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Two new subspecies of Mulga Dragon *Caimanops amphiboluroides* (Lucas and Frost, 1902) (Squamata: Agamidae).

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ABSTRACT

An audit was conducted on the endemic Western Australian lizard species, the Mulga Dragon *Caimanops amphiboluroides* (Lucas and Frost, 1902), treated by many authors as being within an expanded *Diporiphora* Gray, 1842.

Bbased on inspection of numerous specimens throughout the known range it was found that those from the south-east of Western Australia and others from a coastal region inland from Geraldton were morphologically distinct from those found north of these areas in the Pilbara and adjacent areas.

As far as is known, the two southern groups of lizards are geographically disconnected by a distance of at least 150 km north-south and by a lesser distance east-west, consisting of mainly unsuitable habitat, indicating long-term divergence and so the unnamed forms are herein described as new subspecies. While no collection location was given for the holotype of Lucas and Frost, inspection of photos of the said specimen confirms it is of the north-west form and so the other populations are herein formally named as *Caimanops amphiboluroides aurantiaco subsp. nov.* and *Caimanops amphiboluroides leucolateralis subsp. nov.*.

Keywords: Lizards; taxonomy; nomenclature; Agamidae; *Caimanops*; *amphiboluroides*; Western Australia; new subspecies; *aurantiaco*; *leucolateralis*.

INTRODUCTION

As part of an ongoing audit of Australian reptiles, specimens of the endemic Western Australian dragon species, the Mulga Dragon *Caimanops amphiboluroides* (Lucas and Frost, 1902) from across their entire range were inspected.

The genus *Caimanops* Storr (1974) has been treated as monotypic for the species originally described as *Diporiphora amphiboluroides* Lucas and Frost, 1902.

The species-level taxon as recognized is a Western Australian endemic, being found in a broad area encompassing nearly half of the land mass of Western Australia, excluding the far south, the tropics and the most arid areas.

Within this remaining area, the species appears to have a disjunct distribution, with specimens from various parts of their range morphologically distinct from one another.

Inspection of specimens from across the known range found those from two regions to be different from the nominate form.

Those from the Goldfields area and nearby areas to the immediate north and west, in south-east Western Australia as well as specimens from the coastal region inland from Geraldton were found to be most divergent from the rest of the population, generally found in the southern to middle interior of Western Australia, including the Pilbara region and nearby parts of the coast.

On this basis they are formally described below as two new subspecies.

MATERIALS AND METHODS

While this is self evident from both abstract and introduction, I mention that inspection of specimens of this species has been over a 40 year period. The holotype (via photos) of *Diporiphora amphiboluroides* Lucas and Frost, 1902, provided to me by the Western Australian Museum has been inspected and carefully matched by myself with specimens from the north-west of the range of the putative species.

In other words it is consistent with that form.

In fact it appears that there may be several distinct forms within *Caimanops amphiboluroides* (Lucas and Frost, 1902) as currently recognized. However in the absence of molecular evidence and collection data for regions between known populations, I have taken a conservative step and only recognized two such populations as being distinct at a taxonomic level.

The population in question are from the Goldfields region of South-east Western Australia and besides being morphologically distinct from the northern populations, it is separated from it by a well demarcated zone of about 150 km across mainly unsuitable habitat.

This implies no gene flow between populations and long term isolation as opposed to the alternative explanation of no collection in the said regions. This in turn explains the morphological differences between the populations as consistently observed.

While it is likely that the south-eastern population is sufficiently divergent to warrant recognition as a full species, I have taken the conservative position and herein formally described as a subspecies in accordance with the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

A second apparently isolated population inland from Geraldton on the Western Australian coast is also morphologically divergent from the two aforementioned forms and so it too is formally named in this paper as a new subspecies.

It should be noted that unless mandated by the *International Code of Zoological Nomenclature* or relevant subsequent publication, the spelling of the scientific names should not be altered.

There are no conflicts of interest in the preparation of this paper and relevant museum staff across Australia are thanked for their assistance's in this and other relevant scientific projects myself and colleagues have engaged in over the last 40 years, most of whom have done an excellent job in this regard.

