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A new species of *Nactus* gecko from boulder-pile habitat on Dauan Island, Torres Strait, Australia

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Abstract

The Torres Strait Islands lie between Cape York Peninsula, north-east Australia, and the southern coast of Papua New Guinea. The vertebrate fauna of these islands is a relatively depauperate mix of Australian and New Guinean species, with only two endemic species described to date. Here we describe a new species of *Nactus* gecko discovered during a targeted survey of Dauan Island in the northern Torres Strait. *Nactus simakal* **sp. nov.** is a genetically (ND2 mtDNA) and morphologically highly distinct species, with a banded pattern and a slender, elongate form. It is saxicoline, living on deeply piled boulder habitat, and is likely to be restricted to Dauan Island. *Nactus simakal* **sp. nov.** is currently known from a very small area and further surveys, and assessment of current and potential threats, are required to assess the conservation status of this species. *Nactus simakal* **sp. nov.** is similar in general appearance to *N. galgajuga* (Ingram, 1978), which is restricted to boulder-pile habitat 750 km to the south in mainland north-east Queensland but is readily distinguished from that species morphologically and genetically.

Key words: *Nactus*, new species, Torres Strait, Queensland, saxicoline, boulder-field

Introduction

The Torres Strait islands lie between the tip of Cape York, north-east Australia, and the southern coast of Papua New Guinea (Fig. 1). The islands are hill tops or coral cays currently surrounded by shallow sea (< 25 m depth). For extended periods in history, for example during the last glacial maxima (approx. 18,000 years ago), sea levels in the region were more than 100 m lower than present (Lewis *et al.* 2013) and the exposed Arafura Plain connected Cape York and southern New Guinea. As would therefore be expected, the islands have a mix of Australian and New Guinean fauna (Lavery *et al.* 2012). The Torres Strait islands are relatively depauperate for vertebrate species, due to the generally small size and low elevation of the islands, and there is a general pattern of higher diversity on islands of greater size and habitat complexity (Lavery *et al.* 2012).

Only two vertebrate species are described as endemic to islands in the Torres Strait. The rainbow skink *Carlia quinquecarinata* (Macleay, 1877) was described from Erub (Darnley) Island and morphologically similar individuals occur on Mer (Murray) Island (Donnellan *et al.* 2009), so it is generally considered to be restricted to those two islands (e.g., Wilson & Swan 2021). However, genetic similarity between individuals from Erub Island and rainbow skinks on Dauan Island (CJH, unpub. data) and on mainland southern Papua New Guinea (Donnellan *et al.* 2009; Bragg *et al.* 2018) suggests *C. quinquecarinata* may be more widespread and not endemic to the Torres Strait islands. The Bramble Cay Melomys, *Melomys rubicola* Thomas, 1924 was endemic to Bramble Cay (Maizab Kaur), a coral cay in the far north-east of the Torres Strait region, but is now extinct (Gynther *et al.* 2016; Woinarski *et al.* 2016). The Torres Strait islands have been subject to vertebrate surveys (e.g., Draffan *et al.* 1983; Cameron *et al.* 1984; Ingram 2008; Lavery *et al.* 2012; Gynther *et al.* 2014) but these have aimed to broadly catalogue species richness of islands rather than targeting specific habitats or groups most likely to yield island-endemic species.

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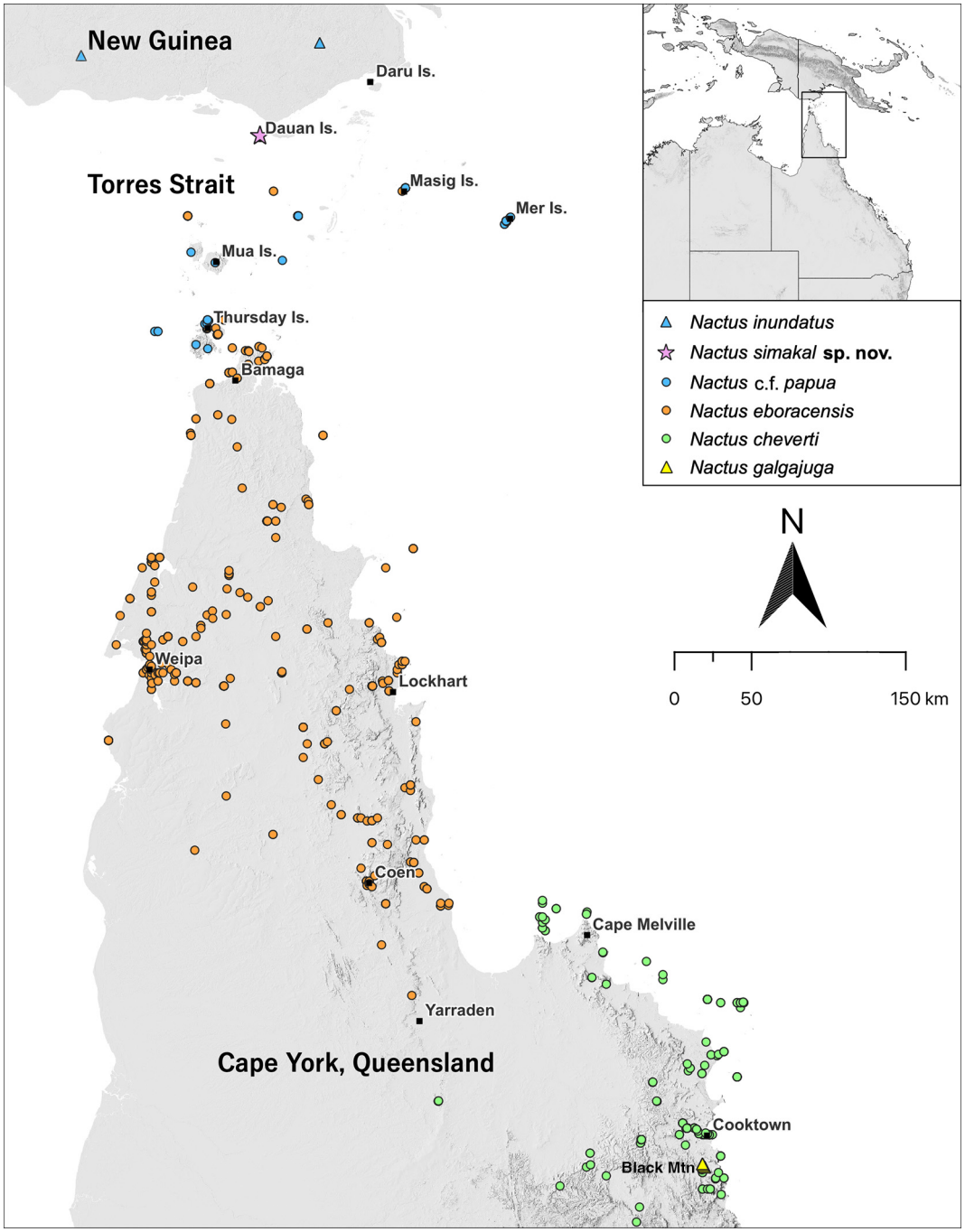

