

**A further three new species of frog in the genus
Limnodynastes Fitzinger, 1843 from north Queensland, Australia.**

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ABSTRACT

The Australasian frog genus *Limnodynastes* Fitzinger, 1843 *sensu* Hoser, 2020 is further divided with new species formally named for the first time in accordance with the rules set out in the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

These are previously unnamed species in both the *Limnodynastes peronii* (Duméril and Bibron, 1841) species group (1 new species) and the *L. tasmaniensis* Günther, 1858 species group (2 new species), each being found in relatively small regions in (mainly) north-east Queensland, Australia.

Besides being easily diagnosed morphologically, each of the new taxa has species level divergence from their nearest living relatives based on previous molecular studies.

Limnodynastes maxhoseri sp. nov. previously treated as a population of either *L. peronii* or *L. lineatus* De Vis, 1884 (*sensu* Hoser, 2020) occurs north of the Burdekin Gap in the wet tropics region of far north Queensland.

L. enidconnorsae sp. nov. previously treated as a population of *L. tasmaniensis* or *L. affinis* (*sensu* Hoser, 2020) is confined to a small area in the vicinity of Proserpine, north Queensland, including wetlands immediately south, but not including specimens from north of the Burdekin River or from Mackay and south of Mackay.

L. nathanscanesi sp. nov. previously treated as a population of *L. tasmaniensis* or *L. affinis* (*sensu* Hoser, 2020) occurs in most parts of coastal Queensland south from Mackay to just north of the NSW and Queensland border.

Keywords: Taxonomy; Amphibia; nomenclature; Frog; Australia; Proserpine; Mackay, Wet tropics; Queensland; *Limnodynastes*; *peronii*; *alexanteneri*; *cameronganti*; *lineatus*; *tasmaniensis*; *affinis*; *shanscarffi*; new species; *maxhoseri*; *enidconnorsae*; *nathanscanesi*.

INTRODUCTION

The Australasian frogs of the genus *Limnodynastes* Fitzinger, 1843, as recognized by most publishing herpetologists in year 2020 (*sensu* Cogger 2014) were comprehensively reviewed by Hoser (2020), resulting in new genus and species level arrangements of taxa.

That paper placed relevant taxa into three genera, all names being previously available, resurrected various species using available names and also formally named for the first time eight new species and a subspecies, based on morphological and molecular divergences.

The final arrangement in that paper was as follows:

Genus *Limnodynastes* Fitzinger, 1843.

Limnodynastes peronii (Duméril and Bibron, 1841) (type species); *L. affinis* Günther, 1863; *L. alexanteneri* Hoser, 2020; *L.*

cameronganti Hoser, 2020; *L. depressus* Tyler, 1976; *L. fletcheri* Boulenger, 1888; *L. lineatus* De Vis, 1884, *L. shanscarffi* Hoser, 2020 and *L. tasmaniensis* Günther, 1858.

Genus *Platyplectron* (Peters, 1863).

Platyplectron dumerilii (Peters, 1863) (type species); *P. dorsalis* (Gray, 1841); *P. gerrymarantellii* Hoser, 2020; *P. grayi* (Steindachner, 1867); *P. insularis* (Parker, 1940); *P. interioris* (Fry, 1913); *P. terraereginae* (Fry, 1915) and *P. timjamesi* Hoser, 2020.

Genus *Ranaster* Macleay, 1877.

Ranaster convexiusculus Macleay, 1877 (type species); *R. henrywajswelneri* Hoser, 2020;

R. lignarius (Tyler, Martin and Davis, 1979) (including subspecies *R. lignarius divergens* Hoser, 2020); *R. snakemansboggensis* Hoser, 2020 ; *R. salmini* (Steindachner, 1867) and *R.*

scottyjamesi Hoser, 2020.

The species *P. interioris* (Fry, 1913) was only tentatively recognized on the basis it appeared to be morphologically distinct and reproductively isolated from the others, even though it had been shown by Schäuble *et al.* (2000) to be genetically similar to the type form of *P. dumerilii*.

Type *Limnodynastes peronii* (Duméril and Bibron, 1841) are from Sydney, New South Wales (NSW), Australia and regarded as generally restricted to the NSW Coast.

Other morphologically and genetically divergent, recognized species within the complex are *L. lineatus* De Vis, 1884 occurring along most of the Queensland coast and nearby ranges, south of the Burdekin River, *L. alexanteneri* Hoser, 2020 from the eastern suburbs of Melbourne, east to about the Latrobe Valley in eastern Victoria and *L. cameronganti* Hoser, 2020 from the Otway ranges and west to south-east South Australia and also including King Island (Tasmania) and north-west Tasmania.