The conservation significance of timely recognition of potentially threatened taxa is important and best explained via the papers of Hoser (2019a, 2019b), which means I have absolutely no hesitation in publishing the scientific descriptions within this paper.

References relevant to the taxonomy and nomenclature adopted in this paper include the following: Cogger (2014), Cogger *et al.* (1983), Gray (1842), Hoser (2015, 2019a, 2019b), Hugall *et al.* (2008), Lucas and Frost (1902), Ride *et al.* (1999), Storr (1974), Wells and Wellington (1984, 1985) and sources cited therein.

In terms of the generic placement of the nominate species and subspecies, I note that the molecular results published by Hugall *et al.* (2008) support this position, albeit ambiguously. It should however be noted that many authors still place this taxon within the genus *Diporiphora* Gray, 1842 and people working with these lizards should be aware of the existence of two generic names.

Until the publication of this paper, no one has to the best of my knowledge ever countenanced the possibility that there may be more than one taxonomic entity within *Caimanops amphiboluroides* as conceived to date. However inspection of specimens across the known range of the putative species by myself, led to no other sensible conclusion.

Of note is that Storr (1974) at page 126 grouped the holotype of *Caimanops amphiboluroides* within the northern group of animals, but failed to give any reason for doing so. My own inspection of the same animal confirmed his judgement as correct. That Storr was able to place this specimen within a geographical grouping indicated he was aware of regional differences in the putative taxon, but evidently he was of the view that these differences did not warrant distinction at a taxonomic level.

CAIMANOPS AMPHIBOLUROIDES AURANTIACO SUBSP. NOV.

LSID urn:lsid:zoobank.org:act:F9F8CCF8-40C7-4659-8187-03A15BEF5071

Holotype: A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number R12034 collected at Mount Linden, Western Australia, Australia. Latitude 29.19 S., Longitude 122.25 E.

The government-owned Western Australian Museum, Perth, Western Australia, Australia allows access to its holdings.

Paratypes: 1/ A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number R39044 collected at Youanmi, Western Australia, Australia, Latitude 8.62 S., Longitude 118.83 E.

2/ A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number R544 collected at Mount Sefton Western Australia, Australia, Latitude 28.42 S., Longitude 123.23 E.

Diagnosis: *Caimanops amphiboluroides aurantiaco subsp. nov..* from the Goldfields and immediately adjacent areas of south-east Western Australia is readily separated from the nominate form of the species by the following suite of characters: White markings on flanks forming cross bands, orange on dorsum and sides almost immaculate, versus a dorsum heavily peppered and mottled with white on nominate form. There are no obvious cross bands on the flanks of the nominate form, which instead have alternate indistinct whitish markings on the lower flanks.

In *C. amphiboluroides aurantiaco subsp. nov.* there are five white bars (markings) on each side of the lower flanks, versus 6-7 in the nominate subspecies.

C. amphiboluroides aurantiaco subsp. nov.. has a significantly larger crest on back of neck than nominate form based on a visual inspection of specimens, but this is not quantified here.

Nuchal spines on *C. amphiboluroides aurantiaco subsp. nov..* are creamish white, versus brownish grey in nominate form and coloured in *amphiboluroides leucolateralis subsp. nov.* including as seen on the holotype for *C. amphiboluroides* Lucas and Frost, 1902, which is otherwise faded.

The subspecies *Caimanops amphiboluroides leucolateralis subsp. nov.* from within a 200 km radius of Geraldton in Western Australia is readily separated from the other two subspecies by the following: A distinctly greyish dorsal colouring, lacking the orangeish or reddish tinge or colour seen in the other two subspecies. It is further separated by the presence of a well-defined thick white line or streak running along the mid flank on either side. There are no obvious spines on the limbs and the nuchal spines are coloured.

Scales on the upper hind legs of nominate *Caimanops amphiboluroides amphiboluroides* are barely noticeably raised and those on the upper hind legs of *C. amphiboluroides aurantiaco subsp. nov.* are raised to form an appearance of tiny tubercles.

