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A new species of velvet gecko (Diplodactylidae: *Oedura*) from basalt habitat of inland north Queensland, Australia

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Abstract

Many *Oedura* geckos are saxicoline, and a number of these species are restricted to outcropping of a particular rock type. Most commonly this is sandstone, but some species primarily occur on other rock types, such as granite or limestone. There are few areas of extensive basalt outcropping in Australia, and these are typically of young age. Here I describe a new species of *Oedura* discovered in the Sturgeon Basalt outcropping of inland north-east Queensland, an extensive outcropping of deep age. *Oedura atra* **sp. nov.** is readily distinguished from congeners by its relatively dark colouration, with pattern restricted to narrow, pale bands, and other morphological features such as a short, broad tail, and a relatively wide head. It is genetically divergent from, but allied to, several *Oedura* species in inland north Queensland, with the ND4 mtDNA phylogeny suggesting closest relationship to *O. argentea* Hoskin, Zozaya & Vanderduys, 2018. *Oedura atra* **sp. nov.** appears to be restricted to basalt rocks and is only known from a localised area. However, it is likely to be more widely distributed along the extensive basalt outcropping in this region. *Oedura atra* **sp. nov.** best fits a conservation status of Data Deficient, pending further surveys and assessment of potential threats.

Key words: colour pattern, *Oedura argentea*, *Oedura atra* **sp. nov.**, saxicoline, Sturgeon Basalt

Introduction

Oedura Gray, 1842 geckos are endemic to Australia, occupying many woodland and rock habitats across eastern, central and northern Australia. Nineteen species are described, with over half of those species recognised in the last 20 years. These descriptions have come from field discoveries of morphologically obviously distinct species (e.g., *O. jowalbinna* Hoskin & Higgie, 2008; *O. murrumanu* Oliver, Laver, Melville & Doughty, 2014; *O. argentea*) or from detailed morphological and genetic assessment of species complexes (*O. marmorata* group—Oliver & Doughty 2016; *O. monilis* group—Hoskin 2019).

A number of *Oedura* species have localised distributions, associated with particular geological features. For example, *O. filicipoda* King, 1984 is restricted to sandstone of the Mitchell Plateau in the northern Kimberley region (north-west Australia), while the sister species *O. murrumanu* is restricted to limestone outcropping of the Oscar Range in the south-west of the Kimberley. In north-east Australia, *O. jowalbinna* is restricted to sandstone of the Laura region, *O. argentea* is restricted to sandstone of the Gregory Range, and *O. coggeri* Bustard, 1966 is distributed through inland north-east Queensland, primarily on granites. The restriction of these saxicoline species to certain rock types has not only resulted in localised and patchy distributions but has also driven adaptation in colour pattern. For example, the sandstone species *O. jowalbinna* and *O. argentea* are pale with yellowish markings and some degree of banding, while the granite-associated *O. coggeri* has a pattern of spots, blotches or mottling; in both cases providing camouflage on their typical backgrounds.

Here I describe a species discovered on black basalt rocks in the Sturgeon Basalt outcropping of the Hughenden area, inland north-east Queensland (Fig. 1). The species is highly distinct for colour-pattern and morphology, and is genetically divergent from its probable sister-species *O. argentea*. It offers an interesting addition to colour pattern adaptation to surface geology in saxicoline species of this genus.

