

***Daraninanura brevipalmata daranini* subsp. nov. and *Daraninanura brevipalmata andypadgetti* subsp. nov., two new frogs from Eastern Australia.**

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ABSTRACT

Until now the species *Litoria brevipalmata* Tyler, Martin and Watson, 1972, more recently placed into the genus *Daraninanura* Hoser, 2020 has been treated as a single biological entity. No author has until now countenanced the possibility that more than one diagnosable taxon existed. Inspection of specimens across the known range from the NSW Central Coast to South-east Queensland, revealed significant regional divergence. The two northern forms are herein formally described as new subspecies. **Keywords:** Frog; Queensland; New South Wales; Australia; tree frog; *Litoria*; *Daraninanura*; *brevipalmata*; new subspecies; *daranini*; *andypadgetti*.

INTRODUCTION

In 2020, I published a three volume monograph on the Australasian Tree Frogs including formal descriptions of 12 tribes, 11 subtribes, 34 genera, 26 subgenera, 62 species and 12 subspecies new to science (Hoser, 2020). The species originally described as *Litoria brevipalmata* Tyler, Martin and Watson, 1972 was formally placed in a newly erected monotypic genus *Daraninanura* Hoser, 2020 based on significant morphological and genetic divergence from all other species as outlined by Hoser (2020) including a 35.1 MYA estimated divergence from nearest living relatives.

Placement of the putative taxon into the genus *Nyctimystes* Stejneger, 1916 by various authors, including as seen at <https://en.wikipedia.org/wiki/Nyctimystes> is in error and reflects the stupidity of the relevant authors.

Nyctimystes Stejneger, 1916, type species *Nyctimantis papua* Boulenger, 1897 is not remotely rated to *Daraninanura* Hoser, 2020 at the species level, having diverged an estimated 40 MYA prior, based on the phylogenies cited by Hoser (2020).

At the time of publication of Hoser (2020), I was aware of significant regional variation in specimens of the single putative species within the genus. However, in the first instance, the variation did not appear to be strongly correlated with known biogeographical barriers, or extant distributional gaps and so I deferred any taxonomic actions pending further examination of specimens.

Notwithstanding significant challenges over the following year, I was able to inspect several hundred specimens and photos of specimens from across the known range of the putative species to the extent that there appears to be at least two other populations that are readily identifiable and separable from the

nominate form with ease allowing them to be given formal taxonomic recognition.

MATERIALS AND METHODS

Relevant published literature as cited by Hoser (2020) as well as Anstis (2013), Ardis (1996), Barker *et al.* (1995), Cavanaugh (1996), Cogger (2014), Czechura (1978), Duellman *et al.* (2016), Eipper and Rowland (2018), Lemckert *et al.* (2006), McDonald (1974), Murphy and Turbill (1999), Natrass and Ingram (1993), Power (2017), Tyler, Martin and Watson (1972), Vanderduys (2012) and Wells and Wellington (1985) and sources cited therein were reviewed as were several hundred specimens and photos of specimens from across the known range of the putative species, those specimens being inspected as best as possible within the constraints of state of preservation, stage of life or quality of images on hand.

Consistent diagnosable differences were noted between populations with a view to separation of these on the basis of these differences and known gaps in distribution.

Any clearly divergent populations were to be targeted for formal taxonomic recognition.

RESULTS

Specimens clustered into three main groups, being those from south of the Hunter Valley, those north of there to south-east Queensland, generally in the vicinity of the border ranges and those from north of there to the Sunshine Coast area in south-east Queensland.

Morphologically at least, those populations were readily separable and based on apparently disjunct distributions are herein taxonomically recognized as subspecies.

However it is noted that the presumed and stated boundaries for

each taxon herein may not be exact.

It is likely each taxon in fact represents separate species instead, but the conservative treatment herein (as subspecies) reflects the fact that there is no molecular data in support of the latter contention.

The only population previously named is the southern one with a type locality of 5 miles north-west of Gosford, New South Wales, Australia.

The other two are formally named as new subspecies.

In terms of the following descriptions the following should be noted.

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 the two newly named subspecies are deemed to be the same 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.

Material in each of the formal descriptions is repeated 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.

Each description effectively separates and diagnoses each of the three subspecies as defined herein, both from one another and as a group from all other Australian tree frogs.

Material downloaded from the internet and cited anywhere in this paper was downloaded and checked most recently as of 4 August 2021, unless otherwise stated and were accurate in terms of the context cited herein as of that date.

