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A biogeographical puzzle: description of two new frog species (Microhylidae: *Callulops* and *Choerophryne*) from boulder-field habitat of Dauan Island, Torres Strait, Australia

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Abstract

A targeted reptile and frog survey of Dauan Island, in the northern Torres Strait between Australia and New Guinea, found two frog species that could not be assigned to known species. These are described herein, based on differences in morphology and call to congeners. *Callulops gobakula* **sp. nov.** and *Choerophryne koeypad* **sp. nov.** are restricted to deep boulder-field habitat and are almost certainly endemic to Dauan Island. Dauan Island sits in a broad region of low microhylid diversity (northern Cape York, Torres Strait and southern New Guinea), and the species are biogeographically remarkable in being distributed well to the south of congeners. The nearest *Callulops* record is 200 km north (and all other records are over 280 km north of Dauan Island) and the nearest *Choerophryne* records are about 280 km north, associated with the Central Cordillera of New Guinea. This indicates that both genera were once much more widespread but contracted away from the Torres Strait and southern lowlands of New Guinea due to historical climate drying and loss of wet rainforests. Their persistence on Dauan Island can be attributed to climatic buffering in the deep boulder-fields in which they live. Both species currently warrant a Vulnerable IUCN listing under Criterion D2. Further surveys are required to map their distribution and abundance on Dauan Island, and to assess potential threats. The new species add two new genera to the Australian faunal list, albeit due to an arbitrary political boundary that extends Australian territory nearly to the New Guinean coast.

Key words: Asterophryinae, New Guinea, Queensland, saxicoline

Introduction

Microhylidae is represented in Australia and New Guinea by the subfamily Asterophryinae. Species and generic diversity are exceptionally high in New Guinea, with 15 genera and over 250 species described thus far (Frost 2024; AmphibiaWeb 2025), but are comparatively low in Australia, with only two genera (*Cophixalus* and *Austrochaperina*) and 24 species (Hoskin 2013). In New Guinea, microhylid frog diversity is highest in association with the mountains of the Central Cordillera and ranges along the northern coast (Fig. 1; Oliver *et al.* 2022). In Australia, microhylid diversity is largely restricted to the coastal mountains of the Wet Tropics region (between Townsville and Cooktown) (Fig. 1), with a small number of additional species on Cape York and one in the far north of the Northern Territory (Hoskin 2004). Between the northern Wet Tropics and the rainforest lowlands of the Central Cordillera is an approximately 1000 km stretch with lower density of microhylid records (Fig. 1) and fewer species (Hoskin 2004; Hoskin & Aland 2011; Oliver *et al.* 2022). This 'gap' in microhylid records and diversity is driven by seasonally drier climates, resulting in the predominance of savannah vegetation, and marine environments.

Cape York comprises the southern 600 km of this 'gap' and is dominated by drier habitat types, with microhylid species largely restricted to highly localized rainforest areas and deep boulder-fields in low-elevation coastal ranges (Hoskin 2004, 2013; Hoskin & Aland 2011). The widespread, habitat-generalist *Austrochaperina gracilipes* Fry, 1912 occurs through much of northern Cape York and is the only species shared between Cape York and southern New Guinea (Fig. 1). Between Cape York and southern New Guinea is the Torres Strait, a shallow sea of approximately 150 km width and averaging 10 m depth. The scattered low-elevation islands have relatively low

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vertebrate diversity (Lavery *et al.* 2012), and *A. gracilipes* was the only microhylid recorded prior to this study. The northern part of the 'gap' is the southern lowlands of New Guinea, including the Trans-Fly Region (Fig. 1). A number of widespread microhylid species occur through this area, including in the seasonally dry habitats of the Trans-Fly Region (Fig. 1; Allison 2006), but the lowlands are relatively depauperate until you reach the wetter rainforest foothills of the Central Cordillera (e.g., Richards 2018, 2025), 250 km or more north of the Torres Strait.

Here I describe two new microhylid frog species found during a targeted frog and reptile survey of a northern island in the Torres Strait — Dauan Island. The island is only 11 km from the coastline of New Guinea (Fig. 1) but is politically part of Australia, with the northern boundary of the state of Queensland extending to the northern islands of the Torres Strait. Dauan Island is also geologically allied to Australia because the 275 m elevation granite boulder-mountain that comprises the island represents one of the northernmost extensions of the Australian continental basement outcropping (Loffler 1977). These frogs are exceptional, biogeographically, because they are the first range-restricted microhylid species found in the northern Cape York/Torres Strait/Trans-Fly region and because they belong to two genera — *Callulops* and *Choerophryne* — with all congeners occurring over 200 km and 280 km, respectively, to the north of Dauan Island. *Callulops* and *Choerophryne* are speciose genera, with 29 and 39 described species respectively (Frost 2024; AmphibiaWeb 2025), and the diversity of both is highest in the Central Cordillera and northern ranges of New Guinea.

Methods & Results

The following morphology and call measures were taken from the type series of both species, with methodology aligned with that of other studies on these two genera, particularly Kraus & Allison (2005a, 2009a). Morphology and call data were compared to data of congeners taken from the following species descriptions and revisions: *Callulops*: Barbour (1910); Boettger (1895); Boulenger (1888, 1898, 1914); Günther (2013); Günther *et al*. (2012); Kraus (2012, 2019); Kraus & Allison (2003, 2009a); Loveridge (1948); Méhely (1901); Mertens (1930); Oliver *et al.* (2012); Peters (1867); Richards *et al.* (1995); Vogt (1911); Werner (1901); Zweifel (1972); *Choerophryne*: Burton & Zweifel (1995); Günther (2008); Günther & Richards (2011, 2017, 2018); Günther *et al*. (2018); Iannella *et al*. (2014); Iannella *et al*. (2015); Kraus (2010, 2013, 2018); Kraus & Allison (2001, 2005a, 2005b, 2009b); Menzies (1999); Richards & Burton (2003); Richards *et al*. (2007); and a general source for New Guinea microhylids: Menzies (2006).

***Morphology*.** All measurements on the type series were taken using Mitutoyo electronic calipers and rounded to the nearest 0.1 mm. The following traits were measured, following the definitions in Kraus & Allison (2005a, 2009a): snout-to-vent length (SVL), tibia length from heel to outer surface of flexed knee (TL–knee); tibia length from heel to skinfold on knee (TL–fold; only for *Callulops*; skinfold absent on *Choerophryne*); arm length (ArmL) from elbow to tip of 3rd finger; forearm length (FA), calculated as ArmL minus HandL; head width (HW) at widest point of head, usually at tympana; head length (HL), from posterior edge of tympanum to tip of snout (not possible for *Choerophryne* due to lack of visible tympanum); horizontal eye diameter (EYE); horizontal diameter of tympanum (TYM; not possible for *Choerophryne* due to lack of visible tympanum); internarial distance (IN), distance between centers of nares; eye-to-naris distance (EN), distance between anterior edge of eye and center of naris; snout length (SN), from anterior edge of eye to tip of snout (measured in a straight line from eye to snout, rather than in lateral projection); hand length (HandL), from proximal margin of palm (or proximal margin of metacarpal tubercle) to tip of third finger; foot length (FootL), from proximal margin of sole (or proximal margin of metatarsal tubercle) to tip of fourth toe; third finger length (F3L), from proximal margin of palm to tip of finger; fourth toe length (T4L), from proximal margin of sole to tip of toe; transverse width of discs on first and third fingers (1FD and 3FD, respectively); transverse width of discs on first and fourth toes (1TD, 4TD). Other morphological traits assessed included: presence/absence of marginal grooves on all finger and toe discs; presence/absence of webbing between all fingers and toes; presence/absence of metacarpal and metatarsal tubercles; counts of obvious subarticular tubercles on toes. Some specimens were known to be males because they were observed calling in the field. The female *Callulops* were confirmed as such through dissection in the lab to reveal oviducts and eggs.

Table 1 presents measurements and select proportions for all four individuals in the type series of each species.

