MORPHOLOGY-BASED REVISION OF MUREXIA AND ANTECHINUS
(MARSUPIALIA: DASYURIDAE)

STEVE VAN DYCK

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The unremarkable, rat-like appearance of 16 named forms of small Irian Jayan and Papua
New Guinean dasyurids previously assigned to Antechinus Waterhouse, 1837, and Murexia
Tate & Archbold, 1937, has resulted in persistent taxonomic confusion. In this paper the two
genera are systematically revised and a hypothesis of phylogenetic relationships proposed. I
conclude that the New Guinea taxa assigned to Antechinus (pre-1984) represent three related
but morphologically primitive taxa that lack clear signs of relationship to each other. They
are referred to monotypic Micromurexia (for M. habbema), Phascomurexia (for P. naso), and
Murexechinus (for M. melanurus) all but distantly related to Australian antechinuses. New
Guinea Murexia is monotypic (M. longicaudata) and highly plesiomorphic. It has no
especially close relationship with the more derived rothschildi which has traditionally been
assigned to Murexia but is assigned here to Paramurexia gen. nov.; the Murexinae is not
supported, and the Australian Antechinus forms a monophyletic group with Phascogale.

Keywords: Murexia, Antechinus, Marsupialia, New Guinea, taxonomy.

Steve Van Dyck, Queensland Museum, PO Box 3300, South Brisbane 4101, Australia;
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Two laconic remarks made by Schlegel (1866) in the original description of Phascogale
longicaudata, had significance well beyond their immediate 19th century context ... 'Cette espèce rappelle, par sa taille, le jeune du rat ordinaire'
[This species calls to mind, by its build, the young of the common rat ...], '... et offrant en général absolument les mêmes caractères que les
Antechinus de l'Australie ...' [... and offering in general absolutely the same characteristics as the Antechinus of Australia ...].

Ever since Schlegel's time, the unremarkable, rat-like appearance of his P. longicaudata has
consistently confounded its affinities with the suite of other equally unremarkable, rat-like
dasyurids from New Guinea.

Schlegel's other observation that P. longicaudata shared attributes with the Australian Antechinus
was later echoed by Thomas (1899) in his description of the Papua New Guinean species
Phascogale melanura, 'P. melanurus clearly belongs to the group comprising the small <
Antechini > of Australia, Ph. minimax, flavipes etc., and of which Ph. longicaudata is the largest
member ...'.

Tate & Archbold (1941) assigned 3 New Guinean dasyurids Phascogale tafa, P. melanurus and a new species, habbema to the
Australian Antechinus on the basis of their 'generalised forms'. In so doing Tate & Archbold
finally formalised the close link suggested by Schlegel & Thomas between the small dasyurids
of Australia and those of Irian Jaya/Papua New Guinea.

Acceptance of the trans-Torresian distribution of Antechinus prevailed until 1984, when Woolley
presented results of studies of phallic morphology in New Guinea dasyurids, indicating
a very dubious relationship between Australian and New Guinean members of Antechinus, and
thus challenging the integrity of the Phascogalinae (sensu Archer, 1982a) not long
after consensus from a diversity of opinion indicated that Antechinus in Australia was not
monophyletic (but included what we now regard as Dasykaluta rosamondae, Pseudantechinus
macdonnellensis, P. ningbing, Parantechinus apicalis and Pa. bilarni). This was followed (Van
Dyck, 1988) by a clarification of specific epithets applicable to 'Antechinus' of New Guinea
(melanurus, habbema and naso) but more importantly providing morphological
confirmation that these species (and Murexia) deserved generic reclassification, that their
inclusion in Antechinus was, as Woolley had suggested, inappropriate.

