

Nine new species of *Dimophora* from Australia (Hymenoptera: Ichneumonidae): new insights on the distribution of a poorly known genus of parasitoid wasps

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Running title: *Dimophora* parasitoid wasps in Australia

Abstract

Parasitoid wasps fulfil a vital role in all terrestrial ecosystems as natural enemies of spiders and insects, including many agricultural pests. Despite their value in biological control, even the most basic knowledge of species diversity is missing for large parts of the world, including Australia. The ichneumonid genus *Dimophora* (Cremastinae) was previously known from eight extant species that, with the exception of the Neotropical *Dimophora daschi* Gauld, were all believed to occur only in the Northern Hemisphere. Here, eleven species of this genus are reported for the first time from Australia, nine of which are described as new (*D. biquadra* n. sp., *D. diabolica* n. sp., *D. kentmartini* n. sp., *D. lutulenta* n. sp., *D. migrosi* n. sp., *D. ocellata* n. sp., *D. ryhsi* n. sp., *D. ruficollis* n. sp., and *D. turista* n. sp.). The two remaining species, *D. nitens* (Gravenhorst) and *D. evanialis* (Gravenhorst), also occur in the Holarctic region; their presence in Australia might thus represent recent invasions. However, as the current study illustrates, our knowledge of ichneumonid diversity

is far too patchy in most regions of the world to draw sound conclusions about biogeographic patterns. Phylogenetic analyses are needed to decide whether the surprisingly high diversity of *Dimophora* in Australia is due to a recent radiation, if it indicates that this is its centre of origin, or if it simply reflects a relict distribution of the genus. In any case, the doubling of the number of species of this rare genus demonstrates the need for taxonomic studies of parasitoid wasps in Australia.

Key words alpha-taxonomy, biogeography, species description, species richness.

Introduction

Ichneumonid parasitoid wasps complete their larval development inside or attached to immature stages of insects or spiders which they eventually kill in the process; they play a vital role in almost every terrestrial ecosystem, including agricultural settings (Quicke 1997). Numerous species have been successfully used as biocontrol agents, for instance several species of Rhyssinae that keep the populations of the introduced woodwasp *Sirex noctilio* Fabricius at bay in Australia and New Zealand (Taylor 1976). A deeper understanding of the biology, population dynamics and evolution of parasitoids is often hampered by the lack of very basic knowledge on species diversity, which can also prevent effective biocontrol.

The ichneumonid fauna of Australia is very poorly known. Gauld (1984a) compiled a seminal work that was based on thousands of ichneumonid specimens from all major collections in Australia as well as a vast amount of newly collected material. In this work, he provided a useful key to the ichneumonid subfamilies present in Australia, reported 135 known and 80 new genera from the country and listed a tentative number of morphospecies for each genus. He estimated that there might be about 2,000 ichneumonid species on the continent, of which less than a third have been described (Yu et al. 2012). Since then, only very little progress has been made in ichneumonid taxonomy in Australia, with most work containing only single species descriptions, often in the context of agricultural pests and biocontrol. Notable exceptions include a few comprehensive revisions of genera and even small and medium-sized subfamilies (Gauld 1984b; Gauld & Holloway 1986; Fitton 1987; Jerman & Gauld 1988; Wharton et al. 2008; Wharton et al. 2010). Wahl and Sharkey (1993) partly updated the taxonomy of Gauld (1984a) and also included subfamilies that have not (yet) been reported from Australia.

In the subfamily Cremastinae, which mainly parasitise concealed microlepidopterans, current knowledge lags even more behind the actual diversity of the Australian fauna. In what is certainly an underestimate of the total species richness, Gauld (1984a) mentions that he has seen 128 morphospecies (nine *Dimophora*, one *Gahus*, 50 *Pristomerus*, 55 *Temelucha*, and 13 *Trathala*). To date only ten of these have been formally described, mostly by Girault (1925a, 1925b, 1933) who described five species currently classified in the genus *Pristomerus*. Kerrich (1959) added two species to the two known Australian *Temelucha* (Morley 1912; Szépligeti 1906), and Gauld (1984a) erected the new genus *Gahus* and described its type species. No Australian species were ever described in the genus *Dimophora*.

In a first effort to describe the Australian cremastine fauna, I here revise the genus *Dimophora* to include eleven Australian species, nine of which are described as new. A dichotomous key to the Australian species is provided, and species descriptions and high-resolution photographs allow confirmation of the identifications. Finally, I discuss implications of the current study for the biogeographic history of the genus and for ichneumonid taxonomy in Australia.

Materials and Methods

To denote the states of Australia, the official abbreviations are used (ACT = Australian Capital Territory, NT = Northern Territory, QLD = Queensland, SA = South Australia, TAS = Tasmania, VIC = Victoria, WA = Western Australia).

A total of 126 Australian specimens of this genus could be obtained from the following collections:

ANIC - Australian National Insect Collection, CSIRO, Canberra, ACT, Australia (53 specimens)

BMNH - Natural History Museum, London, UK (67 specimens)

QM - Queensland Museum, Brisbane, QLD, Australia (1 specimen)

WINC - Waite collection at the University of Adelaide, SA, Australia (5 specimens)

Several additional collections in Australia were visited and searched for *Dimophora* specimens, among both the sorted and unsorted ichneumonid material, but without any success. These include, sorted by state: Museum and Art Gallery of the Northern Territories and the Department of Primary Industries and Fisheries in Darwin (NT), Queensland Primary Industries Insect Collection in Brisbane (QLD), the Tasmanian Museum and Art Gallery and

Tasmanian Agricultural Insect Collections in Hobart (TAS), and Museum Victoria in Melbourne (VIC).

The morphological terminology follows Gauld (1984a). Measurements were taken from up to ten specimens per species and sex, if available, using an ocular with a scale mounted on a standard stereo microscope. Ovipositor length was defined as the portion which protrudes from the apex, i.e., is identical to the length of the ovipositor sheaths (which are often difficult to measure because they distort in dried specimens). Tergite length was measured laterally, and width was measured at both the base and the apex. Images were taken using a Visionary Digital BK+ photo system which consisted of a Canon 7D digital camera and a Canon 180 mm Macro lens or a K2 lens system attached to it. Images were stacked using the Zerene Stacker software (version 1.04) and edited in Adobe Photoshop CS5.

Taxonomic part

Genus *Dimophora* Förster, 1869: 155

Dimophorus Thomson, 1889: 1355–1356

Oligotmema Cushman, 1920: 280

Type species: *Dimophora robusta* Brischke, 1880

Genus diagnosis

Within the Australian Cremastinae, *Dimophora* is very easily identified by the presence of a large and well-defined, almost rhombic areolet; none of the other genera reported from the continent show any trace of the outer vein of the areolet (vein 3r-m). *Dimophora* species are rather stout, have no traces of thyridiae on the second tergite, no tooth on the hind femur, and the lower edges of the first tergite are parallel, separated by a visible portion of the first sternite for their entire length.

The areolet is also present in some New World cremastine genera: *Xiphosomella*, *Creagrura*, and *Polyconus* differ from *Dimophora* by their well-developed thyridiae; *Eiphosoma* bears a tooth below the hind femur; and *Ptilobaptus* has the lateral sides of the first tergites extended ventrally, so that they touch ventrally and cover part of the first sternite. From the Old World, only two genera known from the Ethiopian region have an areolet: *Eurygenys* has a very small clypeus with a median tooth and the lateral part of the second tergite hanging down, even though it is separated from the dorsal part by a crease; and the curious *Belesica* is easily recognized by a flattened horn between the antennal bases and

strongly bulging genae. Townes (1971) provided a key and additional characters to identify the cremastine genera known worldwide.

Comments

Eleven species were distinguished among the Australian material. A dichotomous key is given here to aid in their identification, and diagnoses and descriptions of all species follow there-after, in alphabetical order. The diagnoses include forewing length, number of flagellomeres and all characters mentioned in the key, while the descriptions cover a broader range of characters. If notable intra-specific variation was encountered, then this is reflected in the species sections, with values or states of the holotype given in brackets.

Key to the Australian species of *Dimophora*

1. Head between compound eye and antennal base with protrusion (Fig. 1). Area superomedia of propodeum usually wider than long or about as long as wide, sometimes up to 1.5 times longer than wide. Larger species, forewing length 4.4–7.1 mm. 2
 - Head between compound eye and antennal base unmodified, flat. Area superomedia of propodeum almost always distinctly longer than wide. Smaller to larger species, forewing length 2.5–5.2 mm. 3
2. Head and mesosoma black, at most with some orange or yellow areas along inner eye margin, on clypeus and in malar space (Fig. 3A). Portion of ovipositor that protrudes from metasoma 0.8–1.3 times as long as hind tibia. *Dimophora diabolica* sp. n.
 - Head and mesosoma predominantly orange, black only on back of head and whole mesoscutum (Fig. 5A). Ovipositor 1.15–1.7 times as long as hind tibia. *Dimophora kentmartini* sp. n.
3. Mesoscutum orange or red. Back of head usually orange, but sometimes with black areas. 4
 - Mesoscutum black. Back of head always with at least some black areas, usually all dark. 5
4. Antenna from base dark brown–ivory–black (Fig. 12A). Metasoma and hind femur and tibia black or dark brown. Mesosoma dark orange. Ocelli not enlarged, hind ocelli separated from compound eye by more than 1.5 times their diameter (Fig. 12C). [male unknown] *Dimophora turista* sp. n.
 - Antenna all black or dark brown. Metasoma with tergite 2 and usually also 3 orange or yellow, hind femur and tibia orange or brown (Fig. 9A). Mesosoma orange. Ocelli enlarged, hind ocelli separated from compound eye at most by their diameter (Fig. 9C). [female unknown] *Dimophora ocellata* sp. n.

5. Face black, at most with some orange along inner eye margins and light marks across malar space. Pronotum black. 6
- Face orange, yellow, or brown, clearly lighter than dark back of head (in *D. biquadra*, the orange facial pattern is restricted to sides of lower half of face, reaching about halfway between clypeus and antennal sockets, Fig. 2B). Pronotum orange, red, or brown at least along anterior margin, clearly lighter than mesoscutum. 7
6. Metasoma with tergite 2 and often also most of tergites 1 and 3 red or orange, remainder black or dark brown (Fig. 8A). Larger species, forewing length 4.3–5.8 mm. Antenna with more than 30 flagellomeres. Hind femur and tibia orange or brown.
- Dimophora nitens* (Gravenhorst)
- Metasoma black or brown, usually with a light band basally on tergite 3 (Fig. 4F). Smaller species, 2.7–3.6 mm. Antenna with 30 or less flagellomeres. Hind femur and tibia often darkened. *Dimophora evanialis* (Gravenhorst)
7. Larger species, forewing length 4.6–5.2 mm. Metasoma orange, at most with some irregular brown markings mostly on laterotergites (Fig. 7A). Mesosoma orange except for black mesoscutum and base of propodeum. *Dimophora migrosi* sp. n.
- Smaller species, forewing length at most 4.2 mm. Metasoma usually with extended dark brown colouration, especially on tergites 1 to 3 (in males of *D. lutulenta*, only tergite 1 is mostly dark). Mesopleuron and propodeum usually with more extensive dark colouration. 8
8. Very small species, forewing length 2.5–2.7 mm. Antenna with 23–24 flagellomeres. Mesoscutum very short, about 0.7–0.8 times as long as wide (Fig. 10C).
- Dimophora rhyssi* sp. n.
- Larger species, forewing length 2.8–4.2 mm. Antenna with at least 26 flagellomeres. Mesoscutum usually shorter than wide, but never as strongly shortened. 9
9. Mesosoma orange at least on pronotum, often propleuron, part of mesosternum and apex of propodeum (Fig. 6A). Mesopleuron and areas of propodeum strongly coriaceous, with punctures often less conspicuous than the matt background sculpture.
- Dimophora lutulenta* sp. n.
- Mesosoma with orange colour less pronounced, usually only on pronotum, and a diffuse brown on parts of mesopleuron or propodeum. Mesopleuron and areas of propodeum not as strongly coriaceous, with punctures more conspicuous than background sculpture and at least with some shiny areas between the punctures. 10
10. Face mostly orange (Fig. 11B). Ovipositor shorter than hind tibia (0.7–0.8).

