

Taxonomy of *Dendrolagus goodfellowi* (Macropodidae: Marsupialia) with Description of a New Subspecies

T.F. FLANNERY

Australian Museum,
PO Box A285, Sydney South, NSW 2000, Australia

ABSTRACT. Three subspecies of *Dendrolagus goodfellowi* can be distinguished. The nominotypical form is known from two skins and a skull collected in south-eastern New Guinea. *Dendrolagus g. buergersi* (of which *D. g. shawmayeri* is here considered a synonym) is the best represented in museum collections, and is distributed along the Papua New Guinea Central Cordillera, from Wau in the east to Mount Bubiari in the west. *Dendrolagus g. pulcherrimus* n.subsp. is known from a complete spirit specimen, one skin and two skulls collected near Sibilanga in the North Coast Ranges. It is the most distinctive of the subspecies, readily distinguished from all other forms by the broad P³ with large posterobuccal cusp, orange shoulders, head and ear, pale yellow to white tail rings, white ear margins and pinkish limbs and face. Questioning of local hunters suggests that it is already extinct through most of its original range.

FLANNERY, T.F., 1993. Taxonomy of *Dendrolagus goodfellowi* (Macropodidae: Marsupialia) with description of a new subspecies. Records of the Australian Museum 45(1): 33–42.

Dendrolagus goodfellowi is one of the smallest members of the genus *Dendrolagus*. A sight record from the Foja Mountains, Irian Jaya by Diamond (1985), and specimens from the eastern Torricelli Mountains here described as a new subspecies, suggests that it was once widespread along the New Guinean North Coastal Ranges. Along the Central Cordillera it is known only from eastern New Guinea; from Mount Bubiari (approximately 15 km east of the Papua New Guinea/Irian Jaya border) in the west to the mountains of the extreme south-east of the New Guinean mainland in the east (Flannery, 1990; Flannery & Seri, 1990a). *Dendrolagus goodfellowi* occurs in mid-montane oak forest, at elevations of between 1,000–1,200 m and 2,865

m on the Central Cordillera, but extends as low as 680 m in the North Coast Ranges. Its ecology is poorly known, but it is unusual among tree-kangaroos, and indeed among the medium-sized to large macropodids in general, in that it is not sexually dimorphic in size. This study, however, has revealed sexual dimorphism in the extent of convergence of the parietal crests on the skull. It is represented in museum collections by relatively few wild caught specimens and is declining in the wild. Fortunately, however, it breeds readily in captivity (George, 1978; Flannery, 1990).

The taxonomy of *Dendrolagus goodfellowi* Thomas, 1908 has long been confused, partly due to a dearth of specimens. For example Rothschild & Dollman (1936)

had just six individuals (which they divided between three subspecies), while Groves (1982) had only 16, including juveniles and partial specimens. Groves (1982) considered its various subspecies, along with *Dendrolagus spadix* Troughton & Le Souef, 1936, to be forms of *Dendrolagus matschiei* Förster & Rothschild, 1907. More recent research, however, has revealed that *D. goodfellowi* and *D. spadix* probably occur in sympatry in southern New Guinea, and that *D. spadix* is moreover very different in morphology from *D. goodfellowi* (Flannery, 1990). These new data suggest that these two taxa should be considered as distinct species. *Dendrolagus matschiei* of the Huon Peninsula and *D. goodfellowi* of the Central Cordillera and North Coast Ranges are allopatric, but differ in pelage and cranial morphology. Most reviewers have considered them to be distinct species (e.g., Rothschild & Dollman, 1936; Flannery, 1990), although Groves (1982) considered them to be conspecific.

Material here considered as *D. goodfellowi* has usually been divided between three subspecies (e.g., Rothschild & Dollman, 1936; Laurie & Hill, 1954; Groves, 1982; Flannery, 1990). These are *D. g. goodfellowi* Thomas, 1908 from south-eastern New Guinea, *D. g. buergersi* Matschie, 1912 from western Papua New Guinea, and

D. g. shawmayeri Rothschild & Dollman, 1936 from the Papua New Guinea central highlands.

This work was initiated when a specimen of *D. goodfellowi* was collected near Sibilanga in the North Coast Range of Papua New Guinea. This was the first time that the species had been collected away from the Central Cordillera.

Materials and Methods

Colours where capitalised refer to Smythe (1974). Measurements are in millimetres, and weights are in grams. External measurements were taken in the field. Summary statistics, bivariate plots and t-tests were compiled using STATISTIX. Prefixes for institutions are as follows: AM M – Australian Museum; BMNH – British Museum of Natural History, BZM – Berlin Zoological Museum; MVZ – Museum of Vertebrate Zoology, Berkeley. Only adults (individuals with all molars fully erupted) were included in the cranial measurements. Measurements for the BMNH and BZM specimens were taken from Thomas (1908), Rothschild

