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Mesochorus baccanellonyah sp. nov.; a new species of parasitoid wasp from South Australia

Erinn P. Fagan-Jeffries [1,2]*, Alice Woodward [3], Sylvia Clarke [3].

[1] School of Biological Sciences, The University of Adelaide, South Australia
[2] South Australian Museum, South Australia
[3] Murraylands and Riverland Landscape Board, South Australia
*Corresponding author: erinn.fagan-jeffries@adelaide.edu.au
Erinn Fagan-Jeffries https://orcid.org/0000-0002-3322-6255

Abstract

Mesochorus is a genus of ichneumonid wasps (Hymenoptera: Ichneumonidae) containing approximately 900 species which are generally hyperparasitoids of ichneumonid or braconid wasps, or occasionally of tachinid flies. The hosts of *Mesochorus* are generally endoparasitoids of larval insects such as Lepidoptera and Coleoptera. Only one species is currently described from Australia, of which the holotype can not be located. In 2022, students at Elliston Primary School in South Australia collected a specimen of *Mesochorus* in a Malaise trap as part of the citizen science project Insect Investigators. We here describe *Mesochorus baccanellonyah* Fagan-Jeffries, sp. nov. from this single specimen, both for the greater meaning this species name has to the community, and to help inspire future work on this genus in Australia.

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Introduction

The ichneumonid genus *Mesochorus* Gravenhorst, 1829 (Hymenotpera: Ichneumonidae: Mesochorinae) contains around 900 described species (Riedel, 2023; Sharkey et al., 2023; Yu et al., 2016), yet only one species is formally described from Australia. *Mesochorus pinarae* Girault, 1979 was described from a single specimen reared from larval "*Pinara despecta*" (Lepidoptera: Lasiocampidae) from "W. Australia" (Girault, 1979). The description of *M. pinarae* is brief and ambiguous, and the holotype has no depository listed and is listed as 'lost' by Gauld (1984); enquiries with collection managers at Australian institutions including the Western Australian Museum, Australian National Insect Collection and Queensland Museum (where many of Girault's other types are held) have yet to locate it. Without a more precise collection locality or an examinable holotype, the species is essentially unidentifiable due to the opaque description. Even the reported host, *Pinara despecta*, does not appear to be a valid genus and species combination, or at least we have not been able to locate an accepted synonym; according to the Australian Faunal Directory (ABRS, 2020), *Pinara* has six

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valid species in Australia, none of which list *despecta* as a synonym. The entry for *Entometa fervens* (Walker, 1855) lists *Entometa despecta* Walker, 1869 as a synonym, but we have not found a mention of this species ever being recognised within *Pinara*.

Mesochorus species are, as far as is known, koinobiont and endoparasitic hyperparasitoids, most often attacking parasitoid wasps in the superfamily Ichneumonoidea (and occasionally tachinid flies) who in turn are parasitoids of caterpillars (Lepidoptera), beetle larvae (Coleoptera) and larval sawflies (Symphyta) (Quicke, 2015; Sharkey et al., 2023). *Mesochorus* is found in all regions of the world, with the two most recent revisions describing new species using purely morphological data (39 new species from Southeast Asia) (Riedel, 2023) or conversely almost entirely using DNA barcodes as diagnoses (158 new species from Costa Rica) (Sharkey et al., 2023).

Like most of Australia's parasitoid wasp diversity, the Mesochorinae remains mostly undocumented due to a lack of taxonomists; it is highly likely that tens, if not more than a 100, species of *Mesochorus* are present in the country based on the numbers described in other regions. Gauld (1984) states that he saw 12 undescribed species of the genus in collections. Whilst in this taxonomic environment it might be considered unwise to describe an isolated species based off a single, slightly broken (missing the apical flagellomeres) specimen without host data, we here describe *Mesochorus baccanellonyah* as new with the following justification:

1) The holotype specimen has COI barcoding data publicly available, and can therefore be incorporated into future revisions of the genus that use *either* molecular or morphological data.

2) It is hoped that describing a new species of *Mesochorus* in a modern context will prevent future taxonomists becoming 'paralysed' by the existence of a single historical species with a lost holotype, and instead inspire future projects on this subfamily in the region.