Hoser (2020) treated all specimens from coastal Queensland as *L. lineatus*, but inspection of a larger number of further specimens within the species complex, including those north of the Burdekin Gap, Queensland, showed those specimens to be morphologically divergent and worthy of consideration as a potentially unnamed species, initiating further investigations in this regard.

The fact to be ascertained was whether or not the far north Queensland population was sufficiently divergent to be recognized taxonomically, if so at what level and if worthy of taxonomic recognition, to formally name it.

In terms of the *L. tasmaniensis* Günther, 1858 species group, Hoser (2020) recognized each of *L. tasmaniensis*, with a type locality of southern Australia, *L. affinis* with a type locality of the Clarence River in northern New South Wales and *L. shanescaffii* from Ravenshoe, North Queensland and generally occupying the wet tropics of far north Queensland, north of the Burdekin Gap.

That classification was called into question after revisiting the molecular data of Schäuble and Moritz (2001) and required the critical re-examination of hundreds of specimens from all parts of the range of putative *L. tasmaniensis*.

Contrary to the position of Hoser (2020), Schäuble and Moritz (2001) identified four species-level divergent groups within putative *L. tasmaniensis*.

L. shanescaffii and *L. tasmaniensis* as conceived by Hoser (2020) appeared valid, but *L. affinis* as defined and effectively re-described by Hoser (2020) appeared to be a composite of up to three species and Schäuble and Moritz (2001) put that taxon closest to the nominate form of *L. tasmaniensis* as opposed to any other potential species.

Hoser (2020) mistakenly thought that *L. affinis* (if valid) was a Queensland taxon, extending south to include northern New South Wales, whereas it was in fact a NSW taxon, extending to far south Queensland on the coast only and possibly further north west of the Great Dividing Range.

The Hoser (2020) account of *L. affinis* was based on coastal Queensland animals and not specimens from the type locality in New South Wales.

Rather than adopt the Wolfgang Wüster strategy of defending the indefensible (see for example, Hoser 2007, 2009, 2012a, 2012b, 2013a, 2015a-f, 2019a, 2019b or ICZN 1991, 2001, 2012, 2021 and sources cited therein), I decided to critically analyse my taxonomy of 2020 with respect of the *L. tasmaniensis* species group and if need be, to junk any cherished theories I may have had, including a past diagnosis of *L. affinis* that appeared to be simply in error.

MATERIALS AND METHODS

Molecular studies including that of Roberts and Maxon (1986), Schäuble *et al.* (2000), Schäuble and Moritz (2001) or more recently Pyron and Wiens (2011) p. 563, were revisited and support the three-way split of the genus *Limnodynastes sensu* Cogger (2014) into three well-defined and divergent species

groups based on timelines of divergence as seen on page 565 of Roberts and Maxon (1986), and as done by Hoser (2020).

Hence no change was required to the genus-level taxonomy of Hoser (2020).

Noting the molecular results of Schäuble and Moritz (2001) with respect of both putative *Limnodynastes peronii* and *L. tasmaniensis*, identifying different species groups (or as sometimes put “divergent lineages”), as mentioned in the introduction, hundreds of specimens of each species group were inspected from all parts of the known ranges of each and/or reinspected.

As for Hoser (2020), specimens of all relevant species (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.

Key publications relevant to the taxonomic and nomenclatural conclusions herein were the following:

Anstis (2013), Boulenger (1888), Clulow and Swan (2018), Clyne (1969), Cogger (2014), Cogger *et al.* (1983), De Vis (1884), Dubois *et al.* (2019), Duméril and Bibron (1841), Eipper and Rowland (2018), Fitzinger (1843), Fry (1913, 1915), Gray (1831, 1841), Günther (1858, 1863), Hero *et al.* (1991), Hoser (1989, 2022a-b), Macleay (1887), Parker (1940), Peters (1863), Ride *et al.* (1999), Roberts and Maxon (1986), Schäuble *et al.* (2000), Schäuble and Moritz (2001), Steindachner (1867), Tyler (1976), Tyler *et al.* (1979), Vanderduys (2012), Wells and Wellington (1985) and sources cited therein.

Since Hoser (2020) was published, I have been fortunate in having been able to examine further large numbers of specimens of the relevant species groups from all parts of their known ranges, including from southern Victoria, Tasmania, coastal New South Wales and numerous parts of the Queensland coast, including the regions south and north of the Burdekin Gap, north-east Queensland as well as north and south of the border ranges in southern Queensland and northern New South Wales.

RESULTS

These were inferred in both the abstract and introduction and self evident in the descriptions that follow.

The final results of this further audit of the *Limnodynastes peronii* and *L. tasmaniensis* species groups confirmed an arrangement of species effectively in line with the results of Schäuble and Moritz (2001).