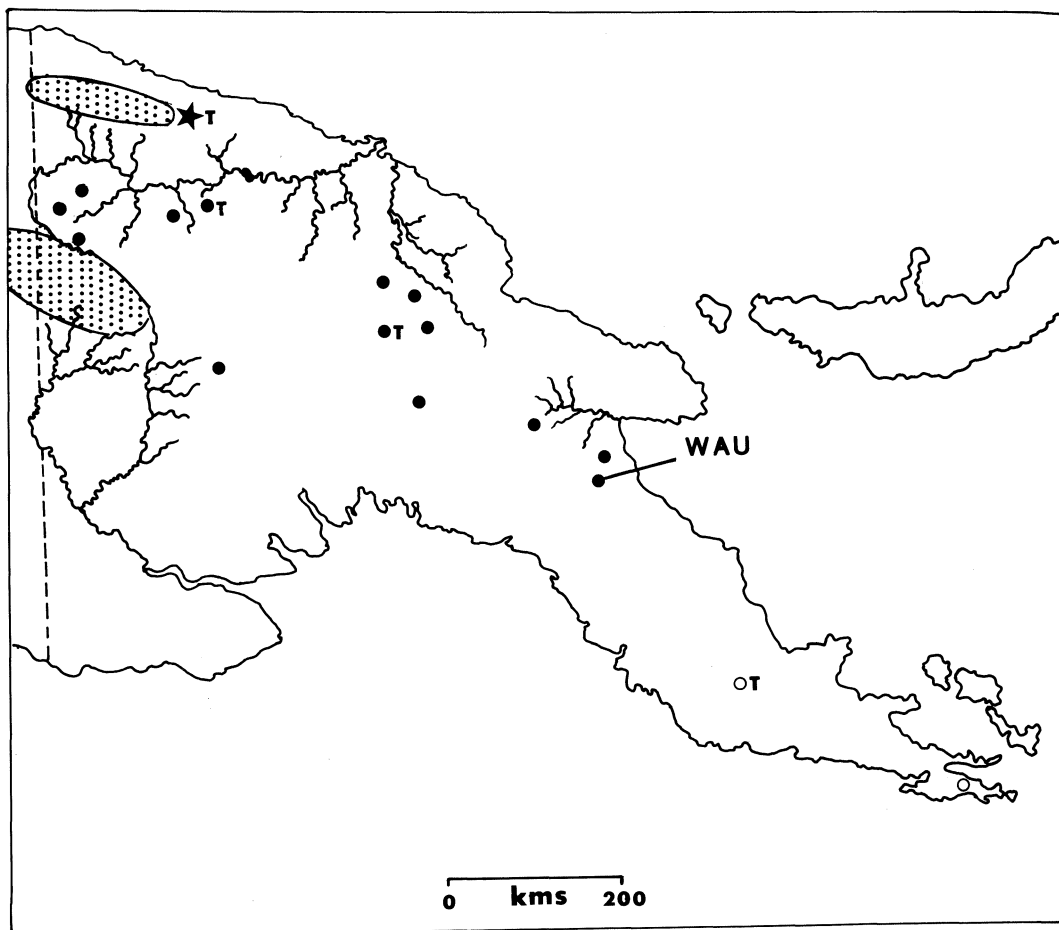


Fig.1. The distribution of *Dendrolagus goodfellowi*. Circle = *D. g. goodfellowi*, dot = *D. g. buergersi*, star = *D. g. pulcherrimus*. Shaded area = regions above 600 m elevation searched by the author and which lack *D. goodfellowi* (see text). T = type locality. The type locality of *D. g. shawmayeri* is the easternmost of the localities marked with a dot and a T.

& Dollman (1936), and Laurie (1952). Those of the MVZ specimens was taken from Lidicker & Ziegler (1968), and these two specimens have not been examined personally by me. The adult AM M specimens examined and used for statistical analysis are listed in Appendix II. Table 1 is listed in Appendix I.

Results

There is considerable variability in pelage from throughout the species range. The features of the pelage that vary most are as follows: 1) pattern of mottling on tail, 2) colour of back, 3) distinctness of dorsal stripes, 4) colour of face and shoulders, 5) colour of limbs. Rothschild & Dollman (1936) placed much emphasis on the pattern of yellow mottling and ringing on the tail. The examination of larger series held at the Australian Museum reveals that these patterns vary enormously between individuals in the only large sample available (that of *D. g. buergersi*), and that they are of no use as a taxonomic character.

Geographic variation in other features is well-marked. Only two skins are known from south-east New Guinea. They differ however from those collected further west along the Central Cordillera in that the back is generally darker, with a buff-coloured speckling not seen in individuals from elsewhere. The dorsal stripes are poorly expressed, with those on the shoulders being almost entirely obscured. The face and shoulders are dark brown. The limbs are likewise dark brown. Two individuals from the Wau area (Fig.1) show essentially similar features, although neither has the buff-coloured speckling of the dorsum. One entirely lacks shoulder stripes, while the other has them poorly expressed (Lidicker & Ziegler, 1968). The relatively large sample available from the Papua New Guinea central highlands (Appendix 1) is relatively uniform in body colouration. The specimens differ from individuals from the south-east in their generally lighter brown back, usually better expressed dorsal stripes (although occasional animals have the stripes muted (e.g., AM M7221), and in having yellow limbs which are sharply offset from the brown body. Animals from west of the central highlands are indistinguishable in pelage from the central highlands sample.