3) The holotype specimen was collected by regional school students from Elliston Primary School in South Australia, as part of the citizen science program Insect Investigators. The species has a very special name dedicated to two people recently lost to the community, and therefore the description of this species has a broader importance and impact than simple taxonomic documentation.

Methods

The holotype specimen was collected in a Malaise trap in native scrubland next to Elliston Primary school during March 2022, whilst the students and teachers were participating in Insect Investigators, a citizen science project (insectinvestigators.com.au). The specimen (along with others from the trap samples) were barcoded for the standard cytochrome oxidase subunit 1 (COI) region by the Centre for Biodiversity Genomics, Guelph, Canada.

The specimen was identified as *Mesochorus* by both DNA barcoding data (through the identification of the sequence on the Barcode of Life Database) and through the key to world genera of Mesochorinae (Araujo, Vivallo & Santos, 2018).

We diagnose the species against those known from Southeast-Asia using Riedel (2023), and against the single described Australian species (*Mesochorus pinarae* Girault, 1979) using the original description (as the holotype has been missing since at least Gauld (1984) who lists it as 'lost'). As diagnosing the species against the ~900 *Mesochorus* known from other regions of the world is impractical, we use DNA barcodes to determine that the species is not closely related to any of the sequenced species with data publicly available. On the BOLD database (as of 25/10/2024) there are 503 BINs (Barcode Index Numbers, a form of Operational Taxonomic Unit) from 47 countries that are identified as *Mesochorus*; all of which have COI barcodes that are at least 7% divergent to the Elliston specimen.

Specimens were examined under an Olympus SZX16 microscope, with measurements taken using the Olympus cellSense imaging software. Images were taken on a Canon EOS 5DSR with a MP-E 65 mm lens, and stacked in Zerene Stacker (zerenesystems.com).

Characters used in the description, and morphological terms, generally follow Riedel (2023) to allow the species to be easily integrated with recent revisions of the genus in other regions, although we simplify and reduce some character descriptions, instead referring to relevant figures. Occasionally we substitute the Hymenoptera Anatomy Ontology (Yoder et al. 2010) preferred term for clarity (e.g. for mesoscutellar disc).

Body length was measured in lateral view, the sum of three straight lines: 1) the anterior edge of the head to the posterior of the mesosoma, 2) the length of T1 and 3) the length of the remainder of the metasoma, from the posterior boundary of T1 to the point in line with the end of the hypopygium.

Abbreviations used:

· OED: minimum distance between lateral ocellus and compound eye

· OOD: minimum distance between lateral ocelli

· T1: First metasomal tergite

The species epithet was collaboratively created during an online workshop with a class of Elliston Primary School students during December 2023. After a presentation on taxonomy and how species are named, students and teachers brainstormed name ideas on an online discussion board whilst receiving live feedback from the authors. The final name idea was decided by

vote during the workshop, and then slightly adjusted for clarity by the authors.

Discussion

We are aware of at least six other species of *Mesochorus* in Australia with publicly available DNA barcoding data on BOLD, including one represented by four specimens collected by Kalumburu Remote Community School in Western Australia as part of Insect Investigators in 2022 (BOLD:ADV8359, e.g. ASMII13815-22). There are likely many more represented in museum collections and undersampled habitats. Whilst a complete revision of the genus in Australia would be more ideal than an isolated species description, with the small number of taxonomists working on parasitoid wasps in the country, this may be some time coming.

We have not diagnosed *M. baccanellonyah* against *Mesochorus* species from outside Australia and Southeast Asia as it would be highly impractical. Whilst there is a small possibility this species is present in another country and a synonomy may be required in the future, on balance, it is unlikely. There are 2110 sequences identified as Ichneumonidae from Australia on BOLD (as of 26/10/2024), forming 403 different BINs. Only 30 (~7%) of those BINs also contain a sequence from another country; supporting the suggestion of Austin et al. (2004) that a high proportion of Australian hymenopteran species are endemic.

We observed that the teachers and students thoroughly enjoyed participating in the new discovery and the Insect Investigators project as a whole. During our visit to the school and the subsequent online workshop, they were highly engaged when we spoke to them about the taxonomic process and were passionate about collecting insects in their own local area.

