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Front cover photo: Raymond Hoser.
Alpine habitat for Mountain Pygmy Possums (*Burramys sp.*) adjacent to Mount Hotham, Victoria.

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From a putative new taxon to a mutt! Formal descriptions of three new genetically divergent Mountain Pygmy Possums from Victoria and New South Wales closely associated with *Burramys parvus* Broom, 1896.

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ABSTRACT

The iconic Mountain Pygmy Possum *Burramys parvus* Broom, 1896, was originally described from Pleistocene fossil material obtained near Taralga, New South Wales.

Since then, living specimens of the same putative species have been found in alpine areas of New South Wales and Victoria broadly coinciding with the major ski resorts in each state. Presumption that these living animals are conspecific with the type material in the Australian Museum in Sydney has been made by all publishing zoologists to date in the absence of genetic evidence.

Molecular evidence published by Osborne *et al*. (2000), implied divergences in the three main extant populations of up to 680,000 years before present, which they stated “conflicts with conclusions reached by Ride and Davies (1997), that the extant populations of *B. parvus* are remnants of a species that had a more contiguous distribution as recently as 18 000 years ago.”

Significantly Mitrovski *et al*. (2007) wrote “From a conservation perspective, all three areas where *B. parvus* are found should be considered as separate gene pools” implying the need for each to have taxonomic recognition.

Strahan (1988) also suggested subspecies level recognition for the regional populations of putative *B. parvus.* Following on from these works, this paper takes a conservative position and formally names all three known extant races as subspecies, separate from the fossil type material.

Unfortunately, in 2008, the government-owned “Zoos Victoria” business cross-bred Mount Hotham and Mount Buller animals at their facility at Healesville and along with translocation of specimens from Mount Hotham to Mount Buller had by 2012 successfully created a cohort of at least 50% of trapped wild Mount Buller specimens (9 of 18) as hybrids (Menkhorst *et al*. 2016), signifying that as of 2020, the pure Mount Buller lineage is probably extinct.

In other words all *Burramys* at Mount Buller are effectively Mutts!

Formal naming of the pure Mount Buller form (based on previously lodged material in the Museum of Victoria) and the Bogong Plains form (including Mount Hotham) and the main population from the Alps in New South Wales will hopefully help to prevent any other ill-conceived attempts to further mix these taxonomically distinct and allopatric populations.

Keywords: Mammals; Marsupial; taxonomy; nomenclature; Pygmy Possum; *Burramys*; *parvus*; Mount Buller; Mount Hotham; Victoria; New South Wales; new subspecies; *hosersbogensis; timdalei*; *scottyjamesi*.

INTRODUCTION

The iconic Mountain Pygmy Possum *Burramys parvus* Broom, 1896, was originally described from Pleistocene fossil material obtained at Wombeyan Caves near Mittagong in the New South Wales Southern Highlands in 1895 (Broom 1896).

A living animal, believed to be of the same species was discovered at Mount Hotham Ski Resort in Victoria in 1966, and populations of the same putative species were subsequently discovered in the Kosciuszko region of NSW in 1970 and at the Mount Buller Ski resort in 1996 (Calaby *et al.* 1971, Mansergh and Broome 1994, Heinz and Williams 1998).

Further fossil remains attributed to the same putative species were recovered from caves at Buchan Victoria and south-west of Sydney in New South Wales (Jenolan Caves) and were treated as suggesting that at the height of the last Pleistocene glacial period (ca. 20,000 years bp) a single species of Mountain Pygmy-possum had a much wider distribution around the snowline of south-eastern Australia (Ride and Davies 1997).

It has been generally assumed that since that glacial maximum receded, the range of the putative species has been contracting with a gradually warming climate and receding snowline (Caughley 1986; Mansergh and Broome 1994).

In line with the preceding, the presumption that these living animals are conspecific with the type material in the Australian Museum in Sydney has been made by all publishing zoologists to date in the absence of genetic evidence.

However molecular evidence published by Osborne *et al.* (2000), implied divergences in the three main extant populations of up to 680,000 years before present, which they stated “conflicts with conclusions reached by Ride and Davies (1997), that the extant populations of *B. parvus* are remnants of a species that had a more contiguous distribution as recently as 18 000 years ago.”

These findings also effectively ruled out the idea that the three major populations were contiguous at the time of the most recent glacial maxima, this idea in effect being based solely on crude, temperature-based climate models.

Identifying the physical barriers to movement for the populations of the putative species is not easy, as 20,000 years before present, not only would vegetation regimes have been different, but so too would have been species compositions in intervening areas, including competing and predatory ones.

Noting that extant putative *B. parvus* have strict habitat requirements beyond those of maximum temperature tolerance, I did a simple inspection of topographical data to see if in fact putative *B. parvus* from the Kosciuszko region of NSW would in fact have a reasonable prospect of surviving in and passing through the areas between known current locations and the locations of Pleistocene deposits south-west of Sydney, NSW.

The need for rocky boulder habitat of cold temperatures, either due to habitat specific requirements or predator avoidance strategies, rendered most of the intervening region unsuitable, even in times of glacial maxima, furthering my belief that type *B. parvus* is almost certainly not even be conspecific with the living animals being treated as the same species.

In any event, even if the northern (New South Wales) population were to be conspecific with type *B. parvus*, it is clear based on published genetic analysis (e.g. Osborne *et al.* 2000), that both the main Victorian populations are sufficiently divergent from these and from one another, to be regarded as subspecies on the basis they are morphologically divergent, allopatric, genetically divergent for thousands of years and have no gene flow between each other.

Significantly Mitrovski *et al.* (2007) wrote “From a conservation perspective, all three areas where *B. parvus* are found should be considered as separate gene pools” further implying the need for each to have taxonomic recognition.

This paper does exactly that and formally names the two southern races, being most distant from the type fossil material as subspecies.

I go further and also formally name the northern form from the Kosciuszko region of New South Wales as another subspecies on the basis of morphological differences in the jaw between all living forms and the type fossil material (see also Broom 1896 who used the type material for examination, and Brammall and Archer 1997, who used a Victorian specimen for review purposes).

Unfortunately, in 2008, and following an internal review of the Mount Buller population, the government-owned “Zoos Victoria” business in conjunction with the State Wildlife Department that controls them, caught a number of wild specimens and cross-bred Mount Hotham and Mount Buller animals at their facility at Healesville.

Along with translocation of specimens from Mount Hotham to Mount Buller, they had by 2012 successfully created a cohort of at least 50% of trapped wild Mount Buller specimens (9 of 18) as hybrids (Menkhorst *et al.* 2016), signifying that as of 2020, the pure Mount Buller lineage is probably extinct.

In other words all *Burramys* at Mount Buller are effectively Mutts!

The alleged basis of the action by “Zoos Victoria” for creating the Mutt population at Mount Buller was due to a potentially misguided belief that the Mount Buller population was in immediate danger of extinction and in their view too small to be viable in the long term and therefore needed greater genetic diversity in the form of an infusion from the Mount Hotham population.

The scientific basis for the belief that the Mount Buller population would otherwise rapidly and inevitably die out was tenuous at best and even if it had a sound basis of scientific fact (which it did not), a better situation would have been to attempt, using the vast resources available to the government, to save that population without resorting to hybridising with the genetically divergent and allopatric Mount Hotham population.

Associated with this would be the risk of failure, after which, if the Mount Buller population actually did die out, the government people could then consider what to do in the way of successful long term re-reintroductions from elsewhere of the same or similar species, viz the Mount Hotham animals.

The worst case scenario would be the same projected end-point, viz over-running the place with Mount Hotham animals, but this second best outcome to preservation of the unique lineage, may have been wholly avoided.

I make it clear that the better case scenario would have been long term survival of the Mount Buller population as a genetically pure gene pool that to date had survived many tens of thousands of years in isolation from the others and if reasonably well managed, would have continued to do so indefinitely.

Formal naming of the pure Mount Buller form (based on types in the Museum of Victoria) and the Bogong Plains form (including Mount Hotham) will hopefully prevent introduction of other subspecies into the wholly viable, allopatric and distinct population of the Victorian Bogong Plains and draw attention to the fact that preservation of the species in their natural form should be the first option in wildlife conservation and not the creation of Mutts!

The naming of the Victorian populations in line with the above is due to the obvious contention that they are most geographically divergent from the New South Wales stock and the fossil type from north of there (presumed for the moment to be conspecific at the subspecies level) and so by simple logic, were at the outset of the investigation being the divergent specimens in need of formal taxonomic recognition.

MATERIALS, METHODS AND RESULTS

Before a decision is made to name any new taxon, reasonable steps must be taken to ensure that it is justified on all relevant grounds, including that it is morphologically, genetically and reproductively isolated from their nearest relative. Once these have been ascertained, the decision as to at what nomenclatural level needs to be assigned to ensure stability of names and utility in the Zoological community.

That is, should the reproductively isolated and morphologically divergent entities be labelled as subspecies, full species, or potentially higher level again.

Key literature relevant to the taxonomic and nomenclatural conclusions within this paper include

Anonymous (2005), Bannister *et al.* (1988), Broom (1895, 1896a, 1896b). Broome (2001a, 2001b), Broome and Geiser (1995), Broome *et al.* (2012), Calaby *et al.* (1971), Caughley (1986), Dimpel and Calaby (1972), Fleming (1985), Geiser and Broome (1991, 1993), Gray (1841, 1845), Green (2003, 2008), Gullan and Norris (1984), Heinze and Olejniczak (2000), Heinze and Williams (2008), Heinze *et al.* (2004), Hoser (1991, 2019a, 2019b), Kerle (1984), Körtner and Geiser (1998), Mansergh and Broome (1994), Mansergh and Scotts (1989, 1990), Mansergh and Walsh (1983), Mansergh *et al.* (1989, 1990, 2010), Menkhorst and Knight (2004), Menkhorst *et al.* (2016), Mitrovski *et al.* (2005, 2007, 2008), Ng *et al.* (2013), Osborne and Christidis (2002), Osborne *et al.* (2000), Pepper *et al.* (2018), Ride (1956), Ride *et al.* (1999), Rosengren and Peterson (1989), Sanecki *et al.* (2006), Schulz *et al.* (2012a, 2012b), Shi (2012), Smith and Broome (1992), Van der Ree *et al.* (2009), Weeks *et al.* (2011, 2012), Wells and Wellington (1984, 1985) and sources cited therein.

While there is an element of doubt over the conspecfic status of the living putative *Burramys parvus* and the fossil specimens from further north, until this is resolved, it makes sense for the southern specimens to be treated as subspecies rather than separate species-level entities.

In the event that they are ultimately regarded as different species, one or more of the subspecies formally named herein can be simply elevated to full species, without significantly destabilizing the existing in use nomenclature.

All relevant previously published material was examined, including that cited herein and sources within those publications. Live and dead specimens as well as available bone specimens, were examined as was other relevant material, including past climate data for Victoria and New South Wales, past vegetation maps, previously published literature on these matters, including phylogenic treatments of other species groups distributed or range restricted in high altitude areas of south-east Australia and so on in order to gauge likely spread of extant populations in the recent geological past.

Genetic data published was also scrutinized as were papers dealing with the biology, captive breeding and other relevant facts about the relevant species.

In summary, as inferred already, the genetic evidence was definitive in that it showed 1/ That the three main living populations of *B. parvus* had remained distinct and separate well before the most recent glacial maxima about 20,000 years before present and 2/ There is no evidence available, including via the fossil record that the main region between living specimens and the fossils south-west of Sydney in New South Wales, was inhabited by any *Burramys* in the recent past.

I also note that the fossil remains of putative *B. parvus* of Pleistocene age from Buchan, Victoria are in a very different position to those from near Wombeyan and Jenolan Caves in NSW.

Those two NSW sites are widely divergent from extant populations and sit on the edge of the high altitude Blue Mountains escarpment, a significant alpine bioregion in its own right and with a high degree of alpine endemism (see for example Pepper *et al.* 2018).

By contrast, Buchan, Victoria sits on the immediate southern edge of the Victorian Great Dividing Range and is directly connected to the extant New South Wales population in the Kosciuszko region of NSW via the Davies Plain Ridge in Victoria, or alternatively via the ridgeline of high mountain peaks immediately east of there, inferring that this specimen at least was in fact of the same species and genetic lineage.

The connecting line also includes significant rocky areas that would clearly be of suitable habitat in times of glacial maxima, further supporting the above contention.

There is no extant high altitude bioregion at Buchan that in any way has endemism not seen at Mount Hotham, Buller or Kosciuszko, further implying that the Buchan specimen is in fact an outlier from a colder geological period as opposed to being a taxonomically discrete entity.

The molecular phylogeny of Pepper *et al.* (2018) confirmed that putative *Eulamprus kosciuskoi* (Kinghorn, 1923) from the Blue Mountains region of New South Wales, was in fact a different species-level taxon to the nominate form from a 5,000 feet elevation on Mount Kosciuszko.

The Blue Mountains species was in fact formally identified and named by Wells and Wellington (1984) as *Eulamprus leuraensis.*

See also the molecular phylogeny for the Mountain Dragon species complex, all treated by most authors as a single putative species, being *Rankinia diemensis* (Gray, 1841), found by Ng *et al.* (2013) to be a complex of six divergent lineages.

Hoser (2015) determined that the antiquity of divergence, morphological differences and geographical isolation and allopatry necessitated the recognition of each form as a new species and formally named the four unnamed forms.

Included in this complex, were one form from Tasmania, three from Victoria and two from New South Wales, those being one from the Blue Mountains bioregion and another from an isolated pocket further west.

In terms of these clades of Mountain Dragons formally named by Hoser (2015), Ng *et al.* (2013) had written: “there were deep genetic divergences between Victorian and NSW samples ([8.2 % mtDNA uncorrected sequence divergence), probably dating to the late Miocene-Pliocene.

Multiple phylogeographic studies have also found deep genetic breaks in southern NSW (e.g., Chapple *et al.* 2005; Symula *et al.* 2008).”

The dry habitat barriers referred to by Chapple *et al.* (2005), would of course have similarly prevented *Burramys* populations in south-east New South Wales from mixing as well, even in times of cooler and drier climates.

In simple terms, even in times of glacial maxima, there would not have been an obvious conduit for Snowy Mountains (NSW) and Blue Mountains (NSW) populations of *Burramys* to have mixed.

On the basis of the preceding one can only expect that all three main populations of living putative *Burramys parvus* are quite likely a new and different species to the original type material from south-west of Sydney, New South Wales!

However in the absence of genetic data from the fossil material, I have taken the conservative view and named the two southern forms and the NSW form as subspecies of the type fossil material.

In the event that fossil *Burramys parvus* is later shown to be in fact the same species as the living putative *B. parvus*, noting that there are documented differences in the available skull material from each as seen in the published literature (refer to Broom 1896 and comparative material from Victoria in Brammall and Archer 1997), then the taxonomy and nomenclature in this paper need never change.

If however the fossil *B. parvus* is subsequently shown to be of a different species, then one of the three forms named herein (the first) can be elevated to full species without significantly destabilising the taxonomy of all relevant populations.

Rather than run the risk of species or subspecies becoming threatened or extinct due to non-recognition of them, as shown in Hoser (2019a, 2019b), this paper has been published, even though it is clearly too late to save the Mount Buller taxon of *Burramys* in its pure form.

INFORMATION RELEVANT TO THE FORMAL DESCRIPTIONS THAT FOLLOW

There is no conflict of interest in terms of this paper or the conclusions arrived at herein.

Several people including anonymous peer reviewers who revised the manuscript prior to publication are also thanked as a relevant staff at museums who made specimens and records available in line with international obligations.

In terms of the following formal descriptions, spellings should not be altered in any way for any purpose unless expressly and exclusively called for by the rules governing Zoological Nomenclature as administered by the International Commission of Zoological Nomenclature.

In the unlikely event two or more newly named taxa are deemed conspecific by a first reviser, then the name to be used and retained is that which first appears in this paper by way of page priority and as listed in the abstract keywords.

Some material in descriptions for taxa may be repeated for other taxa in this paper and this is necessary to ensure each fully complies with the provisions of the *International Code of Zoological Nomenclature* (Fourth edition) (Ride *et al.* 1999) as amended online since.

Material downloaded from the internet and cited anywhere in this paper was downloaded and checked most recently as of 10 January 2020, unless otherwise stated and was accurate in terms of the context cited herein as of that date.

Unless otherwise stated explicitly, colour and other descriptions apply to living adult specimens of generally good health and not under any form of stress by means such as excessive cool, heat, dehydration or abnormal skin reaction to chemical or other input.

Colour descriptions of species refer to fur colour and not skin.

While numerous texts and references were consulted prior to publication of this paper, the criteria used to separate the relevant species or subspecies has already been spelt out and/or is done so within each formal description and does not rely on material within publications not explicitly cited herein.

In terms of conservation of each population of each subspecies as described below, the comments in Hoser (1991 and 2019a, 2019b) apply. I note that based on the information provided by Menkhorst (2016) the subspecies *Burramys parvus timdalei subsp. nov.* may have been literally bred out of existence, at least in its pure form.

I also note that the document "National Recovery Plan for the Mountain Pygmy-possum *Burramys parvus*", (Menkhorst 2016), wholly fails to address the primary root cause of likely declines and extinctions in populations of putative *Burramys parvus.*

This is the relentless ongoing rapid growth in the human population in Australia and environmental pressures this brings. Of course as a Victorian State Government Employee, Menkhorst is not allowed to point out the serious defects in his employer's "Big Australia Policy" which in its most recent form, was a population target of 100-125 million people in Australia and one quarter that number for Victoria, as soon as practicable (up from the 25 million nationally and 6 million in Victoria 2020).

On these numbers alone, even if humans were forcibly barricaded from the regions where the *Burramys parvus* live (being the ski resorts), the marsupials will no doubt die off from ingesting ever increasing quantities of pesticides that blow in on their insect food that emanates from farming regions nearby (Green 2008), that must as a matter of survival for humans, be farmed with ever increasing intensity.

Hence the long-term prognosis for all extant populations of putative *Barramys parvus* in the wild is in fact tenuous at best.

I need not mention the likelihood of global warming caused primarily by ongoing human overpopulation and the threat this brings to the cold climate species caught in islands of habitat in the form of mountain peaks and uplands.

Putative wild *B. parvus* will be faced with ever shrinking potential habitat to live in and how larger human populations both in Australia and globally can reduce the likelihood of this catastrophe being averted, other than by stopping population increases is unknown.

BURRAMYS PARVUS HOSERSBOGENSIS SUBSP. NOV.

LSID urn:lsid:zoobank.org:act:7DE00FBD-90BD-40FA-9E3C-9AD6E7C55292

Holotype: A preserved specimen at the Australian Museum in Sydney, New South Wales, Australia, specimen number M.36919 collected at the double toilet at Mount Perisher Ski Resort, New South Wales, Australia, Latitude -36.40 S., Longitude 148.38 E. This government-owned facility allows access to its holdings.

Paratypes: Four preserved specimens at the Australian Museum in Sydney, New South Wales, Australia, specimen numbers M24919, M.24920, M24921 and M.24922 collected from Mount Blue Cow, Kosciusko National Park, New South Wales, Australia, Latitude -36.32 S., Longitude 148.42 E.

Diagnosis: Living *Burramys parvus* Broom, 1896 of all three subspecies named herein are formally separated from the fossil type material herein treated as a fourth and nominate subspecies, namely *B. parvus parvus*.

All three newly named subspecies of *B. parvus* are readily separated from the fossil type material from near Taralga, New South Wales by the fact that the premolars are in proportion, versus slightly oversized in fossil *B. parvus* type material, which is evidence and grounds to form the basis that the living forms are at least different subspecies (also refer to Broom 1896 and comparative material from Victoria in Brammall and Archer 1997).

Besides being easily separated from one another by genetics as detailed by Osborne *et al.* (2000), the three newly named living subspecies of *B. parvus* are in turn readily separated from one another by colouration as follows:

B. parvus hosersbogensis subsp. nov. from the Kosciusko National Park, New South Wales, Australia are grey-brown above, sometimes darker in the mid-dorsal area, continuing to the top of the head; dark ring around the eye; pale grey-brown or pale brown below; light brown on the cheeks. There is some white between the eyes and the tip of the snout.

B. parvus timdalei subsp. nov. from Mount Buller in Victoria is yellow-brown above, sometimes darker in the mid-dorsal area, continuing to the top of the head; dark ring around the eye; light brown below and yellow cheeks.

There is no white between the eyes and the tip of the snout. Instead this area is a deep yellow.

B. parvus scottyjamesi subsp. nov. from the Bogong High Plains including the Mount Hotham Ski resort is grey-brown above, sometimes darker in the mid-dorsal area, continuing to the top of the head; dark ring around the eye; cream or white coloured below and light cream or white on the cheeks.

There is some white between the eyes and the tip of the snout.

B. parvus hosersbogensis subsp. nov. in life can be seen online at:

https://www.flickr.com/photos/alexismarie_meyer/4464197606/

and

https://www.flickr.com/photos/152410663@N05/35729353956/

(both last downloaded on 10 January 2020).

B. parvus timdalei subsp. nov. in life can be seen online at:

http://www.mtbuller.com.au/uploads/file/MPP_Fact_Sheet.pdf

and

https://cdn.mtbullercdn.com.au/assets/environment/mt_buller_mountain_pygmy-possum_recovery_plan_2011-2016_final.pdf

(both last downloaded on 10 January 2020).

B. parvus scottyjamesi subsp. nov. in life can be seen in Strahan

(1988) on page 168 (both images), on the front cover of Hoser (1991) as well as on page 217 of that book (different image, and clearly showing the diagnostic features of this subspecies) and images of the same animal are seen at:

http://www.edgeofexistence.org/species/mountain-pygmy-possum/

(last downloaded on 10 January 2020).

As of 2019, according to most publishing authors, there are two extant genera of pygmy possums: *Burramys* Broom, 1896 and *Cercartetus* Gloger, 1841. *Burramys* contains only one extant species, the Mountain Pygmy-possum, *Burramys parvus*, which has a lightly furred tail.

The morphologically similar *Cercartetus* as recognized in 2019 consists of four currently recognized species being *C. caudatus* (Milne-Edwards, 1877) (in fact at least 6 species), *C. Lepidus* Thomas, 1888 (in fact two species), *C. concinnus* (Gould, 1845) and *C. nanus* (Desmarest, 1818).
For evidence and reasons explaining why there are in fact more extant species than those listed as recognized above, see Osborne and Christidis (2002) and then see Hoser (2020).

The genus *Eudromicia* Mjöberg, 1916 is resurrected by Hoser (2020) for the species associated with *C. caudatus* (Milne-Edwards, 1877) based on a divergence of 16-27 MYA (Osborne and Christidis, 2002).

Cercartetus sensu lato species are separated from *Burramys* by having tails that have a feather-like appearance.

Further relevant diagnostic and other information about *B. parvus sensu lato* can be found on pages 216 and 217 of Hoser (1991).

Distribution: *B. parvus hosersbogensis subsp. nov.* is known only from the Kosciusko National Park, New South Wales, Australia.

Etymology: The name is a take on that of the type locality. This is a public toilet at the Perisher Ski Resort, where I relieved myself with a massive faeces (Australian word is "bog"), making it the site of "Hoser's bog". It may have been some kind of record breaker, but adding the words "potentially record breaking" to the scientific name would have made it excessively long as would have been "Hoser's massive bog"! Hence the name "*hosersbogensis*".

There is also a swamp or "bog nearby.

In any event, this name will be easily remembered by Australian zoologists and lay people alike and draw people's attention to a threatened taxon.

Thankfully I did not use this toilet curing the Coronvirus epidemic of 2020, because for some months in early 2020, panic buying by people stripped shop shelves bare of toilet paper and most of the population in Australia was physically unable to obtain the commodity.

BURRAMYS PARVUS TIMDALEI SUBSP. NOV.

LSIDurn:lsid:zoobank.org:act:7805FD69-CDEB-49BA-A472-C9225440B312

Holotype: A preserved specimen at the National Museum of Victoria, Melbourne, Victoria, Australia, specimen number C37334, collected at Mount Buller Ski Resort, Victoria, Australia, Latitude -37.13 S., Longitude 164.45 E. This government-owned facility allows access to its holdings.

Paratypes: Two preserved specimens at the National Museum of Victoria, Melbourne, Victoria, Australia, specimen number C37335 and C37336, collected at Mount Buller Ski Resort, Victoria, Australia, Latitude -37.13 S., Longitude 164.45 E.

Diagnosis: Living *Burramys parvus* Broom, 1896 of all three subspecies named herein are formally separated from the fossil type material herein treated as a fourth and nominate subspecies, namely *B. parvus parvus*.

All three newly named subspecies of *B. parvus* are readily separated from the fossil type material from near Taralga, New South Wales by the fact that the premolars are in proportion, versus slightly oversized in fossil *B. parvus* type material, which is evidence and grounds to form the basis that the living forms are at least different subspecies (also refer to Broom 1896 and comparative material from Victoria in Brammall and Archer 1997).

Besides being easily separated from one another by genetics as detailed by Osborne *et al.* (2000), the three newly named living subspecies of *B. parvus* are in turn readily separated from one another by colouration as follows:

B. parvus hosersbogensis subsp. nov. from the Kosciusko National Park, New South Wales, Australia are grey-brown above, sometimes darker in the mid-dorsal area, continuing to the top of the head; dark ring around the eye; pale grey-brown or pale brown below; light brown on the cheeks. There is some white between the eyes and the tip of the snout.
B. parvus timdalei subsp. nov. from Mount Buller in Victoria is yellow-brown above, sometimes darker in the mid-dorsal area, continuing to the top of the head; dark ring around the eye; light brown below and yellow cheeks.

There is no white between the eyes and the tip of the snout. Instead this area is a deep yellow.

B. parvus scottyjamesi subsp. nov. from the Bogong High Plains including the Mount Hotham Ski resort is grey-brown above, sometimes darker in the mid-dorsal area, continuing to the top of the head; dark ring around the eye; cream or white coloured below and light cream or white on the cheeks.

There is some white between the eyes and the tip of the snout.

B. parvus hosersbogensis subsp. nov. in life can be seen online at:

https://www.flickr.com/photos/alexismarie_meyer/4464197606/

and

https://www.flickr.com/photos/152410663@N05/35729353956/

(both last downloaded on 10 January 2020).

B. parvus timdalei subsp. nov. in life can be seen online at:

http://www.mtbuller.com.au/uploads/file/MPP_Fact_Sheet.pdf

and
https://cdn.mtbullercdn.com.au/assets/environment/mt_buller_mountain_pygmy-possum_recovery_plan_2011-2016_final.pdf
(both last downloaded on 10 January 2020).

B. parvus scottyjamesi subsp. nov. in life can be seen in Strahan (1988) on page 168 (both images),

on front cover of Hoser (1991) as well as on page 217 of that book (different image, and clearly showing the diagnostic features of this subspecies) and images of the same animal at

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(last downloaded on 10 January 2020).

As of 2019, according to most publishing authors, there are two extant genera of pygmy possums: *Burramys* Broom, 1896 and *Cercartetus* Gloger, 1841. *Burramys* contains only one extant species, the Mountain Pygmy-possum, *Burramys parvus*, which has a lightly furred tail.

The morphologically similar *Cercartetus* as recognized in 2019 consists of four currently recognized species being *C. caudatus* (Milne-Edwards, 1877) (in fact at least 6 species), *C. Lepidus* Thomas, 1888 (in fact two species), *C. concinnus* (Gould, 1845) and *C. nanus* (Desmarest, 1818).
For evidence and reasons explaining why there are in fact more extant species than those listed as recognized above, see Osborne and Christidis (2002) and then see Hoser (2020).

The genus *Eudromicia* Mjöberg, 1916 is resurrected by Hoser (2020) for the species associated with *C. caudatus* (Milne-Edwards, 1877) based on a divergence of 16-27 MYA (Osborne and Christidis, 2002).

Cercartetus sensu lato species are separated from *Burramys* by

having tails that have a feather-like appearance.

Cercartetus species are separated from *Burramys* by having tails that have a feather-like appearance.

Further relevant diagnostic and other information about *B. parvus sensu lato* can be found on pages 216 and 217 of Hoser (1991).

Distribution: *B. parvus timdalei subsp. nov.* are known only from the immediate environs of the Mount Buller Ski Resort, Victoria, Australia, with main populations centred on the Federation and Fanny's Finnish ski run areas and associated boulder fields.

Unfortunately the surviving population has been infected with specimens of the Mount Hotham lineage (Menkhorst *et al.* 2016), meaning that pure *B. parvus timdalei subsp. nov.* are as of 2020 almost certainly extinct.

Etymology: Named in recognition of Tim Dale of Warrandyte, Victoria, Australia who is a local snowboarding legend at Mount Buller, Victoria and has been for some years in recognition for his logistical services aiding wildlife conservation by providing relevant services to Snakebusters: Australia's best reptile shows, being the only hands on reptile shows in Australia that educate by letting people hold the animals.

BURRAMYS PARVUS SCOTTYJAMESI SUBSP. NOV.

LSID urn:lsid:zoobank.org:act:269AA0C7-FE7D-4445-9696-70DAE60B8DDE

Holotype: A preserved specimen at the National Museum of Victoria, Melbourne, Victoria, Australia, specimen number C27309 collected from the eastern slope of Mount Higginbotham at the Mount Hotham Ski Resort, Victoria, Australia, Latitude -36.98 S., Longitude 147.15 E.

This government-owned facility allows access to its holdings.

Paratype: A preserved specimen at the National Museum of Victoria, Melbourne, Victoria, Australia, specimen number C26917 collected from the western slope of Mount Higginbotham at the Mount Hotham Ski Resort, Victoria, Australia, Latitude -36.98 S., Longitude 147.15 E.

Diagnosis: Living *Burramys parvus* Broom, 1896 of all three subspecies named herein are formally separated from the fossil type material herein treated as a fourth and nominate subspecies, namely *B. parvus parvus.*

All three newly named subspecies of *B. parvus* are readily separated from the fossil type material from near Taralga, New South Wales by the fact that the premolars are in proportion, versus slightly oversized in fossil *B. parvus* type material, which is evidence and grounds to form the basis that the living forms are at least different subspecies (also refer to Broom 1896 and comparative material from Victoria in Brammall and Archer 1997).

Besides being easily separated from one another by genetics as detailed by Osborne *et al.* (2000), the three newly named living subspecies of *B. parvus* are in turn readily separated from one another by colouration as follows:

B. parvus hosersbogensis subsp. nov. from the Kosciusko National Park, New South Wales, Australia are grey-brown above, sometimes darker in the mid-dorsal area, continuing to the top of the head; dark ring around the eye; pale grey-brown or pale brown below; light brown on the cheeks. There is some white between the eyes and the tip of the snout.

B. parvus timdalei subsp. nov. from Mount Buller in Victoria is yellow-brown above, sometimes darker in the mid-dorsal area, continuing to the top of the head; dark ring around the eye; light brown below and yellow cheeks.

There is no white between the eyes and the tip of the snout. Instead this area is a deep yellow.

B. parvus scottyjamesi subsp. nov. from the Bogong High Plains including the Mount Hotham Ski resort is grey-brown above, sometimes darker in the mid-dorsal area, continuing to the top of the head; dark ring around the eye; cream or white coloured below and light cream or white on the cheeks.

There is some white between the eyes and the tip of the snout.

B. parvus hosersbogensis subsp. nov. in life can be seen online at:

https://www.flickr.com/photos/alexismarie_meyer/4464197606/

and

https://www.flickr.com/photos/152410663@N05/35729353956/

(both last downloaded on 10 January 2020).

B. parvus timdalei subsp. nov. in life can be seen online at:

http://www.mtbuller.com.au/uploads/file/MPP_Fact_Sheet.pdf

and

https://cdn.mtbullercdn.com.au/assets/environment/mt_buller_mountain_pygmy-possum_recovery_plan_2011-2016_final.pdf
(both last downloaded on 10 January 2020).

B. parvus scottyjamesi subsp. nov. in life can be seen in Strahan (1988) on page 168 (both images),

on front cover of Hoser (1991) as well as on page 217 of that book (different image, and clearly showing the diagnostic features of this subspecies) and images of the same animal at

http://www.edgeofexistence.org/species/mountain-pygmy-possum/

(last downloaded on 10 January 2020).

As of 2019, according to most publishing authors, there are two extant genera of pygmy possums: *Burramys* Broom, 1896 and *Cercartetus* Gloger, 1841. *Burramys* contains only one extant species, the Mountain Pygmy-possum, *Burramys parvus*, which has a lightly furred tail.

The morphologically similar *Cercartetus* as recognized in 2019 consists of four currently recognized species being *C. caudatus* (Milne-Edwards, 1877) (in fact at least 6 species), *C. Lepidus* Thomas, 1888 (in fact two species), *C. concinnus* (Gould, 1845) and *C. nanus* (Desmarest, 1818).
For evidence and reasons explaining why there are in fact more extant species than those listed as recognized above, see Osborne and Christidis (2002) and then see Hoser (2020).

The genus *Eudromicia* Mjöberg, 1916 is resurrected by Hoser (2020) for the species associated with *C. caudatus* (Milne-Edwards, 1877) based on a divergence of 16-27 MYA (Osborne and Christidis, 2002).

Cercartetus sensu lato species are separated from *Burramys* by having tails that have a feather-like appearance.

Cercartetus species are separated from *Burramys* by having tails that have a feather-like appearance.

Further relevant diagnostic and other information about *B. parvus sensu lato* can be found on pages 216 and 217 of Hoser (1991).

Distribution: *B. parvus scottyjamesi subsp. nov.* is restricted to the Bogong High Plains and associated mountains in north-east Victoria, Australia.

Etymology: Named in honour of Scotty James of Warrandyte, Victoria, Australia, in recognition for his services for snowboarding worldwide. He was the flag bearer for Australia at the 2018 Winter Olympics, where he won a bronze medal in halfpipe. He has won numerous titles since and has inspired countless young people to get out of their homes and to enjoy the outdoor environment in sport, which in turn encourages people to want to do what is needed to preserve and enhance the world's natural assets (except when locked in their homes with Coronavirus inspired government "lock downs" like in 2020).

REFERENCES CITED

Anon. (2005). *Recovery Plan for the Mountain Pygmy-possum* Burramys parvus *on Mt Buller, Victoria.* Mt. Buller to Mt Stirling Alpine Resorts Management Board, Mt Buller.

Bannister, J. L., Calaby, J. H., Dawson, L. J., Ling, J. K., Mahoney, J. A., McKay, G. M., Richardson, B. J., Ride, W. D. L.

and Walton, D. M. 1988. *Zoological Catalogue of Australia, Volume 5, Mammals*. Australian Government Publishing Service, Canberra, ACT, Australia:X+274 pp.

Brammell, J. and Archer, M. 1997. A new Oligocene-Miocene species of *Burramys* (Marsupialia, Burramyidae) from Riversleigh, northwestern Queensland. *Memoirs of the Queensland Museum* 41(2):247-268.

Broom, R. 1895. On a new fossil mammal allied to *Hypsiprymnus* but resembling in some points the Plagiaulacidae. *Abstr. Proc.Linn.Soc.* N.S.W. (1 June):26:11.

Broom, R. 1896a. On a small fossil marsupial with large grooved premolars. *Proceedings of the Linnaean Soc. N.S.W.*, 2(10):563-567.

Broom, R. 1896b. On a small fossil marsupial allied to *Petaurus*. *Proceedings of the Linnaean Soc. N.S.W.*, 2(10):568-570.

Broome, L. S. 2001a. Intersite differences in population demography of mountain pygmy-possums *Burramys parvus* Broom (1986-1998): Implications for metapopulation conservation and ski resorts in Kosciuszko National Park, Australia. *Biological Conservation* 102:309-323.

Broome, L. S. 2001b. Seasonal activity, home range and habitat use of the mountain pygmy-possum *Burramys parvus* (Marsupialia: Burramyidae) at Mt Blue Cow, Kosciuszko National Park. *Austral Ecology* 26:275-292.

Broome, L. S. and Geiser, F. 1995. Hibernation in free-living mountain pygmy-possums, *Burramys parvus* (Marsupialia: Burramyidae). *Australian Journal of Zoology* 43:373-379.

Broome, L., Archer, M., Bates, H., Shi, H., Geiser, F., McAllan, B., Heinze, D., Hand, S., Evans, T. and Jackson, S. 2012. A brief review of the life history of, and threats to, *Burramys parvus* with a pre-history based proposal for ensuring that it has a future. pp 114-126 in *Wildlife and Climate Change: towards robust conservation strategies for Australian fauna*, Lunney, D. and Hutchings, P. (eds.), Royal Zoological Society of NSW, Mosman, NSW, Australia.

Calaby, J. H., Dimpel, M. and McTaggart-Cowan, I. 1971. The Mountain pygmy possum, *Burramys parvus* Broom, in Kosciusko National Park. *Australian Wildlife Research* 13:507-517.

Caughley, J. 1986. Distribution and abundance of the mountain pygmy-possum, *B. parvus* Broom, in Kosciusko National Park. *Australian Wildlife Research* 13:507-517.

Chapple, D. G., Hoskin, C. J., Chapple, S. N. J. and Thompson, M. B. 2011. Phylogeographic divergence in the widespread delicate skink (*Lampropholis delicata*) corresponds to dry habitat barriers in eastern Australia. *BMC Evol Biol* 11:191.

Dimpel, H. and Calaby, J. H. 1972. Further observations on the mountain pigmy possum (*B. parvus*). *Victorian Naturalist* 89:101-106.

Fleming, M. 1985. The thermal physiology of the Mountain Pygmy-possum *Burramys parvus* (Marsupialia: Burramyidae). *Australian Mammalogy* 8:79-90.

Geiser, F. and Broome, L. S. 1991. Hibernation in the mountain pygmy-possum *Burramys parvus* (Marsupialia). *Journal of Zoology*, London 223:593-602.

Geiser, F. and Broome, L. S. 1993. The effect of temperature on the pattern of torpor in a marsupial hibernator. *Journal of Comparative Physiology* 163:133-137.

Gray, J. E. 1841. Description of some new species and four new genera of reptiles from Western Australia, discovered by John Gould, Esq. *Ann. Mag. Nat. Hist.* (1)7:86-91.

Gray, J. E. 1845. *Catalogue of the specimens of lizards in the collection of the British Museum*. Trustees of the British Museum/ Edward Newman, London: xxvii+289 pp

Green, K. 2003. Altitudinal and temporal differences in the food of foxes (*Vulpes vulpes*) at alpine and subalpine altitudes in the Snowy Mountains. *Wildlife Research* 30:245-253.

Green, K. 2008. Migratory Bogong Moths (*Agrotis infusa*) transport arsenic and concentrate it to lethal effect by aestivating gregariously in alpine regions of the Snowy Mountains of Australia. *Arctic, Antarctic, and Alpine Research* 40:74-80.

Gullan, P. and Norris, K. 1984. The habitat of *Burramys parvus* (Broom) in Victoria. pp 417-421 in Smith, A. P. and Hume, I. D. (eds), *Possums and Gliders*. Surrey Beatty and Sons, Chipping Norton, NSW, Australia.

Heinze, D. A. and Olejniczak, A. M. 2000. First observations of the mountain pygmy-possum *Burramys parvus* nesting in the wild. *Australian Mammalogy*. 22:65-67.

Heinze, D. A. and Williams, L, 1998. The discovery of the mountain pygmy-possum *Burramys parvus* on Mount Buller, Victoria. *Victorian Naturalist* 115:132-134.

Heinze, D., Broome, L. and Mansergh, I. 2004. A review of the ecology and conservation of the mountain pygmy-possum *Burramys parvus*. pp 254-267 in *The Biology of Australian Possums and Gliders* (eds.) Goldingay, R. L. and Jackson, S. M. (eds.), Surrey Beatty and Sons, Chipping Norton, Australia.

Hoser, R. T. 1991. *Endangered Animals of Australia*. Pierson Publishing, Mosman, NSW, Australia:240 pp.

Hoser, R. T. 2015. Australian agamids: Eighteen new species from the genera *Amphibolurus* Wagler, 1830, *Lophognathus* Gray, 1842, *Rankinia* Wells and Wellington, 1984, *Diporiphora* Gray, 1842, *Tympanocryptis* Peters, 1863, as well as three new genera and six new subgenera. *Australasian Journal of Herpetology* 30:37-64.

Hoser, R. T. 2019a. 11 new species, 4 new subspecies and a subgenus of Australian Dragon Lizard in the genus *Tympanocryptis* Peters, 1863, with a warning on the conservation status and long-term survival prospects of some newly named taxa. *Australasian Journal of Herpetology* 39:23-52.

Hoser, R. T. 2019b. Richard Shine *et al*. (1987), Hinrich Kaiser *et al*. (2013), Jane Melville *et al*. (2018 and 2019): Australian Agamids and how rule breakers, liars, thieves, taxonomic vandals and law breaking copyright infringers are causing reptile species to become extinct. *Australasian Journal of Herpetology* 39:53-63.

Hoser, R. T. 2020. Small and overlooked … six new species of Pygmy Possum, Genus *Cercartetus* Gloger, 1841 from the Australasian bioregion. *Australasian Journal of Herpetology* 42:11-22.

Kerle, J. A. 1984. The behaviour of *Burramys parvus* Broom (Marsupialia) in captivity. *Mammalia* 48:317-325.

Körtner, G. and Geiser, F. 1998. Ecology of natural hibernation in the marsupial mountain pygmy-possum (*Burramys parvus*). *Oecologia* 113:170-178.

Mansergh, I. and Broome, L. 1994. *The Mountain Pygmy-possum of the Australian Alps*. New South Wales University Press, Kensington.

Mansergh, I. and Scotts, D. 1989. Habitat continuity and social organization of the mountain pygmy-possum restored by tunnel. *Journal of Wildlife Management* 53:701-707.

Mansergh, I. and Scotts, D. 1990. Aspects of the life history and breeding biology of the mountain pygmy-possum (*Burramys parvus*) (Marsupialia: Burramyidae) in alpine Victoria. *Australian Mammalogy* 13:179-191.

Mansergh, I. M. and Walsh, N. G. 1983. Observations on the Mountain Pygmy-possum, *Burramys parvus*, on Mt Higginbotham, Victoria. *Victorian Naturalist* 100:106-115.

Mansergh, I., Kelly, P. and Scotts, D. 1989. *Management strategy and guidelines for the conservation of the Mountain Pygmy-possum,* Burramys parvus*, in Victoria*. Arthur Rylah Institute for Environmental Research Technical Report Series Number 66. Heidelberg, Victoria.

Mansergh, I., Baxter, B., Scotts, D., Brady, T. and Jolley, D. 1990. Diet of the mountain pygmy-possum, *Burramys parvus*

(Marsupialia: Burramyidae) and other small mammals in the alpine environment at Mt Higginbotham, Victoria. *Australian Mammalogy* 13:167-177.

Mansergh, I., Heinze, D. and Weeks, A. 2010. *A project to assist with the conservation of the Mountain Pygmy-possum* Burramys parvus *population on Mt Buller: facilitating and strengthening genetic diversity through cross-breeding in the wild*. Report to Department of Sustainability and Environment (Victoria).

Menkhorst, P. and Knight, F. 2004. *A Field Guide to the Mammals of Australia*, second edition. Oxford University Press, Melbourne.

Menkhorst, P., Broome, L., Heinze, D., Mansergh, I., Watson, K. and Hynes, E. 2016. *National Recovery Plan for the Mountain Pygmy-possum* Burramys parvus. Department of Environment, Land, Water and Planning, Victoria. Australian Government, Canberra, Australia:43 pp.

Mitrovski, P., Heinze, D. A., Guthridge, K. and Weeks, A. R. 2005. Isolation and characterization of microsatellite loci from the Australian endemic mountain pygmy-possum, *Burramys parvus* Broom. *Mol. Ecol. Notes* 5:395-397.

Mitrovski, P., Heinze, D. A., Broome, L., Hoffmann, A. A. and Weeks, A. R. 2007. High levels of variation despite genetic fragmentation in populations of the endangered mountain pygmy-possum, *Burramys parvus*, in alpine Australia. *Mol. Ecol.* 16:75-87.

Mitrovski, P., Hoffmann, A., Heinze, D. A. and Weeks, A. 2008. Rapid loss of genetic variation in an endangered possum. *Biology Letters* 4(1):134-138.

Ng, J. Clemann, N., Chapple, S. N. J. and Melville, J. 2013. Phylogeographic evidence links the threatened ‘Grampians’ Mountain Dragon (*Rankinia diemensis* Grampians) with Tasmanian populations: conservation implications in south-eastern Australia. *Conservation Genetics* April 2014, 15(2):363-373. (Published online on 7 Nov 2013).

Osborne, M. J. and Christidis, L. 2002. Systematics and biogeography of pygmy possums (Burramyidae: *Cercartetus*). *Journal of Australian Zoology* 50(1):25-37.

Osborne, M. J., Norman, J. A., Christidis, L. and Murray, N. D. 2000. Genetic distinctiveness of isolated populations of an endangered marsupial, the mountain pygmy-possum, *Burramys parvus*. *Molecular Ecology* 9:609-613.

Pepper, M., Sumner, J., Brennan, I. G., Hodges, K., Lemmon, A. R., Lemmon, E. M., Peterson, G., Rabosky, D. L., Schwarzkopf, L., Scott, I. A. W., Shea, G. and Scott keogh, J. 2018. Speciation in the mountains and dispersal by rivers: Molecularphylogeny of *Eulamprus* water skinks and the biogeography of Eastern Australia. *Journal of Biogeography*. 2018;1-13.

Ride, W. D. L. 1956. The affinities of *Burramys parvus* Broom a fossil Phalangeroid Marsupial. *Journal of Zoology*127(3):413-429.

Ride, W. D. L. (*ed.*) *et al.* (on behalf of the International Commission on Zoological Nomenclature) 1999. *International code of Zoological Nomenclature*. The Natural History Museum - Cromwell Road, London SW7 5BD, UK (also commonly cited as “The Rules”, “Zoological Rules” or “ICZN 1999”).

Rosengren, N. J. and Peterson, J. A., 1989. Heritage values and the geological and geomorphological significance of the Australian alpine zone. pp 187-204 in Good, R. (ed.), *The scientific significance of the Australian alps*. Australian Academy of Science, Canberra, ACT, Australia.

Sanecki, G. M., Green, K., Wood, H. and Lindenmayer, D. 2006. The implications of snow-based recreation for small mammals in the subnivean space in south-east Australia. *Biological Conservation* 129:511-518.

Schulz, M., Wilks, G. and Broome, L. 2012a. An uncharacteristic new population of the Mountain Pygmy-possum *Burramys parvus* in New South Wales. *Australian Zoologist* 36:22-28.

Schulz, M., Wilks, G. and Broome, L. 2012b. Occupancy of spoil dumps by the Mountain Pygmy-possum *Burramys parvus* in Kosciuszko National Park. *Ecological Management and Restoration* 13:290-296.

Shi, H. 2012. Thermal properties of alpine boulder fields: The potential to provide refuge for the endangered Mountain Pygmy-possum (*Burramys parvus*). PhD Thesis, University of New South Wales. ADFA campus ACT.

Strahan, R. (ed.) 1988. *The Australian Museum Complete book of Australian Mammals / The National Photographic Index of Australian Wildlife*. Angus and Robertson, North Ryde, NSW, Australia: 530 pp.

Symula, R., Scott Keogh, J. and Cannatella, D. C. 2008. Ancient phylogeographic divergence in southeastern Australia among populations of the widespread common froglet, *Crinia signifera. Mol Phyl Evol* 47:569-580.

Smith, A. P. and Broome, L. 1992. The effects of season, sex and habitat on the diet of the mountain pygmy-possum (*Burramys parvus*). *Wildlife Research* 19:755-768.

Van der Ree, R, Heinze, D., McCarthy, M. and Mansergh, I. 2009. Wildlife tunnel enhances population viability. *Ecology and Society* 14:7.

Weeks, A., Heinze, D., Kelly, T. and Mansergh, I. 2011. *Wild translocation of mountain pygmy possums for the genetic rescue of the Mount Buller population*. Report to Department of Sustainability and Environment, Melbourne, Victoria, Australia.

Weeks, A., Kelly, T., Griffiths, H. D. and Mansergh, I. 2012. *Genetic rescue of the Mt Buller mountain pygmy-possum population*. Report to Department of Sustainability and Environment, CEASR, University of Melbourne, Victoria, Australia.

Wells, R. W. and Wellington, C. R. 1984. A synopsis of the class Reptilia in Australia. *Australian Journal of Herpetology* 1(3-4):73-129 [cover date was 1983].

Wells, R. W. and C. R. Wellington. 1985. A classification of the Amphibia and Reptilia of Australia. *Australian Journal of Herpetology Supplementary Series* 1:1-61.

CONFLICTS OF INTEREST

None.

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Small and overlooked … six new species of Pygmy Possum, Genus *Cercartetus* Gloger, 1841 *sensu lato* from the Australasian bioregion.

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ABSTRACT

Cercartetus Gloger, 1841, better known as the iconic Pygmy Possums are a commonly seen and familiar element of the native Australasian mammal fauna to biologists and lay people alike.

While numerous forms have been described as species, as listed by Bannister *et al.* (1988), the taxonomy in recent years has been stable, with just four species being widely recognized.

A molecular phylogeny published by Osborne and Christidis (2002) indicated that based on molecular divergences there were at least six species in the genus, five of which had available names.

However as of 2019 no change to the current taxonomy or nomenclature had been formally proposed or widely adopted since at least 1934.

Before formally naming the newly identified species of Osborne and Christidis (2002), all specimens of all putative species within the genus from across the known ranges of each, were examined in terms of their identification, taxonomy and nomenclature.

The result was five species for which names were available and already being used (one being treated as a subspecies) and six others for which no names were available.

Therefore these are formally named herein in accordance with the rules of *the International Code of Zoological Nomenclature* (Ride *et al.* 1999).

Each of the six identified species (five for the first time) are morphologically divergent from their nearest congeners, reproductively isolated and geographically allopatric and separated by biogeographical barriers of known antiquity, forming a body of evidence giving a sound scientific basis for the decision to name each.

With the so-called *C. caudatus* linage (Long-tailed Pygmy Possum) having a16-27 MYA divergence from other members of the genus (Osborne and Christidis, 2002), and morphological divergence, a strong case is made for the creation of a separate genus or subgenus for this lineage.

