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Cover photo: *Glabellula australis*(Malloch).

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The genus *Glabellula* Bezzi (Diptera: Mythicomyiidae) in Australia, with descriptions of new species[1]

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Abstract. The microbombyliid genus *Glabellula* Bezzi in Australia is reviewed. Two new species, *G. tagos* Evenhuis, **n. sp**. and *G. whartoni* Evenhuis, **n. sp.,** are described and illustrated and a key to species is presented.

INTRODUCTION

Species of *Glabellula* Bezzi are tiny (2–4 mm in length), usually dark colored flies. Extant species of the genus are known from all the zoogeographic realms except the Oriental (it has been recorded from the Neotropical Region [viz., Central America in Evenhuis *et al.* (2009)], although it is not yet recorded from the South American continent). Previous to the commencement of my study of the world Mythicomyiidae in the late 1980s, specimens of *Glabellula* and other mythicomyiids were rarely collected and were uncommon in collections. With the advent of fine-mesh Malaise trap netting since the 1970s and a varied array of trapping methods such as colored water pan traps and pitfall traps, the numbers of collected mythicomyiids including *Glabellula* has dramatically increased. Their immature biology has only been touched upon by a few papers. Andersson (1974) showed them to be possible inquilines in the nest of *Formica* in Sweden. A recent paper by Mielczarek (2018) has corroborated the association with immatures and *Formica* in Poland and apparently made the first observation of a female ovipositing: he observed them ovipositing over an ant hill while hovering; the hovering oviposition behavior has also been seen in a few bombyliid subfamilies.

In Australia, very few works have focused on this genus. The first species described from Australia was originally described (Malloch 1924) in a separate genus (as *Pachyneres australis* Malloch). *Pachyneres* was soon after (Malloch 1928a) shown to be a junior synonym of *Glabellula* Bezzi. Since then, no new species in the genus have been described, yet a number of specimens from throughout the continent have been collected by various methods including hand netting, Malaise traps, and water pan traps.

The results of these efforts is that two new species have been found, viz., *Glabellula tagos* Evenhuis, **n. sp**. and *G. whartoni* Evenhuis, **n. sp.,** which are described and illustrated herein. The Australian species differ from most *Glabellula* found elsewhere in having a spherical-ellipsoid antennal first flagellomere without an evident second flagellar segment (Fig. 12) whereas other species have a distinct second flagellar segment of varying lengths [NB: I have at hand a few undescribed species from the United States and

1. Contribution 2019-001 to the Pacific Biological Survey.

Africa that also lack the second flagellar segment, but the first flagellomere shape is more conical in those species as opposed to globular in the Australian species.] In all other features, the Australian species fit the salient characters of *Glabellula*. With the new species found in this study, there are now three species known from Australia. A key to identify them is given.

MATERIAL AND METHODS

Specimens in this study have been seen in, are deposited in, or derive from the following collections: AMS (the Australian Museum, Sydney, New South Wales, Australia); ANIC (Australian National Insect Collection, CSIRO, Canberra, ACT, Australia); BPBM (Bernice Pauahi Bishop Museum, Honolulu, Hawai'i, USA); NLE (Neal Evenhuis personal collection, Honolulu, Hawai'i, USA; to be deposited in BPBM); UQ (University of Queensland Insect Collection, Brisbane, Queensland, Australia).

TAXONOMY

Genus *Glabellula* Bezzi

Platygaster Zetterstedt, 1837: 54. *Nomen nudum.*

Platygaster Zetterstedt, 1838: 574. Type species: *Platygaster arcticus* Zetterstedt, 1838, by monotypy. [Preoccupied by *Platygaster* Latreille, 1809.]

Sphaerogaster Zetterstedt, 1842: 22 (new replacement name for *Platygaster* Zetterstedt). Type species: *Platygaster arctica* Zetterstedt, 1838, automatic. [Preoccupied by *Sphaerogaster* Sturm, 1826.]

