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Diversity and distribution of cave crickets in the genus *Micropathus* Walker, 1869, threatened short-range endemics from Tasmanian wet forest (Orthoptera: Rhaphidophoridae)

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Abstract. Rhaphidophoridae, also called cave crickets, is a globally distributed insect group belonging to the katydids and allies (Orthoptera: Ensifera: Tettigoniidea). Rhaphidophorids are restricted to humid microhabitats such as caves and wet forests, but the group's true diversity is poorly known. In Australia, 27 species are described from nine genera in the subfamily Macropathinae, with the highest diversity concentrated in the mesic island state of Tasmania. *Micropathus* Richards, 1964 is the most widespread genus on the island and contains five species largely restricted to subterranean habitats. *Micropathus* is reliant on pockets of relictual wet forest, placing species at risk of decline due to climate and land use change, and one species is listed as Critically Endangered. A recent molecular phylogeny for Macropathinae identified two additional, putatively undescribed species of *Micropathus*, neither of which can be adequately conserved without formal scientific names. Integrating morphological evidence alongside this phylogenetic framework, we describe *Micropathus ditto* Beasley-Hall sp. nov., previously thought to be a subpopulation of *Micropathus tasmaniensis*, and *Micropathus zubat* Beasley-Hall sp. nov., currently known only from the remote Forest Hills karst system. We also provide a key to *Micropathus* and redescribe its existing members to better reflect intraspecific morphological variation in the genus.

Keywords. Macropathinae, cave cricket, cave wētā, Tasmania, Australia.

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Introduction

Rhaphidophoridae Walker, 1869 (Orthoptera: Ensifera: Tettigoniidea), commonly called cave crickets, cave wētā, or camel crickets, is a nocturnal and often subterranean group of insects found on all

continents except Antarctica. Despite their common name, raphidophorids may be found outside of caves in suitably humid, sheltered, and dark habitats such as alpine scree, animal and bird burrows, mine adits, burrows in sand dunes, and underneath logs and boulders in wet forest (Richards 1967, 1987). In Australia, the family is exclusively represented by Macropathinae Karny, 1930, with most taxonomic work on the group having been conducted in the 1960s and 1970s by Dr Aola Richards. Richards largely relied on the spination of the legs and the shape of the terminalia to delimit species, but subsequent taxonomic efforts have been complicated by the cryptic nature of individuals, the remoteness and inaccessibility of many subterranean habitats for sampling, and a high degree of intraspecific morphological variation. Nine Australian genera have been described to date (Richards 1987; Iannello & Beasley-Hall 2024). Of these, five are represented in Tasmania, where the group is the most speciose (Richards 1987; Beasley-Hall *et al.* 2025a). *Micropathus* Richards, 1964 and *Parvotettix* Richards, 1970 are the most widespread: the former is apparently restricted to subterranean and wet forest habitats in the more mesic, western portion of the island, whereas *Parvotettix* is found across the climatically drier east and appears to be more tolerant of above-ground habitats. The remaining Tasmanian raphidophorid genera have more restricted distributions and are mostly limited to islands (*Cavernotettix* Richards, 1966; *Speleotettix* Chopard, 1944; *Tasmanoplectron* Richards, 1971).

Micropathus was the first Australian raphidophorid described by Richards, who considered it the dominant genus on the island (Richards 1967). The genus presently contains five species: *Micropathus tasmaniensis* Richards, 1964; *M. cavernicolus* Richards, 1964 (formerly *cavernicola*); *M. fuscus* Richards, 1968, *M. montanus* Richards, 1971, and *M. kiernani* Richards, 1974. All members are known from the entrance-twilight-transition zone inside caves – where they typically cluster in dense colonies comprising hundreds of crickets – amongst which sympatric species of *Parvotettix* may occur as solitary individuals (Richards 1970). *Micropathus* has also been collected occasionally from mine adits, rainforest, subalpine scrub, and wet sclerophyll forest (Richards 1987). Specimen abundance and ease of sampling in limestone caves, as well as biassed sampling of these habitats historically, means that Raphidophoridae may be under-represented in museum collections from non-karst habitats (Threatened Species Section 2022). As such, the broader distribution and habitat tolerances of Raphidophoridae in Tasmania remains an important question for further research and conservation, especially because several species appear to have restricted distribution ranges on land subjected to native forest logging and land clearing. Indeed, *M. kiernani* is currently listed as Critically Endangered federally and Endangered at the state level owing to its known range encompassing a single cave (Threatened Species Section 2022).

A recent molecular phylogeny of Macropathinae by the authors highlighted the existence of several undescribed Australian species and genera, with deep divergences between major clades suggesting additional new taxa remain to be sampled (Beasley-Hall *et al.* 2025a). Of particular interest in the present study were two cave-dwelling lineages identified as putatively new species of *Micropathus*. Here, we integrate this molecular evidence alongside morphological data to describe *Micropathus ditto* Beasley-Hall sp. nov. and *Micropathus zubat* Beasley-Hall sp. nov. We also redescribe existing species of *Micropathus* and present an updated key to the genus. Finally, we undertake a preliminary reappraisal of the known distributions of *Micropathus* spp. and identify priorities for their further research and conservation management.

Material and methods

The identity of the new species described here was established using molecular data in a recent phylogenetic study by the authors (Beasley-Hall *et al.* 2025a). Briefly, specimens of *Micropathus* were obtained from the field or loaned from the Australian National Insect Collection (ANIC), Tasmanian Museum and Art Gallery (TMAG), or South Australian Regional Facility for Molecular Evolution (SARFME) as part of a broader sampling effort targeting all described Australian Raphidophoridae. Coding genes and ribosomal RNAs from the nucleus and mitochondrion were recovered using Sanger

or next-generation sequencing depending on specimen condition. Phylogenetic analysis was performed on a robust dataset that integrated recently sequenced Australian samples alongside published sequences from throughout the Southern Hemisphere. We recovered all species of *Micropathus*, and the genus itself, as monophyletic with high node support (summarised in Fig.). This analysis also revealed two undescribed lineages: the first being sister to *M. kiernani* and including specimens previously identified as southern populations of *M. tasmaniensis*, and the second sister to a clade containing *M. montanus* and *M. cavernicolus*.

We examined the morphology of the same specimens sequenced in the aforementioned Australia-wide study as well as additional conspecifics from the same localities. Specimens unavailable for morphological inspection, but with a known phylogenetic placement per Beasley-Hall *et al.* (2025), are referred to below as having been examined for molecular data only and a GenBank accession supplied (COI). Morphological examinations were performed using a Zeiss Stemi 2000 stereo microscope with a focus on characters associated with leg spination and the terminalia, known to differ reliably among Australian species and genera (Richards 1964, 1974). Our terminology around these characters follows Richards (1964) and more recently Trewick (2024). Specimens were imaged using a Canon EOS 5DS R and a Canon MP-E 65 mm f/2.8 1–5× Macro lens. Resulting images were stacked and processed using the PMax stacking method in Zerene Stacker ver. 1.04, Adobe Photoshop 2025, and Adobe Lightroom 2025.

Results

Taxonomy

Class Insecta Linnaeus, 1758
Order Orthoptera Olivier, 1789
Infraorder Tettigoniidea Kevan, 1982
Superfamily Rhaphidophoroidea Walker, 1869
Family Rhaphidophoridae Walker, 1869
Subfamily Macropathinae Karny, 1930
Tribe Macropathini Karny, 1930

Genus *Micropathus* Richards, 1964

Micropathus Richards, 1964: 217–218.

Type species

Micropathus tasmaniensis Richards, 1964.

Etymology

An apparent reference to *Macropathus* Walker, 1869, the namesake of ‘Macropathinae’, but not explained by either Walker or Richards. Potential origins for the suffix ‘-pathus’ include the Ancient Greek ‘páthos’ (strong feeling) or the Romance ‘pata’ (); these terms may have been in reference to the elongated legs or antennae characteristic of Rhaphidophoridae for sensing in the dark. However, as *Micropathus* and *Macropathus* have similar morphology in this regard, it is unclear which structure(s) Richards was alluding to when naming the genus. The grammatical gender of the genus is masculine.

Description

Micropathus comprises medium-sized crickets with a body length of up to 20 mm. Individuals range from mid to dark brown and the thoracic nota are generally mid brown and mottled with ochreous brown patterning (e.g.,). The fore coxae bear a single anterolateral spine; all other coxae are unarmed. The

fore and middle femora consistently bear one apical spine each on the prolateral and retrolateral surface, whereas in the hind femora this character is absent prolaterally and variably present retrolaterally. The tibiae have two pairs of apical spines, one each on the superior and inferior surfaces; on the hind tibiae, there are two additional pairs of small, subapical spines situated within each primary apical pair (subapical spines).

Linear spines of the fore and middle legs are present as an average of four pairs on the ventral surface of the tibiae, with one member of each pair facing prolaterally and the other retrolaterally. The number of dorsal linear spines on the hind legs varies by species and life stage. However, in most species the ventral surface of the hind femora is unarmed prolaterally, and linear spines are variably present (0–5) retrolaterally. The genus can be split into two broad groups on this basis: species with ventral linear spines variably present on the retrolateral surface of the hind femora (*M. montanus*, *M. cavernicolus*, *M. zubat* Beasley-Hall sp. nov., and *M. fuscus*) vs species always lacking those the surface is completely unarmed; (*M. tasmaniensis*, *M. kiernani*, and *M. ditto* Beasley-Hall sp. nov.). These differences are reflected in the genus being split into two major phylogenetic clades as in Fig. 1a. The hind tibiae generally bear 25– linear spines on either side of the dorsal surface, and the first and second tarsal segments between 0–4 on either side of the dorsal surface.

Parvotettix Richards, 1968 and *Tasmanoplectron* Richards, 1971 are the two other genera described from Tasmania proper (i.e., excluding the islands of the Bass Strait) and *Micropathus* can be differentiated from them relatively easily based on leg spination. In *Parvotettix*, the fore and middle legs are almost without spines: apical spines are restricted to the tibiae only (vs the tibiae and femora in *Micropathus*) and linear spines only occur on the dorsal surface of the hind tibia, where they are few but extremely long and visible from a distance with the naked eye. Individuals of *Parvotettix* tend to rest on substrate with their legs folded close to the body rather than splayed wide as in *Micropathus* (Richards 1970). *Parvotettix* is also much smaller and more strongly pigmented compared to *Micropathus*, with most species appearing dark brown to black (Richards 1968, 1987). Similarly, *Tasmanoplectron* bears linear spines on both the dorsal as well as ventral surfaces of the middle tibia; this character only occurs on the ventral surface in all other Australian Rhabdophoridae, including *Micropathus* (Richards 1971a). *Tasmanoplectron* also has teeth on both the ventral and lateral surfaces of the ovipositor, whereas in all other genera these are restricted to the ventral valves only.

Finally, *Micropathus* has several synapomorphies helpful in distinguishing it from all other Australian Rhabdophoridae. Firstly, the distal margin of the male suranal plate is curved ventrally and is sclerotised and dark on the underside, with this thickening of the cuticle often produced into a row of tubercles or spines. While similar curvature also occurs in Tasmanian and New Zealand Macropathinae, such projections are unique to *Micropathus*. Secondly, the female subgenital plate is split medially at the distal margin into two distinctive, spiked lobes (Fig. 2), which in adults may be sclerotised at the apex or in their entirety (see Remarks). Most other Australian genera also bear these lobes, but they occur in a trilobed configuration when present and the structures are generally wide, sloping, and less clearly demarcated from the subgenital plate.