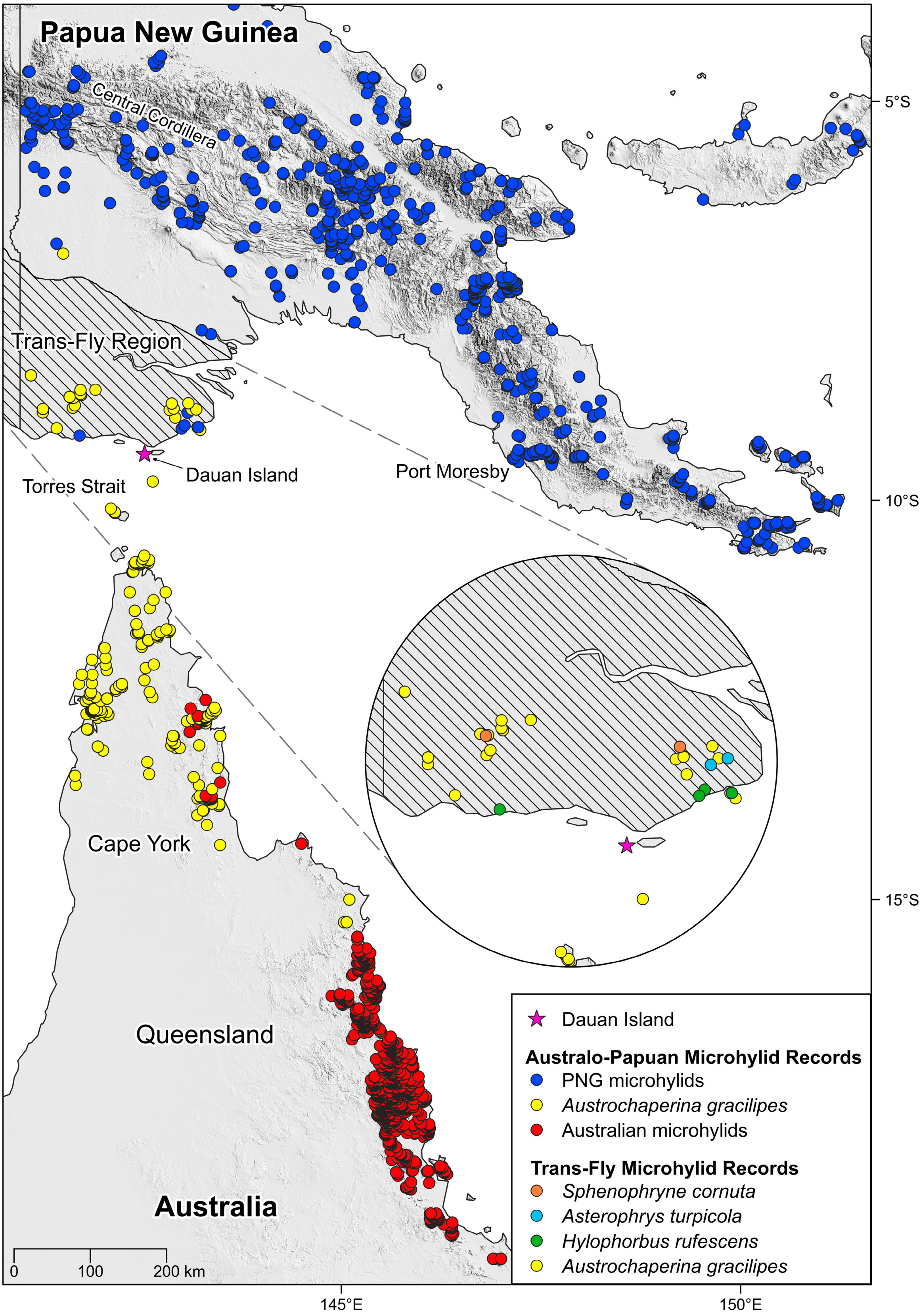

FIGURE 1. Map of northern Queensland (Australia) and Papua New Guinea, showing microhylid occurrence records from the Atlas of Living Australia (https://www.ala.org.au), the Online Zoological Collections of Australian Museums (https://ozcam.org.au), VertNet (http://www.vertnet.org/), species descriptions, and other published sources. Yellow dots show *Austrochaperina gracilipes* records. All other microhylid species on the main Papua New Guinea map are grouped as blue dots, but the inset shows species-specific records in the Trans-Fly Region. All *Cophixalus* species records in Australia are grouped as red dots.

TABLE 1. Morphological measurements and ratios for the type specimens of *Callulops gobakula* **sp. nov.** (QM J98925–28) and *Choerophryne koeypad* **sp. nov.** (QM J98929–32). All measurements are in mm. See Methods for explanation of traits.

	Callulops gobakula **sp. nov.**				*Choerophryne koeypad* **sp. nov.**			
	J98925	**J98926**	**J98927**	**J98928**	**J98929**	**J98930**	**J98931**	**J98932**
	Holo.	Para.	Para.	Para.	Holo.	Para.	Para.	Para.
	Male	Male	Female	Female	Male	Male	Male	Male
Measures								
SVL	51.1	48.5	51.8	50.8	21.0	20.0	21.2	21.1
HW	17.8	17.5	18.2	17.8	7.1	7.7	7.3	7.9
HL	15.9	15.7	16.3	15.6				
SN	6.2	5.6	6.2	5.6	2.9	2.8	3.0	2.8
EN	3.3	3.6	4.2	3.6	2.0	1.8	1.9	1.9
IN	4.0	4.0	4.2	4.1	1.7	1.6	1.6	1.6
EYE	5.0	4.5	4.8	4.6	2.2	2.3	2.1	2.3
TYM	3.1	3.3	4.2	3.5				
ArmL	22.5	22.0	22.1	22.6	9.8	10.0	9.5	10.2
FA	21.0	20.7	20.6	21.2	4.9	4.9	4.8	5.3
HandL	13.4	12.2	13.4	12.7	4.9	5.1	4.7	4.9
F3L	8.3	7.7	8.1	8.7	2.9	3.1	3.0	2.9
3FD	1.4	1.2	1.5	1.3	1.3	1.4	1.0	1.3
1FD	1.2	1.2	1.3	1.2	0.8	0.8	0.6	0.8
TL–knee	20.5	19.9	21.2	20.5	8.3	8.4	8.9	8.8
TL–fold	18.1	18.2	18.6	19.0				
FootL	21.5	20.6	21.0	20.0	6.7	6.7	6.6	6.5
T4L	14.1	12.2	12.7	12.7	3.4	3.8	3.5	3.8
4TD	1.5	1.3	1.6	1.4	1.2	0.9	0.7	0.8
1TD	1.1	1.2	1.1	1.0	1.0	0.9	0.7	0.8
Ratios								
HW/SVL	0.35	0.36	0.35	0.35	0.34	0.38	0.35	0.37
HL/SVL	0.31	0.32	0.31	0.31				
HL/HW	0.90	0.90	0.90	0.88				
SN/SVL	0.12	0.12	0.12	0.11	0.14	0.14	0.14	0.13
EN/SVL	0.064	0.073	0.080	0.071	0.096	0.092	0.090	0.091
IN/SVL	0.078	0.082	0.081	0.081	0.080	0.081	0.074	0.077
EN/IN	0.82	0.90	1.00	0.87	1.20	1.13	1.22	1.17
EYE/SVL	0.097	0.093	0.093	0.091	0.106	0.117	0.101	0.107
TYM/SVL	0.061	0.067	0.082	0.068				
ArmL/SVL	0.44	0.45	0.43	0.44	0.46	0.50	0.45	0.48
FA/SVL	0.18	0.20	0.17	0.19	0.23	0.24	0.23	0.25
HandL/SVL	0.26	0.25	0.26	0.25	0.23	0.25	0.22	0.23

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TABLE 1. (Continued)

	Callulops gobakula **sp. nov.**				*Choerophryne koeypad* **sp. nov.**			
	J98925	**J98926**	**J98927**	**J98928**	**J98929**	**J98930**	**J98931**	**J98932**
	Holo.	Para.	Para.	Para.	Holo.	Para.	Para.	Para.
	Male	Male	Female	Female	Male	Male	Male	Male
F3L/SVL	0.16	0.16	0.16	0.17	0.14	0.15	0.14	0.14
3FD/SVL	0.027	0.025	0.028	0.025	0.063	0.070	0.049	0.060
1FD/SVL	0.023	0.024	0.024	0.024	0.039	0.038	0.028	0.036
TL–knee/SVL	0.40	0.41	0.41	0.40	0.39	0.42	0.42	0.42
TL–fold/SVL	0.35	0.38	0.36	0.37				
FootL/SVL	0.42	0.42	0.41	0.39	0.32	0.33	0.31	0.31
T4L/SVL	0.28	0.25	0.24	0.25	0.16	0.19	0.17	0.18
4TD/SVL	0.029	0.026	0.031	0.028	0.058	0.046	0.034	0.040
1TD/SVL	0.022	0.025	0.022	0.020	0.047	0.043	0.033	0.037
3FD/4TD	0.92	0.95	0.92	0.90	1.08	1.52	1.42	1.51

SVL was measured for additional *Callulops* individuals in the field, using Mitutoyo vernier calipers to the nearest 0.1 mm. Sex of unvouchered *Callulops* in life was determined by whether they were calling (males) and by the more rotund body shape of probable females. Sub-adult *Callulops* were determined based on smaller size and ornate colour pattern.

Call. Two individuals of each species were recorded in the field: *Callulops* QM J98925, QM J98926; *Choerophryne* QM J98929, QM J98930. Calls were recorded with an Edirol R09 recorder and a Sennheiser (K6 ME-66) directional microphone. Call traits were measured from up to five calls of each individual, using Raven Lite version 2.0.5. The following traits were measured for each call: call duration, from beginning of first note of call to end of last note of call; number of notes; note rate, number of notes divided by duration from beginning of first note to beginning of last note; dominant frequency, measured across the entire call, and measured as the frequency/frequencies with the most energy in the spectrum view; note length, from beginning to end of note, averaged for the middle three notes in the call; note interval, from end of note to beginning of next note, averaged between middle four notes in the call; call interval, measured from end of last note of a call to beginning of first note of the next call. All measures were averaged across calls within an individual and then these values were used to generate the average call metrics for the species.

Table 2 presents the measurements for all calls assessed for both species.

Genetics. A section of 16S mtDNA was sequenced to assess generic placement of the two species. Four individuals were sequenced — two of the larger species and two of the smaller species. The primers 16Sar and 16Sbr were used and PCR conditions were as per Hoskin (2004). The resulting sequences were assessed against sequences on GenBank. The two sequences of the larger species (QM J98926 = GenBank PQ667885; QM J98927 = PQ667886) were most similar (average of 2.5% divergence) to the sequences of *Callulops robustus* (Boulenger, 1898) from Namosado (6.25° S, 142.7833° E, PNG; GenBank KC179971; de Sá *et al.* 2012) and Magidobo (6.1833° S, 142.7667° E, PNG; KM509105; Peloso *et al.* 2016); but '*C. robustus*' at both these localities would now be considered *C. omnistriatus* Kraus & Allison, 2009a. The two sequences of the smaller species from Dauan Island (QM J98929 = PQ667887; QM J98931 = PQ667888) were most similar to a sequence of *Choerophryne exclamitans* (Kraus & Allison, 2005a) (Genbank KM509085; 6.1015° S, 146.5581° E, Abalgamut, Huon Peninsula, PNG; Peloso *et al.* 2016), with approximately 3% divergence. The genetic data were used solely to assess the generic placement of the new species and were not used to assess species status or phylogenetic relationships to other species due to the paucity of species represented by this section of 16S on GenBank. Justification for recognizing the species was based entirely on morphological and call data.

TABLE 2. Call measurements for two individuals of *Callulops gobakula* **sp. nov.** (QM J98926, QM J98925) and *Choerophryne koeypad* **sp. nov.** (QM J98930, QM J98929). Dom. Freq. 1 and Dom. Freq. 2 are the dominant frequency peaks, with two peaks in *C. gobakula* **sp. nov.** and one in *C. koeypad* **sp. nov.** calls.