Kirsch et al. (1990), using DNA hybridisation, and Baverstock et al. (1990), using albumin
immunology, confirmed the closer relationship between New Guinea 'antechinuses' and New
Guinea *Murexia* than with Australian *Antechinus*. Krajewski et al. (1993) concluded that New Guinea *Antechinus* and *Murexia* formed a clade that was the sister-group of Australian antechinuses. Krajewski et al. (1994) called for the abolition of the Murexicinae and Phascolosoricinae, in favour of the Phascolaginidae and the Dasyurinae (respectively). Krajewski et al. (1996), on the basis of analysis of cytochrome b sequencing, concluded that the Phascolaginidae (sensu Archer, 1982a) actually consisted of 3 clades corresponding to *Phascogale*, Australian *Antechinus*, and New Guinea ‘antechinuses’ and *Murexia*. They also proposed monophyly of *Murexia* and all *Antechinus* apart from *Phascogale*, and recommended assignment of the New Guinea antechinuses *A. habbema*, *A. melanurus*, *A. naso* and *A. wilhelmina* (provisionally) to *Murexia*.

Since Schlegel's description of *P. longicaudata*, 15 species or subspecies of *Murexia* and *Antechinus* have been described from New Guinea. The primary objective of this study is to clarify the generic relationships of the New Guinea species previously assigned to *Antechinus*. At a specific level, there has been, since then, reasonable concurrence with other authors (Woolley, 1989; Krajewski et al., 1996), however, at the generic and subspecific levels there are major discrepancies between conclusions from morphological and molecular analyses.


**METHODS**

Terminology of cranial morphology follows Archer (1976a), dental and external morphology follows Archer (1976b, 1981), and tooth number follows Luckett (1993). Cranial and dental measurements were made with NSK electronic digital calipers (to 0.01mm). All specimens compared in diagnoses were adults with fully erupted P3.

Specimens were examined from the Australian Museum, Sydney (AM M); Australian National Wildlife Collection, Division of Wildlife Research, Canberra (CM); Bernice Bishop Museum, Honolulu (BBM); Natural History Museum, London (BMNH); Rijksmuseum van Natuurlijke Historie, Leiden (RMNH); American Museum of Natural History, New York (AMNH); Museum National D'Histoire Naturelle, Paris (MNHN); Museo Civico Del Storia Naturale, Genova (MCSN); Museum of Comparative Zoology, Harvard College, Cambridge (MCZ); Zoologisches Museum der Humboldt-Universität zu Berlin (ZM); Queensland Museum, Brisbane (QMJ or JM).


I present only the most economical primary synonymy. Species diagnoses attempt to describe absolute diagnostic features, while more relative diagnostic characters, appear in Remarks. In most instances subjective synonyms are dealt with in detail to provide reasonable justification for taxonomic decisions made here, and to remove subjectivity.
Pelage colours were compared with Ridgway (1912) and statistical significance between means was established through Students T-tests.

**PHYLOGENETIC ANALYSIS**

Binary coding of character states was rarely possible, and most characters were scored multistate. Both the branch and bound algorithm of Hennig '86 V1.5 (Farris, 1988) and PAUP version 4.0b2 (Swofford 1998) were used to analyse the data matrix in Table 8. A heuristic search of the data was completed using step-wise addition sequences, tree-bisection-reconnection (TBR) branch swapping, MULPARS, and zero branches collapsed to yield polytomies. The strict consensus (Bremer, 1990) of the most parsimonious trees was computed using PAUP and Hennig '86. Successive approximations character weighting (successive weighting) was implemented using PAUP with a base weight of 1000. Clados Version 1.2 (Nixon, 1992) was used to study character evolution. In the character matrix, A. stuartii, A. agilis and A. subtropicus are merged into the single taxon Antechinus stuartii for the analysis. In addition, a heuristic search of the data was invoked using 500 bootstrap pseudoreplicates, Branch-swapping, Tree-bisection-reconnection, MuTrees and a Consensus Tree formulated using the 50% majority-rule criterion (not shown).

