

A new subspecies of Lace Monitor ***Varanus varius* (White, 1790).**

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RAYMOND T. HOSER

LSIDurn: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

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ABSTRACT

The large and well-known eastern Australian Lace Monitor *Varanus varius*, has long been recognized as comprising more than one form and/or taxonomic entities.

Confusion has arisen with the so-called Bell's form, being the broad banded form, often being treated as separate from the narrow-banded "normal" form, although it is well-known that both forms regularly breed with one another and that both forms can hatch from a single clutch of eggs.

In the face of the preceding, Smissen *et al.* (2013) identified three main lineages within the species relying on DNA.

Inspection of live and dead specimens from across the known ranges of each lineage, showed consistent morphological differences between the lineages and so each are formally recognized herein as subspecies.

The so-called Bells form, described as a species being *Varanus belli* Duméril and Bibron, 1836, based on a broad-banded specimen, is in fact a mutant found in one of the three herein recognized subspecies, not of the nominate form and so is nominate for the subspecies.

The third subspecies, *Varanus varius gedyei* *subsp. nov.* from far north Queensland is formally named for the first time.

Keywords: Taxonomy; nomenclature; Australia; Lace Monitor; *Varanus*; *varius*; *belli*; North Queensland; Australia; new subspecies; *gedyei*.

INTRODUCTION

The Lace Monitor *Varanus varius* (White, 1790) is one of Australia's largest lizards and well-known to many Australians. Images of both type form *Varanus varius* from the type locality (Sydney district, New South Wales) and the broad-banded "Bell's form" are depicted on page 121 of Hoser (1989).

A specimen of the morphologically distinct latter form was formally named as *Varanus belli* by Duméril and Bibron in 1836. However because it has been known for many years that "normal looking" Lace Monitors and Bells form specimens will readily mate and breed, producing offspring of one, other or both forms, all authors in the last fifty years have treated all *Varanus varius* as a single species.

Exceptional to that was Wells and Wellington (1985) who wrote: "We consider that *V. varius* is a species complex, but in their paper, they gave no evidence or information to justify this view. Smissen *et al.* (2013) identified three main lineages within the species relying on DNA.

They found three clades (1, 2 and 3), being as follows:

Clade 1 confined to the wet tropics of far north Queensland;

Clade 2 found in Queensland south of the Burdekin gap and including the Murray Darling basin of New South Wales, including relevant parts of far north Victoria and South Australia; Clade 3 being generally along the New South Wales coast and south into nearby parts of far north-east Victoria.

They also found the following divergences, being:

"the age of the split between clade 3 and clades 1 and 2 is estimated to date to the Plio-Pleistocene - 2.7 Ma (95% CI: 1.6-3.3 Ma); the age of the split between clade 1 and clade 2 is estimated to date to the Pleistocene, 0.85 Ma (95% CI: 0.06-1.7 Ma)."

While the age of the split between the third clade and the others would normally be species-level divergence, Smissen *et al.* (2013) found some genetic admixture in specimens from the Hunter Valley corridor, indicating subspecies level differentiation would be more appropriate for the clades.

Smissen *et al.* (2013) did not look at the morphology of the lizards in each clade to see if there were consistent differences between the lineages.

They did not see which available names could be applied to each lineage or if any were potentially unnamed.

The purpose of my study was to answer the two preceding questions better put as:

1/ Are the lineages morphology divergent enabling classification as subspecies? and;

2/ If there are consistent diagnosable differences between the relevant lizards, then are there available names for these lineages? and if not, one or more should be assigned according to the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999, as amended online since).

MATERIALS AND METHODS

Specimens of the putative species *Varanus varius* from all parts of the known range were examined, both live, dead and from quality photos of specimens with known provenance, with a view to identifying consistent differences between regions, so-called forms or the genetic lineages identified by Smitsen *et al.* (2013). Groups identified as morphologically distinct were then matched with available names (when available).

Relevant literature was inspected, including a general sweep of all the popular Australian field guides and the like with photos of specimens with known provenance as well as online photos of the same.