	Call duration (s)	Number of notes	Note rate (notes/s)	Dom. freq. 1 (Hz)	Dom. freq. 2 (Hz)	Note length (s)	Note interval (s)	Call interval (s)
C. gobakula **sp. nov.**								
J98925								
call 1	2.24	9	4.19	1029	1591	0.098	0.160	30.83
call 2	2.49	10	4.22	1029	1624	0.103	0.145	36.32
call 3	2.69	10	3.86	1029	1704	0.101	0.164	45.21
call 4	2.55	10	4.10	1045	1704	0.102	0.172	37.16
call 5	2.53	10	4.12	1029	1688	0.104	0.179	
J98926								
call 1	2.50	11	4.56	1061	1511	0.097	0.140	21.17
call 2	2.20	9	4.31	1093	1447	0.092	0.156	26.31
call 3	2.91	12	4.29	1093	1511	0.107	0.134	
C. koeypad **sp. nov.**								
J98929								
call 1	2.07	13	6.40	2934		0.0475	0.124	1.45
call 2	1.73	11	6.47	2934		0.0475	0.123	1.54
call 3	1.64	10	6.21	2901		0.0542	0.133	2.49
call 4	3.17	19	6.13	2885		0.0502	0.132	1.67
call 5	2.80	17	6.18	2901		0.0510	0.130	1.66
J98930								
call 1	1.16	7	6.36	3077		0.0511	0.144	1.23
call 2	0.78	5	6.94	3077		0.0593	0.110	1.00
call 3	1.21	7	6.14	3092		0.0454	0.155	1.81
call 4	0.96	6	6.52	3077		0.0453	0.150	1.98
call 5	0.96	6	6.45	3092		0.0522	0.134	1.69

Systematics

The new species are assigned to genus based primarily on the 16S mtDNA data outlined above. Assessment of external morphology and call further supported the generic assignments. This includes the following traits for *Callulops*: moderate to large body size; stout body; short, broadly rounded snout; digital discs typically not or only slightly expanded, and narrower than those on the toes; croaking call (Zweifel 1972; Günther 2009; Oliver *et al.* 2012; Kraus 2019). For *Choerophryne*, this includes small size (generally <20 mm); fifth toe longer than third; discs of fingers broader than those of toes (Günther & Richards 2017; Günther *et al.* 2018). Internal morphological traits were not assessed, to limit damage on the few specimens in each type series.

***Callulops gobakula* sp. nov.**

Gobakula Frog

(Figures 2–4)

Material examined. Holotype. QM J98925, field number conx5942, male, calling when captured, Dauan Island (9.4227° S, 142.5301° E), 12 January 2021, C. J. Hoskin, K. Aland, A. Davies, A. Zwar. **Paratypes.** QM J98926, field number conx5925, calling male; QM J98927, field number conx5926, female, with eggs; QM J98928, field number conx5927, female, with eggs. Collection details as for holotype.

Diagnosis. A medium-sized *Callulops* (male SVL 48.5–51.1 mm; females 48.5–52.2 mm), with moderately long hindlimbs (TL–knee/SVL 0.40–0.41), distinctly enlarged finger and toe discs of approximately equal width (3FD/4TD 0.90–0.95), all discs with a terminal (circum-marginal) groove (but can be indistinct on 1st finger), moderately long hands (HandL/SVL 0.25–0.26) and feet (FootL/SVL 0.39–0.42), relatively small eye (EYE/SVL 0.094–0.097), two subarticular tubercles on toe 4, distinct tympanum, relatively smooth skin, adult dorsal colour uniform brown, subadults patterned with gold or orange blotches and flecks, and call a series of 9–12 croaks (notes) uttered at 3.9–4.6 notes/s, for a call duration of 2.2–2.9 s, with two dominant frequency peaks at about 1.06 and 1.58 kHz.

FIGURE 2. The holotype (QM J98925) of *Callulops gobakula* **sp. nov.**

Description of type series. Measurements and proportions of the type series are presented in Table 1. A medium-sized *Callulops* (SVL mean 50.5 mm, range 48.5–51.8 mm); the two adult males (calling when collected) and two adult females (with well-developed eggs) similar in size (males 48.5 mm, 51.1 mm; females 50.8 mm, 51.8 mm). Head wide (HW/SVL 0.35–0.36), wider than long (HL/HW 0.88–0.90); broadly triangular in dorsal view, snout moderately long (SN/SVL 0.11–0.12); canthus rostralis rounded; loreal region steeply oblique, almost vertical, slightly concave posterior to naris; nostrils rounded, directed laterally, closer to tip of snout than to eyes; tip of snout broad (IN/SVL 0.078–0.082); internarial distance slightly greater than, or about equal to, distance from naris to eye (EN/IN 0.82–1.00); snout rounded in lateral view, moderately truncate (but still slightly rounded) in dorsal view; eyes of moderate size (EYE/SVL 0.094–0.097; EYE/SN 0.78–0.83); tympanum moderate size (TYM/SVL 0.061–

0.082), obviously distinct (QM J98928), reasonably distinct (QM J98926, QM J98927) or indistinct (QM J98925); with a minimal (QM J98927), moderately distinct (QM J98925), or obvious supratympanic fold (QM J98926, QM J98928) extending from behind eye over tympanum and terminating above forelimb. Relatively long forearm, hand and 3rd finger (ArmL/SVL 0.43–0.45; FA/SVL 0.17–0.20; HandL/SVL 0.25–0.26; F3L/SVL 0.16–0.17). Relative length of fingers 3>4≅2>1, with fingers 2 and 4 of similar length, and finger 3 conspicuously long; fingers unwebbed; discs present on all fingers, slightly less than twice width of penultimate phalanges; largest on 3rd finger (3FD/SVL 0.025–0.028), smallest on 1st finger (1FD/SVL 0.023–0.024), rounded on fingers 1 and 2, slightly truncate on fingers 3 and 4; circum-marginal grooves present on all finger discs but typically indistinct (faint) on finger 1 (but distinct on QM J98928), moderately distinct to distinct on finger 2, and distinct on fingers 3 and 4; subarticular tubercles prominent, one on fingers 1 and 2; two on fingers 3 and 4; inner and two outer metacarpal tubercles low, elongate. Relatively long hindlimb, foot and 4th toe (TL–fold/SVL 0.35–0.38; TL–knee/SVL 0.40–0.41; FootL/SVL 0.39–0.42; T4L/SVL 0.24–0.28). Relative length of toes 4>3>5≅2>1, toe 4 conspicuously long; toes unwebbed; discs present on all toes, twice width of penultimate phalanges, widest on toe 4 (4TD/SVL 0.026–0.031), narrowest on toe 1 (1TD/SVL 0.020–0.025), larger than those of fingers (3FD/4TD 0.90–0.95), rounded on toes 1–3, slightly truncate on toes 4 and 5; all toe discs with distinct circum-marginal grooves; one prominent subarticular tubercle on each of toes 1 and 2; two low but prominent subarticular tubercles on each of toes 3, 4 and 5, those on toe 4 are on the two most distal joints; inner metatarsal tubercle small but prominent, oval shaped; no metatarsal tubercle. ***Skin texture in preservative***. Dorsal, lateral and ventral surfaces perfectly smooth (Fig. 2). ***Colouration in preservative***. Dorsal colour uniformly purplish brown (Fig. 2); indistinct paler crescent above shoulder on each side (absent on QM J98927). Ventral surfaces cream or light brown, with purplish tinge around margins of throat and belly and on underside of limbs. Palmar surfaces light brown, with some paler areas and fine white stippling; palmar and subarticular tubercles pale grey. Plantar surfaces brown; metatarsal and subarticular tubercles grey. Pupil horizontal (but usually heavily dilated).

Colour pattern and skin texture in life. ***Adults***. Fairly uniform brown across all dorsal surfaces, with fine mottling of darker and lighter brown (Fig. 3A–D). Faint gold/cream crescent on each shoulder, above forelimb insertion, and faint gold marking between eye and tympanum. Paler brown/grey on tip of snout, along jawline, and on eyelids and knees, and paler patches on tops of hands, feet and digits. Dorsal brown colour becomes lighter on lateral surfaces and grades to light brown or cream on the ventral surfaces, which are unpatterned. Iris black, with heavy copper stippling. Variation among adults is minimal (e.g., Fig. 3A–D) except that some are lighter in all aspects of colour pattern, including a lighter brown or golden–brown dorsum, whiter lateral and ventral surfaces, and more prominent cream or golden crescent above the shoulder and between the eye and tympanum. Dorsal surfaces smooth or finely rugose (Fig. 3A–D); ventral surfaces smooth. ***Subadults*** (Fig. 3E–F). Dorsal surfaces more patterned than adults, typically bright golden on top of head and dorsum, becoming more blotched and flecked golden on a dark brown ground colour on the posterior half of the back, and with golden flecks on the dorsal surfaces of the arms and legs. Crescent above arms and small blotch between eye and tympanum prominent golden or orange (Fig. 3E–F). Some individuals have bright orange flecks on the back and tops of hindlimbs. Sides of face dark brown. Ventral markings dark brown or grey, with white flecks. Dorsal surfaces smooth or finely rugose; ventral surfaces smooth.

SVL measurements of additional, unvouchered animals in life. Calling males: 49.1 mm, 50.1 mm; probable females: 48.5 mm, 50.5 mm, 51.9 mm, 52.2 mm; subadults (based on more ornate colour pattern): 38.1 mm, 39.4 mm.

Call. A series of croaks: "rark, rark, rark, rark…", starting quietly and becoming louder through the call (Fig. 4). Call parameters are presented in Table 2, and have the following average values (with range in parentheses): call duration 2.52 s (2.20–2.91); number of notes 10.2 (9–12), note rate 4.24 notes/s (3.86–4.56); dominant frequency (two clear energy peaks of similar magnitude in the spectrum view), peak one 1057 Hz (1029–1093), peak two 1576 Hz (1447–1704); note length 0.100 s (0.092–0.107); note interval 0.154 s (0.134–0.179); call interval 30.56 s (21.17–45.21).

Comparisons. I first compare *C. gobakula* **sp. nov.** to all congeners, and then in more detail to the morphologically most similar species, *C. omnistriatus*.