The most distinctive of all the individuals examined are the skin and spirit specimen from near Sibilanga in the North Coast Ranges. They differ from all others examined in that: 1) the tail is ringed with white (in the spirit specimen with a very pale yellow tinge) rather than yellow; 2) the back is Mahogany Red rather than some shade of brown; 3) the throat is white (rather than yellow); 4) the face is pink (rather than brown); 5) the ear rims are white (rather than brown); 6) and the entire shoulder area and crown of the head is Spectrum Orange (rather than brown). They further differ from individuals from the central highlands and the west of Papua New Guinea in that the rump stripes are not as distinct as they usually are in that sample, and in that the limbs

are pink and grade into the Mahogany Red of the body, rather than being yellow and sharply offset from the body.

Examination of the skull also reveals geographic as well as sex related variability. Although the sexes do not differ in size, the shape of the parietal crests do seem to be sex related. In old males the crests coalesce to form a ridge on the skull midline, and even in young individuals come into proximity. In females however, they remain separated throughout life, usually not approaching closer than about 0.5 mm, and often up to 10 mm. To assess geographic variation 12 variables were measured (Table 1), and the sample divided into four geographical regions: south-east New Guinea (for which there was a single specimen, the holotype of *D. goodfellowi*), the central highlands (previously recognised as *D. goodfellowi shawmayeri*), west Papua New Guinea (previously recognised as *D. goodfellowi buergersi*), and the two individuals from near Sibilanga in the North Coast Range. The skull of the third Sibilanga specimen was not removed for measuring as it was felt that it was important to keep the animal entire in spirit for future research. A series of t-tests revealed no differences significant at the 0.05 level between the west Papua New Guinea and central highlands samples. Given this result and the great morphological similarity between these samples, they were then pooled for comparison with that from the North Coast Range. Of the eight variables that could be compared, one (P^3 width) was significantly different at 0.05. The great width of P^3 in the North Coast Range specimens is partly due to the great development of the posterobuccal cusp on this tooth. A series of bivariate plots reveals other differences between these populations. P^3 in the North Coast Range specimens is clearly relatively short and broad (Fig.2), while the nasals in this sample are wide relative to the overall width of the rostrum (Fig.3). I could find no other differences in the skull that consistently distinguish the skulls of the three samples under study.

The single adult skull from south-east New Guinea has proved somewhat difficult to analyse. It falls within the range of variability of the central highlands population for all variables except cheektooth row length. In this dimension it is the largest individual known. Further material is needed before the distinctiveness or otherwise of the cranium of this population can be further tested.

This analysis suggests that the division of *D. goodfellowi* from the Central Cordillera into three subspecies is incorrect. There are no consistent differences between samples from western Papua New Guinea (previously called *D. g. buergersi*), and those from the central highlands (previously assigned to *D. g. shawmayeri*). The very poorly known nominotypical population from south-eastern New Guinea does appear to differ consistently from those collected further west, at least in some aspects of pelage. However, only two skins and one skull are known, and some individuals from the Wau area appear to be intermediate between those from the south-east and those from further west

(Fig.1). The most distinctive sample is that from Sibilanga in the North Coast Range. There seems little doubt but that the Sibilanga population represents a form distinct from all others. It is also clear that the populations from western Papua New Guinea and the Papua New Guinea central highlands areas are indistinguishable. The main problem revolves around the very poorly-known nominotypical race from south-east Papua New Guinea. The few data available indicate that they have a distinctive pelage and large teeth. Under these circumstances it seems wise to retain the status quo, and treat the south-eastern form as a distinct subspecies until more material becomes available.

Systematics

Macropodidae Gray, 1821

Dendrolagus Müller, 1840

Dendrolagus goodfellowi Thomas, 1908

Dendrolagus goodfellowi goodfellowi Thomas, 1908

Table 1

Type material. HOLOTYPE, BMNH 8.10.10.1, adult male

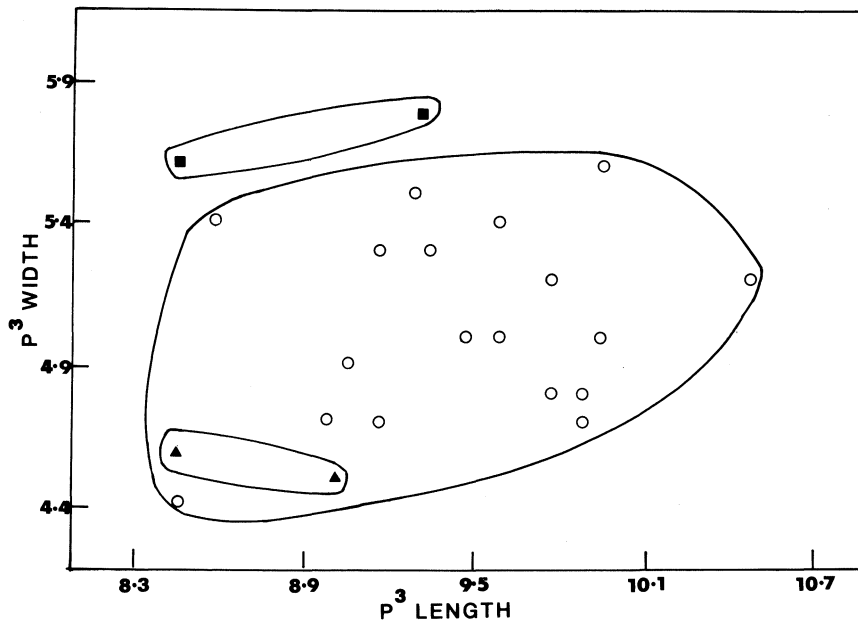


Fig.2. Bivariate plot of P³ length over width for *D. g. pulcherrimus* (square), *D. g. buergersi* from Wau to Mount Sisa (circles; previously considered to be *D. shawmayeri*), and others (diamond).