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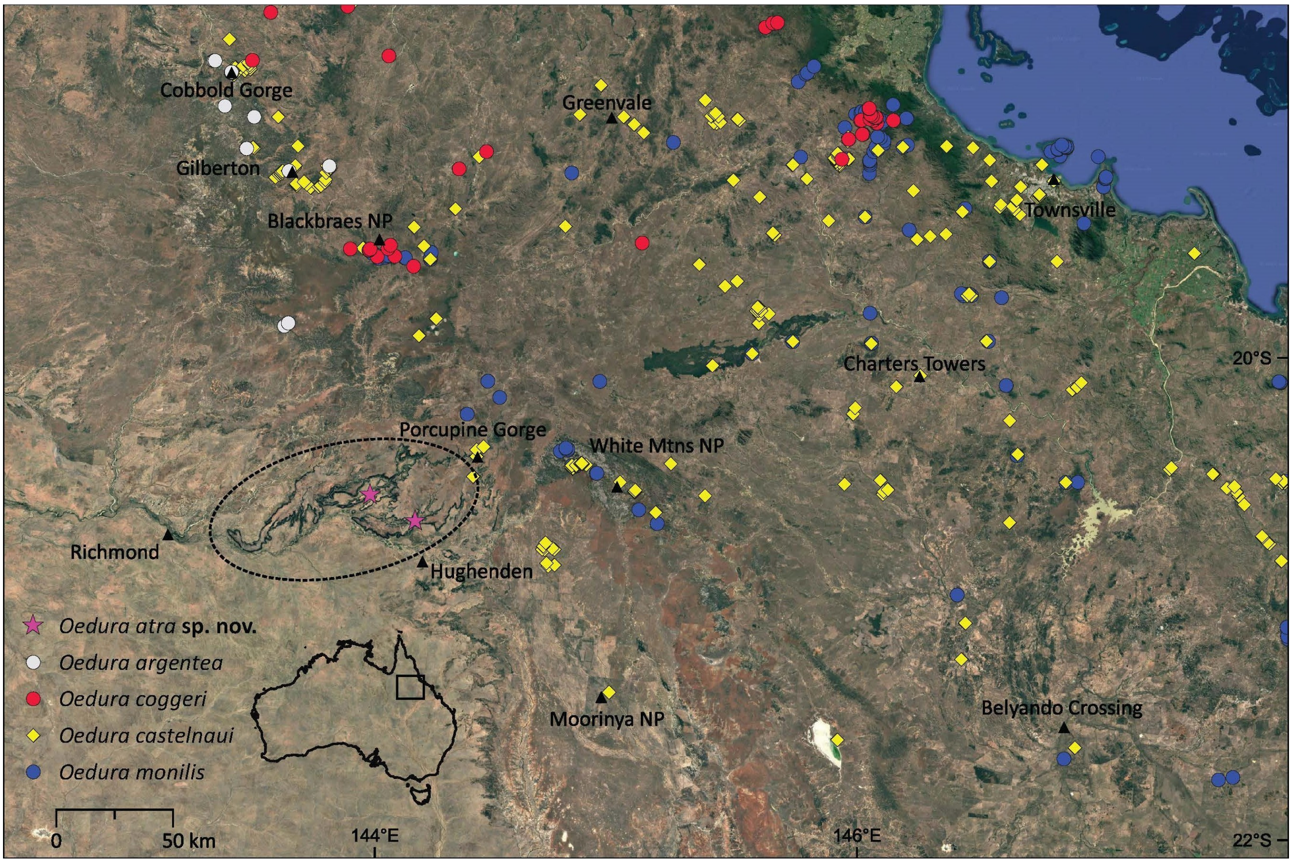

FIGURE 1. Map of inland north-east Queensland showing the known locality for *O. atra* **sp. nov.** (pink stars) and records of the four other *Oedura* species in the region. Note the fine black 'squiggle' lines of the Sturgeon basalt outcropping north and west of Hughenden (within the dashed ellipse). The east to west extent of this outcropping is about 100 km. Inset map shows Australia.

Methods

Morphology. Detailed morphometric measurements and scale counts were recorded on the four specimens in the type series. An additional 15 individuals were photographed in life to assess colour pattern. Nine of these individuals were measured for SVL in life, and the number of pre-cloacal pores was counted from photos of two adult males. Sub-adults and juveniles were designated based on size and colour pattern.

Morphometric measurements are: snout to vent length (SVL), tip of snout to anterior margin of cloaca with body straightened; interlimb length (AG), axilla to groin; forearm length (FL), palm to elbow (with wrist and elbow bent); lower hindlimb length (LHL), heel to knee (with ankle and knee bent at a 90° angle); neck length (NL), axilla to mid posterior margin of ear; head length (HL), mid anterior margin of ear to tip of snout; head width (HW), widest point across head (between eyes and ear openings); head depth (HD), maximum depth of head just posterior to the orbitals; snout length (SL), anterior margin of eye to tip of snout; eye diameter (ED), transverse length of eye; eye to naris (EN), from anterior corner of eye to posterior edge of naris; internarial distance (IN), the distance between the inner edge of the nares; tail length (TL), posterior margin of cloaca to tip of tail (preserved *Oedura* tails are easily dislodged during attempts to straighten for measurement, so TL was measured by bending thin wire along midline of tail and then straightening that for measurement); maximum tail width (TW); maximum tail depth (TD). Regrown tails were distinguished by looking for an abrupt change in colour pattern and scale characteristics along the length of the tail. Original tail refers to a full original tail and regrown tail refers to a fully (or apparently fully) regrown tail. Measurements of preserved specimens were taken using Mitutoyo electronic callipers to the nearest 0.1 mm. Field measurements of SVL were done by holding the gecko straight on a clear plastic ruler.

