Phalanger lulluae. By Christopher A. Norris

Published 3 December 1999 by the American Society of Mammalogists

Phalanger Storr, 1780

Coecoes Pallas, 1766:60. Type species: Didelphis orientalis Pallas, 1766 by monotypy. [nom. codd.; name generally attributed to Lacépède, 1801.]

Phalanger Storr, 1780:33. Type species: Didelphis orientalis Pallas, 1766 by monotypy.

Phalangista Geoffroy and Cuvier, 1795:187. Type species: Didelphis orientalis Pallas, 1766 by monotypy.

Ballantina Illiger, 1811:77. Type species: Didelphis orientalis Pallas, 1766 by monotypy.

Sipalus Fischer, 1813:581. Type species: Didelphis orientalis Pallas, 1766 by monotypy.

Cuscus Lesson, 1826:150. Type species: Didelphis orientalis Pallas, 1766 by monotypy.

Spilocuscus Gray, 1860:316. Type species: Phalangista maculata Desmarest, 1818 by subsequent designation (Thomas, 1888).

CONTENTS AND CONTENT. Order Diprotodontia, Suborder Phalangerida, Superfamily Phalangeroidea, Family Phalangeridae, Tribe Phalangerini, Genus Phalanger. Some authors have included Ailurocopis Wagler, 1830 and Strigocuscus Gray, 1861 as synononyms of Phalanger (McKay, 1988; Tate, 1945), whilst others have given Spilocuscus full generic status (Flannery et al., 1987; George, 1987). However, the monophyly of Strigocuscus sensu Flannery et al. (1987) is still in doubt (Norris, 1992; Springer et al., 1990) and inclusion of some of the species of Strigocuscus in Phalanger, combined with full generic status for Spilocuscus, would lead to the creation of a paraphyletic genus Phalanger (Norris, 1992). The alternative solution, namely the allocation of a new generic name to the species formerly included in Strigocuscus, would be at odds with the apparent molecular conservatism of the phalangerids (Barserstock et al., 1990). Hence, for the purposes of this account, Spilocuscus is treated as a subgenus of Phalanger. A key to the species of Phalanger follows (adapted from Flannery, 1994; Flannery and Boasdi, 1995; Menzies and Perrett, 1986):

1 Inflated frontal bones; ear pinnae hidden in fur (Subgenus Spilocuscus) 2
2 Frontal bones not inflated; visible ear pinnae 5
3 Extensive areas of jet black color on dorsum; head covered in reddish fur 4
4 Mottled, spotted, or with absence of jet black coloration on dorsum; fur on head gray, white, orange, or combination of these colors 4
5 Length of head and body >400 mm P. rufoniger
5 Length of head and body <400 mm P. kraemeri
4 Dark spots on dorsal pelage small and well separated P. pappensis
5 P4 and p4 massive, deflected outward from toothrow; tail extremely rugose with coarse tubercles P. gymnitis
5 P4 and p4 smaller, not deflected outwards; tail with fine tubercles or smooth skin 6
6 Snout narrow; facial extent of lachrymal reduced; diastema between I3 and C1 P. alexandrae
6 Snout broad; facial extent of lachrymal moderate to extensive; no separation between I3 and C1 7
7 Bright red pelage on shoulders; dorsal stripe restricted to head region P. alexandrae
7 Gray or tan pelage on shoulders; dorsal stripe runs from head to lower back 8
8 Forequarters yellowish tan or brownish red and noticeably lighter in color than hindquarters; profuse white or dark spotting may be present on dorsum; white or yellow patch on ventral pelage not extensive P. ornatus
9 Dorsal pelage irregularly mottled with brown, ochre, and white; white ventral pelage, with dark irregular spots P. lulluae
9 No spotting of dorsal or ventral pelage 10
10 Fur short to moderately long, <20 mm P. intercostellatus
10 Fur moderate to very long, >20 mm P. lulluae
11 Tail uniformly black in both sexes; fur wedge on tail short P. intercostellatus
11 Tail with white tip in females; fur wedge of tail extensive P. ornatus
12 Gray dorsal pelage with broad dorsal stripe 13
13 Chocolate brown dorsal pelage with no dorsal stripe 14
12 Molar teeth very small; ears short, thinly furred, with no ear flashes; elbows uniformly colored P. matanik
13 Molar teeth moderately large; ears comparatively long, with white ear flashes; white elbow patches P. vestitus
14 Tubercles at base of tail P. carchelatal P. carchelatal
14 No tubercles at base of tail P. sericeus