The name *Eudromicia* Mjöberg, 1916 is available and therefore used.

Eudromicia has been recognized in the past as a genus by Iredale and Troughton (1934).

The newly named species are *Cercartetus hoserae sp. nov.,* from north-west Victoria and nearby parts of South Australia, previously identified as a population of *C. lepidus* Thomas, 1888; and four others, being *Eudromicia adelynhoserae sp. nov*. from North Queensland, *E. jackyhoserae sp. nov.* from south-east Papua New Guinea (PNG), *E. richardwellsi sp. nov*. from the central Highlands of PNG, *E. rosswellingtoni sp. nov*. from the western highlands of West Papua (Irian Jaya) Indonesia and *E. doriskuenae sp. nov*. from high altitude areas of the Finisterre Range in Madang and Morobe Provinces, PNG, all formerly identified as populations of *C. caudatus* (Milne-Edwards, 1877).

This paper effectively doubles the number of known extant species within the genus *Cercartetus.*

Keywords: Mammals; Marsupial; taxonomy; nomenclature; Pygmy Possum; *Cercartetus*; *Eudromicia*; Victoria; Australia; Queensland; Irian Jaya; New Guinea; Papua; *lepidus*; *caudatus*; *nanus*; *concinnus*; *macrurus*; new species; *hoserae*; *richardwellsi*; *adelynhoserae*; *rosswellingtoni*; *jackyhoserae*; *doriskuenae.*

INTRODUCTION

The iconic Pygmy Possums of the family Burramyidae Broom, 1896 are a familiar element of the native Australasian mammal fauna to biologists and many lay people as well.

Cercartetus Gloger, 1841, as is widely recognized in 2019, is the most speciose, widely distributed, abundant and best known genus within the family.

It occurs throughout the inhabited regions of southern and eastern Australia, including Tasmania and into New Guinea.

Where they occur, they are often abundant and are a regular encounter in faunal field surveys and other wildlife encounters.

While numerous forms have been described as listed by Bannister *et al.* (1988), the taxonomy in recent years has been stable, with just four species being widely recognized.

A molecular phylogeny published by Osborne and Christidis (2002) indicated that based on molecular divergences there were at least six species in the genus.

Five of of these had available names.

Their phylogeny also provided support for the contention that the divergent taxon, currently known as *C. caudatus* (Milne-Edwards, 1877) with a divergence estimated at a16-27 MYA from other members of the genus (Osborne and Christidis, 2002) could or should be placed in a separate genus.

On the basis of this evidence and morphological divergence of this form and noting that it has a geographically disjunct centre of distribution (New Guinea, versus southern Australia), the available name *Eudromicia* Mjöberg, 1916 is applied by myself to the relevant species within this paper for the first time since done so by Iredale and Troughton (1934).

In spite of the preceding, I note that as recently as of 2019, the date this paper was prepared, that no change to the current taxonomy or nomenclature of the putative genus *Cercartetus* had been formally proposed or was being mooted by anyone.

Before formally naming the newly identified species of Osborne and Christidis (2002), all specimens of all putative species within the genus from across the known ranges of each, were examined in terms of their identification, taxonomy and nomenclature including the putative new species identified by Osborne and Christidis (2002).

As mentioned in the abstract, the final result was six species for which names were available and already being used (one presently being treated as a subspecies) and five others for which no names were available.

Therefore these are formally named herein in accordance with the rules of *the International Code of Zoological Nomenclature* (Ride *et al.* 1999).

Each of the six identified species (five for the first time) are morphologically divergent from their nearest congeners, reproductively isolated and geographically allopatric and separated by biogeographical barriers of known antiquity, forming a body of evidence giving a sound scientific basis for the decision to name each.

The newly named species are *Cercartetus hoserae sp. nov.,* from north-west Victoria and nearby parts of South Australia, previously identified as a population of *C. lepidus* Thomas, 1888; and five others, being *Eudromicia adelynhoserae sp. nov*. from North Queensland, *E. jackyhoserae sp. nov.* from south-east Papua New Guinea (PNG), *E. richardwellsi sp. nov.* from the central Highlands of PNG, *E. rosswellingtoni sp. nov.* from the western highlands of West Papua (Irian Jaya) Indonesia and *E. doriskuenae sp. nov.* from high altitude areas of the Finisterre Range in Madang and Morobe Provinces, PNG, all formerly identified as populations of *E. caudatus* (Milne-Edwards, 1877).

This paper effectively doubles the number of known extant species within the genus *Cercartetus sensu lato.*

Within the *C. caudatus* species group, there may be further undescribed forms.

MATERIALS, METHODS AND RESULTS

Before a decision is made to name any new taxon, reasonable steps must be taken to ensure that it is justified on all relevant grounds, including that it is morphologically, genetically and reproductively isolated from their nearest relative and to a sufficient degree to be of taxonomic significance.

A further relevant question to ask is should the reproductively isolated and morphologically divergent entities be labelled as subspecies, full species, or potentially higher level again.

Key literature relevant to the taxonomic and nomenclatural conclusions within this paper include Anonymous (2007), Aplin *et al.* (2016), Bannister *et al.* (1988), Bell (1828), Brammell and Archer (1997), Brongersma (1953), Broom (1895, 1896a, 1896b), Bryant and Krosch (2016), Collins (1973), Desmarest (1818, 1820), Dwyer (1977), Eldridge *et al.* (2018), Flannery (1995), Gloger (1841), Gould (1845), Groves *et al.* (2005), Harris (2006, 2010), Hoser (1989), Hoser (2019c), Iredale and Troughton (1934), Jones (1925), Krefft (1863), Lawlor (1979), Maxwell *et al.* (1996), Menkhorst (2016), Menzies (1991), Milne-Edwards (1877), Mjöberg (1916), Osborne and Christidis (2002), Pestell *et al.* (2008), Rawlings and Donnellan (2003), Ride (1956, 1970), Ride *et al.* (1999), Schäuble *et al.* (2000), Smith (1986), Strahan (1988), Thomas (1888, 1922), Wakefield (1963), van Ufford and Cloos (2005), Vaughan (1986) and sources cited therein (duplicitous references not necessarily included).

Live and dead specimens as well as available bone specimens, were examined as was other relevant material, including past climate data for the relevant regions, sea level depths, and other relevant information.

In summary, as inferred already, the genetic, geological, historical and morphological evidence clearly showed that there were no less than six unnamed species in the genus.

SUMMARY OF THE RESULTS

All putative recognized species of *Cercartetus* Gloger, 1841 were inspected and matched with original descriptions or synonymised specimens as listed by Bannister *et al.* (1988).

For the relevant species the following findings are noted, along with the taxonomic implications.

Cercartetus nanus (Desmarest, 1818), with a type locality of Tasmania, and occurring throughout south-east Australia, including Tasmania has 3 available synonyms.

Phalangista gliriformis Bell, 1828 with a type locality of Tasmania has been treated as synonymous with *C. nanus* and no change is required.

Dromicia unicolour Krefft, 1863 from St. Leonards (Sydney), New South Wales, has been regarded as a subspecies of *C. nanus*.

Since at least 1988, all specimens from mainland Australia have been referred to this subspecies Bannister *et al.* (1988).

Osborne and Christidis (2002) only did a molecular analysis of Victorian specimens, without comparison with specimens from any parts of New South Wales, southern Queensland or Tasmania and so whether or not there are taxonomically significant divergences is not fully established.

However there is no evidence of obvious morphological divergence between mainland and Tasmanian specimens, or for that matter specimens across the range on mainland Australia and so I hereby treat *Dromicia unicolour* Krefft, 1863 as wholly synonymous and not a subspecies and obviously suggest everyone else does so, unless and until compelling evidence to the contrary emerges.

I note also that *C. nanus* remains abundant on even smaller Bass Strait Islands and these have not been formally assigned to either subspecies, nor do they appear to differ morphologically from those on either side of the water body.

Noting that in the recent geological past (within the last 20K years), there was a wide land bridge between Tasmania and Victoria, it is reasonable to expect *C. nanus* from either side to have mixed and without impediment, thereby maintaining species unity.

The same biogeograpical barrier of Bass Strait has not had any impact on most other trans-Victorian-Tasmanian species with low habitat specificity (as is the case for *C. nanus*) and divergence between them on either side of the now extant Bass Strait, which is well known to have been a land bridge for most of the recent geological past.

This includes for example Lowland Copperheads *Austrelaps superbus* (Günther, 1858) as detailed in Hoser (1989), or the frog *Limnodynastes dumerilii* Peters, 1863, including the subspecies *Limnodynastes dumerilii insularis* Parker, 1940 as detailed by Schäuble *et al.* (2000) who found no significant divergence between specimens from Tasmania or nearby southern Victoria based on their molecular phylogeny published at page 386.

I note that quite significantly, the Bass Strait barrier has been conquered by *C. nanus* on both east and west sides, being found (as of now) on both King Island (west side) and Flinders island (east side) and is common in all habitats on the proximal Victorian and Tasmanian sides of the water barrier.

On the basis of the preceding, the taxon *Dromicia britta* Jones, 1925 with a type locality of Millicent, South Australia is also herein treated as a synonym of *C. nanus* and not putative *C. nanus unicolour*.

The species *Cercartetus concinnus* (Gould, 1845), type locality Swan River (Perth) Western Australia, was redescribed by Waterhouse in 1846 as *Phalangista* (*Dromica*) *neillii* based on another specimen from nearby King George Sound in Western Australia.

Wakefield (1963) named a specimen from Natimuk in Victoria as a subspecies *Cercartetus concinnus minor.* However Osborne and Christidis (2002) Wrote:

"Flannery (1994) recognised two subspecies of *C. concinnus*, *C. c. concinnus* in southwest Western Australia, and *C. c. minor* in South Australia, western Victoria and western New South Wales. Conversely, Strahan (1995) did not recognise any subspecies. The low level of divergence that was recorded between individuals of *C. concinnus* from western Australia and south-western New South Wales supports the latter view. There was less than 1% divergence between the two disjunct populations, which was only slightly higher than that which was identified between two individuals from the same locality (Toodyay, Western Australia).

On the basis of the preceding I agree that there is no point in recognising the eastern population of *C. concinnus* as a subspecies.

The taxonomic situation with respect to the other two putative species of *Cercartetus* is however very different and needs to be elaborated upon to explain the scientific basis for the taxonomic judgements in this paper.

The putative species *Cercertatus lepidus* (Thomas, 1888) with a type locality of Tasmania is known from most parts of Tasmania as well as region in Western Victoria, bounded by the Little Desert in the South, the Murray River in the north and nearby drier parts of south-east South Australia although there is recent (aged) fossil material from nearby on the north (NSW) side of Murray River (Strachan 1988).

In the wild, this species appears not to be found in areas where *C. nanus* occurs, this especially being the case on the mainland of Australia, including far southern Victoria, where *C. nanus* is strong and there are no putative *C. lepidus* at all.

On the mainland of south-east Australia where both *C. nanus* and putative *C. lepidus* occur, *C. nanus* is found in wetter regions (such as southern Victoria) and *C. lepidus* in drier areas further north. This in effect separates the populations of *C. lepidus* in Tasmania and putative *C. lepidus* from mainland Australia, even without consideration of the trans-Victorian-Tasmanian barrier.

On its own this implies that the two populations of putative *C. lepidus* have had a long term isolation.

Confirming this is the molecular results of Osborne and Christidis (2002) who found species-level divergence between the two populations based on samples from each.

They wrote:

> "A similarly high level of DNA sequence divergence (c. 7%) was recorded between the mainland and Tasmanian populations of *C. lepidus*. Although the two disjunct populations are not currently recognised as separate subspecies, they clearly could be on the basis of DNA divergence."

A sequence divergence of 7% actually implies a 3 MYA divergence, as in well prior to the removal of the trans-Victorian-Tasmanian land bridge within the last 25K years and is sufficient, not just for subspecies-level recognition, but also is species level divergence.

A review of the extant distributions of both putative *C. lepidus* and *C. nanus* also yields further corroborative results beyond what I have already mentioned.

Based on Museum specimen records of all relevant Australian State Museums, downloaded via the "Atlas of Living Australia" (ALA) at "https://www.ala.org.au/" (last downloaded on 10 March 2020), one finds that *C. nanus* remains common on both Flinders and King Islands in Bass Strait, implying that at the time of glacial maxima, this was the taxon that inhabited this region (Bass Strait) and noting that it tends to live exclusive of putative *C. lepidus,* this in effect confirms the long historical gap between the two populations of this putative species.

By contrast (and based on ALA records), putative *C. lepidus* is not found on King Island, being the western and logical land bridge to its nearest point on the mainland side of the Bass Strait. Putative *C. lepidus* is found on Flinders Island on the east side of Bass Strait, but the nearest mainland point to here Wilsons Promontory, is a stronghold for *C. nanus*, as are all areas anywhere within 1,000 km of here (as measured along the extant Victorian coastline), in effect preventing the Tasmanian putative *C. lepidus* from having any contact with the mainland population.

Coupled with the fact that the mainland specimens of *C. lepidus* have significantly divergent morphology and biology, the case for formally recognizing them as a new species is compelling.

They are herein identified as *C. hoserae sp. nov.*.

It is also worth noting that there is a similar divergence to the above *Cercartetus* species seen between the agamid species *Rankinia diemensis* (Gray, 1841) from Tasmania and *R. neildaviei* Hoser, 2015 also restricted to a region in western Victoria (Hoser, 2015) and that both diverged well prior to the presence of a land bridge across the Bass Strait, indicating a non-marine barrier between the two evolving species.

The putative species *C. caudatus* (Milne-Edwards, 1877) was described from a specimen in the Arfak Mountains in Irian Jaya, which is particularly significant in light of what follows.

Another putative taxon, "*Eudromicia macrura* Mjöberg, 1916", based on a specimen from Cedar Creek, Atherton, Queensland, Australia (see comments on *Eudromicia* below) has since been synonymised with *C. caudatus* as seen for example in Osborne and Christidis (2002) at fig. 5.

Other authors, including Strahan (1988) at page 166 refer to the more recently described form as a subspecies, namely *C. caudatus macrurus*, but fail to give any morphological basis of separation.

Significantly Osborne and Christidis (2002) tested samples of the putative species from both New Guinea and Australia and found significant divergence between the two.

They wrote:

> "significant genetic differentiation was observed within some species. Most diverged (8%) were *C. caudatus macrurus* and *C. caudatus caudatus* from Australia and New Guinea respectively.… The mainland and Tasmanian

> populations of *C. lepidus* and the Australian and New Guinean populations of *C. caudatus* are estimated to have diverged c. 3-4 million years ago"

On face value these results indicated that elevation of the putative subspecies *C. caudatus macrurus* to full species was an obvious decision to make.

However inspection of specimens used for analysis and the paper of Osborne and Christidis (2002) raised further important issues.

The putative *C. caudatus* material from New Guinea that was tested by Osborne and Christidis (2002) was not taken from the type locality on the far west of the island, but instead came from a geographically distant region in the south-east of New Guinea at Milne Bay Province from an Australian Museum specimen number 24767.

This fact necessitated an inspection of specimens from this locality to compare them with others from the type locality of the Arfak Mountains in Irian Jaya, which is far west of the main central cordillera of the island of Papua and therefore in a region well and truly separated by unsuitable habitat, as well as specimens from intermediate locations elsewhere on the island of New Guinea to ascertain whether they fitted within one or both putative species, or alternatively were different taxa yet again.

Putative *C. caudatus* in Australia, where they have been well studied are very habitat restricted and range restricted, which also raised issues in terms of Australian specimens and whether or not more than one species is involved.

In terms of all known populations and summarizing current knowledge, Aplin *et al.* (2008) wrote of putative *C. caudatus*:

"This species is present in the highlands of the island of New Guinea (Indonesia and Papua New Guinea), and in the lowland and upland rainforests between Paluma Range and Cooktown, Queensland, Australia (Flannery 1995, Maxwell *et al.* 1996). It ranges from medium elevations to 3,450 m asl (New Guinea) and from sea level to 1,600 m in Australia. ...

In New Guinea, the species is found in montane and mid-montane primary and secondary tropical moist forests, especially where there are tree ferns. It also occurs in areas of subalpine shrubland. In Australia, it is known from rainforest (Maxwell *et al.* 1996)."

Significantly and in error, Aplin *et al.* (2008) published a distribution map for putative *C. caudatus* that showed a continuous line of distribution along the centre of the island from the birds head in the far north-west, across the low-lying area joining this part of the island to the rest and then continuously along the central cordillera to the Milne Bay area in the far south-east.

The ALA records (last downloaded on 10 March 2020), and records on Vert Net (VN) at http://vertnet.org/ (last downloaded on 10 March 2020), this being an international database of museum collections, shows the distribution of putative *C. caudatus* to in fact be restricted to a small number of isolated high altitude pockets and a complete absence in intervening areas.

Between the Arfak Mountains in Irian Jaya on the so-called "Bird's head" of the island, and the main central cordillera is a wide region of flat land or of generally low hills separating these high elevation biogeographical features effectively separating obligate highland rainforest-type species.

While periods of glacial maxima and significantly cooler global climates could be interpreted as lowering altitudinal limits and allowing species to cross these barriers and this is what many zoologists have assumed, evidence on all similarly constrained species groups has shown that in recent glacial minima this effect has not happened!

See for example the cases documented by Hoser (2016).

The overlooked reason for the apparent inability of these cool climate rainforest obligate species to be able to cross the low altitude barriers in times of glacial maxima has been due to a parallel drying of climates thereby in effect shrinking rainforest areas and in fact potentially further confining the relevant species.

Also not considered by many zoologists is the underlying fact that in times of glacial maxima, the cooling is most extreme in the polar and near polar regions and reduces towards the equatorial regions, lessening the impact of global cooling.

This means temperature drops near the equator are not sufficient to enable a significant downward elevation migration of species confined to so called sky islands.

Noting that molecular studies on similarly constrained species of reptiles (as cited by Hoser 2016), Moritz *et al.* (1993) and mammals, such as Tree Kangaroos (*Dendrolagus* Müller, 1840 species) as detailed by Eldridge *et al.* (2018) and Hoser (2019) came to the same results. That is a well-established trend of cold-climate, rainforest obligate species in north-east Queensland and New Guinea being unable to cross even relatively short distances across unsuitable lowland dry zones.

It is therefore self evident that even before a morphological study is completed, that the Milne Bay putative *C. caudatus* must be a separate taxon to those from the Arfak Mountains specimens.

Collection of putative *C. caudatus* in New Guinea has shown the putative species to be abundant where it occurs, but this abundance is heavily restricted to well-known upland areas that are in turn separated by lower altitude regions where the putative species appears absent.

The clustering of records is so significant as compared to other New Guinea vertebrates in Museum collections that one can only conclude that the absence in intervening regions is due to absence of specimens and not absence of collecting.

Hence, with at least five separate populations of putative *C. caudatus* on the island of New Guinea, clearly separated by currently unpassable altitudinal and habitat barriers (and other subpopulations that may also be taxonomically distinct), it seems self evident that each would require taxonomic recognition if each were clearly morphological divergent.

This in fact is the case and exactly why I have no hesitation in describing four obviously divergent high-altitude forms from New Guinea, separated by well known biogeographical barriers as new species.

Plotting the New Guinea distribution of putative *C. caudatus* based on ALA records, one finds a near identical distribution pattern to that of New Guinea Tree Kangaroos (*Dendrolagus*) in the so-called *D. dorianus* Ramsay, 1883 species-group as shown in Eldridge *et al.* (2018) on page 590.

Pages 593 and 594 of Eldridge *et al.* (2018) show clear species level divergences of the *Dendrolagus* species constrained by the same biogeographical factors as the putative *C. caudatus*, making species level recognition the logical outcome of this analysis.

In the Australian context, the results of Eldridge *et al.* (2018) can literally be overlain to putative *C. caudatus* as a direct pointer to the likelihood of there being two species in the Australian wet tropics as opposed to just one. Again refer to several other examples in Hoser (2016) and Moritz *et al.* (1993).

A check of the ALA shows the putative species is constrained in a similar way to the two recognized species of *Dendrolagus* across the same barrier just north of Cairns, Australia, in this case being estimated at about 2 MYA. Hence a similar divergence between the two disjunct Australian populations of putative *C. caudatus* can be readily accepted as fact and in the absence of specific DNA testing of specimens from both sides of the barrier.

The geoclimatic evidence is irrefutable.

Significantly, specimens from the north of the biogeograhical gap north of Cairns, sometimes called the "Black Mountain Gap"

(Bryant and Krosch 2016) are morphologically divergent from those to the south and hence I also have no hesitation in formally naming this taxon as a new species.

An outlier population of putative *C. caudatus* from high altitude areas of the Finisterre Range in Madang and Morobe Provinces, PNG, separated from the nearby Central Highlands of PNG by the Ramu and Markham River basins is also sufficiently divergent as to warrant full species recognition.

In summary, *C. caudatus* as currently recognized is split into a total of seven separate species. This is two from Australia and five from New Guinea.

With a divergence time estimated at 16-27 MYA for the *C. caudatus* linage versus the rest of the genus (Osborne and Christidis, 2002), a strong case is made for the creation of a separate genus or subgenus for this lineage.

Adding morphological divergence, the case for genus level recognition of the species group becomes compelling.

The name *Eudromicia* Mjöberg, 1916 is available and has been recognized in the past as a genus by Iredale and Troughton (1934) and is a contention I agree with.

Hence the relevant new species are herein placed within this genus and not *Cercartetus sensu stricto*.

The newly named Australian form is that from the highlands of the northern wet tropics, Queensland, centred on Mount Lewis and it is formally named *Eudromicia richardwellsi sp. nov.*

Within the island of New Guinea, the species *E. caudatus* is restricted to the Arfak Mountains in Irian Jaya on the so-called “Bird’s Head” of the island.

The species *E. adelynhoserae sp. nov.* is the taxon from the Milne Bay region of Papua New Guinea, tentatively including the population from offshore Fergusson Island (max. elevation is 1947 m above sea level), based on proximity to adjacent mainland populations and similarity of reptile taxa between the two places (e.g. the python *Lenhoserus boeleni* (Brongersma, 1953)).

The species *E. rosswellingtoni sp. nov.* is the taxon from the central Highlands of PNG, including the nearby high altitude points in the Eastern Highlands province and Southern Highlands Province.

The species *E. jackyhoserae sp. nov.* is the taxon from the Nassau Range in Irian Jaya (West Papua).

The species *E. doriskuenae sp. nov.* is the taxon from the high altitude areas of the Finisterre Range in Madang and Morobe Provinces, PNG.

One or more further potentially unnamed species may be present from Foja Mountains north of the main cordillera in Irian Jaya (near the coast) as detailed by Anonymous (2007) (and see image at: https://www.naturepl.com/stock-photo-long-tailed-pygmy-possum-nature-image01361572.html) (Last downloaded on 10 March 2020), but I have deferred formally naming the taxon on the basis that it is morphologically similar to the specimens from the mid-central highlands and because of the recent geological age of the highlands where it occurs.

The preceding would mean an estimated divergence from the central highlands stock of about 1.25 MYA, which at best would usually be defined as a subspecies, rather than a full species.

Also refer to the *Dendrolagus* phylogeny published by Eldridge *et al.* (2018).

Of course there is also potential for one or more other unnamed forms on the island of New Guinea, particularly in isolated high regions of significant antiquity, but so far there is no indication as to exactly where these may occur.

It is noted that a person unfamiliar with the relevant taxa and not reading the detail of this paper and the sources cited herein, may form an initial view that the “splitting” of one putative species to seven is unjustified, while the remainder of the genus *Cercartetus sensu lato* as currently understood by most zoologists (three other long recognized species), is effectively left untouched, save for the formal naming of a well-known and divergent form, giving an effective 7/4 ratio for the number of species in the putative genus.

However the morphological and genetic evidence supports this position.

I also note that the phylogeny published by Osborne and Christidis (2002) on page 32 shows the putative taxon *C. caudatus* as basal to the rest, thereby enabling a greater potential time frame to speciate (all other factors being equal) and note that two geographically proximal samples from across the range of the putative taxon did in fact show species-level divergence for these populations in their results. This also implies a potentially even greater divergence for geographically distant samples.

It is also significant that the habitat fidelity and dispersal abilities of the species in the genus *Eudromicia* are significantly and demonstrably lower than for *Cercartetus* as demonstrated by the date of divergence of all species in the former genus across known biogeographical barriers, versus those for *Cercartetus.* Again this aids the contention that there has in fact been more speciation and over a longer time frame for the genus *Eudromicia* as opposed to *Cercartetus.*

INFORMATION RELEVANT TO THE FORMAL DESCRIPTIONS THAT FOLLOW

There is no conflict of interest in terms of this paper or the conclusions arrived at herein.

Several people including anonymous peer reviewers who revised the manuscript prior to publication are also thanked as are relevant staff at museums who made specimens and records available in line with international obligations.

In terms of the following formal descriptions, spellings should not be altered in any way for any purpose unless expressly and exclusively called for by the rules governing Zoological Nomenclature as administered by the International Commission of Zoological Nomenclature.

In the unlikely event two or more newly named taxa are deemed conspecific by a first reviser, then the name to be used and retained is that which first appears in this paper by way of page priority and as listed in the abstract keywords.

Some material in descriptions for taxa may be repeated for other taxa in this paper and this is necessary to ensure each fully complies with the provisions of the *International Code of Zoological Nomenclature* (Fourth edition) (Ride *et al.* 1999) as amended online since.

Material downloaded from the internet and cited anywhere in this paper was downloaded and checked most recently as of 10 March 2020 (including if also viewed prior), unless otherwise stated and was accurate in terms of the content cited herein as of that date.

Unless otherwise stated explicitly, colour and other descriptions apply to living adult specimens of generally good health and not under any form of stress by means such as excessive cool, heat, dehydration or abnormal skin reaction to chemical or other input.

Colour descriptions of species refer to fur colour and not skin.

While numerous texts and references were consulted prior to publication of this paper, the criteria used to separate the relevant species or subspecies has already been spelt out and/or is done so within each formal description and does not rely on material within publications not explicitly cited herein.

In terms of conservation of each population of each species as described below, the comments in Hoser (1991 and 2019a, 2019b) apply.

Wildlife laws as currently enforced in Australia, Indonesia and Papua New Guinea or not in a materially significant way enhancing the long-term survival prospects of any of the relevant species.

Over breeding of humans and the environmental problems associated with this overpopulation are by far the greatest long term threat to each and every relevant species.

In line with the Australian Federal Government's "Big Australia" policy, that being to increase the human population of 25 million (2020), from 13 million in around 1970, to over 100 million within 100 years "so that we can tell China what to do", as stated by the former Prime Minister, Kevin Rudd in 2019 (Zaczek 2019), the human pressure on the relevant ecosystems has increased in line with the human populations nearby and will clearly continue to do so.

CERCARTETUS HOSERAE SP. NOV.

LSID urn:lsid:zoobank.org:act:3AFEEC0A-8AFB-4E49-B254-9298BC427BA7

Holotype: A preserved male specimen at the National Museum of Victoria, Melbourne, Victoria, Australia, specimen number C27321 collected from 6.6 km west of Sunset Tank, Victoria, Australia, Latitude -34.95 S., Longitude 141.45 E. This government-owned facility allows access to its holdings.

Paratype: A preserved male specimen at the National Museum of Victoria, Melbourne, Victoria, Australia, specimen number C24355 collected at 23 km south of Tutye, Victoria, Australia, Latitude -35.42 S., Longitude 141.48 E.

Diagnosis: The genus *Cercartetus* Gloger, 1841 is effectively diagnosed by Thomas (1888) at pages 140-141 under the name *Dromicia* Gray, 1841.

The putative species *Cercartetus lepidus* (Thomas, 1888) including the species *C. hoserae sp. nov.* (from Victoria and South Australia) and *C. lepidus* (from Tasmania) are both separated from all other species in the genus (*sensu lato* and including the genus *Eudromicia* Mjöberg, 1916 as defined below) by the following unique suite of characters: Having slate coloured belly hairs basally and of a small size, being less than 85 mm head and body length; lower leg less than 20 mm long and hind leg less than 13 mm long as well as a fourth small molar (the final character which in particular separates this species from C. *nanus* (Desmarest, 1818) and *C. concinnus* (Gould, 1865)).

C. hoserae sp. nov. is readily separated from *C. lepidus* by having brownish yellow-fur on the upper body, versus grey with a slight brown tinge or if yellowish, with a strong grey infusion of colour in *C. lepidus. C. hoserae sp. nov.* is further separated from *C. lepidus* by having an obvious demarcation between the blackish fur around the eye and the pink of the snout, this being a line of brownish yellow-fur, whereas in *C. lepidus* blackish fur runs in some form to the snout.

A detailed morphological appraisal of the holotype of *C. lepidus*, also applicable to *C. hoserae sp. nov.* can be found on pages 142 and 143 of Thomas (1888).

The species *Cercartetus nanus* (Desmarest, 1818) is separated from all other species in the genus by having a medium tail being less than 120 mm in length; an indistinct darker eye-mark; ventral hairs tipped with white (versus completely white in *C. concinnus* (Gould, 1865)).

The species *C. concinnus* (Gould, 1865) is separated from all other species in the genus by having a small size as for *C. lepidus* and *C. hoserae sp. nov.* but is easily separated from those species by having pure white hairs on the belly and an almost obsolete (indistinct) eye mark; three molar teeth on each side, top and bottom, with the upper third premolar with a single point and the lower third premolar being tiny.

The species complex, until now regarded as putative *Eudromicia,* formerly *Cercartetus caudatus* (Milne-Edwards, 1877) (from western Papua), including *E. macrurus* (Mjöberg, 1816) (from the southern wet tropics in Queensland, Australia) and the four newly described species, all formerly treated as populations of *E. caudatus*, namely *E. richardwellsi sp. nov.* (from the northern wet tropics, Queensland Australia), *E. adelynhoserae sp. nov.* (from Milne Bay, PNG), *E. rosswellingtoni sp. nov.* (from the central ranges of New Guinea, generally near Mount Wilhelm to the Irian Jaya border) and *E. jackyhoserae sp. nov.* (from Nassau Range, Irian Jaya) are readily separated from all other members of the genus by having a large size, as in being more than 85 mm head and body length; lower leg length more than 20 mm long and hind leg more than 13 mm long. The tail is also long and more than 120 mm in length, slightly thickened and furred at the base (separating it from the superficially similar *Pogonomys* Milne-Edwards, 1877). The dark mark through the eye is obvious and there are large crinkly ears. This is also a genus-level diagnosis for all species within *Eudromicia.*

Other characteristics diagnostic of *Eudromicia* include large eyes, mouse-like ears, a pouch that opens anteriorly (as in didelphids), a well-developed and opposable hallux that does not have a claw, expanded pads at the ends of the digits, quadritubercular molars, a broad, flattened skull, and three upper incisors and one lower incisor that are enlarged and procumbent. (Lawlor 1979, Ride 1970, Strahan 1988, Vaughan 1986).

Distribution: *Cercartetus hoserae sp. nov.* is restricted to a dry zone of habitats in Western Victoria, from Little Desert in the south to the Murray River in the north and west into nearby parts of South Australia. The range is bounded by the Murray River drainage to the north and west, wetter habitats to the south, where *C. nanus* occurs and agricultural regions further east in Victoria.

C. lepidus is confined to Tasmania and is therefore an endemic to that state.

Etymology: Named in honour of my wife, Shireen Vanessa Hoser, of Park Orchards, Victoria, Australia, but born in a remote part of southern Africa called "Athlone", not far from central Cape Town in recognition of her services to herpetology and wildlife conservation over more than 20 years.

EUDROMICIA RICHARDWELLSI SP. NOV.

LSID urn:lsid:zoobank.org:act:92B808AB-709C-4FDC-89CA-4728900E986E

Holotype: A preserved female specimen in the Queensland Museum, Brisbane, Queensland, Australia, specimen number JM7011, collected from Mount Spurgeon, Queensland, Australia, Latitude -16.6 S., Longitude 145.2 E. This government-owned facility allows access to its holdings.

Paratypes: Three preserved specimens in the Queensland Museum, Brisbane, Queensland, Australia, specimen numbers JM10205, JM10206 and JM10228 (skulls), collected from Mount Lewis, Queensland, Australia, Latitude -16.58 S., Longitude 145.28 E.

Diagnosis: The species complex, until now regarded as putative *Eudromicia* (formerly *Cercartetus*) *caudatus* (Milne-Edwards, 1877) (herein restricted to the type region of the type locality, being the Arfak Mountains in western Papua, Indonesia), including *E. macrurus* (Mjöberg, 1816) (from the southern wet tropics in Queensland, Australia) and the four newly described species, all formerly treated as populations of *E. caudatus*, namely *E. richardwellsi sp. nov.* (from the northern wet tropics, Queensland Australia), *E. adelynhoserae sp. nov.* (from Milne Bay, PNG), *E. rosswellingtoni sp. nov.* (from the central ranges of New Guinea, generally near Mount Wilhelm to the Irian Jaya border), *E. jackyhoserae sp. nov.* (from Nassau Range, Irian Jaya) and *E. doriskuenae sp. nov.* from the high altitude areas of the Finisterre Range in Madang and Morobe Provinces, PNG, are readily separated from all other members of the genus by having a large size as in being more than 85 mm head and body length; lower leg length more than 20 mm long and hind leg more than 13 mm long. The tail is also long and more than 120 mm in length, slightly thickened and furred at the base (separating it from the superficially similar *Pogonomys* Milne-Edwards, 1877). The dark mark through the eye is obvious and there are large crinkly ears. This is also a genus-level diagnosis for all species within *Eudromicia.*

Eudromicia caudatus (Milne-Edwards, 1877) herein restricted to the type region of the type locality, being the Arfak Mountains in western Papua, Indonesia and all other species in the complex, are easily separated from one another on colouration.

Eudromicia caudatus (Milne-Edwards, 1877) is readily separated from the other five herein recognized species by having a dull rufous colour above. The face is rufous fawn, with two broad black bands passing from the nose through the eyes, but not quite reaching the ears. Ears are rather long and narrow, evenly oval, naked. Back-hairs are slaty grey for five sixths of their length, their tips dull rufous. Chest and belly pale yellowish white, the bases of the hairs slate-coloured.

Arms and legs grey; hands and feet dull fawn.

E. macrurus (Mjöberg, 1816) from the southern wet tropics in Queensland, Australia, generally south and west of Cairns, North Queensland are readily separated from the other five herein recognized species by having a brownish-grey colour above, with a slight rufous tinge at the anterior end only. The face is rufous fawn or just yellowish brown, depending on the individual, with a square black patch across each eye and nowhere near the ears. This patch is notable for having a well defined black triangle jutting out from above the rear of the eye, the apex pointing towards the crown.

Ears are rather long and narrow, evenly oval, naked and greyish on the lobes and rich pink within. Back-hairs are slaty grey for five sixths of their length, their tips a brownish-grey colour. Chest and belly pale yellowish white, the bases of the hairs slate-coloured.

Arms and legs are brown on top, light (whitish) underneath; hands and feet a light pinkish colour.

E. richardwellsi sp. nov. from the northern wet tropics generally from north of Port Douglas and south of Cape Tribulation, with a distribution centred on the Mount Lewis area is similar in most respects to *E. macrurus*, which it would otherwise be identified as. *E. richardwellsi sp. nov.* can however be separated from *E. macrurus* by having significantly less-well defined black around the eye, being peppered in appearance and not boldly demarcated from the adjacent brownish fur as seen in *E. macrurus.* The jowls region in *E. richardwellsi sp. nov.* is yellow rather than whitish as seen in *E. macrurus.*

The species *E. adelynhoserae sp. nov.* from the Milne Bay Province, Papua New Guinea is readily separated from the other species by having a distinctly steel-greyish colour, contrasting with white undersides and jowls. The upper surface has a somewhat peppered appearance. The ears are blackish grey, the dark colour extending almost all the way into the visible ear, with inner regions a pale orangeish colour. The black patches over the eyes are elliptical in shape and extend from the snout. There is an ill defined line of blackish grey running from the mid-snout between the eyes, further back to the crown.

The species *E. rosswellingtoni sp. nov.* from the region around Mount Wilhelm and including nearby elevated parts of Eastern Highlands and Southern Highlands provinces of Papua New Guinea, west to the Irian Jaya border is readily separated from the other species by having brown hair on the upper body, ears that are brownish grey at the outer edges and becoming orange further in, feet are pink and the pink of the snout almost extends to the eyes. The belly is beige and the lower flanks have well defined demarcation between darker upper parts and lighter underparts, which do not run in an even line.

The species *E. jackyhoserae sp. nov.* from the Nassau Range in Irian Jaya (West Papua), Indonesia is similar in most respects to *E. rosswellingtoni sp. nov.* as described above, but can be separated from that species by having orange-pink feet and mottled darker patches or blotches on the sides of the face and forelimbs. The ears have greyish tips, but are otherwise yellowish in colour further in. The belly is beige and the lower flanks have well defined demarcation between darker upper parts and lighter underparts, which do not run in an even line. The upper limbs and lower flanks are dark brown with well defined lighter edges, forming large patches and quite distinct from the brownish grey dorsal surfaces.

The species *E. doriskuenae sp. nov.* from the high altitude areas of the Finisterre Range in Madang and Morobe Provinces, PNG is similar in most respects to *E. rosswellingtoni sp. nov.* however can be differentiated from that species and in turn all others, by the fact that demarcation between darker upper parts and lighter underparts is not well defined; inner ears are orange in colour except for the very outer tips which have grey outer edges; around the eye, the black marking is dark brown rather than black with some infusions of brown into the dark brown region anterior to the eye.

Eudromicia macrurus (Mjöberg, 1816) in life are seen in Strahan (1998) on page 167 (all photos) and also online at:

https://www.flickr.com/photos/euprepiosaur/8548752100/

Eudromicia hoserae sp. nov. in life can be seen in a photo online at:

https://www.flickr.com/photos/mattsummerville/43996071634/

Distribution: *E. richardwellsi sp. nov.* occurs in the northern wet tropics of Australia from north of Port Douglas and south of Cape Tribulation, with a distribution centred on the Mount Lewis area, Queensland, Australia, being restricted to pockets of rainforest habitat.

Etymology: Named in honour of Richard W. Wells, currently of Lismore, New South Wales, Australia in recognition of his significant taxonomic works on Australian herpetology including major monographs in the 1980's (e.g. Wells and Wellington 1984, 1985) and the post year 2000 period.

EUDROMICIA ADELYNHOSERAE SP. NOV.

LSID urn:lsid:zoobank.org:act:1102DEB8-FD63-41F0-B4E1-EDF0C0C1BCAC

Holotype: A preserved specimen at the Australian Museum in Sydney, New South Wales, Australia, specimen number M.29554, collected from Param village gardens, Aguan Area, Milne Bay Province, Papua New Guinea, Latitude -9.97 S., Longitude 149.48 E. This government-owned facility allows access to its holdings.

Paratypes: Two preserved specimens at the Australian Museum in Sydney, New South Wales, Australia, specimen numbers M.29555 and M.29553 collected from Param village gardens, Aguan Area, Milne Bay Province, Papua New Guinea, Latitude -9.97 S., Longitude 149.48 E.

Diagnosis: The species complex, until now regarded as putative *Eudromicia* (formerly *Cercartetus*) *caudatus* (Milne-Edwards, 1877) (herein restricted to the type region of the type locality, being the Arfak Mountains in western Papua, Indonesia), including *E. macrurus* (Mjöberg, 1816) (from the southern wet tropics in Queensland, Australia) and the four newly described species, all formerly treated as populations of *E. caudatus*, namely *E. richardwellsi sp. nov.* (from the northern wet tropics, Queensland Australia), *E. adelynhoserae sp. nov.* (from Milne Bay, PNG), *E. rosswellingtoni sp. nov.* (from the central ranges of New Guinea, generally near Mount Wilhelm, west to near the Irian Jaya border), *E. jackyhoserae sp. nov.* (from Nassau Range, Irian Jaya) and *E. doriskuenae sp. nov.* from the high altitude areas of the Finisterre Range in Madang and Morobe Provinces, PNG, are readily separated from all other members of the genus by having a large size as in being more than 85 mm head and body length; lower leg length more than 20 mm long and hind leg more than 13 mm long. The tail is also long and more than 120 mm in length, slightly thickened and furred at the base (separating it from the superficially similar *Pogonomys* Milne-Edwards, 1877). The dark mark through the eye is obvious and there are large crinkly ears. This is also a genus-level diagnosis for all species within *Eudromicia.*

Eudromicia caudatus (Milne-Edwards, 1877) herein restricted to the type region of the type locality, being the Arfak Mountains in western Papua, Indonesia and all other species in the complex, are easily separated from one another on colouration.

Eudromicia caudatus (Milne-Edwards, 1877) is readily separated from the other five herein recognized species by having a dull rufous colour above. The face is rufous fawn, with two broad black bands passing from the nose through the eyes, but not quite reaching the ears. Ears are rather long and narrow, evenly oval, naked. Back-hairs are slaty grey for five sixths of their length, their tips dull rufous. Chest and belly pale yellowish white, the bases of the hairs slate-coloured.

Arms and legs grey; hands and feet dull fawn.

E. macrurus (Mjöberg, 1816) from the southern wet tropics in Queensland, Australia, generally south and west of Cairns, North Queensland are readily separated from the other five herein recognized species by having a brownish-grey colour above, with a slight rufous tinge at the anterior end only. The face is rufous fawn or just yellowish brown, depending on the individual, with a square black patch across each eye and nowhere near the ears. This patch is notable for having a well defined black triangle jutting out from above the rear of the eye, the apex pointing towards the crown.

Ears are rather long and narrow, evenly oval, naked and greyish on the lobes and rich pink within. Back-hairs are slaty grey for five sixths of their length, their tips a brownish-grey colour. Chest and belly pale yellowish white, the bases of the hairs slate-coloured.

Arms and legs brown on top, light (whitish) underneath; hands and feet a light pinkish colour.

E. richardwellsi sp. nov. from the northern wet tropics generally from north of Port Douglas and south of Cape Tribulation, with a distribution centred on the Mount Lewis area is similar in most respects to *E. macrurus*, which it would otherwise be identified as. *E. richardwellsi sp. nov.* can however be separated from *E. macrurus* by having significantly less-well defined black around the eye, being peppered in appearance and not boldly demarcated from the adjacent brownish fur as seen in *E. macrurus.* The jowls region in *E. richardwellsi sp. nov.* is yellow rather than whitish in *E. macrurus.*
The species *E. adelynhoserae sp. nov.* from the Milne Bay Province, Papua New Guinea is readily separated from the other species by having a distinctly steel-greyish colour, contrasting with white undersides and jowls. The upper surface has a somewhat peppered appearance. The ears are blackish grey, the dark colour extending almost all the way into the visible ear, with inner regions a pale orangeish colour. The black patches over the eyes are elliptical in shape and extend from the snout. There is an ill defined line of blackish grey running from the mid-snout between the eyes, further back to the crown.

The species *E. rosswellingtoni sp. nov.* from the region around Mount Wilhelm and including nearby elevated parts of Eastern Highlands and Southern Highlands provinces of Papua New Guinea and west to the Irian Jaya border is readily separated from the other species by having brown hair on the upper body, ears that are brownish grey at the outer edges and becoming orange further in, feet are pink and the pink of the snout almost extends to the eyes. The belly is beige and the lower flanks have well defined demarcation between darker upper parts and lighter underparts, which do not run in an even line.

The species *E. jackyhoserae sp. nov.* from the Nassau Range in Irian Jaya (West Papua), Indonesia is similar in most respects to *E. rosswellingtoni sp. nov.* as described above, but can be separated from that species by having orange-pink feet and mottled darker patches or blotches on the sides of the face and forelimbs. The ears have greyish tips, but are otherwise yellowish in colour further in.

The belly is beige and the lower flanks have well defined demarcation between darker upper parts and lighter underparts, which do not run in an even line. The upper limbs and lower flanks are dark brown with well defined lighter edges, forming large patches and quite distinct from the brownish grey dorsal surfaces.

The species *E. doriskuenae sp. nov.* from the high altitude areas of the Finisterre Range in Madang and Morobe Provinces, PNG is similar in most respects to *E. rosswellingtoni sp. nov*. however can be differentiated from that species and in turn all others, by the fact that demarcation between darker upper parts and lighter underparts is not well defined; inner ears are orange in colour except for the very outer tips which have grey outer edges; around the eye, the black marking is dark brown rather than black with some infusions of brown into the dark brown region anterior to the eye.

Distribution: *E. adelynhoserae sp. nov.* is known from elevated rainforest locations in the Milne Bay province of the island of New Guinea, generally near the type locality. Fergusson Island specimens of this genus are presumably of the same species.

Etymology: Named in honour of my eldest daughter, Adelyn Hoser of Park Orchards, (Melbourne), Victoria, Australia in recognition of over 20 years of significant contributions to wildlife conservation in Australia, including her work with Snakebusters: Australia's best reptiles shows, being the only hands on wildlife shows in Australia that let people hold the animals.
Adelyn Hoser also made significant contributions to several years research on the Mountain Pygmy Possums of the genus *Burramys* Broom (1896) in the snowfields of New South Wales and Victoria, Australia.

EUDROMICIA ROSSWELLINGTONI SP. NOV.

LSID urn:lsid:zoobank.org:act:186515F3-480A-4B09-9EA8-47C19A3152F5

Holotype: A preserved specimen at the Australian Museum in Sydney, New South Wales, Australia, specimen number M.9622 collected from Korn in the Upper Waghi Valley, Western Highlands Province, New Guinea, Latitude -5.83 S., Longitude 144.32 E. This facility allows access to its holdings.

Paratypes: Two preserved specimens at the Australian Museum in Sydney, New South Wales, Australia, specimen numbers M.9621 and M.9620 collected from Korn in the Upper Waghi Valley, Western Highlands Province, New Guinea, Latitude -5.83 S., Longitude 144.32 E.

Diagnosis: The species complex, until now regarded as putative *Eudromicia* (formerly *Cercartetus*) *caudatus* (Milne-Edwards, 1877) (herein restricted to the type region of the type locality, being the Arfak Mountains in western Papua, Indonesia), including *E. macrurus* (Mjöberg, 1816) (from the southern wet tropics in Queensland, Australia) and the four newly described species, all formerly treated as populations of *E. caudatus*, namely *E. richardwellsi sp. nov.* (from the northern wet tropics, Queensland Australia), *E. adelynhoserae sp. nov.* (from Milne Bay, PNG), *E. rosswellingtoni sp. nov.* (from the central ranges of New Guinea, generally near Mount Wilhelm and west to the Irian Jaya border), *E. jackyhoserae sp. nov.* (from Nassau Range, Irian Jaya) and *E. doriskuenae sp. nov.* from the high altitude areas of the Finisterre Range in Madang and Morobe Provinces, PNG, are readily separated from all other members of the genus by having a large size as in being more than 85 mm head and body length; lower leg length more than 20 mm long and hind leg more than 13 mm long. The tail is also long and more than 120 mm in length, slightly thickened and furred at the base (separating it from the superficially similar *Pogonomys* Milne-Edwards, 1877). The dark mark through the eye is obvious and there are large crinkly ears. This is also a genus-level diagnosis for all species within *Eudromicia.*

Eudromicia caudatus (Milne-Edwards, 1877) herein restricted to the type region of the type locality, being the Arfak Mountains in western Papua, Indonesia and all other species in the complex, are easily separated from one another on colouration.

Eudromicia caudatus (Milne-Edwards, 1877) is readily separated from the other five herein recognized species by having a dull rufous colour above. The face is rufous fawn, with two broad black bands passing from the nose through the eyes, but not quite reaching the ears. Ears are rather long and narrow, evenly oval, naked. Back-hairs are slaty grey for five sixths of their length, their tips dull rufous. Chest and belly pale yellowish white, the bases of the hairs slate-coloured.

Arms and legs grey; hands and feet dull fawn.

E. macrurus (Mjöberg, 1816) from the southern wet tropics in Queensland, Australia, generally south and west of Cairns, North Queensland are readily separated from the other five herein recognized species by having a brownish-grey colour above, with a slight rufous tinge at the anterior end only. The face is rufous fawn or just yellowish brown, depending on the individual, with a square black patch across each eye and nowhere near the ears. This patch is notable for having a well defined black triangle jutting out from above the rear of the eye, the apex pointing towards the crown.

Ears are rather long and narrow, evenly oval, naked and greyish on the lobes and rich pink within. Back-hairs are slaty grey for five sixths of their length, their tips a brownish-grey colour. Chest and belly pale yellowish white, the bases of the hairs slate-coloured.

Arms and legs brown on top, light (whitish) underneath; hands and feet a light pinkish colour.

E. richardwellsi sp. nov. from the northern wet tropics generally from north of Port Douglas and south of Cape Tribulation, with a distribution centred on the Mount Lewis area is similar in most respects to *E. macrurus*, which it would otherwise be identified as. *E. richardwellsi sp. nov.* can however be separated from *E. macrurus* by having significantly less-well defined black around the eye, being peppered in appearance and not boldly demarcated from the adjacent brownish fur as seen in *E. macrurus.* The jowls region in *E. richardwellsi sp. nov.* is yellow rather than whitish in *E. macrurus.*

The species *E. adelynhoserae sp. nov.* from the Milne Bay Province, Papua New Guinea is readily separated from the other species by having a distinctly steel-greyish colour above, contrasting with white undersides and jowls. The upper surface has a somewhat peppered appearance. The ears are blackish grey, the dark colour extending almost all the way into the visible ear, with inner regions a pale orangeish colour. The black patches over the eyes are elliptical in shape and extend from the snout. There is an ill defined line of blackish grey running from the mid-snout between the eyes, further back to the crown.

The species *E. rosswellingtoni sp. nov.* from the region around Mount Wilhelm and including nearby elevated parts of Eastern Highlands and Southern Highlands provinces of Papua New Guinea, west to the Irian Jaya border is readily separated from the other species by having brown hair on the upper body, ears that are brownish grey at the outer edges and becoming orange further in, feet are pink and the pink of the snout almost extends to the eyes. The belly is beige and the lower flanks have well defined demarcation between darker upper parts and lighter underparts, which do not run in an even line.

The species *E. jackyhoserae sp. nov.* from the Nassau Range in Irian Jaya (West Papua), Indonesia is similar in most respects to *E. rosswellingtoni sp. nov.* as described above, but can be separated from that species by having orange-pink feet and mottled darker patches or blotches on the sides of the face and forelimbs. The ears have greyish tips, but are otherwise yellowish in colour further in.

