, and dentary with P_1 and P_2 in two individuals of *melas*: (*a*) and (*c*) (Group 8, no. 77); and (*b*) and (*d*) (Group 11, no. 11). Upper premolars identified in (*a*), lower premolars in (*c*).

which this happens is not known but the finding, in one specimen (no. 45), that the first pair of upper incisors also were not fully erupted suggests that it may occur soon after the weaning. The first pair of upper incisors in dasyurids is known to erupt later than I^{2-4}, and it has been suggested that their late eruption facilitates suckling (Luckett & Woolley, 1996). A dp_3 was not found in any of the specimens examined.

Talonid of M_4—Tate (1947) considered that the talonid of M_4 of *wavicus* was narrower than that of *melas*, and almost as narrow as *wallacei*, but he gave no measurements. The talonid of M_4 was examined in a small number of adult male specimens including four in Group 1 (*wallacei*), one in Group 4 (*wavicus*), and one in Group 5 and two in Group 8 (*melas*) but the claimed differences between the three species could not be confirmed. One specimen of *leucura* also was examined and no marked difference seen between it and the other species.

Characteristics of the four species referred to above are summarized in Table 2.

Field observations—Numerous records indicate that *Myoictis* is active during daylight hours. The five specimens of *wallacei* that I obtained on the Aru Islands (Wokam and Kobroor) were all either speared or caught by hand by local people in the late afternoon. One informant said that they are active in the morning and evening and that they live on the ground, eat insects and lizards and seek refuge in rock piles and tree hollows. They are known there as "Sidoki" (Manumbai language) and "Undukwai" (Dobel language). Three that were obtained alive were fed geckos and freshwater shrimps (*Caradina typa*). The shrimps, which were found in large numbers close to the edges of shallow streams where *Myoictis* were reported to have been seen drinking, may form part of their natural diet. The shrimps imparted a reddish colour, not unlike the colour of the tail of *wallacei*, to their urine. In captivity, both *wallacei* and *wavicus* tended to be active for a period in the morning and again in the evening, rather like *Phascolosorex dorsalis* (Woolley *et al*., 1991).

Peter Dwyer (unpublished observations) observed that *leucura* was sometimes active during the daytime. One of the specimens of *wavicus* that I obtained was caught by hand in the morning as it was moving up the trunk of a tree, and another was removed in the afternoon from a trap which had been empty in the morning. The type specimen of *wavicus* was shot on a log, and B. Beehler (Flannery, 1990, 1995a) was able to attract one in the early morning by imitating its call. Hunters using dogs at Nenei in the Arfak Mountains captured specimens of *melas* for me in the late afternoon. Stein (1933) reported shooting specimens during the day on Japen Island and in the Weyland Ranges, and there are records on museum specimen labels of *melas* being shot in the Snow Mountains. Thus it appears that all four species of *Myoictis* exhibit a diurnal activity pattern.

Systematics

Each of the four species of *Myoictis* referred to above can be readily recognized by the appearance of the tail. Two of the four, *Myoictis melas* (Müller, 1840) and *Myoictis wallacei* (Gray, 1858), have previously been recognized as species by some authors (e.g., Tate, 1947, who gave the authority for *melas* as Müller & Schlegel), and another, *Myoictis melas wavicus*, as a subspecies (Tate, 1947). Here the latter has been accorded full specific status. The fourth constitutes a new species which is formally described below.

Myoictis melas (Müller, 1840)

Type material. Holotype: RMNH 25750a. Mounted skin and front portion of skull of adult male. Melanistic specimen. Collected in 1828 by S. Müller at Lobo, Triton Bay, 03°45'S 134°05'E.

Lectotype designation. Synonym: *Phascogale thorbeckiana* Schlegel, 1866. Syntypes RMNH 25749c (mounted skin and skull of adult male), RMNH 25749d (skin of adult female) collected in 1865 by H.A. Bernstein on Salawati Island, 01°05'S 130°53'E. I herein designate the more complete specimen RMNH 25749c as the LECTOTYPE, and RMNH 25749d as the PARALECTOTYPE, of *Phascogale thorbeckiana* Schlegel. Tate (1947) listed four "cotypes" for *Phascogale thorbeckiana* and attributes all four to Bernstein; the extra two specimens were collected by D.S. Hoedt on Salawati Island in 1867 and are not registered as types.

Phascogale bruijnii Peters, 1875. Holotype MCG 590 (skin and partial skull of adult male) collected in 1874 by A.A. Bruijn, at Andai, Arfak Mountains, 00°51'S 134°01'E. Tate (1947) listed MCG 3904 as a cotype of *Phascogale bruijnii*; however, as noted by van der Feen (1962), MCG 3904 was not collected until after the description of *bruijnii* and could not have been used for the description.

Phascogale melas senex Stein, 1932. Holotype ZM 44226. Skin and skull of adult male collected in 1931 by G. Stein at Kunupi, Weyland Range, 03°52'S 135°31'E.

Phascogale melas bürgersi Stein, 1932. Holotype ZM 20355. Skin and skull of adult, sex unknown, collected in 1913 by J. Bürgers at Meanderberg, April River, 04°00'S 141°45'E.

Distribution. Widely distributed in the north of mainland New Guinea and on Salawati, Waigeo and Japen Islands. Altitude records range from 3–1800 m.

Diagnosis. *Myoictis melas* differs from other species of *Myoictis* in having a well haired, tapering tail with a dorsal crest.

Description. Coat colour is variable. A small number of specimens are melanistic. The majority are brightly coloured with either whitish or reddish hairs between the black dorsal stripes, and they have bright reddish patches on the nape and behind the ears. Body dimensions can be found in Table 2. The first interdigital and thenar footpads may be either fused or not fused. The posterior palatal foramina are small and P_3 is absent. Females have six nipples.

Myoictis wallacei Gray, 1858

Material examined. Holotype BM 58.2.20.1. Skin and skull of juvenile male. Back of skull damaged, M^2 and M_3 erupted. Collected in 1857 by A.R. Wallace on the Aru Islands, 06°00'S 134°30'E.

Lectotype designation. Synonym: *Phascogale pilicauda* Peters & Doria, 1881. SYNTYPES: MCG 3922 (skin and skull of adult female) and ZM 5680 (skin with tip of tail missing and skull of adult female). Both collected by L.M. D'Albertis near the Fly River, 08°25'S 143°10'E. I herein designate the better preserved specimen MCG 3992 as the LECTOTYPE, and ZM 5680 as the PARALECTOTYPE, of *Phascogale pilicauda* Peters & Doria.

Distribution. Aru Islands and southern mainland New Guinea from Merauke in the west to Avera (Avela), Aroa River in the east. Altitude records range from <30 to 923 m.

