

A new species of Tree Kangaroo, Genus *Dendrolagus* Müller, 1840 from Tembagapura, Mimika, Irian Jaya, Indonesia.

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ABSTRACT

An ongoing audit of vertebrate fauna in Australasia has revealed an unnamed species of Tree Kangaroo *Dendrolagus* Müller, 1840 from Tembagapura, Mimika, Irian Jaya, Indonesia. The purpose of this paper is to formally name the taxon.

D. hoserae sp. nov. is not common and due to its specialized habitat requirements including relatively cold, high altitude habitat of limited land area, it is particularly vulnerable to extinction due to an ongoing increase in human population and activity in the area. Less immediate threats such as global warming, introduced competing species and pathogens may also cause the ultimate extinction of this little-known taxon.

A subspecies of *D. ursinus* (Temminck, 1836) is also formally named for the first time.

Keywords: taxonomy; nomenclature; tree kangaroo; Irian Jaya; New Guinea; Indonesia; *Dendrolagus*; *dorianus*; *stellarum*; *mayri*; *ursinus*; new species; *hoserae*; new subspecies; *arfakensis*.

INTRODUCTION

As referred to in the abstract, an ongoing audit of vertebrate fauna in Australasia has revealed an unnamed species of Tree Kangaroo *Dendrolagus* Müller, 1840 from Tembagapura, Mimika, Irian Jaya, Indonesia.

While the main focus of interest in the ongoing audit of vertebrates has been reptiles, obviously unnamed forms in other vertebrate classes have also been targeted for formal recognition as a failure to do so places them at direct risk of extinction as shown in Hoser (2019a, 2019b).

Therefore, the purpose of this paper is to formally name the taxon. It appears to be most closely related to *D. stellarum* Flannery and Seri, 1990, in turn a part of the *D. dorianus* Ramsay, 1883 species group.

The previously unnamed taxon subject of this paper has also been speculated as being a population of the little known *Dendrolagus mayri* Rothschild and Dollman, 1933, known from mountains further west.

However as part of the investigation preceding the publication of this paper, the relevant taxon was checked against all previously named forms, synonyms and "races" and none were found to match it. Therefore it was unnamed and in accordance with the *International Code of Zoological Nomenclature* (Ride *et al.* 1999), has been formally named below.

The same applied to a regionally distinct allopatric population of *D. ursinus* (Temminck, 1836), also formally named for the first time.

MATERIALS, METHODS AND RESULTS

In the course of publishing numerous papers formally naming new species of snakes and lizards from the island of New Guinea, I have had to consult relevant literature on the relevant groups of reptiles to check for synonyms in need of resurrection, testing hypothesis for isolation of population and causes of it and to try to detect biogeographical barriers likely to cause allopatric speciation in a place that is biologically still relatively unknown.

It is therefore impossible to treat reptiles in isolation to other similarly affected vertebrates and this includes mammals. Since 2003, I've been aware of at least one form of Tree Kangaroo in Irian Jaya that appeared to be unnamed as detailed by Bowyer *et al.* (2003).

This population, treated as a western population of *D. stellarum* Flannery and Seri, 1990, was known only from the high mountains near Tembagapura, Mimika, Irian Jaya, Indonesia. This remained the case as of 2018, when Eldridge *et al.* (2018) also referred to the form as a variant of *D. stellarum*.

On the internet, various authors have speculated that the taxon may be one of the following:

- 1/ The little known *D. mayri* Rothschild and Dollman, 1933,
- 2/ A local (western) of *D. stellarum*, as posted by Flannery *et al.* from Flannery *et al.* (1996), or
- 3/ As merely a variant of the better known *D. dorianus* Ramsay, 1883.

Eldridge *et al.* (2018), wrote: "Since genetic data from *D. d.*

mayri was not available it remains unknown if the Tembapapura specimens represent a new and undescribed tree-kangaroo taxon or are an eastern population of the poorly known *D. d. mayri*, which occurs a further 300 km to the west.

However in light of the preceding, investigating the matter of the identity of this taxon was very simple.