Dimophora ruficollis sp. n.

- Face with orange colouration only on the sides of the lower face (Fig. 2B). Ovipositor as long as or longer than hind tibia (1.0–1.3).

Dimophora biquadra sp. n.

***Dimophora biquadra* sp. n.**

<http://zoobank.org/urn:lsid:zoobank.org:act:105FF229-8202-4FB4-B97E-4828BD9C2491>

Figure 2

Etymology: This name refers to the two quadratic marks laterally on the lower face (Fig. 2B).

Diagnosis: (Male unknown). Forewing length 3.35–3.5 (holotype: 3.5) mm. Antenna with 30–31 (30) flagellomeres. Head between eye and antennal base flat, without protrusion. Ocelli of female slightly enlarged, distance of hind ocellus to compound eye about 1.25 times diameter of ocellus. Mesoscutum about as long as wide. Mesopleuron with some coriaceous sculpture between strong punctures and with moderate impunctate area around speculum. Area superomedia of propodeum about as long as wide; areas of propodeum smooth and shining between strong punctures. Portion of ovipositor that protrudes from metasoma 1.05–1.3 (1.3) times as long as hind tibia.

Description: *Head.* Clypeus moderately large, convex when viewed from side, margin convex; mandibles with lower tooth longer than upper tooth. Occipital carina complete, evenly arched or slightly angled above. Genal carina joining oral carina briefly before reaching base of mandible. Whole head coriaceous and matt, face and clypeus with dense and strong punctures, vertex with some sparse punctures. Antenna with last flagellomeres about as long as wide, scape excised at an angle of about 50°.

Mesosoma. Pronotum with epomia indistinct; mesoscutum without notauli; mesopleuron with sternaulus only slightly impressed; scutellum not carinate. Propodeum with complete set of carinae, longitudinal carinae sometimes weak medially; metapleuron with short vertical carina arising above mid coxa. Mesosoma weakly to strongly coriaceous and with strong and dense punctures. Wings hyaline, radial cell along anterior margin of wing 1.0–1.3 times as long as stigma, areolet large, almost rhombic; hind wing with outer veins reduced, usually not pigmented except at base. Legs simple, hind coxa coriaceous and matt.

Metasoma. First tergite 1.6–1.7 times as long as second tergite, second tergite 1.5–1.6 times wider apically than basally. First tergite with rather shallow but long glymma, petiolus

flattened; first sternite reaching to about half the length of tergite, its sides parallel. Third tergite with laterotergite separated by crease at most at very base; metasoma weakly compressed from tergite 3 onwards. Tergites smooth and shining, almost impunctate, tergites 1 and 2 with quite strong longitudinal striae. Ovipositor almost straight, only weakly down-curved towards tip, laterally compressed, with subapical notch.

Colouration of female: Head black, clypeus and mandibles orange to yellow, yellow from malar space extended upwards over about half height of face as two squares next to compound eyes; antenna black or dark brown, lighter brown to orange towards base. Mesosoma including scutellum black, anterior margin of pronotum and propleurae orange; legs orange, hind tibia darker orange and hind tarsi brown; forewing with stigma often lighter in anterior half. Metasoma brown, lighter brown towards posterior end, especially on laterotergites.

Material examined: Holotype #f, QLD, Windsor Tableland; iii.1981; leg. R.Storey; BMNH. One paratype #f, from the same location.

***Dimophora diabolica* sp. n.**

<http://zoobank.org/urn:lsid:zoobank.org:act:533B86F2-A405-4B1C-9FDD-592338435B9E>

Figure 3

Etymology: This species got its name because of the two facial protrusions that are reminiscent of horns (Fig. 3C), which in combination with the black and red colouration, are features and colours often associated with the devil.

Diagnosis: Forewing length 4.4–7.1 mm (holotype: 6.3). Antenna in females with 33–38 (38), in males with 36–40 flagellomeres. Head with protrusion between eye and antennal base (Fig. 1). Ocelli of male not enlarged, distance of hind ocellus to compound eye about 1.5 times diameter of ocellus. Mesoscutum about as long as wide to distinctly longer than wide. Mesopleuron smooth and shining between strong punctures, often with parallel wrinkles especially in anterior half, with moderate to large impunctate area around speculum. Area superomedia of propodeum about as long as wide to slightly longer; areas of propodeum smooth and shining between strong punctures. Portion of ovipositor that protrudes from metasoma 0.8–1.3 times as long as hind tibia.

Description: *Head.* Clypeus moderately large, convex when viewed from side, margin convex; mandibles with lower tooth longer than upper tooth. Occipital carina complete,

evenly arched or slightly angled above. Genal carina joining oral carina briefly before reaching base of mandible. Whole head coriaceous and matt, face and clypeus with dense and strong punctures, vertex with some sparse punctures. Antenna with last flagellomeres about as long as wide, scape excised at an angle of about 50°.

Mesosoma. Pronotum with epomia distinct; mesoscutum with notauli barely reaching behind level of tegula; mesopleuron with sternaulus deeply impressed; scutellum not carinate. Propodeum with complete set of carinae, longitudinal carinae sometimes weak medially; metapleuron with short vertical carina arising above mid coxa. Mesosoma smooth and shining and with strong and dense punctures, mesoscutum but not scutellum coriaceous between punctures. Wings slightly tinged, radial cell along anterior margin of wing 0.95–1.25 times as long as stigma, areolet large, almost rhombic; hind wing with outer veins reduced, usually not pigmented except at base. Legs simple, hind coxa coriaceous and matt.

Metasoma. First tergite 1.6–2.0 times as long as second tergite, second tergite 1.5–1.8 times wider apically than basally. First tergite with a rather shallow but long glymma, petiolus flattened; first sternite reaching to about half length of tergite, its sides parallel. Third tergite with laterotergite separated by crease at most at base; metasoma weakly compressed from tergite 3 onwards. Tergites smooth and shining, almost impunctate, tergites 1 and 2 with weak longitudinal striae. Ovipositor weakly to strongly down-curved, laterally compressed, with subapical notch; male clasper bluntly rounded.

Colouration of female: Head black, orange often apically on clypeus, orange or yellow in malar space, antenna either all dark or with median segments orange and basal segments brown. Mesosoma black, legs orange or red, forewing with stigma often lighter in anterior half. Metasoma red, posterior segments often brown.

Colouration of male: As in female.

Material examined: Holotype #f, NSW, Batlow, Bago forest, Pilot Hill, Experimental Control area, Phasid Ecol. Exp.; 12.iii.1957; leg. T.G.Campbell; ANIC. Paratypes: Same as holotype: 1#m, 1#f. ACT, Black Mountain, Malaise site 2; 18.-29.ii.1980; leg. D.H.Colless; ANIC: 1#f. ACT, Canberra, Black Mountain; ix.1981; leg. I.Gauld; BMNH, 1#f. ACT, Canberra, Malaise trap; 3.iii.1980; leg. C.R.Tidemann; ANIC: 2#f. 18.iii.1980: 1#f. 20.ii.1981: 1#f. 23.xii.1978; leg. N.J.Short: 1#f. ACT, Honeysuckle creek, 35.35S / 149.00E, Malaise trap; 21.-31.iii.1985; leg. I.Naumann, I.Cardale; ANIC: 1#f. NSW, Brown Mountain; 10.iii.1961; leg. D.H.Colless; ANIC: 2#f. TAS, 5km W Buckland, 42.37S / 147.39E; 27.i.1983; leg. I.Naumann, I.Cardale; ANIC: 1#m. TAS, Collins Vale, Fairy Glen; i.-ii.1983; leg. Williams & Gauld; BMNH: 1#f. TAS, Tasmania, Mt. Barrow Rd, 890m. Nothofagus

etc., beating *Acacia dealbata* foliage; 15.-17.ii.1980; leg. A.Newton, M.Thayer; ANIC: 1#f. VIC, Upper Buckland River; 29.ii.1964; leg. A.Neboiss; ANIC: 1#m.

***Dimophora evanialis* (Gravenhorst, 1829a: 16) (*Mesoleptus*)**

cognata Brischke, 1880: 177

annellata (Thomson, 1890: 1458) (*Dimophorus*)

prima (Cushman, 1920: 280) (*Oligotmema*)

meridionator (Aubert, 1959: 163) (*Dimophorus*)

Figure 4

Diagnosis: Forewing length 2.9–3.4 mm (European specimens: 2.7–3.7). Antenna in females with 27–30, in males with 25–26 flagellomeres. Head between eye and antennal base flat, without protrusion. Ocelli of male not enlarged, distance of hind ocellus to compound eye about 1.5 times diameter of ocellus. Mesoscutum 0.8–1.0 times as long as wide. Mesopleuron smooth and shining between strong punctures, sometimes with some restricted coriaceous areas, and with moderate impunctate area around speculum. Area superomedia of propodeum longer than wide; areas of propodeum smooth and shining between strong punctures. Portion of ovipositor that protrudes from metasoma 0.7–1.0 times as long as hind tibia.

Description: *Head.* Clypeus moderately large, convex when viewed from side, margin convex; mandibles with lower tooth longer than upper tooth. Occipital carina complete, evenly arched to angled above. Genal carina joining oral carina briefly before reaching base of mandible. Whole head coriaceous and matt, face and clypeus with dense and strong punctures, vertex with some sparse punctures. Antenna with last flagellomeres wider than long, scape excised at an angle of about 45°.

Mesosoma. Pronotum with epomia weak to absent; mesoscutum with notauli absent to barely visible; mesopleuron with sternaulus weakly to distinctly impressed; scutellum not carinate. Propodeum with complete set of carinae, longitudinal carinae sometimes weak medially; metapleuron with short vertical carina arising above mid coxa. Mesosoma smooth and shining and with strong and dense punctures, mesoscutum but not scutellum strongly coriaceous between punctures. Wings slightly tinged, radial cell along anterior margin of wing 1.0–1.15 times as long as stigma, areolet large, almost rhombic; hind wing with outer veins reduced, usually not pigmented except at base. Legs simple, hind coxa coriaceous and matt.