FIGURE 1. Map of occurrence records of *Nactus* species in northern Queensland and southern New Guinea. Occurrence records come from the Queensland Museum, Australian Museum, author observations, and Zug (2020).

Nactus geckos are found in New Guinea, north-east Australia, western Pacific islands, and the Mascarene Islands. The majority of diversity is in New Guinea, with 20 species described (Zug 2020). There are four species of *Nactus* in Queensland, Australia (Fig. 1). Three of these occur on the mainland: *N. cheverti* (Boulenger, 1885), *N. galgajuga*, and *N. eboracensis* (Macleay, 1877) (Fig. 1). And two occur in the Torres Strait islands, between the northern tip of Cape York and New Guinea (Fig. 1): *N. eboracensis*, which also occurs on adjacent Cape York Peninsula, and *N.* c.f. *papua*, Torres Strait populations of the species *N. papua* Zug, 2020 which otherwise occurs well to the north-east in the Gulf of Papua (Zug 2020). *Nactus* populations on the New Guinea mainland directly north of the Torres Strait have been identified as *N. inundatus* Zug, 2020 (Fig. 1; Zug 2020). *Nactus* species of New Guinea and north-east Australia are generally morphologically conservative inhabitants of the forest floor that share

a cryptic colouration of shades of brown and grey (Zug & Fisher 2012; Zug 2020). The two exceptions are the boldly banded species *N. kunan* Zug & Fisher, 2012 and *N. galgajuga*. The latter species is also exceptional in being of very slender form and in having a 'beaky' head shape and large eyes, reflecting adaptation to a saxicoline life on a boulder-field mountain in north-east Australia (Ingram 1978).

Here we describe a highly distinct new *Nactus* species from deeply piled boulder habitat on Dauan Island, in the far northern Torres Strait. Dauan Island is dominated by Mt Cornwallis (Simikal Pad), a 275 m elevation hill of piled granite boulders representing one of the northernmost extensions of the Australian continental basement outcropping (Loffler 1977).

Methods & Results

Morphology. Measurements of preserved specimens were taken using Mitutoyo electronic callipers to the nearest 0.1 mm. Morphometric measurements are as follows: snout to vent length (SVL), tip of snout to anterior margin of cloaca with body straightened; interlimb length (AG), axilla to groin (measured from the hind side of the front limb to the front side of the hindlimb, with limbs held at right angles to the body); body width (BW) measured at midbody, with callipers drawn in to touch sides; length of original tail (oTL), posterior margin of cloaca to tip of tail (*Nactus* tails are easily dislodged during attempts to straighten for measurement, so TL was measured by bending thin wire along midline of tail and then adjusting it for a straight-line measurement); width of original tail (oTW) measured approximately one-quarter of the way along the tail, thus allowing for some partially broken tails to also be included in the data set because they are typically broken beyond that point; original tail depth (oTD), measured approximately one-quarter of the way along the tail; forelimb length (L1), axilla to tip of longest digit, with limb straightened at right angles to body; forearm length (FL), palm to elbow (with wrist and elbow bent at about 90° angle, and measured by closing the callipers from the 'heel' of the palm to the elbow); hindlimb length (L2), measured from groin (at anterior side of limb) to tip of longest digit, with limb straightened at right angles to body; lower hindlimb length (LHL), heel to knee (with ankle and knee bent at about 90° angle); neck length (NL), axilla to mid posterior margin of ear opening; snout to forelimb length (SF), distance from anterior edge of forelimb insertion to tip of snout; 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; snout width (SW), internarial distance from naris to naris; eye diameter (ED), horizontal distance across exposed eyeball.

