

Appendix 1: Taxonomic revisions of the species groups

These descriptions are linked to the manuscript:

A framework for resolving cryptic species: a case study from the lizards of the Australian Wet Tropics

Sonal Singhal, Conrad J. Hoskin, Patrick Couper, Sally Potter, Craig Moritz

Systematic Biology, doi: 10.1093/sysbio/syy026

'*Lampropholis coggeri*' species group

Lampropholis coggeri Ingram

Material examined: Holotype: QM J27133 Shiptons Flat ($15^{\circ} 48' S$, $145^{\circ} 16' E$). QM J60888, J60890 Big Tableland ($15^{\circ} 42' 30'' S$, $145^{\circ} 16' 30'' E$); QM J25330 Home Rule, foot of path to Granites ($15^{\circ} 44' 40'' S$, $145^{\circ} 17' 55'' E$); QM J25201, J25202, J25203 Granite Ck to Cedar Bay, on track ($15^{\circ} 45' S$, $145^{\circ} 20' E$); QM J25254, J25255, J25271 Mt Hartley, near Home Rule, S of Cooktown ($15^{\circ} 46' S$, $145^{\circ} 19' E$); QMJ57936 Mt Sampson ($15^{\circ} 48' S$, $145^{\circ} 12' E$); QM J27131, J27134, Shiptons Flat ($15^{\circ} 48' S$, $145^{\circ} 16' E$); QM J25217 Mt Finnigan NP ($15^{\circ} 48' 30'' S$, $145^{\circ} 15' 30'' E$); QM J40536, J40542 Mt Finnigan, 37km S Cooktown ($15^{\circ} 49' S$, $145^{\circ} 17' E$); QM J26301 Mt Finnigan, 37km S Cooktown ($15^{\circ} 49' 10'' S$, $145^{\circ} 16' 50'' E$); QM J60886 Mt Finnigan, top grid ($15^{\circ} 49' 30'' S$, $145^{\circ} 17' 30'' E$); QM J60221 Mt Misery Rd ($15^{\circ} 53' S$, $145^{\circ} 13' E$); QM J60736 Mt Misery, ca 5km by Rd junction W/Normanby Tin works Rd ($15^{\circ} 53' 23'' S$, $145^{\circ} 12' 31'' E$); QM J60734 Thornton Pk, N on CREB track from Daintree R ($16^{\circ} 06' 03'' S$, $145^{\circ} 20' 10'' E$); QM J59102 Mt Windsor Tableland, Whypalla SF ($16^{\circ} 12' 39'' S$, $144^{\circ} 58' 46'' E$); QM J48693 Windsor Tableland SF, survey peg TA213 ($16^{\circ} 13' S$, $145^{\circ} E$); QM J75461 Mount Windsor Tableland ($16^{\circ} 13' S$, $145^{\circ} 02' E$); QM J49580 Mossman Bluff ($16^{\circ} 30' S$, $145^{\circ} 22' E$); QM J49581, J49582 Bakers Blue Mt, 17km W Mt Molloy ($16^{\circ} 39' S$, $145^{\circ} 07' E$); QM J39871 Bakers Blue Mt, 17km W Mt Molloy ($16^{\circ} 42' S$, $145^{\circ} 10' E$); QM J55742 Kuranda ($16^{\circ} 49' S$, $145^{\circ} 38' E$); QM J51952 North-South Bell Peak Saddle, Malbon Thompson Ra ($17^{\circ} 6' S$, $145^{\circ} 54' E$); QM J27009 Crowley Ck, via Mt Molloy ($17^{\circ} 42' S$, $146^{\circ} 01' E$).

Diagnosis: *Lampropholis coggeri* is a small, dark-sided rainforest skink with pentadactyl limbs (overlapping when adpressed) and a movable lower eyelid containing a transparent disc. It is reliably distinguished from its sibling species (*L. similis* sp. nov. and *L. elliotensis* sp. nov.) by 17 nucleotide differences in the mitochondrial gene *NADH dehydrogenase 4* that result in 15 amino acid differences among these species (Table A1).

Measurements and scale counts of holotype QM J27133: SVL 36.5 mm; AG 19.1 mm; L1 9.07 mm; L2 10.3 mm; HL 6.9 mm; HW 5.1 mm; midbody scale rows 26; paravertebral scales 48; lamellae beneath fourth toe 22; supralabials 7; infralabials 6; supraciliaries 7.

Description: SVL 32–43.6 mm (n = 30, mean = 36.3); AG % SVL 45–60% SVL (n = 30, mean = 52%); L1 24–29% SVL (n = 10, mean = 25%); L2 28–40% SVL (n = 30, mean = 34%); HW 70–

83% HL (n = 31, mean = 77%). **Body:** Robust. Head and body continuous with almost no narrowing at neck. Snout rounded in profile. Limbs well-developed, pentadactyl, meeting or very narrowly separated when adpressed. **Scalation:** Dorsal scales smooth (or with three to four faint striations) with a broadly curved posterior edge; nasals widely spaced; rostral and frontonasal in broad contact; prefrontals moderately separated (narrow separation in QM J25271 and J27131); frontal contacting frontonasal, prefrontals, first two supraoculars and frontoparietal; supraoculars four, second largest; supraciliaries seven, first largest; lower eyelid movable with small palpebral disc about half the size of lower eyelid; ear opening round or vertically elliptic, subequal to or smaller than palpebral disc; frontoparietals fused, interparietal free; primary temporal single, secondary temporals two (upper largest and overlapping lower); loreals two, subequal or second largest; preoculars two, subequal or lower largest; presuboculars two, upper largest; supralabials seven, with fifth below eye and last overlapping lower secondary temporal and postsupralabials; postsupralabial divided; infralabials six, two in contact with postmental; midbody scale rows 25–30 (n = 31, mode = 26); paravertebral scales (to the level of the posterior margin of the hindlimbs) 47–54 (n = 31, mode = 50); fourth toe longest, subdigital lamellae 20–24 (n = 30, mode = 22) with a single row of scales on the dorsal surface; outer preanal scales overlap inner preanals; three pairs of enlarged chin shields, first pair in contact, second pair separated by a single scale row, third pair separated by three scale rows.

Color pattern in preservative: *Body:* Dorsal ground color brown to olive-brown, sparsely flecked with four to six longitudinal rows of black dashes. Dorsolateral zone marked by a narrow pale stripe that extends from eye to base of tail. This is bordered below by a jagged row of black streaks or spots. Upper to mid lateral zone olive-brown with dark streaks and pale flecks, merging evenly with paler lower flanks. *Head:* As for dorsum with varying degrees of darker smudges or blotches. *Limbs:* Olive-brown with pale and dark spotting. *Tail:* As for back with continuation of the dark, broken dorsolateral stripe and bearing pale grey and black blotches on lateral surfaces. *Ventral surfaces:* Grey to cream, sparsely to heavily spotted with black. Underside of tail with dark spots on a pale background, spots often concatenated forming a reticulated pattern.

Comparison with similar species: For separating this species from other members of the '*L. coggeri*' group (*L. similis* sp. nov. and *L. elliotensis* sp. nov.), see species account for *L. similis* sp. nov.