Metasoma. First tergite 1.6–2.0 times as long as second tergite, second tergite 1.5–1.8 times wider apically than basally. First tergite with rather shallow but long glymma, petiolus flattened; first sternite reaching to about half length of tergite, its sides parallel. Third tergite with laterotergite separated by crease at most at base; metasoma weakly compressed from tergite 3 onwards. Tergites smooth and shining, almost impunctate, tergites 1 and 2 with weak longitudinal striae. Ovipositor weakly down-curved, laterally compressed, with subapical notch; male clasper bluntly rounded.

Colouration of female: Head black, orange often on clypeus, orange or yellow in malar space and on mandibles, antenna dark. Mesosoma black, legs orange, dark brown to black basally on mid and sometimes fore coxae, most of hind coxa, and often most of hind femur, hind tibia orange or dark brown; forewing with stigma often lighter in anterior half. Metasoma black or dark brown, lighter basally on tergite 3, and posterior segments often with light apical bands.

Colouration of male: As in female.

Material examined: ACT, Canberra, Black Mountain; ix.1981; leg. I. Gauld; BMNH: 1#f. ACT, Wallaroo Rd, near Hall, Malaise trap; Mar Apr or May 1999-2003; leg. Mark Short; ANIC: 1#f. NSW, Offord; 31.i.1961; leg. D.H.Colless; ANIC: 1#f. NSW, Pearl Beach, Crommlin Biological Field Station, 33.5511°S / 151.2978°E; xii.2009; leg. Andy Austin; WINC: 2#f. NSW, Pearl Beach, Crommlin Biological Field Station, 33°55'030"–49°613"S / 151°29'795"–68°22"E; 18-24.ii.2008; leg. Andy Austin; WINC: 1#m. QLD, 28km S Miles; 23.ix.1980; leg. D.H.Colless; ANIC: 1#f. VIC, Dinner Plain, 11km from Hotham Heights; 27.ii.1980; leg. I.Naumann, I.Cardale; ANIC: 1#m. VIC, Victoria; 1912; leg. C. French; BMNH: 1#f. WA, Yallingup; xi. 1913; leg. R.E. Turner; BMNH: 1#m. Unknown locality, leg. J.A. Berry, ANIC: 1#f.

Material from Europe: United Kingdom, British Isles; BMNH: 1#m. Channel Islands, Brecqhou Island; 21.viii.1967; leg. C.I.E.A.; BMNH: 1#f. England, Sussex, W. of Arundel; 20.viii.1984; leg. M.Edwards; BMNH: 1#f.

Notes: The Australian specimens differ slightly from the specimens seen from Europe which often lack the yellow colouration in the malar space and have fewer flagellar segments. However, these differences do not seem to justify the erection of a new species; they might merely represent regional differences.

***Dimophora kentmartini* sp. n.**

<http://zoobank.org/urn:lsid:zoobank.org:act:5DDB821E-71F5-49E9-89EE-DB6F806A77ED>

Figure 5

Etymology: This species is dedicated to my great friend Kent Martin who provided me with all the natural and cultural knowledge necessary to survive a year as a researcher in Australia. As Kent put it himself, the species furthermore has a certain adventurous air to it, which also is the case for its eponym.

Diagnosis: Forewing length 4.4–6.4 mm (holotype: 6.4). Antenna with 37–39 flagellomeres in both sexes (38). Head between eye and antennal base with protrusion (Fig. 1). Ocelli of male not enlarged, distance of hind ocellus to compound eye about 1.5 times diameter of ocellus. Mesoscutum about as long as wide. Mesopleuron smooth and shining between strong punctures, with parallel wrinkles especially in anterior half and with large impunctate area around speculum. Area superomedia of propodeum wider than long, as long as wide, to up to 1.5 times longer than wide (wider than long); areas of propodeum smooth and shining between strong punctures. Portion of ovipositor that protrudes from metasoma 1.15–1.7 (1.7) times as long as hind tibia.

Description: *Head.* Clypeus moderately large, wide, convex when viewed from side, margin convex; mandibles with lower tooth longer than upper tooth. Occipital carina complete, evenly arched or straight to slightly dipped above. Genal carina joining oral carina briefly before reaching base of mandible. Whole head coriaceous and matt, face and clypeus with dense and strong punctures, vertex with some sparse punctures. Antenna with last flagellomeres about as long as wide, scape excised at an angle of about 50°.

Mesosoma. Pronotum with epomia often weak, sometimes distinct; mesoscutum with notauli barely reaching behind level of tegula; mesopleuron with sternaulus deeply impressed; scutellum not carinate. Propodeum with complete set of carinae, longitudinal carinae sometimes weak medially; metapleuron with short vertical carina arising above mid coxa. Mesosoma smooth and shining and with strong and dense punctures, mesoscutum but not scutellum coriaceous between punctures. Wings slightly tinged to hyaline, radial cell along anterior margin of wing 0.95–1.25 times as long as stigma, areolet large, almost rhombic; hind wing with vein Cu1 usually absent, distal abscissa of vein 1A short and weak. Legs simple, hind coxa coriaceous and matt.

Metasoma. First tergite 1.6–1.85 times as long as second tergite, second tergite 1.45–1.9 times wider apically than basally. First tergite with rather shallow but long glymma,

petiolus flattened; first sternite reaching to about half length of tergite, its sides parallel. Third tergite with laterotergite separated by crease at most at base; metasoma weakly compressed from tergite 3 onwards. Tergites smooth and shining, almost impunctate, tergites 1 and 2 sometimes with weak longitudinal striae. Ovipositor weakly to strongly down-curved, laterally compressed, with subapical notch; male clasper with oblique apical truncation.

Colouration of female: Head black, orange to yellow on most of clypeus, along inner and usually also outer eye margin, malar space, and lower part of gena, sometimes also main part of face yellow; antenna with median segments orange and basal segments brown. Mesosoma including scutellum and propodeum orange, mesoscutum black; legs orange, forewing with stigma often lighter in anterior half. Metasoma orange, posterior segments sometimes with some brown areas.

Colouration of male: As in female.

Material examined: Holotype #f: NSW, Bensville; 10.xii.1976; leg. Z.Liepa; ANIC. Paratypes: NSW, Monga; 8.iv.1959; leg. E.F.Riek; ANIC: 1#f. NSW, Pearl Beach, Crommlin Biological Field Station, 33°55'030"–49'613"S / 151°29'795"–68'22"E; 18–24.ii.2008; leg. Andy Austin; WINC: 2#f. QLD, Brisbane, Long Pocket; ii.1977; BMNH: 1#f. QLD, Brisbane, Long Pocket; i.1977; leg. I.D. Galloway; BMNH: 1#f, 1#m. QLD, Brisbane, Oxley; v.1977; leg. I.D. Galloway; BMNH: 1#f.

***Dimophora lutulenta* sp. n.**

<http://zoobank.org/urn:lsid:zoobank.org:act:F318B96B-F79C-482A-A659-8BE223FECFC3>

Figure 6

Etymology: This species is named in memory of a hiking trip to Tasmania together with Jana Rogasch, Farid Anwari, Lovisa Rosnäs, Bjørn Dueholm, and Emilie Roy-Dufresne. We encountered a lot of mud in the Tasmanian wilderness, and it came in every possible shade of brown, just like this species, which also occurs in Tasmania, and thus gets the name from the Latin word for “muddy”.

Diagnosis: Forewing length 3.2–4.2 mm (holotype: 4.2). Antenna in females with 30–34 (32) flagellomeres, in males with 28–30. Head between eye and antennal base flat, without protrusion. Ocelli of male not to slightly enlarged, distance of hind ocellus to compound eye about 1.2–1.6 times diameter of ocellus. Mesoscutum slightly shorter than to about as long as wide. Mesopleuron strongly coriaceous especially on lower half, with rather weak punctures

that are inconspicuous against matt background, with a few parallel wrinkles especially in anterior half and with small smooth area around speculum. Area superomedia of propodeum about as long as to distinctly longer than wide; areas of propodeum coriaceous and with some punctures, especially on dorsal surface. Portion of ovipositor that protrudes from metasoma 0.65–1.0 (0.85) times as long as hind tibia.

Description: *Head.* Clypeus moderately large, convex when viewed from side, margin convex; mandibles with lower tooth longer than upper tooth. Occipital carina complete, evenly arched or slightly angled above. Genal carina joining oral carina briefly before reaching base of mandible. Whole head coriaceous and matt, face and clypeus with dense but rather weak punctures. Antenna with last flagellomeres about shorter than wide, scape excised at an angle of about 50°.

Mesosoma. Pronotum with epomia indistinct; mesoscutum without distinct notauli; mesopleuron with sternaulus present but weak; scutellum not carinate. Propodeum with complete set of carinae, longitudinal carinae sometimes weak medially; metapleuron with short vertical carina arising above mid coxa. Mesosoma strongly coriaceous even medially on scutellum; punctures, where present, weak and almost disappearing against background sculpture. Wings hyaline to slightly tinged, radial cell along anterior margin of wing 0.8–1.1 times as long as stigma, areolet moderately large, almost rhombic; hind wing with outer veins reduced, usually not pigmented except at base. Legs simple, hind coxa coriaceous and matt.

Metasoma. First tergite 1.45–1.8 times as long as second tergite, second tergite 1.4–1.9 times wider apically than basally. First tergite with rather shallow but long glymma, petiolus flattened; first sternite reaching to about half length of tergite, its sides parallel. Third tergite with laterotergite separated by crease at most at base; metasoma weakly compressed from tergite 3 onwards. Tergites smooth and shining, almost impunctate, tergites 1 and 2 with longitudinal striae and leather-like sculpture. Ovipositor almost straight to weakly down-curved, laterally compressed, with subapical notch; male clasper bluntly rounded.

Colouration of female: Head black, face, clypeus, mandibles, and outer eye margins orange to yellow; antenna brown, lighter basally where it is often orange. Mesosoma including scutellum and propodeum orange to brown, mesoscutum black, dark markings at about midheight of mesopleuron and dorsally on propodeum (extent of these markings varying considerably); legs orange, hind coxae often dark brown at base; forewing with stigma often lighter in anterior half. Metasoma dark brown basally, orange basally on tergite 3 and often also on posterior tergites.

Colouration of male: As in female, but with dark brown colouration on mesopleuron and propodeum often less extended, metasoma often mostly orange.

