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A KEY TO THE MICROHYLID FROGS OF AUSTRALIA, AND NEW DISTRIBUTIONAL DATA

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The frog family Microhylidae is represented in Australia by *Cophixalus* (14 species) and *Austrochaperina* (5 species). The majority of these species have small rainforest distributions in north-east Queensland, primarily at higher altitude. Research on Australian microhylid frogs is increasing due to recognition of their importance in assessments of biodiversity and evolutionary history of rainforest areas, and due to their predicted susceptibility to global climate change. Accurate species identification is therefore imperative. Most of the Australian species are morphologically very similar, making identification (even between the two genera) difficult. A key to identify all 19 Australian microhylid species is provided, based on a combination of morphology, colour and pattern, calls, and distributions. The key is suitable for use in the field as well as for preserved specimens. Distributional data incorporating new records from recent fieldwork is also presented. □ *Microhylidae, distribution, key, Cophixalus, Austrochaperina, Australia, Wet Tropics.*

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The frog family Microhylidae is distributed on all continents except Antarctica (Zug et al., 2001). In Australia the family is represented by two genera, *Cophixalus* (14 species) and *Austrochaperina* (5 species), and comprises a relatively small component of the frog fauna (Hoskin, 2004). All the species are restricted to north-east Queensland and the northern tip of the Northern Territory, the majority being endemic to the ‘Wet Tropics’ region of north-east Queensland (between Townsville and Cooktown) where they account for >50% of the rainforest frog diversity (Hoskin, 2004). Twelve of the 14 *Cophixalus* species have very small distributions and six of these are restricted to high altitude (>700m) mountaintops (Hoskin, 2004). Most Australian microhylid frogs are restricted to rainforest, a few species also occur in sclerophyll forest, and two species are restricted to boulder fields (Zweifel, 1985; Hoskin, 2004).

Identification of the Australian microhylid species is notoriously difficult due to their small size, generally conservative morphology and cryptic habits. A key was constructed by Zweifel (1985) but it includes traits that are hard to determine in the field and does not incorporate recently described species (Richards et al., 1994; Davies & McDonald, 1998; Hoskin, 2004) or new morphological, distributional and call data (Hoskin, 2004; Hoskin & Higgie, 2005). Here I present a key for all 19 Australian microhylid frog species based on a combination of morphology, pattern/colour, distribution and call data. This

data comes from Zweifel (1985), Hoskin (2004), Davies & McDonald (1998), and unpublished data I have collected. *Cophixalus crepitans* and *C. peninsularis* are not distinguished from each other in the key due to the lack of suitable characters and uncertainty over whether these two are in fact distinct species (Hoskin, 2004).

The key is suitable for identifying both live individuals in the field and museum specimens, and requires callipers or a ruler and magnification using a hand-lens, microscope or digital camera. It is of greatest value for identifying live adult males which, due to their calling activity, are the most commonly encountered and easily identified individuals. Snout to vent length (SVL) is measured from the tip of the snout to the vent (with the frog held flat), and the categories defined for species incorporate the bulk of adults measured. Some species are included twice in the key to allow for difficulty in scoring characters or in determining the appropriate size (SVL) category. Colour and pattern traits are generally less distinct in preserved specimens and some of the colour traits are only suitable for live animals (these are pointed out). All photos are of preserved specimens and Queensland Museum registration numbers (QMJ) are presented where applicable. All photos of hands are of the underneath and the fingers are numbered one to four from innermost to outermost.

The male call of each species is described in the key; for details of the calls (including spectrograms, characteristics and variation within species) refer to