Distribution: *Lampropholis coggeri* occurs north of a line extending from Mareeba, to Lake Barrine, top of the Gillies Range and Gordonvale, and then extending south-east to the mouth of the Russell River (to include the Malbon Thompson Range). The northern extent for this species is the Big Tableland area near Cooktown (Bell *et al.* 2010). The only area this species co-occurs with *L. similis* sp. nov. is along a narrow parapatric contact zone in the Lake Barrine–Gillies highway area. Individuals in this region require genetic verification.

Habitat and habits: Occurs in rainforest and associated moist habitats, including wet sclerophyll forests; from sea level to the uplands but is absent from the peaks where *L. robertsi* occurs (>1100 m) (Williams *et al.* 2010).

Lampropholis similis sp. nov.

Material examined: Holotype: QM J91380 The Pinnacles, SW of Townsville ($19^{\circ} 23' 42''$ S, $146^{\circ} 39' 07''$ E). Paratypes: QM J49741 Gadgarra SF ($17^{\circ} 16'$ S, $145^{\circ} 41'$ E); QM J49593 Bellenden Ker NP, TV station ($17^{\circ} 16'$ S, $145^{\circ} 51'$ E); QM J47096, J49619, J66621 Lake Eacham ($17^{\circ} 17'$ S, $145^{\circ} 37'$ E); QM J39865 Bellenden Ker Ra, Cableway Base Station ($17^{\circ} 20'$ S, $145^{\circ} 52'$ E); QM J45916, J45918 Russell R, cave site ($17^{\circ} 22'$ S, $145^{\circ} 53'$ E); QM J49576, J49613 Mt Hypipamee NP ($17^{\circ} 25' 54''$ S, $145^{\circ} 29' 08''$ E); QM J48692 Longlands Gap, Herberton Range ($17^{\circ} 27' 45''$ S, $145^{\circ} 28' 30''$ E); QM J62904 Stone Ck, Hasenpusch Property ($17^{\circ} 28'$ S, $146^{\circ} 01'$ E); QM J73520 Millaa Millaa Lookout ($17^{\circ} 31'$ S, $145^{\circ} 37'$ E); QM J61054 E margin of Palmerston NP ($17^{\circ} 37'$ S, $145^{\circ} 46'$ E), QM J31134, J31135 Majors Mt, via Ravenshoe ($17^{\circ} 38' 20''$ S, $145^{\circ} 31' 15''$ E); QM J62704 Dunk Is ($17^{\circ} 57'$ S, $146^{\circ} 09'$ E); QM J74017 Kirrama ($18^{\circ} 10'$ S, $145^{\circ} 38'$ E), QM J44199, J44173 Hinchinbrook Is, Gayundah Ck ($18^{\circ} 22'$ S, $146^{\circ} 13'$ E); QM J49610 Curacao Is, Palm group ($18^{\circ} 40'$ S, $146^{\circ} 33'$ E); QM J76307 Palm Is ($18^{\circ} 45'$ S, $146^{\circ} 36'$ E); QM J53044 Mt Halifax, 250 m SE ($19^{\circ} 06'$ S, $146^{\circ} 22'$ E); QM J46777 Bluewater Ra, N of Townsville ($19^{\circ} 11'$ S, $146^{\circ} 33'$ E); QM J86759 Hervey Range ($19^{\circ} 21' 49.98''$ S, $146^{\circ} 28' 42.36''$ E); QM J91377, J91378, The Pinnacles, SW of Townsville ($19^{\circ} 23' 37''$ S, $146^{\circ} 39' 07''$ E); QM J27621 Hervey Ra, 10km S, 35km W Townsville ($19^{\circ} 35'$ S, $146^{\circ} 36'$ E).

Diagnosis: *Lampropholis similis* sp. nov. is a small, dark-sided rainforest skink with pentadactyl limbs (overlapping or very narrowly separated when adpressed) and a movable lower eyelid containing a transparent disc. It is reliably distinguished from its sibling species (*L. coggeri* and *L. elliotensis* sp. nov.) by 17 nucleotide differences in the mitochondrial gene *NADH dehydrogenase subunit 4* that result in 15 amino acid differences (Table A1).

Etymology: From the Latin for similar, alluding to its likeness with *L. coggeri*.

Measurements and scale counts of holotype QM J91380: SVL 39.4 mm; AG 20 mm; L1 9.58 mm; L2 14.1 mm; HL 7.9 mm; HW 6.1 mm; midbody scale rows 28; paravertebral scales 49; lamellae beneath fourth toe 22; supralabials 7; infralabials 6; supraciliaries 7.

Description: SVL 32.4–42.2 mm ($n = 29$, mean = 37.5); AG % SVL 41–58% SVL ($n = 29$, mean = 51%); L1 22–29% SVL ($n = 10$, mean = 25%); L2 30–39% SVL ($n = 29$, mean = 35%); HW 69–89% HL ($n = 29$, mean = 75%). **Body:** Robust. Head and body continuous with almost no narrowing at neck. Snout rounded in profile. Limbs well-developed, pentadactyl, meeting or very narrowly separated when adpressed. **Scalation:** Dorsal scales smooth (or with three to four faint striations) with a broadly curved posterior edge; nasals widely spaced; rostral and frontonasal in broad contact; prefrontals moderately to widely separated; frontal contacting frontonasal, prefrontals, first two supraoculars and frontoparietal; supraoculars four, second largest; supraciliaries seven (eight in QM J27621), first largest; lower eyelid movable with small palpebral disc, about half the size of lower eyelid; ear opening round to vertically elliptic, subequal to or smaller than palpebral disc; frontoparietals fused, interparietal free; primary temporal single, secondary temporals two (upper largest and overlapping lower); loreals two, subequal or second largest; preoculars two, lower largest; presuboculars two (one in QMJ45916, J45918, J49613, J49741 and J66621), upper largest; supralabials seven, with fifth below eye and last overlapping lower secondary temporal and postsupralabials; postsupralabial divided; infralabials six, two in contact with postmental; midbody scale rows 26–31 ($n = 29$, mode = 28); paravertebral scales (to the level of the posterior margin of

the hindlimbs) 47–52 (n = 29, mode = 50); fourth toe longest, subdigital lamellae 20–24 (n = 27, mode = 22) with a single row of scales on the dorsal surface; outer preanal scales overlap inner preanals; three pairs of enlarged chin shields, first pair in contact, second pair separated by a single scale row, third pair separated by three scale rows.

Color pattern in preservative: As for *L. coggeri* but some specimens from the southern portion of the range are devoid or nearly devoid of any back pattern (black dashes not present on ground color for QM J27621, J49610, J86759 and J91378).

Comparison with similar species: Separating this species from other members of the '*L. coggeri*' group (*L. coggeri* and *L. elliotensis* sp. nov.) relies heavily on genetic data. Seventeen nucleotide differences in the mitochondrial gene *NADH dehydrogenase subunit 4* result in differences at 15 amino acids among these species (Table A1). Additionally, both *L. similis* sp. nov. and *L. coggeri* tend to be longer-limbed than *L. elliotensis* sp. nov. (Table 2, S8). In these species, the adpressed limbs usually touch or overlap. In *L. elliotensis* sp. nov. the adpressed limbs are usually separated by several scale rows.