**TAXONOMIC HISTORY OF THE PHASCOGALINAE**

Suprageneric classification within the Dasyuridae was reviewed and revised by Archer (1982a) and challenged by Westerman & Woolley (1993), and Krajewski et al. (1994, 1996). Goldfuss (1820) assigned Australian carnivorous marsupials to the tribe Dasyurini. From this tribe Waterhouse proposed the Dasyuridae and the Myrmecobiidae. Bonaparte (1838) removed Thylacinus from the Dasyuridae to the Thylacinidae, but proposed the Phascogalinae, within the Dasyuridae to, presumably, accomodate the smaller representatives. Gill (1872) erected a suborder, the Dasyuromorpha, to accomodate the Myrmecobiidae and the Dasyuridae (which contained subfamilies Sarcophilini, Dasyurinae and Phascogalinae). But Thomas (1888) did not adopt the Phascogalinae, and divided the Dasyuridae into the Myrmecobiinae and Dasyurinae. Iredale & Troughton (1934) (classifying only Australian mammals) recognised 3 subfamilies in the Dasyuridae: Phascogalinae (Antechinus, Planigale, Phascogale, Dasyurus, Dasyuroidea, Sminthopsis and Antechinomys), Dasyurinae and Thylacininae. Simpson (1945) assigned Dasyurus, Dasyuroidea, Dasyurinus, Satanelus and Sarcophylos to the Dasyurinae, which, along with the Phascogalinae, Myrmecobiinae and Thylacininae accounted for the Polprotodontia. Tate (1947) instead, divided the Dasyuridae into the Dasyurinae (based on the reduction of P^1 and P^2 being smaller than P^1) and the Phascogalinae to which he assigned Antechinus, Murexia, Thylacinus, Sminthopsis, Antechinomys, Planigale and Phascogale. Similarly, Laurie & Hill (1954) acccommodated New Guinean representatives of Murexia, Sminthopsis, Planigale and Antechinus in the Phascogalinae. Ride (1964) recognised four marsupial orders, one of which, the Marsupicarnivora contained the superfamly Dasyuroidea made up of the Thylacinidae and Dasyuridae. The Dasyuridae contained Myrmecobiinae and the Dasyurinae (containing all dasyurid genera other than Myrmecobius). Kirsch (1977) used Gill's (1872) Dasyuromorpha to accomodate the Dasyuroidea which contained the Myrmecobiidae and the Dasyuridae.

**POLYPHYLY OF THE PHASCOGALINAE.**

Several studies that suggested Antechinus was not monophyletic were based on phallic morphology (Woolley, 1982), interpretation of enzyme data (Baverstock et al., 1982) and cranial and dental examinations (Archer, 1982a; Kirsch & Archer, 1982). They specifically impacted on what we now regard as Dasykaluta rosamondae, Pseudantechinus macdonnellensis, P. ninbing, Parantechinus apicalis and Pa. bilarni. The broad spectrum of species, historically representing the Phascogalinae, was reduced by Archer (1982a), with restriction of its constituents to Phascogale and Antechinus (the New Guinea 'antechinuses', and 7 thin-tailed Australian antechinuses) on the putative synapomorphies of enlargement of P^1, reduction in M^2 complexity, and slight reduction in posterior premolar size. At the same time Archer erected the Murexiniae, for Murexia longicaudata and M. rothschildi, in recognition of the primitive nature of the dentition and basiuranum. Woolley's (1984) studies of phallic morphology in New Guinea dasyurids indicated a more than dubious relationship between Australian and New Guinean members of Antechinus, again challenging integrity of the Phascogalinae. This was followed (Van Dyck, 1988) by a clarification.
FIG. 1. Tooth numbering and limits of measured dimensions. Abbreviations are: APV = anterior palatal vacuity length; BL = basicranial length; Dent = dentary length; HB = head and body length; IBW = distance between right and left auditory bullae; IOW = interorbital width; IPV = inter-palatal vacuity length; M2W = width of second upper molar; NW = nasal width the level of the premaxillary/nasal/maxillary junction; OBW = basicranial width from outside right and left auditory bullae; PPV = posterior palatal vacuity length; R-LC1 = rostral width at the level of the upper canines; R-LM1 = rostral width at the level of the first upper molars; R-LM1’T = width between the ectolophs of right and left first upper molars; R-LM2 = rostral width at the level of the second upper molars; R-LM3 = rostral width at the level of the third upper molars; T = tail length; TL = total length, body and tail; ZW = zygomatic width.
of specific epithets applicable to the 'Antechinus' of New Guinea (melanurus, habbema and naso) but more importantly providing morphological confirmation that these species deserved generic reclassification, that their inclusion in Antechinus was inappropriate. The specific epithets were tentatively confirmed by Woolley (1989), who again drew attention to distinction between Australian and New Guinean 'ant-echinuses'. Kirsch et al. (1990), using DNA hybridisation, and Baverstock et al. (1990), using albumin immunology, confirmed the closer relationship between small New Guinean 'antechinuses' and New Guinean Murexia than with Australian Antechinus. While both studies concluded, however, that New Guinean 'antechinuses' were monophyletic with Murexia, Baverstock et al. (1990) concluded that Australian species of Antechinus and Phascogale formed a monophyletic group (also see Aplin et al., 1993), while Kirsch et al. (1990) found Phascogale to be part of a broader context i.e., the sister group of all Australian and New Guinean Antechinus and Murexia. Kirsch's results (with respect to Phascogale) were confirmed by Krajewski et al. (1993) who also concluded that New Guinean species of Antechinus and Murexia formed a clade that was the sister-group of Australian antechinuses. On the basis of cytochrome-b and MC'F data, however, Westerman & Woolley (1993) suggested Murexia longicaudata and M. rothschildi were allied to the Dasyurinae, not the Murexinae.

