A significant range extension for the Western Soil-Crevice Skink *Proablepharus reginae* (Glauert 1960) and an updated reptile species list of Cape Range, Western Australia

Chad Beranek[1,2,*], Stephen Mahony[1,3,4] and Shawn Scott[5,6]

[1] Conservation Biology Research Group, School of Environmental and Life Sciences, University of Newcastle, University Drive, Callaghan, New South Wales 2308, Australia

[2] FAUNA Research Alliance, PO Box 5092, Kahibah, New South Wales 2290, Australia

[3] Collections and Research, Western Australian Museum, 49 Kew Street, Welshpool, Western Australia 6106, Australia

[4] Australian Museum Research Institute, Australian Museum, 1 William St, Sydney 2010, Australia.

[5] Royal Zoological Society of South Australia, Frome Road, Adelaide, South Australia 5001, Australia

[6] UniSA STEM and Clinical & Health Sciences, University of South Australia, North Terrace, Adelaide, South Australia 5001, Australia

[*] Corresponding author. chad.beranek@uon.edu.au

ABSTRACT

We describe a 226 km range extension for the known distribution of the Western Soil-Crevice Skink *Proablepharus reginae* in Western Australia. This record from Cape Range National Park is the first for this species on the North West Cape and within the Cape Range IBRA sub-region and marks the most westerly record of *P. reginae* for mainland Australia. This finding raises the terrestrial reptile species richness for the Cape Range peninsula to 90. Previous surveys in this area failed to detect *P. reginae*, which demonstrates the value of repeated surveys in documenting species richness in remote locations. Furthermore, we provide morphological and ecological data and discuss this record in the contexts of geographic variation and the high number of isolated reptile populations and endemism seen on the Cape Range peninsula.

Key words: Cape Range National Park, endemism, lizard, North West Cape, reptile, skink, isolation

Published: 31 August 2021 DOI: https://doi.org/10.7882/AZ.2021.029

Introduction

The Australian scincid genus *Proablepharus* currently contains two species; the Western Soil-Crevice Skink *P. reginae* (Glauert 1960) and the Northern Soil-Crevice Skink *P. tenuis* (Broom 1896) (Wilson and Swan 2017; Couper *et al.* 2018). Formerly containing five species, this genus underwent a recent taxonomic and phylogenetic revision, with Couper *et al.* (2018) establishing that a combination of genetic paraphyly, differences in vertebral count, scalation, and consistency in size disparity was evidence for the description of *Austroablepharus* and transfer to it of three taxa; *A. barrylyoni*, *A. kinghorni*, and *A. naranjicaudus*. These two genera are morphologically distinctive and together can be differentiated from other scincid genera by a combination of the following character states: possession of ablepharine eyes (eyes immovable due to fusion of the lower eyelid to upper, and forming a transparent spectacle), pentadactyl limbs, horizontally-elliptical ear openings, supranasal scales absent, labial scales 7–8, and subdigital lamellae undivided (Horner 1992; Storr *et al.* 1999; Wilson and Swan 2017; Couper *et al.* 2018). *Proablepharus* spp. can be further diagnosed from *Austroablepharus* phenetically by their smaller size, typically unfused frontoparietal scales (v fused in *Austroablepharus*), smooth subdigital lamellae (v typically keeled or mucronate in *Austroablepharus*), lack of striped pattern in adults, and blander appearance, with the exception of a vibrant flush to the head and gular region in breeding males (Couper *et al.* 2018). However, juveniles can be striped, and have a red-orange tail. *Proablepharus reginae* is distinguishable from its congener *P. tenuis* in Western Australia in possessing four supraocular scales (v three distinct supraoculars, and the first being fused with the first two supraciliaries) and having unfused frontoparietal scales (v usually fused) (Storr 1975; Horner 1992; Wilson and Swan 2017).

Proablepharus reginae has the more widespread and westerly distribution of the genus. The species occurs in most arid and semi-arid habitats containing sandy or stony soil and supporting *Triodia* (Wilson and Swan 2017). This distribution encompasses the majority of the eastern and northern interior of Western Australia (WA), western Northern Territory (NT) and north-western South Australia (SA). This species is also known from Barrow Island (BI), WA, with specimens from there being smaller, darker, and with a higher number of subdigital lamellae beneath the fourth toe (Storr 1975).

