Australasian Journal of Herpetology 47:57-63.
Published 9 July 2020.

ISSN 1836-5698 (Print)
ISSN 1836-5779 (Online)

Four new species of frog in the genus *Assa* from eastern Australia.

LSIDURN:LSID:ZOOBANK.ORG:PUB:6A3BBABD-1FEC-47E8-B8DE-F1C370ED0FFD

RAYMOND T. HOSER
LSID urn:lsid:zoobank.org:author:F9D74EB5-CFB5-49A0-8C7C-9F993B8504AE

488 Park Road, Park Orchards, Victoria, 3134, Australia.
***Phone*: +61 3 9812 3322 *Fax*: 9812 3355 *E-mail*: snakeman (at) snakeman.com.au**
Received 10 October 2018, Accepted 28 February 2020, Published 9 July 2020.

ABSTRACT

The Australian frog genus *Assa* Tyler, 1972 has been treated by all publishing authors since 1972 as monotypic for the type species *A. darlingtoni* (Loveridge, 1933), originally described as *Crinia darlingtoni.*

However an audit of the known populations in New South Wales and Queensland found them to be deeply divergent morphologically and separated by well defined biogeographic barriers of antiquity.

Therefore four new species are formally identified and named according to the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999) as amended online since.

Due to the limited distributions of each, all are vulnerable to extinction and increased measures to ensure the survival of each should be implemented as a matter of urgency.

Keywords: Taxonomy; amphibia; nomenclature; frog; Australia; Myobatrachidae; Queensland; New South Wales; Gautam Mukherji; Brian Champion; James Bond; Robert Ekstein, *Assa*; darlingtoni; new species; *guatammukherjii*; *brianchampioni*; *jamesbondi*; *roberteksteini.*

INTRODUCTION

The Australian frog genus *Assa* Tyler, 1972 has been treated by all publishing authors since 1972 as monotypic for the type species *A. darlingtoni (*Loveridge, 1933), originally described as *Crinia darlingtoni.*

This is a divergent genus characterised by the presence of an inguinal pouch on either side in males.

During summer, larvae in various stages, including metamorphosing individuals are found in them, as they develop from egg to small frog in these pouches (Anstis 2013).

Known populations tend to be strongly associated with Antarctic Beech *Nothofagus moorei* (Mueller, 1866) forests or similar moist high altitude rainforests.

An audit of the known populations in New South Wales and Queensland completed during a field trip to New South Wales and Queensland in 2019 found these populations to be deeply divergent morphologically and separated by well defined biogeographic barriers of antiquity.

Therefore four new species are formally identified and named according to the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999) as amended online since.

Due to the limited distributions of each, all are vulnerable to extinction and increased measures to ensure the survival of each should be implemented as a matter of urgency. In saying the preceding, merely outlawing private ownership of the said species as is presently the case, will not on its own ensure their survival.

MATERIALS, METHODS AND RESULTS

These are inferred in both the abstract as well as the introduction and self evident in the descriptions that follow.

Live 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 web domains, blogs, photo-sharing sites and the like.

The final results of this audit found that the species originally described as *Crinia darlingtoni* Loveridge, 1933, more recently transferred to the monotypic genus *Assa* by Tyler in 1972 is in fact at least five.

With no names available for any of the unnamed populations, four new species are formally identified and named for the first time in accordance with the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999) as amended online since.

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 in mind (protection of biodiversity) as to why I have chosen to publish this paper.

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 5 January 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 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/them 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.

Published references of relevance to the genus *Assa* Tyler, 1972 as currently understood and relevant to the taxonomic and nomenclatural decisions within this paper include the following: Anstis (2013), Barker *et al*. (1995), Cogger (2014), Cogger *et al*. (1983), Dubois *et al.* (2019), Ehmann and Swan (1985), Eipper and Rowland (2018), Hines *et al.* (1999), Loveridge (1933), Parker (1940), Ride *et al.* (1999), Roberts and Maxon (1986), Schäuble *et al*. (2000), Tyler (1972), Vanderduys (2012), Wells and Wellington (1985) and sources cited therein.

ASSA GUATAMMUKHERJII SP. NOV.

LSIDurn:lsid:zoobank.org:act:69BBEF53-CAA8-4410-8686-E1087935E6EC

Holotype: A preserved specimen at the Australian Museum, Sydney, New South Wales, Australia, specimen number R.96797, collected at the Cedar Valley Walking Track, Cedar Creek, Gibraltar Range National Park, New South Wales, Australia, Latitude -29.4750 S., Longitude 152.333 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.96912 collected at the West Fork of Oorowin Rd, 4.0 km north of The Sugarloaf in Washpool State Forest, New South Wales, Australia, -29.3958 S., Longitude 152.3722 E.

