

# Revision of the Australian genus *Alfredella* Masner & Huggert (Hymenoptera, Platygastridae, Sceliotrachelinae)

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## Abstract

The genus *Alfredella* Masner & Huggert is revised. *Alfredella tasmanica* Masner & Huggert is redescribed, *Al. teres* (Buhl), **comb. nov.** is transferred to *Alfredella* from *Amitus* Haldeman, and *Al. auriel* Lahey, **sp. nov.** (New South Wales, Tasmania) and *Al. mephisto* Lahey, **sp. nov.** (Western Australia) are described as new. The genus *Masnerium* Polaszek, **syn. nov.** is treated as a junior synonym of *Amitus*, and its type species, *M. wellsae* Polaszek, is transferred to *Amitus* as *Am. wellsae* (Polaszek), **comb. nov.** The relationship between *Alfredella* and morphologically similar genera is discussed, and a key is provided to distinguish between *Aleyroctonus* Masner & Huggert, *Alfredella*, and *Amitus*.

## Keywords

*Aleyroctonus*, *Amitus*, endemic, Platygastroidea, Tasmania, taxonomy

## Introduction

The subfamily Sceliotrachelinae contains a diverse assemblage of genera, most of which contain a small number of described species. Sceliotracheline wasps are minute in size, infrequently collected, and are most diverse in regions where they have been studied

the least. Masner and Huggert (1989) made a significant contribution to the study of these wasps in their seminal treatise of the subfamily and described 13 new monotypic genera, most of which are known only from the Southern Hemisphere. In particular, the landmasses that Australasia comprises (Australia, Melanesia, New Zealand, and Tasmania) are major centers of platygastroid diversity (Masner and Huggert 1989). Nineteen of the 28 described genera of Sceliotrachelinae are found throughout this region, eight of which are endemic to either Australia or New Zealand.

This research is conducted as part of an effort to revise the fauna of Sceliotrachelinae, with priority given to monotypic genera (Talamas and Masner 2016; Lahey et al. 2019b, c). Our purpose is to revise the species-level taxonomy of *Alfredella* Masner & Huggert, update its generic concept, and compare the genus to putative closely related taxa. Masner and Huggert (1989) considered *Amitus* Haldeman to be the sister taxon to *Alfredella*, a relationship corroborated by a recent phylogenomic analysis of Platygastroidea based on ultraconserved elements (Blaimer et al., unpublished data). Both genera are extremely similar morphologically, and we compared specimens of the two genera to ensure the validity of *Alfredella* when developing the generic key. During this process, *Amitus* specimens from around the world were examined, along with new material of the monotypic *Masnerium* Polaszek.

The contributions of the authors are as follows: Z. Lahey: character definition and coding, generic concept development, key development, manuscript preparation, species concept development; E. Talamas: character definition, imaging, manuscript preparation; L. Masner: provision of specimens; and N.F. Johnson: project coordination, manuscript preparation.

## Materials and methods

The numbers prefixed with “OSUC”, “USNMENT”, and “ZMUC” are unique identifiers for the individual specimens. Details of the data associated with these specimens may be accessed at <https://mbd-db.osu.edu/> by entering the unique specimen identifier (e.g., OSUC 666417) in the form (note the blank space after some acronyms).

The following terms and abbreviations are used to describe the morphological structures discussed in the text – sensillar formula of clavomeres: distribution of papillary sensilla (PS) on the ventral clavomeres of the female (Yang et al. 2016), with the segment interval followed by the number of PS per segment (e.g., A10–A8/1-2-2) (Bin 1981); LOL: lateral ocellar line, shortest distance between the outer margins of the lateral and median ocelli (Masner 1980); OD: ocellar diameter, greatest width of each ocellus; OOL: ocular ocellar line, shortest distance between the inner orbit and outer margin of the lateral ocellus (Masner 1980); POL: posterior ocellar line, shortest distance between the inner margins of the lateral ocelli (Masner 1980); T1, T2, ... T6: metasomal tergite 1, 2, ... 6; S1, S2, ... S6: metasomal sternite 1, 2, ... 6. Morphological terminology follows Masner and Huggert (1989), Mikó et al. (2007), and Lahey et al. (2019a–c). Morphological terms were matched to concepts in the

Hymenoptera Anatomy Ontology (Yoder et al. 2010) using the text analyzer function. A table of morphological terms and URI links is provided in Suppl. material 1.

Morphological character matrices and taxonomic descriptions were generated with vSysLab (<https://vsyslab.osu.edu/>), a web application that utilizes specimen data from the Hymenoptera Online Database (<https://mbd-db.osu.edu/>). Morphological characters are in the format of character: character state. Multistate characters are separated by a semicolon (e.g., number of clavomeres: 4; 5).

The point map of *Alfredella* species distributions was created with SimpleMapper (Shorthouse 2010). Nomenclature of the bio- and ecoregions of Australia inhabited by *Alfredella* species follows that used in the Interim Biogeographic Regionalisation for Australia version 7 (<https://www.environment.gov.au/land/nrs/science/ibra/australias-bioregions-maps>) (Thackway and Cresswell 1995).

Photographs of card- or point-mounted insects were captured using a Macroscopic Solutions Macropod Micro Kit, with optical slices rendered in Helicon Focus. Image stacks were processed with CombineZP to produce single montage images, which were subsequently imported into Adobe Photoshop CC to correct for brightness and contrast. Most scanning electron micrographs were taken with a Phenom XL G2 Desktop Scanning Electron Microscope, using a eucentric stage and Phenom ProSuite Software. The scanning electron micrographs of *Amitus* (Figs 57–59, 61) were taken following the methods of Talamas et al. (2016).

## Collections

This work is based on specimens deposited in the following repositories:

<b>ANIC</b>	Australian National Insect Collection, Canberra, ACT, Australia
<b>CNCI</b>	Canadian National Collection of Insects, Ottawa, Ontario, Canada
<b>NHMUK</b>	Natural History Museum, London, United Kingdom
<b>OSUC</b>	C.A. Triplehorn Collection, The Ohio State University, Columbus, Ohio, USA
<b>USNM</b>	Smithsonian National Museum of Natural History, Washington, DC, USA
<b>ZMUC</b>	Zoological Museum, Natural History Museum of Denmark, University of Copenhagen, Copenhagen, Denmark

## Abbreviations and characters annotated in the figures

<b>ac</b>	acetabular carina (Fig. 58)
<b>afp</b>	anterior mesofurcal pit (Figs 58, 60)
<b>als</b>	anterolateral striae on T2 (Figs 3, 50, 61)
<b>amp</b>	anterior mesosternal pits (Figs 58, 60)
<b>apT2</b>	anteromedial pits on T2 (Fig. 61)
<b>atp</b>	anterior tentorial pit (Fig. 59)
<b>auc</b>	axillular carina (Figs 2, 61–63)
<b>axu</b>	axillula (Figs 61, 62)

<b>cly</b>	clypeus (Fig. 59)
<b>daa</b>	dorsal axillar area (Fig. 61)
<b>ecc</b>	epiclypeal carina (Fig. 59)
<b>fs</b>	foamy structures (Figs 3, 61)
<b>mas</b>	malar sulcus (Fig. 49)
<b>mbd</b>	mandible (Fig. 59)
<b>mnt</b>	metanotal trough (Figs 62, 63)
<b>msc</b>	mesoscutum (Fig. 61)
<b>mshs</b>	mesoscutal humeral sulcus (Fig. 61)
<b>not</b>	notaulus (Fig. 61)
<b>pacp</b>	postacetabular pits (Figs 58, 60)
<b>pssu</b>	prespecular sulcus (Fig. 33)
<b>psu</b>	posterior mesoscutellar sulcus (Fig. 20)
<b>R</b>	radial vein (submarginal vein) (Fig. 2)
<b>sce</b>	setation of compound eye (Fig. 2)
<b>scu</b>	mesoscutellum (Fig. 61)
<b>sss</b>	scutoscutellar sulcus (Figs 1, 61)
<b>tac</b>	transaxillar carina (Figs 2, 61–63)
<b>tel</b>	transepisternal line (Figs 51, 58)
<b>tmc</b>	transmetanotal carina (Figs 62, 63)
<b>ts</b>	torular striae (Fig. 59)
<b>ty</b>	tyloid (Figs 38, 40, 41, 55, 57)

## Character discussion

### Anterolateral striae on T2

*Alfredella* and *Amitus* have striae that radiate from the anterior margin of T2 as well as the margins of the anteromedial pits (Figs 3, 50, 61). This character is particularly subtle in *Alfredella* relative to *Amitus* and requires the anterior margin of T2 to be free of obstructions such as the wings, hind legs, and detritus. Another Australian genus, *Oligomerella* Masner & Huggert, also possesses striations on T2; however, this genus has a distinct malar sulcus (Fig. 49) and the 3-merous clava is massive relative to A3–A7. We provide images of this exceptionally rare genus for the first time (Figs 46–49).

### Claval formula

The antennal clava of *Alfredella* is 4- or 5-merous, with a papillary sensillar formula of 1-2-2-1 (*Al. auriel*), 1-2-2-1-1 (*Al. teres*), or 1-2-2-2-1 (*Al. auriel*, *Al. mephisto*, *Al. tasmanica*). Identifying specimens based on this character alone can be challenging and is best performed when examining the antennae ventrally or at an oblique angle. A small drop of exudate can usually be seen at the tip of each papillary sensillum, which serves as a good indicator of their presence (arrows on Fig. 30).

## Shape of clypeus

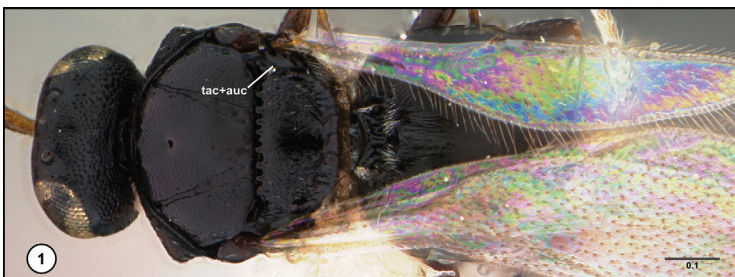
The shape of the ventral margin of the clypeus differs between species of *Alfredella*. In *Al. tasmanica*, the ventral clypeal margin is rounded (Fig. 44), whereas it is slightly more acuminate in *Al. mephisto* (Fig. 43). The clypeus is distinctly acuminate in *Al. auriel* and *Al. teres*; however, these two taxa differ by the setation of the clypeal area: sparse in *Al. auriel* (Fig. 42) and dense in *Al. teres* (Fig. 43).