Phalanger lulluae Thomas, 1896

Woodland Island Cuscus


Phalanger orientalis peninsularis Tate, 1945:2. Type locality “Rocky scrub, 30 miles north of Coen, north Queensland,” Australia.

CONTENTS AND CONTENT. Context given above. No subspecies of P. lulluae are recognized.

DIAGNOSIS. The most distinctive feature of P. lulluae (Fig. 1) is its pelage: the dorsal fur is irregularly mottled with brown, ochre, and white, whilst the ventral is white with irregular dark spotting. The only other taxa of Phalanger with mottled fur are the nominate subspecies of P. ornatus (Flannery and Boasdi, 1995) and the four species of the subgenus Spilocuscus. Absence of any obscure coloration in P. ornatus and the enlarged frontal bones,

reduced ear pinnae, and great size of the *Spiloglossus* species, combined
with the allopatric distribution of *P. illulatae*, make confusion
unlikely (Flannery, 1994). Facial skin in *P. illulatae* is black, with a
contrasting pink rhinarium. The skull is similar to that of *P.
ornatus* but more pear-shaped and widest at the posterior end of
the zygomatic (Fig. 2). Nasal bones terminate above the ends of the
premaxillae, and the paroccipital processes are comparatively long.
B3 is relatively smaller and C1 relatively larger than in *P. ornatus.*
A diastema between B3 and C is absent, although the two teeth are
divergent at their apices. P2 is absent (Menzies and Pernetta,
1986). Molars are not strongly crenulated (George, 1987). The m2
has a well-developed paraconid on m2, and anterior cingulum ex-
tends lingual to the preprotocrista on the upper molars. Large, well-
developed cingula occur between the lophids of the lower molars
(Flannery et al., 1987).

**GENERAL CHARACTERS.** The Woodlark Island cuscus is
a medium-sized phalangerid possum with a short, woolly pelage, a
dark dorsal stripe, and pale ear flaps variably present (Flannery,
1994). Phalangerids are distinguished from other diprotodont mars-
upials by reduced exposure of the mastoid on the rear face of the
cranial (Flannery et al., 1987) and a resulting non-tetrahedral ge-
ometry of the periotic (Norriss, 1994); reduction or loss of P2 and
enlargement of P1; and reduction or loss of fur on the distal portion
of the tail, with at least partial development of dermal scales or
tubercles (Flannery et al., 1987). Within the Phalangeridae, the
genus *Phalanger* can be distinguished from *Ailurops, Strigocus-
cus, Wyula*, and *Trichosurus* by expansion of the orbital wing of
the maxilla; coarse and complex crenulation of the molars, with
well-developed protoconules and metaconules; separation of the
preprotocristae of M2 from the parastyle (Flannery et al., 1987); and
possession of a phalangerin periotic morphology (Norriss, 1994).

Fur color in *P. illulatae* is extremely variable, with mottled
patterns of brown, ochre, and white which give the animal a mar-
bled appearance. Light and dark morphs are recognized according
to the proportions of brown/ochre to white fur. In light morphs, the
predominant fur color is white/cream, with small patches of darker
fur. These patches coalesce in the dark morphs to form broader
expanses of dark fur, broken up with small white spots. The dorsal
stripe is more pronounced in light morphs (Flannery, 1994). As in
all species of *Phalanger,* the distal portion of the tail is naked.
The furred portion of the tail terminates abruptly; the skin of the
distal portion is dark in coloration and moderately rugose.

Females are slightly larger (on average) than males (Flannery,
1994). Mean external measurements (in mm) for five males and five
females respectively, are as follows: length of head and body, 362,
367; length of tail, 310, 312; length of hind foot, 51.2, 46.5; length
of ear, 20.3, 21.0; width of cranium across zygomatic arches, 49.1,
49.0; Mean weights (in g) for males and females are 1.495 and
1.770 respectively (Flannery, 1994).

