



## The advertisement call and clutch size of the Golden-capped Boulder-frog *Cophixalus pakayakulangun* (Anura: Microhylidae)

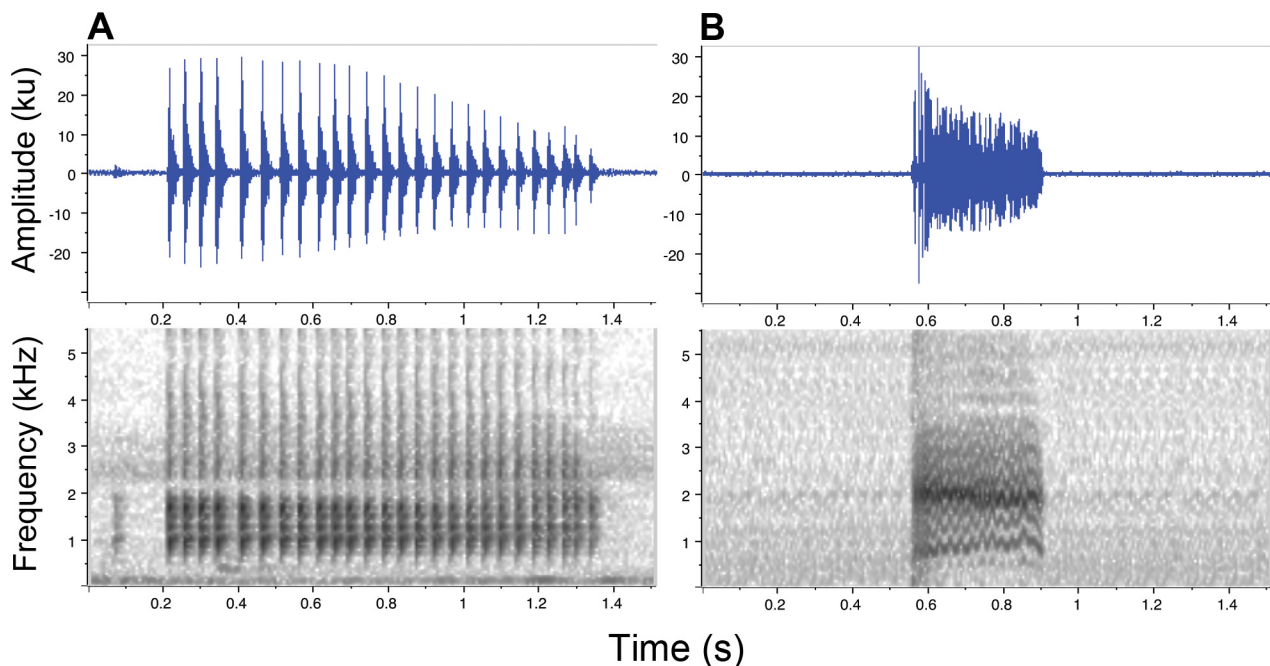
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In Australia, the family Microhylidae consists of 19 species of *Cophixalus* Boettger 1892 and 5 species of *Austrochaperina* Fry 1912 (Hoskin 2012; Hoskin, submitted). Most of these species have highly localized distributions in the rainforests and boulder-fields of north-east Australia (Zweifel 1985; Hoskin 2004; Hoskin & Aland 2011). Australian microhylid frogs are terrestrial breeders with direct development (Zweifel 1985; Hoskin 2004; Anstis *et al.* 2011). The natural history of Australia's microhylids is fairly well known, with the basics of breeding biology such as calls and clutch sizes published for most species (Zweifel 1985; Hoskin 2004; Anstis *et al.* 2011; Hoskin & Aland 2011; Hoskin 2012; Hoskin, submitted). Hoskin & Aland (2011) described two new species from Cape York Peninsula, *C. pakayakulangun* and *C. kulakula*, each restricted to boulder-field areas only 30 km apart but readily distinguished by morphology and genetics. Calls could not be compared because the call of *C. pakayakulangun* was not known at that time. Clutch information for *C. pakayakulangun* was also not available at the time of description.