Material examined: Holotype #f: QLD, Lamington Plateau, O'Reillys; iii.1980; BMNH. Paratypes: Same as holotype: 4#f. ACT, Black Mountain, Malaise site 2; 1–15.iii.1980; leg. D.H.Colless; ANIC: 1#f. 12–30.iv.1980: 1#f. 15–31.iii.1980: 1#f. ACT, Black Mountain, Malaise trap; iv.1982; leg. I.Naumann, I.Cardale; ANIC: 1#f. NSW, 26–27 mi. Glen Innes to Grafton H'way; 20.iv.1970; leg. D.H.Colless; ANIC: 1#f. NSW, Brown Mountain; 18.i.1961; leg. E.F.Riek; ANIC: 1#m. NSW, Monga; ii.1983; leg. I.Gauld; BMNH: 1#m. NSW, Mt. Keira 600m; ii.1983; leg. I.Gauld; BMNH: 1#m. NSW, Palm Creek National Park; 29.xii.1960; leg. D.H.Colless; ANIC: 1#m. NSW, Royal National Park; ii.1983; leg. I.Gauld; BMNH: 1#f, 4#m. QLD, Bald Mountain area, 3,500–4,000', via Emu Vale, South East Qld; 27–31.i.1972; leg. S.R.Monteith; ANIC: 1#m. QLD, Baldy Mountain Road via Atherton; vi.1981; leg. J.Brown; BMNH: 1#f. QLD, Lamington National Park, 3000 feet; 6–7.iii.1980; leg. H. Evans, A. Hook; QM: 1#f. QLD, Windsor Tableland; iii.1981; leg. R. Storey; BMNH: 1#f, 5#m. QLD, Windsor Tableland via Mt. Carbine; i.–iii.1981; leg. Galloway; BMNH: 1#m. TAS, Mt. Barrow 1000m; ii.1983; leg. I.Gauld; BMNH: 2#m. TAS, Mt. Field Nat. Park, 200m; i–ii.1983; leg. I.Gauld; BMNH: 5#f, 5#m. TAS, Strathgordon Road, 7km W. of Maydena; ii.1983; leg. I.Gauld; BMNH: 1#f. VIC, Karlo CK 21km EbyN Cann River; 25.ii.1980; leg. I.Naumann, I.Cardale; ANIC: 1#m. VIC, Toolangi; i–ii.1983; leg. Farrugia & Gauld; BMNH: 9#f, 3#m.

***Dimophora migrosi* sp. n.**

<http://zoobank.org/urn:lsid:zoobank.org:act:B7EF68AE-6321-42EF-AFD7-8F4B21ED6382>

Figure 7

Etymology: This wasp is dedicated to the Swiss grocery chain MIGROS, for their commitment to biodiversity and sustainability. The logo of the chain, an orange "M", is of the same colour as this wasp, which will hopefully motivate even further engagements with nature by MIGROS in the future.

Diagnosis: Forewing length 4.6–5.5 mm (holotype: 5.5). Antenna with 32–34 flagellomeres in both sexes (33). Head between eye and antennal base flat, without protrusion. Ocelli of male not enlarged, distance of hind ocellus to compound eye about 1.5 times diameter of ocellus. Mesoscutum about as long as wide. Mesopleuron smooth and shining between strong

punctures, with parallel wrinkles especially in anterior half, often with some restricted coriaceous areas and with moderate impunctate area around speculum. Area superomedia of propodeum about as long as wide to about 1.3 times longer than wide; areas of propodeum smooth and shining between strong punctures. Portion of ovipositor that protrudes from metasoma 0.7–0.85 (0.8) times as long as hind tibia.

Description: *Head.* Clypeus moderately large, convex when viewed from side, margin convex; mandibles with lower tooth longer than upper tooth. Occipital carina complete, evenly arched to angled above. Genal carina joining oral carina briefly before reaching base of mandible. Whole head coriaceous and matt, face and clypeus with dense and strong punctures, vertex with some sparse punctures. Antenna with last flagellomeres about as long as wide, scape excised at an angle of about 50°.

Mesosoma. Pronotum with epomia weak to absent; mesoscutum with notauli absent to barely visible; mesopleuron with sternaulus weakly to distinctly impressed; scutellum not carinate. Propodeum with complete set of carinae, longitudinal carinae sometimes weak medially; metapleuron with short vertical carina arising above mid coxa. Mesosoma smooth and shining and with strong and dense punctures, mesoscutum but not scutellum strongly coriaceous between punctures. Wings slightly tinged, radial cell along anterior margin of wing 1.0–1.15 times as long as stigma, areolet large, almost rhombic; hind wing with outer veins reduced, usually not pigmented except at base. Legs simple, hind coxa coriaceous and matt.

Metasoma. First tergite 1.6–2.0 times as long as second tergite, second tergite 1.5–1.8 times wider apically than basally. First tergite with rather shallow but long glymma, petiolus flattened; first sternite reaching to about half length of tergite, its sides parallel. Third tergite with laterotergite separated by crease at most at base; metasoma weakly compressed from tergite 3 onwards. Tergites smooth and shining, almost impunctate, tergites 1 and 2 with weak longitudinal striae. Ovipositor weakly down-curved, laterally compressed, with subapical notch; male clasper bluntly rounded.

Colouration of female: Head black, face including clypeus and mandibles orange to yellow, usually orange along outer eye margin; antenna black or dark brown, lighter towards base. Mesosoma including scutellum and most of propodeum orange, mesoscutum black, propodeum usually with black marks anterodorsally; legs orange, hind tibia apically and hind tarsi often brown; forewing with stigma often lighter in anterior half. Metasoma orange.

Colouration of male: As in female.

Material examined: Holotype #f: NSW, Monga; ii.1983; leg. I.Gauld; BMNH. Paratypes: NSW, Brown Mountain; 8.iii.1963; leg. D.H.Colless; ANIC: 1#f. NSW, Brown Mountain; 10.iii.1961; leg. D.H.Colless; ANIC: 2#f, 2#m. VIC, Toolangi; i–ii.1983; leg. Farrugia & Gauld; BMNH: 1#f.

***Dimophora nitens* (Gravenhorst, 1829b: 618) (*Campoplex*)**

robusta Brischke, 1880: 176

similis Brischke, 1880: 177

arenicola (Thomson, 1890: 1427) (*Dimophorus*)

Figure 8

Diagnosis: Forewing length 4.6–4.8 mm (European specimens: 4.3–5.8). Antenna in males with 34 flagellomeres (31 in European specimens, including a female). Head between eye and antennal base flat, without protrusion. Ocelli of male not enlarged, distance of hind ocellus to compound eye about 1.5–1.8 times diameter of ocellus. Mesoscutum about as long as wide. Mesopleuron weakly to strongly coriaceous between strong punctures and with moderate impunctate area around speculum. Area superomedia of propodeum longer than wide; areas of propodeum smooth and shining between strong punctures. Portion of ovipositor that protrudes from metasoma 1.1 times as long as hind tibia (European specimens, no females from Australia found in collections).

Description: *Head.* Clypeus moderately large, convex when viewed from the side, margin convex; mandibles with lower tooth longer than upper tooth. Occipital carina complete, evenly arched above. Genal carina joining oral carina briefly before reaching base of mandible. Whole head coriaceous and matt, face and clypeus with dense punctures, vertex with some sparse punctures. Antenna with last flagellomeres slightly longer than wide, scape excised at an angle of about 50°.

Mesosoma. Pronotum with epomia weak to absent; mesoscutum with notauli weakly but distinctly impressed; mesopleuron with sternaulus weakly to distinctly impressed; scutellum not carinate. Propodeum with a complete set of carinae, longitudinal carinae sometimes weak medially; metapleuron with short vertical carina arising above mid coxa. Mesosoma mostly coriaceous and with strong and dense punctures, mesopleuron with at least some smooth areas; mesoscutum and less so scutellum strongly coriaceous between

punctures. Wings slightly tinged, radial cell along anterior margin of wing 1.0–1.1 times as long as stigma, areolet large, almost rhombic; hind wing with outer veins reduced, not pigmented except at base. Legs simple, hind coxa coriaceous and matt.

Metasoma. First tergite 1.4–1.8 times as long as second tergite, second tergite 1.4–1.9 times wider apically than basally. First tergite with rather shallow but long glymma, petiolus flattened; first sternite reaching to about half length of tergite, its sides parallel. Third tergite with laterotergite separated by crease on about half its length; metasoma weakly compressed from tergite 3 onwards. Tergites smooth and shining, almost impunctate, tergites 1 and 2 with weak longitudinal striae. Male clasper truncate.

Colouration of female: Head black, orange often apically on clypeus, orange or yellow in malar space, antenna dark. Mesosoma black, legs orange or red, forewing with stigma often lighter in anterior half. Metasoma black, red on apical half of tergite 1 and all of tergites 2 and 3, posterior segments often with light apical bands.

Colouration of male: As in female.

Material examined: ACT, Wallaroo Rd, near Hall, Malaise trap; Mar Apr or May 1999–2003; leg. Mark Short; ANIC: 1#m. WA, Millbrook NR, 34°51.4'S, 117°48.6'E. Privately owned blue-gum plantation; iv.2000; leg. S.Cunningham; ANIC: 1#m.

Material from Europe: Poland, City of Danzig, Zoppot; 11.viii.1937; leg. K.Clarke; BMNH: 1#f. Unknown locality, just "Brit. Mus. 1930-223"; BMNH: 1#m.

Notes: The two males from Australia differ slightly from the specimens seen from Europe which often lack the yellow colouration in the malar space, have fewer flagellar segments and darkened coxae. However, these differences do not seem to justify the erection of a new species; they might merely be a consequence of the small number of specimens seen from both regions.

***Dimophora ocellata* sp. n.**

<http://zoobank.org/urn:lsid:zoobank.org:act:44E10E35-DE88-401C-B2A4-2BC2DEA8C7A3>

Figure 9

Etymology: The name of this species refers to the enlarged ocelli found in this species.

Diagnosis: (Female unknown). Forewing length 4.1–4.4 mm (holotype: 4.4). Antenna with 32–34 (32) flagellomeres. Head between eye and antennal base flat, without protrusion. Ocelli of male enlarged, distance of hind ocellus to compound eye about one diameter of

ocellus. Mesoscutum about as long as wide to slightly shorter. Mesopleuron smooth and shining between strong punctures and with large impunctate area around speculum. Area superomedia of propodeum about 1.3–1.8 times longer than wide; areas of propodeum smooth and shining between strong punctures.

Description: *Head.* Clypeus moderately large, convex when viewed from side, margin convex; mandibles with lower tooth longer than upper tooth. Occipital carina complete, evenly arched or straight above. Genal carina joining oral carina briefly before reaching base of mandible. Whole head coriaceous and matt, face and clypeus with dense and strong punctures, vertex with some sparse punctures. Antenna with last flagellomeres about as long as wide, scape excised at an angle of about 45°.

Mesosoma. Pronotum with epomia weak to distinct; mesoscutum with notauli weak, barely reaching behind level of tegula; mesopleuron with sternaulus deeply impressed; scutellum not carinate. Propodeum with complete set of strong carinae; metapleuron with short vertical carina arising above mid coxa. Mesosoma smooth and shining and with strong and dense punctures, mesoscutum but not scutellum coriaceous between punctures. Wings slightly tinged, radial cell along anterior margin of wing 1.0–1.25 (1.05) times as long as stigma, areolet large, almost rhombic; hind wing with outer veins reduced, usually not pigmented except at base. Legs simple, hind coxa coriaceous and matt.