Glabellula Bezzi, 1902: 191 (new replacement name for "*Platygaster* . . . und *Sphaerogaster* . . . und *Glabella*"). Type species: *Platygaster arcticus* Zetterstedt, 1838, by subsequent designation of I.C.Z.N. (1989: 148 [Opinion 1545]).

Pachyneres Greene, 1924: 62. Type species: *Pachyneres crassicornis* Greene, 1924, by monotypy.

Proglabellula Hennig, 1966: 15. Type species: *Proglabellula electrica* Hennig, 1966, by monotypy.

The generic name for the species reviewed here was first described as *Platygaster* by Zetterstedt (1838) in his *Insecta Lapponica* monograph, with its type species, *Platygaster arctica*, by monotypy. Four years later, Zetterstedt (1842) noted that *Platygaster* was preoccupied in Hymenoptera by Latreille, 1809, and proposed *Sphaerogaster* as a replacement name for it. *Sphaerogaster* remained used until Loew (1873) supposed that it was preoccupied (in Coleoptera by Sturm, 1826). However, Loew was unsure that his new species *femorata* was synonymous with Zetterstedt's concept of *Sphaerogaster* and proposed *Glabella* as a new genus, rather than explicitly proposing it as a replacement name for *Sphaerogaster*. As luck would have it, *Glabella* too was preoccupied (by Swainson, 1840), which was pointed out by Bezzi (1902). Bezzi, unfortunately proposed *Glabellula* as a replacement name for *Platygaster* Zetterstedt, *Sphaerogaster* Zetterstedt, and *Glabella* Loew, which meant that there were two type species for the replacement name *Glabellula*. The situation was resolved when the International Commission on Zoological Nomenclature (1989) ruled that the type species of *Glabellula* Bezzi is *Platygaster arcticus*.

Zetterstedt (1838) originally placed *Glabellula* in the Acroceridae noting its similarity to the habitus of *Simulium*. Walker (1855) indicated that it probably belonged

Figs. 1–3. Australian *Glabellula* habituses, lateral view. **1**. *G. australis*. **2**. *G. tagos*, n. sp. **3**. *G. whartoni*, n. sp.

in a family other than the Acroceridae, but Becker (1900) was the first to explicitly place it in the Bombyliidae. Becker (1913) placed it within his subfamily Cyrtosiinae, but the next year Cockerell (1914) proposed separating it into the Glabellulinae. This last subfamily placement has been followed in subsequent systematic works and catalogs (e.g., Melander, 1950; Painter & Painter, 1965; Hull, 1973; Bowden, 1980; Evenhuis, 1989, 2002; Zaitzev, 1989; Yeates, 1994; Greathead & Evenhuis, 1997, 2001).

The genus *Glabellula* is distinguished from all other mythicomyiids based on the medial interruption of sclerotization on abdominal tergite II and in the wing by the tiny marginal cell of the wing formed by vein R_{2+3} joining R_1 well before the costa combined with the cell bm united with cell dm (= bm+dm in this work) (e.g. Fig. 8). Within this generic definition, species worldwide still have a wide array of shapes and sizes of head, thorax, and antennal flagellomeres allowing for a high degree of species diversity.

Key to species of *Glabellula* Bezzi occurring in Australia

1. Generally brown-colored species (Fig. 2); scutellum predominantly tan to yellow, brown color, if present, restricted to base; frons white; tip of oral margin tan; medial and anal region of wing with veins translucent to white ... (Western Australia)..... ..... ***Glabellula tagos*** Evenhuis, **n. sp**.
– Generally black-colored species (Figs. 1, 3); scutellum predominantly dark brown to black, yellow to white color, if present, restricted to lateral margins; frons yellowish brown to brown; tip of oral margin brown to black; veins in medial (all specimens) and anal region (most specimens) of wing brown 2

