A new frog species (Myobatrachidae: *Uperoleia*) from the Northern Deserts region of Australia, with a redescription of *U. trachyderma*

RENEE A. CATULLO1,3, PAUL DOUGHTY2 & J. SCOTT KEOGH1

1Evolution, Ecology & Genetics, Research School of Biology, The Australian National University, Canberra, ACT, 0200 AUSTRALIA
2Department of Terrestrial Zoology, Western Australian Museum, 49 Kew Street, Welshpool WA 6106, AUSTRALIA.
3Corresponding author. E-mail: renee.catullo@anu.edu.au

Abstract

The frog genus *Uperoleia* (Myobatrachidae) is species rich, with the greatest diversity in the northern monsoonal region of Australia. Due in part to their small body size, conservative morphology and distribution in diverse habitats, the genus is likely to harbor cryptic species. A recent study (Catullo et al. 2013) assessed region-wide genetic, acoustic and phenotypic variation within four species in northern Australia. Catullo et al. (2013) presented multiple lines of evidence that the widespread *U. trachyderma* comprises distinct allopatric western and eastern lineages within the Northern Deserts bioregion of Australia. Here we formally describe the western lineage as *U. stridera* sp. nov. and redescribe the eastern (type) clade as *U. trachyderma*. The new species can be distinguished from *U. trachyderma* by fewer pulses per call, a faster pulse rate, and the lack of scattered orange to red flecks on the dorsum. The description of *U. stridera* sp. nov. brings the number of *Uperoleia* species to 28, by far the largest genus in the Myobatrachidae, and further highlights the Australian monsoonal tropics as a region of high endemism.

Key words: Australian Monsoonal Tropics, advertisement call, cryptic species, *Uperoleia stridera* sp. nov., *Uperoleia trachyderma*

Introduction

The frog genus *Uperoleia* (Myobatrachidae) is represented in Australia by 27 currently recognized species, with the majority of species discovery and description occurring in the last few decades. A significant review of *Uperoleia* by Tyler et al. (1981) described nine new species, followed by the description *U. aspera* Tyler, Davies & Martin 1981, *U. trachyderma* Tyler, Davies & Martin 1981b, and *U. glandulosa* Davies, Mahony, and Roberts 1985. Six more species were described in 1986 (Davies et al.; Davies & Littlejohn). Following almost two decades between the description of new species, the past few years have seen the description of a number of species from the poorly explored monsoonal tropics or arid regions of Australia, including *U. daviesae* Young, Tyler & Kent 2005 from the Top End, *U. micra* Doughty & Roberts 2008 from the north-west Kimberley, and *U. saxatilis* Catullo, Doughty, Roberts, & Keogh 2011 from the Pilbara. The northern monsoonal tropics region has 17 *Uperoleia* species, representing almost two-thirds of *Uperoleia* diversity. Another 10 species occur in the eastern mesic region and the arid zone. The monsoonal tropics are a geologically and climatically diverse region, characterized by a wet summer associated with cyclonic activity, and a dry winter season (Bowman et al. 2010). Due to a low population density, little infrastructure, and difficult access during the wet season, this region has been poorly explored.