Distribution: The distribution of *L. similis* sp. nov. includes the Mt Bellenden Ker Range (but not the Malbon Thompson Range to the east) and extends all the way south to Hervey Range and The Pinnacles, near Townsville (Bell et al. 2010). The only area this species co-occurs with *L. coggeri* is along a narrow parapatric contact zone in the Lake Barrine–Gillies highway area. Individuals in this region require genetic verification.

Habitat and habits: Occurs in rainforest and associated moist habitats, including wet sclerophyll forests, montane heath, and gallery forests; occurs from sea level to the uplands but is generally absent from the peaks where *L. bellendenkerensis* occurs.

Zoobank ID: urn:lsid:zoobank.org:act:23E36086-C261-4D2A-958B-547A17239529

Lampropholis elliotensis sp. nov.

Material examined: Holotype: QM J91382 Mt Elliot (19° 28' 55" S, 146° 59' E). Paratypes: QM J91386, J91116 Mt Elliot (19° 28' 55" S, 146° 59' E); QM J91385 Mt Elliot (19° 28' 58" S, 146° 59' 01" E); QM J52841, J52842, J52843, J52844 Mt Elliot (19° 29' S, 146° 57' E); QM J54810, J54811, J54812, J54813, J54814, J54815, J54816, J54817 Mt Elliot, summit (19° 30' S, 146° 57' E).

Diagnosis: *Lampropholis elliotensis* sp. nov. is a small, dark-sided rainforest skink with pentadactyl limbs (usually separated by several scales rows when adpressed) and a movable lower eyelid containing a transparent disc (Fig. A1). It is reliably distinguished from its sibling species (*L. similis* sp. nov. and *L. coggeri*) by 17 nucleotide differences in the mitochondrial gene *NADH dehydrogenase subunit 4* that result in 15 amino acid differences among the species (Table A1).

Etymology: Refers to Mt Elliot, the type locality.

Measurements and scale counts of holotype QM J91382: SVL 37.5 mm; AG 19.6 mm; L1 9.26 mm, L2 12mm; HL 6 mm; HW 5.3 mm; midbody scale rows 24; paravertebral scales 48; lamellae beneath fourth toe 22; supralabials 7; infralabials 6; supraciliaries 7.

Description: SVL 31.5–40.2 mm (n = 10, mean = 36.4); AG % SVL 48–57% SVL (n = 10, mean = 53%); L1 20–26% SVL (n = 10, mean = 23%); L2 31–37% SVL (n = 10, mean = 33%); HW 75–88% HL (n = 10, mean = 80%). **Body:** Robust. Head and body continuous with almost no narrowing at neck. Snout rounded in profile. Limbs well-developed, pentadactyl, not meeting when adpressed (separated by several scale rows in adults). **Scalation:** Dorsal scales smooth (or with three to four faint striations) with a broadly curved posterior edge; nasals widely spaced; rostral and frontonasal in broad contact; prefrontals moderately to widely separated; frontal contacting frontonasal, prefrontals, first two supraoculars and frontoparietal; supraoculars four, second largest; supraciliaries seven, first largest; lower eyelid movable with small palpebral disc, about half the size of lower eyelid; ear opening round to vertically elliptic, subequal to or smaller than palpebral disc; frontoparietals fused, interparietal free; primary temporal single, secondary temporals two (upper largest and overlapping lower); loreals two (one in QM J91385), subequal or second largest; preoculars two, subequal or lower largest; presuboculars two (only one in QM J54817 and QM J91116), upper largest; supralabials seven with fifth below eye (or eight with sixth below eye QM J52842) and last supralabial overlapping lower secondary temporal and postsupralabials; postsupralabial divided; infralabials six (rarely seven, 2/15), two in contact with postmental; midbody scale rows 24–28 (n= 14, mode = 26); paravertebral scales (to the level of the posterior margin of the hindlimbs) 48–51 (n = 14, mode = 49); fourth toe longest, subdigital lamellae 19–24 (n = 14, mode = 21) with a single row of scales on the dorsal surface; outer preanal scales overlap inner preanals; three pairs of enlarged chin shields, first pair in contact, second pair separated by a single scale row, third pair separated by three scale rows.

Color pattern in preservative: As for *L. coggeri*.

Comparison with similar species: For separating this species from other members of the '*L. coggeri*' group, see species account for *L. similis* sp. nov.

Distribution: Occurs on Mt Elliot, south of Townsville, in Bowling Green Bay National Park. All records come from above 600 m elevation.

Habitat and habits: Usually found amongst leaf-litter in rocky situations. This species has not been recorded in lowland rainforest around Mt Elliot, despite considerable survey effort (Hoskin, unpub. data).