## Tyloid

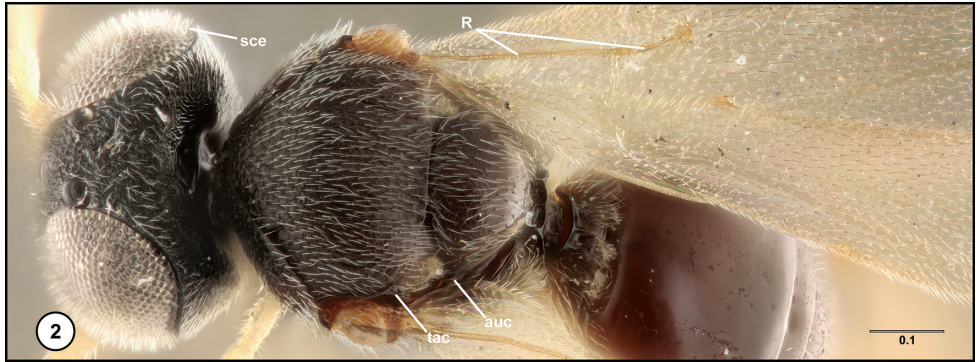
Males of three of the four *Alfredella* species possess a noticeable tyloid on A4. The shape of the tyloid is plate-like in *Al. auriel* (Fig. 38) and *Al. teres* (Fig. 41), a potential synapomorphy that supports *Alfredella* and *Amitus* as sister groups. The shape of the tyloid is less clear in *Al. tasmanica*: its presence is indicated by a ventral ridge that extends most of the length of A4 (Fig. 40), but we were not able to acquire images that completely show this character. A tyloid was not observed on A4 of *Al. mephisto* (Fig. 39), most likely due to the accumulation of detritus on the only specimen available for scanning electron microscopy.

## Key to *Aleyroctonus*, *Alfredella*, and *Amitus*

- 1 Tubular R vein of fore wing absent (Fig. 1); epiclypeal carina present (Fig. 59); transaxillar and axillular carinae fused (Figs 1, 61, 62); mesopleuron without prespecular sulcus (Fig. 51) ..... ***Amitus* Haldeman**
- Tubular R vein of fore wing present (Fig. 2); transaxillar and axillular carinae separated (Figs 2, 63); mesopleuron with prespecular sulcus indicated dorsally (Fig. 33) ..... **2**
- 2 Propodeum without foamy structures (Fig. 2); anterolateral surface of T2 without longitudinal striae (Fig. 2); setation of compound eyes dense (Fig. 2) ..... ***Aleyroctonus* Masner & Huggert**
- Propodeum with foamy structures (Fig. 3); anterolateral surface of T2 with striae radiating from anteromedial pit (Fig. 3); setation of compound eyes short or not distinct (Fig. 3) ..... ***Alfredella* Masner & Huggert**



**Figure 1.** *Amitus granulatus* MacGown & Nebeker, female holotype (USNM201059097), head, mesosoma, metasoma, dorsal view. Scale bar in millimeters.



**Figure 2.** *Aleyroctonus stanslyi* Lahey & Polaszek, female holotype (OSUC 697919), head, mesosoma, metasoma, dorsolateral view. Scale bar in millimeters.

**Key to species of *Alfredella***

- 1 Notauli constricted posteriorly (Figs 7, 29); transepisternal line weakly arched (Figs 6, 28) ..... **2**
- Notauli of even width throughout their length or absent (Figs 13, 20); transepisternal line strongly arched medially (Figs 12, 16, 22)..... **3**
- 2 Medial portion of mesoscutum and mesoscutellum setose (Figs 26, 29, 32); surface sculpture of mesoscutum and mesoscutellum composed of large reticulations (Figs 29, 32) ..... *Alfredella teres* (Buhl)
- Medial portion of mesoscutum and mesoscutellum glabrous (Figs 5, 7, 10); surface sculpture of mesoscutum and mesoscutellum composed of fine reticulations (Figs 5, 7, 10) ..... *Alfredella auriel* Lahey, **sp. nov.**
- 3 Notauli parallel (Figs 18, 20, 25); posterior mesoscutellar sulcus absent medially (Fig. 20); ventral margin of clypeus rounded (Fig. 44) ..... *Alfredella tasmanica* Masner & Huggert
- Notauli converging posteriorly or notauli absent (Figs 11, 13); posterior mesoscutellar sulcus complete (Figs 11, 13); ventral margin of clypeus acuminate (Fig. 43)..... *Alfredella mephisto* Lahey, **sp. nov.**

**Taxonomy**

***Alfredella* Masner & Huggert**

*Alfredella* Masner & Huggert, 1989: 39 (original description. Type: *Alfredella tasmanica* Masner & Huggert, by monotypy and original designation); Vlug 1995: 10 (citation of type species); Lahey, Masner, and Johnson 2019: 69 (keyed).

**Diagnosis.** *Alfredella* is most similar to *Aleyroctonus* and *Amitus*. The combination of a tubular R vein in the fore wing (absent in *Amitus*) and anterolateral striae on T2

(absent in *Aleyroctonus*) is enough to separate *Alfredella* from these genera. Moreover, *Alfredella* is one of only two platygastroid genera where the antennal clava is composed of both articulated (e.g., A6 and A7) and 'compact' (e.g., A8–A10) clavomeres. Additional diagnostic characters include the presence of malar striae, a 4- or 5-merous antennal clava, a distinct transepisternal line, and the presence of foamy structures on the propodeum.

**Description. Head.** Color of head: black. Shape of head in dorsal view: transverse. Occipital carina: present. Setation of compound eye: present, short. Hyperoccipital carina: absent. Occipital pit: absent. Paraocellar depressions: absent. Preocellar depressions: absent. Setation of occiput: present, short. Antennal scrobe: present. Frontal ledge: absent. Sculpture of frons immediately dorsal to toruli: concentrically rugose. Sculpture of upper frons: reticulate. Sculpture of vertex: reticulate. Malar striae: present. Malar sulcus: absent. Facial striae: absent. Epistomal sulcus: absent. Anteclypeus: undifferentiated from postclypeus. Orientation of mandiblar teeth: transverse. Mandibular dentition: bidentate. Number of maxillary palpomeres: 1. Number of labial palpomeres: 1. Number of antennomeres in female: 10. Number of antennomeres in male: 9. Number of clavomeres: 4; 5. Sensillar formula of A10–A6: 1-2-2-1-0; 1-2-2-1-1; 1-2-2-2-1. Condition of A6: articulate. Condition of A7: articulate. Condition of A10–A8, female: fused, sutures present. Length of pedicel: approximately as long as A3+A4.

**Mesosoma.** Epomial carina: present ventrally. Pronotal shoulders: visible in dorsal view, not sharply angled. Sculpture of mesoscutum: reticulate. Anterior admedian line: present. Median mesoscutal line: absent. Notaulus: present. Parapsidal line: present. Mesoscutal humeral sulcus: present as a thin furrow. Netrion: present. Scutoscutellar sulcus: present as a deep, noncrenulate groove. Sculpture of mesoscutellum: reticulate. Shape of mesoscutellum: nearly hexagonal, widest medially. Setation of axillula: dense. Metascutellum: concealed by posterior margin of mesoscutellum. Prespecular sulcus: present. Transepisternal line: present, terminating in anterior and posterior pits. Mesopleural carina: absent. Metapleural carina: present. Metapleural sulcus: absent. Metapleural pit: present. Location of metapleural pit: at anterior margin of metapleuron. Paracoxal sulcus: absent. Setation of plical area: dense. Protibial spur: bifid. Tibial spur formula: 1-2-2. Tarsal formula: 5-5-5. Length of tarsal claws: equal. Foamy structures: present on lateral propodeal carinae and metapleural carina.

**Metasoma.** Number of visible terga, female: 6. Number of visible terga, male: 8. Number of visible sterna: at least 6. Width of laterotergites: short. Sculpture of terga: T2 anterolaterally striate. Laterotergites: present. Laterosternites: absent. Sculpture of nucha: longitudinally foveolate. Shape of T1: transverse. Anterior pits on T2: present as transverse, setose depressions medially. Longest tergite: T2. Sculpture of S2: smooth except for longitudinal striation and reticulation surrounding felt field. Transverse felt field on anterior S2: present.

**Wings.** Color of wings: hyaline. Wing development: macropterous. Length of fore wing: exceeding apex of metasoma. Marginal cilia of fore wing: present. R of fore wing: present, tubular. Length of fore wing R: approximately 1/3 length of fore wing. Shape of knob of R: truncate, not rounded. Cu of fore wing: nebulous. M of fore wing:

nebulous. M+Cu of fore wing: nebulous. Marginal cilia of hind wing: present. R of hind wing: present, tubular.

**Distribution.** Mainland Australia (Australian Capital Territory, New South Wales, Queensland, South Australia, Western Australia) and the island of Tasmania. The absence of specimens from Victoria is likely due to a lack of collecting.

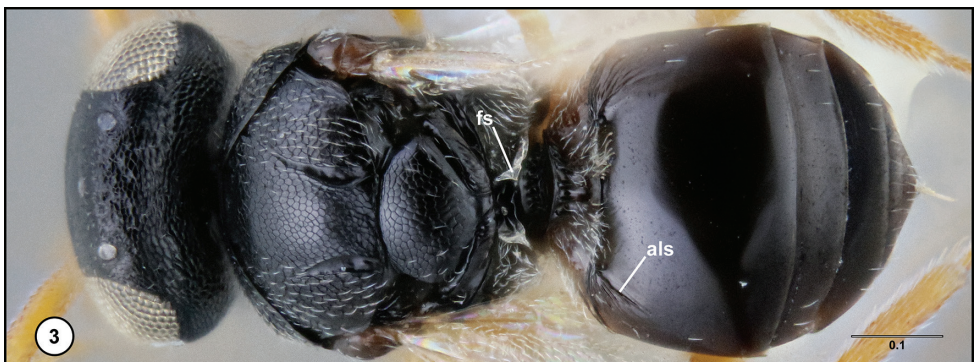
## Species descriptions

### *Alfredella auriel* Lahey, sp. nov.

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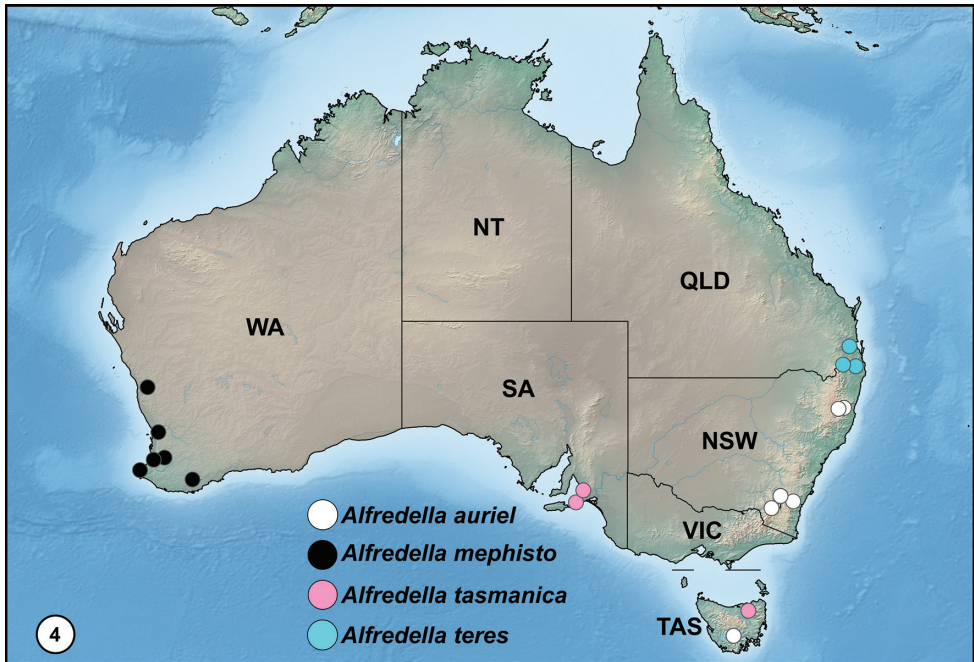
Figs 3, 5–10, 34, 38, 42