Taxonomy

Family ICHNEUMONIDAE Latreille, 1802

Subfamily Mesochorinae Förster 1869

Genus *Mesochorus* Gravenhorst, 1829: 960.

Type species: *Mesochorus splendidulus* Gravenhorst.

For a list of synonyms, see Sharkey et al. (2023).

Mesochorus can be distinguished from other genera of Mesochorinae by the "dorsal margin of supraclypeal area with transverse carina below antennal sockets, even if weak or only partially developed" (Araujo, Vivallo & Santos, 2018).

Mesochorus baccanellonyah Fagan-Jeffries, sp. nov.

Figs 1–2

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Holotype: Female; AUS; S. Aust.; Elliston Primary School, in remnant native bushland next to school; -33.643, 134.892; 22–29 March 2022; Elliston Primary School Students and teachers leg.; Malaise trap as part of Insect Investigators; BOLD Process ID: ASMII8989-22; SAMA: 32-48142.

Mesochorus baccanellonyah can most likely be separated from *M. pinarae* by the colour of the mesoscutellar disc, which is orange in *M. pinarae* and probably black in *M. pinarae* (if Girault's 'disk scutum' is presumed to be analogous). Additionally, the area basalis (median basal area of the propodeum, anterior to the hexagonal areola) is longer than wide in *M. baccanellonyah* and is described as wider than long in *M. pinarae.*

In Riedel's key to Southeast-Asian subgenera (Riedel, 2023), *M. baccanelloyah* keys to subgenus *Mesochorus* Gravenhorst. In the key for the subgenus *Mesochorus* sensu stricto (Riedel, 2023), *M. baccanellonyah* keys to couplet 25, where it can be distinguished from both *M. pictiloides* Riedel and *M. annamensis* Riedel by fore wing vein 1cu-a being interstitial (in *M. pictiloides* vein 1cu-a is postfurcal by 0.4 × its length, and in *M. annamensis* by 0.6 × its length).

♀: Body length 3.1 mm. Fore wing length 2.5 mm.

Head. Flagellum slender, with 27 flagellomeres (holotype missing the seven most apical flagellomeres, but pictured in Fig. 1B); 1st flagellomere 6.0 × longer than wide (0.34 mm long) and 1.6 × longer than 2nd flagellomere, 2nd flagellomere 4.0 × longer than wide; preapical flagellomere ~2.0 × longer than wide. Lateral ocellus 0.08 mm; OED 1.6 × and OOD 0.8 × ocellar diameter. Occipital carina absent medially. Face (Fig. 2D) covered in regular punctures associated with setae, punctures separated by 1–1.5 × diameter of puncture, with weakly defined central longitudinal ridge, width of face (measured as distance between inner margins of eye at approximately halfway between subantennal transverse carina and posterior edge of clypeus) 0.40 mm, 1.1 × combined length of face and clypeus; inner eye margins approximately parallel. Subantennal transverse carina dipped medially. Clypeus with a few irregularly spaced punctures not associated with setae, larger than those on face. Malar space and ventral half of facial orbit striate. Mandible with two teeth, ventral tooth very slightly longer than dorsal tooth.

Mesosoma. 1.5 × longer than high in lateral view. Mesoscutum covered in punctures normally associated with a short white seta, very smooth along posterior margin. Mesoscutellar disc smooth with a few scattered punctures. Propodeum (Fig. 2A) completely carinate. Hind femur 4.7 × longer than wide; hind metatarsus 0.6 × as long as hind tibia and 2.5 × longer than 2nd hind tarsomere. Hind tarsal claw with two small basal spines, one longer than the other (viewed under 230 × magnification). Vein 1cu-a interstitial (Fig. 2C). Pterostigma 3.2 × longer than wide.

