

Integrative taxonomic revision of the Australian cave cricket *Speleotettix* Chopard, 1944 (Orthoptera: Rhabdiphoridae): New species, distribution and conservation implications

Perry G. Beasley-Hall¹  | Steven A. Trewick² | Brock A. Hedges¹ |
Steven J. B. Cooper^{1,3} | Elizabeth H. Reed¹ | Andrew D. Austin¹

¹School of Biological Sciences, University of Adelaide, Adelaide, South Australia, Australia

²Wildlife and Ecology Group, Massey University, Palmerston North, New Zealand

³Evolutionary Biology Unit, South Australian Museum, Adelaide, South Australia, Australia

Correspondence

P. G. Beasley-Hall, School of Biological Sciences, The University of Adelaide, Adelaide, South Australia, Australia.

Email: perry.beasley-hall@adelaide.edu.au

Funding information

This work was funded by a fellowship awarded to PGBH through the National Taxonomy Research Grant Program by the Australian Government's Department of Climate Change, Energy, the Environment and Water (no. 4-H3JJWE), with co-funding from the Australian Speleological Federation, South Australian Museum, Environment Institute and the University of Adelaide.

Abstract

Cave crickets, also called wētā, are an important component of subterranean realms globally, but the true diversity of the group is poorly known. *Speleotettix* Chopard, 1944 contains two species from southeast Australia, *Speleotettix tindalei* Chopard, 1944 and *Speleotettix chopardi* (Karny, 1935). However, the initial description of the genus was poorly characterised, and its taxonomy has remained unclear since. Here, we take an integrative molecular and morphological approach to redescribe *Speleotettix* and describe three new species: *Speleotettix aolae* Beasley-Hall, **sp. nov.** from Victoria and *Speleotettix binoomea* Beasley-Hall, **sp. nov.** from New South Wales, both found in limestone caves, and *Speleotettix palaga* Beasley-Hall, **sp. nov.** from mineshafts in Victoria. To provide consistency in future work on the group, we also redescribe *S. tindalei* and treat *S. chopardi* as a *nomen dubium*. Finally, we transfer the threatened species *Cavernotettix craggiensis* Richards, 1974, an island species from Tasmania's Bass Strait, into the genus as *Speleotettix craggiensis* (Richards, 1974) **comb. nov.** In so doing, we increase the number of described rhabdiphorid species in Australia to 27 and significantly expand the distribution of *Speleotettix*, making it the most widespread of the Australian genera currently known. As all members of *Speleotettix* are short-range endemics at risk of decline, these findings have implications for their future conservation management.

KEYWORDS

Macropathinae, wētā

INTRODUCTION

The orthopteran family Rhabdiphoridae Walker, 1869 is a globally distributed group of insects commonly known as cave crickets or wētā. Despite their common name,

species are found in a range of habitats unified by cool, humid microclimates and low light levels, including wet forest, mineshafts and animal burrows (Lavoie & Poulson 2007). The subfamily Macropathinae Karny, 1930 represents the entirety of the rhabdiphorid fauna in the

Perry Beasley-Hall: <http://zoobank.org/urn:lsid:zoobank.org:author:D8C4DBEA-5C2D-4A07-AEF7-0842ABFB708C>

<http://zoobank.org/urn:lsid:zoobank.org:pub:455CB2A7-8DC9-4C47-8559-E30AD90556EC>

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial](https://creativecommons.org/licenses/by-nc/4.0/) License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited and is not used for commercial purposes.

© 2025 The Author(s). Austral Entomology published by John Wiley & Sons Australia, Ltd on behalf of Australian Entomological Society.

Southern Hemisphere except for Southeast Asia and Papua New Guinea. Recent work has dealt with the systematics and taxonomy of New Zealand rhabdophorids (Fitness et al. 2018; Hegg, Morgan-Richards, & Trewick 2019, 2022; Johns & Cook 2013; Trewick 1999), but no such research has been conducted on Australian species for over five decades (Richards 1974).

Nine rhabdophorid genera are described from Australia: *Australotettix* Richards, 1964; *Cavernotettix* Richards, 1966; *Eburnocauda* Beasley-Hall & Iannello, 2024; *Micropathus* Richards, 1964; *Novotettix* Richards, 1966; *Pallidotettix* Richards, 1968; *Parvotettix* Richards, 1968; *Speleotettix* Chopard, 1944; and *Tasmanoplectron* Richards, 1971. To date, morphological characters used by Richards correlate well with phylogenetic relationships and existing generic assignments hold up well under molecular scrutiny (Beasley-Hall et al. 2018, 2025). However, *Speleotettix* is poorly known because it is the only genus not described by Richards, meaning its descriptions were based on a different set of morphological characters and therefore cannot easily be compared with the remainder of the Australian fauna. The genus presently contains two species, *Speleotettix tindalei* Chopard, 1944 from the Limestone Coast of South Australia and *Speleotettix chopardi* (Karny, 1935) from the Dandenong Ranges in Victoria. The descriptions of both species (and the genus itself) are inadequate and require revision, primarily because neither provide sufficient morphological information for confident identification of taxa.

Several additional species putatively assigned to *Speleotettix* have remained undescribed for decades. Richards deposited specimens from caves in central New South Wales (NSW) into museum collections under the tag name *Speleotettix profundus* in the 1960s, but this taxon was never formally described. In a subsequent species checklist for Australia, Richards alluded to an undescribed member of *Cavernotettix* Richards, 1966 from the “central coastal ranges” et al. of NSW with no mention of *S. profundus* (Richards, 1987). The shared location and morphological similarity between the two genera suggest Richards was referring to a single taxon with an uncertain generic placement. Richards also referred to two other undescribed species of *Speleotettix* from lava tubes and woodland in “coastal southwest Victoria” (VIC) but provided no further information on their morphology or exact locality (Richards 1987).

A taxonomic revision of *Speleotettix* is necessary not only because of the above issues but because most, if not all, members of the genus are short-range endemics likely deserving of conservation listing. Robust, accurate descriptions and keys are necessary for identification and subsequent conservation management of species (Dubois 2003; Vogel Ely et al. 2017), and a formal scientific name is generally required for a taxon to be protected under Australian environmental legislation and the International Union for Conservation of Nature's Red List of Threatened Species (IUCN Standards and Petitions

Committee 2024; Murphy & van Leeuwen 2021). As such, here we undertake a complete revision of *Speleotettix* to lay the groundwork for future taxonomic and conservation work on the group. We begin by redescribing the genus and the two existing species therein. We then revisit locations mentioned by Richards to house undescribed taxa and describe three new species, *Speleotettix aolae* Beasley-Hall, 2025 sp. nov., *Speleotettix binoomea* Beasley-Hall, 2025 sp. nov. and *Speleotettix palaga* Beasley-Hall, 2025 sp. nov. The generic identity of these taxa within *Speleotettix* was confirmed in a recent molecular phylogeny by the authors (Beasley-Hall et al. 2025) (Figure 1). Finally, we redescribe *Cavernotettix craggiensis* Richards, 1974 as a member of *Speleotettix* following its recovery within the genus based on the aforementioned phylogenetic study (Figure 1).

MATERIALS AND METHODS

Taxon sampling and imaging

Specimens were collected from the field and loaned from museum collections. Crickets were identified as *Speleotettix* as a first pass based on the coxae lacking anterolateral spines, the hind femora bearing an apical retrolateral spine only, and the male suranal plate being developed into two elongate processes. Identification was further confirmed using mitochondrial and nuclear molecular data presented in a sister study by Beasley-Hall et al. (2025). Samples were imaged using a Canon EOS 5DS R and a Canon MP-E65mm f/2.8 1-5× macro lens. Images were processed using Zerene Stacker v.1.04 with the PMax stacking method, Adobe Photoshop 2025 and Adobe Lightroom 2025.

DNA sequencing and phylogenetic analysis

In addition to justifying our descriptions with molecular data from Beasley-Hall et al. (2025), we also sequenced the cytochrome oxidase I (*COI*) gene from new material deposited at the Australian Museum from Junction and Fig Tree caves at Wombeyan, NSW (Figure 1). The identity of this population was previously uncertain as it was recovered as multifurcating (i.e., with a polytomy) by Beasley-Hall et al. (2025), albeit with a close relationship to populations at Jenolan and Abercrombie. No new material from Abercrombie was available to us in the present study.

DNA extractions of fresh specimens from Wombeyan were performed using a Genra Puregene Tissue Kit (QIAGEN), and we amplified *COI* using the primers LCO1490 + HCO2198 (Folmer et al. 1994). PCRs were performed using a standard hot-start protocol consisting of a preheat step at 95°C for 10 min, denaturation at 95°C for 45 s, annealing at 48°C for 45 s, extension at 72°C for 1 min, 72°C for 10 min and 25°C for 2 min 20 s. Denaturation, annealing and extension steps were repeated for

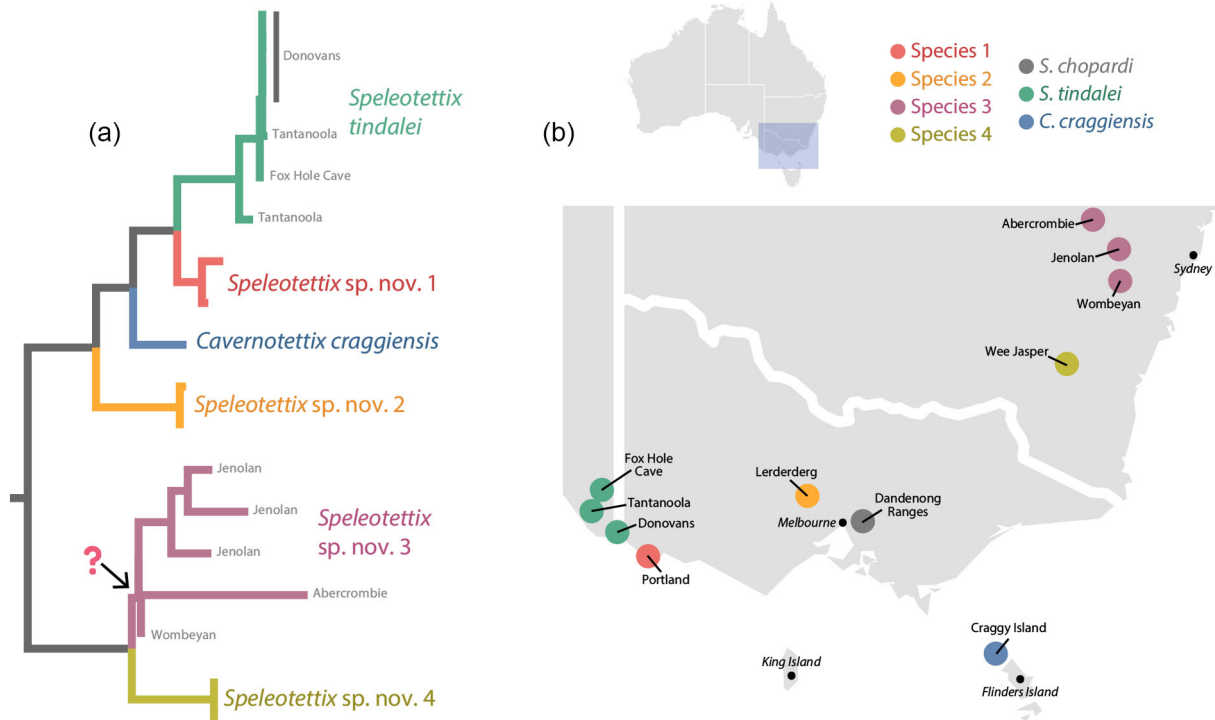


FIGURE 1 (a) Phylogenetic relationships among members of *Speleotettix* adapted from Beasley-Hall et al. (2025). *Cavernotettix craggiensis* is assigned to the genus in the present paper. Samples from caves at Abercrombie and Wombeyan were putatively assigned to sp. nov. 3 by those authors, but their position remains unclear given polytomies in the relevant clade (red question mark). (b) Locations of populations shown in (a) as well as *Speleotettix chopardi*, the second described species in the genus.