Diagnosis: All species of the genus *Assa* Tyler, 1972 are separated from all other Australian frogs by way of the diagnosis presented by Tyler (1972) or alternatively Cogger (2014) in an abridged form at page 73.

Where each species live, they are found in high numbers and easily located by lifting surface ground cover, under which they hide, enabling specimens of both sexes to be found.

The five relevant species are all geographically allopatric and the three southern-most species seem to be associated almost exclusively with Antarctic Beech *Nothofagus moorei* (Mueller, 1866) forests.

The two northern species seem to be associated with wet sclerophyll forest at (usually) high altitude, although the species from the Conondale Range does extend to as low as 300 metres above sea level, versus more than 600 metres for all others.

The five relevant species are all variable in colour between individuals and even the relative state of the specimen in terms of day versus night, or hot versus cold, but in spite of this, they are readily distinguished from one another by colouration in males (as defined below).

Assa darlingtoni (Loveridge, 1933) from the border ranges area of New South Wales and Queensland, (Australia) including the McPherson Range, Main Range National Park and Mount Warning is readily separated from the other four species by the following suite of characters: There is a dark bar under the eye to the lip bounded by white, markings on the back are semi-distinct, however there is well defined boundary on the mid upper back where pigment lightens to form a well defined whitish line which indents anteriorly in the mid back, leaving a dark brown “mountain shape” on the back posterior to this; there are well defined bands on the dorsal surface of the upper back legs; there is no distinct line of black on the dorso-lateral line, but instead one or more broken areas of black peppering or irregular spotting.

Assa guatammukherjii sp. nov. is the taxon from the Gibralter Range in New South Wales, Australia and is separated from the other four species by the following suite of characters: There are very prominent markings on the back, including two blackish chevrons across the back, with light brown between them. There is also a distinct unbroken line of black on the dorso-lateral line. There are well defined bands on the dorsal surface of the upper back legs. There is a well defined black (as opposed to any other colour) line running from below the eye, down to the lip.

Assa brianchampioni sp. nov. from the Dorrigo Plateau area of New South Wales, Australia is separated from the other four species by the following suite of characters: Indistinct markings on body and the dark bar under the eye is absent or indistinct; white spots or marks on upper and lower labial area are prominent. There are orange spots on dorsal surface of the upper hind legs.

Assa jamesbondi; *sp. nov.* from the Conondale Range, in the Sunshine Coast hinterland, Queensland, Australia is readily separated from the other four species by the following suite of characters: Indistinct dorsal markings, including an indistinct dark bar under the eye and obvious orange spotting around the

lips and on front limbs; there are no obvious markings on the dorsum of the upper back legs, save for scattered orange spots and obvious orange blotches on the dorsal surface of the lower hind limbs. There is no distinct line of black on the dorso-lateral line. Flanks are brownish-greyish-black with a somewhat broken ridge of lighter brown on the margin between the flank and the dorsum.

Assa robertekseteini sp. nov. from the D'Aguilar Range north west of the Brisbane City centre, including Mount Glorious, in Queensland, Australia, is similar in most respects to *Assa jamesbondi*; *sp. nov.* but with semidistinct markings on middle of back and no orange spots on forelimbs. Brown upper flanks have no black on the margin with dorsum and there is little markings of any sort delineating the boundary between the lateral and dorsal surfaces. There is prominent white spotting on the lips. There are indistinct dark or light markings on the upper surfaces of the upper hind legs.

Females of each species (above) are similar in that the demarcation between upper flank and dorsal surface is bounded by a well-defined dark line, which on the lower serface fades into the lighter colour of the venter, either suddenly and well defined, or alternatively by way of streaking, spotting or otherwise fading. Patterning in adult females varies significantly and may include similar markings to the males or alternatively a pattern generally including a dark mid-dorsal area and light on the sides of the back, often bold in nature.

Assa darlingtoni (Loveridge, 1933) in life is depicted in Cogger (2014) on page 73 (two images), Vanderduys (2012) on page 133 and Anstis (2013) on pages 527 (except far right), 528, 529 and 531 (left).