Cape Range is situated on the western edge of the North West Cape of WA and hosts a high diversity of endemic reptile taxa (Kendrick 1993; Kealley *et al.* 2018). The region also comprises numerous isolated populations of more easterly species (Kendrick 1993). Prior to 1990, only the Cape Range Slider *Lerista allochira* (Kendrick 1989) was thought to be endemic (Kealley *et al.* 2018). Following this, *Anilios splendidus* (Aplin 1998), a Cape Range endemic typhlopid snake, was described. With ongoing taxonomic and phylogenetic investigations of remote or isolated ranges, instances of cryptic speciation continue to be revealed. These investigations have also elucidated previously unknown endemism for the Cape Range penisula; *Crenadactylus tuberculatus* Doughty *et al.* 2016, *Delma tealei* Maryan *et al.* 2007, *Diplodactylus capensis* Doughty *et al.* 2008, and *Gehyra capensis* Kealley *et al.* 2018. This high diversity of isolated endemic reptile taxa highlights Cape Range as a conservation priority region (Kealley *et al.* 2018).

The endemism apparent in Cape Range is likely a result of its isolated and unique habitat type (Kendrick 1993; Doughty *et al.* 2008). Cape Range is an area of deeply dissected limestone that rises to 315 m and is surrounded by a sharp transition from rock to sand dune (Storr and Hanlon 1980). This sharp transition between landscape and habitat types drive speciation in reptiles in arid and semi-arid regions of Australia (Pianka 1969). Cape Range was likely formed via an anticline occurring in the late Miocene (~7 Ma) (Wyrwoll *et al.* 1993). This also occurred during a period of climatic change as Australia underwent aridification, particularly to the west and interior of the continent (Byrne *et al.* 2011).

Here we report a 226 km range extension to west of the known range of *P. reginae* in Cape Range National Park (CRNP). Furthermore, we provide an updated accounting of the recorded reptile taxa of Cape Range as adapted from Kendrick (1993) and suggest further lines of study to support our understanding of *P. reginae* on the North West Cape, WA.

Observation and range extension

At 16:28hrs on 20 August 2019, an adult-sized *P. reginae* (Figure 1) was located beneath the base of a spinifex hummock *Triodia angusta* and atop the underlying soil at Shothole Canyon, Cape Range National Park, WA,

Figure 1. Adult male *P. reginae* in life. Note characteristic bronze-olive dorsal colouration contrasted by vibrant orange head. Photo: S. Mahony.

Australia (GPS: -22.061367, 114.01358, elevation: 121 m). Local weather constituted sunny conditions and an ambient temperature of ~22°C at time of capture. The specimen was identified as *P. reginae* based on the following morphological character states: large, unblinking eyes, horizontally elliptical tympanum, four supraocular scales (Figure 2) and unfused frontoparietal scales (Figure 3), the characteristic bronze-olive dorsal colouration with dark-edged scales contrasted by vibrant orange about the head and throat, and its small size (34 mm SVL and 0.71g total weight prior to preservation) (Wilson and Swan 2017). The colouration of the head and gular region was indicative of it being a reproductively active male (Wilson and Swan 2017) that was also undergoing ecdysis as patches of exfoliating skin were evident (also seen in Figure 2). The specimen was collected and lodged in the Western Australian Museum (WAM) where it is registered as R165479.

Figure 2. Lateral aspect of head of male *P. reginae* in life. Note presence of four supraocular scales and exfoliating skin surrounding tympanum. Photo: S. Mahony.

Figure 3. Dorsal aspect of head of male *P. reginae* in life. Note divided frontoparietal scales. Photo: S. Mahony.

The surrounding habitat agrees with the description for the area in Storr and Hanlon (1980) and constituted the sharply sloping hillsides of the valley with heavy stony soil. Vegetation consisted primarily of hummock grasslands *T. angusta* with scattered *Eucalyptus prominens* extending from the low dissections to the upper margins of the cliff faces within the canyon. While searching, the following lizard taxa were also encountered at the same site: *Crenadactylus tuberculatus*, *Cyclodomorphus melanops melanops*, *Diplodactylus capensis*, *Gehyra capensis*, *Menetia surda*, and *Strophurus elderi*.

Discussion

This is the first published record of *P. reginae* in Cape Range National Park, North West Cape, Western Australia and represents the first record for the species to the west of the Pilbara on the North West Cape peninsula and within the Cape Range IBRA sub-region (CAR01) (ALA 2020). Following capture, relevant texts (Storr *et al.* 1999; Wilson and Swan 2017) and database records representing museum specimens (ALA 2020) were reviewed to ascertain the known occupancy of CRNP by *P. reginae*. Previously unknown from the entirety of the North West Cape peninsula, this observation marks a 226 km range extension to the west of the nearest and then most westerly record for mainland Australia at Cane River Conservation Park (CRCP) (ALA 2020; Figure 4).