39 cycles. Product purification and DNA sequencing was outsourced to the Australian Genome Research Facility (Melbourne, Australia). *COI* sequences from the two Wombeyan samples were aligned against barcodes from Beasley-Hall et al. (2025) using MUSCLE v.3.8.425 (Edgar 2004) for a total of 678 bp. The dataset was partitioned by codon position. Phylogenetic analysis was conducted using IQTREE v.1.6.12 with 1000 ultrafast bootstrap replicates and substitution model selection performed by ModelFinder (MFP + MERGE option) (Hoang et al. 2018; Kalyanamoorthy et al. 2017). We manually rooted the tree at the split between *S. binomea* and all other members of the genus based on the topology recovered by Beasley-Hall et al. (2025).

Species delimitation

We conducted species delimitation analyses to support our morphological descriptions of new members of *Speleotettix*. Here we followed the unified species concept (USC) of De Queiroz (2007), which conceptualises species as “separately evolving metapopulation lineages” (or segments thereof) supported by lines of evidence which may include reciprocal monophyly, fixed morphological differences or reproductive isolation. In keeping with the USC and to avoid potentially over- or under-splitting lineages by relying on a single method in isolation (Luo et al. 2018),

we used several different approaches to test our species hypothesis: (1) the distance-based Assemble Species by Automatic Partitioning method (ASAP) (<https://bioinfo.mnhn.fr/abi/public/asap/asapweb.html>; Puillandre, Brouillet, & Achaz 2021); (2) the distance and tree-based Species Delimitation plugin (SDP) (v.1.4.5; Masters, Fan, & Ross 2011) in Geneious Prime v.2024.0.3 (<http://geneious.com>); and (3) the tree-based Bayesian implementation of the Poisson tree process (bPTP) (<https://species.h-its.org/ptp/>; Zhang et al. 2013).

The ASAP method identifies barcode gaps without the need for a user-specified prior on intraspecific divergence and can rank alternative partitioning schemes. We ran the analysis using Kimura 2-parameter distances and a probability threshold of 0.01. We next used SDP, which relies on a single gene tree to calculate average pairwise intraspecific and interspecific genetic differences between putative species. The SDP plugin also calculates the probability of reciprocal monophyly stemming from evolutionary lineage separation vs. a random outcome of the coalescent process using Rosenberg’s P_{AB} , with a value of <0.05 indicating strong evidence for delimitation between species (Rosenberg 2007). Finally, we used bPTP, a tree-based method that relies on the number of substitutions along branches to infer species boundaries. We ran bPTP for 100 000 MCMC generations using a thinning of 100 and a 10% burn-in. We were not able to include

S. chopardi in these analyses due to its status as a *nomen dubium* (see [Taxonomy](#) section below).

Abbreviations and terminology

Collection abbreviations

iNaturalist = Available from [iNaturalist.org](https://www.inaturalist.org) (as of 21 May 2024).

ANIC = Australian National Insect Collection, CSIRO, Canberra

AM = Australian Museum, Sydney

QM = Queensland Museum

MNHN = *Muséum National d'Histoire Naturelle*, Paris

Locations

NSW = New South Wales

SA = South Australia

TAS = Tasmania

VIC = Victoria

We use ‘single quotation marks’ to indicate unofficial taxonomic or location names, as for *S. profundus*, and “double quotation marks” to indicate exact quotes from published texts.

Morphological terminology

The terminology for raphidophorid morphology is inconsistent in the literature. Here, we follow the conventions of Richards (1964a) and more recent studies of

Macropathinae (Fitness et al. 2015; Hegg et al. 2022) in referring to terminalia and the spination of the legs. *Apical spines* are positioned at the distal end of a leg segment, and *subapical spines* are positioned between a pair of apical spines, the latter only occurring on the hind tibia (Figure 2). *Linear spines* occur in rows along a leg segment and may occur on the dorsal (also *superior*) or ventral (also *inferior*) surface of that segment. Both apical and linear spines may face closer to the head (*prolateral*) or the posterior of the body (*retrolateral*).

Apical and linear spines are sometimes referred to as *immovable spines* and *movable spurs*, respectively, particularly when referring to the Northern Hemisphere Raphidophoridae (Jiao et al. 2008; Qin, Liu, & Li 2016; Zhou & Yang 2022). Further complicating matters, Richards sometimes confused her descriptions of spine placement and would refer to structures directed prolaterally as being retrolateral, and vice versa (e.g., Richards 1964b, 1966b). This phrasing is particularly confusing for projections on the coxae which, unlike apical or linear spines of other leg segments, do not clearly face in either direction yet are helpful in distinguishing *Speleotettix* from related genera like *Cavernotettix*. We do not consider Richards’ terms appropriate for the coxae and instead follow Hegg et al. (2022) in referring to forward-facing processes as *anterolateral spines* and downward-facing processes as *ventrally directed*.

RESULTS

Species delimitation

We used the molecular phylogeny of Beasley-Hall et al. (2025) (Figure 1) to construct an initial species hypothesis

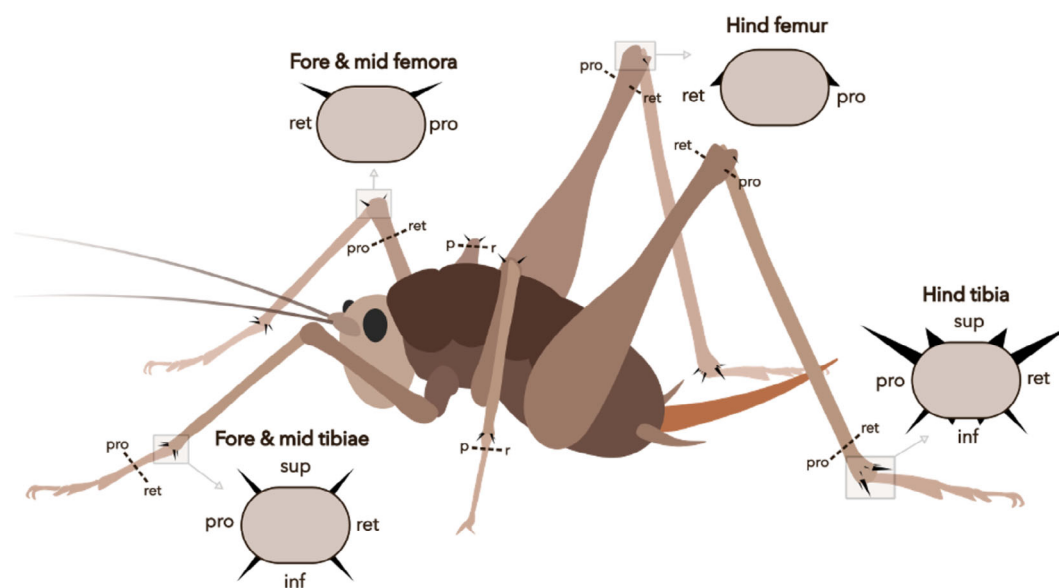


FIGURE 2 Apical and subapical spines on the femora and tibiae can be used to distinguish raphidophorid genera. Pro = prolateral (p); ret = retrolateral (r); sup = superior surface; inf = inferior surface. Cross-sections, denoted by opaque boxes, are from a distal perspective. Diagram after Fitness et al. (2015).

Diagnosis

Speleotettix comprises medium-sized crickets with an adult body length—that is, from the top of the fastigium to the distal margin of the suranal plate—of up to 19 mm and a distribution spanning the Bass Strait of TAS and southeast mainland Australia (SA, VIC and NSW) (Figure 1). The basic body colouration is beige with brown patterning. Unlike many other Australian Rhabdophoridae, the genus is identified by a combination of morphological characters rather than a single trait. *Speleotettix* lacks spination on the coxae, also shared by *Novotettix* Richards, 1966 and *Pallidotettix* Richards, 1968 but differentiated by a deeply emarginate distal margin of the male suranal plate and fewer dorsal linear spines on the hind tarsi. *Speleotettix* can also be differentiated by the comparatively weak teeth on the female ovipositor, which are more well-pronounced and may be reflexed proximally in *Novotettix* and *Pallidotettix*.

Redescription

Head

Light to mid brown patterning on vertex and frons, spanning median ocellus. Eyes black. Fastigium higher than long, indented medianly and divided into two laterally compressed tubercles. Antennae long, scapes almost touching at their bases.

Body

Basic body colour in life pale beige to ochreous with light to mid brown patterning. Body moderately clothed with short, pale brown setae. A median dorsal line present, beginning at the fastigium and running down the length of the body and becoming less visible beyond the thoracic nota. Two faint, glabrous patches resembling eyespots on either side of the pronotum, which may appear murky or shadow-like compared with surrounding patterning, where the internal cryptopleura attaches to the underside of the plate. Prominent tubercles may be present at the distal margin of abdominal tergites, as in *Speleotettix palaga* sp. nov.

Legs

Legs light to mid brown and interspersed with patches of beige on hind femora. Coxae unarmed and lacking both anterolateral spines and ventrally directed processes. Apical spines constant in number among species, except for hind femora (see below). Fore and middle femora bearing one prolateral and one retrolateral spine at apex and without ventral linear spines. Fore and mid tibiae bearing both apical and dorsal linear spines: apex of tibiae with four spines, one pair directed prolaterally and retrolaterally on superior surface, other prolaterally and retrolaterally on inferior; dorsal linear spine counts on tibiae vary among

species. Fore and mid tarsi unarmed. Apex of hind femora usually with a single retrolateral spine only, but variably bearing a small prolateral spine in some species. Four apical spines on hind tibiae, as on fore and mid tibiae, but supplemented by two pairs of subapical spines between each primary pair. Apical spines present in a single pair each on first and second hind tarsal segments. Third and fourth hind tarsal segments unarmed.

Male terminalia

Male suranal plate deeply emarginate such that the posterior margin resembles an upside-down V, forming two triangular lobes. Subgenital plate trilobed, lateral lobes bearing styli; median lobe generally longer than lateral lobes. Sternite IX, which precedes the subgenital plate, bearing a medium-sized median tubercle; margin between the two structures often poorly visible.

Female terminalia

Female suranal plate broadly oval-shaped, concave laterally and straight to moderately emarginate at the distal margin. Female subgenital plate trilobed; lobes wide, median lobe generally longer than lateral lobes. Ovipositor ranging from blue-grey or beige (juveniles) to brick red (adults) in life, often becoming translucent amber following ethanol preservation. Ovipositor with six to eight teeth ranging from very weakly to moderately produced at distal margin; vertical ridges often present on the median surface leading to each tooth, which may be lacking for the most distal and/or proximal. Dorsal valve and median surface of ovipositor unarmed.

Remarks

Speleotettix is the sister genus to *Cavernotettix* (Beasley-Hall *et al.*, 2025; Figure 1). The two genera have similar morphologies and are difficult to distinguish in photographs alone, particularly if the spines (or lack thereof) on the fore coxae and/or the male suranal plate is not visible. Identification is further complicated by the fact that the genera are reportedly sympatric east of the Melbourne metropolitan area (Mesa 1970), but this has not been confirmed by the authors. *Speleotettix* comprises a northern and southern clade: one in NSW (*S. binomea* sp. nov. and *Wee Jasper* sp. nov.) and the other in SA, VIC and TAS (*S. tindalei*, *S. aolae* sp. nov., *S. craggiensis* comb. nov. and *S. palaga* sp. nov.).