This meant that for the *Limnodynastes peronii* complex, there were five valid species, being the four recognized by Hoser (2020) as well as another unnamed form from north of the Burdekin Gap in the wet tropics of far north Queensland.

This result necessitated a redefinition of *L. lineatus* with a type locality of Mackay, north Queensland, which is herein included within the formal description of *L. maxhoseri*.

Both taxa are morphologically similar and can be separated from the other species in the complex as one (as effectively done by Hoser 2020), before relying on diagnostic features to separate the two from one another as done in this paper.

While numerous other diagnostic differences were identified in the taxa *L. alexanteneri* and *L. cameronganti* following close examination of numerous other specimens, the original descriptions of each were perfectly adequate and stood up to further scrutiny.

The two species were also separated and defined by the most obvious character traits.

Further biogeographic evidence in support of the molecular and morphological evidence underpinning the descriptions of both those species (*L. alexanteneri* and *L. cameronganti*) can be found in the later papers of Hoser (2022a) and Hoser (2022b), including the sources cited therein.

In terms of the *L. tasmaniensis* group, Hoser (2020) clearly got parts of the final analysis wrong and this needed to be corrected in this paper as a matter of urgency.

I note that I identified the mistakes myself and have chosen to identify them as the correct ethical and scientific thing to do. Had someone else pointed out the errors to me, the result herein would be identical and I would also be thanking that person for a critical analysis of an earlier work.

Fortunately, the species, *L. shanescarffi* as conceived and described by Hoser (2020) is valid and the description does not inherently need any modification.

However *L. affinis* as defined by Hoser (2020) was clearly in error and needed to be redone.

This more recent assessment upon revisiting the results of Schäuble and Moritz (2001), effectively places *L. affinis* with a type locality of the Clarence River in New South Wales, Australia as a synonym of the better known *L. tasmaniensis*.

Putative *L. affinis* from far southern Queensland and nearby northern New South Wales is divergent from type *L. tasmaniensis* from further south, but in my opinion at best only as a subspecies.

Hence in this paper, I formally synonymise *L. affinis* with *L. tasmaniensis*, without attempting to define any subspecies or differences between the two.

Two apparently unnamed and divergent lineages of putative *L. tasmaniensis* from Queensland, south of the Burdekin Gap were inspected to see if they could be separated from the remaining two recognized forms (*L. tasmaniensis* and *L. shanescarffi*).

This was possible and on the basis of molecular and morphological divergence these apparently allopatric forms have been formally named as new species herein.

These are *L. enidconnorsae* sp. nov. from the immediate vicinity of Proserpine, Queensland and *L. nathanscanesi* sp. nov. from Mackay, south to near the NSW and Queensland border.

Hoser (2020) had mistakenly treated these taxa (principally that from Mackay, Qld and south) as *L. affinis* in error in the misguided belief that specimens from the Clarence River in northern New South Wales were of this form.

This was not the case.

The type for *L. affinis* is from the Clarence River in northern New South Wales and as already inferred, is most similar morphologically and by way of divergence to the type form of *L. tasmaniensis*.

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 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 6 December 2022, unless otherwise stated and were accurate in terms of the context cited herein as of that date.

Unless otherwise stated explicitly, colour 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. 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.

LIMNODYNASTES MAXHOSERI SP. NOV.

LSIDDurn:lsid:zoobank.org:act:8CA9AD99-263B-4EB3-BC3E-3B8999DB42C8

Holotype: A preserved specimen at the Australian Museum, Sydney, New South Wales, Australia, specimen number R.111904 collected from Kouri Creek, north-west shore of Lake Tinaroo, Queensland, Australia, Latitude -17.166 S., Longitude 145.55 E.

This NSW Government-owned facility allows access to its holdings.

Paratypes: 1/ A preserved specimen at the Queensland Museum, Brisbane, Queensland, Australia, specimen number J60404 collected from Lake Euramoo, Queensland, Australia, Latitude -17.15 S., Longitude 145.62 E.

2/ A preserved specimen at the Queensland Museum, Brisbane, Queensland, Australia, specimen number J61550 collected from the Danbulla Scientific Reserve, via Tinaroo, Queensland, Australia, Latitude -17.2 S., Longitude 145.67 E.

3/ A preserved specimen at the Queensland Museum, Brisbane, Queensland, Australia, specimen number J60396 collected from Severin, Boar Pocket Road, near Tinaroo Dam, Queensland, Australia, Latitude -17.183 S., Longitude 145.667 E.