Scale characters were counted on the left side of specimens, unless otherwise stated. Characters are defined as follows: subcaudal scales keeled or smooth (Fig. 2); tubercle rows at the midbody, the number of longitudinal rows of enlarged tubercles counted dorsally across the midbody; tubercle rows at the hips, the number of longitudinal rows of enlarged tubercles counted dorsally at the hips; 2nd parasagittal count, number of enlarged tubercles in the second parasagittal, counted from above axilla to above inguen (as per Zug 2020); 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 groove %, rostral crease as a percentage of rostral scale depth; number of chin scales in direct contact with the posterior (i.e., ventral) margins of the mental scale and first infralabials; number of scales contacting the nasal scale (counted as all scales contacting the nasal, including the rostral and first supralabial); number of enlarged post-cloacal tubercles ('spurs'); number of pre-cloacal pores in males (total count); subdigital lamellae, the number of scales in a direct series on the ventral surface of 4th toe or 4th finger, commencing with distal enlarged scale and ending where the scales cease to be noticeably larger than the adjacent scales.

Table 1 presents measurement and scale data for all four individuals in the type series, and summary data for a series of *N.* c.f. *papua* from Torres Strait islands (see Appendix for specimens examined).

Genetics. Two individuals of *N. simakal* **sp. nov.** were sequenced for an approximately 1,075 base pair (bp) section of the protein-coding mtDNA gene ND2, using the forward primer 'L4437' (AAG CTT TCG GGG CCC ATA CC) and reverse primer 'tRNA-asn' (CTA AAA TRT TRC GGG ATC GAG GCC), and an annealing temperature of 55°C. The resulting sequences were uploaded to GenBank (OM523359 = QM J97603; OM523360 = QM J97602). Three individuals of *N. cheverti* were also sequenced using the same methodology, and these were also uploaded to GenBank (OM523363, Cape Tribulation, -16.06954° S, 145.46148° E; OM523361, OM523362, Redlynch, Cairns,

-16.94639° S, 145.68694° E). These five sequences, along with 28 *Nactus* sequences available on GenBank from Heinicke *et al.* (2010) and Zug & Fisher (2012), and a sequence of *Dixonius aaronbaueri* (HM997152), were imported into Geneious Prime 2023.0.1 (https://www.geneious.com). The sequences were aligned using the Clustal Omega alignment method, with default values, and the resulting alignment was inspected by eye for any obvious alignment errors and verified by translating the ND2 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 the *D. aaronbaueri* sequence was selected as the outgroup, based on Jackman *et al.* (2008) and Heinicke *et al.* (2010).

TABLE 1. Morphological measurements, proportions, and scale counts for the type specimens of *N. simakal* **sp. nov.** All measurements are in mm. The final column presents data for *N.* c.f. *papua* from nearby islands, as average followed by range in brackets. See Appendix for list of *N.* c.f. *papua* specimens examined.

	QMJ97603	**QMJ97602**	**QMJ97604**	**QMJ97605**	***N.* c.f. *papua***
	Holotype	Paratype	Paratype	Paratype	Average (range)
	Female	Male	Male	Female	
Measurements					N = 13
SVL	45.49	44.38	53.59	52.89	46.75 (39.89–52.67)
Interlimb length (AG)	14.79	18.00	19.64	21.92	19.73 (15.47–22.78)
Forearm length (FL)	7.05	6.95	7.64	7.59	6.42 (5.45–7.53)
Lower hindlimb (LHL)	9.07	8.94	10.00	10.55	7.96 (6.66–8.90)
Full forelimb (L1)	16.20	16.87	18.69	18.61	15.33 (11.90–17.84)
Full hindlimb (L2)	21.30	22.72	28.67	24.84	21.42 (17.79–24.65)
Neck length (NL)	8.13	9.70	9.02	8.85	7.08 (6.13–8.62)
Snout–forelimb (SF)	20.93	20.79	24.42	21.83	18.83 (16.18–20.60)
Snout length (SL)	5.02	4.98	6.32	5.88	5.16 (4.20–6.23)
Head length (HL)	12.53	11.33	13.48	13.27	12.25 (10.18–13.58)
Head width (HW)	8.55	7.91	9.79	9.93	9.15 (8.00–10.21)
Head depth (HD)	4.14	4.19	5.60	4.98	5.54 (4.47–6.89)
Eye diameter (ED)	2.69	2.74	3.88	3.10	2.56 (2.01–2.95)
Proportions					N = 13
AG/SVL	0.33	0.41	0.37	0.41	0.42 (0.38–0.48)
FL/SVL	0.15	0.16	0.14	0.14	0.14 (0.13–0.15)
LHL/SVL	0.20	0.20	0.19	0.20	0.17 (0.16–0.18)
L1/SVL	0.36	0.38	0.35	0.35	0.33 (0.30–0.36)
L2/SVL	0.47	0.51	0.53	0.47	0.46 (0.41–0.50)
NL/SVL	0.18	0.22	0.17	0.17	0.15 (0.13–0.18)
SF/SVL	0.46	0.47	0.46	0.41	0.40 (0.37–0.42)
HL/SVL	0.28	0.26	0.25	0.25	0.26 (0.25–0.28)
HW/SVL	0.19	0.18	0.18	0.19	0.20 (0.18–0.21)
HD/SVL	0.091	0.094	0.104	0.094	0.12 (0.11–0.13)
ED/SVL	0.059	0.062	0.072	0.059	0.055 (0.049–0.061)
Original Tail					N = 7
Tail Length (TL)	63.24	58.44	Half lost	59.80	48.00 (40.52–54.80)
Tail Width (TW)	3.23	3.02	4.10	4.24	3.97 (3.45–4.56)

.....continued on the next page

TABLE 1. (Continued)