Metasoma. First tergite 1.45–1.7 (1.6) times as long as second tergite, second tergite 1.45–1.7 (1.55) times wider apically than basally. First tergite with rather shallow but long glymma, petiolus flattened; first sternite reaching to about half length of tergite, its sides parallel. Third tergite with laterotergite separated by crease at most at base; metasoma weakly compressed from tergite 3 onwards. Tergites smooth and shining, almost impunctate, tergites 1 and 2 with weak longitudinal striae. Male clasper bluntly rounded.

Colouration of male: Head orange, yellow around malar space; antenna black or dark brown, lighter brown towards base and with orange scape and pedicel. Mesosoma and legs orange, hind femur often darker orange to brown, yellow or ivory around knee, hind tibia and tarsi brown; forewing with stigma often lighter in anterior half. Metasoma black, orange basally and apically on tergite 1, all orange on tergites 2 and 3 and with narrow, yellow bands apically on all tergites.

Material examined: Holotype #m: QLD, Desally Ck., 10km WbyN Mt. Carbine, 16.30S, 144.55E; ANIC. Paratypes: NT, Black Point Cobourg Pen.; 31.i.1977; leg. E.D.Edwards; ANIC: 1#m. QLD, 13km E by S Weipa, Malaise trap. 12.40S, 143.00E; 20.iii–20.iv.1994; leg. P.Zborowski; ANIC: 1#m. 16.ii–20.iii.1994: 1#m. 20.iii.-20.iv.1994: 1#m. QLD, Mt.

Cook National Park, 15.29S / 145.16E; 10–12.v.1981; leg. I.D.Naumann; ANIC: 1#m. QLD, S, Coen, Malaise trap.E; 13.i–25.ii.1994; leg. P.Zborowski, W. McKay; ANIC: 1#m. QLD, The Bend, 3km NbyW Coen. 13.56S, 143.12E; 25.vi.1989; leg. I.D.Naumann; ANIC: 1#m.

***Dimophora rhysi* sp. n.**

<http://zoobank.org/urn:lsid:zoobank.org:act:CDEC966D-ED43-410C-80FD-CF3FA1FD30CB>

Figure 10

Etymology: This particularly small *Dimophora* species is named after the Low King of the dwarfs, Rhys Rhysson, from the late Terry Pratchett's novel "The Fifth Elephant", and is dedicated to its inventor and father of the Discworld series. He will be sorely missed.

Diagnosis: Forewing length 2.5–2.7 mm (holotype: 2.5). Antenna with 23–24 (23) flagellomeres in both sexes. Head between eye and antennal base flat, without protrusion. Ocelli of male not enlarged, distance of hind ocellus to compound eye about 1.5 or more times diameter of ocellus. Mesoscutum transverse, about 0.8 times as long as wide. Mesopleuron coriaceous on whole surface, with weak punctures disappearing against background sculpture, with a small smooth area around speculum. Area superomedia of propodeum about as long as wide to 1.2 times longer than wide; areas of propodeum coriaceous and devoid of punctures. Portion of ovipositor that protrudes from metasoma 0.85 times as long as hind tibia.

Description: *Head.* Clypeus rather small, convex when viewed from side, margin convex; mandibles with lower tooth longer than upper tooth. Occipital carina complete, evenly arched or slightly angled above. Genal carina joining oral carina briefly before reaching base of mandible. Whole head coriaceous and matt, face and clypeus with dense and strong punctures, vertex with some sparse punctures. Antenna with last flagellomeres about as long as wide, scape excised at an angle of about 50°.

Mesosoma. Pronotum with epomia indistinct; mesoscutum without notauli; mesopleuron with sternaulus weak; scutellum not carinate. Propodeum with complete set of carinae, longitudinal carinae sometimes weak medially; metapleuron without or with very short vertical carinae arising above mid coxa. Mesosoma strongly coriaceous even on scutellum, at most with very weak punctures. Wings hyaline, radial cell along anterior margin of wing 1.0–1.1 times as long as stigma, areolet rather small, almost rhombic; hind wing with

outer veins reduced, usually not pigmented except at base. Legs simple, hind coxa coriaceous and matt.

Metasoma. First tergite 1.5 times as long as second tergite, second tergite 1.75–1.85 times wider apically than basally. First tergite with rather shallow but long glymma, petiolus slightly flattened; first sternite reaching to about half length of tergite, its sides parallel. Third tergite with laterotergite separated by crease at most at base; metasoma weakly compressed from tergite 3 onwards. Tergites smooth and shining, almost impunctate, tergites 1 and 2 with weak background sculpture, mostly shining. Ovipositor straight, only very weakly down-curved at very end, laterally compressed, with a subapical notch; male clasper not visible.

Colouration of female: Head brown, lighter brown to orange on lower face and clypeus, yellow in malar space; antenna yellow to orange on basal half, brown on apical half.

Mesosoma dark brown to black, pronotum lighter brown to orange; legs orange, yellow or ivory around knee; forewing with stigma often lighter in anterior half. Metasoma brown, lighter brown to orange on tergite 2.

Colouration of male: As in female.

Material examined: Holotype #f: QLD, Mt. Glorious; ii–vi.1977; leg. A. Hiller; BMNH.

Paratype: SA, Adelaide, Mt. Lofty; 29.i.1977; leg. Z. Boucek; BMNH: 1#m.

Note: Two additional female specimens from Mt. Glorious show very similar characteristics in terms of size, colouration, and body shape, but have a strikingly different sculpture on the mesosoma, with both mesopleuron and the areas of the propodeum entirely smooth and shining between strong punctures. More material needs to be studied to decide whether they represent an additional species or whether these differences are indeed intra-specific. These two females are thus excluded from the type series.

***Dimophora ruficollis* sp. n.**

<http://zoobank.org/urn:lsid:zoobank.org:act:B6893120-4335-4BA2-AB0E-8C9B0482B71C>

Figure 11

Etymology: This species gets its name from its rufous pronotum, which looks like a collar.

Diagnosis: Forewing length 4.1 mm in female holotype, 2.9 mm in male paratype. Antenna of female broken, in male with 26 flagellomeres. Head between eye and antennal base flat, without protrusion. Ocelli of male not enlarged, distance of hind ocellus to compound eye about 1.5 times the diameter of the ocellus. Mesoscutum 0.85–1.0 times as long as wide.

Mesopleuron smooth and shining between strong punctures and with a large impunctate area around speculum. Area superomedia of propodeum about as long as wide in female, longer than wide in male; areas of propodeum smooth and shining between strong punctures. Portion of ovipositor that protrudes from metasoma 0.75 times as long as hind tibia.

Description: *Head.* Clypeus moderately large, convex when viewed from side, margin convex; mandibles with lower tooth longer than upper tooth. Occipital carina complete, evenly arched or slightly angled above. Genal carina joining oral carina briefly before reaching base of mandible. Whole head coriaceous and matt, face and clypeus with dense and strong punctures, vertex with some sparse punctures. Antenna with last flagellomeres about as long as wide, scape excised at an angle of about 50°.

Mesosoma. Pronotum with epomia indistinct; mesoscutum with notauli barely indicated; mesopleuron with sternaulus only weakly impressed; scutellum not carinate. Propodeum with complete set of carinae, longitudinal carinae sometimes weak medially; metapleuron with short vertical carina arising above mid coxa. Mesosoma smooth and shining and with strong and dense punctures, mesoscutum but not scutellum coriaceous between punctures. Wings slightly tinged, radial cell along anterior margin of wing 1.0 times as long as stigma, areolet large, almost rhombic; hind wing with outer veins reduced, usually not pigmented except at base. Legs simple, hind coxa coriaceous and matt.

Metasoma. First tergite 1.7 times as long as second tergite, second tergite 1.6 times wider apically than basally. First tergite with rather shallow but long glymma, petiolus flattened; first sternite reaching to about half length of tergite, its sides parallel. Third tergite with laterotergite separated by a crease at most at the very base; metasoma weakly compressed from tergite 3 onwards. Tergites smooth and shining, almost impunctate, tergites 1 and 2 with weak longitudinal striae. Ovipositor weakly down-curved towards tip, laterally compressed, with a subapical notch; male clasper narrowly rounded.

Colouration of female: Head black, face including clypeus and mandibles orange to yellow, orange along outer eye margin; antenna black or dark brown, lighter brown to orange towards base. Mesosoma including scutellum black, pronotum and propleurae orange; legs orange, hind coxa darkened at base; forewing with stigma often lighter in anterior half. Metasoma dark brown with a broad orange band basally on tergite 3 and narrow, yellow bands apically on all tergites.

Colouration of male: As in female, but pronotum only orange anteriorly.

Material examined: Holotype #f: QLD, Bald Mountain area, 3,500-4,000', via Emu Vale, South East Qld; 27.-31.i.1972; leg. S.R.Monteith; ANIC. Paratype: NSW, 20 mi. Glen Innes to Grafton H'way; 20.iv.1970; leg. D.H.Colless; ANIC: 1#m.

***Dimophora turista* sp. n.**

<http://zoobank.org/urn:lsid:zoobank.org:act:0CF5D300-EBA4-4646-84EE-E3BCD58F0C35>

Figure 12

Etymology: This species is named after the dark orange colouration of the face and mesosoma. The colour reminds of the notorious tourist visiting Australia and getting sunburnt already on the first day.

Diagnosis: (Male unknown). Forewing length 3.6–4.5 mm (holotype: 4.3). Antenna in females with 31–36 flagellomeres (32). Head between eye and antennal base flat, without protrusion. Ocelli of female not enlarged. Mesoscutum as long as wide. Mesopleuron weakly to distinctly coriaceous between strong punctures, on upper half with some striae and with moderate impunctate area around speculum. Area superomedia of propodeum slightly to strongly elongate, usually 1.2–2 times as long as wide; areas of propodeum smooth and shining between strong punctures. Portion of ovipositor that protrudes from metasoma 1.0–1.1 (1.1) times as long as hind tibia.

Description: *Head.* Clypeus moderately large, convex when viewed from the side, margin convex; mandibles with lower tooth longer than upper tooth. Occipital carina complete, evenly arched or slightly angled above. Genal carina joining oral carina briefly before reaching base of mandible. Whole head coriaceous and matt, face and clypeus with dense and strong punctures, vertex with some sparse punctures. Antenna with last flagellomeres about as long as to shorter than wide, scape excised at an angle of about 50°.

Mesosoma. Pronotum with epomia often indistinct; mesoscutum with notauli weak and barely reaching behind level of tegula; mesopleuron with sternaulus deeply impressed; scutellum not carinate. Propodeum with complete set of carinae, longitudinal carinae sometimes weak medially; metapleuron with short vertical carina arising above mid coxa. Mesosoma smooth and shining and with strong and dense punctures, mesoscutum but not scutellum coriaceous between punctures. Wings slightly tinged, radial cell along anterior margin of wing 0.95–1.25 times as long as stigma, areolet large, almost rhombic; hind wing

with veins Cu1 and distal abscissa of vein 1A absent or very weak. Legs simple, hind coxa coriaceous and matt.