Zoobank ID: urn:lsid:zoobank.org:act:6CE54452-528E-4B3E-9655-AC2262A26849

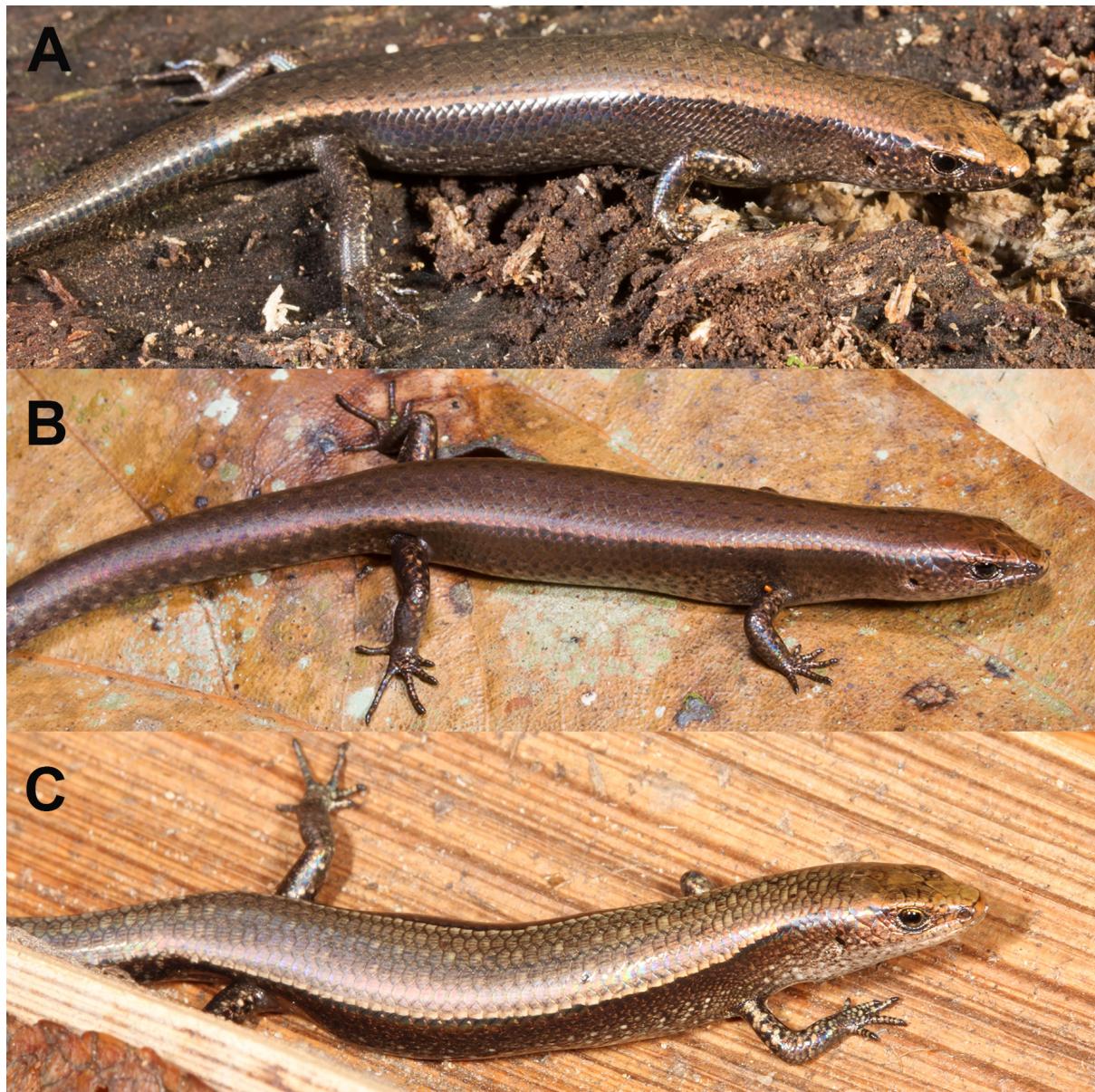


Fig. A1: (A) *Lampropholis coggeri* (Windsor Tableland, Stephen Zozaya), (B) *L. similis* sp. nov. (Paluma Range, Stephen Zozaya), (C) *L. elliotensis* sp. nov. (Mt Elliot, Conrad Hoskin).

Table A1: Diagnostic nucleotide and amino acid differences among the species in the '*Lampropholis coggeri*' species group. Nucleotide positions are given with respect to the *Scincella vandenburghi* mitochondrial genome (GenBank: NC_030776).

position	10810	10870	10894	10924	10996	11047	11215	11344, 11345	11347, 11348	11396	11424	11461	11504	11559	11569															
<i>L. similis</i> sp. nov.	A	I	C	L	T	S	G	A	G	G	A	M	A	I	A,	T	C,	H	C	T	C	N	A	S	C	S	C	R	C	A
<i>L. elliotensis</i> sp. nov.	C	L	A	I	T	S	T	S	A	S	G	V	G	V	G,	V	A,	N	T	I	A	K	G	C	S	T	C	T	V	
<i>L. coggeri</i>	C	L	A	I	A	T	T	S	G	G	A	M	A	I	A,	I	A,	S	C	T	A	K	G	G	T	L	T	C	T	V

'*Lampropholis robertsi*' species group

Lampropholis robertsi Ingram

Material examined: Holotype: QM J43911 Thornton Peak, via Daintree ($16^{\circ} 10' S, 145^{\circ} 22' E$). QM J39856, J39857, J43912, J43964, J49648, J49659 Thornton Peak, via Daintree ($16^{\circ} 10' S, 145^{\circ} 22' E$); QM J43918 Thornton Peak ($16^{\circ} 10' S, 145^{\circ} 23' E$); QM J43958 Thornton Peak summit ($16^{\circ} 10' S, 145^{\circ} 23' E$); QM J55836 Mt Spurgeon, 7km N, Camp 2 ($16^{\circ} 22' S, 145^{\circ} 13' E$); QM J55833, J55834, J55835 Black Mt, 4.5km N Mt Spurgeon ($16^{\circ} 24' S, 145^{\circ} 12' E$); QM J54324 Mt Spurgeon ($16^{\circ} 26' S, 145^{\circ} 12' E$); QM J51948 Carbine Tableland, Pauls Luck ($16^{\circ} 27' S, 145^{\circ} 15' E$); QM J63545, J63548, J63550, J63553, J63561, J63563 Mt Lewis Rd, 29km along rd ($16^{\circ} 30' 50'' S, 145^{\circ} 16' 05'' E$); QM J47097, J48295 Mt Lewis, via Mt Molloy ($16^{\circ} 35' S, 145^{\circ} 17' E$); QM J56464 Mt Lewis ($16^{\circ} 35' S, 145^{\circ} 17' E$).

Diagnosis: A large *Lampropholis* with dark flanks and prominent spotting on the posterior ventral surfaces, a row of dark edged pale spots on underside of tail. This species is reliably distinguished from its closest congener (*L. bellendenkerensis* sp. nov.) by 14 nucleotide differences in the mitochondrial gene *NADH dehydrogenase 4* that result in nine amino acid differences between the species (Table A2).

Measurements and scale counts of holotype QM J43911: SVL 45.3 mm; AG 22.9; L1 12.0 mm; L2 15.9 mm; HL 8.41 mm; HW 6.0 mm; midbody scale rows 28; paravertebral scales 53; lamellae beneath fourth toe 26; supralabials 7; infralabials 6; supraciliaries 7.

Description: SVL 36.6–51.45 mm (n = 17, mean = 44.35); AG % SVL 46–54% SVL (n = 17, mean = 50%); L1 26–32% (n = 17, mean = 29%); L2 34–43% SVL (n = 17, mean = 38%); HW 69–79% HL (n = 17, mean = 73%). **Body:** Robust. Head and body continuous with almost no narrowing at neck. Snout rounded in profile. Limbs well-developed, pentadactyl, meeting or narrowly separated when adpressed. **Scalation:** Dorsal smooth (or with three to four faint striations) with a broadly curved posterior edge; nasals widely spaced; rostral and frontonasal in broad contact; prefrontals moderately to widely separated; frontal contacting frontonasal, prefrontals, first two supraoculars and frontoparietal; supraoculars four, second largest; supraciliaries seven, first usually largest but sometimes subequal to third or fourth; lower eyelid movable with small palpebral disc, less than half the size of lower eyelid; ear opening round to vertically elliptic, subequal to palpebral disc; frontoparietals fused, interparietal free; primary temporal single, secondary temporals two (upper largest and overlapping lower); loreals two, subequal or second largest; preoculars two, lower largest; presuboculars two, upper largest; supralabials seven with fifth below eye (eight in QM J55833, with sixth below eye), and last overlapping lower secondary temporal and postsupralabials; postsupralabial divided; infralabials six (seven in QM J55833 and J56464) two in contact with postmental; midbody scale rows 26–28 (n = 23, mode = 26); paravertebral scales (to the level of the posterior margin of the hindlimbs) 49–54 (n = 21, mode = 54); fourth toe longest, subdigital lamellae 21–26 (n = 21, mode = 23) with a single row of scales on the dorsal surface; outer preanal scales overlap inner preanals; three pairs of enlarged chin shields, first pair in contact, second pair separated by a single scale row, third pair separated by three scale rows.

Color pattern in preservative: **Adults** - *Body*: Dorsal ground color copper-brown, plain or with sparse, longitudinally aligned black dashes (intensity of color varies markedly between individuals). Striations on dorsal scales with diffuse black outlines. Dorsolateral zone with a ragged-edged black stripe that runs from behind eye to base of tail and is bordered above by a thin gold to light brown stripe. Upper lateral zone rich bronze-brown (for two to three scale rows), merging with, or clearly defined from, the paler grey to brown lower flanks which bear dark flecks and spotting. Upper and lower lateral colors may be separated by a discontinuous row of white scales (often interspersed with black streaks). *Head*: Copper-brown above with scattered dark blotches. Facial markings of varying intensity but labials often bear strong dark spots. Rostral with dark medial streak and dark lateral and lower edges. *Limbs*: Copper-brown with dark spotting. *Tail*: As for dorsum with darker sides bearing pale spots and a row of dark dashes on the upper lateral edge (a broken continuation of dark dorsolateral stripe) *Ventral surfaces*: Grey with varying degrees of spotting sometimes present on chin and throat but most prominent on lower body, hindlimbs and tail. A row of dark-edged, pale blotches on underside of tail. **Juveniles**: Ventral pattern bold. Infralabials barred and dark speckling present on chin, throat and body. Underside of body dark with prominent white blotches. Large pale spots along underside of tail.

