

Two new subspecies of Thorny Devil, *Moloch horridus* Gray, 1841.

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ABSTRACT

The iconic Thorny Devil lizards of Australia, genus *Moloch* Gray, 1841 have always been treated as a monotypic genus. The species *Moloch horridus* Gray, 1841 has never been subdivided even at the subspecies level.

An audit of specimens from across Australia revealed three main populations, all readily distinguishable on the basis of differences in morphology and colour.

Although the genus itself has been shown to be significantly divergent from all other Australian agamids in numerous published molecular studies, there is no published data demonstrating timelines of divergences between regional populations.

Due to the consistent differences between the three main populations of *Moloch horridus* Gray, 1841, and no evidence of intermingling due to allopatry, each warrants taxonomic recognition at the species level.

Conservatively, the two unnamed forms are formally named herein.

The type form *Moloch horridus horridus* Gray, 1841 is herein restricted to coastal Western Australia and adjacent parts of south-west Australia.

Moloch horridus browni subsp. nov. is the taxon which occupies most of Central Australia, extending from western Queensland in the east, through the southern Northern Territory and including most of the eastern half of Western Australia.

Moloch horridus granti subsp. nov. is the taxon found on the Eyre Peninsula of South Australia and adjacent parts of southern South Australia.

Keywords: Taxonomy; nomenclature; Australia; Thorny Devil; Agamidae; *Moloch*; *horridus*; South Australia; Western Australia; Queensland; Northern Territory; new subspecies; *browni*; *granti*.

INTRODUCTION

The iconic Thorny Devil lizards of Australia, genus *Moloch* Gray, 1841 have always been treated as a monotypic genus. The species *Moloch horridus* Gray, 1841 has never been subdivided even at the subspecies level.

The closest to subdivision of the species as recognized to date was perhaps the paper of Wells and Wellington (1985), where for the entire genus they wrote:

"MOLOCH Gray, 1841.

Moloch horridus Gray, 1841. We regard this species as composite and recommend the urgent examination of specimens across its entire range."

Browne-Cooper *et al.* (2007) speculated that there may be a second species, but gave no indication as to where this idea

came from or even on what basis. Their view was cited by Brown (2014).

This paper presents an answer to the question posed as to whether or not there are more than one taxonomically recognisable entities within the genus *Moloch*.

MATERIALS, METHODS AND RESULTS

An audit of several hundred specimens from across Australia, including the entire known range of *Moloch* in the wild state revealed three main populations, all readily distinguishable on the basis of differences in morphology and colour.

Although the genus itself has been shown to be significantly divergent from all other Australian agamids in numerous published molecular studies, including for example Hugall *et al.*

(2008) and Pyron *et al.* (2013) there is no published data demonstrating timelines of divergences between regional populations.

Due to the consistent differences between the three main populations of *Moloch horridus* Gray, 1841 and no evidence of intermingling due to allopatry, each warrants taxonomic recognition at the species level.

Cogger *et al.* (1983), at page 122 cites no known synonyms for the species *Moloch horridus* Gray, 1841, however an audit of the literature found one.

This was *Acanthosaurus gibbosus* Berthold, 1846.

Both the nominate specimen, depicted in Gray (1845) and the lizard of Berthold conform to the form from the west coast of Western Australia as described later in this paper in the descriptions of each new subspecies.

Conservatively, the two unnamed forms are formally named herein as subspecies.

Molecular studies in future are likely to warrant elevation of each and perhaps other populations to full species level. This is particularly the case for the most divergent population, herein named as *Moloch horridus browni subsp. nov.*

The type form *Moloch horridus horridus* Gray, 1841 is herein restricted to coastal Western Australia and adjacent parts of south-west Australia.

Moloch horridus browni subsp. nov. is the taxon which occupies most of Central Australia, extending from western Queensland in the east, through the southern Northern Territory and including most of the eastern half of Western Australia.

Moloch horridus granti subsp. nov. is the taxon found on the Eyre Peninsula of South Australia and adjacent parts of southern South Australia.

While all relevant literature was consulted in terms of this taxonomic revision, none assisted in any way in terms of differentiating or diagnosing regional populations.

It was quite a surprise to find that not one single herpetologist in history had prior to now engaged in the fairly simple exercise of auditing specimens from across the known range of *Moloch* to see if there were taxonomically significant differences between populations.