Storr (1975) reported morphometric differences between mainland and BI populations of *P. reginae*, stating that the BI population is smaller (mean SVL 30.3 mm v 33.2 mm), possesses more subdigital lamellae (mean 23.6 v 22.8), and usually not possessing upper periocular granules hidden by the brow (v usually hidden in mainland populations). We compared the individual collected at CRNP with the locality differences stated in Storr (1975) and observed conformity with the mainland population in its larger size (34 mm) and in having the upper periocular granules hidden by the brow. However, the number of subdigital lamellae (24) of the CRNP specimen is higher than the mean count for the BI population. Collection and examination of a larger sample size may allow for a greater understanding of potential morphological trends between populations.

Kendrick (1989) developed a list of known reptile diversity for Cape Range based on specimens maintained at the WAM with specific locality records. Here, the list is used as a basis and updated to reflect additions and taxonomic

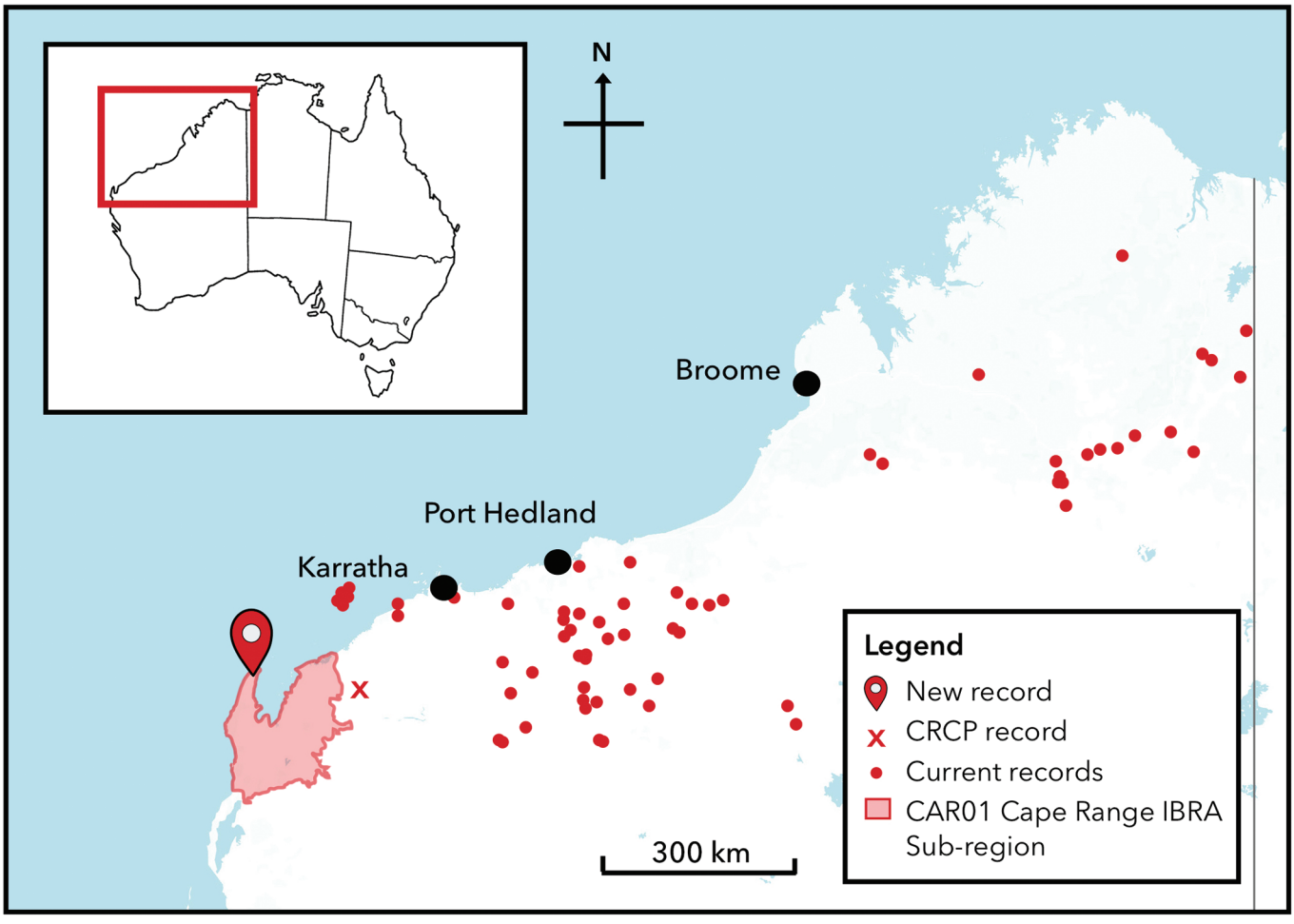

Figure 4. Map displaying new record for *P. reginae* at Cape Range National Park relative to nearest record at Cane River Conservation Park and other records in northern WA.