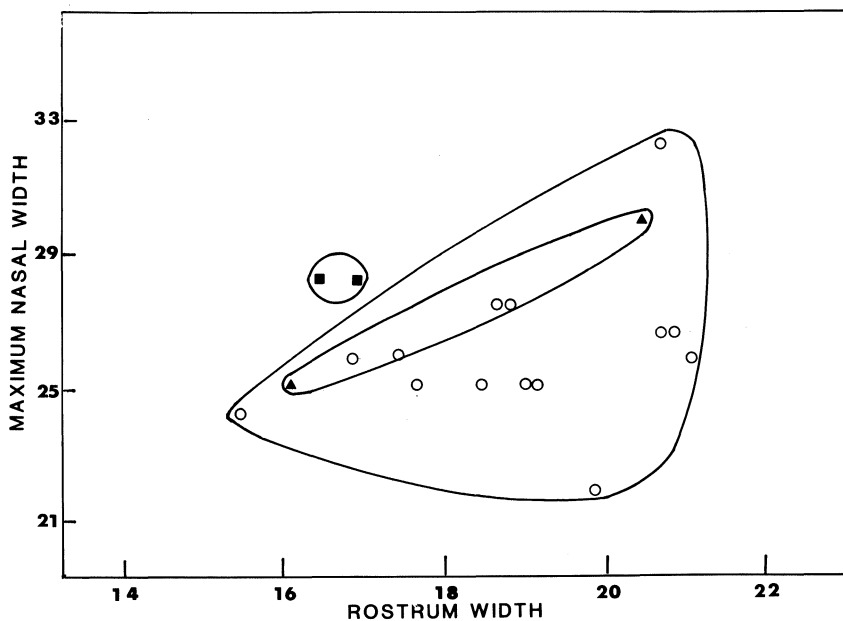


Fig.3. Bivariate plot of maximum nasal width over rostrum width. Symbols as in Figure 2.

skin and skull (broken posteriorly), collected by Mr Walter Goodfellow in 1908 near Mount Obree (9°30'S 148°03'E), Owen Stanley Range, Papua New Guinea (Fig.1).

Diagnosis. Differing from other subspecies in the buff speckling of the pelage and possibly larger cheekteeth. Differing from *D. goodfellowi buergersi* (except those from the Wau area) in having indistinct dorsal stripes, and in having the body colour (brown) extending to the wrists and ankles. Differing from *D. goodfellowi pulcherrimus* n.subsp. in having a yellow (rather than white) throat, brown (rather than pink) face and limbs, brown (rather than white) ear margins, brown (rather than Spectrum Orange) shoulders, brown (rather than Mahogany Red) dorsum, and yellow (rather than white) tail rings, and in having P³ with less a well-developed posterobuccal cusp.

Discussion. *Dendrolagus goodfellowi goodfellowi* remains very poorly known. Only a single specimen, consisting of a skin but no skull, has been collected since the holotype was described. This specimen (BMNH 50.1433) was collected in the mountains of mainland New Guinea to the west of Samarai Island, extreme south-east New Guinea, sometime between 1932 and 1949, by Mr Fred Shaw Mayer (Laurie, 1952; Groves, 1982). Numerous major expeditions have worked in the south-east of New Guinea (e.g., the 1933-1934, 1953 and 1956-1957 Archbold Expeditions), yet have not encountered this species. It may well be rare and endangered.

The Wau area is geographically intermediate between the south-east and central highlands areas of Papua New Guinea (Fig.1). Individuals from this area reported upon by Lidicker & Ziegler (1968) possess a combination of features seen in *D. g. goodfellowi* and *D. g. buergersi*. They are similar to the former in having the limbs coloured the same as the body, and in having the dorsal stripes muted, yet they lack the buff speckling and apparently large cheekteeth of that subspecies. The Wau area may lie in a hybrid zone between these two populations. However, more specimens from this general region are needed before the status of these individuals can be fully determined. Curiously, *Dendrolagus dorianus* is also divided into a south-eastern and central highlands subspecies. In this case however, animals from the Wau area clearly fall with those from the central highlands and the boundary between these two distinctive subspecies lies near Garaina approximately 60 km south-east of Wau (Kawei, 1989). *Dendrolagus dorianus* is generally restricted to higher elevations than *D. goodfellowi*, so gene flow may be more restricted by low points in the Central Cordillera in this species than in *D. goodfellowi*.