Assa guatammukherjii sp. nov. in life is depicted at:

https://www.flickr.com/photos

/23031163@N03/38440057655/in/

photolist-21yPkUK-2cTcvxu-99fzrX

and

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

reptileshots/45868003902/in/photolist-21yPkUK-2cTcvxu-99fzrX/

and

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

stephenmahony/5344230197/in/photolist-21yPkUK-2cTcvxu-99fzrX/

Assa brianchampioni sp. nov. in life is depicted in Anstis (2013) on page 526 (far right) and online at:

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

ryanfrancis/24546774504/in/photolist-Dp7CS5-EdB8xF

and

https://www.flickr.com/photos/ryanfrancis/25084209441/in/photolist-Dp7CS5-EdB8xF/

Assa jamesbondi; *sp. nov.* in life is depicted online at:

https://www.flickr.com/photos/reptileshots/38477704112/in/photolist-21C9hTA-PZup5z

and:

https://www.flickr.com/photos/44269129@N05/

31499349141/in/photolist-21C9hTA-PZup5z/

Assa robertekseteini sp. nov. in life is depicted online at:

https://www.flickr.com/photos/129794304@N02/

29857633724/in/photolist-Muqbhm-MZMmMu

and:

https://www.flickr.com/photos/129794304@N02/

30189944790/in/photolist-Muqbhm-MZMmMu/

Distribution: *Assa guatammukherjii sp. nov.* is only known from the Gibralter Range in New South Wales, Australia, where it is usually found within Antarctic Beech *Nothofagus moorei* (Mueller, 1866) forests.

Etymology: Named in honour of Gautam Mukherji a Melbourne, Australia based barrister for services to wildlife conservation, including dealing with anti-conservation-minded criminals, reptile thieves and trademark infringing thieves in court proceedings. These police-protected criminals have sought to undermine the valuable conservation work of the Snakebusters and Reptile Party teams purely for their own financial self-gratification.

Members of the cohort also have criminal track records including crimes such as theft, sex offences, child sex offences, (all of which they have been convicted of), vexatious litigation, copyright fraud, trademark infringement, misleading and deceptive conduct in business (a serious criminal offence) and other activities that have caused untold destruction and damage to the wildlife conservation cause and society in general. At times in his role as barrister in legal proceedings, Gautam Mukherji has been one of the main objects holding back and preventing yet more damage being caused by some of these evil individuals.

ASSA BRIANCHAMPIONI SP. NOV.

LSIDurn:lsid:zoobank.org:act:4B2808EB-5E3B-4101-A358-94215422ECA3

Holotype: A preserved specimen at the Australian Museum, Sydney, New South Wales, Australia, specimen number R.145797, collected about 2 km west of Never Never Picnic Area, on Dome Road in Dorrigo National Park, New South Wales, Australia, Latitude -30.3561 S., Longitude 152.7867 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.145771, collected about 2 km west of Never Never Picnic Area, on Dome Road in Dorrigo National Park, New South Wales, Australia, Latitude -30.3561 S., Longitude 152.7867 E.

Diagnosis: All species of the genus *Assa* Tyler, 1972 are separated from all other Australian frogs by way of the diagnosis presented by Tyler (1972) or alternatively Cogger (2014) in an abridged form at page 73.

Where each species occurs, they are found in high numbers and easily located by lifting surface ground cover, under which they hide, enabling specimens of both sexes to be found.

The five relevant species are all geographically allopatric and the three southern-most species seem to be associated almost exclusively with Antarctic Beech *Nothofagus moorei* (Mueller, 1866) forests.

The two northern species seem to be associated with wet sclerophyll forest at (usually) high altitude, although the species from the Conondale Range does extend to as low as 300 metres above sea level, versus more than 600 metres for all others.

The five relevant species are all variable in colour between individuals and even the relative state of the specimen in terms of day versus night, or hot versus cold, but in spite of this, they are readily distinguished from one another by colouration in males (as defined below).

Assa darlingtoni (Loveridge, 1933) from the border ranges area of New South Wales and Queensland, (Australia) including the McPherson Range, Main Range National Park and Mount Warning is readily separated from the other four species by the following suite of characters: There is a dark bar under the eye to the lip bounded by white, markings on the back are semi-distinct, however there is well defined boundary on the mid upper back where pigment lightens to form a well defined whitish line which indents anteriorly in the mid back, leaving a dark brown "mountain shape" on the back posterior to this; there are well defined bands on the dorsal surface of the upper back legs; there is no distinct line of black on the dorso-lateral line, but instead one or more broken areas of black peppering or irregular spotting.