**DISTRIBUTION.** The species is confined to Woodlark Is-
land, Papua New Guinea (9°09'S, 132°36'E) and the neighboring
island of Alcester (Fig. 3; Flannery, 1995). The genus *Phalanger*
had probably evolved by the Late Miocene or Early Pliocene
(White, 1967). No fossils of *P. illulatae* are known.

**FORM AND FUNCTION.** Dental formula of *P. illulatae* is
1/1, c 1/0, p 2/1, m 4/4, total 32; in addition, two or three small
uncuspid teeth of unknown homology lie between p1 and p3 (Men-
zes and Pernetta, 1986). Upper and lower jaws bear a molari-
form P3 with a three-pointed crest; its symmetrical lateral faces are
bounded by sharp, straight ridges. Molars are mildly crenulated;
M2 is short and wide. The skull is pear-shaped and widest at the
posterior end of the zygomatic (Menzies and Pernetta, 1986). As
with most phalangerids, with age caudal portions of the suprane-
brate ridges fuse to form a pronounced sagittal process. In *P.
illulatae* the interorbital trough is broad and shallow. The lachrymal
is broadly exposed on the face of the rostrum.

*P. illulatae* exhibits the typical characteristics of phalangerids,
developed as adaptations to an arboreal life.Digits one and two are
opposable against digits three, four and five. The tail is prehensile,
and the distal portion of the tail is naked, to assist in gripping.
The first and second digits of the pes are syndactylyous, as is the case
with all phalangerids (Flannery, 1994). Large paracloacal glands
are present, which exude a sticky white secretion with a strong,
metallic odor.

**FIG. 2.** Dorsal, ventral, and lateral views of the skull and
lateral and dorsal view of the mandible of *Phalanger illulatae* (adult male, Natural History Museum, BMNH 96.11.5.25: paratype) from Woodlark Island, Papua New Guinea. Greatest length of skull
is 61 mm.
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FIG. 3. Distribution of Phalanger luteolus.

ONTOGYNY AND REPRODUCTION. During August 1987, five females of *P. luteolus* were captured on Woodlark and Alcester Islands (Flannery, 1994). Of these, one was parous, but lacked young; one showed evidence of lactation; two had naked pouch young; and one had a well grown back young. Thus breeding probably takes place over an extended period.

ECOLOGY. The Woodlark Island cuscus prefers lowland dry forest, both primary and secondary (Flannery, 1994). For this reason, the species is more abundant over the eastern half of Woodlark Island where this is the predominant vegetation type rather than in the drier, western rainforest. Local people claim that the animal feeds on two abundant species of vine, which have yet to be identified (Flannery, 1994). Evidence from other species of Phalanger suggests a more catholic diet, including fruit and even small animals (Flannery, 1994; Menzies and Perrett, 1986).

*Phalanger luteolus* is the largest species of terrestrial mammal on Woodlark Island (Flannery, 1995). The only other species of arboreal mammal present on the island is the much smaller sugar glider (*Petaurus breviceps*), which feeds on a variety of foods, including fruits and beetle larvae (Hide et al., 1984). The most abundant mammalian frugivores in the forest canopy are bats, of which four species (*Dobsonia pannisthenia*, *Nyciternes major*, *Pteropus conspicillatus*, and *Pteropus hypomelas*—Flannery, 1995) could be regarded as potential competitors with *P. luteolus*.

*Phalanger luteolus* is moderately abundant on Woodlark Island, even in areas which lie in close proximity to settlements. The animal is not known to raid gardens and is thus not regarded as a pest; it is, however, hunted for its meat. Hunting of the animal occupies a comparatively minor role in the culture of Woodlark Island's indigenous peoples, taking place only during the "gardening season" or when the sea is too rough for fishing (Flannery, 1994).