Diagnosis. *Myoictis wallacei* differs from other species of *Myoictis* in having a bushy, reddish-haired tail.

Description. The general coat colour is a rusty brown, somewhat lighter on the head and tail. The median dorsal stripe is faint on the head. Body dimensions can be found in Table 2. The first interdigital and thenar footpads are generally not fused. The posterior palatal foramina are large, and P_3 is double rooted. Females have six nipples.

Myoictis wavicus Tate, 1947

Material examined. Holotype: MCZ 28082. Skin and skull of adult male. Collected in 1932 by H. Stevens at Wau, 07°20'S 146°43'E.

Distribution. Northern side of the central mountain ranges in the vicinity of Wau, Papua New Guinea. Altitude records range from 975–1810 m.

Diagnosis. *Myoictis wavicus* differs from other species of *Myoictis* in having a short-haired tail.

Description. The general coat colour is grey-brown with lighter hairs between the black dorsal stripes. Body dimensions can be found in Table 2. The first interdigital and thenar footpads are fused. The posterior palatal foramina are large, and P_3 is single rooted. Females have four nipples.

Myoictis leucura n.sp.

Type material. HOLOTYPE AM 17122. Skin and skull of adult male. Collected in 1985 by K. Aplin at Agofia, Mt Sisa (Haliago), Papua New Guinea, 06°17'S 142°45'E, 650 m. The tip of tail has been damaged in preparation of the skin (white portion reduced in length from 9 mm, when the specimen was first examined in spirit, to 5 mm on the prepared skin). PARATYPE AM 17091, adult female in alcohol, skull extracted, collected in 1985 by K. Aplin at Namosado, Mt Sisa (Haliago), 06°15'S 142°47'E, 750–1000 m.

Distribution. Southern side of the central mountain ranges in Papua New Guinea from Mt Bosavi in the west to Mt Victoria/Vanapa R. in the east. Altitude records range from 650 to 1600 m.

Diagnosis. *Myoictis leucura* differs from other species of *Myoictis* in having a white-tipped tail with long hairs on the top and sides of the tail, the hairs decreasing in length towards the tip.

Description. The external appearance of the holotype is similar to the specimen shown in Fig. 3c except that the portion of the tail that is white is shorter. The general coat colour is a dark reddish brown above, with brighter, reddish hairs between the black dorsal stripes, and lighter below. The dorsal stripes extend from behind the ears to the rump, and the median stripe extends forward on the head. Red auricular patches are absent. The ears and feet are dark. The first interdigital and thenar footpads are generally not fused. Body dimensions can be found in Table 2. The posterior palatal foramina are large, and P_3 is single rooted. Females have four nipples.

Comparison with other species. Differences between *Myoictis leucura* and other species are summarized in Table 2. *Myoictis leucura* can be distinguished from *M. wallacei, M. wavicus* and *M. melas* by the form of the tail. *Myoictis leucura* is larger than *M. wavicus* but similar in size to *M. wallacei* and *M. melas* with respect to mass, head-body length, foot length, basicranial length and length of the lower molar tooth row. The females of *M. leucura* (and *M. wavicus*) differ from *M. wallacei* and *M. melas* in having four rather than six nipples. *Myoictis leucura* can be distinguished from *M. melas* by the larger size of the posterior palatal foramina and by the presence of the third lower premolar tooth. *Myoictis leucura* can be distinguished from both *M. wallacei* and *M. melas* by the upper premolar tooth row gradient, and from *M. wallacei* in having a single rooted, as opposed to a double rooted, lower third premolar tooth. Differences in coat colour between the species are described earlier.

Comments

Observed differences in coat colour, which led to the present study, are useful for recognition of three species, *M. wallacei, M. leucura*, and *M. wavicus*, but not the fourth, *M. melas*. There is little variation in colour in the specimens assigned to each of the first three species but the specimens assigned to *melas* show a variety of coat colours. In comparison with *melas*, the other three species (*wallacei, leucura* and *wavicus*) have more restricted ranges. Collection of new material and further study of specimens from within the large geographic range of *melas* may reveal the existence of other forms within this species.

The four species recognized show no overlap in range but more intensive collecting may alter this situation. The differences "in the hand" between the four, together with the experience of the author in the captive breeding of many species of dasyurid marsupials, suggest that interbreeding would not occur even if the ranges were found to overlap.

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References

Blayney, J.A., 1901. Report respecting a visit paid by the Resident Magistrate of the Central District and the Government Agent of the Mekeo Station to the inland tribes of Mafulu, Iaroga, and Sekuba. Appendix J. In *Annual Report on British New Guinea from 1 July, 1899 to 30 June, 1900*, pp. 60–69. Brisbane: Government Printer.

Central Mapping Bureau, 1974. *Papua New Guinea Gazetteer*. Port Moresby: The Papua New Guinea Place Names Committee.

Flannery, T.F., 1990. *Mammals of New Guinea*. Chatswood: Reed Books.

Flannery, T.F., 1995a. *Mammals of New Guinea* (revised edition). Chatswood: Reed Books.

Flannery, T.F., 1995b. *Mammals of the South-West Pacific and Moluccan Islands*. Chatswood: Reed Books.

Gray, J.E., 1858. List of species of Mammalia sent from the Aru Islands by Mr. A.R. Wallace to the British Museum. *Proceedings of the Zoological Society of London*: 106–113.

Husson, A.M., 1955. Notes on the mammals collected by the Swedish New Guinea Expedition 1948–1949. *Nova Guinea* 6 (n.s.): 283–306.

Husson, A.M., & L.B. Holthuis, 1955. The dates of publication of Verhandelingen over de Natuurlijke Geschiedenis der Nederlandsche Overzeesche Bezittingen edited by C.J. Temminck. *Zoologische Mededelingen* 34: 17–24.

Hydrographic Office of United States Navy Department, 1944. *Gazetteer (No. 2) New Guinea and Nearby Islands*. Hydrographic Office Publication No. 882, Washington: United States Government Printing Office.

Jentinck, F.A., 1908. Mammals collected by the Dutch New Guinea Expedition 1907. *Nova Guinea* 9: 1–14.

Jentinck, F.A., 1911. New and interesting mammals of the Dutch-New-Guinea Expedition to the Snow-Mountains. *Notes Leyden Museum* 33: 233–238.

Laurie, E.M.O., & J.E. Hill, 1954. *List of land mammals of New Guinea, Celebes and adjacent islands 1758–1952*. London: British Museum (Natural History).

Luckett, W.P., 1993. An ontogenetic assessment of dental homologies in therian mammals. In *Mammal Phylogeny*, ed. F.S. Szalay & M.C. McKenna, pp. 182–284. New York: Springer-Verlag.