Remarks

Richards confused ‘*prolateral*’ and ‘*retrolateral*’ in her original descriptions of *Micropathus*, necessitating the redescriptions presented here. She used these terms to refer to the positioning of spines facing the anterior (prolateral) or posterior (retrolateral) ends of the body, leading to the incorrect reporting of spine counts helpful for distinguishing species. Richards also apparently overlooked intraspecific variation in several characters related to the legs and terminalia. note that Richards referred to the distinctive lobes projecting from the distal margin of the female subgenital plate as sclerotised (Fig. 1). While we agree that the structures do appear to be markedly sclerotised in some specimens – e.g., *M. montanus* and

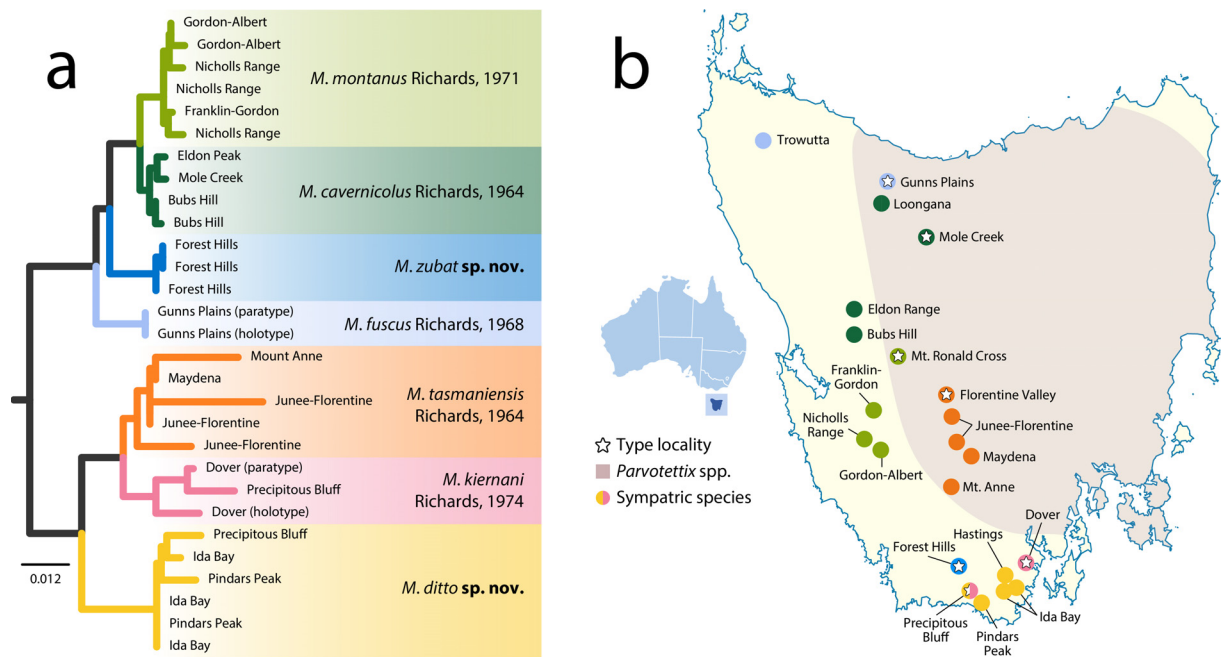


Fig. 1. a. Phylogeny of *Micropathus* Richards, 1964 adapted from Beasley-Hall *et al.* (2025a), with localities labelled at tips. Scale bar is in substitutions/site. **b.** Populations of *Micropathus* examined here. Split circles indicate sympatry and the general distribution of *Parvotettix* Richards, 1970, the sister genus to *Micropathus*, is shown in light brown.

M. zubat Beasley-Hall sp. nov. – we consider it possible that for species with more delicate lobes, the structures are darkened because of tissue damage. In Rhabdiphoridae, the ventral female subgenital plate makes contact with the dorsal male suranal plate during copulation and the structures are thought to stabilise mating pairs (Stritih & Čokl 2012). We have examined several species of *Micropathus* with lobes with darkened, delicate, and jagged apices only seen in adults, whereas the structures are rounded and uniform in younger females. Thus, we consider this could result from breakage in life and may not reflect interspecific variation.

Key to the species of *Micropathus* Richards, 1964

- Ventral surface of hind femur with linear spines. Male subgenital plate rounded, often not readily distinguishable from preceding sternite 9 (e.g., Fig. 9c) 2
 - Ventral surface of hind femur without linear spines. Male subgenital plate bulbous, pronounced from preceding sternite 9 (e.g., Figs 6c, 8c) 5
- Body colouration predominantly dark brown with mid brown patterning (Fig. 7). Hind femur with ventral linear spines prolaterally. Female subgenital plate concave distolaterally, bearing two long, distomedial lobes (Fig. 2d). Male suranal plate with straight proximal margin, notched distally (Fig. 2d) *M. fuscus* Richards, 1968
 - Body colouration mid brown (e.g., Fig. 5). Hind femur with ventral linear spines retrolaterally only 3

3. Female subgenital plate strongly concave laterally and with horn-like projections at distolateral corners (Fig. 2a). Proximal margin of male suranal plate forming three rounded lobes margin rounded *M. montanus* Richards, 1971
– Female subgenital plate straight to convex laterally, convex distolaterally (Fig. 2b–c) 4
4. Distolateral portion of female subgenital plate with broadly square, sclerotised corners; two sclerotised lobes at distal margin separated by wide medial notch (Figs 2c, 9e). Proximal margin of male suranal plate forming three rounded lobes; distal margin with faint medial notch (Fig. 2c, 9b) *M. zubat* Beasley-Hall sp. nov.
– Distolateral portion of female subgenital plate rounded; two lobes originating from medial surface of plate and separated by a furrow; distal margin of plate with a deep but narrow medial notch (Figs 2b, 4b). Male suranal plate oval-shaped and rounded at proximal and distal margins (Fig. 2b)
..... *M. cavernicolus* Richards, 1964
5. Lobes originating from medial surface of female subgenital plate, measuring at least half length of plate (Figs 2g, 6e). Male suranal plate with rounded proximal margin and a moderate medial notch on distal margin (Figs 2d, 6b). Male subgenital plate pale and with a prominent triangular apex (Fig. 6c)
..... *M. ditto* Beasley-Hall sp. nov.
– Lobes originating from distal margin of female subgenital plate, measuring less than half length of plate 6
6. Body colouration mid brown. Lobes on female subgenital plate measuring around a quarter length of plate and separated at their bases by a medial furrow (Figs 2e, 8e). Distal margin of male suranal plate uninterrupted or with a faint medial notch (Fig.). Male subgenital plate uniform in colour to preceding sternite and with a rounded, poorly pronounced apex (Fig. 8c)
..... *M. tasmaniensis* Richards, 1964
– Body colouration uniformly dark brown. Distal margin of male suranal plate uninterrupted (Fig. 2f). Lobes on female subgenital plate short, measuring around an eighth length of plate, and touching at their bases (Fig. 2f). Female subgenital plate rounded laterally and distally
..... *M. kiernani* Richards, 1974

Micropathus cavernicolus Richards, 1964

Figs 1–4, Table 1

Micropathus cavernicola Richards, 1964: 220–223, fig. 2.

Micropathus cavernicola – Richards 1968: 171 (in key, additional records); 1971: 578–579 (in key, additional records); 1974: 252–253 (in key, additional records).

Diagnosis

The apices of the hind femora variably bear an apical spine on the retrolateral side. The ventral surfaces of the hind femora are unarmed prolaterally but variably bear linear spines on the retrolateral side. The male suranal plate is simple and rounded both proximally and distally (Fig. 4b). The female subgenital plate bears two long, broad lobes originating from its medial surface and extend past the distal margin of the plate. The lobes are separated by a furrow at the bases and further diverge distally (Fig. 4b).

Etymology

Not explained by Richards. The New Latin adjective ‘*cavernicolus*’ means ‘cave’ or ‘crevice-dwelling’ and ‘*cavernicola*’ is its feminine inflection. Per Article 34.2 of the International Code of Zoological

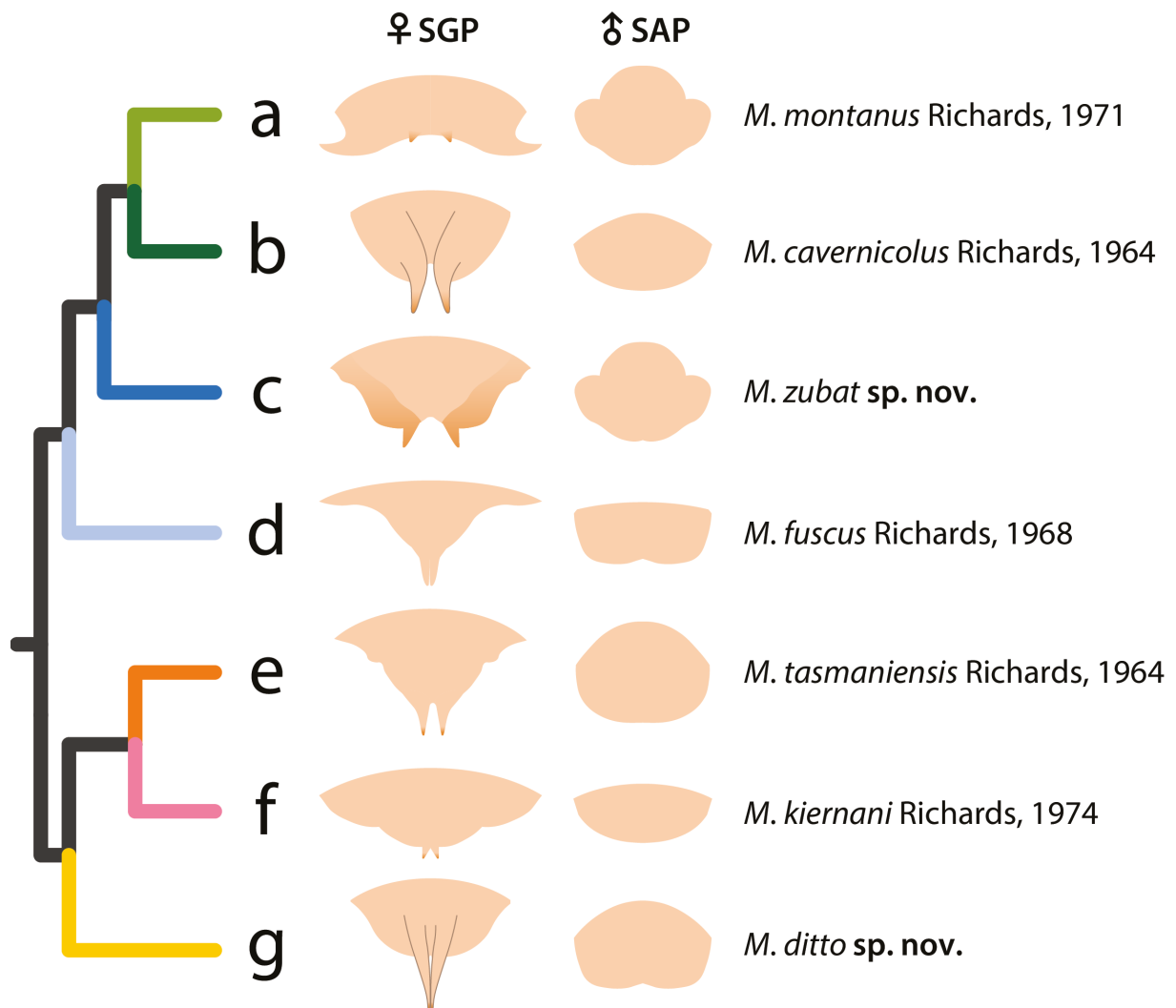


Fig. 2. Simplified depictions of the terminalia of *Micropathus* Richards, 1964. Abbreviations: SGP = subgenital plate; SAP = suranal plate. Sclerotisation is indicated by darkened tissue. For some species, this darkening may be indicative of breakage in life (see Remarks section for the genus).