BEHAVIOR. Although there are no published records of behavior in *Phalanger luteolus*, a 1987 expedition by Oxford University to Woodlark Island, afforded the opportunity to make some observations (S. Haiselden et al., in litt.). Radio-tracking studies revealed a strong tendency for individuals to become localized in one area, containing a small number of sleeping trees, around which the animal's activity is centered. Animals sleep during the day, sheltering under epiphytes or in hollows within the tree, emerging shortly after nightfall to forage. The Woodlark Island cuscus is almost entirely arboreal, carrying out most of its foraging in the upper regions of the forest canopy, although nest sites may be lower down in the sleeping trees.

*P. luteolus* produces a wide range of vocalizations, including snarls, barks, and a whining cry which is not unlike the crying of a human infant. These calls are particularly evident when individuals come into contact with one another while foraging; in general, the animals are solitary and intraspecific interactions are often aggressive. Mating behavior has not been observed.

CONSERVATION STATUS. Prior to 1987, the Woodlark Island cuscus was known from only eight specimens: six (including the Holotype) were collected by Week in 1955; the remaining two by the American Museum of Natural History's Fifth Archbold Expedition to New Guinea in 1956–1957. These specimens were all collected around Kulumadatu, on the western half of the Island, which was formerly the main settlement. The Archbold Expedition reported the animal to be scarce (Brass, 1959), which led to fears that the species might be vulnerable to extinction (George, 1979) and its classification as "Vulnerable" by the IUCN (Thornton and Jenkins, 1982). In 1987, however, scientific expeditions from the Australian Museum and the University of Oxford found the animal to be as common as previously. Further six specimens were collected by the two groups (Flannery, 1994). The species is still considered to be vulnerable by virtue of its restricted distribution.

REMARKS. The taxonomy of the Family Phalangeridae is complex and not entirely resolved, despite a number of recent revisions (Flannery et al., 1987; George, 1987; Menzies and Perrett, 1986; Norris, 1992; Springer et al., 1990). The position of *P. luteolus* within the phalangerid phylogeny has also been the subject of some debate. On the basis of phenetic similarity, some authors favor a sister-group relationship with *P. ornatus*, a species endemic to Batjan island in the Moluccas (Menzies and Perrett, 1986). This similarity may support the theory that the isolation of these two species on islands almost 2,000 km apart represents a relict distribution of a formerly widespread group of cuscuses. However, although *P. luteolus* and *P. ornatus* show superficially similar patterns of pelage coloration, *P. ornatus* shares a distinctive set of morphological synapomorphies with another Moluccan species, *P. rothchildi*, as well as with the widely-distributed ground cuscus, *P. gymnotis* (Flannery et al., 1987). These synapomorphies define a clade which is quite distinct from the other species of Phalanger, including *P. luteolus* (Norris, 1992). The distinctive spotted coat pattern of the Woodlark Island cuscus, together with the tendency of the species to exceed males in size, may suggest a sister-group relationship with the spotted cuscuses (subgenus Spilocuscus—Flannery, 1995). However, *P. luteolus* possesses none of the distinctive suite of dental and skeletal characters which defines this group. At present, the best consensus is that *P. luteolus* forms part of a clade within Phalanger which contains all the species of this genus, including those of the subgenus Spilocuscus, with the exception of *P. gymnotis*, *P. ornatus*, and *P. rothchildi* (Norris, 1992). The genetics of *P. luteolus* are unknown.

The generic name *Phalanger* is from the Greek for a spider's web, a reference to the webbed appearance of the syndactylous hind foot. The specific designation *luteolus* is from the Latin for woodlark, in reference to the island where the species was first discovered (Thomas, 1890).

I thank P. D. Jenkins of the Natural History Museum, London, for arranging the photograph of the skull of *P. luteolus* and Bigalale of the National Museum and Art Gallery, Port Moresby, for the photograph of the living specimen. I am grateful for the advice given to me by T. F. Flannery of the Australian Museum, Sydney and J. L. Menzies of the University of Papua New Guinea.

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Editors of this account were CYNTHIA E. REBAR, VIRGINIA HAYSSEN, KARL F. KOOPMAN, AND ELAINE ANDERSON. Managing Editor was BARBARA H. BLAKE.

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