The medium body size of *C. gobakula* **sp. nov.** (male SVL 48.5–51.1 mm; females 48.5–52.2 mm) distinguishes it from five smaller species (which all attain maximum SVL < 40 mm, at least for males): *C. boettgeri* (Méhely, 1901); *C. dubius* (Boettger, 1895); *C. eremnosphax* Kraus & Allison, 2009; *C. fuscus* (Peters, 1867); *C. glandulosus* (Zweifel, 1972). Body size also distinguishes *C. gobakula* **sp. nov.** from many species that attain substantially larger size (all attain SVL > 70 mm): *C. argus* Kraus, 2019; *C. bicolor* Kraus, 2019; *C. doriae* (Boulenger, 1888); *C. personatus* (Zweifel, 1972); *C. robustus*; *C. stellatus* Kraus, 2019; *C. stictogaster* (Zweifel, 1972); *C. taxispilotus* Kraus, 2019; *C. valvifer* (Barbour, 1910). The moderately long hindlimbs of *C. gobakula* **sp. nov.** (TL–knee/SVL 0.40–0.41) distinguish it from many species with short hindlimbs (TL–knee/SVL maximum < 0.38): *C. comptus* (Zweifel, 1972); *C. fojaensis* Oliver, Richards & Tjaturadi, 2012; *C. fuscus*; *C. glandulosus*; *C. humicola* (Zweifel, 1972); *C. kampeni* (Boulenger, 1914); *C. kopsteini* (Mertens, 1930); *C. personatus*; *C. sagittatus* Richards, Burton, Cunningham & Dennis, 1995; *C. stictogaster*; *C. wilhelmanus* (Loveridge, 1948); and from those with particularly long hindlimbs (TL–knee/SVL minimum > 0.43): *C. biakensis* Günther, Stelbrink & von Rintelen, 2012; *C. boettgeri*; *C. dubius*; *C. marmoratus* Kraus & Allison, 2003; *C. mediodiscus* Oliver, Richards & Tjaturadi, 2012; *C. neuhaussi* (Vogt, 1911); *C. yapenensis* Günther, Stelbrink & von Rintelen, 2012. It further differs from the morphologically similar species, *C. mediodiscus*, by having shorter hands and feet (HandL/SVL 0.25–0.26 *vs* 0.28–0.30; FootL/SVL 0.39–0.42 *vs* 0.48–0.54) and a call that has more notes (9–12 *vs* 4) that are uttered at a faster note rate (3.86–4.56 notes/s *vs* 1.42–1.49 notes/s). The relatively smooth dorsal and lateral skin of *C. gobakula* **sp. nov.** differs from the pustulose skin of: *C. argus*; *C. bicolor*; *C. doriae*; *C. microtis* (Werner, 1901); *C. neuhaussi*; *C. robustus*; *C. stellatus*; and *C. taxispilotus*. *Callulops gobakula* **sp. nov.** has circum-marginal grooves on all toe and finger discs (but can be indistinct on 1st finger), which separates it from the following species with circum-marginal grooves absent from all toe and finger discs: *C. argus*, *C. bicolor*, *C. glandulosus*, *C. stellatus*, *C. stictogaster*; and those with grooves absent from finger discs: *C. doriae*, *C. neuhaussi*, *C. robustus*; and those with grooves absent from fingers 1 and 2: *C. eremnosphax*. The presence of distinctly expanded finger and toe discs distinguishes *C. gobakula* **sp. nov.** from four species that lack discs entirely: *C. glandulosus*, *C. sagittatus*, *C. stictogaster*, *C. wilhelmanus*; and from species that have discs only minimally expanded: *C. comptus*, *C. fojaensis*. *Callulops gobakula* **sp. nov.** differs from *C. wondiwoiensis* Günther, Stelbrink & von Rintelen, 2012 and *C. yapenensis* by having a smaller eye (EYE/SVL 0.091–0.097 *vs* 0.107–0.125 and 0.135, respectively), a greater EN/IN ratio (0.82–1.00 *vs* 0.64–0.88 and 0.74, respectively), and an obviously different call, including faster note rate (mean 4.24 notes/s *vs* mean 2.18 notes/s and 2.55 notes/s, respectively) and lower dominant frequency (mean 1.58 kHz *vs* mean 1.75 kHz and 2.2 kHz, respectively).

Callulops gobakula **sp. nov.** is most similar to *C. omnistriatus*, but it differs in many morphological traits, including smaller males (SVL 48.5–51.1 mm *vs* 55.0–59.6 mm) and females (SVL 48.5–52.2 mm *vs* 49.9–66.9 mm); having shorter hindlimbs (TL–knee/SVL 0.40–0.41 *vs* 0.41–0.47); shorter foot (FootL/SVL 0.39–0.42 *vs* 0.42–0.48); smaller eye (EYE/SVL 0.09–0.10 *vs* 0.12–0.14; EYE/SN 0.78–0.83 *vs* 1.0–1.3); narrower toe discs (4TD/SVL 0.026–0.031 *vs* 0.033–0.039); presence of two subarticular tubercles on fourth toe (*vs* three); circum-marginal groove on disc of 1st finger indistinct to moderately distinct (*vs* well-developed); snout less obviously truncate in dorsal view; iris reddish brown/copper in life (*vs* light green-bronze); dorsal and ventral surfaces lacking a purplish wash in life (*vs* violet or lavender wash); call of 9–12 notes (*vs* 5–6 notes). Data for *C. omnistriatus* comes from Kraus & Allison (2009a) and Richards (2025).

Etymology. The species name *gobakula* is derived from the local language (Kalaw Kawaw Ya) words "goba kula", meaning boulders, and refers to the species being restricted to areas of piled boulders. Local language was provided by Laurie Elisala, Torenzo Elisala, Abi Mooka, Tenny Elisala, and Thomas Mooka.

Distribution. Only known from Dauan Island (Fig. 5). Likely to be endemic to the island, based on the lack of piled boulder habitat on nearby islands or the adjacent New Guinean mainland. All records come from the lower and mid slopes of Mt Cornwallis (Simakal Pad), from an elevational range of 30–140 m a.s.l. Surveys were not conducted at higher elevations.

Natural history. Restricted to areas of deeply piled granite boulders with associated rainforest vegetation (Fig. 6). Males were found calling at night in narrow gaps between surface boulders. Females and sub–adults were found active at night on boulders and leaf-litter among boulders. Frogs were agile on the granite boulders and quickly retreated into deep gaps among the rocks when disturbed. The finger and toe discs were used in an 'angular', 'gripping' way (e.g., Figs 3A, 3D) when climbing on the rocks. *Callulops gobakula* **sp. nov.** was not found during surveys in adjacent habitats without deeply piled boulders. Surveys were conducted during wet weather, and it is assumed the species retreats deep among boulders during dry periods. *Callulops gobakula* **sp. nov.** is assumed to be a terrestrial breeder with direct development, like all other asterophryines. This is further supported by the large, pale eggs found in females QM J98927 and QM J98928, which are typical of other asterophryines (e.g., Hoskin 2004; Anstis *et al*. 2011).

Conservation. If *C. gobakula* **sp. nov.** is restricted to Dauan Island, then it has a very small distribution. The island has an area of about 3.4 km^2, of which approximately 1 km^2 is estimated to be potentially suitable piled rock habitat (or 1.05 km^2 measured as a minimum convex polygon). *Callulops gobakula* **sp. nov.** fits an IUCN Vulnerable listing based on Criterion D2: 'restricted area of occupancy (AOO <20 km^2) or number of locations (≤5), with a plausible future threat that could drive the taxon to Critically Endangered or Extinct in a very short time'. The 'plausible future threat' is Yellow Crazy Ants *Anoplolepis gracilipes* (Smith, 1857). This invasive species is not known from Dauan Island but has been accidentally introduced to many tropical islands, globally, where it has had many documented impacts on invertebrates and vertebrates (e.g., Holway *et al.* 2002; Lach & Hooper-Bùi 2010). Severe impacts have been documented on the abundance of small skinks in rainforest of mainland north Queensland (Lach *et al.* 2022). Based on likelihood of introduction and documented impacts, particularly on islands, it is reasonable to consider Yellow Crazy Ants as a plausible future threat that could rapidly impact *C. gobakula* **sp. nov.** More detailed surveys are required to estimate fine-scale distribution on Dauan Island and to assess other potential threats.