The taxonomic literature was inspected, including the publications of White (1790), Daudin (1802), Duméril and Bibron (1836), Borre (1870) and Berney (1936) as well as Boulenger (1885), Cogger *et al.* (1983), Denzer *et al.* (2020), Smitsen *et al.* (2013) and Wells and Wellington (1985).

RESULTS

Specimens assigned to the three main lineages of Smitsen *et al.* (2013), were all found to be readily diagnosable and separable from one another, allowing for confident taxonomic assignment of each.

No such analysis has ever been done in the past and I was surprised how obvious the differences between the three lineages were.

These differences are detailed below in the relevant description of a new subspecies from north Queensland, with the diagnostic differences being usable for descriptions of the two previously named subspecies, which until now have not previously been diagnosed.

The depth of divergence and possible ongoing mixture of genes between two of the three lineages as documented by Smitsen *et al.* (2013), is why all are treated as subspecies and not full species.

In terms of available names and to which subspecies they should be assigned to, I note the following facts.

There is no type locality known for the original taxon name "*Lacerta varia* White, 1790".

However the image produced with the publication is of a typical specimen of the coastal New South Wales lineage, most readily identified by the obvious thick white cross-bands (unbroken) across the forelimbs, which is diagnostic for that subspecies. That is clade 3, as identified by Smitsen *et al.* (2013).

"*Tupinambis variegatus* Daudin, 1802" with a type locality of Port Jackson (Sydney), New South Wales, is clearly a junior (subjective) synonym of the preceding species and subspecies.

"*Varanus belli* Duméril and Bibron, 1836", conforms to the broad-banded form found mainly in the Murray Darling basin and less commonly in coastal Queensland and so must be within that lineage, or the so-called clade 2 of Smitsen *et al.* (2013).

It is the first available name for that lineage.

Varanus (Hydrosaurus) mustelinus Borre (1870) also appears to be of the coastal New South Wales form and is therefore a junior (subjective) synonym of the species and subspecies *Varanus varius*.

"*Varanus varius* Berney, 1936", appears to be an erroneous use of *Varanus varius* White, 1790.

The genus *Varanus* Merrem, 1820 has a type species of "*Lacerta varia* White, 1790" by subsequent designation of Gray (1827).

The readily separable lineage from north of the Burdekin Gap in far north Queensland (wet tropics), has no available name and so is formally named herein according to the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999 as amended online since).

VARANUS VARIUS GEDYEI SUBSP. NOV.

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Holotype: A preserved specimen at the Queensland Museum, Brisbane, Queensland, Australia, specimen number J76106 collected from near Ravenshoe, far north Queensland, Australia, Latitude -17.598889 S., Longitude 145.476944 E. This government-owned facility allows access to its holdings.

Paratype: A preserved specimen at the Queensland Museum, Brisbane, Queensland, Australia, specimen number J87081 collected from Hopevale Road, 30 km from Cooktown, far north Queensland, Australia, Latitude -15.35 S., Longitude 145.05 E.

Diagnosis: *Varanus varius gedyei subsp. nov.* occurs in far north Queensland, in a coastal region generally north from Mt Elliot south-west of Townsville to Munburra (just north of Cooktown) in the north.

It is one of three subspecies of *V. varius* separated from one another by the following three suites of characters:

1/ *Varanus varius gedyei subsp. nov.* is readily separated from the other two subspecies by the unique combination of having a bluish pink tongue with white tips, distinct large ocelli on the upper body in adults (surrounded by black), especially on top of the lower back, no dorsal bands in adults, upper legs with white/yellow spots, not bands or spots fused to bands, or configured as such or similar as in all other subspecies.

The large size and clarity of the yellow to white ocelli on the dorsum in adults of this subspecies readily separate it from the other two.

2/ The type form of *Varanus varius varius* (White, 1790), from coastal New South Wales and nearby parts of north-east Victoria is identified by the possession of thick white or yellow cross bands across the upper and lower forelimbs, usually unbroken or if so, the dots are elongated and tending towards bands and a relatively thick white tongue.

3/ *Varanus varius belli* (Duméril and Bibron, 1836) from inland New South Wales, Queensland south of the Burdekin River and immediately adjacent parts of Victoria and South Australia of the "normal Lace Monitor colouration" is identified by the possession of a relatively thin blue tongue and with banding on the forelimbs broken to form elongated spots or peppering.

