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A new species of Velvet Gecko (*Oedura*: Diplodactylidae) from the limestone ranges of the southern Kimberley, Western Australia

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Abstract

We describe a new species of large *Oedura* from the Oscar Range on the southern edge of the Kimberley Craton in north-western Australia. *Oedura murrumanu* **sp. nov.** can be distinguished from all congeners by the combination of large size (snout-vent length to 103 mm), moderately long and slightly swollen tail, tiny scales on the dorsum, fringe of laterally expanded lamellae on each digit, and 6–7 paired distal subdigital lamellae on the fourth toe. The new species is the first endemic vertebrate known from the limestone ranges of the southern Kimberley; however, this area remains poorly surveyed and further research (particularly wet season surveys and genetic analyses) is required to better characterise regional biodiversity values.

Key words: Australian Monsoonal Tropics, endemism, lizard, mesic refigia, Oscar Range, saxacoline

Introduction

The Kimberley region of north-west Australia is characterised geologically by an array of ancient and highly weathered exposed rock formations (Tyler *et al.* 2012; Pepper & Keogh 2014). One distinctive and discrete geological feature of this region is a fringe of exposed fossilized Devonian limestone reefs that form a broken chain around much of the southern and eastern edge of the Kimberley Craton (Tyler 2011; Tyler *et al.* 2012). In the south-west Kimberley the exposed portion of these limestone deposits form the Oscar and Napier Ranges. These low (<100 m above the surrounding plains) and narrow ranges (generally less than a few km wide) are isolated from other ranges of exposed rock in the Kimberley by flat low-lying plains. While they are home to a diverse radiation of micro-endemic Camaenid snails (Solem 1985; Cameron 1992), no endemic vertebrates are currently recognised from this area.

Australian Velvet Geckos (genus *Oedura*) are moderate to large geckos (snout-vent length [SVL] 69–113 mm) with a continuous distribution spanning much of northern and eastern Australia, with further isolates in the arid zone (Pilbara, Central Ranges and Flinders Ranges) (Oliver *et al.* 2012a, 2014; Wilson & Swan 2013). Two endemic species of *Oedura* are currently recognized from the Kimberley region: *O. gracilis* King, 1984 and *O. filicipoda* King, 1984. The former occurs over most of the Kimberley plateau and extends into the far north-west Northern Territory, while the latter is restricted to the deeply dissected sandstone plateaus of the relatively high rainfall zone of the north-west Kimberley (from the Mitchell Plateau in the north to the Artesian Range to the south; Fig. 1) (Atlas of Living Australia 2013).

For nearly a decade, an additional distinctive *Oedura* has been known from the Oscar Range of the south-west Kimberley (G. Gaikhorst, M. Kearney, B. Stewart, pers. comm.), however, no specimens have been available for taxonomic study. During recent fieldwork in the south-west Kimberley we were able to collect a small series of this form to assess if it is distinctive from other recognised *Oedura*, especially *O. filicipoda* which it resembles.

We found the Oscar Range form to be morphologically and genetically distinctive from all other *Oedura*

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species. The Oscar Range form is similar to *O. filicipoda* in that it shares an elongate body with long limbs with distinct fringing on the digits, but differs in possessing a longer and narrower tail and has larger spots on the dorsum. Genetically it differs from *O. filicipoda* by over 16% sequence divergence for the *ND2* mtDNA region, strongly supporting its distinctiveness as a new taxon. Below we present a description of the Oscar Range form as a new species, including the morphological and genetic evidence, and discuss the growth of biological knowledge from the Kimberley.