Nomenclature, Latin adjectival species-group names are required to agree with the gender of the genus with which they are associated (ICZN 1999). As such, the gender ending of *Micropathus cavernicola* is invalid and the correct declension is *Micropathus cavernicolus*.

Type material

Holotype

AUSTRALIA– **Tasmania** • ♂; Mole Creek area, “Maracoopa” [Marakoopa] Cave; 28 Jul. 1957; A. Goede leg.; ANIC 14-042009; ANIC.

Other material examined

AUSTRALIA – **Tasmania** – **Bubs Hill** • 1 ♂; Quarry Cave; 42.117° S, 145.75° E; 14 Apr. 2012; S.M. Eberhard leg.; GenBank: PV368128 (*COI*); SARFMEE 12:0963a; SARFMEE – **Eldon Range** • 3 ♀♀,



Fig. 3. Female *Micropathus cavernicolus* Richards, 1964 in a mine adit near Mount Huxley Lookout, southwest Tasmania. Photograph © Bruno Bell (CC BY-NC) via iNaturalist observation 111915702.

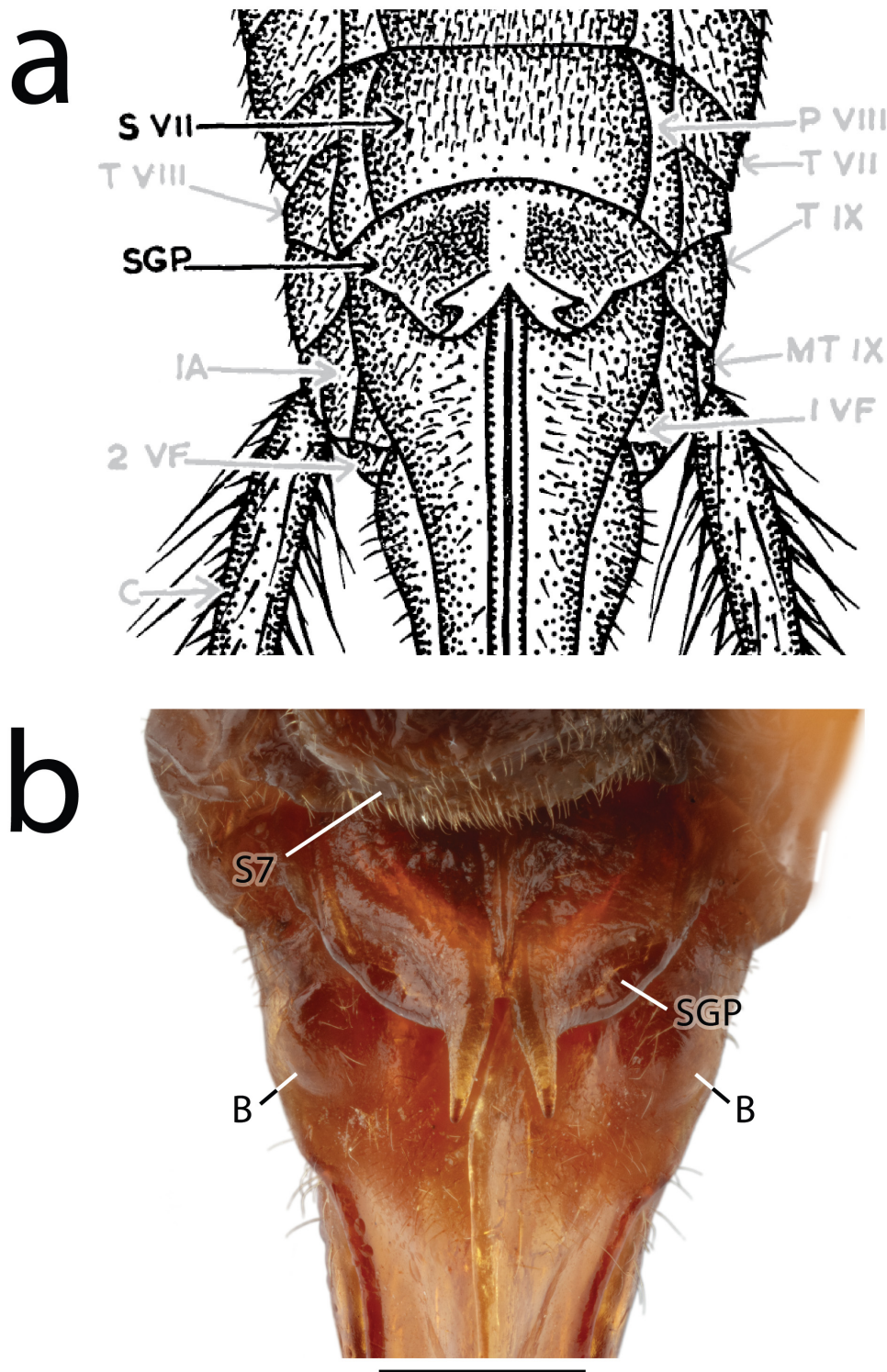


Fig. 4. Female subgenital plate of *Micropathus cavernicolus* Richards, 1964. **a.** Original drawing by Richards (1964) showing lobes of the distal margin projecting laterally (). Extraneous morphological labels are greyed out. Illustration © Bishop Museum Press, used with permission. **b.** Subgenital plate without distortion, showing the lobes projecting distally as in life (Eldon Range, TAS; TMAG F073341). Abbreviations: B = basivalvula; S = sternite; SGP = subgenital plate. Scale bar = 1 mm.

3 ♂♂; Carnivore Cave; 41.983° S, 145.75° E; 950 m a.s.l.; 13 Apr. 2012; R. Eberhard leg.; GenBank: PV368126 (*COI*); TMAG F073341; TMAG. – **Loongana** • 1 ♂; River Leven environs; 41.414° S, 145.97° E; 384 m a.s.l.; 13 Jan. 2023; R. Beaver leg.; photograph; iNaturalist 148317397. – **Mole Creek** • 2 ♂♂; Westmorland Cave (MC-X64); 41.614° S, 146.4° E; 13 Apr. 2012; R. Eberhard and S.M. Eberhard leg.; TMAG F073212; TMAG • 1 ♂; Marakooopa Cave; 41.578° S, 146.30° E; 477 m a.s.l.; 13 Dec. 2006; M. Morgan-Richards leg.; photograph; iNaturalist 169848453 • 1 ♂; near intersection of Sassafras and Platypus Creeks; 41.578° S, 146.35° E; 5 Apr. 2024; J. Cordwell leg.; photograph; iNaturalist 206636454 • 1 ♀; unnamed cave; 41.574° S, 146.29° E; 17 Feb. 2022; N. Anderson leg.; photograph; iNaturalist 107455864 • 1 ♀; King Solomons Cave; 41.552° S, 146.25° E; 1 Mar. 2008; iNaturalist user jmanins leg.; photograph; iNaturalist 233667984. – **Mount Huxley** • 1 ♀; mine adit 100 m SSE of Mt Huxley Lookout; 42.163° S, 145.59° E; 619 m a.s.l.; 16 Apr. 2022; P. Crofts leg.; photograph; iNaturalist 112830411 • 1 ♂; same data as for preceding; photograph; iNaturalist 112830408 • 3 ♀♀, 1 ♂, 1 spec.; same data as for preceding; K. Martin-Smith leg.; photograph; iNaturalist 112213642 • 1 ♀; among colony of hundreds; same data as for preceding; B. Bell leg.; photograph; iNaturalist 111915702. – **Mount Roland** • 1 ♂; Minnow River environs; 41.484° S, 146.30° E; 837 m a.s.l.; 21 Jun. 2023; S. Ayre leg.; photograph; iNaturalist 174066162.

Redescription

As in Richards (1964), with exceptions as follows: ♀ subgenital plate with two lobes projecting from medial surface of plate, bases of lobes separated by a furrow, and with darkened apices in some individuals. Hind femur unarmed prolaterally, but an apical spine variably present retrolaterally and 0–4 retrolateral linear spines on ventral surface. Hind tibia with 31–45 prolateral and 28–40 retrolateral dorsal linear spines. First segment of hind tarsus with 1–3 prolateral and 1–2 retrolateral dorsal linear spines. Second tarsal segment with 1–2 dorsal linear spines prolaterally and retrolaterally.

Distribution

Northern-central Tasmania at altitudes 500–950 m. *Micropathus cavernicolus* primarily occurs in limestone caves of the Mole Creek, Loongana, Bubs Hill, and Eldon Range karsts (Fig. 1b) but has also been found in rainforest surrounding caves, mine adits in non-karst terrain, and under stones (Richards 1987).

Remarks

Richards described *M. cavernicolus* from material she later realised was distorted, making her initial description of the female subgenital plate inaccurate (Richards 1968). The original description states the distal portion of the plate and its associated lobes are folded back dorsally, a distortion we have observed even in relatively fresh ethanol-preserved specimens. Richards did not provide a corrected illustration of this character, which we show in Fig. 4. According to Richards, *M. fuscus* is sympatric with *M. cavernicolus* at Loongana (Richards 1971b), but no material of the latter was available to us for examination from the area.

Micropathus ditto Beasley-Hall sp. nov.

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Figs 1–2, 5–6, Table 1

Diagnosis

The hind femora are entirely unarmed and lack both apical and linear spines, the only known member of *Micropathus* with this configuration. The male suranal plate is rounded at the proximal margin and emarginate distally, forming two rounded lobes, unlike *M. tasmaniensis* and *M. kiernani* (Figs 2, 6b). The male subgenital plate is triangular distally with a pronounced, rounded apex (Fig. 6c). The female suranal

plate is triangular proximally and faintly emarginate distally (Fig. 6d). The female subgenital plate bears two lobes originating from its medial surface rather than the distal margin, further distinguishing the species from its close relatives. These lobes are separated at the bases by a distinct medial groove and remain in contact throughout their length (Figs 6e).