Comparison with similar species: *Lampropholis robertsi* and *L. bellendenkerensis* sp. nov. cannot be separated using morphological characters. They are distinguished genetically by 13 nucleotide differences in the mitochondrial gene *NADH dehydrogenase 4* that result in nine amino acid differences between the two species (Table A2).

Distribution: *Lampropholis robertsi* is restricted to Thornton Peak and the uplands of the Carbine Tableland (e.g., Mt Lewis, Mt Spurgeon).

Habitat and habits: Occurs in upland rainforest and heath (all records come from above approximately 900 m elevation). Most often seen in warmer, sunlit areas such as in canopy gaps or rocky areas.

Lampropholis bellendenkerensis sp. nov.

Material examined: Holotype: QM J39855 Bellenden Ker Ra ($17^{\circ} 20' S$, $145^{\circ} 52' E$). Paratypes: QM J51406 Mt Lewis SF, 25 km along rd ($16^{\circ} 31' 45'' S$, $145^{\circ} 16' 30'' E$); QM J62209 Bellenden Ker, top of ($17^{\circ} 13' S$, $145^{\circ} 53' E$); QM J55837 Massey Ra, 4km W Centre Bellenden Ker ($17^{\circ} 16' S$, $145^{\circ} 49' E$); QM J40033, J40036, J40037, J40038, J40039 Mt Bellenden Ker summit, near TV Tower and station ($17^{\circ} 16' S$, $145^{\circ} 51' E$); QM J46193 Bellenden Ker NP ($17^{\circ} 16' S$, $145^{\circ} 51' E$); QM J39490, J39491 Mt Bellenden Ker summit ($17^{\circ} 20' S$, $145^{\circ} 52' E$); QM J40041 Mt Bartle Frere, east face ($17^{\circ} 24' S$, $145^{\circ} 49' E$); QM J47956, J47959 Mt Bartle Frere ($17^{\circ} 24' S$, $145^{\circ} 49' E$); QM J64652 Longlands Gap ($17^{\circ} 28' S$, $145^{\circ} 29' E$); QM J31196 Mt Fisher, via Millaa Millaa ($17^{\circ} 33' S$, $145^{\circ} 33' E$); QM J41707, J41708 Mt Fisher, Whiteing Rd, 7 km SW Millaa Millaa ($17^{\circ} 33' S$, $145^{\circ} 33' E$).

Diagnosis: A large *Lampropholis* with dark flanks and prominent spotting on the posterior ventral surfaces, a row of dark edged pale spots on underside of tail (Fig. A2). This species is reliably distinguished from its closest congener (*L. robertsi*) by 13 nucleotide differences in

the mitochondrial gene *NADH dehydrogenase 4* that result in nine amino acid differences between the species (Table A2).

Etymology: Refers to Mt Bellenden Ker, the type locality.

Measurements and scale counts of holotype QM J39855: (specimen also a paratype of *L. robertsi*): SVL 43.7mm; AG 22.9 mm; L1 12.1 mm; L2 16.6 mm; HL 8.1 mm; HW 6.1 mm; midbody scale rows 28; paravertebral scales 54; lamellae beneath fourth toe 23; supralabials 7; infralabials 6; supraciliaries 7.

Description: SVL 35.4–47.5 mm (n = 16, mean = 42.13); AG % SVL 46–56% SVL (n = 16, mean = 51%); L1 24–30% (n = 16, mean = 28); L2 33–40% SVL (n = 16, mean = 37%); HW 67–75% HL (n = 16, mean = 71%). **Body:** Robust. Head and body continuous with almost no narrowing at neck. Snout rounded in profile. Limbs well-developed, pentadactyl, meeting or narrowly separated when adpressed. **Scalation:** Dorsal scales smooth (or with three to four faint striations) with a broadly curved posterior edge; nasals widely spaced; rostral and frontonasal in broad contact; prefrontals moderately to widely separated; frontal contacting frontonasal, prefrontals, first two supraoculars and frontoparietal; supraoculars four, second largest; supraciliaries seven (eight in QM J47959, J46193 and J51406), first largest but sometimes subequal to third or fourth; lower eyelid movable with small palpebral disc, less than half the size of lower eyelid; ear opening round to vertically elliptic, subequal to or smaller than palpebral disc; frontoparietals fused, interparietal free; primary temporal single, secondary temporals two (upper largest and overlapping lower); loreals two, subequal or second largest; preoculars two, lower largest; presuboculars two, upper largest; supralabials seven, with fifth below eye and last overlapping lower secondary temporal and postsupralabials; postsupralabial divided; infralabials six, two in contact with postmental; midbody scale rows 26–30 (n = 18, mode = 28); paravertebral scales (to the level of the posterior margin of the hindlimbs) 48–55 (n = 17, mode = 51); fourth toe longest, subdigital lamellae 21–24 (n = 15, mode = 23) with a single row of scales on the dorsal surface; outer preanal scales overlap inner preanals; three pairs of enlarged chin shields, first pair in contact, second pair separated by a single scale row, third pair separated by three scale rows.

Color pattern in preservative: As for *L. robertsi*.

Comparison with similar species: See species account for *L. robertsi*.

Distribution: *Lampropholis bellendenkerensis sp. nov.* occurs in the uplands of the Bellenden Ker Range (Mt Bellenden Ker and Mt Bartle Frere) and in the highest areas of the southern Atherton Tablelands (including Mt Baldy, Longman's Gap, Mt Fisher and the Tully Falls area). All records come from above approximately 900 m elevation.

Habitat and habits: As for *L. robertsi*.

Zoobank ID: urn:lsid:zoobank.org:act:C721A396-F4A2-4205-A7FE-ED8FC8F90FAD



Fig. A2: (A) *Lampropholis robertsi* (Mt Lewis, Stephen Zozaya) (B) *L. bellendenkerensis* sp. nov. (Mt Bartle Frere, Anders Zimny).