Krajewski et al. (1994) called for abolition of Muricinae (sic) and Phascolosoricinae, in favour of Phascogalinae and Dasyurinae respectively. Krajewski et al. (1996) presented the following results of phylogenetic analysis of cytochrome b sequences from 10 species of the Phascogalinae: the subfamily consisted of 3 clades corresponding to 1. Phascogale 2. Australian Antechinus, and New Guinean 'antechinuses' and 3. Murexia. There was monophyly of Murexia and all Antechinus apart from Phascogale; a sister-species relationships existed between A. melanurus and A. naso, and between A. stuartii and A. swainsonii. They also suggested early divergence of A. habbema. But finally, and most importantly, Krajewski et al. recommended assignment of the New Guinean antechinuses A. habbema, A. melanurus, A. naso and A. wilhelmina (provisionally) to Murexia. This was echoed by Armstrong et al. (1998).

Morphological comparisons presented here suggest that M. habbema, M. longicaudata, P. naso, P. rothschildi and M. melanurus represent a suite of related but morphologically primitive taxa that lack clear signs of close relationship but that have minor autapomorphies to distinguish them from one another. They are largely plesiomorphic in their teeth and skulls relative to Australian Antechinus and other dasyurid genera.

SYSTEMATICS

Family DASYURIDAE

Antechinus Macleay, 1841

_Phascologale_ (in part) Temminck 1824.
_Phascolosorex_ (in part) Thomas 1888.


SPECIES INCLUDED. godmani (Thomas, 1923); swainsonii (Waterhouse, 1840); minutus (Geoffroy [Saint-Hilaire], 1803); bellus (Thomas, 1904); flavipes (Waterhouse, 1837); adustus (Thomas, 1923); subtropicus Van Dyck & Crowther, 2000; leo Van Dyck, 1980, agilis Dickman et al., 1998.