Molecular evidence of Bowyer *et al.* (2003) and Eldridge *et al.* (2018) confirmed that the taxon was neither of *D. stellarum* or *D. dorianus sensu stricto*. The taxon did appear to be marginally more closely related to *D. stellarum* than *D. dorianus*, but all had a similar divergence timeline, in spite of widely divergent distributions in a linear manner along the central cordillera of New Guinea. This indicated that the forces isolating the three species were much the same across the range of the species (and others in the *D. dorianus* group).

Clearly the relevant species are restricted to high altitude habitat and the restriction has been caused by a likely combination of competing species at lower altitudes, climate change (warming at various intervals) and the effects of specialization causing the restrictive factors to magnify over the following 2 to 3 million years.

With it completely settled that the apparently unnamed taxon is not either of *D. stellarum* or *D. dorianus*, including named subspecies and available synonyms (all from the Papuan side of the range of the taxon), the only question left to resolve is whether or not this apparently unnamed form was in fact a population of the little-known *D. mayri*.

There is no doubt that the absence of tested DNA samples of *D. mayri* and the possibility that this far western population of so called *D. stellarum* is in fact *D. mayri* has led to caution among scientists in not formally naming this form.

However investigating the hypothesis that the Tembapapura, Mimika, Irian Jaya, Indonesia are not the same as *E. mayri* was not difficult at all.

Groves (1982) gave a detailed description of both *D. dorianus* of which *D. stellarum* would have been grouped and the little known *D. mayri*. They are in fact quite different and this means that there is no possibility at all that the Tembapapura specimens were of the species *D. mayri*.

This is also the only logical conclusion when reconciling available information on relevant biogeographical barriers.

E. mayri was until 2018 known only from the holotype collected at the Wondiwoi Range in the Wondiwoi Peninsula, Irian Jaya, in a high altitude (over 1,500 metre) zone.

It has in 2018 been photographed in the same location for the first time since the holotype was first captured.

While *E. mayri* and the species from Tembapapura, Mimika, Irian Jaya, Indonesia are both of the *E. dorianus* complex and similar in form and colouration, they are distributionally disjunct and separated by the low lying Wamma River and associated floodplains, also inhabited by competing species.

This means that there is no possibility that in recent times (meaning the last 2 million years) that either population would have had natural contact.

Hence this means that Tembapapura, Mimika, Irian Jaya, Indonesia *Dendrolagus* in the *D. dorianus* species group cannot be the same taxon as *E. mayri*. As it is also not the same as *D. stellarum*, it must therefore be unnamed and so is formally named for the first time in this paper.

The newly named taxon *D. hoserae* sp. nov. is not particularly common, although at the present time regularly seen by locals where it is known (Flannery *et al.* 1996) and due to its specialized habitat requirements including relatively cold, high altitude habitat of limited land area, it is particularly vulnerable to extinction.

This is due to an ongoing increase in human population and activity in the area. Less immediate, but perhaps harder to deal with threats such as global warming, introduced competing species and pathogens may also cause the decline and ultimate

extinction of this little-known taxon.

The decline of all *Dendrolagus* in island New Guinea is well-known based on anecdotal evidence, due to hunting by increasing numbers of tribal people and land clearing for wood and agricultural practices. This pressure is likely to continue and increase as human populations and economic activity increases on the island. Hence the urgency in needing to have all relevant large and potentially vulnerable species documented and protected by law as soon as practicable.

A distinct allopatric population of *D. ursinus* (Temminck, 1836), from the Arfak Mountains, Irian Jaya, has consistent differences in colouration to the nominate form from near Triton Bay, Irian Jaya and appears to be separated by a substantial zone of unsuitable habitat also inhabited by a competing species in the form of *D. inustus* Müller, 1840. It is therefore formally named below as a subspecies on the basis that there is no available name for this taxon. The taxon *D. leucogenys* Matschie, 1916 also applies to the Triton Bay, Irian Jaya form of *D. ursinus*.

It is noted that based on foot morphology *D. ursinus* is significantly less mobile than the potentially competing species *D. inustus* Müller, 1840, known to occupy areas of lower altitude and to likely compete with it. Hence the distributional gap between populations is almost certainly archaic and warrants taxonomic subdivision of the two main populations of the species to at least subspecies level (in the bare minimum).