**Description.** Setation of mandibles: present. Setation of clypeal area: sparse. Shape of clypeus: acuminate. Anterior tentorial pits: small. Facial and malar striae: present, dorsal striations confluent with concentric sculpture of antennal scrobe. Central keel: absent. Setation of interantennal area: extending to dorsal margin of toruli. Sculpture of frons: reticulate dorsally and along inner orbits, reticulations fading medially, supplanted by concentric striations of antennal scrobe, punctation present near ocelli. Position of lateral ocellus: approximately 1 OD from inner margin of compound eye. Interocular space: 1.25× length of compound eye. Occiput directly anterior to anteromedial portion of occipital carina: granulate. Sculpture of occiput: reticulate; granulate. Color of antennomeres: yellow-orange; concolorous with legs. Number of papillary sensilla on A6: 0; 1. Number of papillary sensilla on A7: 1. Glabrous patch on lateral propodeal area adjacent to spiracle: present. Shape of mesoscutellum in lateral view: flat. Shape of transepisternal line: weakly arched. Shape of mesoscutellum in dorsal view: pentagonal. Sculpture of posterior mesoscutellar sulcus: striate. Posterior mesoscutellar sulcus: complete. Setation of mesoscutum: absent posteromedially, dense lateral to notauli. Setation of mesoscutellum: present throughout. Path of notauli: converging posteriorly. Shape of notaulus: abruptly widening posteriorly. Setation of anteromedial T2: interrupted medially. Number of setae on lateral surface of T3: 3. Number of setae on



**Figure 3.** *Alfredella auriel* Lahey, female (USNMMENT01197967), head, mesosoma, metasoma, dorsal view. Scale bar in millimeters.





**Figure 4.** Distribution of *Alfredella* Masner & Huggert across Australia. Multiple specimens collected from the same locality are indicated by a single circle. States and territories are abbreviated as follows: NSW (New South Wales), NT (Northern Territory), QLD (Queensland), SA (South Australia), TAS (Tasmania), VIC (Victoria), WA (Western Australia).

lateral surface of T4: 4. Number of setae on lateral surface of T5: 5. Felt field on S2: 0.5 as long as lt2. Setation of laterotergites: present on lt2–lt5. Setation of dorsal surface of hind coxa: absent medially. Color of coxae: yellow-orange.

**Diagnosis.** This species is easily recognized by the shape of the notauli, lack of setae on the mesoscutal midlobe, and sparsely setose clypeal area.

**Distribution.** New South Wales, Tasmania.

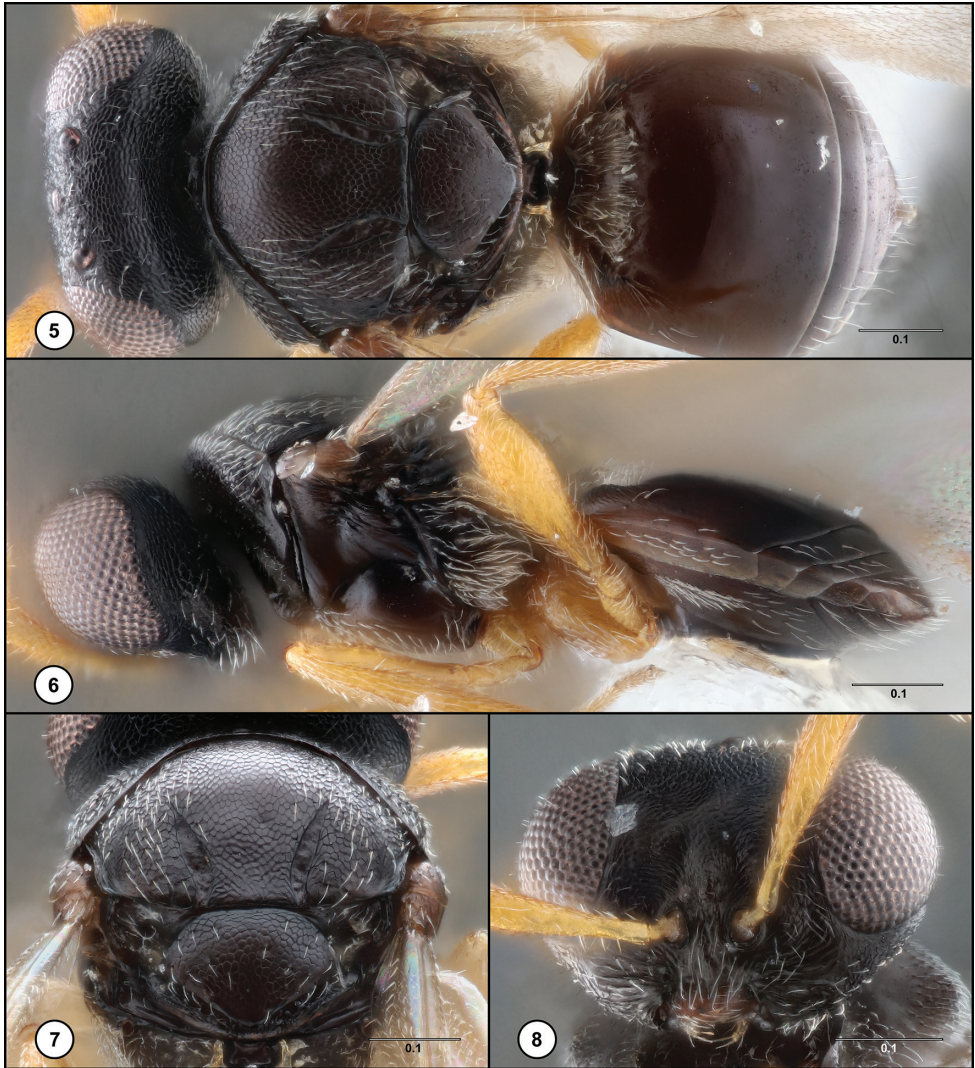
**Inhabited ecoregions (bioregions).** Temperate Broadleaf and Mixed Forests (South Eastern Queensland, South East Corner, South Eastern Highlands, Tasmanian Southern Ranges).

**Etymology.** Auriel is the Archangel of Hope from the Diablo video game franchise. The epithet is treated as a noun in apposition.

**Material examined.** *Holotype*, female: AUSTRALIA: NSW, New England N. P., 1300–1500 m, Feb. 13, 1984, L. Masner, s. s., OSUC 698019 (deposited in ANIC).

**Paratypes:** AUSTRALIA: 8 females, 6 males, OSUC 698007–698009, 698011–698012, 698014–698015, 698017–698018, 698020–698024 (CNCI). Additional material: AUSTRALIA: 1 female, USNMENT01197967 (USNM).

**Comments.** While most female specimens in the type series have a 4-merous clava, we examined four specimens (OSUC 698007–698009, USNMENT01197967) from Kosciuszko National Park (New South Wales) with 5 clavomeres. We treat these specimens under *Al. auriel* given a lack of additional characters that would warrant new species status.



**Figures 5–8.** *Alfredella auriel* Lahey, female holotype (OSUC 698019) **5** head, mesosoma, metasoma, dorsal view **6** head, mesosoma, metasoma, lateral view **7** mesosoma, posterodorsal view **8** head, anterior view. Scale bars in millimeters.

***Alfredella mephisto* Lahey, sp. nov.**

<http://zoobank.org/E4CC0A93-6144-45B7-95F1-09BD50D1588A>

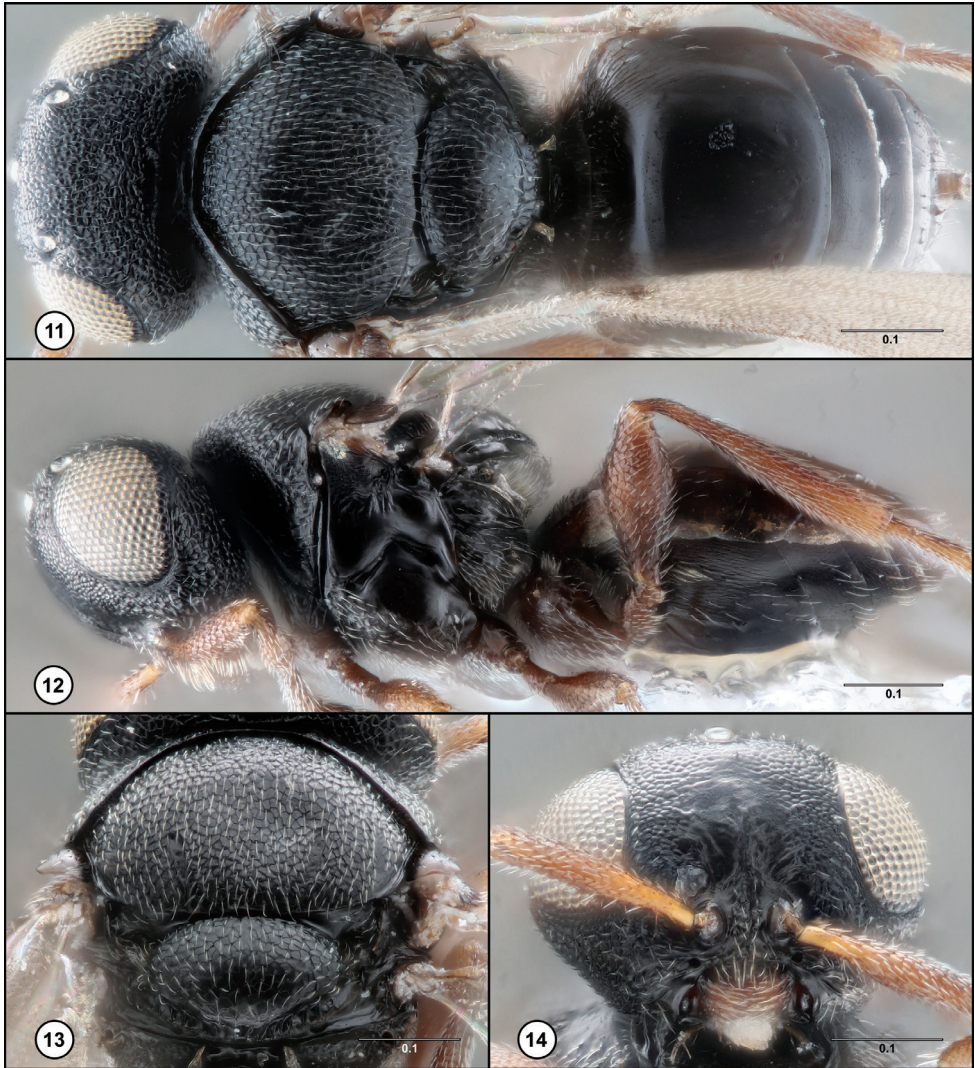
Figs 11–16, 35, 39, 43

**Description.** Setation of mandibles: present. Setation of clypeal area: dense. Shape of clypeus: truncate. Anterior tentorial pits: large. Facial and malar striae: present, dorsal striations confluent with concentric sculpture of antennal scrobe. Central keel: present; absent. Setation of interantennal area: surpassing dorsal margin of toruli. Sculpture