Luckett, W.P., & P.A. Woolley, 1996. Ontogeny and homology of the dentition in dasyurid marsupials: development in *Sminthopsis virginiae*. *Journal of Mammalian Evolution* 3: 327–364.

MacGregor, W.M., 1898. Visit of inspection from mouth of Mambare River across the island. In *Annual Report on British New Guinea from 1 July, 1896 to 30 June, 1897*, pp. xi–xiii and map. Brisbane: Government Printer.

Macklot, H.C., 1830. Verslag van het land, de bewoners en voortbrengselen van eenige plaatsen op de kust van Nieuw Guinea, welke in den loop van het jaar 1828, door de natuurkundige kommissie in Oost-Indië, aan boord van Z.M. korvst Triton, zijn bezocht, alsmede van den voorwerpen van natuurlijke historie, welke gedurende de reis, van den 20 Mei tot den 30 Augustus, op en langs die kust, door gemelde kommissie zijn verzameld. *Bijdragen tot de Naturkunige Wetenschappen* 5: 142–182.

Mahoney, J.A., & W.D.L. Ride, 1988. Dasyuridae. In *Zoological Catalogue of Australia 5: Mammalia*. Canberra: Australian Government Publishing Service.

Meek, A.S., 1913. *A Naturalist in Cannibal Land*. London: T. Fisher Unwin.

Menzies, J.I., 1991. *A Handbook of New Guinea Marsupials and Monotremes*. Madang: Kristen Press.

Müller, S., 1840. Bijdragen tot de kennis van Nieuw-Guinea. In *Verhandelingen over de Natuurlijke Geschiedenis der Nederlandische Overzeesche Bettingen, Land-en Volkenkunde*, ed. C.J. Temminck, p. 20. Leiden: S. and J. Luchtmans & C.C. van der Hoek.

Müller, S., & H. Schlegel, 1845. Beschrijving eener nieuwe soort van vleeschetende buidelieren, *Phascogalea melas*. In *Verhandelingen over de Natuurlijke Geschiedenis der Nederlandische Overzeesche Bettingen, Zoologie*, ed. C.J. Temminck, pp. 149–152, plate 25. Leiden: S. & J. Luchtmans & C.C. van der Hoek.

Peters, W., 1875. Diagnosi di una nuova specie di marsupiale del genere *Chaetocercus*. *Annali del Museo Civico di Storia Naturale di Genova* 7: 420.

Peters, W., & G. Doria, 1881. Enumerazione dei Mammiferi raccolti da O. Beccari, L.M. D'Albertis ed. A.A. Bruijn nella Nuova Guinea propriamente detta. *Annali del Museo Civico di Storia Naturale di Genova* 16: 664–707.

Schlegel, H., 1866a. Observations Zoologiques. *Phascogalea Thorbeckiana*. *Nederlands Tijdschrift voor de Dierkunde* 3: 257–258.

Schlegel, H., 1866b. Observations Zoologiques. *Phascogale Wallacei*. *Nederlands Tijdschrift voor de Dierkunde* 3: 355–356.

Stein, G., 1932. Einige neue Beuteltiere aus Neuguinea. *Zeitschrift für Säugetierkunde* 7: 254–257.

Stein, G., 1933. Notizen zur Biologie papuanischer Saugetier. *Zeitschrift für Säugetierkunde* 8: 123–125.

Tate, G.H.H., 1947. On the anatomy and classification of the Dasyuridae (Marsupialia). Results of the Archbold Expeditions. No. 56. *Bulletin of the American Museum of Natural History* 88: 97–156.

Tate, G.H.H., & R. Archbold, 1937. Some marsupials of New Guinea and Celebes. Results of the Archbold Expeditions. No. 16. *Bulletin of the American Museum of Natural History* 73: 331–476.

Thomas, O., 1887. On the specimens of *Phascologale* in the Museo Civico, Genoa, with notes on the allied species of the genus. *Annali del Museo Civico di Storia Naturale di Genova* (2)4: 502–511.

Thomas, O., 1888. *Catalogue of the Marsupialia and Monotremata in the collection of the British Museum (Natural History)*. London: British Museum.

van der Feen, P.J., 1962. Catalogue of the Marsupialia from New Guinea, the Moluccas and Celebes in the Museo Civico Di Storia Naturale "Giacomo Doria" in Genoa. *Annali del Museo Civico di Storia Naturale di Genova* 73: 19–73.

Woolley, P.A., 1994. The dasyurid marsupials of New Guinea: use of museum specimens to assess seasonality of breeding. *Science in New Guinea* 20: 49–55.

Woolley, P.A., S.A. Raftopoulos, G.J. Coleman & S.M. Armstrong, 1991. A comparative study of the circadian activity patterns of two New Guinean dasyurid marsupials, *Phascolosorex dorsalis* and *Antechinus habbema. Australian Journal of Zoology* 39: 661–671.

Ziegler, A., 1982. An ecological check list of New Guinea recent mammals. In *Biogeography and Ecology of New Guinea*, ed. G.L. Gressitt, pp. 863–894. The Hague: Junk.

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Appendix 1. Data for each of the Museum specimens examined. A reference number has been assigned to each specimen. [F] footnotes; [M] melanistic specimen; [S] spirit specimen; [T] previously designated type of species or subspecies (see below); asterisks (*) identify collector's numbers.