Catullo et al. (2013) investigated genetic, phenotypic, and acoustic variation of the *U. lithomoda/U. trachyderma/U. minima/U. mimula* species complex from across monsoonal northern Australia. Frogs of this species complex represent a monophyletic group that also included five other species with a sharp “click” as a call (see also Catullo et al. 2011). This study concluded that multiple lines of evidence supported the existence of two distinct lineages that occur in the western and eastern Northern Deserts bioregion within currently described *U. trachyderma*. While there was some mitochondrial incongruence, the acoustic, nDNA, and morphological
evidence support the western lineage (hereafter *U. trachyderma* W, described below) as a species distinct from typotypic *U. trachyderma* (hereafter *U. trachyderma* E, Catullo et al. 2013; see Fig. 2). Call data distinguished *U. trachyderma* E versus *U. trachyderma* W individuals by pulse rate, call rate and average number of pulses (Table 1, Fig. 2c). *Uperoleia trachyderma* W individuals called at a significantly higher pulse rate and call rate than the *U. trachyderma* E individuals. The *U. trachyderma* W individuals also produced mostly two pulse calls and *U. trachyderma* E individuals produced mostly three pulse calls (Fig. 1c). Despite some evidence of past hybridization, the individuals from the east and the individuals from the west are non-overlapping in discriminant function analyses (Fig. 2d in Catullo et al. 2013) of call traits, traits which are associated with mate choice and species recognition in frogs (Gerhart & Huber 2012; Hoskin et al. 2011). The clades differ in color patterns (Fig. 3) but are morphologically indistinguishable in multivariate analyses of body shape characters (Fig. 2c in Catullo et al. 2013). The eastern individuals have orange to red dorsal tubercles that are not present in the western clade (Fig. 3b versus 3c).

Catullo et al. (2013) concluded that multiple lines of evidence supported complete or near-complete reproductive isolation based on the ‘substantial reproductive isolation’ interpretation of the Biological Species Concept (Coyne & Orr 2004). Here we revise the taxonomy of *U. trachyderma* s.l., with the description of the western clade as a new species and the redescription of *U. trachyderma* from the eastern portion of the Northern Deserts.

**Methods**

**Call data.** Details of call recording and analysis are available in Catullo et al. (2013) and individual specimen results are in Table 2. The following call traits were recorded: call rate per minute, duration (beginning of the first pulse to the end of the last pulse of a call), number of pulses per call, pulse rate (number of pulses divided by call duration), and dominant frequency (the frequency at which the call is of greatest intensity). We selected representative calls for Fig. 1c as they were recorded at similar temperatures (between 23.5 and 25.5°C). A summary of call data for each species is presented in Table 1. Call rate data was normally distributed (Shapiro-Wilk test, \( W = 0.9962, p = 0.575 \)) and temperature was not correlated with call rate (\( p > 0.1 \) for both species), therefore we only report raw call rate data.

<table>
<thead>
<tr>
<th>Species</th>
<th>Duration (ms)</th>
<th>Dominant Frequency (Hz)</th>
<th>Pulses/s</th>
<th>Pulses/call</th>
<th>Call Rate (calls/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>U. trachyderma</em> (N = 7)</td>
<td>0.046 [0.005]</td>
<td>3394.50 [159.62]</td>
<td>69.63 [4.54]</td>
<td>3.19 [0.33]</td>
<td>56.86 [10.91]</td>
</tr>
<tr>
<td><em>U. stridera</em> (N = 17)</td>
<td>0.024 [0.004]</td>
<td>3236.70 [147.10]</td>
<td>90.41 [8.45]</td>
<td>2.16 [0.31]</td>
<td>90.74 [16.29]</td>
</tr>
</tbody>
</table>

**Morphometrics.** Details of all morphological assessments and analysis are available in Catullo et al. (2013) and individual specimen results are in Table 2. We measured the following morphological characters: snout-urostyle length (SUL), eye-naris distance (EN—from anterior corner of the eye to midpoint of closest nostril), interorbital distance (IO—from anterior corners), internarial distance (IN—from medial margins of nares), eye length (EyeL—from corner of anterior and posterior edges), arm length (ArmL—from elbow to tip of 3rd finger), tibia length (TL), and foot + tarsus length (from knee to tip of 4th toe). All measurements were taken with electronic calipers to the nearest 0.01 mm. Statistics reported below are: Mean±S.D. [Range]. Institutional abbreviations where type material is deposited: Museum & Art Gallery of the Northern Territory, Darwin—NTM; South Australian Museum, Adelaide—SAMA; Western Australian Museum, Perth—WAM; Natural History Museum, University of Kansas—KU. A summary of the morphological variation in each species is presented in Table 3.
### Table 1. Details of specimens included and data generated in this study. The ‘mDNA’ column indicates the assignment of the individual to the morphotype, and the ‘DNA’ column indicates the clad assignment of the individual. The ‘Call’ column indicates the morphotype, and the ‘Morphology’ column indicates the individual’s morphological characteristics.