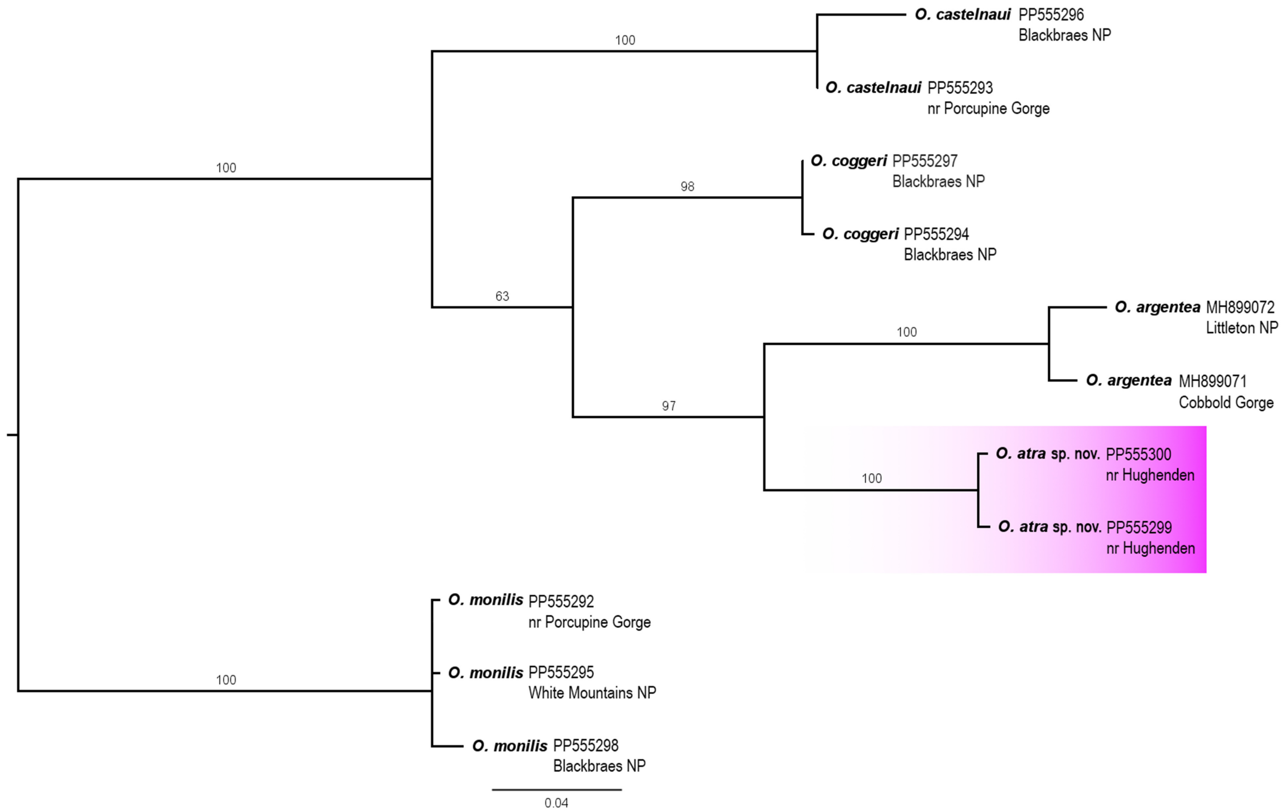

FIGURE 2. Maximum-likelihood phylogeny of *Oedura* species of inland north-east Queensland, based on approximately 850 bp ND4 mtDNA, with *O. monilis* used as the outgroup. The *O. atra* **sp. nov.** sequences are marked in pink. All sequences for other species come from as close to the distribution of *O. atra* **sp. nov.** as possible. GenBank accession code and locality are presented for all sequences. All localities are marked on Figure 1. The scale bar shows 4% uncorrected sequence divergence.

Scale counts are: interorbital scales, the number of scales across the top of the head between the mid-point of the orbits (count repeated four times and median value taken); supralabial and infralabial scale rows (starting at rostral and mental scales, respectively), count terminates posteriorly at the angle of the mouth where labials cease to be two times the size of the adjacent head scales; rostral crease as a percentage of rostral depth; the number of scales bordering the upper (posterior) margin of the rostral; the number of scales contacting the nostril; subdigital lamellae (on all toes and fingers) from tip of digit to end of enlarged lamellae row, count terminates proximally when lamellae cease to be two times the size of the adjacent scales; the number of enlarged cloacal spurs on each side; the number of pre-cloacal pores in males; the number of scales without pores (if any) that split the series of scales with pre-cloacal pores.

The morphological data was compared to that reported in recently published species descriptions and revisions of *Oedura*; specifically, Hoskin and Higgie (2008), Oliver & Doughty (2016), Hoskin *et al.* (2018), and Hoskin (2019).

Genetics. Two individuals of *O. atra* **sp. nov.** from the type series (QM J98083, QM J98084) were sequenced for an approximately 850 base pair (bp) section of the protein-coding mtDNA gene ND4, using the primers ND4 and tLeu2 (O'Connor & Moritz 2003), and an annealing temperature of 48°C. Additionally, individuals of the following species were sequenced from as close as possible to the distribution of *O. atra* **sp. nov.**: *O. castelnaui* (Thominot, 1889) (Blackbraes National Park [NP] -19.53652°, 144.20402°; Kennedy Development Road, turnoff to Porcupine Gorge -20.40908°, 144.42238°), *O. coggeri* (Blackbraes NP -19.54768°, 143.89862°), and *O. monilis* De Vis, 1888 (White Mountains NP -20.68695°, 145.17165°; Porcupine Creek -20.09652°, 144.46920°; Blackbraes NP -19.57795°, 144.08330°). Two sequences of *O. argentea* were downloaded from GenBank (Cobbold Gorge -18.81563°, 143.40706°; Littleton NP -18.21415°, 142.71477°). GenBank accession numbers and localities for all individuals are included on Figure 2, and all localities are displayed on Figure 1. The eleven sequences were imported into Geneious Prime 2023.0.1 (https://www.geneious.com) and aligned using the Clustal Omega alignment method, with default values. The resulting alignment was inspected by eye for any obvious alignment errors and verified by translating the ND4 coding region into amino acids. RAxML v. 8.2.12 (Stamatakis 2014) was then used to generate a phylogeny, using the GTRGAMMA model (i.e., General Time Reversible Model, with optimisation of substitution rate and GAMMA model of rate heterogeneity). A rapid Bootstrap analysis was run in RAxML, followed by a 'thorough search' for the best-scoring maximum-likelihood tree, using 100 bootstrap replicates. The unrooted RAxML_bipartitions file was then imported into the program Figtree v. 1.4.4 (Rambaut 2018) and an *O. monilis* sequence was selected as the outgroup.