Assa guatammukherjii sp. nov. is the taxon from the Gibralter Range in New South Wales, Australia and is separated from the other four species by the following suite of characters: There are very prominent markings on the back, including two blackish chevrons across the back, with light brown between them. There

is also a distinct unbroken line of black on the dorso-lateral line. There are well defined bands on the dorsal surface of the upper back legs. There is a well defined black (as opposed to any other colour) line running from below the eye, down to the lip.

Assa brianchampioni sp. nov. from the Dorrigo Plateau area of New South Wales, Australia is separated from the other four species by the following suite of characters: Indistinct markings on body and the dark bar under the eye is absent or indistinct; white spots or marks on upper and lower labial area are prominent. There are orange spots on dorsal surface of the upper hind legs.

Assa jamesbondi; *sp. nov.* from the Conondale Range, in the Sunshine Coast hinterland, Queensland, Australia is readily separated from the other four species by the following suite of characters: Indistinct dorsal markings, including an indistinct dark bar under the eye and obvious orange spotting around the lips and on front limbs; there are no obvious markings on the dorsum of the upper back legs, save for scattered orange spots and obvious orange blotches on the dorsal surface of the lower hind limbs. There is no distinct line of black on the dorso-lateral line. Flanks are brownish-greyish-black with a somewhat broken ridge of lighter brown on the margin between the flank and the dorsum.

Assa robertekseteini sp. nov. from the D'Aguilar Range north west of the Brisbane City centre, including Mount Glorious, in Queensland, Australia, is similar in most respects to *Assa jamesbondi*; *sp. nov.* but with semidistinct markings on middle of back and no orange spots on forelimbs. Brown upper flanks have no black on the margin with dorsum and there is little markings of any sort delineating the boundary between the lateral and dorsal surfaces. There is prominent white spotting on the lips. There are indistinct dark or light markings on the upper surfaces of the upper hind legs.

Females of each species (above) are similar in that the demarcation between upper flank and dorsal surface is bounded by a well-defined dark line, which on the lower serface fades into the lighter colour of the venter, either suddenly and well defined, or alternatively by way of streaking, spotting or otherwise fading. Patterning in adult females varies significantly and may include similar markings to the males or alternatively a pattern generally including a dark mid-dorsal area and light on the sides of the back, often bold in nature.

Assa darlingtoni (Loveridge, 1933) in life is depicted in Cogger (2014) on page 73 (two images), Vanderduys (2012) on page 133 and Anstis (2013) on pages 527 (except far right), 528, 529 and 531 (left).

Assa guatammukherjii sp. nov. in life is depicted online at:
https://www.flickr.com/photos/23031163@N03/
38440057655/in/photolist-21yPkUK-2cTcvxu-99fzrX
and
https://www.flickr.com/photos/reptileshots/
45868003902/in/photolist-21yPkUK-2cTcvxu-99fzrX/
and
https://www.flickr.com/photos/stephenmahony/
5344230197/in/photolist-21yPkUK-2cTcvxu-99fzrX/

Assa brianchampioni sp. nov. in life is depicted in Anstis (2013) on page 526 (far right) and online at:
https://www.flickr.com/photos/ryanfrancis/
24546774504/in/photolist-Dp7CS5-EdB8xF
and
https://www.flickr.com/photos/ryanfrancis/
25084209441/in/photolist-Dp7CS5-EdB8xF/

Assa jamesbondi; *sp. nov.* in life is depicted online at:
https://www.flickr.com/photos/reptileshots/
38477704112/in/photolist-21C9hTA-PZup5z
and
https://www.flickr.com/photos/44269129@N05/
31499349141/in/photolist-21C9hTA-PZup5z/

Assa robertekseteini sp. nov. in life is depicted online at:
https://www.flickr.com/photos/129794304@N02/
29857633724/in/photolist-Muqbhm-MZMmMu
and
https://www.flickr.com/photos/129794304@N02/
30189944790/in/photolist-Muqbhm-MZMmMu/

Distribution: *Assa brianchampioni sp. nov.* is only known from the Dorrigo Plateau area, in New South Wales, Australia where it is strongly associated with Antarctic Beech *Nothofagus moorei* (Mueller, 1866) forests.

Etymology: Named in honour of Brian Champion of near Parramatta, (Sydney), New South Wales, Australia in recognition of his contributions to herpetology in Australia spanning some decades, including through captive breeding various species such as Green Pythons *Chondropython viridis*.