Etymology

Named after , a Pokémon from the video game franchise of the same name. Ditto has the unique ability to transform into an exact replica of other Pokémon and mimic their physical appearance. To us, this trait is reminiscent of *M. ditto* Beasley-Hall sp. nov. effectively hiding in plain sight: the species has been known to science for over sixty years, but until the present study it was considered a southern population of *M. tasmaniensis*. As a result, *M. ditto* has already been the subject of diverse studies concerning phylogenetic relationships, feeding habits, and chromosome numbers, but under an incorrect name (Richards 1968; Eberhard 2001; Allegrucci *et al.* 2010; Richardson *et al.* 2013; Beasley-Hall *et al.* 2018; Allegrucci & Sbordoni 2019). This confusion was caused by the species sharing very similar morphology. Indeed, Richards' description of *M. tasmaniensis* erroneously included an illustration of *M. ditto* (see redescription of the former below). The species name 'ditto' is not a Latin or latinised word and we therefore treat it as indeclinable in compliance with ICZN Article 31.2.3 (ICZN 1999).

Type material

Holotype

AUSTRALIA – **Tasmania** • ♂; Precipitous Bluff, Damper Cave (PB1); 43.482° S, 146.59° E; 152 m a.s.l.; 3 Feb. 2023; S.M. Eberhard leg.; GenBank: PV368136 (COI); TMAG F156341; TMAG.

Paratypes

AUSTRALIA – **Tasmania** • 2 ♀♀; same data as for holotype; TMAG F156342 to F156343; TMAG • 1 ♂; same data as for holotype; TMAG F156342; TMAG • 1 ♀; same data as for holotype; ANIC 14-008973; ANIC • 1 ♂; same data as for holotype; ANIC 14-008974; ANIC.

Other material examined

TASMANIA – **Hastings Caves State Reserve** • 1 ♂; near Platypus Walk; 43.413° S, 146.87° E; 23 Dec. 2018; M. Van Dyke leg.; photograph; iNaturalist 37292098. – **Ida Bay** • 3 ♀♀; Big Tree Pot Cave (IB-009); 43.463° S, 146.85° E; 211 m a.s.l.; 28 Sep. 2011; R. Eberhard leg.; valley entrance to cave; GenBank: PV368135 (COI); TMAG F156345 to F156347; TMAG • 1 ♂; same data as for preceding; TMAG F073198; TMAG • 1 spec.; Exit Cave; 43.476° S, 146.839° E; 119 m a.s.l.; 23 Feb. 2011; S.M. Eberhard leg.; molecular data only; GenBank: PV197427 (*12S* rRNA); SARFMEE 12:0954. – **Lune River** • 1 ♀; unnamed cave; 43.445° S, 146.82° E; 551 m a.s.l.; 11 Aug. 2024; C. Fitzgerald leg.; photograph; iNaturalist 235051418 • 1 ♀; Lune River environs; 43.465° S, 146.87° E; elev. 225 m; 14 Dec. 2021; S. Grove leg.; photograph; iNaturalist 103213443. – **Mystery Creek Cave** • 2 ♂♂; 43.462° S, 146.85° E; 139–160 m a.s.l.; 21 Dec. 2023; J. Thurman leg.; photograph; iNaturalist 195459143, 195459145 • 1 ♀; same data as for preceding; 170 m a.s.l.; 13 Mar. 2021; T. Rudman leg.; photograph; iNaturalist 71119620 • 1 nymph; same data as for preceding; elev. 146 m; 26 Jun. 2024; B. Bell leg.; photograph; iNaturalist 225296767 • 1 ♀, 1 ♂; same data as for preceding; 151 m a.s.l.; 4 Feb. 2023; M. Van Schilt leg.; photograph; iNaturalist 148003491 • 3 ♀♀, 4 ♂♂, 3 nymphs; same data as for preceding; 177 m a.s.l.; 9 Dec. 2015; S. Grove leg.; photograph; iNaturalist 9359209. – **Pindars Peak** • 1 spec.; Morning Light Cave (PP1); 43.543° S, 146.67° E; 305 m a.s.l.; 24 Nov. 2011; S.M. Eberhard leg.; molecular data only; GenBank: PV197429 (*12S* rRNA); SARFMEE 12:0618; SARFMEE.

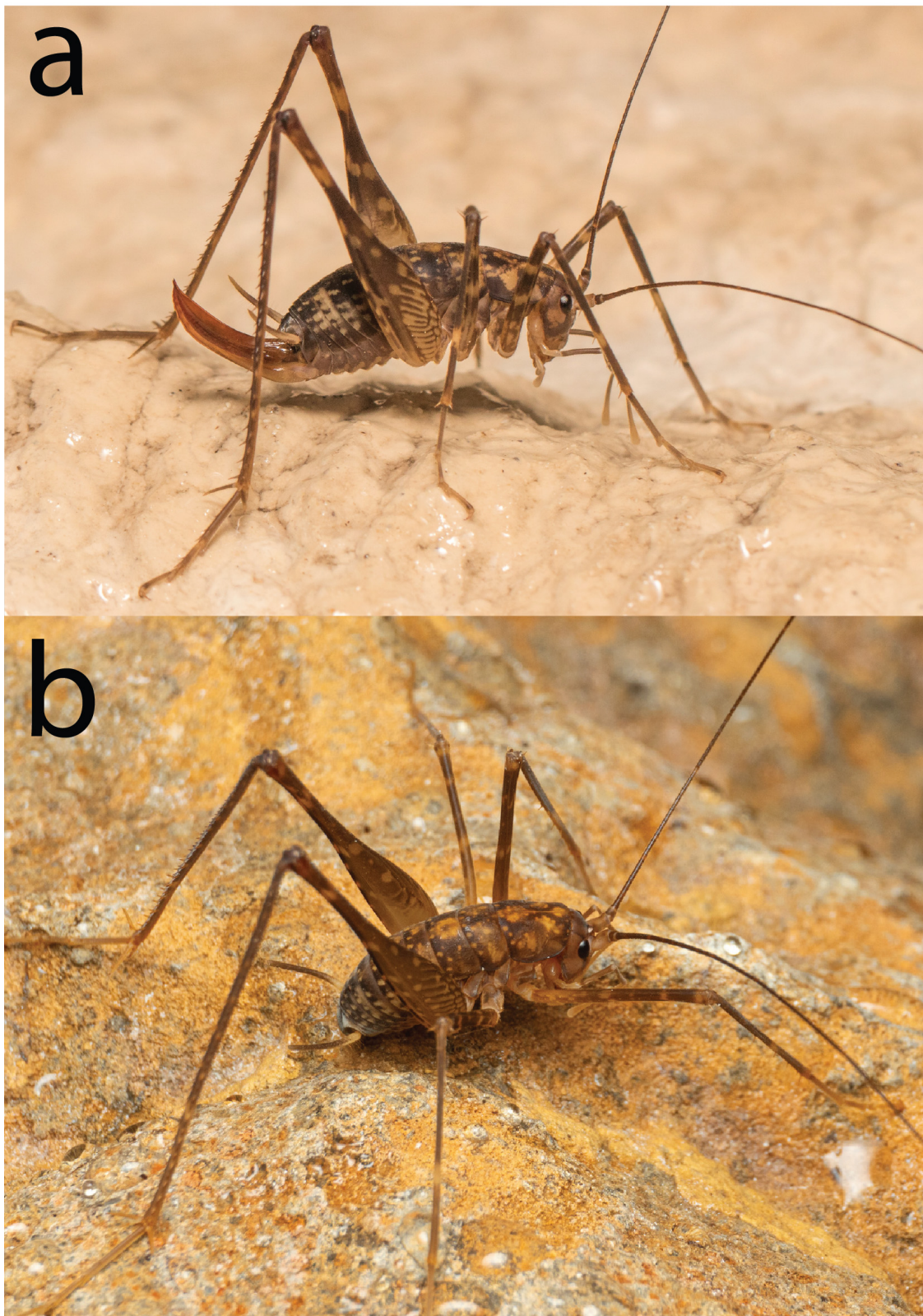


Fig. 5. *Micropathus ditto* Beasley-Hall sp. nov. in the Mystery Creek Cave area of southeast Tasmania. **a.** ♀. **b.** ♂. Photographs © Tim Rudman and Jessa Thurman via iNaturalist observations 71119620, 195459143.

Description

MEASUREMENTS. ♂ body length 14–15 mm. ♀ body length 14–16 mm, ovipositor 11–12.5 mm. Hind tibia 23–25 mm; sexual dimorphism absent.

HEAD. Light brown and mottled with mid brown patterning on vertex and frons. Fastigium divided into two tubercles with a pale ocelliform spot on either side. Medial ocellus present.

BODY. Generally mid brown mottled with pale brown and ochreous patches particularly prominent on thoracic nota. Thoracic nota and abdominal sternites with row of pale brown flecks at distal margins. Thin medial line running down thoracic nota, not visible beyond metanotum.

LEGS. Ochreous brown with pale brown striations and patches concentrated proximally. Fore and middle legs as in generic diagnosis above, with ventral surface of tibiae bearing two rows of linear spines, one each prolaterally and retrolaterally, each containing 3–5 linear spines. Hind femur without apical or linear spines. Dorsal surface of hind tibia with 32–38 linear spines prolaterally and 28–32 retrolaterally. First