Systematics

Oedura atra **sp. nov.** is assigned to *Oedura* based on a combination of external morphological characters outlined in Oliver *et al.* (2012): a genus of the Diplodactylidae distinguished from all related genera by the possession of enlarged juxtaposed dorsal scales approximately the same size as the ventrals (*versus* much smaller in related genera), and from other taxa formerly placed in *Oedura* (*Amalosia*, *Hesperoedura*; Oliver *et al.* 2012) by the combination of large size (SVL > 60 mm), possession of one or more cloacal spurs, and a dorsal pattern generally including a weak to bold series of transverse bands or disjunct blotches with no evidence of a vertebral stripe.

Oedura atra sp. nov.

Basalt Velvet Gecko
(Figs. 3–5A)

Material examined. Holotype. QM J98083, female, Sturgeon Basalt, north of Hughenden, (-20.67680°, 144.16797°), collected by C. J. Hoskin, 1 October 2022, field collection code conx6580.

Paratypes. QM J98082 (female), J98084 (male), J98085 (male), collection details as for holotype, field collection codes conx6579, conx6581, conx6582, respectively.

Diagnosis. *Oedura atra* **sp. nov.** is a medium-sized *Oedura* with a body pattern of narrow, pale bands on a dark background; a tail that is relatively short (original TL/SVL 0.55–0.58; regrown TL/SVL 0.46–0.47) and wide (original TW/TL 0.24–0.30; regrown TW/TL 0.34–0.35); a relatively wide head (HW/SVL 0.20–0.21); a pale nuchal band that is narrowly continuous with the pale line along the mouth to the snout; a single cloacal spur on each side; a dark brown/copper iris; and a rostral scale only partially divided by a medial vertical groove.

Etymology. From the Latin adjective *atra*, meaning black or dark, in reference to the dark colouration of this species. The name is used here as an adjective.

Measurements and scale counts of type series. Table 1.

TABLE 1. Morphological measurements, proportions, and scale counts for the type specimens of *O. atra* **sp. nov.** All measurements are in mm. *SVL average and range includes an additional six adults measured in the field. **Male pore number and pore gap include an additional two males assessed in the field.

	J98082 Paratype Female	**J98083** Holotype Female	**J98084** Paratype Male	**J98085** Paratype Male	Average (range)
Measurements					
SVL	84.30	82.65	79.89	76.90	80.67 (72.0–90.0)*
Interlimb length (AG)	40.48	40.12	38.14	34.80	38.39 (34.80–40.48)
Forearm length (FL)	11.47	10.64	10.90	11.26	11.07 (10.64–11.47)
Lower hindlimb (LHL)	12.05	13.02	12.44	12.15	12.42 (12.05–13.02)
Neck length (NL)	15.33	16.53	15.43	16.41	15.93 (15.33–16.53)
Head length (HL)	20.48	20.67	19.34	18.16	19.66 (18.16–20.67)

.....*continued on the next page*

TABLE 1. (Continued)