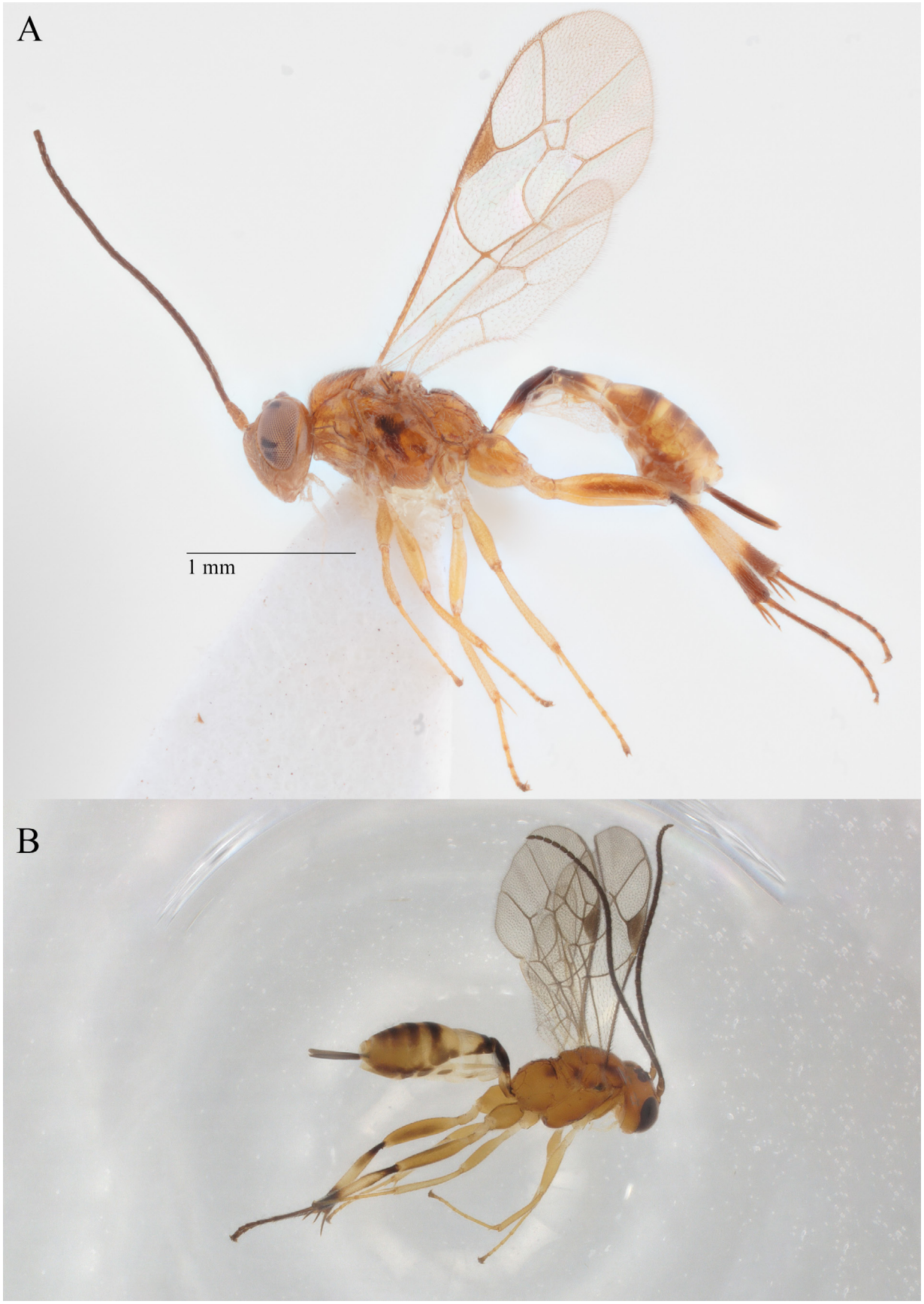

Figure 1: *Mesochorus baccanellonyah* holotype; **A.** lateral habitus **B.** specimen before DNA extraction (CC-BY 2022 Centre for Biodiversity Genomics).