Etymology

Not explained by Chopard. From the Latin *spēlēō* = cave and Ancient Greek *téttix* = cicada, also used to refer to crickets and grasshoppers. The genus name is masculine.

Distribution

SA, VIC, NSW and the Bass Strait of TAS (Figure 1). All species of *Speleotettix* occur in aphotic habitats or in close proximity to them, presumably observed when foraging. In SA, far west VIC and NSW, *Speleotettix* occurs in the twilight zone of limestone and marble caves. In the Central Victorian Uplands, *S. palaga* is known from mineshafts. In TAS, *S. craggiensis* has been found under boulders and in animal burrows.

Key to species of *Speleotettix*

1. Female suranal plate with a distinct median notch at the distal margin (Figure 5d). Lobes of female subgenital plate subtriangular, lateral lobes longer than median lobe and plate uniformly sclerotised (Figure 5e). General body colour mid brown and beige to ochreous (Figure 6). ***binoomea* sp. nov.**

Female suranal plate straight or only weakly emarginate at the distal margin (Figure 9d). Median lobe of female subgenital plate longer than lateral lobes (Figure 9e). General body colour mid brown and beige (Figure 10).2

2. Female ovipositor with moderately produced teeth. Teeth most easily counted by their dentate disruption of the dorsal margin (Figure 4g).3

Female ovipositor with weakly produced teeth, dorsal margin almost flat. Teeth most easily counted by ridges on the median surface of the ovipositor (Figure 9g).4

3. Lateral lobes of female subgenital plate subrectangular with corners rounded distolaterally; distal margin of lateral lobes sclerotised and mid to dark brown, colouration sometimes extending to the median surface of lobes (Figure 8e). Distal margin of female suranal plate emarginate (Figure 9d). Ovipositor with six teeth on the dorsal margin (Figure 9f). ***palaga* sp. nov.**

Lateral lobes of female subgenital plate rectangular, distal margin of plate truncate. Distal margin of female suranal plate straight (Figure 8d). Ovipositor with eight teeth on the dorsal margin (Figure 8f). ***craggiensis* comb. nov.**

4. Lateral lobes of female subgenital plate not produced, flat; distal margin of lobes sclerotised and mid brown (Figure 9e). Distal margin of female suranal plate weakly emarginate (Figure 11d). ***tindalei***

Lateral lobes of female subgenital plate rounded; median surface margin of lateral lobes sclerotised and

mid brown (Figure 4e). Distal margin of female suranal plate straight to weakly emarginate (Figure 4d). ***aolae* sp. nov.**

***Speleotettix aolae* Beasley-Hall, sp. nov.**

(Figure 4)

<http://zoobank.org/urn:lsid:act:10E6D414-5308-472C-896F-70815A94C0D4>

Speleotettix sp. nov. 1 (Beasley-Hall *et al.*, 2025)

Material examined

Holotype

Adult ♂, Cave BR5 (Big Cave), Portland, VIC, –38.335746, 141.508171, coll. S. Iannello, 18 March 2023, ANIC 14-009156.

Paratype

?Subadult ♀, same locality and collection information, ANIC 14-009157.

Other material

2 ♂, 2 ♀, same locality and collection information, ANIC 14-009158–14-009161. Jackass Fern Gully Picnic Area near Fitzroy River, VIC (photograph only), –38.074639, 141.425361, iNaturalist 119041985.

Diagnosis

Speleotettix aolae can be differentiated from other members of *Speleotettix* by the female terminalia. The species has a suranal plate with a straight to weakly emarginate distal margin and the subgenital plate bears lateral lobes which are rounded, shorter than the median lobe and darker than the surrounding plate due to sclerotisation. The ovipositor has eight weakly produced teeth on the dorsal margin.

Description

Measurements

Holotype body length 14 mm, hind tibia 20 mm. ♀ paratype 11 mm, hind tibia 21 mm, ovipositor 11 mm.

Head

Light brown banding on vertex and frons of head forming a rough M shape, extending to a horizontal band that spans the fastigium.

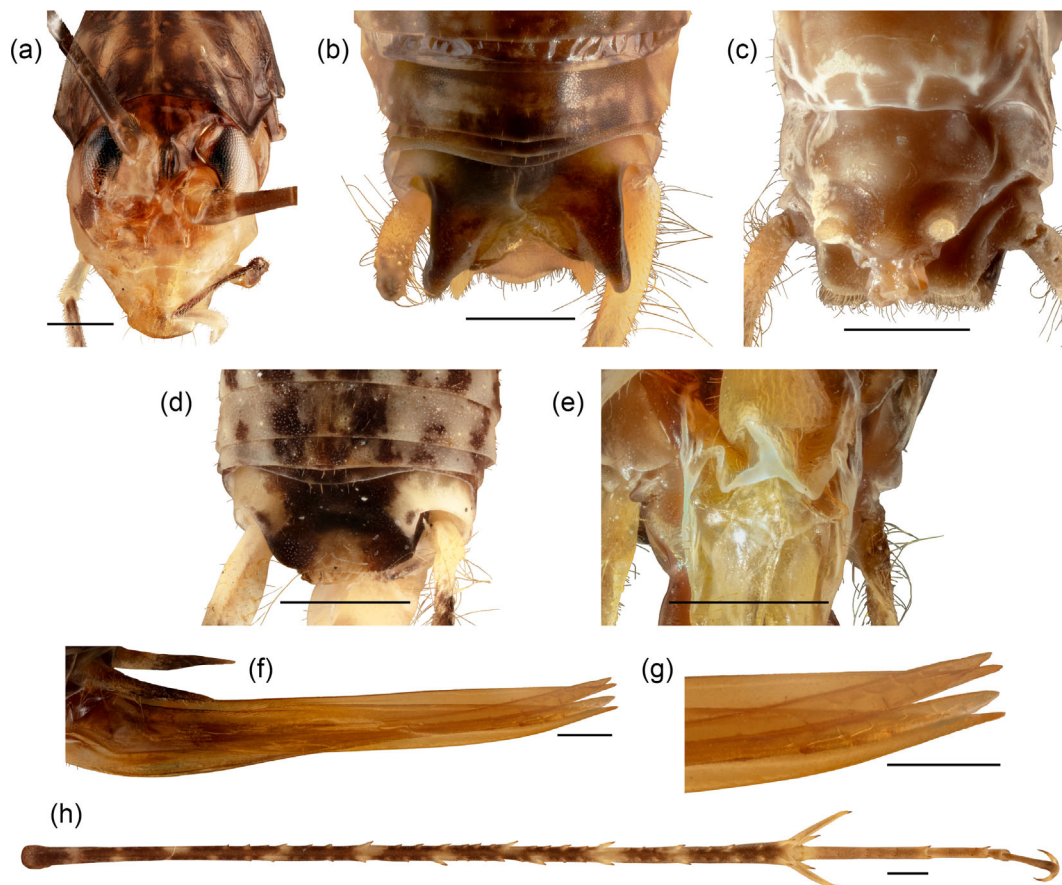


FIGURE 4 *Speleotettix aolae* Beasley-Hall, sp. nov. Head (a); dorsal view of terminalia (b ♂, d ♀); ventral view of terminalia (c ♂, e ♀); lateral view of ovipositor (f, g); dorsal view of hind tibia and tarsus (h). Scale bar = 1 mm.

Body

Body generally mid brown and beige, with brown mottling covering thoracic nota and abdominal tergites and interrupted by beige patches. Small, well-defined spots generally concentrated on either side of the dorsal median line and at the distal margin of nota and tergites, with larger patches occurring laterally. Patterning mirrored on either side of the dorsal median line and continuing in this manner down the body.

Legs

Legs generally light brown and interspersed with beige patches, with the hind femora also bearing beige striations laterally. Hind tibia with equidistant beige spots dorsally, typically coinciding with pairs of larger dorsal linear spines.

Fore and mid femur without ventral linear spines. Inferior surface of fore and mid tibia armed with two rows bearing an average of three dorsal linear spines each, one prolateral and one retrolateral. Ventral surface of hind femur bearing an average of 56 (min. 45, max. 62) prolateral and 41 (39–44) retrolateral linear spines in males and 9 (7–11) and 10 (9–11), respectively, in females. Dorsal surface of hind tibia with an average of

51 (46–58) prolateral and 48 (43–52) retrolateral linear spines in both sexes. First segment of hind tarsus with an average of 3 (2–5) dorsal linear spines prolaterally and 3 (1–4) retrolaterally. Second tarsal segment bearing an average of 2 dorsal linear spines, 1 (1–2) each prolaterally and retrolaterally.

Male terminalia

Suranal plate predominantly beige and light brown, with dark brown at the lateral margins; plate sparsely clothed with short setae. Distal margin of plate thickly clothed with longer setae and strongly emarginate. Subgenital plate light brown and sparsely clothed with short brown setae; a rounded, poorly pronounced median lobe at the distal margin, longer than lateral lobes.

Female terminalia

Suranal plate beige medianly and mid to dark brown laterally. Proximal margin of plate rounded, distal margin straight to weakly emarginate. Entire surface of plate sparsely covered in short, brown setae and with longer setae densely concentrated at the distal margin. Subgenital plate distorted, but appearing sclerotised and

bearing three beige lobes; lateral lobes rounded, median lobe broad with a triangular apex and longer than lateral lobes. Ovipositor bearing eight weakly produced teeth.

Remarks

The female specimens of *S. aolae* examined here did not exceed 11 mm in body size and have very poorly produced teeth on the dorsal valve of the ovipositor (Figure 4f,g), suggesting they may be subadults. We have nonetheless included the shape of the teeth in our key to the genus as the species is sister to *S. tindalei*, in which this trait is present in adults. We also note the subgenital plate in the female paratype is distorted (Figure 4e); its general shape and degree of sclerotisation can still be gauged, but it is likely the plate is not cross-shaped in fresher material.

Etymology

Dedicated to Dr Aola Richards (1927–2021), who described the majority of the Australian and New Zealand Rhabdophoridae. It is a feminine noun in the genitive case.

Distribution

Limestone caves in the Portland area, VIC, Australia.

Speleotettix binoomea Beasley-Hall, sp. nov.

(Figure 5)

<http://zoobank.org/urn:lsid:act:0F07C512-3B3D-423D-B004-1DC2E7956C17>

Cavernotettix sp. (Eberhard, 2014).