Hoskin (2004). The CD by Stewart (1998) includes calls of many of these species. It should be noted that the calls of some species (e.g. *Cophixalus hosmeri*, *C. neglectus* and *C. ornatus*) can be different to those presented on the CD due to high levels of intra-specific call variation (Hoskin, 2004). It should also be noted that the call presented for *C. concinnus* on the CD is that of *C. aenigma* (Hoskin, 2004). Descriptions of distribution in the key are approximate, for details see Hoskin (2004). In addition, recent fieldwork has further clarified the distribution of some species. *C. bombiensis* is now confirmed (by call, morphology and genetic data) to be present at Mossman Gorge (16°28'25"S, 145°19'49"E, 100m elevation, 16/1/05), a significant southerly range extension. The lower altitudinal limit of *C. concinnus* has been estimated in the field to be 1080m (Hoskin & Higgie, 2005), which is similar to the estimate of 1100m based on museum specimen data (Hoskin, 2004). I recently found *C. neglectus* calling at 975m elevation on Mt Bartle Frere (17°22'39"S, 145°47'12"E, 26/1/05). This is similar to the lower altitudinal limit of 900m reported by Zweifel (1985) and McDonald (1992), but differs from the lower elevational limits recorded on recent altitudinal surveys of Mt Bartle Frere (1150m, Hoskin, 2004; 1340m, Shoo & Williams, 2004) and Mt Bellenden Ker (1200m, Shoo & Williams, 2004; 1230m, this paper, 17°15'51"S, 145°51'52"E, 20/1/05). Although the 975m record suggests a lower altitudinal limit for *C. neglectus* than has been recently recognised, it should be noted that it is based on a small chorus of males that were calling in a deep rock pile at considerably lower elevation than the nearest other males found calling on that night, which were at 1125m elevation (17°22'45"S, 145°47'24"E, 26/1/05).

Cophixalus and *Austrochaperina* can be distinguished from other rainforest frogs in northern Australia (except *Taudactylus*) by the absence of webbing between the toes. From *Taudactylus* they can be distinguished by lacking barring on the legs and by lacking prominent, rounded tubercles on the underside of the hands. Cogger (2000) provides additional characters for distinguishing the microhylid frogs from other Australian frogs.

KEY TO AUSTRALIAN MICROHYLID FROGS (*COPHIXALUS* AND *AUSTROCHAPERINA*)

1. Small to medium body size (SVL 18–47mm) 2
Very small body size (SVL 12–18mm) 16
2. Finger discs obviously expanded from finger width (although disc on first finger very small) (e.g. Figs 1A–B) 3
Finger discs not obviously expanded (e.g. Figs 1C–D) 10
3. Third finger disc obviously wider than disc of fourth toe, and more truncate than rounded (e.g. Figs 1A, 1E) 4
Third finger disc about the same width as, or narrower than, disc of fourth toe, and more rounded than truncate (e.g. Fig. 1B) 7
4. Ventral pattern (particularly throat and chest) of dark blotches on a red (in life) and white background (Fig. 1F); call a short trill/creak; >1100m Thornton Peak *C. concinnus*
No obvious dark blotching or red on ventral surfaces, instead, evenly pale, yellow or grey, or finely spotted with grey or brown. 5
5. SVL 18–28mm; dorsal pattern of dark and cream markings on a pale grey or brown background; call a short 'beep'; widespread in southern and central Wet Tropics, between Carbine Tableland and Paluma *C. ornatus*
SVL >29mm 6
6. SVL 29–47mm; axilla and groin orange or yellow (in life), female dorsum yellow (in life) or pale (in preservative), males mottled grey or brown; call a slow tapping; boulder fields of Black Treveltham Range *C. saxatilis*
SVL 40–46mm (female); axilla and groin scarlet (in life), female dorsum tan with brown speckles, male unknown; call unknown; boulder fields of Cape Melville *C. zweifeli*
7. Found south of Cairns 8
Found north of Cairns 9
8. Prominent black dorsolateral dash above forelimb; fingers long; call a short trill/creak; >900m Mt Elliot *C. mcdonaldi*
Dorsolateral surface may be blotched or smudged brown, but no prominent black dorsolateral dash above forelimb; fingers short; call a short buzz or squelch; >1000m Mt Bartle Frere and Mt Bellenden Ker *C. neglectus*
9. Call a short trill/creak; generally calls from elevated position; >1100m Carbine Tableland. *C. monticola*
Call a slow or medium-paced tapping; generally calls from ground or close to it; >700m Carbine and Thornton Uplands and Mt Finnigan. *C. aenigma*
10. First finger about half length of second (e.g. Fig. 1C) 11
First finger short, obviously less than half length of second (e.g. Fig. 1D) 15
11. Found north of Cooktown or in Northern Territory; SVL <21mm. 12
Found south of Cooktown; SVL >21mm 13
12. Found on northern tip of Northern Territory and associated offshore islands; call a series of peeps uttered rapidly (about 40 per 10 seconds) *A. adelphe*
Found on Cape York Peninsula north of Cooktown (also in southern PNG); call a series of peeps uttered slowly (about 15 per 10 seconds) *A. gracilipes*
13. In life, a well-defined pale line extending from nostril over eye and a reddish flecked iris; in preservative, reasonably sharp demarcation from darker throat and chest to lighter abdomen; call a rapid series of high-pitched notes; widespread in the Wet Tropics *A. pluviialis*
In life, no (or poorly defined) pale line extending from nostril over eye and a golden flecked iris; in preservative,