2. Wing with cell bm+dm open distally (Fig. 10); vein M_1 angled upward at wing margin; proboscis white to yellowish brown; interhumeral marks absent (Fig. 6) .... ***Glabellula whartoni*** Evenhuis, **n. sp**.
– Wing with cell bm+dm closed distally by a crossvein (Fig. 8); vein M_1 angled downward at wing margin; proboscis dark brown to black; interhumeral marks present (Fig. 4) or absent ..... *Glabellula australis* (Malloch)

Figs. 4–6. *Glabellula* thoraces, anterior view. **4**. *G. australis*. **5**. *G. tagos*, n. sp. **6**. *G. whartoni*, n. sp.

SPECIES ACCOUNTS

Glabellula (*Glabellula*) *australis* (Malloch)

(Figs. 1, 4, 7, 8,11, 12, 13)

Pachyneres australis Malloch, 1924: 205. Hardy, 1927: 337. Malloch, 1928b: 606. Colless & McAlpine, 1970: 707.

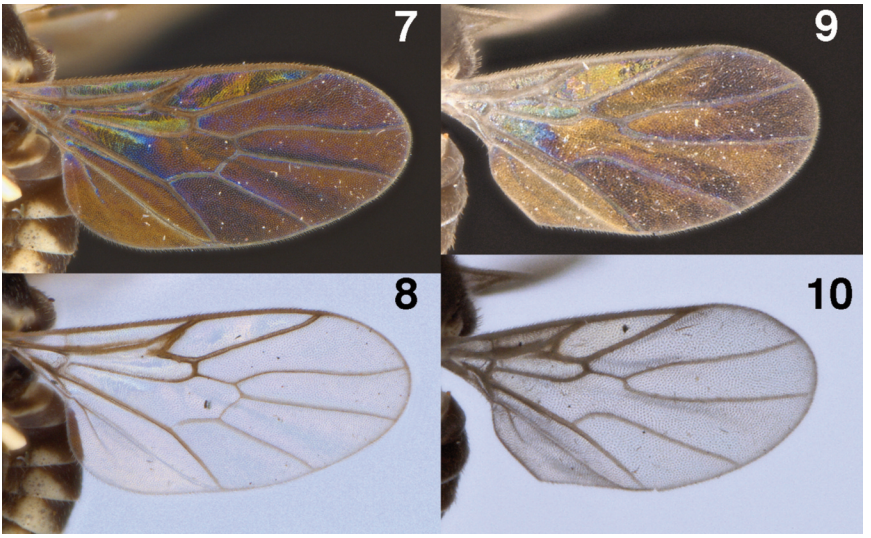
Glabellula australis (Malloch). Malloch, 1928a: 138; 1928b: 606. Melander, 1950: 141. Hennig, 1966: 15. Cole & Schlinger, 1969: 238. Schlüter, 1976: 360. Daniels, 1978: 425. Evenhuis, 1983: 465; 1989: 360; 2002: 28. Colless & McAlpine, 1991: 758. Schumann, 1991: 83.

Diagnosis. Most similar among Australian species to *G. whartoni* by the generally black color, but can be separated from it by the presence of a crossvein closing the cell bm+dm (this crossvein absent in *G. whartoni*) and vein M_1 angled downward at the wing margin (this vein angled upward in *G. whartoni*).

Redescription

Male. Length: 1.98–2.36 mm. Body generally dark brown to black. *Head*. Dark brown to black, virtually bare, occiput with minute white hairs along posterior eye margin; eyes dichoptic, separated at vertex by 1.5 × distance between lateral ocelli; front dark brown above, yellowish brown above antennal sockets; face yellowish brown to brown, tip of oral margin dark brown; antennae black; scape minute; pedicel cylindrical, slightly wider than long; flagellomere (Fig. 12) ovoid, length about 1.2 × greatest width, with very small depression apically, style absent; mentum dark brown; proboscis black, thick, length slightly extending beyond oral margin; labium large, one half-length of proboscis; labrum sclerotized, stiff, pointed apically, length one-half of proboscis length; palpus not evident.