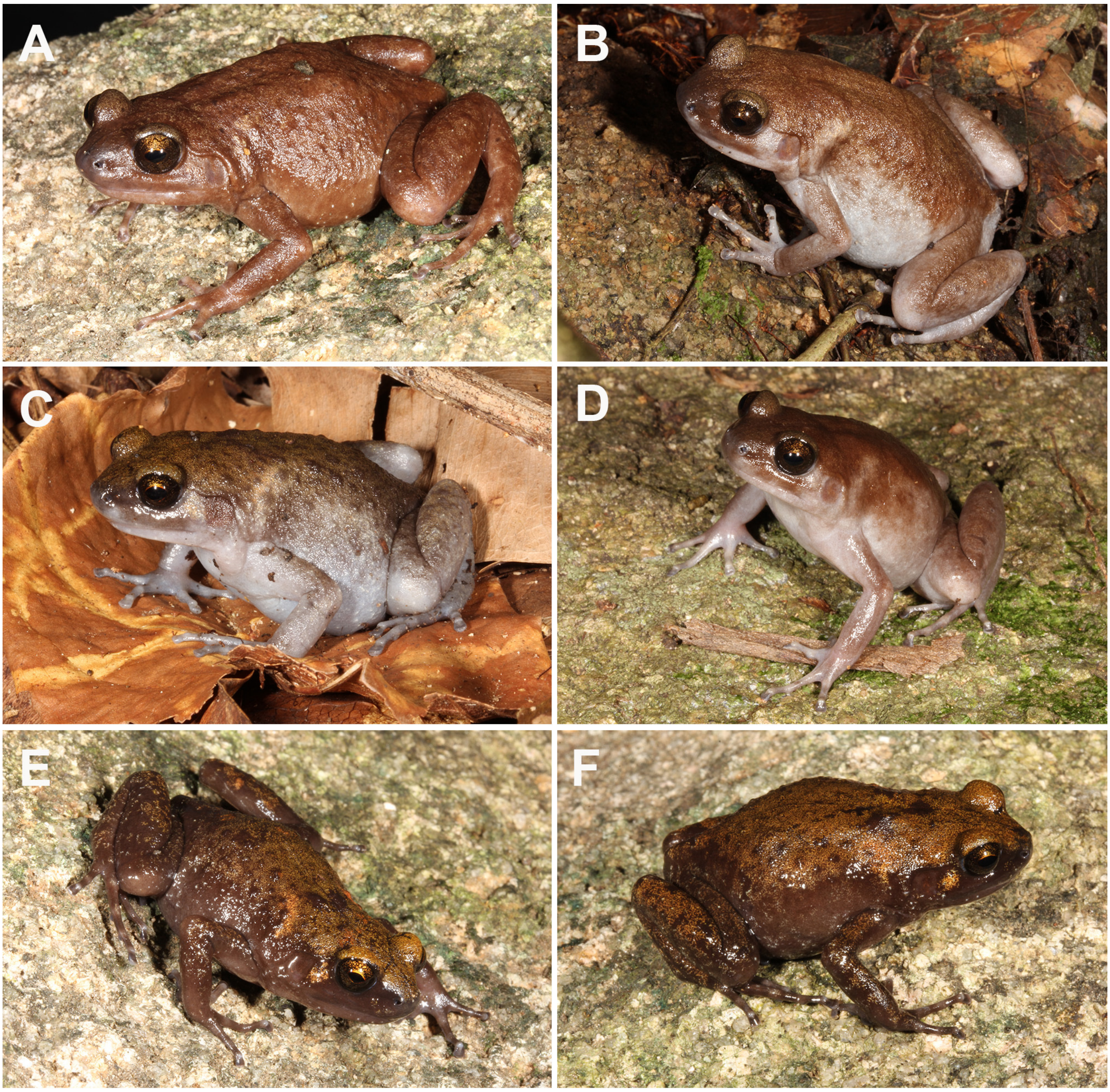

FIGURE 3. Colour pattern variation in *Callulops gobakula* **sp. nov.** in life. Panels A–D are adults; panels E and F are subadults. (A) is QM J98925 (holotype); (B–F) were not vouchered.

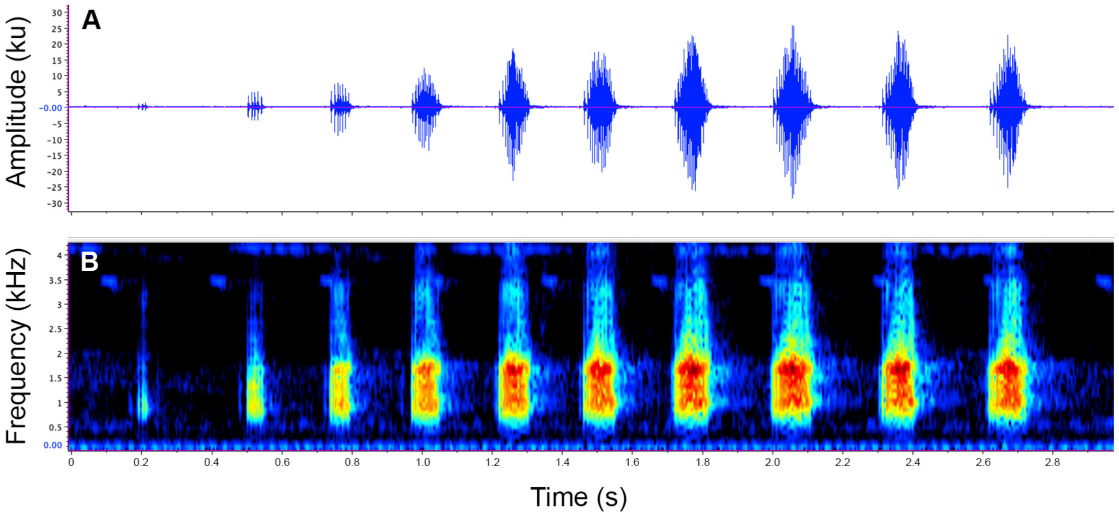

FIGURE 4. A single call of *Callulops gobakula* **sp. nov.** (holotype, QM J98925): (A) waveform, displaying amplitude (y-axis) against time (x-axis, seconds); (B) spectrogram, displaying call frequency (y-axis) and intensity (degree of shading) against time (x-axis, seconds).

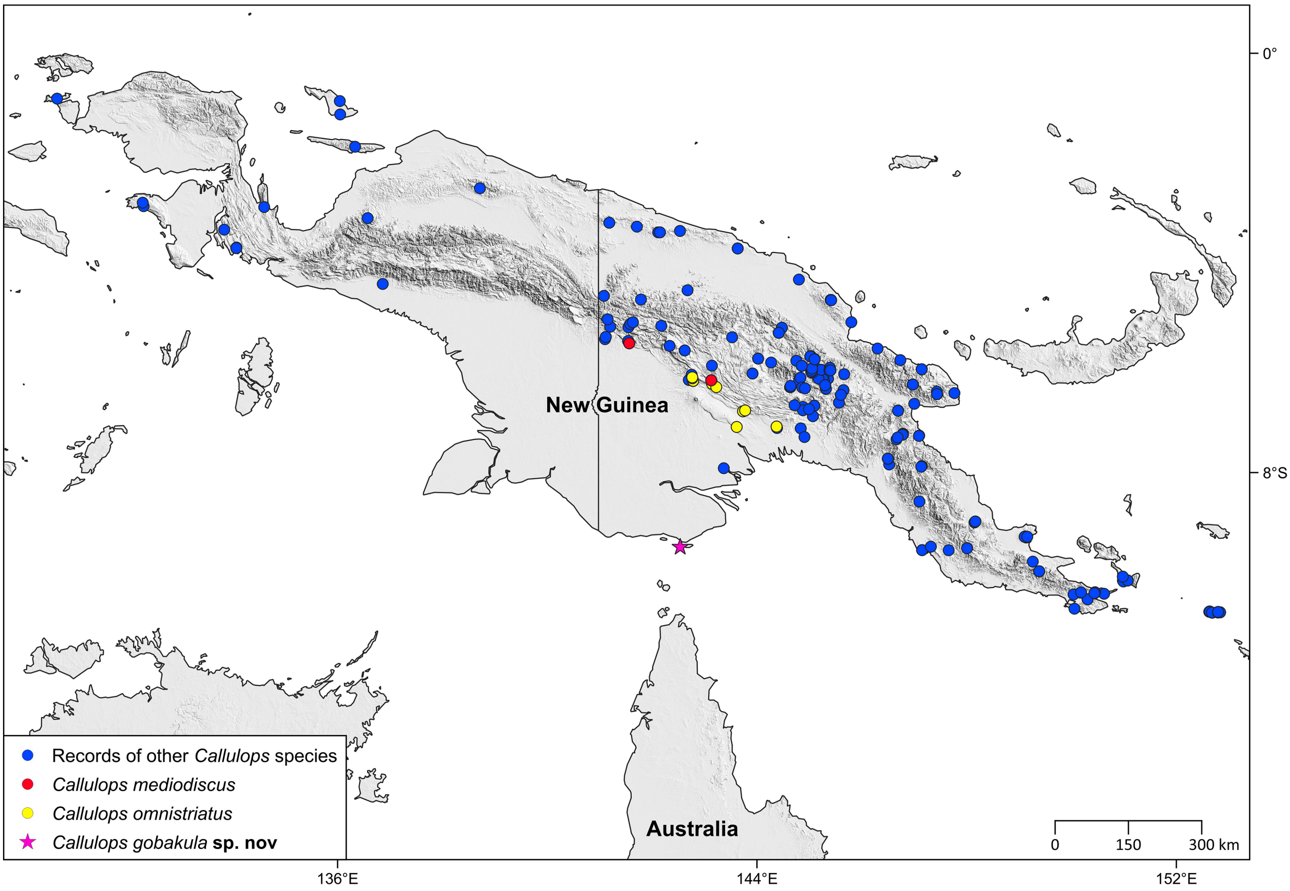

FIGURE 5. Map of northern Australia and New Guinea, showing *Callulops* occurrence records from the Atlas of Living Australia (https://www.ala.org.au), the Online Zoological Collections of Australian Museums (https://ozcam.org.au), VertNet (http://www.vertnet.org/), species descriptions, and other published sources. Most *Callulops* species are grouped as blue dots, with only *C. omnistriatus* (yellow dots), *C. mediodiscus* (red dots) and *C. gobakula* **sp. nov.** (pink star) shown separately.

FIGURE 6. Boulder-field habitat on Dauan Island, from a distance (top) and at ground-level (bottom). *Callulops gobakula* **sp. nov.** and *Choerophryne koeypad* **sp. nov.** co-occur in the habitat in these photos. *C. gobakula* **sp. nov.** was found on and among the boulders, while *C. koeypad* **sp. nov.** was found on the boulders and overhanging vegetation.

***Choerophryne koeypad* sp. nov.**

Koeypad Frog

(Figures 7–9)

Material examined. Holotype (Fig. 7). QM J98929, field number conx5944, male, calling when captured, Dauan Island (9.4227° S, 142.5301° E), 13 January 2021, C. J. Hoskin, K. Aland, A. Davies, A. Zwar. **Paratypes.** QM J98930, QM J98931, QM J98932 (field numbers conx5945, conx5946, conx5947, respectively), all calling males. Collection details as for holotype.

FIGURE 7. The holotype (QM J98929) of *Choerophryne koeypad* **sp. nov.**

Diagnosis. A relatively large (males 20.0–21.2 mm), short–snouted (SN/SVL 0.13–0.14) *Choerophryne* species, with a hidden tympanum in males, relatively short hindlimbs (TL–knee/SVL 0.39–0.42), relatively short hands (HandL/SVL 0.22–0.25) and feet (FootL/SVL 00.31–0.33), relatively smooth dorsal skin, and call a regularly repeated (call interval 1.0–2.5 s) burst of 'tinks' of relatively short call duration (0.78–3.17 s), moderate note rate (6.13–6.94 notes/s) and relatively low frequency (dominant frequency 2885–3092 Hz).