Ref. no.	Accession no.	Collector	Date	Locality	Coordinates	Elevation (m)	Specimen sex	skin	skull
American Museum of Natural History, New York (AMNH)									
1	101976	F. Shaw Mayer	22.7.1930	Mt Derimapa, Weyland Range	03°42'S 135°55'E	1524	♀	✓	✓
2	101977	··	26.7.1930	Mt Derimapa, Weyland Range	03°42'S 135°55'E	1524	♀	✓	✓
3	103267	G. Stein	6.9.1931	Kunupi, Weyland Range	03°52'S 135°31'E	1400–1800	♂	✓	✓
4	105976	R. Archbold, G.H.H. Tate	19.8.1936	Lake Daviumbu	07°31'S 141°15'E	30	♂	✓	✓
5	152009	Archbold, Richardson & Rand	25.1.1939	Araucaria Creek, Idenburg River	03°30'S 139°11'E	800	♂	✓	✓
6	152006	··	25.2.1939	Rattan Camp, Idenburg River	03°30'S 139°09'E	1200	♂	✓	✓
7	152005	··	12.3.1939	Araucaria Camp, Idenburg River	03°30'S 139°11'E	850	♀	✓	✓
8	152004	··	16.3.1939	Araucaria Camp, Idenburg River	03°30'S 139°11'E	850	♂	✓	✓
9	152003	··	20.3.1939	Araucaria Camp, Idenburg River	03°30'S 139°11'E	850	♂	✓	✓
10	152001	··	23.3.1939	Araucaria Camp, Idenburg River	03°30'S 139°11'E	850	♀	✓	✓
11	152010	··	20.4.1939	Bernhard Camp, Idenburg River	03°29'S 139°13'E	75	♂	✓	✓
12	152836	··	25.4.1939	Bernhard Camp, Idenburg River	03°29'S 139°13'E	50–75	♂	✓[S]	—
13	152011	··	29.4.1939	Bernhard Camp, Idenburg River	03°29'S 139°13'E	75	♂	✓	✓
14	152012	··	1.5.1939	Bernhard Camp, Idenburg River	03°29'S 139°13'E	75	♂	✓	✓
15	221648	L.P. Richards	22.12.1962	Oransbari	01°21'S 134°16'E	3	♂	✓	✓
16	221649	··	11.1.1963	Oransbari	01°21'S 134°16'E	3	♂	✓	✓
17	198237	J. Diamond	25.7.1966	Miliom, Torricelli Mountains	03°29'S 142°03'E	457	♀	✓[S]	—
Australian Museum, Sydney (AM)									
18	8907	W.B. Richardson	23.3.1939	Araucaria Camp, Idenburg River	03°30'S 139°11'E	850	♂	✓	✓
19	15612	P.D. Dwyer – E891*	24.8.1979	Bobole area, Mt Sisa (Haliago)	06°12'S 142°46'E	1200–1400	—	—	✓
20	15613	·· – E1078*	2.9.1979	··	06°12'S 142°46'E	1100	♂	—	✓
21	17081	K.P. Aplin – G81*	14.10.1985	Magidobo, Mt Sisa (Haliago)	06°11'S 142°46'E	1450	♂	✓[S]	—
22	17091	·· – N42*	27.10.1985	Namosado, Mt Sisa (Haliago)	06°15'S 142°47'E	750–1000	♀	✓[S]	✓
23	17122	·· – U57*	8.11.1985	Agofia, Mt Sisa (Haliago)	06°17'S 142°45'E	650	♂	✓	✓
24	17123	·· – Q03*	1.11.1985	Namosado, Mt Sisa (Haliago)	06°15'S 142°47'E	750–1000	♂	✓[S]	✓
25	27671	T.F. Flannery	10.3.1990	Miwautei area, Torricelli Mts.	03°25'S 142°07'E	900	♂	✓[S]	✓
Australian National Wildlife Collection, CSIRO Canberra (ANWC)									
26	29374	P.A. Woolley – LTU1*	18.3.1983	Big Wau Creek Ridge	07°23'S 146°43'E	1810	♀	✓[S]	✓
27	29375	·· – LTU2*	22.3.1983	··	07°23'S 146°43'E	1810	♀	—	✓
28	29376	G.L. Grossek – LTU3*	12.3.1984	Mt Missim	07°17'S 146°46'E	1450	♀	—	✓
29	29377	·· – LTU4*	26.8.1984	··	07°17'S 146°46'E	1450	♂	✓[S]	—
30	29378	·· – LTU5*	8.9.1984	Big Wau Creek Ridge	07°23'S 146°43'E	1810	♀	✓[S]	—
31	29379	P.A. Woolley – LTU6*	10.9.1984	··	07°23'S 146°43'E	1810	♀	✓	✓
32	29380	·· – LTU7*	12.9.1984	··	07°23'S 146°43'E	1810	♂	✓	✓
33	29368	·· – N/11*	12.9.1992	Nenei, Arfak Mountains	01°29'S 133°59'E	795	♂	✓[S]	✓
34	29369	·· – N/12*	12.9.1992	··	01°29'S 133°59'E	795	♂	✓	✓
35	29370	·· – N/15*	12.9.1992	··	01°29'S 133°59'E	795	♂	✓[S]	✓
36	29371	·· – N/16*	12.9.1992	··	01°29'S 133°59'E	795	♂	✓[S]	✓
37	29381	·· – NA/6*	21.10.1992	E of Selibata, Wokam, Aru Islands	05°54'S 134°32'E	<30	♀	✓[S]	✓
38	29382	·· – NA/18*	27.10.1992	Jirlai, Kobroor, Aru Islands	05°54'S 134°26'E	<30	♂	✓[S]	✓

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Appendix 1. Continued from facing page.