	J98082 Paratype Female	**J98083** Holotype Female	**J98084** Paratype Male	**J98085** Paratype Male	Average (range)
Head width (HW)	17.26	17.35	16.20	15.15	16.49 (15.15–17.35)
Head depth (HD)	8.76	9.10	8.25	7.80	8.48 (7.80–9.10)
Snout length (SL)	9.06	9.19	8.53	8.30	8.77 (8.30–9.19)
Eye diameter (ED)	3.94	4.18	4.40	3.59	4.03 (3.59–4.40)
Eye to naris (EN)	7.02	6.93	7.15	6.15	6.81 (6.15–7.15)
Internare (IN)	3.29	3.23	3.48	3.24	3.31 (3.23–3.48)
Select proportions					
AG/SVL	0.48	0.49	0.48	0.45	0.47 (0.45–0.49)
FL/SVL	0.14	0.13	0.14	0.15	0.14 (0.13–0.15)
LHL/SVL	0.14	0.16	0.16	0.16	0.15 (0.14–0.16)
HL/SVL	0.24	0.25	0.24	0.24	0.24 (0.24–0.25)
HW/SVL	0.20	0.21	0.20	0.20	0.20 (0.20–0.21)
HD/SVL	0.10	0.11	0.10	0.10	0.10 (0.10–0.11)
SL/SVL	0.11	0.11	0.11	0.11	0.11 (0.11–0.11)
Original Tail					
Tail Length (TL)		45.20	46.05		45.63 (45.20–46.05)
Tail Width (TW)		13.36	11.25		12.31 (11.25–13.36)
Tail Depth (TD)		8.62	7.15		7.89 (7.15–8.62)
TL/SVL		0.55	0.58		0.56 (0.55–0.58)
TW/SVL		0.16	0.14		0.15 (0.14–0.16)
TD/SVL		0.10	0.09		0.10 (0.09–0.10)
TW/TL		0.30	0.24		0.27 (0.24–0.30)
TD/TL		0.19	0.16		0.17 (0.16–0.19)
Regrown Tail					
Tail Length (TL)	39.86			35.59	37.73 (35.59–39.86)
Tail Width (TW)	13.80			12.13	12.97 (12.13–13.80)
Tail Depth (TD)	9.90			8.22	9.06 (8.22–9.90)
TL/SVL	0.47			0.46	0.47 (0.46–0.47)
TW/SVL	0.16			0.16	0.16 (0.16–0.16)
TD/SVL	0.12			0.11	0.11 (0.11–0.12)
TW/TL	0.35			0.34	0.34 (0.34–0.35)
TD/TL	0.25			0.23	0.24 (0.23–0.25)
Scale counts					
Interorbitals	18	20	20	19	18.75 (18–20)
Rostral crease %	40	50	50	50	47.5 (40–50)
Supralabials	10	12	11	10	10.75 (10–12)
Infralabials	10	10	9	9	9.5 (9–10)
3rd finger lamellae	7	7	7	7	7 (7–7)
4th toe lamellae	9	8	8	8	8.25 (8–9)
Postcloacal tubercles	1	1	1	1	1 (1–1)
Male pores			14	11	14 (11–16)**
Pore gap			3	4	3.5 (3–4)**

FIGURE 3. Dorsal view of the holotype (far left) and the three paratypes of *O. atra* **sp. nov.** Specimens from left to right: QM J98083, QM J98084, QM J98082, QM J98085.

Description of type series. Medium-sized (SVL 76.90–84.30 mm, mean 80.94 mm). ***Head.*** Distinct from neck and relatively broad (HW/SVL = 0.20–0.21), moderately depressed (HD/SVL = 0.10–0.11), and covered in small granular scales that are largest on the dorsal and lateral surfaces of the snout; interorbital counts 18–20; rostral scale approximately twice as wide as deep, divided 40–50% vertically by a medial groove; rostral contacting nostril, bordered by 2–3 (mean 2.25) scales along its dorsal edge, and bordered laterally on each side by the first supralabial scales; 6 scales contacting nostril; supralabials 10–12 (10.75); second supralabial wider and taller than first; infralabials 9–10 (9.5); mental scale contacts first infralabials and a single granular throat scale that is three or four times larger than the subsequent granular throat scales; other scales contacting infralabials about twice the size of granular throat scales and grading quickly into these in one or two rows; granular scales on throat minute and even-sized; ear opening small, and rounded to vertically elongate. ***Body.*** Moderately robust (AG/SVL 0.45–0.49), slightly depressed, covered in small granular scales; scales on ventral surface slightly larger than those on dorsum; scales on lateral and dorsolateral surfaces arranged in transverse rows; 1 low, blunt, post-cloacal tubercle behind the lower posterior margin of the thigh in both sexes, typically more well-defined and broader in males; pre-cloacal pore counts on the two males 14 and 11, divided medially by 3 and 4 granular scales without pores, respectively; pre-cloacal pores not evident in females. ***Limbs.*** Moderately long (FL/SVL = 0.13–0.15; LHL/SVL = 0.14–0.16); pentadactyl; digits dorsoventrally compressed and expanded distally, each with an enlarged pair of apical lamellae followed by a transverse series of lamellae that are single proximally and divided distally; apical pair of lamellae discontinuous with other lamellae; hindlimb with 6–7 (6.25) enlarged lamellae (including apical pair) on 1st toe, 7–8 (7.5) on 2nd toe, 8 on 3rd toe, 8–9 (8.25) on 4th toe (with proximal 3 or 4 lamellae single and distal 5 lamellae split/paired), and 8 on 5th toe; forelimb with 7 enlarged lamellae (including apical pair) on 3rd finger (with proximal 3 lamellae single and distal 4 lamellae split/paired). ***Original tail.*** Moderately short (original TL/SVL = 0.55–0.58) and broad (original TW/TL = 0.24–0.30), and slightly depressed (original TD/TL = 0.16–0.19); rectangular scales arranged in a block-like pattern of concentric rings; scales similar size on dorsal and ventral surfaces, and about twice the size of those on body. ***Regrown tail.*** Short (regrown TL/SVL = 0.46–0.47), bulbous (regrown TW/TL =