ASSA JAMESBONDI SP. NOV.

LSIDurn:lsid:zoobank.org:act:A8D1156E-6121-48D4-9247-4E7C2751ACDF

Holotype: A preserved male specimen at the Queensland Museum, Brisbane, Queensland, Australia, specimen number J86637, collected at Bundaroo Creek, Conondale National Park, Queensland, Australia, Latitude -26.6958 S., Longitude 152.6119 E.

This government-owned facility allows access to its holdings.

Paratypes: 1/ A preserved male specimen at the Queensland Museum, Brisbane, Queensland, Australia, specimen number J86635, collected at South Booloumba Creek, Conondale Forest Reserve, Queensland, Australia, Latitude -26.7122 S., Longitude 152.6189 E.

2 and 3/ Two preserved specimens at the Queensland Museum, Brisbane, Queensland, Australia, specimen numbers J34334 and J34335 collected from Kondalilla, Queensland, Australia, Latitude Latitude -26.7 S., Longitude 152.9 E.

Diagnosis: All species of the genus *Assa* Tyler, 1972 are separated from all other Australian frogs by way of the diagnosis presented by Tyler (1972) or alternatively Cogger (2014) in an abridged form at page 73.

Where each species occurs, they are found in high numbers and easily located by lifting surface ground cover, under which they hide, enabling specimens of both sexes to be found.

The five relevant species are all geographically allopatric and the three southern-most species seem to be associated almost exclusively with Antarctic Beech *Nothofagus moorei* (Mueller, 1866) forests.

The two northern species seem to be associated with wet sclerophyll forest at (usually) high altitude, although the species from the Conondale Range does extend to as low as 300 metres above sea level, versus more than 600 metres for all others.

The five relevant species are all variable in colour between individuals and even the relative state of the specimen in terms of day versus night, or hot versus cold, but in spite of this, they are readily distinguished from one another by colouration in males (as defined below).

Assa darlingtoni (Loveridge, 1933) from the border ranges area of New South Wales and Queensland, (Australia) including the McPherson Range, Main Range National Park and Mount Warning is readily separated from the other four species by the following suite of characters: There is a dark bar under the eye to the lip bounded by white, markings on the back are semi-distinct, however there is well defined boundary on the mid upper back where pigment lightens to form a well defined whitish line which indents anteriorly in the mid back, leaving a dark brown "mountain shape" on the back posterior to this; there are well defined bands on the dorsal surface of the upper back legs; there is no distinct line of black on the dorso-lateral line, but instead one or more broken areas of black peppering or irregular spotting.

Assa guatammukherjii sp. nov. is the taxon from the Gibralter Range in New South Wales, Australia and is separated from the other four species by the following suite of characters: There are very prominent markings on the back, including two blackish chevrons across the back, with light brown between them. There is also a distinct unbroken line of black on the dorso-lateral line. There are well defined bands on the dorsal surface of the upper back legs. There is a well defined black (as opposed to any other colour) line running from below the eye, down to the lip.

Assa brianchampioni sp. nov. from the Dorrigo Plateau area of New South Wales, Australia is separated from the other four species by the following suite of characters: Indistinct markings on body and the dark bar under the eye is absent or indistinct; white spots or marks on upper and lower labial area are prominent. There are orange spots on dorsal surface of the upper hind legs.

Assa jamesbondi; *sp. nov.* from the Conondale Range, in the Sunshine Coast hinterland, Queensland, Australia is readily separated from the other four species by the following suite of characters: Indistinct dorsal markings, including an indistinct dark bar under the eye and obvious orange spotting around the lips and on front limbs; there are no obvious markings on the dorsum of the upper back legs, save for scattered orange spots and obvious orange blotches on the dorsal surface of the lower hind limbs. There is no distinct line of black on the dorso-lateral line. Flanks are brownish-greyish-black with a somewhat broken ridge of lighter brown on the margin between the flank and the dorsum.

Assa robertekssteini sp. nov. from the D'Aguilar Range north west of the Brisbane City centre, including Mount Glorious, in Queensland, Australia, is similar in most respects to *Assa jamesbondi*; *sp. nov.* but with semidistinct markings on middle of back and no orange spots on forelimbs. Brown upper flanks have no black on the margin with dorsum and there is little markings of any sort delineating the boundary between the lateral and dorsal surfaces. There is prominent white spotting on the lips. There are indistinct dark or light markings on the upper surfaces of the upper hind legs.