As this exercise was done by myself for the first time ever, the differences between populations were obvious and within a short time enabled me to accurately tell location provenance of specimens put to me on a blind test, using characters diagnostic for each.

Each species is named according to the rules set out in the *International Code of Zoological Nomenclature* (Ride *et al.* 1999) and the following points relevant to each description are as follows.

Names or spelling should not be altered in any way unless mandated by the *International Code of Zoological Nomenclature* or publication that supersedes it.

In the event that a later author (first reviser) seeks to merge the two named taxa with one another, the first name to be used is that dictated by page priority and in the abstract keywords.

Colour descriptions relevant to each species do, unless otherwise stated, reflect colour in life of adult specimens.

There are no conflicts of interest in terms of this paper and the taxonomic and nomenclatural decisions taken herein.

Relevant literature in terms of this paper includes the following:

Browne-Cooper *et al.* (2007), Berthold (1846), Bohme and Bischoff (1984), Boulenger (1885), Brown (2014), Bush (1981), Cogger (2014), Cogger *et al.* (1983), Gray (1841), Hugall *et al.* (2008), Hutchinson and Hutchinson (2011), Macey *et al.* (2000), Manthey and Schuster (1999), Pianka (1969, 1997), Pianka and Pianka (1970), Pianka *et al.* (1998), Pyron *et al.* (2013), Siebenrock (1892), Switak (2017), Wells and Wellington (1985), Wilson (2015), Wilson and Knowles (1988), Wilson and Swan (2017) and sources cited therein.

MOLOCH HORRIDUS BROWNI SUBSP. NOV.

LSIDURN:LSID:ZOOBANK.ORG:ACT:2CCBB7D2-3019-4F7D-BCE5-8B8EC4066B2B

Holotype: A preserved specimen at the Australian Museum in Sydney, New South Wales, Australia, specimen number: R.113242, collected at 20 km north of Ethabuka Station Headquarters, north west of Bedourie, Queensland, Australia, Latitude 23.73 S., Longitude 138.45 E. The Australian Museum in Sydney, New South Wales, Australia is a government-owned facility that allows access to its holdings.

Paratype: A preserved specimen at the Queensland Museum, Brisbane, Australia, specimen number: J85414, collected at Cravens Peak, south-west of Boulia, Queensland, Australia, Latitude 23.13 S., Longitude 138.34 E.

Diagnosis: Until now, all lizards in the genus *Moloch* have been treated as being of the species *Moloch horridus* Gray, 1841. The genus and species as defined and diagnosed herein are readily separated from all other Australian agamids by the large conical spines that cover the fat depressed body and the presence of a large spinal nuchal hump or appendage, a large curved spine above each eye and a spinose tail that is shorter than the head and body (adapted from Cogger 2014).

All have a colour pattern including a dorsal surface with alternating dark and light cross bands of irregular shape and confused further by the conical scales and spines.

The nominate form *Moloch horridus horridus* from the west coast of Western Australia and nearby parts of the south-west of the State, away from the south coast, are separated from the other two subspecies by a dorsal pattern including chocolate brown cross-bands with lots of white and other colours on them; the dark sections of the flanks are heavily marked with white and the yellow cross-bands on the dorsal surface are faded or light yellow in colour.

The subspecies *Moloch horridus browni subsp. nov.* from central Australia, including the eastern half of Western Australia and far western Queensland is readily separated from the other two subspecies by a dorsal colouration incorporating yellow and brick-red cross-bands, both being clean as in lacking any significant intrusions of white pigment, flecks or the like.

The subspecies *Moloch horridus granti subsp. nov.* from the Eyre Peninsula in South Australia and immediately adjacent areas of the state are readily separated from the other two subspecies by a dorsal colouration including strong deep yellow cross-bands and chocolate brown cross-bands between these, the latter being clean on the upper surface (minimal white speckling or similar) and with only limited amounts of white intrusions or specking on the flanks. Unlike the other two subspecies, *Moloch horridus granti subsp. nov.* is characterised by a dominance of deep yellow on the head and large spines above the eyes.

Moloch horridus browni subsp. nov. is depicted in life in Wilson (2015) at page 167, Brown (2014) at page 765 at top, 765 at bottom, 776 at top and bottom left, 777 top right and Cogger (2014) at page 747.