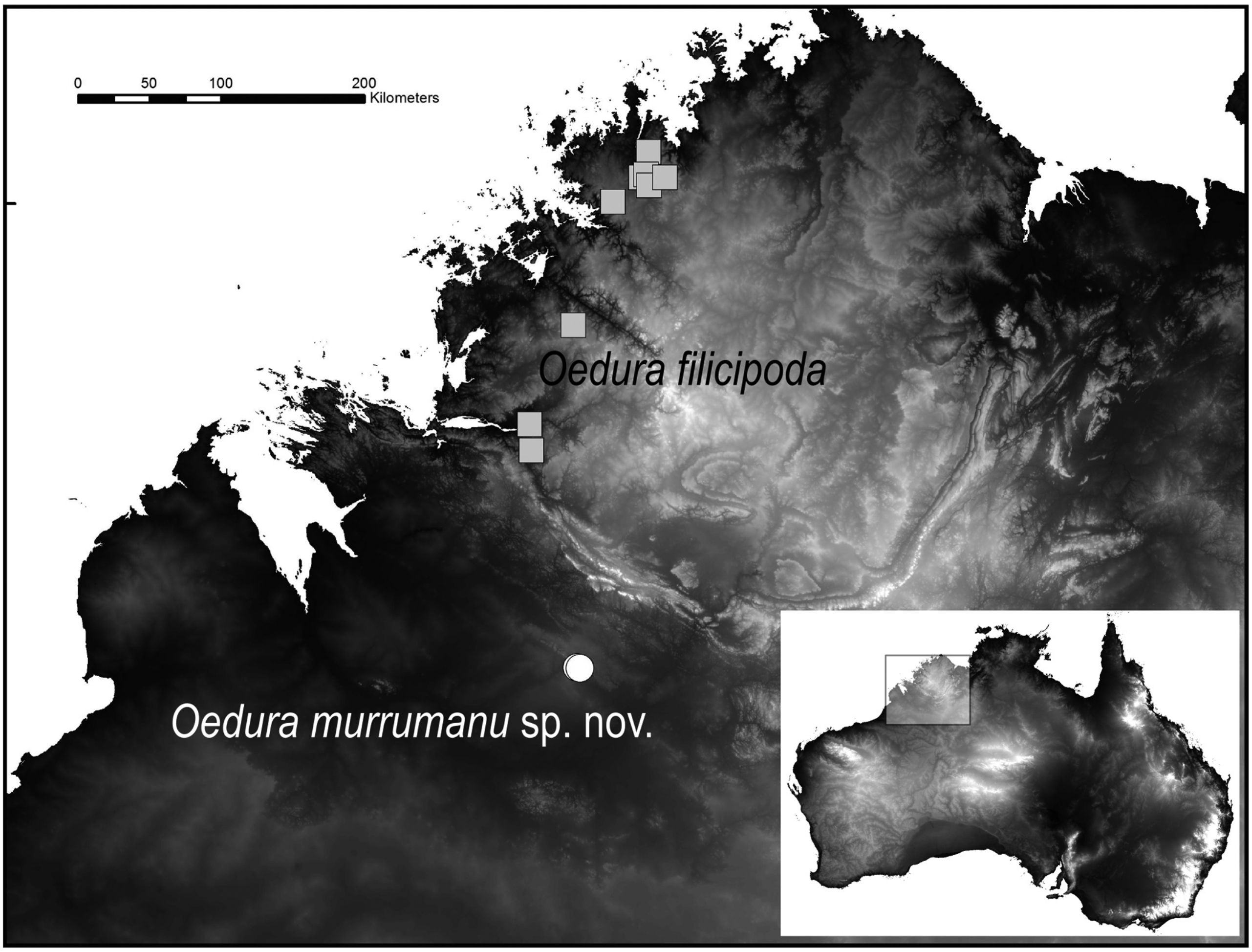

FIGURE 1. The Kimberley region of north-west Australia showing localities of museum records of *Oedura murrumanu* **sp. nov.** and *O. filicipoda*. Lighter areas indicate higher elevation.

Methods

All specimens were observed during nocturnal surveys for herpetofauna in the Oscar Range on the 28 October 2013. Type material and tissues have been deposited in the Western Australian Museum (WAM) and Museum Victoria (NMV).

Morphology. We examined material held in the NMV and WAM (Appendix 1). Measurements taken were as follows: SVL, total length from tip of snout to the anterior edge of vent; head width (HW), maximum width of the head; head depth (HD) maximum depth of the head just posterior to the orbitals; head length (HL), from anterior edge of ear to tip of snout; eye to naris distance (EN), from anterior corner of eye to posterior edge of naris; internarial distance (IN), from inner edge of the nares; interorbital distance (IO), from the anterior-dorsal edge of the eye; transverse length of eye (EYE); axilla to groin (trunk) distance (Trk) from posterior edge of forelimb insertion to anterior edge of hindlimb insertion; length of lower arm (Crus) from posterior edge of bent elbow to wrist; length of lower leg (Tibia), from anterior edge of bent knee to heel; tail length (TL); maximum tail width (TW) and depth (TD); and maximum width (including lamallae) of the 3rd finger (3FW) and 3rd toe (3TW).

The following details of scalation were also recorded: number of supralabials (SuL) more than twice the size of surrounding granular scales (both total number and number to mid-point of eye); infralabials (InL) more than twice size of surrounding granular scales; number of small granular scales along the dorsal edge of the nasals and between the much larger lateral supranasals (InN); length of rostral crease (RC) as a percentage of rostral height; total number of expressed pre-cloacal pores (PP) on males, and the number of intervening poreless scales; total number of enlarged cloacal spurs (CS) on right and left side; and total number of enlarged lamellae (more than twice the width of surrounding scales) under the third finger (FL3) and third toe (TL3).

Genetics. Between 816–1161 base pairs (bp) of sequence data from the mitochondrial *ND2* gene was amplified for the holotype and all five paratypes of the Oscar Range specimens using primer pairs L4437 (5'-AAGCTTTCGGGGCCCATACC-3') and Asn-tRNA (5'-CTAAAATRTTRCGGGATCGAGGCC-3') with an annealing temperature of 55ºC (Macey *et al.* 1997; Read et al. 2001); or *ND2.F* (5'-GCCCATACCCCGAAAATSTTG-3') and *ND2.R* (5'-TTAGGGTRGTTATTTGHGAYATKC-3') with an annealing temperature of 55ºC (Oliver *et al.* 2007). Nearest relatives and pairwise distance (P) values were estimated using published sequence data for other *Oedura* species (Oliver *et al.* 2012a, 2014) and uncorrected P distances between samples were estimated using MEGA v. 5.2.2 (Tamura *et al.* 2011). GenBank accession numbers for the new sequences are KM016836—KM016841.

Systematics

***Oedura murrumanu* sp. nov.**
Limestone Range Velvet Gecko
(Figs. 2–5, 6A)

Holotype. WAM R173368 (Field# PMO54), an adult male with original tail, Oscar Range, Western Australia (17.9166°S, 125.3024°E), collected by Paul Oliver, Paul Horner, and Susan Perkins on 28 October 2013.

Paratypes. WAM R173370 (Field# PMO56), NMV D76948 (PMO55) with same collection details as holotype; NMV D77002 (PMO51), NMV D76947 (PMO53), WAM R173369 (Field# PMO52) collected by Paul Oliver, Paul Horner, and Susan Perkins, Oscar Range (17.9125°S, 125.2827°E) on 28 October 2013.

Diagnosis. A large (SVL to 103 mm) species of *Oedura*, with a wide (HW/SVL 0.18–0.20) and relatively shallow head (HD/SVL 0.011), moderately long (TL/SVL 0.69–0.74) and slightly to moderately swollen tail (TW < HW), large eyes (EYE/SVL 0.067–0.069), rostral crease extending less than 20% height of rostral, digits with 3–7 paired sets of distal subdigital lamellae, of which the largest are expanded to form distinct lateral fringes, a weak postorbital stripe, light spots on dorsum and head typically > 3 scales wide, and 5 light bands on the tail (Figs. 2–6).

Description of the holotype. Adult male with the following dimensions (in mm): SVL 103.0, HW 19.1, HD 11.3, HL 25.4, EN 10.2, IN 4.1, IO 8.4, EYE 7.0, TrK 48.9, Crus 17.8, Tibia 19.4, TL 76.0, TW 8.3, TD 7.1, 3FW 3.0, 3TW 3.3.