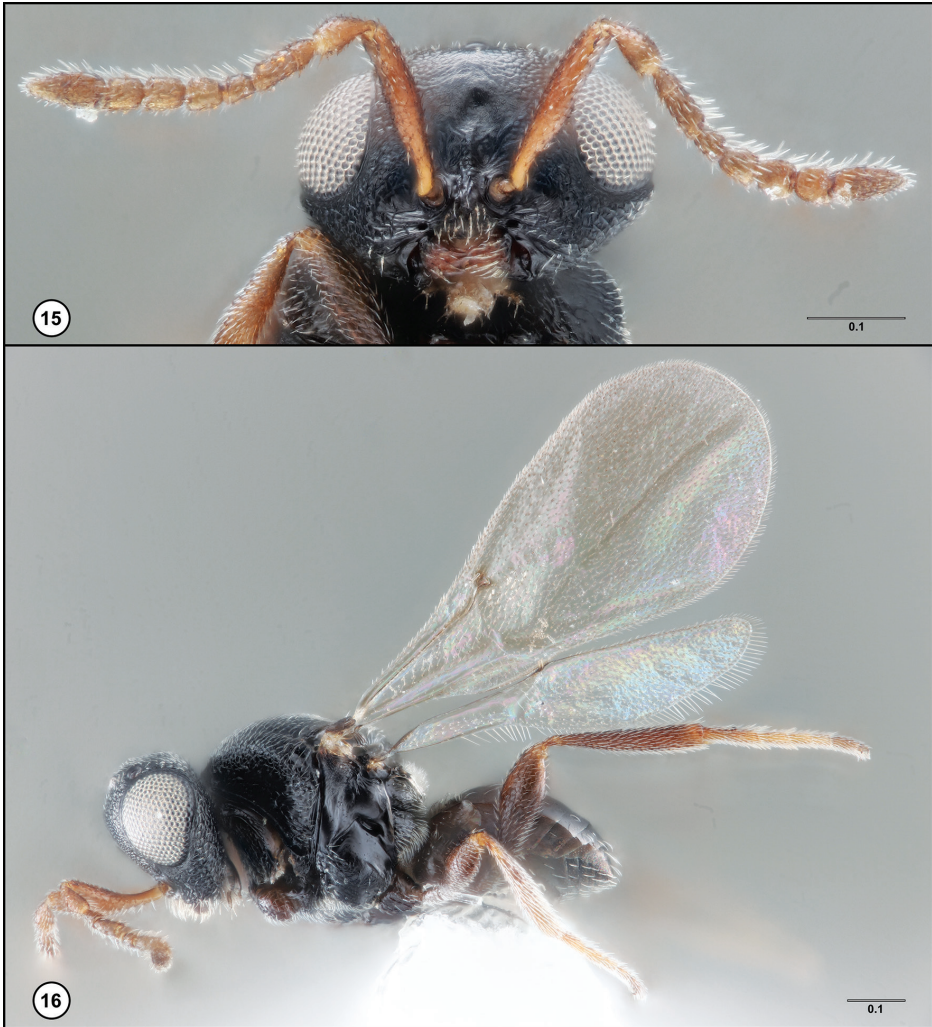
**Figures 9, 10.** *Alfredella auriel* Lahey, male paratype (OSUC 698020) **9** head, anterior view **10** head, mesosoma, metasoma, dorsal view. Scale bars in millimeters.

of frons: reticulate dorsally and along inner orbits, smooth medially, with weak concentric striations of antennal scrobe, punctation absent near ocelli. Position of lateral ocellus: less than 1 OD from inner margin of compound eye. Interocular space: 1.25× length of compound eye. Occiput directly anterior to anteromedial portion of occipital carina: densely reticulate. Sculpture of occiput: densely reticulate. Color of antennomeres: brown-light brown; concolorous with legs. Number of papillary sensilla on A6: 1. Number of papillary sensilla on A7: 2. Glabrous patch on lateral propodeal area adjacent to spiracle: absent. Shape of mesoscutellum in lateral view: convex. Shape of transepisternal line: arched. Shape of mesoscutellum in dorsal view: oval, 2× wider



**Figures 11–14.** *Alfredella mephisto* Lahey, female holotype (OSUC 697984) **11** head, mesosoma, metasoma, dorsal view **12** head, mesosoma, metasoma, lateral view **13** mesosoma, posterodorsal view **14** head, anterior view. Scale bars in millimeters.

than long. Sculpture of posterior mesoscutellar sulcus: striate. Posterior mesoscutellar sulcus: complete, medial portion sometimes hidden by overhang of mesoscutellum. Setation of mesoscutum: present. Setation of mesoscutellum: present throughout. Path of notauli: subparallel; diverging anteriorly. Shape of notauli: narrowing posteriorly. Setation of anteromedial T2: contiguous. Number of setae on lateral surface of T3: 3. Number of setae on lateral surface of T4: 3. Number of setae on lateral surface of T5: 6. Felt field on S2: approximately as long as lt2. Setation of laterotergites: present on



**Figures 15, 16.** *Alfredella mephisto* Lahey, male paratype (OSUC 697985) **15** head, anterior view **16** head, mesosoma, metasoma, lateral view. Scale bars in millimeters.

lt2. Setation of dorsal surface of hind coxa: absent medially. Color of coxae: brown; lighter than mesosoma.

**Diagnosis.** *Alfredella mephisto* is identifiable by the abbreviated notauli and complete posterior mesoscutellar sulcus.

**Distribution.** Western Australia.

**Inhabited ecoregions (bioregions).** Mediterranean Forests, Woodlands, and Scrub (Esperance Plains, Jarrah Forest, Swan Coastal Plain, Warren).

**Etymology.** Mephisto is one of the Prime Evils in the Diablo video game franchise. The epithet is treated as a noun in apposition.

**Material examined.** *Holotype*, female: AUSTRALIA: WA, 34°23.71'S, 117°53.09'E, Stirling Range National Park, 22.XI.2002, J. George, OSUC 697984 (deposited in ANIC). *Paratypes*: AUSTRALIA: 4 females, 4 males, OSUC 697985 (ANIC); OSUC 697986–697992 (CNCI).

**Comments.** *Alfredella mephisto* is the only species from Western Australia treated in this revision. We examined a single male of an undescribed species from the same state (OSUC 698016; collected near Yarragil Campground, Dwellingup) but have chosen not to describe it until additional material is collected.

### *Alfredella tasmanica* Masner & Huggert

Figs 17–25, 36, 40, 44

*Alfredella tasmanica* Masner & Huggert, 1989: 40 (original description); Vlug 1995: 10 (cataloged, type information).

**Description.** Setation of mandibles: present. Setation of clypeal area: dense. Shape of clypeus: truncate. Anterior tentorial pits: large. Facial and malar striae: present, dorsal striations not confluent with concentric sculpture of antennal scrobe. Central keel: absent. Setation of interantennal area: surpassing dorsal margin of toruli. Sculpture of frons: reticulate throughout, weakly reticulate medially, punctuation absent dorsally. Position of lateral ocellus: less than 1 OD from inner margin of compound eye. Interocular space: 1.25× length of compound eye. Occiput directly anterior to anteromedial portion of occipital carina: smooth to reticulate. Sculpture of occiput: densely reticulate; reticulate. Color of antennomeres: yellow-brown; concolorous with legs. Number of papillary sensilla on A6: 1. Number of papillary sensilla on A7: 2. Glabrous patch on lateral propodeal area adjacent to spiracle: absent. Shape of mesoscutellum in lateral view: convex. Shape of transepisternal line: arched. Shape of mesoscutellum in dorsal view: oval, 2× wider than long. Sculpture of posterior mesoscutellar sulcus: laterally striate, smooth medially. Posterior mesoscutellar sulcus: incomplete medially. Setation of mesoscutum: present. Setation of mesoscutellum: present throughout. Path of notauli: subparallel. Shape of notauli: same width throughout. Setation of anteromedial T2: contiguous. Number of setae on lateral surface of T3: 2; 3. Number of setae on lateral surface of T4: 4. Number of setae on lateral surface of T5: 6. Felt field on S2: approximately as long as lt2. Setation of laterotergites: present on lt2. Setation of dorsal surface of hind coxa: sparse. Color of coxae: brown; concolorous with mesosoma.

**Diagnosis.** *Alfredella tasmanica* differs from its congeners by the abbreviated, parallel notauli, incomplete posterior mesoscutellar sulcus, and nearly truncate ventral clypeal margin.

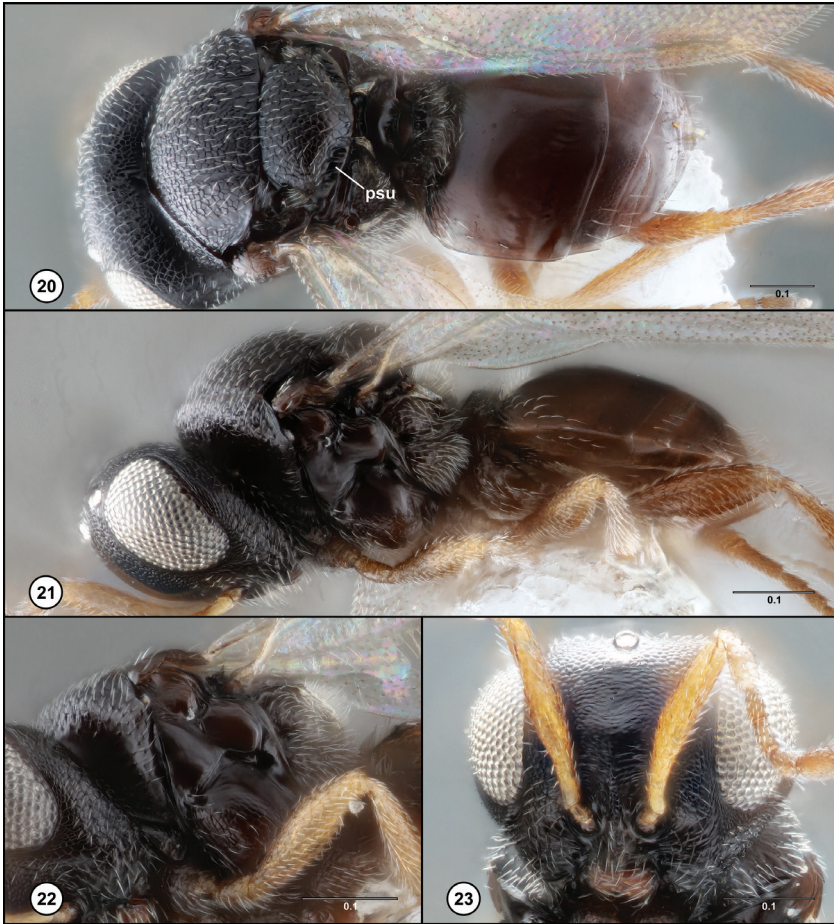
**Distribution.** Australian Capital Territory, South Australia, Tasmania.