Diagnosis: Until the publication of Hoser (2020), all of *Limnodynastes peronii* (Duméril and Bibron, 1841), *L. alexanteneri* Hoser, 2020; *L. cameronganti* Hoser, 2020 and *L. lineatus* De Vis, 1884 had been generally recognized by publishing herpetologists as simply *L. peronii* (*sensu* Cogger *et al.* 1983).

Notwithstanding this, molecular data as published 2 decades back, by Schäuble *et al.* (2000) and Schäuble and Moritz (2001) indicated at least five species being within the species complex and the same five forms are readily diagnosable and separable from one another on morphological features. They are also distributionally disjunct, evolving separately and self-evidently warrant species-level recognition.

All five species (including the newly named *L. maxhoseri* sp. nov.) are separated from all other *Limnodynastes* (*sensu lato*) species (including all species within the genera *Platyplectron* Peters, 1863 and *Ranaster* Macleay, 1877) by the following unique combination of characters: There is no skin flap or papillae in the anterior corner of the eye; the inner metatarsal tubercle is small to moderate and not shovel-shaped; the metacarpal of the inner finger is much longer than that of the

second finger; the toes are free and the snout is pointed and prominent.

Colouration is variable, but invariably brown or grey-brown above with a series of somewhat irregular dark-brown stripes or spots running anterior to posterior and dark irregular spots or mottling on the flanks. Dark dorsal markings may have lighter centres and there is sometimes a vertebral stripe which may be distinct, indistinct and of similar or different colour to other parts of the dorsum. There is a dark band along the snout, continuous behind the eye and running through the tympanum to the base of the forelimb. The band is usually bordered below by a white or yellow glandular fold.

All five species are characterised by two thick and usually irregular blackish stripes running down the spine, from between the eyes to the lower back or pelvic girdle, the stripes being separated by a lighter mid-dorsal line which may be thin or thick, and of variable colour, but invariably lighter in colour than the separated black stripes. Beyond these stripes, the dorsal surface is lighter, before there is another thick and irregular-shaped marking in the form of a stripe on the top of either flank. The flanks themselves are generally light in colouration with scattered bits of dark pigment, peppering or spots.

The limbs have scattered dark spots and irregular cross-bands, which may merge to form irregular stripes along the limb. The venter is generally whitish and often flecked with brown or grey. There is no tibial gland.

Nominate *L. peronii* is of the form seen around Sydney, New South Wales and nearby coastal areas of New South Wales and far north-east Victoria. It is depicted in Hoser (1989) on page 27 (bottom two images) and Cogger (2014) on page 50 (top right). It is separated from the other four species, namely *L. alexanteneri*, *L. cameronganti*, *L. lineatus* and *L. maxhoseri sp. nov.* by the following unique suite of characters: Flesh in the groin and armpits is either white or with only a slight yellowish tinge. Specimens with orange on the back, do not have this pigment bounded by black on the upper flank stripes as seen in *Ranaster salmini* Steindachner, 1867 (a putative species which Hoser (2020) showed was in fact two, being a coastal and an inland form which are morphologically and genetically diagnosable, the coastal species being formally named as *Ranaster snakemansbogensis* Hoser, 2020). The mid and upper flanks of this species (*L. peronii*) are characterised by having small to medium blackish spots of irregular shape. Limbs are mainly light with scattered irregular spots or blotches of small to medium size; exceptional to this is a series of 3-5 medium sized dark spots on the upper surface of the folded rear leg.

L. peronii is also characterised and separated from all of *L. alexanteneri*, *L. cameronganti*, *L. lineatus* and *L. maxhoseri sp. nov.* by having 2-6 scattered dark spots of irregular shape on each of the middle and lower flanks.

L. lineatus De Vis, 1884 from coastal Queensland, south of the Burdekin Gap and *L. maxhoseri sp. nov.* from the wet tropics of far north Queensland, north of the Burdekin Gap are both similar in most respects to *L. peronii* but both are most readily separated from that species by having well-defined light areas within the dark stripe area on the upper flanks, and heavy yellow pigment in the groin and back of the upper hind limbs. The dark mid-dorsal stripes run to the pelvic girdle, versus not that far in *L. peronii*.

Adult male *L. maxhoseri sp. nov.* is separated from all other species in the *L. peronii* species complex by having small but obvious raised whitish tubercles or carbuncles running along the dorsal midline of the upper forearm.

L. lineatus and *L. maxhoseri sp. nov.* are separated from all of *L. alexanteneri*, *L. cameronganti* and *L. peronii* by having a well defined row of 5 to 9 large dark spots along each of the lower flanks. *L. lineatus* also has spots and/or peppering merged to form lines running longitudinally down each of the fore and hind limbs, while these spots are reduced to be scattered in *L. maxhoseri sp. nov.*

L. maxhoseri sp. nov. is separated from *L. lineatus* by having a

mid-dorsal light stripe that is thin and often reduced in intensity, versus moderately thick and well defined in *L. lineatus*.