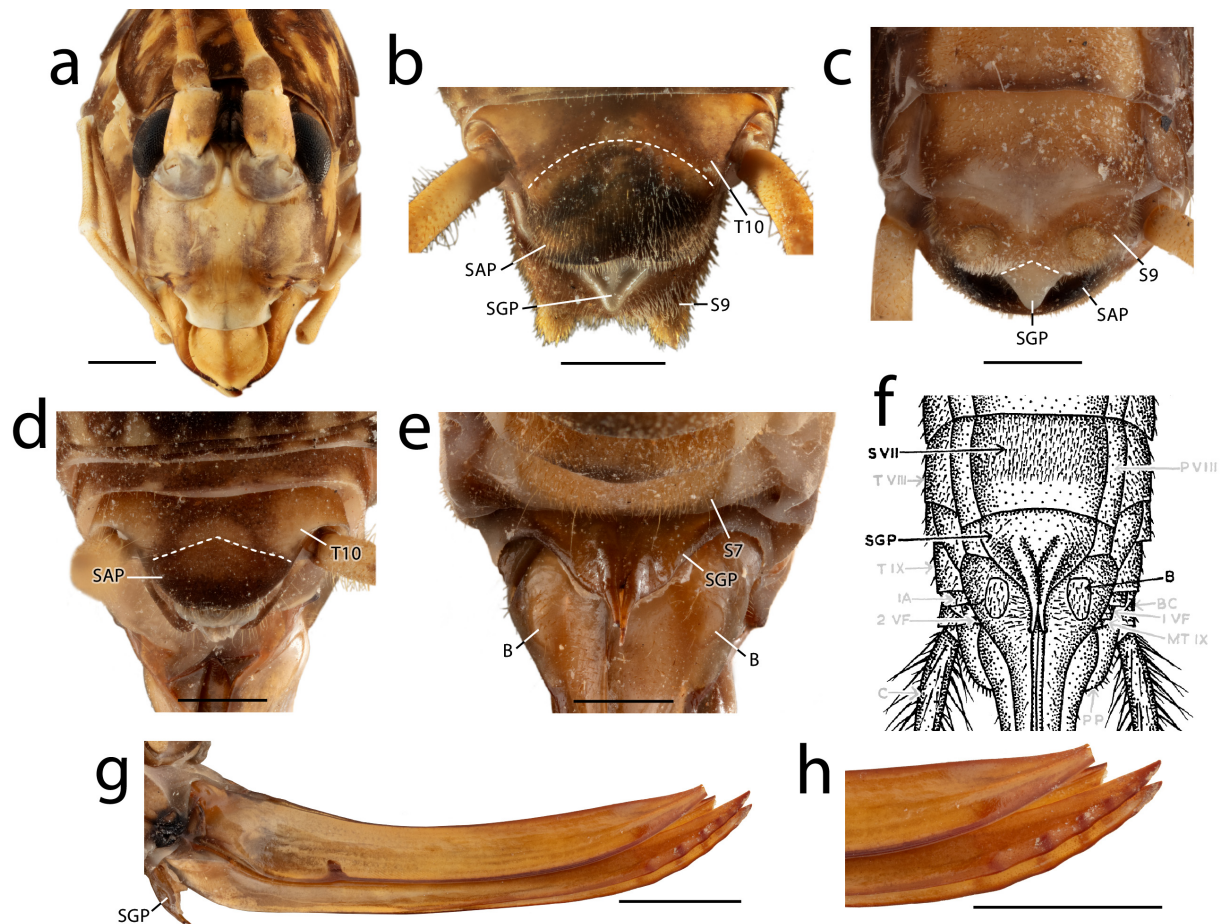


Fig. 6. *Micropathus ditto* Beasley-Hall sp. nov. from Damper Cave at Precipitous Bluff, TAS. **a–c.** ♂, holotype (TMAG F156341). **b.** ♀, paratype (TMAG F156342). **a.** Head. **b–c.** Dorsal and ventral views of ♂ terminalia. **d–f.** Dorsal and ventral views of ♀ terminalia, including Richards' illustration erroneously included in her description of *M. tasmaniensis*; extraneous morphological labels are greyed out. Illustration © Bishop Museum Press, used with permission. **g–h.** Lateral view of ovipositor. Abbreviations: B = basivalvula; S = sternite; SAP = suranal plate; SGP = subgenital plate; T = tergite. Dotted lines in b–d indicate plate margins. Scale bars = 1 mm.

segment of hind tarsus with 1–4 dorsal linear spines prolaterally and 1–3 retrolaterally. Second tarsal segment with 1–2 dorsal linear spines each prolaterally and retrolaterally.

MALE TERMINALIA. Suranal plate dark brown and densely setose except for proximomedially. Proximal margin of suranal plate rounded. Suranal plate straight laterally, becoming rounded distolaterally. Distal margin of suranal plate emarginate medially and curved ventrally, forming two wide, rounded lobes; underside of each lobe with a black, dentate fringe of tubercles which may be produced as thin spines. Sternite 9 with styles; proximomedially lacking setae and with a pale, V-shaped ridge; distal margin curved dorsally, subgenital plate originating underneath. Subgenital plate pale, without setae, and prominently triangular with rounded apex.

FEMALE TERMINALIA. Suranal plate mid brown and setose at distal margin but otherwise glabrous. Proximal margin of suranal plate broadly triangular and with rounded apex. Plate laterally convex, distal margin rounded and with a faint medial notch. Subgenital plate convex laterally with two long, narrow lobes produced from medial surface and separated by distinct medial groove, their length extending past distal margin and measuring over half that of plate; apices of lobes rounded. Basivalvulae present, bulbous, positioned lateromedially. Ovipositor light reddish brown. Ventral valve of ovipositor bearing 6–7 small, weakly produced teeth decreasing in size towards apex; each tooth often paired with sclerotised ridge on corresponding lateral surface.

Distribution

In limestone and dolomite caves of the Ida Bay, Precipitous Bluff, Pindars Peak, and Hastings karst areas in southern Tasmania, up to 500 m a.s.l. (Fig. 1b).

Remarks

Micropathus ditto Beasley-Hall sp. nov. was previously considered a southern population of *M. tasmaniensis* and is referred to as *Micropathus* “sp. nov. 2” in the phylogeny of Beasley-Hall *et al.* (2025). Its range notably includes caves at Ida Bay, a popular caving destination. In the past this karst area was subject to considerable cave fauna sampling, monitoring, and conservation studies driven in part by successive threats posed by native forest logging and limestone quarrying. As such, its life history and ecology – while still poorly known – may be slightly better studied than other Australian Rhabdophoridae. *Micropathus ditto* co-occurs with cave-adapted glow-worms, beetles, spiders, and harvestmen (Driessen 2009). The species is the main prey of the large, iconic Tasmanian cave spider *Hickmania troglodytes* (Richards & Ollier 1976). Eggs of *M. ditto*, laid in moist sediment banks, are also a key food source for troglobitic beetles at Ida Bay (Driessen 2009). Similar to the Rhabdophoridae in the Northern Hemisphere, these surveys suggest *Micropathus ditto* is a keystone species due to their biomass and abundance in cave habitats.

***Micropathus fuscus* Richards, 1968**

Figs 1–2, 7, Table 1

Micropathus fuscus Richards, 1968: 171–174, fig. 2.

Micropathus fuscus – Richards 1971: 579 (in key); 1974: 252 (in key).

Diagnosis

Micropathus fuscus has a dark brown body colouration mottled with lighter brown patterning (Fig. 7). The apices of the hind femora variably bear an apical spine on the retrolateral side. *Micropathus fuscus* is the only known member of *Micropathus* with ventral linear spines on both the prolateral and retrolateral

sides of the hind femora, although we note the former does not occur in all individuals due to intraspecific variation. In other species, ventral linear spines either occur on the retrolateral side only, with no variation (*M. cavernicolus*, *M. montanus*, *M. zubat* sp. nov. Beasley-Hall), or the hind femora lack these spines entirely (*M. ditto* Beasley-Hall sp. nov., *M. kiernani*, *M. tasmaniensis*). The distal margin of the suranal in *M. fuscus* has a medial notch in both sexes (Fig. 2). The female subgenital plate bears long lobes originating from the plate's distal surface and in contact throughout their entire length. The lobes are usually rounded at the apex but may be broken in adults.

Etymology

Not explained by Richards. The Latin adjective '*fuscus*' means 'dark' or 'brown', referring to the body colour of the species.



Fig. 7. Female *Micropathus fuscus* Richards, 1968 in the Julius River Forest Reserve in northwest Tasmania. Note the dark brown body colouration interrupted by mid brown mottling. Photograph © Brendan Costello via iNaturalist observation 70307645.

Type material

Holotype

AUSTRALIA – **Tasmania** • ♂; unnamed cave 34 chains N of Heka, 3 miles NW of Gunns Plains; 6 May 1967; A. Goede leg.; ANIC 14-042010; ANIC.

Paratype

AUSTRALIA – **Tasmania** • ♀; same data as for holotype; molecular data only; GenBank: PV440717 (*COI*); ANIC 14-008969; ANIC.

Other material examined

AUSTRALIA – **Tasmania** • 1 ♀; Julius River Forest Reserve; 41.143° S, 145.04° E; 130 m a.s.l.; 28 Feb. 2021; B. Costello leg.; photograph; iNaturalist 70307645.

Redescription

As in Richards (1968), with exceptions as follows: male suranal plate with distal margin curved ventrally and with a dentate fringe of small, dark brown tubercles underneath, but without pronounced spine-like projections. Hind femur variably bearing a small retrolateral apical spine and 0–1 prolateral and 3–6 retrolateral ventral linear spines. Hind tibia with 22–31 prolateral and 20–30 retrolateral dorsal linear spines. First segment of hind tarsus with 0–2 prolateral and 1–3 retrolateral dorsal linear spines. Second tarsal segment with 0–2 dorsal linear spines prolaterally and retrolaterally.

Distribution

Micropathus fuscus was described from caves in the Gunns Plains karst in northern Tasmania (Fig. 1b). Richards later observed the species at Loongana in Leven Cave (L3) and further west at Trowutta Arch. We have been unable to examine material from Loongana, but a photograph from the citizen science platform iNaturalist suggests the presence of the species approximately 1 km from Trowutta based on its distinctive body colouration (Fig 7; see Other material examined). *Micropathus fuscus* is not known from elevations above 300 m (Richards 1987) and so far all records of the species have been from caves.

Remarks

While the holotype label of *M. fuscus* states it was collected 3 miles northwest of Gunns Plains, the species description reads “5 km southwest”, making it difficult to pinpoint a precise type locality. Richards differentiated *M. fuscus* from other members of the genus by a lack of spine-like projections on the distal margin of the male suranal plate (Richards 1974). However, upon inspecting the holotype we observed a convex, dentate fringe of dark brown tubercles on either side of the distomedial notch. While the species indeed lacks clearly pronounced spine-like projections compared to some other members of *Micropathus*, it appears this character is more variable than originally described by Richards. Both *M. fuscus* and *M. kiernani* can be distinguished by their dark brown body colouration, with other members of *Micropathus* being a light to mid brown.

Micropathus kiernani Richards, 1974

Fig. 1–2, Table 1

Micropathus kiernani Richards, 1974: 253–255, fig. 3.

Diagnosis

Micropathus kiernani has a dark brown body colouration similar to *M. fuscus* but without its light brown patterning. It is the most strongly pigmented member of the genus. The apices of the hind femora

variably bear a spine retrolaterally, but the ventral surfaces are entirely without linear spines. The male suranal plate is simple, being rounded both proximally and distally (Fig. 2). The female subgenital plate is wide and rounded and bears two short, spiked lobes at the distal margin. The lobes touch at the bases but diverge distally (Fig. 2).

Etymology

Named for Kevin Kiernan, a Tasmanian speleologist, geomorphologist, and conservationist. The species name '*kiernani*' is a noun in the genitive case per ICZN Article 31.1.1 (ICZN 1999).

Type material

Holotype

AUSTRALIA – **Tasmania** • ♂; Francistown near Dover, sandstone cave; 12 May 1973; K. Kiernan leg.; GenBank: PV440718 (*COI*); ANIC 14-042015; ANIC.

Paratype

AUSTRALIA – **Tasmania** • ♀; same data as for holotype; molecular data only; GenBank: PV440730 (*COI*); ANIC 14-008956; ANIC.

Other material examined

AUSTRALIA – **Tasmania** • 1 ♀, Precipitous Bluff, Damper Cave (PB1); 43.482° S, 146.58° E; 26 m a.s.l.; 3 Feb. 2023; S.M. Eberhard leg.; GenBank: PV440729 (*COI*); TMAG F156348; TMAG • 1 ♂; same data as for preceding; TMAG F156349; TMAG.

Redescription

As in Richards (1974), with exceptions as follows: ♂ suranal plate with distal margin curved ventrally and occasionally with projections underneath, ranging from a fringe of tubercles to prominent individual spines. Hind femur variably bearing a small retrolateral apical spine. Hind tibia with 21–35 prolateral and 22–35 retrolateral dorsal linear spines. First segment of hind tarsus with 0–5 prolateral and 1–4 retrolateral dorsal linear spines. Second tarsal segment with 0–2 prolateral and 0–2 retrolateral dorsal linear spines.

Distribution

Micropathus kiernani is listed as Critically Endangered federally and Rare under Tasmanian state legislation due to its exceptionally narrow distribution, previously restricted to a single sandstone cave at Francistown (Fig. 1b; Threatened Species Section 2022). However, we recently discovered a second population around 40 km away at Precipitous Bluff that was confirmed as *M. kiernani* based on a phylogenetic analysis against the type material (Beasley-Hall *et al.* 2025a). *Micropathus kiernani* was previously only known from a moderate elevation (200 m), but this new record expands its altitudinal range to as low as 26 m. While this new record indicates *M. kiernani* is not as restricted as initially thought, the species nonetheless qualifies as a short-range endemic given its known distribution of less than 10 000 km² (Harvey 2002).