**Figures 17–19.** *Alfredella tasmanica* Masner & Huggert, female holotype (ANIC 32-153909) **17** head, anterior view (inset: specimen labels) **18** head, mesosoma, metasoma, dorsal view **19** head, mesosoma, metasoma, dorsolateral view. Scale bars in millimeters.

**Inhabited ecoregions (bioregions).** Deserts and Xeric Shrublands (Flinders Lofty Block); Temperate Broadleaf and Mixed Forests (Kanmantoo, Ben Lomond, Tasmanian Southern Ranges).

**Material examined.** *Holotype*, female: AUSTRALIA: Tasmania, Mt. Field N.P., Jan. 8–14, 1984, L. Masner, MT, ANIC Database No. 32 153909 (deposited in ANIC). *Paratypes*: AUSTRALIA: 3 females, 1 male, [OSUC 697975–697978](#) (CNCI). Other material: AUSTRALIA: 5 females, [OSUC 697979–697983](#) (CNCI).



**Figures 20–23.** *Alfredella tasmanica* Masner & Huggert, female paratype (OSUC 697975) **20** head, mesosoma, metasoma, posterdorsal view **21** head, mesosoma, metasoma, lateral view **22** mesopleuron, ventrolateral view **23** head, anterior view. Scale bars in millimeters.

**Comments.** The distribution of this species is expanded to include the Fleurieu Peninsula and Waite Arboretum of South Australia and Black Mountain of Australian Capital Territory. *Alfredella tasmanica* likely has a wide distribution across southern Australia, and its absence from Victoria is probably due to a lack of collecting in that region.

***Alfredella teres* (Buhl), comb. nov.**

Figs 26–33, 37, 41, 45

*Amitus teres* Buhl, 2014: 428 (original description, diagnosis).

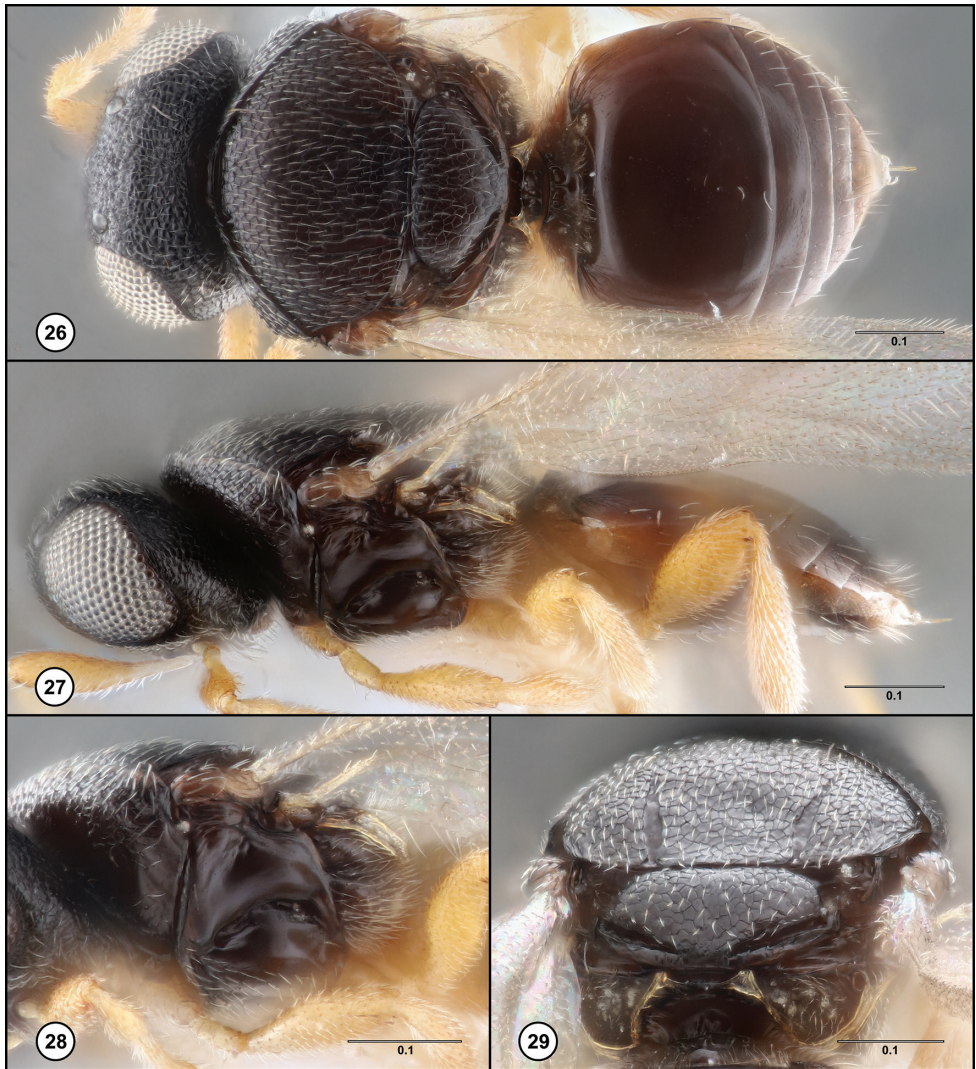
**Description.** Setation of mandibles: present. Setation of clypeal area: dense. Shape of clypeus: acuminate. Anterior tentorial pits: large. Facial and malar striae: present,





**Figures 24, 25.** *Alfredella tasmanica* Masner & Huggert, male paratype (OSUC 697978) **24** head, anterior view **25** head, mesosoma, metasoma, dorsal view. Scale bars in millimeters.

dorsal striations confluent with concentric sculpture of antennal scrobe. Central keel: present. Setation of interantennal area: extending to dorsal margin of toruli. Sculpture of frons: reticulate dorsally and along inner orbits, reticulations fading medially, supplanted by concentric striations of antennal scrobe ventrally, completely smooth dorsally, punctuation present near ocelli. Position of lateral ocellus: less than 1 OD from inner margin of compound eye. Interocular space:  $1.25\times$  length of compound eye. Occiput directly anterior to anteromedial portion of occipital carina: densely reticulate. Sculpture of occiput: densely reticulate. Color of antennomeres: yellow-orange; concolorous with legs. Number of papillary sensilla on A6: 1. Number of papillary sensilla on A7: 1. Glabrous patch on lateral propodeal area adjacent to spiracle: present. Shape

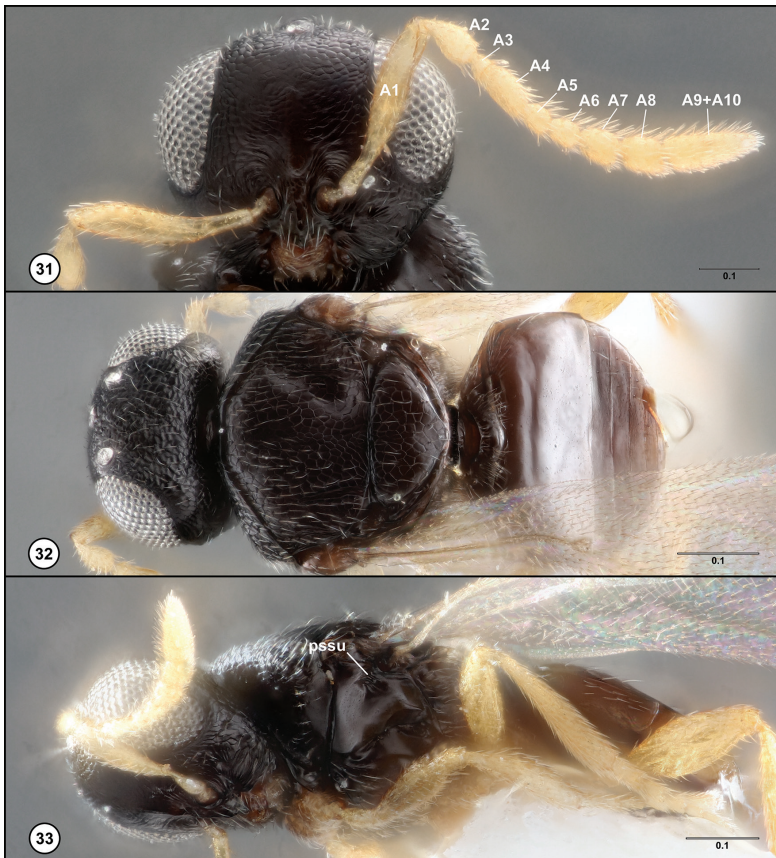


**Figures 26–29.** *Alfredella teres* (Buhl), female (OSUC 697995) **26** head, mesosoma, metasoma, dorsal view **27** head, mesosoma, metasoma, lateral view **28** mesopleuron, lateral view **29** mesosoma, postero-dorsal view. Scale bars in millimeters.

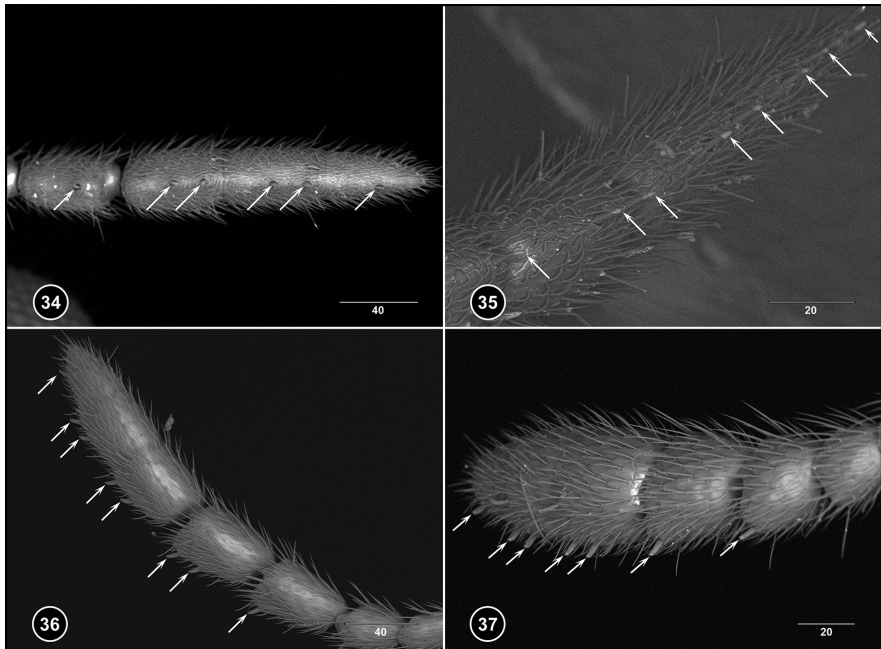
of mesoscutellum in lateral view: flat. Shape of transepisternal line: straight. Shape of mesoscutellum in dorsal view: pentagonal. Sculpture of posterior mesoscutellar sulcus: weakly striate. Posterior mesoscutellar sulcus: incomplete medially. Setation of mesoscutum: present. Setation of mesoscutellum: present throughout. Path of notauli: converging posteriorly. Shape of notauli: gradually widening posteriorly. Setation of anteromedial T2: interrupted medially. Number of setae on lateral surface of T3: 3; 4; 5. Number of setae on lateral surface of T4: 3; 4; 5. Number of setae on lateral surface of T5: 6. Felt field on S2: approximately as long as lt2. Setation of laterotergites: present on lt2. Setation of dorsal surface of hind coxae: absent medially. Color of coxae: orange.