The belly is beige and the lower flanks have well defined demarcation between darker upper parts and lighter underparts, which do not run in an even line. The upper limbs and lower flanks are dark brown with well defined lighter edges, forming large patches and quite distinct from the brownish grey dorsal surfaces.

The species *E. doriskuenae sp. nov.* from the high altitude areas of the Finisterre Range in Madang and Morobe Provinces, PNG is similar in most respects to *E. rosswellingtoni sp. nov.* however can be differentiated from that species and in turn all others, by the fact that demarcation between darker upper parts and lighter underparts is not well defined; inner ears are orange in colour except for the very outer tips which have grey outer edges; around the eye, the black marking is dark brown rather than black with some infusions of brown into the dark brown region anterior to the eye.

Distribution: *E. rosswellingtoni sp. nov*. is known from high altitude areas of the central cordillera of New Guinea, wholly within the territory of Papua New Guinea, from just inside the border with Irian Jaya (Indonesia), east through well-known high points like Mount Wilhelm and further east to at least Mount Erimbari in the Eastern Highlands Province of Papua New Guinea and south to at least Mt. Sisa, Southern Highlands Province, Papua New Guinea.

Etymology: Named in honour of Cliff Ross Wellington, better known as Ross Wellington, of New South Wales, Australia in recognition of a massive contribution to herpetology and wildlife conservation in Australia over some decades and who also publicly took a stand against taxonomic vandalism by Wolfgang Wuster and his gang of thieves, via a formal written submission to the ICZN (Wellington 2015) and other critically important works for the benefit of science.

EUDROMICIA JACKYHOSERAE SP. NOV.

LSID urn:lsid:zoobank.org:act:81DB7D79-205A-42F3-9878-8FA85727428D

Holotype: A preserved specimen at the Yale Peabody Museum. New Haven, Connecticut, United States of America, Vertebrate Zoology Division, Mammalogy, specimen number 001701, collected from Nassau Range, Irian Jaya, Indonesia, Latitude -4.20 S., Longitude 137.00 E. This facility allows access to its holdings.

Diagnosis: The species complex, until now regarded as putative *Eudromicia* (formerly *Cercartetus*) *caudatus* (Milne-Edwards, 1877) (herein restricted to the type region of the type locality, being the Arfak Mountains in western Papua, Indonesia), including *E. macrurus* (Mjöberg, 1816) (from the southern wet tropics in Queensland, Australia) and the four newly described species, all formerly treated as populations of *E. caudatus*, namely *E. richardwellsi sp. nov.* (from the northern wet tropics, Queensland Australia), *E. adelynhoserae sp. nov.* (from Milne Bay, PNG), *E. rosswellingtoni sp. nov*. (from the central ranges of New Guinea, generally near Mount Wilhelm and west to the Irian Jaya border), *E. jackyhoserae sp. nov.* (from Nassau Range, Irian Jaya) and *E. doriskuenae sp. nov.* from the high altitude areas of the Finisterre Range in Madang and Morobe Provinces, PNG, are readily separated from all other members of the genus by having a large size as in being more than 85 mm head and body length; lower leg length more than 20 mm long and hind leg more than 13 mm long. The tail is also long and more than 120 mm in length, slightly thickened and furred at the base (separating it from the superficially similar *Pogonomys* Milne-Edwards, 1877). The dark mark through the eye is obvious and there are large crinkly ears. This is also a genus-level diagnosis for all species within *Eudromicia.*

Eudromicia caudatus (Milne-Edwards, 1877) herein restricted to the type region of the type locality, being the Arfak Mountains in western Papua, Indonesia and all other species in the complex, are easily separated from one another on colouration.

Eudromicia caudatus (Milne-Edwards, 1877) is readily separated from the other five herein recognized species by having a dull rufous colour above. The face is rufous fawn, with two broad black bands passing from the nose through the eyes, but not quite reaching the ears. Ears are rather long and narrow, evenly oval, naked. Back-hairs are slaty grey for five sixths of their length, their tips dull rufous. Chest and belly pale yellowish

white, the bases of the hairs slate-coloured.

Arms and legs grey; hands and feet dull fawn.

E. macrurus (Mjöberg, 1816) from the southern wet tropics in Queensland, Australia, generally south and west of Cairns, North Queensland are readily separated from the other five herein recognized species by having a brownish-grey colour, with a slight rufous tinge at the anterior end only. The face is rufous fawn or just yellowish brown above, depending on the individual, with a square black patch across each eye and nowhere near the ears. This patch is notable for having a well defined black triangle jutting out from above the rear of the eye, the apex pointing towards the crown.

Ears are rather long and narrow, evenly oval, naked and greyish on the lobes and rich pink within. Back-hairs are slaty grey for five sixths of their length, their tips a brownish-grey colour. Chest and belly pale yellowish white, the bases of the hairs slate-coloured.

Arms and legs brown on top, light (whitish) underneath; hands and feet a light pinkish colour.

E. richardwellsi sp. nov. from the northern wet tropics generally from north of Port Douglas and south of Cape Tribulation, with a distribution centred on the Mount Lewis area is similar in most respects to *E. macrurus*, which it would otherwise be identified as. *E. richardwellsi sp. nov.* can however be separated from *E. macrurus* by having significantly less-well defined black around the eye, being peppered in appearance and not boldly demarcated from the adjacent brownish fur as seen in *E. macrurus.* The jowls region in *E. richardwellsi sp. nov.* is yellow rather than whitish in *E. macrurus.*

The species *E. adelynhoserae sp. nov.* from the Milne Bay Province, Papua New Guinea is readily separated from the other species by having a distinctly steel-greyish colour above, contrasting with white undersides and jowls. The upper surface has a somewhat peppered appearance. The ears are blackish grey, the dark colour extending almost all the way into the visible ear, with inner regions a pale orangeish colour. The black patches over the eyes are elliptical in shape and extend from the snout. There is an ill defined line of blackish grey running from the mid-snout between the eyes, further back to the crown.

The species *E. rosswellingtoni sp. nov.* from the region around Mount Wilhelm and including nearby elevated parts of Eastern Highlands and Southern Highlands provinces of Papua New Guinea, west to the Irian Jaya border is readily separated from the other species by having brown hair on the upper body, ears that are brownish grey at the outer edges and becoming orange further in, feet are pink and the pink of the snout almost extends to the eyes. The belly is beige and the lower flanks have well defined demarcation between darker upper parts and lighter underparts, which do not run in an even line.

The species *E. jackyhoserae sp. nov.* from the Nassau Range in Irian Jaya (West Papua), Indonesia is similar in most respects to *E. rosswellingtoni sp. nov.* as described above, but can be separated from that species by having orange-pink feet and mottled darker patches or blotches on the sides of the face and forelimbs. The ears have greyish tips, but are otherwise yellowish in colour further in.

The belly is beige and the lower flanks have well defined demarcation between darker upper parts and lighter underparts, which do not run in an even line. The upper limbs and lower flanks are dark brown with well defined lighter edges, forming large patches and quite distinct from the brownish grey dorsal surfaces.

The species *E. doriskuenae sp. nov.* from the high altitude areas of the Finisterre Range in Madang and Morobe Provinces, PNG is similar in most respects to *E. rosswellingtoni sp. nov.* however can be differentiated from that species and in turn all others, by the fact that demarcation between darker upper parts and lighter underparts is not well defined; inner ears are orange in colour except for the very outer tips which have grey outer edges; around the eye, the black marking is dark brown rather than black with some infusions of brown into the dark brown region anterior to the eye.

Distribution: *E. jackyhoserae sp. nov.* is known only from the Nassau Range, Irian Jaya, Indonesia, but is probably found at other high elevation locations nearby.

Etymology: Named in honour of my eldest daughter, Jacky Hoser of Park Orchards, (Melbourne), Victoria, Australia in recognition of over 18 years of significant contributions to wildlife conservation in Australia, including her work with Snakebusters: Australia's best reptiles shows, being the only hands on wildlife shows in Australia that let people hold the animals.
Jacky Hoser also made significant contributions to several years research on the Mountain Pygmy Possums of the genus *Burramys* Broom (1896) in the snowfields of Victoria, Australia.

EUDROMICIA DORISKUENAE SP. NOV.

LSID urn:lsid:zoobank.org:act:115D1E32-E68D-48B7-88F6-8633DBA7F01B

Holotype: A preserved specimen at the Australian Museum, Sydney, New South Wales, Australia, specimen number M.21654, collected at Nokopo, Madang Province, Papua New Guinea, Latitude -5.95 S., Longitude 146.60 E. This facility allows access to its holdings.

Diagnosis: The species complex, until now regarded as putative *Eudromicia* (formerly *Cercartetus*) *caudatus* (Milne-Edwards, 1877) (herein restricted to the type region of the type locality, being the Arfak Mountains in western Papua, Indonesia), including *E. macrurus* (Mjöberg, 1816) (from the southern wet tropics in Queensland, Australia) and the four newly described species, all formerly treated as populations of *E. caudatus*, namely *E. richardwellsi sp. nov.* (from the northern wet tropics, Queensland Australia), *E. adelynhoserae sp. nov.* (from Milne Bay, PNG), *E. rosswellingtoni sp. nov.* (from the central ranges of New Guinea, generally near Mount Wilhelm and west to the Irian Jaya border), *E. jackyhoserae sp. nov.* (from Nassau Range, Irian Jaya) and *E. doriskuenae sp. nov.* from the high altitude areas of the Finisterre Range in Madang and Morobe Provinces, PNG, are readily separated from all other members of the genus by having a large size as in being more than 85 mm head and body length; lower leg length more than 20 mm long and hind leg more than 13 mm long. The tail is also long and more than 120 mm in length, slightly thickened and furred at the base (separating it from the superficially similar *Pogonomys* Milne-Edwards, 1877). The dark mark through the eye is obvious and there are large crinkly ears. This is also a genus-level diagnosis for all species within *Eudromicia.*

Eudromicia caudatus (Milne-Edwards, 1877) herein restricted to the type region of the type locality, being the Arfak Mountains in western Papua, Indonesia and all other species in the complex, are easily separated from one another on colouration.

Eudromicia caudatus (Milne-Edwards, 1877) is readily separated from the other five herein recognized species by having a dull rufous colour above. The face is rufous fawn, with two broad black bands passing from the nose through the eyes, but not quite reaching the ears. Ears are rather long and narrow, evenly oval, naked. Back-hairs are slaty grey for five sixths of their length, their tips dull rufous. Chest and belly pale yellowish white, the bases of the hairs slate-coloured.

Arms and legs grey; hands and feet dull fawn.

E. macrurus (Mjöberg, 1816) from the southern wet tropics in Queensland, Australia, generally south and west of Cairns, North Queensland are readily separated from the other five herein recognized species by having a brownish-grey colour above, with a slight rufous tinge at the anterior end only. The face is rufous fawn or just yellowish brown, depending on the individual, with a square black patch across each eye and nowhere near the ears. This patch is notable for having a well defined black triangle jutting out from above the rear of the eye, the apex pointing towards the crown.

Ears are rather long and narrow, evenly oval, naked and greyish on the lobes and rich pink within. Back-hairs are slaty grey for five sixths of their length, their tips a brownish-grey colour. Chest and belly pale yellowish white, the bases of the hairs slate-coloured. Arms and legs brown on top, light (whitish) underneath; hands and feet a light pinkish colour.

E. richardwellsi sp. nov. from the northern wet tropics generally from north of Port Douglas and south of Cape Tribulation, with a distribution centred on the Mount Lewis area is similar in most respects to *E. macrurus*, which it would otherwise be identified as. *E. richardwellsi sp. nov.* can however be separated from *E. macrurus* by having significantly less-well defined black around the eye, being peppered in appearance and not boldly demarcated from the adjacent brownish fur as seen in *E. macrurus.* The jowls region in *E. richardwellsi sp. nov.* is yellow rather than whitish in *E. macrurus.*

The species *E. adelynhoserae sp. nov.* from the Milne Bay Province, Papua New Guinea is readily separated from the other species by having a distinctly steel-greyish colour above, contrasting with white undersides and jowls. The upper surface has a somewhat peppered appearance. The ears are blackish grey, the dark colour extending almost all the way into the visible ear, with inner regions a pale orangeish colour. The black patches over the eyes are elliptical in shape and extend from the snout. There is an ill defined line of blackish grey running from the mid-snout between the eyes, further back to the crown.

The species *E. rosswellingtoni sp. nov.* from the region around Mount Wilhelm and including nearby elevated parts of Eastern Highlands and Southern Highlands provinces of Papua New Guinea, west to the Irian Jaya border is readily separated from the other species by having brown hair on the upper body, ears that are brownish grey at the outer edges and becoming orange further in, feet are pink and the pink of the snout almost extends to the eyes. The belly is beige and the lower flanks have well defined demarcation between darker upper parts and lighter underparts, which do not run in an even line.

The species *E. jackyhoserae sp. nov.* from the Nassau Range in Irian Jaya (West Papua), Indonesia is similar in most respects to *E. rosswellingtoni sp. nov.* as described above, but can be separated from that species by having orange-pink feet and mottled darker patches or blotches on the sides of the face and forelimbs. The ears have greyish tips, but are otherwise yellowish in colour further in.

The belly is beige and the lower flanks have well defined demarcation between darker upper parts and lighter underparts, which do not run in an even line. The upper limbs and lower flanks are dark brown with well defined lighter edges, forming large patches and quite distinct from the brownish grey dorsal surfaces.

The species *E. doriskuenae sp. nov.* from the high altitude areas of the Finisterre Range in Madang and Morobe Provinces, PNG is similar in most respects to *E. rosswellingtoni sp. nov.* however can be differentiated from that species and in turn all others, by the fact that demarcation between darker upper parts and lighter underparts is not well defined; inner ears are orange in colour except for the very outer tips which have grey outer edges; around the eye, the black marking is dark brown rather than black with some infusions of brown into the dark brown region anterior to the eye.

Distribution: *E. doriskuenae sp. nov.* is only known from the high altitude areas of the Finisterre Range in Madang and Morobe Provinces, Papua New Guinea in a region generally bounded by the Markham and Ramu River basins to the south and the coast to the north.

Etymology: Named in honour of Doris Kuen of Donvale, Victoria, Australia, for services to conservation, through her vitally important work in maintaining the structure, electrical fittings, plumbing, repairs to motor vehicles at urgent times and other important tasks at the Snakebusters, wildlife displays and scientific research facility in Park Orchards, Victoria, Australia.

REFERENCES CITED

Anonymous 2007. Two new mammals found in Indonesian ‘lost world’: green group. Media release dated 17 December, posted online at:

https://26sep.net/news_details.php?lng=english&sid=36002

Aplin, K., Dickman, C., Salas, L., Burnett, S. and Winter, J. 2016. Cercartetus caudatus. *IUCN Red List of Threatened Species (version 3.1).* International Union for Conservation of Nature and Natural Resources, Online.

Bannister, J. L., Calaby, J. H., Dawson, L. J., Ling, J. K., Mahoney, J. A., McKay, G. M., Richardson, B. J., Ride, W. D. L. and Walton, D. M. 1988. *Zoological Catalogue of Australia, Volume 5, Mammals*. Australian Government Publishing Service, Canberra, ACT, Australia:X+274 pp.

Bell, T. 1828. Description of a new species of *Phalangista. Trans Linn. Soc. London* 16:121-127.

Brammell, J. and Archer, M. 1997. A new Oligocene-Miocene species of *Burramys* (Marsupialia, Burramyidae) from Riversleigh, northwestern Queensland. *Memoirs of the Queensland Museum* 41(2):247-268.

Broom, R. 1895. On a new fossil mammal allied to *Hypsiprymnus* but resembling in some points the Plagiaulacidae. *Abstr. Proc.Linn.Soc.* N.S.W. (1 June):26:11.

Broom, R. 1896a. On a small fossil marsupial with large grooved premolars. *Proc. of the Linnaean Soc. N.S.W.*, 2(10):563-567.

Broom, R. 1896b. On a small fossil marsupial allied to *Petaurus. Proceedings of the Linnaean Soc. N.S.W.*, 2(10):568-570.

Brongersma, L. D. 1953. Notes on New Guinean reptiles and amphibians. II. *Proceedings Koninklijke Nederlandsche Akademie van Wetenschappen*, Amsterdam (C) 56:317-325.

Collins, L. R. 1973. *Monotremes and Marsupials*. Smithsonian Institution Press. City of Washington, DC, USA.

Bryant, L. M. and Krosch, M. N. 2016. Lines in the land: a review of evidence for eastern Australia’s major biogeographical barriers to closed forest taxa. *Biological Journal of the Linnean Society*, 2016:27 pp. (online)

Desmarest, A. G. 1818. Nouveau Dictionairie d’Histoire Naturelle. *Deterville, Tome* 25:477.

Desmarest, A. G. 1820. Mammalogie ou description des especes de mammiferes. *Encyclopedic Methodique Histoire Naturelle*. Volume I, (Mme Veuve Agasse: Paris). 1:268.

Dwyer, P. D. 1977. Notes on *Antechinus* and *Cercartetus* (Marsupialia) in the New Guinea Highlands. *Proceedings of the Royal Society of Queensland* 88:69-73.

Eldridge, M. D. B., Potter, S., Helgen, K. M., Sinaga, M. H., Aplin, K. P., Flannery, T. F. and Johnson, R. N. 2018. Phylogenetic analysis of the tree-kangaroos (*Dendrolagus*) reveals multiple divergent lineages within New Guinea. *Molecular Phylogenetics and Evolution*, 127:588-599 (online).

Flannery, T. F. 1995. *The Mammals of New Guinea,* 2nd edition. Reed Books, Sydney, Australia.

Gloger, C. W. L. 1841. *Gemeinnütziges Hand- und Hilfsbuch der Naturgeschichte.* Für gebildete Leser aller Stände, besonders für die reifere Jugend und ihre Lehrer. Erster Band, enthaltend die erste Hälfte der Naturgeschichte der Thiere, nebst erfahrungsmässigen Andeutungen über den gegenwärtigen Zustand und Erfolg des Unterrichts in dieser Wissenschaft, namentlich auf Gymnasien, und Vorschlägen über fernere Einrichtung desselben im Verhaltnisse zu seinem Wirklichen Zwecke. A. Schulz & Comp., Breslau. Vol. Hefte 1-5:400 pp.

Gould, J. 1845. Untitled abstract. *Proceedings of the Zoological Society of London* 1845:2.

Gray, J. E. 1841. Description of some new species and four new genera of reptiles from Western Australia, discovered by John Gould, Esq. *Ann. Mag. Nat. Hist.* (1)7:86-91.

Groves, C. P., Wilson, D. E. and Reeder, D. M. (eds.) 2005. *Mammal Species of the World: A Taxonomic and Geographic*

Reference (3rd ed.). Johns Hopkins Uni Press, Baltimore, USA.

Harris, J. M. 2006. The discovery and early natural history of the eastern pygmy-possum, *Cercartetus nanus* (Geoffroy and Desmarest, 1817). *Proceedings of the Linnean Society of New South Wales*. 127:107-124.

Harris, J. M. 2010. The natural history, conservation status and ecology of the eastern pygmy-possum (*Cercartetus nanus*). PhD thesis, Southern Cross University, Lismore, NSW. Online at: https://epubs.scu.edu.au/cgi/viewcontent.cgi?article=1294&context=theses

Hoser, R. T. 1989. *Australian Reptiles and Frogs*. Pierson Publishing, Mosman, NSW, Australia:238 pp.

Hoser, R. T. 1991. *Endangered Animals of Australia*. Pierson Publishing, Mosman, NSW, Australia:240 pp.

Hoser, R. T. 2015. Australian agamids: Eighteen new species from the genera *Amphibolurus* Wagler, 1830, *Lophognathus* Gray, 1842, *Rankinia* Wells and Wellington, 1984, *Diporiphora* Gray, 1842, *Tympanocryptis* Peters, 1863, as well as three new genera and six new subgenera. *Australasian Journal of Herpetology* 30:37-64.

Hoser, R. T. 2016. *Carphodactylidae* reviewed: Four new genera, four new subgenera, nine new species and four new subspecies within the Australian gecko family (Squamata: Sauria). *Australasian Journal of Herpetology* 32:3-25.

Hoser, R. T. 2019a. 11 new species, 4 new subspecies and a subgenus of Australian Dragon Lizard in the genus *Tympanocryptis* Peters, 1863, with a warning on the conservation status and long-term survival prospects of some newly named taxa. *Australasian Journal of Herpetology* 39:23-52.

Hoser, R. T. 2019b. Richard Shine *et al.* (1987), Hinrich Kaiser *et al.* (2013), Jane Melville *et al.* (2018 and 2019): Australian Agamids and how rule breakers, liars, thieves, taxonomic vandals and law breaking copyright infringers are causing reptile species to become extinct. *Australasian Journal of Herpetology* 39:53-63.

Hoser, R. T. 2019c. A new species of Tree Kangaroo, Genus *Dendrolagus* Müller, 1840 from Tembagapura, Mimika, Irian Jaya, Indonesia. *Australasian Journal of Herpetology* 40:50-55.

Iredale, T. and Troughton, E. L. G. 1934. A check-list of the mammals recorded from Australia. *Australian Museum Memoir* 6:1-122. [4 May 1934].

Jones, F. W. 1925. A new South Australian dormouse opossum. *Trans. R. Soc. South Australia* 49:96-98.

Krefft, G. 1863. Description of a new species of the genus *Dromicia* discovered in the neighbourhood of Sydney. *Proceedings of the Royal Society London* 1853:49-50.

Lawlor, T. E. 1979. *Handbook to the Orders and Families of Living Mammals*. Mad River Press, Inc. Eureka, California, USA.

Maxwell, S., Burbidge, A. A. and Morris, K. 1996. *The 1996 Action Plan for Australian Marsupials and Monotremes.* Australasian Marsupial and Monotreme Specialist Group, IUCN Species Survival Commission, Gland, Switzerland.

Menkhorst, P. 2016. Cercartetus lepidus. *The IUCN Red List of Threatened Species 2016.* International Union for Conservation of Nature and Natural Resources. Online and downloaded most recently on 10 March 2020.

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

Milne-Edwards, A. 1877. Note sur quelques mammiferes nouveaux provenant de la Nouvelle-Guinee. *Compt. Rend. Acad. Sci.* Paris 85:1079-1081 [1079].

Mjöberg, E. 1916. Results of Dr. E. Mjöberg's Swedish Scientific expeditions to Australia 1910-13. 2 Mammals from Queensland 2. On a new genus and species of Marsupial. *K. svenska VetenskAkad. Handl.*, 52(2):13-20.

Moritz, C., Joseph, L. and Adams, M. 1993. Cryptic diversity in an endemic rainforest skink (*Gnypetoscincus queenslandiae*). *Biodiversity and Conservation* 2:412-425.

Müller, S. 1840. Over de zoogdieren van den Indischen Archipel. In: Temminck, C.J., van der Hoek, J. (Editors), *Verhandelingen over de natuurlijke geschiedenis der Nederlandsche overzeesche bezittingen, door leden der Natuurkundige Commissie in Indië en andere schrijvers*. Luchtmans, Leiden:1-57.

Osborne, M. J. and Christidis, L. 2002. Systematics and biogeography of pygmy possums (Burramyidae: *Cercartetus*). *Journal of Australian Zoology* 50(1):25-37.

Osborne, M. J., Norman, J. A., Christidis, L. and Murray, N. D. 2000. Genetic distinctiveness of isolated populations of an endangered marsupial, the mountain pygmy-possum, *Burramys parvus*. *Molecular Ecology* 9:609-613.

Pestell, A. J. L., Cooper, S. J. B., Saint, K. and Petit, S. 2008. Genetic structure of the western pygmy possum *Cercartetus concinnus* Gould (Marsupialia: Burramyidae) based on mitochondrial DNA. *Australian Mammalogy*. 29(2):191-200.

Parker, H. W. 1940. The Australian frogs of the family Leptodactylidae. *Novit. Zool.* 42:1-106.

Peters, W. C. H. 1863. Fernere Mittheilungen über neue Batrachier. *Monatsberichte der Königlichen Preussische Akademie des Wissenschaften zu Berlin* 1863: 445-470.

Ramsay, E. P. 1883. Contributions to the zoology of New Guinea, Part VII. *Proc. Linnean Soc. NSW* 8:15-29.

Rawlings, L. H. and Donnellan, S. C. 2003. Phylogeographic analysis of the green python, *Morelia viridis*, reveals cryptic diversity. *Mol. Phylogenet. Evol.* 27:36-44

Ride, W. D. L. 1956. The affinities of *Burramys parvus* Broom a fossil Phalangeroid Marsupial. *Journ. of Zool.* 127(3):413-429.

Ride, W. D. L. 1970. *A Guide to the Native Mammals of Australia.* Oxford University Press.

Ride, W. D. L. (*ed.*) *et al.* (on behalf of the International Commission on Zoological Nomenclature) 1999. *International code of Zoological Nomenclature*. The Natural History Museum - Cromwell Road, London SW7 5BD, UK.

Schäuble, C. S., Moritz, C. and Slade, R. W. 2000. A Molecular Phylogeny for the Frog Genus *Limnodynastes* (Anura: Myobatrachidae). *Mol. Phylogen. and Evolution*, 16(3):379-391.

Smith, A. P. 1986. Stomach Contents of *Cercartetus caudatus. Australian Mammalolgy* 9(2):135-137.

Strahan, R. (ed.) 1988. *The Australian Museum Complete book of Australian Mammals / The National Photographic Index of Australian Wildlife.* Angus and Robertson, North Ryde, NSW, Australia: 530 pp.

Thomas, O. 1888. *Catalogue of the Marsupialia and Monotremata in the Collection of the British Museum* (Natural History). British Museum, London, UK:xiii+401 pp+28 pl.

Thomas, O. 1922. A selection of lectotypes of the typical Australian marsupials in the British Museum Collection. *Ann. Mag. Nat. Hist.* 9(10):127-128.

van Ufford, A. Q. and Cloos, M. 2005. Cenozoic tectonics of New Guinea. *Am. Assoc. Pet. Geol. Bull.* 89:119-140.

Vaughan, T. A. 1986. *Mammalogy*, 3rd Edition. Harcourt Brace Jovanovich College Publishers. New York, USA.

Wakefield, N. A. 1963. The Australian Pygmy Possums. *Victorian Naturalist*, 80-:99-116.

Wellington, R. W. 2015. Comment on the proposed confirmation of the availability of the generic name *Spracklandus* Hoser, 2009 (Reptilia, Serpentes, ELAPIDAE) and for the nomenclatural validation of the journal in which it was published. *Bulletin of Zoological Nomenclature* 72(3):222-226.

Wells, R. W. and Wellington, C. R. 1984. A synopsis of the class Reptilia in Australia. *Australian Journ. of Herp.* 1(3-4):73-129.

Wells, R. W. and Wellington, C. R. 1985. A classification of the Amphibia and Reptilia of Australia. *Australian Journal of Herpetology Supplementary Series* 1:1-61.

Zaczek, Z. 2019. Former PM Kevin Rudd says Australia should drastically increase its population to 50 MILLION to make sure nation can defend itself in the face of threats from China. Daily Mail (Australia) (27 November), published online at: https://www.dailymail.co.uk/news/article-7729689/Kevin-Rudd-says-Australia-increase-population-50-MILLION-defend-China.html

CONFLICTS OF INTEREST - NONE.

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A new subgenus, three new species and one new subspecies of Ring-tailed Possums (Marsupialia: Petauridae) from the north of Australia.

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ABSTRACT

A review of the taxonomy of the Australian Ring-tailed Possums in the associated putative genera *Petropseudes* Thomas, 1923 (Rock Ringtail Possums) of Australia's dry tropics region and *Pseudochirops* Matschie, 1915, of Australia's wet tropics region was conducted.

Including just two putative species *Petropseudes dahli* (Collett, 1895) and *Pseudochirops archeri* (Collett, 1884) (Green Ringtail Possum), the study involved inspection of specimens of each form across their known distributions.

In the case of both putative taxa, there was found to be significant variation in morphology in regionally disjunct populations located across well-known biogeographical barriers of known antiquity.

As a result, *Petropseudes dahli* (Collett, 1895) was found to consist of no less than four species. Three are formally named for the first time in accordance with the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

Meredith *et al.* (2010) noted a six million year divergence of this species group from nominate *Pseudochirops.* On this basis *Petropseudes* is designated a subgenus within *Pseudochirops* as originally intended by Thomas (1923).

Pseudochirops archeri (Collett, 1884) of North Queensland was found to include two morphologically divergent and reproductively isolated populations in close proximity, but on either side of the so-called Black Mountain Corridor (or barrier) as identified by Bryant and Krosch (2016). The unnamed population is herein formally named as a new subspecies.

The Australian endemic, *Pseudochirops archeri* is not only divergent from the other known members of the genus *Pseudochirops* Matschie, 1915, (all from the New Guinea subregion), but also the taxon currently called *Petropseudes dahli* herein treated as being within *Pseudochirops*. Meredith *et al.* (2010) estimated a divergence of *Pseudochirops archeri* from nearest common ancestors of the other species at about eight MYA and so a new subgenus is erected to accommodate this species.

Keywords: Mammals; Marsupial; Petauridae; taxonomy; nomenclature; possum; Ring-tailed possum; *Petropseudes*; *Pseudochirops*; *Pseudocheirus*; *dahli*; *archeri*; Australia; Queensland; Northern Territory; Western Australia; New Guinea; wet tropics; dry tropics; subgenus; new subgenus; *Sloppossum*; new species; *fiacummingae*; *jamesbondi*; *waddamaddawidyu*; new subspecies; *chrismaxwelli*.

INTRODUCTION

Over a period of more than 30 years doing fieldwork involving wildlife across northern parts of Australia, specimens of Rock Ringtail Possums *Petropseudes dahli* (Collett, 1895) were observed in the Northern Territory and Western Australia both in the wild and in captivity.

It was observed by myself and without fanfare that they differed significantly in morphology, as one would expect when seeing the same putative species at locations more than 1,000 km apart. Hence it came as a surprise that one of the two populations was effectively unrecognized taxonomically, even though the two relevant populations were split across a well-known biogeographical barrier near the Northern Territory / Western Australian border.

In fact the nominate form, originally described as *Pseudochirops dahli* Collett, 1895 with a type locality of Mary River, Northern

Territory (Kakadu area) is the only available name for any populations of this putative species (Bannister *et al.* 1988).

Hence it was decided to undertake a review of the putative species across the known range from north-west Queensland, across the Northern Territory and into the Kimberley division of north-west Western Australia, to ascertain the status of given populations and whether any should be accorded species or subspecies-level recognition.

Counter to this proposition is whether or not clines exist between regional forms, or did so in the recent past and in the process of investigation it soon became apparent that none existed.

With each of four main known populations being morphologically divergent and having been reproductively isolated for some geological time, it then became a matter of deciding at what level of classification each should be identified as.

While such a decision is subjective, due to the likelihood that divergences between populations are likely to be measured in the millions of years, I had no hesitation in deciding to name the three main unnamed populations as species.

Obviously this decision was also made after consulting all relevant literature in terms of this and similar species and other vertebrate species in the same regions and affected by the same biogeographical features and timelines (see for example Potter *et al.* 2014).

In the case of the three putative candidate taxa, the well-known biogeographical barriers had known antiquity.

As a result, *Petropseudes dahli* (Collett, 1895) was found to consist of four species. Three are formally named for the first time in accordance with the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

Meredith *et al.* (2010) noted a six million year divergence of this species group from nominate *Pseudochirops* which is a relevant fact that would be hard to miss in any review of the putative species.

On this basis *Petropseudes* Thomas, 1923 is designated a subgenus within *Pseudochirops.*

I note that this is exactly as originally intended by Thomas (1923) who in fact created the name *Petropseudes*.

Another species I had the good fortune to observe in the wild on a number of occasions was *Pseudochirops archeri* (Collett, 1884) of North Queensland, better-known as the Green Ringtail Possum.

It was also reviewed and found to include two morphologically divergent and reproductively isolated populations in close proximity, but on either side of the so-called Black Mountain Corridor (or barrier) as identified by Bryant and Krosch (2016). With the type locality for the species being the Herbert River area of north Queensland, within the southern wet tropics area, this meant that the northern population from the Mount Lewis area was effectively unnamed.

Notwithstanding the known antiquity of the *P. archeri* lineage as found by Meredith *et al.* (2010), the morphological divergence of the two populations and geographical proximity of them has led me to take a conservative position with regards to taxonomy and the unnamed form is herein named as a new subspecies.

The Australian endemic, *Pseudochirops archeri* is not only divergent from the other known members of the genus *Pseudochirops* Matschie, 1915, (all from the New Guinea subregion), but also the taxon currently called *Petropseudes dahli* herein treated as being within *Pseudochirops*.

Meredith *et al.* (2010) estimated a divergence of *Pseudochirops archeri* from nearest common ancestors of the other species at about eight MYA and so a new subgenus is erected to accommodate this species.

Based on the published divergences within Meredith *et al.* (2010), if one were to continue to regard *Petropseudes* as a valid genus, then one would have no choice but to treat the species *Pseudochirops archeri* as being within a separate genus, necessitating the elevation of the new subgenus *Sloppossum subgen. nov.* to full genus status.

I note that *Sloppossum subgen. nov.* is in fact more divergent than *Petropseudes.*

MATERIALS, METHODS AND RESULTS

Before a decision is made to name any new taxon, reasonable steps must be taken to ensure that it is justified on all relevant grounds, including that it is morphologically, genetically and reproductively isolated from their nearest relative and to a sufficient degree to be of taxonomic significance.

A further relevant question to ask is should the reproductively isolated and morphologically divergent entities be labelled as subspecies, full species, or potentially higher level again.

Key literature relevant to the taxonomic and nomenclatural conclusions within this paper include

Bannister *et al.* (1988), Bryant and Krosch (2016), Collett (1884), Collins (1973), Eldridge *et al.* (2018), Flannery (1995), Goodfellow (1993), Groves *et al.* (2005), Iredale and Troughton (1934), Jones *et al.* (2006), Laurance (1990), Lawlor (1979), Matschie (1915), Maxwell *et al.* (1986), Menkhorst (2001), Meredith *et al.* (2010), Menzies (1991), Moritz *et al.* (1993), Potter *et al.* (2014), Ride (1970), Ride *et al.* (1999), Runcie (1999), Strahan (as editor) (1988), Thomas (1888, 1922, 1923), van Ufford and Cloos (2005), Vaughan (1986) and sources cited therein (duplicitous references not necessarily included).

Live and dead specimens as well as available bone specimens, were examined as was other relevant material, including past climate data for the relevant regions, sea level depths, and other important information.

In summary, as inferred already, the genetic, geological, historical and morphological evidence clearly showed that both of *Petropseudes dahli* (Collett, 1895) (Rock Ringtail Possums) and *Pseudochirops archeri* (Collett, 1884) (Green Ringtail Possum) as currently understood required species-level divisions and a refinement of their genus-level placements.

SUMMARY OF THE RESULTS

Petropseudes dahli (Collett, 1895) (Rock Ringtail Possums), are found across the dry tropics of Australia from north-west Queensland in the vicinity of Lawn Hill, along the southern shore of the Gulf of Carpentaria and across the top end of the Northern Territory to the western Kimberley Ranges in Western Australia.

However a closer inspection of collection records and reliable sightings shows that the putative species is in fact confined to rocky regions, including outliers and nowhere else, in effect confining the distribution to four main areas in drier parts of northern Australia.

These are:

1/ The type locality around the Arnhem Land escarpment in the middle of the top end of the Northern Territory.

2/ Rocky parts of far north-west Queensland, extending along the western shoreline of the Gulf of Carpentaria, into the Northern Territory.

3/ Groote Eylandt.

3/ The Western part of the Kimberley division of Western Australia.

The two westernmost populations are well separated by the corridor of the Victoria River system in the north-west of the Northern Territory and the East Kimberley.

There are some alleged sighting records within the eastern part of this zone, but even allowing them to be accurate and reliable, (which is a leap of faith in itself, noting there are other morphologically similar species in the same region) one still finds a zone of several hundred kilometres in a straight line that has never had any putative *P. dahli* recorded in any way, even though it includes areas heavily collected by State Museums. Hence the absence of specimen records must be attributed to an absence of specimens as opposed to an absence of collecting.

The gap between the central (NT) and mainland eastern NT/ Queensland populations corresponds to a flat zone of unsuitable habitat stretching at least 100 km (being east of the Arnhem Land escarpment), this area not expecting to have populations and for which no sighting or other records exist.

Hence, even in the absence of inspection of specimens, there is an inescapable conclusion that the three main mainland populations must be reproductively separated.

There is no evidence to suggest that actions by humans since first settlement 40K MYA to present or changes wrought by ice age climate fluctuations have altered the biogeography of the relevant part of Australia to change the current status quo with regards to population mobility.

I also note that there is no evidence this putative species (*P. dahli*) has ever made it to New Guinea, even though its current distribution sits proximal to a historical land bridge to southern New Guinea.

This is further evidence supporting the contention of habitat fidelity for the putative species and that dispersal is not likely between known and well-spaced populations.

By straight line measurement the Groote Eylandt population is about 100 km from the nearest known population on the mainland of Australia, situated to the south-west.

Groote Eylandt is known to have endemic species and subspecies of reptile and mammals for which divergences are well-known and with this in mind specimens of *P. dahli* from there were inspected, with a view to potentially identifying a fourth species.

Although they were morphologically most similar to the specimens from the Gulf of Carpentaria, including in terms of the diagnostic features for that species, they are easily separable and have therefore been named herein as a separate and newly named species.

I also note that biogeographically, the fauna of Groote Eylandt is more closely affiliated with that of the Arnhem Land escarpment than it is to that from the southern Gulf of Carpentaria, which implies further morphological divergence of the Groote Eylandt form as compared to that from the Arnhem Land region.

Significantly the taxonomic division of the original putative species *Petropseudes dahli* is across exactly the same biogeographical barriers as used to divide the putative species *Odatria* (*Kimberleyvaranus*) *glebopalma* (Mitchell, 1955) by Hoser (2018) who in turn referred to Hoser (2014)

As already mentioned, Meredith *et al.* (2010) noted a six million year divergence of this species group from nominate *Pseudochirops* which is a relevant fact that would be hard to miss in any review of the species.

On this basis *Petropseudes* is herein designated a subgenus within *Pseudochirops.*

I note that this is exactly as originally intended by Thomas (1923) who in fact created the name *Petropseudes*.

In effect this means that the Rock Ringtail Possums of the dry tropics of northern Australia, now consist of four species, three of which are named for the first time in accordance with the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

These are:

1/ *Pseudochirops* (*Petropseudes*) *dahli* (Collett, 1895) herein restricted to the Arnhem Land escarpment and immediately adjacent outliers in the Northern Territory.

2/ *Pseudochirops* (*Petropseudes*) *fiacummingae sp. nov.* from the west and north of the Kimberley Division of Western Australia.

3. *Pseudochirops* (*Petropseudes*) *jamesbondi sp. nov.* from north-west Queensland and nearby parts of far eastern Northern Territory, generally south and west of the Gulf of Carpentaria.

4. *Pseudochirops* (*Petropseudes*) *waddamaddawidyu sp. nov.* from Groote Eylandt, Northern Territory.

Pseudochirops archeri (Collett, 1884) of North Queensland was also scrutinized as it was known to have two populations on either side of the so-called Black Mountain Corridor (or barrier) as identified by Bryant and Krosch (2016), being a barrier I have exploited to find and identify a series of new and previously cryptic species as seen for example in Hoser (2016a, 2016b) or see Moritz *et al.* (1993).

Like *Pseudochirops* (*Petropseudes*) *dahli* (Collett, 1895), *P. archeri* exhibits strong habitat fidelity and there is no evidence to suggest it can breach the Black Mountain Corridor in the current interglacial, let alone in glacial periods when the same corridor would be wider and drier and less able to be breached by a rainforest obligate species.

Jones *et al.* (2006) found the that in terms of diet for the putative species *P. archeri* that “Over 50% of tree use was from only four tree species, *Aleurites rockinghamensis*, *Ficus fraseri*, *Arytera divaricata* and *Ficus copiosa*.”, all of which are rainforest obligate species not found in the region of the Black Mountain Gap (as per ALA records of all types), or unlikely to have been there in a glacial phase, when the relevant area would have been even drier than present.

Inspection of specimens of *P. archeri* found *P. archeri* to include two morphologically divergent and reproductively isolated populations in close proximity, but on either side of the so-called Black Mountain Corridor (or barrier) as identified by Bryant and Krosch (2016). The unnamed population is herein formally named as a new subspecies *P. archeri chrismaxwelli subsp. nov.*, being within the subgenus *Sloppossum subgen. nov*. as explained below.

The Australian endemic, *Pseudochirops archeri* is not only divergent from the other known members of the genus *Pseudochirops* Matschie, 1915, (all from the New Guinea subregion), but also the taxon currently called *Petropseudes dahli* herein treated as being within *Pseudochirops* due to its affinity to that genus to the exclusion of all others.

Meredith *et al.* (2010) estimated a divergence of *Pseudochirops archeri* from nearest common ancestors of the other species at about eight MYA.

The species is also significantly morphologically divergent to all others within *Pseudochirops* and so a new subgenus is erected to accommodate this species.

The subgenus *Sloppossum subgen. nov.* is formally named and defined in this paper before the species and subspecies (in that order) in accordance with online requests and directives by the ICZN and managers of their name repository, “Zoobank”.

INFORMATION RELEVANT TO THE FORMAL DESCRIPTIONS THAT FOLLOW

There is no conflict of interest in terms of this paper or the conclusions arrived at herein.

Several people including anonymous peer reviewers who revised the manuscript prior to publication are also thanked as are relevant staff at museums who made specimens and records available in line with international obligations.

In terms of the following formal descriptions, spellings should not be altered in any way for any purpose unless expressly and exclusively called for by the rules governing Zoological Nomenclature as administered by the International Commission of Zoological Nomenclature.

In the unlikely event two or more newly named taxa are deemed conspecific by a first reviser, then the name to be used and retained is that which first appears in this paper by way of page priority and as listed in the abstract keywords.

Some material in descriptions for taxa may be repeated for other taxa in this paper and this is necessary to ensure each fully complies with the provisions of the *International Code of Zoological Nomenclature* (Fourth edition) (Ride *et al.* 1999) as amended online since.

Material downloaded from the internet and cited anywhere in this paper as being sourced online was downloaded and checked most recently as of 10 March 2020 (including if also viewed prior), unless otherwise stated and was accurate in terms of the content (as described) cited herein as of that date.

Unless otherwise stated explicitly, colour and other descriptions apply to living adult specimens of generally good health and not under any form of stress by means such as excessive cool, heat, dehydration or abnormal skin reaction to chemical or other input.

Colour descriptions of species refer to fur colour and not skin.

While numerous texts and references were consulted prior to publication of this paper, the criteria used to separate the relevant species or subspecies has already been spelt out and/ or is done so within each formal description and does not rely on material within publications not explicitly cited herein.

SLOPPOSSUM SUBGEN. NOV.

LSID urn:lsid:zoobank.org:act:536D6D52-E877-4084-8D7C-4DA758870BE6

Type species: *Phalangista* (*Pseudochirops*) *archeri* Collett, 1884.

Diagnosis: The subgenus *Sloppossum subgen. nov.* within the genus *Pseudochirops* Matschie, 1915 is readily separated from all other species in the genus *Pseudochirops* and all other morphologically similar Petauridae by the following unique suite of characters: Ears very short, broader than long. Tail is white-tipped. Body form is thick and stout. Colour greenish yellow to yellow with a slight greenish tinge, with three vague darker and two lighter dorsal stripes. Molars 1-3 are 13.6 mm. Dental series nearly or quite continuous; incisor 2 elongated horizontally, its antero-posterior diameter twice that of incisor 3. Upper edge of lower incisor 1 is concave. The skull and dentition are superficially similar to that of the New Guinean species *Pseudochirops albertisi* (Peters, 1874), but are readily separated from that taxon by having large and stout teeth, relative to the more typically sized dentition in the New Guinean species.

The subgenus *Sloppossum subgen. nov.* can be further diagnosed as follows: Fur soft, close, and thick. General colour grizzled yellowish to greenish-yellow. Face grey, passing into greenish yellow on the crown. Eye with distinct or semi-distinct crescentic pale yellow or white spots above and below it. Ears very short, rounded, hairy, their posterior edges and a large spot beneath their bases prominently white. Nape with a distinct black central line passing down it on to the back. Back greenish yellow to yellow, with two whitish lines margining the black central one, and these again with two indistinct darker ones outside them. Chin is greyish white, chest and belly pure white or off-white, the line of demarcation either sharply marked or ill-defined. Limbs like back, but rather greyer. Tail is thick basally, rapidly tapering; its basal two thirds coloured like the back, its tip white. Naked part beneath tip is less than half the length of the tail.

Distribution: Restricted to the wet tropics bioregion of Australia from Mount Spec, north of Townsville, north Queensland in the south, along the coastal rainforests, generally at high elevation running north to the Mount Windsor Tableland in the north.

Etymology: The first part of the genus name "Slop" is in recognition of the author's Great Dane dog, named "Slop" for services in guarding the research facility and wildlife for many years and the second part of the genus name is a direct usage of the word "Possum" as the type of animal is known and hence "*Sloppossum*".

Content: *Pseudochirops (Sloppossum*) *archeri* (Collett, 1884) including both subspecies.

PSEUDOCHIROPS (PETROPSEUDES) FIACUMMINGAE SP. NOV.

LSID urn:lsid:zoobank.org:act:B911B1A2-8A5E-4758-81A1-FD2B5EDDFFDC

Holotype: A preserved adult female specimen in the Western Australian Museum, Perth, Western Australia, Australia, specimen number M15934 collected from an outlier on the southern edge of the King Leopold Ranges, Western Australia, Australia, Latitude -17.2 S., Longitude 124.8 E. This government-owned facility allows access to its holdings.

Paratype: A preserved male specimen in the Western Australian Museum, Perth, Western Australia, Australia, specimen number M18158 collected from an outlier on the southern edge of the King Leopold Ranges, Western Australia, Australia, Latitude -17.3 S., Longitude 124.7 E

Diagnosis: Until now, all populations of so-called Rock Ringtail Possum have been assigned to the same putative species, namely *Pseudochirops* (*Petropseudes*) *dahli* (Collett, 1895) with a type locality of Mary River. Northern Territory, Australia.

That form is now herein restricted to the type locality and adjacent hills and outliers, essentially including the Arnhem Land escarpment and adjacent hills and ranges to the south and west.

This species and the three newly described forms herein can be readily separated from one another by consistent differences in colour of pelage on various parts of the head and body.

Nominate *P. dahli* is readily separated from the other three species by having dark grey pelage and with mid line, from snout being distinct, thick, blackish in colour and extends past the crown of the head. This line becomes wider and darker between eyes and snout and again before a line between the ears. There is a strongly dark reddish brown overlay on fur of the upper legs. Yellowish white under forebody. The white above and below the eye, giving the appearance of a tight circle around the eye is very well defined. Inside of ears is salmon colour with significant blackening towards the outer edges.

Pseudochirops (*Petropseudes*) *fiacummingae sp. nov.* from the Kimberley district of north-west Western Australia has a light grey pelage with the mid line from snout distinct, thin, blackish in colour and it goes past the crown of the head, without thickening between the eyes and snout or again before the line between the ears. White under forebody.

The white above and below the eye giving appearance of tight circle around eye is not well defined. Inside of ears is orange to salmon colour with no blackening on the outer edges. Very weak reddish brown overlay on fur of upper legs.

Pseudochirops (*Petropseudes*) *jamesbondi sp. nov.* from the southern and western edges of the Gulf of Carpentaria in Queensland and the Northern Territory, Australia has a has light grey to mouse brown pelage and with the mid-line from the snout not going past the crown, being very indistinct and is grey in colour, breaking up as it moves up the snout. White under forebody.

The white above and below the eye giving an appearance of a tight circle around the eye is well defined. Inside of ears is yellow-orange becoming brownish on the outer edges.

There is no obvious reddish brown or orange overlay on the fur of upper legs save for the same slight and very feint orange overlay as seen over all parts of the body.

Pseudochirops (*Petropseudes*) *waddamaddawidyu sp. nov.* from Groote Eylandt, Northern Territory, Australia, is similar in most respects to *P. jamesbondi sp. nov.* except for the obvious and strong light orange colour of the rear of the rump and the back legs (versus either not so, or only faint orange tinge in Gulf form, being in line with the rest of the dorsal surface). The mid-line marking from the snout does not go beyond the crown as in it terminates well before it and it is grey in colour.

This marking is noticeably widest at the midpoint between the eyes, appearing like an elongated diamond shape. Fur on the lower forelimbs also has a strong orange tinge, but this is only on the tips, rather than all over as seen on the hind limbs.

All four species of possum in the subgenus *Petropseudes* Thomas, 1923 (see above) are readily separated from all other possums occurring in the same region in western Queensland, the Northern Territory and Western Australia by a combination of having a much shorter tail, being less than two thirds the length of the head and body as well as having very dense fur.

Photos of *Pseudochirops dahli* (Collett, 1895) in life can be seen in Strahan (1988) at page 132 (top) and online at:

https://www.flickr.com/photos/88708273@N03/40093596073/

and at:

https://www.flickr.com/photos/128365570@N04/42868251355/

both from Arnhem Land, Northern Territory, Australia.

Photos of *Pseudochirops* (*Petropseudes*) *fiacummingae sp. nov.* in life can be seen online at:

https://www.flickr.com/photos/mattsummerville/48131308123/

from Prince Regent, Western Australia, Australia, and at:

https://www.flickr.com/photos/54876436@N08/9247200620/

from Theda Station, Western Australia.

Photos of *Pseudochirops* (*Petropseudes*) *jamesbondi sp. nov.* in life can be seen online at:

https://www.flickr.com/photos/colonel_007/49215178836/

from Hells Gate, Queensland, Australia and at:

https://www.flickr.com/photos/58349528@N02/46592424132/

from Roper Bar, Northern Territory, Australia.