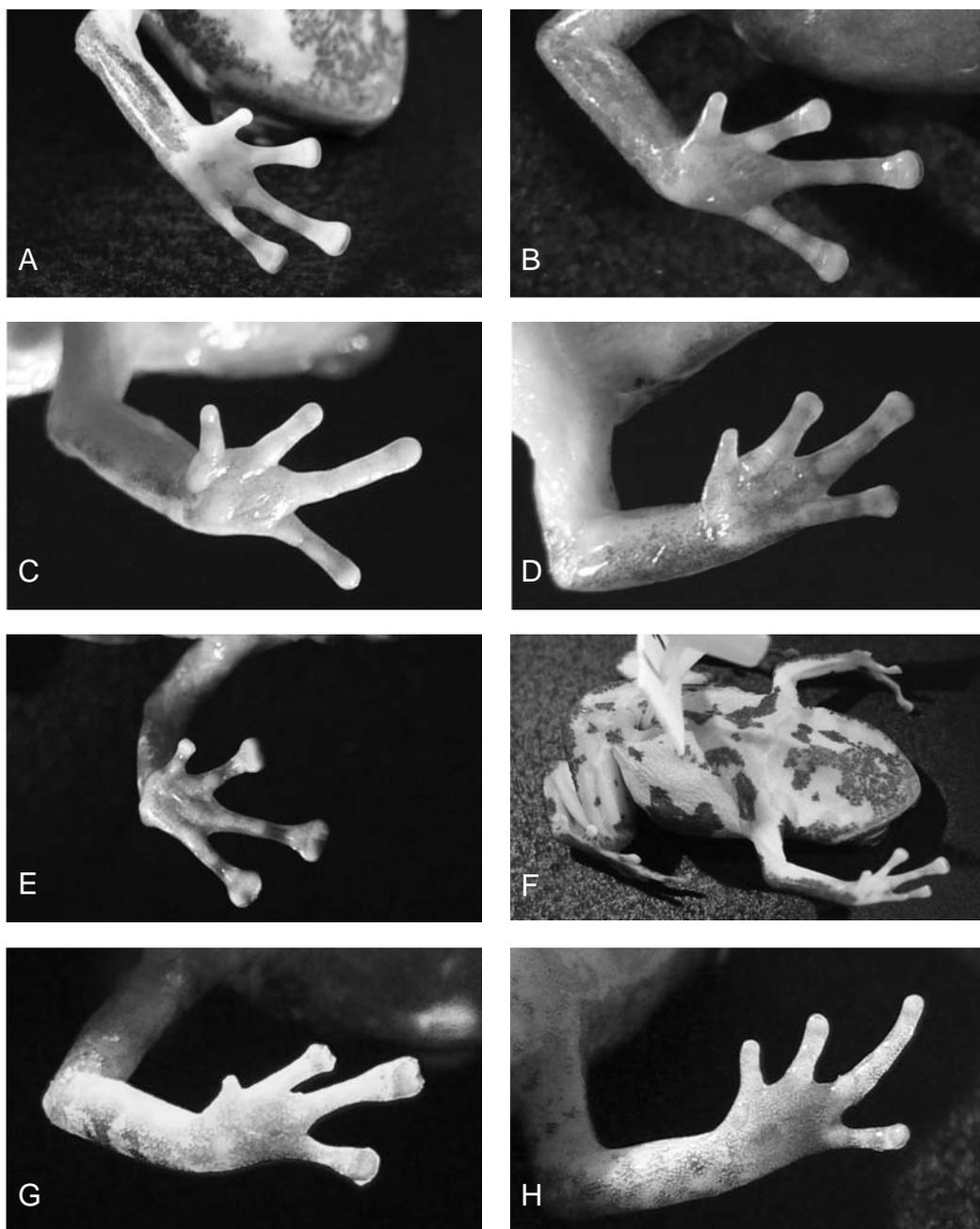


FIG. 1. A, *Cophixalus concinnus*, QMJ43917; B, *C. aenigma*, QMJ53879; C, *Austrochaperina robusta*, QMJ55888; D, *C. neglectus*, QMJ55795; E, *C. ornatus*, Mt Bartle Frere; F, *C. concinnus*, QMJ43917; G, *C. crepitans*, QMJ28817; H, *Austrochaperina gracilipes*, QMJ70512.