Dendrolagus goodfellowi buergersi Matschie, 1912

Table 1

Synonym. *Dendrolagus goodfellowi shawmayeri* Rothschild & Dollman, 1936.

Type material. HOLOTYPE, BZM 22155, adult male skin and skull, collected by Dr Bürgers in August, 1912 in the Hunstein Mountains (4°21'S 138°08'E), north-west Papua New Guinea (Fig.1).

Diagnosis. Differing from all other subspecies in the sharply-defined yellow limbs, which contrast with the brown body, and the yellow dorsal stripes on the shoulders and rump (they occasionally coalesce to run the entire length of the back). Further differing from *D. g. goodfellowi* in lacking buff speckling over the body, and possibly in having smaller cheekteeth. Further differing from *D. g. pulcherrimus* in having yellow (rather than white) throat and tail rings, brown (rather than pink) face, brown (rather than white) ear margins, brown (rather than Spectrum Orange) shoulders, brown (rather than Mahogany Red) back, and a narrower P³ with a less well-developed posterobuccal cusp.

Discussion. *Dendrolagus goodfellow buergersi* is the best-represented of all the forms of *D. goodfellowi* in museum collections. It is also the only subspecies currently kept in zoos. It is fairly uniform in morphology throughout its range, except for the population near Wau, which shows some features typical of animals from the south-east. There is considerable variability, however, in tail length and colour, and the intensity of the expression of the dorsal stripes. AM M7221 from high elevation (2,865 m) on Mount Jaka is at one extreme of variability in these features. The dorsal stripes are less prominent than in other Australian Museum specimens, and the tail is very short and entirely brown. As this specimen represents by far the highest elevational record for the species, these features could be the effect of altitude. Another possibility is that the specimen is a hybrid, possibly with *D. dorianus*, as this species is dull coloured and has a brownish-black tail. The colouration of the tail is perhaps the most variable feature, varying from brown, through brown with yellow blotches and rings, through to nearly entirely yellow.

When describing *D. g. shawmayeri* from the Papua New Guinea central highlands, Rothschild & Dollman (1936) note that it differs from other forms in having a more crimson tint to the coat, more distinct striping of the anterior of the body, in having the banding on the posterior of the body lighter, in having hands, feet and tail more richly coloured, in that markings on tail differ in being 'more transverse' throughout, in that the buff colour of the tail is more pronounced, and in having the underparts more yellow. They did not specify which features distinguish *D. g. buergersi* from *D. g. shawmayeri*, but none of these features distinguish animals from the Hunstein Range or other parts west of the central highlands population when the larger samples now available are examined.

Flannery & Seri (1990a) have recently determined the distribution of this subspecies in the western part of its range (west of 142°E). They found that the westernmost population is located at elevations above 1,000 m on Mount Bubiari (4°33'S 141°09'E). It is widespread at

elevations above 1,200 m to the north of the Sepik and Ok Om Rivers in the Telefomin area, but it is absent to the south and west of this area (Fig.1). Unless some unusual differential extinction has occurred, this pattern of distribution suggests that the Sepik River has formed a barrier to the dispersal of this species.

Dendrolagus goodfellowi pulcherrimus n.subsp.

Figs 4,5, Table 1

Type material. HOLOTYPE, AM M21717, adult female skin and skull collected by Pavel German and Lester Seri, 9 Mar. 1990, elevation of 1,120 m in the Kukumbau area on Mount Sapau (3°32'S 142°31'E), near Sibilanga, West Sepik Province.

PARATYPES, AM M23423, adult female whole in spirit (gut separated but intact), collected by Veari Kula, 13 Dec. 1990, elevation of 680 m in the Mount Macholp area (3°21'S 142°35'E) near Sibilanga, West Sepik Province. AM M22173, trophy skull (sex unknown), purchased at Parkop Village near Sibilanga in March 1990 by Pavel German and Lester Seri.

Etymology. Most beautiful (L.)

Diagnosis. Differing from all other subspecies in the greater width of P³, the white (as opposed to yellow) throat and tail rings, white (as opposed to dark brown) ear margins, pink (as opposed to dark brown) face, Spectrum Orange (as opposed to brown) shoulders and crown of head, mahogany red (rather than brown) dorsum, and brown (rather than yellow) feet. Further differing from *D. g. buergersi* in its pinkish (rather than yellow) arms, which gradually merge in with the body

colour rather than being sharply offset.

Description. *Skull.* Holotype skull from aged animal, with enamel crowns of all teeth breached by wear. Paratype skull from younger individual with P¹ erupted but no cheektooth crowns breached by wear. Paratype lacks occipital region and zygomatic arches. Description is of holotype, but variation in paratype is noted. Right side of rostrum damaged and partially healed prior to death. Further damage to region occurred at time of capture. Parietal crests very poorly developed, and not approaching closer than 9.5 mm (Fig.5). Parietal crests of paratype approach within 3 mm of each other, even though from a younger individual, indicating that it is probably male. No inflation of frontals. Remainder of skull as in other *D. goodfellowi*.