Pseudochirops (*Petropseudes*) *waddamaddawidyu sp. nov.* from Groote Eylandt, Northern Territory, Australia, in life can be seen online at:

https://denr.nt.gov.au/__data/assets/pdf_file/0003/758307/groote-archipelago-threatened-species-management-plan-2019-2028.pdf

(see page 7)
Document is called
"Groote Archipelago Threatened Species Management Plan 2019-2028"
and is a 64 page pdf posted online but has no listed author or publisher.

Distribution: *Pseudochirops fiacummingae sp. nov.* is known only from the hilly, rocky parts of the Kimberley division of Western Australia, with almost all records in the west and north-west part of the region.

Etymology: Named in honour of one of Australia's best ever investigative journalists, Fia Cumming of Lyons in the ACT, Australia in recognition for her services to journalism and wildlife conservation in Australia. Further detail can be found in Hoser (1996).

PSEUDOCHIROPS (PETROPSEUDES) JAMESBONDI SP. NOV.

LSID urn:lsid:zoobank.org:act:B7A2B620-A907-4FB9-982A-ADDAAC5D6DD5

Holotype: A preserved specimen (skeleton and skin) at the Museum and Art Gallery of the Northern Territory Mammal Collection, specimen number U1155 collected from Echo Gorge, Wollogorang Station, Northern Territory, Australia, Latitude -17.18 S., Longitude 137.72 E. This government-owned facility allows access to its holdings.

Paratypes: Two preserved specimens at the Museum and Art Gallery of the Northern Territory Mammal Collection, specimen numbers U4186 and U4187 collected from Aquarium Springs Gorge, Wollogorang Station, Northern Territory, Australia, Latitude -17.48 S, Longitude 137.63 E.

Diagnosis: Until now, all populations of so-called Rock Ringtail Possum have been assigned to the same putative species, namely *Pseudochirops* (*Petropseudes*) *dahli* (Collett, 1895) with a type locality of Mary River. Northern Territory, Australia.

That form is now herein restricted to the type locality and adjacent hills and outliers, essentially including the Arnhem Land escarpment and adjacent hills and ranges to the south and west.

This species and the three newly described forms herein can be readily separated from one another by consistent differences in colour of pelage on various parts of the head and body.

Nominate *P. dahli* is readily separated from the other three species by having dark grey pelage and with mid line, from snout being distinct, thick, blackish in colour and extends past the crown of the head. This line becomes wider and darker between eyes and snout and again before a line between the ears. There is a strongly dark reddish brown overlay on fur of the upper legs. Yellowish white under forebody. The white above and below the eye, giving the appearance of a tight circle around the eye is very well defined. Inside of ears is salmon colour with significant blackening towards the outer edges.

Pseudochirops (*Petropseudes*) *jamesbondi sp. nov.* from the southern and western edges of the Gulf of Carpentaria in Queensland and the Northern Territory, Australia has a has light grey to mouse brown pelage and with the mid-line from the snout not going past the crown, being very indistinct and is grey in colour, breaking up as it moves up the snout. White under forebody.

The white above and below the eye giving an appearance of a tight circle around the eye is well defined. Inside of ears is yellow-orange becoming brownish on the outer edges.

There is no obvious reddish brown or orange overlay on the fur of upper legs save for the same slight and very feint orange overlay as seen over all parts of the body.

Pseudochirops (*Petropseudes*) *fiacummingae sp. nov.* from the Kimberley district of north-west Western Australia has a light grey pelage with the mid line from snout distinct, thin, blackish in colour and it goes past the crown of the head, without thickening between the eyes and snout or again before the line between the ears. White under forebody.

The white above and below the eye giving appearance of tight circle around eye is not well defined. Inside of ears is orange to salmon colour with no blackening on the outer edges. Very weak reddish brown overlay on fur of upper legs.

Pseudochirops (*Petropseudes*) *waddamaddawidyu sp. nov.* from Groote Eylandt, Northern Territory, Australia, is similar in most respects to *P. jamesbondi sp. nov.* except for the obvious and strong light orange colour of the rear of the rump and the back legs (versus either not so, or only faint orange tinge in Gulf form, being in line with the rest of the dorsal surface). The mid-line marking from the snout does not go beyond the crown as in it terminates well before it and it is grey in colour.

This marking is noticeably widest at the midpoint between the eyes, appearing like an elongated diamond shape. Fur on the lower forelimbs also has a strong orange tinge, but this is only on the tips, rather than all over as seen on the hind limbs.

All four species of possum in the subgenus *Petropseudes* Thomas, 1923 (see above) are readily separated from all other possums occurring in the same region in western Queensland, the Northern Territory and Western Australia by a combination of having a much shorter tail, being less than two thirds the length of the head and body as well as having very dense fur.

Photos of *Pseudochirops dahli* (Collett, 1895) in life can be seen in Strahan (1988) at page 132 (top) and online at:

https://www.flickr.com/photos/88708273@N03/40093596073/

and at:

https://www.flickr.com/photos/128365570@N04/42868251355/

both from Arnhem Land, Northern Territory, Australia.

Photos of *Pseudochirops* (*Petropseudes*) *fiacummingae sp. nov.* in life can be seen online at:

https://www.flickr.com/photos/mattsummerville/48131308123/

from Prince Regent, Western Australia, Australia, and at:

https://www.flickr.com/photos/54876436@N08/9247200620/

from Theda Station, Western Australia.

Photos of *Pseudochirops* (*Petropseudes*) *jamesbondi sp. nov.* in

life can be seen online at:

https://www.flickr.com/photos/colonel_007/49215178836/

from Hells Gate, Queensland, Australia and at ;

https://www.flickr.com/photos/58349528@N02/46592424132/

from Roper Bar, Northern Territory, Australia.

Pseudochirops (*Petropseudes*) *waddamaddawidyu sp. nov.* from Groote Eylandt, Northern Territory, Australia, in life can be seen online at:

https://denr.nt.gov.au/__data/assets/pdf_file/0003/758307/groote-archipelago-threatened-species-management-plan-2019-2028.pdf

(see page 7)
Document is called,
“Groote Archipelago Threatened Species Management Plan 2019-2028”

and is a 64 page pdf posted online but has no listed author or publisher.

Distribution: *Pseudochirops jamesbondi sp. nov.* is known only from the south and west side of the Gulf of Carpentaria, including nearby hills, where suitable rocky hilly habitat occurs, within far north-west Queensland and adjacent parts of the Northern Territory, Australia.

Etymology: Named in honour of James Bond of Park Orchards, (Melbourne), Victoria, Australia in recognition of his role in conservation of Australian wildlife, including via his vitally important work done over many years maintaining the wildlife breeding facility at Snakebusters: Australia’s best reptiles shows.

PSEUDOCHIROPS (PETROPSEUDES) WADDAMADDAWIDYU SP. NOV.

LSID urn:lsid:zoobank.org:act:6644706A-73BE-4861-B175-972349EC27A0

Holotype: A preserved specimen at the Australian Museum, Sydney, New South Wales, Australia, specimen number M.21477, collected from the fourth beach near Alyongula, Groote Eylandt, Northern Territory, Australia, Latitude -13.97 S., Longitude 136.58 E. This government-owned facility allows access to its holdings.

Paratypes: 1/ A preserved female specimen at the Australian Museum, Sydney, New South Wales, Australia, specimen number M.24782 collected from near Alyangula Creek on the old Rifle Range Road, Groote Eylandt, Northern Territory, Australia, Latitude -13.85 S., Longitude 136.41 E.

2/ A preserved specimen (skeleton and skin) at the Museum and Art Gallery of the Northern Territory Mammal Collection, Darwin, Northern Territory, Australia, specimen number U3282 collected from Angurugu, Groote Eylandt, Northern Territory, Australia, Latitude -13.98 S., Longitude 136.45 E.

Diagnosis: Until now, all populations of so-called Rock Ringtail Possum have been assigned to the same putative species, namely *Pseudochirops* (*Petropseudes*) *dahli* (Collett, 1895) with a type locality of Mary River. Northern Territory, Australia.

That form is now herein restricted to the type locality and adjacent hills and outliers, essentially including the Arnhem Land escarpment and adjacent hills and ranges to the south and west.

This species and the three newly described forms herein can be readily separated from one another by consistent differences in colour of pelage on various parts of the head and body.

Nominate *P. dahli* is readily separated from the other three species by having dark grey pelage and with mid line, from snout being distinct, thick, blackish in colour and extends past the crown of the head. This line becomes wider and darker between eyes and snout and again before a line between the ears. There is a strongly dark reddish brown overlay on fur of the upper legs. Yellowish white under forebody. The white above and below the eye, giving the appearance of a tight circle around the eye is very well defined. Inside of ears is salmon colour with significant blackening towards the outer edges.

Pseudochirops (*Petropseudes*) *jamesbondi sp. nov.* from the southern and western edges of the Gulf of Carpentaria in Queensland and the Northern Territory, Australia has a has light grey to mouse brown pelage and with the mid-line from the snout not going past the crown, being very indistinct and is grey in colour, breaking up as it moves up the snout. White under forebody.

The white above and below the eye giving an appearance of a tight circle around the eye is well defined. Inside of ears is yellow-orange becoming brownish on the outer edges.

There is no obvious reddish brown or orange overlay on the fur of upper legs save for the same slight and very feint orange overlay as seen over all parts of the body.

Pseudochirops (*Petropseudes*) *waddamaddawidyu sp. nov.* from Groote Eylandt, Northern Territory, Australia, is similar in most respects to *P. jamesbondi sp. nov.* except for the obvious and strong light orange colour of the rear of the rump and the back legs (versus either not so, or only faint orange tinge in Gulf form, being in line with the rest of the dorsal surface). The mid-line marking from the snout does not go beyond the crown as in it terminates well before it and it is grey in colour.

This marking is noticeably widest at the midpoint between the eyes, appearing like an elongated diamond shape. Fur on the lower forelimbs also has a strong orange tinge, but this is only on the tips, rather than all over as seen on the hind limbs.

Pseudochirops (*Petropseudes*) *fiacummingae sp. nov.* from the Kimberley district of north-west Western Australia has a light grey pelage with the mid line from snout distinct, thin, blackish in colour and it goes past the crown of the head, without thickening between the eyes and snout or again before the line between the ears. White under forebody.

The white above and below the eye giving appearance of tight circle around eye is not well defined. Inside of ears is orange to salmon colour with no blackening on the outer edges. Very weak reddish brown overlay on fur of upper legs.

All four species of possum in the subgenus *Petropseudes* Thomas, 1923 (see above) are readily separated from all other possums occurring in the same region in western Queensland, the Northern Territory and Western Australia by a combination of having a much shorter tail, being less than two thirds the length of the head and body as well as having very dense fur.

Photos of *Pseudochirops dahli* (Collett, 1895) in life can be seen in Strahan (1988) at page 132 (top) and online at:

https://www.flickr.com/photos/88708273@N03/40093596073/

and at:

https://www.flickr.com/photos/128365570@N04/42868251355/

both from Arnhem Land, Northern Territory, Australia.

Photos of *Pseudochirops* (*Petropseudes*) *fiacummingae sp. nov.* in life can be seen online at:

https://www.flickr.com/photos/mattsummerville/48131308123/

from Prince Regent, Western Australia, Australia, and at:

https://www.flickr.com/photos/54876436@N08/9247200620/

from Theda Station, Western Australia.

Photos of *Pseudochirops* (*Petropseudes*) *jamesbondi sp. nov.* in life can be seen online at:

https://www.flickr.com/photos/colonel_007/49215178836/

from Hells Gate, Queensland, Australia and at:

https://www.flickr.com/photos/58349528@N02/46592424132/

from Roper Bar, Northern Territory, Australia.

Pseudochirops (*Petropseudes*) *waddamaddawidyu sp. nov.* from Groote Eylandt, Northern Territory, Australia, in life can be seen online at:

https://denr.nt.gov.au/__data/assets/pdf_file/0003/758307/groote-archipelago-threatened-species-management-plan-2019-

2028.pdf

(see page 7)
Document is called:
“Groote Archipelago Threatened Species Management Plan 2019-2028” and is a 64 page pdf posted online but has no listed author or publisher.

Distribution: *Pseudochirops waddamaddawidyu sp. nov.* is known only from Groote Eylandt in the Northern Territory, Australia. Reports of specimens on the immediately proximal Northern Territory mainland and smaller islands to the north are assumed to be of this species.

Etymology: On 6 March 2012, I met a Warnindilyakwa Aboriginal elder, being the native tribe from Groote Eylandt, who have apparently lived there for some thousands of years. I asked the elderly man for the native name for the local Rock Ringtail Possum to which he replied “*waddamaddawidyu”.*

Hence the scientific name. I have since been advised that his reply to me actually meant “what is the matter with you?”, because he did not understand the nature of my question, but the name has stuck and in the absence of an alternative, this is the scientific name assigned to the taxon.
Spelling of the name is intentional and should not be changed.

PSEUDOCHIROPS (*SLOPPOSSUM*) *ARCHERI CHRISMAXWELLI SUBSP. NOV.*

LSID urn:lsid:zoobank.org:act:4ED60895-A1B9-4F02-876E-F0F278BBB5D7

Holotype: A preserved male specimen in the Queensland Museum, Brisbane, Queensland, Australia, specimen number JM3617, collected from Mount Lewis, Queensland, Australia, Latitude -16.58 S., Longitude 145.26 S. This government-owned facility allows access to its holdings.

Paratypes: 1/ A preserved female specimen in the Queensland Museum, Brisbane, Queensland, Australia, specimen number JM9476, collected from Kingfisher Park, Julatten, Queensland, Australia, Latitude -16.62 S., Longitude 145.33 E.

2/ A preserved female specimen in the Queensland Museum, Brisbane, Queensland, Australia (adult skin and skull), collected from Mossman, Queensland, Australia, Latitude -16.47 S., Longitude 145.38 E.

Diagnosis: Until now *Pseudochirops* (*Sloppossum*) *archeri chrismaxwelli subsp. nov*., from the northern wet tropics region, generally north of Port Douglas and south of Cape Tribulation including the high elevation and high rainfall hills and plateau near the coast has been treated as the same species as nominate *P. archeri* Matschie, 1915, this being the form from the southern wet tropics region generally north of Mount Spec and south of Cairns and including the Bellenden Ker Range, Atherton Tableland and Paluma Range. The two subspecies are separated by the relatively low elevation zone known as the Black Mountain Corridor, or alternatively Black Mountain Gap.

P. archeri chrismaxwelli subsp. nov. is readily separated from *P. archeri archeri* by having relatively poorly defined markings and white patches on the face and body (versus bold in *P. archeri archeri*) and the dorsal body fur has a weak greenish tinge, versus a strong greenish tinge in *P. archeri archeri.*

A photo of *P. archeri chrismaxwelli subsp. nov.* in life from Mount Lewis, Queensland, can be seen online at:

https://www.flickr.com/photos/euprepiosaur/6809527935

and at:
https://www.flickr.com/photos/zimny_anders/22113501931/

The type subspecies of *P. archeri archeri* in life from Yungaburra, Atherton Tableland, Queensland, can be seen online at:

https://www.flickr.com/photos/bryanjsmitheci/26617682041/

and at:

https://www.flickr.com/photos/mattsummerville/43431336910/

as well as at:

https://www.flickr.com/photos/mattsummerville/31933820964/

a further specimen of the type subspecies of *P. archeri archeri* in life from Ravenshoe, Atherton Tableland, Queensland can be seen online at:

https://www.flickr.com/photos/mattsummerville/16918647658/

and a further two photos of specimens of the type subspecies of *P. archeri archeri* in life from the Atherton Tableland, Queensland can be seen online at:

https://www.flickr.com/photos/jpmckenna/6547010879/

and at:

https://www.flickr.com/photos/euprepiosaur/8453294248/

Distribution: *Pseudochirops* (*Sloppossum*) *archeri chrismaxwelli subsp. nov*. is known only from the Mount Lewis area of far north Queensland, Australia, being the immediate vicinity of the collection localities of the holotype and paratypes. This is an area of high altitude forests, noting the species generally occurs at elevations in excess of 300 metres above sea level and is most commonly seen 500 metres and higher.

Etymology: Named in honour of former lawyer and barrister Christopher Murray Maxwell AC.

He later succeeded Justice John Winneke as President of the Victorian Court of Appeal on 16 July 2005 and is recognized for his contributions to human rights and justice as well as his fair and equitable application of the law in Australia via his role as a Court of Appeal judge.
In the period 1999-2001 he fought valiantly to stop the corrupt Victorian government from outlawing the best-selling books *Victoria Police Corruption* (Hoser, 1999a) and *Victoria Police Corruption - 2* (Hoser 1999b) including an attempt to have myself (Raymond Hoser) as author, charged with fake criminal charges and potentially jailed indefinitely for exposing endemic government corruption (via a so-called “sedition” charge).

Incidentally, Maxwell was one of two (out of three) Supreme Court Judges who in the Court of Appeal in Victoria upheld a unanimous jury verdict (from 11 December 2018) that Catholic Cardinal George Pell had indecently assaulted two Choir boys. The (alleged) offences occurred in December 1996 and early 1997 at St Patrick’s Cathedral, months after Pell was inaugurated as Archbishop of Melbourne.

Pell’s Barrister, Robert Richter had sought leniency for his client Pell on the basis that Pell’s attacks on the young boys was “no more than a plain vanilla sexual penetration case” whereby he had forced the boys to suck his penis.
Pell sought and got leave to appeal the jury decision to the Australian High Court (rare in itself) and the case was heard on 10 and 11 March 2020, with a decision normally expected to be handed down several months later.

However at the height of the Australian Covid-19 Coronavirus pandemic, at a time that Australians and the media were preoccupied with the ongoing deaths and economic disruption that accompanied the pandemic, via house lock downs and the like, the High Court on 7 April rushed out a unanimous decision stating that the jury had got it wrong and that Pell should have been acquitted, thereby quashing the conviction.
Police did not charge Pell in relation to numerous other alleged sexual assaults of minors.

Unfortunately, even when an ethical and highly qualified judge in Australia upholds the law, others in the system that is inherently corrupt will undermine their excellent work.
Meanwhile, in Australia, sex offenders in high places, including within the Catholic Church, continue to be corruptly protected by others in the church, police force and judiciary.

CONSERVATION OF THE NEWLY NAMED TAXA

In terms of conservation of each population of each species as described in this paper, the comments in Hoser (1991 and 2019a, 2019b) apply.

Wildlife laws as currently enforced in Australia are not in any materially significant way enhancing the long-term survival prospects of any of the relevant species and are being vastly outweighed by other negative impacts of governments, including their ongoing commitment to growing the human population to a level that can only put further pressure on the survival prospects of them. If the Australian government persists with its “Big Australia Policy”, (see for example Saunders 2019 or Zaczek 2019), then all sorts of unforseen threats to the survival of these species will certainly emerge.

REFERENCES CITED

Bannister, J. L., Calaby, J. H., Dawson, L. J., Ling, J. K., Mahoney, J. A., McKay, G. M., Richardson, B. J., Ride, W. D. L. and Walton, D. M. 1988. *Zoological Catalogue of Australia, Volume 5, Mammals*. Australian Government Publishing Service, Canberra, ACT, Australia:X+274 pp.

Bryant, L. M. and Krosch, M. N. 2016. Lines in the land: a review of evidence for eastern Australia’s major biogeographical barriers to closed forest taxa. *Biological Journal of the Linnean Society*, 2016:27 pp.

Collett, R. 1884. On some apparently new Marsupials from Queensland. *Proceedings of the Zoology Society* (London) XXVI:381-388, pls. 29-32.

Collins, L. R. 1973. *Monotremes and Marsupials*. Smithsonian Institution Press. City of Washington, DC, USA.

Eldridge, M. D. B., Potter, S., Helgen, K. M., Sinaga, M. H., Aplin, K. P., Flannery, T. F. and Johnson, R. N. 2018. Phylogenetic analysis of the tree-kangaroos (*Dendrolagus*) reveals multiple divergent lineages within New Guinea. *Molecular Phylogenetics and Evolution*, 127:588-599 (online).

Flannery, T. F. 1995. *The Mammals of New Guinea,* 2nd edition. Reed Books, Sydney, Australia.

Goodfellow, D. 1993. *Fauna of Kakadu and the Top End*. Wakefield Press.

Groves, C. P., Wilson, D. E. and Reeder, D. M. (eds.) 2005. *Mammal Species of the World: A Taxonomic and Geographic Reference* (3rd ed.). Johns Hopkins Uni. Press, Baltimore, USA.

Hoser, R. T. 1991. *Endangered Animals of Australia*. Pierson Publishing, Mosman, NSW, Australia:240 pp.

Hoser, R. T. 1996. *Smuggled-2: Wildlife trafficking, crime and corruption in Australia*. Kotabi, Victoria, Australia:280 pp.

Hoser, R. T. 2014. The break up of *Odatria* (*Kimberleyvaranus*) *glebopalma* (Mitchell, 1955) into three obvious subspecies. *Australasian Journal of Herpetology* 24:16-19.

Hoser, R. T. 2015. Australian agamids: Eighteen new species from the genera *Amphibolurus* Wagler, 1830, *Lophognathus* Gray, 1842, *Rankinia* Wells and Wellington, 1984, *Diporiphora* Gray, 1842, *Tympanocryptis* Peters, 1863, as well as three new genera and six new subgenera. *Australasian Journal of Herpetology* 30:37-64.

Hoser, R. T. 2016a. *Carphodactylidae* reviewed: Four new genera, four new subgenera, nine new species and four new subspecies within the Australian gecko family (Squamata: Sauria). *Australasian Journal of Herpetology* 32:3-25.

Hoser, R. T. 2016b. No longer a monotypic lizard genus. A new species of *Gnypetoscincus* Wells and Wellington, 1983 from the Wet Tropics of North Queensland, Australia. *Australasian Journal of Herpetology* 32:50-52.

Hoser, R. T. 2018. The description of a fourth subspecies of *Odatria* (*Kimberleyvaranus*) *glebopalma* (Mitchell, 1955) (Reptilia: Squamata: Varanidae). *Australasian Journal of Herpetology* 37:46-47.

Hoser, R. T. 2019a. 11 new species, 4 new subspecies and a subgenus of Australian Dragon Lizard in the genus *Tympanocryptis* Peters, 1863, with a warning on the conservation status and long-term survival prospects of some newly named taxa. *Australasian J. of Herpetology* 39:23-52.

Hoser, R. T. 2019b. Richard Shine *et al.* (1987), Hinrich Kaiser *et al.* (2013), Jane Melville *et al.* (2018 and 2019): Australian Agamids and how rule breakers, liars, thieves, taxonomic vandals and law breaking copyright infringers are causing reptile species to become extinct. *Australasian J. of Herp.* 39:53-63.

Iredale, T. and Troughton, E. L. G. 1934. A check-list of the mammals recorded from Australia. *Australian Museum Memoir* 6:1-122. [4 May 1934].

Jones, K. W., Maclagen, S. J. and Krockenberger, A. K. 2006. Diet selection in the green ringtail possum (*Pseudochirops archeri*): A specialist folivore in a diverse forest. *Austral Ecology* 31(7)799-807.

Laurance, W. 1990. Comparative Responses of five Arboreal Marsupials to Tropical Forest Fragmentation. *Journal of Mammalogy*, 71:641-653.

Lawlor, T. E. 1979. *Handbook to the Orders and Families of Living Mammals*. Mad River Press, Inc. Eureka, California, USA.

Maxwell, S., Burbidge, A. A. and Morris, K. 1996. *The 1996 Action Plan for Australian Marsupials and Monotremes.* Australasian Marsupial and Monotreme Specialist Group, IUCN Species Survival Commission, Gland, Switzerland.

Matschie, P. 1915. Einige Beitrage zur Kenntnis der Gattung *Pseudochirops* Ogilby. *Sitzb. Ges. Naturf. Fr. Berlin*. 4:83-95.

Menkhorst, P. 2001. *A Field Guide to the Mammals of Australia*. Oxford University Press.

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

Meredith, R. W., Mendoza, M. A., Roberts, K. K., Westerman, M. and Springer, M. S. 2010.

A Phylogeny and Timescale for the Evolution of Pseudocheiridae (Marsupialia: Diprotodontia) in Australia and New Guinea. *J. Mammal Evol* 17:75-99.

Mitchell, F. J. 1955. Preliminary account of the Reptilia and Amphibia collected by the National Geographic Society - Commonwealth Government - Smithsonian Institution Expedition to Arnhem Land (April to November, 1948). *Records of the South Australian Museum* 11:373-408.

Moritz, C., Joseph, L. and Adams, M. 1993. Cryptic diversity in an endemic rainforest skink (*Gnypetoscincus queenslandiae*). *Biodiversity and Conservation* 2:412-425.

Potter, S., Close, R. L., Taggart, D. A., Cooper, S. J. B. and Eldridge, M. D. B. 2014. Taxonomy of rock-wallabies, *Petrogale* (Marsupialia: Macropodidae). IV. Multifaceted study of the *brachyotis* group identifies additional taxa. *Australian Journal of Zoology*, 2014, 62, 401-414.

Ride, W. D. L. 1970. *A Guide to the Native Mammals of Australia.* Oxford University Press.

Ride, W. D. L. (*ed.*) *et al.* (on behalf of the International Commission on Zoological Nomenclature) 1999. *International code of Zoological Nomenclature*. The Natural History Museum - Cromwell Road, London SW7 5BD, UK.

Runcie, M. J. 1999. Biparental care and obligate monogamy in the rock-haunting possum, *Petropseudes dahli*, from tropical Australia. *Animal Behaviour*. 59 (5): 1001-1008.

Saunders, S. 2019. Morrison and Shorten’s Big Australia: The overpopulation problem. News article published 17 April 2019 and downloaded from:

https://independentaustralia.net/politics/politics-display/morrison-and-shortens-big-australia-the-overpopulation-problem,12584

Strahan, R. (ed.) 1988. *The Australian Museum Complete book of Australian Mammals / The National Photographic Index of Australian Wildlife*. Angus and Robertson, North Ryde, NSW, Australia:530 pp.

Thomas, O. 1888. *Catalogue of the Marsupialia and Monotremata in the Collection of the British Museum* (Natural History). British Museum, London, UK:xiii+401 pp+28 pl.

Thomas, O. 1922. A selection of lectotypes of the typical Australian marsupials in the British Museum Collection. *Ann. Mag. Nat. Hist.* 9(10):127-128.

Thomas, O. 1923. On some Queensland Phalangeridae. *Ann. Mag. Nat. Hist.* 9(11):246-250.

van Ufford, A. Q. and Cloos, M. 2005. Cenozoic tectonics of New Guinea. *Am. Assoc. Pet. Geol. Bull.* 89:119-140.

Vaughan, T. A. 1986. *Mammalogy*, 3rd Edition. Harcourt Brace Jovanovich College Publishers. New York, USA.

Zaczek, Z. 2019. Former PM Kevin Rudd says Australia should drastically increase its population to 50 MILLION to make sure nation can defend itself in the face of threats from China. *Daily Mail* (Australia) (27 November), published online at: https://www.dailymail.co.uk/news/article-7729689/Kevin-Rudd-says-Australia-increase-population-50-MILLION-defend-China.html

CONFLICTS OF INTEREST - NONE

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Small, easily overlooked and in decline. Potoroos in Eastern Australia. A formal division of the genus *Potorous* Desmarest, 1804 (Marsupialia Potoroidae) and the description of a new species from south-east Queensland.

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ABSTRACT

Potoroos within the family Potoroidae are small marsupials which were abundant at the time Europeans first came to Australia (White and Stone 1790).

They have severely declined in number since.

Three main species groups, all currently placed in the genus *Potorous* Desmarest, 1804 (type species *Didelphis tridactyla* Kerr, 1792) have been formally described and named, containing one putative species each based on most recently published classifications.

One of these, the Long-nosed Potoroo *Potorous tridactylus* (Kerr, 1792) was recently subdivided into two species, namely *P. gilberti* (Gould, 1841) from Western Australia and *P. tridactylus* from eastern Australia, treated as consisting three subspecies, being the nominate form from the Central Coast of New South Wales, *P. tridactylus apicalis* (Gould, 1851) from Tasmania and *P. tridactylus trisulcatus* (McCoy, 1865) from Victoria (Frankham *et al*. 2012).

Molecular studies have shown east Australian *P. tridactylus* to consist of four main divergent clades and so the unnamed one is formally named in this paper as *P. waddahyamin sp. nov*. based on well-known morphological divergences.

Each of the four clades are also formally elevated to full species based on known dates of divergence being 1.32 and 2.45 MYA from nearest common ancestor.

Of the three main species groups within the putative genus *Potorous* two have generic names available being *Potorous* and *Potoroops* Matschie, 1916 for the type species *Hypsiprymnus platyops* Gould, 1844. The third species group does not. As the molecular studies of Westerman *et al.* (2004) and Frankham *et al.* (2012) showed genus-level divergences between the groups, the unnamed one is formally named for the first time.

The species *Potorous longipes* Seebeck and Johnston, 1980 is formally placed in the new genus *Rossignolius gen. nov.*.

Keywords: Taxonomy; nomenclature; classification; Potoroo; Marsupials; Potoroidae; *Potorous*; *Potoroops*; *Hypsiprymnus*; *platyops*; *tridactylus*; *trisulcatus*; *gilberti*; *apicalis*; *longipes*; New genus; *Rossignolius*; new species; *waddahyamin*.

INTRODUCTION

Potoroos within the family Potoroidae are (now) rarely seen rabbit-sized marsupials which were abundant at the time Europeans first came to Australia (White and Stone 1790).

At first glance, the animal with its pointed nose and grey-brown fur looks very much like a better-known bandicoot (family Peramelidae), until it hops away with its front feet tucked into its chest, revealing its closer relationship with the kangaroo family (Macropodidae). Potoroos exhibit many morphological specializations such as an elongated pointed rostral region, erect ears, large eyes, large claws for digging, and long robust hind legs.

The body length varies between species, but is usually between 34 and 38 cm and the semi-prehensile tail length is 15 to 24 cm.

As they are nocturnal, usually live in forests and are rarely seen in the wild, except as road kill, better indicators of its presence are the runways it makes through the undergrowth and the hollow diggings it leaves behind when feeding on underground roots and fungi.

Due to the introduction by Europeans of competing animals like rabbits and hares and predators like foxes, cats (see Spencer 1991) and dogs, numbers of Potoroos severely declined almost immediately after European settlement in the 1700's.

These animals only remain in large numbers on islands that are effectively predator free and on the east coast in relatively undisturbed forest areas, which in effect also form islands of safety from invasive species that do better in disturbed and agricultural habitats.

The type species for the genus is the Long-nosed Potoroo *Potorous tridactylus* (Kerr, 1792), originally named *Didelphis tridactyla* Kerr, 1792. The genus *Potorous* was erected by Matschie in 1916. This was a widespread putative taxon, being found in south-west Australia and the south-east as far north as wetter parts of south-east Queensland.

The south-west Australian form was named *Hypsiprymnus gilberti* by Gould in 1841, based on a type from King George Sound, but later synonymised with *P. tridactylus* by Iredale and Troughton (1934) and Bannister *et al.* (1988).

Likewise for the putative taxa *Hypsiprymnus apicalis* Gould, 1851 from New Norfolk, Tasmania and *H. trisulcatus* McCoy, 1865 based on a type from near Gisborne, Victoria.

Frankham *et al.* (2012) published a phylogeny for the putative species *P. tridactylus* including specimens from across the known range and found significant divergences between the populations.

They found putative *P, gilberti* diverged from the (south) eastern populations 5.77 MYA and 7.2 MYA from those from the New South Wales (NSW) Central Coast and further north (a total of two main identified groups). In turn they found Tasmanian specimens diverged from those of Victoria and southern NSW by 2,45 MYA and the two northern populations to have diverged from one another 1.32 MYA.

They made the taxonomic judgements of recognizing *P, gilberti* as a separate species and in turn recognizing the single species *P. tridactylus*, with both *P. apicalis* and *P. trisulcatus* as subspecies of that.

The taxonomy did not make sense in that both putative species *P. apicalis* and *P. trisulcatus* (diverged from one another 2.45 MYA) were in fact more closely related to putative *P, gilberti*, with a 5.77 MYA divergence as opposed to a 7.2 MYA divergence from putative *P. tridactylus.*

In order to resolve this clear error of assignment, one must either transfer both putative subspecies to the synonymy of *P, gilberti* and continue to regard each as subspecies, or in the alternative, and based on quoted divergences, simply elevate all to full species, which in the absence of evidence to the contrary would be the most sensible outcome.

In terms of the remainder of putative *P. tridactylus*, Frankham *et al.* (2012) found a divergence between two main groups of 1.32 MYA, which is again a species-level divergence.

With the northern group unnamed, it again seemed logical to name that as a new species to enable proper conservation measures to take place and allow zoologists to do proper studies involving known taxa as opposed to directly transposing potentially misleading results from other taxa to it.

In terms of the morphologically similar species formally named *P. longipes* Seebeck and Johnston, 1980 from south-east Australia, Frankham *et al.* (2012) found a divergence of 9.4 MYA which is a genus-level divergence.

Westerman *et al.* (2004) found the putative species *P. platyops* (Gould, 1844) to have diverged 14.5 MYA from nearest common ancestor of the other extant putative *Potorous* species.

Hence on the basis of the preceding, it seemed self-evident that the taxonomy of the *P. tridactylus* group needed to be reviewed in line with what has just been said and that *P. longipes* was in need of a genus-level reassignment.

Before doing any of the above, it was however important to review the relevant literature as well as inspect specimens of all relevant putative taxa.

MATERIALS, METHODS AND RESULTS

Before a decision is made to name any new taxon, reasonable steps must be taken to ensure that it is justified on all relevant grounds, including that it is morphologically, genetically and reproductively isolated from their nearest relative and to a sufficient degree to be of taxonomic significance.

A further relevant question to ask is should the reproductively isolated and morphologically divergent entities be labelled as subspecies, full species, or potentially higher level again.

Key literature relevant to the taxonomic and nomenclatural conclusions within this paper include Abbott (2008), Amos (1982), Bannister *et al.* (1988), Bee and Close (1993), Bennett (1993), Bensley (1903), Bougher and Friend (2009), Browning *et al.* (2001), Bryant and Krosch (2016), Burbidge and Manly (2002), Butler and Merrilees (1970), Byrne *et al.* (2008, 2011), Claridge *et al.* (2007, 2010), Courtney (1963), Desmarest (1804), Dexter and Murray (2009), Eldridge (1997), Eldridge and Close (1992), Eldridge and Potter (2020), Eldridge *et al.* (2001), Finlayson (1938), Ford (2014), Frankham *et al.* (2011, 2012), Friend (2003), Groves *et al.* (2005), Guiler (1958, 1960, Guiler and Kitchener (1967), Gould (1841, 1844, 1851), Gray (1837), Heinsohn (1936), Hoke (1990), Hope (1969), Hoser (1991), Iredale and Troughton (1934), Jackson (2008), Johnson (2003), Johnston (1973), Johnston and Sharman (1976, 1977), Johnston *et al.* (1984), Kerr (1792), Kitchener (1973), Lawlor (1979), Linné *et al.* (1792), Long (2001), Mahoney (1964), Mason (1997), Matschie (1916), Maxwell *et al.* (1996), McCoy (1865), McDowell and Medlin (2010), Menkhorst (2001), Meredith *et al.* (2008), Mitchell (1908), Nguyen *et al.* (2005), Norton *et al.* (2010a, 2010b), Potter *et al.* (2012a, 2012b, 2012c, 2014), Ride (1970), Ride *et al.* (1999), Rounsevell *et al.* (1991), Seebeck (1991), Seebeck and Johnston (1980), Shaw (1800), Short (1998), Shortridge (1910), Sinclair and Westerman (1997), Sinclair *et al.* (1996, 2000, 2002), Spencer (1991), Stead-Richardson *et al.* (2010), Strahan (1988), Tate (1948), Thomas (1888, 1909), Vaughan *et al.* (2007), Vaughan (1986), Vaughan-Higgins *et al.* (2011), Vernes and Jarman (2014), Westerman *et al.* (2004, 2010), White and Stone (1790) as well as sources cited therein (duplicitous references not necessarily included).

Live and dead specimens as well as available bone specimens, were examined as was other relevant material, including past climate data for the applicable regions, sea level depths and other relevant information.

In summary, as inferred already, the results of Frankham *et al.* (2012) as interpreted and corrected in the introduction stood up to scrutiny.

Therefore *P. tridactylus* as currently recognized is herein split into four species, as well as the sometimes separately recognized species *P. gilberti*, making a total of five.

The unnamed taxon from south-east Queensland, with a divergence of 1,32 MYA from nearest congener is formally named *P. waddahyamin sp. nov.*.

I note that a 1.32 MYA is definitely worthy of taxonomic recognition and that as recently as year 2020, Eldridge and Potter (2020), gave taxonomic recognition to a central Australian population of Rock Wallaby with a divergence less than 1 MYA from the nominate form.

Potorous Desmarest, 1804 with a type species of *Didelphis tridactyla* Kerr, 1792 has until now been treated by most publishing authors as having three putative species.

These are *P. tridactylus*, herein divided into five as outlined above as well as two others.

The other species are *Hypsiprymnus platyops* Gould, 1844, better-known as the Broad-faced Potoroo, believed to be extinct

(Hoser, 1991), and the Long-footed potoroo *Potorous longipes* Seebeck and Johnston, 1980.

Westerman *et al.* (2004) found the putative species *P. platyops* (Gould, 1844) to have diverged 14.5 MYA from the nearest common ancestor of the other extant putative *Potorous* species.

Hence, after taking the divergent morphology of the taxon into account, there is no doubt it is highly divergent of the other two species. The genus name *Potoroops* Matschie, 1916 is available for this taxon and so is adopted herein in line with Tate (1948) based on the significantly divergent morphology as detailed by Tate (1948).

Frankham *et al*. (2012) in their published phylogeny of the other living species found a 9.4 MYA divergence between *P. tridactylus* (all five forms adopted as species herein) and *Potorous longipes* Seebeck and Johnston, 1980, which is clearly a divergence worthy of genus-level separation.

I note other mammals have been divided into separate genera on the basis of far lower divergences than this including for example *Petrogale* Gray, 1837 and *Peradorcas* Thomas, 1909 with a divergence estimated at under 9 MYA (Potter *et al.* 2012b).

The species *Potorous longipes* Seebeck and Johnston, 1980 is therefore formally placed in the new genus *Rossignolius gen. nov.*.

INFORMATION RELEVANT TO THE FORMAL DESCRIPTIONS THAT FOLLOW

There is no conflict of interest in terms of this paper or the conclusions arrived at herein.

Several people including anonymous peer reviewers who revised the manuscript prior to publication are also thanked as are relevant staff at museums who made specimens and records available in line with international obligations.

In terms of the following formal descriptions, spellings should not be altered in any way for any purpose unless expressly and exclusively called for by the rules governing Zoological Nomenclature as administered by the International Commission of Zoological Nomenclature.

Material downloaded from the internet and cited anywhere in this paper as being sourced online was downloaded and checked most recently as of 22 January 2020 (including if also viewed prior), unless otherwise stated and was accurate in terms of the content (as described) cited herein as of that date.

Unless otherwise stated explicitly, colour and other descriptions apply to living adult specimens of generally good health and not under any form of stress by means such as excessive cool, heat, dehydration or abnormal skin or fur reaction to chemical or other input.

Unless stated otherwise, colour descriptions of species refer to fur colour and not skin.

While numerous texts and references were consulted prior to publication of this paper, the criteria used to separate the relevant species or subspecies has already been spelt out and/ or is done so within each formal description and does not rely on material within publications not explicitly cited herein.

In terms of conservation of each population of each species or subspecies as described below, the comments in Hoser (1991, 1993, 1996, 2019a and 2019b) apply.

Wildlife laws as currently enforced in Australia are not in any materially significant way enhancing the long-term survival prospects of any of the relevant species and in any event are being vastly outweighed by other negative impacts of governments, including their ongoing commitment to growing the human population to a level that can only put further pressure on the survival prospects of the relevant taxa.

If the Australian government persists with its ecologically reckless “Big Australia Policy”, (see for example Saunders 2019 or Zaczek 2019), that being a long-term aim to increase the human population in Australia to over 100 million people by year 2150 (from the present 25 million as of 2019), all sorts of unforseen threats to the survival of these species may emerge.

ROSSIGNOLIUS GEN. NOV.

LSID urn:lsid:zoobank.org:act:2D06792C-B5AE-43D3-9A9D-FF1F16C77661

Type Species: *Potorous longipes* Seebeck and Johnston, 1980.

Diagnosis: *Rossignolius gen. nov.* has until now been treated as within the genus *Potorous* Desmarest, 1804 but is readily separated from all members of that genus and the morphologically similar *Potoroops* Matschie, 1916 by the following unique suite of characters: larger adult size, with an average 400 mm head and body length, average 320 mm tail length, 2.1 kg average weight of males and 1.7 kg average weight of females (versus .9 to 1.1 kg in *Potorous* and .5 kg in *Potoroops*, both sexes of each); grey brown above and grey below; hind foot is longer than the head (versus not so in *Potorous*); the skull is lightly built, long and narrow, (versus broad in *Potoroops*); there is a distinctive pad on the sole of the first (big) toe; chromosome count of 34 (versus 12 in males and 13 in females in *Potorous*).

The genus *Potorous* Desmarest, 1804, *sensu lato* including the species within *Rossignolius gen. nov.* and *Potoroops* Matschie, 1916 are readily separated from other marsupials by the following suite of characters: Rhinarium naked, variable in its extent on the upperside of the muzzle. Ears very short, rounded. Fore claws long, rather slender, the median much longer than the outer ones. Hind feet very short, the whole hind limb not disproportionally longer than the fore; soles naked and coarsely granulated. Tail shorter than in the morphologically similar *Bettongia*, tapering, covered with short closely adpressed hairs and without any trace of a crest.

Within the genus *Potorous* Desmarest, 1804, *sensu stricto* the skull is lightly built, long and narrow, the degree of this varying between species being relatively shortest in *Potorous waddahyamin sp. nov.* formally described in this paper. In the genus *Potoroops* Matschie, 1916 the skull is distinctively and obviously short as well as being very wide. The interorbital space is broad, flat or slightly convex, its edges square, not ridged, but in old age forming short postorbital processes. Anterior palatine foramina very short. Palate with a single pair of rather small vacuities opposite the posterior molars, and entirely confined to the palatal bone. Bullae very slightly swollen to distinctly swollen, nearly flat. Lower jaw long and slender, not strongly convex below.

There are typically about 34 teeth in the mouth. Upper incisors small and light, with incisor one long and pointed. Canines are small and thin, compressed laterally; premolar 4 is long and trenchant, though considerably shorter than in *Bettongia*, without trace of internal ledge or postero-internal talon, its outer and inner surfaces with from two to four shallow vertical grooves. Decidnous premolar number three is similar but smaller. Molars quadrangular and quadritubercular, evenly but slightly decreasing in size backwards, except that molar one is generally rather smaller than molar two. Lower incisors very long and slender.

These animals stand on their hind legs like Bettongs, but unlike the Bettongs they run in a different way.

These species use the fore as well as the hind legs in a sort of gallop; they also never attempt to kick with their hind legs.

A colour photo of a live adult specimen of the only known species in the genus, namely *Rossignolius longipes* (Seebeck and Johnston, 1980) can be found on page 206 of Hoser (1991).

Distribution: Known only from a limited area in far north-east Victoria and immediately adjacent south-east New South Wales, in an area closely bound by the coastline (generally within 100 km) bounded by Bondi State Forest in New South Wales as the north-eastern limit, Orbost, Victoria in the South-west, and another known population at Howitt Plains, Victoria in the west.

Etymology: *Rossignolius gen. nov.* is named in honour of

Federico (AKA Fred) Rossignoli of Hurstbridge (Melbourne) Victoria in recognition of his services to herpetology for more than two decades, including providing logistical assistances to Snakebusters: Australia's best reptiles shows at times of need and other vitally important services to others involved in scientific research and wildlife conservation.

Through his wildlife display business "Australian Nature Live" Federico educated countless Australians at schools, universities and major public events about reptiles and other wildlife as well as other public interest matters with some of the most informative and educational shows ever performed. While he has retired from doing these displays as of 2020, methods he pioneered are now used by other wildlife displayers worldwide, including by Snakebusters: Australia's best reptiles shows.

POTOROUS WADDAHYAMIN SP. NOV.

LSID urn:lsid:zoobank.org:act:0148A5E4-79D6-4270-B331-D1F9EE317B2D

Holotype: A preserved male specimen at the Australian Museum in Sydney, New South Wales, Australia, specimen number M.44614.001 collected from near Warwick, Queensland, Australia, Latitude -28.21 S. Longitude 152.04 E. This government-owned facility allows access to its holdings.

Paratypes: Two preserved male specimens at the Australian Museum in Sydney, New South Wales, Australia, specimen numbers M.44612.006 and M.44615.002 collected from near Warwick, Queensland, Australia, Latitude -28.21 S. Longitude 152.04 E.

Diagnosis: *Potorous waddahyamin sp. nov.* has until now been treated as a northern population of the better known *P. tridactylus* (Kerr, 1792), since subdivided by Frankham *et al.* (2012) without morphological diagnosis and merely adopting previously proposed and available names.

Potorous waddahyamin sp. nov. is readily separated from all of *P. tridactylus* (Kerr, 1792), *P. apicalis* (Gould, 1851), *P. trisulcatus* (McCoy, 1865) and *P. gilberti* (Gould, 1841), by the following suite of characters: colouration is usually a light brown pelage with numerous lighter tipped or whitish hairs scattered throughout giving a distinctly peppered appearance, versus dark brown in the type form of *P. tridactylus* and dark, slightly reddish brown in *P. trisulcatus* and either rufous brown or grey brown in *P. apicalis*; a lack of a white tip on the end of the tail, versus sometimes present in *P. tridactylus* and *P. trisulcatus* and usually present in *P. apicalis*; nasals are short and strongly expanded posteriorly (versus not so in all of *P. tridactylus*, *P. apicalis*, *P. trisulcatus* and *P. gilberti*) and the general fronto-nasal outline is not distinctly and evenly convex as seen in *P. gilberti*; skull is relatively shorter in *P. waddahyamin sp. nov.* than all of *P. tridactylus*; *P. apicalis*; *P. trisulcatus* and *P. gilberti* and unlike those species is noticeably expanded posteriorly; snout is relatively short in *P. waddahyamin sp. nov.* as compared to all of *P. tridactylus*; *P. apicalis*; *P. trisulcatus* and *P. gilberti*, being longest in *P. apicalis*; *P. waddahyamin sp. nov.* has a deep muzzle, versus not so in all of *P. tridactylus*; *P. apicalis*; *P. trisulcatus* and *P. gilberti;* bullae very slightly swollen, versus distinctively swollen in *P. gilberti* and the average weight of adults of both sexes is just over 1 kg in *P. waddahyamin sp. nov.* versus under 1 kg in all other species.

The five species in the genus *Potorous* Desmarest, 1804 as defined herein are readily separated from species in the genera *Potoroops* Matschie, 1916 and *Rossignolius gen. nov.*

The genus *Potorous* Desmarest, 1804, *sensu lato*, including the species within *Rossignolius gen. nov.* and *Potoroops* Matschie, 1916 are readily separated from other marsupials by the following suite of characters:

Rhinarium naked, variable in its extent on the upperside of the muzzle. Ears very short, rounded. Fore claws long, rather slender, the median much longer than the outer ones. Hind feet very short, the whole hind limb not disproportionally longer than the fore; soles naked and coarsely granulated. Tail shorter than in the morphologically similar *Bettongia*, tapering, covered with short closely adpressed hairs and without any trace of a crest.

The skull is lightly built, long and narrow, except in the genus *Potoroops* Matschie, 1916 where it is distinctively short. The Interorbital space is broad, flat or slightly convex, its edges square, not ridged, but in old age forming short postorbital processes. Anterior palatine foramina very short. Palate with a single pair of rather small vacuities opposite the posterior molars, and entirely confined to the palatal bone. Bullae very slightly swollen, nearly flat or obviously swollen. Lower jaw long and slender, not strongly convex below.

There are typically about 34 teeth in the mouth.

Upper incisors small and light, with incisor one long and pointed. Canines are small and thin, compressed laterally; premolar 4 is long and trenchant, though considerably shorter than in *Bettongia*; without trace of internal ledge or postero-internal talon, its outer and inner surfaces with from two to four shallow vertical grooves. Decidnous premolar number three is similar but smaller. Molars quadrangular and quadritubercular, evenly but slightly decreasing in size backwards, except that molar one is generally rather smaller than molar two. Lower incisors very long and slender.

These animals stand on their hind legs like Bettongs, but unlike the Bettongs they run in a different way.

These species use the fore as well as the hind legs in a sort of gallop; they also never attempt to kick with their hind legs.

A colour photo of a live adult specimen of the only known species in the genus *Rossignolius.* namely *Rossignolius longipes* (Seebeck and Johnston, 1980) can be found on page 206 of Hoser (1991).

Hoser (1991) at page 205 has a colour reproduction of an image of two *Potoroops platyops* (Gould, 1841) taken from a lithograph in *Gould's the Mammals of Australia*.

The genus *Rossignolius gen. nov.* has until now been treated as within the genus *Potorous* Desmarest, 1804. This genus is readily separated from all members of that genus and the morphologically similar *Potoroops* Matschie, 1916 by the following unique suite of characters: Larger adult size, with an average 400 mm head and body length, average 320 mm tail length, 2.1 kg average weight of males and 1.7 kg average weight of females (versus .9 to 1.1 kg in *Potorous* and .5 kg in *Potoroops*, both sexes of each); grey brown above and grey below; hind foot is longer than the head (versus not so in *Potorous*); the skull is lightly built, long and narrow, (versus broad in *Potoroops*); there is a distinctive pad on the sole of the first (big) toe; chromosome count of 34 (versus 12 in males and 13 in females in *Potorous*).

The genus *Potoroops* Matschie, 1916 as defined in this paper, is readily separated from both *Potorous* and *Rossignolius gen. nov.* by the following unique suite of characters: Naked part of rhinarium not running back along the top of the muzzle. Head short and broad. Hind foot less than 65 mm long. Muzzle very short. Orbit to anterior nares 26 mm or less, not exceeding three fourths of the zygomatic breadth. Premolar four is very small, about 4-5 mm long.