The broad-banded Bells form, found throughout most or all of the range of this same subspecies and which is included in it as a mutant form of it (also being of the holotype specimen's form), often has a white tongue as part of that mutation, and is readily separated from all other *V. varius* within this subspecies and the other subspecies by the possession of 1, 2 or 3, broad yellow bands across the dorsum and similar on the upper tail, versus numerous narrow bands, spots, peppering or ocelli in all the other forms and subspecies.

Colour images of *Varanus varius gedyei subsp. nov.* in life can be found online at:

<https://www.inaturalist.org/observations/110275358>

and

<https://www.inaturalist.org/observations/98354913>

and

<https://www.inaturalist.org/observations/100970845>

and

<https://www.inaturalist.org/observations/90004993>

and

<https://www.inaturalist.org/observations/46346161>

Colour images of the type form of *Varanus varius varius* (White, 1790), can be found in Hoser (1989), on page 121 (centre), and Cogger (2014) on page 787 at left, as well as online at: <https://www.inaturalist.org/observations/106384561>

and <https://www.inaturalist.org/observations/16148566>
and <https://www.inaturalist.org/observations/107257217>
and <https://www.inaturalist.org/observations/82514944>

Colour images of both the distinctive broad banded and "normal pattern" *Varanus varius belli* (Duméril and Bibron, 1836) in life can be found in Cogger (2014) on page 787 (right images), Wilson and Knowles (1988) page 321, top right ("normal pattern") and bottom left (Broad banded form) and Hoser (1989) on page 121 bottom for the broad-banded form and on page 201 top is a photo of a "normal pattern" male and "intermediate pattern" female.

Colour images of "normal pattern" *Varanus varius belli* (Duméril and Bibron, 1836) in life can be found online at:

<https://www.inaturalist.org/observations/65455100>
and <https://www.inaturalist.org/observations/103225102>
and <https://www.inaturalist.org/observations/70723653>
and <https://www.inaturalist.org/observations/107805779>

Colour images of the distinctive broad banded *Varanus varius belli* (Duméril and Bibron, 1836) in life can be found online at: <https://www.inaturalist.org/observations/100755020>

and <https://www.inaturalist.org/observations/107991529>
and <https://www.inaturalist.org/observations/71840436>

All the previously cited images were downloaded and checked most recently on 16 April 2022.

All three subspecies of *Varanus varius* can be readily separated from all other species of Varanid lizard by the following unique suite of characters:

Tail is strongly laterally (vertically) compressed, except for at the base; a distinct and obvious moderate to low median double keel dorsally along the posterior half of the tail; caudal scales are not arranged in regular rings as the ventral caudal scales are larger than the dorsal ones; nostrils are directed laterally (not upwards); all supraoculars are small and irregularly distributed; there is a row of enlarged scales forming a ridge on the inner edge of the basal part of the fourth toe (derived and modified from Cogger 2014).

Distribution: *Varanus varius gedyei* subsp. nov. occurs in far north Queensland, in a coastal region generally north from Mt Elliot south-west of Townsville to Munburra (just north of Cooktown) in the north, including hilly and wooded country to the nearby west.

Conservation: This and the other two subspecies do not appear to be under any obvious extinction threat. Populations in national parks and reserves appear to be secure.

Etymology: Named in honour of well-known snake breeder Andrew Gedye of the Cairns district in far north Queensland, Australia, (formerly of Cheltenham, Victoria, Australia), in recognition of his services to herpetology spanning some decades, including with respect of breeding in captivity rare and little-known forms.

SUMMARY

The formal taxonomic recognition of a genetically isolated lineage of Lace Monitors that diverged from all others some 850,000 years prior is long overdue.

Noting this divergence, an apparent lack of any gene flow

between this and the other two subspecies of *V. varius* and that the relevant lizards are morphologically divergent, it is important that this evolving lineage be allowed to continue its evolutionary trajectory without risk of human transmigration of specimens from elsewhere.

The decision to classify the new taxon as a subspecies was made primarily on the basis of a divergence time being less than a million years, but in excess of 800K years.

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CONFLICT OF INTEREST

None.