Moloch horridus granti subsp. nov. is depicted in life in Brown (2014) at page 777 bottom left.

Moloch horridus horridus is depicted in life in Wilson and Knowles on page 218, lower right and Brown (2014) on page 777 at top left.

Distribution: *Moloch horridus browni subsp. nov.* occurs in central Australia, including the eastern half of Western Australia and far western Queensland

Etymology: Named in honour of Dr. Danny Brown of South-east Queensland in recognition of his amazing books on keeping and breeding Australian reptiles, generally regarded as "best in class", including for example Brown (2014) as cited herein.

He also publicly blew the whistle on improper practices involving well known and now deceased animal abuser Steve Irwin, who was famous for corruptly making millions of dollars in cash and kind from government hand-outs and animal cruelty on TV.

MOLOCH HORRIDUS GRANTI SUBSP. NOV.

LSIDURN:LSID:ZOOBANK.ORG:ACT:6C1BE5B9-27E0-4EE0-A820-ACEB24EA12B2

Holotype: A preserved specimen in the South Australian Museum, Adelaide, South Australia, Australia, specimen number: R37796, collected at Sinclair's Gap / Secret Rocks, South Australia, Australia, Latitude 33.18 S., Longitude 137.00 E. The South Australian Museum, Adelaide, South Australia, Australia is a government-owned facility that allows access to its holdings.

Paratype: A preserved specimen in the South Australian Museum, Adelaide, South Australia, Australia, specimen number: R25326, collected at Myola Station, 5 km west of Iron Baron, South Australia, Australia, Latitude 33.02 S., Longitude 137.22 E.

Diagnosis: Until now, all lizards in the genus *Moloch* have been treated as being of the species *Moloch horridus* Gray, 1841. The genus and species as defined and diagnosed herein are readily separated from all other Australian agamids by the large conical spines that cover the fat depressed body and the presence of a large spinal nuchal hump or appendage, a large curved spine above each eye and a spinose tail that is shorter than the head and body (adapted from Cogger 2014).

All have a colour pattern including a dorsal surface with alternating dark and light cross bands of irregular shape and confused further by the conical scales and spines.

The nominate form *Moloch horridus horridus* from the west coast of Western Australia and nearby parts of the south-west of the State, away from the south coast, are separated from the other two subspecies by a dorsal pattern including chocolate brown cross-bands with lots of white and other colours on them; the dark sections of the flanks are heavily marked with white and the yellow cross-bands on the dorsal surface are faded or light yellow in colour.

The subspecies *Moloch horridus granti subsp. nov.* from the Eyre Peninsula in South Australia and immediately adjacent areas of the state are readily separated from the other two subspecies by a dorsal colouration including strong deep yellow cross-bands and chocolate brown cross-bands between these, the latter being clean on the upper surface (minimal white speckling or similar) and with only limited amounts of white intrusions or speckling on the flanks. Unlike the other two subspecies, *Moloch horridus granti subsp. nov.* is characterised by a dominance of deep yellow on the head and large spines above the eyes.

The subspecies *Moloch horridus browni subsp. nov.* from central Australia, including the eastern half of Western Australia and far western Queensland is readily separated from the other two subspecies by a dorsal colouration incorporating yellow and brick-red cross-bands, both being clean as in lacking any significant intrusions of white pigment, flecks or the like.

Moloch horridus browni subsp. nov. is depicted in life in Wilson (2015) at page 167, Brown (2014) at page 765 at top, 765 at bottom, 776 at top and bottom left, 777 top right and Cogger (2014) at page 747.

Moloch horridus granti subsp. nov. is depicted in life in Brown (2014) at page 777 bottom left.

Moloch horridus horridus is depicted in life in Wilson and Knowles on page 218, lower right and Brown (2014) on page 777 at top left.

Distribution: *Moloch horridus granti subsp. nov.* occurs on the Eyre Peninsula in South Australia and adjacent areas.

Etymology: Named in honour of Scott Grant, who as of 2019 was owner and manager of the Whyalla Fauna Park in Whyalla, South Australia, Australia in recognition for his contributions to wildlife conservation in Australia.

That park was shut down by government directive in November 2021 because it was viewed as competition for their own dysfunctional Adelaide Zoo business.

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CONFLICTS OF INTEREST

None.