The diagnosis for both the genus *Caimanops* Storr, 1974 and the two subspecies within the genus, is directly taken from Storr (1974) and copied almost verbatim below (with minor modifications) as it still applies and there is no need to change it.

The genus *Caimanops* Storr, 1974 is defined herein as moderately large agamid lizards with short limbs and tail; tympanum, nuchal crest, gular fold and pre-anal pores present (although these pores are sometimes hard to see). Agreeing with *Physignathus* Cuvier, 1829 and *Intellagama* Wells and Wellington, 1985 and *Diporiphora* Gray, 1842 in having each pre-anal pore perforating a scale and in the alignment of the pores being directed backwards towards midline, but differing from both of those genera in having nasal located on (not below) the canthus rostralis, tail terminating obtusely (as in *Chelosania* Gray, 1845), five low crests along back, dark dorsal markings ranging from distinct to semi-distinct are longitudinal (not transverse) in orientation (except in the case of subspecies *C. amphiboluroides aurantiaco subsp. nov.*) and there is a complete absence of a white upper dorsolateral stripe. Agreeing with *Physignathus* and *Intellagama* (but not *Diporiphora*) in having a nuchal crest of laterally compressed scales, snout low and truncate in profile and no vertebral stripe.

A photo of the nominate subspecies *Caimanops amphiboluroides* in life is seen in Wilson and Knowles (1988) on page 205 at top right and Brown (2014) at top right.

A photo of *C. amphiboluroides aurantiaco subsp. nov.* in life was found online at: https://www.flickr.com/photos/gondwanareptileproductions/31565466685/in/photolist-Hj16RL-k3bsNF-bByDFu-Q6kgwe-GDJHYa-23w75xf-nYFQTx-dHzSi8-cFziJd and downloaded on 10 May 2019.

A photo of *Caimanops amphiboluroides leucolateralis subsp. nov.* in life is seen in Storr, Smith and Johnstone 1983 on plate 1, top left as well as in Brown (2014) on page 719, top left.

Distribution: Goldfields region of south-east Western Australia and nearby areas to the immediate west and north, generally south of latitude 28.40 South. Storr (1974) gives a northern extremity for the nominate form of 23.15 South and a southern extremity for the southern form (new subspecies) of 29.20 South, although more recent records are further south of here, but still away from southwest Australian coast.

The subspecies *Caimanops amphiboluroides leucolateralis subsp. nov.* occurs within a 200 km radius of Geraldton, West Australia.

Nominate *C. amphiboluroides amphiboluroides* is found in the central part of Western Australia generally around the southern part of the Pilbara, including areas immediately south and east.

Etymology: *aurantiaco* in Latin refers to the strong orange colour on the upper back region in this taxon.

CAIMANOPS AMPHIBOLUROIDES LEUCOLATERALIS SUBSP. NOV.

LSID urn:lsid:zoobank.org:act:22CCD5BD-CC7D-48ED-BCE7-C4227608B999

Holotype: A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number R5297 collected at Gullewa, Western Australia, Australia. Latitude 28.39 S., Longitude 116.19 E. The Western Australian Museum, Perth, Western Australia, Australia allows access to its holdings.

Paratype: A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number R53062 collected at Bullardoo Station, Mullewa, Western Australia, Australia. Latitude 27.50 S., Longitude 115.40 E.

Diagnosis: The subspecies *Caimanops amphiboluroides leucolateralis subsp. nov*. from within a 200 km radius of Geraldton, on the West Australian coast, is readily separated from the other two subspecies by the following: A distinctly greyish dorsal colouring, lacing the orangeish or reddish tinge or colour seen in the other two subspecies. It is further separated by the presence of a well-defined thick white line or streak running along the mid flank on either side. There are no obvious spines on the limbs and the nuchal spines are coloured. Scales on the upper hind legs of nominate *Caimanops amphiboluroides amphiboluroides* are slightly but barely noticeably raised and those on the upper hind legs of *C. amphiboluroides aurantiaco subsp. nov.* are raised to form an appearance of tiny tubercles.