changes as appropriate. Where possible, specific references to taxonomic works have been included. Alternatively, references in which revised nomenclature is earliest used (to the best of our knowledge) have been cited. To determine the existing known terrestrial reptile assemblage for the Cape Range peninsula, relevant articles and texts (Storr and Hanlon 1980; Kendrick 1989, 1993; Storr *et al.* 1999; Wilson and Swan 2017) and online biological databases (ALA 2020) based on museum and government records were reviewed. We compiled an initial list using Kendrick (1993), reviewed the literature (and incorporated updated taxonomy) and databases mentioned above, and in including the present record, this results in an increase of the documented reptile assemblage of Cape Range to 90 (see Table 1). Kendrick (1993) lists 84 species of reptile for the Cape Range peninsula, however, he lists two separate subspecies for *Morethia ruficauda*, each being included as individual taxa. Here, we include both subspecies within Table 1 but these are considered a single species in the tally and hence reduces the initial list to 83.

This observation is significant for two primary reasons. Firstly, previous herpetofauna surveys, both professional and amateur, conducted in this area failed to detect this species, and secondly, it reinforces an existing pattern of species complexes which occur in the Pilbara bioregion with isolated populations or sister species at Cape Range without known occurrence in the intervening sand dune habitats.

It is unknown if the CRNP population of *P. reginae* is connected to the larger population further east. Although it is possible that the two populations are connected, a combination of the changes in habitat type between the north and south of the Cape Range peninsula and the degrees of anthropogenic disturbance on this area may have resulted in allopatry. One explanation is that there is an unbroken distribution between the population of CRNP and populations within CRCP. We expect this is unlikely as this area is dominated by sand dunes, and *P. reginae* appears to be restricted to areas with stony soils supporting *Triodia* (Wilson and Swan 2017; ALA 2020). Practitioners conducting herpetofauna surveys between these regions should be aware of the potential for recording *P. reginae*, especially during active searches in areas supporting *Triodia* or when establishing appropriate trapping lines in such habitat.

Despite previous fauna surveys, *P. reginae* has not been recorded before on the Cape Range peninsula (Storr and Hanlon 1980; Kendrick 1993; Wilson and Swan 2017; ALA 2020). We conclude that further collection of *P. reginae* in this area could improve knowledge of potential molecular and morphological variation within this population. Conducting more herpetofauna surveys in Cape Range to gain additional specimens may also uncover reptile species that are yet to be locally discovered. Collection of additional specimens of *P. reginae* would permit comparative genetic and morphological analyses to be conducted, particularly on the interpopulation differences between CRNP, the Pilbara, and BI. Such analyses will allow assessment of genetic isolation, divergence, and cryptic speciation, which can, in turn, support the development of appropriate conservation and management approaches for this and other species in the area.

Table 1. Updated reptile species list for the Cape Range peninsula. Largely adapted from Kendrick (1993), with taxonomic updates as referenced in the table.

Taxa – Kendrick (1993)	Current taxonomy	Endemic	References
Gekkonidae	Diplodactylidae		Han *et al.* 2004
Crenadactylus ocellatus horni	*Crenadactylus tuberculatus*	E	Doughty *et al.* 2016
Diplodactylus ciliaris aberrans	*Strophurus ciliaris aberrans*		Melville *et al.* 2004
Diplodactylus conspicillatus	*Diplodactylus bilybara*		Oliver *et al.* 2014
Diplodactylus elderi	*Strophurus elderi*		Melville *et al.* 2004
Diplodactylus jeanae	*Strophurus jeanae*		Melville *et al.* 2004
Diplodactylus mitchelli	*Diplodactylus capensis*	E	Doughty *et al.* 2008
Diplodactylus ornatus	*Diplodactylus ornatus*		
Diplodactylus rankini	*Strophurus rankini*		Melville *et al.* 2004
Diplodactylus stenodactylus	*Lucasium woodwardi*		Oliver *et al.* 2007; Eastwood *et al.* 2020
Diplodactylus strophurus	*Strophurus strophurus*		Melville *et al.* 2004
	Carphodactylidae		Han *et al.* 2004
Nephrurus levis occidentalis	*Nephrurus l. occidentalis*		
	Gekkonidae		Han *et al.* 2004
Gehyra pilbara	*Gehyra capensis*	E	Kealley *et al.* 2018
Gehyra punctata			