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Latitude/Longitude</th>
<th>Location</th>
<th>Morphotype</th>
<th>DNA</th>
<th>Call</th>
<th>Morphology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up1090</td>
<td>N 20° 10' S 144° 20'E</td>
<td>Carpentaria Highway, NT</td>
<td>U. gouldiana</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Up1091</td>
<td>N 20° 10' S 144° 20'E</td>
<td>Carpentaria Highway, NT</td>
<td>U. gouldiana</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Up1092</td>
<td>N 20° 10' S 144° 20'E</td>
<td>Carpentaria Highway, NT</td>
<td>U. gouldiana</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Up1093</td>
<td>N 20° 10' S 144° 20'E</td>
<td>Carpentaria Highway, NT</td>
<td>U. gouldiana</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Up1094</td>
<td>N 20° 10' S 144° 20'E</td>
<td>Carpentaria Highway, NT</td>
<td>U. gouldiana</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Up1095</td>
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<td>U. gouldiana</td>
<td>yes</td>
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<tr>
<td>Up1096</td>
<td>N 20° 10' S 144° 20'E</td>
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<td>U. gouldiana</td>
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<td>U. gouldiana</td>
<td>yes</td>
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<td>yes</td>
</tr>
</tbody>
</table>

**Notes:**
- U. gouldiana: Western Desert morphotype.
- U. strigata: Northern Desert morphotype.
- U. tubulifera: Southern Desert morphotype.

**Additional Information:**
- Specimens were collected from various locations in the Northern Territory of Australia, including the Carpentaria Highway.
- The specimens were identified based on their DNA sequence and morphological characteristics.
- The study aimed to provide a comprehensive understanding of the diversity within the genus *Uperoleia* in the Northern Desert of Australia.
**FIGURE 1.** Mitochondrial (a) and nuclear (b) phylogenies of *U. stridera* **sp. nov.** and *U. trachyderma* (modified from Catullo et al. 2013). Patterned bars indicate final species allocation based on genetics, morphology, and acoustics. Individuals with differing mitochondrial versus nuclear haplotypes are indicated by arrows. Oscillogram and spectrograms for the holotype of *U. stridera* **sp. nov.** (Up0261, WAM R164738, from near Fitzroy Crossing, WA) and *U. trachyderma* (Up1091, NTM R36190, from Bullwaddy Conservation Reserve, NT) are pictured in (c). Oscillograms display amplitude (y-axis) against time (x-axis), and spectrograms display frequency (y-axis) against time (x-axis). Time for each graph is one second.

**Systematics**

The new species is clearly assignable to *Uperoleia* based on genetic data (Catullo et al. 2013) and external characters such as the combination of flash coloration and extensive glands that cover the tympanum. *Uperoleia*
A NEW *UPEROLEIA* FROM THE NORTHERN DESERTS OF AUSTRALIA

*trachyderma* has been previously assigned to *Uperoleia* based on morphological characters (Davies et al. 1986), as well as genetic data (Catullo et al. 2011, 2013). It is important to note that due to hybridization, mtDNA cannot be used to accurately identify these species.

**Genus Uperoleia Gray, 1841**


Type species—*U. marmorata* Gray, 1841, by monotypy.

**Uperoleia trachyderma**  
Blacksoil Toadlet  
Fig. 2 & 3c


**Holotype.** SAMA R20374 (male), collected on the Newcastle Creek floodplain at the George Redman Causeway, Northern Territory (17°14′S, 133°28′E) by M. Davies, A.A. Martin and M.J. Tyler on 16 December 1980.