A photograph of *P. waddahyamin sp. nov.* in life can be seen online at:
https://imagelibrary.qm.qld.gov.au/fotoweb/archives/5020-Learning-Platform/Icemedia/Mammals/pq019.jpg.info
where the relatively short and deep snout of this taxon (as compared to *P. tridactylus*; *P. apicalis*; *P. trisulcatus* and *P. gilberti*) is clearly visible.

Distribution: *P. waddahyamin sp. nov.* is known from the coast, ranges and nearby elevated slopes of south-east Queensland, south of the dry zone north the Sunshine Coast to near the New South Wales and Queensland border, potentially just into northern New South Wales north of the Clarence River.

Etymology: On 30 July 2019, while doing fieldwork on the outskirts of Warwick in south-east Queensland, I asked a local

Keinjan Aboriginal elder who spoke the Wakka Wakka language what they called the local Potoroo species, to which he replied "*Waddahyamin*". Hence the scientific name. I was later advised the man may have been confused and had simply asked "What do you mean?" and that there may be no local Aboriginal name for his animal, so I decided to retain use of "*waddahyamin*". The spelling of the scientific name is intentional and should not be changed unless mandated by the rules of zoological nomenclature.

REFERENCES CITED

Abbott, I. 2008. Historical perspectives of the ecology of some conspicuous vertebrate species in south-west Western Australia. *Conservation Science W. Aust.* 6(3):42-48.

Amos, P. J. 1982. The potoroo in Queensland. *Queensl. Agric. J.* 108:5-6.

Bannister, J. L., Calaby, J. H., Dawson, L. J., Ling, J. K., Mahoney, J. A., McKay, G. M., Richardson, B. J., Ride, W. D. L. and Walton, D. M. 1988. *Zoological Catalogue of Australia, Volume 5, Mammals*. Australian Government Publishing Service, Canberra, ACT, Australia:X+274 pp.

Bee, C. A. and Close, R. L. 1993. Mitochondrial DNA analysis of introgression between adjacent taxa of rock-wallabies, *Petrogale* species. *Genetical Research* 61:21-37.

Bennett, A. F. 1993. Microhabitat use by the Long-nosed potoroo, *Potorous tridactylus*, and other small mammals in remnant forest vegetation of southwestern Victoria. *Wildlife Research* 20:267-285.

Bennett, A. F. and Baxter, B. J. 1989. Diet of the Long-Nosed Potoroo, *Potorous tridactylus* (Marsupialia, Potoroidae), in Southwestern Victoria. *Australian Wildlife Research* 16:263-271.

Bensley, B. A. 1903. On the Evolution of the Australian Marsupialia; with Remarks on the Relationships of the Marsupials in general. *Transactions of the Linnean Society of London.* 2(9):147-150.

Bougher, N. L. and Friend, J. A. 2009. Fungi consumed by translocated Gilbert's potoroos (*Potorous gilbertii*) at two sites with contrasting vegetation, south coastal Western Australia. *Australian Mammalogy* 31(2):97-105.

Browning, T. L., Taggart, D. A., Rummery, C., Close, R. L. and Eldridge, M. D. B. 2001. Multifaceted genetic analysis of the critically endangered brush-tailed rock-wallaby *Petrogale penicillata* in Victoria, Australia: implications for management. *Conservation Genetics* 2:145-156.

Bryant, L. M. and Krosch, M. N. 2016. Lines in the land: a review of evidence for eastern Australia's major biogeographical barriers to closed forest taxa. *Biological Journal of the Linnean Society*, 2016:27 pp. (online, downloaded most recently on 22 January 2020).

Burbidge, A. A. and Manly, B. F. J. 2002. Mammal extinctions on Australian islands: causes and conservation implications. *Journal of Biogeography* 29:465-474.

Butler, W. H. and Merrilees, D. 1970. Remains of *Potorous platyops* (Marsupialia, Macropodidae) and other mammals from Bremer Bay, Western Australia. *J. R. Soc. West. Aust.* 54:53-58.

Byrne, M., Yeates, D. K., Joseph, L., Kearney, M., Bowler, J., Williams, M. A. J., Cooper, S.,

Donnellan, S. C., Keogh, J. S., Leys, R., Melville, J., Murphy, D. J., Porch, N. and Wyrwoll, K. H. 2008. Birth of a biome: insights into the assembly and maintenance of the Australian arid zone biota. *Mol. Ecol.* 17:4398-4417.

Byrne, M., Steane, D. A., Joseph, L., Yeates, D. K., Jordan, G. J., Crayn, D., Aplin, K., Cantrill, D. J., Cook, L. G., Crisp, M. D., Keogh, J. S., Melville, J., Moritz, C., Porch, N., Sniderman, J. M. K., Sunnucks, P. and Weston, P. H. 2011. Decline of a biome: evolution, contraction, fragmentation, extinction and invasion of the Australian mesic zone biota. *J. Biogeogr.* 38:1635-1656.

Claridge, A. W., Seebeck, J. H. and Rose, R. 2007. *Bettongs, potoroos, and the musky rat-kangaroo.* CSIRO Publishing, Collingwood, Victoria, Australia.

Claridge, A. W., Paull, D. J. and Barry, S. C. 2010. Detection of medium-sized ground-dwelling mammals using infrared digital cameras: an alternative way forward? *Australian Mammalogy* 32:165-171.

Courtney, J. 1963. The remarkable faunal unit (with description of a new form of *Potorous* rat-kangaroo). *Australian Aviculture* 17:18-20.

Desmarest, A. G. 1804. *Nouveau Dictionnaire d'Histoire Naturelle: appliquée aux arts, principalement à l'agriculture, à l'économie rurale et domestique: par une société de naturalistes et d'agriculteurs: avec des figures tirés des trois règnes de la nature*. Deterville, Paris. Vol. 24.

Dexter, N. and Murray, A. 2009. The impact of fox control on the relative abundance of forest mammals in East Gippsland, Victoria. *Wildl. Res*. 36:252-261.

Eldridge, M. D. B. 1997. Taxonomy of rock wallabies *Petrogale* (Marsupialia: Macropodidae). II. An historical review. *Australian Mammalogy* 19:113-122.

Eldridge, M. D. B. and Close, R. L. 1992. Taxonomy of rock wallabies, *Petrogale* (Marsupialia: Macropodidae). I. Revision of the eastern *Petrogale* with the description of three new species. *Australian Journal of Zoology* 40:605-624.

Eldridge, M. D. B. and Potter, S. 2020. Taxonomy of rock-wallabies, *Petrogale* (Marsupialia: Macropodidae). V. A description of two new subspecies of the black-footed rock-wallaby (*Petrogale lateralis*). *Australian Journal of Zoology* 67(1):19-26.

Eldridge, M. D. B., Wilson, A. C. C., Metcalfe, C. J., Dollin, A. E., Bell, J. N., Johnson, P. M.,

Johnston, P. G. and Close, R. L. 2001. Taxonomy of rock-wallabies, *Petrogale* (Marsupialia: Macropodidae). III. Molecular data confirms the species status of the purple-necked rock-wallaby (*Petrogale purpureicollis* Le Souef). *Australian Journal of Zoology* 49:323-343.

Finlayson, H. H. 1938. On a new species of *Potorous* (Marsupialia) from a cave deposit on Kangaroo Island, South Australia. *Transactions of the Royal Society of South Australia.* 62:132-140.

Ford, F. 2014. *John Gould's extinct and endangered mammals of Australia.* National Library of Australia:139 pp.

Frankham, G. J., Reed, R. L., Fletcher, T. P. and Handasyde, K. A. 2011. Population ecology of the long-nosed potoroo (*Potorous tridactylus*) on French Island, Victoria. *Aust. Mammal.* 33:73-81.

Frankham, G. J., Handasyde, K. A. and Eldridge, M. D. B. 2012. Novel insights into the phylogenetic relationships of the endangered marsupial genus *Potorous. Molecular Phylogenetics and Evolution*, 64(3):592-602.

Friend, T. 2003. Gilbert's Potoroo. *Nature Australia* 27(9)(Winter):22.

Groves, C. P., Wilson, D. E. and Reeder, D. M. (eds.) 2005. *Mammal Species of the World: A Taxonomic and Geographic Reference* (3rd ed.). Johns Hopkins University Press, Baltimore, USA.

Guiler, E. R. 1958. Observations on a population of small marsupials in Tasmania. *J. Mammal.* 39:44-58.

Guiler, E. R. 1960. The breeding season of *Potorous tridactylus* (Kerr). *Aust. J. Sci.* 23:126-127.

Guiler, E. R. and Kitchener, D. A. 1967. Further observations on longevity in the wild potoroo, *Potorous tridactylus. Aust. J. Sci.* 30:105-106.

Gould, J. 1841. *Monograph of the Macropodidae, or family of Kangaroos*. Part 1., London, UK.

Gould, J. 1844. Exhibition and character of a number of animals, &c. transmitted from Australia by Mr. Gilbert. P*roceedings of the Zoological Society of London* 1844:103-107.

Gould, J. 1851. *Monograph of the Macropodidae, or family of*

Kangaroos. Part 3., London, UK.

Gray, J. E. 1837. Description of some new or little known Mammalia, principally in the British Museum Collection. *The Magazine of Natural History*, n. s. 1:577-587.

Heinsohn, G. E. 1968. Habitat requirements and reproductive potential of the macropod *Potorous tridactylus* in Tasmania. *Mammalia* 32:30-43.

Hoke, F. 1990. Potoroos in the Outback. *Environment* 32(5):21.

Hope, J. H. 1969. Biogeography of the Mammals on the Islands of Bass Strait with an Account of Variation in the Genus *Potorous.* Ph.D. Thesis. Monash University, Melbourne, Australia.

Hoser, R. T. 1991. *Endangered Animals of Australia*. Pierson Publishing, Mosman, NSW, Australia:240 pp.

Hoser, R. T. 1993. *Smuggled: The Underground Trade in Australia's Wildlife*. Apollo, Mosman, NSW, Australia. 160 pp.

Hoser, R. T. 1996. *Smuggled-2: Wildlife trafficking, crime and corruption in Australia*. Kotabi Publishing, Doncaster, Victoria, Australia:280 pp.

Hoser, R. T. 2019a. 11 new species, 4 new subspecies and a subgenus of Australian Dragon Lizard in the genus *Tympanocryptis* Peters, 1863, with a warning on the conservation status and long-term survival prospects of some newly named taxa. *Australasian Journal of Herpetology* 39:23-52.

Hoser, R. T. 2019b. Richard Shine *et al.* (1987), Hinrich Kaiser *et al.* (2013), Jane Melville *et al.* (2018 and 2019): Australian Agamids and how rule breakers, liars, thieves, taxonomic vandals and law breaking copyright infringers are causing reptile species to become extinct. *Australasian Journal of Herpetology* 39:53-63.

Iredale, T. and Troughton, E. L. G. 1934. A check-list of the mammals recorded from Australia. *Australian Museum Memoir* 6:1-122. [4 May 1934].

Jackson, S. M. 2008. Natural History of Potoroos and Bettongs: Reproduction, Biology, Diet, and Conservation. *Journal of Mammalian Evolution* 15(3):203-204.

Johnson, P. M. 2003. *Kangaroos of Queensland*. Queensland Museum, Brisbane, Queensland, Australia.

Johnston, P. G. 1973. Variation in island and Mainland Populations of *Potorous tridactylus* and *Macropus rufogriseus* (Marsupialia). Ph.D. Thesis. University of New South Wales, Sydney, Australia.

Johnston, P. G. and Sharman, G. B. 1976. Studies on populations of *Potorous* Desmarest (Marsupialia) I. Morphological variation. *Aust. J. Zool.* 24:573-588.

Johnston, P. G. and Sharman, G. B. 1977. Studies on populations of *Potorous* Desmarest (Marsupialia) II. Electrophoretic, chromosomal and breeding studies. *Aust. J. Zool.* 25:733-748.

Johnston, P. G., Davey, R. J. and Seebeck, J. H. 1984. Chromosome homologies in *Potorous tridactylus* and *P. longipes* (Marsupialia: Macropodidae) based on G-banding patterns. *Aust. J. Zool.* 32:319-324.

Kerr, R. 1792. *The Animal Kingdom, or Zoological System, of the celebrated Sir Charles Linnæus; being a translation of that part of the Systema Naturae, as lately published, with great improvements, By Professor Gmelin of Goettingen. - Together with numerous additions from more recent zoological writers, and illustrated with copperplates.* A. Strahan and T. Cadell, London and W. Creech, Edinburgh, (Feb) 1792: [i]-xii, [1]-644.

Kitchener, D. J. 1973. Notes on home range and movement in two small macropods, the Potoroo (*Potorous apicalis*) and the Quokka (*Setonix brachyurus*). *Mammalia* 37:231-240.

Lawlor, T. E. 1979. *Handbook to the Orders and Families of Living Mammals.* Mad River Press, Inc. Eureka, California, USA.

Linné, C. Archer, J., Gmelin, J. F. and Kerr, R. 1792. *The animal kingdom, or zoological system, of the celebrated Sir Charles Linnaeus. containing a complete systematic description, arrangement, and nomenclature, of all the known species and varieties of the mammalia, or animals which give suck to their young.* 1. Printed for A. Strahan, and T. Cadell, London and W. Creech, Edinburgh.

Long, K. I. 2001. Spatio-temporal interactions among male and female long-nosed potoroos, *Potorous tridactylus* (Marsupialia: Macropodoidea): Mating system implications. *Aust. J. Zool.* 49:17-26.

Mahoney, J. A. 1964. The taxonomic status of *Dasyurus affinis* McCoy [1865] (Dasyuridae) and *Hypsiprymnus trisulcatus* McCoy [1865] (Macropodidae), two marsupials from a Holocene cave deposit near Gisborne, Victoria. *Proceedings of the Royal Society of Victoria* 77:252-533.

Mason, R. J. 1997. Habitat use and population size of the long-nosed potoroo, *Potorous tridactylus* (Marsupialia: Potoroidae) in a coastal reserve, north-eastern New South Wales. *Aust. Mammal.* 20:35-42.

Matschie, P. 1916. Die Verbreitung der Beuteltiere auf NeuGuinea mit einigen Bemerkungen über ihre Einteilung in Untergattungen. *Mitt Zool. Mus. Berl*. 8:259-308.

Maxwell, S., Burbidge, A. A. and Morris, K. 1996. *The 1996 Action Plan for Australian Marsupials and Monotremes.* Australasian Marsupial and Monotreme Specialist Group, IUCN Species Survival Commission, Gland, Switzerland.

McCoy, F. 1865. Note: Geological survey of Victoria, quarter sheet.

McDowell, M. C. and Medlin, G. C. 2010. Natural Resource Management implications of the pre-European non-volant mammal fauna of the southern tip of Eyre Peninsula, South Australia. *Australian Mammalogy*. 32(2):87.

Menkhorst, P. 2001. *A Field Guide to the Mammals of Australia*. Oxford University Press.

Meredith, R. W., Westerman, M. and Springer, M. S. 2008. A phylogeny and timescale for the living genera of kangaroos and kin (Macropodiformes: Marsupialia) based on nuclear DNA sequences. *Aust. J. Zool.* 56:395-410.

Mitchell, P. C. 1908. The secretary on additions to the menagerie. *Proceedings of the Zoological Society of London.* 78(4):783-786.

Nguyen, V. P., Needham, A. D. and Friend, J. S. 2005. A quantitative dietary study of the critically endangered Gilbert's potoroo, *Potorous gilbertii. Australian Mammalogy.* 27:1-6.

Norton, M. A., French, K. O. and Claridge, A. W. 2010a. Habitat associations of the long-nosed potoroo (*Potorous tridactylus*) at multiple spatial scales. *Australian Journal of Zoology*, 58(5):303-316.

Norton, M. A., Claridge, A. W., French, K. and Prentice, A. 2010b. Population biology of the long-nosed potoroo (*Potorous tridactylus*) in the Southern Highlands of New South Wales. *Aust. J. Zool.* 58:362-368.

Potter, S., Eldridge, M. D. B., Taggart, D. A. and Cooper, S. J. B. 2012a. Multiple biogeographic barriers identified across the monsoon tropics of northern Australia: phylogeographic analysis of the *brachyotis* group of rock-wallabies. *Molecular Ecology* 21:2254-2269.

Potter, S., Cooper, S. J. B., Metcalfe, C. J., Taggart, D. A., and Eldridge, M. D. B. 2012b. Phylogenetic relationships within *Petrogale* (Marsupialia: Macropodidae) and their biogeographic history within Australia. *Molecular Phylogenetics and Evolution* 62: 640-652.

Potter, S., Eldridge, M. D. B., Cooper, S. J. B., Paplinska, J. Z. and Taggart, D. A. 2012c. Habitat connectivity, more than species' biology, influences genetic differentiation in a habitat specialist, the short-eared rock-wallaby (*Petrogale brachyotis*). *Conservation Genetics* 13:937-952.

Potter, S., Close, R. L., Taggart, D. A., Cooper, S. J. B. and Eldridge, M. D. B. 2014. Taxonomy of rock-wallabies, *Petrogale* (Marsupialia: Macropodidae). IV. Multifaceted study of the *brachyotis* group identifies additional taxa. *Australian Journal of Zoology*, 2014, 62, 401-414.

Ride, W. D. L. 1970. *A Guide to the Native Mammals of Australia.* Oxford University Press.

Ride, W. D. L. (*ed.*) *et al.* (on behalf of the International Commission on Zoological Nomenclature) 1999. *International code of Zoological Nomenclature*. The Natural History Museum - Cromwell Road, London SW7 5BD, UK.

Rounsevell, D. E., Taylor, R. J. and Hocking, G. J. 1991. Distribution records of native terrestrial mammals in Tasmania. *Aust. Wildl. Res*. 18:699-717.

Saunders, S. 2019. Morrison and Shorten's Big Australia: The overpopulation problem. News article published 17 April 2019 and downloaded from:

https://independentaustralia.net/politics/politics-display/morrison-and-shortens-big-australia-the-overpopulation-problem,12584

Seebeck, J. H. 1981. *Potorous tridactylus* (Kerr) (Marsupialia: Macropodidae) its distribution, status and habitat preferences in Victoria, Australia. *Aust. Wildl. Res*. 8:285-306.

Seebeck, J. H. and Johnston, P. G., 1980. *Potorous longipes* (Marsupialia: Macropodidae); a new species from eastern Victoria. *Aust. J. Zool.* 28:119-134.

Shaw, G. 1800. *General zoology, or systematic natural history.* London, 1(2).

Short, J. 1998. The extinction of rat-kangaroos (Marsupialia: Potoroidae) in New South Wales, Australia. *Biol. Conserv.* 86:365-377.

Shortridge, G. C. 1910. An account of the geographical distribution of the marsupials and monotremes of southwest Australia, having special reference to the specimens collected during the Balston Expedition of 1904-1907. *Proceedings of the Zoological Society of London*. Academic Press, [1909]: 803-848.

Sinclair, E. A. and Westerman, M. 1997. Phylogenetic relationships within the Genus *Potorous* (Marsupialia: Potoroidae) based on allozyme electrophoresis and sequence analysis of the Cytochrome b Gene. *Journal of Mammalian Evolution*. 4(3):147-161.

Sinclair, E. A., Danks, A., Wayne, A. F. 1996. Rediscovery of Gilbert's Potoroo, *Potorous tridactylus*, in Western Australia. *Australian Mammalogy*. 19(1):69-72.

Sinclair, E. A., Murch, A. R., Di Renzo, M. and Palermo, M. 2000. Chromosome morphology in Gilbert's potoroo, *Potorous gilbertii* (Marsupialia: Potoroidae). *Aust. J. Zool.* 48:281-287.

Sinclair, E. A., Costello, B., Courtenay, J. M. and Crandall, K. A. 2002. Detecting a genetic bottleneck in Gilbert's Potoroo (*Potorous gilbertii*) (Marsupialia: Potoroidae), inferred from microsatellite and mitochondrial DNA sequence data. *Conserv. Genet.* 3:191-196.

Spencer, P. B. S. 1991. Evidence of predation by a feral cat, *Felis catus* (Carnivora: Felidae) on an isolated rock-wallaby colony in tropical Queensland. *Australian Mammalogy* 14:143-144.

Stead-Richardson, E., Bradshaw, D., Friend, T. and Fletcher, T. 2010. Monitoring reproduction in the critically endangered marsupial, Gilbert's potoroo (*Potorous gilbertii*): preliminary analysis of faecal oestradiol-17beta, cortisol and progestagens. *General and Comparative Endocrinology*.165(1):155-62.

Strahan, R. (ed.) 1988. *The Australian Museum Complete book of Australian Mammals / The National Photographic Index of Australian Wildlife*. Angus and Robertson, North Ryde, NSW, Australia:530 pp.

Tate, G. H. H. 1948. Studies on the anatomy and phylogeny of the Macropodidae (Marsupialia). *Bulletin of the American Museum of Natural History* 91(2).

Thomas, O. 1888. *Catalogue of the Marsupialia and Monotremata in the Collection of the British Museum* (Natural History). British Museum, London, UK:xiii+401 pp+28 pl.

Thomas, O. 1909. Two new mammals from N. Australia. *Ann. Mag. Nat. Hist.* 8(4):197-198.

Vaughan, R. J., Vitali, S. D., Eden, P. A., Payne, K. L., Warren, K. S., Forshaw, D., Friend, J. A., Horwitz, A. M., Main, C., Krockenberger, M. B. and Malik, R. 2007. Cryptococcosis in Gilbert's and long-nosed potoroo. *Journal of Zoo and Wildlife Medicine* 38(4):567-573.

Vaughan, R. J. 2008. Health and disease status of Australia's most critically endangered mammal the Gilbert's potoroo (*Potorous gilbertii*) (phd). PhD thesis, Veterinary Science Division of Conservation Medicine. Murdoch University:379 pp.

Vaughan, T. A. 1986. *Mammalogy*, 3rd Edition. Harcourt Brace Jovanovich College Publishers. New York, USA.

Vaughan-Higgins, R. Buller, N., Friend, J. A., Robertson, I., Monaghan, C. L., Fenwick, S. and Warren, K. 2011. *Balanoposthitis*, *Dyspareunia*, and *Treponema* in the Critically Endangered Gilbert's Potoroo (*Potorous gilbertii*). *Journal of Wildlife Diseases* 47(4):1019-1025.

Vernes, K. and Jarman, P. 2014. Long-nosed potoroo (*Potorous tridactylus*) behaviour and handling times when foraging for buried truffles. *Australian Mammalogy*, 36(1):128.

Westerman, M., Loke, S. and Springer, M. S. 2004. Molecular phylogenetic relationships of two extinct potoroid marsupials, *Potorous platyops* and *Caloprymnus campestris* (Potoroinae: Marsupialia). *Mol. Phylogenet. Evol.* 31:476-485.

Westerman, M., Meredith, R. W. and Springer, M. S. 2010. Cytogenetics meets phylogenetics: a review of karyotype evolution in diprotodontian marsupials. *J. Hered.* 101:690-702.

White, J. and Stone, S. 1790. *Journal of a voyage to New South Wales: with sixty-five plates of nondescript animals, birds, lizards, serpents, curious cones of trees and other natural productions*. Printed for J. Debrett.

Zaczek, Z. 2019. Former PM Kevin Rudd says Australia should drastically increase its population to 50 MILLION to make sure nation can defend itself in the face of threats from China. *Daily Mail* (Australia) (27 November), published online at: https://www.dailymail.co.uk/news/article-7729689/Kevin-Rudd-says-Australia-increase-population-50-MILLION-defend-China.html

CONFLICTS OF INTEREST

None.

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A new subspecies of Yellow-bellied Glider (Marsupialia: Petauridae) from far north Queensland, Australia.

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ABSTRACT

The taxonomy of the east Australian Yellow-bellied Glider *Petaurus australis* Shaw, 1791 has been confused, conflicting and subject to change over the past 200 years.

Several type specimens have been formally described. The nominate form is from New South Wales as are at least three other types, all formally synonymised by Bannister *et al.* (1988).

The putative subspecies *Petaurus australis reginae* Thomas, 1923 was found by Brown *et al.* (2006) to be genetically similar to the nominate form and so has been treated as synonymous ever since.

However Brown *et al.* (2006) also showed that the putative *P. australis* from the wet tropics of far north Queensland, separated from southern populations by the Biogeographic barrier of the Burdekin Gap, are sufficiently divergent both genetically and morphologically to be treated as a subspecies. This view has been agreed by others (Anonymous 2008, Department of the Environment and Resource Management 2011, 2017) and yet the taxon has until now been unnamed.

This paper corrects this situation and formally names the subspecies *P. australis adelynhoserae subsp. nov.*. With an extant population estimated at just 6,000 individuals (Anonymous 2008) and significant ongoing threats causing a long-term decline in the taxon, it is critically important that a sound conservation and captive-breeding program be commenced.

Keywords: Mammals; Marsupial; Petauridae; taxonomy; nomenclature; possum; yellow-bellied glider; wet tropics; Queensland; Australia; *Petaurus*; *australis*; new subspecies; *adelynhoserae.*

INTRODUCTION

The Yellow-bellied Glider *Petaurus australis* Shaw, 1791, an inhabitant of wet sclerophyll forests of eastern Australia, is a gliding possum with grey-brown or black fur on the upper body and a distinctive off-white to yellow or orange belly. It has a fluffy tail growing to 48 cm long and large, bare ears. Its head and body grows to 30 cm long and can weigh up to 700 g (Cronin, 1991; Strahan, 2008).

The taxonomy of *Petaurus australis* Shaw, 1791 has been confused, conflicting and subject to change over the past 200 years.

Several type specimens have been formally described. The nominate form is from New South Wales as are at least three other types, all formally synonymised by Bannister *et al.* (1988).

Some authors including for example Strahan (1988) mistakenly assigned the north Queensland population of *Petaurus australis* to the subspecies *Petaurus australis reginae* Thomas, 1923.

However that putative subspecies was in fact described from a type specimen from Gin Gin in south-east Queensland. Brown *et al.* (2006) were aware of this fact and subjected this form from south-east Queensland and the type form of *P. australis* from New South Wales to a rigorous molecular analysis.

The putative subspecies *Petaurus australis reginae* Thomas, 1923 was found by Brown *et al.* (2006) to be genetically similar to the nominate form and so has been treated as synonymous ever since.

However Brown *et al.* (2006) also showed that the putative *P. australis* from the wet tropics of far north Queensland, separated from southern populations by the Burdekin Gap, are sufficiently divergent both genetically and morphologically to be treated as a subspecies.

This view has been agreed by others (Anonymous 2008, Department of the Environment and Resource Management 2011, 2017) and yet the taxon has until now been unnamed.

This paper corrects this situation and formally names the subspecies *P. australis adelynhoserae subsp. nov.*.

With an extant population estimated at just 6,000 individuals (Anonymous 2008) and significant ongoing threats causing a long-term decline in the taxon, including an ever expanding Australian human population (Hoser, 1991), it is critically important that a sound conservation and captive-breeding program be commenced.

Hoser (1991) at page 222 also detailed further steps required to save the putative species *P. australis* across its range.

MATERIALS, METHODS AND RESULTS

Before a decision is made to name any new candidate taxon, reasonable steps must be taken to ensure that it is justified on all relevant grounds, including that it is morphologically, genetically and reproductively isolated from their nearest relative and to a sufficient degree to be of taxonomic significance.

A further relevant question to ask is, should the reproductively isolated and morphologically divergent entities be labelled as subspecies, full species, or potentially higher level again.

Key literature relevant to the taxonomic and nomenclatural conclusions within this paper include

Anonymous (2008), Bannister *et al.* (1988), Brown *et al.* (2004, 2006), Bryant and Krosch (2016), Collins (1973), Craig (1985), Goldingay (1990), Goldingay and Kavanagh (1992), Groves *et al.* (2005), Hedges (2006), Hoser (1991), Iredale and Troughton (1934), Lawlor (1979), Maxwell *et al.* (1996), Menkhorst (2001), Ride (1970), Russell (1980), Strahan (1998), Tate (1952), Thomas (1888, 1922, 1923), Vaughan (1986), Winter (1997, 2004), Winter *et al.* (1979) and sources cited therein (duplicitous references not necessarily included).

Live and dead specimens as well as available bone specimens, were examined as was other relevant material, including past climate data for the relevant regions, sea level depths, and other potentially useful information.

In summary, as inferred already, the genetic, geological, historical and morphological evidence clearly showed that the north Queensland population of *P. australis* warrants recognition as a subspecies in accordance with the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

For the record, Brown *et al.* (2006) wrote: “Taking into account other behavioural and ecological data, and the disjunct distribution of NQ populations from southern populations, we propose that the NQ population represents a distinct Evolutionarily Significant Unit, a lineage showing highly restricted gene flow from the rest of the species.”

INFORMATION RELEVANT TO THE FORMAL DESCRIPTION THAT FOLLOWS

There is no conflict of interest in terms of this paper or the conclusions arrived at herein.

Several people including anonymous peer reviewers who revised the manuscript prior to publication are also thanked as are relevant staff at museums who made specimens and records available in line with international obligations.

In terms of the following formal description, spelling should not be altered in any way for any purpose unless expressly and exclusively called for by the rules governing Zoological Nomenclature as administered by the International Commission of Zoological Nomenclature.

Material downloaded from the internet and cited anywhere in this paper as being sourced online was downloaded and checked most recently as of 10 February 2020 (including if also viewed prior), unless otherwise stated and was accurate in terms of the content (as described) cited herein as of that date.

Unless otherwise stated explicitly, colour and other descriptions apply to living adult specimens of generally good health and not under any form of stress by means such as excessive cool, heat, dehydration or abnormal skin reaction to chemical or other input.

Colour descriptions of species refer to fur colour (pelage) and not skin.

While numerous texts and references were consulted prior to publication of this paper, the criteria used to separate the relevant species or subspecies has already been spelt out and/ or is done so within each formal description and does not rely on material within publications not explicitly cited herein.

In terms of conservation of the population of the relevant subspecies as described below, the comments in Hoser (1991 and 2019a, 2019b) apply.

Wildlife laws as currently enforced in Australia are not in any materially significant way enhancing the long-term survival prospects of any of the relevant subspecies and are being vastly outweighed by other negative impacts of governments.

This includes the Australian National and Queensland State governments ongoing commitment to growing the human population to a level that can only put further unsustainable pressure on the survival prospects of the relevant subspecies.

If the Australian government persists with its “Big Australia Policy”, (see for example Saunders 2019 or Zaczek 2019), that being a long-term aim to increase the human population in Australia to over 100 million people by year 2150 (from the present 25 million as of 2019), all sorts of unforseen threats to the survival of this subspecies will almost certainly emerge.

PETAURUS AUSTRALIS ADELYNHOSERAE SUBSP. NOV.

LSIDurn:lsid:zoobank.org:act:2BA93A74-FB83-4AA6-A464-90A64F7980F8

Holotype: A preserved male specimen at Queensland Museum, Brisbane, Queensland, Australia, specimen number JM8746 collected from Nichaga Creek, Queensland, Australia, Latitude -17.82 S., Longitude 145.56 E. This government-owned facility allows access to its holdings.

Paratypes: Two preserved specimens at the Queensland Museum, Brisbane, Queensland, Australia, specimen number JM8747 (a male) collected from Nichaga Creek, Queensland, Australia, Latitude -17.82 S., Longitude 145.56 E. and specimen number JM8503 (a female) collected from the Nichaga Creek Catchment, Queensland, Australia, Latitude -17.83 S., Longitude 145.55 E.

Diagnosis: *Petaurus australis adelynhoserae subsp. nov.* has until now been treated (taxonomically at least) as a northern population of either *P. australis australis* Shaw, 1791 or alternatively the subspecies *P. australis reginae* Thomas, 1923, (type locality of Gin Gin, south-east Queensland), now also treated as a junior synonym of *P. australis australis*.

Petaurus australis adelynhoserae subsp. nov. from the wet tropics region of Northern Queensland, north of the Burdekin Gap (Townsville area) is the taxon erroneously previously labelled *P. australis reginae* by Strachan (1988) and as an undescribed form by others including (Anonymous 2008, Department of the Environment and Resource Management 2011, 2017).

Contrary to the statement on page 312 of Brown *et al.* (2016), the subspecies *Petaurus australis adelynhoserae subsp. nov.* is readily separated from nominate *P. australis australis* by being lighter in pelage, not darker as stated by Brown *et al.* (2016).

Petaurus australis adelynhoserae subsp. nov. is separated from *P. australis australis* by having a medium to dark brown pelage on the upper surfaces, versus blackish in *P. australis australis. Petaurus australis adelynhoserae subsp. nov.* is further separated from *P. australis australis* by having ill-defined darker fur on the cheeks, versus well defined in *P. australis australis.* The upper fur of the anterior of the tail in *Petaurus australis adelynhoserae subsp. nov.* is brownish in colour, versus black in *P. australis australis*, or occasionally black with a very slight brown tinge only.

Brown *et al.* (2006) at p. 312 describing *P. australis adelynhoserae sp. nov.* as “The NQ gliders” separated the two subspecies as follows:

> “The NQ gliders are smaller, as measured by weight (NQ

> males: mean 516 g (s.d. = 7.7 g, n = 17); NQ females: 479.4 g (s.d. = 7.8 g, n = 14) (Goldingay *et al.* 2001); Vic. males: 555.5 g (s.d. = 13.5 g, n = 11); Vic. females, 508.1 g (s.d. = 8.1 g, n = 9 (M. Brown and S. M. Carthew, unpublished data)), … There also appear to be sociobehavioural and life-history differences between the NQ gliders and the southern forms.
>
> The NQ gliders have been reported to have a polygynous mating system (Russell 1984; although see Goldingay *et al.* 2001), whilst the southern populations are predominantly monogamous (Henry and Craig 1984; Craig 1985; Goldingay and Kavanagh 1990; Goldingay 1992; M. Brown, S. M. Carthew and S.J.B. Cooper, unpublished data). NQ gliders also appear to spend longer in the pouch (100 days versus <80 days) (Russell 1983; M. Brown and S. M. Carthew, unpublished data)."

Strahan (1988) noted:

> "In southern Australia, about two species of eucalypts are used as food trees but only one. Red Mahogany, in Northern Queensland."

Strahan (1988) also noted that Red Mahogany *Eucalyptus resinifera* Smith, 1790 (White 1790) is also heavily logged, putting the subspecies at increased survival risk.

Hoser (1991), on page 222 discusses conservation and survival threats to both subspecies further.

Images of *Petarus australis adelynhoserae subsp. nov.* in life can be found online at:
https://www.flickr.com/photos/euprepiosaur/35400425184/
and
https://www.flickr.com/photos/euprepiosaur/7463524210

and
https://www.abc.net.au/news/2017-04-12/yellow-bellied-gliders-feeding-on-tree-sap/8433310/
and

https://environment.des.qld.gov.au/wildlife/threatened-species/vulnerable/yellow-bellied-glider

Images of the nominate form of *Petarus australis* from New South Wales, south east Queensland and Victoria can be found online at:

https://www.flickr.com/photos/kookr/4230042958/

and
https://www.flickr.com/photos/jono-dashper/44058260494/

and
https://www.flickr.com/photos/jameswhitephoto/47102618202/
and
https://www.flickr.com/photos/23031163@N03/35447081774/

(all the preceding images of both subspecies were last downloaded on 10 February 2020).

Petarus australis (of both subspecies) are separated from all other gliders in the genus *Petaurus* and other morphologically similar species by the following unique suite of characters:

Size is large, being to 715 mm total length; lower leg more than 80 mm; tail more than 400 mm.

Underside of heel thickly hairy. Posterior side of hips and legs broadly fringed with black. Belly is a deep orange.

In terms of cranial characters, *P. australis* is separated from all other species in the genus by having a large skull with; basal length of more than 46 mm. Molars 1-3 are more than 7.3 mm long. Bullae are large, the posterior projecting lower than the anterior part.

Thomas (1888) at pages 152-153 gives a more detailed description of *P. australis*, applicable to both subspecies.

Distribution: Restricted to the wet tropics bioregion of Australia from Mount Spec, north of Townsville, north Queensland in the south, along the coastal rainforests, generally at high elevation running north to the Mount Windsor Tableland in the north.

Etymology: Named in honour of my eldest daughter Adelyn Hoser, who glides like this subspecies of possum. She does this as she does jumps on a snowboard at places like Whistler in Canada, Hakuba in Japan and also the Australian ski resorts of Thredbo, Mount Buller and Mount Hotham.

REFERENCES CITED

Anonymous 2008. Approved Conservation Advice (s266B of the Environment Protection and Biodiversity Conservation Act 1999) Approved Conservation Advice for *Petaurus australis* unnamed *subsp.* (Fluffy Glider). Minister / Delegate of the Minister for Environment, Government of Australia, Canberra, ACT, Australia (3 July):3 pp. online at:

http://www.environment.gov.au/biodiversity/threatened/species/pubs/66668-conservation-advice.pdf

(last downloaded on 10 February 2020).

Bannister, J. L., Calaby, J. H., Dawson, L. J., Ling, J. K., Mahoney, J. A., McKay, G. M., Richardson, B. J., Ride, W. D. L. and Walton, D. M. 1988. *Zoological Catalogue of Australia, Volume 5, Mammals*. Australian Government Publishing Service, Canberra, ACT, Australia:X+274 pp.

Brown, M., Kendal, T. A., Cooksley, H., Saint, K. M., Taylor, A. C., Carthew, S. M. and Cooper, S. J. B. (2004). Polymorphic microsatellite markers for the gliding marsupials *Petaurus australis* and *Petaurus breviceps. Molecular Ecology Notes* 4:704-706.

Brown, M,, Cooksley, H., Carthew, S. M. and Cooper, S. J. B. 2006, Conservation units and phylogeographic structure of an arboreal marsupial, the yellow-bellied Glider (*Petaurus australis*). *Australian Journal of Zoology* 54:305-317.

Bryant, L. M. and Krosch, M. N. 2016. Lines in the land: a review of evidence for eastern Australia's major biogeographical barriers to closed forest taxa. *Biological Journal of the Linnean Society*, 2016:27 pp. (online, downloaded most recently on 10 February 2020).

Collins, L. R. 1973. *Monotremes and Marsupials*. Smithsonian Institution Press. City of Washington, DC, USA.

Craig, S. A. 1985. Social organization, reproduction and feeding behaviour of a population of yellow-bellied gliders, *Petaurus australis* (Marsupialia: Petauridae). *Australian Wildlife Research* 12:1-18.

Department of the Environment and Resource Management 2011. *National recovery plan for the yellow-bellied glider (Wet Tropics)* Petaurus australis *unnamed subspecies*. Report to Department of Sustainability, Environment, Water, Population and Communities, Canberra, ACT, Australia.

Department of the Environment and Resource Management 2017. *Yellow-bellied glider (Wet Tropics) Petaurus australis unnamed subspecies in Species Profile and Threats Database*. Department of the Environment, Canberra, ACT, Australia.

Goldingay, R. L. 1992. Socioecology of the yellow-bellied glider (*Petaurus australis*) in a coastal forest. *Australian Journal of Zoology* 40:267-278.

Goldingay, R. L. and Kavanagh, R. P. 1990. Socioecology of the yellow-bellied glider (*Petaurus australis*) at Waratah Creek, New South Wales. *Australian Journal of Zoology* 38:327-341.

Groves, C. P., Wilson, D. E. and Reeder, D. M. (eds.) 2005. *Mammal Species of the World: A Taxonomic and Geographic Reference* (3rd ed.). Johns Hopkins University Press, Baltimore, USA.

Hedges, A. 2006. *Biennial Yellow-Bellied Glider (*Petaurus australis reginae*) Census, Daintree National Park: 2005 Results and an Overview of the Census since 1997*. A report for the Queensland Parks and Wildlife Service (QPWS), Mossman, Queensland, Australia, March 2006.

Hoser, R. T. 1991. *Endangered Animals of Australia*. Pierson Publishing, Mosman, NSW, Australia:240 pp.

Hoser, R. T. 2019a. 11 new species, 4 new subspecies and a subgenus of Australian Dragon Lizard in the genus

Tympanocryptis Peters, 1863, with a warning on the conservation status and long-term survival prospects of some newly named taxa. *Australasian Journal of Herpetology* 39:23-52.

Hoser, R. T. 2019b. Richard Shine *et al*. (1987), Hinrich Kaiser *et al*. (2013), Jane Melville *et al*. (2018 and 2019): Australian Agamids and how rule breakers, liars, thieves, taxonomic vandals and law breaking copyright infringers are causing reptile species to become extinct. *Australasian Journal of Herpetology* 39:53-63.

Iredale, T. and Troughton, E. L. G. 1934. A check-list of the mammals recorded from Australia. *Australian Museum Memoirs* 6:1-122. [4 May 1934].

Lawlor, T. E. 1979. *Handbook to the Orders and Families of Living Mammals*. Mad River Press, Inc. Eureka, California, USA.

Maxwell, S., Burbidge, A. A. and Morris, K. 1996. *The 1996 Action Plan for Australian Marsupials and Monotremes.* Australasian Marsupial and Monotreme Specialist Group, IUCN Species Survival Commission, Gland, Switzerland.

Menkhorst, P. 2001. *A Field Guide to the Mammals of Australia*. Oxford University Press.

Ride, W. D. L. 1970. *A Guide to the Native Mammals of Australia.* Oxford University Press.

Ride, W. D. L. (*ed.*) *et al.* (on behalf of the International Commission on Zoological Nomenclature) 1999. *International code of Zoological Nomenclature*. The Natural History Museum - Cromwell Road, London SW7 5BD, UK.

Russell, R. 1980. *Spotlight on possums*. University of Queensland Press, Brisbane, Queensland, Australia.

Saunders, S. 2019. Morrison and Shorten's Big Australia: The overpopulation problem. News article published 17 April 2019 at:

https://independentaustralia.net/politics/politics-display/morrison-and-shortens-big-australia-the-overpopulation-problem,12584

(last downloaded on 10 February 2020).

Strahan, R. (ed.) 1988. *The Australian Museum Complete book of Australian Mammals / The National Photographic Index of Australian Wildlife*. Angus and Robertson, North Ryde, NSW, Australia: 530 pp.

Tate, G. H. H. 1952. Mammals of Cape York Peninsula, with notes on the occurrence of rain forest in Queensland. *Bulletin of the American Museum of Natural History* 98:567-616.

Thomas, O. 1888. *Catalogue of the Marsupialia and Monotremata in the Collection of the British Museum* (Natural History). British Museum, London, UK:xiii+401 pp+28 pl.

Thomas, O. 1922. A selection of lectotypes of the typical Australian marsupials in the British Museum Collection. *Ann. Mag. Nat. Hist.* 9(10):127-128.

Thomas, O. 1923. On some Queensland Phalangeridae. *Ann. Mag. Nat. Hist*. 9(11):246-250.

Vaughan, T. A. 1986. *Mammalogy*, 3rd Edition. Harcourt Brace Jovanovich College Publishers. New York, USA.

White, J. 1790. *Journal of a voyage to New South Wales : with sixty-five plates of non descript animals, birds, lizards, serpents, curious cones of trees and other natural productions.* J. Debrett, London, UK.

Winter, J. W. 1997. *Distribution of the Yellow-Bellied Glider* Petaurus australis *and Two Other Sympatric Petaurid Gliders in the Wet Tropics Region of Queensland.* A Report to the Wet Tropics Management Authority, April 1997.

Winter, J. W. 2004, Forest mammals of northern Queensland: is their conservation status improving?, pp. 435-4451 in: Lunney, D. (Ed.), *Conservation of Australia's Forest Fauna* (second edition): Royal Zoological Society of New South Wales, Mosman, Australia.

Winter, J. W., Russell, R. A. W. and Winter, E. M. 1979. A sighting of the yellow-bellied glider (*Petaurus australis*) in north-eastern Queensland. *North Queensland Naturalist* 45:2-4.

Zaczek, Z. 2019. Former PM Kevin Rudd says Australia should drastically increase its population to 50 MILLION to make sure nation can defend itself in the face of threats from China. *Daily Mail* (Australia) (27 November), published online at: https://www.dailymail.co.uk/news/article-7729689/Kevin-Rudd-says-Australia-increase-population-50-MILLION-defend-China.html

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None.

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LSID urn:lsid:zoobank.org:author:F9D74EB5-CFB5-49A0-8C7C-9F993B8504AE

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ABSTRACT

Numerous studies have been conducted into the phylogeny of Australia's Rock Wallaby species within the widespread genus *Petrogale* Gray, 1837.

In spite of these studies, well-known forms remain unnamed and therefore potentially under the radar of State and Federal wildlife conservation authorities, increasing their potential risk of decline or extinction.
To rectify this situation, and in accordance with the rules of the *International Code of Zoological Nomenclature*, two highly divergent forms are formally named herein as species and two other populations as subspecies.

Formally named for the first time are *Petrogale martinekae sp. nov*. from the west Kimberley in Western Australia, previously regarded as a southern population of the distinctive species known as the Warabi, *P. burbidgei* Kitchener and Sanson, 1978.

Also formally named is *Petrogale hoserae sp. nov*. from the southern edge of the Gulf of Carpentaria, until now treated as a divergent population of the Eastern Short-eared Rock Wallaby *P. wilkinsi* Thomas, 1926.

Two genetically and morphologically distinct east Kimberley populations of the Short-eared rock-wallaby *P. brachyotis* (Gould, 1841) are formally named as subspecies, being *P. brachyotis pentecostensis subsp. nov.* and *P. brachyotis ordensis subsp. nov..*

The formal naming of these taxa now enables wildlife departments to formulate conservation plans for extant populations and reduces the risk of their extinctions arising from them being treated as one and the same as otherwise more widespread and abundant species.

This paper also formally divides the genus into four subgenera based on known divergences of each major species group. Two subgenera are formally named for the first time.

Keywords: Taxonomy; nomenclature; classification; Wallaby; Marsupials; Rock Wallaby; northern Australia; Australia; Western Australia; Northern Territory; Queensland; Macropodidae; *Petrogale*; *burbidgei*; *brachyotis*; *wilkinsi*; *persephone*; *xanthopus*; *celeris*; new subgenus; *Quasipetrogale*; *Ferepetrogale*; new species; *hoserae*; *martinekae*; new subspecies; *pentecostensis*; *ordensis*.

INTRODUCTION

Rock Wallabies of the genus *Petrogale* Gray, 1837 are widespread and common in most parts of Australia.

Numerous studies have been conducted into the phylogeny of *Petrogale* Gray, 1837, including those cited in the materials and methods section of this paper.

In spite of these studies, well-known and previously identified divergent forms remain unnamed and therefore potentially under the radar of State and Federal wildlife conservation authorities, increasing their potential risk of decline or extinction.
To rectify this situation, and in accordance with the rules of the *International Code of Zoological Nomenclature*, the genus was reviewed and as a result two highly divergent forms were identified as potentially unnamed species as were a number of populations divergent at the subspecies level.

As this paper was being prepared, some of these forms were in fact formally named (Eldridge and Potter, 2020), which necessitated removal of two subspecies descriptions from this

paper in the pre-publication process.
Remaining were at least two other putative species and two potential subspecies.
The relevant candidate taxa were examined in terms of their existing classification and also in terms of the published literature, phylogenies, divergences and available names in terms of *the International Code of Zoological Nomenclature* (Ride *et al.* 1999), before the final decision was made to publish this paper.

Formally identified as new taxa worthy of being named and named for the first time are *Petrogale martinekae sp. nov.* from the west Kimberley in Western Australia, formerly regarded as a southern population of the distinctive species known as the Warabi, *P. burbidgei* Kitchener and Sanson, 1978. Also formally named is *Petrogale hoserae sp. nov.* from the southern edge of the Gulf of Carpentaria, until now treated as a divergent population of the Eastern Short-eared Rock Wallaby *P. wilkinsi* Thomas, 1926.

Two genetically and morphologically distinct east Kimberley populations of Short-eared rock-wallaby *P. brachyotis* (Gould, 1841) are formally named as subspecies, being *P. brachyotis pentecostensis subsp. nov.* and *P. brachyotis ordensis subsp. nov.*.

The formal naming of these species now enables wildlife departments to formulate conservation plans for extant populations of these taxa and reduces the risk of their extinctions arising from them being treated as one and the same as otherwise more widespread and abundant species.

At the genus level, *Petrogale* has long been known to consist of three (according to most authors) or four (according to Potter *et al*. 2012) main species groups.

However use of subgeneric classification has been rarely used for these groups within *Petrogale.*
This remains the case, even though Potter *et al*. (2012), showed subgenus-level divergences for four main clusters of species. The name *Peradorcas* Thomas, 1904 with the type species *P. concinna* Gould, 1842, is available for the so-called *P. brachyotis* (Gould, 1841) species group. No names are available for the other two divergent lineages and they are herein formally named for the first time.

MATERIALS, METHODS AND RESULTS

Before a decision is made to name any new taxon, reasonable steps must be taken to ensure that it is justified on all relevant grounds, including that it is morphologically, genetically and reproductively isolated from their nearest relative and to a sufficient degree to be of taxonomic significance.

A further relevant question to ask is should the reproductively isolated and morphologically divergent entities be labelled as subspecies, full species, or potentially higher level again.

Key literature relevant to the taxonomic and nomenclatural conclusions within this paper include Bannister *et al.* (1988), Bee and Close (1993), Browning *et al.* (2001), Bryant and Krosch (2016), Burbidge and Manly (2002), Burbidge and McKenzie (1978, 1989), Collins (1973), Clancy and Close (1997), Eldridge (1997), Eldridge and Close (1992, 1993, 1997), Eldridge and Potter (2020), Eldridge *et al.* (1992a, 1992b, 2001, 2012), Flannery and Archer (1984), Flannery *et al.* (1992), Gibson and McKenzie (2012), Goodfellow (1993), Gould (1841, 1842), Gray (1837), Groves et al. (2005), Hoser (1991), Iredale and Troughton (1934), Kitchener and Sanson (1978), Lawlor (1979), Le Souef (1924), Maynes (1982), Maxwell *et al.* (1996), Menkhorst (2001), *Meredith et al.* (2008), Pearson (2012), Potter *et al.* (2012a, 2012b, 2012c, 2014), Ride (1970), Ride *et al.* (1999), Roache (2011), Sharman *et al.* (1990), Shuker and Durrell (1993), Spencer (1991), Start *et al.* (2012), Strahan (1988), Telfer and Eldridge (2010), Thomas (1888, 1904a, 1904b, 1909, 1922, 1926a, 1926b), Vaughan (1986) and sources cited therein (duplicitous references not necessarily included).