Speleotettix sp. nov. 3 (Beasley-Hall *et al.*, 2025)

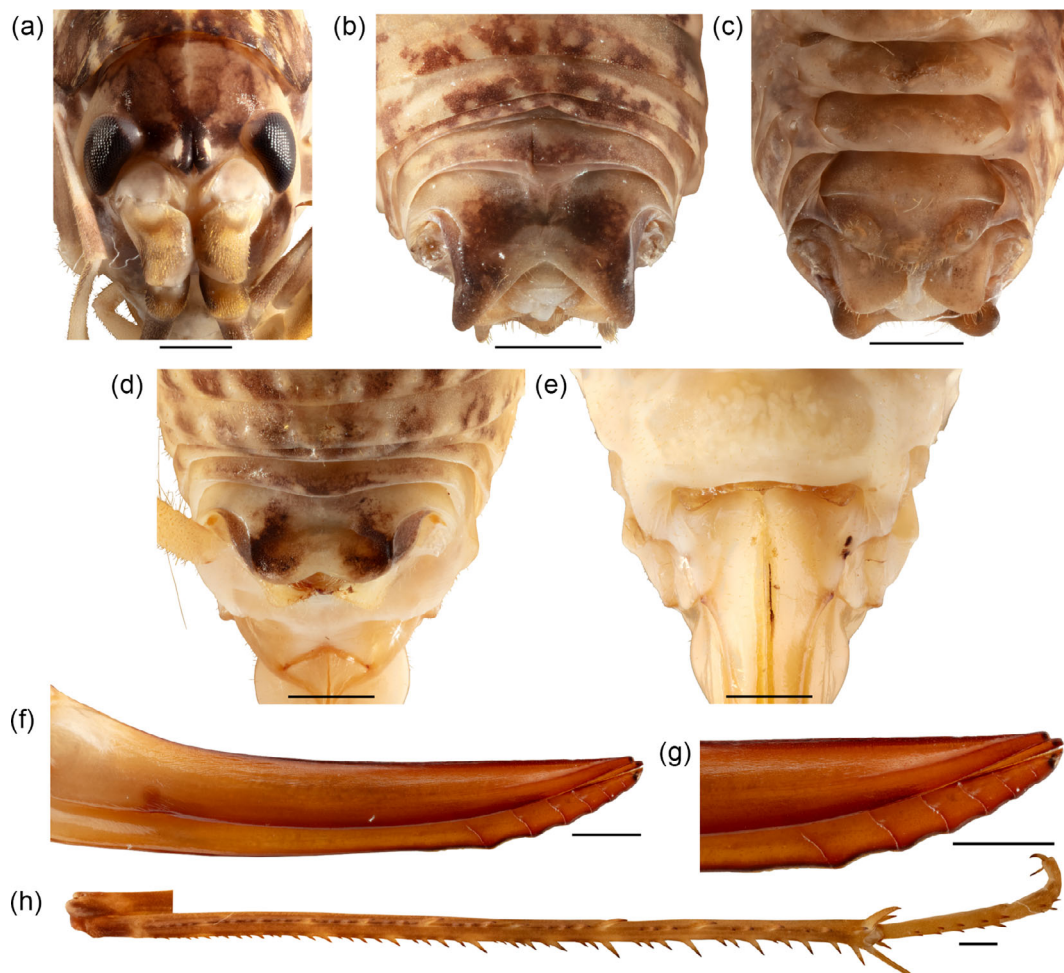


FIGURE 5 *Speleotettix binoomea* Beasley-Hall, sp. nov. Head (a); dorsal view of terminalia (b ♂, d ♀); ventral view of male and female terminalia (c ♂, e ♀); lateral view of ovipositor (f,g); dorsal view of hind tibia (h). Scale bar = 1 mm.

Material examined

Holotype

Adult ♂, entry to Orient Cave, Jenolan Karst Conservation Reserve, NSW, −33.821389, 150.022194, coll. A. Musser and M. Collins, 9 June 2023, AM K.621932.

Paratypes

Adult ♀, Binoomea Cut, Jenolan Karst Conservation Reserve, NSW, −33.821, 150.022, coll. A. Musser, 10 June 2023, AM K.621931. Other material: ♂, same locality and collection information as holotype, AM K.621930. 3 ♀ (AM K.627706, K.627707, K.627710), 2 ♂ (AM K.627708, K.627709), Hennings Cave J76 entrance chamber, Jenolan Karst Conservation Reserve, NSW, −33.798833, 150.017611, coll. H. M. Smith, A. Musser and T. Willmore, 13 June 2023. 1 ♂, Hennings Cave J76 entrance chamber, Jenolan Karst Conservation Reserve, NSW, −33.821694, 150.022194, coll. A. Musser, H. M. Smith and T. Willmore, 13 June 2019, AM K.386399. 1 ♂, entry to Temple of Baal Cave (photograph only), Jenolan Karst Conservation Reserve, NSW, −33.818944, 150.020806, iNaturalist [184652560](https://www.inaturalist.org/observations/184652560). 2 ♀ (AM K.638921, K.638922), 2 ♂ (AM K.638925, K.638926), Junction Cave, Wombeyan Karst Conservation Reserve, NSW, coll. H. M. Smith, A. Musser and T. Willmore, 23–24 March 2024; GenBank no. for AM K.638921 PV461561. 1 ♀ (AM K.638923), 1 ♂ (AM K.638924), Fig Tree Cave, Wombeyan Karst Conservation Reserve, NSW, same collection information as previous; GenBank no. for AM K.638923 PV461562. 1 ♂, 1 ♀, Junction Cave, Wombeyan Karst Conservation Reserve, NSW, coll. F. Stone and T. Matts, 19 February 1997, QM (unregistered material, loan no. ENT22.19). Sex not recorded, Fig Tree Cave, Wombeyan, NSW, coll. A. M. Richards, 2 September 1961, ANIC 14-009132 (molecular data only). Sex not recorded, Abercrombie Caves, NSW, coll. E. Slater, 29 May 1960, ANIC 14-009131 (molecular data only).

Diagnosis

Speleotettix binoomea can be differentiated from other members of *Speleotettix* by its body colour and the female terminalia. The species is generally beige or ochreous, the latter particularly prominent in males from Jenolan but also evident at Wombeyan (Figure 10). The suranal plate is notched at the distal margin and the subgenital plate's lateral lobes are longer than the median lobe. The ovipositor has eight moderately produced teeth on the dorsal margin.

Description

Measurements

Holotype body length 16 mm, hind tibia 25 mm. ♀ paratype 11 mm, hind tibia 21 mm, ovipositor 10 mm.

Head

Delicate, light brown patterning on vertex and frons of head resembling leaf veins, extending below to a more concentrated section of brown spanning the fastigium. Tubercles of fastigium strongly produced.

Body

Median dorsal line on thoracic nota thin and often not extending past metanotum. Body generally mid brown and ochre—the latter more pronounced in males—with brown mottling on thoracic nota and abdominal tergites and interrupted by beige or ochreous patches. Small, well-defined spots generally concentrated on either side of the dorsal median line and at the distal margin of nota and tergites, with larger patches occurring laterally. Patterning mirrored on either side of the dorsal median line and continuing in this manner down the body; in some specimens, mid brown colouration not widespread past thoracic nota, leaving the abdominal tergites largely beige or ochre.

Legs

Legs generally ochreous and interspersed with beige patterning, the hind femora bearing striations laterally. Hind tibia ochreous with equidistant, pale beige spots dorsally, typically coinciding with pairs of larger dorsal linear spines.

Fore and mid femur without ventral linear spines. Ventral surface of fore and mid tibia armed with two rows, bearing an average of three linear spines each, one prolateral and one retrolateral. Hind femur bearing an average of 14 (min. 8, max. 20) prolateral and 9 (6–13) retrolateral ventral linear spines on inferior surface in males and 5 (0–13) and 8 (3–13) in females. Hind tibia with an average of 46 (35–57) prolateral and 37 (29–53) retrolateral dorsal linear spines in both sexes. First segment of hind tarsus with an average of 4 (2–6) dorsal linear spines prolaterally and 2 (0–4) retrolaterally. Second tarsal segment bearing an average of 2 dorsal linear spines, 1 (1–2) each prolaterally and retrolaterally.

Male terminalia

Suranal plate predominantly light to mid brown; glabrous except the distal margin, which is sparsely clothed with short setae; distal margin of plate strongly emarginate. Subgenital plate light brown and sparsely clothed with

short brown setae; a rounded, poorly pronounced median lobe at the distal margin, longer than lateral lobes.

Female terminalia

Suranal plate beige medianly and mid brown laterally. Proximal margin of plate rounded, distal margin emarginate with a median notch. Entire surface of plate sparsely covered in short, brown setae and with longer setae densely concentrated at the distal margin. Subgenital sclerotised at the distal margin and bearing three beige, subtriangular lobes facing distally; median lobe shorter than lateral lobes. Ovipositor bearing eight moderately produced teeth.

Remarks

Speleotettix binooemea is the most morphologically and genetically divergent described species in the genus. It also exhibits variation in body colouration between populations, with males more prominently ochreous at Jenolan compared with Wombeyan (Figure 6). Beasley-



FIGURE 6 *Speleotettix binooemea* Beasley-Hall, sp. nov. in life. The ochreous body colouration is prominent in males at Jenolan and evident to a lesser extent at Wombeyan (see male beneath the female in the mating pair). Images © Anne Musser and Helen Smith.

Hall et al. (2025) also recovered crickets at Abercrombie as members of *S. binooemea*, but no material was available to us from that location for morphological examination.

Etymology

From *binooemea* (pronounced *BIH-noo-mee*), a Gundungurra word meaning “dark places” used to refer to the caves at Jenolan. The Aboriginal people of the Gundungurra Nation are the Traditional Custodians of the land on which the Jenolan Karst Conservation Reserve stands. The species name is an indeclinable noun in apposition.

Distribution

In caves in central and south-east NSW, Australia. Presently known from limestone and marble caves at Jenolan, Abercrombie and Wombeyan Karst Conservation Reserves.

Speleotettix chopardi (Karny, 1935) *nomen dubium*

(Figure 7)

Pachyrhamma chopardi Karny, 1935, pp. 378–383, fig. 43.
Speleotettix chopardi Chopard, 1944, p. 52

Material examined

Holotype

?Juvenile ♂; Dandenong Ranges, VIC; 1935; coll. H. H. Karny 1935; MNHN EO-ENSIF4922. Examined as a digitised specimen via <https://science.mnhn.fr/taxon/species/pachyrhamma/chopardi>.

Remarks

Karny described *P. chopardi* from a single male individual he suspected was a juvenile (Karny 1935). Karny did not provide a precise type locality for the species and did not document exact values for most of the morphological characters he examined. Chopard transferred the species to *Speleotettix* with the establishment of the genus, but it is still considered a member of *Pachyrhamma* in several checklists due to the original description being in French (ABRS 2023; Mesa 1970; Richards 1967).