Taxa – Kendrick (1993)	Current taxonomy	Endemic	References
Gehyra variegata	*Gehyra variegata*		
	Hemidactylus frenatus		Wilson and Swan 2017
Heteronotia binoei	*Heteronotia binoei*		
Pygopodidae			
Aprasia fusca	*Aprasia rostrata*		Maryan *et al.* 2013
	Delma australis		Maryan *et al.* 2007
	Delma butleri		Maryan *et al.* 2015
Delma nasuta	*Delma nasuta*		
Delma pax	*Delma tealei*	E	Maryan *et al.* 2007
Delma tincta	*Delma tincta*		
Lialis burtonis	*Lialis burtonis*		
Pygopus nigriceps	*Pygopus nigriceps*		
Agamidae			
Ctenophorus clayi	*Ctenophorus clayi*		
Ctenophorus femoralis	*Ctenophorus femoralis*		
Ctenophorus inermis	*Ctenophorus nuchalis*		Cogger *et al.* 1983
Ctenophorus isolepis isolepis	*Ctenophorus i. isolepis*		
Ctenophorus maculatus badius	*Ctenophorus m. badius*		
Ctenophorus reticulatus	*Ctenophorus reticulatus*		
Diporiphora winneckei	*Diporiphora adductus*		Doughty *et al.* 2012
Gemmotophora gilberti gilberti	*Lophognathus horneri*		Melville *et al.* 2018
Gemmatophora longirostris	*Gowidon longirostris*		Wells and Wellington 1985; Melville *et al.* 2011
Moloch horridus	*Moloch horridus*		
Pogona minor minor	*Pogona m. minor*		
Tympanocryptis parviceps	*Ctenophorus parviceps*		Melville *et al.* 2008
Scincidae			
Carlia munda	*Carlia munda*		
Cryptoblepharus carnabyi	Synonymised with *Cryptoblepharus plagiocephalus*		Horner 2007
Cryptoblepharus plagiocephalus			
Ctenotus duricola	*Ctenotus pallasotus*		Rabosky *et al.* 2017
Ctenotus fallens	*Ctenotus fallens*		
Ctenotus grandis titan	*Ctenotus g. titan*		
	Ctenotus hanloni		Wilson and Swan 2017; ALA 2020
Ctenotus iapetus	*Ctenotus iapetus*		
Ctenotus pantherinus ocellifer	*Ctenotus p. ocellifer*		
Ctenotus rufescens	*Ctenotus rufescens*		
Ctenotus saxatilis	*Ctenotus saxatilis*		
Cyclodomorphus melanops	*Cyclodomorphus melanops*		
	Eremiascincus isolepis		Mecke *et al.* 2009
Eremiascincus fasciolatus	*Eremiascincus pallidus*		Mecke *et al.* 2013
Eremiascincus richardsonii	*Eremiascincus richardsonii*		
Lerista allochira	*Lerista allochira*	E	
Lerista bipes	*Lerista bipes*		

Taxa – Kendrick (1993)	Current taxonomy	Endemic	References
Lerista elegans	*Lerista elegans*		
Lerista lineopunctulata	*Lerista miopus*		Amey and Edwards 2018
Lerista macropisthopus fusciceps	*Lerista. m. fusciceps*		
Lerista muelleri	*Lerista clara*		Smith and Adams 2007
Lerista planiventralis planiventralis	*Lerista p. planiventralis*		
Lerista praepedita	*Lerista praepedita*		
Lerista uniduo	*Lerista uniduo*		
Menetia greyii	*Menetia greyii*		
Menetia surda	*Menetia surda*		
Morethia lineoocellata	*Morethia lineoocellata*		
Morethia ruficauda exquisita	*M. r. exquisita* only.		Wilson and Swan 2017
Morethia ruficauda ruficauda			
Notoscincus ornatus	*Notoscincus ornatus*		
	Proablepharus reginae		Present study.
Tiliqua multifasciata	*Tiliqua multifasciata*		
Varanidae			
Varanus acanthurus	*Varanus acanthurus*		
Varanus brevicauda	*Varanus brevicauda*		
Varanus eremius	*Varanus eremius*		
Varanus giganteus	*Varanus giganteus*		
Varanus gouldii	*Varanus gouldii*		
	Varanus panoptes rubidus		Wilson and Swan 2017
Varanus tristis tristis	*Varanus t. tristis*		
Typhlopidae			
Ramphotyphlops diversus ammodytes	*Anilios ammodytes*		Pyron and Wallach 2014; Wilson and Swan 2017
Ramphotyplops grypus	*Anilios grypus*		Pyron and Wallach 2014
	Anilios splendidus	E	(Aplin 1998)
Boidae	**Pythonidae**		Wilson and Swan 2003
Aspidites melanocephalus	*Aspidites melanocephalus*		
Morelia stimsoni stimsoni	*Antaresia childreni*		Esquerré *et al.* 2021
Morelia perthensis	*Antaresia perthensis*		Wilson and Swan 2003
Elapidae			
Acanthophis sp.	*Acanthophis wellsi*		Aplin and Donnellan 1999
Demansia calodera	*Demansia calodera*		
Demansia psammophis cupreiceps	*Demansia p. cupreiceps*		
	Demansia rufescens		Wilson and Swan 2017
Denisonia fasciata	*Suta fasciata*		Lee 1997
Furina ornata	*Furina ornata*		
Pseudechis australis	*Pseudechis australis*		
Pseudonaja modesta	*Pseudonaja modesta*		
Pseudonaja nuchalis	*Pseudonaja mengdeni*		Skinner 2009
Vermicella bertholdi	*Simoselaps bertholdi*		Lee 1997;
Vermicella littoralis	*Simoselaps littoralis*		Wilson and Swan 2003
Vermicella semifasciata	*Brachyurophis approximans*		Wilson and Swan 2003