A large (103 mm SVL) slender gecko (Fig. 2). Head robust and clearly wider than body (HW/SVL 0.19), distinct from neck, much wider than deep (HD/HW 0.59). Snout rounded in dorsal profile, truncate in lateral profile, longer than eye (EN/EYE 1.5); loreal region convex; interorbital region and top of snout slightly concave; canthus rostralis broadly rounded, weakly defined. Eyes very large (EYE/SVL 0.068), pupil vertical, supraciliaries extending from anteroventral edge to posterodorsal edge of eye, longest at the anterodorsal corner. Ear opening circular, bordered by an indistinct posterior skin fold. Rostral broadly rectangular with rounded edges, twice as wide as high, with medial suture extending less than 20% of distance from dorsal edge towards ventral edge, bordered dorsally by two nasals. Supranasals in series of 6 posterior to rostral, small and granular, distal pair distinctly larger than the 4 smaller medial scales. Nares bordered by first supralabial, rostral, 1 supranasal, 2 enlarged postnasals. Supralabials approximately equal in width and height, 17 on right and left, 12–13 to midpoint of eye. Head, temporal, and nuchal scales very small and granular; dorsal scales above eyes and on snout conspicuously larger. Enlarged infralabials 13 on right and left; anterior labials higher than wide, medial labials wider than high, posterior labials approximately as wide as high, all bordered by 3–4 rows of slightly enlarged scales grading to small granular gular scales. Mental divided, broadly rectangular with slightly concave distal edges, approximately 1.6 times longer than wide.

FIGURE 2. Dorsal and ventral veiw of preserved holotype of *Oedura murrumanu* **sp. nov.** Photographs—D. Paul, Museum Victoria.

Body slender and long (TrL/SVL 0.48), slightly dorsoventrally compressed. Ventrolateral folds prominent behind forelimbs, present but less prominent along remainder of trunk. Body scalation small and granular, mid-dorsal and ventral scales about twice the size of lateral scales. Femoral pores small and circular, positioned medially within pore-bearing scales, 10 on left, 8 on right, separated by 7 scales lacking pores.

Forelimbs long and slender (FA/SVL 0.17). Hindlimbs slightly longer and much more robust (CS/SVL 0.19). Digits long and well developed, all with expanded subdigital lamellae (Figs. 2, 3); distal lamellae paired and widened, forming a distinct lateral fringe along the distal edge of all digits; terminal lamellae prominently expanded and widely separated from penultimate lamellae; respective numbers of divided and undivided lamellae on right hand I:8,2 II:8,4 III:9,5 IV:10,6 V:10,4, left hand I:7,2 II:8,5 III:9,5 IV:10,5 V:8,4; right foot I:8,3, II:8,6, III:10,7, IV:10,7, V:9,6; left foot I:9,3, II:8,6, III:10,6, IV:11,8, V:11,6. Claws present on all digits, minute, not extending beyond terminal lamellae.

Tail original, narrower than body, slightly swollen, widest about 30 mm from base, slightly flattened, scalation homogeneous. Cloacal sacs swollen and moderately prominent with 1 (left) and 2 (right) enlarged rounded cloacal spurs at anterior edge.

Coloration. In preservative (Fig. 2), dominant coloration of dorsum dark purplish-brown, flecked with extensive subtle light cream spots, typically > 3 scales wide and often connected to other spots forming an irregular reticulum; dorsum marked with four relatively straight-edged and well defined light cream transverse bands containing numerous tiny brown maculations; of these bands, the single nuchal band is approximately half the width of others. Dorsum of head dark purplish-brown with extensive light blotching and vermiculations. Lateral surface of head with a continuous but indistinctly edged dark brown postorbital stripe, bordered ventrally by an unpigmented region. Loreal region dark brown, lips indistinctly barred. Limbs mottled with same dominant colors as torso, but with less brown and no distinct pattern, hindlimbs much darker than forelimbs, dorsal surface of digits with small amount of brown maculation. Ventral surfaces unpigmented, with the exception of dark brown barring and maculations on the infralabials. Tail with alternating dark brown (4) and dirty cream (5) bands, most bands with some flecking of the alternate color (either dark brown or cream), bands of varying width, distal light band by far the widest, more than twice the width of other bands. Venter of tail unpigmented.

Photographs of the holotype in life (Fig. 3) show that the overall color pattern is similar to that in preservative. The base coloration is purplish brown, the lighter regions of the trunk, head, and tail have a distinctly yellowish wash, and the light transverse bands on the tail are white. The iris is black with extensive silvery flecks.

Variation. Summary meristic data (in mm) for the adults in the type series (3 males, 1 female) are as follows (mean, with range in parentheses): SVL 100.1 (94.7–103); HW 18.6 (17.4–19.1); HD 11.0 (10.6–11.4); HL 24.5 (22.6–25.6); EN 9.4 (8.6–10.2); IN 3.9 (3.6–4.1); IO 8.4 (8.0–9.0); EYE 6.8 (6.5–7.0); Trk 44.5 (41.2–48.9); Crus 16.6 (15.5–17.8); Tibia 18.1 (17.2–19.4); TL (original) 71 (65–76); TL (regrown) 63 (58–67); TW 10.0 (8.3–12.3); TD 7.2 (6.4–7.8); 3FW 2.9 (2.7–3.1); 3TW 3.2 (3.0–3.4). Summary scalation data for these same four individuals is: SuL (midpoint of eye) 12.2 (11.0–13.0); SuL (rictus of jaw) 16.3 (15.0–17.0); InL 13.8 (12.0–15.0); InI 4.0 (4.0–4.0); RC 14% (5–20%); PP (males only) 15.7 (15.0–16.0); CS (males only) 1.5 (1.0–2.0); FL3 9.0 (9.0–9.0), TL3 9.8 (9.0–10.0). Individual measurements and scale counts for all types are presented in Table 1.