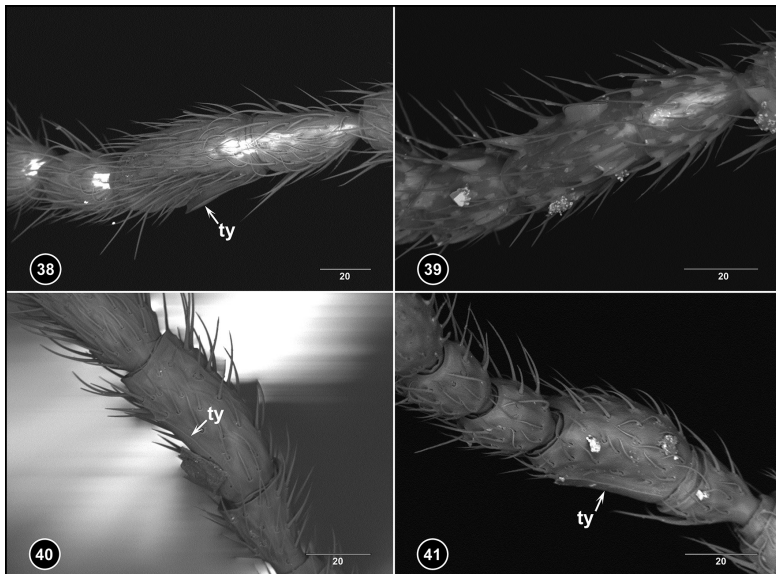
**Figure 30.** *Alfredella teres* (Buhl), female (OSUC 697995), head, anterior view. Scale bar in millimeters.



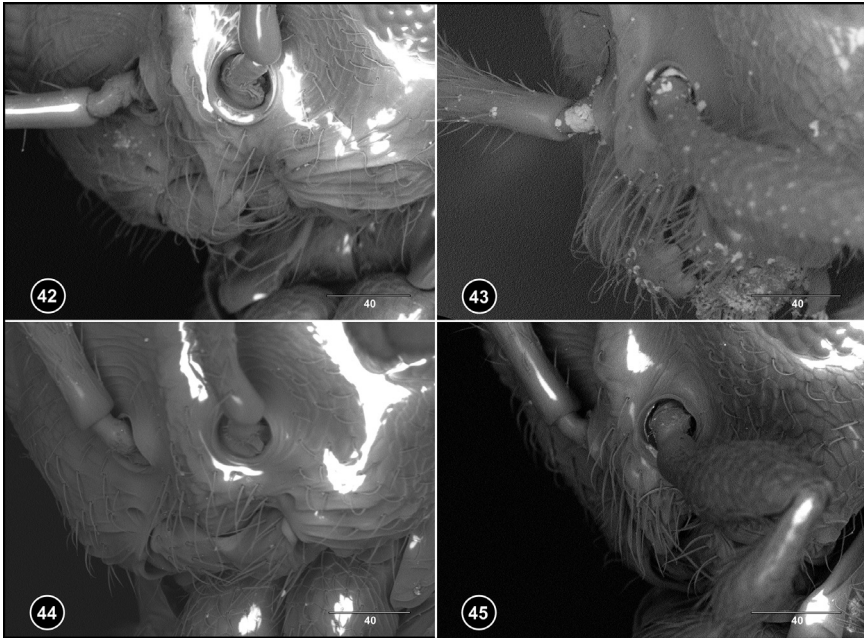
**Figures 31–33.** *Alfredella teres* (Buhl), male (OSUC 697999) **31** head, anterior view **32** head, mesosoma, metasoma, dorsal view **33** head, mesosoma, metasoma, ventrolateral view. Scale bars in millimeters.



**Figures 34–37.** Clava and claval formulae of female *Alfredella* Masner & Huggert **34** *Alfredella auriel* Lahey, holotype (OSUC 698019), ventral view **35** *Alfredella mephisto* Lahey, holotype (OSUC 697984), ventral view **36** *Alfredella tasmanica* Masner & Huggert, paratype (OSUC 697975), lateral view **37** *Alfredella teres* (Buhl), (OSUC 697995), posterolateral view. Each arrow indicates a papillary sensillum. Scale bars in micrometers.



**Figures 38–41.** Tyloid morphology of male *Alfredella* Masner & Huggert **38** *Alfredella auriel* Lahey, paratype (OSUC 698020), lateral view **39** *Alfredella mephisto* Lahey, paratype (OSUC 697985), lateral view (tyloid not observed) **40** *Alfredella tasmanica* Masner & Huggert, paratype (OSUC 697978), lateral view **41** *Alfredella teres* (Buhl), (OSUC 697999), lateral view. Scale bars in micrometers.



**Figures 42–45.** Clypeal morphology of female *Alfredella* Masner & Huggert **42** *Alfredella auriel* Lahey, holotype (OSUC 698019), anterior view **43** *Alfredella mephisto* Lahey, holotype (OSUC 697984), anterolateral view **44** *Alfredella tasmanica* Masner & Huggert, paratype (OSUC 697975), anterior view **45** *Alfredella teres* (Buhl), (OSUC 697995), anterolateral view. Scale bars in micrometers.

**Diagnosis.** The percurrent notauli and flattened mesoscutellum immediately separates *Al. teres* from *Al. mephisto* and *Al. tasmanica*, and the evenly setose mesoscutum and mesoscutellum distinguishes *Al. teres* from *Al. auriel*.

**Distribution.** Queensland.

**Inhabited ecoregions (bioregions).** Temperate Broadleaf and Mixed Forests (South Eastern Queensland).

**Material examined. Holotype,** female: AUSTRALIA: Queensland, Mount Glorious, 27°19'54"S, 152°45'29"E, 30.X–26.XI.1998, Malaise trap, rainforest, N. Power, Au 1581f, ZMUC 00044534 (deposited in ZMUC). Other material: AUSTRALIA: 10 females, 4 males, OSUC 697993–698006, 698010 (CNCI).

**Comments.** *Alfredella teres* was originally described as a species of *Amitus* by Buhl (2014), who considered *Al. teres* to be a characteristic species of *Amitus*. Superficially, *Al. teres* is similar to *Amitus*: it is dorsoventrally flattened, the notauli are percurrent and widened posteriorly, and its light-yellow appendages contrast with its entirely black body. However, this species has a tubular vein in the fore wing, which excludes it from *Amitus* in the generic concept provided by Masner and Huggert (1989). Masner and Huggert (1989) discussed the probable presence of *Amitus* in Australia, drawing attention to morphological differences between the putative Australian species and those from other continents. These characters included the proximity of the lateral ocelli to the inner margin of the compound eye, the 'rim' along the posterior margin of the mesoscutellum, and similarity



**Figures 46–48.** *Oligomerella donnae* Masner & Huggert, female holotype (ANIC 32-153903) **46** head, mesosoma, metasoma, dorsal view (inset: specimen labels) **47** head, mesosoma, metasoma, dorsolateral view **48** head, mesosoma, metasoma, lateral view. Scale bars in millimeters.



**Figure 49.** *Oligomerella donnae* Masner & Huggert, female holotype (ANIC 32-153903), head, anter-oventral view. Scale bar in millimeters.

in the shape of the male antennae (A8–A10) and female clava. We consider the assertion by Buhl (2014) that Australian species of *Amitus* have a tubular vein in the fore wing to be a consequence of generic misplacement, and we find that *Al. teres* fully conforms to the generic concepts of *Alfredella* provided here and in Masner and Huggert (1989).

## Synonymy of *Masnerium* Polaszek

### *Amitus* Haldeman

*Amitus* Haldeman, 1850: 109 (original description. Type: *Amitus aleurodinus* Haldeman, by monotypy); Cresson 1887: 250 (catalog of species of U.S. and Canada); Ashmead 1893: 263, 264, 292 (description, keyed); Dalla Torre 1898: 481 (catalog of species); Ashmead 1903: 97, 99 (keyed); Kieffer 1914: 361 (keyed); Kieffer 1916: 552 (description); Fouts 1924: 3, 8 (description, keyed); Kieffer 1926: 562, 697 (description, keyed, key to species); Jansson 1939: 175 (keyed); Maneval 1940: 117 (keyed); Mani 1941: 34 (catalog of species of India); Debauche 1947: 282 (taxonomic status); Muesebeck and Walkley 1951: 709 (catalog of species of U.S. and Canada); Muesebeck and Walkley 1956: 327 (citation of type species); De Santis 1967: 228 (catalog of species of Argentina); Hellén 1968: 46 (description); Kozlov 1971: 57 (keyed); Kozlov 1978: 656 (key to species of the European USSR); MacGown and Nebeker 1978: 278 (review of species of Western Hemisphere); Muesebeck 1979: 1174 (catalog of species of U.S. and Canada); Mani and Sharma 1982: 205 (description); Viggiani and Mazzone 1982: 63 (key to species of Italy); Huldén 1986: 21 (key to the species of Finland); Masner and Huggert 1989: 51 (description, species list); Vlug 1995: 15 (cataloged, catalog of world species); Kozlov 1995: 126 (keyed); Austin and Field 1997: 55, 68 (structure of ovipositor system, discussion of phylogenetic relationships); Polaszek 1997: 77 (description); Buhl 1999: 18 (key to species of Fennoscandia and Denmark); Buhl and Notton 2009: 1655 (distribution); Ghahari and Buhl 2011: 331 (species of Iran); Anjana, Rajmohana, Vimala and Sundararaj 2016: 107 (description, key to species of India).

*Zacrita* Förster, 1878: 46 (original description. Type: *Zacrita longicornis* Förster, by monotypy and original designation. Synonymized by Ashmead (1893)); Ashmead 1893: 292 (junior synonym of *Amitus* Haldeman); Muesebeck and Walkley 1956: 409 (citation of type species).

*Elaptus* Forbes, 1885: 110 (original description. Type: *Elaptus aleurodis* Forbes, by monotypy. Error for *Alaptus* Westwood. Synonymized implicitly by Ashmead (1893)); Ashmead 1893: 292 (junior synonym of *Amitus* Haldeman); Muesebeck and Walkley 1956: 349 (citation of type species).

*Passalida* Brèthes, 1914: 2 (original description. Type: *Passalida spinifera* Brèthes, by monotypy and original designation. Synonymized by De Santis (1941)); Muesebeck and Walkley 1956: 382 (citation of type species).