Interestingly, the individuals at Precipitous Bluff were found amongst a colony of *M. ditto* Beasley-Hall sp. nov. Documented instances of sympatry in the Australian Rhabdophoridae have previously only involved members of different genera (Richards 1971b); to our knowledge, this is the first recorded instance involving congeners. The two species are readily distinguished at a distance by their body colouration, even when occurring together in a tangle: *M. kiernani* stands out against the much lighter brown of *M. ditto* with a uniformly dark brown body, similar in shade to *M. fuscus* (Fig. 7).

Remarks

In addition to correcting of Richards' terminology regarding the orientation of leg spines in *M. kiernani*, there are several characters we have observed to differ from its initial description. Firstly, Richards described the male suranal plate of *M. kiernani* as bearing four anteriorly directed processes on the underside of the distal margin, which she illustrated as separate, well-produced teeth. However, upon inspecting the holotype we observed two lateromedial rows of tubercles, suggesting the trait is more variable than supposed by Richards. Secondly, the Precipitous Bluff material bears an apical spine on the retrolateral surface of the hind femur, previously thought absent from *M. kiernani*. As such, *M. ditto* Beasley-Hall sp. nov. is the only known member of *Micropathus* in which this trait does not exhibit intraspecific variation.

Micropathus montanus Richards, 1971

Figs 1–2, Table 1

Micropathus montanus Richards, 1971: 580–583, fig. 2.

Micropathus montanus – Richards 1974: 252–253 (in key, additional records).

Diagnosis

The apices of the hind femora variably bear an apical spine on the retrolateral side. The ventral surfaces of the hind femora are unarmed prolaterally but variably bear linear spines on the retrolateral side. The male suranal plate has a proximal margin that resembles three wide, rounded lobes and is rounded distally (Fig. 2). The female subgenital plate is concave at the lateral margin and forms two strongly reflexed lobes at the distal corners. The distal margin of the plate bears two to three small, sclerotised lobes with pointed apices (Fig. 2).

Etymology

Not explained by Richards. The Latin adjective '*montānus*' means 'dwelling in the mountains' in reference to the species occurring at high altitudes.

Type material

Holotype

AUSTRALIA – **Tasmania** • ♂; Mount Ronald Cross, Virgo Cave; 26 Jan. 1969; R.J. Cockerill leg.; ANIC 14-009107; ANIC.

Paratype

AUSTRALIA – **Tasmania** • ♀; same data as for holotype; ANIC 14-008965; ANIC.

Other material examined

TASMANIA – **Franklin-Gordon Wildlife Reserve** • 1 ♀; Lancelot Rivulet karst, Cave 22; 42.520° S, 145.92° E; 2 Dec. 2022; R. Eberhard leg.; GenBank: PV368131 (*COI*); TMAG F138844; TMAG. – **Gordon-Albert karst** • 3 ♀♀, 3 ♂♂; Gaxi Cave; 42.743° S, 145.89° E; 5 Nov. 2011; R. Eberhard leg.; GenBank: PV368132 (*COI*); TMAG F073206; TMAG • 1 spec.; unnamed cave; 42.740° S, 145.95° E; same data as for preceding; molecular data only; GenBank: MH171950 (*12S rRNA*); SARFMEE 12:0967; SARFMEE. – **Nicholls Range** • 1 ♀, 1 ♂; Bill Nielsen / Rotuli Cave (NR-001); 42.707° S, 145.85° E; same data as for preceding; GenBank: PV368133 (*COI*); TMAG F073218; TMAG • 1 spec.; Kayak Kavern; 42.633° S, 145.83° E; same data as for preceding; S.M. Eberhard leg.; molecular data only; GenBank: MH171948 (*12S rRNA*); SARFMEE 12:0964a; SARFMEE.

Distribution

Central western Tasmania at 200–960 m a.s.l. (Fig. 1b; Richards 1987). Habitat ranges from caves in lowland riverine rainforest in the Gordon-Albert and Nicholls Range areas to subalpine caves at Mount Ronald Cross.

Redescription

As in Richards (1971a), with exceptions as follows: ♀ subgenital plate with two to three short, sclerotised, and spine-like lobes at distal margin. Hind femur unarmed prolaterally but variably bearing a small retrolateral apical spine and 1–5 retrolateral ventral linear spines. Hind tibia with 29–41 prolateral and 27–42 retrolateral dorsal linear spines. First segment of hind tarsus with 1–5 prolateral and 1–4 retrolateral dorsal linear spines. Second tarsal segment with 1–3 dorsal linear spines prolaterally and retrolaterally.

Micropathus tasmaniensis Richards, 1964
Figs 1–2, 8, Table 1

Micropathus tasmaniensis Richards, 1964: 218–220, fig. 1.

Micropathus tasmaniensis – Richards 1968: 171 (in key, additional records); 1971: 579–580 (in key, additional records); 1974: 252 (in key, additional records).

Diagnosis

The apices of the hind femora variably bear a spine retrolaterally but the ventral surfaces are entirely without linear spines. The male suranal plate is rounded at the proximal margin and bears a weak medial notch distally (Figs 2, 8b). The female subgenital plate bears two elongate, finger-like lobes projecting distally (Figs 2, 8e). The ovipositor bears 7–8 small teeth on its ventral valves (Fig. 8f–g).

Etymology

Not explained by Richards. Formed from Tasmania + the Latin suffix ‘-ēnsis’ to form an adjective, which takes the masculine ending following the grammatical gender of the genus.

Type material

Holotype

AUSTRALIA – **Tasmania** • ♂; Florentine Valley, unnamed limestone cave; 3 Dec. 1961; G. Dolezal leg.; ANIC 14-042011; ANIC.

Other material examined

TASMANIA – **Junee-Florentine karst** • 2 ♀♀; Mount Field National Park, Growling Swallet Cave (JF-036); 42.690° S, 146.50° E; 600 m a.s.l.; 12 Sep. 2011; R. Eberhard leg.; TMAG F073187; TMAG. – **Maydena** • 1 ♀, 1 ♂; Risbys Basin, Hellebore Cave; 42.772° S, 146.60° E; 310 m a.s.l.; 24 Apr. 2022; R. Eberhard leg.; GenBank: PV368140 (*COI*); TMAG F127197; TMAG • 1 ♀; Junee Cave State Reserve, unnamed cave [likely Junee Cave JF8]; 42.737° S, 146.60° E; 300 m a.s.l.; 5 Oct. 2021; R. Turnbull leg.; photograph; iNaturalist 97974950 • 1 ♀; same data as for preceding; 19 Sep. 2021; N. Fitzgerald leg.; photograph; iNaturalist 95367962 • 1 ♀; same data as for preceding; 5 Dec. 2024; K. Magnacca leg.; photograph; iNaturalist 259004982 • 1 spec.; Junee Cave State Reserve, Junee Cave (JF8); 42.737° S, 146.60° E; 320 m a.s.l.; 12 Sep. 2011; S.M. Eberhard leg.; molecular data only; GenBank: MH171949 (*12S rRNA*); SARFMEE 12:0620; SARFMEE. – **Mount Anne** • 3 ♀♀, 1 ♂; northeast ridge of mountain,

Cave MA-CS-8; 42.922° S, 146.46° E; 895 m a.s.l.; 17 Dec. 2022; S.M. Eberhard leg.; GenBank: PV368139 (*COI*); TMAG F156350 to F156353; TMAG.

Other material (not examined)

TASMANIA – **Florentine Valley** • 1 spec.; What-U-Callit Cave (JF-456); 42.530° S, 146.45° E; 12 Sep. 2011; R. Eberhard leg.; TMAG F073207; TMAG • 1 spec.; Frankcombes Cave (JF-007); 42.533° S, 146.46° E; 27 Jul. 2012; R. Eberhard leg.; TMAG F073223; TMAG • 1 spec.; Beginners Luck Cave (JF-079); 42.569° S, 146.47° E; 27 Jul. 2012; R. Eberhard leg.; TMAG F073191; TMAG • 1 spec.; Cashions Creek Cave; 25 Nov. 1971; T. Goede leg.; TMAG F000199. – **Junee-Florentine karst** • 1 spec.; Niggly Cave (JF-237); 42.702° S, 146.53° E; 3 Jul. 2011; R. Eberhard leg.; TMAG F073224; TMAG.

Redescription

MEASUREMENTS. ♂ body length 14–19 mm. ♀ body length 10–19 mm, ovipositor 8.5–11 mm. Hind tibia 19–24 mm.

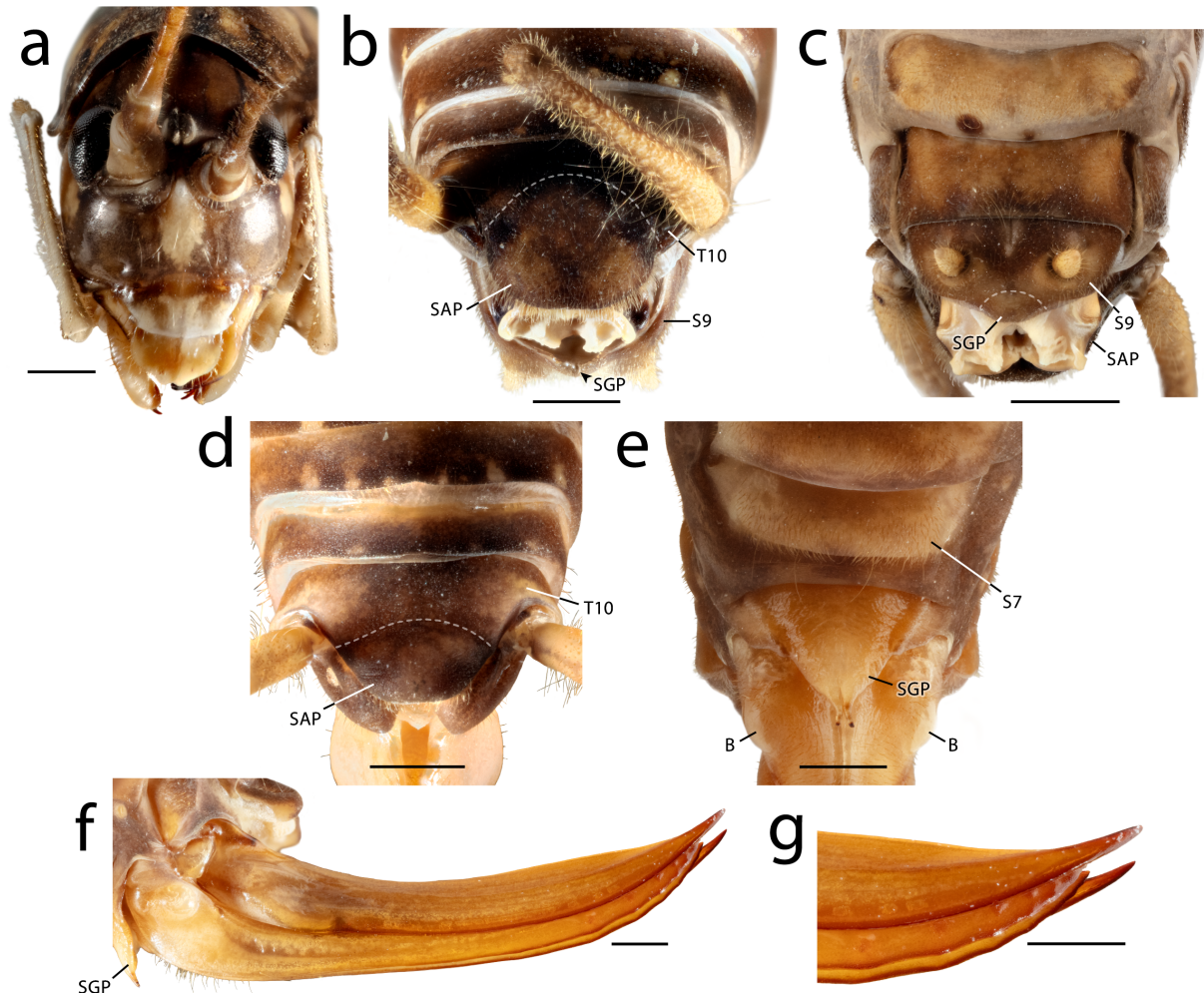


Fig. 8. *Micropathus tasmaniensis* Richards, 1964 from Hellebore Cave near Maydena, TAS (TMAG F127198). **a.** Head. **b–c.** Dorsal and ventral views of ♂ terminalia. **d–e.** Dorsal and ventral views of ♀ terminalia. **f–g.** Lateral view of ovipositor. Abbreviations: B = basivalvula; S = sternite; SAP = suranal plate; SGP = subgenital plate; T = tergite. Dotted lines in b–d indicate plate margins. Scale bars = 1 mm.