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

A general reference to "colour" is unless otherwise stated, referring to the dorsal and obvious colouration of the frog on the usually visible upper surfaces.

Unless otherwise stated, the following applies. Size measurements and ratios quoted herein are for normal adults of normal adult size. Where one number only is given, this is the average measurement. Where two numbers are given in the form of a range, this means "known range" based on previously measured and recorded specimens.

Delays in recognition of these unique taxa could jeopardise the long-term survival of these taxa as

outlined by Hoser (2019a, 2019b) and sources cited therein.

DARANINANURA BREVIPALMATA DARANINI SP. NOV.

LSIDurn:lsid:zoobank.org:act:E7524B50-8D75-41B3-8EE5-ABBD888F5B16

Holotype: A preserved specimen in the Queensland Museum in Brisbane, Queensland, Australia, specimen number J66065 collected 1km along Bellthorpe-Sunday Creek Road in the Conondale Range, Queensland, Australia, Latitude -26.758333 S., Longitude 152.625 E. This government-owned facility allows access to its holdings.

Paratypes: 1/ A preserved specimen in the Queensland Museum in Brisbane, Queensland, Australia, specimen number J66103 collected on the Jimna-Bellthorpe Road, 2km from Sunday Creek Turnoff, in the Conondale Range, Queensland,

Australia, Latitude -26.725 S., Longitude 152.491667 E.

2/ Two preserved specimens at the Queensland Museum in Brisbane, Queensland, Australia, specimen numbers J71305 and J71306 both collected from the Hell Hole Logging Area, Squirrel Creek State Forest, in the Conondale Range, Queensland, Australia, Latitude -26.708333 S., Longitude 152.341667 E.

Diagnosis: The genus *Daraninanura* Hoser, 2020 monotypic for the type species *D. brevipalmata* (Tyler, Martin and Watson, 1972) is readily separated from all other Australasian Tree Frogs (Pelodyadidae) by the following unique suite of characters: Rich brown to chocolate brown or reddish brown above, occasionally with scattered small black flecks or similar such markings, usually being semi-distinct or indistinct. There is a wide canthal stripe running from snout to eye, continuing past the eye as a wide black band, almost over-writing the standard (for frogs) sized tympanum, continuing to the flank and sometimes bordered above with white or yellow. The upper lip has a narrow white or yellow stripe, narrowly edged below with brown, which continues as a glandular stripe from the angle of the mouth to the base of the forearm. The lower flanks are yellowish to whitish with scattered black spots, flecks or peppering. Groin is green or blue green. There are no red or orange spots on the hind side of the thighs. There is a dark stripe along the front edge of the hindlimb. Venter is white to light yellow. Top of iris is silver to gold in colour.

Skin is smooth to slightly leathery above and coarsely granular below. There are small and widely scattered tubercles on the upper flanks, being largest and most numerous at about the middle of the dorsum. Snout is rounded in shape. Vomerine teeth are prominent between the choanae. There is no pectoral fold. Finger and toe discs are of medium size, fingers are unwebbed and toes about one third webbed.

There is a prominent inner metatarsal tubercle and an indistinct small outer tubercle. The second finger is longer than the first, the first finger being so short that when pressed together with the second, it reaches no further than the base of the disc of the second.

It is not widely known that adults of this species are sexually dimorphic.

Males are characterised by a strong yellowish colour of lighter areas of the upper surfaces, in particular the upper labial and throat regions, versus generally white or whitish in females.

Adults of the three subspecies are readily separated from one another as follows:

Nominate *Daraninanura brevipalmata brevipalmata* has mint green to turquoise in the concealed and semi-concealed regions of the limbs and adjacent body. The dorsum of females is greyish brown, sometimes with a slight reddish tinge. In both sexes there are semi-prominent dark grey flecks across the dorsal surface and ten or more scattered black spots of irregular shape on each of the rear lower flanks. The wide canthal stripe running from snout to eye has an indistinct lower boundary. Tubercles on the upper flanks do not come near the tympanum.

Nominate *D. brevipalmata brevipalmata* of both sexes are depicted in life in Cogger (2014) on page 153. Anstis (2013) also shows images of this taxon at various life-cycle stages.