Ref. no.	Accession no.	Collector	Date	Locality	Coordinates	Elevation (m)	Specimen sex	skin	skull
39	29383	·· – NA/33*	3.11.1992	··	05°54'S 134°26'E	<30	♂	✓[S]	✓
40	29384	·· – NA/34*	4.11.1992	··	05°54'S 134°26'E	<30	♂	✓[S]	✓
41	29385	·· – NA/35*	4.11.1992	··	05°54'S 134°26'E	<30	♂	✓[S]	✓
		Bernice P. Bishop Museum, Honolulu (BBM)							
42	22196	L.P. Richards	18.12.1962	Oransbari	01°21'S 134°16'E	3	♂	✓	✓
43	27519	H.W. Clissold	23.3.1963	Big Wau Creek Ridge	07°23'S 146°43'E	1676	♂	✓	✓
44	103164	A.B. Mirza	14.5.1973	NNW slopes Mt Bosavi	06°28'S 142°50'E	700	♀	✓	✓
45	103336	··	9.6.1973	··	06°28'S 142°50'E	1400	♀	✓	✓
46	103840	··	20.2.1974	5 km N Wanuma, Adelbert Mts.	04°50'S 145°19'E	1200	♂	✓	✓
47	103842	··	20.2.1974	··	04°50'S 145°19'E	1200	♂	✓	✓
		British Museum (Natural History), London (BM)							
48[T]	58.2.20.1	A.R. Wallace	1857	Aru Islands	06°00'S 134°30'E	—	♂	✓	✓
49	20.1.26.7	··	—	Dorey (Manokwari)	00°52'S 134°05'E	—	—	—	✓
50	68.9.7.7	H. Bernstein	—	Sailolo, Salawati Island	01°05'S 130°53'E	—	♂	✓	✓
51	87.8.17.4	A.A. Bruijn	Jun 1875	Salawati Island	01°05'S 130°53'E	—	♀	✓[S]	—
52	87.8.17.3	L.M. D'Albertis	—	Katau (Binaturi)River	09°07'S 142°58'E	—	♂	✓[S]	✓
53	1.6.5.21	H. Rolle	—	Silokiloki, Aru Islands	06°00'S 134°30'E	—	♂	✓[S]	✓
54	1939.3224	H. Kühn	—	Aru Islands	06°00'S 134°30'E	—	—	✓	✓
55	1939.3225	—	1896	Mt Victoria/Vanapa River	08°53'S 147°30'E	—	♂	✓	—
56	1939.3227	W. Doherty	Feb 1897	Kapaur (FakFak)	02°56'S 132°17'E	—	♂	✓	—
57	1939.3228	J.M. Dumas	Jan 1899	Mt Moari, Arfak Mountains	01°20'S 134°09'E	914	♂	✓	✓
58	1939.3229	··	Jan 1899	··	01°20'S 134°09'E	914	♂	✓	✓
59[F1]	1939.3226	A.S. Meek	7.2.1903	Avera, Aroa River (Avela)	08°39'S 147°05'E	923	♂	✓	✓
60	11.11.11.98	G.C. Shortridge	20.10.1910	Wataikwa River Camp	04°19'S 136°51'E	213	♂	✓	✓
61	11.11.11.99	··	20.10.1910	··	04°19'S 136°51'E	213	♂	✓	✓
62[M]	11.11.11.100	··	28.9.1910	··	04°19'S 136°51'E	213	♀	✓	✓
63[M]	11.11.11.101	··	12.10.1910	··	04°19'S 136°51'E	213	♀	✓	✓
64	11.11.11.102	C.H.B. Grant	15.2.1911	··	04°19'S 136°51'E	213	♂	✓	✓
65[M]	11.11.11.103	··	1.2.1911	Iwaka River, Camp 3	04°17'S 136°54'E	—	♂	✓	✓
66[M]	11.11.11.104	··	27.1.1911	··	04°17'S 136°54'E	—	♀	✓	✓
67	13.6.18.91	C.B. Kloss	18.12.1912	Utakwa River, Camp 3	04°27'S 137°14'E	762	♂	✓	✓
68	21.8.1.14	Pratt Brothers	19.1.1921	Wanggar River, Weyland Range	03°40'S 135°25'E	213	♂	✓	✓
69	29.5.27.53	F. Shaw Mayer	20.7.1928	Arfak Mountains	01°09'S 134°00'E	1000	♂	✓	✓
70	29.5.27.54	··	22.7.1928	··	01°09'S 134°00'E	1000	♂	✓	✓
71[F2]	—	E. Mayr – 1582*	19.7.1928	Wasior, Wandammen Peninsula	02°43'S 134°31'E	—	♂	✓	—
72	1939.3230	F. Shaw Mayer	17.7.1930	Mt Derimapa, Weyland Range	03°42'S 135°55'E	1524	♂	✓	✓
73	33.6.1.77	··	10.9.1930	Wasior, Wandammen Peninsula	02°43'S 134°31'E	60	♀	✓	✓
74	34.2.4.1	W.C. Frost	1933	Kobroor, Aru Islands	06°15'S 134°20'E	<30	♂	✓[S]	✓
75	46.683	L.E. Cheesman	4.10.[19]39	Mt Eiori Camp, Japen Island	01°45'S 136°10'E	609	♂	✓	✓
		Museo Civico di Storia Naturale "Giacomo Doria", Genoa (MCG)							
76	3926	O. Beccari	1875	Ansus, Japen Island	01°43'S 135°48'E	—	♂	✓	✓
77[T]	3904	··	Jul 1875	Andai, Arfak Mountains	00°51'S 134°01'E	—	♂	✓	✓
78[T]	590	A A. Bruijn	1874	··	00°51'S 134°01'E	—	♂	✓	✓
79[T]	3922	L.M. D'Albertis	1876	Fly River	08°25'S 143°10'E	—	♀	✓	✓
80	10461	L. Loria	1894	Vanapa River (mountainous part)	08°54'S 147°20'E	—	♂	✓	—
		Museum für Naturkunde an der Humboldt-Universität zu Berlin (ZM)							
81[T]	5680	L.M. D'Albertis	—	Fly River	08°25'S 143°10'E	—	♀	✓	✓
82[M/F3]	A376.11	A.S. Meek	8.10.1910	Mt Utakwa area, Snow Mountains	04°15'S 137°17'E	—	—	✓	✓
83[T]	20335	J. Bürgers	1.8.1913	Meanderberg, April River	04°00'S 141°45'E	—	—	✓	✓
84	91661	G. Stein	21.3.1931	Japen Island	01°45'S 136°10'E	—	♀	✓	✓
85	91662	··	14.7.1931	··	01°45'S 136°10'E	—	♂	✓	✓
86	91665	··	29.7.1931	Wanggar River, Weyland Range	03°40'S 135°25'E	—	♂	✓	✓
87[T]	44226	··	7.9.1931	Kunupi, Weyland Range	03°52'S 135°31'E	1400–1800	♂	✓	✓
88	91664	··	2.9.1931	··	03°52'S 135°31'E	1400–1800	♀	✓	✓
89	91663	··	8.10.1931	··	03°52'S 135°31'E	1400–1800	♀	✓	✓
		Museum of Comparative Zoology, Harvard University (MCZ)							
90[T]	28082	H. Stevens	27.3.1932	Wau	07°20'S 146°43'E	975	♂	✓	✓
		Muséum national d'Histoire naturelle, Paris (MNHN)							
91[F4]	375	C.A. Maingonnat	1868	Gilolo (Halmahera) Island	01°00'N 128°00'E	—	♀	✓	—
92	376	L. Laglaise	1888	Waigeo Island	00°13'S 130°50'E	—	—	✓	—
		Museum Zoologicum Bogoriense, Bogor (MZB)							
93	14471	J.P.K. van Eechoud	1939	Pionier bivak, Mamberamo River	02°20'S 138°00'E	30	♂	✓	—
94	8215	Archbold, Richardson & Rand	9.3.1939	Rattan Camp, Idenburg River	03°30'S 139°09'E	1200	♂	✓	✓
95[F5]	8216	··	27.3.1939	··	03°30'S 139°09'E	1200	♀	✓	✓
96[M/F6]	24201	J.I. Menzies	10.3.2002	Saengga (1 km E. BP Base Camp)	02°30'S 133°15'E	<100	♂	✓	✓

continued…

Appendix 1. Continued from previous pages.