HEAD. Light brown and mottled with mid to dark brown patterning on vertex and frons. Fastigium divided into two tubercles with a pale ocelliform spot on either side. Median ocellus present.

BODY. Generally mid brown mottled with pale brown and ochreous patches, particularly prominent on thoracic nota. Thoracic nota and abdominal sternites with row of pale brown flecks at distal margin. Thin medial line running down thoracic nota, not visible beyond metanotum.

LEGS. Ochreous brown with pale brown striations and patches concentrated proximally. Hind femur variably bearing an apical spine on retrolateral surface, often reduced in size relative to other spp. when present. Ventral surface of fore and mid tibia armed with two rows of linear spines, one prolateral and one retrolateral, each bearing 3–5 spines prolaterally and 3–4 retrolaterally. Hind femur without ventral linear spines. Hind tibia with 29–36 prolateral and 27–32 retrolateral dorsal linear spines prolaterally and retrolaterally. First segment of hind tarsus with 1–4 dorsal linear spines. Second tarsal segment with 1–2 prolateral and 1–3 retrolateral dorsal linear spines.

MALE TERMINALIA. Suranal plate dark brown, densely setose at distal margin; proximal margin rounded, approximately level with base of cerci; plate rounded and weakly notched distomedially; curved ventrally at distal margin, underside bearing a narrow, raised fringe of dark brown tubercles on either side of distomedial notch. Sternite 9 bearing styles, mid to dark brown and with pale, V-shaped ridge medially; entire surface setose with long, dense setae at distolateral corners. Subgenital plate rounded with short setae concentrated distally.

FEMALE TERMINALIA. Suranal plate convex laterally and rounded distally. Subgenital plate pale, without setae; plate narrowing distally and split into two flattened, finger-like lobes at distal margin measuring approximately $\frac{1}{3} \times$ as long as plate; often with sclerotised apices in adults. Basivalvulae present, bulbous, positioned laterally. Ovipositor light reddish brown. Ventral valve of ovipositor bearing 7–8 small, weakly produced teeth decreasing in size towards apex; each tooth often paired with process resembling sclerotised tubercle on corresponding lateral surface.

Distribution

Southern-central Tasmania at 300–750 m a.s.l (Fig. 1b). Known from limestone caves of the Juneeflorentine karst east of Lake Gordon and Lake Pedder and described from an unnamed cave in the Florentine Valley 270 m south south-east from Frankcombe Cave (JF-007) (Richards 1964, 1968). Richards stated the species is also found in the Hobart and Mount Cygnet area (Richards 1968), but we have not been able to inspect material from these locations.

Remarks

Micropathus tasmaniensis was described from the Florentine Valley in southern-central Tasmania and was said by Richards to also occur in the southeast near Hastings and Ida Bay (Fig.). However, a molecular phylogenetic analysis has indicated the southeast population is a separate species (Beasley-Hall *et al.* 2025a), necessitating the description of *M. ditto* Beasley-Hall sp. nov. (see above) and the redescription of *M. tasmaniensis* from Florentine Valley material alone. The species are similar morphologically but primarily differ in the shape of the terminalia. This redescription was complicated by Richards' initial definition of *M. tasmaniensis*, which was confusingly inconsistent and referenced both species due to an assumption that these differences simply reflected intraspecific variation (see Fig. 6f).

Richards correctly illustrated the female suranal plate of the species, but in-text the structure is described as either rounded distally (as in *M. tasmaniensis*) or occasionally notched (as in *M. ditto* Beasley-Hall sp. nov.). Curiously, Richards refers to the female subgenital plate as it presents in *M. ditto* only, with

no mention of females from the type locality of *M. tasmaniensis* at Florentine Valley. The lobes at the distal margin of the plate are not as pronounced in *M. tasmaniensis* as in *M. ditto*; it is possible Richards assumed her female paratypes were immatures and instead defaulted to the morphology of females further south. Finally, Richards described *M. tasmaniensis* as bearing 6–7 teeth on the female ovipositor, but we instead observe this range in *M. ditto* and 7–8 in *M. tasmaniensis*. The male terminalia illustrated by Richards correctly depict *M. tasmaniensis*.

Micropathus zubat Beasley-Hall sp. nov.

urn:lsid:zoobank.org:act:9A782EB4-742C-4B69-9497-CD6D9533ED78

Figs 1–2, 9, Table 1

Diagnosis

The apices of the hind femora bear an apical spine on the retrolateral side. The ventral surfaces of the hind femora are unarmed prolaterally but variably bear linear spines retrolaterally. The male suranal plate has a proximal margin that resembles three wide, rounded lobes / similar to *M. montanus*, but has a small medial notch on the distal margin rather than being rounded (Figs 2, 9b). The female subgenital plate is very distinctive: the structure is sclerotised at the lateral and distal margins, appearing orange, and bears two well-produced, spiked lobes originating from the distal margin. The lobes are separated by a deep medial notch and resemble fangs, readily differentiating it from both *M. cavernicola* and *M. montanus* (Figs 2, 9e).

Etymology

Named after Zubat, a bat Pokémon from the video game franchise of the same name. The two spiked lobes on the female subgenital plate are reminiscent of the pair of long fangs on Zubat's upper jaw. Like many Rhabdiphoridae, Zubat is also found in cave and forest habitats. The species name 'zubat' is not a Latin or latinised word and we therefore treat it as indeclinable in compliance with ICZN Article 31.2.3 (ICZN 1999).

Type material

Holotype

AUSTRALIA – **Tasmania** • ♂; Southwest National Park, Forest Hills, Cave 2; 43.333° S, 146.53° E; 360 m a.s.l.; 15 Feb. 2012; S.M. Eberhard and R. Eberhard leg.; GenBank: PV368134 (*COI*); TMAG F073188; TMAG.

Paratypes

AUSTRALIA – **Tasmania** • 1 ♀; same data as for holotype; TMAG F156354; TMAG • 1 ♀; same data as for holotype; ANIC 14-008975; ANIC.

Other material examined

AUSTRALIA – **Tasmania** • 1 spec.; same data as for holotype; molecular data only; GenBank: MH171951 (*12S* rRNA); SARFMEE 12:0965; SARFMEE.

Description

MEASUREMENTS. ♂ holotype body length 16.5 mm. ♀ body length 15–16 mm, ovipositor 9–9.5 mm. Hind tibia 24 mm; sexual dimorphism in leg lengths or armature unknown as hind legs were broken from specimens prior to examination.

HEAD. Light brown and mottled with mid to dark brown patterning on vertex and frons. Fastigium divided into two tubercles with a pale ocelliform spot on either side. Medial ocellus present.

BODY. Generally mid brown mottled with pale brown and ochreous patches, particularly prominent on thoracic nota. Thoracic nota and abdominal sternites with row of pale brown flecks at distal margin. A thin medial line running down thoracic nota, not visible beyond metanotum.

LEGS. Ochreous brown with pale brown striations and patches concentrated proximally. Fore and middle legs as in generic diagnosis above, with ventral surface of tibiae bearing two rows, one prolateral and other retrolateral of 4–5 linear spines each. Length of hind femur unarmed prolaterally but with 0–3 ventral linear spines retrolaterally. Hind tibia with 38–48 dorsal linear spines prolaterally and 32–47 retrolaterally; sexual dimorphism in tibial armature unknown as hind legs were separated from specimens prior to examination. First segment of hind tarsus with 3–4 dorsal linear spines prolaterally and 2–4 retrolaterally. Second tarsal segment with 2–3 dorsal linear spines prolaterally and 1–2 retrolaterally.

MALE TERMINALIA. Suranal plate mid to dark brown and densely setose at distal margin. Proximal margin of suranal plate broadly triangular. Distal margin of suranal plate rounded, weakly notched medially; suranal plate curved ventrally, bearing four wide, convex projections on underside, one pair on either side of distomedial notch. Each pair of projections separated by depression bearing black, dentate fringe