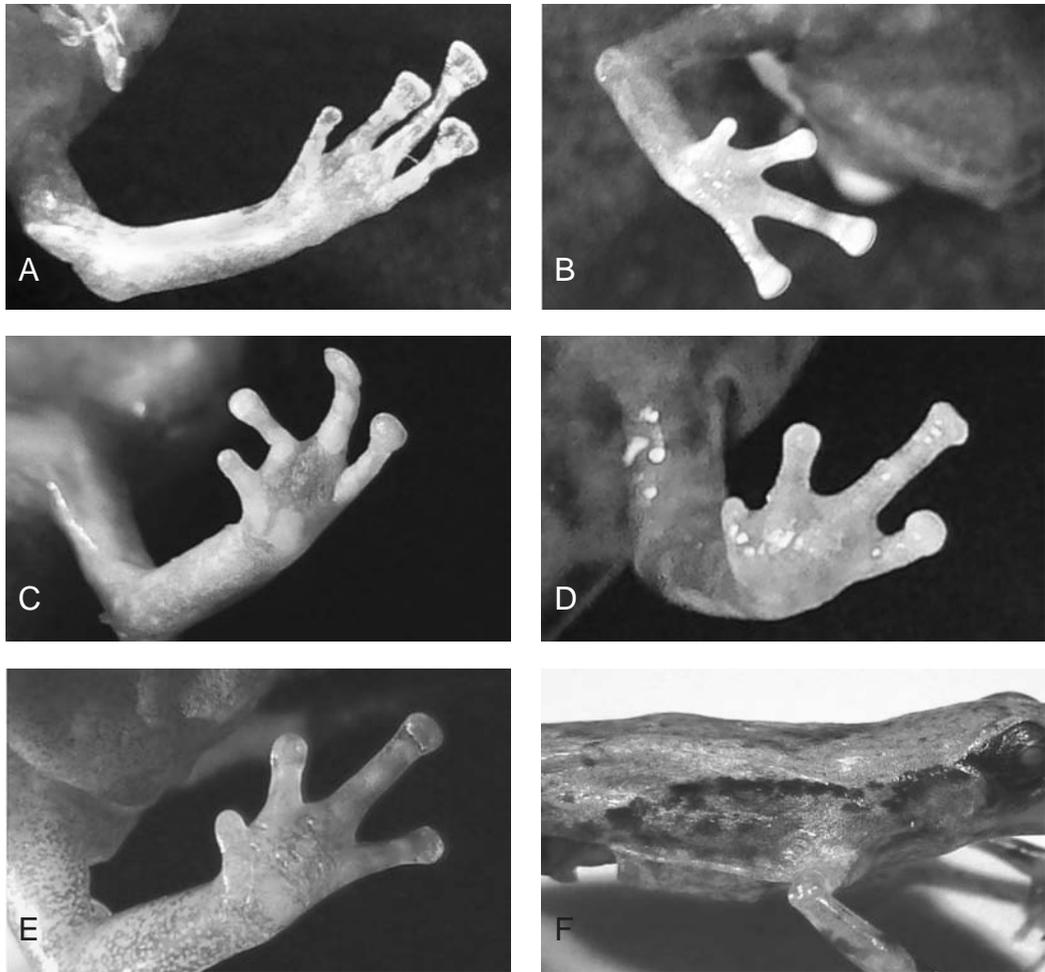


FIG 2. A, *Cophixalus ornatus*, Tully Valley; B, *C. infacetus*, QMJ39897; C, *C. exiguus*, QMJ40596. D, *C. bombiens*, QMJ55993; E, *C. hosmeri*, QMJ56467; D, *C. bombiens*, Windsor Tbl.

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| <p>gradual transition from darker throat and chest to lighter abdomen; call a series of brief, high-pitched whistles or whistle-like couplets. 14</p> <p>14. Call a series of brief, high-pitched whistles/chirps, uttered as couplets (in pairs); southern half of Wet Tropics north to northern Atherton Tableland, Lamb Range and Malbon Thompson Range <i>A. robusta</i> Call a series of brief, high-pitched whistles/chirps; northern half of Wet Tropics south to Lamb Range and northern Atherton Tableland. <i>A. fryi</i></p> <p>15. Prominent black dorsolateral dash above forelimb; fingers long; call a short trill; >900m Mt Elliot <i>C. mcdonaldi</i> Dorsolateral surface may be blotched or smudged brown, but no prominent black dorsolateral dash above forelimb; fingers short; call a short buzz or squelch; >1000m Mt Bartle Frere and Mt Bellenden Ker <i>C. neglectus</i></p> <p>16. Found north of Cooktown or in Northern Territory . . . 17</p> | <p>Found south of Cooktown. 19</p> <p>17. First finger short, obviously less than half length of second (e.g. Fig. 1G); call a short rattle, composed of paired clicks; McIlwraith Ra <i>C. crepitans/C. peninsularis</i> First finger about half length of second (e.g. Fig. 1H) 18</p> <p>18. Found on northern tip of Northern Territory and associated offshore islands; call a series of peeps uttered rapidly (about 40 per 10 seconds). <i>A. adelphe</i> Found on Cape York Peninsula north of Cooktown (also in southern PNG); call a series of peeps uttered slowly (about 15 per 10 seconds) <i>A. gracilipes</i></p> <p>19. Found south of Cairns. 