	QMJ97603	**QMJ97602**	**QMJ97604**	**QMJ97605**	***N.* c.f. *papua***
	Holotype	Paratype	Paratype	Paratype	Average (range)
	Female	Male	Male	Female	
Tail Depth (TD)	2.85	2.41	3.40	4.17	3.65 (3.32–3.96)
Tail proportions					N = 7
Original TL/SVL	1.39	1.32		1.13	1.09 (0.92–1.18)
Original TW/SVL	0.071	0.068	0.077	0.080	0.088 (0.078–0.101)
Original TD/SVL	0.063	0.054	0.063	0.079	0.081 (0.076–0.087)
Scale counts					N = 13
Tubercle rows, midbody	14	14	12	12	13.8 (12–15)
2nd parasagittal row	30	34	30	35	25.2 (20–31)
Rostral groove %	70	50	60	50	47.7 (10–70)
Supralabials	8	7	8	8	7.3 (7–8)
Infralabials	8	7	8	7	6.5 (6–7)
4th finger lamellae	14	14	15	16	14.0 (13–15)
4th toe lamellae	19	18	17	18	17.5 (15–20)
Subcaudal keels	prominent	prominent	prominent	prominent	prominent
Postcloacal spurs	3/2	2/2	2/2	2/2	1.6 (1–2)
Male pores		9	9		5.6 (4–7)

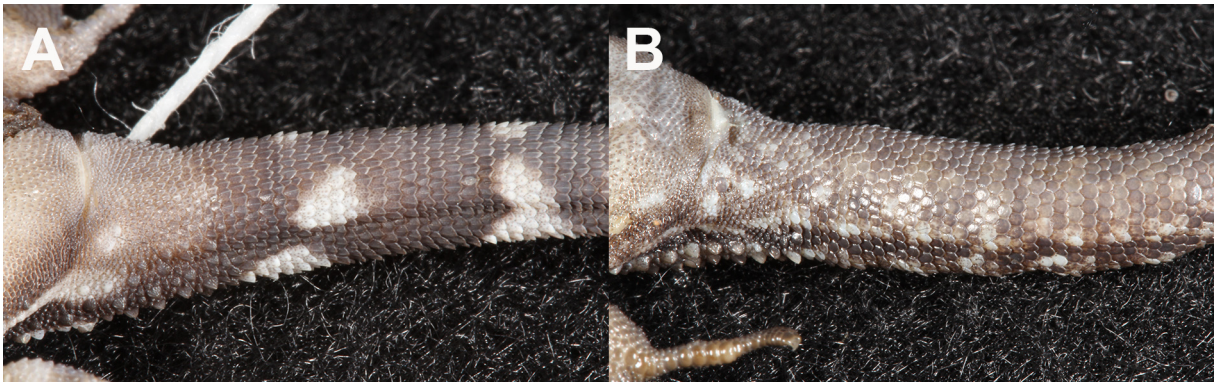

FIGURE 2. Example of keeled (A) and unkeeled (B) subcaudal scales. (A) *N. simakal* **sp. nov.** (QM J97603); (B) *N. cheverti* (QM J97608, Fitzroy Island). Photos: Conrad Hoskin.

The resulting phylogeny (Fig. 3) shows strong support for all recognised species for which sequences are available, with exception of paraphyly of *N. multicarinatus*. The two *N. simakal* **sp. nov.** sequences are a highly divergent (> 20% uncorrected distance) lineage allied to the clade containing *N. eboracensis* and *N. alotau* Zug, 2020 (Fig. 3). The sequences of *Nactus alotau* come from the Lakekamu River basin, Tekadu (Heinicke *et al.* 2010), and the species is distributed from Milne Bay and along the Gulf Coast in south-east Papua New Guinea (Zug 2020).

Systematics

The new species is assigned to *Nactus* based on mtDNA genetics (Fig. 3), and external character states, including: slender, padless digits, angular in profile; all digits clawed; fine dorsal scales with longitudinal rows of enlarged tubercles; pre-anal pores present in males; small size (Kluge 1983; Cogger 2014).