Acknowledgements

Thanks to the staff of the WAM for the provision of equipment that greatly assisted during this field expedition. The specimen was collected under permit F025000006-3 as held by the WAM. We thank Dr Paul Doughty for collecting the morphometric data of the specimen described here. Thanks to Dr Glenn Shea for providing assistance with historical taxonomic information and to Ms Jasmine Armstrong for designing the map used here. Our gratitude to Dr Paul Doughty and Dr Mark Harvey of the WAM, whose comments greatly improved the manuscript. Further thanks to the two anonymous reviewers who provided constructive feedback and commentary on this paper.

References

ALA 2020. Atlas of Living Australia. Accessed 10 January 2020. https://bie.ala.org.au/search?q=proablepharus+reginae..

Amey, A.P. and Edwards, D.L. 2018. Taxonomy of the Sand Sliders of Western Australia's central coast (genus *Lerista*, Squamata: Scincidae): recognition of *Lerista miopus* (Günther, 1867). *Zootaxa* **4317:** 111-133. https://doi.org/10.11646/zootaxa.4317.1.5

Aplin, K.P. 1998. Three new blindsnakes (Squamata: Typhlopidae) from northwestern Australia. *Records of the Western Australian Museum* **19:** 1-12.

Aplin, K.P. and Donnellan, S.C. 1999. An extended description of the Pilbara death adder, *Acanthophis wellsi* Hoser (Serpentes: Elapidae), with notes on the desert death adder, *A. pyrrhus* Boulenger, and identification of a possible hybrid zone. *Records of the Western Australian Museum* **19:** 277-298.

Byrne, M., Steane, D.A., Joseph, L., Yeates, D.K., Jordan, G.J., Crayn, D., Aplin, K., Cantrill, D.J. Cook, L.G. and Crisp, M.D. 2011. Decline of a biome: evolution, contraction, fragmentation, extinction and invasion of the Australian mesic zone biota. *Journal of Biogeography* **38:** 1635-1656. https://doi.org/10.1111/j.1365-2699.2011.02535.x

Cogger, H.G., Cameron, E.E. and Cogger, H.M. 1983. Zoological Catalogue of Australia – Volume 1: Amphibia and Reptilia. Australian Government Publishing Service, Canberra, ACT.

Couper, P.J., Hoskin, C.J., Potter, S., Bragg, J.G. and Moritz, C. 2018. A new genus to accommodate three skinks currently assigned to *Proablepharus* (Lacertilia: Scincidae). *Memoirs of the Queensland Museum* **60:** 227-231. https://doi.org/10.17082/j.2204-1478.60.2017.2017-15

Doughty, P., Oliver, P. and Adams, M. 2008. Systematics of stone geckos in the genus *Diplodactylus* (Reptilia: Diplodactylidae) from northwestern Australia, with a description of a new species from the Northwest Cape, Western Australia. *Records of the Western Australian Museum* **24:** 247-265. https://doi.org/10.18195/issn.0312-3162.24(3).2008.247-265

Doughty, P., Kealley, L. and Melville, J. 2012. Taxonomic assessment of *Diporiphora* (Reptilia: Agamidae) dragon lizards from the western arid zone of Australia. *Zootaxa* **3518:** 1-24. https://doi.org/10.11646/zootaxa.3518.1.1