Females of each species (above) are similar in that the demarcation between upper flank and dorsal surface is bounded by a well-defined dark line, which on the lower serface fades into the lighter colour of the venter, either suddenly and well defined, or alternatively by way of streaking, spotting or otherwise fading. Patterning in adult females varies significantly and may include similar markings to the males or alternatively a pattern generally including a dark mid-dorsal area and light on the sides of the back, often bold in nature.

Assa darlingtoni (Loveridge, 1933) in life is depicted in Cogger (2014) on page 73 (two images), Vanderduys (2012) on page 133 and Anstis (2013) on pages 527 (except far right), 528, 529 and 531 (left).

Assa guatammukherjii sp. nov. in life is depicted online at: https://www.flickr.com/photos/23031163@N03/38440057655/in/photolist-21yPkUK-2cTcvxu-99fzrX

and

https://www.flickr.com/photos/reptileshots/45868003902/in/photolist-21yPkUK-2cTcvxu-99fzrX/

and

https://www.flickr.com/photos/stephenmahony/5344230197/in/photolist-21yPkUK-2cTcvxu-99fzrX/

Assa brianchampioni sp. nov. in life is depicted in Anstis (2013) on page 526 (far right) and online at:

https://www.flickr.com/photos/ryanfrancis/24546774504/in/photolist-Dp7CS5-EdB8xF

and

https://www.flickr.com/photos/ryanfrancis/25084209441/in/photolist-Dp7CS5-EdB8xF/

Assa jamesbondi; *sp. nov.* in life is depicted online at:

https://www.flickr.com/photos/reptileshots/38477704112/in/photolist-21C9hTA-PZup5z

and

https://www.flickr.com/photos/44269129@N05/31499349141/in/photolist-21C9hTA-PZup5z/

Assa robertekssteini sp. nov. in life is depicted online at:

https://www.flickr.com/photos/129794304@N02/29857633724/in/photolist-Muqbhm-MZMmMu

and

https://www.flickr.com/photos/129794304@N02/30189944790/in/photolist-Muqbhm-MZMmMu/

Distribution: *Assa jamesbondi sp. nov.* is only known from the Conondale Range and nearby areas west of the Sunshine Coast urban areas in south-east Queensland, Australia.

Etymology: Named in honour of James Bond of Park Road in Park Orchards, Victoria, Australia where he has lived for decades in recognition of the huge amount of logistical work he has done over many years to assist the wildlife research, education and conservation work of the team at Snakebusters: Australia's best reptile shows.

ASSA ROBERTEKSTEINI SP. NOV.

LSIDurn:lsid:zoobank.org:act:E6D1869A-5186-41BB-8558-CF759AE430D4

Holotype: A preserved specimen at the Queensland Museum, Brisbane, Queensland, Australia, specimen number J51584, collected at 1 km south of the junction of Tennison Woods Mountain Road and Wivenhoe Highway, in the D'Aguilar National Park, Queensland, Australia, Latitude -26.6958 S., Longitude 152.6119 E. This government-owned facility allows access to its holdings.

Diagnosis: All species of the genus *Assa* Tyler, 1972 are separated from all other Australian frogs by way of the diagnosis presented by Tyler (1972) or alternatively Cogger (2014) in an abridged form at page 73.

Where each species lives, they are found in high numbers and easily located by lifting surface ground cover, under which they hide, enabling specimens of both sexes to be found.

The five relevant species are all geographically allopatric and the three southern-most species seem to be associated almost exclusively with Antarctic Beech *Nothofagus moorei* (Mueller, 1866) forests.

The two northern species seem to be associated with wet sclerophyll forest at (usually) high altitude, although the species from the Conondale Range does extend to as low as 300 metres above sea level, versus more than 600 metres for all others.

The five relevant species are all variable in colour between individuals and even the relative state of the specimen in terms of day versus night, or hot versus cold, but in spite of this, they are readily distinguished from one another by colouration in males (as defined below).

Assa darlingtoni (Loveridge, 1933) from the border ranges area of New South Wales and Queensland, (Australia) including the McPherson Range, Main Range National Park and Mount Warning is readily separated from the other four species by the following suite of characters: There is a dark bar under the eye to the lip bounded by white, markings on the back are semi-distinct, however there is well defined boundary on the mid upper back where pigment lightens to form a well defined whitish line which indents anteriorly in the mid back, leaving a dark brown "mountain shape" on the back posterior to this; there are well defined bands on the dorsal surface of the upper back legs; there is no distinct line of black on the dorso-lateral line, but instead one or more broken areas of black peppering or irregular spotting.