Thorax. Mesonotum and scutellum subshining dark brown to black, with scattered yellowish brown hairs dorsally and anteriorly; humeral callus, thin notopleural line to wing base, thin ridge along postalar callus, small supra alar spot, interhumeral mark (Fig.



Figs. 7–10. *Glabellula* wings. **7**. *G. australis*, Wing Interference Pattern. **8**. *G. australis*, normal view. **9**. *G. whartoni,* n. sp., Wing Interference Pattern. **10**. *G. whartoni,* n. sp., normal view.

4), propleuron, and katepimeron yellow; halter stem brown, knob yellowish brown.

Legs. Coxae and legs dark brown, apices of femora and tibia paler brown to yellowish.

Wing (Fig. 8). Hyaline; costal and radial veins brown, remainder paler brown; costa fades between end of R_{4+5} and M_1 or ends at M_1; vein Sc incomplete, ending at level of origin of Rs; Rs evanescent at connection with R_1; R_{4+5} straight to wing margin, not curved; vein M_1 slightly curved toward wing margin; M_2 straight to wing margin; crossvein dm-cu closing cell dm present; CuA thick at base, thinning on apical 1/3 to wing margin; anal cell open in wing margin by width slightly less than r-m crossvein; A_1 straight to wing margin, not curved or sinuous. Wing Interference Pattern as in Fig. 7.

Abdomen. Dorsum dark brown, with scattered minute white hairs; yellow spots laterally on tergites II–VII, extending medially as posterior fasciae on tergites IV–VII, broadest on tergite VII; venter brown.

Genitalia (Fig. 11). Gonocoxites and epandrium dark brown; gonocoxa broadly elliptical in ventral view, semi-obovate in lateral view; gonostylus C-shaped, thin; epandrium subrectangular (longer than high) with large pointed pseudosurstylus separated (?articulating) from epandrium by thick dark suture; cercus hemispherical, pale yellow, with short hairs apically; distiphallus elongate-conical with pointed aedeagal apex; aedeagal apodeme peanut-shaped in lateral view, with long, thin lateral rami; parameral sheath thin apically, broadening to flared apex, long, extending from aedeagal apex to tip of aedeagal apodeme, with paired thick, thorn like processes apically, making phallus look trifid when viewed ventrally.

Female. Same as male except as follows: face paler than in male, often yellow brown, less so darker; mesonotum more extensively minute white haired dorsally; lateral mesonotal yellow marks more extensive in same areas; halter knob yellow with brown

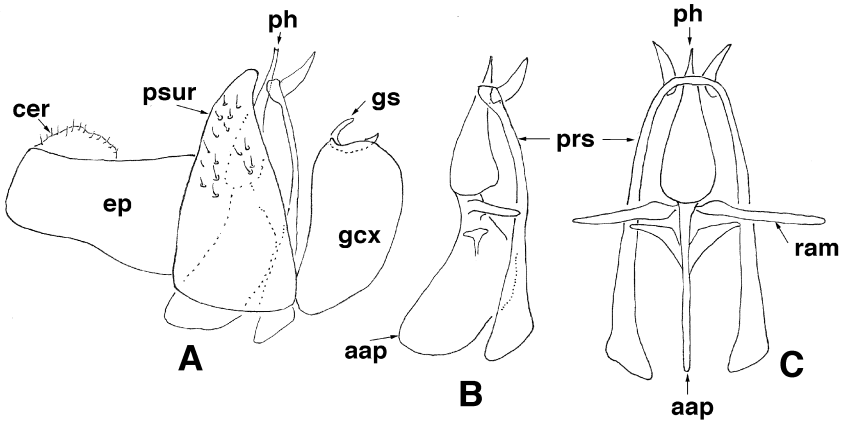


Fig. 11. *Glabellula australis*, male genitalia. **A**. hypopygium, lateral view. **B**. phallic complex, lateral view. **C**. phallic complex, ventral view. Abbreviations: aap = aedeagal apodeme; cer = cercus; ep = epandrium; gcx = gonocoxa; gs = gonostylus; ph = distiphallus; prs = parameral sheath; psur = pseudosurstylus; ram = lateral ramus.