In *L. lineatus* the mid-dorsal stripe is obviously whitish and of different colour to the brown zones or stripes on the flanks of the dorsum, versus often barely different in colour in the mid-stripe and flank light zones in *L. maxhoseri sp. nov.*, the mid-dorsal stripe often being greyish or brown, instead of whitish or yellow (as seen in *L. lineatus*).

In adult *L. lineatus* the darker markings on the dorsum are usually a dark chocolate brown, versus dark greenish-grey or greenish-brown in *L. maxhoseri sp. nov.*

Below the eye, the dark area on the upper lip is reduced to be a large spot in *L. maxhoseri sp. nov.*, versus as a bar extending along the upper lip in *L. lineatus*. In both species the relevant marking is bounded by light white or cream.

L. alexanteneri from Melbourne are nearby parts of West Gippsland, including the Latrobe Valley are separated from *L. peronii*, *L. lineatus*, *L. maxhoseri sp. nov.* and *L. cameronganti* by having unpigmented versus pigmented eggs.

L. alexanteneri is separated from the other four species *L. peronii*, *L. cameronganti*, *L. lineatus* and *L. maxhoseri sp. nov.* by the black to dark brown stripe area of the upper flank being noticeably wider and more prominent at the anterior end of the body, than posterior, versus of more-or-less even thickness or prominence along the entire flank in the other three species.

L. alexanteneri is also separated from all of *L. peronii*, *L. cameronganti*, *L. lineatus* and *L. maxhoseri sp. nov.* by having no dark pigment on the middle or lower flanks save for a single large spot on the upper flank just posterior to the forelimb.

L. cameronganti from south-west Victoria and nearby parts of south-east South Australia near the coast, as well as King Island nearby parts of north-west Tasmania (see for example the phylogeny of Schauble and Moritz 2001) is separated from the other four species *L. alexanteneri*, *L. peronii*, *L. lineatus* and *L. maxhoseri sp. nov.* by having an extremely well-defined pattern of longitudinal stripes running down the body, including a well-defined dark stripe along each of the upper flanks and a well-defined large dark blotch forming a stripe on each of the lower flanks, this not being seen in any of the other species.

L. cameronganti also has a consistently strong and well-defined beige to yellow mid-dorsal stripe running to the rear of the body, being well bounded by the adjoining black stripes, which are also thin and well-defined. The yellow or white mid-dorsal stripe in this species is also thicker than either of the blackish stripes that bound it on the body, which is in stark contrast to the other four species, where the reverse is the case. There is a well-defined dark stripe along the upper surface of the anterior part of each hind limb, but not on the forelimbs (in contrast to *L. lineatus* and *L. maxhoseri sp. nov.*).

Photos of *L. peronii* in life (as defined in this paper) can be found in Hoser (1989) at page 27 (two bottom images) and Cogger (2014) at pages 50 and 51 (right and left respectively), Anstis (2013) on page 410 (two top images) and online at:

<https://www.flickr.com/photos/14807473@N08/3558432634/>

Photos of *L. maxhoseri sp. nov.* in life can be seen in Anstis (2013) on page 410 at bottom right and Vanderduys (2012) on page 88 at bottom left, or also can be found online at:

<https://www.inaturalist.org/observations/62880727>

and

<https://www.inaturalist.org/observations/103627802>

and

<https://www.inaturalist.org/observations/106789627>

Photos of *L. lineatus* in life can be found online at:

<https://www.flickr.com/photos/113096834@N02/12051078886/>

and

<https://www.flickr.com/photos/smacdonald/395057571/in/album-72157594543840677/>

Photos of *L. alexanteneri* Hoser, 2020 in life can be found in

Hero *et al.* (1991) on page 72 and online at:

<https://www.flickr.com/photos/reptileshow/52593636543/>
and

<https://www.flickr.com/photos/craigboase/14068509511/>
and

<https://www.flickr.com/photos/gondwanareptileproduction/28732302793/>
and

<https://www.flickr.com/photos/160417453@N04/39688090763/>
Photos of *L. cameronganti* Hoser, 2020 in life can be found online at:

<https://www.flickr.com/photos/reptileshow/52592636612/>
and

<https://www.flickr.com/photos/goldcoastsnakeman/52155007343/>
and

<https://www.frogwatchsa.com.au/species/view/21>

A comparative photo of both *L. cameronganti* Hoser, 2020 and *L. alexanteriori* Hoser, 2020 in life can be found online at:

<https://www.flickr.com/photos/reptileshow/52593627058/>

Distribution: *L. maxhoseri* sp. nov. is found in the wet tropics region of far north Queensland, generally from north of Townsville to Daintree, with a centre of distribution around the Atherton Tablelands region.