Ref. no.	Accession no.	Collector	Date	Locality	Coordinates	Elevation (m)	Specimen sex	skin	skull
				Papua New Guinea Museum, Boroko (PNGM)					
97	23685	H.W. Clissold	24.3.1963	Big Wau Creek Ridge	07°23'S 146°43'E	1524	♂	✓	✓
98	23918	P.D. Dwyer– E8*	6.3.1979	Bobole area, Mt Sisa (Haliago)	06°12'S 142°46'E	1000–1600	♂	✓	✓
99	23917	·· – E296*	26.5.1979	Namosado area, Mt Sisa (Haliago)	06°15'S 142°47'E	700–900	♀	✓	✓
100	23295	·· – E1247*	6–9.1979	··	06°15'S 142°47'E	700–900	—	—	✓
101	23296	·· – E1245*	6–9.1979	··	06°15'S 142°47'E	700–900	—	—	✓
102[F7]	23297	·· – E1249*(cranium)	6–9.1979	··	06°15'S 142°47'E	700–900	—	—	✓
		·· – E1223*(mandibles)							
103	23299	·· – E1222*	6–9.1979	··	06°15'S 142°47'E	700–900	—	—	✓
104	23300	·· – E1248*	6–9.1979	··	06°15'S 142°47'E	700–900	—	—	✓
105	23301	·· – E1221*	6–9.1979	··	06°15'S 142°47'E	700–900	—	—	✓
106	23302	·· – E1246*	6–9.1979	··	06°15'S 142°47'E	700–900	—	—	✓
107	23303	·· – E1217*	6–9.1979	··	06°15'S 142°47'E	700–900	—	—	✓
108	23298	·· – E1201*	25.9.1979	··	06°15'S 142°47'E	700–900	♂	—	✓
109	23676	·· – E222*	11.5.1979	Bobole area, Mt Sisa (Haliago)	06°12'S 142°46'E	1000–1600	—	—	✓
110	··	·· – E349*	30.5.1979	··	06°12'S 142°46'E	1000–1600	—	—	✓
111	··	·· – E899*	27.8.1979	··	06°12'S 142°46'E	1000–1600	—	—	✓
112	··	·· – E1325*	30.10.1979	··	06°12'S 142°46'E	1000–1600	—	—	✓
113	··	·· – E1496*	4.12.1979	··	06°12'S 142°46'E	1000–1600	♂	—	✓
114	··	·· – E2079*	10.1979–3.1980	Namosado area, Mt Sisa (Haliago)	06°15'S 142°47'E	700–900	—	—	✓
115	··	·· – E2080*	10.1979–3.1980	··	06°15'S 142°47'E	700–900	—	—	✓
116	··	·· – E2112*	10.1979–3.1980	··	06°15'S 142°47'E	700–900	—	—	✓
117	··	·· – E2113*	10.1979–3.1980	··	06°15'S 142°47'E	700–900	—	—	✓
118	··	·· – E2114*	10.1979–3.1980	··	06°15'S 142°47'E	700–900	—	—	✓
119	··	·· – E2115*	10.1979–3.1980	··	06°15'S 142°47'E	700–900	—	—	✓
				Queensland Museum, Brisbane (QM)					
120	13672	—	reg. 1913	Vanapa River valley	08°54'S 147°20'E	—	♂	✓[S]	✓
				Rijksmuseum van Natuurlijke Historie, Leiden (RMNH)					
121[T/M]	25750a	S. Müller	Aug 1828	Lobo, Triton Bay	03°45'S 134°05'E	—	♂	✓	✓
122	35141a	C.B.H. von Rosenberg	1865	Aru Islands	06°00'S 134°30'E	<30	♀	✓	✓
123[T]	25749c	H.A. Bernstein	Feb 1865	Sailolo, Salawati Island	01°05'S 130°53'E	—	♂	✓	✓
124[T]	25749d	··	22.2.1865	··	01°05'S 130°53'E	—	♀	✓	—
125	25749b	D.S. Hoedt	17.6.1867	··	01°05'S 130°53'E	—	♀	✓	✓
126	25749a	··	9.7.1867	··	01°05'S 130°53'E	—	♂	✓	✓
127	117	*N.G. Expedition 1906–1907*	10.8.1907	Alkmaar	04°40'S 138°43'E	30	♂	—	✓
128[M]	16167	S. Bergman	28.12.1948	Kambala	03°51'S 133°26'E	—	♀	✓	✓
129	16846	A.J.M. Monsanto	3.8.1959	Merauke	08°27'S 140°22'E	—	♂	✓	✓
				University of Papua New Guinea Museum, Boroko (UPNG)					
130	3273	J.I. Menzies	1994	Nenei, Arfak Mountains	01°29'S 133°59'E	795	♀	✓	✓
				Western Australian Museum, Perth (WAM)					
131	2809	Archbold, Richardson & Rand	2.5.1939	Bernhard Camp, Idenburg River	03°29'S 139°13'E	75	♂	✓	✓

[F1] (59) The location of Avera was determined by reference to Blayney (1901). In this report the position of Avera village is described in the text but on the accompanying map it is shown as Avela. Avela, but not Avera, can be found on modern maps. This specimen bears two labels, one giving the locality as Avera and the date of collection as 7.2.0(?3) and the other (in a different hand) gives the locality as A(?rru), Aroa River and a date of 7.2.06. Meek is known to have been collecting on the north side of British New Guinea in 1906, and on the south side in the Avera/Aroa River area in 1902–03 and 1904–05, so the 1906 date is incorrect. "Arru" might be read as Auiu (if the i lacked the dot), the name of a creek close to Avera that is mentioned in the 1901 report. Examination of letters written by Meek that are held in the archives of the British Museum, including one from Avera dated 17 February 1903, suggest that 1903 was the year of collection.

[F2] (71) This specimen does not have a BM accession number.

[F3] (82) Tate (1947) gives the locality as "Snow Mountains" (probably Mount Goliath) but Meek did not collect in the Mount Goliath area until 1911. In 1910 he was in the Mount Utakwa area (Meek, 1913).

[F4] (91) The provenance of the specimen is doubtful, and it is not shown on the distribution map (Fig. 2). C.A. Maingonnat was a taxidermist (from Obituary in "The Humming Bird", April 1891), and a merchant of natural history wares in Paris (from http://www.rom.on.ca/biodiversity/auk/aukgre3.html [25.10. 2005]). Coat colour similar to that of specimen 16 (Group 8), no other data.

[F5] (95) Specimen donated to MZB by AMNH (AMNH no. 152008). Six pouch young (AMNH numbers 152811–16) of this female are held in the AMNH in spirit. Crown-rump length of young 14–15 mm.

[F6] (96) Skin not examined. Colour photographs of intact animal seen.

[F7] (102) Composite specimen.

Previously designated type specimens: 48 (*Myoictis Wallacii*); 77 (*Phascogale Thorbeckiana*); 78 (*Chaetocercus Bruijnii*); 79, 81 (*Phascogale pilicauda*); 83 (*Phascogale melas bürgersi*); 87 (*Phascogale melas senex*); 90 (*Myoictis melas wavicus*); 121 (*Phascogalea melas*); 123,124 (*Phascogalea Thorbeckiana*).