Most specimens have the same base coloration of dark purplish-brown with three broad light transverse bands on the the torso, and an additional narrower nuchal band (Fig. 4). However, the extent and density of light and dark mottling increases with size: the posterior torso of the largest specimen (NMV D76947) is heavily mottled and bands are less defined. The anterior light bands also sometimes contain an indistinct brown medial region, especially on paratype NMV D77002. On all specimens the venter is largely unpigmented, except for a small number of light brown maculations on the labial scales. All original tails have four dark brown bands and five light creamish bands, including a long distal band. Regrown tails are mottled with dark brown and light cream on the dorsal and lateral surfaces and unpigmented ventrally. Regrown tails also seem to be shorter and more swollen, although the sample size is small (N = 2).

The single juvenile and subadult specimens have the same basic pattern of alternating light and dark bands as the adults, but are much more neatly patterned, with high contrast between bands, no obvious mottling on the torso and tail, and less extensive mottling on the head and limbs (Fig. 5).

Comparisons with other species. *Oedura murrumanu* **sp. nov.** differs from all *Oedura* occuring outside Western Australia by having prominent lateral expansions of the digital lamallae. *Oedura murrumanu* **sp. nov.** can also be distinguished from *O. gracilis* (also occuring in the Kimberley) by its lateral expansion of the digital lamellae, and further differs in its higher number of paired lamellae on digits (6–7 *versus* 3–4 on toe 4), shorter tail (less than *versus* equal to or more than length of SVL), slightly swollen tail (*versus* tapering), and lower number of light transverse bands on the dorsum (4 *versus* 5 or more) and tail (5 *versus* 6 or more).

Two other species of *Oedura* occuring in Western Australia also have lateral expansions of the digital lamallae. *Oedura murrumanu* **sp. nov.** can be distingushed from *O. filicipoda* (north-west Kimberley) by its much narrower tail (less than width of body *versus* near to or wider than width of head), slightly longer tail (both regrown and original), higher number of light bands on the tail (5 *versus* 3) and typically much larger light spots on the head and often body (usually > 3 scales wide *versus* < 3 scales wide). *Oedura murrumanu* **sp. nov.** differs from populations of *Oedura marmorata* Gray in Western Australia (Pilbara and Carnarvon Region) in having a larger eye (EYE/SVL 0.067–0.069 *versus* 0.051–0.064), shorter rostral crease (< 20% *versus* > 20% of rostral height), wider and more clearly defined dorsal bands, and much more minute dorsal scales. Photographs of typical individuals of all three species of *Oedura* occuring in the Kimberley (*O. murrumanu* **sp. nov.**, *O. filicipoda* and *O. gracilis*) are shown in Fig. 6.

Etymology. 'Murru manu' ('u' pronouced as 'oo') is the word for gecko in the language of the Bunuba people of the south-west Kimberley. This new species is probably entirely restricted to the traditional lands of the Bunuba.

Distribution. All museum and sight records are from around the type locality (Fig. 1). Further survey work is required to determine if it occurs elsewhere in the Oscar Range, however, there are no obvious barriers between the type locality and large areas of similar limestone to the east, west and north.

Ecology. The type series of *O. murrumanu* **sp. nov.** was collected towards the start of the 'wet season' (late October) following a brief rain shower. Individuals were observed on horizontal rock platforms and associated with deep horizontal crevices among smooth, weathered limestone (Fig. 7). Several were observed drinking water that had pooled on the rocks. The single adult female paratype (WAM R176699) contains well-developed eggs (approximately 10 mm in diameter and shelled), suggesting that at least some egg-laying occurs early in the wet season. Other geckos recorded at the same time and place were *Gehyra* cf. *multiporosa*, *Heteronotia planiceps*, and *Nephrurus sheai*.

At the same locality in the late wet season (late February, 2013) several individuals were observed in inaccessible spots on limestone pillars, and one further individual was observed on lower rocks as it appeared to be stalking smaller *Gehyra* species (G. Gaikhorst, pers. comm.).

Molecular comparisons. The genetic analysis indicated the sister species of *O. murrumanu* **sp. nov.** is *O. filicipoda*. Mean pairwise *ND2* sequence divergence between these species is 16.1%. In contrast, pairwise divergences among the six samples of *O. murrumanu* **sp. nov.** are very low (less than 0.1%), providing strong support that *O. murrumanu* **sp. nov.** is a distinct taxon.

TABLE 1. Meristic and mensural data for the type series of *Oedura murrumanu* **sp. nov.**

	WAM R173368 holotype PMO54	NMV D77002 paratype PMO51	NMV D76947 paratype PMO53	WAM R173369 paratype PMO52	NMV D76948 paratype PMO55	WAM R173370 paratype PMO56
SEX	m	m	m	f	subadult	juvenile
SVL	102.5	100.0	103.0	94.7	85.7	72.9
HW	19.1	18.6	19.1	17.4	16.2	14.3
HD	11.3	10.6	11.4	10.6	9.4	7.9
HL	25.4	22.6	25.6	24.2	22.2	20.2
EN	10.2	9.6	9.2	8.6	8.3	7.2
IN	4.1	4.0	3.8	3.6	3.3	2.8
IO	8.4	9.0	8.2	8.0	7.9	6.8
EYE	7.0	6.8	6.9	6.5	6.3	6.2
Trk	48.9	41.2	46.6	41.4	38.8	31.5
Crus	17.8	16.5	16.6	15.5	15.0	12.5
Tibia	19.4	17.2	18.3	17.4	15.8	13.1
Tail	original	regrown	regrown	original	original	original
TL	76.0	67.0	58.7	65.0	62.8	52.9
TW	8.3	9.9	12.3	9.6	8.9	7.1
TD	7.1	6.4	7.8	7.4	6.6	5.1
3FW	3.0	2.8	3.1	2.7	2.7	2.2
3TW	3.2	3.3	3.4	3.0	2.8	2.4
SuL	13//17	12//17	13//16	12//15	11//16	12//16
InL	15	14	14	12	15	14
InI	4	4	4	4	3	4
RC	20%	20%	10%	5%	15%	5%
PP	16(7)	16(6)	15(6)	_	na	na
CS	2//1	2//1	2//1		1//1	1//1
FL3	9	9	9	9	9	9
TL3	9	10	10	10	11	10