dorsally; tibia brown to yellow; veins of wing paler than in male; anal cell more narrowly open in margin (or closed in a few specimens). *Genitalia* (Fig. 13): with genital fork U-shaped, thin, with caudal tip angled 90°; spermathecal reservoirs coiled, darkly sclerotized, with clear slightly swollen bulb basally with band of glandular trichomes, apical duct thin, as long as sperm pump; sperm pump with lightly sclerotized flared internal structure; basal or common duct absent.

Types. Holotype ♀ from Australia: **New South Wales**: Como, December 1923, H. Peterson. Holotype in AMS. Type examined. *Other specimens examined*: **Australian Capital Territory**: Black Mountain: 8♂♀, 4–31 Dec 1987, Malaise, M.E. Irwin (NLE); 3♀, 13 Oct 1977, 2 Dec 1979, 4 Jan 1980, Z. Liepa (ANIC). New South Wales: 1♂, Sassafras, 5 Nov 1968, D.H. Colless (ANIC). **Queensland**: 2♂, 5 km N Leyburn, 23 Jan 1988, G. and A. Daniels (UQ); 1, Murrays Spring, 7 km W Musselbrook Resource Center, Lawnhill [Boojimulla] National Park, 200 m, 18°35'15"S, 138°04'28"E, 14 May 1995, G. Daniels, M.A. Schneider, UQIC Reg. #53016 (UQ). 1♂, same data except 12 May 1995, M.A. Schneider, G. Daniels, UQIC Reg. #52015 (UQ). **Tasmania**: 1♂, Barrow Creek, 8 km NE Nunamara, 12 Jan–6 Feb 1983, Malaise, I.D. Naumann, J.C. Cardale (ANIC). **Western Australia**: 2♂, Moir's Rock, 42 km NNW Salmon Gums, 32.39°S/121.25°E, 2 Jan 1987, G. & A. Daniels (UQ).

Roberts (1929: 568) mentioned a specimen collected at Sydney in April, but it has not been examined in this study.

Remarks. Darker specimens are found in the Queensland and Tasmanian specimens, where the interhumeral marks are absent, otherwise the salient characters of the species are the same. Some dimorphism is noted within populations where females have a continuous yellow lateral notopleural stripe from the humeral callus to the postalar callus; this stripe is interrupted at the transverse suture by dark color in males. Given the presence of

specimens of *G. australis* in Western Australia as well as the eastern Australian states and Tasmania, it could be expected that further collecting will find populations in Victoria, South Australia and/or Northern Territory although the genus has not yet been recorded from those states.

Distribution: Australia: ACT, New South Wales, Queensland, Tasmania, Western Australia.

Glabellula (*Glabellula*) *tagos* Evenhuis, new species

(Figs. 2, 5, 14)

Diagnosis. Easily separated from the congeners in Australia by the generally brown color (*G. australis* and *G. whartoni* are generally black in coloration), by the tan scutellum (black in *G. australis* and *G. whartoni*), and by the white proboscis (yellowish brown in *G. whartoni* and dark brown to black in *G. australis*).

Description

Male. Length: 2.00–2.30 mm. Body generally brown to tan. *Head*. Brown, black at vertex, virtually bare, occiput with minute yellowish white hairs along vertex and posterior eye margin; eyes dichoptic, separated at vertex by 1.5 × distance between lateral ocelli; front brown above, white above antennal sockets; face white, tip of oral margin tan; antennae with scape minute; pedicel cylindrical, slightly wider than long, brown basally, yellowish apically; flagellomere ovoid, length about 1.2 ×greatest width, with very small depression apically; style absent; mentum tan; proboscis white, thick, length slightly extending beyond oral margin; labium large, white, one half-length of proboscis; labrum brown, sclerotized, stiff, pointed apically, length one-half of proboscis length; palpus not evident.