Metasoma. First tergite 1.6–1.8 times as long as second tergite, second tergite 1.6–1.9 times wider apically than basally. First tergite with rather shallow but long glymma, petiolus flattened; first sternite reaching to about half length of tergite, its sides parallel. Third tergite with laterotergite separated by a crease at most at base; metasoma weakly compressed from tergite 3 onwards. Tergites smooth and shining, almost impunctate, tergites 1 and 2 with weak longitudinal striae or leather-like sculpture. Ovipositor weakly down-curved, laterally compressed, with subapical notch.

Colouration of female: Head dark orange, darkened on back of head except along outer eye margins, yellow in malar space, antenna dark brown in basal third, yellow or ivory medially and black apically. Mesosoma dark orange, legs orange, hind leg dark brown except for orange joints and trochantellus; forewing with stigma often lighter in anterior half. Metasoma dark brown to black, often slightly lighter on tergites 2 and 3.

Material examined: Holotype #f: QLD, 2km EbyS Hidden Valley, 18.59S / 146.02E; 12.v.1980; leg. I.Naumann, I.Cardale; ANIC. Paratypes: QLD, Split Rock, 15.39S / 144.31E, Malaise trap; 13.xii.1992-18.ii.1993; leg. P.Zborowski; ANIC: 1#f. QLD, Station Ck, 7km WSW Hope Vale Mission, 15.19S / 145.03E, ex ethanol; 10.v.1981; leg. I.D.Naumann; ANIC: 1#f. WA, CALM site 13/4, 12km S of Kalumburu Mission, 14.25S / 126.38E. Malaise trap with trough; 7.-11.vi.1988; leg. T.A.Weir; ANIC: 1#f. Also in New Zealand: Mt. Cook National Park, 15.29S / 145.16E4; 10.-12.v.1981; leg. I.D.Naumann; ANIC: 1#f.

Discussion

This study revises the genus *Dimophora* in Australia, reporting for the first time eleven species of the genus from this continent, nine of which are described as new. Previously, only eight extant and two fossil species of the genus *Dimophora* have been known worldwide (Yu et al. 2012). Among the extant species, five are Nearctic, one is Neotropical (from Costa Rica), one is Palearctic (*D. nitens*), and one has a Holarctic distribution (*D. evanialis*, Table 1). The latter two also seem to occur in Australia, even though the Australian individuals diverge somewhat morphologically from the specimens seen from Europe. I adopted a conservative approach here and did not describe these specimens as new species; if this view is confirmed, then they might represent recent immigrants to Australia. Besides the species introduced in Australia for biological control purposes (e.g. *Rhyssa* to control *Sirex*

woodwasps), similar cases are rare, and they all are likely to have been accidental introductions by humans, e.g. *Venturia canescens* commonly found in flour storage and *Xenolytus bitinctus* associated with synanthropic tineids (Gauld 1984a).

The distributional patterns observed among the previously described species of *Dimophora* suggested an origin and centre of diversity of the genus in the Northern hemisphere. The two fossils listed from this genus, *D. fumipenis* (Théobald) from the Oligocene in France and *D. antiqua* (Brues) from the Miocene in Colorado, USA, would support such a view; however, a closer look at the original descriptions suggests that they might not actually belong to this genus (cf. the thickened hind femur in the former and infusate wing in the latter, plus the shape of the areolet in both; Brues 1910, Théobald 1937). Nevertheless, the opinion prevailed among ichneumonologists that *Dimophora* was a Northern element. Gauld (1984a), when reporting on the ichneumonid genera he has seen in Australian collections, remarked that *Dimophora*'s "existence in Australia is rather puzzling" (p. 301). By reporting nine new species of *Dimophora* from Australia, the current study more than doubles the number of extant species and overturns the previous view of this genus as being mainly Holarctic. Gauld hypothesized that *Dimophora* shows a relict distribution, and that it used to be present worldwide. A relict scenario is also in agreement with the very patchy fossil record and the supposedly basal position of the genus within the subfamily based on the observation of several characters interpreted as plesiomorphic (Gauld 1984a). However, a basal position of the genus could not be recovered in the only molecular phylogenetic analysis that included a reasonable number of cremastine genera (Quicke et al. 2009). Furthermore, absence of evidence cannot be considered as evidence for absence, especially in the case of parasitoid wasp distributions in regions as understudied as the Old World and New World tropics (Quicke 2012). Current distribution records might thus give a drastic underestimation of the actual distribution of the genus, and *Dimophora* might have a much larger distribution than currently recognized. This is also evidenced by numerous undescribed species of this genus from Brazil present in the collection of the BMNH (Gavin Broad, pers. comm.). Insights into the geographic origin and subsequent biogeographic expansion of *Dimophora* will have to await the construction of a robust phylogenetic hypothesis for the genus. In any case, the present study has shifted the centre of present-day diversity of *Dimophora* to the Southern hemisphere; this underlines the importance of taxonomic studies in regions of the world that have hitherto been neglected, and exemplifies their potential even in groups of high ecological and economic interest, such as parasitoid wasps.

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Table 1. Distribution of previously known *Dimophora* species.

Species	Distribution	References
<i>Dimophora evanialis</i> (Gravenhorst, 1829)	Holarctic	Sedivy 1970, Dasch 1979
<i>Dimophora nitens</i> (Gravenhorst, 1829)	Palaeartic	Sedivy 1970, Fitton & Gauld 1980
<i>Dimophora capillata</i> Dasch, 1979	Nearctic	Dasch 1979
<i>Dimophora ignota</i> Dasch, 1979	Nearctic	Dasch 1979
<i>Dimophora patula</i> Dasch, 1979	Nearctic	Dasch 1979
<i>Dimophora punctifera</i> Dasch, 1979	Nearctic	Dasch 1979
<i>Dimophora vesca</i> Dasch, 1979	Nearctic	Dasch 1979
<i>Dimophora daschi</i> Gauld, 2000	Neotropical	Gauld 2000
<i>Dimophora antiqua</i> (Brues, 1910)	fossil, Miocene, USA	Brues 1910, Menier et al. 2004
<i>Dimophora fumipennis</i> (Théobald, 1937)	fossil, Oligocene, France	Théobald 1937, Menier et al. 2004

Figure legends.

Figure 1. Protrusion between the compound eye and antennal bases as shown in *Dimophora kentmartini* sp. n.

Figure 2. Holotype of *Dimophora biquadra* sp. n. A. Habitus. B. Head. C. Mesoscutum and head. D. Head and mesosoma from lateral, showing mesopleural sculpture. E. Propodeum. F. Metasoma. Scale bars represent 2 mm (A) and 0.5 mm (B, C, D, E, F).

Figure 3. Holotype of *Dimophora diabolica* sp. n. A. Habitus. B. Head. C. Mesoscutum and head. D. Head and mesosoma from lateral, showing mesopleural sculpture. E. Propodeum. F. Metasoma. Scale bars represent 2 mm (A) and 0.5 mm (B, C, D, E, F).

Figure 4. Australian specimen of *Dimophora evanialis* Gravenhorst. A. Habitus. B. Head. C. Mesoscutum and head. D. Head and mesosoma from lateral, showing mesopleural sculpture. E. Propodeum. F. Metasoma. Scale bars represent 2 mm (A) and 0.5 mm (B, C, D, E, F).

Figure 5. Holotype of *Dimophora kentmartini* sp. n. A. Habitus. B. Head. C. Mesoscutum and head. D. Head and mesosoma from lateral, showing mesopleural sculpture. E. Propodeum. F. Metasoma. Scale bars represent 2 mm (A) and 0.5 mm (B, C, D, E, F).

Figure 6. Holotype of *Dimophora lutulenta* sp. n. A. Habitus. B. Head. C. Mesoscutum and head. D. Head and mesosoma from lateral, showing mesopleural sculpture. E. Propodeum. F. Metasoma. Scale bars represent 2 mm (A) and 0.5 mm (B, C, D, E, F).

Figure 7. Holotype of *Dimophora migrosi* sp. n. A. Habitus. B. Head. C. Mesoscutum and head. D. Head and mesosoma from lateral, showing mesopleural sculpture. E. Propodeum. F. Metasoma. Scale bars represent 2 mm (A) and 0.5 mm (B, C, D, E, F).

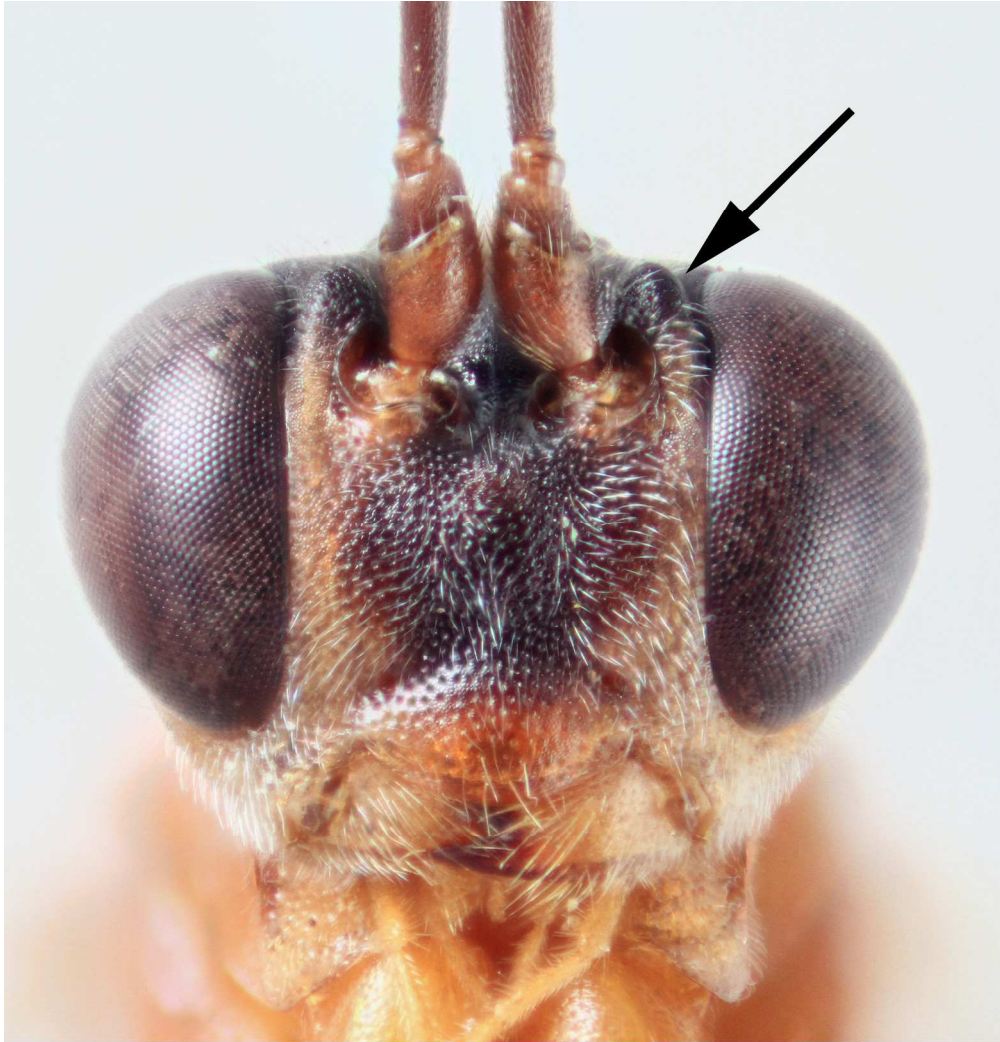
Figure 8. Australian specimen of *Dimophora nitens* Gravenhorst. A. Habitus. B. Head. C. Mesoscutum and head. D. Head and mesosoma from lateral, showing mesopleural sculpture. E. Propodeum. F. Metasoma. Scale bars represent 2 mm (A) and 0.5 mm (B, C, D, E, F).