GENERIC DIAGNOSIS. Penis with a bifid tip. Tail shorter than the head-body length (the tail does not possess a terminal brush or ventral crest as in _Phascogale, Dasyuroideae, Dasyurus, Antechinomys, Sminthopsis longicaudata_). Pelage not including dorsal striping (as in _Paramurexia, Myoictis, Phascolosorex, Thylacinus_) or spots (as in _Dasyurus_). M1 of reduced protocone breadth, with complete or incomplete anterior cingulum but with the anterior margin indented posteriorly, and never anteriorly convex (as in _Micromurexia, Murexia, Phasmocomurexia, Paramurexia, Murexechinus, Myoictis_). P3 might be relatively reduced, never reduced to a spicule or lost from the premolar row (as in _Dasyurus, Sarcophilus, Dasykaluta, Parantechinus, Dasyuroideae, some Planigale_). M with reduced paraconid but never greatly reduced as in _Parantechinus, Pseudantechinus, Dasyurus, Sarcophilus_. Tail not incrassate (as in some _Sminthopsis, Pseudantechinus, Dasykaluta, Dasyurus, Sarcophilus_). Auditory bullae not enormously enlarged (as in _Ningoai, Dasykaluta, Pseudantechinus, Dasyuroideae, Phascogale, some Sminthopsis_). Squamosal and frontal bones not in contact (as in _Sminthopsis, Thylacinus, Neophascogale, Phascolosorex, Planigale ingrami, Myoictis, Antechinomys_). Metacristids and hypocristids not transverse to the long axis of the skull (as in _Sminthopsis, Thylacinus,_

DESCRIPTION. Dentition. Upper Incisors: \( \text{i}^{1} \) is not needle-like, taller-crowned than other incisors and may be very procumbent in some species (adustus) or totally non-procumbent in others (minimus). Right and left \( \text{i}^{1} \) may be separated by a small gap (leo) or may touch (most others), however in swainsonii and minimus R and LI \( \text{i}^{1} \) form a V-shaped cutting wedge. \( \text{i}^{1} \) crown may be narrow, long, pointed and curved, the arc of this curve orienting along the incisor row (godmani) or almost lensate, triangular, uncurved and flaring (swainsonii, minimus), alternatively, it may be massive, strongly curved, and almost caniniform (adustus). In most species it is separated from \( \text{i}^{2} \) by a distinct diastema (however, in swainsonii and minimus it is not). \( \text{i}^{2-4} \) may be relatively compressed laterally (lensate) with broad roots (swainsonii) or narrowly rooted with heavier, more massive crowns (bellus, leo). \( \text{i}^{2-4} \) are invariably cingulated, this may be relatively weakly defined leading to a lack of differentiation between wide roots and crowns (godmani, minimus, swainsonii) or heavy (adustus). Relative crown size in \( \text{i}^{2-4} \) varies from overall approximate equality (swainsonii, minimus, godmani) to a condition of decreasing size, \( \text{i}^{2} > \text{i}^{3} > \text{i}^{4} \) (leo, flavipes, adustus, stuartii, agilis, subtropicus). \( \text{i}^{4} \) lacks a secondary posterior cusp. It is also characterised by an increased crown height and a narrow root. In overall crown size \( \text{i}^{2} > \text{i}^{3} > \text{i}^{4} \). Only in adustus is \( \text{i}^{4} \) conspicuously enlarged but not to the extent seen in P. calura and P. tapoatafa.

Upper Canines: May be relatively long (not as long as in Micromurexia, Murexia, Phascomurexia), curved, needle-like and weakly cingulated (godmani, swainsonii, minimus) or more robust as in leo. There is no anterior cusp but a very small posterior cingular cusp is sometimes present (leo, flavipes, adustus, stuartii, agilis, subtropicus, swainsonii).

Upper Premolar: Rows may be long with the premolars widely spaced and exceptionally slender (swainsonii, minimus), or alternatively, the teeth may be crushed and bulbous (leo, flavipes, adustus). Posterior cusps on \( \text{P}^{3} \) may be seen in swainsonii, minimus and godmani. In all species \( \text{P}^{3} > \text{P}^{2} > \text{P}^{1} \) and in none is \( \text{P}^{2} \) lost.