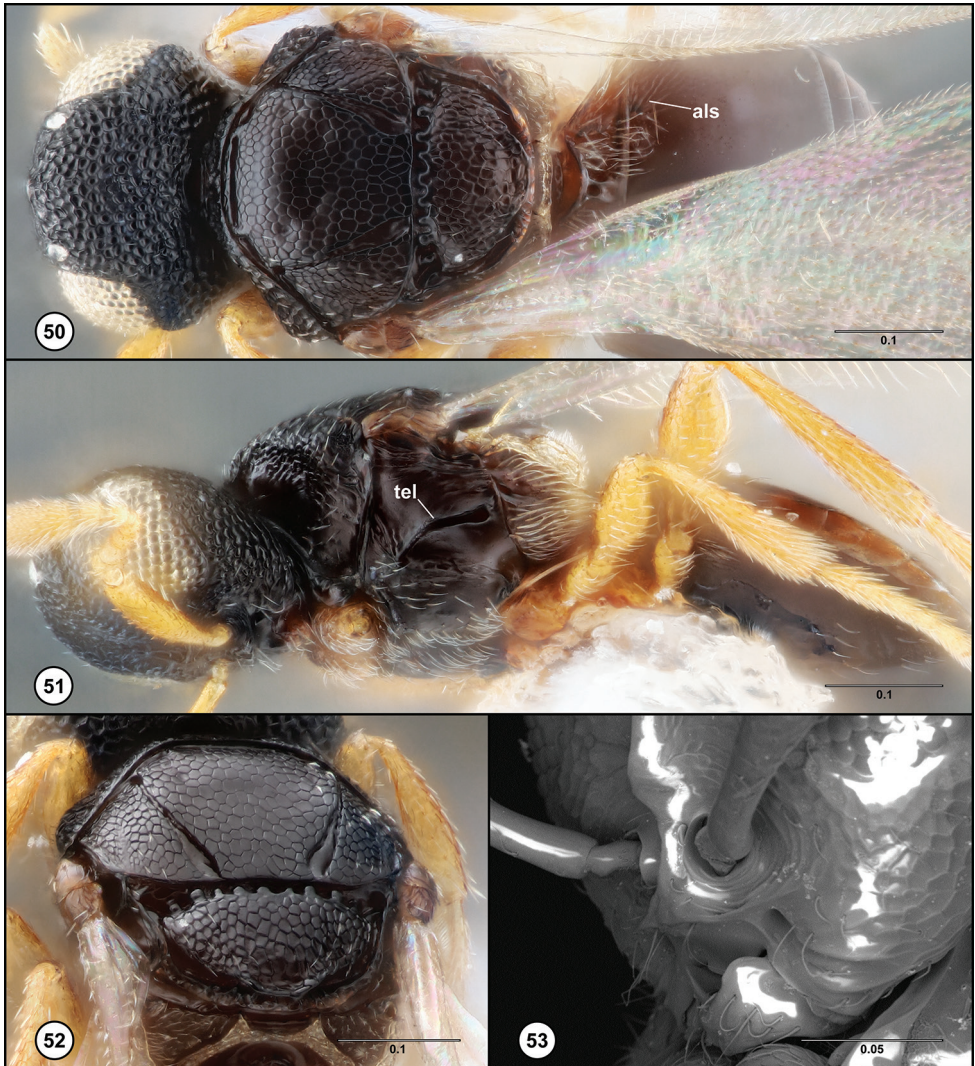
*Masnerium* Polaszek, 2009: 120 (original description. Type: *Masnerium wellsae* Polaszek, by monotypy and original designation), syn. nov.

***Amitus wellsae* (Polaszek), comb. nov.**

Figs 50–55, 60

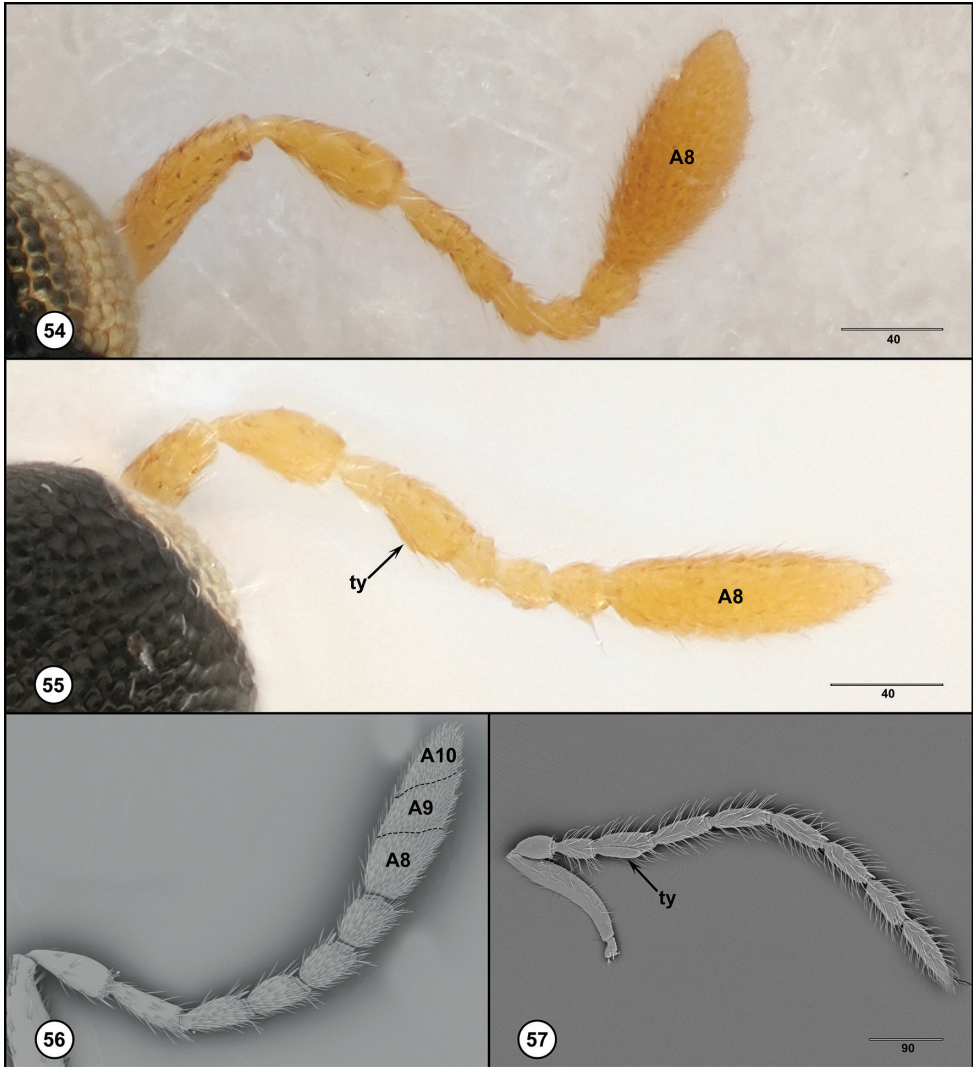
*Masnerium wellsae* Polaszek, 2009: 121 (original description).

**Comments.** Polaszek (2009) established the genus *Masnerium* for a single male specimen reared from the whitefly *Aleuroduplidens wellsae* Martin (Hemiptera, Aleyrodidae, Aleyrodinae) in Australia (Martin 1999). The following combination of characters was



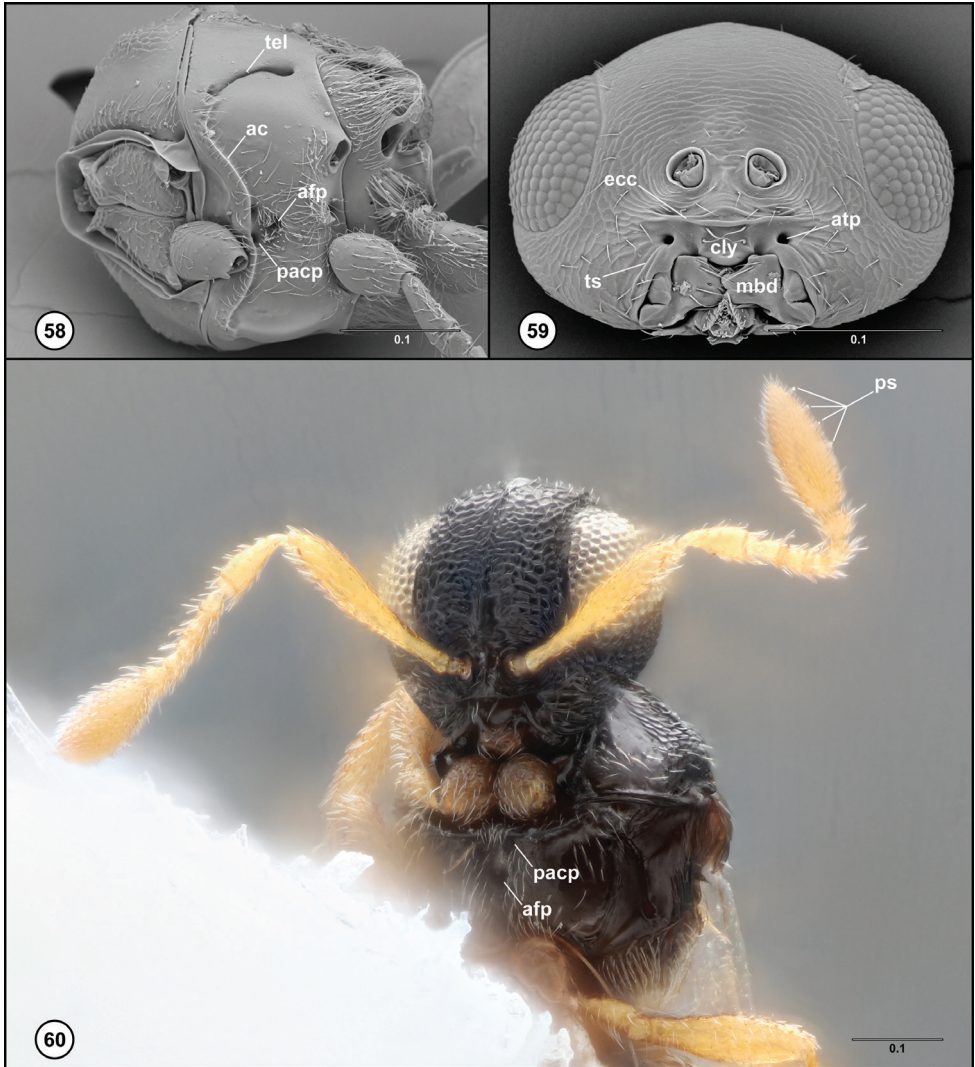
**Figures 50–53.** *Amitus wellsae* (Polaszek), female (OSUC 697974) **50** head, mesosoma, metasoma, dorsal view **51** head, mesosoma, metasoma, lateral view **52** mesosoma, posterodorsal view **53** head, anterior view. Scale bars in millimeters.





**Figures 54–57.** *Amitus* Haldeman antennal morphology **54** *Amitus wellsae* (Polaszek), female (NHMUK010370369), lateral view **55** *Amitus wellsae* (Polaszek), male (NHMUK010370506), lateral view **56** *Amitus* sp., female (OSUC 665643), lateral view (coated) **57** *Amitus* sp., male (USNMMENT00989622\_3), lateral view (coated). Scale bars in micrometers.

used to distinguish *Masnerium* from other sceliotrachelines: (1) submarginal vein of fore wing absent, (2) foamy structures on propodeum present, and (3) male antennae 8-merous (Polaszek 2009). We posit that this character suite is not unique to *Masnerium* and that the taxon is best treated as a junior synonym of *Amitus*, a genus that was not discussed in Polaszek (2009). We base our appraisal on several character systems shared between *Am. wellsae* and other members of the genus, in addition to the morphology of the female, which we illustrate for the first time.