We have inspected the digitised holotype of *S. chopardi* and can confirm Karny's measurements of the length of the body and leg segments are correct, and his approximate counts of the linear spines on the legs agree

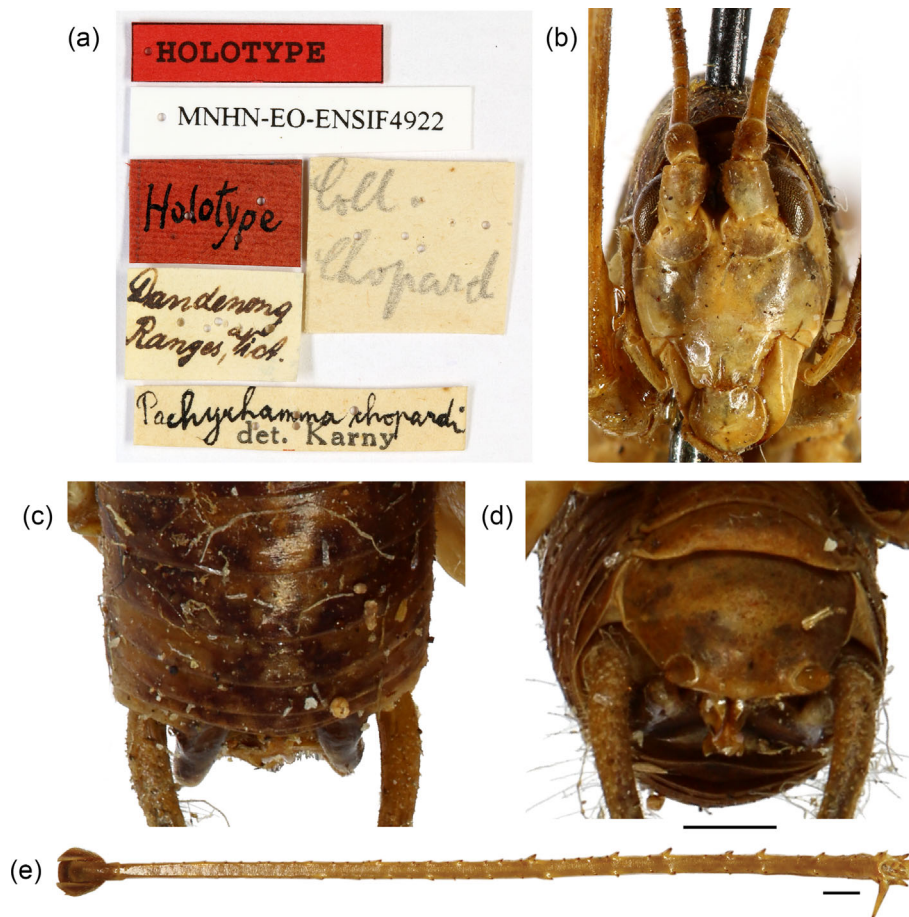


FIGURE 7 *Speleotettix chopardi* (Karny, 1935), holotype male. Specimen label (a); head (b); dorsal and ventral views of male terminalia (c,d); dorsal view of hind tibia (e). Images reproduced under a CC BY-NC-ND 4.0 licence (<https://science.mnhn.fr/taxon/species/pachyrhamma/chopardi>). Scale bar = 1 mm. Images without scale bars lacked them in the original photograph.

with ours. The specimen appears to be a member of *Speleotettix* due to the lack of anterolateral spine on the fore coxae and the shape of the male suranal and subgenital plates. However, the holotype has distorted over time: the male suranal plate is very different to the original illustration by Karny, which depicts a weaker, U-shaped emargination at the distal margin more suggestive of *Cavernotettix* (Karny, 1935). Further, if the specimen is actually a juvenile, these characters may not be helpful in providing a generic identification in the first place. Based on our observations, *Speleotettix* adults are usually 11 mm or longer and Karny's specimen is on the cusp at 11.5 mm. Karny states that the fore coxa of the specimen is unarmed (which would rule out *Cavernotettix*), but as he only examined a single individual, we cannot rule out the character being broken or simply missed. The female is not known.

Karny's lack of information regarding the specimen's collection locality only complicates matters further. The Dandenong Ranges is a 35-km² region of thick rainforest with elevations of up to 600 m and is a cool, mesic habitat typical of Australian Rhabdophoridae. An undescribed species of *Cavernotettix* is found in the Ranges and a new genus, *Eburnocauda* Beasley-Hall and Iannello,

2024, was recently described only 30 km away (Iannello & Beasley-Hall 2024). Mesa (1970) and Richards (1987) referred to further undescribed species richness in the area, but this material was never deposited in a collection for examination. Given the high biodiversity of the region, we cannot rule out the existence of additional, undescribed members of Macropathinae being sympatric with *S. chopardi*. In other words, further sampling effort targeting the Dandenong Ranges may not resolve this problem.

Considering the myriad of issues above, is our view that the quality of the description (and holotype) of *S. chopardi* currently makes its confident identification to the genus or species level an impossibility. In order to avoid future impediment to taxonomic work on the group in Australia, we believe *S. chopardi* represents a *nomen dubium* and a neotype will need to be designated in future.

Distribution

Dandenong Ranges, VIC, Australia. Precise locality unknown.

***Speleotettix craggiensis* (Richards, 1974)
comb. nov.**

(Figure 8)

Cavernotettix craggiensis Richards, 1974, pp. 256–259.

Material examined

Holotype

Adult ♂; under boulders on Craggy Island, Bass Strait, TAS; coll. M. H. Christie, 18 June 1972; ANIC 14-042006.

Paratypes

Adult ♀; under stones on Craggy Island, Bass Strait, TAS; coll. J. S. Whinray, 16 June 1972; TMAG F000260. 1 ♀; same collection and locality information as previous; 19 June 1972; TMAG F000261. Sex not recorded; under stones on Craggy Island, Bass Strait, TAS; coll. M. H. Christie, ANIC 14-008962 (molecular data only).

Diagnosis

Speleotettix craggiensis can be differentiated from other members of *Speleotettix* by the female terminalia. The subgenital plate has distinctive square lateral lobes that are abruptly truncated at the distal margin, but not darkened by sclerotisation relative to the remainder of the plate. The suranal plate has a straight distal margin and the ovipositor has eight moderately produced teeth on the dorsal margin. *Speleotettix craggiensis* is the largest recorded member of *Speleotettix*, with a body size of up to 19 mm in males and 18 mm in females.

Redescription

As in Richards (1974), with exceptions as follows: hind femur bearing an average of 43 (min. 31, max. 59) ventral prolateral and 62 (48–79) retrolateral linear spines on inferior surface in males and 24 (18–35) and 35 (25–48) in females. Hind tibia with an average of 40 (32–47) prolateral and 42 (34–51) retrolateral dorsal linear spines in both sexes. The first segment of hind tarsus with an average of 3 (1–4) dorsal linear spines prolaterally and 4 (2–5) retrolaterally.

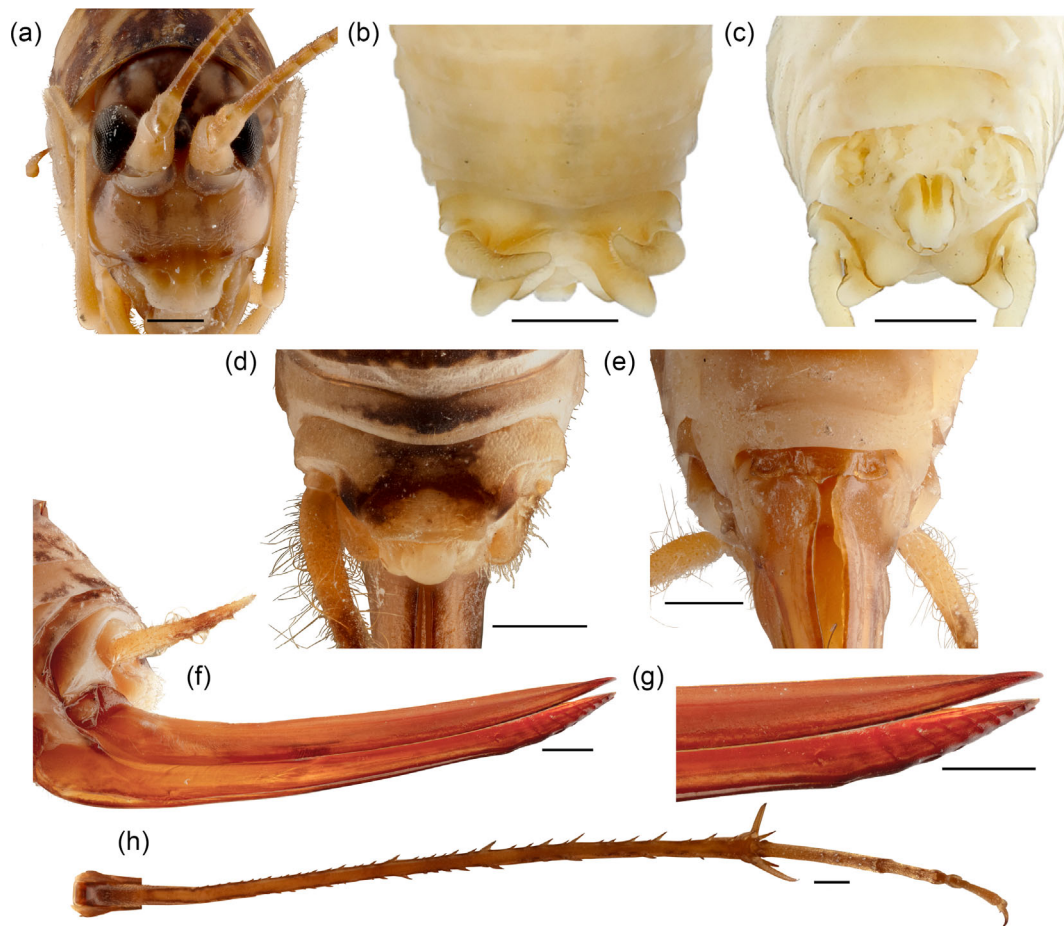


FIGURE 8 *Speleotettix craggiensis* (Richards, 1974) comb. nov. holotype and paratype. Head (a); dorsal view of terminalia (b ♂, d ♀); ventral view of male and female terminalia (c ♂ with subgenital plate removed, e ♀); lateral view of ovipositor (f,g); dorsal view of hind tibia (h). Scale bar = 1 mm. Male holotype (b,c) artificially paler than in life due to the age and preservation of the specimen.

Second tarsal segment bearing an average of 2 dorsal linear spines, 1 (1–3) each prolaterally and retrolaterally.

Remarks

Richards (1974) incorrectly documented linear spine counts for this species in her original description. Macropathines typically bear a greater number of dorsal linear spines on the prolateral surface of the hind leg compared with the retrolateral, but counts in Richards' original description are reversed in this respect. Upon inspecting type material of the species, we confirm this mistake and provide corrections to her original counts above. Values for the left and right side of the body have been averaged and rounded to the nearest whole number.

Speleotettix craggiensis comb. nov. was described within *Cavernotettix* based on presumed affinities with *Cavernotettix wyanbenensis* Richards, 1966 and *Cavernotettix buchansensis* Richards, 1966. However, the species lacks the anterolateral spine on the fore coxae, a trait present in all other *Cavernotettix* and absent in *Speleotettix*. Additional characters shared by *Speleotettix* species include a greater number of teeth on the ventral valve of the ovipositor compared with *Cavernotettix* and prominent lateral lobes on the male suranal plate separated by a deep emargination at the distal margin. The species was recovered within *Speleotettix* in a recent molecular phylogeny by Beasley-Hall et al. (2025) (Figure 1), confirming its generic placement. *Speleotettix craggiensis* comb. nov. is the only member of the genus currently known from TAS. The species is listed as rare under state environmental legislation owing to its extremely limited distribution (Threatened Species Section 2022).

Distribution

Craggy Island, Bass Strait, TAS, Australia. Recorded under boulders and in burrows of breeding seabirds (Richards 1974, 1987).

Speleotettix palaga Beasley-Hall, sp. nov.

(Figure 9)

<http://zoobank.org/urn:lsid:act:34BE5EB6-9E3E-496D-8169-78372DA09AF0>

Speleotettix sp. nov. 2 (Beasley-Hall et al., 2025).

Material examined

Holotype

Adult ♂, unnamed mining tunnel in Wombat-Lerderderg National Park near Blackwood, VIC, –37.480278, 144.330222, coll. S. Iannello, 16 December 2023, ANIC 14-009162.

Paratypes

2 ♀, 2 ♂ (all subadult), same locality and collection information as holotype, ANIC 14-009163–14-009166.

Other material

2♀, 1 ♂, Imperial Mine, Jack Cann Reserve in Wombat State Forest, VIC, –37.478694, 144.290833, coll. S. Iannello, 16 December 2023, ANIC 14-009167–14-009169. 1 ♀, unnamed mining tunnel in Blackwood, VIC (photograph only), –37.478444, 144.290972, iNaturalist 27853615. 1 ♀, Bullarto, VIC (photograph only), –37.404722, 144.218111, iNaturalist 213067284. 1 ♀, Lerderderg area, VIC (photograph only), –37.492278, 144.436389, iNaturalist 125136101. 1 ♂, Blighs Road near Lyonville, VIC (photograph only), –37.386056, 144.288472, iNaturalist 173174834. 1 ♂, Domino Road near Lyonville, VIC (photograph only), –37.397667, 144.278028, iNaturalist 204638088.