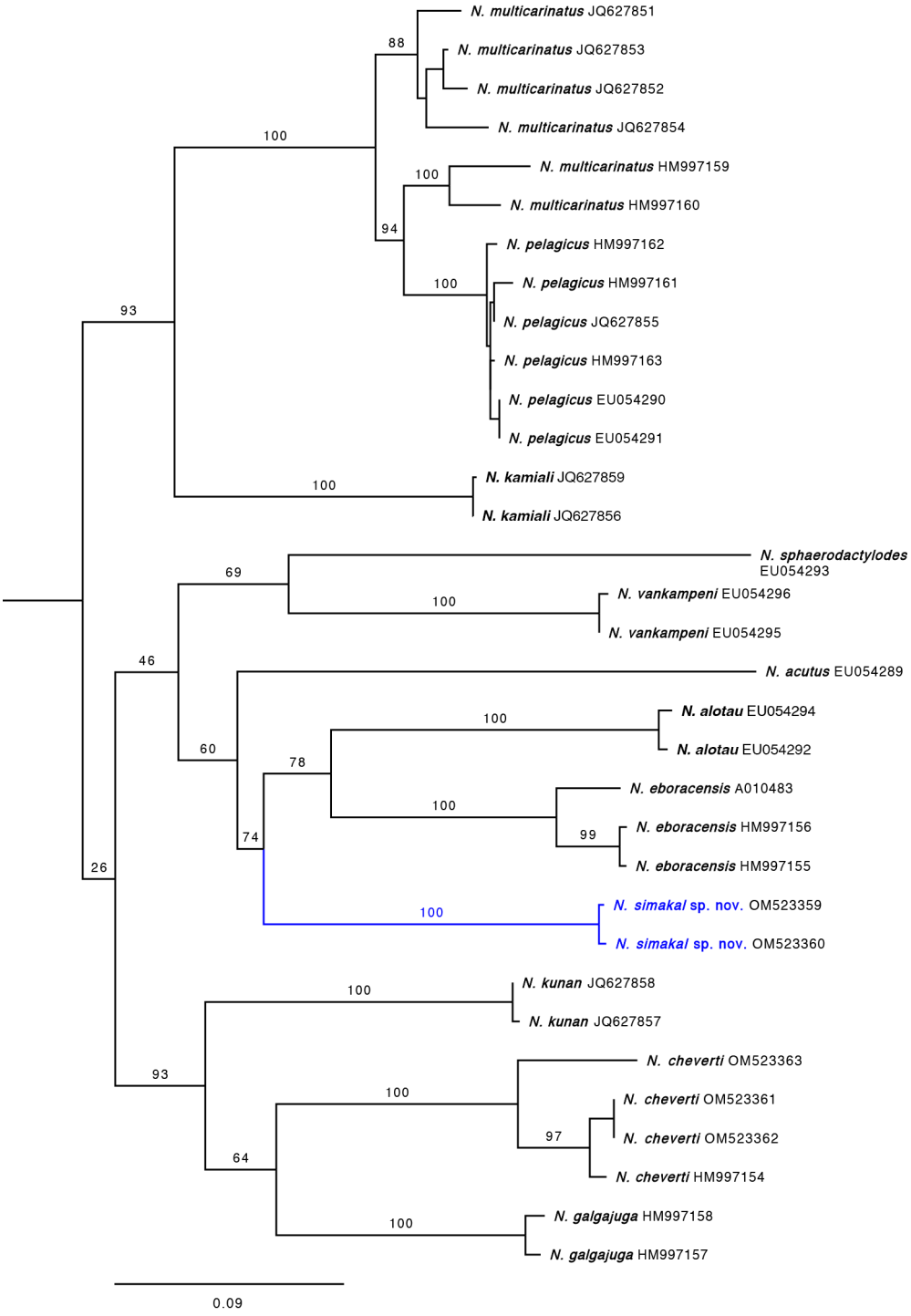

FIGURE 3. Phylogeny of *Nactus* geckos based on approximately 1,075 bp ND2 mtDNA. The two *N. simakal* **sp. nov.** sequences are marked in blue. GenBank accession codes are presented for all sequences. Locality information for sequences is provided in Heinicke *et al.* (2010) and Zug & Fisher (2012). Labelling of *N. alotau* and *N. kamiali* comes from subsequent identification of sequenced populations in Zug (2020). *Dixonius aaronbaueri* was used as the outgroup (not shown). The scale bar shows 9% uncorrected sequence divergence.

***Nactus simakal* sp. nov.**
Dauan Island Gecko
(Figures 4–7)

Material examined. Holotype. Female, QM J97603 (Fig. 4), Dauan Island (-9.41337° S, 142.53781° E; 50 m above sea level), field collection code: conx5934, C. J. Hoskin, K. Aland, A. Davies & A. Zwar, 11/01/2021. **Paratypes.** QM J97602 (field collection code: conx5935), QM J97604 (conx5943), QM J97605 (conx5948), all collection details as for holotype.

Diagnosis. A slender, elongate *Nactus* gecko with strongly banded pattern and prominently keeled subcaudal scales.

Measurements and scale counts of type series. Table 1.