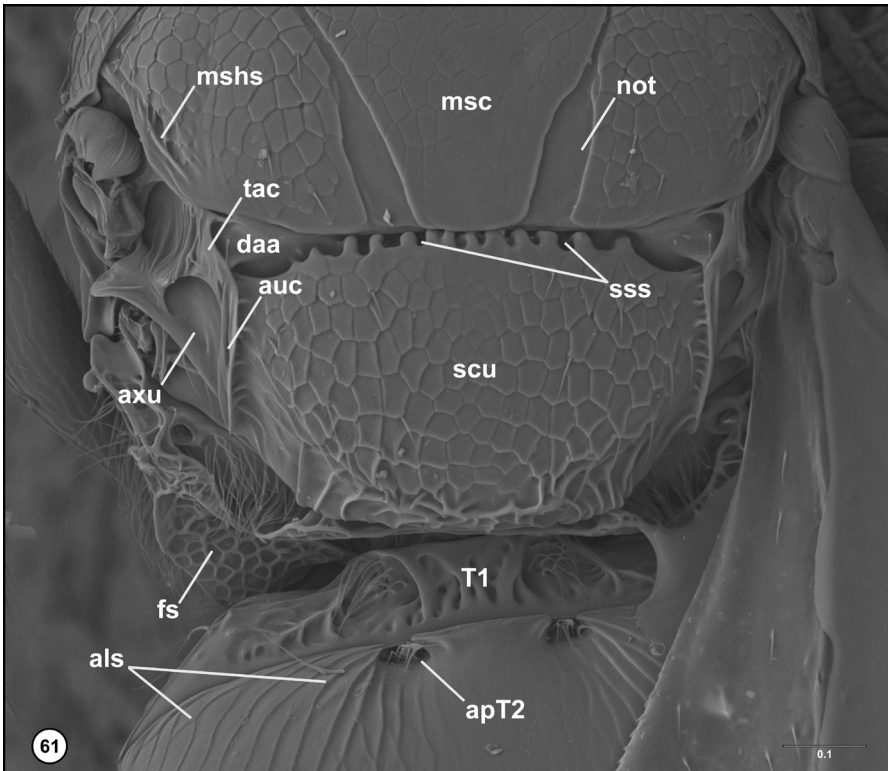


**Figures 58–60.** **58** *Amitus* sp., male (USNMENT00989622\_2), mesosoma, ventral view (coated) **59** *Amitus* sp., male (USNMENT00989622\_4), head, anterior view (coated) **60** *Amitus wellsae* (Polaszek), female (OSUC 697974), head and mesosoma, ventral view. Scale bars in millimeters.

### Character analysis.

(1) ***Submarginal vein of fore wing absent.*** This character is a hallmark of the genus *Amitus*, as it was used by Haldeman (1850) to derive the genus name. No *Amitus* species known to us have any remnant of tracheate fore wing venation. For this reason, this character is not useful for identifying *Masnerium* as a lineage separate from *Amitus*.

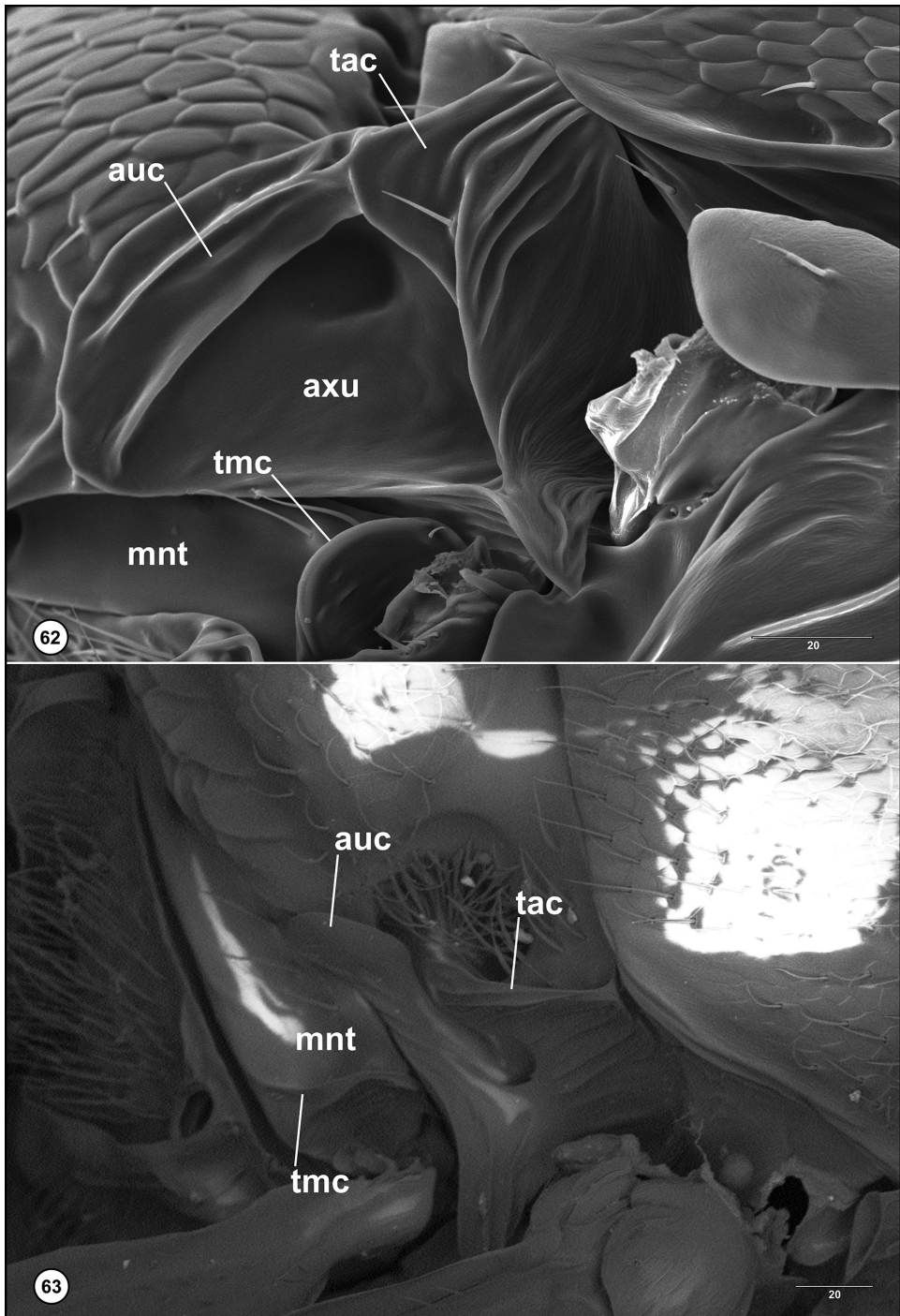
(2) ***Foamy structures on the propodeum.*** The presence of this character was given inflated importance by Polaszek (2009) because the taxa with which he compared *Am. wellsae*, *Aleyroctonus* and *Aphanomerus*, lack foamy structures entirely. The form



**Figure 61.** *Amitus* sp., male (USNMENT00989622\_4), mesosoma, T1, and T2, dorsal view (coated). Scale bar in millimeters.

and distribution of foamy structures in *Am. wellsae* is characteristic of other members *Amitus* and cannot be used to separate the two genera.

(3) **Male antennae 8-merous.** There is a tendency of the terminal antennomeres in certain playgastroid taxa to fuse, leaving no external trace (sutures) by which to determine the original number of segments (e.g., *Pseudaphanomerus* Szélnyi). Similarly, in certain platygastroids the male antenna has converged in form with that of the female (Talamas and Masner 2016) (e.g., *Annettella gracilis* Masner & Huggert; *Aphanomerella* Dodd; *Errolium piceum* Masner & Huggert; *Helava* Masner & Huggert; *Microthoron* Masner; *Parabaeus* Kieffer; *Plutomerus* Masner & Huggert; *Psilanteris* Kieffer; *Tetrabaeus americanus* (Brues)), making it difficult to distinguish between the sexes based on the antenna unless the papillary sensilla are visible or noticeable modifications have been made to the male sex-segment(s). The antenna of male *Am. wellsae* exhibits both types of modification: the apical antennomere (A8) lacks sutures, causing the shape of the antennal club to resemble that of the female due to the fusion of the terminal antennomeres (A8–A10). Because this has occurred independently in numerous sceliotracheline genera, we do not consider it to indicate a separate genus. Rather, we refer to Masner and Huggert (1989) who put forth that this character is useful for diagnosing Australian species of *Amitus*.



**Figures 62, 63.** Comparative morphology of the scutellar-axillar complex in *Amitus* and *Alfredella*  
**62** *Amitus* sp., female (OSUC 665643), lateral view (coated) **63** *Alfredella mephisto* Lahey, male paratype (OSUC 697985), lateral view. Scale bars in micrometers.

(4) **Number and arrangement of papillary sensilla.** The number (4) and distribution (1-2-1) of papillary sensilla on the clava of *Am. wellsae* is characteristic of the genus.

(5) **Epiclypeal carina.** We coin this term to refer to the transverse carina located between the toruli and clypeus (Fig. 59). The epiclypeal carina is distinct from the epistomal sulcus because it terminates dorsal and lateral to the anterior tentorial pits. *Amitus wellsae* and all other species of the genus known to us possess this character, but the epiclypeal carina is not unique to *Amitus*. *Neobia* Masner & Huggert (Sceliotraachelinae) and some species of *Leptacis* Förster (Platygastrinae) also have this character.

(6) **Structure of the dorsal mesosoma.** The dorsal mesosoma is the most significant source of characters that separates *Am. wellsae* from its congeners. In *Am. wellsae*, the anterior margin of the mesoscutum is excavated between the antero-admedian lines, and the posteromedial margin of the mesoscutellum has a distinct rim. Other members of the genus either lack the excavated region on the anteromedial mesoscutum entirely or it is incomplete. Likewise, the posterior margin of the mesoscutellum lacks a defined rim in the non-Australian species of the genus. Most importantly, however, the transaxillar and axillular carinae are fused in *Am. wellsae*, a diagnostic character for *Amitus* (Figs 1, 62).

(7) **Structure of the lateral mesosoma.** The morphology of the lateral mesosoma was not treated by Polaszek (2009) due to the mounting method. The structure of the lateral mesosoma in *Am. wellsae* is representative of the genus. The netrion is clearly indicated, the transepisternal line terminates in anterior and posterior pits, the acetabular carina is visible at the anteroventral edge of the mesopleuron, and the sculpture of the metapleural carina is foamy (Fig. 51).

## Acknowledgements

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## Supplementary material I

### Revision of the Australian genus *Alfredella* Masner & Huggert

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Data type: Morphological terminology

Explanation note: List and definitions of morphological terms used in a Revision of the Australian genus *Alfredella* Masner & Huggert (Hymenoptera, Platygastriidae, Sceliotrachelinae).

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