I¹ largest of incisors; extends further ventrally than I²⁻³. I² smaller than I³; crown morphology of I²⁻³ obliterated by wear. In paratype I³ has groove on posterior surface. C¹ large, rectangular in buccal outline. P¹ relatively short, with distinct, large posterobuccal cusp connected to main crest by thin ridge (in paratype posterobuccal cusp is free standing). Main crest with large anterior and posterior cusps, with three smaller cuspules placed between. Posterolingual cusp large, giving rise to lingual cingulum that terminates just posterior to anterior cusp of main crest. P₃ relatively short and thick, with small posterobuccal and lingual ridgelets. Other features largely obliterated by wear. Molars brachydont, similar in morphology to those of other *Dendrolagus goodfellowi*.

Skin. Dimensions taken in the field as follows (holotype first, spirit paratype next): head-body length = 585 mm, 630 mm; tail-vent length = 725 mm, 710 mm; hindfoot length (s.u.) = 115 mm, 120 mm; ear length (n.) = 54



Fig.4. Captive adult male of *D. g. pulcherrimus*, caught in the Weigin area, Torricelli Mountains, PNG. Photo T. Flannery.

mm, 54 mm; weight = 7,100-7,200 g, 7,000 g. In holotype both nipples enlarged. Claws of hands and feet close to Kingfisher Rufus, thus lighter than in other *D. goodfellowi*; pads of hand and feet yellow/white; throat covered in short white hairs; forearms and feet not matching any colour in Smythe, but admixture of long yellowish and red hairs giving a pink appearance; face overall pinkish in appearance due to intermixing of very short whitish and red hairs and skin showing through; skin of face pinkish white before preparation. Ears with a striking white rim. Inside of ear and small patch at base close to Pratt's Rufus. Chest with a narrow (about 30 mm) longitudinal band of yellowish hairs down midline. Remainder of venter coloured as back. Cloacal region near Orange-Yellow. Shoulders striking Spectrum Orange, with Burnt Sienna mid-dorsal stripe running from hair whorl in middle of back to crown (Fig.4). Back, venter and most of tail close to Mahogany Red. Twinned stripes on rump close to Burnt Orange. Limbs same colour as face, gradually merging into Mahogany Red of body (Fig.4). Tail thinly-furred. Half way down tail are two incomplete whitish bands, followed by four white bands, increasing in width posteriorly. Last 20 mm of tail Mahogany Red.

Spirit paratype (examined before immersion in alcohol) differing from holotype as follows: tail more thickly furred, with three rather than four complete pale tail bands, no incomplete bands; bands with a slight yellowish tinge, Mahogany Red tail tuft, shoulders even more brilliant Burnt Orange, and where they merge into forelimbs a brilliant red band of fur present, orange area of shoulders more extensive posteriorly, almost joining rump stripes. Dorsal stripe even darker and more contrasting with Mahogany Red back.

Discussion. A mammal survey of the North Coast Ranges is now complete. During the survey, which was undertaken from 1985-1990, I was able to determine that *D. goodfellowi* is unknown in the Bewani and Mount Menawa areas in the west of the ranges; and that it no longer exists in the west Torricellis, at least as far east

as the Mount Sulen area (3°25'S 142°12'E). A captive specimen, reputedly caught in the Weigin area (3°28'S 142°16'E), was however observed in Karetei Village near Fatima Catholic Mission. The owner reported it to be rare in the Weigin area. Furthermore, during a short visit to the Jayapura area, Irian Jaya, I established that it is unknown in the Cyclops Mountains and the Sentani area. Thus *D. g. pulcherrimus* exists over a small area in the eastern Torricellis, from around 142°16'E to 142°35'E. It probably also exists in the Foja Mountains of Irian Jaya (see below), which is some 400 km to the west of Sibilanga. As it is apparently absent in all intervening ranges (Cyclops, Bewani, Menawa and west Torricelli Mountains) it is likely that it has become extinct in this extensive area in prehistoric and historic times. Currently human populations are very low in this area and abundant apparently suitable habitat exists.

In the densely populated western and central Torricelli Mountains area local Olo speaking peoples remember a tree-kangaroo called *Weimanke*. They describe it as being brown with a pinkish white face. However, the animal has not been seen in their area for about 70 years, and is now considered by them to be extinct (Flannery & Seri, 1990b). I was therefore somewhat surprised to find a population of *D. goodfellowi* in the small Mount Sapau montane block at the extreme eastern end of the Torricelli Mountains. The local name for this species is *Weiman* or *Weimank*, and the description from hunters and congruence of names leaves no doubt but that is the same species as the extinct animal from further west.