Description of type series. Measurements and proportions of the type series are presented in Table 1. A moderately large *Choerophryne* (male SVL mean 20.8 mm, range 20.0–21.2 mm). Head relatively wide (HW/SVL 0.34–0.38); broadly triangular in dorsal view, with a relatively short snout (SN/SVL 0.13–0.14); canthus rostralis rounded; loreal region steeply oblique, almost vertical, slightly concave posterior to naris; nostrils round, directed laterally, much closer to tip of snout than to eyes; tip of snout broad (IN/SVL 0.064–0.072); internarial distance less than distance from naris to eye (EN/IN 1.33–1.46); snout generally slightly projecting (overhung) in lateral view (but no projection in QM J98929), truncate in dorsal view; eyes moderately large (EYE/SVL 0.10–0.12; EYE/SN 0.71–0.85); tympanum completely hidden by skin; no supratympanic fold. Moderately long forearm, hand and 3rd finger (ArmL/SVL 0.45–0.50; FA/SVL 0.23–0.25; HandL/SVL 0.22–0.25; F3L/SVL 0.14–0.15). Relative length of fingers 3>4>2>1; fingers unwebbed, but thickened skin gives the appearance of basal 'webbing' between fingers 2–3 and 3–4; large discs present on all fingers, about three times the width of penultimate phalanges (except the disc on finger 1, which is about two times wider); disc largest on 3rd finger (3FD/SVL 0.049–0.070), smallest on 1st finger (1FD/SVL 0.028–0.039); discs on all fingers truncate, especially on fingers 2, 3 and 4, where the discs are 'T-shaped' with a slight indentation at the midpoint of the distalmost edge; circum-marginal grooves present on all finger discs but generally hard to discern (perhaps an artefact of preservation), and particularly indistinct on finger 4; subarticular tubercles present, obvious near base of fingers 1 and 2 and about halfway along fingers 3 and 4, and second, smaller, tubercle usually present near distal end of each finger; metacarpal tubercles absent, but thickened, unpigmented skin present along base of palm. Hindlimb, foot and 4th toe relatively long (TL–knee/SVL 0.39–0.42; FootL/SVL 0.31–0.33; T4L/SVL 0.16–0.19). Relative length of toes 4>5≥3>2>1; toes unwebbed (but QM J98932 has thickened skin between base of toes 3–4 and 4–5); discs present on all toes, about twice width of penultimate phalanges (except disc on toe 1, which is about 1.5 times); disc widest on toe 4 (4TD/SVL 0.034–0.058), narrowest on toe 1 (1TD/SVL 0.033–0.047); toe discs smaller than those of fingers (3FD/4TD 1.08–1.52); rounded to moderately truncate, especially on toes 2, 3, 4 and 5; all discs with well–developed circum-marginal grooves; one subarticular tubercle on each toe, about halfway along, but some indication of a second tubercle on toe 4; a small, low, elongate, inner metatarsal tubercle; outer metatarsal tubercle absent. ***Skin texture in preservative***. Dorsal texture smooth or very finely granular or dimpled (Fig. 7). Lateral surfaces smooth. Ventral surfaces smooth but with very fine granular texture on vocal sac (e.g., Fig. 8F). ***Colouration in preservative*** (e.g., Figs 7, 8F). Dorsal body and head pale beige ground colour with irregular, dark brown blotches; on closer inspection (under magnification) dorsal surface light brown (QM J98929 and QM J98930) or light grey (QM J98931, QM J98932), heavily patterned with dark brown blotching due to areas of dense stippling (remaining surfaces lightly stippled). Dorsal surfaces of all limbs (including hands and feet) as for head and back but paler. Dark grey along upper loreal area, between naris and eye; some indication of a thin, pale beige midline streak along top of snout and head (continuing as a vertebral line down the back), and pale beige interorbital bar (pale markings on head more conspicuous on two paler frogs: QM J98931 and QM J98932). Lateral surfaces cream or white, heavily stippled with brown or black. Ventral surfaces (Fig. 8F) cream or white, with very fine brown or black stippling on all surfaces, most prominent on throat and chest and under forearms; palmar and plantar surfaces pale grey with scattered fine black stippling, white subarticular tubercles and areas of thickened white skin at base of palm and heel. Pupil horizontal (but usually dilated).

Colour pattern and skin texture in life. ***Adult males*** (e.g., Fig. 8A–E). Dorsal ground colour light brown/ straw, with dark brown mottling or blotching. In some individuals blotching on back, shoulders and head connected to form extensive, irregular dark area down back, from between eyes to lumbar region. Most individuals with indication of pale beige interorbital bar and a thin, pale beige vertebral line extending from snout down length of back to urostyle, but these pale beige markings interrupted by darker markings. Dark brown band along upper canthal area, from naris to eye, continuing behind eye as an irregular band of irregular dark lateral markings above forelimb to groin. Dorsal colour and pattern of limbs, feet, hands and digits, as for head and back but typically paler (e.g., Fig. 8B, 8E). Posterior thigh light grey, extending as light grey blotches onto top of thigh, with some straw-coloured markings (Fig. 8B). Ventral surfaces pale pinkish grey, with small white spots and blotches on chest and throat. Underside of limbs, feet, hands and digits also pale pinkish grey, with small white spots on trailing edge of underside of thighs, and subarticular tubercles and discs white. Dorsal skin texture finely granular, with all dorsal surfaces evenly covered in small, rounded pustules and fine pitting. Ventral surfaces smooth. ***Females and subadults.*** Unknown.

Call. Each call is a short series of high-pitched notes: "tink, tink, tink, tink, …" (Fig. 9). Males call incessantly, with calls uttered in quick succession (interval between calls is about the same as call duration). Call measures are presented in Table 2, and have the following average values (with range in parentheses): call duration 1.65 s (0.78–3.17); number of notes 10.0 (5–19), note rate 6.38 notes/s (6.13–6.94); dominant frequency, one clear peak in energy, 2997 Hz (2885–3092); note length 0.0504 s (0.045–0.059); note interval 0.134 s (0.110–0.155); call repetition rate 1.65 s (1.00–2.49).

Comparisons. The combination of short snout (i.e., not obviously elongated), hidden or inconspicuous tympanum, and call that is a burst of 'tinks' distinguishes *C. koeypad* **sp. nov.** from all congeners except *C. exclamitans* and *C. crucifer* Günther & Richards, 2017.

Choerophryne koeypad **sp. nov.** is most similar to *C. exclamitans*, with which is shares a hidden tympanum in males and a metallic, tinking call. *Choerophryne koeypad* **sp. nov.** differs from *C. exclamitans* in the following morphological traits: larger size (adult male SVL mean 20.8 mm, range 20.0–21.2 *vs* mean 17.1 mm, 15.3–20.6); shorter hand (HandL/SVL mean 0.24, 0.22–0.25 *vs* 0.26, 0.25–0.29); shorter foot (FootL/SVL mean 0.32, 0.31–0.33 *vs* 0.35, 0.33–0.38); dorsal surfaces smooth to finely granular (*vs* more rugose, with scattered larger tubercles); ventral colour in preservative pale cream (e.g., Fig. 8F) (*vs* "overall uniformly dark gray" Kraus & Allison 2005a), and ventral colour in life pale pinkish grey with scattered small white spots (*vs* "peppered light gray on a dark gray background" Kraus & Allison 2005a). The call of *C. koeypad* **sp. nov.** differs from that of *C. exclamitans* in being shorter (mean 1.65 s, 0.78–3.17 *vs* 4.7 s, 0.32–6.75); having fewer notes (mean 10, 5–19 *vs* 35, 3–48), slower note rate (mean 6.15 notes/s, 5.81–6.41 *vs* 7.6 notes/s, 6.5–9.4; calculated here as number of notes divided by entire call duration, to match Kraus & Allison (2005a)); lower dominant frequency (mean 2997 Hz, 2885–3092 *vs* 3400 Hz, 3256–3480); longer note length (mean 50 ms *vs* 20 ms); and much faster call rate (average interval between calls 1.7 s *vs* 18 s).

Choerophryne koeypad **sp. nov.** differs from *C. crucifer* (which also has a short snout, an inconspicuous tympanum, and a tinking call) in being substantially larger (adult male SVL 20.0–21.2 mm *vs* 13.4–17.3 mm); having the tympanum completely hidden (*vs* small, about one-third of eye diameter); and in having a call of higher note rate (6.13–6.94 notes/s *vs* 4.39–5.18 notes/s) and much lower dominant frequency (mean 2997 Hz *vs* 5500 Hz). Data for *C. crucifer* comes from Günther & Richards (2017).

Etymology. The species name *koeypad* is derived from the local language (Kalaw Kawaw Ya) words "koey pad", meaning rocky mountain, and refers to the species being restricted to boulder habitat on Simakal Pad (Mt Cornwallis). Local language was provided by Laurie Elisala, Torenzo Elisala, Abi Mooka, Tenny Elisala, and Thomas Mooka.

Distribution. Only known from Dauan Island (Fig. 10). Likely to be endemic to the island, based on the lack of piled boulder habitat on nearby islands or the adjacent New Guinean mainland. All records come from the lower to mid slopes of Mt Cornwallis (Simakal Pad), from about 40–150 m a.s.l., but no surveys were conducted above this elevation.