A male of the subspecies is also depicted in life online at: <https://www.flickr.com/photos/14807473@N08/3558431834/> and females at:

<https://www.flickr.com/photos/thelizardlab/50813283642/> and

<https://www.inaturalist.org/observations/73373295>

Daraninanura brevipalmata andypadgetti subsp. nov. has mint green to turquoise in the concealed and semi-concealed regions of the limbs and body. The wide canthal stripe running from snout to eye has a distinct lower boundary and is significantly narrower than seen in the other two subspecies, with there being a distinctive wide light brown strip or region between the canthal

stripe and the whitish or yellowish upper labial area. Tubercles on the upper flanks do not come near the tympanum. The dorsum of both sexes lacks mottling or obvious pigment, instead being generally greyish chocolate brown or chocolate brown in females and yellowish-brown in males.

In the groin area of either side are about 5 black spots of irregular shape and size, being generally medium in size and distinct.

Female *D. brevipalmata andypadgetti subsp. nov.* in life is depicted online at:

<https://www.flickr.com/photos/58349528@N02/23846100292/>

Male *D. brevipalmata andypadgetti subsp. nov.* in life is depicted online at:

<https://www.flickr.com/photos/ryanfrancis/50833160441/>
and

<https://www.flickr.com/photos/ryanfrancis/50826732436/>
and

<https://www.flickr.com/photos/ryanfrancis/50826827877/>

Daraninanura brevipalmata daranini subsp. nov. is separated from the other two subspecies by having lime green instead of mint green to turquoise in the concealed and semi-concealed regions of the limbs and adjacent body. Males have a light brown dorsum peppered or spotted with irregular-shaped black flecks, often corresponding to tubercles, which (in both sexes) are larger in this subspecies than in the other two. The tubercles on the flanks come as far forward as the tympanum (above it), or at least close to it, versus not so in the other two species.

Females have a distinctive reddish-brown colouration on the dorsum.

The wide canthal stripe running from snout to eye has a distinct lower boundary as in *D. brevipalmata andypadgetti subsp. nov.* but the stripe is so wide as to make the brown region below very narrow. There are usually about five fairly large black spots of irregular shape on each side of the groin region. The underside of the throat in males has obvious areas of dark or darkened mottling or colouration on a yellow background, especially in the anterior parts, this not being the case in the other two subspecies, where it is generally simply yellow of even texture and intensity.

D. brevipalmata daranini subsp. nov. in life in amplexus is depicted online at:

https://www.flickr.com/photos/jono_hooper/27020910934/

or calling males at:

<https://www.flickr.com/photos/12742129@N07/49114947031/>
and

<https://www.inaturalist.org/observations/14599470>

Duellman *et al.* (2016) found the type and only species in the genus *Daraninanura* Hoser, 2020 to have diverged from its nearest living relative 35.1 MYA, necessitating the transfer of this species to a new genus and the genus to a new tribe as done within the paper of Hoser (2020).

Distribution: *D. brevipalmata daranini subsp. nov.* occurs in a range generally bound by the Border Ranges area in the south on the New South Wales and Queensland border, extending north to include wetter parts of south-east Queensland, with a centre of distribution being the Sunshine Coast, Queensland, Australia.

Etymology: *D. brevipalmata daranini subsp. nov.* is named in honour of Dara Nin, of Ringwood, Victoria, Australia who has worked with the team at Snakebusters: Australia's best reptiles shows and various wildlife conservation activities over a ten year period in recognition of his contributions to wildlife conservation in Australia. Etymology is as for the genus.

On one occasion while doing a reptile display at Morwell in Victoria he successfully stopped Bana Irvine Osborne and her mother Margaret Irvine Osborne from stealing reptiles from a wildlife display (in breach of a court order). The two were later found attempting to steal material from cars.

DARANINANURA BREVIPALMATA ANDYPADGETTI SUBSP. NOV.

LSIDurn:lsid:zoobank.org:act:A24ED582-8BE1-4875-B484-A777AD4F4E8A

Holotype: A preserved specimen at the Australian Museum, Sydney, New South Wales, Australia, specimen number R.147667 collected from Juhles Mountain Rd, Two Mile Creek, Lansdowne State Forest, New South Wales, Australia, Latitude -31.7861 S., Longitude 152.60833 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 D58639 collected from 4 km north-east of Byabarra, New South Wales, Australia, Latitude -31.5 S., Longitude 152.57 E.