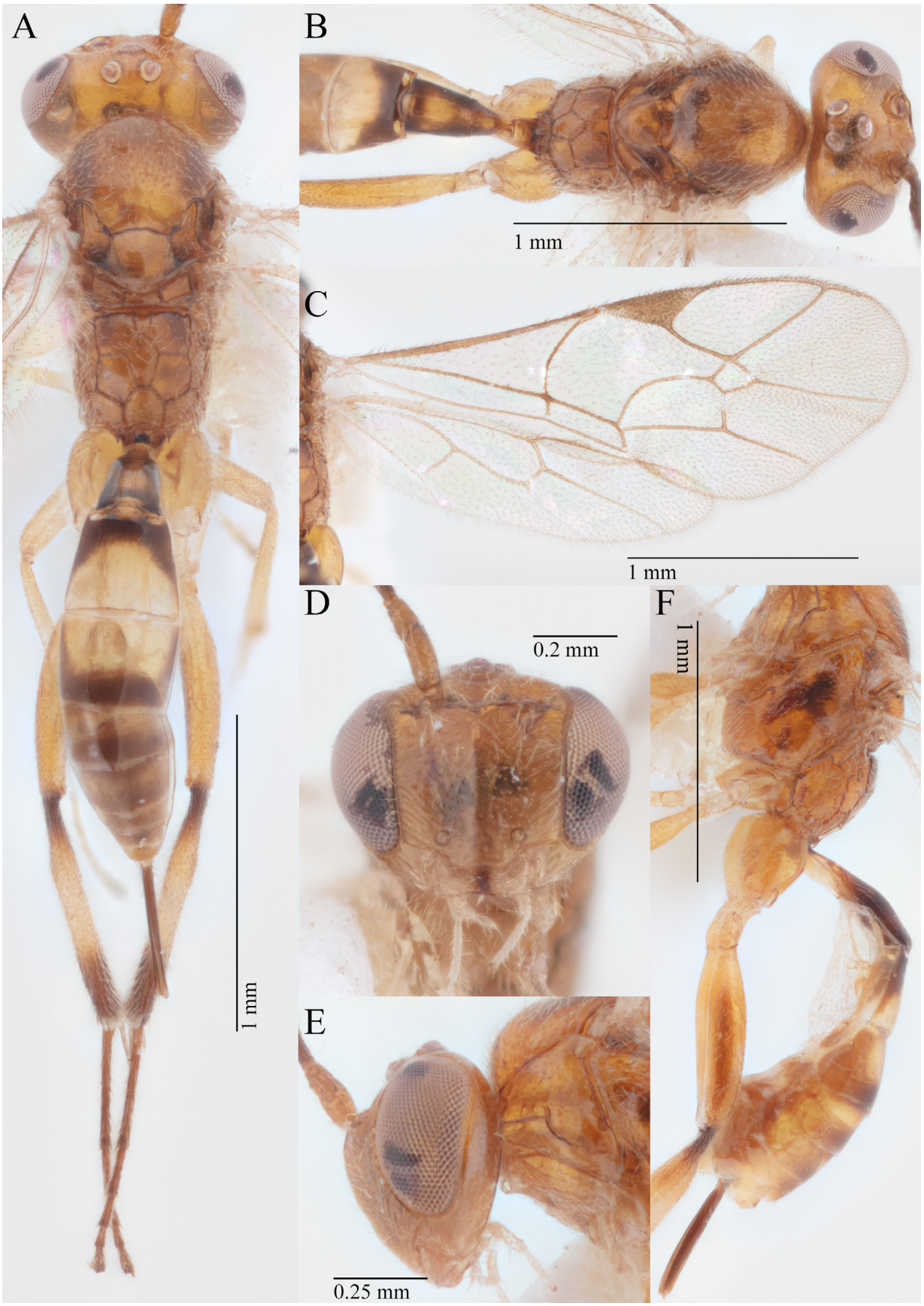

Figure 2: *Mesochorus baccanellonyah* holotype; **A.** dorsal habitus **B.** dorsal head, mesosoma and T1,2 **C.** fore and hind wings **D.** anterior head **E.** lateral head (enlarged from Fig 1A) **F.** lateral mesosoma and metasoma (enlarged from Fig 1A).

Metasoma. Tergites smooth (2A-B). Ovipositor sheath (Fig. 2F) 8.5 × longer than maximum width; 0.6 × as long as hind tibia; 1.2 × as long as hind metatarsus; several dense setae at anterior end of sheath, setae shorter and sparser for rest of length.