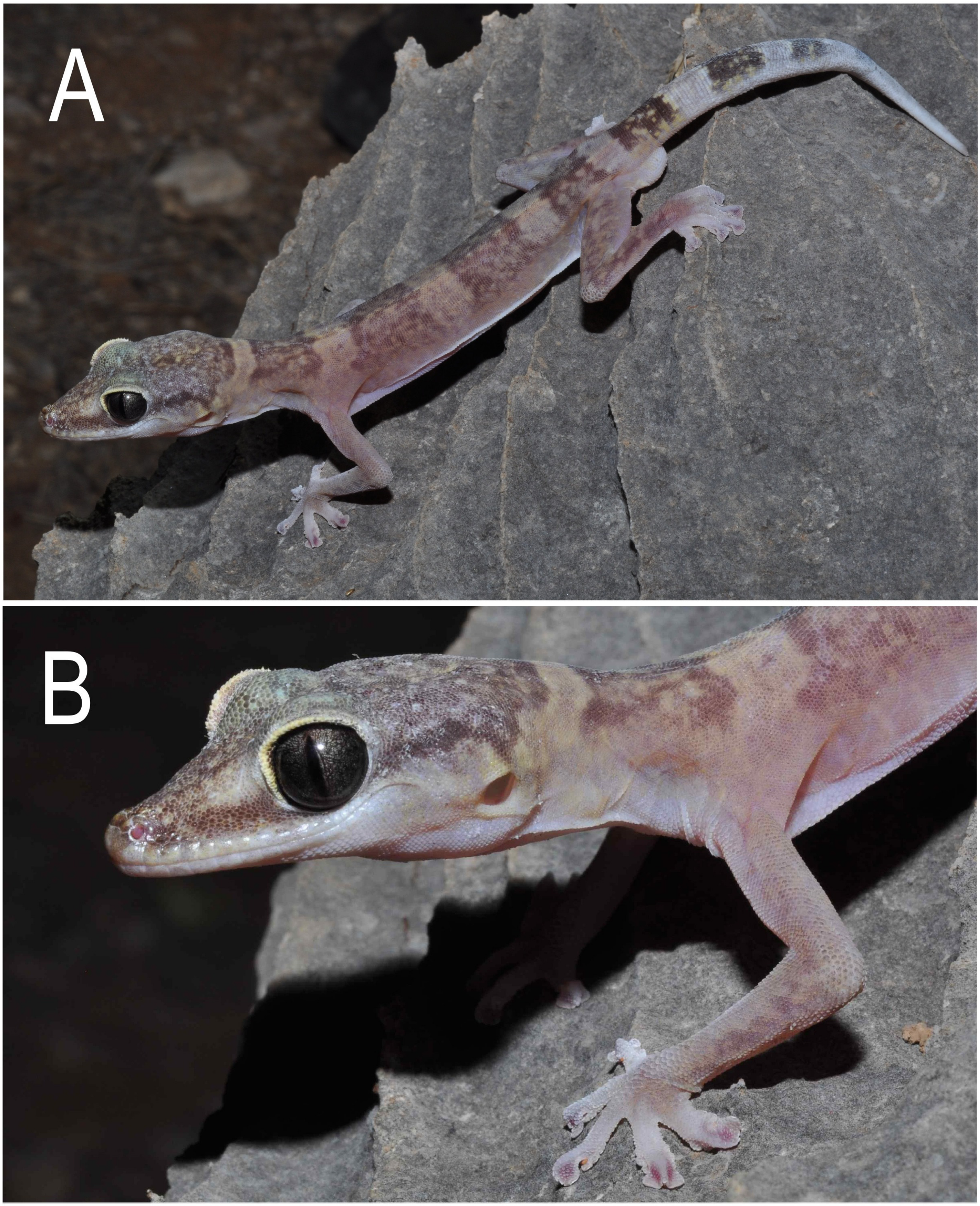

FIGURE 3. (A) Holotype of *Oedura murrumanu* **sp. nov.** (WAM R173368) in life, (B) close-up of head and fringed fingers. Photographs—P. Horner. Scale bar = 50 mm.