Upper Molars: The anterior cingulum on \( \text{M}^{1} \) originates in a small but prominent stylar cusp A, and, in species where the cingulum is broad and complete, continues into the trigon basin (adustus, stuartii, agilis, subtropicus, swainsonii). In those species where the cingulum is narrow and almost incomplete, it becomes indistinct at the base of the paracone apex (bellus, leo, flavipes). The anterior margin of \( \text{M}^{1} \) is indented posteriorly, and never anteriorly convex (as in Micromurexia, Murexia, Phascomurexia, Paramurexia, Murexechinus, Myoictis). \( \text{M}^{1} \) is invariably longer than \( \text{M}^{2} \) in which the ectoloph is indented to the greatest extent in bellus, leo and flavipes. Stylar cusp B lies at the termination of the anterobuccally oriented preparacrista. It is more reduced than in Micromurexia, Murexia, Phascomurexia, Paramurexia, Murexechinus and Myoictis, but it is never reduced to a minute spur or entirely lost. The paracone of \( \text{M}^{1} \) is approximately half the height of the metacone, it is never fused with stylar cusp B. Stylar cusp D of \( \text{M}^{1} \) and \( \text{M}^{2} \) is usually taller and more prominently conical than in Micromurexia, Murexia, Phascomurexia, Paramurexia, Murexechinus and Myoictis and reaches its greatest development for the genus in swainsonii. The condition in godmani most closely approximates that reduced condition in New Guinea taxa mentioned above. Stylar cusps C and E are usually not prominent and a posterior cingular is usually absent in bellus, leo, minimus and godmani. \( \text{M}^{3} \) protocone is variably reduced but minute in bellus and leo, slightly larger in adustus, minimus, stuartii, agilis, subtropicus and godmani, and largest in swainsonii.

In \( \text{M}^{2} \) and \( \text{M}^{3} \), the broad anterior cingular which contacts the metastylar cusp of \( \text{M}^{4} \) lapers very quickly as it progresses along the base of the paracontour and usually degenerates labially, well buccal to the base of the paracone apex (in A. adustus the anterior cingular is usually just complete). No protoconule is visible. \( \text{M}^{4} \) lacks stylar cusps A, C and E. Stylar cusp D is slightly reduced in \( \text{M}^{4} \) to a very small, sharp peak.

In \( \text{M}^{4} \) the broad anterior cingular usually terminates quickly away from metastylar corner of \( \text{M}^{5} \), however a continuous anterior cingular is often seen in adustus, stuartii, agilis, subtropicus and flavipes. A posterior cingular is absent. \( \text{M}^{5} \) shows some metacone development in leo, swainsonii, minimus and godmani but generally the metacone is greatly reduced.

Lower Incisors: \( \text{i}^{1} \) crown is invariably larger than \( \text{i}^{2} \) which is subequal to \( \text{i}^{3} \) except in swainsonii in which \( \text{i}^{1} > \text{i}^{2} > \text{i}^{3} \). Lower incisors are oval in anterolateral view and gauge-like in occlusal view. \( \text{i}^{1} \) and \( \text{i}^{2} \) are almost prostrate in flavipes,
slightly more erect in bellus, leo, adustus, minimus and godmani, and most erect in adustus and swainsonii. $I_3$ is usually incisiform except in minimus where it is premolariform in lateral view with a large posterior cusp. The lower canine rests against this cusp. In occlusal view a small notch separates the posterior cusp from a prominent posterolinguinal lobe which wraps posteriorly around the canine and the crown enamel of primary and posterior cusps folds noticeably so that the crest of the two cusps bisects the tooth longitudinally. In some species the heel is narrower on $I_3$ than $I_1$ (bellus in particular).

Lower Canines: $C_1$ may be caniniform and strongly sickle-shaped (godmani, minimus) or thicker and more erect (leo, adustus, flavipes, stuartii, agilis, subtropicus). In swainsonii however, $C_1$ is premolariform with minimal curvature from root to crown. The canine may be weakly cingulated buccally and lingually (bellus, godmani, swainsonii, agilis, subtropicus, stuartii). A. leo has weak buccal cingula but is strongly cingulated lingually, while strong buccal and lingual cingula are found in minimus and adustus.