Description of type series. A medium-sized (SVL 44.4–53.6 mm, mean 49.1 mm) *Nactus* with slender body and limbs, a long, slender tail, and a banded pattern. ***Body*.** Moderate length (AG/SVL 0.33–0.41, mean 0.38); slightly flattened; slender (BW/SVL 0.18–0.22, mean 0.20); dorsal scales minute, with longitudinal rows of enlarged tubercles (12–14 rows, mean 13.0, counted at the mid body; 7–8 rows, mean 7.8, counted at the hips), with the rows starting on the back of the head, 'funnelling' through the neck, then extending generally unbroken down the back and flanks and converging above the hips and base of tail (enlarged tubercle count for second parasagittal: 30–35 tubercles, mean 32.3); scales on ventral surfaces of head and body moderate-sized, finely keeled, and increasing in size from throat to subcaudals; typically 2 spurs (post-cloacal tubercles) positioned laterally on either side of the cloaca in both sexes (except holotype, which has 3 on left side, 2 on right side), rounded rather than pointed, more well-defined in males; row of 9 (N = 2) pre-cloacal pores in mature males, aligned in a V-shape, not divided medially, not extending to underside of legs; pre-cloacal pores not evident in females (N = 2); neck long (NL/SVL = 0.17–0.22, mean 0.18). ***Head*.** Distinct from neck; moderately long (HL/SVL = 0.25–0.28, mean 0.26), narrow (HW/SVL = 0.18–0.19, mean 0.18) and flattened (HD/SVL = 0.091–0.104, mean 0.096); snout moderately long (SL/HL = 0.40–0.47, mean 0.44), relatively wide (SW/HW = 0.22–0.22, mean 0.22) and slightly up-turned to give a 'beaky' appearance; snout covered in small granular scales, with some larger tubercles interspersed across the crown; scales diamond-shaped on snout and temporal areas; scales highly variable in shape across crown; rostral scale approximately twice as wide as deep, divided 50–70% (mean 58%) vertically by a medial groove; rostral contacting nostril, scales bordering posterior margin of supra-nasals 13–14 (mean 13.3); scales contacting nostril 6–7 (mean 6.3), counted as all scales contacting the nasal (including the rostral and first supralabial); supralabials, total count 7–8 (mean 7.8); supralabials, count to below middle of eye 3; supralabials all similar shape, but decreasing in size posteriorly; infralabials, total count 7–8 (mean 7.5); infralabials, count to below middle of eye 3; first two infralabials obviously deeper than wide; two large scales contact posterior margin of mental scale and first infralabials, typically contacting each other to exclude granular scales from contacting mental; scales contacting other infralabials then minute and rounded, except for those along the infralabials, which are moderate-sized (but quickly grade ventrally to minute rounded scales on throat); ear opening small and rounded or slightly horizontally or diagonally elongate; eye large (ED/SVL = 0.059–0.072, mean 0.063). ***Limbs.*** Long (FL/SVL = 0.14–0.16, mean 0.15; L1/SVL 0.35–0.38, mean 0.36; LHL/SVL = 0.19–0.20, mean 0.20; L2/SVL 0.47–0.53, mean 0.50); scales on dorsal surface of forelimbs evenly small; scattered large tubercles on posterior thigh and lower hindleg (crus); scales under limbs evenly very small; digits laterally compressed, with small subdigital lamellae, all undivided, with the lamellae being relatively large for the first half of the series and then small to the tip of the digit, with the apical lamellae forming a sheath on the claw; lamellae shape and size progression similar on all digits; finger subdigital lamellae counts (including apical pair): F1 9–10 (mean 9.5), F2 12–14 (mean 13.0), F3 14–15 (mean 14.5), F4 14–16 (mean 14.8), F5 12–13 (mean 12.8); toe subdigital lamellae counts (including apical pair): T1 10–11 (mean 10.3), T2 13–15 (mean 14.0), T3 16–19 (mean 17.5), T4 17–19 (mean 18.0), T5 17–18 (mean 17.8); large scales along the inner and outer edge of the palm and foot, the rest smaller and even-sized. ***Original tail.*** Long (TL/SVL = 1.13–1.39, mean 1.28, N = 3), narrow (TW/SVL = 0.068–0.080, mean 0.074, N = 4), rounded to slightly depressed (TW/TD = 1.02–1.25, mean 1.15, N = 4; TD/SVL = 0.054–0.079, mean 0.065, N = 4), and evenly tapering to a very fine tip; enlarged, longitudinal tubercle rows extend about 10% along base of tail; remaining dorsal scales on tail moderate-sized and pointed; scales on underside of tail large, with angular posterior edge, and obviously keeled; ***Regrown tail.*** No regrown tails in type series. ***Colouration in spirit*** (e.g., Figs 4B, 6). Dorsal pattern consists of prominent dark and pale bands. A thin, dark vertebral line typically connects the dark bands and breaks the pale

bands. Dark bands are black or dark brown; each pale band has a white anterior edge and then grades to dark grey. All individuals share the same number of bands on the body, consisting of a pale nape band, then five pale bands from the shoulders to above the vent (i.e., just posterior to the hips), and five dark bands from the neck to the hips. Dark and pale bands are approximately even width on body. Bands extend along tail, but as unbroken dark and white bands, with the dark bands getting relatively broader along the length. Bands on body and tail fade out abruptly on lower lateral surfaces. Forelimbs faintly banded; hind limbs prominently banded with two or three dark bands on a grey background. Top of head grey or light brown with brown blotches or mottling; dark band extends from snout, above supralabials, through the ear opening, and then in an irregular way around back of crown; pale grey band along canthal ridge; infralabials white, and white markings extending along lower sides of head (and as pale spots along lower flank in some individuals). Ventral surface of head, body and limbs cream or grey/light brown; darker pigment starts posterior to cloaca and underside of tail dark brown to black, with white tail bands not quite connecting initially (Fig. 2A) but then connecting ventrally towards end of tail. Palms and feet dark grey. ***Colour pattern in life*** (Figs 4A, 5, 7A). As described above but all markings more contrasting dark and light. A subadult photographed in life (but not collected) had a similar pattern to the adults but most aspects were more contrasting dark and white, including bright white spots extending from the lower jaw, along the neck and flanks, and down the lower lateral surfaces of the tail (Fig. 5D).

FIGURE 4. Holotype of *N. simakal* **sp. nov.** (QM J97603) in life (A) and preserved (B). Photos: Conrad Hoskin.