Color. Head including face and clypeus orange; palps, mandibles (except teeth) paler than face, cream-coloured; mandible teeth dark (Fig. 2D); Scape and pedicel same colour as face; flagellomeres darker than scape, brownish. Mesosoma orange with darker areas (Fig. 1A–B; 2A–B, F). All coxae paler than mesosoma; fore and mid legs completely pale orange; hind femur with darker area centrally; hind tibia dark proximally and distally with pale orange/cream area centrally; hind tarsi dark (Fig. 1A–B). Wing veins and pterostigma dark (Fig. 1B), though appearing paler, similar colour to mesosoma, under bright light (e.g. Fig. 1A). T1 mostly dark, with yellowish area anteriorly and posteriorly in dorsal centre (Fig. 2B); T2 mostly dark anteriorly, mostly pale posteriorly (Fig. 2A); T3 mostly pale anteriorly, dark in posterior third (Fig. 2A); remaining tergites mostly dark but yellowish laterally (Fig. 2A,F).

Male unknown.

Distribution: Currently known only from a single specimen from the west coast of Eyre Peninsula in South Australia.

Etymology: This name of this species holds a very special place in the community of Elliston. It is named in honour of two people the community lost during 2022-23: Nyah Dudley, the daughter of two teachers and younger sister of an Insect Investigators participant, an enthusiastic nature lover and friend to many in the school; and Simon Baccanello, a new but much-loved teacher to the class, someone whose personality, professionalism and love of life made it feel like he was part of the school community for far longer. This species also has a light-hearted connection to both people, being black and yellow in colouration (Mr Baccanello's nickname from lots of younger students based on his surname) and the 'big eyes and pigtail-like antennae' reminiscent of two of Nyah's most memorable features. The species epithet is a noun in apposition.

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References

ABRS (2020) Australian Faunal Directory. Australian Biological Resources Study, Canberra. Viewed 18 June 2024. https://biodiversity.org.au/afd/home

Araujo RO, Vivallo F, Santos BF (2018) Ichneumonid wasps of the subfamily Mesochorinae: New replacement names, combinations and an updated key to the world genera (Hymenoptera: Ichneumonidae). Zootaxa 4521(1), 52–60. https://doi.org/10.11646/zootaxa.4521.1.2

Austin AD, Yeates DK, Cassis G, Fletcher MJ, La Salle J, Lawrence JF, McQuillan PB, Mound LA, Bickel DJ, Gullan PJ, Hales DF, Taylor GS (2004) Insects "Down Under" - Diversity, endemism and evolution of the Australian insect fauna: Examples from select orders. *Australian Journal of Entomology*, 43(3), 216–234. https://doi.org/10.1111/j.1326-6756.2004.00448.x

Gauld ID (1984) An Introduction to the Ichneumonidae of Australia. British Museum (Natural History): 413 pp.

Girault AA (1979) New lower Hymenoptera from Australia and India. Memoirs of the American Entomological Institute 26: 293–298.

Quicke DLJ (2015) The Braconid and Ichneumonid Parasitoid Wasps. John Wiley & Sons, Ltd, Chichester, UK, 681 pp.

Riedel M (2023) Contribution to the taxonomy of the Southeast Asian Mesochorinae (Hymenoptera, Ichneumonidae). Zootaxa 5245: 1–72. https://doi.org/10.11646/zootaxa.5245.1.1

Sharkey MJ, Baker A, McCluskey K, Smith A, Naik S, Ratnasingham S, Manjunath R, Perez K, Sones J, D'souza M, Jacques BS, Hajibabaei M, Whitfield J, Arias D, Solis A, Metz M, Burns J, Zuñiga R, Phillips-Rodriguez E, Espinoza B, Chacon I, Hebert P, Hallwachs W, Janzen D (2023) Minimalist revision of Mesochorus Gravenhorst, 1829 (Hymenoptera: Ichneumonidae: Mesochorinae) from Área de Conservación Guanacaste, Costa Rica, with 158 new species and host records for 129 species. Revista de Biologia Tropical 71. https://doi.org/10.15517/rev.biol.trop..v71iS2.56316

Yoder MJ, Mikó I, Seltmann KC, Bertone MA, Deans AR (2010) A Gross Anatomy Ontology for Hymenoptera. Moreau CS (Ed.). PLoS ONE 5: e15991. https://doi.org/10.1371/journal.pone.0015991

Yu D, van Achterberg C, Horstmann K (2016) World Ichneumonoidea 2015. Taxonomy, Biology, Morphology and Distribution. Taxapad, Vancouver, Canada.