Appendix 2. Data for specimens collected in each of the localities (1–13) shown in Fig. 2. Reference numbers of specimens from Appendix 1. (*Status*) based on dentition, or in a few cases in which teeth could not be examined, on assessment of reproductive condition; *SA*, subadult—incomplete set of cheek teeth, or sexually immature; *A*, adult—all cheek teeth fully erupted, or sexually mature. (*H-B*), head-body length from tip of nose to base of tail. (*Foot*), length from heel to base of claw of longest digit. (*Footpads*), *NF*—first interdigital and thenar pads not fused; *F*, first interdigital and thenar pads fused. (*BC*), basicranial length. (P^3), *SR*, single rooted; *DR*, double rooted; presence of deciduous precursor shown in parentheses. (M_{1-4}),length of lower molar tooth row.

Ref. no.	Sex	Status SA	Status A	Mass g	No. of nipples	H-B mm	Foot mm	Footpads NF	Footpads F	BC mm	P^3 SR	P^3 DR	P_3 SR	P_3 DR	M_{1-4} mm
1 Aru Islands															
37	♀		✓	192	6	208	39.9	✓		—		✓		✓	12.4
38	♂		✓	206		206	37.8	✓		42.9		✓	absent	12.3	
39	♂		✓	245		222	38.5	✓L	✓R	45.1		✓	✓R	✓L	12.2
40	♂		✓	240		200	34.0	✓		44.9		✓		✓	12.1
41	♂		✓	230		215	39.2	✓		45.2		✓		✓	11.9
48	♂	✓		—		—	—	✓		—	not showing		not showing		—
53	♂		✓	—		—	38.0	✓		44.0		✓		✓	12.2
54	—	✓	—	—		—	—	✓		—	—	—	not fully up		—
74	♂		✓	—		—	38.6	✓		46.1		✓	✓R	✓L	12.2
122	♀		✓	—	—	—	—	—	—	—		✓		✓	12.1
2 Southern mainland New Guinea															
4	♂		✓	—		198	36.0	✓		45.0		✓		✓	11.6
52	♂		✓	—		185	39.0	✓		44.4		✓		✓	12.0
59	♂		✓	—		—	—	✓L	✓R	41.4		✓		✓	11.8
79	♀		✓	—	6	176	32.5	—	—	40.0		✓	✓		11.2
81	♀		✓	—	—	—	—	—	—	40.6		✓		✓	11.3
129	♂		✓	—		—	—	—	—	—		✓		✓	11.8
3 Mt Bosavi, Mt Sisa, Mt Victoria/Vanapa River															
19	—		✓	—		—	—	—	—	41.4		✓	✓		11.4
20	♂		✓	225		205	—	—	—	43.5		✓	✓		11.6
21	♂	✓		—		145	33.0	✓		—	—	—	—	—	—
22	♀		✓	200	4	197	38.0	✓		43.0		✓	✓		11.2
23	♂		✓	225		225	39.0	✓		44.7		✓	✓		12.2
24	♂		✓	—		230	41.0	✓L	✓R	46.2		✓	✓		11.9
44	♀		✓	—	—	192	40.0	✓		43.5		✓	✓		11.9
45	♀	✓		—	—	159	36.0	✓		36.3	—(dp^3)	—	not showing		11.3
55	♂	—	—	—		—	—	✓		—	—	—	—	—	—
80	♂	—	—	—		200	—	—	—	—	—	—	—	—	—
98	♂	✓		—		155	34.0	✓		—	—(dp^3)	—	not showing		11.1
99	♀	✓		—	—	165	34.4	✓L	✓R	37.5	—(dp^3)	—	not showing		11.7
100	—		✓	—		—	—	—	—	46.0		✓	✓		12.0
101	—		✓	—		—	—	—	—	46.2		✓	✓		11.7
102	—		✓	—		—	—	—	—	43.8		✓	✓		11.7
103	—		✓	—		—	—	—	—	45.1		✓	✓		11.6
104	—		✓	—		—	—	—	—	43.2		✓	✓		11.8
105	—		✓	—		—	—	—	—	44.3		✓	✓		11.6
106	—		✓	—		—	—	—	—	42.3		✓	✓		11.8
107	—		✓	—		—	—	—	—	43.8		✓	✓		12.0
108	♂		✓	230		200	40.0	—	—	43.2		✓	✓		11.8
109	—		✓	—		—	—	—	—	43.4		✓	✓		11.6
110	—		✓	—		—	—	—	—	42.2		✓	✓		11.3
111	—	✓		—		—	—	—	—	31.7	—(dp^3)	—	not showing		—
112	—	✓		—		—	—	—	—	—	—(dp^3)	—	not showing		11.8
113	♂		✓	200		205	—	—	—	41.2		✓	✓		11.6
114	—		✓	—		—	—	—	—	44.3		✓	✓		11.9
115	—		✓	—		—	—	—	—	41.7		✓	✓		11.7
116	—		✓	—		—	—	—	—	41.8		✓	✓		11.6
117	—	✓		—		—	—	—	—	—	not showing		not showing		11.9
118	—		✓	—		—	—	—	—	43.9		✓	✓		11.5
119	—		✓	—		—	—	—	—	39.4		✓	✓		11.9
120	♂	✓		—		—	—	—	—	—	not fully up		not showing		12.2
4 Wau, Mt Missim															
26	♀		✓	61	4	140	30.5		✓	35.1		✓	✓		10.5
27	♀		✓	—	4	165	32.6	—	—	37.8		✓	✓		10.7
28	♀		✓	—	4	170	32.0	—	—	38.4		✓	✓		11.1
29	♂		✓	110		165	34.5		✓	—	—	—	—	—	—
30	♀		✓	71	4	155	30.2		✓	—	—	—	—	—	—
31	♀		✓	—	4	170	32.0	—	—	37.8		✓	✓		11.1
32	♂		✓	—		175	33.5		✓	40.4		✓	✓		10.7
43	♂		✓	—		173	35.0		✓	41.6		✓	✓		10.7
90	♂		✓	134		168	33.0		✓	39.9		✓	✓		10.5
97	♂		✓	—		169	36.0		✓	39.6		✓	✓		11.0
5 Bomberai Peninsula															
56	♂		✓	—		—	—		✓	—	—	—	—	—	—
96	♂		✓	223		215	42.0	—	—	47.2		✓	absent		12.6
121	♂		✓	—		200	34.0		✓	—		✓	✓		12.5
128	♀		✓	—	—	—	—	—	—	43.5		✓	absent		12.7

continued…

Appendix 2. Continued from previous page.