**FIGURE 1.** A single call of: (A) *C. pakayakulangun* and (B) *C. kulakula*. Top row shows waveform, displaying amplitude (y-axis) against time (x-axis, seconds). Bottom row shows spectrogram, displaying call frequency (y-axis) and intensity (degree of shading) against time (x-axis, seconds). Air temperature for both recordings was 28°C.

Here we report the advertisement call and clutch size for *C. pakayakulangun*. The call was recorded from a single male calling consistently under hot humid conditions in the early evening on 21/12/2012. Air temperature at the time of recording (approx. 8:00 pm) was 28°C. The call was recorded using a Sony ICD-UX523F recorder and Sony ECM-MS907 microphone. The software Raven Pro Version 1.3 was used to measure call traits. Spectrograms were produced

using the Hann window function with a window size of 256 samples and a 3 dB bandwidth of 248 Hz. The following call traits were measured: call rate, the time between consecutive calls; call duration, the length of a single call from the beginning of the first pulse to the end of the last pulse; number of pulses; pulse rate, number of pulses divided by call duration; dominant frequency, the frequency at which the call is of greatest intensity. The calls show two frequency peaks of equal intensity, so a lower frequency peak and an upper frequency peak were measured separately. Five consecutive calls were measured and the average and range are presented. Clutch size was counted from dissection of a gravid female (Queensland Museum specimen J92319) euthanized on 17/4/2013. Two clutches were evident in the female, distinguished by being of different egg size and being spatially separated in the body cavity (i.e., two clumps).

Figure 1 shows a single representative call of *C. pakayakulangun* and *C. kulakula*. The call of *C. pakayakulangun* is a slow creak with the following measurements (mean followed by range in brackets): call rate 3.95 s (3.68–4.22); call duration 1.16 s (1.14–1.20); pulses per call 26 (24–29); pulse rate 22 pulses/s (21–24); lower dominant frequency peak 0.98 kHz (0.96–1.00); upper dominant frequency peak 1.66 kHz (1.64–1.68). The call of *C. pakayakulangun* is clearly different from that of its sister species *C. kulakula* (Fig. 1; Hoskin & Aland 2011) and that of all other Australian microhylids (Zweifel 1985; Hoskin 2004; Hoskin 2012; Hoskin, submitted). The counts of the two clutches contained within the female *C. pakayakulangun* were a clutch of 45 large ova and a clutch of 48 smaller ova. These are similar clutch sizes to that recorded for the sister species *C. kulakula* (47 eggs) (Hoskin & Aland 2011), with the clutch sizes for these two species being significantly larger than those recorded for all other species (6–22, average 12) (Hoskin 2004).

## Acknowledgments

Funding was provided by the Australian Biological Resources Study. Collecting was conducted under the permit WITK05232208, provided by the Queensland Department of Environment and Resource Management.

## References

- Anstis, M., Parker, F., Hawkes, T., Morris, I. & Richards, S.J. (2011) Direct development in some Australopapuan microhylid frogs of the genera *Austrochaperina*, *Cophixalus* and *Oreophryne* (Anura: Microhylidae) from northern Australia and Papua New Guinea. *Zootaxa*, 3052, 1–50.
- Hoskin, C.J. (2004) Australian microhylid frogs (*Cophixalus* and *Austrochaperina*): phylogeny, taxonomy, calls, distributions and breeding biology. *Australian Journal of Zoology*, 52, 237–269.  
<http://dx.doi.org/10.1071/zo03056>
- Hoskin, C.J. (2012) Two new frog species (Microhylidae: *Cophixalus*) from the Australian Wet Tropics region, and redescription of *Cophixalus ornatus*. *Zootaxa*, 3271, 1–16.
- Hoskin, C.J. (submitted) A new frog species (Microhylidae: *Cophixalus*) from boulder-pile habitat of Cape Melville, north-east Australia.
- Hoskin, C.J. & Aland, K. (2011) Two new frog species (Microhylidae: *Cophixalus*) from boulder habitats on Cape York Peninsula, north-east Australia. *Zootaxa*, 3027, 39–51.
- Zweifel, R.G. (1985) Australian frogs of the family Microhylidae. *Bulletin of the American Museum of Natural History*, 182 (3), 265–388.