**Paratypes.** KU 189561, NTM 9865, SAMA 20375–6. The series was collected with the holotype.

**Type locality for Uperoleia trachyderma.** The holotype for *U. trachyderma* (SAMA R20374) was collected at Newcastle Creek, NT (17°14′S, 133°28′E) (Fig. 2). This area corresponds with the distribution of the eastern Northern Deserts clade. In addition, the holotype was reported by Tyler et al. (1981b) to have a harsh ‘creak’ of four pulses as a call as well as orange tubercles on the dorsal surface, characteristics that have only been found in the *U. trachyderma* E nDNA clade individuals. Thus, based on available data, we have determined that the *U. trachyderma* holotype belongs to the *U. trachyderma* E nDNA clade.

**Comment on previous descriptions.** In the Davies et al. (1986) redescription of this species, a number of specimens were examined from the western side of the Northern Deserts. These localities do not fall into the range of *U. trachyderma*, and are likely to represent *U. stridera* sp. nov. These individuals and their locations were: SAMA R25952–61 from 113.9 km S Victoria Hwy/Delamere Hwy junction; SAMA R24017 from 415.1 km W Katherine on Victoria Hwy; and SAMA R24018–28 from 4.4 km W Keep River on Victoria Hwy.

**Diagnosis.** Distinguished from all other *Uperoleia* by a combination of small body size (males 18.1–22.1 mm SUL), flattened head (HD/SUL 0.15±0.01 [0.12–0.17]) broad snout (EN/IN 1.24±0.08 [1.14–1.36]), absence of maxillary teeth, finely tubercular skin, large red groin and femoral patches, large round parotoid glands reaching only to arms, well developed oval inguinal glands and large obvious coccygeal glands. Toes and fingers unwebbed, and highly reduced inner and outer metatarsal tubercles. Scattered light orange to red dorsal tubercles. A sharp click consisting of three to four pulses as an advertisement call.

**Material examined.** See Table 2 for specimens labeled as “*U. trachyderma*” under the nDNA clade column.

**Description of series.** Body size small, square and flattened in shape. Head is small, dorso-laterally compressed and shallow in depth. When viewed laterally, snout does not slope, tip is distinct and flattened; when viewed from above, the sides of the snout slope gradually to a sharp corner forming a flattened tip. Canthus rostralis prominent, slightly protruding and well defined; loreal region slopes to jaw and is only slightly convex. Moderate rounded medial projection (synthesis of mentomeckelian bones) that matches notch on upper jaw. Nostrils directed upward and slightly outward; nares have no visible rim. Anterior corner of eye covered by slight
flap of skin. Posterior edge of brow does not project over side of head. Tympana covered by skin and parotoid glands. Tongue oval and elongate. Maxillary and vomerine teeth absent. EN larger than IN.

Arms and hands gracile. Arms are of moderate length and the fingers are moderately fringed and unwebbed. Finger length 3>4>2>1. Tubercles under fingers well developed; one on first and second, two on third and fourth. Well developed outer palmar tubercle on distal portion of wrist; well developed inner palmer tubercle on medial portion of wrist. Nuptial pad of males on outer portion of first finger (beginning 2/3 from attachment of finger), extending to base of wrist and encroaching on inner palmar tubercle.

Legs of moderate length and thin build. Toe length 4-3>5-2>1. Tubercles under toes well developed and conical; one on first and second, two on third and fifth, three on fourth. Toes moderately long, unwebbed, and strongly fringed. Small spade-shaped inner metatarsal tubercle along first toe. Outer metatarsal tubercle conical and highly reduced along fifth toe.