Literature relevant to the taxonomic conclusions made herein include the following:

Amrine-Madsen *et al.* (2003), Aplin *et al.* (1993, 1999, 2010), Beck (2017), Bowyer *et al.* (2003), Byrne *et al.* (2011), Colgan and Flannery (1993), De Vis (1887-1888), Eldridge and Coulson (2015), Eldridge *et al.* (2018), Flannery (1993, 1995), Flannery and Archer (1984), Flannery and Boeadi (1995), Flannery and Seri (1990a, 1990b), Flannery and Szalay (1982), Flannery *et al.* (1983, 1992, 1996), Förster and Rothschild (1907), Georges *et al.* (2014), Groves (1982, 2005), Heinsohn (2003), Helgen (2007a, 2007b), Helgen and Flannery (2004), Helgen *et al.* (2010), Hocknull *et al.* (2007), Hume *et al.* (1989), Husson (1955), Irestedt *et al.* (2009, 2015), Joseph *et al.* (2014), Kawei (1989), Kirsch *et al.* (1990, 1997), Laurie and Hill (1954), Malekian *et al.* (2010), Martin (2005), Matschie (1912, 1916a, 1916b), McGreevy *et al.* (2011), McGuigan *et al.* (2000), Meredith *et al.* (2008, 2009, 2010), Mitchell *et al.* (2014), Moyle *et al.* (2016), Müller (1840), Osborne and Christidis (2001), Parham *et al.* (2012), Potter *et al.* (2012), Pratt and Beehler (2014), Prideaux and Warburton (2008, 2009, 2010), Prideaux *et al.* (2007), Ramsay (1883), Rawlings and Donnellan (2003), Rothschild and Dollman (1933, 1936), Rothschild and Rothschild (1898), Rowe *et al.* (2011), Sanders and Lee (2007), Schneider *et al.* (1998), Schweizer *et al.* (2015), Taberlet *et al.* (1992), Tamura *et al.* (2011), Tate (1948), Thomas (1908), Todd *et al.* (2014), Toussaint *et al.* (2014), Troughton and Le Souef (1936a, 1936b), Turnbull *et al.* (2003), Unmack *et al.* (2013), van Ufford and Cloos (2005), Westerman *et al.* (2006, 2012), Wheeler *et al.* (2001), Windsor and Dagg (1971), Woodhead *et al.* (2016), Yang and Rannala (2006) and sources cited therein.

In terms of the following descriptions it should be noted that the spelling of the names assigned to the species or subspecies should not be changed unless mandatory under the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999) or superseding documents.

DENROLAGUS HOSERAE SP. NOV.

LSID urn:lsid:zoobank.org:act:90C295AF-5065-4593-A2E3-B663E9995626

Holotype: A preserved specimen lodged at the Australian Museum, Sydney, New South Wales, Australia, specimen number M.30720.001 collected from near the summit of Gunung Ki on Kali Oragam, Tembapapura area, Mimika, Irian Jaya, Indonesia, Latitude 4.05 S., Longitude 137.07 E.

This government-owned facility allows access to its holdings.

Paratype: A preserved female specimen at the Australian Museum, Sydney, New South Wales, Australia, specimen number AM30750.001, collected from a forest at Mile 61, Nogol Tawat Nin, Tembagapura area, Mimika, Irian Jaya, Indonesia.

Diagnosis: *Dendrolagus hoseae* sp. nov. has until now been treated as a western race of *D. stellarum* (Flannery and Seri, 1990), *D. dorianus* Ramsay, 1883 or alternatively an eastern form of *D. mayri* Rothschild and Dollman, 1933. However Bowyer *et al.* (2003) and Eldridge *et al.* (2018) found that this form diverged from nominate *D. stellarum* (its closest relative) more than 2.5 MYA warranting species-level diagnosis for this taxon.

D. hoseae sp. nov. is similar in most respects to *D. stellarum* as defined by Flannery and Seri (1990) and *D. mayri* as defined by Groves (1982) at page 185 and is clearly a member of the *D. dorianus* species group.