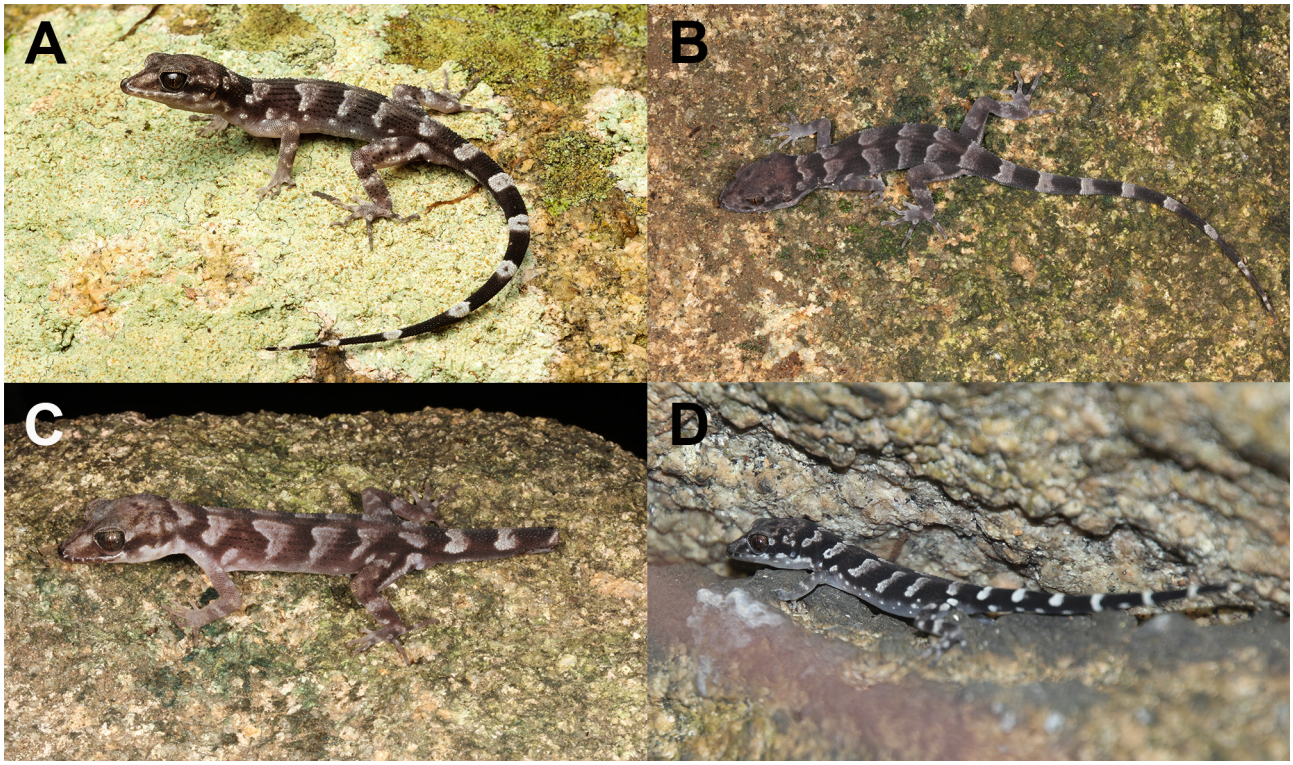

FIGURE 5. *Nactus simakal* **sp. nov.** in life. (A–C) Adults; (D) sub-adult. Photos: (A, D) Alexander Davies; (B, C) Conrad Hoskin.

Comparisons. Readily distinguished from all other *Nactus* (except *N. galgajuga* and *N. kunan*) by obviously banded colour pattern (*versus* all other species light or medium grey/brown dorsal ground colour, with variable dark brown bars/blotches/flecks and white spots/flecks; Zug & Fisher 2012; Zug 2020). Distinguished from *N. kunan* by pale bands being white/grey (*vs* yellow), smaller size (SVL 44.4–53.6 *vs* 56.6 mm), and longer snout–forelimb length (SF/SVL 0.41–0.47 *vs* 0.40) (*N. kunan* data from a single adult female; Zug & Fisher 2012). *Nactus simakal* **sp. nov.** is distinguished from *N. galgajuga* by keeled subcaudal scales (*vs* smooth). In terms of other *Nactus* recorded on Torres Strait islands, *N. simakal* **sp. nov.** is readily distinguished from *N. eboracensis* by keeled subcaudal scales (*vs* smooth), and from *N.* c.f. *papua* by banded body pattern (*vs* brown or grey with dark brown bars or blotches, and white flecks), slender and elongate form (e.g., Fig. 6), and shape differences including longer hindlimbs (LHL/SVL, L2/SVL), longer neck (NL/SVL) and snout–forelimb (SF/SVL), flatter head (HD/SVL), and longer (TL/SVL), thinner (TW/SVL) and flatter (TD/SVL) tail (Table 1).

Genetic data. Two ND2 sequences were deposited on GenBank: OM523359 (specimen: QM J97603; holotype; genetic sample code: conx5934) and OM523360 (specimen: QM J97602; paratype; genetic sample code: conx5935).

Etymology. The species name '*simakal*' is in reference to Simakal Pad, the local language name for Mt Cornwallis (the mountain that dominates Dauan Island). The local language name was provided by Laurie Elisala, Torenzo Elisala, Abi Mooka, Tenny Elisala, and Thomas Mooka.

Distribution. Known only from Dauan Island, in the northern Torres Strait (Fig. 1). The island is only 10.5 km from the mainland of New Guinea but is situated within the boundaries of the state of Queensland, Australia. *Nactus simakal* **sp. nov.** is probably restricted to Dauan Island due to occurrence on deeply piled granite boulder habitat, which is not present to any significant degree on nearby islands or the adjacent New Guinea mainland.

Natural history. Habitat consists of piled granite rock. All observations were made in areas of boulders under a rainforest canopy (e.g., Fig. 8). Observed at night on rock surfaces or in crevices among rocks. Moves quickly across rock surfaces and into deep crevices when disturbed. No information on diet but assumed to feed on invertebrates. No information on breeding biology. Neither of the two females collected in January were carrying eggs.

FIGURE 6. Adult *N. simakal* **sp. nov.** (QM J97603; below) compared with adult *N.* c.f. *papua* (QM J52386, Mer/Murray Island; above). Note the banded pattern, elongate form, and long, slender tail of *N. simakal* **sp. nov.** Photo: Conrad Hoskin.

FIGURE 7. Similarity in general appearance between *N. simakal* **sp. nov.** (A) and *N. galgajuga*. Photos: (A) Conrad Hoskin; (B) Scott Macor.