Thorax. Mesonotum subshining brown, with scattered yellowish white hairs dorsally and anteriorly; scutellum tan, yellowish apically; humeral callus, broad notopleural line to wing base, postalar callus, supra alar triangular spot, small interhumeral mark (Fig. 5), upper portions of all pleural sclerites yellow; halter stem and knob white, latter with small brown spot dorsally.

Legs. Coxae brown; femora brown basally, yellow to white apically; tibia and tarsi yellow to white.

Wing (cf. Fig. 2). Hyaline; veins pale yellow to translucent; costa ends slightly beyond end of M_1; vein Sc incomplete, ending at level of origin of Rs; Rs evanescent at connection with R_1; R_{4+5} straight to wing margin; vein M_1 slightly curved downward at wing margin; M_2 straight to wing margin; crossvein dm-cu closing cell dm present; anal cell open in wing margin by width subequal to that of r-m crossvein; A_1 straight to wing margin, not curved or sinuous.

Abdomen. Brown, with scattered minute white hairs dorsomedially; yellow spots laterally on tergites III–VIII, extending medially as posterior fasciae on tergites V–VIII, broadest on tergite VIII; venter brown, sternites II, III with yellow longitudinal stripe medially.

Genitalia. Not dissected; gonocoxa yellow epandrium yellow; pseudosurstylus yellow basally, brown apically.

Female. Same as male except as follows: *Genitalia* (Fig. 14): with genital ork U-shaped, thin, with caudal tip swollen, club-shaped; spermathecal reservoirs recurved,

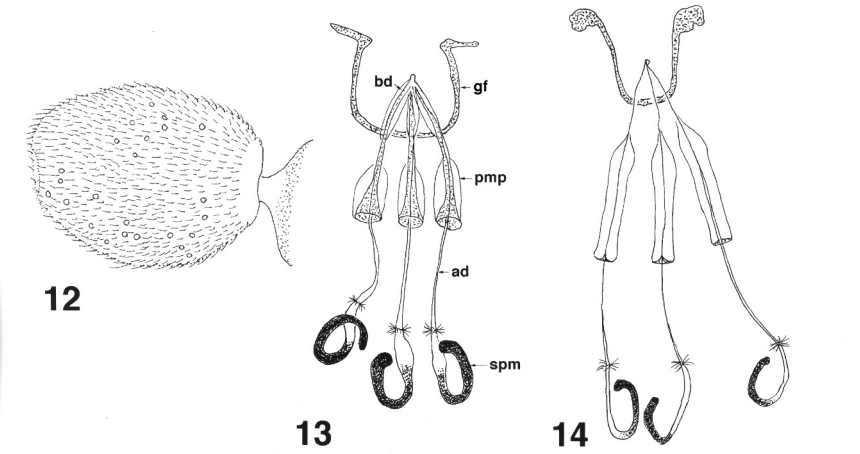


Fig. 12. *Glabellula australis*, antennal flagellomere, lateral view. **Figs. 13–14**. *Glabellula* female genitalia. **13**. *G. australis*. **14**. *G. tagos*, n. sp. Abbreviations: ad = apical spermathecal duct; bd = basal spermathecal duct; gf = genital fork; pmp = sperm pump; spm = spermathecal reservoir.

darkly sclerotized on apical half, with band of glandular trichomes basally, apical duct thin, as long as sperm pump; sperm pump with thin flared apical valve; basal duct thin, length slightly less than one-half length of sperm pump.