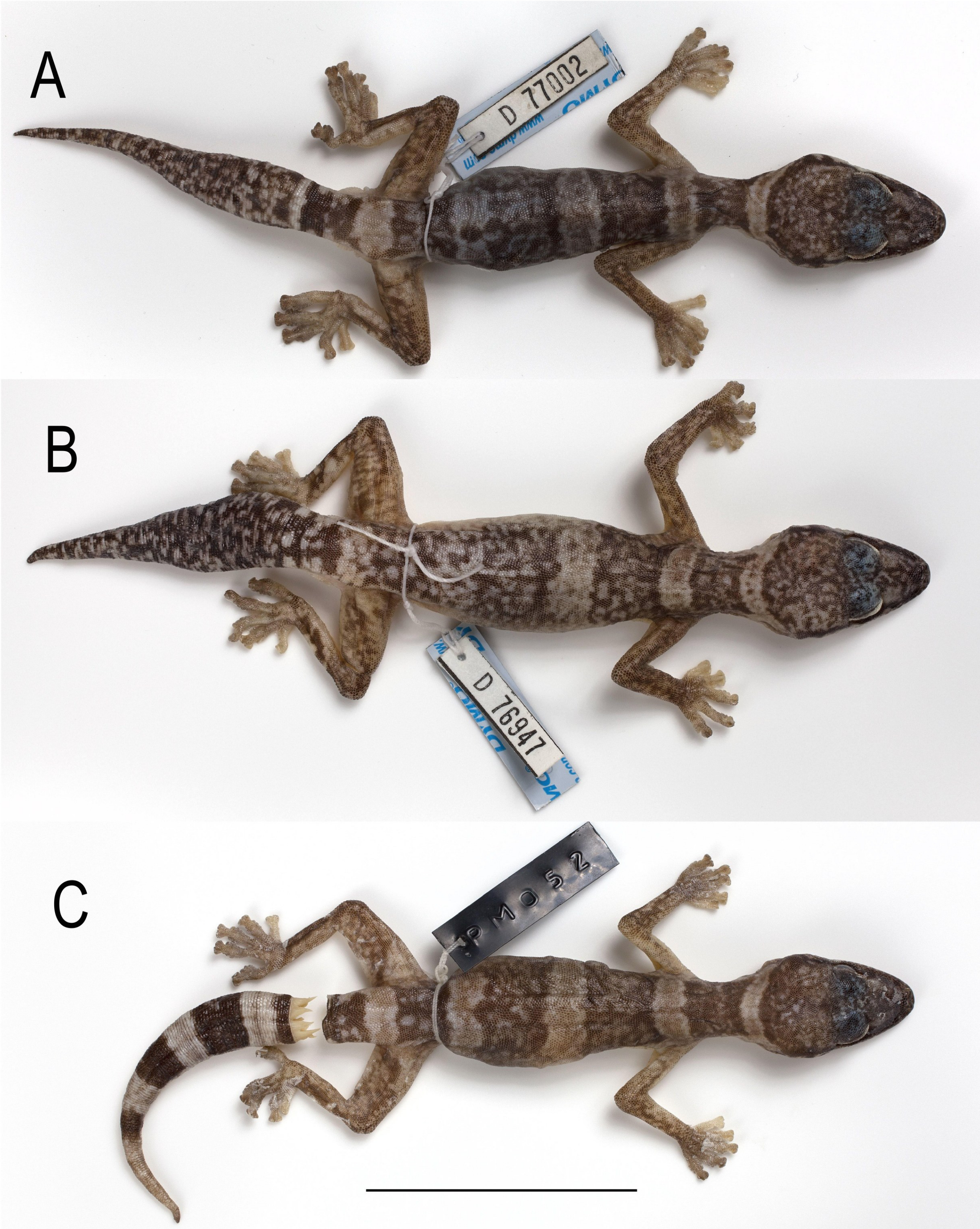

FIGURE 4. Dorsal view of adult paratypes of *Oedura murrumanu* **sp. nov.** showing variation in color pattern and original *versus* regrown tails. From top to bottom A) NMV D77002) NMV D76947, WAM R173369. Photographs—D. Paul, Museum Victoria.

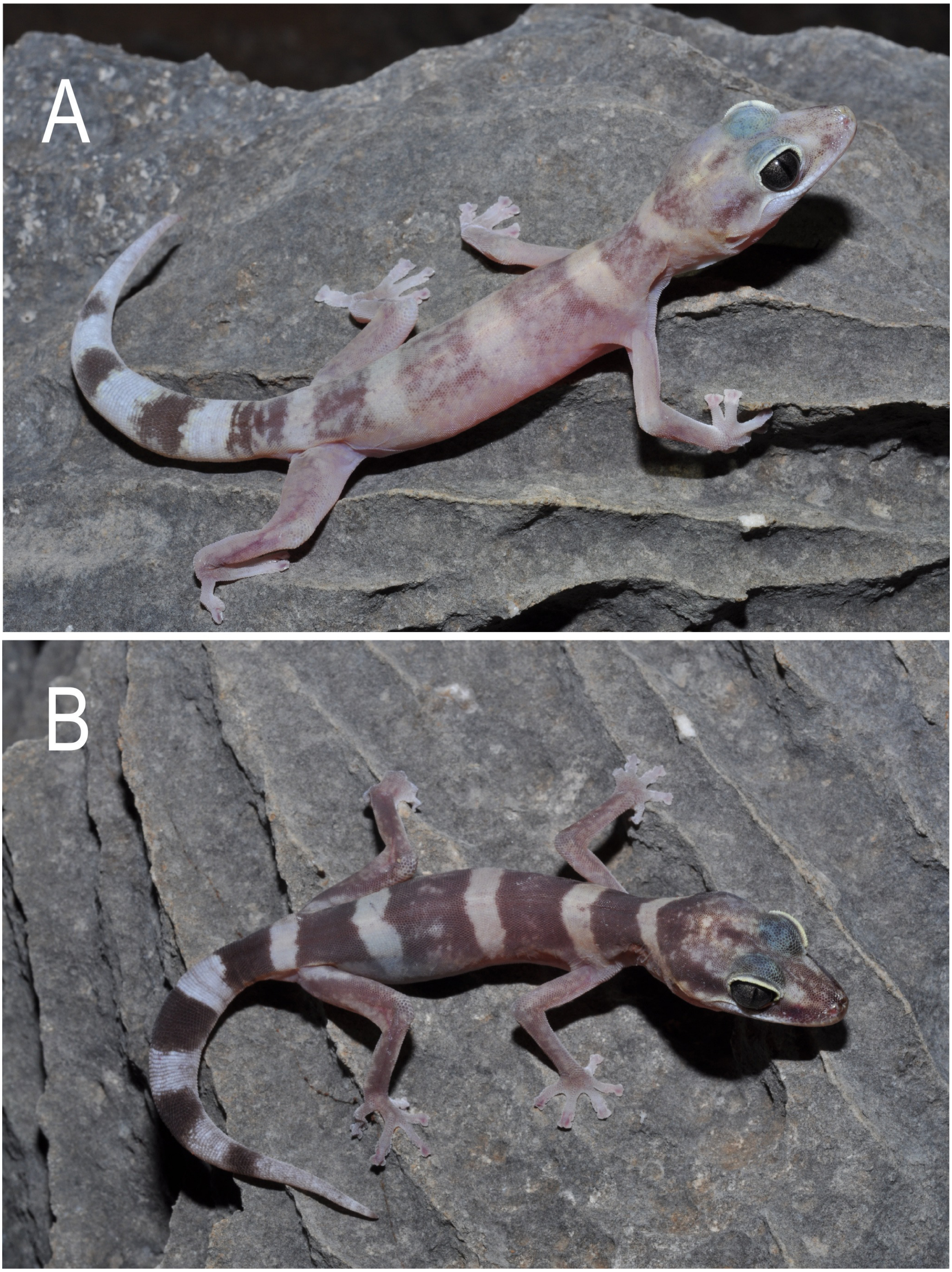

FIGURE 5. (A) *Oedura murrumanu* **sp. nov.** subadult NMV D76948 and (B) juvenile NMV D173370. Photographs—P. Horner.