Table A2: Diagnostic nucleotide and amino acid differences among the species in the '*Lampropholis robertsi*' species group. Nucleotide positions are given with respect to the *Scincella vandenburghi* mitochondrial genome (GenBank: NC_030776).

position	10863	11014	11287 - 9	11302, 11304	11347	11364	11380, 11382	11468	11504
<i>L. robertsi</i>	A/ G	M G	G A	AC G	T G, T	V A	N A	Q C, C	L L
<i>L. bellendenkerensis</i> sp. nov.	T	I	A	T	TTA	L	A, C	I	G D

'*Carlia rubrigularis*' species group

Carlia rubrigularis Ingram & Covacevich

Material examined: Holotype: QM J29956 Innisfail, NE Queensland (17° 32' S, 146° 01' E). Paratypes: QM J50463 Lake Eacham (17° 16' 57" S, 145° 37' 46" E); QM J50466 Lake Eacham (17° 17' S, 145° 38' E); QM J45919 Malanda (17° 21' S, 145° 36' E); QM J71004 Boonjee, 6.5km ESE Lamin's Hill (17° 25' 30" S, 145° 44' 30" E); QM J55865 Polly Ck, Seymour Ra (17° 28' S, 146° 02' E); QM J48167, J48169 Walter Hill Ra, Charappa Ck drainage, Suttees Rd (17° 42' 30" S, 145° 41' 30" E); QM J50459 Cochable Ck, plateau logging area (17° 44' S, 145° 39' E); QM J50458 Cochable Ck, plateau logging area (17° 44' S, 145° 47' E); QM J71002 Murdering Pt, Kurrimine Bch, via Silkwood. (17° 46' 30" S, 146° 06' 30" E); QM J48206 Billy Ck Bridge SF 758, vicinity of bridge (17° 49' 25" S, 145° 47' 05" E); QM J73365 Koombooloomba township (17° 50' S, 145° 34' E); QM J48175 Laceys Ck SF, Mission Beach (17° 51' 10" S, 146° 03' 55" E); QM J30835 Mission Beach (17° 52' S, 146° 06' E); QM J70987 Tully, 15km E (17° 56' S, 146° 03' E); QM J65366 Kirrama Ra (18° 03' 30" S, 145° 36' 30" E); QM J48374 Kirrama SF, Jennings Logging Area (18° 04' 30" S, 145° 37' 30" E); QM J48315 Kirrama Ra, Alma Gap Logging Rd (18° 12' 15" S, 145° 49' 30" E); QM J48336 Kirrama Ra, crest of range rd (18° 13' 30" S, 145° 47' 30" E); QM J44191, J44215 Hinchinbrook Is, Gayundah Ck (18° 22' S, 146° 13' E); QM J61207 Broadwater Ck NP, 11km S of Mt McAlister (18° 23' 30" S, 145° 56' 30" E); QM J45549 Mt Diamantina (18° 25' S, 146° 17' E); QM J51591 Long Pocket, Herbert R (18° 31' S, 146° 00' E); QM J75285 Paluma (18° 57' S, 146° 09' E); QM J79575, J79652 Mt Spec (18° 57' S, 146° 11' E); QM J79600, J79602 Paluma (19° 00' S, 146° 12' E); QM J74902 Bluewater Ra, N of Townsville (19° 14' 30" S, 146° 24' 30" E).

Diagnosis: *Carlia rubrigularis* is distinguished from all other *Carlia* spp., except members of the '*C. rhomboidalis*' group, in possessing an interparietal fused to the frontoparietals. As with *C. crypta* sp. nov., adult males possess a red throat. It is reliably distinguished from this species by four nucleotide differences in the mitochondrial gene *NADH dehydrogenase subunit 4* that result in three amino acid differences (Table A3).

Measurements and scale counts of holotype QM J29956: SVL 40.7 mm; AG 20.8 mm; L1 14.8 mm; L2 20.5 mm; HL 9.5 mm; HW 7.2 mm; midbody scale rows 32; paravertebral scales 44; lamellae beneath fourth toe 29; supralabials 7 ; infralabials 6 ; supraciliaries 7.

Description: SVL 40.7–55.3 mm (n = 31, mean = 48.7); AG % SVL 42–55% SVL (n = 31, mean = 49%); L1 33–36% (n = 10, mean = 35%); L2 41–50% SVL (n = 31, mean = 45%); HW 68–88% HL (n = 31, mean = 74%). **Body:** Robust. Head and body continuous with almost no narrowing at neck. Snout rounded in profile. Limbs well-developed, forelimb tetradactyl, hindlimb pentadactyl, limbs broadly overlapping when adpressed. **Scalation:** Dorsal scales smooth (with three to four faint striations) with a broadly curved posterior edge; nasals widely spaced; rostral and frontonasal in broad contact; prefrontals large, narrowly to moderately separated; frontal contacting frontonasal, prefrontals, first two supraoculars and frontoparietal; supraoculars four, second largest; supraciliaries seven (eight in QM J55865 and J30835), first largest but sometimes subequal to fourth; lower eyelid movable with a small palpebral disc, less than or equal to half the size of lower eyelid; ear opening round

with one to three enlarged, pointed lobules on anterior margin and smaller pointed lobules on other margins, larger than palpebral disc; frontoparietals and interparietal fused forming a single shield; primary temporal single, secondary temporals two (upper largest and overlapping lower); loreals two, second usually largest but sometimes subequal; preoculars two, lower largest; presuboculars one; supralabials seven, with fifth below eye (eight with sixth below eye in QM J79575) and last overlapping lower secondary temporal and postsupralabials; postsupralabial divided; infralabials six, two in contact with postmental; midbody scale rows 30–36 (n = 31, mode = 32); paravertebral scales (to the level of the posterior margin of the hindlimbs) 45–50 (n = 31, mode = 45); fourth toe longest, subdigital lamellae 24–31 (n = 31, mode = 29) with a single row of scales on the dorsal surface; outer preanal scales overlap inner preanals; three pairs of enlarged chin shields, first pair in contact, second pair separated by a single scale row, third pair separated by three scale rows.

Color pattern in preservative: Adults: *Body*: Dorsum olive-brown with fine black striations. Usually a row of dark paravertebral spots or streaks extending from axilla to groin, with an unmarked scale separating each spot (some specimens with more extensive spotting, spots present on all dorsal rows). A narrow pale stripe is present on the dorsolateral zone, running from behind eye, onto dorsal edges of tail. Upper lateral surfaces copper-brown, infused with black and bearing dark-edged scales. Some indication of a pale, dark-edged, mid-lateral line or row of spots is usually present but not always discernible (strongest posterior to ear). Lower flanks light brown to grey, merging evenly with pale ventral color. *Head*: Copper colored, usually plain but sometimes a few small darker markings are present. A dark streak present beneath eye, along anterior orbit. *Limbs*: Copper-brown with dark speckling. *Tail*: As for dorsum with a dark transverse streak along the anterior edge of every second vertebral scale. *Ventral surfaces*: Cream to silvery grey. **Juveniles**: As for adults but pattern stronger and more sharply defined particularly the dorsolateral and mid lateral stripes. The latter branches and extends as a pale, dark-edged streak onto the upper surfaces of the fore and hindlimbs.

In life: Red on throat and neck of breeding males.

Comparison with similar species: For separating this species from other members of the '*C. rugrigularis*' group, see species account for *C. crypta* sp. nov.

Distribution: See species account for *C. crypta* sp. nov.

Habitat and habits: See species account for *C. crypta* sp. nov.

Carlia crypta sp. nov.