Evidence for the existence of *D. g. pulcherrimus* in the Foja Mountains consists of a sighting made by Jared Diamond (personal communication) at an elevation of 1,500 m in the Fojas at 8.00 am on 10 February 1981 in good weather. He observed the animal for 10 minutes at close range as it perched on a branch two m from the ground. (Such an interaction with a wild tree-kangaroo would be impossible elsewhere in New Guinea, but the Fojas are uninhabited and the fauna does not fear Man). The tail and body appeared to be each just under a metre long. The body was rich red in colour,

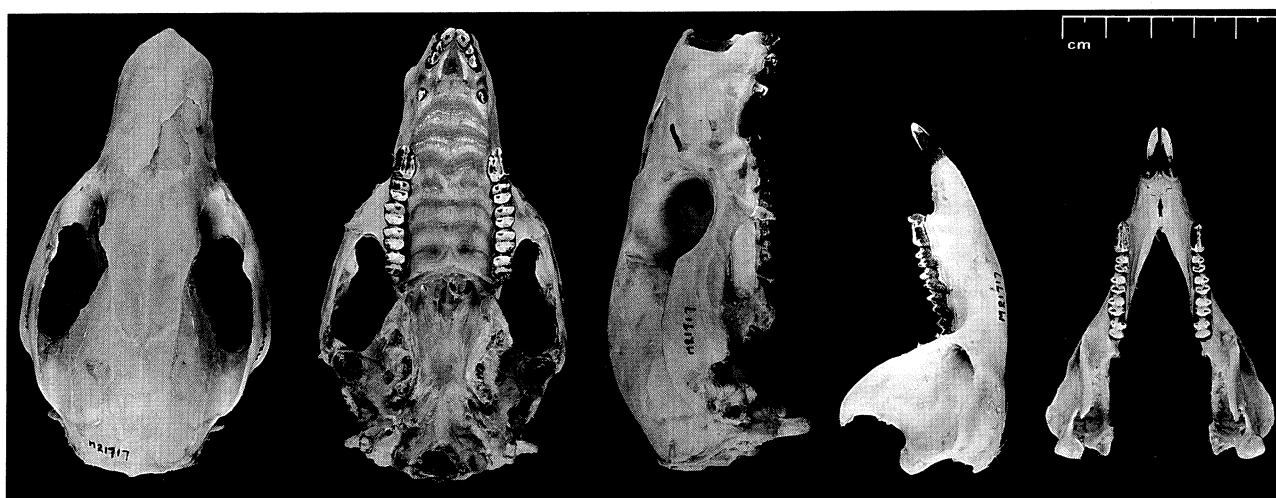


Fig.5. Skull of AM M21717, holotype of *D. g. pulcherrimus*.

the head pale dull yellow, the face pinker, and the tail yellowish with five dark spots. The arms were red like the body. This description agrees well with *D. g. pulcherrimus*, but differs from all other tree-kangaroos, in the combination of red (rather than brown) body, yellow head, pink face, and arms coloured (approximately) like the body. It differs, however, in tail colour from *D. g. pulcherrimus*, which is Mahogany Red with whitish rings, rather than predominantly yellow with brown spots. This sighting confirms that a form very similar (or identical to) *D. g. pulcherrimus* exists in the Foja Mountains.

The occurrence of a distinctive subspecies of *D. goodfellowi* in the North Coast Ranges poses a zoogeographic riddle, for there is no obvious way that it could have reached these ranges from the eastern part of the Central Cordillera. Cordilleran populations are restricted to 1,200 m elevation and above. *Dendrolagus g. pulcherrimus* occurs as low as 680 m in the North Coast Ranges. *Dendrolagus goodfellowi* does not occur to the west of the Sepik River on the Central Cordillera, although ample habitat exists there (Flannery & Seri, 1990a). This indicates that the North Coast Range population may not have dispersed across the hilly Sepik-Mamberamo corridor which stretches northwards from the Central Cordillera at about 141°E. This corridor rarely rises above 400 m elevation, so it could only have been used by montane-adapted species during glacial maxima. Indeed, it is not certain even at those times that altitudinal zonation was sufficiently depressed to allow species that are currently found only above 680 m elevation to inhabit it. It is possible that this corridor was used, and that differential extinction has removed *D. goodfellowi* from the area to the west of its present range on the Central Cordillera. This would be an unusual pattern of extinction, for the area is sparsely populated, and apparently suitable habitat is abundant. However, given the apparent pattern of extinction in the North Coast Ranges it is a possibility. Another possibility is that the species dispersed from the south or east at some distant period when the Sepik flowed elsewhere, and a hilly corridor linked the Central Cordillera and eastern end of the North Coast Ranges.

The discovery of a population of *D. goodfellowi* in the North Coast Ranges raises the question of the status of *D. matschiei* (which is restricted to the Huon Peninsula, also north of the Central Cordillera). The new subspecies shares a few features in common with *D. matschiei* (such as pale ears and face) but is nonetheless quite distinct. A re-examination of the status of *D. matschiei* is, however, beyond the scope of this work.

ACKNOWLEDGMENTS. Staff of the Papua New Guinea Nature Conservation Section, Department of Environment and Conservation, deserve my most sincere thanks, for without their help, I would have been unable to carry out the programme during which the new subspecies was discovered. In particular I would like to thank Mr Lester Seri, who first informed me of the possibility that three tree-kangaroo species

co-existed at Sibilanga; Mr Pavel German, who actually collected and preserved the holotype of *D. g. pulcherrimus*, and Mr Veari Kula who collected the spirit paratype. Professor Jared Diamond also deserves my most sincere thanks for allowing me access to his notes on tree-kangaroos in the Foja Mountains. I would also like to thank the people of the Sibilanga area for their help during our fieldwork, and the Sandaun (West Sepik Province) Government, for their support. The Estate of Winifred Scott and the Australian Museum funded this research. Ms Tish Ennis drafted the figures, and the photographs were prepared by the staff of the Australian Museum photographic section.