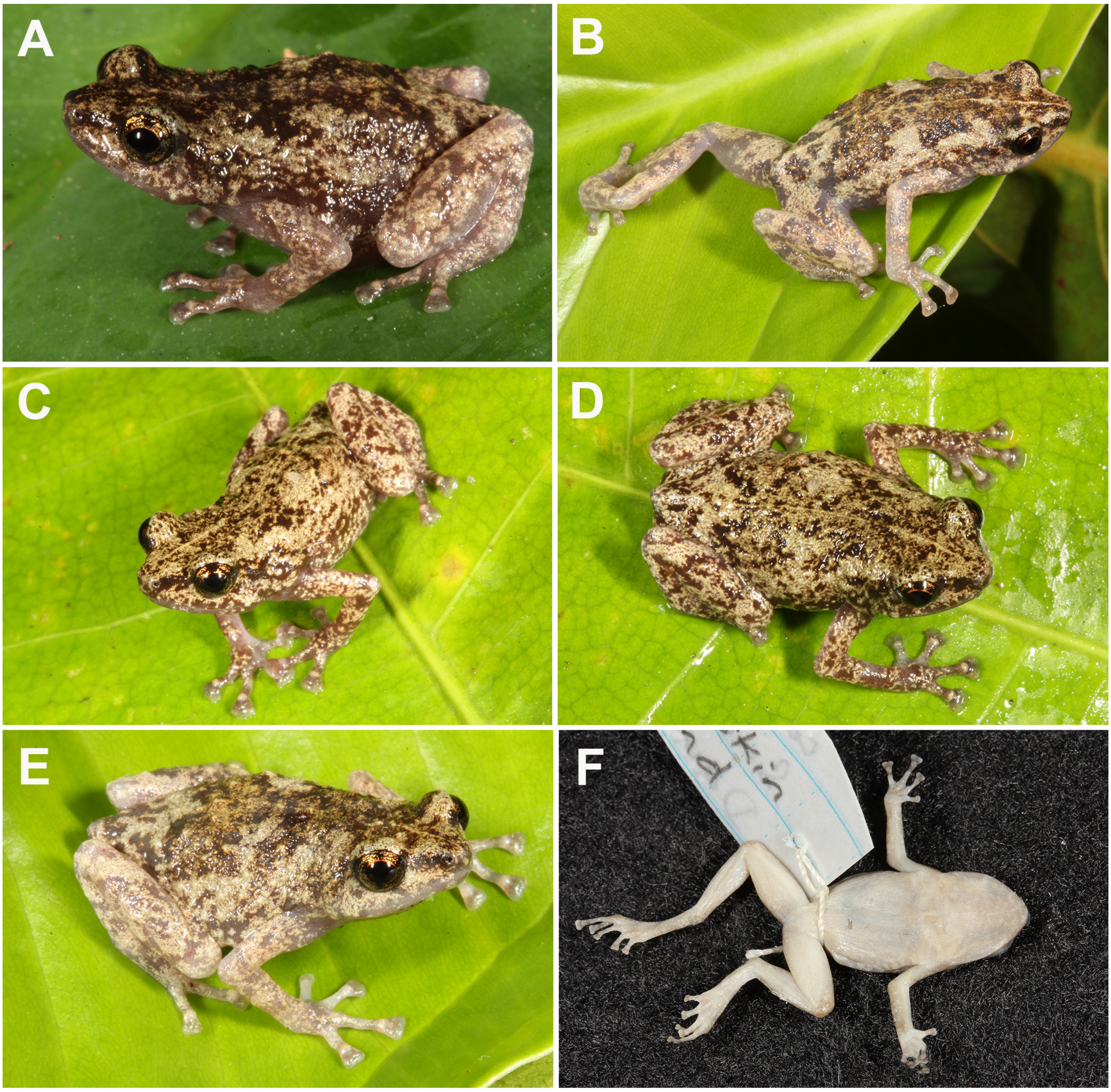

FIGURE 8. Colour pattern variation in *Choerophryne koeypad* **sp. nov.** in life (A–E) and ventral colouration in preservative (F). (A) is QM J98930; (B) is QM J98931; (C, D) is QM J98929 (holotype); (E, F) is QM J98932.

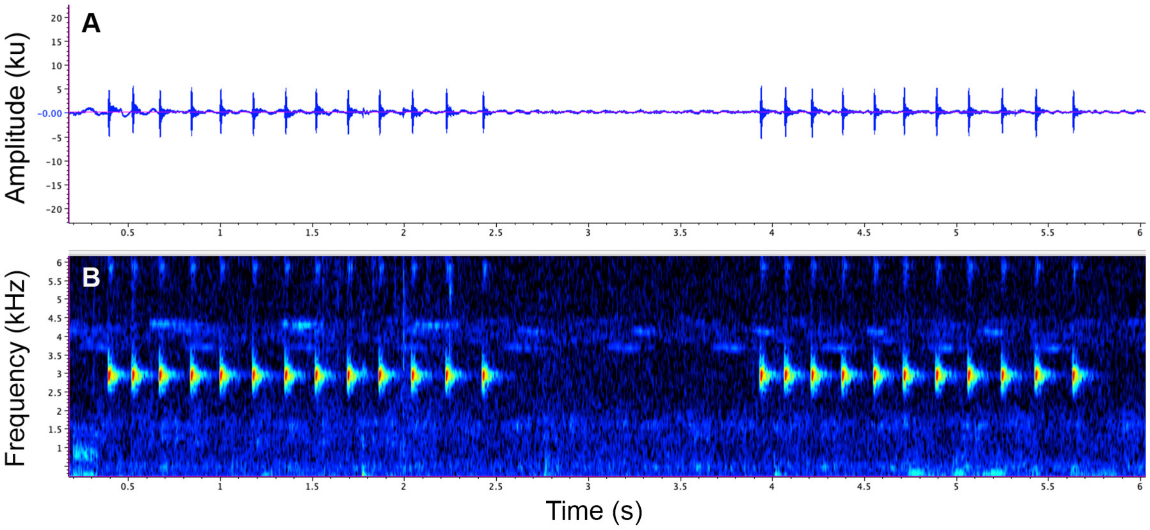

FIGURE 9. Two consecutive calls of *Choerophryne koeypad* **sp. nov.** (holotype, QM J98929): (A) waveform, displaying amplitude (y-axis) against time (x-axis, seconds); (B) spectrogram, displaying call frequency (y-axis) and intensity (degree of shading) against time (x-axis, seconds).

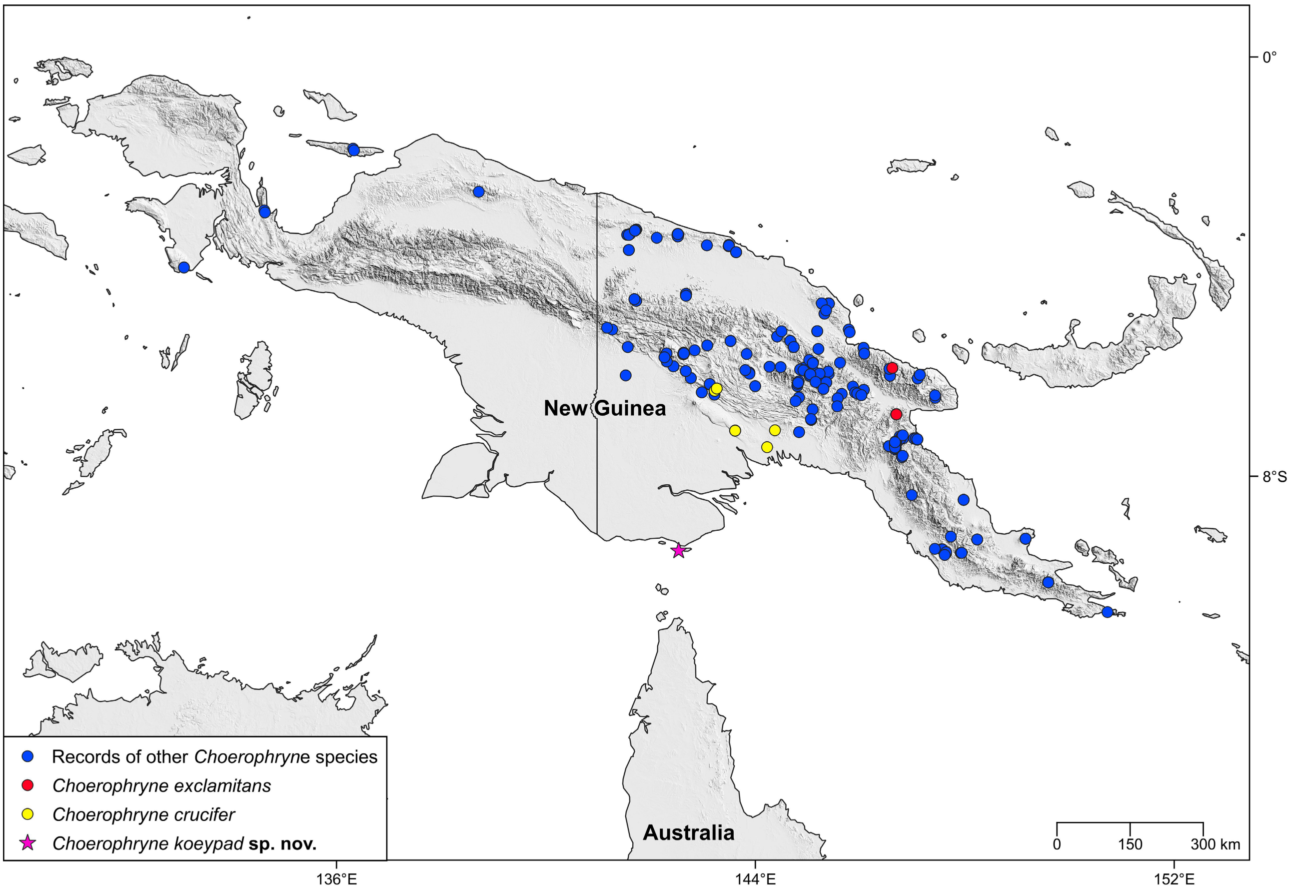

FIGURE 10. Map of northern Australia and New Guinea, showing *Choerophryne* occurrence records from the Atlas of Living Australia (https://www.ala.org.au), the Online Zoological Collections of Australian Museums (https://ozcam.org.au), VertNet (http://www.vertnet.org/), species descriptions, and other published sources. Most *Choerophryne* species are grouped as blue dots, with only *C. exclamitans* (red dots), *C. crucifer* (yellow dots) and *C. koeypad* **sp. nov.** (pink star) shown separately.