Assa guatammukherjii sp. nov. is the taxon from the Gibralter Range in New South Wales, Australia and is separated from the other four species by the following suite of characters: There are very prominent markings on the back, including two blackish

chevrons across the back, with light brown between them. There is also a distinct unbroken line of black on the dorso-lateral line. There are well defined bands on the dorsal surface of the upper back legs. There is a well defined black (as opposed to any other colour) line running from below the eye, down to the lip.

Assa brianchampioni sp. nov. from the Dorrigo Plateau area of New South Wales, Australia is separated from the other four species by the following suite of characters: Indistinct markings on body and the dark bar under the eye is absent or indistinct; white spots or marks on upper and lower labial area are prominent. There are orange spots on dorsal surface of the upper hind legs.

Assa jamesbondi; *sp. nov.* from the Conondale Range, in the Sunshine Coast hinterland, Queensland, Australia is readily separated from the other four species by the following suite of characters: Indistinct dorsal markings, including an indistinct dark bar under the eye and obvious orange spotting around the lips and on front limbs; there are no obvious markings on the dorsum of the upper back legs, save for scattered orange spots and obvious orange blotches on the dorsal surface of the lower hind limbs. There is no distinct line of black on the dorso-lateral line. Flanks are brownish-greyish-black with a somewhat broken ridge of lighter brown on the margin between the flank and the dorsum.

Assa roberteksteini sp. nov. from the D'Aguilar Range north west of the Brisbane City centre, including Mount Glorious, in Queensland, Australia, is similar in most respects to *Assa jamesbondi*; *sp. nov.* but with semidistinct markings on middle of back and no orange spots on forelimbs. Brown upper flanks have no black on the margin with dorsum and there is little markings of any sort delineating the boundary between the lateral and dorsal surfaces. There is prominent white spotting on the lips. There are indistinct dark or light markings on the upper surfaces of the upper hind legs.

Females of each species (above) are similar in that the demarcation between upper flank and dorsal surface is bounded by a well-defined dark line, which on the lower serface fades into the lighter colour of the venter, either suddenly and well defined, or alternatively by way of streaking, spotting or otherwise fading. Patterning in adult females varies significantly and may include similar markings to the males or alternatively a pattern generally including a dark mid-dorsal area and light on the sides of the back, often bold in nature.

Assa darlingtoni (Loveridge, 1933) in life is depicted in Cogger (2014) on page 73 (two images), Vanderduys (2012) on page 133 and Anstis (2013) on pages 527 (except far right), 528, 529 and 531 (left).

Assa guatammukherjii sp. nov. in life is depicted online at:
https://www.flickr.com/photos/23031163@N03/
38440057655/in/photolist-21yPkUK-2cTcvxu-99fzrX
and
https://www.flickr.com/photos/reptileshots/
45868003902/in/photolist-21yPkUK-2cTcvxu-99fzrX/
and
https://www.flickr.com/photos/stephenmahony/
5344230197/in/photolist-21yPkUK-2cTcvxu-99fzrX/

Assa brianchampioni sp. nov. in life is depicted in Anstis (2013) on page 526 (far right) and online at:
https://www.flickr.com/photos/ryanfrancis/
24546774504/in/photolist-Dp7CS5-EdB8xF
and
https://www.flickr.com/photos/ryanfrancis/
25084209441/in/photolist-Dp7CS5-EdB8xF/

Assa jamesbondi; *sp. nov.* in life is depicted online at:
https://www.flickr.com/photos/reptileshots/
38477704112/in/photolist-21C9hTA-PZup5z
and
https://www.flickr.com/photos/44269129@N05/
31499349141/in/photolist-21C9hTA-PZup5z/

Assa roberteksteini sp. nov. in life is depicted online at:
https://www.flickr.com/photos/129794304@N02/
29857633724/in/photolist-Muqbhm-MZMmMu
and
https://www.flickr.com/photos/129794304@N02/
30189944790/in/photolist-Muqbhm-MZMmMu/

Distribution: *Assa roberteksteini sp. nov*. is only known from the D'Aguilar Range, including Mount Glorious in south-east Queensland, Australia.

Etymology: Named in honour of Robert Ekstein of Forestville (Sydney) in New South Wales, Australia for numerous services to assist this author and the team at Snakebusters: Australia's best reptile shows to aid the wildlife conservation, education and research activities undertaken.