0.34–0.35), and moderately depressed (regrown TD/TL = 0.23–0.25); scales as for original tail. ***Colouration in spirit*** (Fig. 3). Dorsal pattern consists of five, transverse, white bands from nape band to band over hips. These white bands are generally unbroken, except QM J98084 which has a narrow, medial break in bands one to four, and QM J98083 which has a break in band four. White bands about one-quarter or less of the width of the dark space in between. Bands essentially straight (transverse), with a slight U-shape to some (including the nape band in all specimens). White bands extend down the lateral surfaces and terminate at the edge of the ventral surface, where narrow black edging encloses each band. Each white band is bordered on its anterior and posterior edge by a diffuse black marking ('band') of similar width, which has a sharp edge with the white band but merges into the dark spaces in between. Background colour between bands is heavy dark brown mottling on a light brown background. White bands continue onto original tail (QM J98082 and QM J98084) as five white bands of similar width to body bands, but tail banding less distinct because the dark areas in between the bands are also marked with white, transverse dashes and spots. Regrown tails (QM J98083 and QM J98085) black with transverse white or cream dashing. White nuchal band more of less connects over ear opening to white band along supralabials, but narrow and often broken behind ear opening/edge of nape and corner of gape. Sides and top of head otherwise uniformly dark grey/brownish with diffuse darker marking around the edge. Darker along canthal area to snout. Forelimbs dark greyish brown with diffuse dark brown mottling. Hindlimbs dark greyish brown with diffuse paler mottling to give the appearance of indistinct paler spots (e.g., QM J98082). Ventral surfaces of throat, neck, body and limbs evenly cream-coloured, with a grey tinge on underside of limbs. Underside of original tails white down the center, with pattern from lateral tail surfaces extending under on the edges. Underside of regrown tails dark grey, similar to dorsal and lateral surfaces but paler and without white dashes. Cloacal spurs white.