Etymology: Named in honour of Max Hoser of Campbelltown, New South Wales, Australia for various contributions to herpetology in the 1960's and 1970's.

LIMNODYNASTES ENIDCONNORSAE SP. NOV.

LSIDurn:lsid:zoobank.org:act:2A912D03-2BC4-444A-BE03-8578C346C003

Holotype: A preserved male specimen at the Queensland Museum, Brisbane, Queensland, Australia, specimen number J75770 collected from Goorganga Plain, on the Bruce Highway, near Proserpine, Queensland, Australia, Latitude -20.466667 S., Longitude 148.583333 E.

This government-owned facility allows access to its holdings.

Paratypes: 1/ A preserved female specimen at the Queensland Museum, Brisbane, Queensland, Australia, specimen number J75771 collected from Goorganga Plain, on the Bruce Highway, near Proserpine, Queensland, Australia, Latitude -20.466667 S., Longitude 148.583333 E.

2/ A preserved female specimen at the Queensland Museum, Brisbane, Queensland, Australia, specimen number J87627 collected from Deadman Creek, Proserpine, Queensland, Australia, Latitude -20.505 S., Longitude 148.556111 E.

3/ A preserved female specimen at the Queensland Museum, Brisbane, Queensland, Australia, specimen number J87654 collected from Thompson Creek, Proserpine, Queensland, Australia, Latitude -20.511111 S., Longitude 148.565 E.

Diagnosis: Until 2020, *Limnodynastes shanescarffi* Hoser, 2020 from the wet tropics region of far north Queensland, had been treated as a northern population of the widespread species *Limnodynastes tasmaniensis* Günther, 1858.

Both would key out as the same species in Cogger (2014).

The same applies for the two species formally named in this paper in the same species complex, being, *L. enidconnorsae* sp. nov. and *L. nathanscanesi* sp. nov..

L. enidconnorsae sp. nov. is confined to a small area in the vicinity of Bowen to Proserpine, north Queensland, Australia, while *L. nathanscanesi* sp. nov. is restricted to a region along the coast of Queensland, generally bound by Mackay in the north and Brisbane in the south.

L. tasmaniensis, including *L. affinis* Günther, 1863, (type locality of Clarence River, NSW) herein synonymised with that taxon, is found throughout inland Queensland, including the far south coast of the State, as well as all or most of New South Wales, Victoria and Tasmania as well as most parts of eastern South Australia.

While all four species are variable in colour, *L. shanescarffi*

Hoser, 2020, *L. enidconnorsae* sp. nov. and *L. nathanscanesi* sp. nov. are all readily separated from *L. tasmaniensis* by having a dorsal colouration incorporating a dominance of dark-greenish-blackish or dark-brownish-blackish spots and blotches (versus obviously green in *L. tasmaniensis*).

L. shanescarffi is further separated from the other three species by having the dark occupying more than 70% of the upper surface, versus less than 70% in the other three species, as well as an obvious purple tinge on the lower flanks and inner thighs, versus greenish-grey in *L. enidconnorsae* sp. nov., brownish in *L. nathanscanesi* sp. nov. and yellow in *L. tasmaniensis*.

L. shanescarffi has a dark blotch beneath and slightly anterior to the eye of size nearly as large as the eye, versus extremely small, irregularly shaped and barely noticeable in *L. enidconnorsae* sp. nov., small and elongate in shape in *L. nathanscanesi* sp. nov., or small in size and generally ovoid in shape in *L. tasmaniensis*.

Male *L. shanescarffi* also have obvious orange-red spotting or peppering on the upper body and limbs, which is also present to a lesser extent in most females, this being separate from any vertebral stripe that may or may not be present.

L. shanescarffi, *L. enidconnorsae* sp. nov. and *L. nathanscanesi* sp. nov. are all readily separated from *L. tasmaniensis* by the fact that they have a well defined white or yellowish-white stripe running beneath the eye and the ear to the front leg. This is either absent or ill-defined, or not a bold white to creamy-white in *L. tasmaniensis*.

The colour of the lighter background (between the blotches) on the dorsum is different in adults of each of the preceding species and aids in separating all four of them.

In *L. shanescarffi* and *L. tasmaniensis* the colour is beige in both species, although there is a distinctive yellow tinge in the latter species (not seen in *L. shanescarffi*). For *L. enidconnorsae* sp. nov. the colour is a light, washed out green, while in *L. nathanscanesi* sp. nov. it is brownish, ranging from reddish-brown to greyish-brown.

The preceding character states identified in each of the relevant four species, means that all four species as defined herein, can be readily separated from one another.