Doughty, P., Ellis, R.J. and Oliver, P.M. 2016. Many things come in small packages: Revision of the clawless geckos (*Crenadactylus*: Diplodactylidae) of Australia. *Zootaxa* **4168:** 239-278. https://doi.org/10.11646/zootaxa.4168.2.2

Eastwood, J.A., Doughty, P., Hutchinson, M.N. and Pepper, M. 2020. Revision of *Lucasium stenodactylus* (Boulenger, 1896; Squamata: Diplodactylidae), with the resurrection of *L. woodwardi* (Fry, 1914) and the description of a new species from south-central Australia. *Records of the Western Australian Museum* **35:** 063-086. https://doi.org/10.18195/issn.0312-3162.35.2020.063-086

Esquerré, D., Donnellan, S.C., Pavón-Vázquez, C.J., Fenker, J. and Keogh, J.S. 2021. Phylogeography, historical demography and systematics of the world's smallest pythons (Pythonidae, *Antaresia*). *Molecular Phylogenetics and Evolution* **107181**. https://doi.org/10.1016/j.ympev.2021.107181

Han, D., Zhou, K. and Bauer, A.M. 2004. Phylogenetic relationships among gekkotan lizards inferred from C-*mos* nuclear DNA sequences and a new classification of the Gekkota. *Biological Journal of the Linnean Society* **83:** 353-368. https://doi.org/10.1111/j.1095-8312.2004.00393.x

Horner, P. 1992. Skinks of the Northern Territory. Northern Territory Museum of Arts and Sciences Handbook Series Number 2, Darwin, NT.

Horner, P. 2007. Systematics of the snake-eyed skinks, *Cryptoblepharus* Wiegmann (Reptilia: Squamata: Scincidae) – an Australian-based review. *The Beagle, Records of the Museums and Art Galleries of the Northern Territory, Supplement* **3:** 21-198.

Kealley, L., Doughty, P., Pepper, M., Keogh, J. S., Hillyer, M. and Huey, J. 2018. Conspicuously concealed: revision of the arid clade of the *Gehyra variegata* (Gekkonidae) group in Western Australia using an integrative molecular and morphological approach, with the description of five cryptic species. *PeerJ* **6:** e5334. https://doi.org/10.7717/peerj.5334

Kendrick, P.G. 1989. Two new species of *Lerista* (Lacertilia: Scincidae) from the Cape Range and Kennedy Range of Western Australia. *Journal of Herpetology* **23:** 350-355. https://doi.org/10.2307/1564045

Kendrick, P.G. 1993. Biogeography of the vertebrates of the Cape Range peninsula, Western Australia. *Records of the Western Australian Museum* **45:** 193-206.

Lee, M.S.Y. 1997. Phylogenetic relationships among Australian elapid snakes: the soft anatomical data reconsidered. *Herpetological Journal* **7:** 93-102.

Maryan, B., Aplin, K.P. and Adams, M. 2007. Two new species of the *Delma tincta* group (Squamata: Pygopodidae) from northwestern Australia. *Records of the Australian Museum* **23:** 273-305. https://doi.org/10.18195/issn.0312-3162.23(3).2007.273-305

Maryan, B., Bush, B.G. and Adams, M. 2013. Morphological and molecular assessment of *Aprasia fusca* and *A. rostrata* (Squamata: Pygopodidae), with a description of a new species from the Lake MacLeod region, Western Australia. *Records of the Western Australian Museum* **28:** 144-163. https://doi.org/10.18195/issn.0312-3162.28(2).2013.144-163

Maryan, B., Brennan, I.G., Adams, M. and Aplin, K.P. 2015. Molecular and morphological assessment of *Delma australis* Kluge (Squamata: Pygopodidae), with a description of a new species from the biodiversity 'hotspot' of southwestern Western Australia. *Zootaxa* **3946:** 301-330. https://doi.org/10.11646/zootaxa.3946.3.1

Mecke, S., Doughty, P. and Donnellan, S.C. 2009. A new species of *Eremiascincus* (Reptilia: Squamata: Scincidae) from the Great Sandy Desert and Pilbara Coast, Western Australia and reassignment of eight species from *Glaphyromorphus* to *Eremiascincus*. *Zootaxa* **2246:** 1-20. https://doi.org/10.11646/zootaxa.2246.1.1

Mecke, S., Doughty, P. and Donnellan, S. C. 2013. Redescription of *Eremiascincus fasciolatus* (Günther, 1867) (Reptilia: Squamata: Scincidae) with claification of its synonyms and description of a new species. *Zootaxa* **3701:** 473-517. https://doi.org/10.11646/zootaxa.3701.5.1