Dorsal fur colouration in *D. hoseae* sp. nov. is noticeably lighter than that of *D. stellarum*, this being the simplest way to tell the two taxa apart. *D. stellarum* is a dark greyish-brownish black in overall colour on top, with silver-tipped markings on its back, legs and arms that are distinctive. *D. hoseae* sp. nov. is a drab brown-grey to buffy-brown on top, sometimes speckled with lighter brown-grey tips all over and minimal contrast in colour on the limbs, save for slight lightening at the terminal ends. No dorsal stripe is visible and this is in contrast to *D. mayri*, which has a vaguely defined one. Hands and feet are dark.

E. mayri is further separated from all other members of the *D. dorianus* species group including *D. hoseae* sp. nov. and *D. stellarum* by the absence of any detectable whorl on the tail.

D. hoseae sp. nov. is also notable for having a slight lightening in fur colour on the upper forehead.

D. hoseae sp. nov. has a pale spot at the base of the tail versus indistinct in *D. stellarum* and absent in *D. mayri*.

The *D. dorianus* group of *Dendrolagus* Müller, 1840 are separated from all other species by the median dorsal hair-whorl being near the root of the tail, versus in centre of the back in the so-called *goodfellowi* group, or on or behind the shoulders in the so-called Australian/*ursinus/inustus* groups of species, dominated in New Guinea by species apparently more able to cross lowland areas.

As mentioned already, exceptional to this is that *E. mayri* is further separated from all other members of the *D. dorianus* species group including *D. hoseae* sp. nov. and *D. stellarum* by the absence of any detectable whorl on the tail.

The *D. dorianus* group are also separated from most other species by a well furred inner ear, a trait in common with *D. ursinus*, but not *D. inustus*.

Species within the *D. dorianus* species group have longer arms relative to the legs and a tibia shorter than the femur in other species of *Dendrolagus*, reflected by the fact that they move more on all fours (quadrupedally) than the other species.

They climb with alternating leg movements, clasping the stem with its long arms, elbows well beint (seen less often in other species) and sleeps lying down rather than sitting up, "tucked under" and often on the ground. They drink frequently and ruminant (modified from Groves 1982).

Distribution: *D. hoseae* sp. nov. are known only from the area immediately adjacent to the type locality, generally within an altitude range of 2,500 to 3,200 meters above sea level.

Conservation: See relevant comments in Hoser (1991, 2019a, 2019b) and sources cited therein.

Etymology: Named in honour of my wife, Shireen Hoser in recognition for her contributions to herpetology and wildlife conservation on a global scale, spanning some decades, including most of the "back office work" for Reptile Parties, Melbourne reptile shows and other wildlife conservation and education activities done by myself and our dedicated team of co-workers.

DENROLAGUS URSINUS ARFAKENSIS SP. NOV.

LSID urn:lsid:zoobank.org:act:F763EFCE-527C-4721-899B-2030D1670FD3

Holotype: A preserved specimen in the Australian Museum, Sydney, New South Wales, Australia, specimen number M.35030 collected from near the summit of summit of Gunung Gripo, near Mokwam, Arfak Mountains, Irian Jaya, Indonesia, Latitude 1.00 S., Longitude 132.00 E.

This government-owned facility allows access to its holdings.

Paratype: A preserved specimen in the Australian Museum, Sydney, New South Wales, Australia, specimen number M.17882.001 collected from the Arfak Mountains, Irian Jaya, Indonesia, Latitude 1.03 S., Longitude 133.93 E.

Diagnosis: *Dendrolagus ursinus arfakensis* sp. nov. is similar to the nominate form as defined by Groves (1982). It is however differentiated from that taxon by colouration pattern on the head.

D. ursinus ursinus has a face only marginally darker than the lower part of the head and neck, or nowhere near as dark as the colour of the well-defined blackish hood over the back of the head, ears and neck, which is well-defined and very prominent. By contrast *D. ursinus arfakensis* sp. nov. has a generally dark nose and front of snout, lightening somewhat on the mid face before the hood, which in turn is not as well defined as in the nominate form. In the nominate form the line of the hood is well-defined and distinct, versus indistinct in *D. ursinus arfakensis* sp. nov..

Distribution: Restricted to the Arfak Mountains and immediately adjacent elevated regions on the birds-head region of Irian Jaya.

Conservation: See relevant comments in Hoser (1991, 2019a, 2019b) and sources cited therein.

Etymology: Named in reflection of the location where this subspecies occurs.

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