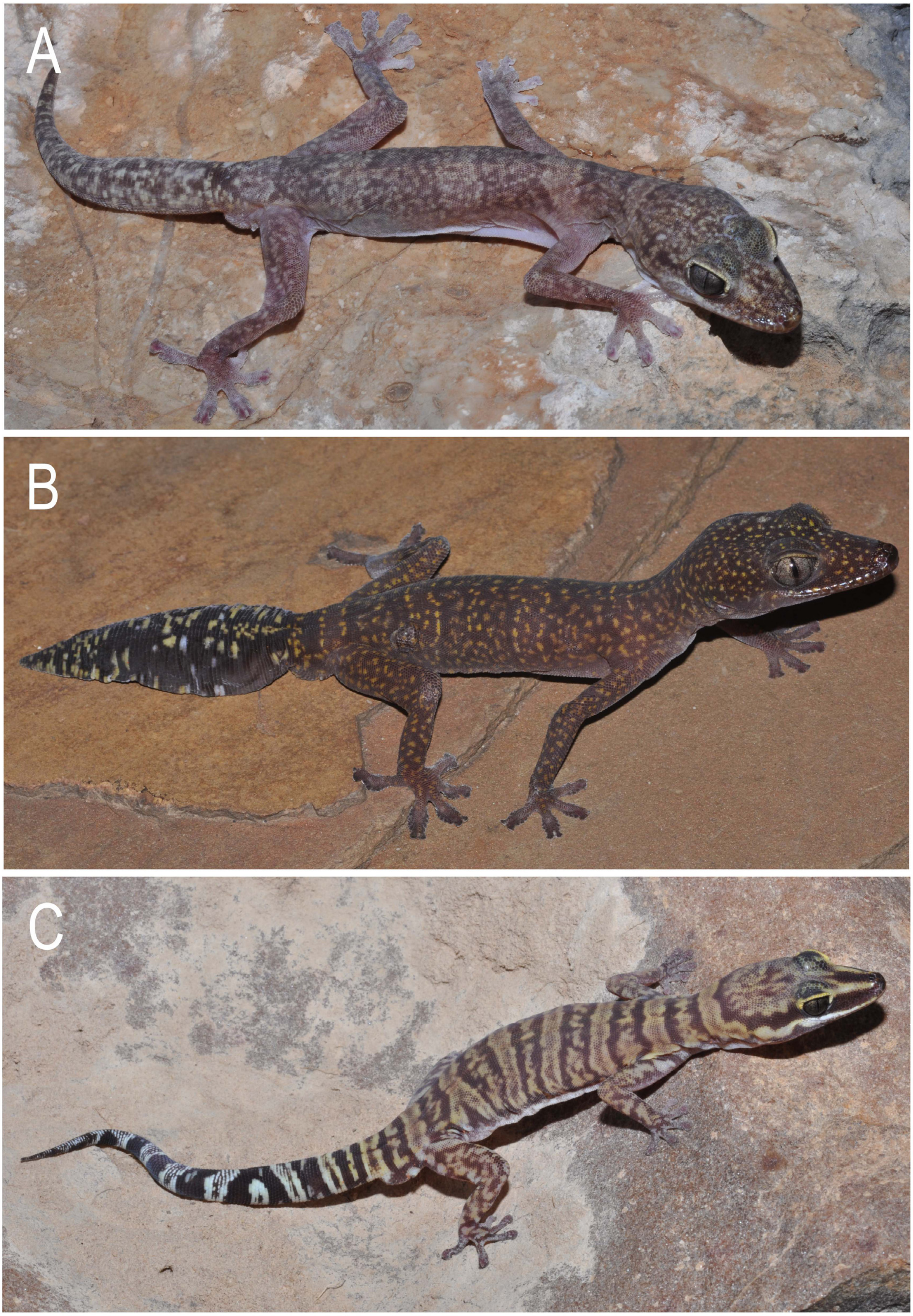

FIGURE 6. The three endemic *Oedura* of the Kimberley region: (A) *O. murrumanu* **sp. nov.** with regrown tail (specimen released), (B) *O. filicipoda* from the Artesian Range and (C) *O. gracilis* from the King Leopold Ranges. Photographs A and C—P. Horner, B—P. Oliver.

FIGURE 7. Deeply dissected limestone formations at type locality of *Oedura murrumanu* **sp. nov.** in the Oscar Range. Photograph—P. Oliver.

Discussion

Oedura murrumanu **sp. nov.** is a large and highly distinctive gecko species that occurs close to some of the most frequently visited parts of the Kimberley, yet it has remained undescribed until now. A number of factors may explain the paucity of records for this species. Its overall distribution may actually be very limited - known localities are in an area with a unique and restricted geology, and considerable searching in the surrounding areas did not reveal any further specimens (Oliver and Doughty, pers. obs.). Field observations also indicate that many reptiles (including *Oedura*) are less active in northern Australia during the dry season (pers. obs.). Owing to the lack of sealed roads, however, access to most of the Kimberley is limited during peak activity times in the wet season. Finally, when the resources required for fieldwork in the Kimberley are available (especially for wet season work), researchers have until recently tended to focus on the more diverse and topographically complex mesic regions of the north-west Kimberley (Miles & Burbidge 1975; Burbidge & McKenzie 1978; Doughty *et al.* 2012; Palmer *et al.* 2013).