Conservation. Given restriction to a single island and a very small known area of occurrence on the island, *N. simakal* **sp. nov.** requires conservation assessment. Assuming *N. simakal* **sp. nov.** is found in all piled rock areas across the island, the extent of potential habitat is approximately 1.3 km^2 (or 1.4 km^2 as a minimum convex polygon). Density appears to be low, but this may reflect low detection rather than actual low density. Invasive Asian house geckos, *Hemidactylus frenatus* Duméril and Bibron, 1836, could pose a risk to *N. simakal* **sp. nov.**. *Hemidactylus frenatus* was observed on Dauan Island during the survey but was only seen on buildings and in coastal forests. The species was not detected in the piled boulder habitat occupied by *N. simakal* **sp. nov.**; however, this should be monitored through time given invasion of various natural habitats by *H. frenatus* in other parts of north-east Queensland (Hoskin 2011; Barnett *et al*. 2017, 2018). This invasive species should be recognised as a significant potential threat to *N. simakal* **sp. nov.** given the severe declines documented in several *Nactus* species in the Mascarene Islands due to *H. frenatus* invasion of natural habitats (Cole *et al.* 2005). Other invasive species also pose a potential threat, including invasive ants. Yellow crazy ant (*Anoplolepis gracilipes*) infestations have been shown to impact small lizards in north-east Queensland (Lach *et al.* 2022) and have been implicated in reptile declines on Christmas Island (Smith *et al.* 2012). *Nactus simakal* **sp. nov.** is best considered Data Deficient until further data on distribution, abundance and threats are obtained.

FIGURE 8. Habitat of *N. simakal* **sp. nov.** on Dauan Island. Photo: Conrad Hoskin.

Discussion

Nactus simakal **sp. nov.** is the second described vertebrate species regarded as truly endemic to islands of the Torres Strait. The other, the Bramble Cay Melomys *Melomys rubicola* (now extinct), was only known to occur on Bramble Cay (Maizab Kaur) in the far north-east of the Torres Strait region. The rainbow skink *Carlia quinquecarinata* is known with certainty from Erub (Darnley) and Mer (Murray) Islands but may also occur on Dauan Island and the adjacent New Guinea mainland (Donnellan *et al.* 2009; Bragg *et al.* 2018; CJH, unpub. data). It is likely that *N. simakal* **sp. nov.** is restricted to Dauan Island, given its apparent dependence on the deeply piled granite geomorphology of the island. This geomorphology does not occur on the adjacent islands (Saibai and Boigu) or the far southern region of New Guinea, which are essentially flat and lack significant exposed rock. Surveys of other Torres Strait islands have found *N. eboracensis* and *N.* cf. *papua* (Fig. 1). Interestingly, neither of these two species were found on Dauan Island during this survey or on a previous survey (Lavery *et al.* 2012). Further survey effort is warranted on Dauan Island for other *Nactus* species and to better resolve the distribution of *N. simakal* **sp. nov.** across the island.

Nactus simakal **sp. nov.** resembles *N. galgajuga* in general appearance—in having a banded pattern, slender form, large eyes, a 'beaky' face, and a long, slender tail (Fig. 7). This is likely the result of similar adaptations to a saxicoline lifestyle in deeply piled boulder habitats (*N. galgajuga* occupies the exposed granite boulder-fields of Black Mountain, 750 km south; Fig. 1). Interestingly, *Saltuarius eximius* Hoskin & Couper, 2013, a leaf-tailed gecko restricted to piled granite boulder-fields at Cape Melville, also shares a slender form, beaky face, and large eyes (Hoskin & Couper 2013). Despite general similarity, *N. simakal* **sp. nov.** does not appear to be closely related to *N. galgajuga* (Fig. 3) and similarity in morphology and pattern is likely independently evolved.

Phylogenetically (at least for ND2), *N. simakal* **sp. nov.** is in a clade that contains *N. eboracensis*, of Cape York and Torres Strait islands, and *N. alotau*, a species of south-east coastal areas of Papua New Guinea (Fig. 3). Genetic data is not available for *N.* c.f. *papua* and *N. inundatus*, distributed in the Torres Strait and southern Papua New Guinea, respectively (Fig. 1). Of interest is that *N. simakal* **sp. nov.** and *N. alotau* have keeled subcaudal scales, while *N. eboracensis* has smooth subcaudals. In another clade, *N. kunan*, a species from the Admiralty Islands (PNG), has keeled subcaudals and two Australian species, *N. cheverti* and *N. galgajuga*, have smooth subcaudals.

In both clades the basal species has keeled subcaudals. A much more comprehensive phylogeny of Australo-Papuan *Nactus* is required, including many nuclear genes and many more New Guinean populations/species, to resolve the biogeographic history and morphological evolution of this interesting group.

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APPENDIX. Additional material examined.

Nactus* c.f. *papua (all localities in Torres Strait, Queensland, Australia; specimens listed as *Nactus pelagicus* in the Queensland Museum register):
J26003, J26004, J26006, Booby Island (10° 36’ S; 141° 55’ E); J52384, J52386–J52388, Murray Island (09° 56’ S; 144° 02’ E); J86735, Prince of Wales Island (10° 42’ 18” S; 142° 13’ 18” E); J87712, Mer Island (09° 54’ 26” S; 144° 03’ 24” E); J88956, Hammond Island (10° 32’ 6” S; 142° 13’ 37” E); J88963, Hammond Island (10° 33’ 16” S; 142° 12’ 12” E); J88973, Goldmine Ck, Hammond Island (10° 33’ S; 142° 13’ E); J93503, Ullu Island (10° 10’ 9” S; 142° 40’ 25” E).