Lower Premolar: Rows may be long, with the premolars widely spaced and exceptionally slender (swainsonii, slightly less so in minimus and godmani), or alternatively, the teeth may be more crushed and bulbous (leo, bellus, flavipes, adustus) and in these the $P_3$ is often oriented more transversely in the tooth row. Lower premolars are cingulated. Postero-lingual lobing occurs in bellus, leo and flavipes. $P_3$ is never absent. The bulk of each premolar mass is concentrated anteriorly to the line drawn transversely through the middle of the two premolar roots.

Lower Molars: $M_1$ talonid is wider than the trigonid and the anterior cingulum is present but usually poorly developed or absent (variably absent in stuartii and swainsonii). If the cingulum is present it terminates at the posterior base of the protoconid. There is a very weak buccal cingulum in most species but again, it is not always present in stuartii and swainsonii. It is confined between the bases of the protoconid and hypoconid as a thickened bulge of enamel. The paraconid which is more reduced than in Micromurexia, Murexia and Phascomurexia but similar to that seen in Paramurexia and Murexechinus, appears in occlusal view as a small steeply-sided or low spur, the lingual edge of which makes an appreciable swelling on the endoloph of $M_1$ in bellus, godmani, minimus but little or no contribution in leo, swainsonii, adustus, agilis, subtropicus, flavipes or stuartii. The metacristids are roughly oblique to the long axis of the dentary. The cristid obliqua extends from the hypoconid to the posterior wall of the trigonid, intersecting the trigonid at a point directly below the tip of the protoconid in bellus, leo, godmani, but slightly lingual to that in the other species (stuartii sometimes slightly buccal). From the base of the metaconid posteriorly, the talonid endoloph may follow the line of the dentary past the base of the entoconid and along the dentary line to the hypoconulid as in leo, swainsonii, minimus, adustus or it may take a sharp lingual orientation until it meets the base of the entoconid where it then orient buccally to meet the hypoconulid (bellus, godmani, stuartii). In $M_1$ the entoconid is usually minute or low.

In $M_2$ the talonid is usually wider than that of the trigonid. The anterior cingulum is poorly developed in all species and terminates lingually to accommodate the hypoconulid notch and continues very weakly into the buccal cingulum which terminates slightly anterior to a vertical line drawn through the tip of the hypoconid. Buccal cingula are strongly present only in A. leo, and posterior cingula in leo, bellus, swainsonii and adustus. The paraconid is well-developed throughout but is the smallest trigonid cusp. It is slightly taller than the entoconid which is well developed in godmani, swainsonii, variably in stuartii and weakly developed in the rest. Its greatest reduction is seen in bellus, leo and flavipes. The hypoconid is shorter than the entoconid. The metacristid is more steeply inclined from the protoconid to the metaconid fissure than from the entoconid to the metaconid fissure. The cristid obliqua extends to the base of the protoconid, intersecting the trigonid at a point directly below the protoconid tip, but well buccal to the metaconid fissure. From the base of the entoconid posteriorly, the talonid endoloph follows the line of the dentary axis in leo, godmani, swainsonii, minimus and adustus, but takes a more lingual orientation in bellus and stuartii. In M4, the entoconid is a more buccal orientation in flavipes.

In $M_4$ of most species the talonid is slightly wider than the trigonid. The anterior cingulum is poorly developed in all but leo and adustus and buccal and posterior cingula are weak in all but leo and bellus. The cristid obliqua intersects the trigonid at a point more buccal to the longitudinal vertical mid-line through the protoconid tip than
in \( M_2 \). This intersection does not, however, reach the point directly below the metacristid fissure. The endoloph of the talonid in \( M_2 \) orients directly along the line of the dentary in bellus, godmani, adustus but takes a more buccal orientation in leo, swainsonii, minimus, flavipes and variably in stuartii. The entoconid is relatively tall only in minimus, godmani, adustus and variably in stuartii, agilis and subtropicus.

The \( M_4 \) trigonid is wider than the talonid. The anterior buccal and posterior cingula are as in \( M_2 \) and \( M_3 \). The paraconid is shorter than the metaconid. TALONID cusps are reduced to 2 in bellus, adustus, stuartii, agilis, subtropicus, swainsonii, minimus and godmani and 1 in leo and flavipes. The hypoconid is reduced relative to \( M_2 \). The crista obliqua is a high crest which intersects the trigonid directly below the metacristid fissure, this being markedly more lingual than intersections of the crista obliqua for \( M_1-M_3 \).