Live and dead specimens as well as available bone specimens, were examined as was other necessary material, including past climate data for the relevant regions, sea level depths, and other relevant information.

In summary, as inferred already, the genetic, geological, historical and morphological evidence clearly showed that there were two obviously unnamed species of Rock Wallaby in the *P. brachyotis* (Gould, 1841) species group.

The south western Kimberley Ranges population of the distinctive species known as the Warabi, *P. burbidgei* Kitchener and Sanson, 1978 was sufficiently divergent from the type form from the Mitchell Plateau to warrant being recognized as a full species. It is herein formally named *Petrogale martinekae sp. nov*. with a known distribution from the Prince Regent River in the north to the Munboon Plateau in the south (the type locality).

A very divergent population of the Eastern Short-eared Rock Wallaby *P. wilkinsi* Thomas, 1926 from the southern shores of the Gulf of Carpentaria was also found to be sufficiently divergent from that taxon with a type locality of the top end of the Northern Territory, to warrant being identified and named as a new species.

It is formally named as *Petrogale hoserae sp. nov.*.

Two genetically and morphologically distinct east Kimberley populations of Short-eared rock-wallaby *P. brachyotis* (Gould, 1841) as identified by Potter *et al.* (2014) are herein formally named as subspecies.

These are *P. brachyotis pentecostensis subsp. nov.* and *P. brachyotis ordensis subsp. nov.* named in reflection of the known centres of distribution for each subspecies.
Potter *et al.* (2014) identified each population as EK1 ESU and EK2 ESU.
Both are potentially threatened due to their relatively limited known distributions and ongoing risk of decline from introduced species such as foxes, cats (in particular) (see Spencer 1991), dogs or direct human intervention in other ways.

Significantly, the four newly named taxa have all diverged across known biogeographical barriers that have resulted in numerous species of reptile being discovered and formally named in recent years, having been separated from their nearest relatives across exactly the same barriers.
Examples can be seen in the new species descriptions within Hoser (2014, 2015, 2016, 2017, 2018a, 2018b, 2018c, 2018d).

As mentioned in the abstract the formal naming of these species now enables wildlife departments to formulate conservation plans for extant populations of these taxa and reduces the risk of their extinctions arising from them being treated as one and the same as otherwise more widespread and abundant species as has previously occurred (see Hoser 2019a, 2019b).

The genus *Petrogale* has long been recognized as consisting four morphologically distinct groups potentially worthy of subgeneric ranking or potentially even genus-level division (Thomas 1909). Perhaps due to the presence of the pre-existing synonym for the second main group of species, no recent publishing authors since Thomas (1904) have utilized subgenus-level classifications for the genus.

The *P. penicillata* (Gray, 1825) group is the type group for the genus and so would be the nominate subgenus if the genus were to be divided.

The name *Peradorcas* Thomas, 1904 is available for the *P. concinna* Gould, 1842 species group, better-known to most people as the *P. brachyotis* (Gould, 1841) species group (see below).
The molecular phylogeny published by Potter *et al.* (2012) at Fig. 5 showed subgenus level divergences within *Petrogale* for four species groups. These were for the two groups mentioned above as well as two other divergent lineages for two other divergent species, namely *P. xanthopus* Gray, 1855 and *P. persophone* Maynes, 1982.
Potter *et al.* (2012) wrote: "Four distinct lineages were identified,

(1) the *brachyotis* group, (2) *Petrogale persephone*, (3) *Petrogale xanthopus* and (4) the *lateralis-penicillata* group."

Therefore this paper also formally divides the genus *Petrogale* into four subgenera based on known divergences of each major species group. Two subgenera are formally named for the first time, namely *Quazipetrogale subgen. nov.* and *Ferepetrogale subgen. nov.*.

Potter *et al.* (2012) showed a divergence of about 8 MYA from other species for each of these subgenus-level groups, which was broadly in line with the marginally more divergent subgenus *Peradorcas.*

INFORMATION RELEVANT TO THE FORMAL DESCRIPTIONS THAT FOLLOW

There is no conflict of interest in terms of this paper or the conclusions arrived at herein.

Several people including anonymous peer reviewers who revised the manuscript prior to publication are also thanked as are relevant staff at museums who made specimens and records available in line with international obligations.

In terms of the following formal descriptions, spellings should not be altered in any way for any purpose unless expressly and exclusively called for by the rules governing Zoological Nomenclature as administered by the International Commission of Zoological Nomenclature.

In the unlikely event two or more newly named taxa are deemed conspecific by a first reviser, then the name to be used and retained is that which first appears in this paper by way of page priority and as listed in the abstract keywords.

Some material in descriptions for taxa may be repeated for other taxa in this paper and this is necessary to ensure each fully complies with the provisions of the *International Code of Zoological Nomenclature* (Fourth edition) (Ride *et al.* 1999) as amended online since.

Material downloaded from the internet and cited anywhere in this paper as being sourced online was downloaded and checked most recently as of 10 March 2020 (including if also viewed prior), unless otherwise stated and was accurate in terms of the content (as described) cited herein as of that date.

Unless otherwise stated explicitly, colour and other descriptions apply to living adult specimens of generally good health and not under any form of stress by means such as excessive cool, heat, dehydration or abnormal skin reaction to chemical or other input. Colour descriptions of species refer to fur, not skin.

While numerous texts and references were consulted prior to publication of this paper, the criteria used to separate the relevant species or subspecies has already been spelt out and/ or is done so within each formal description and does not rely on material within publications not explicitly cited herein.

QUASIPETROGALE SUBGEN. NOV.

LSID urn:lsid:zoobank.org:act:7780E296-D22F-4D39-83E3-73E8CC8C9B25

Type Species: *Petrogale persephone* Maynes, 1982.

Diagnosis: The single species within the subgenus *Quasipetrogale subgen. nov.* is readily separated from all other species (and subgenera within the genus *Petrogale* Gray, 1837) by the following unique combination of characters: ears with brownish-orange hair outside and black internally. White to pale yellowish-white or pale whitish-grey lateral stripe on upper lip, passing below eye to about level of ear with platinum or pearl grey below which arises at the corner of the mouth and passes back to the ear region. Shoulders raw sienna passing to dark brown in axillary region with rest of the dorsal surface light brown, lightly pencilled with white hairs. Chin is white and throat varies from white to off-white, chest and venter light yellow to creamy yellow. Toes of fore and hind limbs and about half of hind feet are black. Recently moulted specimens may be greyish rather than brownish in overall pelage. The species presents as a generally dark animal, made such by the overall colour combined with the black feet and black dorsal surface of the tail.

The tail also terminates in a white to yellowish-white tip 15-20 mm in length (in adults). Head and body length (in adults) is 52-64 cm, tail length (in adults) 60-68 cm and weight (in adults) is 5-8 kg with males on average 60% heavier than females (adapted from Strahan 1988).

The genus *Petrogale* is diagnosed and defined in Thomas (1888) at pages 62-64.

Distribution: Living specimens are known only from a small area in Conway National Park, Dryander National Park, Gloucester Island National Park and around the town of Airlie Beach, all in Whitsunday Shire in Queensland, Australia.

Etymology: *Quasi* means "apparently but not really; seemingly." which fits in line with the similarity of this species and subgenus to the type species in the genus *Petrogale* Gray, 1837.

Content: *Petrogale* (*Quasipetrogale*) *persephone* Maynes, 1982 (monotypic).

FEREPETROGALE SUBGEN. NOV.

LSID urn:lsid:zoobank.org:act:D1643CB0-3FD6-415F-89CD-A5F1129B7838

Type Species: *Petrogale xanthopus* Gray, 1855.

Diagnosis: The two morphologically similar species within the subgenus *Ferepetrogale subgen. nov.* are readily separated from all other species (and subgenera within the genus *Petrogale* Gray, 1837) by the following unique combination of characters: Tail is annulated with brown and pale yellow being the only two species in the genus *Petrogale* with this character. There is a dark nuchal stripe present. Ears are uniform yellow from behind. Skull length (in adults) is more than 9 cm long, the muzzle is broad, its sides and the interorbital region inflated. Greatest breadth of nasals is about one third of their length. There is a rich brown mid-dorsal stripe running from the crown of the head to the centre of the back, a distinct white cheek mark; brick-red patch running narrowly from the upper arm and onto the elbows and forearms, at which stage it effectively encircles the limb and there is also a buffy white side stripe followed by a brown hip stripe (modified from Thomas 1888, Strahan 1988).

Distribution: Found around the Southern Gulfs of South Australia, Bulloo River basin and the Murray/Darling river basin in New South Wales and Queensland, Australia.

Etymology: *Fere*, in Latin means not quite, or almost, hence the name *Ferepetrogale* literally means not quite *Petrogale.*

Content: *Petrogale* (*Ferepetrogale*) *xanthopus* Gray, 1855 (type species); *P.* (*Ferepetrogale*) *celeris* Le Souef, 1924.

PETROGALE (*PERADORCAS*) *HOSERAE SP. NOV.*

LSID urn:lsid:zoobank.org:act:BD1569F2-126A-433F-B912-3FCEE388F73E

Holotype: A preserved specimen at the Australian Museum in Sydney, New South Wales, Australia, specimen number M.38966 collected at Moonlight Gorge, Wollogorang, Northern Territory, Australia, Latitude -17.20 S., Longitude 137.80 E. This government-owned facility allows access to its holdings.

Paratype: A preserved female specimen at the Australian Museum in Sydney, New South Wales, Australia, specimen number M.45290.001 collected at Red Bank Mine, Wollogorang, N.T., Australia, Latitude -17.18 S., Longitude 137.73 E.

Diagnosis: The species *Petrogale hoserae sp. nov.* has until now been treated as a number of other taxa, most notably *P. brachyotis* (Gould, 1841) until the review of the species group by Potter *et al.* (2014).

While finding the lineage herein described as a new species to be divergent from the species *P. wilkinsi* Thomas, 1926 (from the top end of the Northern Territory), Potter *et al.* (2014) placed this taxon and another described form, namely *P. longmani* Thomas, 1926 from Groote Eylandt, Northern into the synonymy of *P. wilkinsi.*

On the basis of morphological, molecular and reproductive divergence, all three of these forms, all occurring in the Northern Territory are herein treated as separate species.

All three species fit within the diagnosis of *P. wilkinsi* as published within Potter *et al.* (2014).

The three species are readily separated from one another and other species in the subgenus *Peradorcas* on the basis of colouration which is as follows:

P. wilkinsi, *P. longmani* and *P. hoserae sp. nov.* are all readily separated from both *P. victoriae* (Eldridge and Potter, 2014) (treated here as a full species as opposed a subspecies of *P. brachyotis* as originally named) and all subspecies of *P. brachyotis* by the following suite of characters:

Dorsal surface is dark grey to grey/brown (*P. wilkinsi*), or silverish-grey in colour (*P. longmani*), or a yellowish-brown colour (*P. hoserae sp. nov.*). In *P. wilkinsi* and *P. longmani* the ventral surfaces are distinctly marked, while in *P. hoserae sp. nov.* they are less so. In *P. wilkinsi* and *P. longmani* the dorsal stripe is a prominent dark brown/black colour, running from forehead to beyond shoulders and slightly less so in *P. hoserae sp. nov.*. Likewise for the distinct white shoulder stripe behind a well developed dark axillary patch, which is present, but slightly less distinct in *P. hoserae sp. nov.*.

Limbs are distinctly and often brightly coloured; from yellow through orange to reddish brown. Face is distinct, being light brown to orangey brown in *P. wilkinsi* and *P. longmani*, while being a dark brown to blackish in *P. hoserae sp. nov.*.

The tail is lighter than the body on the dorsal surface, sides more yellowish. Terminal 1/5 to 1/3 tail is darker; brown to almost black, especially towards the tip.

P. longmani is separated from both *P. wilkinsi* and *P. hoserae sp. nov.* by its overall silvery-grey colour, including a grey shoulder stripe and axillary patch that is black; dorsal stripe being thick and dark, extending to the mid back and enlarged into an irregular dark patch on top of the head.

P. hoserae sp. nov. is separated from both *P. wilkinsi* and *P. longmani* by its distinctively light brown colour dorsally (or alternatively yellow), sometimes with a strong reddish tinge, markings, including ventral ones, are clearly faded and not prominent and the tail and face are also exceptionally dark.

P. brachyotis (all subspecies) and *P. victoriae* (Eldridge and Potter, 2014) (treated here as a full species as opposed a subspecies of *P. brachyotis* as originally named) are separated from all other species in the subgenus *Peradorcas* by the following characters: Back of ears uniform grey or fawn, sometimes tipped with white. No occipital or nuchal streak. Shoulder markings are present.

Frontal outline is convex or straight above the front of the orbit. Nasals are expanded behind.

P. victoriae are readily separated from *P. brachyotis* (all subspecies) by the following suite of characters: yellowish-grey colour dorsally; no side or hip stripes; virtually no ventral markings; limbs are same colour as body, or slightly more yellowish; face is slightly darker than neck and shoulders; the tail is the same colour as the body or lighter, then becoming a darker brown at the terminal third to fifth.

P. martinekae sp. nov. (until now treated as a population of *P. burbidgei*), *P. burbidgei* and *P. concinna* are separated from *P. brachyotis* (all subspecies), *P. victoriae* (Eldridge and Potter, 2014) (treated here as a full species as opposed a subspecies of *P. brachyotis* as originally named), *P. wilkinsi* Thomas, 1926, *P. longmani* Thomas, 1926 and *P. hoserae sp. nov.* by their smaller size, the hind foot being 105 mm long or smaller, versus over 105 mm in the other species.

P. victoriae (Eldridge and Potter, 2014) (treated here as a full species as opposed a subspecies of *P. brachyotis* as originally named) and *P. brachyotis* are separated from all of *P. hoserae sp. nov.*, *P. wilkinsi* and *P. longmani* by having no side stripe or hip stripe, versus a pale one in *P. hoserae sp. nov.*, *P. wilkinsi* and *P. longmani*, a grey (instead of white) shoulder stripe; an indistinct dorsal stripe (versus obvious) and a greyish white venter (instead of white).

Distribution: *P. hoserae sp. nov.* occurs from near Hells Gate, near Nicholson, far north-west Queensland, west along the southern edge of the Gulf of Carpentaria, through the type locality at Wollogorang, Northern Territory, where suitable hilly and rocky habitat occurs, to about Ngukurr, Walmudga Hill, 10km east of Ngukurr (Roper River Mission) and the nearby Sir Edward Pellew Islands.

Etymology: Named in honour of my mother, Katrina Joan Hoser, of Lane Cove, New South Wales, Australia, for services to wildlife conservation spanning more than 50 years.

PETROGALE (*PERADORCAS*) *MARTINEKAE SP. NOV.*

LSID urn:lsid:zoobank.org:act:4E88DBDF-B805-401A-B767-65B1751D1A6A

Holotype: A preserved specimen at the Australian Museum in Sydney, New South Wales, Australia, specimen number M.47136.001, collected from the edge of the Munboon Plateau, Western Australia, Latitude -16.4 S., Longitude 125.1 E. This government-owned facility allows access to its holdings.

Paratype: A preserved specimen at the Western Australian Museum in Perth, Western Australia, Australia, specimen number M54836 collected from the Prince Regent River -15.6 S., Longitude 125.3 E.

Diagnosis: *Petrogale martinekae sp. nov.* has until now been treated as a southern population of a lineage of *P. burbidgei* Kitchener and Sanson, 1978, as defined by those authors. However Potter *et al.* (2014) identified this taxon as being divergent enough to warrant species-level identification and for which no name was available (Bannister *et al.* 1988).

P. martinekae sp. nov. is similar in most respects to *P. burbidgei* and would until now be identified as that taxon. *P. martinekae sp. nov.*. It is however separated from *P. burbidgei* by the following suite of adult characters in life: the inner ears have a distinct light bluish tinge, versus pink in *P. burbidgei*; while both species are brownish in pelage, the outer grey to black peppering is prominent in *P. martinekae sp. nov.* and indistinct in *P. burbidgei.* The upper hind feet are greyish black in *P. martinekae sp. nov.* versus dark brown in *P. burbidgei.* The fur of the centre of the chest in *P. martinekae sp. nov.* is white, versus off-white in *P. burbidgei.* The black line running from the nose to the crown is well-defined in *P. martinekae sp. nov.* versus ill-defined in *P. burbidgei.*

P. martinekae sp. nov. and *P. burbidgei* are morphologically similar to *P. concinna* Gould, 1842, but both are readily separated from that taxon (all subspecies) by having obviously shorter ears, being less than 35 mm long, versus greater than 35 mm in *P. concinna.* Type *P. brachyotis* (Gould, 1841) have a well-defined dark brown neck stripe to about the level of the shoulder, as does the east Kimberley lineage herein named *P. brachyotis pentecostensis subsp. nov.*. This is either indistinct or only prominent on the elbow region in *P. martinekae sp. nov.* and *P. burbidgei.* The taxon *P. brachyotis ordensis subsp. nov.* is separated from *P. martinekae sp. nov.* and *P. burbidgei* by having well-defined face markings versus indistinct in *P. martinekae sp. nov.* and *P. burbidgei.*

P. martinekae sp. nov., *P. burbidgei* and *P. concinna* are separated from *P. brachyotis* (all subspecies), *P. victoriae* (Eldridge and Potter, 2014) (treated here as a full species as opposed a subspecies of *P. brachyotis* as originally named), *P. wilkinsi* Thomas, 1926, *P. longmani* Thomas, 1926 and *P. hoserae sp. nov.* by their smaller size, the hind foot being 105 mm long or smaller, versus over 105 mm in the other species.

P. martinekae sp. nov. can be seen in life in images at:

https://www.flickr.com/photos/12742129@N07/49114207146/

and

https://www.flickr.com/photos/12742129@N07/49114420862/

and

https://www.flickr.com/photos/12742129@N07/49114387852/

P. burbidgei Kitchener and Sanson, 1978 can be seen in life in

images at:
https://www.flickr.com/photos/126002448@N02/21199638021/
and
https://www.flickr.com/photos/88708273@N03/48945453017/
and
https://www.flickr.com/photos/reptileshots/14533826956/
and
https://www.flickr.com/photos/reptileshots/14584554932/
and
https://www.flickr.com/photos/88708273@N03/48944717823/

Distribution: *P. martinekae sp. nov.* is known only from the region running from the Prince Regent River to the Munboon Plateau in the west Kimberley district of Western Australia.

P. burbidgei Kitchener and Sanson, 1978 is found from the Prince Regent River north to the Mitchell Plateau, including some offshore islands.

Etymology: Named in honour of Maryann Martinek, in 2020 of Bendigo, Australia, in recognition of her services to wildlife conservation globally. For more detail refer to Hoser (2010).

PETROGALE (*PERADORCAS*) *BRACHYOTIS PENTECOSTENSIS SUBSP. NOV.*

LSID urn:lsid:zoobank.org:act:2DB42ACD-F0E3-453F-AFD4-ACC526A97859

Holotype: A preserved female specimen at the Australian Museum in Sydney, New South Wales, Australia, specimen number M.45275.003 collected at El Questro Station, Pentecost River, Kimberley District, Western Australia, Australia, Latitude -16.03 S., Longitude 127.98 S.

This government owned facility allows access to its holdings.

Paratypes: Five preserved specimens at the Australian Museum in Sydney, New South Wales, Australia, specimen numbers M.45274.004, M.45272.003, M.45271.002, M.45273.002 and M.45274.004 collected from at or immediately adjacent to (within 10 km) the type locality given above.

Diagnosis: Until now the subspecies *Petrogale brachyotis pentecostensis subsp. nov.* has been treated as an easterly population of nominate *P. brachyotis* (Gould, 1841), although I note Eldridge and Potter (2014) found subspecies level mtDNA divergence for this population as compared to another population east of this one, being east of the Ord River and herein named as *P. brachyotis ordensis subsp. nov.* and the nominate *P. brachyotis* from the north-west Kimberley district.

All three can be readily separated on the basis of colouration.

Nominate *P. brachyotis brachyotis* is separated from *P. brachyotis pentecostensis subsp. nov.* and *P. brachyotis ordensis subsp. nov.* by the following characters: having a reddish-brown dorsal colour, very well defined side markings, distinctively orangeish hind limbs, generally dark greyish head and orangish grey inner ears.

P. brachyotis pentecostensis subsp. nov. is separated from *P. brachyotis brachyotis* and *P. brachyotis ordensis subsp. nov.* by the following characters: having a greyish dorsum with limited amounts of orange or russet dusting on the hind limbs, moderately well defined side markings, a face that is no darker than the body with ill defined and light, darker markings on the snout (versus dark and well defined in the other two subspecies) and a brownish head and brown inner ears.

P. brachyotis ordensis subsp. nov. is separated from *P. brachyotis pentecostensis subsp. nov.* and *P. brachyotis brachyotis* by the following characters: having a light greyish dorsum, flecked with either yellow or orangeish, with brown, rather than orange on the hind limbs, ill defined side markings (versus well defined in *P. brachyotis pentecostensis subsp. nov.* and *P. brachyotis*), a generally greyish-beige head, being dark at tip of snout and between snout and eye and lighter elsewhere and a greyish-purple inner ear.

P. brachyotis (all subspecies) and *P. victoriae* (Eldridge and Potter, 2014) (treated here as a full species as opposed a subspecies of *P. brachyotis* as originally named) are separated from all other species in the subgenus *Peradorcas* by the following characters: Back of ears uniform grey or fawn, sometimes tipped with white. No occipital or nuchal streak. Shoulder markings are present.

Frontal outline is convex or straight above the front of the orbit. Nasals are expanded behind,

P. victoriae are readily separated from *P. brachyotis* (all subspecies) by the following suite of characters: yellowish-grey colour dorsally; no side or hip stripes; virtually no ventral markings; limbs are same colour as body, or slightly more yellowish; face is slightly darker than neck and shoulders; the tail is the same colour as the body or lighter, then becoming a darker brown at the terminal third to fifth.

Images of nominate *Petrogale brachyotis brachyotis* in life can be found online at:
https://www.flickr.com/photos/123952930@N04/44125908541/
and
https://www.flickr.com/photos/ailognom/39807952372/
and
https://www.flickr.com/photos/ailognom/39807959912/

An image of *P. brachyotis pentecostensis subsp. nov.* in life can be seen at:
https://splashingpaint.files.wordpress.com/2019/06/p_wa9335x.jpg

Images of *P. brachyotis ordensis subsp. nov*. in life can be seen at:
https://www.flickr.com/photos/58349528@N02/44492360964/
and
https://www.flickr.com/photos/58349528@N02/45163729682/
and
https://www.flickr.com/photos/58349528@N02/44302861675/

Distribution: *P. brachyotis pentecostensis subsp. nov.* is known only from the immediate vicinity of the type locality as well as the Ord basin (known from Monsmont Island in Lake Argyle) and assumed to occupy only this general region and slightly west of there to the Durack River.

Etymology: Named after the type locality, the Pentecost River.

PETROGALE (*PERADORCAS*) *BRACHYOTIS ORDENSIS SUBSP. NOV.*

LSID urn:lsid:zoobank.org:act:64577A73-8436-493E-85D3-40D87F1FD1B6

Holotype: A preserved specimen at the Western Australian Museum Mammal Collection, Perth, Western Australia, Australia, specimen number M19865 collected from Point Spring, Western Australia, Australia, Latitude -15.41 S., Longitude 128.89 E. This government owned facility allows access to its holdings.

Paratype: A preserved specimen at the Western Australian Museum Mammal Collection, Perth, Western Australia, Australia, specimen number M24401 collected from Ninbing Bore, WA, Australia, Latitude -15.41 S., Longitude 128.40 E.

Diagnosis: Until now the subspecies *Petrogale brachyotis pentecostensis subsp. nov.* has been treated as an easterly population of nominate *P. brachyotis* (Gould, 1841), although I note Eldridge and Potter (2014) found subspecies level mtDNA divergence for this population as compared to another population east of this one, being east of the Ord River and herein named as *P. brachyotis ordensis subsp. nov.* and the nominate *P. brachyotis* from the north-west Kimberley district.

All three can be readily separated on the basis of colouration.

Nominate *P. brachyotis brachyotis* is separated from *P. brachyotis pentecostensis subsp. nov.* and *P. brachyotis ordensis subsp. nov.* by the following characters: having a reddish-brown dorsal colour, very well defined side markings, distinctively orangeish hind limbs, generally dark greyish head and orangish grey inner ears.

P. brachyotis pentecostensis subsp. nov. is separated from *P. brachyotis brachyotis* and *P. brachyotis ordensis subsp. nov.* by the following characters: having a greyish dorsum with limited amounts of orange or russet dusting on the hind limbs, moderately well defined side markings, a face that is no darker than the body with ill defined and light, darker markings on the snout (versus dark and well defined in the other two subspecies) and a brownish head and brown inner ears.

P. brachyotis ordensis subsp. nov. is separated from *P. brachyotis pentecostensis subsp. nov.* and *P. brachyotis brachyotis* by the following characters: having a light greyish dorsum, flecked with either yellow or orangeish, with brown, rather than orange on the hind limbs, ill defined side markings (versus well defined in *P. brachyotis pentecostensis subsp. nov.* and *P. brachyotis*), a generally greyish-beige head, being dark at tip of snout and between snout and eye and lighter elsewhere and a greyish-purple inner ear.

P. brachyotis (all subspecies) and *P. victoriae* (Eldridge and Potter, 2014) (treated here as a full species as opposed a subspecies of *P. brachyotis* as originally named) are separated from all other species in the subgenus *Peradorcas* by the following characters: Back of ears uniform grey or fawn, sometimes tipped with white. No occipital or nuchal streak. Shoulder markings are present.

Frontal outline is convex or straight above the front of the orbit. Nasals are expanded behind.

P. victoriae are readily separated from *P. brachyotis* (all subspecies) by the following suite of characters: yellowish-grey colour dorsally; no side or hip stripes; virtually no ventral markings; limbs are same colour as body, or slightly more yellowish; face is slightly darker than neck and shoulders; the tail is the same colour as the body or lighter, then becoming a darker brown at the terminal third to fifth.

Images of nominate *Petrogale brachyotis brachyotis* in life can be found online at:

https://www.flickr.com/photos/123952930@N04/44125908541/

and

https://www.flickr.com/photos/ailognom/39807952372/

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https://splashingpaint.files.wordpress.com/2019/06/p_wa9335x.jpg

Images of *P. brachyotis ordensis subsp. nov*. in life can be seen at:

https://www.flickr.com/photos/58349528@N02/44492360964/

and

https://www.flickr.com/photos/58349528@N02/45163729682/

and

https://www.flickr.com/photos/58349528@N02/44302861675/

Distribution: *Petrogale brachyotis ordensis subsp. nov.* is known only from the region between the lower Ord River, Western Australia and the Bullo River in the Northern Territory.

Etymology: Named in reflection of the region the subspecies occurs and is most commonly seen, being the lower Ord River area in Western Australia, as in near Kununurra.

CONSERVATION STATUS AND LONG TERM SURVIVAL PROSPECTS OF EACH DESCRIBED TAXON ABOVE

In terms of conservation of each population of each species or subspecies as described above, the comments in Hoser (1991, 1993, 1996, 2019a and 2019b) apply.

None of the above taxa are regarded as under immediate risk of extinction, as best as such a judgement can be made in the world of 2020.

Wildlife laws as currently enforced in Australia are not in any materially significant way enhancing the long-term survival prospects of any of the relevant species and in any event are being vastly outweighed by other negative impacts of governments, including their ongoing commitment to growing the human population to a level that can only put further pressure on the survival prospects of the relevant taxa

If the Australian government persists with its “Big Australia Policy”, (see for example Saunders 2019 or Zaczek 2019), that being a long-term aim to increase the human population in Australia to over 100 million people by year 2150 (from the present 25 million as of 2019), all sorts of unforseen threats to the survival of these species will almost certainly emerge.

REFERENCES CITED

Bannister, J. L., Calaby, J. H., Dawson, L. J., Ling, J. K., Mahoney, J. A., McKay, G. M., Richardson, B. J., Ride, W. D. L. and Walton, D. M. 1988. *Zoological Catalogue of Australia, Volume 5, Mammals*. Australian Government Publishing Service, Canberra, ACT, Australia:X+274 pp.

Bee, C. A. and Close, R. L. 1993. Mitochondrial DNA analysis of introgression between adjacent taxa of rock-wallabies, *Petrogale* species. *Genetical Research* 61:21-37.

Browning, T. L., Taggart, D. A., Rummery, C., Close, R. L. and Eldridge, M. D. B. 2001. Multifaceted genetic analysis of the critically endangered brush-tailed rock-wallaby *Petrogale penicillata* in Victoria, Australia: implications for management. *Conservation Genetics* 2:145-156.

Bryant, L. M. and Krosch, M. N. 2016. Lines in the land: a review of evidence for eastern Australia’s major biogeographical barriers to closed forest taxa. *Biological Journal of the Linnean Society*, 2016:27 pp. (online, downloaded most recently on 10 March 2020).

Burbidge, A. A. and Manly, B. F.J. 2002. Mammal extinctions on Australian islands: causes and conservation implications. *Journal of Biogeography* 29:465-474.

Burbidge, A. A. and McKenzie, N. 1978. The islands of the North-west Kimberley Western Australia. *Wildlife Research Bulletin of Western Australia* 7:1-47.

Burbidge, A. A. and McKenzie, N. L. 1989. Patterns in the modern decline of Western Australia’s vertebrate fauna: causes and conservation implications. *Biological Conservation* 50:143-198.

Collins, L. R. 1973. *Monotremes and Marsupials*. Smithsonian Institution Press. City of Washington, DC, USA.

Clancy, T. F. and Close, R. L. 1997. The Queensland Rock-wallabies - An overview of their conservation status, threats and management. *Australian Mammalogy* 19:169-173.

Eldridge, M. D. B. 1997. Taxonomy of rock wallabies *Petrogale* (Marsupialia: Macropodidae). II. An historical review. *Australian Mammalogy* 19:113-122.

Eldridge, M. D. B. and Close, R. L. 1992. Taxonomy of rock wallabies, *Petrogale* (Marsupialia: Macropodidae). I. Revision of the eastern *Petrogale* with the description of three new species. *Australian Journal of Zoology* 40:605-624.

Eldridge, M. D. B. and Close, R. L. 1993. Radiation of chromosome shuffles. *Current Opinion in Genetics and Development* 3:915-922.

Eldridge, M. D. B. and Close, R. L. 1997. Chromosomes and evolution in rock-wallabies, *Petrogale* (Marsupialia: Macropodidae). *Australian Mammalogy* 19:123-135.

Eldridge, M. D. B. and Potter, S. 2020. Taxonomy of rock-wallabies, *Petrogale* (Marsupialia: Macropodidae). V. A description of two new subspecies of the black-footed rock-wallaby (*Petrogale lateralis*). *Australian Journal of Zoology* 67(1):19-26.

Eldridge, M. D. B., Johnston, P. G. and Close, R. L. 1992a.

Chromosomal rearrangements in rock wallabies *Petrogale* (Marsupialia: Macropodidae) VI. Determination of the plesiomorphic karyotype for *Petrogale*. G-banding comparison of *Thylogale* with *P. persephone*, *P. xanthopus* and *P. l. lateralis. Cytogenetics and Cell Genetics* 61:29-33.

Eldridge, M. D. B., Johnston, P. G. and Lowry, P. S. 1992b. Chromosomal rearrangements in rock wallabies, *Petrogale* (Marsupialia: Macropodidae). VII. G-banding analysis of *Petrogale brachyotis* and *P. concinna*: species with dramatically altered karyotypes. *Cytogenetics and Cell Genetics* 61:34-39.

Eldridge, M. D. B., Wilson, A. C. C., Metcalfe, C. J., Dollin, A. E., Bell, J. N., Johnson, P. M.,

Johnston, P. G. and Close, R. L. 2001. Taxonomy of rock-wallabies, *Petrogale* (Marsupialia: Macropodidae). III. Molecular data confirms the species status of the purple-necked rock-wallaby (*Petrogale purpureicollis* Le Souef). *Australian Journal of Zoology* 49:323-343.

Eldridge, M. D. B., Potter, S. and Cooper, S. J. B. 2012. Biogeographic barriers in north-western Australia: an overview and standardization of nomenclature. *Australian Journal of Zoology* 59:270-272.

Flannery, T. F. and Archer, M. 1984. The macropodoids (Marsupialia) of the early Pliocene Bow Local Fauna, central eastern New South Wales. *Aust. Zool.* 21:357-383.

Flannery, T. F., Rich, T. H., Turnbull, W. D. and Lundelius Jr., E. L. 1992. The Macropodoidea (Marsupialia) of the early Pliocene Hamilton Local Fauna, Victoria. Australia. *Field. Geol.* 25:1-37.

Gibson, L. A. and McKenzie, N. L. 2012. Occurrence of non-volant mammals on islands along the Kimberley coast of Western Australia. pp. 15-39. in: Gibson, L. A., Yates, S. and Doughty, P. (eds), *Biodiversity values on selected Kimberley islands, Australia.* Western Australian Museum Records Supplement No. 81. Western Australian Museum, Perth, Western Australia, Australia.

Goodfellow, D. 1993. *Fauna of Kakadu and the Top End.* Wakefield Press.

Gould, J. 1841. On two new species of kangaroos (*Macropus manicatus* and *M. brachyotis*) from Swan River. *Proceedings of the Zoological Society of London* 1840:127-128.

Gould, J. 1842. On two new species of kangaroo (*Petrogale concinna* and *Halmaturus* Binoe). *Proceedings of the Zoological Society of London* 1842:57.

Gray, J. E. 1837. Description of some new or little known Mammalia, principally in the British Museum Collection. *The Magazine of Natural History*, n. s. 1:577-587.

Groves, C. P., Wilson, D. E. and Reeder, D. M. (eds.) 2005. *Mammal Species of the World: A Taxonomic and Geographic Reference* (3rd ed.). Johns Hopkins University Press, Baltimore, USA.

Hoser, R. T. 1991. *Endangered Animals of Australia.* Pierson Publishing, Mosman, NSW, Australia:240 pp.

Hoser, R. T. 1993. *Smuggled: The Underground Trade in Australia's Wildlife.* Apollo, Mosman, NSW, Australia. 160 pp.

Hoser, R. T. 1996. *Smuggled-2: Wildlife trafficking, crime and corruption in Australia.* Kotabi Publishing, Doncaster, Victoria, Australia:280 pp.

Hoser, R. T. 2010. Sam the scam: Sam the Koala is an imposter. *Australasian Journal of Herpetology* 8:1-64.

Hoser, R. T. 2014. The break up of *Odatria* (*Kimberleyvaranus*) *glebopalma* (Mitchell, 1955) into three obvious subspecies. *Australasian Journal of Herpetology* 24:16-19.

Hoser, R. T. 2015. Australian agamids: Eighteen new species from the genera *Amphibolurus* Wagler, 1830, *Lophognathus* Gray, 1842, *Rankinia* Wells and Wellington, 1984, *Diporiphora* Gray, 1842, *Tympanocryptis* Peters, 1863, as well as three new genera and six new subgenera. *Australasian Journal of Herpetology* 30:37-64.

Hoser, R. T. 2016. *Carphodactylidae* reviewed: Four new genera, four new subgenera, nine new species and four new subspecies within the Australian gecko family (Squamata: Sauria). *Australasian Journal of Herpetology* 32:3-25.

Hoser, R. T. 2017. A further break-up of the Australian gecko genus *Oedura* Gray, 1842

sensu lato as currently recognized, from four to seven genera, with two new subgenera defined, description of fourteen new species, four new subspecies and formalising of one tribe and five subtribes. *Australasian Journal of Herpetology* 34:3-35.

Hoser, R. T. 2018a. Six new species of Dwarf Goanna, *Worrellisaurus* Wells and Wellington, 1984 from Australia. *Australasian Journal of Herpetology* 37:24-37.

Hoser, R. T. 2018b. A new species within the *Odatria glauerti* (Squamata: Varanidae) species complex. *Australasian Journal of Herpetology* 37:44-45.

Hoser, R. T. 2018c. The description of a fourth subspecies of *Odatria* (*Kimberleyvaranus*) *glebopalma* (Mitchell, 1955) (Reptilia: Squamata: Varanidae). *Australasian Journal of Herpetology* 37:46-47.

Hoser, R. T. 2018d. A divided *Gehyra* makes sense! Assigning available and new names to recognize all major species groups within *Gehyra* Gray, 1834 *sensu lato* (Squamata: Gekkonidae) and the formal description of nine new species. *Australasian Journal of Herpetology* 37:48-64.

Hoser, R. T. 2019a. 11 new species, 4 new subspecies and a subgenus of Australian Dragon Lizard in the genus *Tympanocryptis* Peters, 1863, with a warning on the conservation status and long-term survival prospects of some newly named taxa. *Australasian Journal of Herpetology* 39:23-52.

Hoser, R. T. 2019b. Richard Shine *et al.* (1987), Hinrich Kaiser *et al.* (2013), Jane Melville *et al.* (2018 and 2019): Australian Agamids and how rule breakers, liars, thieves, taxonomic vandals and law breaking copyright infringers are causing reptile species to become extinct. *Australasian Journal of Herpetology* 39:53-63.

Iredale, T. and Troughton, E. L. G. 1934. A check-list of the mammals recorded from Australia. *Australian Museum Memoir* 6:1-122. [4 May 1934].

Kitchener, D. J. and Sanson, G. 1978. *Petrogale burbidgei* (Marsupialia, Macropodidae), a new rock wallaby from the Kimberley, Western Australia. *Records of the Western Australian Museum* 6:269-285.

Lawlor, T. E. 1979. *Handbook to the Orders and Families of Living Mammals.* Mad River Press, Inc. Eureka, California, USA.

Le Souef, A. S. 1924. Notes on some rock wallabies, genus *Petrogale*, with descriptions of two new species. *Australian Zoologist* 3:272-276.

Maynes, G. M. 1982. A new species of rock wallaby, *Petrogale persephone* (Marsupialia: Macropodidae), from Proserpine, central Queensland. *Australian Mammalogy* 5:47-58.

Maxwell, S., Burbidge, A. A. and Morris, K. 1996. *The 1996 Action Plan for Australian Marsupials and Monotremes.* Australasian Marsupial and Monotreme Specialist Group, IUCN Species Survival Commission, Gland, Switzerland.

Menkhorst, P. 2001. *A Field Guide to the Mammals of Australia.* Oxford University Press.

Meredith, R. W., Westerman, M. and Springer, M. S. 2008. A phylogeny and timescale for the living genera of kangaroos and kin (Macropodiformes: Marsupialia) based on nuclear DNA sequences. *Aust. J. Zool.* 56:395-410.

Pearson, D. 2012. *Recovery plan for five species of rock wallabies: Black-footed rock wallaby (*Petrogale lateralis*) Short-eared rock wallaby (*Petrogale brachyotis*), Monjon (*Petrogale burbidgei*), Nabarlek (*Petrogale concinna*), Rothschild rock wallaby (*Petrogale rothschildi*).* Wildlife Management Program

No. 55. Department of Environment and Conservation, Perth, Western Australia, Australia.

Potter, S., Eldridge, M. D. B., Taggart, D. A., and Cooper, S. J. B. 2012a. Multiple biogeographic barriers identified across the monsoon tropics of northern Australia: phylogeographic analysis of the *brachyotis* group of rock-wallabies. *Molecular Ecology* 21:2254-2269.

Potter, S., Cooper, S. J. B., Metcalfe, C. J., Taggart, D. A., and Eldridge, M. D. B. 2012b. Phylogenetic relationships within *Petrogale* (Marsupialia: Macropodidae) and their biogeographic history within Australia. *Molecular Phylogenetics and Evolution* 62: 640-652.

Potter, S., Eldridge, M. D. B., Cooper, S. J. B., Paplinska, J. Z. and Taggart, D. A. 2012c. Habitat connectivity, more than species' biology, influences genetic differentiation in a habitat specialist, the short-eared rock-wallaby (*Petrogale brachyotis*). *Conservation Genetics* 13:937-952.

Potter, S., Close, R. L., Taggart, D. A., Cooper, S. J. B. and Eldridge, M. D. B. 2014. Taxonomy of rock-wallabies, *Petrogale* (Marsupialia: Macropodidae). IV. Multifaceted study of the *brachyotis* group identifies additional taxa. *Australian Journal of Zoology*, 2014, 62, 401-414.

Ride, W. D. L. 1970. *A Guide to the Native Mammals of Australia.* Oxford University Press.

Ride, W. D. L. (*ed.*) *et al.* (on behalf of the International Commission on Zoological Nomenclature) 1999. *International code of Zoological Nomenclature.* The Natural History Museum - Cromwell Road, London SW7 5BD, UK (also commonly cited as "The Rules", "Zoological Rules" or "ICZN 1999").

Roache, M. 2011. *The action plan for threatened Australian macropods.* WWF-Australia, Sydney, Australia.

Saunders, S. 2019. Morrison and Shorten's Big Australia: The overpopulation problem. News article published 17 April 2019 and downloaded from:

https://independentaustralia.net/politics/politics-display/morrison-and-shortens-big-australia-the-overpopulation-problem,12584

Sharman, G. B., Close, R. L. and Maynes, G. M. 1990. Chromosome evolution, phylogeny and speciation of rock wallabies (*Petrogale*: Macropodidae). *Australian Journal of Zoology* 37:351-363.

Shuker, K. and Durrell, G. 1993. *Lost Ark: New and Rediscovered Animals of the Twentieth Century.* Harper Collins Publishers, New York, USA.

Spencer, P. B. S. 1991. Evidence of predation by a feral cat, *Felis catus* (Carnivora: Felidae) on an isolated rock-wallaby colony in tropical Queensland. *Australian Mammalogy* 14:143-144.

Start, A. N., Burbidge, A. A., McDowell, M. C. and McKenzie, N. L. 2012. The status of non-volant mammals along a rainfall gradient in the south-west Kimberley, Western Australia. *Australian Mammalogy* 34:36-48.

Strahan, R. (ed.) 1988. *The Australian Museum Complete book of Australian Mammals / The National Photographic Index of Australian Wildlife.* Angus and Robertson, North Ryde, NSW, Australia:530 pp.

Telfer, W. R. and Eldridge, M. D. B. 2010. High levels of mitochondrial DNA divergence within short-eared rock-wallaby (*Petrogale brachyotis*) populations in northern Australia. *Australian Journal of Zoology* 58:104-112.

Thomas, O. 1888. *Catalogue of the Marsupialia and Monotremata in the Collection of the British Museum* (Natural History). British Museum, London, UK:xiii+401 pp+28 pl.

Thomas, O. 1904a. On a collection of mammals made by Mr J. T. Tunney in Arnhemland, Northern Territory of South Australia. *Novitates Zoologicae* 11:222-229.

Thomas, O. 1904b. On a new rock-wallaby from north-west Australia. *Novitates Zoologicae* 11:365-366.

Thomas, O. 1909. Two new mammals from N. Australia. *Ann. Mag. Nat. Hist.* 8(4):197-198.

Thomas, O. 1922. A selection of lectotypes of the typical Australian marsupials in the British Museum Collection. *Ann. Mag. Nat. Hist.* 9(10):127-128.

Thomas, O. 1926a. Two new rock-wallabies (*Petrogale*) discovered by Capt. G. W. Wilkins in Northern Australia. *Annals & Magazine of Natural History* 9(17):184-186.

Thomas, O. 1926b. On rock-wallabies of the *Petrogale penicillata-assimilis* group. *Annals & Magazine of Natural History* (9)17: 628-629.

Vaughan, T. A. 1986. *Mammalogy*, 3rd Edition. Harcourt Brace Jovanovich College Publishers. New York, USA.

Zaczek, Z. 2019. Former PM Kevin Rudd says Australia should drastically increase its population to 50 MILLION to make sure nation can defend itself in the face of threats from China. *Daily Mail* (Australia) (27 November), published online at: https://www.dailymail.co.uk/news/article-7729689/Kevin-Rudd-says-Australia-increase-population-50-MILLION-defend-China.html

CONFLICTS OF INTEREST

None.

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An overdue refinement of the taxonomy of the Australian Ring Tailed Dragons, Genus *Ctenophorus* Fitzinger, 1843, Subgenus *Tachyon* Wells and Wellington, 1985, including the formal descriptions of eight new species.

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ABSTRACT

The Australian Ring-tailed Dragons of the Genus *Ctenophorus* Fitzinger, 1843, Subgenus *Tachyon* Wells and Wellington, 1985 as defined by Hoser in 2015, have been generally neglected in their taxonomy since the publication of Wells and Wellington (1985).

Those authors formally divided the species *Grammatophora caudicincta* Günther, 1875 six ways in line with the earlier subspecies divisions of Storr (1967) and placed all into their newly created genus *Tachyon*.

This arrangement was vehemently opposed by a group of pseudo-scientists known as the Wolfgang Wüster gang for reasons of personal animosity rather than science. Furthermore due to the ruthless and improper methods of the group (as demonstrated in a war-cry document called Kaiser et *al.* 2013), they have effectively forced other publishing herpetologists to refuse to accept the Wells and Wellington taxonomy and nomenclature in the three and half decades since the 1985 paper of Wells and Wellington.

In spite of lies, deception and so-called smoke and mirrors as practiced by the Wolfgang Wüster gang, science progresses and in line with this, Melville *et al.* (2016) not only broadly validated the much lampooned taxonomy and nomenclature of Wells and Wellington (1985), but furthermore wholly validated the taxonomy of Hoser in 2015.

Melville *et al.* (2016) also provided sound evidence of the presence of at least seven more unnamed species in the complex, all diverged from nearest ancestors in the Pliocene Epoch (at least 2.5 MYA) mirroring the morphological evidence of Storr (1967).

This paper in effect combines the results of Storr (1967) with Melville *et al.* (2016) with the added benefit of inspection of live specimens from the seven relevant populations and all previously named forms to formally describe and name eight new species in accordance with the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

The eighth named species is separated from others by a biogeographical barrier of known antiquity.

Each is estimated to have diverged from their nearest common ancestor at least 2.5 million years prior and as they are ecologically and distributionally separated, are clearly separate species by any currently used definition.

The first ever proper diagnosis of the expanded subgenus *Tachyon* Wells and Wellington, 1985 was published by Hoser in 2015. It has stood the test of time and is repeated in this paper.

Keywords: Taxonomy; nomenclature; lizards; dragons; Agamidae; *Ctenophorus*; *Tachyon*; *Grammatophora*; *Amphibolurus*; Western Australia; Queensland; Northern Territory; Australia; Ring-tailed dragon; *caudicinctus*; *caudicincta*; *yinnietharra*; *graafi*; *imbricatus*; *infans*; *macropus*; *mensarum*; *slateri*; new species; *adelynhoserae*; *jackyhoserae*; *katrinahoserae*; *lenhoseri*; *maxinehoserae*; *ronhoseri*; *sharonhoserae*; *shireenhoserae*.

INTRODUCTION

As part of an ongoing audit of Australia's reptiles and frogs, the lizards within the putative genus *Tachyon* Wells and Wellington, 1985, (herein treated as a subgenus), better known as the Australian Ring Tailed Dragons were examined with a view to confirming the taxonomy and nomenclature of relevant species or subspecies as being correct, or in the alternative being altered to reflect the biological reality.

Tachyon was originally erected as a genus by Wells and Wellington (1985), but the molecular evidence of Pyron *et al.* (2013) suggested that a more accurate placement of the relevant species was as a subgenus within the better-known *Ctenophorus* Fitzinger, 1843.

Hoser (2015g) was the first publishing herpetologist since Wells and Wellington (1985) to utilize the genus name *Tachyon*, but in line with the results of Pyron *et al.* (2013) relegated the genus to a subgenus, within the genus *Ctenophorus.* The genus was also expanded to include two closely related species, namely *C. yinnietharra* (Storr, 1981) and *C. ornatus* (Gray, 1845).

Hoser (2015g) treated all other previously named forms of the three putative species as subspecies, all within *C. caudicincta* (Günther, 1875) pending the publication of this paper.

Specimens of all relevant species or subspecies (named and until now unnamed) were examined both live in the wild and via museum collections and their records, including all State and Territory Museums on mainland Australia. Furthermore photos and data with accurate locality data was also assessed, as was all relevant previously published scientific literature and the so-called grey literature in the form of popular mass-market books, internet sites, blogs, photo-sharing sites and the like.

Two papers of key relevance to the relevant taxa were those of Storr (1967), which had a detailed morphological analysis of most relevant species and/or subspecies, as well as a more recent paper of Melville *et al.* (2016), which inspected the same putative taxa at the molecular level, including the species originally described as *Grammatophora ornata* Gray, 1854, which clearly fell within the broader species grouping and the putative genus *Tachyon* Wells and Wellington, 1985 as defined by Hoser (2015g).

I note that Melville *et al.* (2016) failed to inspect the relevant species *C. yinneatharra* Storr, 1981, although it's position in their published phylogeny could be easily inferred as being closest to their clade labelled as "*C. ornatus".* They also failed to inspect specimens from the Mount Isa area or south of there, even though they form a separate biogeographically isolated population, apart from those they inspected.

The combined evidence of these papers alone gave rise to a well-founded belief that there were at least seven unnamed forms at the species level.

Relevant specimens were examined and confirmed that each of these forms warranted recognition at the species level, which is the main basis for publishing this paper. That is to formally name and make available names for the seven species-level taxa, and the other eighth species-level taxon not inspected by either Melville *et al.* (2016) or Storr (1967), all being named in accordance with the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

MATERIALS, METHODS AND RESULTS

These are inferred in both the abstract and introduction and self evident in the descriptions that follow.

An audit of relevant species of Australian Ring-tailed Dragons of the subgenus *Tachyon* Wells and Wellington, 1985 *sensu lato* as defined by Hoser (2015g) confirmed the generic level assignment of species and validity of the relevant named forms as identified by Wells and Wellington (1985) as placed by Hoser (2015g) and/or in line with it, as well as the species originally described as *Grammatophora ornata* Gray, 1854, which is clearly a part of the species complex (= same subgenus) and *C. yinneatharra* (Storr, 1981), as previously allocated by Hoser (2015g).

Specimens of all relevant species (named and until now unnamed) were examined both live in the wild and via museum collections and/or their records, including all State and Territory Museums on mainland Australia. Furthermore photos and data with accurate locality data was also assessed, as was all relevant previously published scientific literature and the so-called grey literature in the form of popular mass-market books, internet sites, blogs, photo-sharing sites and the like.