Dorsum covered in fine tubercles which extend down arms, legs, and across the ventral surface. Cloacal flap present, moderately fimbriated in males and status is unknown in females. Parotoid gland round, extremely well developed and obvious, starting from just behind eye and extending posteriorly to arms and to below the angle of the jaw. Inguinal glands well developed, oblong, situated on the side of the body, extending from approximately halfway between arm and leg to the groin coloration; posterior half of gland covered when leg is normally situated. Coccygeal glands large, round and obvious; situated on the torso above the legs. No glands evident between inguinal and parotoid glands. Mandibular gland moderately developed, disrupted, and situated alongside the parotoid gland at the corner of the jaw.

Coloration. Dorsal ground color frequently a rich medium brown, but a few individuals tended towards a grayish brown. Some individuals displayed solid dorsal coloration, while in others the dorsal pigment was mottled with darker spots of a similar color. All individuals displayed scattered dorsal tubercles that ranged from light orange to red. In most individuals the glands were slightly paler than the remaining dorsal surface. A slightly darker V, pointing posteriorly, was present between the eyes of most individuals. Groin and femoral coloration, usually extending down to top of the crus, was universally red. All males had darkly pigmented chins, with the dark pigment extending just posterior to the arms. The belly of all individuals is a cream color with scattered darker spots, which becomes blotchy as it nears the legs, then ceases abruptly. Ventral background pigment, except for a faint scattering of cream tubercles in some individuals, is not present on the thigh region any individuals examined.

Advertisement call. Figure 1c and Table 1 summarize the main features of the call. This species produces a short sharp sound, audible as a slow click. All individuals of U. trachyderma gave calls consisting of three pulses (Fig. 1c), although some individuals also gave intermittently gave four-pulse calls. The four-pulse calls had a similar pulse rate to the three-pulse calls. Call rate of U. trachyderma was significantly lower than the call rate for U. stridera sp. nov.

Habitat. High population densities in protected claypan swamps, in chorus with Cyclorana maculosa, Litoria rubella, and L. caerulea. Individuals in low-density populations were found in boggy portions of pastures and ditches. This species appears to prefer fine soils such as blacksoil, which become extremely soft when wet. This may be associated with the extremely small size and highly reduced metatarsal tubercles, which would limit burrowing capabilities in other soil types.

Distribution. Found in the eastern portion of the Northern Deserts region: from approximately Cloncurry, Queensland, to east of Daly Waters, Northern Territory (Fig. 2d, Table 2). Like U. stridera sp. nov., ecological niche modeling suggests that the sandstone escarpments of the Top End biogeographic region represent the northern barrier to this species, and that the southern barrier corresponds with the 18th parallel, which is the approximate transition to extreme aridity and highly variable rainfall (Catullo et al. 2013). These models also suggest that the Carpentarian Gap (MacDonald 1969) represents a major barrier for the eastern side of the distribution.

Comparisons with other species. Uperoleia trachyderma can be distinguished from all species of Uperoleia except U. stridera sp. nov. by the combination of small size (SUL = 19.77 [1.34]), dorsal-lateral compression (HD/SUL = 0.15 [0.01]) giving the frog a distinct flat aspect, extremely reduced metatarsal tubercles, and by the presence of fine dorsal tubercles. This species is distinguished from U. stridera sp. nov. by a lower pulse rate, a lower call rate, the presence of three or four pulses in the call versus two or three pulses (Fig. 1c, Table 1), and field location (Fig. 2d). This species is also distinguished by the presence of light orange to red dorsal tubercles, which are absent in U. stridera sp. nov.
FIGURE 2. Map of the Australian Monsoonal Tropics showing the distribution of (a) nDNA groups, (b) mtDNA clades, (c) acoustic variation, and (d) total known distribution of *U. stridera* sp. nov (green) and *U. trachyderma* (yellow) based on our data and previous taxonomic descriptions. Half coloured shapes in (b) indicate locations with multiple mtDNA clades present. Arrowheads in (d) indicate type localities. In (a), major bioregions are in bold, and biogeographical barriers are in italics. In (b), dashed lines indicate major roads and dots indicate locations. Modified from Catullo *et al.* 2013.
a) *U. stridera* sp. nov. holotype (WAM R164738)