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APPENDIX I

Table 1. Summary statistics for samples of *D. goodfellowi*. Although *D. g. shawmayeri* is regarded as a synonym of *D. g. buergersi* here, the samples are kept separate to allow for a statistical comparison. CB = condylobasal length, BZ = bizygomatic width, CT = cheektooth row length, PW = P³ maximum width, PL = P³ length, M2 = M²⁻² external width, NL = nasal length, MN = maximum nasal width, BM = bimaoid width, RB = rostral breadth, RD = rostrum depth, IO = interorbital width.

| | | <i>D. g. pulcherrimus</i> | <i>D. g. buergersi</i> | <i>D. g. shawmayeri</i> | <i>D. g. goodfellowi</i> |
|----|-----|---------------------------|------------------------|-------------------------|--------------------------|
| CB | X | 107.4 | 110.6 | 108.6 | 115.0 |
| | R | — | 103.9-114.1 | 99.5-119.0 | — |
| | N | 1 | 4 | 19 | 1 |
| | STD | — | 4.57 | 4.97 | — |
| BZ | X | 63.4 | 63.0 | 63.2 | 67.0 |
| | R | — | 60.2-65.5 | 58.0-68.1 | — |
| | N | 1 | 5 | 19 | 1 |
| | STD | — | 2.13 | 2.80 | — |
| CT | X | 33.5 | 33.1 | 33.7 | 37.0 |
| | R | 32.4-34.6 | 32.3-34.0 | 31.0-36.3 | — |
| | N | 2 | 4 | 16 | 1 |
| | STD | — | 0.79 | 1.33 | — |
| PW | X | 5.7 | 4.6 | 5.1 | 5.6 |
| | R | 5.6-5.8 | 4.5-4.6 | 4.4-5.6 | — |
| | N | 2 | 2 | 18 | 1 |
| | STD | — | — | 0.33 | — |
| PL | X | 9.0 | 8.8 | 9.5 | 10.0 |
| | R | 8.5-9.4 | 8.5-9.1 | 8.5-10.5 | — |
| | N | 2 | 2 | 18 | 1 |
| | STD | — | — | 0.51 | — |
| M2 | X | 31.9 | 31.3 | 30.7 | — |
| | R | 30.2-33.5 | 30.1-32.7 | 28.4-32.4 | — |
| | N | 2 | 3 | 14 | — |
| | STD | — | — | 1.17 | — |
| NL | X | 44.2 | 43.7 | 45.2 | 42.5 |
| | R | 43.6-44.8 | 41.0-45.4 | 37.5-50.0 | — |
| | N | 2 | 4 | 17 | 1 |
| | STD | — | 1.91 | 3.00 | — |
| MN | X | 16.9 | 18.5 | 18.9 | 19.0 |
| | R | 16.7-17.1 | 16.3-20.6 | 15.3-21.3 | — |
| | N | 2 | 2 | 16 | 1 |
| | STD | — | — | 1.81 | — |
| BM | X | 47.1 | 45.9 | 46.7 | — |
| | R | — | 42.7-49.0 | 42.3-50.7 | — |
| | N | 1 | 2 | 13 | — |
| | STD | — | — | 2.51 | — |
| RB | X | 28.0 | 28.5 | 26.0 | — |
| | R | — | 24.8-30.4 | 22.1-31.9 | — |
| | N | 1 | 3 | 14 | — |
| | STD | — | — | 2.18 | — |
| RD | X | 26.3 | 22.2 | 25.9 | — |
| | R | 24.6-28.0 | 18.0-28.4 | 23.0-30.5 | — |
| | N | 2 | 4 | 14 | — |
| | STD | — | — | 2.12 | — |
| IO | X | 24.3 | 25.7 | 24.7 | 22.0 |
| | R | 21.9-26.6 | 23.7-27.6 | 20.5-27.8 | — |
| | N | 2 | 2 | 17 | 1 |
| | STD | — | — | 2.06 | — |

APPENDIX II

Australian Museum specimens of adult *D. goodfellowi* measured for statistical analysis during this study: *D. g. pulcherrimus* AM M21717 female Mount Sapau Sibilanga area; AM M22173 sex unknown Sibilanga area; *D. g. buergersi* AM M17213 female Thurnwald Range, AM M17222 female Upper Skgonga River (west Sepik Province), AM M17620 male Thurnwald Range, AM M7221 female Mount Jaka Mount Hagen District, AM M7416, AM M7536, AM M7417, AM M7580 females Mount Hagen district (all except AM M7417 via Taronga Zoo), AM M7535 male Mount Hagen District via Taronga Zoo; AM M6509 male Wau district, AM M15721 sex unknown Mount Sisa Southern Highlands Province; AM M5757, AM M7869, AM M7589 females Taronga Zoo (bred from Mount Hagen stock), AM M7999, AM M7574, AM M7568 males Taronga Zoo (bred from Mount Hagen stock).