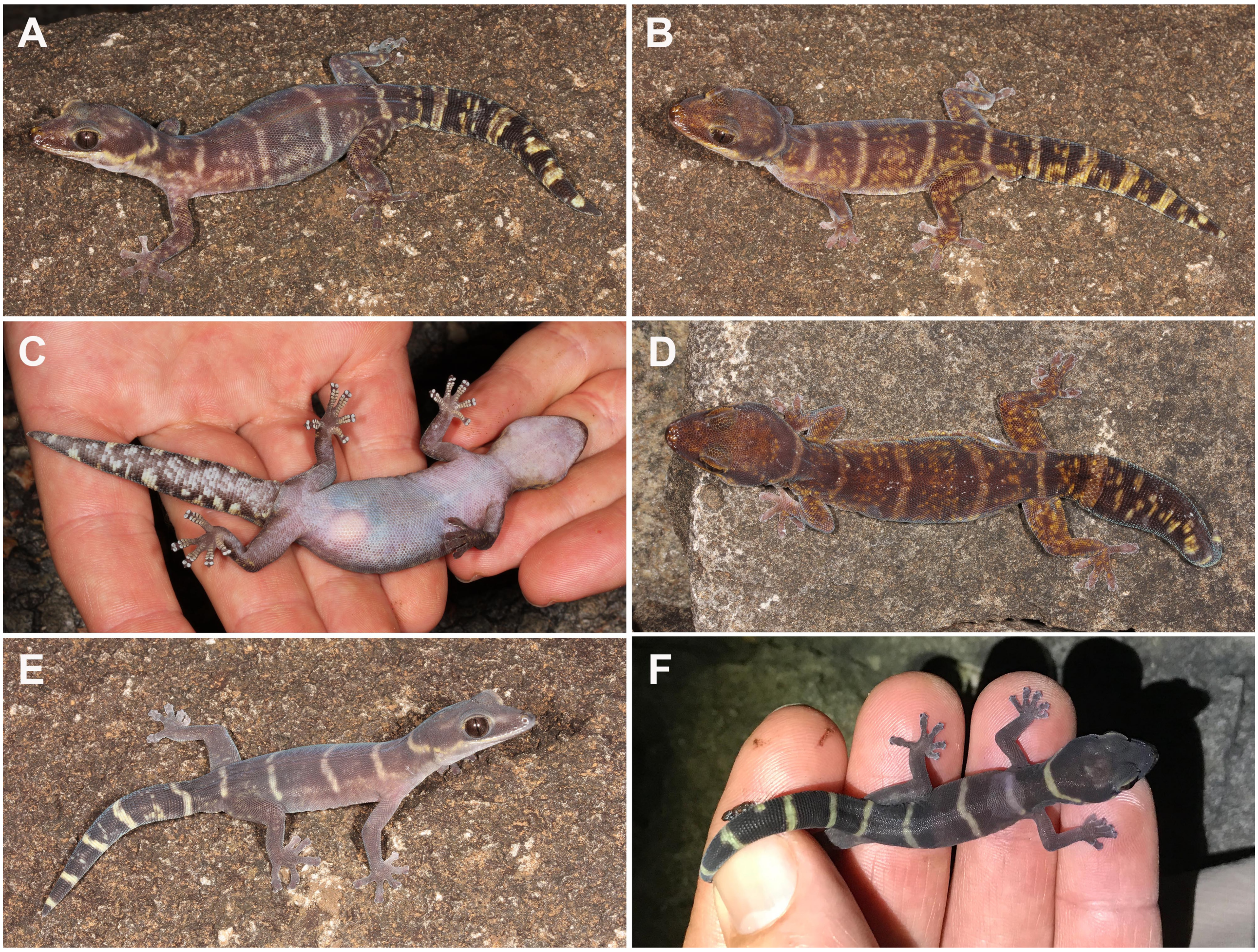

FIGURE 4. *Oedura atra* **sp. nov.** in life: (A, B) adults with original tails, (C) ventral surface of adult with an original tail (note egg visible through ventral surface), (D) adult with regrown tail, (E) subadult with original tail (note skin about to shed), (F) juvenile with original tail. Panel D shows QM J98082 in life; the other individuals were photographed in the wild and not collected.

FIGURE 5. Comparison of *O. atra* **sp. nov.** (A) with nearby *Oedura* species with body pattern of bands or elongate blotches: *O. argentea* (B), *O. monilis* (C), *O. castelnaui* (D). Photos: Scott Macor (A), Stephen Zozaya (C), Conrad Hoskin (B, D).

Colouration in life (Figs 4, 5A). As described above, but colour pattern more pronounced—pale body bands whiter, dark areas in between darker (and with a purplish tinge), background colour more yellowish, and bands and other pale markings on tail more yellowish. Some adults are very dark (e.g., Fig. 5A), while other adults have darker markings more limited to the edges of the pale bands and tail, with more pale/yellow background colouration (e.g., Fig. 4B). Subadults (e.g., Fig. 4E) and juveniles (e.g., Fig. 4F) have a simple pattern of thin, white or cream bands on the body and tail, on an evenly dark grey or black background. Iris dark brown coloured with fine copper or silver markings throughout.

Additional morphological data. SVL of six adults measured in the field was 72–90 mm (av. 80.5 mm), consisting of five males measuring 72–81 mm (av. 79 mm) and a female measuring 90 mm. A sub-adult (Fig. 5E) was 59 mm, and a juvenile (Fig. 5F) was 39 mm. The number of pre-cloacal pores on two adult males was 15 and 16, and the pore gap was 3 and 4 scales, respectively.

Genetic data. ND4 mtDNA sequences for two individuals in the type series (QM J98083 = PP555299, QM J98084 = PP555300) are uploaded to GenBank. A phylogeny including congeners that are morphologically most similar, and samples from close to the distribution of *O. atra* **sp. nov.**, places *O. atra* **sp. nov.** as a divergent lineage allied to *O. argentea* in the broader '*O. coggeri*' species group (Fig. 2). Uncorrected ND4 sequence divergence between *O. atra* **sp. nov.** and *O. argentea* averages 11.6%, and divergence between *O. atra* **sp. nov.** and *O. coggeri*, *O. castelnaui* and *O. monilis* averages 12.7%, 15.8% and 18.5%, respectively. The ND4 phylogeny provides a preliminary assessment of relationships, and more thorough genetic analysis involving more genes, more species, and more localities within species is required to better test the phylogenetic placement of *O. atra* **sp. nov.**

Comparison with other species. *Oedura atra* **sp. nov.** is readily distinguished from all other *Oedura* species by the combination of having a single post-cloacal tubercle on each side and body pattern of slender, pale, transverse bands on a dark background, with the transverse bands being much narrower than the width of the darker area between them (Figs 4A, 5). *Oedura atra* **sp. nov.** is most similar to the other *Oedura* species in inland northeastern Queensland with patterns consisting of transverse bands or bars—*O. argentea*, *O. castelnaui* and *O. monilis* (Fig. 5). It is not known to co-occur with any of these species (Fig. 1), but further surveys may find species in close proximity. *Oedura atra* **sp. nov.** is distinguished from *O. argentea* (Fig. 5B) by narrow bands on body (*versus* broad), dark iris (*versus* silver), original and regrown tails relatively short (original TL/SVL 0.55–0.58 *versus* 0.64–0.77; regrown TL/SVL 0.46–0.47 *versus* 0.51–0.66) and wide (original TW/TL 0.24–0.30 *versus* 0.13–0.18; regrown TW/TL 0.34–0.35 *versus* 0.18–0.24), and lower number of pre-cloacal pores in adult males (11–16 *versus*14–20). *Oedura* *atra* **sp. nov.** is readily distinguished from *O. castelnaui* (Fig. 5D) by narrow, straight bands on body (*versus* broad, backward-sweeping bands), and wider head (HW/SVL 0.20–0.21 *versus* 0.16–0.19). *Oedura atra* **sp. nov.** is readily distinguished from *O. monilis* (Fig. 5C) by body pattern of narrow bands (*versus* blotches and/or transverse bars, and at least some pale lateral spots), and by connection (albeit narrow) of nuchal band to white band along mouth (*versus* no connection between nape bar/blotches and pale band along mouth in *O. monilis*). *Oedura coggeri* also occurs in the same general region as *O. atra* **sp. nov.** (although they are very unlikely to co-occur) and *O. atra* **sp. nov.** is readily distinguished from that species by bands on body (*versus* spots, blotches or broken bars in *O. coggeri*), no spotting on the legs (*versus* limbs spotted), and larger size (max. SVL 90 mm *versus* 81 mm). *Oedura atra* **sp. nov.** differs from *O. cincta* De Vis, 1888 (which occurs to the south-west of the area shown in Figure 1) by body pattern of narrow pale bands (*versus* typically, broad bands), having only a single post-cloacal tubercle on each side (*versus* up to 4), and by its partially divided rostral scale (*versus* usually fully divided).