An image of *L. shanescarffi* (including specimens of both sexes) in life, can be found in Vanderduys (2012) on page 90 at bottom.

The same species is depicted online at:

<https://www.inaturalist.org/observations/104935104>

L. enidconnorsae sp. nov. in life is depicted online at:

<https://www.inaturalist.org/observations/141233655>

L. nathanscanesi sp. nov. in life is depicted online at:

<https://www.inaturalist.org/observations/111977878>

and

<https://www.inaturalist.org/observations/139598550>

L. tasmaniensis in life (as defined in this paper) is depicted in Hoser (1989) on page 28 (at top), Hero *et al.* (1991) on page 70, Cogger (2014) on page 52 (all photos), Clulow and Swan (2018) on page 158 top, or Anstis (2013) on pages 415-417 (all images).

Distribution: *L. enidconnorsae* sp. nov. appears to be restricted to the Proserpine area of far north Queensland, excluding areas north of the Burdekin River and Mackay and areas south of Mackay. There is a disjunction in known distributions of *L. shanescarffi* north of the Burdekin River, and *L. nathanscanesi* sp. nov. found generally from Mackay and south of Mackay along the coastal strip.

Neither *L. shanescarffi* or *L. enidconnorsae* sp. nov. are known from the region between Bowen and Ayr, a distance of over 100 km by road.

Neither *L. enidconnorsae* sp. nov. or *L. nathanscanesi* sp. nov. are known from the area between Bloomsbury in the north and Kuttatubul in the south, being a distance of about 50 km by road.

L. nathanscanesi sp. nov. is restricted to a region along the coast of Queensland, generally bound by Mackay in the north and

Brisbane in the south.

L. shanescarffi sp. nov. appears to be restricted to north-east Queensland in the wet tropics region, generally north of the Burdekin River Gap (Ayr/Home Hill).

L. tasmaniensis, including *L. affinis* Günther, 1863, (type locality of Clarence River, NSW) herein synonymised with that taxon is found throughout inland Queensland, including the far south coast of the State, as well as all or most of New South Wales, Victoria and Tasmania as well as most parts of eastern South Australia.

Etymology: Named in honour of Enid Connors (AKA Noddy), wife of the late Neville Connors (died 6 January 2014), both being globally recognized aviculturalists and owner of the Casuarina Parrot Gardens, Meyers Road, Ramornie, near Grafton, New South Wales, Australia, in recognition of her lifetime of services to aviculture and wildlife conservation generally.

As of 2022 her Facebook page can be viewed at: <https://www.facebook.com/glossyblackcockatoo/>

An obituary to Neville Connors can be found online at:

<https://watchbird-ojs-tamu.tdl.org/watchbird/index.php/watchbird/article/view/3652>

LIMNODYNASTES NATHANSCANESI SP. NOV.

LSIDDurn:lsid:zoobank.org:act:59467325-E1F8-442C-BCAE-3D9200FF6ED0

Holotype: A preserved specimen at the Queensland Museum, Brisbane, Queensland, Australia, specimen number J52293 collected from Olsens Caverns (near Rockhampton, Queensland, Australia), Latitude -23.166667 S., Longitude 150.466667 E.

This government-owned facility allows access to its holdings.

Paratypes: Five preserved specimens held at the Australian National Wildlife Collection, owned by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), a government department, in Canberra, ACT, Australia and all collected from locations within the Shoalwater Bay Army Training Reserve, north of Rockhampton in Queensland, Australia, being specimen numbers A01818, A01835, A01836, A01837 and A01847.

Diagnosis: Until 2020, *Limnodynastes shanescarffi* Hoser, 2020 from the wet tropics region of far north Queensland, had been treated as a northern population of the widespread species *Limnodynastes tasmaniensis* Günther, 1858.

Both would key out as the same species in Cogger (2014).

The same applies for the two species formally named in this paper in the same species complex, being, *L. enidconnorsae* sp. nov. and *L. nathanscanesi* sp. nov..

L. enidconnorsae sp. nov. is confined to a small area in the vicinity of Bowen to Proserpine, north Queensland, Australia, while *L. nathanscanesi* sp. nov. is restricted to a region along the coast of Queensland, generally bound by Mackay in the north and Brisbane in the south.

L. tasmaniensis, including *L. affinis* Günther, 1863, (type locality of Clarence River, NSW) herein synonymised with that taxon is found throughout inland Queensland, including the far south coast of the State, as well as all or most of New South Wales, Victoria and Tasmania as well as most parts of eastern South Australia.