Diagnosis

Speleotettix palaga can be differentiated from other members of *Speleotettix* by its body colouration and the female terminalia. Adults often have a row of prominent tubercles on the distal margin of each of the thoracic nota and abdominal tergites (Figure 10, bottom image). The lateral lobes of the subgenital plate are subrectangular with rounded corners and a mid brown, distinct from the remainder of the plate. The ovipositor has six moderately produced teeth on the dorsal margin.

Description

Measurements

Holotype body length 16 mm, hind tibia 22 mm. ♀ paratype 13 mm, hind tibia 18 mm, ovipositor 10 mm.

Head

Mid brown banding on vertex and frons of head forming a bold M shape, extending to a horizontal band spanning fastigium.

Body

Body varying from predominantly mid brown to beige, with brown mottling covering thoracic nota and abdominal tergites and interrupted by beige patches. Small, well-defined spots generally concentrated on either side of the dorsal median line and at the distal margin of nota and tergites, with larger patches occurring laterally. Patterning mirrored on either side of the dorsal median line and continuing in this manner down the body. Abdomen often with a row of prominent beige tubercles at distal margins of tergites, appearing similar to raindrops clinging to the body.

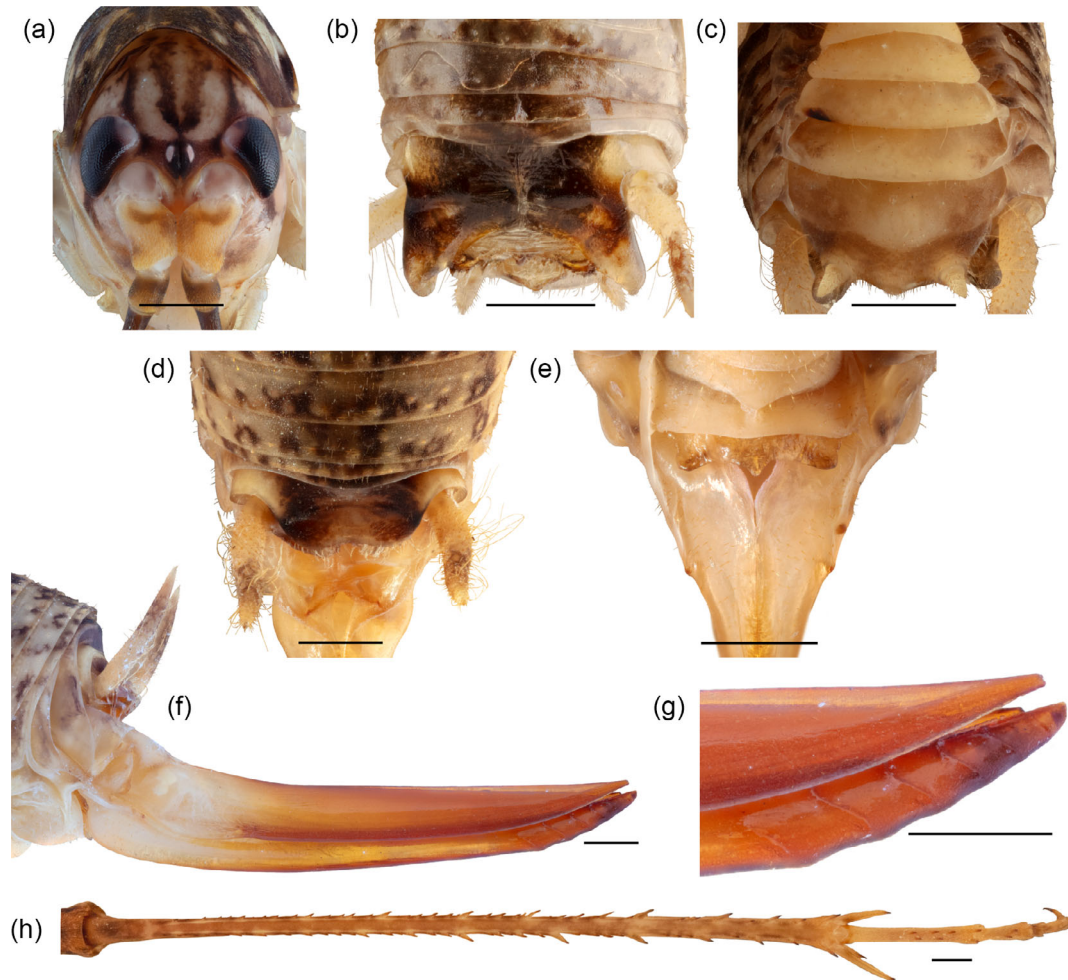


FIGURE 9 *Speleotettix palaga* Beasley-Hall, sp. nov. head (a); dorsal view of terminalia (b ♂, d ♀); ventral view of male and female terminalia (c ♂, e ♀); lateral view of ovipositor (f,g); dorsal view of hind tibia and tarsus (h). Scale bar = 1 mm.

Legs

Legs generally light brown and interspersed with beige patches, with hind femora also bearing beige striations laterally. Hind tibia with equidistant, pale beige spots dorsally, typically coinciding with pairs of larger dorsal linear spines.

Fore and mid femur without ventral linear spines. Ventral surface of fore and mid tibia armed with two rows, bearing an average of three linear spines each, one prolateral and one retrolateral. Ventral surface of hind femur bearing an average of 32 (min. 18, max. 60) prolateral and 29 (11–49) retrolateral linear spines in males and 16 (0–38) and 18 (8–34) in females. Hind tibia with an average of 40 prolateral and 37 retrolateral dorsal linear spines in both sexes. First segment of hind tarsus with an average of 3 (2–4) dorsal linear spines prolaterally and 3 (2–5) retrolaterally. Second tarsal segment bearing an average of 2 dorsal linear spines, 1 (1–2) prolaterally and 1 (no variation) retrolaterally.

Male terminalia

Suranal plate predominantly mid brown and glabrous except the distal margin, which is sparsely clothed with short setae; distal margin of plate strongly emarginate.

Subgenital plate light brown and sparsely clothed with short brown setae; a rounded, poorly pronounced median lobe at the distal margin, longer than lateral lobes.

Female terminalia

Suranal plate ranging from uniformly dark brown to dark brown patterning restricted to lateral regions only. Proximal margin of plate rounded, distal margin emarginate. Entire surface of plate sparsely covered in short, brown setae and with longer setae densely concentrated at the distal margin. Subgenital plate sclerotised at the distal margin; thickening of cuticle particularly pronounced at the lateral lobes, which are mid to dark brown and sub-rectangular; median lobe very well pronounced with a triangular apex and longer than lateral lobes. Ovipositor bearing six moderately produced teeth.

Etymology

From the Latin *palaga*, meaning gold ingot, in reference to the disused gold mines of the Blackwood area in which the species is found. It is a feminine noun used in apposition.



FIGURE 10 *Speleotettix palaga* Beasley-Hall, in life, with distinct raindrop-like tubercles at the distal margins of tergites (bottom image). Images © Paul George and user Mononymous via iNaturalist (observations 27853615, 204638088), reproduced under Creative Commons licences.

Distribution

Known from mining tunnels in the Blackwood area near and within Wombat–Lerderderg State Park, VIC, Australia.

Speleotettix tindalei Chopard, 1944

Speleotettix tindalei Chopard, 1944, pp. 53–54. (Figure 11)

Material examined

Cotypes

1 ♂, 1 ♀; cave section 272, Hindmarsh S. E. [Tantanoola Caves], SA; coll. N. B. Tindale [n.d.]; MNHN EO-ENSIF4918 and EO-ENSIF4919. Examined as digitised specimens via <https://science.mnhn.fr/taxon/species/speleotettix/tindalei>.

Other material

3 ♀, 1 ♂; toilet block at Tantanoola Caves Conservation Park, SA; collection date unknown, provided to the authors on 19 March 2023, ANIC 14-009172–14-009175. 1 ♀, 3 ♂; on road at Donovans, SA near VIC border;

–38.015194, 140.958278; coll. S. Bourne, 1 May 2016. 1 ♀; ‘Fox Hole’ Cave near Monbulla, SA; –37.419556, 140.677111; coll. P. Beasley-Hall and A. D. Austin, 21 May 2016. 4 ♀, 2 ♂; Tantanoola Caves Conservation Park; iNaturalist 202122890, 184652288, 148238575, 127656272, 112495949, 133543241 (photographs). 1 ♂; unnamed cave on private property near Mount Schank; –37.924138, 140.676520; iNaturalist 221982389 (photograph). ♂; Moerlong area, approx. 9 km SSE from ‘Fox Hole’ Cave; –37.490974, 140.736310; iNaturalist 185713623 (photograph).

Diagnosis

The female subgenital plate of *S. tindalei* resembles that of *S. palaga* in that the lateral lobes are strongly sclerotised and darkened in both species, but in *tindalei* the lobes are not pronounced and are darkened at the distal margin only. In *S. palaga*, the dark brown colouration extends to the median surface of the lobes, which are rounded and jut out from the surrounding plate. The ovipositor has eight weakly produced teeth on the dorsal margin. While the trait exhibits considerable variation within species, it is also noteworthy that *S. tindalei* has comparatively modest counts of ventral linear spines of the hind femur: we have not observed more than 36 spines on the prolateral or retrolateral surfaces. In other members of *Speleotettix*, these counts may reach 60 (e.g., in *S. aolae* and *palaga*). These counts are lower only in *S. binomea* (20 or fewer).

Redescription

Measurements

Body length up to 16 mm, hind tibia up to 29.5 mm; ovipositor up to 13 mm.

Head

Mid brown banding on vertex and frons of head forming a rough M shape, extending to a horizontal band spanning fastigium.

Body

Body generally mid brown and beige, with brown mottling covering thoracic nota and abdominal tergites and interrupted by beige patches. Small, well-defined spots generally concentrated on either side of the dorsal median line and occasionally at the distal margin of nota and tergites, with larger patches occurring laterally. Patterning mirrored on either side of the dorsal median line and continuing in this manner down the body.