Natural history. Restricted to areas of deeply piled granite boulders with associated rainforest vegetation (Fig. 6). Males were most commonly found calling from the upper surface of green leaves of vines and other vegetation growing amongst the boulders, in the range of 50 cm to 2.5 m above the surface rocks. Several males were calling from the vertical faces of large surface boulders, and one male was calling from below surface level in piled boulders. Females and subadults were not found. *Choerophryne koeypad* **sp. nov.** was only found in direct association with piled boulders, and surveys away from piled rock did not find the species. Our survey, on the western side of Mt Cornwallis (Simakal Pad), found lower density and more patchy occurrence of males at lower elevations and more uniform occurrence and higher density towards mid elevation on the mountain. No surveys were conducted at higher elevations (i.e., >150 m a.s.l. to the summit at 290 m a.s.l.). Surveys were conducted during wet weather, and it is assumed this species retreats among boulders during dry periods. There is no information on breeding biology but *C. koeypad* **sp. nov.** is assumed to be a terrestrial breeder with direct development, as for other asterophryines (e.g., Hoskin 2004; Anstis *et al*. 2011).

Conservation. Assuming *C. koeypad* **sp. nov.** is restricted to Dauan Island, it has a very small distribution. The area of potentially suitable boulder-field habitat is estimated as 1 km^2 (or 1.05 km^2 measured as a minimum convex polygon), but patchy occurrence in the survey to date suggests the species is unlikely to occur in all of that area. *Choerophryne koeypad* **sp. nov.** fits an IUCN listing of Vulnerable (Criterion D2) based on the following. It has an area of occupancy well below the threshold of 20 km^2 and occurs at a single location (as defined by 'a single threatening event could rapidly affect all individuals'; IUCN 2024), with a plausible future threat (Yellow Crazy Ants) that could rapidly drive the species to Critically Endangered or Extinct (as covered above for *C. gobakula* **sp. nov.**). More detailed surveys are required to estimate fine-scale distribution on Dauan Island, and to assess other potential threats.

Discussion

The description of these two species brings the number of described *Callulops* to 30 and the number of described *Choerophryne* to 40. Their discovery substantially extends the known distributions of both genera (Figs 5, 10). The nearest *Callulops* record is a '*C. robusta*' collected at 'Aramia River' (Zweifel 1972), approximately 200 km north of *C. gobakula* **sp. nov.** (Fig. 5). Uncertainty remains around this record because no other *Callulops* have been collected from that region, and the specimen was not assessed in subsequent revisions of the *C. robusta* species complex. The next closest *Callulops* records are *C. omnistriatus*, approximately 280 km north of *C. gobakula* **sp. nov.** (Fig. 5). The closest *Choerophryne* records are *C. crucifer*, approximately 280 km north of *C. koeypad* **sp. nov.** (Fig. 10), at lowland sites close to the Central Cordillera (e.g., Günther & Richards 2017; Richards 2018). The discovery of the two species also adds both genera to the Australian faunal list, albeit due to an arbitrary political boundary that extends to within sight of the New Guinean mainland. The Australian microhylid list now consists of 19 *Cophixalus*, 5 *Austrochaperina*, 1 *Callulops* and 1 *Choerophryne*. Twenty-five of these 26 species are found in the state of Queensland, with only *A. adelphe* Zweifel, 1985 found in the Northern Territory.

Callulops gobakula **sp. nov.** and *Choerophryne koeypad* **sp. nov.** are biogeographically interesting in that they are the first range-restricted microhylid species found in the otherwise extensive 'gap' of relatively low microhylid diversity in northern Cape York, the Torres Strait islands, and the Trans-Fly Region. *Austrochaperina gracilipes* is distributed through much of this area (Fig. 1), and the other species recorded in the Trans-Fly Region (inset Fig. 1) are also widespread habitat-generalist species. The limited microhylid diversity through this region correlates with the relatively dry and seasonal environment. Microhylid diversity in northern Queensland is highest in rainforests of the wet, relatively aseasonal uplands of the Wet Tropics mountains (Hoskin 2004). The exceptional microhylid diversity in New Guinea is in rainforests associated with the high rainfall Central Cordillera and mountainous areas along the northern coast (Menzies 2006; Oliver *et al.* 2022). The seasonally dry savannah, grassland and lowland 'monsoon' rainforest vegetation communities of northern Cape York, the Torres Strait islands, and the Trans-Fly Region are less suitable for microhylid frogs, possibly due to the terrestrial, direct-developing breeding mode known or assumed for all members of the sub-family Asterophryinae (Hoskin 2004; Menzies 2006; Anstis *et al.* 2011).

This leads to two obvious questions: (i) how did *Callulops* and *Choerophryne* get to Dauan Island in the first place?, and (ii) why did they apparently only persist, regionally, on this small island? The presence of *Cophixalus* and *Austrochaperina*, both generally rainforest-associated genera, on either side of the 'gap' suggests that rainforest must once have been continuous through southern New Guinea, the Torres Strait (which has come and gone as a marine barrier with global sea level changes; Lewis *et al.* 2013; Mitchell *et al*. 2014; Brennan *et al.* 2024) and northern Cape York. Recent phylogenetic data show that these two rainforest-associated genera spread from New Guinea to Australia in the order of 11–13 million years ago (Brennan *et al.* 2024), at a time when rainforest must have been continuous between northern Queensland and New Guinea across a Torres Strait land bridge. Intervening populations of *Cophixalus* and *Austrochaperina* (other than *A. gracilipes*) subsequently disappeared during climatic drying and loss of wetter rainforest habitats. The fact that the two Dauan Island species are *Callulops* and *Choerophryne* is more biogeographically intriguing, given the lack of congeners to the south, but probably represents a similar history. The simplest explanation is that these genera had continuous distributions through southern New Guinea to at least the northern Torres Strait at some historical period when wet rainforest was more extensive, but then suffered widespread loss from the southern lowlands of New Guinea when climatic conditions became drier. There is no current or fossil evidence that *Callulops* and *Choerophryne* ever made it to the mainland of Australia. Therefore, the period during which their southernmost distributions extended to at least Dauan Island was probably after the early period of connection that enabled the southerly spread of *Cophixalus* and *Austrochaperina*. It is less likely that they were in northern Australia but went extinct there.

The answer to the second question, why both genera only persisted on Dauan Island, hundreds of kilometers south of all known congeners, probably relates to geology. In seasonally dry areas of Cape York most microhylid species have only persisted in areas of deeply layered rock (granite 'boulder-fields'), where long-term temperature and moisture buffering has enabled the persistence of rainforest-associated lineages ('litho-refugia' Couper & Hoskin 2008). There are five *Cophixalus* species in northern Queensland that are restricted to deep boulder-fields surrounded by hot, dry woodlands that lack microhylid frogs (Davies & McDonald 1998; Hoskin & Aland 2011; Hoskin 2013). Dauan Island provides another example of microhylid frogs persisting in a long-term climate buffered boulder-field environment, isolated from congeners by unsuitably hot, dry environments, and in this case also the marine barrier of the Torres Strait at various points in time, including since the last glacial maximum (Nix & Kalma 1972; Lewis *et al.* 2013). Deep boulder-fields are rare geological formations (for example, they are highly localized and limited in number in northern Queensland; Hoskin 2013) and do not occur in southern New Guinea. It may be that the boulder-fields of Dauan Island offered the only refuge for *Callulops* and *Choerophryne* in the vast lowlands of southern New Guinea and Torres Strait during periods of global drying, leaving them marooned on a small island. Detailed phylogenetics of Australo-Papuan microhylid frogs will help answer these questions — by identifying the sister taxa of the Dauan species and estimating divergence times. Additionally, further surveys in southern New Guinea, between these species and their nearest congeners, will resolve whether other species have been overlooked.

The description of these two species brings the number of endemic vertebrate species known for Dauan Island to three. This is exceptional, both in the context of Torres Strait islands and in the context of Queensland islands. The other endemic on Dauan Island is the recently described gecko *Nactus simakal* Hoskin, Davies & Aland, 2024. The only other vertebrate endemic to islands of the Torres Strait was the rodent *Melomys rubicola* Thomas, 1924, known from Bramble Cay (Maizab Kaur) in the far north-east of the Torres Strait region (but recently declared extinct due to storm-associated marine inundation; Gynther *et al.* 2016). The skink *Carlia quinquecarinata* (Macleay, 1877) has been considered endemic to Erub (Darnley) and Mer (Murray) Islands in the northeastern Torres Strait (e.g., Wilson & Swan 2021), but genetic data suggest it also occurs on southeastern mainland New Guinea (Donnellan *et al.* 2009; Bragg *et al.* 2018). Dauan Island has a higher number of endemic vertebrates than is known for any other Queensland island. Scawfell Island has the next highest number with two endemics (a gecko and a skink), and several other islands have one endemic each: Hinchinbrook Island (a frog), Magnetic Island (a skink), Whitsunday Island group (a skink), and K'gari/Fraser Island (a skink) (Hoskin 2024).

Dauan Island is therefore of significance for its endemic biodiversity and warrants conservation attention. Range-restricted species offer conservation challenges because they can be rapidly impacted by a single threat (Bertola *et al*. 2018; Ward *et al.* 2025). Further, species on islands appear to be particularly vulnerable (Ward *et al.* 2025); for example, the three Australian vertebrate species declared extinct since 2000 were all on tropical islands (Woinarski *et al.* 2016). Introduced species are a major threat to island endemics, and this includes invasive ants (Holway *et al.* 2002; Lach & Hooper-Bùi 2010). Yellow Crazy Ants pose a particular threat to the Dauan Island endemics, based on how readily they are accidentally introduced to islands and their documented impacts (Holway *et al.* 2002; Lach & Hooper-Bùi 2010), including on small vertebrates (e.g., Lach *et al.* 2022). The Asian House

Gecko *Hemidactylus frenatus* Duméril and Bibron, 1836 is another invasive species worth considering as a potential threat. *Hemidactylus frenatus* is present on Dauan island but thus far appears largely restricted to buildings and coastal forests (Hoskin *et al.* 2024). However, given spread into natural habitats elsewhere, particularly on islands (Hoskin 2011), and known competitive impacts on native geckos (e.g., Cole *et al.* 2005), it requires monitoring as a potential threat (via exploitative competition; Hoskin 2011) to the endemic gecko *N. simakal* and the two frogs described herein. The most important conservation action for Dauan Island is investment in biosecurity to avoid introducing species that could impact the endemic diversity and the biological community more broadly, as has happened on many other tropical islands (e.g., Christmas Island, Smith *et al.* 2012; Woinarski *et al.* 2016).

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