![Images of Uperoleia stridera sp. nov. holotype](image1)

b) *U. trachyderma* variation, in life

![Images of U. trachyderma in life](image2)

c) *U. stridera* sp. nov. variation, in life

![Images of U. stridera sp. nov.](image3)

**FIGURE 3.** (a) Dorsal, dorsolateral, and ventral photos of the holotype of *Uperoleia stridera* sp. nov. (WAM R164738); (b) Photos of *U. trachyderma* in life (NTM R36190, R36194, & R36202); and (c) Photos of *U. stridera* sp. nov. (NTM R36209, R36212, & R36213). Photos by M. Whitehead & R. Catullo.

*Uperoleia stridera* sp. nov.

*Ratcheting Toadlet*

Fig. 3

**Holotype.** WAM R164738 (male), collected 13 km W of Fitzroy Crossing, WA (18°8′25.7″S, 125°29′32.9″E) by P. Doughty, P. Oliver, and D. Moore on 15 January 2008.

Paratypes. WAM R164691 (male), collected 35 km SE of Fitzroy Crossing, WA (18°27′14.7″S, 125°45′69″E); WAM R164718 (male), collected 75 km SE of Fitzroy Crossing, WA (18°42′22.7″S, 125°46′51″E); WAM 164722 (male), collected 75 km SE of Fitzroy Crossing, WA (18°36′32.9″S, 125°46′51.1″E); NTM R27425 (male), collected at Pigeon Hole station (16°48′36″S, 131°12′36″E); NTM R36205 (male), collected 30 km S of Top Springs, NT (16°44′18.5″S, 131°38′41.4″E); NTM R36207 (male), collected 20 km S of Top Springs, NT (16°41′35″S, 131°43′6.0″E); NTM R36209 (male), collected at Top Springs, NT (16°32′45.7″S, 131°47′43.6″E); NTM R36213 (male), collected 27 km N of Top Springs on Buchanan Hwy, NT (16°24′12.0″S, 131°35′35.3″E); NTM R36214 (male), collected 10 km N of Top Springs on Buchanan Hwy, NT (16°29′20.8″S, 131°43′41.1″E).
**Additional Material.** See Table 2 for specimens labeled as “*U. stridera sp. nov.*” under the nDNA clade column.

**Diagnosis.** Distinguished from all other *Uperoleia* by a combination of small body size (males 19.0–25.0 mm) with flattened head (HD/SUL 0.14±0.01 [0.12–0.15]), broad snout (EN/IN 1.13±0.05 [1.05–1.21]), absence of maxillary teeth, finely tubercular skin, large red groin and femoral patches, large round parotoid glands reaching only to arms, well developed oval inguinal glands and large conspicuous coccygeal glands, toes and fingers unwebbed, and highly reduced inner and outer metatarsal tubercles. Further distinguished from *U. trachyderma* by lack of orange to red flecks on dorsum. A sharp click consisting of two to three pulses as an advertisement call repeated, on average, 90 times per minute at a faster rate than *U. trachyderma* (Table 1).

**Holotype measurements.** Measurements (in mm): SUL–24.3; ArmL–10.5; TL–8.6; FL–14.9; HD–3.5; IO–4.3; Eyel–2.5; EN–2.3; IN–1.9.

**Description of holotype.** Body size small, square and flattened in shape. Head is small, dorso-laterally compressed and shallow in depth (HD/SUL = 0.14, IO/HD = 1.24). When viewed laterally, snout is horizontal, tip is distinct and flattened; when viewed from above, the sides of the snout slope gradually up to a sharp angle that forms a flattened tip (EN/IN = 1.21). Canthus rostralis prominent, slightly protruding and well defined; loreal region slopes to jaw and is only slightly convex. Moderately rounded medial projection (synthesis of mentomeckelian bones) that matches notch on upper jaw. Nostrils directed upward and slightly outward; nares have no visible rim. Anterior corner of eye covered by slight flap of skin. Posterior edge of brow does not project over side of head side of head. Tympana covered by skin and parotoid glands. Tongue oval and elongate. Maxillary and vomerine teeth absent. EN larger than IN.