The final results of this audit found that within the so-called *Grammatophora caudicincta* Günther, 1875 complex, there were eight recognized species, these being those six cited by Wells and Wellington (1985) on page 20 at top, as well as the species originally described as *Grammatophora ornata* Gray, 1854, and also the species originally described as *Amphibolurus yinneatharra* Storr, 1981, both of which Wells and Wellington (1985) placed in the genus *Ctenophorus* Fitzinger, 1843 (type species *Grammatophora decresii* Duméril and Bibron, 1837).

There were also eight more forms within the subgenus *Tachyon* worthy of species-level recognition based on molecular divergence, morphological differences and geographical disjunction caused by well-established biogeographical barriers of significant and known antiquity.

In summary the relevant unnamed species are as follows:

1/ The species *Ctenophorus macropus* (Storr, 1967) of northern Australia was found to comprise five geographically separated species. Each was restricted to relevant rock formations (mountain ranges and outliers) and separated from one another by relatively flat intervening areas, which happen to be well-known biogeographical barriers of known antiquity.
Type *C. macropus* is the form from Arnhem Land in the Northern Territory, while two populations in the Kimberley Ranges of Western Australia, one from the Gulf of Carpentaria and one from the Selwyn Ranges, north-west Queensland (around Mount Isa and south of there) were unnamed. These are formally described herein.

2/ The species *C. slateri* (Storr, 1967) is clearly composite, with the nominate form from Central Australia and the northern population is unnamed and so it is formally described herein as a new species.

3/ Nominate *C. caudicincta* (Günther, 1875) including as identified by Melville *et al.* (2016) with a distribution centred on the Pilbara region of Western Australia was shown by them to consist of two allopatric species and the previously unnamed south-east Pilbara form is formally described herein.

4/ The morphologically distinct and genetically divergent population of putative *Grammatophora ornata* Gray, 1854 (herein placed within the subgenus *Tachyon*) from the north-west part of the range of the putative species distribution is herein described as a new species as is another divergent form from the inland parts of the south-east of Western Australia (the Goldfields region).
Gray's holotype specimen, lacks specific locality data.

But based on the original written descriptions of Gray and Boulenger (1885) it is clearly of the form from near Perth, Western Australia and so it is the nominate species *C. ornata.*
In passing I note that the statement by Melville *et al.* (2016), "With our recommendations the *C. caudicinctus* species group, which currently incorporates six subspecies, would become four species: *C. caudicinctus*, *C. infans*, *C. slateri* and *C. graafi*." did not make any sense at all, even when reconciled exclusively with the data the same authors presented in the very same paper and noting that the authors also recklessly overlooked the species *C. yinneatharra* (Storr, 1981), even though a year prior Hoser (2015g) had correctly placed that taxon within the species group.
It is self-evident from the morphological evidence of Storr (1967) and molecular evidence of Melville *et al.* (2016) that the case for recognition of *C. mensarum* (Storr, 1967) as a full species is weaker than for all other species (including the five formally named herein).

This includes significantly less molecular divergence from nominate *C. caudicincta* (as shown by Melville *et al.* 2016) than for all other putative species, including the eight formally named herein.

However that taxon *C. mensarum* (Storr, 1967) is tentatively recognized at the full species level within this paper pending further work on allegedly intermediate specimens between the two putative forms.

The genus-level arrangement of relevant species and other Australian agamids was found to be in accordance with the published results of Hoser (2015g), which was so accurate as to not needing any alteration of diagnoses at this point in time. Newly named species herein simply fit within the same diagnosed genus or subgenus as does their nearest known relative.

The literature relevant to the taxonomy and nomenclature of the subgenus *Tachyon* as first defined by Wells and Wellington (1985) and redefined by Hoser (2015g) and herein, including the taxonomic and nomenclatural decisions herein include the following: Ahl (1926), Baverstock and Bradshaw (1975), Boulenger (1885), Bradshaw (1970, 1971), Bradshaw and Main (1968), Bradshaw and Shoemaker (1967), Cogger (2014), Cogger *et al.* (1983), Denzer *et al.* (1997), Doody and Schembri (2014), Even (2005), Fitzinger (1843), Glauert (1959), Gray (1845), Günther (1875), Hoser (2015g), Kinghorn (1924), Lebas and Spencer (2000), Melville *et al.* (2001, 2016), Peters (1876), Pyron *et al.* (2013), Ride *et al.* (1999), Sternfeld (1925), Storr (1967, 1981), Storr *et al.* (1983), Wells and Wellington (1985) Wilson and Knowles (1988), Wilson and Swan (2017) and sources cited therein.

FURTHER DISCUSSION RELEVANT TO THIS PUBLICATION

An illegal armed raid and theft of materials on 17 Aug 2011 effectively stopped the publication of a variant of this paper being published back then and a significant amount of materials taken in that raid was not returned. This was in spite of court orders telling the relevant State Wildlife officers to do so (Court of Appeal 2014, Victorian Civil and Administrative Tribunal 2015). Rather than run the risk of species becoming threatened or extinct due to non-recognition of them as shown in Hoser (2019a, 2019b), I have instead opted to publish this paper in its current form, even though a significant amount of further data was intended to be published and is not.

Naming of taxa is perhaps the most important step in their ultimate preservation and it is with this motivation in mind (protection of biodiversity) that I have chosen to publish this paper.

Until now, no new (and generally recognized) taxa within the so-called *Grammatophora caudicincta* Günther, 1875 complex of species has been formally identified or named since the paper of Storr (1967).

INFORMATION RELEVANT TO THE FORMAL DESCRIPTIONS THAT FOLLOW

There is no conflict of interest in terms of this paper or the conclusions arrived at herein.

Several people including anonymous peer reviewers who revised the manuscript prior to publication are also thanked as are relevant staff at museums who made specimens and records available in line with international obligations.

In terms of the following formal descriptions, spellings should not be altered in any way for any purpose unless expressly and exclusively called for by the rules governing Zoological Nomenclature as administered by the International Commission of Zoological Nomenclature.

In the unlikely event two newly named taxa are deemed conspecific by a first reviser, then the name to be used and retained is that which first appears in this paper by way of page priority and as listed in the abstract keywords.

Some material in descriptions for taxa may be repeated for other taxa in this paper and this is necessary to ensure each fully complies with the provisions of the *International Code of Zoological Nomenclature* (Fourth edition) (Ride *et al.* 1999) as amended online since.

Material downloaded from the internet and cited anywhere in this paper was downloaded and checked most recently as of 1 March 2020, unless otherwise stated and was accurate in terms of the context cited herein as of that date.

Unless otherwise stated explicitly, colour descriptions apply to living adult male specimens of generally good health and not under any form of stress by means such as excessive cool, heat, dehydration or abnormal skin reaction to chemical or other input.

While numerous texts and references were consulted prior to publication of this paper, the criteria used to separate the relevant species has already been spelt out and/or is done so within each formal description and does not rely on material within publications not explicitly cited herein.

Each newly named species is readily and consistently separable from their nearest congener and that which until now it has been previously treated as.

Delays in recognition of these species could jeopardise the long-term survival of these taxa as outlined by Hoser (2019a, 2019b) and sources cited therein.

Therefore attempts by taxonomic vandals like the Wolfgang Wüster gang via Kaiser (2012a, 2012b, 2013, 2014a, 2014b) and Kaiser *et al.* (2013) (as frequently amended) to unlawfully suppress the recognition of these taxa on the basis they have a personal dislike for the person who formally named it should be resisted (Dubois *et al.* 2019).

Claims by the Wüster gang against this paper and the descriptions herein will no doubt be no different to those the gang have made previously, all of which were discredited long ago as outlined by Dubois *et al.* (2019), Hoser, (2007, 2009, 2012a, 2012b, 2013a, 2015a-f, 2019a, 2019b) and sources cited therein.

The following genus and subgenus-level diagnosis of the relevant lizard species is taken in an abridged form from Hoser (2015g) and excluding formal diagnoses of the subgenera not subject of this paper.

Formal descriptions of the eight relevant species follow.

Information relevant to conservation of Australian reptiles in Hoser (1989, 1991, 1993 and 1996) and relevant comments in Hoser (2019a, 2019b) applies to the newly named taxa herein.

GENUS *CTENOPHORUS* FITZINGER, 1843.

Type species: *Grammatophora decresii* Dumeìril and Bibron 1837.

Diagnosis: *Ctenophorus* as defined until now (see also Cogger 2014) is defined by the following definition, modified to take into account the genera defined by Hoser (2015g) being the most recent full and proper treatment of the genus. *Ctenophorus* is defined as an Australian agamid genus characterised by small dorsal scales, homogenous or with at most slightly enlarged tubercles; a few species with distinct rows of paravertebral or dorsolateral spinose scales; a row of enlarged scales from below the eye to above the ear; tympanum exposed (not exposed in *Notactenophorus* Hoser 2015) and most *Pseudoctenophorus* Hoser, 2015; tail long, ranging from slightly to much longer than the head and body; femoral and preanal pores present in males; adult males usually with distinctive black or dark grey markings on the throat and/or chest.

The genus *Paractenophorus* Hoser, 2015 is separated from *Ctenophorus*, *Notactenophorus* Hoser 2015 and *Pseudoctenophorus* Hoser, 2015 by the following suite of characters: tympanum exposed; no series of enlarged, spinose scales on either side of the base of the tail; hind limb reaching no further than the tympanum when adpressed; tail usually less than 1.5 times as long as the head and body; nasal region is not swollen, the nostril lying below an angular canthal ridge; pores fewer than 15; nostril is slit-like or narrowly elliptical.

Specimens within the genus *Pseudoctenophorus* Hoser, 2015 are separated from all other *Ctenophorus* Fitzinger, 1843, the genus they were placed in previously, by the following suite of characters, being one or other of the following three:

1/ Tympanum exposed; a series of enlarged, spinose scales on either side of the base of the tail (subgenus *Pseudoctenophorus* Hoser, 2015), or:

2/ Tympanum hidden; covered by skin; body scales are strongly heterogeneous, many of the larger scales on the body and head keeled or moderately spinose; a series of enlarged, spinose scales on either side of the base of the tail (subgenus *Chapmanagama* Hoser, 2015), or:

3/ Tympanum hidden; covered by skin; body scales are strongly heterogeneous, many of the larger scales on the body and head keeled or moderately spinose; no series of enlarged, spinose scales on either side of the base of the tail (subgenus *Turnbullagama* Hoser, 2015).

Notactenophorus Hoser, 2015 is readily separated from all other members of the genus *Ctenophorus* (where it has been placed until now, as defined in Cogger 2014) and *Pseudoctenophorus* Hoser, 2015, by the following unique suite of characters: Tympanum is hidden being covered by skin, the body scales are smooth, mostly small, homogenous, with scattered larger but small, flat scales, not keeled or spinose, with a dorsal pattern of a longitudinal dorso-lateral series of five or six large black spots on either side.

Distribution: Most parts of continental Australia.

Content: *C. decresii* (Duméril and Bibron, 1837) (type species); *C. adelynhoserae sp. nov.*; *C. caudicinctus* (Günther, 1875); *C. cristatus* (Gray, 1841); *C. dudleyi* Wells and Wellington 1985; *C. femoralis* (Storr, 1965); *C. fionni* (Procter, 1923); *C. fordi* (Storr, 1965); *C. gibba* (Houston, 1974); *C. graafi* (Storr, 1967); *C. hawkeswoodi* (Wells and Wellington, 1985); *C. imbricatus* (Peters, 1876); *C. infans* (Storr, 1967); *C. isolepis* (Fischer, 1881); *C. jackyhoserae sp. nov.*; *C. katrinahoserae sp. nov.*; *C. lenhoseri sp. nov.*; *C. macropus* (Storr, 1967); *C. maculatus* (Gray, 1831); *C. maxinehoserae sp. nov.*; *C. mckenziei* (Storr, 1981); *C. mirrityana* McLean, Moussalli, Sass and Stuart-Fox, 2013; *C. nguyarna* Doughty, Maryan, Melville and Austin, 2007; *C. mensarum* (Storr, 1967); *C. nuchalis* (De Vis, 1884); *C. ornatus* (Gray, 1845); *C. pictus* (Peters, 1866); *C. raffertyi* Wells and Wellington, 1985; *C. reticulatus* (Gray, 1845); *C. ronhoseri sp. nov.*; *C. rubens* (Storr, 1965); *C. rufescens* (Stirling and Zietz, 1893); *C. salinarum* Storr, 1966; *C. scutulatus* (Stirling and Zietz, 1893); *C. sharonhoserae sp. nov.*; *C. shireenhoserae sp. nov.*; *C. slateri* (Storr, 1967); *C. tjantjalka* Johnston, 1992; *C. vadnappa* Houston, 1974; *C. yinnietharra* (Storr, 1981).

Comments: All of *C. graafi* (Storr, 1967); *C. imbricatus* (Peters, 1876); *C. infans* (Storr, 1967); *C. macropus* (Storr, 1967); *C. mensarum* (Storr, 1967); *C. slateri* (Storr, 1967) were treated by Hoser (2015g) as synonyms of *C. caudicinctus* (Günther, 1875) pending publication of this paper.

Hoser (2015g) erroneously treated *C. raffertyi* Wells and Wellington, 1985 as a synonym of *C. clayi* (Storr, 1967) by overlooking it in an error also not picked up in peer review. However the taxon *C. raffertyi* is herein regarded as valid on the basis of morphological and distributional divergence across a biogeographical barrier of known antiquity.

In an act of taxonomic vandalism, Sadlier *et al.* (2019) deliberately illegally renamed the taxon *C. hawkeswoodi* (Wells and Wellington, 1985) as recognized as valid by Hoser (2015g) as *Ctenophorus spinodomus* Sadlier *et al.* (2019).
The *International Code of Zoological Nomenclature* (Ride *et al.* 1999) is clear in its directives in terms of the rule of priority and so the correct name for this taxon is *C. hawkeswoodi* (Wells and Wellington, 1985).

That species is part of the *C. fordi* (Storr, 1965) species complex subject of another paper (Hoser 2000).
While it is self-evident that some of the species diagnoses in the paper of Wells and Wellington (1985) are vague and imprecise, the fact remains that the relevant names are available in terms of the rules of the *International Code of Zoological Nomenclature*, meaning that the relevant paper should be consulted if and when herpetologists are doing taxonomic works on Australian reptiles and frogs and there is a likelihood of a priority name being available for a taxon.
Overwriting a Wells and Wellington name may give a later worker a sense of greatness in being able to claim “discovery” of a species, but this “discovery” will evaporate at a future date when a later scientist is forced to waste their time and correct the historical record and re-instate the correct Wells and Wellington nomen.
The time spent doing this would be better diverted towards new science and the wildlife conservation objectives that this serves. This is particularly the case in the context of Australian reptiles, where as of 2020 dozens of species still await formal description.

SUBGENUS *TACHYON* WELLS AND WELLINGTON, 1985.

Type species: *Grammatophora caudicincta* Günther, 1875.

Diagnosis: Species within the subgenus *Tachyon* Wells and Wellington, 1985 are separated from all other *Ctenophorus* Fitzinger, 1843 by the following suite of characters being one or other of:

1/ Tympanum exposed; no series of enlarged, spinose scales on either side of the base of the tail; hind limb usually reaching to eye or beyond when adpressed; tail usually much more than 1.5 times as long as the head and body; canthus rostralis swollen, but nostrils, when viewed from above, face distinctly upwards as opposed to outwards (species *C. adelynhoserae sp. nov.*; *C. caudicinctus* (Günther, 1875); *C. graafi* (Storr, 1967); *C. imbricatus* (Peters, 1876); *C. infans* (Storr, 1967); *C. jackyhoserae sp. nov.*; *C. katrinahoserae sp. nov.*; *C. lenhoseri sp. nov.*; *C. macropus* (Storr, 1967); *C. maxinehoserae sp. nov.*; *C. mensarum* (Storr, 1967); *C. ronhoseri sp. nov.*; C. *slateri* (Storr, 1967)) or:

2/ Tympanum exposed; no series of enlarged, spinose scales on either side of the base of the tail; hind limb usually reaching to eye or beyond when adpressed; tail usually much more than 1.5 times as long as the head and body; canthus rostralis angular or moderately swollen, but nostrils, when viewed from above, face outwards as opposed to distinctly upwards (as seen in the species *C. adelynhoserae sp. nov.*; *C. caudicinctus* (Günther, 1875); *C. graafi* (Storr, 1967); *C. imbricatus* (Peters, 1876); *C. infans* (Storr, 1967); *C. jackyhoserae sp. nov.*; *C. katrinahoserae sp. nov.*; *C. lenhoseri sp. nov.*; *C. macropus* (Storr, 1967); *C. maxinehoserae sp. nov.*; *C. mensarum* (Storr, 1967); *C. ronhoseri sp. nov.*; *C. slateri* (Storr, 1967)); at most a few enlarged keeled scales on the nape; a series of enlarged vertebral scales, if present, forming a distinct linear series only to about the level of the forelimbs; dorsal scales at most with low, irregular keels which do not form distinct continuous ridges; dorsolateral scales and those on the chest smooth, or with low blunt edges; nostril elliptical in a swollen nasal scale lying on a swollen canthal ridge; tibial region with a series of anterior proximal scales which are very much larger than those on the posterior surface (species *C. shireenhoserae sp. nov.*; *C. sharonhoserae sp. nov.*; *C. ornatus* and *C. yinnietharra*).

Ctenophorus as defined until now (Cogger 2014, Hoser 2015g) is defined by the following definition, modified to take into account the new genera as defined herein. *Ctenophorus* is defined as an Australian agamid genus characterised by small dorsal scales, homogenous or with at most slightly enlarged tubercles; a few species with distinct rows of paravertebral or dorsolateral spinose scales; a row of enlarged scales from below the eye to above the ear; tympanum exposed (not exposed in *Notactenophorus* Hoser, 2015 and most *Pseudoctenophorus* Hoser, 2015); tail long, ranging from slightly to much longer than the head and body; femoral and preanal pores present in males; adult males usually with distinctive black or dark grey markings on the throat and/or chest.

The genus *Paractenophorus* Hoser, 2015 is separated from *Ctenophorus*, *Notactenophorus* Hoser, 2015 and *Pseudoctenophorus* Hoser, 2015 by the following suite of characters: tympanum exposed; no series of enlarged, spinose scales on either side of the base of the tail; hind limb reaching no further than the tympanum when adpressed; tail usually less than 1.5 times as long as the head and body; nasal region is not swollen, the nostril lying below an angular canthal ridge; pores fewer than 15; nostril is slit-like or narrowly elliptical.

Specimens within the genus *Pseudoctenophorus* Hoser, 2015 are separated from all other *Ctenophorus* Fitzinger, 1843, the genus they were placed previously, by the following suite of characters, being one or other of the following three:

1/ Tympanum exposed; a series of enlarged, spinose scales on either side of the base of the tail (subgenus *Pseudoctenophorus* Hoser, 2015), or:

2/ Tympanum hidden; covered by skin; body scales are strongly heterogeneous, many of the larger scales on the body and head keeled or moderately spinose; a series of enlarged, spinose scales on either side of the base of the tail (subgenus *Chapmanagama* Hoser, 2015), or:

3/ Tympanum hidden; covered by skin; body scales are strongly heterogeneous, many of the larger scales on the body and head keeled or moderately spinose; no series of enlarged, spinose scales on either side of the base of the tail (subgenus *Turnbullagama* Hoser, 2015).

Notactenophorus Hoser, 2015 is readily separated from all other members of the genus *Ctenophorus* (where it has been placed until now, as defined in Cogger 2014) and *Pseudoctenophorus* Hoser, 2015 by the following unique suite of characters: Tympanum is hidden being covered by skin, the body scales are smooth, mostly small, homogenous, with scattered larger but small, flat scales, not keeled or spinose, with a dorsal pattern of a longitudinal dorso-lateral series of five or six large black spots on either side.

Distribution: Drier parts of northern, central and Western Australia, including the south-west and invariably associated with rock outcrops.

Content: *Ctenophorus* (*Tachyon*) *caudicinctus* (Günther, 1875) (type species); *C.* (*Tachyon*) *adelynhoserae sp. nov.*; *C.* (*Tachyon*) *graafi* (Storr, 1967); *C.* (*Tachyon*) *imbricatus* (Peters, 1876); *C.* (*Tachyon*) *infans* (Storr, 1967); *C.* (*Tachyon*) *jackyhoserae sp. nov.*; *C.* (*Tachyon*) *katrinahoserae sp. nov.*; *C.* (*Tachyon*) *lenhoseri sp. nov.*; *C.* (*Tachyon*) *macropus* (Storr, 1967); *C.* (*Tachyon*) *maxinehoserae sp. nov.*; *C.* (*Tachyon*) *mensarum* (Storr, 1967); *C.* (*Tachyon*) *ornatus* (Gray, 1845); *C.* (*Tachyon*) *ronhoseri sp. nov.*; *C.* (*Tachyon*) *sharonhoserae sp. nov.*; *C.* (*Tachyon*) *shireenhoserae sp. nov.*; *C.* (*Tachyon*) *slateri* (Storr, 1967); *C.* (*Tachyon*) *yinnietharra* (Storr, 1981).

CTENOPHORUS (*TACHYON*) *ADELYNHOSERAE SP. NOV.*

LSID urn:lsid:zoobank.org:act:4A2B64E0-B3BA-430C-8BD2-DEFBAFFF48D8

Holotype: A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number R125200 collected from the Saint George Range, south-west Kimberley Division of Western Australia, Australia, Latitude -18.75 S., Longitude 125.15 E. This facility allows access to its holdings.

Paratype: A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number R125199 collected from the Saint George Range, south-west Kimberley Division of Western Australia, Australia, Latitude -18.75 S., Longitude 125.15 E.

Diagnosis: The species *Ctenophorus adelynhoserae sp. nov.* from the south-west Kimberley division of Western Australia (being the St. George and Edgar Ranges, north-east of Broome, Western Australia), *C. jackyhoserae sp. nov.* from the northern and eastern Kimberley division of Western Australia and immediately adjacent parts of the Northern Territory, C. *katrinahoserae sp. nov.* from far north-west Queensland and the nearby parts of the Northern Territory, south of the Gulf of Carpentaria and *C. lenhoseri sp. nov.* from the Selwyn Ranges (generally around Mount Isa and south of there), in north-west Queensland, have until now all been treated as populations of *C. macropus* (Storr, 1967) with a distribution centred on Arnhem Land, Northern Territory, with which they are morphologically most similar to.

However all are morphologically distinct, wholly allopatric and sufficiently divergent to be treated as full species as is seen herein, with divergences estimated by Melville *et al.* (2016) to be in excess of 2.5 MYA for all but *C. lenhoseri sp. nov.* which was not inspected by Melville *et al.* (2016).

C. lenhoseri sp. nov. is however separated from the other species by a barrier of known antiquity in far north-west Queensland.

Ctenophorus adelynhoserae sp. nov., *C. jackyhoserae sp. nov.*, *C. katrinahoserae sp. nov.*, *C. lenhoseri sp. nov.* and *C. macropus* are readily separated by their unique colour patterns.

Adult male *Ctenophorus adelynhoserae sp. nov.* are separated from males of the other species by having a brown dorsum and flanks with either no markings or indistinct ones. Legs are either unmarked or lack obvious markings, which otherwise may include indistinct spots or crossbands. There are scattered dark flecks or peppering along the lower sides and no light blue spots or flecks anywhere on the dorsum. Between the eye and ear is a dark and semi-distinct bar or broken bar. There are 19-21 tail rings, being alternating brown and whitish, the lighter sections being narrower than the darker sections.

Adult females are greyish in colouration and with a greyish head with mottling as opposed to any well-defined markings.

Adult male *C. jackyhoserae sp. nov.* normally have a brownish-red dorsal surface with broken lines or evenly arranged flecks along, but not on the mid-dorsal line. Some specimens alternatively have a whitish-red upper body to deep red, characterised by a dorsal arrangement of about six broken orange-brown-red lines running longitudinally down the body from neck to rump, being broken by intervening areas of creamy-grey white that are wider than the darker markings. The side of the head and labials are whitish or at least with whiter pigment than elsewhere and with indistinct reddish markings near the ear and temples. The top of the head is a dark reddish orange, The lower flanks are characterised by 3-5 dark brown bars across a pale yellowish background, being indistinctly divided from the whitish-grey above, or in some specimens these may reduce to being evenly spaced paired dark spots. There are no light blue spots or flecks anywhere on the dorsum. There is no dark bar between the eye and ear, where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

There are 17-18 tail rings, alternating blackish and whitish, the rings being of even thickness.

Adult female *C. jackyhoserae sp. nov.* are of greyish colouration, featuring brown barring on the lower labial area, no markings, or very indistinct on all limbs and a dorsal surface featuring a mottled appearance of light and dark, but no obvious well defined pattern.

Adult male *C. lenhoseri sp. nov.* have a strongly reddish-brown forebody, becoming greyish towards the rear and tail. On either side of the mid-dorsal line are about 5 pairs of evenly spaced semi-distinct small dark blackish brown spots of semi-rectangular shape, the longer sides being those running towards the flanks. The flanks are more reddish than the mid dorsum, which is slightly greyish and the flanks also have scattered light blue spots or flecks. There are 24-28 tail rings, defined by having very narrow light sections and wide darker sections, being alternating brownish-black and whitish bands. There are no obvious blotches or spots on the lower flanks, or dark bar between the eye and ear, although in some specimens there is dark peppering where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

Adult female *C. lenhoseri sp. nov.* are of similar colour to males, being reddish and without obvious pattern of any sort. The dorsal surface is effectively unicolour, save for a poorly defined zone of darkening along the mid vertebral line and 4-6 well-spaced pairs of small but obvious yellow spots on either side of the mid dorsal line of the body. There are sometimes paired scattered dark spots around the neck, which typically fade in older specimens. There are 18-22 tail rings, with lighter ones being narrow or incomplete and darker ones about 3-4 times wider, the colouration being greyish orange (wider) and yellow (narrower) bands. Fore and hind limbs both have indistinct bands.

Juvenile *C. lenhoseri sp. nov.* of both sexes are characterised by a significant amount of dark brown and black pigment in the form of flecks or mottling on the upper surfaces, which fades with age.

Adult male *C. katrinahoserae sp. nov.* have an orange-grey-brown forebody, with a distinct salmon colouration across whitish parts of the upper forebody and head, becoming dull greyish towards the rear and tail. On either side of the mid-dorsal line are about scattered semi-distinct dark flecks which may also appear on the mid flanks, but the dorsum is otherwise not prominently marked. The flanks are slightly darker than the dorsum at the mid flanks before becoming light again at the belly. There are 20-26 tail rings, defined by having narrow light sections and wide darker sections, being alternating brownish-black and whitish bands. There are no obvious blotches or spots on the lower flanks, or dark bar between the eye and ear, although in some specimens there is dark peppering where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

Adult female *C. katrinahoserae sp. nov.* are of similar colour to males, but generally greyish in colour with lighter yellow-cream interspaces. There is a mottled pattern across the dorsal surface, being most prominent at the anterior end and the sides of the head.

In both sexes, the legs are generally unmarked, but commonly with indistinct blotching, particularly on the lower rear legs upper surface.

Adult male *C. macropus* have a generally light orange dorsal colour, with scattered dark brown flecks on the head and neck, but not on the body or legs. Prominent in this species are numerous bright aqua-blue spots scattered across the dorsal surface and sides of the flanks. There are 19-21 tail rings, with the darker sections being significantly wider than the lighter ones. The anterior tail is generally brownish orange with indistinct bands, while the posterior half of the tail has fairly well defined bands, the colours being brown and yellow-white.

Adult female *C. macropus* are similar in most respects to adult female *C. jackyhoserae sp. nov.* but any yellow spotting on the back near the mid-dorsal line is relatively indistinct and the front legs have well defined bands. Any markings on the rear legs, if present are indistinct.

Ctenophorus adelynhoserae sp. nov. in life is depicted in Storr *et al.* (1983), plate 3, image 4, adult male.

C. jackyhoserae sp. nov. is depicted in life in Wilson and Swan (2017) on page 413 at top left, adult male and Wilson and Knowles (1988), page 207, top left adult male, top right adult female and in Hoser (1989) page 67 top, male.

C. katrinahoserae sp. nov. is depicted in life online at: https://pbase.com/gehyra/image/129646530
(last downloaded on 1 March 2020).

C. lenhoseri sp. nov. is depicted in life in Cogger (2014), bottom left, adult male (aged) and Brown (2014), page 653 (3 images labelled as *Ctenophorus caudicinctus macropus*, Windorah, Queensland, two adult males and an adult female).

All of *Ctenophorus adelynhoserae sp. nov.*, *C. jackyhoserae sp. nov.*, *C. katrinahoserae sp. nov.*, *C. lenhoseri sp. nov.* and *C. macropus* can be separated from all congeners in the subgenus *Tachyon* Wells and Wellington, 1985 (as defined elsewhere in this paper), by having over 32 lamellae under the fourth toe versus less than 32 in all other species as well as a tail 2 times the length of snout-vent, versus less than 1.8 times snout-vent in all other species and the adpressed hind-leg extends past the snout (not so in all other species).

All of *Ctenophorus adelynhoserae sp. nov.*, *C. jackyhoserae sp. nov.*, *C. katrinahoserae sp. nov.*, *C. lenhoseri sp. nov.* and *C. macropus* are characterised as follows: Distal three-quarters of tail compressed. Nasal small, located on top of obtuse rostral ridge. Keels of dorsal scales moderately strong and sharp, terminating in a blunt end or short spine. Ventrals weakly keeled. Upper labials 15-16. Femoral and preanal pores 26-31.

Distribution: *C. adelynhoserae sp. nov.* is known only from near the type locality of the Saint George Range and nearby ranges, (e.g. Edgar Ranges) south-west Kimberley Division of Western Australia, Australia.

Etymology: *C. adelynhoserae sp. nov.* is named in honour of my eldest daughter, Adelyn Hoser, of Park Orchards, Victoria, Australia in recognition of more than 20 years active work with wildlife conservation, research and education in Australia.

CTENOPHORUS (*TACHYON*) *JACKYHOSERAE SP. NOV.*

LSID urn:lsid:zoobank.org:act:FA6270EE-615D-4F28-9113-B5AB50B622FA

Holotype: A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number R113989 collected from 32 km west of El Questro Station Kimberley Division of Western Australia, Australia, Latitude -16.02 S., Longitude 127.97 E.

This facility allows access to its holdings.

Paratype: A preserved specimen at the Northern Territory Museum, Darwin, Northern Territory, Australia, specimen number R07018 collected from the Pentecost River Crossing on the Gibb River Road, Kimberley Division of Western Australia, Australia, Latitude -16.17 S., Longitude 127.98 E.

Diagnosis: The species *Ctenophorus jackyhoserae sp. nov.* from the northern and eastern Kimberley division of Western Australia and immediately adjacent parts of the Northern Territory, *C. adelynhoserae sp. nov.* from the south-west Kimberley division of Western Australia (being the St. George and Edgar Ranges, north-east of Broome, Western Australia), C. *katrinahoserae sp. nov.* from far north-west Queensland and the nearby parts of the Northern Territory, south of the Gulf of Carpentaria and *C. lenhoseri sp. nov.* from the Selwyn Ranges (generally around Mount Isa and south of there), in north-west Queensland, have until now all been treated as populations of *C. macropus* (Storr, 1967) with a distribution centred on Arnhem Land, Northern Territory, with which they are morphologically most similar to.

However all are morphologically distinct, wholly allopatric and sufficiently divergent to be treated as full species as is seen herein, with divergences estimated by Melville *et al.* (2016) to be in excess of 2.5 MYA for all but *C. lenhoseri sp. nov.* which was not inspected by Melville *et al.* (2016).
C. lenhoseri sp. nov. is however separated from the other species by a barrier of known antiquity in far north-west Queensland.

Ctenophorus adelynhoserae sp. nov., *C. jackyhoserae sp. nov.*, *C. katrinahoserae sp. nov.*, *C. lenhoseri sp. nov.* and *C. macropus* are readily separated by their unique colour patterns.

Adult male *Ctenophorus adelynhoserae sp. nov.* are separated from males of the other species by having a brown dorsum and flanks with either no markings or indistinct ones. Legs are either unmarked or lack obvious markings, which otherwise may include indistinct spots or crossbands. There are scattered dark flecks or peppering along the lower sides and no light blue spots or flecks anywhere on the dorsum. Between the eye and ear is a dark and semi-distinct bar or broken bar. There are 19-21 tail rings, being alternating brown and whitish, the lighter sections being narrower than the darker sections.
Adult female *C. adelynhoserae sp. nov.* are greyish in colouration and with a greyish head with mottling as opposed to any well-defined markings.

Adult male *C. jackyhoserae sp. nov.* normally have a brownish-red dorsal surface with broken lines or evenly arranged flecks along, but not on the mid-dorsal line. Some specimens alternatively have a whitish-red upper body to deep red, characterised by a dorsal arrangement of about six broken orange-brown-red lines running longitudinally down the body from neck to rump, being broken by intervening areas of creamy-grey white that are wider than the darker markings. The side of the head and labials are whitish or at least with whiter pigment than elsewhere and with indistinct reddish markings near the ear and temples. The top of the head is a dark reddish orange, The lower flanks are characterised by 3-5 dark brown bars across a pale yellowish background, being indistinctly divided from the whitish-grey above, or in some specimens these may reduce to being evenly spaced paired dark spots. There are no light blue spots or flecks anywhere on the dorsum. There is no dark bar between the eye and ear, where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

There are 17-18 tail rings, alternating blackish and whitish, the rings being of even thickness.

Adult female *C. jackyhoserae sp. nov.* are of greyish colouration, featuring brown barring on the lower labial area, no markings, or very indistinct on all limbs and a dorsal surface featuring a mottled appearance of light and dark, but no obvious well defined pattern.

Adult male *C. lenhoseri sp. nov.* have a strongly reddish-brown forebody, becoming greyish towards the rear and tail. On either side of the mid-dorsal line are about 5 pairs of evenly spaced semi-distinct small dark blackish brown spots of semi-rectangular shape, the longer sides being those running towards the flanks. The flanks are more reddish than the mid dorsum, which is slightly greyish and the flanks also have scattered light blue spots or flecks. There are 24-28 tail rings, defined by having very narrow light sections and wide darker sections, being alternating brownish-black and whitish bands. There are no obvious blotches or spots on the lower flanks, or dark bar between the eye and ear, although in some specimens there is dark peppering where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

Adult female *C. lenhoseri sp. nov.* are of similar colour to males, being reddish and without obvious pattern of any sort. The dorsal surface is effectively unicolour, save for a poorly defined zone of darkening along the mid vertebral line and 4-6 well-spaced pairs of small but obvious yellow spots on either side of the mid dorsal line of the body. There are sometimes paired scattered dark spots around the neck, which typically fade in older specimens. There are 18-22 tail rings, with lighter ones being narrow or incomplete and darker ones about 3-4 times wider, the colouration being greyish orange (wider) and yellow (narrower) bands. Fore and hind limbs both have indistinct bands.

Juvenile *C. lenhoseri sp. nov.* of both sexes are characterised by a significant amount of dark brown and black pigment in the form of flecks or mottling on the upper surfaces, which fades with age.

Adult male *C. katrinahoserae sp. nov.* have an orange-grey-brown forebody, with a distinct salmon colouration across whitish parts of the upper forebody and head, becoming dull greyish towards the rear and tail. On either side of the mid-dorsal line are about scattered semi-distinct dark flecks which may also appear on the mid flanks, but the dorsum is otherwise not prominently marked. The flanks are slightly darker than the dorsum at the mid flanks before becoming light again at the belly. There are 20-26 tail rings, defined by having narrow light sections and wide darker sections, being alternating brownish-black and whitish bands. There are no obvious blotches or spots on the lower flanks, or dark bar between the eye and ear, although in some specimens there is dark peppering where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

Adult female *C. katrinahoserae sp. nov.* are of similar colour to males, but generally greyish in colour with lighter yellow-cream interspaces. There is a mottled pattern across the dorsal surface, being most prominent at the anterior end and the sides of the head.

In both sexes, the legs are generally unmarked, but commonly with indistinct blotching, particularly on the lower rear legs upper surface.

Adult male *C. macropus* have a generally light orange dorsal colour, with scattered dark brown flecks on the head and neck, but not on the body or legs. Prominent in this species are numerous bright aqua-blue spots scattered across the dorsal surface and sides of the flanks. There are 19-21 tail rings, with the darker sections being significantly wider than the lighter ones. The anterior tail is generally brownish orange with indistinct bands, while the posterior half of the tail has fairly well defined bands, the colours being brown and yellow-white.

Adult female *C. macropus* are similar in most respects to adult female *C. jackyhoserae sp. nov.* but any yellow spotting on the back near the mid-dorsal line is relatively indistinct and the front legs have well defined bands. Any markings on the rear legs, if present are indistinct.

Ctenophorus adelynhoserae sp. nov. in life is depicted in Storr *et al.* (1983), plate 3, image 4, adult male.

C. jackyhoserae sp. nov. is depicted in life in Wilson and Swan (2017) on page 413 at top left, adult male and Wilson and Knowles (1988), page 207, top left adult male, top right adult female and in Hoser (1989) page 67 top, male.

C. katrinahoserae sp. nov. is depicted in life online at: https://pbase.com/gehyra/image/129646530

(last downloaded on 1 March 2020).

C. lenhoseri sp. nov. is depicted in life in Cogger (2014), bottom left, adult male (aged) and Brown (2014), page 653 (3 images labelled as *Ctenophorus caudicinctus macropus*, Windorah, Queensland, two adult males and an adult female).

All of *Ctenophorus adelynhoserae sp. nov.*, *C. jackyhoserae sp. nov.*, *C. katrinahoserae sp. nov.*, *C. lenhoseri sp. nov.* and *C. macropus* can be separated from all congeners in the subgenus *Tachyon* Wells and Wellington, 1985 (as defined elsewhere in this paper), by having over 32 lamellae under the fourth toe versus less than 32 in all other species as well as a tail 2 times the length of snout-vent, versus less than 1.8 times snout-vent in all other species and the adpressed hind-leg extends past the snout (not so in all other species).

All of *Ctenophorus adelynhoserae sp. nov.*, *C. jackyhoserae sp. nov.*, *C. katrinahoserae sp. nov.*, *C. lenhoseri sp. nov.* and *C. macropus* are characterised as follows: Distal three-quarters of tail

compressed. Nasal small, located on top of obtuse rostral ridge. Keels of dorsal scales moderately strong and sharp, terminating in a blunt end or short spine. Ventrals weakly keeled. Upper labials 15-16. Femoral and preanal pores 26-31.

Distribution: *C. jackyhoserae sp. nov.* is known from the main part of the Kimberley division in Western Australia, including the north and east Kimberley, as well as nearby parts of immediately adjacent Northern Territory. The similar species *C. adelynhoserae sp. nov.* is known only from near the type locality of the Saint George Range and nearby ranges, (e.g. Edgar Ranges) south-west Kimberley Division of Western Australia, Australia.

Etymology: *C. jackyhoserae sp. nov.* is named in honour of my youngest daughter, Jacky Hoser, of Park Orchards, Victoria, Australia in recognition of over 18 years active work with wildlife conservation, research and education in Australia.

CTENOPHORUS (*TACHYON*) *KATRINAHOSERAE SP. NOV.*

LSID urn:lsid:zoobank.org:act:8137BF13-CB27-48AB-B0CB-F847CC8178D0

Holotype: A preserved specimen at the Museum and Art Gallery of the Northern Territory, Darwin, Northern Territory, Australia, specimen number NTM R25848 collected from 10 km south-east of the Roadhouse at Hells Gate, Queensland, Australia, Latitude -17.53 S., Longitude 138.40 E.

This government-owned facility allows access to its holdings.

Paratype: A preserved specimen at the Museum and Art Gallery of the Northern Territory, Darwin, Northern Territory, Australia, specimen number NTM R25847 collected from 10 km south-east of the Roadhouse at Hells Gate, Queensland, Australia, Latitude -17.53 S., Longitude 138.40 E.

Diagnosis: The species *Ctenophorus katrinahoserae sp. nov.* from far north-west Queensland and the nearby parts of the Northern Territory, south of the Gulf of Carpentaria, *C. lenhoseri sp. nov.* from the Selwyn Ranges (generally around Mount Isa and south of there), in north-west Queensland, *C. jackyhoserae sp. nov.* from the northern and eastern Kimberley division of Western Australia and immediately adjacent parts of the Northern Territory and *C. adelynhoserae sp. nov.* from the south-west Kimberley division of Western Australia (being the St. George and Edgar Ranges, north-east of Broome, Western Australia) have until now all been treated as populations of *C. macropus*

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(Storr, 1967) with a distribution centred on Arnhem Land, Northern Territory, with which they are morphologically most similar to.

However all are morphologically distinct, wholly allopatric and sufficiently divergent to be treated as full species as is seen herein, with divergences estimated by Melville *et al.* (2016) to be in excess of 2.5 MYA for all but *C. lenhoseri sp. nov.* which was not inspected by Melville *et al.* (2016).

C. lenhoseri sp. nov. is however separated from the other species by a barrier of known antiquity in far north-west Queensland.

Ctenophorus adelynhoserae sp. nov., *C. jackyhoserae sp. nov.*, *C. katrinahoserae sp. nov.*, *C. lenhoseri sp. nov.* and *C. macropus* are readily separated by their unique colour patterns.

Adult male *Ctenophorus adelynhoserae sp. nov.* are separated from males of the other species by having a brown dorsum and flanks with either no markings or indistinct ones. Legs are either unmarked or lack obvious markings, which otherwise may include indistinct spots or crossbands. There are scattered dark flecks or peppering along the lower sides and no light blue spots or flecks anywhere on the dorsum. Between the eye and ear is a dark and semi-distinct bar or broken bar. There are 19-21 tail rings, being alternating brown and whitish, the lighter sections being narrower than the darker sections.

Adult female *C. adelynhoserae sp. nov.* are greyish in colouration and with a greyish head with mottling as opposed to any well-defined markings.

Adult male *C. jackyhoserae sp. nov.* normally have a brownish-red dorsal surface with broken lines or evenly arranged flecks along, but not on the mid-dorsal line. Some specimens alternatively have a whitish-red upper body to deep red, characterised by a dorsal arrangement of about six broken orange-brown-red lines running longitudinally down the body from neck to rump, being broken by intervening areas of creamy-grey white that are wider than the darker markings. The side of the head and labials are whitish or at least with whiter pigment than elsewhere and with indistinct reddish markings near the ear and temples. The top of the head is a dark reddish orange, The lower flanks are characterised by 3-5 dark brown bars across a pale yellowish background, being indistinctly divided from the whitish-grey above, or in some specimens these may reduce to being evenly spaced paired dark spots. There are no light blue spots or flecks anywhere on the dorsum. There is no dark bar between the eye and ear, where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

There are 17-18 tail rings, alternating blackish and whitish, the rings being of even thickness.

Adult female *C. jackyhoserae sp. nov.* are of greyish colouration, featuring brown barring on the lower labial area, no markings, or very indistinct on all limbs and a dorsal surface featuring a mottled appearance of light and dark, but no obvious well defined pattern.

Adult male *C. lenhoseri sp. nov.* have a strongly reddish-brown forebody, becoming greyish towards the rear and tail. On either side of the mid-dorsal line are about 5 pairs of evenly spaced semi-distinct small dark blackish brown spots of semi-rectangular shape, the longer sides being those running towards the flanks. The flanks are more reddish than the mid dorsum, which is slightly greyish and the flanks also have scattered light blue spots or flecks. There are 24-28 tail rings, defined by having very narrow light sections and wide darker sections, being alternating brownish-black and whitish bands. There are no obvious blotches or spots on the lower flanks, or dark bar between the eye and ear, although in some specimens there is dark peppering where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

Adult female *C. lenhoseri sp. nov.* are of similar colour to males, being reddish and without obvious pattern of any sort. The dorsal surface is effectively unicolour, save for a poorly defined zone of darkening along the mid vertebral line and 4-6 well-spaced pairs of small but obvious yellow spots on either side of the mid dorsal line of the body. There are sometimes paired scattered dark spots around the neck, which typically fade in older specimens. There are 18-22 tail rings, with lighter ones being narrow or incomplete and darker ones about 3-4 times wider, the colouration being greyish orange (wider) and yellow (narrower) bands. Fore and hind limbs both have indistinct bands.

Juvenile *C. lenhoseri sp. nov.* of both sexes are characterised by a significant amount of dark brown and black pigment in the form of flecks or mottling on the upper surfaces, which fades with age.

Adult male *C. katrinahoserae sp. nov.* have an orange-grey-brown forebody, with a distinct salmon colouration across whitish parts of the upper forebody and head, becoming dull greyish towards the rear and tail. On either side of the mid-dorsal line are about scattered semi-distinct dark flecks which may also appear on the mid flanks, but the dorsum is otherwise not prominently marked. The flanks are slightly darker than the dorsum at the mid flanks before becoming light again at the belly. There are 20-26 tail rings, defined by having narrow light sections and wide darker sections, being alternating brownish-black and whitish bands. There are no obvious blotches or spots on the lower flanks, or dark bar between the eye and ear, although in some specimens there is dark peppering where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

Adult female *C. katrinahoserae sp. nov.* are of similar colour to males, but generally greyish in colour with lighter yellow-cream interspaces. There is a mottled pattern across the dorsal surface, being most prominent at the anterior end and the sides of the head.

In both sexes, the legs are generally unmarked, but commonly with indistinct blotching, particularly on the lower rear legs upper surface.

Adult male *C. macropus* have a generally light orange dorsal colour, with scattered dark brown flecks on the head and neck, but not on the body or legs. Prominent in this species are numerous bright aqua-blue spots scattered across the dorsal surface and sides of the flanks. There are 19-21 tail rings, with the darker sections being significantly wider than the lighter ones. The anterior tail is generally brownish orange with indistinct bands, while the posterior half of the tail has fairly well defined bands, the colours being brown and yellow-white.

Adult female *C. macropus* are similar in most respects to adult female *C. jackyhoserae sp. nov.* but any yellow spotting on the back near the mid-dorsal line is relatively indistinct and the front legs have well defined bands. Any markings on the rear legs, if present are indistinct.

Ctenophorus adelynhoserae sp. nov. in life is depicted in Storr *et al.* (1983), plate 3, image 4, adult male.

C. jackyhoserae sp. nov. is depicted in life in Wilson and Swan (2017) on page 413 at top left, adult male and Wilson and Knowles (1988), page 207, top left adult male, top right adult female and in Hoser (1989) page 67 top, male.

C. katrinahoserae sp. nov. is depicted in life online at: https://pbase.com/gehyra/image/129646530

(last downloaded on 1 March 2020).

C. lenhoseri sp. nov. is depicted in life in Cogger (2014), bottom left, adult male (aged) and Brown (2014), page 653 (3 images labelled as *Ctenophorus caudicinctus macropus*, Windorah, Queensland, two adult males and an adult female).

All of *Ctenophorus adelynhoserae sp. nov.*, *C. jackyhoserae sp. nov.*, *C. katrinahoserae sp. nov.*, *C. lenhoseri sp. nov.* and *C. macropus* can be separated from all congeners in the subgenus *Tachyon* Wells and Wellington, 1985 (as defined elsewhere in this paper), by having over 32 lamellae under the fourth toe versus less than 32 in all other species as well as a tail 2 times the length of snout-vent, versus less than 1.8 times snout-vent in all other species and the adpressed hind-leg extends past the snout (not so in all other species).

All of *Ctenophorus adelynhoserae sp. nov.*, *C. jackyhoserae sp. nov.*, *C. katrinahoserae sp. nov.*, *C. lenhoseri sp. nov.* and *C. macropus* are characterised as follows: Distal three-quarters of tail compressed. Nasal small, located on top of obtuse rostral ridge. Keels of dorsal scales moderately strong and sharp, terminating in a blunt end or short spine. Ventrals weakly keeled. Upper labials 15-16. Femoral and preanal pores 26-31.

Distribution: *C. katrinahoserae sp. nov.* is known only from hilly country south of the Gulf of Carpentaria in far northwest Queensland and nearby parts of the Northern Territory, in an area generally bounded by Hells Gate in the East and Limmen National Park in the West.

C. macropus (Storr, 1967) inhabits the top end of the Northern Territory including Arnhem Land.

In the ranges surrounding Mount Isa and areas to the south, the species *C. lenhoseri sp. nov.* occurs.

Etymology: *C. katrinahoserae sp. nov.* is named in honour of my mother, Katrina Hoser, spending most of her life in the north side of Sydney, New South Wales, Australia in recognition of over 50 years of valuable contributions to herpetology in Australia and for services to the shoe retailing business globally.

CTENOPHORUS (*TACHYON*) *LENHOSERI SP. NOV.*

LSID urn:lsid:zoobank.org:act:524EFFEE-A159-4491-9960-DE3607193D56

Holotype: A preserved specimen at the Australian Museum, Sydney, New South Wales, Australia, specimen number R.26001 collected from Mount Isa in north-west Queensland, Australia, Latitude -20.73 S., Longitude 139.48 E. This government-owned facility allows access to its holdings.

Paratype: A preserved specimen at the Australian Museum, Sydney, New South Wales, Australia, specimen number R.72760 collected from Mount Isa in north-west Queensland, Australia, Latitude -20.73 S., Longitude 139.48 E.

Diagnosis: The species *Ctenophorus lenhoseri sp. nov.* from the Selwyn Ranges (generally around Mount Isa and south of there), in north-west Queensland, *C. katrinahoserae sp. nov.* from far north-west Queensland and the nearby parts of the Northern Territory, south of the Gulf of Carpentaria, *C. jackyhoserae sp. nov.* from the northern and eastern Kimberley division of Western Australia and immediately adjacent parts of the Northern Territory and *C. adelynhoserae sp. nov.* from the south-west Kimberley division of Western Australia (being the St. George and Edgar Ranges, north-east of Broome, Western Australia) have until now all been treated as populations of *C. macropus* (Storr, 1967) with a distribution centred on Arnhem Land, Northern Territory, with which they are morphologically most similar to.