Figure 9. Holotype of *Dimophora ocellata* sp. n. A. Habitus. B. Head. C. Mesoscutum and head. D. Head and mesosoma from lateral, showing mesopleural sculpture. E. Propodeum. F. Metasoma. Scale bars represent 2 mm (A) and 0.5 mm (B, C, D, E, F).

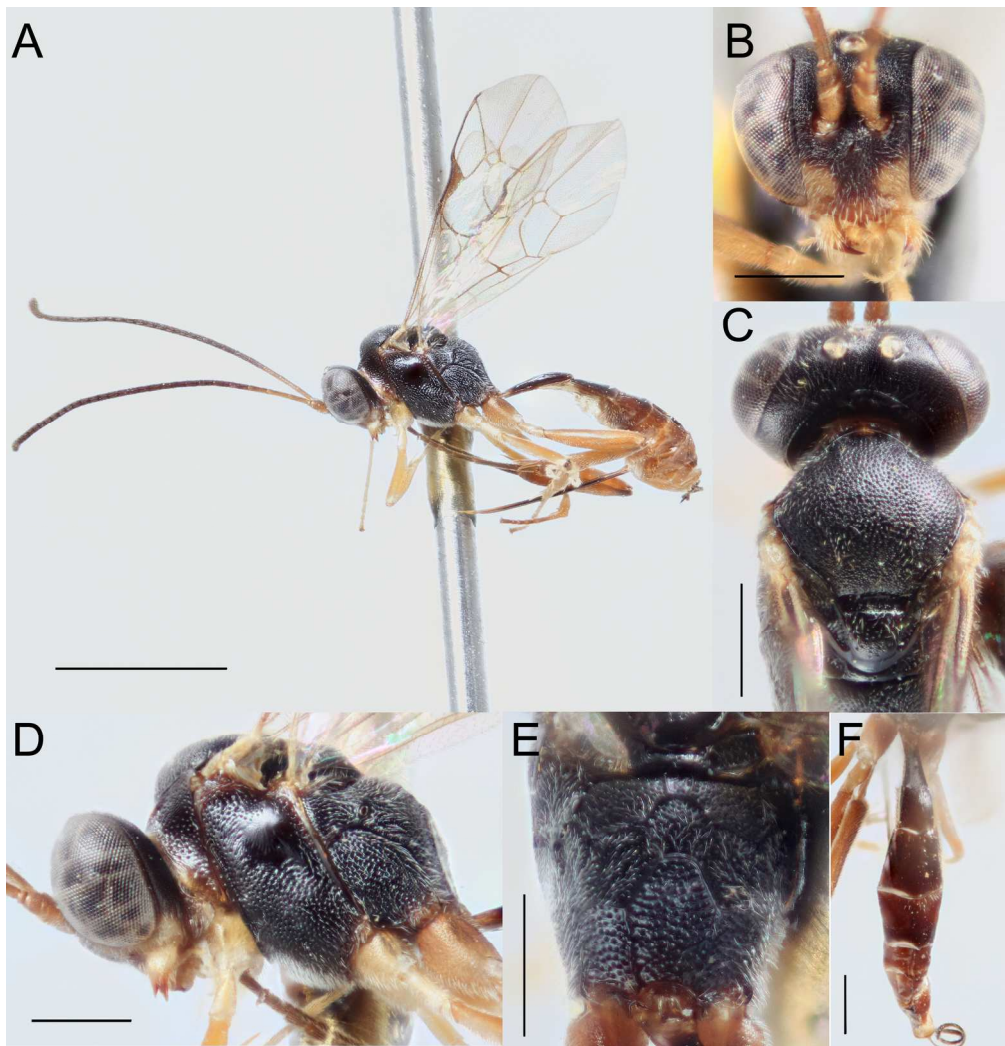
Figure 10. Holotype of *Dimophora rhyisi* sp. n. A. Habitus. B. Head. C. Mesoscutum and head. D. Head and mesosoma from lateral, showing mesopleural sculpture. E. Propodeum. F. Metasoma. Scale bars represent 2 mm (A) and 0.5 mm (B, C, D, E, F).

Figure 11. Holotype of *Dimophora ruficollis* sp. n. A. Habitus. B. Head. C. Mesoscutum and head. D. Head and mesosoma from lateral, showing mesopleural sculpture. E. Propodeum. F. Metasoma. Scale bars represent 2 mm (A) and 0.5 mm (B, C, D, E, F).

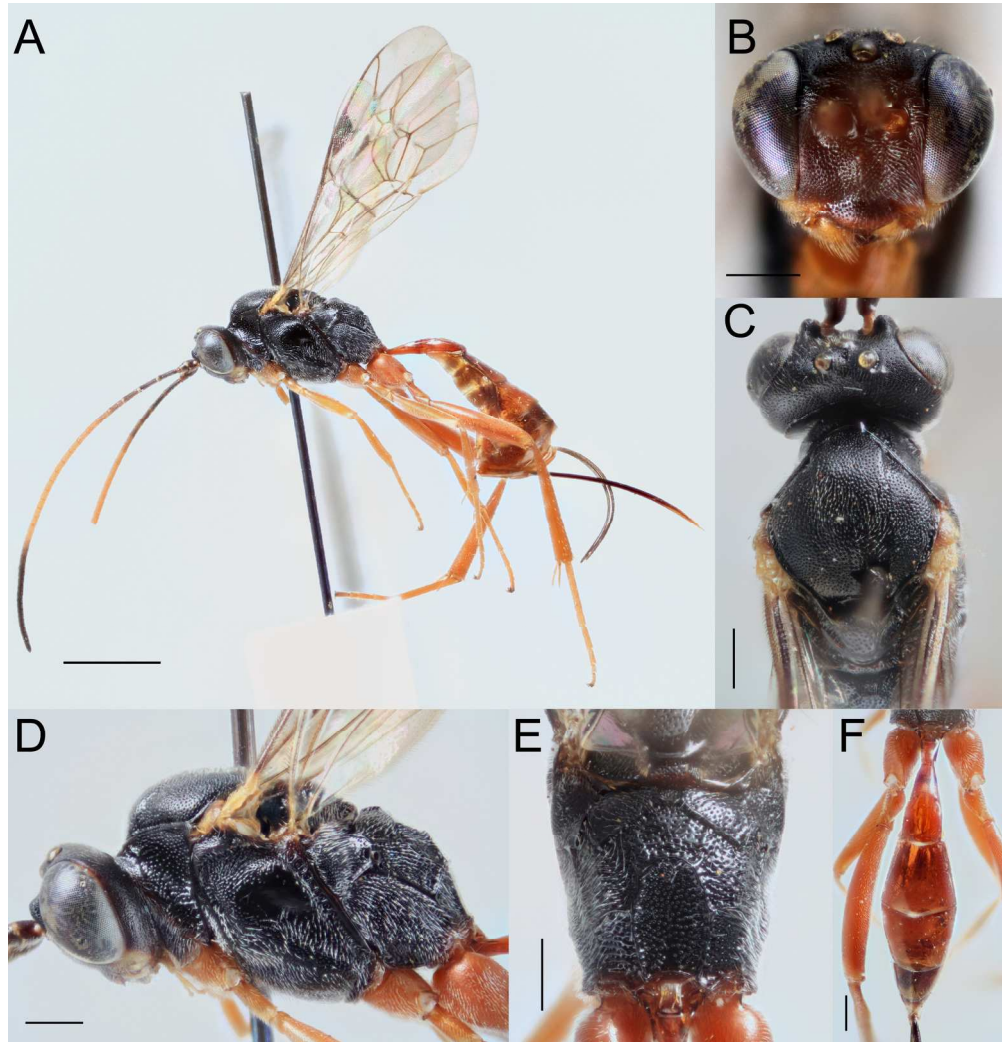
Figure 12. Holotype of *Dimophora turista* sp. n. A. Habitus. B. Head. C. Mesoscutum and head. D. Head and mesosoma from lateral, showing mesopleural sculpture. E. Propodeum. F. Metasoma. Scale bars represent 2 mm (A) and 0.5 mm (B, C, D, E, F).