Ref. no.	Sex	Status SA	Status A	Mass g	No. of nipples	H-B mm	Foot mm	Footpads NF	Footpads F	BC mm	P^3 SR	P^3 DR	P_3 SR	P_3 DR	M_{1-4} mm
6 Snow Mountains															
60	♂	✓		—		140	34.0		✓	—	—(dp^3)	—	—	—	—
61	♂	✓		—		136	33.0		✓	—	—(dp^3)	—	—	—	—
62	♀		✓	—	—	182	38.0	✓		41.9		✓	absent		12.4
63	♀	✓		—	—	166	36.0		✓	—	—(dp^3)	—	—	—	12.5
64	♂		✓	—		196	33.0	—	—	—		✓	absent	—	
65	♂	✓		—		169	34.0		✓	—	—(dp^3)	—	—	—	12.6
66	♀		✓	—	6	194	34.5	✓		44.2		✓	—	—	12.3
67	♂		✓	—		202	39.0	✓R	✓L	—		✓	absent		12.9
82	—	✓		—		—	—	—	—	—	—	—	—	—	—
127	♂		✓	—		240	40.0	—	—	48.3		✓	absent		13.3
7 Salawati and Waigeo Islands															
50	♂		✓	—		—	38.0		✓	—		✓	absent		12.9
51	♀		✓	—	6	190	39.0		✓	—	—	—	absent	—	
92	—	—	—	—		—	—	—	—	—	—	—	—	—	—
123	♂	—	✓	—		—	—	—	—	—		✓	✓	—	13.4
124	♀	—	—	—	—	—	—	—	—	—	—	—	—	—	—
125	♀		✓	—	—	—	—	—	—	—		✓	absent		13.1
126	♂		✓	—		—	—	—	—	—		✓	absent		12.8
8 Arfak Mountains, Oransbari, Wasior															
15	♂	✓		—		173	39.0		✓	39.5	not fully up		—	—	12.7
16	♂		✓	—		221	43.0	✓		47.2		✓	✓		12.2
33	♂	✓		33		171	36.2	✓		—	—(dp^3)	—	—	—	12.3
34	♂		✓	232		210	38.3	✓		46.2		✓	absent		12.6
35	♂	✓		115		153	35.4		✓	38.5	not fully up		—	—	12.2
36	♂		✓	172		202	36.5	✓		43.5		✓	absent		12.8
42	♂		✓	—		201	42.0		✓	44.4		✓	absent		12.2
49	—	✓		—		—	—	—	—	42.4	not fully up		—	—	12.5
57	♂	✓		—		—	—	✓		—	—(dp^3)	—	—	—	12.6
58	♂	—	—	—		—	—	✓		—	—	—	absent		12.2
69	♂		✓	—		194	38.0		✓	44.4		✓	absent		12.4
70	♂	✓		—		159	37.0	✓		—	—(dp^3)	—	—	—	12.6
71	♂	—	✓	255		—	41.0		✓	—	—	—	—	—	—
73	♀		✓	—	6	186	39.0	✓		45.6		✓	absent		12.3
77	♂		✓	—		170	34.0	—	—	40.9		✓[a]	absent		12.4
78	♂		✓	—		—	—	—	—	—		✓	absent		12.6
130	♀		✓	—	6	215	35.5	✓		47.2		✓	absent		12.4
9 Japen Island															
75	♂		✓	—		210	44.0	✓R	✓L	46.0		✓	absent		11.7
76	♂		✓	—		210	42.0	—	—	49.1		✓	absent		13.2
84	♀		✓	—	6	210	39.0	—	—	44.6	—	✓	absent		12.4
85	♂		✓	—		213	36.0	—	—	—	—	—	absent		12.1
10 Weyland Range															
1	♀		✓	—	—	178	36.0		✓	43.2		✓	absent		11.9
2	♀	✓		—	—	169	36.0	✓		—	—(dp^3)	—	—	—	12.1
3	♂		✓	—		189	35.0	✓		42.5		✓	absent		12.8
68	♂		✓	—		210	40.0		✓	48.3		✓	✓R[b]		12.6
72	♂		✓	—		196	40.0	✓L	✓R	47.4		✓	absent		12.5
86	♂	✓		—		181	35.0	—	—	40.9	—(dp^3)	—	—	—	11.4
87	♂		✓	—		210	36.0	—	—	44.1		✓	absent		12.4
88	♀		✓	—	—	172	35.0	—	—	40.3		✓	absent		12.6
89	♀	✓		—	—	147	32.0	—	—	34.8	—(dp^3)		—	—	—
11 Mamberamo River, Idenburg River, April River															
5	♂	✓		—		103	23.0	—	—	27.1	—(dp^3)	—	—	—	—
6	♂		✓	—		218	40.0	✓		45.1		✓	✓R[b]		12.2
7	♀		✓	—	—	—	38.0	✓		—	—	—	—	—	—
8	♂	✓		—		170	38.0	✓		39.2	not showing		—	—	12.1
9	♂		✓	—		207	40.0	✓L	✓R	—		✓	absent		12.0
10	♀	✓		—	—	183	37.0	✓R	✓L	39.2	not fully up		—	—	12.3
11	♂		✓	—		223	43.0	✓		43.3	[c]		absent		12.5
12	♂		✓	—		—	—	—	—	—	—	—	—	—	—
13	♂		✓	—		215	39.0		✓	45.6		✓	✓		12.1
14	♂		✓	—		213	39.0		✓	45.8		✓	absent		13.0
18	♂	✓		—		178	39.0	✓		40.8	not showing		—	—	12.2
83	—		✓	—		—	—	—	—	—	—	✓	absent		12.4
93	♂		✓	—		—	—	—	—	—	—	—	—	—	—
94	♂		✓	—		220	39.0	—	—	—	—	—	—	—	—
95	♀		✓	—	6	194	37.0	—	—	—	—	—	—	—	—
131	♂		✓	—		209	40.0	✓R	✓L	49.6		✓	absent		12.3
12 Torricelli Mountains															
17	♀	✓		—	—	165	38.0	—	—	—	—	—	—	—	—
25	♂	✓		30		100	27.1	—	—	29.6	—(dp^3)	—	—	—	—
13 Adelbert Mountains															
46	♂	✓		—		110	28.0	✓		31.0	—(dp^3)	—	—	—	—
47	♂	✓		—		117	33.0	✓		29.1	—(dp^3)	—	—	—	—

[a] P^3 not fully erupted, bone has been removed on left side to expose roots; [b] left absent; [c] right not fully up, left absent.