Diagnosis: The genus *Daraninanura* Hoser, 2020 monotypic for the type species *D. brevipalmata* (Tyler, Martin and Watson, 1972) is readily separated from all other Australasian Tree Frogs (Pelodyadidae) by the following unique suite of characters: Rich brown to chocolate brown or reddish brown above, occasionally with scattered small black flecks or similar such markings, usually being semi-distinct or indistinct. There is a wide canthal stripe running from snout to eye, continuing past the eye as a wide black band, almost over-writing the standard (for frogs) sized tympanum, continuing to the flank and sometimes bordered above with white or yellow. The upper lip has a narrow white or yellow stripe, narrowly edged below with brown, which continues as a glandular stripe from the angle of the mouth to the base of the forearm. The lower flanks are yellowish to whitish with scattered black spots, flecks or peppering. Groin is green or blue green. There are no red or orange spots on the hind side of the thighs. There is a dark stripe along the front edge of the hindlimb. Venter is white to light yellow. Top of iris is silver to gold in colour.

Skin is smooth to slightly leathery above and coarsely granular below. There are small and widely scattered tubercles on the upper flanks, being largest and most numerous at about the middle of the dorsum. Snout is rounded in shape. Vomerine teeth are prominent between the choanae. There is no pectoral fold. Finger and toe discs are of medium size, fingers are unwebbed and toes about one third webbed.

There is a prominent inner metatarsal tubercle and an indistinct small outer tubercle. The second finger is longer than the first, the first finger being so short that when pressed together with the second, it reaches no further than the base of the disc of the second.

It is not widely known that adults of this species are sexually dimorphic.

Males are characterised by a strong yellowish colour of lighter areas of the upper surfaces, in particular the upper labial and throat regions, versus generally white or whitish in females.

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Nominate *D. brevipalmata brevipalmata* of both sexes are depicted in life in Cogger (2014) on page 153. Anstis (2013) also shows images of this taxon at various life-cycle stages.

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<https://www.inaturalist.org/observations/73373295>

Daraninanura brevipalmata andypadgetti subsp. nov. has mint green to turquoise in the concealed and semi-concealed regions of the limbs and body. The wide canthal stripe running from snout to eye has a distinct lower boundary and is significantly narrower than seen in the other two subspecies, with there being a distinctive wide light brown strip or region between the canthal stripe and the whitish or yellowish upper labial area.

Tubercles on the upper flanks do not come near the tympanum.

The dorsum of both sexes lacks mottling or obvious pigment, instead being generally greyish chocolate brown or chocolate brown in females and yellowish-brown in males.

In the groin area of either side are about 5 black spots of irregular shape and size, being generally medium in size and distinct.

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<https://www.flickr.com/photos/58349528@N02/23846100292/>

Male *D. brevipalmata andypadgetti* subsp. nov. in life is depicted online at:

<https://www.flickr.com/photos/ryanfrancis/50833160441/>
and

<https://www.flickr.com/photos/ryanfrancis/50826732436/>
and

<https://www.flickr.com/photos/ryanfrancis/50826827877/>

Daraninanura brevipalmata daranini subsp. nov. is separated from the other two subspecies by having lime green instead of mint green to turquoise in the concealed and semi-concealed regions of the limbs and body. Males have a light brown dorsum peppered or spotted with irregular-shaped black flecks, often corresponding to tubercles, which (in both sexes) are larger in this subspecies than in the other two. The tubercles on the flanks come as far forward as the tympanum (above it), or at least close to it, versus not so in the other two species.

Females have a distinctive reddish-brown colouration on the dorsum.

The wide canthal stripe running from snout to eye has a distinct lower boundary as in *D. brevipalmata andypadgetti* subsp. nov. but the stripe is so wide as to make the brown region below very narrow. There are usually about five fairly large black spots of irregular shape on each side of the groin region. The underside of the throat in males has obvious areas of dark or darkened mottling or colouration on a yellow background, especially in the anterior parts, this not being the case in the other two subspecies, where it is generally simply yellow and of even complexion and intensity.

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Distribution: *D. brevipalmata andypadgetti* subsp. nov. occurs in a range bound by the Hunter River in the south and the Border Ranges area in the north, generally being the New South Wales North Coast.

Etymology: *D. brevipalmata andypadgetti* subsp. nov. is named in honour of Andy Padgett of Park Orchards, Victoria, Australia who has worked with the team at Snakebusters: Australia's best reptiles shows and various wildlife conservation activities over a ten year period in recognition of his contributions to wildlife conservation in Australia.

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CONFLICT OF INTEREST - NONE