FIGURE 6. Habitat of *O. atra* **sp. nov.** north of Hughenden. *Oedura atra* **sp. nov.** appears to be restricted to the piled basalt rocks and has not been found in the surrounding woodland.

Distribution. Currently known from two areas of basalt rock scree slopes north of Hughenden (Figs 1, 6). The two areas are 23 km straight-line apart. The scree slopes are part of the extensive Sturgeon Basalt outcropping that extends from north of Hughenden approximately 100 km west to near Richmond (Fig. 1). Further surveys are likely to find *O. atra* **sp. nov.** at other sites in this extensive basalt outcropping.

Habitat and natural history notes. *Oedura atra* **sp. nov.** is known from exposed, piled, black basalt rocks. At the two known sites, the basalt outcropping is about 150 m wide, forming the slopes of an extensive linear plateau/outcropping. The habitat is primarily bare rocks (e.g., Fig. 6), with some vegetation growing among the rocks. *Oedura atra* **sp. nov.** has only been found on basalt rocks, or on the trunks of small trees growing among the rocks, in areas of deeply piled rock. It is active at night and retreats into deep crevices and holes in the rocks when disturbed. Surveys in woodland around the known sites have not found this species. There is little information on breeding biology. Surveys in both October and February found females with two well-developed eggs visible through the body wall, and both surveys found juveniles (< 40 mm SVL; e.g., Fig. 4F). Data so far suggests females may be larger than males, with the SVL of three adult females (83 mm, 84 mm, 90 mm) being greater than all seven adult males measured (av. 78.5 mm, 72–81 mm). 7 of 12 adults assessed (58%) had original tails. Other gecko species co-occurring on the basalt rocks were *Gehyra dubia* (Macleay, 1877), *Heteronotia binoei* (Gray, 1845), and *Nephrurus asper* Günther, 1876.

Conservation. *Oedura atra* **sp. nov.** is only known from a small area but it is highly likely to have a larger distribution. The Sturgeon Basalt outcropping is narrow, ranging from about 50 m to 400 m wide (and averaging about 100 m wide) along its length, but it has a convoluted linear extent of at least 800 km. Surveys to date have found the species in areas of more deeply layered basalt rocks and not in areas where the rock is primarily just a surface layer. This suggests the distribution will be patchy, and may comprise many isolated or sem-isolated populations. Further surveys are required to determine how widespread *O. atra* **sp. nov.** is along the Sturgeon Basalt outcropping, and to assess potential threats. Until then, the species should be considered Data Deficient under IUCN Red List criteria.

Discussion

The description of *O. atra* **sp. nov.** brings the number of *Oedura* species to 20. Inland north-east Queensland is a hotspot of diversity, with 5 species (Fig. 1). Of note is that three rock-dwelling species occur in fairly close proximity north of Hughenden. Interestingly, but not unsurprisingly, these three species have colour patterns that match the dominant rock type on which they occur—*O. atra* **sp. nov.** occurs on dark basalt and has pale markings much reduced on a dark background, *O. argentea* occurs on pale sandstones and has extensive pale markings on pale background colours (Fig. 5B), and *O. coggeri* occurs primarily on granites and has matching spotted, mottled or blotched markings (Hoskin 2019). This offers an example of obvious differences in colour pattern of nearby congeners driven by geology. *Oedura atra* **sp. nov.** and *O. argentea* appear to be sister-species (based on the mtDNA herein) and it would be interesting to survey the northern extent of the Sturgeon Basalt outcropping, where it abuts sandstone outcropping, to see if the two species can be found in close proximity.

The Sturgeon Basalt outcropping is the result of eruption of Mt Sturgeon about 4.5 million years ago (Cook & Rozefelds 2015). The lava flowed down river valleys, resulting in the extensive ribbons of black basalt outcropping seen today (Fig. 1). There has therefore been ample time and a unique habitat of ample area for a gecko population to speciate. There are other extensive areas of exposed basalt to the east; for example, the Toomba basalt ('Great Basalt Wall'; extensive black area west of Charters Towers in Figure 1). However, these basalts are much younger (e.g., the Toomba basalt is about 17,000 years old; Cook & Rozefelds 2015). *Oedura atra* **sp. nov.** is similar in general ecology to *Heteronotia atra* Pepper, Doughty, Fujita, Moritz & Keogh, 2013, which is restricted to exposed, dark-coloured, dolerite screes in the Pilbara region of north-west Australia. *Heteronotia atra* also has reduced pattern and dark colour compared to congeners.

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