Types. *Holotype* ♂ from Australia: **Western Australia**: base of "the Governor" on Great Northern Highway, 722 m, 23°02.6'S, 118°50.2'E, 6–17 May 2003, Malaise trap in dry wash, M.E. Irwin, F.D. Parker (CSIRO-Schlinger Pilbara Expedition). *Paratypes*: **Western Australia**: 1♀, 1 km E. Marble Bar at Brookman Creek, Malaise trap in damp, sandy creek bed, 187 m, 21°09.0'S, 119°51.0'E, F.D. Parker, M.E. Irwin (CSIRO-Schlinger Pilbara Expedition; 1♂, 2♀, same data as holotype except Malaise trap in dry was in wooded area; 2♀, 36 km N. Tom Price on Hammersley Iron Road, 610 m, 22°36.5'S, 118°37.2'E, 20 Apr–4 May 2003, F.D. Parker, M.E. Irwin (CSIRO-Schlinger Pilbara Expedition). Holotype and paratypes in ANIC.

Etymology. The species name derives from the Greek ταγός = "mogul, chief"; and is treated here as a noun in apposition.

Distribution. Known only from Western Australia.

Glabellula (*Glabellula*) *whartoni* Evenhuis, new species

(Figs. 3, 6, 9, 10)

Diagnosis. Easily separated from the congeners in Australia by the open cell bm+dm (all others have his cell closed with an apical crossvein. *Glabellula whartoni* also exhibits vein M_1 angled upward at the wing margin (*G. australis* and *G. tagos*, n. sp. each have this vein angled downwards at the wing margin).

Description

Male. Length: 2.15–2.30 mm. Body generally dark brown to black. *Head*. Dark brown to black, virtually bare, occiput with minute white hairs along posterior eye margin; eyes

dichoptic, separated at vertex by 1.5 × distance between lateral ocelli; front dark brown above, yellowish brown above antennal sockets; face yellowish brown to brown, tip of oral margin dark brown; antennae black; scape minute; pedicel cylindrical, slightly wider than long; flagellomere ovoid, length about 1.2 × greatest width, with very small depression apically; style absent; mentum brown; oral genal cup white; proboscis yellowish brown to white, thick, length slightly extending beyond oral margin; labium large, one half-length of proboscis; labrum sclerotized, stiff, pointed apically, length one-half of proboscis length; palpus not evident.

Thorax. Mesonotum and scutellum subshining dark brown to black, with scattered yellowish white hairs dorsally and anteriorly; humeral callus, thin notopleural line to wing base, thin ridge along postalar callus, thin line along transverse suture from notopleural line, upper portions of propleuron and katepimeron yellow; no interhumeral marks present (Fig. 6); halter stem and knob brown, knob white basally.

Legs: Coxae and legs dark brown, apices of femora paler.

Wing (Fig. 10). Hyaline; costal and radial veins brown, remainder paler brown; costa ends slightly beyond R_{4+5}; vein Sc incomplete, ending at level of origin of Rs; Rs evanescent at connection with R_1; R_{4+5} straight to wing margin; vein M_1 angled upward at wing margin; M_2 slightly curved upward to wing margin; crossvein dm-cu closing cell dm absent; anal cell open in wing margin by width subequal to that of r-m crossvein; A_1 straight to wing margin, not curved or sinuous. Wing Interference Pattern as in Fig. 9.

Abdomen. Dorsum dark brown, with scattered minute white hairs; thin yellow posterior fasciae on tergites III–VIII; venter brown.

Genitalia. Not dissected. Hypopygium dark brown.

Female. Unknown.

Types. Holotype ♂ and 3♂ paratypes from Australia: **Western Australia**: Mt. Cook, 12–17 Jan 1999, R. Wharton, J. Woolley & G. Gibson. Holotype in ANIC; paratypes in BPBM.

Etymology. The specific name honors Robert Wharton for his efforts at collecting this new species and donating them for this study.

Distribution. Known only from Western Australia.

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