However all are morphologically distinct, wholly allopatric and sufficiently divergent to be treated as full species as is seen herein, with divergences estimated by Melville *et al.* (2016) to be in excess of 2.5 MYA for all but *C. lenhoseri sp. nov.* which was not inspected by Melville *et al.* (2016).
C. lenhoseri sp. nov. is however separated from the other species by a barrier of known antiquity in far north-west Queensland.

Ctenophorus adelynhoserae sp. nov., *C. jackyhoserae sp. nov.*, *C. katrinahoserae sp. nov.*, *C. lenhoseri sp. nov.* and *C. macropus* are readily separated by their unique colour patterns.

Adult male *Ctenophorus adelynhoserae sp. nov.* are separated from males of the other species by having a brown dorsum and flanks with either no markings or indistinct ones. Legs are either unmarked or lack obvious markings, which otherwise may include indistinct spots or crossbands. There are scattered dark flecks or peppering along the lower sides and no light blue spots or flecks anywhere on the dorsum. Between the eye and ear is a dark and semi-distinct bar or broken bar. There are 19-21 tail rings, being alternating brown and whitish, the lighter sections being narrower than the darker sections.
Adult female *C. adelynhoserae sp. nov.* are greyish in colouration and with a greyish head with mottling as opposed to any well-defined markings.

Adult male *C. jackyhoserae sp. nov.* normally have a brownish-red dorsal surface with broken lines or evenly arranged flecks along, but not on the mid-dorsal line. Some specimens alternatively have a whitish-red upper body to deep red, characterised by a dorsal arrangement of about six broken orange-brown-red lines running longitudinally down the body from neck to rump, being broken by intervening areas of creamy-grey white that are wider than the darker markings. The side of the head and labials are whitish or at least with whiter pigment than elsewhere and with indistinct reddish markings near the ear and temples. The top of the head is a dark reddish orange, The lower flanks are characterised by 3-5 dark brown bars across a pale yellowish background, being indistinctly divided from the whitish-grey above, or in some specimens these may reduce to being evenly spaced paired dark spots. There are no light blue spots or flecks anywhere on the dorsum. There is no dark bar between the eye and ear, where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

There are 17-18 tail rings, alternating blackish and whitish, the rings being of even thickness.
Adult female *C. jackyhoserae sp. nov.* are of greyish colouration, featuring brown barring on the lower labial area, no markings, or very indistinct on all limbs and a dorsal surface featuring a mottled appearance of light and dark, but no obvious well defined pattern.

Adult male *C. lenhoseri sp. nov.* have a strongly reddish-brown forebody, becoming greyish towards the rear and tail. On either side of the mid-dorsal line are about 5 pairs of evenly spaced semi-distinct small dark blackish brown spots of semi-rectangular shape, the longer sides being those running towards the flanks. The flanks are more reddish than the mid dorsum, which is slightly greyish and the flanks also have scattered light blue spots or flecks. There are 24-28 tail rings, defined by having very narrow light sections and wide darker sections, being alternating brownish-black and whitish bands. There are no obvious blotches or spots on the lower flanks, or dark bar between the eye and ear, although in some specimens there is dark peppering where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

Adult female *C. lenhoseri sp. nov.* are of similar colour to males, being reddish and without obvious pattern of any sort. The dorsal surface is effectively unicolour, save for a poorly defined zone of darkening along the mid vertebral line and 4-6 well-spaced pairs of small but obvious yellow spots on either side of the mid dorsal line of the body. There are sometimes paired scattered dark spots around the neck, which typically fade in older specimens. There are 18-22 tail rings, with lighter ones being narrow or incomplete and darker ones about 3-4 times wider, the colouration being greyish orange (wider) and yellow (narrower) bands. Fore and hind limbs both have indistinct bands.

Juvenile *C. lenhoseri sp. nov.* of both sexes are characterised by a significant amount of dark brown and black pigment in the form of flecks or mottling on the upper surfaces, which fades with age.

Adult male *C. katrinahoserae sp. nov.* have an orange-grey-brown forebody, with a distinct salmon colouration across whitish parts of the upper forebody and head, becoming dull greyish towards the rear and tail. On either side of the mid-dorsal line are about scattered semi-distinct dark flecks which may also appear on the mid flanks, but the dorsum is otherwise not prominently marked. The flanks are slightly darker than the dorsum at the mid flanks before becoming light again at the belly. There are 20-26 tail rings, defined by having narrow light sections and wide darker sections, being alternating brownish-black and whitish bands. There are no obvious blotches or spots on the lower flanks, or dark bar between the eye and ear, although in some specimens there is dark peppering where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

Adult female *C. katrinahoserae sp. nov.* are of similar colour to males, but generally greyish in colour with lighter yellow-cream interspaces. There is a mottled pattern across the dorsal surface, being most prominent at the anterior end and the sides of the head.

In both sexes, the legs are generally unmarked, but commonly with indistinct blotching, particularly on the lower rear legs upper surface.

Adult male *C. macropus* have a generally light orange dorsal colour, with scattered dark brown flecks on the head and neck, but not on the body or legs. Prominent in this species are numerous bright aqua-blue spots scattered across the dorsal surface and sides of the flanks. There are 19-21 tail rings, with the darker sections being significantly wider than the lighter ones. The anterior tail is generally brownish orange with indistinct bands, while the posterior half of the tail has fairly well defined bands, the colours being brown and yellow-white.

Adult female *C. macropus* are similar in most respects to adult female *C. jackyhoserae sp. nov.* but any yellow spotting on the back near the mid-dorsal line is relatively indistinct and the front legs have well defined bands. Any markings on the rear legs, if present are indistinct.

Ctenophorus adelynhoserae sp. nov. in life is depicted in Storr *et al.* (1983), plate 3, image 4, adult male.

C. jackyhoserae sp. nov. is depicted in life in Wilson and Swan (2017) on page 413 at top left, adult male and Wilson and Knowles (1988), page 207, top left adult male, top right adult female and in Hoser (1989) page 67 top, male.

C. katrinahoserae sp. nov. is depicted in life online at: https://pbase.com/gehyra/image/129646530

(last downloaded on 1 March 2020).

C. lenhoseri sp. nov. is depicted in life in Cogger (2014), bottom left, adult male (aged) and Brown (2014), page 653 (3 images labelled as *Ctenophorus caudicinctus macropus*, Windorah, Queensland, two adult males and an adult female).

All of *Ctenophorus adelynhoserae sp. nov*., *C. jackyhoserae sp. nov*., *C. katrinahoserae sp. nov*., *C. lenhoseri sp. nov.* and *C. macropus* can be separated from all congeners in the subgenus *Tachyon* Wells and Wellington, 1985 (as defined elsewhere in this paper), by having over 32 lamellae under the fourth toe versus less than 32 in all other species as well as a tail 2 times the length of snout-vent, versus less than 1.8 times snout-vent in all other species and the adpressed hind-leg extends past the snout (not so in all other species).

All of *Ctenophorus adelynhoserae sp. nov*., *C. jackyhoserae sp. nov*., *C. katrinahoserae sp. nov*., *C. lenhoseri sp. nov.* and *C. macropus* are characterised as follows: Distal three-quarters of tail compressed. Nasal small, located on top of obtuse rostral ridge. Keels of dorsal scales moderately strong and sharp, terminating in a blunt end or short spine. Ventrals weakly keeled. Upper labials 15-16. Femoral and preanal pores 26-31.

Distribution: The species *C. lenhoseri sp. nov.* occurs in the ranges surrounding Mount Isa and areas to the south in north-west Queensland.

C. katrinahoserae sp. nov. is known only from hilly country south of the Gulf of Carpentaria in far northwest Queensland and nearby parts of the Northern Territory, in an area generally bounded by Hells Gate in the East and Limmen National Park in the West.

C. macropus (Storr, 1967) inhabits the top end of the Northern Territory including Arnhem Land.

Etymology: *C. lenhoseri sp. nov.* is named in honour of my father, Len Hoser (AKA Leonard Donald Hoser), spending about half of his life living in the north side of Sydney, New South Wales, Australia and the other half in the United Kingdom of England, Wales, Scotland and Northern Ireland in recognition of over three decades of valuable contributions to herpetology in Australia and for services to the bakery business in Australia and the UK.

CTENOPHORUS (*TACHYON*) *MAXINEHOSERAE SP. NOV.*

LSID urn:lsid:zoobank.org:act:EB5ADF71-70FB-45A9-B989-5C107063D718

Holotype: A preserved specimen at the National Museum of Victoria, Melbourne, Victoria, Australia, specimen number D74268 collected from Devils Marbles, Northern Territory, Australia, Latitude -20.5676, Longitude 134.264 E. This facility allows access to its holdings.

Paratype: A preserved specimen at the Museum and Art Gallery of the Northern Territory, Reptile Collection, Darwin, Northern Territory, Australia, specimen number R31309 collected from Devils Marbles, Northern Territory, Australia, Latitude -20.55, Longitude 134.283 E.

Diagnosis: Until now *Ctenophorus maxinehoserae sp. nov.* has been treated as a northern population of *C. slateri* (Storr, 1967), the latter species with a type locality of Hermannsburg, Northern Territory, Australia, Latitude 23.58 S., Longitude 132.46 E.
C. slateri as defined herein is effectively confined to the Macdonnell Ranges of Central Australia.
However genetic divergence and morphological differences, combined with a clearly allopatric population indicate that the lizards herein identified as *Ctenophorus maxinehoserae sp. nov.* found to the north of the type region of *C. slateri* are not of the same species as *C. slateri* (Storr, 1967).

Both *C. maxinehoserae sp. nov.* and *C. slateri* are readily separated from all other species in the subgenus *Tachyon* (Wells and Wellington, 1985) (as defined elsewhere in this paper) by the following unique suite of characters: Keels of dorsal scales sharp and black (versus not so in all other species), the adpressed hind-leg does not extend to the end of the snout, which clearly separates this species from all of *Ctenophorus adelynhoserae sp. nov*., *C. jackyhoserae sp. nov*., *C. katrinahoserae sp. nov*., *C. lenhoseri sp. nov*. and *C. macropus* (Storr, 1967) (these species all previously treated as populations of *C. macropus*), base of tail not compressed; there are no dark blackish caudal bands, nasal on or just below a swollen rostral ridge: pores fewer than 43, colouration with a dorsal surface that is reddish-brown or dull orange, with small indistinct, whitish or darkish specks, spots or small blotches. Tail rings are semidistinct at the anterior end and fully formed at the rear, with darker sections 3-5 times wider, and a colouration of alternating greyish orange and yellowish white bands.

Both male and female *C. maxinehoserae sp. nov.* are readily separated from *C. slateri* by having a series of 6-7 small semi-distinct dark purplish-brown spots running along either side of the mid dorsal line of the body with further similarly-spaced similar markings extending to the upper surface of the base of the tail.
Both male and female *C. slateri* are characterised by having a series of well-defined white to whitish yellow spots running along either side of the mid dorsal line of the body with further similarly-spaced similar but less distinct markings extending to the upper surface of the base of the tail.

C. maxinehoserae sp. nov. is further separated from *C. slateri* by having weakly keeled ventral scales, versus not so in *C. slateri.*

C. maxinehoserae sp. nov. in life is depicted in Wilson and Knowles (1988), on page 206 bottom right, adult male, and Brown (2014), page 653, bottom left.

C. slateri in life is depicted in Brown (2014) on page 653 bottom right, adult female.

Distribution: *C. maxinehoserae sp. nov.* is restricted to ranges and rocky country in the general vicinity of Barrow Creek to Tennant Creek, including the Davenport Ranges in the Northern Territory, Australia, while *C. slateri* is confined to the Macdonnell Ranges and nearby rocky hills in Central Australia.

Etymology: Named in honour of Maxine Hoser of Margate in the United Kingdom of England, Wales, Scotland and Northern Ireland in recognition of her services to herpetology from the 1960's to 1980's.

CTENOPHORUS (*TACHYON*) *RONHOSERI SP. NOV.*

LSID urn:lsid:zoobank.org:act:6BA8B610-14A6-40B6-A681-E7F0AD96F3A8

Holotype: A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number R102084, collected from the Yulpul Rockhole at the north end of the McKay Range, Western Australia, Australia, Latitude -22.97 S., Longitude 122.46 E. This government-owned facility allows access to its holdings.

Paratype: A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number R102611, collected from the Little Sandy Desert, Western Australia, Australia, Latitude -24.05 S., Longitude 120.41 E.

Diagnosis: Morphologically, *Ctenophorus ronhoseri sp. nov.* is most similar to *C. caudicinctus* (Günther, 1875), although genetically it is most closely related to *C. graafi* (Storr, 1967). However the species is sufficiently divergent from all congeners (4.2 MYA from nearest common ancestor according to the evidence of Melville *et al.* 2016), morphologically distinct and reproductively isolated as to warrant being recognized as a full species.

Ctenophorus ronhoseri sp. nov. and *C. caudicinctus* are separated from all other species in the subgenus *Tachyon* (Wells and Wellington) as defined elsewhere in this paper, including the closely related species *C. graafi* (Storr, 1967) by having the nasal on or just below a swollen rostral ridge: pores fewer than 43 and the whole of tail compressed with dark narrow caudal bands encircling the tail.

C. ronhoseri sp. nov. is readily separated from *C. caudicinctus* by having yellowish or orangeish colouration on the back, versus reddish or brown on *C. caudicinctus.* Markings on the back and flanks of adult male *C. ronhoseri sp. nov.* are indistinct, versus distinct in *C. caudicinctus.*

C. caudicinctus also has white marks or peppering on the sides of the head, whereas this is not the case in *C. ronhoseri sp. nov.*.

Distribution: *C. ronhoseri sp. nov.* is known only from the type localities and immediately adjacent hilly areas in the east Pilbara region of Western Australia, Australia.
C. caudicinctus is found in other parts of the Pilbara, including the west Pilbara

Etymology: Named in honour of Ron Hoser, (deceased) of Green Valley, (Sydney), New South Wales, Australia in recognition of numerous contributions to herpetology in the 1960's to 1980's.

CTENOPHORUS (*TACHYON*) *SHARONHOSERAE SP. NOV.*

LSID urn:lsid:zoobank.org:act:2FC73FDD-6F04-41F3-91D6-3676BB32C04B

Holotype: A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number: R12734, collected at Dedari, (Coolgardie), Western Australia, Australia, Latitude -31.08 S., Longitude 120.77 E. This government-owned facility allows access to its holdings.

Paratypes: Two preserved specimens at the Western Australian Museum, Perth, Western Australia, Australia, specimen numbers R29946 and R29947 collected at Widgiemooltha, Western Australia, Australia, Latitude -31.3 S., Longitude 121.58 E.

Diagnosis: Until now *C. sharonhoserae sp. nov.* has been treated as an inland eastern population of *C. ornatus* (Gray, 1845) with a distribution mainly in the Goldfields region of southern Western Australia, Australia.

These two species and third species formally described herein as *C. shireenhoserae sp. nov.* are readily separated by colouration in adult males.

The type form of *C. ornatus* has a generally black dorsal surface with large creamy-white blotches running down the mid-dorsal line and a lesser number of smaller spots on the flanks. The tail has well defined black and yellow-white bands (sometimes uneven) of similar thickness on the dorsal surface and blackish limbs that are strongly banded or marked with yellow-white.
By contrast *C. shireenhoserae sp. nov.* has a generally reddish-brown dorsal surface with an absence of yellow spots on the side. The colour of the mid dorsal blotches is whitish-grey, generally merging to form a mid-dorsal stripe and bounded by dark brown to black. The limbs are generally a light greyish colour and with ill defined blotches or markings. The tail of *C. shireenhoserae sp. nov.* is banded but the lighter interspaces are double the size of the darker sections. The lighter bands are light bluish-grey, versus white to fellow-white in *C. ornatus.*

C. sharonhoserae sp. nov. is separated from both *C. shireenhoserae sp. nov.* and *C. ornatus* by colouration. In this species the mid dorsal blotches are similar in form to those seen in *C. ornatus* including being bounded by black. But unlike *C. ornatus* that has a generally black dorsum and flanks with some obvious yellow spots, *C. sharonhoserae sp. nov.* has a reddish brown dorsum and flanks, with a distinctive line boundary between the reddish brown dorsum and white undersides. At most there are only a small number of very tiny whitish yellow specks on the lower flanks and the mid flanks have no such markings, being either dark or light reddish-brown in colour.
In *C. sharonhoserae sp. nov.* the forelimbs are well-banded and the hind limbs are not, which places this taxon intermediate between *C. shireenhoserae sp. nov.* whose limbs lack obvious distinct bands and *C. ornatus* which has well banded front and hind limbs.

The species *C. shireenhoserae sp. nov.* is in many ways intermediate in form between *C. ornatus* and *C. yinnietherra* (Storr, 1981). *C. yinnietherra* is separated from *C. shireenhoserae sp. nov.*, *C. sharonhoserae sp. nov.* and *C. ornatus* by having the basal portion of the tail unbanded and only banding on the posterior third. *C. yinnietherra* is further separated from both *C. shireenhoserae sp. nov.*, *C. sharonhoserae sp. nov.* and *C. ornatus* by dorsal colouration. The flanks are generally greyish, without obvious markings, forelimbs also greyish and mid-dorsal area and rear limbs generally reddish-orange and without any obvious black markings or black bounding any blotches or spots (which are absent). The anterior half of the tail has an orange upper surface (without bands), versus not orangeish and banded in the other three species.

C. yinnietherra is further separated from *C. shireenhoserae sp. nov.*, *C. sharonhoserae sp. nov.* and *C. ornatus* by having a significant amount of orange around the eye and nearby parts of the head (absent in the other two species).

Adult female *C. yinnietherra* have a generally unbanded tail, versus banded in females of *C. shireenhoserae sp. nov.*, *C. sharonhoserae sp. nov.* and *C. ornatus.* Adult female *C. shireenhoserae sp. nov.* and *C. sharonhoserae sp. nov.* are generally a reddish-brown dorsally with semi-distinct irregular blackish markings, versus greyish-brown dorsally with semi-distinct irregular blackish markings in *C. ornatus.*

C. shireenhoserae sp. nov. in life is depicted in Cogger (2014) on page 716 at top right; Storr, Smith and Johnstone (1983) middle right and in Brown (2014) on page 656 at bottom left (with caption transposed from photo of *C. ornatus* in middle right of same page).

C. ornatus in life is depicted in Cogger (2014) on page 717 at top left; Storr, Smith and Johnstone (1983) top right and left and in Brown (2014) on page 656 at middle right (with caption transposed from photo of *shireenhoserae sp. nov.* in bottom left of same page).

C. sharonhoserae sp. nov. in life is depicted in Storr, Smith and Johnstone (1983) middle left.

C. yinnietherra in life is depicted in Cogger (2014) on page 724 at top and Storr, Smith and Johnstone (1983), bottom right and left.

The type specimen of *C. ornatus* as described by Boulenger (1885), as described by him in terms of colouration, clearly conforms to a male specimen from the wetter parts of South-western Western Australia (as in somewhere near Perth) and so that form is regarded as nominate for *C. ornatus*, thereby confirming the taxon herein described as *C. shireenhoserae sp. nov.* was previously undescribed.
In terms of colouration, Boulenger wrote: "Black above; a series of large irregular yellowish spots along the vertebral line and a few very small ones scattered on the sides; limbs and tail with yellowish cross bars; throat punctate with blackish; a large black spot covers the chest."

> Boulenger's full description of the type specimen for Gray's *C. ornatus* was as follows:
>
> "Habit slender. Head moderately large; snout slightly longer

than the diameter of the orbit; canthus rostralis swollen, not angular; nostril distinctly tubular, directed slightly upwards, much nearer the eye than the end of the snout; tympanum large, three fifths the diameter of the orbit; upper head-scales tubercular, rough, smallest on supraorbital region. Sides of neck rather strongly plicate a distinct dorso-lateral fold. Gular scales minute, smooth. Body much depressed, covered above with small keeled scales, largest and uniform on the vertebral region, minute and intermixed with widely scattered slightly enlarged ones on the sides; no dorsal crest; ventral scales small, smooth. Limbs and digits long, the adpressed hind limb reaching the tip of the snout; the scales on the limbs strongly keeled, those on the arm and tibia much enlarged.

A series of sixty pores extending along the whole length of the thighs, slightly interrupted on the praeanal region. Tail slender, round, depressed at the base; twice as long as head and body;

caudal scales equal, much larger than dorsals, strongly keeled.

Black above; a series of large irregular yellowish spots along the vertebral line and a few very small ones scattered on the sides; limbs and tail with yellowish cross bars; throat punctate with

blackish; a large black spot covers the chest."

Species within the subgenus *Tachyon* Wells and Wellington, 1985 are separated from all other *Ctenophorus* Fitzinger, 1843 by the following suite of characters being one or other of:

1/ Tympanum exposed; no series of enlarged, spinose scales on either side of the base of the tail; hind limb usually reaching to eye or beyond when adpressed; tail usually much more than 1.5 times as long as the head and body; canthus rostralis swollen, but nostrils, when viewed from above, face distinctly upwards as opposed to outwards (species *C. adelynhoserae sp. nov.*; *C. caudicinctus* (Günther, 1875); *C. graafi* (Storr, 1967); *C. imbricatus* (Peters, 1876); *C. infans* (Storr, 1967); *C. jackyhoserae sp. nov.*; *C. katrinahoserae sp. nov.*; *C. lenhoseri sp. nov.*; *C. macropus* (Storr, 1967); *C. mensarum* (Storr, 1967); *C. slateri* (Storr, 1967)) or:

2/ Tympanum exposed; no series of enlarged, spinose scales on either side of the base of the tail; hind limb usually reaching to eye or beyond when adpressed; tail usually much more than 1.5 times as long as the head and body; canthus rostralis angular or moderately swollen, but nostrils, when viewed from above, face outwards as opposed to distinctly upwards (as seen in the species *C. adelynhoserae sp. nov.*; *C. caudicinctus* (Günther, 1875); *C. graafi* (Storr, 1967); *C. imbricatus* (Peters, 1876); *C. infans* (Storr, 1967); *C. jackyhoserae sp. nov.*; *C. katrinahoserae sp. nov.*; *C. lenhoseri sp. nov.*; *C. macropus* (Storr, 1967); *C. mensarum* (Storr, 1967); *C. slateri* (Storr, 1967)); at most a few enlarged keeled scales on the nape; a series of enlarged vertebral scales, if present, forming a distinct linear series only to about the level of the forelimbs; dorsal scales at most with low, irregular keels which do not form distinct continuous ridges; dorsolateral scales and those on the chest smooth, or with low blunt edges; nostril elliptical in a swollen nasal scale lying on a swollen canthal ridge; tibial region with a series of anterior proximal scales which are very much larger than those on the posterior surface (species *C. shireenhoserae sp. nov.*; *C. ornatus* and *C. yinnietharra*).

Ctenophorus as defined until now (Cogger 2014, Hoser 2015g) is defined by the following definition, modified to take into account the new genera as defined herein. *Ctenophorus* is defined as an Australian agamid genus characterised by small dorsal scales, homogenous or with at most slightly enlarged tubercles; a few species with distinct rows of paravertebral or dorsolateral spinose scales; a row of enlarged scales from below the eye to above the ear; tympanum exposed (not exposed in *Notactenophorus* Hoser, 2015 and most *Pseudoctenophorus* Hoser, 2015); tail long, ranging from slightly to much longer than the head and body; femoral and preanal pores present in males; adult males usually with distinctive black or dark grey markings on the throat and/or chest.

The genus *Paractenophorus* Hoser, 2015 is separated from *Ctenophorus*, *Notactenophorus* Hoser, 2015 and *Pseudoctenophorus* Hoser, 2015 by the following suite of characters: tympanum exposed; no series of enlarged, spinose scales on either side of the base of the tail; hind limb reaching no further than the tympanum when adpressed; tail usually less than 1.5 times as long as the head and body; nasal region is not swollen, the nostril lying below an angular canthal ridge; pores fewer than 15; nostril is slit-like or narrowly elliptical.

Specimens within the genus *Pseudoctenophorus* Hoser, 2015 are separated from all other *Ctenophorus* Fitzinger, 1843, the genus they were placed previously, by the following suite of characters, being one or other of the following three:

1/ Tympanum exposed; a series of enlarged, spinose scales on either side of the base of the tail (subgenus *Pseudoctenophorus* Hoser, 2015), or:

2/ Tympanum hidden; covered by skin; body scales are strongly heterogeneous, many of the larger scales on the body and head keeled or moderately spinose; a series of enlarged, spinose scales on either side of the base of the tail (subgenus *Chapmanagama* Hoser, 2015), or:

3/ Tympanum hidden; covered by skin; body scales are strongly heterogeneous, many of the larger scales on the body and head keeled or moderately spinose; no series of enlarged, spinose scales on either side of the base of the tail (subgenus *Turnbullagama* Hoser, 2015).

Notactenophorus Hoser, 2015 is readily separated from all other members of the genus *Ctenophorus* (where it has been placed until now, as defined in Cogger 2014) and *Pseudoctenophorus* Hoser, 2015 by the following unique suite of characters: Tympanum is hidden being covered by skin, the body scales are smooth, mostly small, homogenous, with scattered larger but small, flat scales, not keeled or spinose, with a dorsal pattern of a longitudinal dorso-lateral series of five or six large black spots on either side.

Distribution: *C. sharonhoserae sp. nov.* is found in the semi-arid zone of south-western Western Australia, away from the Darling Range and south coast of Western Australia, and also south of the mulga-eucalypt line in south-west Australia. The distribution is mainly in the Goldfields region of southern Western Australia, Australia.

C ornatus is restricted to the Darling Range (near Perth) and wetter parts of the south coast of south-western Australia.

C. shireenhoserae sp. nov. is known only from near the type locality and nearby areas in Western Australia, generally between Paynes Find and Mount Magnet in Western Australia.

Etymology: *C. sharonhoserae sp. nov.* is named in honour of my cousin Sharon Hoser (now Menzies), originally of the UK, but since having resided in various capital cities of Australia and also in Papua New Guinea in recognition of her contributions to herpetology in the 1960's and 1970's.

CTENOPHORUS (*TACHYON*) *SHIREENHOSERAE SP. NOV.*

LSID urn:lsid:zoobank.org:act:D6B994AC-026E-4285-9F46-51CB695A73BB

Holotype: A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number: R117278 collected 7 km north of Mount Magnet, Western Australia, Latitude -28 S., Longitude 117.87 E. This government-owned facility allows access to its holdings.

Paratype: A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number: R117279 collected 7 km north of Mount Magnet, Western Australia, Latitude -28 S., Longitude 117.87 E.

Diagnosis: Until now *C. shireenhoserae sp. nov.* has been treated as a north-west population of *C. ornatus* (Gray, 1845). These two species and third species formally described herein as

C. sharonhoserae sp. nov. are readily separated by colouration in adult males.

The type form of *C. ornatus* has a generally black dorsal surface with large creamy-white blotches running down the mid-dorsal line and a lesser number of smaller spots on the flanks. The tail has well defined black and yellow-white bands (sometimes uneven) of similar thickness on the dorsal surface and blackish limbs that are strongly banded or marked with yellow-white.

By contrast *C. shireenhoserae sp. nov.* has a generally reddish-brown dorsal surface with an absence of yellow spots on the side. The colour of the mid dorsal blotches is whitish-grey, generally merging to form a mid-dorsal stripe and bounded by dark brown to black. The limbs are generally a light greyish colour and with ill defined blotches or markings. The tail of *C. shireenhoserae sp. nov.* is banded but the lighter interspaces are double the size of the darker sections. The lighter bands are light bluish-grey, versus white to fellow-white in *C. ornatus.*

C. sharonhoserae sp. nov. is separated from both *C. shireenhoserae sp. nov.* and *C. ornatus* by colouration. In this species the mid dorsal blotches are similar in form to those seen in *C. ornatus* including being bounded by black. But unlike *C. ornatus* that has a generally black dorsum and flanks with some obvious yellow spots, *C. sharonhoserae sp. nov.* has a reddish brown dorsum and flanks, with a distinctive line boundary between the reddish brown dorsum and white undersides. At most there are only a small number of very tiny whitish yellow specks on the lower flanks and the mid flanks have no such markings, being either dark or light reddish-brown in colour.

In *C. sharonhoserae sp. nov.* the forelimbs are well-banded and the hind limbs are not, which places this taxon intermediate between *C. shireenhoserae sp. nov.* whose limbs lack obvious distinct bands and *C. ornatus* which has well banded front and hind limbs..

The species *C. shireenhoserae sp. nov.* is in many ways intermediate in form between *C. ornatus* and *C. yinnietherra* (Storr, 1981). *C. yinnietherra* is separated from *C. shireenhoserae sp. nov.*, *C. sharonhoserae sp. nov.* and *C. ornatus* by having the basal portion of the tail unbanded and only banding on the posterior third. *C. yinnietherra* is further separated from both *C. shireenhoserae sp. nov.*, *C. sharonhoserae sp. nov.* and *C. ornatus* by dorsal colouration. The flanks are generally greyish, without obvious markings, forelimbs also greyish and mid-dorsal area and rear limbs generally reddish-orange and without any obvious black markings or black bounding any blotches or spots (which are absent). The anterior half of the tail has an orange upper surface (without bands), versus not orangeish and banded in the other three species.

C. yinnietherra is further separated from *C. shireenhoserae sp. nov.*, *C. sharonhoserae sp. nov.* and *C. ornatus* by having a significant amount of orange around the eye and nearby parts of the head (absent in the other two species).

Adult female *C. yinnietherra* have a generally unbanded tail, versus banded in females of *C. shireenhoserae sp. nov.*, *C. sharonhoserae sp. nov.* and *C. ornatus.* Adult female *C. shireenhoserae sp. nov.* and *C. sharonhoserae sp. nov.* are generally a reddish-brown dorsally with semi-distinct irregular blackish markings, versus greyish-brown dorsally with semi-distinct irregular blackish markings in *C. ornatus.*

C. shireenhoserae sp. nov. in life is depicted in Cogger (2014) on page 716 at top right; Storr, Smith and Johnstone (1983) middle right and in Brown (2014) on page 656 at bottom left (with caption transposed from photo of *C. ornatus* in middle right of same page).

C. ornatus in life is depicted in Cogger (2014) on page 717 at top left; Storr, Smith and Johnstone (1983) top right and left and in Brown (2014) on page 656 at middle right (with caption transposed from photo of *shireenhoserae sp. nov.* in bottom left of same page).

C. sharonhoserae sp. nov. in life is depicted in Storr, Smith and Johnstone (1983) middle left.

C. yinnietherra in life is depicted in Cogger (2014) on page 724 at top and Storr, Smith and Johnstone (1983), bottom right and left.

The type specimen of *C. ornatus* as described by Boulenger (1885), as described by him in terms of colouration, clearly conforms to a male specimen from the wetter parts of South-western Western Australia (as in somewhere near Perth) and so that form is regarded as nominate for *C. ornatus*, thereby confirming the taxon herein described as *C. shireenhoserae sp. nov.* was previously undescribed.

In terms of colouration, Boulenger wrote: “Black above; a series of large irregular yellowish spots along the vertebral line and a few very small ones scattered on the sides; limbs and tail with yellowish cross bars; throat punctate with blackish; a large black spot covers the chest.”

Boulenger’s full description of the type specimen for Gray’s *C. ornatus* was as follows:

“Habit slender. Head moderately large; snout slightly longer than the diameter of the orbit; canthus rostralis swollen, not angular ; nostril distinctly tubular, directed slightly upwards, much nearer the eye than the end of the snout ; tympanum large, three fifths the diameter of the orbit ; upper head-scales tubercular, rough, smallest on supraorbital region. Sides of neck rather strongly plicate a distinct dorso-lateral fold. Gular scales minute, smooth. Body much depressed, covered above with small keeled scales, largest and uniform on the vertebral region, minute and intermixed with widely scattered slightly enlarged ones on the sides; no dorsal crest; ventral scales small, smooth. Limbs and digits long, the adpressed hind limb reaching the tip of the snout; the scales on the limbs strongly keeled, those on the arm and tibia much enlarged.

A series of sixty pores extending along the whole length of the thighs, slightly interrupted on the praeanal region. Tail slender, round, depressed at the base; twice as long as head and body; caudal scales equal, much larger than dorsals, strongly keeled.

Black above; a series of large irregular yellowish spots along the vertebral line and a few very small ones scattered on the sides; limbs and tail with yellowish cross bars; throat punctate with blackish; a large black spot covers the chest.”

Species within the subgenus *Tachyon* Wells and Wellington, 1985 are separated from all other *Ctenophorus* Fitzinger, 1843 by the following suite of characters being one or other of:

1/ Tympanum exposed; no series of enlarged, spinose scales on either side of the base of the tail; hind limb usually reaching to eye or beyond when adpressed; tail usually much more than 1.5 times as

long as the head and body; canthus rostralis swollen, but nostrils, when viewed from above, face distinctly upwards as opposed to outwards (species *C. adelynhoserae sp. nov.*; *C. caudicinctus* (Günther, 1875); *C. graafi* (Storr, 1967); *C. imbricatus* (Peters, 1876); *C. infans* (Storr, 1967); *C. jackyhoserae sp. nov.*; *C. katrinahoserae sp. nov.*; *C. lenhoseri sp. nov.*; *C. macropus* (Storr, 1967); *C. mensarum* (Storr, 1967); *C. slateri* (Storr, 1967)) or:

2/ Tympanum exposed; no series of enlarged, spinose scales on either side of the base of the tail; hind limb usually reaching to eye or beyond when adpressed; tail usually much more than 1.5 times as long as the head and body; canthus rostralis angular or moderately swollen, but nostrils, when viewed from above, face outwards as opposed to distinctly upwards (as seen in the species *C. adelynhoserae sp. nov.*; *C. caudicinctus* (Günther, 1875); *C. graafi* (Storr, 1967); *C. imbricatus* (Peters, 1876); *C. infans* (Storr, 1967); *C. jackyhoserae sp. nov.*; *C. katrinahoserae sp. nov.*; *C. lenhoseri sp. nov.*; *C. macropus* (Storr, 1967); *C. mensarum* (Storr, 1967); *C. slateri* (Storr, 1967));

at most a few enlarged keeled scales on the nape; a series of enlarged vertebral scales, if present, forming a distinct linear series only to about the level of the forelimbs; dorsal scales at most with low, irregular keels which do not form distinct continuous ridges; dorsolateral scales and those on the chest smooth, or with low blunt edges; nostril elliptical in a swollen nasal scale lying on a swollen canthal ridge; tibial region with a series of anterior proximal scales which are very much larger than those on the posterior surface (species *C. shireenhoserae sp. nov.*; *C. ornatus* and *C. yinnietharra*).

Ctenophorus as defined until now (Cogger 2014, Hoser 2015g) is defined by the following definition, modified to take into account the new genera as defined herein. *Ctenophorus* is defined as an Australian agamid genus characterised by small dorsal scales, homogenous or with at most slightly enlarged tubercles; a few species with distinct rows of paravertebral or dorsolateral spinose scales; a row of enlarged scales from below the eye to above the ear; tympanum exposed (not exposed in *Notactenophorus* Hoser, 2015 and most *Pseudoctenophorus* Hoser, 2015); tail long, ranging from slightly to much longer than the head and body; femoral and preanal pores present in males; adult males usually with obvious black or dark grey markings on throat and/or chest.

The genus *Paractenophorus* Hoser, 2015 is separated from *Ctenophorus*, *Notactenophorus* Hoser, 2015 and *Pseudoctenophorus* Hoser, 2015 by the following suite of characters: tympanum exposed; no series of enlarged, spinose scales on either side of the base of the tail; hind limb reaching no further than the tympanum when adpressed; tail usually less than 1.5 times as long as the head and body; nasal region is not swollen, the nostril lying below an angular canthal ridge; pores fewer than 15; nostril is slit-like or narrowly elliptical.

Specimens within the genus *Pseudoctenophorus* Hoser, 2015 are separated from all other *Ctenophorus* Fitzinger, 1843, the genus they were placed previously, by the following suite of characters, being one or other of the following three:

1/ Tympanum exposed; a series of enlarged, spinose scales on either side of the base of the tail (subgenus *Pseudoctenophorus* Hoser, 2015), or:

2/ Tympanum hidden; covered by skin; body scales are strongly heterogeneous, many of the larger scales on the body and head keeled or moderately spinose; a series of enlarged, spinose scales on either side of the base of the tail (subgenus *Chapmanagama* Hoser, 2015), or:

3/ Tympanum hidden; covered by skin; body scales are strongly heterogeneous, many of the larger scales on the body and head keeled or moderately spinose; no series of enlarged, spinose scales on either side of the base of the tail (subgenus *Turnbullagama* Hoser, 2015).

Notactenophorus Hoser, 2015 is readily separated from all other members of the genus *Ctenophorus* (where it has been placed until now, as defined in Cogger 2014) and *Pseudoctenophorus* Hoser, 2015 by the following unique suite of characters: Tympanum is hidden being covered by skin, the body scales are smooth, mostly small, homogenous, with scattered larger but small, flat scales, not keeled or spinose, with a dorsal pattern of a longitudinal dorso-lateral series of five or six large black spots on either side.

Distribution: *C. shireenhoserae sp. nov.* is known only from near the type locality and nearby areas in Western Australia, generally between Paynes Find and Mount Magnet in Western Australia.

C. sharonhoserae sp. nov. is found in the semi-arid zone of south-western Western Australia, away from the Darling Range and south coast of Western Australia, and also south of the mulga-eucalypt line in south-west Australia. The distribution is mainly in the Goldfields region of southern Western Australia, Australia.

C ornatus is restricted to the Darling Range (near Perth) and wetter parts of the south coast of south-western Australia.

Etymology: *C. shireenhoserae sp. nov.* is named in honour of my wife Shireen Vanessa Hoser from a remote part of Africa called "Athlone", in recognition of her contributions to herpetology over more than 20 years.

REFERENCES CITED

Ahl, E. 1926. Neue Eidechsen und Amphibien. *Zool. Anz.* 67:186-192.

Baverstock, P. R. and Bradshaw, S. D. 1975. Variation in rate of growth and adrenal corticosteroidogenesis in field and laboratory populations of the lizard *Amphibolurus ornatus. Comp Biochem Physiol* 52A:557-566.

Boulenger, G. A. 1885. *Catalogue of the lizards in the British Museum (Nat. Hist.) I. Geckonidae, Eublepharidae, Uroplatidae, Pygopodidae, Agamidae.* London:UK:450 pp.

Bradshaw, S. D. 1970. Seasonal changes in the water and electrolyte metabolism of *Amphibolurus* lizards in the field. *Comp Biochem Physiol* 36:689-718.

Bradshaw, S. D. 1971. Growth and mortality in a field population of *Amphibolurus* lizards exposed to seasonal cold and aridity. *Journal of Zoology* 165:1-25.

Bradshaw, S. D. and Main, A. R. 1968. Behavioural attitudes and regulation of temperature in *Amphibolurus* lizards. *Journal of Zoology* 154:193-221.

Bradshaw, S. D. and Shoemaker, V. H. 1967. Aspects of water and electrolyte changes in a field population of *Amphibolurus* lizards. *Comp Biochem Physiol* 20:855-865.

Cogger, H. G. 2014. *Reptiles and Amphibians of Australia*, 7th ed. CSIRO Publishing, Australia:xxx+1033 pp.

Cogger, H. G., Cameron, E. E. and Cogger, H. M. 1983. *Zoological Catalogue of Australia (1) Amphibia and Reptilia*. Aust. Gov. Publishing Service, Canberra, ACT, Australia:319 pp.

Court of Appeal Victoria. 2014. *Hoser v Department of Sustainability and Environment* [2014] VSCA 206 (5 Sept. 2014).

Denzer, W., Günther, R. and Manthey, U. 1997. Annotated type catalogue of the Agamid lizards (Reptilia: Squamata: Agamidae) in the Museum für Naturkunde der Humbolt-Universität zu Berlin (former Zoological Museum Berlin). *Mitt. Zool. Mus. Berlin* 73(2):309-332.

Doody, J. S. and Schembri, B. 2014. *Ctenophorus caudicinctus* (ring-tailed dragon) predation. *Herp. Review* 45(3):494-495.

Dubois, A., Bauer, A. M., Ceriaco, L. M. P., Dusoulier, F., Fretey, T., Lobl, I., Lorvelec, O., Ohler, A., Stopiglia, R. and Aescht, E. 2019. The Linz Zoocode project: a set of new proposals regarding the terminology, the Principles and Rules of zoological nomenclature. First report of activities (2014-2019). *Bionomina* (online), 17:1-111.

Even, E. 2005. Reptielen zoeken in Australië. *Lacerta* 63(2):48-65.

Fitzinger, L . J. 1843. *Systema reptilium.* Vindobonae [Wien] :Braumüller et Seidel,1843.

Glauert, L. 1959. Herpetological Miscellanea. XI. Dragon Lizards of the Genus *Amphibolurus. West. Aust. Naturalist* 7(2):42-51.

Gray, J. E. 1845. *Catalogue of the specimens of lizards in the collection of the British Museum.* Trustees of the British Museum/ Edward Newman, London:UK:xxvii+289 pp.

Günther, A. 1875. A list of the saurians of Australia and New Zealand. pp. 9-19. In: Richardson, J. and Gray, J. E. *The zoology of the voyage of H.M.S. Erebus and Terror, during the years 1839 to 1843*. By authority of the Lords Commissioners of the Admiralty. Vol. 2. E. W. Janson, London, UK.

Hoser, R. T. 1989. *Australian Reptiles and Frogs*. Pierson and Co., Mosman, NSW, 2088:238 pp.

Hoser, R. T. 1991. *Endangered Animals of Australia*. Pierson Publishing, Mosman, NSW, Australia:240 pp.

Hoser, R. T. 1993. *Smuggled: The Underground Trade in Australia's Wildlife*. Apollo Publishing, Moss Vale, NSW, Australia:149 pp.

Hoser, R. T. 1996. *Smuggled-2: Wildlife Trafficking, Crime and Corruption in Australia*. Kotabi Publishing, Doncaster, Victoria, Australia:280 pp.

Hoser, R. T. 2007. Wells and Wellington - It's time to bury the hatchet. *Calodema* Supplementary Paper 1:1-9.

Hoser, R. T. 2009. Creationism and contrived science: A review of recent python systematics papers and the resolution of issues of taxonomy and nomenclature. *Australasian Journal of Herpetology* 2:1-34. (3 February).

Hoser, R. T. 2012a. Exposing a fraud! *Afronaja* Wallach, Wüster and Broadley 2009, is a junior synonym of *Spracklandus* Hoser 2009! *Australasian Journal of Herpetology* 9 (3 April 2012):1-64.

Hoser, R. T. 2012b. Robust taxonomy and nomenclature based on good science escapes harsh fact-based criticism, but remains unable to escape an attack of lies and deception. *Australasian Journal of Herpetology* 14:37-64.

Hoser, R. T. 2013. The science of herpetology is built on evidence, ethics, quality publications and strict compliance with the rules of nomenclature. *Australasian J. of Herp.* 18:2-79.

Hoser, R. T. 2015a. Dealing with the "truth haters" ... a summary! Introduction to Issues 25 and 26 of *Australasian Journal of Herpetology*. Including "A timeline of relevant key publishing and other events relevant to Wolfgang Wüster and his gang of thieves." and a "Synonyms list". *Australasian Journal of Herpetology* 25:3-13.

Hoser, R. T. 2015b. The Wüster gang and their proposed "Taxon Filter": How they are knowingly publishing false information, recklessly engaging in taxonomic vandalism and directly attacking the rules and stability of zoological nomenclature. *Australasian Journal of Herpetology* 25:14-38.

Hoser, R. T. 2015c. Best Practices in herpetology: Hinrich Kaiser's claims are unsubstantiated.

Australasian Journal of Herpetology 25:39-64.

Hoser, R. T. 2015d. PRINO (Peer reviewed in name only) journals: When quality control in scientific publications fails. *Australasian Journal of Herpetology* 26:3-64.

Hoser, R. T. 2015e. Rhodin *et al.* 2015, Yet more lies, misrepresentations and falsehoods by a band of thieves intent on stealing credit for the scientific works of others. *Australasian Journal of Herpetology* 27:3-36.

Hoser, R. T, 2015f. Comments on *Spracklandus* Hoser, 2009 (Reptilia, Serpentes, ELAPIDAE): request for confirmation of the availability of the generic name and for the nomenclatural validation of the journal in which it was published (Case 3601; see *BZN* 70: 234-237; comments *BZN* 71:30-38, 133-135). *Australasian Journal of Herpetology* 27:37-54.

Hoser, R. T. 2015g. Australian agamids: Eighteen new species from the genera *Amphibolurus* Wagler, 1830, *Lophognathus* Gray, 1842, *Rankinia* Wells and Wellington, 1984, *Diporiphora* Gray, 1842, *Tympanocryptis* Peters, 1863, as well as three new genera and six new subgenera. *Australasian J. Herp.* 30:37-64.

Hoser, R. T. 2019a. 11 new species, 4 new subspecies and a subgenus of Australian Dragon Lizard in the genus *Tympanocryptis* Peters, 1863, with a warning on the conservation status and long-term survival prospects of some newly named taxa. *Australasian Journal of Herpetology* 39:23-52.

Hoser, R. T. 2019b. Richard Shine *et al.* (1987), Hinrich Kaiser *et al.* (2013), Jane Melville *et al.* (2018 and 2019): Australian Agamids and how rule breakers, liars, thieves, taxonomic vandals and law breaking copyright infringers are causing reptile species to become extinct. *Australasian Journal of Herpetology* 39:53-63.

Hoser, R. T. 2020. A long overdue refinement of the taxonomy of the Mallee Dragon Complex *Ctenophorus* (*Phthanodon*) *fordi* (Storr, 1965) *sensu lato* with the formal descriptions of four new subspecies. *Australasian Journal of Herpetology* 43:41-49.

Kaiser, H. 2012a. SPAM email sent out to numerous recipients on 5 June 2012.

Kaiser, H. 2012b. Point of view. Hate article sent as attachment with SPAM email sent out on 5 June 2012.

Kaiser, H. 2013. The Taxon Filter, a novel mechanism designed to facilitate the relationship between taxonomy and nomenclature, vis-à-vis the utility of the Code's Article 81 (the Commission's plenary power). *Bulletin of Zoological Nomenclature* 70(4) December 2013:293-302.

Kaiser, H. 2014a. Comments on *Spracklandus* Hoser, 2009 (Reptilia, Serpentes, ELAPIDAE): request for confirmation of the availability of the generic name and for the nomenclatural validation of the journal in which it was published. *Bulletin of Zoological Nomenclature*, 71(1):30-35.

Kaiser H. 2014b. Best Practices in Herpetological Taxonomy: Errata and Addenda. *Herpetological Review*, 45(2):257-268.

Kaiser, H., Crother, B. L., Kelly, C. M. R., Luiselli, L., O'Shea, M., Ota, H., Passos, P., Schleip, W. D. and Wüster, W. 2013. Best practices: In the 21st Century, Taxonomic Decisions in Herpetology are Acceptable Only When supported by a body of Evidence and Published via Peer-Review. *Herpetological Review* 44(1):8-23.

Kinghorn, J. R. 1924. Reptiles and batrachians from south and south-west Australia. *Records of the Australian Museum* 14(3):163-183.

Lebas, N. R. and Spencer, P. B. S. 2000. Polymorphic microsatellite markers in the Ornate Dragon lizard, *Ctenophorus ornatus*. *Molecular Ecology* 9(3):365-366.

Melville, J., Schulte, J. A. and Larson, A. 2001. A molecular phylogenetic study of ecological diversification in the Australian lizard genus *Ctenophorus. Journal of Experimental Zoology: Molecular and Developmental Evolution* 291(4):339-353.

Melville, J., Haines, M. L., Hale, J., Chapple, S. and Ritchie, E. G. 2016. Concordance in phylogeography and ecological niche modelling identify dispersal corridors for reptiles in arid Australia. *Journal of Biogeography*, 10 June (online).

Peters, W. C. H. 1876. Über die von S. M. S. Gazelle mitgebrachten Amphibien. *Monatsber. königl. Akad. Wiss. Berlin.* 1876 (August):528-535.

Pyron, R. A., Burbrink, F. T. and Weins, J. J. 2013. A phylogeny and revised classification of Squamata, including 4161 species of lizards and snakes. Published online at:

http://www.biomedcentral.com/1471-2148/13/93.

Ride, W. D. L. (*ed.*) *et al.* (on behalf of the International Commission on Zoological Nomenclature) 1999. *International code of Zoological Nomenclature*. The Natural History Museum - Cromwell Road, London SW7 5BD, UK (also commonly cited as "The Rules", "Zoological Rules" or "ICZN 1999").

Sadlier, R. A., Colgan, D., Beatson, C. A. and Cogger, H. G. 2019. *Ctenophorus spinodomus sp. nov.*, a New Species of Dragon Lizard (Squamata: Agamidae) from *Triodia* Mallee Habitat of Southeast Australia. *Rec. Aust. Mus.* 71(5):199-215.

Sternfeld, R. 1925. Beiträge zur Herpetologie Inner-Australiens. *Abhandlungen Herausgegeben von der Senckenbergischen Naturforschenden Gesellschaft*, 38:221-251.

Storr, G. M. 1967. Geographic races of the agamid lizard *Amphibolurus caudicinctus. J. Royal Soc. of WA.* 50:49-56.

Storr, G. M. 1981. Three new agamid lizards from Western Australia. *Rec. of the Western Australian Museum* 8(4):599-607.

Storr, G. M., Smith, L. A. and Johnstone, R. E. 1983. *Lizards of Western Australia 2: dragons and Monitors.* Western Australian Museum, Perth, Western Australia, Australia:114 pp.

Victorian Civil and Administrative Tribunal (VCAT). 2015. *Hoser v Department of Environment Land Water and Planning* (Review and Regulation) [2015] VCAT 1147 (30 July), judgment and transcript).

Wells, R. W. and Wellington, C. R. 1985. A classification of the Amphibia and Reptilia of Australia. *Australian Journal of Herpetology Supplementary Series* 1:1-61.

Wilson, S. K. and Knowles, D. G. 1988. *Australia's reptiles. A photographic reference to the terrestrial reptiles of Australia.* Collins Australia, Sydney, Australia:447 pp.

Wilson, S. and Swan, G. 2017. *A complete guide to reptiles of Australia*, 3rd ed. Chatswood: New Holland, 647 pp.

CONFLICTS OF INTEREST

None.

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