***ASSA* SPECIES CONSERVATION.**

While all five species in the genus *Assa* Tyler, 1972 are found in wildlife conservation areas and do not appear to have declined in number since European settlement of Australia, more than 200 years ago, none can be described as being particularly secure into the future.

If the Australian government persists with its "Big Australia Policy", (see for example Saunders 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.

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

These may include direct human activities (e.g. land clearing for homes, agriculture, etc), as well as potential threats caused by changed vegetation regimes, fires and fire management, introduced pests and potential pathogens, including those introduced via the legal importation of foreign reptiles and amphibians by government-owned zoos and associated entities. Added to the preceding are global issues such as global warming, caused principally by global overpopulation of humans as detailed in Hoser (1991), which if it occurs as predicted in the taboid media, may also reduce habitat for the relevant species as available habitat becomes hotter and potentially drier and wholly unsuitable for all five species.

This is not an abstract concept in this case as historically, the genus must have had a continuous distribution through its current range, which has receded at least in the interglacial period at lower altitude areas simply because they are too warm and dry for them.

Due to the risk of unforseen calamity, like the manner Chytrid fungus (*Batrachochytrium dendrobatidis*) decimated populations of frogs in the 1970's to 1990's in Australia (Greshko 2018), it would be prudent for captive populations of all five species in the genus to be established and maintained by government-finded zoos and any other interested parties willing to put time, money and effort into such a project.

REFERENCES CITED

Anstis, M. 2013. *Tadpoles and frogs of Australia*. Reed / New Holland, Sydney, Australia:829 pp.

Barker, J., Grigg, G. C. and Tyler, M. J. 1995. *A Field Guide to Australian Frogs*. Surrey Beatty and Sons, New South Wales.

Cogger, H. G. 2014. *Reptiles and Amphibians of Australia* (Seventh Edition). CSIRO Publishing, Collingwood, Victoria, Australia:1033 pp.

Cogger, H. G., Cameron, E. E. and Cogger, H. M. 1983. *Zoological Catalogue of Australia* (*1*) *Amphibia and Reptilia*, Australian Government Publishing Service, Canberra, ACT, Australia:319 pp.

Court of Appeal Victoria. 2014. *Hoser v Department of*

Sustainability and Environment [2014] VSCA 206 (5 Sep. 2014).

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.

Ehmann, H. and Swan, G. 1985. 'Reproduction and development in the marsupial frog, *Assa darlingtoni* (Myobatrachidae, Anura).' *Biology of Australasian Frogs and Reptiles*. Grigg, G., Shine, R. and Ehmann, H. (eds.), Royal Zoological Society New South Wales, Australia:279-285.

Eipper, S. and Rowland, P. 2018. *A Naturalist's Guide to the Frogs of Australia*. John Beaufoy Publishing, Oxford, UK:176 pp.

Greshko, M. 2018 Ground Zero of Amphibian 'Apocalypse' Finally Found. National Geographic, online at: https://www.nationalgeographic.com/news/2018/05/amphibians-decline-frogs-chytrid-fungi-bd-animals-science/

Hines, H., Mahony, M. and McDonald, K. 1999. An assessment of frog declines in wet subtropical Australia. in *Declines and Disappearances of Australian Frogs*. Campbell, A. (ed.), Environment Australia, Canberra:44-63.

Hoser, R. T. 1989. *Australian Reptiles and Frogs*. Pierson and Co., Sydney, NSW, Australia:238 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 Jour. 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. 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 Journ. 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 Jour. of Herp.* 39:53-63.

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.

Loveridge, Á. 1933. Four new crinine frogs from Australia. *Occasional papers of the Boston Society of Natural History* 8:55-60.

Mueller, F. J. H. von 1866. Fragmenta Phytographiae Australiae. 5:109.

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

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.

Roberts, J. D. and Maxson, L. R. 1986. Phylogenetic-Relationships in the Genus *Limnodynastes* (Anura, Myobatrachidae) - a Molecular Perspective. *Australian Journal of Zoology*, 34(4):561-573.

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

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

Tyler, M. J. 1972. A new genus for the Australian Leptodactylid frog *Crinia Darlingtoni. Zool. Mededelingen* 47(15):194-201.

Vanderduys, E. 2012. *Field guide to the frogs of Queensland.* CSIRO, Collingwood, Victoria, Australia:192 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 2015, 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.

CONFLICTS OF INTEREST

None.