Arms and hands gracile. Arms are of moderate length (ArmL/SUL = 0.43) and the fingers are moderately fringed and unwebbed. Finger length 3>4>2>1. Tubercles under fingers well developed; one on first and second, two on third and fourth. Well-developed outer palmar tubercle on distal portion of wrist; well developed inner palmer tubercle on medial portion of wrist. Nuptial pad of males on outer portion of first finger (beginning 2/3 from attachment of finger), extending to base of wrist and encroaching on inner palmar tubercle.

Legs of moderate length (TL/SUL = 0.35, FTL/SUL = 1.74), thin. Toe length 4>3>5>2>1. Tubercles under toes well developed and conical; one on first and second, two on third and fifth, three on fourth. Toes moderately long, unwebbed, and strongly fringed. Small spade-shaped inner metatarsal tubercle, oriented along first toe. Outer metatarsal tubercle conical and highly reduced, oriented along fifth toe.

Dorsum covered in fine tubercles which extend down arms, legs, and across the ventral surface. Cloacal flap present, moderately fimbriated. Parotoid gland round, extremely well developed and obvious, starting from just behind eye and extending posteriorly to arms and to below the angle of the jaw. Inguinal glands well developed, oblong, situated on the side of the body, extending from approximately halfway between arm and leg to the groin coloration; posterior half of gland covered when leg is normally situated. Coccygeal glands large, round and obvious; situated on the torso above the legs. No glands evident between inguinal and parotoid glands. Mandibular gland moderately developed, disrupted, and situated alongside the parotoid gland at the corner of the jaw.

**Coloration.** In preservative (Fig. 3a), dorsum is a pale grey with large irregular dark patches. The parotoid and coccygeal glands are a light salmon pink. Ventrum is a dull yellow, and the outside edge of the chin is stippled with pigment. The anterior and posterior flash coloration patches are large and come in to close proximity on the dorsal surface of the thigh, separated by a thin strip of dark dorsal coloration.

**Variation** In life, dorsal ground color frequently a light to rich medium brown, although individuals varied from reddish-orange to brownish-gray; some individuals displayed solid coloration, while in others the dorsal pigment was mottled with darker spots of a similar color. In mottled individuals, dorsum scattered with small to large irregular blotches of dark brown, especially near parotoid glands (forming a dark border around them) and coccygeal region; upper limbs also with dark brown markings, often forming bars on the legs. Some individuals displayed uniform coloration, while in others the dorsal pigment was mottled with darker spots of a similar color. In most individuals the parotoid and coccygeal glands were slightly paler than the rest of the dorsal surface, sometimes suffused with orange. A slightly darker ‘V’ (pointing posteriorly) was present between the eyes of most individuals. Groin and femoral coloration, usually extending down to top of the crus, was always a bright red. All males had darkly pigmented chins, with the dark pigment extending just posterior to the arms. The venter of all individuals was a pale white with scattered darker flecks; ventral background pigment, except for a faint scattering of cream tubercles in some individuals, was not present on the thigh region.
Advertisement call. Table 1 and Fig. 1c summarize the main features of the call. This species produces a short sharp sound, audible as a grinding click. All individuals of *U. stridera* primarily gave calls consisting of two pulses (Fig. 1c), although some individuals also periodically produced three-pulse calls. The three-pulse calls had a similar pulse rate as the two-pulse calls, as can be noted by the small standard deviation in pulse rate in Table 1. Individuals producing 3 pulse calls in our analyses were found both the far west (Up0248, Up0250 & Up0261) and east (Up1111) of the *U. stridera* distribution.

Habitat. Usually encountered calling from flooded grasslands, streams, ponds, or roadside ditches.