Material examined: Holotype: QM J75457 Mt Lewis SF, Forestry clearing (16° 35' 40" S, 145° 16' 27" E). Paratypes: QM J25141 Home Rule, near Home Rule Falls, S of Cooktown (15° 44' S, 145° 18' E); QM J25240, J25242 Mt Hedley slopes (15° 44' S, 145° 16' E); QM J25146 Home Rule, Mt Hedley Spur (15° 44' S, 145° 17' E); QM J50335 Home Rule (15° 44' S, 145° 17' E); QM J25293 Home Rule Falls, near (15° 44' S, 145° 18' E); QM J25198, J25199, J25200 Granite Ck to Cedar Bay, on track (15° 45' S, 145° 20' E); QM J25247, J25249 Mt Hartley, near Home Rule, S of Cooktown (15° 46' S, 145° 19' E); QM J17906 Shiptons Flat, Parrot Ck, 32–48 km S

Cooktown (15° 48' S, 145° 15' E); QM J17901, J24649, J24807 Shiptons Flat, via Cooktown (15° 48' S, 145° 16' E); QM J25296 12 Mile Scrub, Gap Ck (15° 48' 30" S, 145° 19' 30" E); QM J25209 Mt Finnigan NP, Horan Ck (15° 49' 10" S, 145° 16' 50" E); QM J75102, J75287 McDowall Range (16° 06' S, 145° 20' E); QM J50482 Windsor Tableland (16° 11' S, 145° 05' E); QM J64965 Windsor Tableland (16° 13' S, 144° 59' E); QM J92870 Daintree (16° 15' S, 145° 19' E); QM J54459 Mt Spurgeon 16° 26' S, 145° 12' E); QM J55832 Mt Spurgeon, 2.5km S (16° 28' S, 145° 12' E); QM J51564 Mossman Bluff Track, 5–10km W Mossman (16° 28' S, 145° 17' E); QM J50465 Mossman Gorge NP (16° 28' S, 145° 20' E); QM J54353 Mossman (16° 28' S, 145° 23' E); QM J89877 Black Mountain Rd, Hockley (16° 36' 41" S, 145° 27' 09" E).

Diagnosis: *Carlia crypta* sp. nov. is distinguished from all other *Carlia* spp., except other members of the 'C. rubrigularis' group, in possessing an interparietal fused to the frontoparietals. As with *C. rubrigularis*, adult males possess a red throat. It is reliably distinguished from this species by four nucleotide differences in the mitochondrial gene *NADH dehydrogenase subunit 4* that result in three amino acid differences (Table A3).

Etymology: From the Latin for hidden, referring to its morphological similarity with *C. rubrigularis*.

Measurements and scale counts of holotype QM J75457: SVL 47.5mm; AG 24.1 mm; L1 14.4 mm; L2 21.2 mm; HL 10 mm; HW 8.4 mm; midbody scale rows 32; paravertebral scales 44; lamellae beneath fourth toe 29; supralabials 7; infralabials 6; supraciliaries 7.

Description: SVL 43.9–54.4 mm (n = 29, mean = 48.4); AG % SVL 41–54% SVL (n = 29, mean = 48%); L1 40–51% (n = 29, mean = 45%); L2 40–51% SVL (n = 29, mean = 45%); HW 67–85% HL (n = 29, mean = 77%). **Body:** Robust. Head and body continuous with almost no narrowing at neck. Snout rounded in profile. Limbs well-developed, forelimb tetractyl, hindlimb pentadactyl, broadly overlapping when adpressed. **Scalation:** Dorsal scales smooth (with three to four faint striations) with a broadly curved posterior edge; nasals widely spaced; rostral and frontonasal in broad contact; prefrontals large, narrowly to moderately separated; frontal contacting frontonasal, prefrontals, first two supraoculars and frontoparietal; supraoculars four, second largest; supraciliaries seven, first usually largest but sometimes subequal to fourth; lower eyelid movable with a small palpebral disc, less than or equal to half the size of lower eyelid; ear opening round with one to three enlarged, pointed lobules on anterior margin and smaller pointed lobules on other margins, larger than palpebral disc; frontoparietals and interparietal fused forming a single shield; primary temporal single, secondary temporals two (upper largest and overlapping lower); loreals two, second usually largest; preoculars two, lower largest; presuboculars one; supralabials seven, with fifth below eye and last overlapping lower secondary temporal and postsupralabials; postsupralabial divided; infralabials six, two in contact with postmental; midbody scale rows 28–34 (n = 29, mode = 32); paravertebral scales (to the level of the posterior margin of the hindlimbs) 43–47 (n = 29, mode = 44); fourth toe longest, subdigital lamellae 26–33 (n = 28, mode = 29) with a single row of scales on the dorsal surface; outer preanal scales overlap inner preanals; three pairs of enlarged chin shields, first pair in contact, second pair separated by a single scale row, third pair separated by three scale rows.

Color pattern in preservative: Variable, as for *C. rubrigularis*.

In life: Red on throat and neck of breeding males.

Comparison with similar species: *Carlia crypta* sp. nov. can only be confused with other members of the '*C. rubrigularis*' group (*C. wundalhini* Hoskin, *C. rubrigularis* Ingram & Covacevich and *C. rhomboidalis* Peters). It is readily separated from both *C. wundalhini* and *C. rhomboidalis* by the coloration of adult males (throat red vs. throat pale in *C. wundalhini* and throat red and blue in *C. rhomboidalis*). It is further separated from *C. wundalhini* in lacking an orange flush on the neck and flanks (vs. orange flush present). In both *Carlia crypta* sp. nov. and *C. rubrigularis*, adult males possess red throats and have no breeding coloration on the flanks. These species cannot be separated by morphological characters or color pattern differences and are diagnosed by genetic data instead. Four nucleotide differences in the mitochondrial gene NADH dehydrogenase 4 lead to three amino acid differences that reliably distinguish the two species (Table A3).

Further, in most instances, these species can be distinguished in the field by their distributions. *Carlia crypta* occurs north of a diagonal line running from approximately Mareeba, through Lake Tinaroo, along the spine of the Lamb Range uplands, to southern Cairns, and east of a line running from southern Cairns to the mouth of the Russell River (i.e. to include Malbon Thompson Range) (Phillips et al. 2004; Dolman & Moritz 2006). The northern limit for *C. crypta* is the Big Tableland area near Cooktown. *Carlia rubrigularis* occurs south of the line defined above, with its southern extent at Pattersons Gorge at the far southern end of Paluma Range, near Townsville. The only area where these species co-occur is a narrow parapatric zone along the approximate boundary defined above. Individuals found along this contact zone (e.g., around Lake Tinaroo, the uplands of Lamb Range, Copperload Dam region, southern Cairns, Redlynch area) require genetic verification.

Distribution: As defined in the paragraph above.

Habitat and habits: Occurs in rainforest and associated moist habitats, including wet sclerophyll forest and montane heath; from sea level to the uplands, but typically absent from the highest peaks.