Legs

Legs generally light brown and interspersed with beige patches, with the hind femora also bearing beige

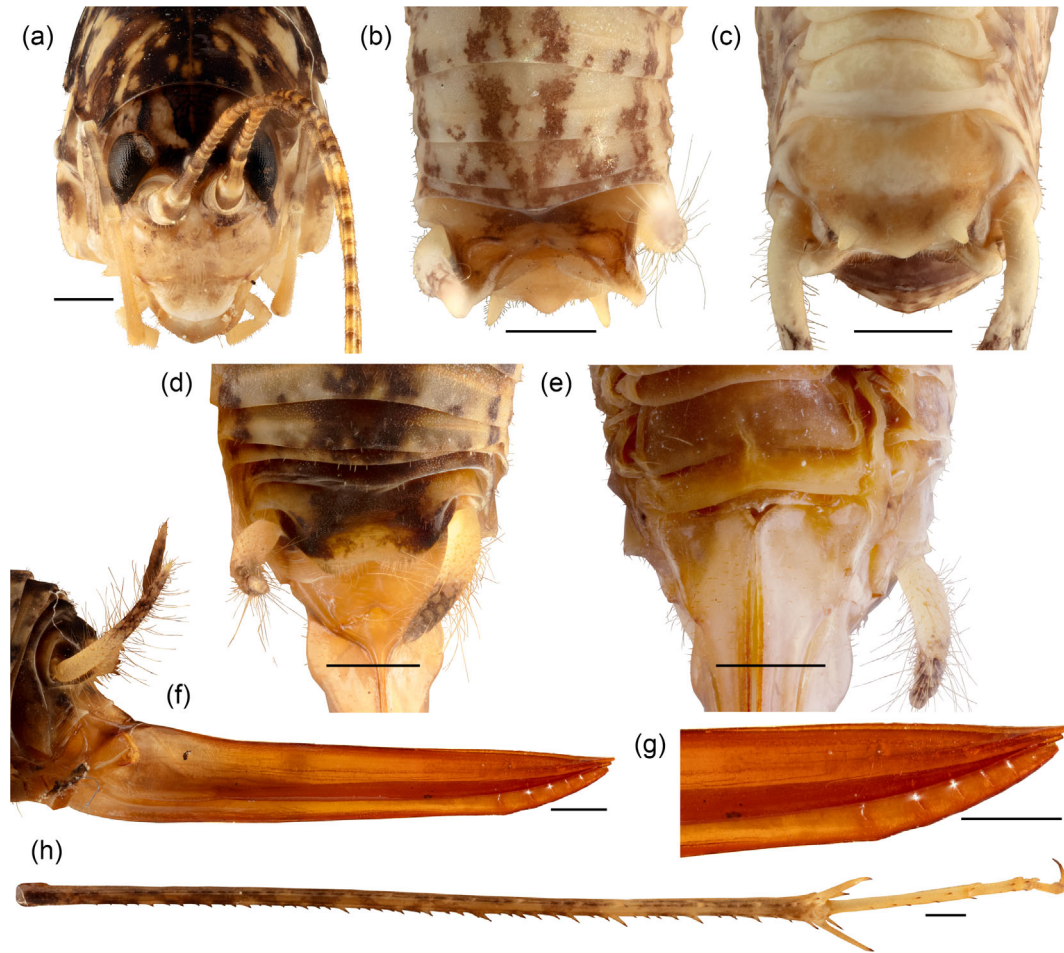


FIGURE 11 *Speleotettix tindalei* Chopard, 1944. Head (a); dorsal view of terminalia (b ♂, d ♀); ventral view of male and female terminalia (c ♂, e ♀); lateral view of ovipositor (f,g); distal view of hind tibia (h). Scale bar = 1 mm.

striations laterally. Hind tibia with equidistant, pale beige spots dorsally, typically coinciding with pairs of larger dorsal linear spines.

Ventral surface of fore and mid tibia armed with two rows, bearing an average of three linear spines each, one prolateral and one retrolateral. Ventral surface of hind femur bearing an average of 21 (10–36) prolateral and 17 (9–28) retrolateral linear spines in males and 27 (19–36) and 23 (17–28) in females. Hind tibia with an average of 52 (45–59) prolateral and 48 (41–57) retrolateral dorsal linear spines in both sexes. First segment of hind tarsus with an average of 4 (2–6) dorsal linear spines prolaterally and 3 (2–4) retrolaterally. Second tarsal segment bearing an average of 2 dorsal linear spines, 1 (0–2) prolaterally and 1 (no variation) retrolaterally, averages in agreement with Chopard's counts.

Male terminalia

Suranal plate predominantly light brown; glabrous except the distal margin, which is sparsely clothed with short setae; distal margin of plate strongly emarginate. Subgenital plate light brown and sparsely clothed with short

brown setae; a rounded, poorly pronounced median lobe at the distal margin, longer than lateral lobes.

Female terminalia

Suranal plate beige medianly and mid to dark brown laterally. Proximal margin of plate rounded, distal margin weakly emarginate. Entire surface of plate very sparsely covered in short, pale setae and with longer setae densely concentrated distolaterally. Subgenital plate sclerotised with lateral lobes truncate, thick and darkened at the distal margin; median lobe well pronounced, longer than lateral lobes and ending at a pointed apex; together, the three lobes resemble a curly bracket.

Remarks

Speleotettix tindalei was described by Chopard in 1944 and is the type species of the genus. While it is clearly nested within *Speleotettix* based on molecular (Beasley-Hall et al. 2025) and morphological data presented here, Chopard did not provide precise numbers of spines on

segments of the hind legs to facilitate generic identification and instead detailed approximate values. Chopard's description of the terminalia is also vague and limited to the male suranal and female subgenital plates.

Counts of spines from fresh specimens collected from the species' type locality broadly agree with those provided by Chopard (e.g., the dorsal surface of the hind tibia bearing 41–59 linear spines on either side compared with Chopard's 'around 50'). However, we count eight teeth on the ventral surface of the ovipositor after examining fresh specimens and digitised type material, whereas Chopard recorded six. This is likely due to the most proximal and distal teeth not being preceded by a ridge on the median surface, making them difficult to see.

We note that Chopard named the type locality of the species as "Hindmarsh S.E." referring to the Hundred of Hindmarsh, an administrative division overlapping with Tantanoola Caves Conservation Park. Hindmarsh is also a suburb in metropolitan Adelaide, almost 400 km north-west of this locality. This seems to have confused Richards, who alluded to a disjunct but unnamed population of *Speleotettix* (presumably *S. tindalei*) in the Adelaide region in addition to this Limestone Coast population. To our knowledge, no Rhabdiphoridae have been documented between the Limestone Coast and Nullarbor Plain in SA, and we consider this an error on Richards' part.

Distribution

Caves in the Limestone Coast of SA (Tantanoola, Naracoorte, and near Monbulla) and, according to Mesa (1970), across the nearby Victorian border at Princess Margaret Rose Cave.

DISCUSSION

The increase in the number of *Speleotettix* species described here represents a significant expansion of the geographic range of the genus, previously only known from two discrete locations ~450 km apart in the south-east of SA and near the Melbourne metropolitan area of VIC (Figure 1). The new species can be delimited using a combination of characters relevant to body colouration, the suranal and subgenital plates, and the ovipositor. However, because considerable intraspecific variability is observed in species of Macropathinae (Richards 1958, 1971), we chose to supplement our descriptions with molecular evidence generated here and in a recent phylogeny (Beasley-Hall et al. 2025) (Figure 1). In our previous phylogenetic study, we sampled a subset of the specimens examined here (with the exception of *S. chopardi*, see Taxonomy section) and recovered *Speleotettix* as reciprocally monophyletic with its sister genus, *Cavernotettix* (Figure 1). *Cavernotettix craggiensis* from the Bass Strait of TAS was also recovered within *Speleotettix* with

high node support, in agreement with its morphological similarity with other members of the genus. Our species descriptions are also supported by several distance and tree-based delimitation methods summarised in Figure 3. All species for which *COI* data were available were separated by at least 4.4% pairwise genetic divergence (Figure 3, Table S1), in agreement with a putative barcode gap in other Rhabdiphoridae (>2.5%) (Allegrucci et al. 2021; Zhao et al. 2022) and the Orthoptera more broadly (>3%) (Huang et al. 2013; Timm et al. 2022; Zhou et al. 2019).

An additional finding from the phylogeny by Beasley-Hall et al. (2025) is the suggestion of an additional undescribed species found at Wee Jasper Caves in NSW. This lineage was recovered as sister to *S. binoomea* in that study, a split supported here by formal delimitation analyses (Figures 1 and 3). However, we do not have adult material of this species available for examination to facilitate a description. Specimens from Wee Jasper were deposited by Richards as additional "types" of *Speleotettix profundus* alongside the Jenolan, Wombeyan, and Abercrombie populations examined here (Figures 1 and 6). Richards also deposited material from caves in Bungonia approximately 50 km south of Wombeyan under the same tag name, which may represent an additional population of *S. binoomea*. Ultimately, in the present study we have resolved the genus and species-level status of *Speleotettix profundus*, which until now had remained enigmatic for over 60 years.

Despite the increased known distribution of the genus, we note most species of *Speleotettix* can be classified as short-range endemics under criteria set out by Harvey (2002), defined as naturally inhabiting a range of <10 000 km². Short-range endemics are particularly vulnerable to extinction and may require conservation listing to ensure their protection in the long term. At present the only protected species in the genus is *S. craggiensis*, known exclusively from under boulders and the burrows of breeding seabirds on Craggy Island, a small rocky island about 20 km from the tip of Flinders Island in the Bass Strait (Richards 1974). The species is listed as rare under the *Tasmanian Threatened Species Protection Act 1995* and has no conservation management plan in place. Threats to all *Speleotettix* species, not just *craggiensis*, include clearing of native forest, predation by invasives, and human disturbance via tourism. Conservation listing is also necessary for these remaining species because they may have narrower habitat or temperature tolerances compared with epigeal relatives, and therefore a greater vulnerability to anthropogenic disturbance and climate change (Mammola et al. 2019).

ACKNOWLEDGEMENTS

We would like to give a hearty thank you to Sil Iannello (Australian Speleological Federation), Helen Smith (AM) and Anne Musser and Michael Collins (Jenolan Caves Reserve Trust) for collecting and transporting specimens.

Thank you also to Andreas Zwick and You Ning Su (ANIC), Derek Smith (AM), and Karin Koch (QM) for facilitating loans of museum material. We are grateful to Gundun-gurra Elder Auntie Sharyn Halls, who approved the use of the *S. binooemea* species name, and Andrew Le Lievre (Jenolan Caves Reserve Trust) for liaising with Auntie Sharyn. Finally, a big cheers to Mark Harvey (Western Australian Museum) for providing helpful advice regarding the International Code on Zoological Nomenclature. Open access publishing facilitated by The University of Adelaide, as part of the Wiley - The University of Adelaide agreement via the Council of Australian University Librarians.

CONFLICT OF INTEREST STATEMENT

The authors have no conflict of interest to disclose.

DATA AVAILABILITY STATEMENT

Newly generated COI data from the Wombeyan population of *Speleotettix binooemea* are available via the GenBank repository and accessions are listed under Material Examined for that species. Specimens were collected under the following permits: AA-0001076 via Parks Victoria and FS/14-3694/1_2024 via the Victorian Department of Energy, Environment and Climate Action, both held by PGBH (Victoria); Y27154-2 via the South Australian Department for Environment and Water, held by ER (South Australia); and SL102683 via the New South Wales Department of Planning and Environment, held by the Australian Museum (New South Wales).