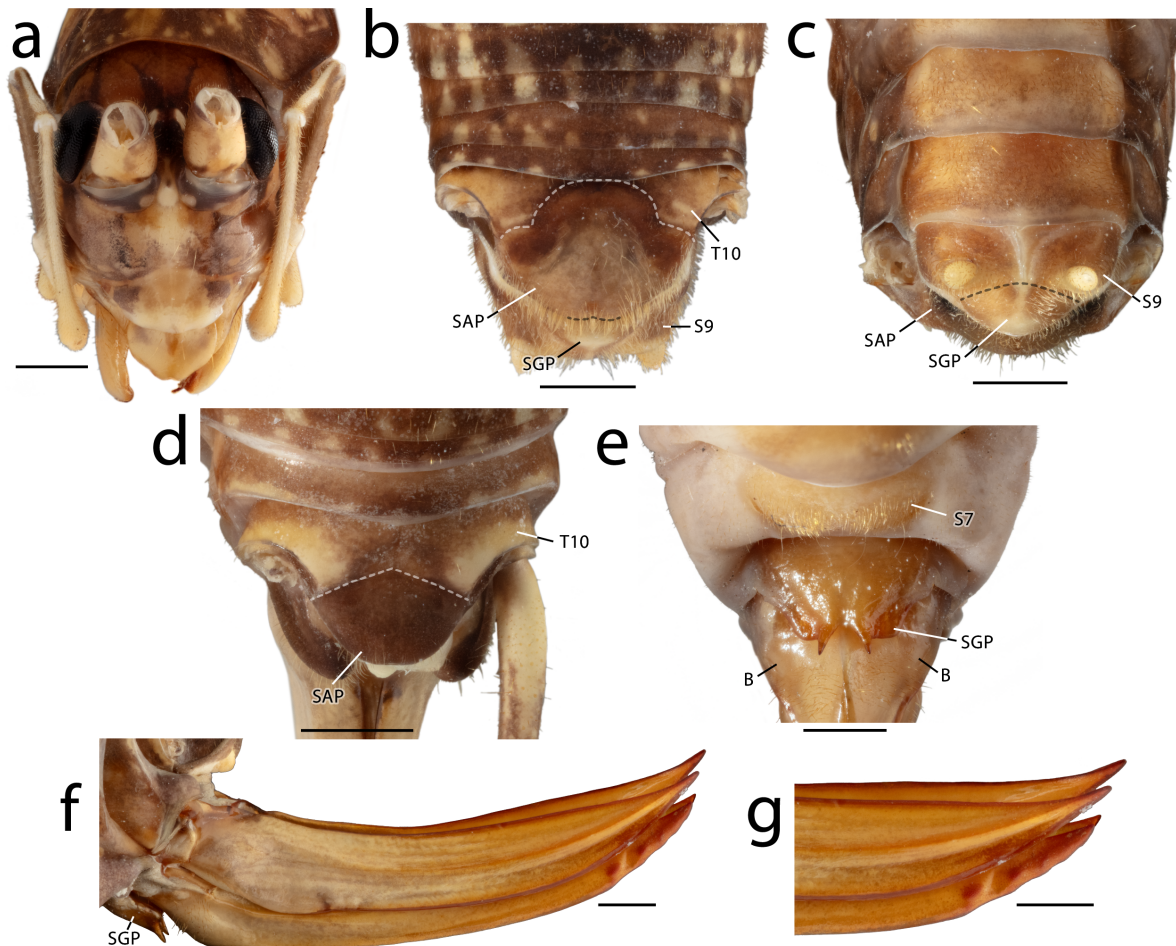


Fig. 9. *Micropathus zubat* Beasley-Hall sp. nov. **a–c.** ♂, holotype (TMAG F073188). **d–g.** ♀, paratype (TMAG F156354) from Cave 2 in Forest Hills, TAS. **a.** Head. **b–c.** Dorsal and ventral views of ♂ terminalia. **d–e.** Dorsal and ventral views of ♀ terminalia. **f–g.** Lateral view of ovipositor. Abbreviations: B = basivalvula; S = sternite; SAP = suranal plate; SGP = subgenital plate; T = tergite. Dotted lines in b–d indicate plate margins. Scale bars = 1 mm.

of tubercles. Sternite 9 with styles; proximomedially lacking setae and with pale, V-shaped ridge; distal margin curved dorsally, subgenital plate originating underneath. Subgenital plate pale, without setae, and rounded.

FEMALE TERMINALIA. Suranal plate mid brown, sparsely setose at distal margin only. Proximal margin of suranal plate resembling three wide, rounded lobes. Plate laterally convex, distal margin rounded to weakly notched medially. Subgenital plate, without setae and concave proximolaterally, becoming convex towards distal margin. Distolateral corners rounded and sclerotised, appearing orange. Distal margin split into two spiked lobes which are also sclerotised and separated by wide, rounded notch; lobes measure approximately fifth of length of plate. Basivalvulae present, bulbous, positioned laterally. Ovipositor light reddish brown. Ventral valve of ovipositor bearing 5 small, weakly produced teeth decreasing in size towards apex; each tooth often paired with process resembling sclerotised tubercle on corresponding lateral surface.

Distribution

Recorded from a single dolomite cave in the Forest Hills karst at 360 m a.s.l., Southwest National Park, southwest Tasmania (Fig. 1b).

Remarks

Micropathus zubat Beasley-Hall sp. nov. was referred to as *Micropathus* “sp. nov. 1” in the phylogeny of Beasley-Hall *et al.* (2025). The species is the first cave-dwelling invertebrate recorded and described from the extremely remote and inaccessible Forest Hills karst in southwest Tasmania. The karst system comprises a stream sinking into a cave in the base of a large, enclosed depression in dense rainforest. While the true extent of this species’ range may be difficult to ascertain, this distribution currently classifies *M. zubat* as an ultra-short range endemic – that is, occupying a range of < 100 km² (Guzik *et al.* 2019), and therefore sampling of nearby karsts such as Cracroft, Mount Bobs, and Vanishing Falls is warranted to better delineate its range.

Discussion

Rhaphidophorids are an important faunal component of caves in the Australian mesic zone where they play a prominent ecological role as predators, omnivorous scavengers, and detritivores. The abundance of rhaphidophorid biomass also supports diverse predator communities (Richards 1971b). Rhaphidophorids are most prominent in Tasmanian caves located in wet forest environments, where locally abundant populations of *Micropathus* spp. constitute the main prey item of the Tasmanian cave spider *Hickmania troglodytes* (Eberhard 1992, 1999). In North America, rhaphidophorids are keystone species because of their significant contribution to the food base in caves via their bodies, faeces, and eggs, which are preyed on by cave beetles (Lavoie & Poulson 2007). In Tasmania, the Ida Bay cave beetle (*Idacarabus troglodytes* Lea, 1910) has been observed feeding on eggs of *Micropathus ditto* Beasley-Hall sp. nov. laid in sediment banks (Driessen 2009). Whether the abundant frass deposits under roosts of *Micropathus* are exploited by other cave invertebrates remains unclear, however cricket bodies and frass are colonised by fungi, which in turn may be exploited by fungivorous species.

Here, we have reassessed the taxonomy of *Micropathus*, the most widespread rhaphidophorid genus on the main island of Tasmania. *Micropathus* is abundant in caves throughout the wetter and more humid western half of the island whereas *Parvotettix* occurs in both subterranean and epigeal habitats in the drier eastern half. Both genera overlap in central Tasmania (Fig. 1b). A recent molecular phylogeny by Beasley-Hall *et al.* (2025) highlighted two undescribed species of *Micropathus*, which we described here as *Micropathus ditto* Beasley-Hall sp. nov. and *Micropathus zubat* Beasley-Hall sp. nov. These taxonomic acts bring the number of species of *Micropathus* to seven for a total of 29 rhaphidophorid species

Summary of distribution, habitats, and conservation status of *Micropathus* spp. * Total estimated area spanning the most distant occurrence records of a species; values do not imply a species occurs homogenously across this range. *Micropathus kiernani* Richards, 1974 is Critically Endangered federally and Endangered at the state level (Threatened Species Section 2022).

Species	Broad region	Known habitats	Known range*	Reserve status
<i>M. cavernicolus</i> Richards, 1964	Central North + West TAS	karst caves in rainforest and wet sclerophyll forest ; mine adits in non-karstic rock	~6,500 km ² , multiple karst and non-karst habitats	partially protected; range affected by land clearing, forestry, agriculture
<i>M. ditto</i> Beasley-Hall sp. nov.	South + Southeast TAS	karst caves in rainforest, wet sclerophyll	~300 km ² , multiple karsts	entire range inside reserved lands
<i>M. fuscus</i> Richards, 1968	Northwest TAS	karst caves in rainforest, wet sclerophyll	~500 km ² , multiple karsts	partially protected; range affected by land clearing, forestry, agriculture
<i>M. kiernani</i> Richards, 1974	South + Southeast TAS	karst and sandstone caves in rainforest, wet sclerophyll	apparently restricted (two caves)	type locality and surrounding habitat affected by land clearing, urbanisation
<i>M. montanus</i> Richards, 1971	Central West TAS	karst caves in rainforest	~900 km ² , multiple karsts	entire range inside reserved lands
<i>M. tasmaniensis</i> Richards, 1964	Central South TAS	karst caves in rainforest, wet sclerophyll	~350 km ² , multiple karsts	partially protected; range affected by forestry
<i>M. zubat</i> Beasley-Hall sp. nov.	South TAS	karst caves in rainforest	apparently restricted (one cave)	entire range inside reserved lands

Australia-wide. *Micropathus ditto* is found in limestone and dolomite caves across an arc of geologically disjunct karst areas in Tasmania's south including Precipitous Bluff, Pindars Peak, Ida Bay, and Hastings (Table 1). In contrast, *M. zubat* is currently known only from the Forest Hills karst and is the first cave invertebrate described from this remote locality (Eberhard 1992). The nearest cavernous karsts to Forest Hills are Cracroft and Vanishing Falls some 20 km away. Further sampling of these neighbouring karsts should be a high research priority to better understand the distribution and conservation status of both *M. zubat* and *M. kiernani*.

Until this study, *M. kiernani* was known only from a small sandstone cave near Dover where it is listed as Critically Endangered and Endangered, respectively, under the federal Environment Protection and Biodiversity Conservation Act (EPBC) 1999 and the Tasmanian Threatened Species Protection Act 1995 (Threatened Species Section 2022). The discovery of a population of this species at Precipitous Bluff sympatric with *M. ditto* Beasley-Hall sp. nov. represents a considerable range extension of > 35 km, and significant improvement in its reservation status as the Precipitous Bluff karst is in the Southwest National Park. Notwithstanding this surprising distribution pattern begs the research question: Are there other populations of *M. kiernani* between these two disjunct locations? Thus, a second overarching research priority is to improve understanding of the habitat preferences and distribution patterns of *Micropathus* spp. beyond cave and karst habitats by sampling prospective habitats such as talus, rock crevices, burrows, and wet forest spanning non-karstic environments over broader geographic regions. To provide a framework for further research, Table 1 summarises the current state of knowledge on the distribution, habitat preferences, and conservation of *Micropathus*.

In addition to the new species mentioned above, we have also undertaken a revision of *Micropathus* more. This was necessitated by some of Richards' early descriptions (which relied on morphology alone) being limited by insufficient material and poorly preserved specimens, leading to confusion and diagnostic oversights. This was in part due to intraspecific morphological variation in the genus, which is relatively common in Macropathinae (e.g., *Speleotettix* Chopard, 1944; Beasley-Hall *et al.* 2025b) and often necessitates the use of DNA barcoding to clarify species boundaries. Of particular focus in the present study was *Micropathus tasmaniensis*, which was originally described by Richards as including populations we have described as *M. ditto* Beasley-Hall sp. nov. Here, we were able to curate a new set of morphological characters reflective of the species hypothesis set out by Beasley-Hall *et al.* (2025) and which more consistently vary among species.

further reinforced that Tasmania is a biodiversity hotspot for Rhabdophoridae. Tasmania was at the centre of an evolutionary radiation that saw the Southern Hemisphere portion of the family spread across Australia and the rest of Gondwana during the Cretaceous (Beasley-Hall *et al.* 2025a). Several Tasmanian caves support more than one species, of note because only a single instance of sympatry is known from the Australian mainland (Iannello & Beasley-Hall 2024). While such occurrences appear to be uncommon in Australia, this is not the case for the more extensive mesic habitats of Aotearoa New Zealand, where a record of four different macropathine species from three genera are known from one cave (Fitness *et al.* 2018). Relevant Tasmanian karsts include Precipitous Bluff, where we have documented intermingled populations of *M. ditto* and *M. kiernani* (Fig. 1b), and Mole Creek and Florentine Valley, where *Parvotettix* and *Micropathus* co-occur, albeit at different sites within the same cave (Richards 1971b). The long-time persistence, radiation, and short-range endemism of *Micropathus* within Tasmania exemplifies the importance of caves and mesic forest environments as critical habitat and refugia for hygrophilous species, especially in the face of drying climate change.

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