Zoobank ID: urn:lsid:zoobank.org:act:3B116172-035D-41EF-958E-F0A35BB15F0D

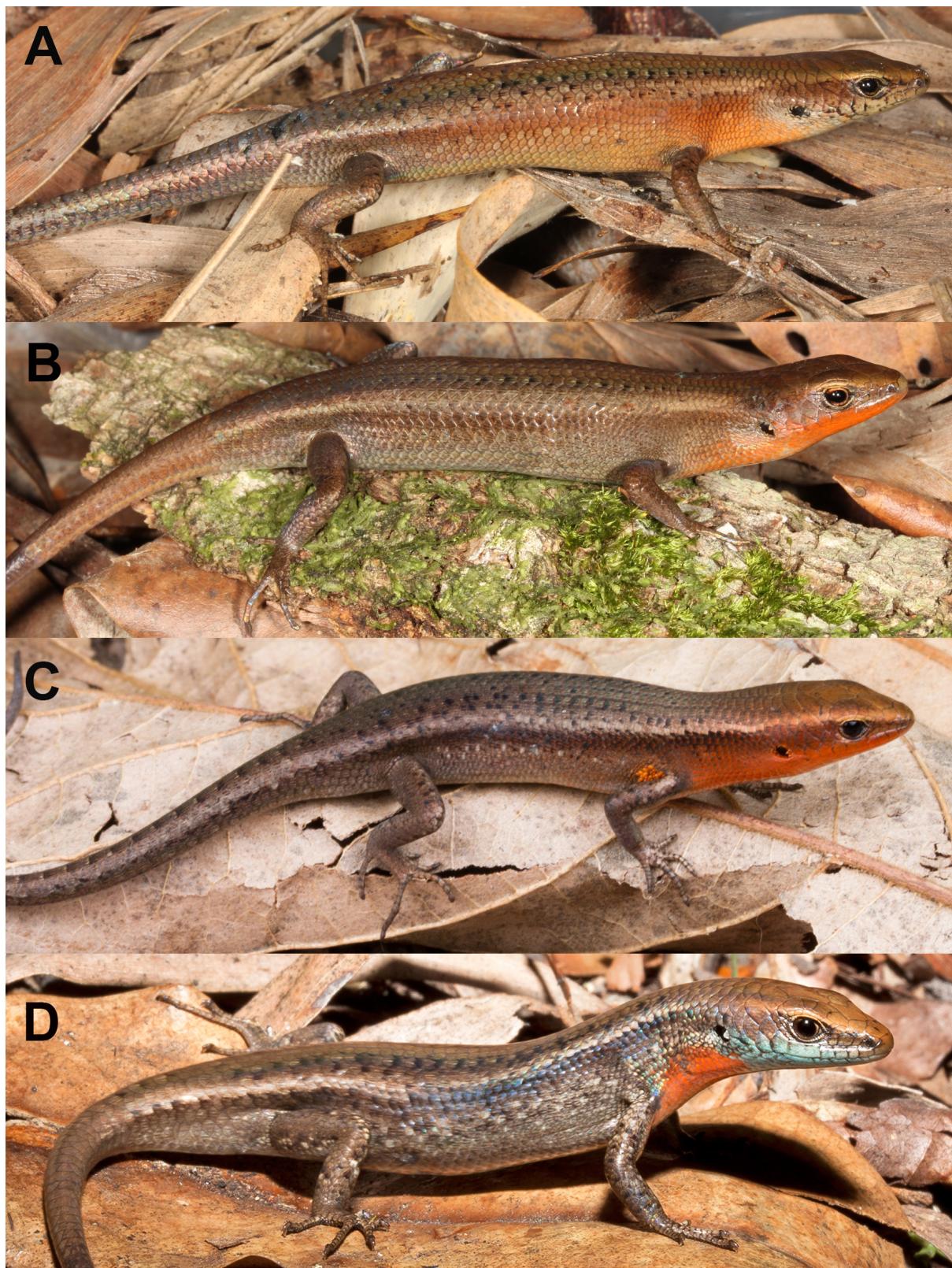


Fig. A3: Pictures of males in breeding color: (A) *Carlia wundalhini* (Cape Melville, Conrad Hoskin), (B) *C. crypta* sp. nov. (Mt Lewis, Conrad Hoskin), (C) *C. rubrigularis* (Kirrama Range, Stephen Zozaya), (D) *C. rhomboidalis* (Mt Blackwood, Anders Zimny). *C. rhomboidalis* and *C. wundalhini* are morphologically distinct from the other species in both breeding colors and body shape (Hoskin 2014, Dolman 2008).

Table A3: Diagnostic nucleotide and amino acid differences among the species in the '*Carlia rubrigularis*' species group. Nucleotide positions are given with respect to the *Scincella vandenburghi* mitochondrial genome (GenBank: NC_030776).

position	11344	11345	11434	11450		
<i>C. wundalhini</i>	G, C	A	A	I	T	M
<i>C. crypta</i> sp. nov.	G, C	A	G	V	T	M
<i>C. rubrigularis</i>	A, T	I	A	I	C	T
<i>C. rhomboidalis</i>	A, C	T	A	I	T	M

Table A4: Summary of characters across the seven species studied for morphology and scales, including the range seen, the number of individuals measured, and the mean or modal value.

	<i>Lampropholis</i>					<i>Carlia</i>	
Character	<i>coggeri</i>	<i>similis</i> sp. nov.	<i>elliottensis</i> sp. nov.	<i>robertsi</i>	<i>bellendenkerensis</i> sp. nov.	<i>rubrigularis</i>	<i>crypta</i> sp. nov.
SVL (mm)	32–44	32–42	32–40	37–51	35–48	41–55	44–54
	n 30	n 29	n 10	n 17	n 16	n 31	n 29
	mean 36	mean 38	mean 36	mean 44	mean 42	mean 49	mean 48
AG %SVL	45–60%	41–58%	48–57%	46–54%	46–56%	42–55%	41–54%
	n 30	n 29	n 10	n 17	n 16	n 31	n 29
	mean	mean	mean	mean	mean 51%	mean 49%	mean
	52%	51%	53%	50			48%
HW % HL	70–83%	69–89%	75–88%	69–79%	67–75%	68–88%	67–85%
	n 31	n 29	n 10	n 17	n 16	n 31	n 29
	mean	mean	mean	mean	mean 71%	mean 74%	mean
	77%	75%	80%	73%			77%
L1 % SVL	24–29%	22–29%	20–26%	26–32%	24–30%	33–36%	30–38%
	n 10	n 10	n 10	n 17	n 16	n 10	n 10
	mean	mean	mean	mean	mean 28%	mean 35%	mean
	25%	25%	23%	29%			34%
L2 % SVL	28–40%	30–39%	31–37%	34–43%	33–40%	41–50%	40–51%
	n 30	n 29	n 10	n 17	n 16	n 31	n 29
	mean	mean	mean	mean	mean 37%	mean 45%	mean
	34%	35	33%	38%			45%
Midbody scale rows	25–30	26–31	24–28	26–28	26–30	30–36	28–34
	n 31	n 29	n 14	n 23	n 18	n 31	n 29
	mode 26	mode 28	mode 26	mode 26	mode 28	mode 32	mode 32
Paravertebral scales	47–54	47–52	48–51	49–54	48–55	45–50	43–47
	n 31	N 29	n 14	n 21	n 17	n 31	n 29
	mode 50	mode 50	mode 49	mode 54	mode 51	mode 45	mode 44
Subdigital lamellae	20–24	20–24	19–24	21–26	21–24	24–31	26–33
	n 30	n 27	n 14	n 21	n 15	n 31	n 28
4 th toe	mode 22	mode 22	mode 21	mode 23	mode 23	mode 29	mode 29

REFERENCES

Williams, S., VanDerWal, J., Isaac, J., Shoo, L.P., Storlie, C., Fox, S., Bolitho, E.E., Moritz, C., Hoskin, C.J. and Williams, Y.M., 2010. Distributions, life history specialisation, and phylogeny of the rainforest vertebrates in the Australian Wet Tropics. *Ecology* (91): 2493.