Although the Kimberley is widely recognised as a centre of biological endemism (Cracraft 1991; Slatyer *et al.* 2007; Bowman *et al.* 2009; Powney *et al.* 2010), a sense of how complex and varied patterns of intraregional diversity in this area are only just beginning to develop (Oliver *et al.* 2012b, 2014; Potter *et al.* 2012; Catullo *et al.* 2014). Recent molecular work suggests that in addition to *O. murrumanu* **sp. nov.**, at least two other gecko lineages may be endemic to the Oscar Range and surrounding areas (*Crenadactylus* sp. A [Oliver *et al.* 2010]) and an isolated population of *Gehyra* cf. *occidentalis* [Laver *et al.*, unpublished data]). The disjunct allopatric distributions of *O. murrumanu* **sp. nov.** and its sister taxon *O. filicipoda* (from the relatively mesic north-west Kimberley) indicate that range attentuation and persistence have played a role in shaping their current distributions. There is also a diverse radiation of micro-endemic Camaenid snails distributed across the Napier and Oscar Ranges (Solem 1985; Cameron 1992). These data suggest that the limestone ranges fringing the Kimberley represent a significant area of localised persistence and endemism.

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APPENDIX 1. Comparative material examined.

Oedura filicipoda (n = 7). Western Australia. WAM R60685, WAM R83707–8 (holotype and paratypes)—Camp Creek, Mitchell Plateau (14.83°S, 125.83); WAM R86897—11 km SE Mount Daglish (16.38°S, 124.98°E); WAM R167805—Surveyor's Pool (14.67°S, 125.73°E); WAM R138874—4.1 km S Donkin's Hill (14.99°S, 125.51°E); WAM R171552—Prince Regent Nature Reserve (15.76°S, 125.26°E).

Oedura gracilis (n = 52). Western Australia. WAM R108641—10 km SE Warmun (17.12°S, 128.25°E); WAM R100186—2.5 km N Face Point, Carson Escarpment (14.84°S, 126.82°E); WAM R138891—4.1 km S Donkin's Hill (14.99°S, 125.51°E); WAM R138878—4.1 km S Donkin's Hill (15.00°S, 125.50°E); WAM R168565–6—Augustus Island (15.35°S, 124.53°E); WAM R171204—Augustus Island (15.39°S, 124.59°E); WAM R171205—Augustus Island (15.35°S, 124.53°E); WAM R168903–4—Bigge Island (14.60°S, 125.12°E); WAM R168564—Boongaree Island (15.10°S, 125.20°E); WAM R103127—Purnululu National Park (17.43°S, 128.40°E); WAM R166107–8—Doongan Station (15.38°S, 126.30°E); WAM R172903–4—Doongan Station (15.20°S, 125.90°E); WAM R172865–71—Ellenbrae Station (15.98°S, 127.05°E); WAM R164908–10—Kater's Island (14.46°S, 125.52°E); WAM R168739—Kater's Island (14.47°S, 125.53°E); WAM R171751—King Edward River (14.89°S, 126.20°E); WAM R114396—Koolan Island (16.15°S, 123.75°E); WAM R171670—Lachlan Island (16.62°S, 123.47°E); WAM R171671–3—Long Island (16.56°S, 123.36°E); WAM R106213—Manning Gorge (16.67°S, 125.95°E); WAM R151005—Mount Nyulasy (16.75°S, 128.29°E); WAM R171677—NW Molema Island (16.26°S, 123.82°E); WAM R156728—Oscar Range (17.64°S, 125.17°E); WAM R168057—Prince Regent River Nature Reserve (15.75°S, 125.37°E); WAM R152718—Purnululu National Park (17.39°S, 128.26°E); WAM R156724–5—Purnululu National Park (17.40°S, 128.41°E); WAM R168454, WAM R168463—Sir Graham Moore Island (13.88°S, 126.57°E); WAM R151963, WAM R151980—South West Osborn Island (14.35°S, 125.95°E; WAM R164863–4—South West Osborn Island (14.37°S, 125.94°E); WAM R171668–9, WAM R171675—Storr Island (15.95°S, 124.56°E); WAM R171674—Sunday Island (16.43°S, 123.18°E); WAM R172341—Theda Station (14.81°S, 126.51°E).

Oedura marmorata (n = 31). Western Australia. WAM R165150—1.5 km NNW Python Pool (21.32°S, 117.23°E); WAM R129595, WAM R129622—120 km NW Newman (22.92°S, 118.88°E); WAM R129635—120KM NW Newman (22.92°S, 119.02°E); WAM R52852—12 km E Tallering Peak (28.10°S, 115.75°E); WAM R84365–6—17 km NNE Anketell Homestead (27.90°S, 118.95°E); WAM R87544—30KM SSW Glenburgh homestead (24.68°S, 115.00°E); WAM R160074—32.5 km ESE Meentheena Outcamp (21.33°S, 120.75°E); WAM R146593–4—40 km SE Pouyouwuncubban (22.15°S, 119.02°E); WAM R160066—58 km ESE Meentheema Outcamp (21.32°S, 121.00°E); WAM R84004—6 km N Mount Magnet (28.03°S, 117.85°E); WAM R105965, WAM R106289—7 km N Mount Magnet (28.00°S, 117.88°E); WAM R132626—Burrup Peninsula (20.60°S, 116.81°E); WAM R119991—Hope Downs (23.01°S, 119.10); WAM R119993—Hope Downs (23.00°S, 119.12°E); WAM R135369, WAM R135445—Mt Brockman (22.31°S, 117.32°E); WAM R154783—Mt Brockman (23.31°S, 119.89°E); WAM R157504, WAM R157508, WAM R157516—Packsaddle Range (22.92°S, 118.89°E); WAM R132296—Ulongunna Rock (27.12°S, 117.23°E); WAM R119086—Virgin Springs, Carnarvon Range (25.10°S, 120.72°E); WAM R154796—Walga Rock (27.40°S, 117.47°E); WAM R154797—Walga Rock (27.40°S, 117.47°E); WAM R157595—West Angelas (23.19°S, 118.86°E); WAM R97012—Woolgerong Rock (27.40°S, 117.38°E); WAM R119837—Yandicoogina (22.72°S, 119.02°E).