While all four species are variable in colour, *L. shanescarffi* Hoser, 2020, *L. enidconnorsae* sp. nov. and *L. nathanscanesi* sp. nov. are all readily separated from *L. tasmaniensis* by having a dorsal colouration incorporating a dominance of dark-greenish-blackish or dark-brownish-blackish spots and blotches (versus obviously green in *L. tasmaniensis*).

L. shanescarffi is further separated from the other three species by having the dark occupying more than 70% of the upper surface, versus less than 70% in the other three species, as well as an obvious purple tinge on the lower flanks and inner thighs, versus greenish-grey in *L. enidconnorsae* sp. nov., brownish in *L. nathanscanesi* sp. nov. and yellow in *L. tasmaniensis*.

L. shanescarffi has a dark blotch beneath and slightly anterior to the eye of size nearly as large as the eye, versus extremely small, irregularly shaped and barely noticeable in *L. enidconnorsae* sp. nov., small and elongate in shape in *L. nathanscanesi* sp. nov., or small in size and generally ovoid in shape in *L. tasmaniensis*.

Male *L. shanescarffi* also have obvious orange-red spotting or peppering on the upper body and limbs, which is also present to a lesser extent in most females, this being separate from any vertebral stripe that may or may not be present.

L. shanescarffi, *L. enidconnorsae* sp. nov. and *L. nathanscanesi* sp. nov. are all readily separated from *L. tasmaniensis* by the fact that they have a well defined white or yellowish-white stripe running beneath the eye and the ear to the front leg. This is either absent or ill-defined, or not a bold white to creamy-white in *L. tasmaniensis*.

The colour of the lighter background (between the blotches) on the dorsum is different in adults of each of the preceding species and aids in separating all four of them.

In *L. shanescarffi* and *L. tasmaniensis* the colour is beige in both species, although there is a distinctive yellow tinge in the latter species (not seen in *L. shanescarffi*). For *L. enidconnorsae* sp. nov. the colour is a light, washed out green, while in *L. nathanscanesi* sp. nov. it is brownish, ranging from reddish-brown to greyish-brown.

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L. tasmaniensis in life (as defined in this paper) is depicted in Hoser (1989) on page 28 (top), Hero *et al.* (1991) on page 70, Clulow and Swan (2018) on page 158 top, Cogger (2014) on page 52 (all photos), or Anstis (2013) on pages 415-417 (all images).

Distribution: *L. enidconnorsae* sp. nov. appears to be restricted to the Proserpine area of far north Queensland, excluding areas north of the Burdekin River and south of Mackay. There is a disjunction in known distributions of *L. shanescarffi* north of the Burdekin River, and *L. nathanscanesi* sp. nov. found generally south of Mackay along the coastal strip.

Neither *L. shanescarffi* or *L. enidconnorsae* sp. nov. are known from the region between Bowen and Ayr, a distance of over 100 km by road.

Neither *L. enidconnorsae* sp. nov. or *L. nathanscanesi* sp. nov. are known from the area between Bloomsbury in the north and Kuttabul in the south, being a distance of about 50 km by road.

L. nathanscanesi sp. nov. is restricted to a region along the coast of Queensland, generally bound by Mackay in the north and Brisbane in the south.

L. shanescarffi sp. nov. appears to be restricted to north-east Queensland in the wet tropics region, generally north of the Burdekin River Gap (Ayr/Home Hill).

L. tasmaniensis, including *L. affinis* Günther, 1863, (type locality of Clarence River, NSW) herein synonymised with that taxon is found throughout inland Queensland, including the far south coast of the State, as well as all or most of New South Wales, Victoria and Tasmania as well as most parts of eastern South Australia.

Etymology: Named in honour of Nathan Scanes, now (as of

2022) of Ramornie, near Grafton, New South Wales, Australia, in recognition of his lifetime of services to herpetology, aviculture and wildlife conservation generally, as well as correcting acts of taxonomic vandalism by the Wolfgang Wüster gang of thieves online.

CONSERVATION THREATS TO THE RELEVANT SPECIES

There are no known significant immediate conservation threats to any species discussed within this paper.

However, 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 26 million as of 2022), all sorts of unforeseen threats to the survival of these species may emerge.

Due to unforeseen potential threats I recommend further research on the relevant species and including means to identify likely threats.

These may include direct human activities (e.g. land clearing for homes or farming activities), as well as potential threats caused by changed vegetation regimes, introduced pests and potential pathogens, including those introduced via the legal importation of foreign reptiles and amphibians by government-owned zoos and other government backed commercial enterprises.

Denial of the existence of the relevant taxa *sensu* Wüster *et al.* as outlined by Hoser (2019a, 2019b), could ultimately cause extinction of some of these frog taxa in the same way it caused one or more earlier extinctions as documented by Hoser (2019a, 2019b).

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CONFLICTS OF INTEREST

None.

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