Distribution. Found in the western portion of the Northern Deserts region: from approximately Fitzroy Crossing, Western Australia, to west of Daly Waters, Northern Territory (Fig. 2). Ecological niche modeling suggests that the sandstone escarpments of the Top End biogeographic region represent the northern barrier to this species, and that the southern barrier (~18°S) is the approximate transition to extreme aridity and highly variable rainfall (Catullo et al. 2013).

Etymology. The name is a euphonious random combination of letters suggestive of the Latin word *strido*, meaning a creaking or grating sound. This refers to the grating nature of the call.

Comparisons with other species. *Uperoleia stridera* can be distinguished from all species of *Uperoleia* except *U. trachyderma* by the combination of small size (SUL = 21.9 [1.7]), pronounced dorsolateral compression (HD/SUL = 0.14 [0.01]), extremely reduced metatarsal tubercles, and presence of fine dorsal tubercles. It is further distinguished from *U. trachyderma* by higher pulse rate (Table 1; Fig. 1c), two or three pulses per call (vs. three or four), by location (Fig. 2d), and by the lack of scattered light orange to red tubercles on the dorsum.

Discussion

The description of *U. stridera* brings the total number of *Uperoleia* to 28, by far the largest genus in the family Myobatrachidae. We note, however, that much of the ecology of both *U. stridera* and *U. trachyderma* remain unknown. It is apparent from examination of Fig. 2 that significant geographic gaps remain to be sampled, a difficult task in this region due to access problems during the wet season. Further work on other species complexes within *Uperoleia* from the monsoonal tropics are likely to result in additional new species and better understanding of morphological, acoustic, and genetic variation in the genus.

Our work contributes to a growing suite of data suggesting that the Northern Deserts region contains a unique assemblage of fauna and may in fact be two distinct bioregions (Catullo et al. 2013). Genetic research into the distributions of *Heteronotia* geckos (Fujita et al. 2010) and agamid lizards (Melville et al. 2011; Smith et al. 2011) support the presence of distinct species associated with the Northern Deserts. As defined by Catullo et al. (2013), the Northern Deserts is comprised of four Interim Biogeographic Regions of Australia (IBRA, Commonwealth of Australia 2005): the Sturt Plateau, the Mount Isa Inlier, the western arm of the Mitchell Grass Downs, and the Ord Victoria Plain. The first three areas encompass the entire distribution of *U. trachyderma* and are poorly conserved, with less than 3% of each included in the National Reserve system of Australia (Commonwealth of Australia 2008a, 2010). The Ord Victoria Plain, which comprises the distribution of *U. stridera*, has greater than 10% overall protection. This figure, however, includes Purnululu National Park, a large area with distinct geology that is probably unsuitable for savannah species, as well as a large area designated ‘minimal use’ but is still utilized for grazing (Commonwealth of Australia 2005, 2008b).

For each of these IBRA regions, land use is almost entirely grazing (Bastin & ACRIS Management Committee 2008). For example, 96% of the Mitchell Grass Downs bioregion is under pastoral lease (Bastin & ACRIS Management Committee 2008). Studies of grazing impact on Australian amphibians are still in their infancy, and the few studies that include amphibians either focused on floodplain species (Jansen & Healey 2003) or found too few individuals to clearly assess any trends (Woinarski & Ash 2002). None of these studies have been able to locate any individuals of the *Uperoleia* genus. However, the negative impact of pastoralism on biodiversity in northern Australia is well established (reviewed in Woinarski & Fisher 2003), and includes evidence from birds (Woinarski & Catterall 2004), reptiles (Price et al. 2010), mammals (Read & Cunningham 2010) and invertebrates (Woinarski et al. 2002). This fits with the trend we found in the field, where large multi-species choruses were only found in the few fenced reserve areas in the region, with smaller scattered low-density populations in areas with strong pastoral use. Thus, these species may be of conservation concern but without further data this cannot be fully assessed.
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