Caimanops amphiboluroides aurantiaco subsp. nov.. from the Goldfields and immediately adjacent areas of south-east Western Australia is readily separated from the nominate form of the species by the following suite of characters: White markings on flanks forming cross bands, orange on dorsum and sides almost immaculate, versus a dorsum heavily peppered and mottled with white on nominate form. There are no obvious cross bands on the flanks of the nominate form, which instead have alternate indistinct whitish markings on the lower flanks. In *C. amphiboluroides aurantiaco subsp. nov.* there are five white bars (markings) on each side of the lower flanks, versus 6-7 in the nominate subspecies.

C. amphiboluroides aurantiaco subsp. nov.. has a noticeably larger crest on back of neck than nominate form and *C. amphiboluroides leucolateralis subsp. nov*. based on a visual inspection of specimens, but this is not quantified here.

Nuchal spines on *C. amphiboluroides aurantiaco subsp. nov.*. are creamish white, versus brownish grey in nominate form and coloured in *amphiboluroides leucolateralis subsp. nov.* including as seen on the holotype for *C. amphiboluroides* Lucas and Frost, 1902, which is otherwise faded.

The diagnosis for both the genus *Caimanops* Storr, 1974 and the two subspecies within the genus, is directly taken from Storr (1974) and copied almost verbatim below (with minor modifications) as it still applies and there is no need to change it.

The *Caimanops* Storr, 1974 are defined herein as moderately large agamid lizards with short limbs and tail; tympanum, nuchal crest, gular fold and pre-anal pores present (although these pores are sometimes hard to see). Agreeing with *Physignathus* Cuvier, 1829 and *Intellagama* Wells and Wellington, 1985 and *Diporiphora* Gray, 1842 in having each pre-anal pore perforating a scale and in the alignment of the pores being directed backwards towards midline, but differing from both of those genera in having nasal located on (not below) the canthus rostralis, tail terminating obtusely (as in *Chelosania* Gray, 1845), five low crests along back, dark dorsal markings ranging from distinct to semi-distinct are longitudinal (not transverse) in orientation (except in the case of subspecies *C. amphiboluroides aurantiaco subsp. nov.*) and there is a complete absence of white dorsolateral stripe on the upper flanks. Agreeing with *Physignathus* and *Intellagama* (but not *Diporiphora*) in having nuchal crest of laterally compressed scales, snout low and truncate in profile and no vertebral stripe. A photo of the nominate subspecies *Caimanops amphiboluroides* is seen in Wilson and Knowles (1988) on page 205, top right.

A photo of *C. amphiboluroides aurantiaco subsp. nov.* in life was found online at: https://www.flickr.com/photos/gondwanareptileproductions/31565466685/in/photolist-Hj16RL-k3bsNF-bByDFu-Q6kgwe-GDJHYa-23w75xf-nYFQTx-dHzSi8-cFziJd and downloaded on 10 May 2019.

A photo of *Caimanops amphiboluroides leucolateralis subsp. nov*. in life is seen in Storr, Smith and Johnstone 1983 on plate 1, top left as well as in Brown (2014) on page 719, top left.

Distribution: The subspecies *Caimanops amphiboluroides leucolateralis subsp. nov*. as far as is known, is found within a 200 km radius of Geraldton in Western Australia.

C. amphiboluroides aurantiaco subsp. nov. is found in the Goldfields region of south-east Western Australia and nearby areas to the immediate west and north, generally south of latitude 28.40 South. Storr (1974) gives a northern extremity for the nominate form of 23.15 South and a southern extremity for the southern form (new subspecies) of 29.20 South, although more recent records are further south of here, but still away from southwest Australian coast.

Nominate *C. amphiboluroides amphiboluroides* is found in the central part of Western Australia generally around the southern part of the Pilbara and including areas immediately south and east of there.

Etymology: *leucolateralis* in Latin refers to the well-defined whitish lateral markings on the lizard.

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CONFLICTS OF INTEREST - NONE.