ORCID

Perry G. Beasley-Hall  <https://orcid.org/0000-0002-7360-7933>

REFERENCES

- ABRS. (2023). Species *Pachyrhamma chopardi* Karny, 1935. Australian Faunal Directory. Available from: <http://biodiversity.org.au/afd/publication/8524b8f3-eeb-464f-a97b-6bd91a943983> [Accessed 21 June 2023].
- Allegretti, G., Rampini, M., Chimenti, C., Alexiou, S. & Di Russo, C. (2021) Dolichopoda cave crickets from Peloponnese (Orthoptera, Rhabdiphoridae): molecular and morphological investigations reveal four new species for Greece. *The European Zoological Journal*, 88(1), 505–524. Available from: <https://doi.org/10.1080/24750263.2021.1902005>
- Beasley-Hall, P.G., Tierney, S.M., Weinstein, P. & Austin, A.D. (2018) A revised phylogeny of macropathine cave crickets (Orthoptera: Rhabdiphoridae) uncovers a paraphyletic Australian fauna. *Molecular Phylogenetics and Evolution*, 126, 153–161. Available from: <https://doi.org/10.1016/j.ympev.2018.04.024>
- Beasley-Hall, P.G., Trewick, S.A., Eberhard, S.M., Zwick, A., Reed, H., Cooper, J.B., et al. (2025) Molecular phylogenetics illuminates evolutionary history and hidden diversity of Australian cave crickets (Orthoptera: Rhabdiphoridae). *bioRxiv*, Available from: <https://doi.org/10.1101/2024.08.11.607522>
- De Queiroz, K. (2007) Species concepts and species delimitation. *Systematic Biology*, 56(6), 879–886. Available from: <https://doi.org/10.1080/10635150701701083>
- Dubois, A. (2003) The relationships between taxonomy and conservation biology in the century of extinctions. *Comptes Rendus Biologies*, 326(S1), 9–21. Available from: [https://doi.org/10.1016/S1631-0691\(03\)00022-2](https://doi.org/10.1016/S1631-0691(03)00022-2)
- Edgar, R.C. (2004) MUSCLE: a multiple sequence alignment method with reduced time and space complexity. *BMC Bioinformatics*, 5(1), 113. Available from: <https://doi.org/10.1186/1471-2105-5-113>
- Fitness, J., Morgan-Richards, M., Ball, O.-P., Godfrey, A. & Trewick, S. (2015) Improved resolution of cave weta diversity (Orthoptera: Rhabdiphoridae): ecological implications for Te Pahi, far north, New Zealand. *New Zealand Journal of Zoology*, 42(1), 1–16. Available from: <https://doi.org/10.1080/03014223.2014.983939>
- Fitness, J., Morgan-Richards, M., Hegg, D. & Trewick, S.A. (2018) Reinstatement of the New Zealand cave wētā genus *Miotopus* Hutton (Orthoptera: Rhabdiphoridae) and description of a new species. *European Journal of Taxonomy*, (468), Available from: <https://doi.org/10.5852/ejt.2018.468>
- Folmer, O., Black, M., Hoeh, W., Lutz, R. & Vrijenhoek, R. (1994) DNA primers for amplification of mitochondrial cytochrome c oxidase subunit I from diverse metazoan invertebrates. *Molecular Marine Biology and Biotechnology*, 3(5), 294–299.
- Harvey, M.S. (2002) Short-range endemism amongst the Australian fauna: some examples from non-marine environments. *Invertebrate Systematics*, 16(4), 555–570. Available from: <https://doi.org/10.1071/IS02009>
- Hegg, D., Morgan-Richards, M. & Trewick, S.A. (2019) Diversity and distribution of Pleioplectron Hutton cave wētā (Orthoptera: Rhabdiphoridae: Macropathinae), with the synonymy of Weta Chopard and the description of seven new species. *European Journal of Taxonomy*, (577), Available from: <https://doi.org/10.5852/ejt.2019.577>
- Hegg, D., Morgan-Richards, M. & Trewick, S.A. (2022) High alpine sorcerers: revision of the cave wētā genus *Pharmacus* Pictet & de Saussure (Orthoptera: Rhabdiphoridae: Macropathinae), with the description of six new species and three new subspecies. *European Journal of Taxonomy*, 808, 1–58. Available from: <https://doi.org/10.5852/ejt.2022.808.1721>
- Hoang, D.T., Chernomor, O., von Haeseler, A., Minh, B.Q. & Vinh, L.S. (2018) UFBoot2: improving the ultrafast bootstrap approximation. *Molecular Biology and Evolution*, 35(2), 518–522. Available from: <https://doi.org/10.1093/molbev/msx281>
- Huang, J., Zhang, A., Mao, S. & Huang, Y. (2013) DNA barcoding and species boundary delimitation of selected species of Chinese Acridoidea (Orthoptera: Caelifera). *PLoS ONE*, 8(12), e82400. Available from: <https://doi.org/10.1371/journal.pone.0082400>
- Iannello, S. & Beasley-Hall, P.G. (2024) Systematics and biology of *Eburnocauda* gen. nov., a cave cricket from Australian granite pseudokarst (Orthoptera: Rhabdiphoridae). *Taxonomy Australia*, 73, 1–9.
- IUCN Standards and Petitions Committee. (2024). Guidelines for using the IUCN Red List Categories and Criteria. No. Version 16. Prepared by the Standards and Petitions Committee.
- Jiao, Z., Niu, C., Liu, X., Lei, C. & Bi, W. (2008) Descriptions of Chinese species of the subgenus *Diestramma* (*Gymnaeta*) *Adelung* (Orthoptera: Rhabdiphoridae). *Zootaxa*, 1917(1), 55–60. Available from: <https://doi.org/10.11646/zootaxa.1917.1.4>
- Johns, P.M. & Cook, L.D. (2013) *Maotoweta virescens* new genus and new species; hidden in a moss forest (Orthoptera: Rhabdiphoridae). *Records of the Canterbury Museum*, 27, 11–17.
- Kalyaanamoorthy, S., Minh, B.Q., Wong, T.K.F., von Haeseler, A. & Jermini, L.S. (2017) ModelFinder: fast model selection for accurate phylogenetic estimates. *Nature Methods*, 14(6), 587–589. Available from: <https://doi.org/10.1038/nmeth.4285>
- Karny, H.H. (1935) Die Gryllacrididen des Pariser Museums und der Collection L. Chopard: Zweiter Teil. *Eos, Revista española de Entomología*, 10, 293–393.

- Lavoie, K. & Poulson, T. (2007) The biology and ecology of North American cave crickets. *Journal of Cave and Karst Studies*, 69, 114–134.
- Luo, A., Ling, C., Ho, S. Y. W. & Zhu, C.-D. (2018) Comparison of methods for molecular species delimitation across a range of speciation scenarios. *Systematic Biology*, 67(5), 830–846.
- Mammola, S., Cardoso, P., Culver, D.C., Deharveng, L., Ferreira, R.L., Fišer, C., et al. (2019) Scientists' warning on the conservation of subterranean ecosystems. *Bioscience*, 69(8), 641–650. Available from: <https://doi.org/10.1093/biosci/biz064>
- Masters, B.C., Fan, V. & Ross, H.A. (2011) Species delimitation—a generous plugin for the exploration of species boundaries. *Molecular Ecology Resources*, 11, 154–157.
- Mesa A (1970). Cytogenetic and evolutionary studies on Macropathinae (Gryllacridoidea: Orthoptera). Thesis. University of Melbourne.
- Murphy, H. & van Leeuwen, S. (2021) Biodiversity: flora and fauna. In: *Australia state of the environment 2021*. Canberra, Australia: Australian Government Department of Agriculture, Water and the Environment.
- Puillandre, N., Brouillet, S. & Achaz, G. (2021) ASAP: assemble species by automatic partitioning. *Molecular Ecology Resources*, 21(2), 609–620. Available from: <https://doi.org/10.1111/1755-0998.13281>
- Qin, Y., Liu, X. & Li, K. (2016) Review of the cave cricket genus *Tamdaotettix* Gorochov with a new species and some new descriptions (Orthoptera: Rhaphidophoridae, Aemodogryllinae). *Zootaxa*, 4154(3), 339–345. Available from: <https://doi.org/10.11646/zootaxa.4154.3.9>
- Richards, A.M. (1958) Revision of the Rhaphidophoridae (Orthoptera) of New Zealand part I—the Rhaphidophoridae of the Chatham Islands 1954 expedition. *Transactions of the Royal Society of New Zealand*, 85, 263–274.
- Richards, A.M. (1964a) The Rhaphidophoridae (Orthoptera) of Australia, 1: Tasmania. *Pacific Insects*, 6, 217–223.
- Richards, A.M. (1964b) The Rhaphidophoridae (Orthoptera) of Australia. Part 2. A new genus. *Proceedings of the Linnean Society of New South Wales*, 89, 373–379.
- Richards, A.M. (1966) The Rhaphidophoridae (Orthoptera) of Australia. 4. A new genus from South Australia. *Proceedings of the Linnean Society of New South Wales*, 91, 109–113.
- Richards, A.M. (1967) The Rhaphidophoridae (Orthoptera) of Australia. Part 5. The Rhaphidophoridae of Flinders Island. *Proceedings of the Linnean Society of New South Wales*, 92, 151–156.
- Richards, A.M. (1971) The Rhaphidophoridae (Orthoptera) of Australia. Part 10. A new genus from southeastern Tasmania with New Zealand affinities. *Pacific Insects*, 13, 589–595.
- Richards, A.M. (1974) The Rhaphidophoridae (Orthoptera) of Australia. Part 11. New species from the Bass Strait Islands and Tasmania. *Pacific Insects*, 16, 245–260.
- Richards, A.M. (1987) Distribution and relationships of the Australian Rhaphidophoridae (Orthoptera): pointers to past climatic changes. In: *Evolutionary biology of orthopteroid insects*. Elsevier, pp. 438–449.
- Rosenberg, N.A. (2007) Statistical tests for taxonomic distinctiveness from observations of monophyly. *Evolution*, 61(2), 317–323. Available from: <https://doi.org/10.1111/j.1558-5646.2007.00023.x>
- Threatened Species Section. (2022). Craggy Island cave cricket (*Cavernotettix craggiensis*): species management profile for Tasmania's threatened species link.
- Timm, V.F., Goncalves, L.T., Valente, V.L.D.S. & Depra, M. (2022) The efficiency of the COI gene as a DNA barcode and an overview of Orthoptera (Caelifera and Ensifera) sequences in the BOLD system. *Canadian Journal of Zoology*, 100(11), 710–719. Available from: <https://doi.org/10.1139/cjz-2022-0041>
- Trewick, S.A. (1999) A new weta from the Chatham Islands (Orthoptera: Rhaphidophoridae). *Journal of the Royal Society of New Zealand*, 29(2), 165–173. Available from: <https://doi.org/10.1080/03014223.1999.9517590>
- Vogel Ely, C., Bordignon, S.A.d.L., Trevisan, R. & Boldrini, I.I. (2017) Implications of poor taxonomy in conservation. *Journal for Nature Conservation*, 36, 10–13. Available from: <https://doi.org/10.1016/j.jnc.2017.01.003>
- Zhang, J., Kapli, P., Pavlidis, P. & Stamatakis, A. (2013) A general species delimitation method with applications to phylogenetic placements. *Bioinformatics*, 29(22), 2869–2876. Available from: <https://doi.org/10.1093/bioinformatics/btt499>
- Zhao, Y., Wang, H., Huang, H. & Zhou, Z. (2022) A DNA barcode library for katydid, cave crickets, and leaf-rolling crickets (Tettigoniidae, Rhaphidophoridae and Gryllacrididae) from Zhejiang Province, China. *ZooKeys*, 1123, 147–171. Available from: <https://doi.org/10.3897/zookeys.1123.86704>
- Zhou, X. & Yang, W. (2022) Ten new species of genus *Tachycines* (Orthoptera, Rhaphidophoridae, Aemodogryllinae) from karst caves in Guizhou, China. *ZooKeys*, 1109, 115–140. Available from: <https://doi.org/10.3897/zookeys.1109.73937>
- Zhou, Z., Guo, H., Han, L., Chai, J., Che, X. & Shi, F. (2019) Singleton molecular species delimitation based on COI-5P barcode sequences revealed high cryptic/undescribed diversity for Chinese katydids (Orthoptera: Tettigoniidae). *BMC Evolutionary Biology*, 19(1), 79. Available from: <https://doi.org/10.1186/s12862-019-1404-5>

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Beasley-Hall, P.G., Trewick, S.A., Hedges, B.A., Cooper, S.J.B., Reed, E.H. & Austin, A.D. (2025) Integrative taxonomic revision of the Australian cave cricket *Speleotettix* Chopard, 1944 (Orthoptera: Rhaphidophoridae): New species, distribution and conservation implications. *Austral Entomology*, 64(3), e70011. Available from: <https://doi.org/10.1111/aen.70011>