20 Found north of Cairns 21</p> <p>20. Large, slightly truncate finger discs (Fig. 2A); SVL>17mm; call a short 'beep', this small 'form' found on Hinchinbrook Is. and lowlands (<500m) of Mt Bartle Frere, Palmerston</p> |
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- Valley, Tully Valley, Mission Beach. *C. ornatus*
Distinct but small, rounded finger discs (Fig. 2B); SVL <17mm; a creaking call of finely pulsed clicks; between Cairns and Herbert River (Ingham) *C. infacetus*
21. First finger well formed, about half length of second (Figs 1B, 2C); male SVL >14mm. 22
First finger a short 'nubbin', about one third length of second (Figs 2D–E); male SVL <14mm 23
22. SVL >17mm; call a slow or medium-paced tapping; >700m Carbine and Thornton Uplands and Mt Finnigan *C. aenigma*
SVL <17mm; call a medium-paced tapping; Big Tableland, Mt Hartley and surrounding lower altitudes (including lower slopes of Mt Finnigan). *C. exiguus*
23. A broken or continuous series of prominent black dashes/blotches extending from behind the eye and down flank (e.g. Fig. 2F); call a short buzz 'bzzzip'; Windsor Tableland and scattered sites (primarily lowland) in northern Wet Tropics (e.g. Thornton Peak area, Shiptions Flat, Mossman Gorge) *C. bombiens*
Flank mottled or blotched but not prominently marked with black as above; call usually a fast-paced tapping/clicking (but occasionally a medium-paced tapping or a buzz); >800m Carbine Tableland *C. hosmeri*
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