**Skull, Externals, etc.** The skulls of swainsonii, minimus and godmani are the most elongate (skull width across lachrymals: length I to lachrymal canal 76-84%), followed by leo, flavipes, stuartii, agilis, subtropicus (85-93%) and the broadest rostrum is found in bellus and adustus (94-102%). Nasal fluting is rarely found, but the condition is sometimes suggested in leo. The tympanic wing of the alisphenoid is generally poorly developed in all except bellus where there is moderately greater expansion. The paras mastoidea and adjacent squamosal are poorly expanded in all species and only in bellus is the skull 'Roman nosed'. It is slightly domed in swainsonii and minimus. Squamosal/frontal contact does not occur in any species, nor do palatine vacuities. Anterior palatal vacuities are very large in swainsonii, minimus and smallest in bellus. Posterior palatal vacuities are largest in swainsonii and subtropicus. Only in bellus, leo and godmani is the supratragus folded. The tail is shorter than the head-body length, but it is further reduced in swainsonii and minimus. All hind foot pads are striated and very long claws are found in swainsonii and minimus. All species lack body stripes and all females possess a rudimentary (ephemeral) pouch in which nipple number may vary from 6 (godmani, adustus) to 10 (leo, bellus) to variable (all others). All males die soon after mating.

REMARKS. The analysis that follows suggests that Phascogale is monophyletic with Antechinus, and represents antechinuses in their most derived state. This is supported by albumin immunology assessment (Baverstock et al., 1990; Aplin et al., 1993) but not through cytochrome b sequence analysis (Krajewski et al., 1993, 1996). Until some consensus is reached between the biochemical and morphological schools on this and broader New Guinea issues discussed later, I am reluctant to propose that Phascogale should accomodate all Phascogalines (sensu Archer, 1982a) or that Antechinus, revert to subgeneric status to accomodate all antechinuses.

**Micromurexia** gen. nov.

*Antechinus* (in part) Macleay, 1841.

TYPE AND ONLY SPECIES. *Antechinus habbema* Tate & Archbold, 1941: 8), based on AMNH 109812, adult \( \delta \) puppet skin with skull extracted, from 9km NE of Lake Habbema, N slope of Mt Wilhelmina, Irian Jaya, 4°05'S, 138°50'E, at 2,800m.

**GENERIC DIAGNOSIS.** \( M_1 \) very broad, with wide protocone and complete anterior cingulum, the anterior margin of this tooth is straight or anteriorly convex, but never indented or concave. TALONID is relatively unreduced, retaining an entoconid, hypoconid and hypoconulid. Tail longer than the head-body length.

It is distinguished from *Phascolosorex* and *Muoictis* by its lack of dorsal body stripes, and from *Neophascogale* by lacking a white tail-tip.

*Micromurexia* is separable from *Phascogale* by the absolutely shorter length of its upper and lower molar rows.

*Micromurexia* differs from *Murexechinus* by: ears lack post-auricular patches and pelage more uniform shade throughout rather than rufous post-auricular patches and definite warming of tones toward rump; claws slightly curved and slender rather than strongly curved and thick; tail dorso-ventrally bicoloured rather than uniform black (sometimes uniform dark brown); \( I^1 \) narrow, needle-like and minutely crowned rather than broad, claw-like and heavily crowned; \( I^2-4 \) uncrowned, narrow and with minimal curvature of the crown rather than strongly cingulated buccally and lingually, blade-like and robust; \( C^1 \) extremely long and slender rather than short and thick; premolars uncrowded and narrow with \( P^3 \) separate from \( P^4 \) rather than premolars crowded, wide and robust; lower molars with greatly developed entoconids (e.g., \( M_3 \) entoconid taller than paraconid in *Mi. habbema*) rather than lack of development in *Mu.*