Melville, J., Schulte II, J.A. and Larson, A. 2004. A molecular study of phylogenetic relationships and evolution of antipredator strategies in Australian *Diplodactylus* geckos, subgenus *Strophurus*. *Biological Journal of the Linnean Society* **82:** 123-138. https://doi.org/10.1111/j.1095-8312.2004.00324.x

Melville, J., Shoo, L.P. and Doughty, P. 2008. Phylogenetic relationships of the heath dragons (*Rankinia adelaidensis* and *R. parviceps*) from the south-western Australian biodiversity hotspot. *Australian Journal of Zoology* **56:** 159-171. https://doi.org/10.1071/ZO07069

Melville, J., Ritchie, E.G., Chapple, S.N.J., Glor, R.E. and Schulte II, J.A. 2011. Evolutionary origins and diversification of dragon lizards in Australia's tropical savannas. *Molecular Phylogenetics and Evolution* **58:** 257-270. https://doi.org/10.1016/j.ympev.2010.11.025

Melville, J., Ritchie, E.G., Chapple, S.N.J., Glor, R.E. and Schulte II, J.A. 2018. Diversity in Australia's tropical savannas: An integrative taxonomic revision of agamid lizards from the genera *Amphibolurus* and *Lophognathus* (Lacertilia: Agamidae). *Memoirs of Museum Victoria* **77:** 41-61. https://doi.org/10.24199/j.mmv.2018.77.04

Oliver, P.M., Hutchinson, M.N. and Cooper, S.J.B. 2007. Phylogenetic relationships in the lizard genus *Diplodactylus* Gray and resurrection of *Lucasium* Wermuth (Gekkota, Diplodactylidae). *Australian Journal of Zoology* **55:** 197-210. https://doi.org/10.1071/ZO07008

Oliver, P.M., Couper, P.J. and Pepper, M. 2014. Independent transitions between monsoonal and arid biomes revealed by systematic revision of a complex of Australian geckos (*Diplodactylus*; Diplodactylidae). *PLoS ONE* **9:** e111895. https://doi.org/10.1371/journal.pone.0111895

Pianka, E.R. 1969. Habitat specificity, speciation, and species density in Australian desert lizards. *Ecology* **50:** 498-502. https://doi.org/10.2307/1933908

Pyron, R.A. and Wallach, V. 2014. Systematics of the blindsnakes (Serpentes: Scolecophidia: Typhlopoidea) based on molecular and morphological evidence. *Zootaxa* **3829(1):** 001-081. https://doi.org/10.11646/zootaxa.3829.1.1

Rabosky, D.L., Doughty, P. and Huang, H. 2017. Lizards in pinstripes: morphological and genomic evidence for two new species of scincid lizards within *Ctenotus piankai* Storr and *C. duricola* Storr (Reptilia: Scincidae) in the Australian arid zone. *Zootaxa* **4303:** 1-26. https://doi.org/10.11646/zootaxa.4303.1.1

Skinner, A. 2009. A multivariate morphometric analysis and systematic review of *Pseudonaja* (Serpentes, Elapidae, Hydrophiinae). *Zoological Journal of the Linnean Society* **155:** 171-197. https://doi.org/10.1111/j.1096-3642.2008.00436.x

Smith, L.A. and Adams, M. 2007. Revision of the *Lerista muelleri* species-group (Lacertilia: Scincidae) in Western Australia, with a redescription of *L. muelleri* (Fischer, 1881) and the description of nine new species. *Records of the Western Australian Museum* **23:** 309-357. https://doi.org/10.18195/issn.0312-3162.23(4).2007.309-357

Storr, G. 1975. The genus *Proablepharus* (Scincidae, Lacertilia) in Western Australia. *Records of the Western Australian Museum* **3:** 335-338.

Storr, G. and Hanlon, T. 1980. Herpetofauna of the Exmouth region, Western Australia. *Records of the Western Australian Museum* **8:** 423-439.

Storr, G.M., Smith, L.A. and Johnstone, R.E. 1999. Lizards of Western Australia. I. Skinks. Revised edition. Western Australian Museum, Perth, WA.

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.

Wilson, S. and Swan, G. 2003. A complete guide to reptiles of Australia. First edition. New Holland Publishers, Sydney, NSW.

Wilson, S. and Swan, G. 2017. A complete guide to reptiles of Australia. Fifth edition. New Holland Publishers, Chatswood, NSW.

Wyrwoll, K., Kendrick, G. and Long, J. 1993. The geomorphology and Late Cenozoic geomorphological evolution of the Cape Range–Exmouth Gulf region. *Records of the Western Australian Museum Supplement* **45:** 1-23.