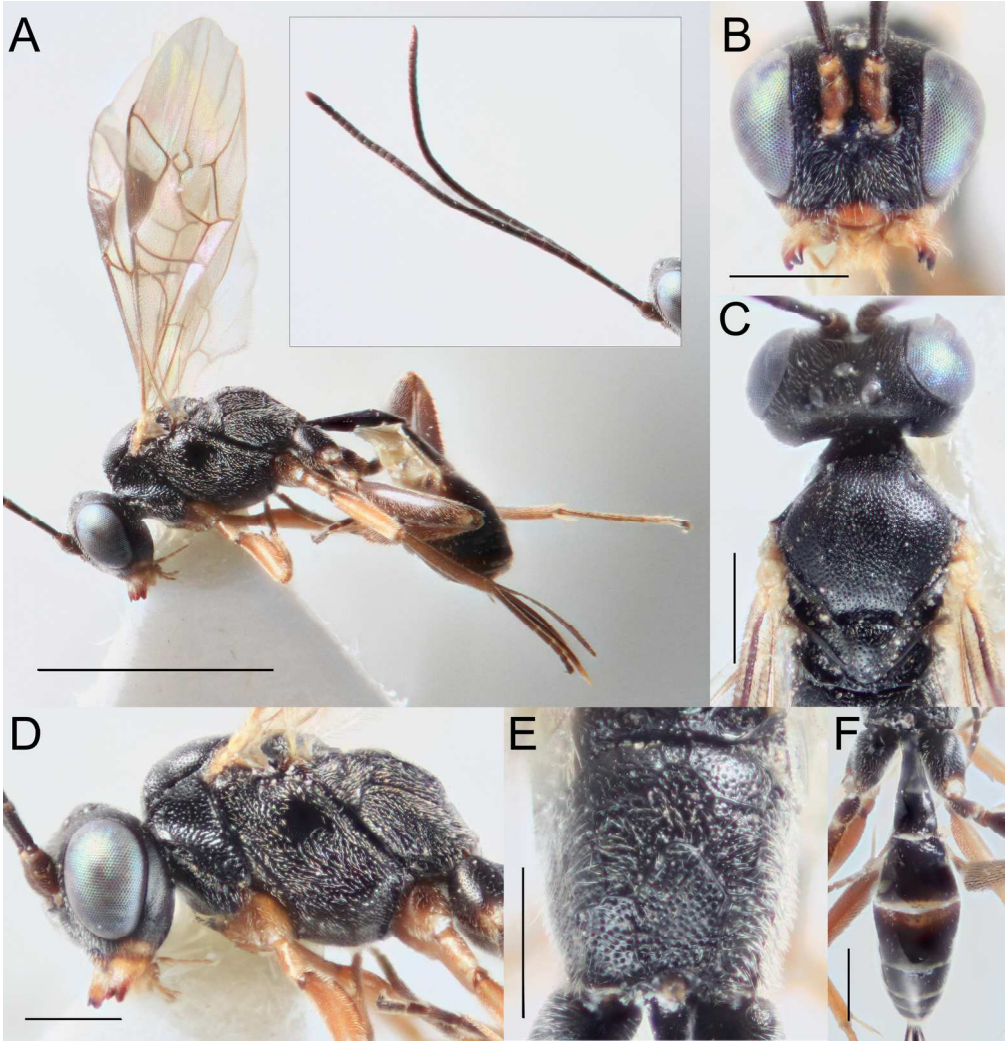
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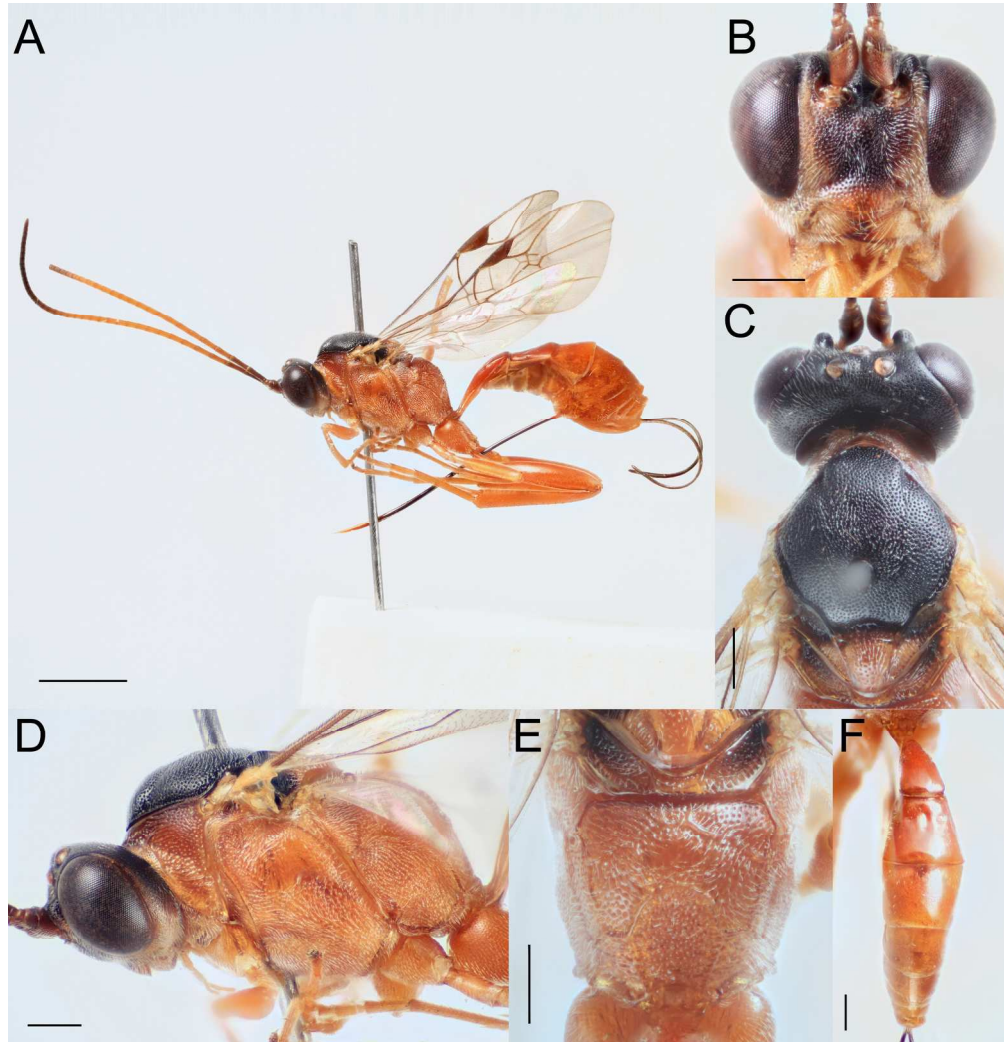
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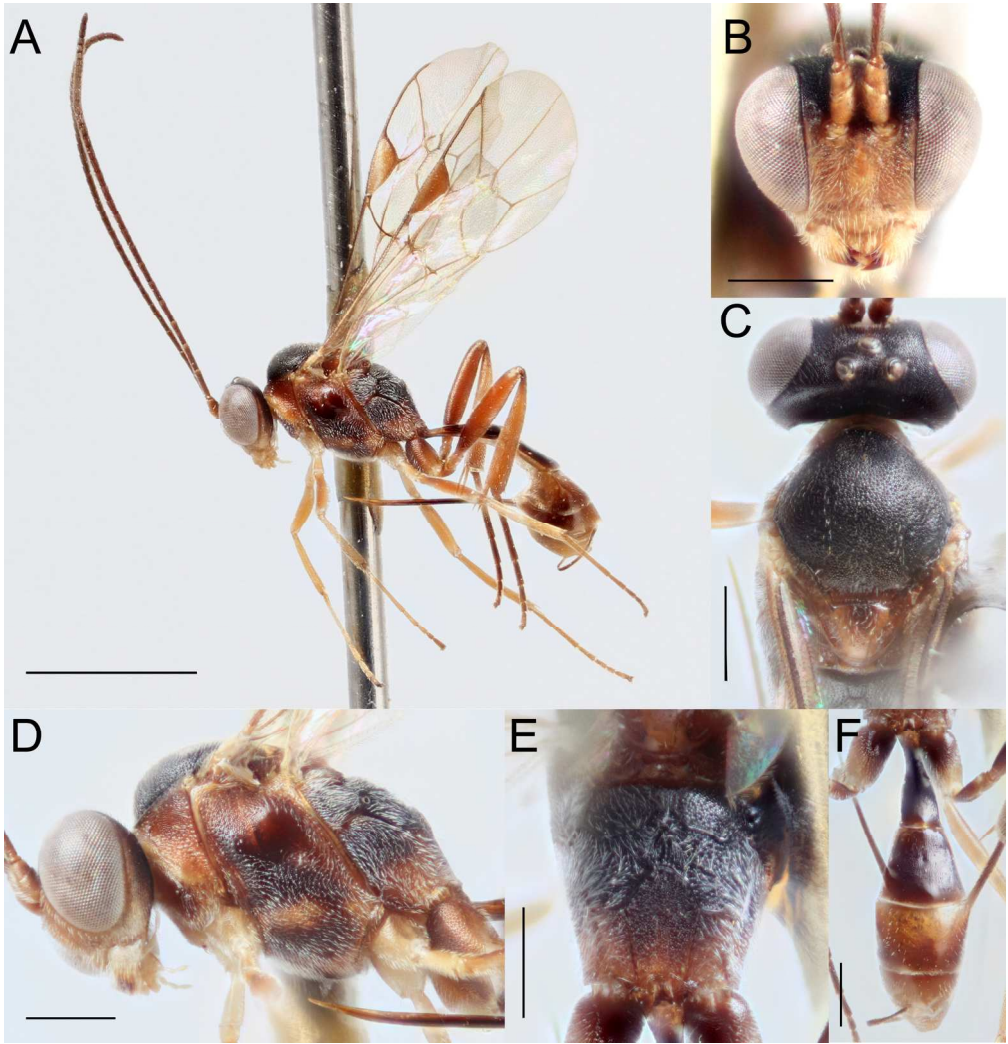
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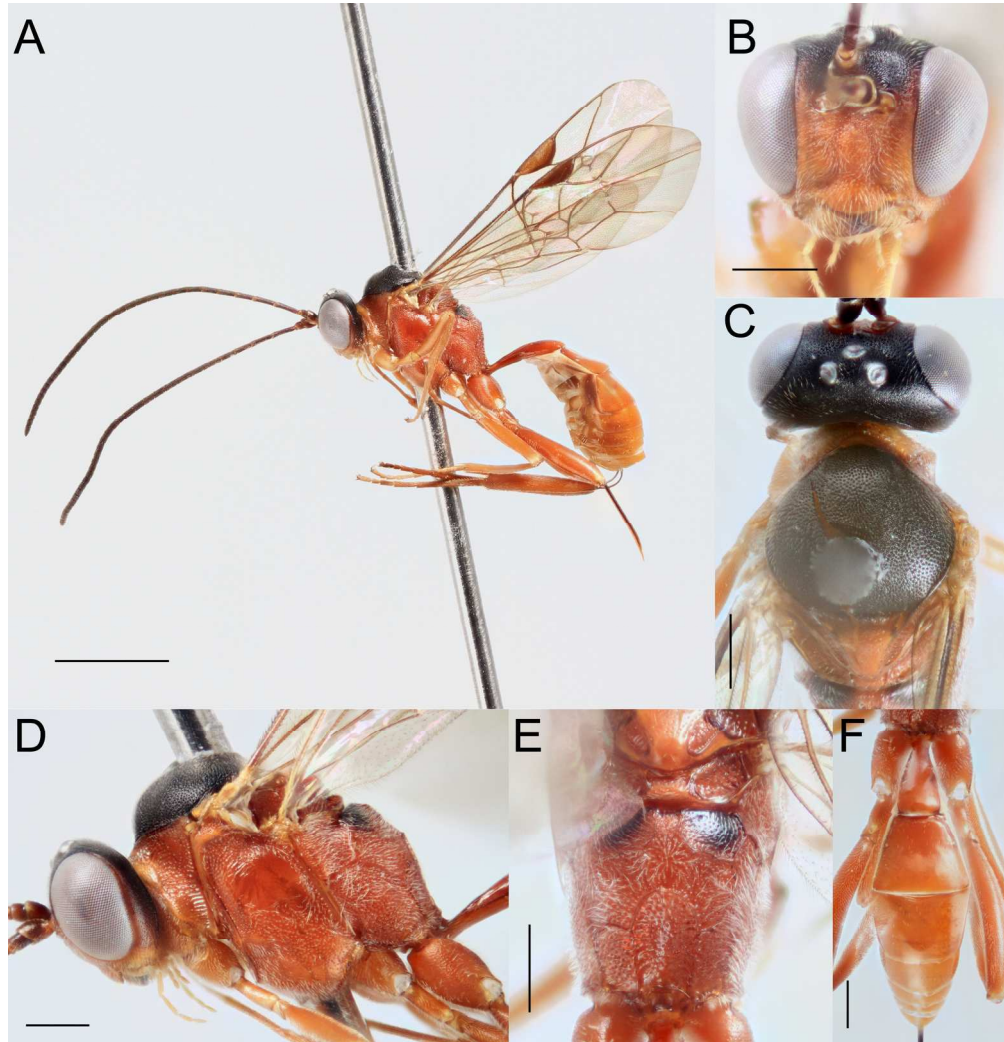
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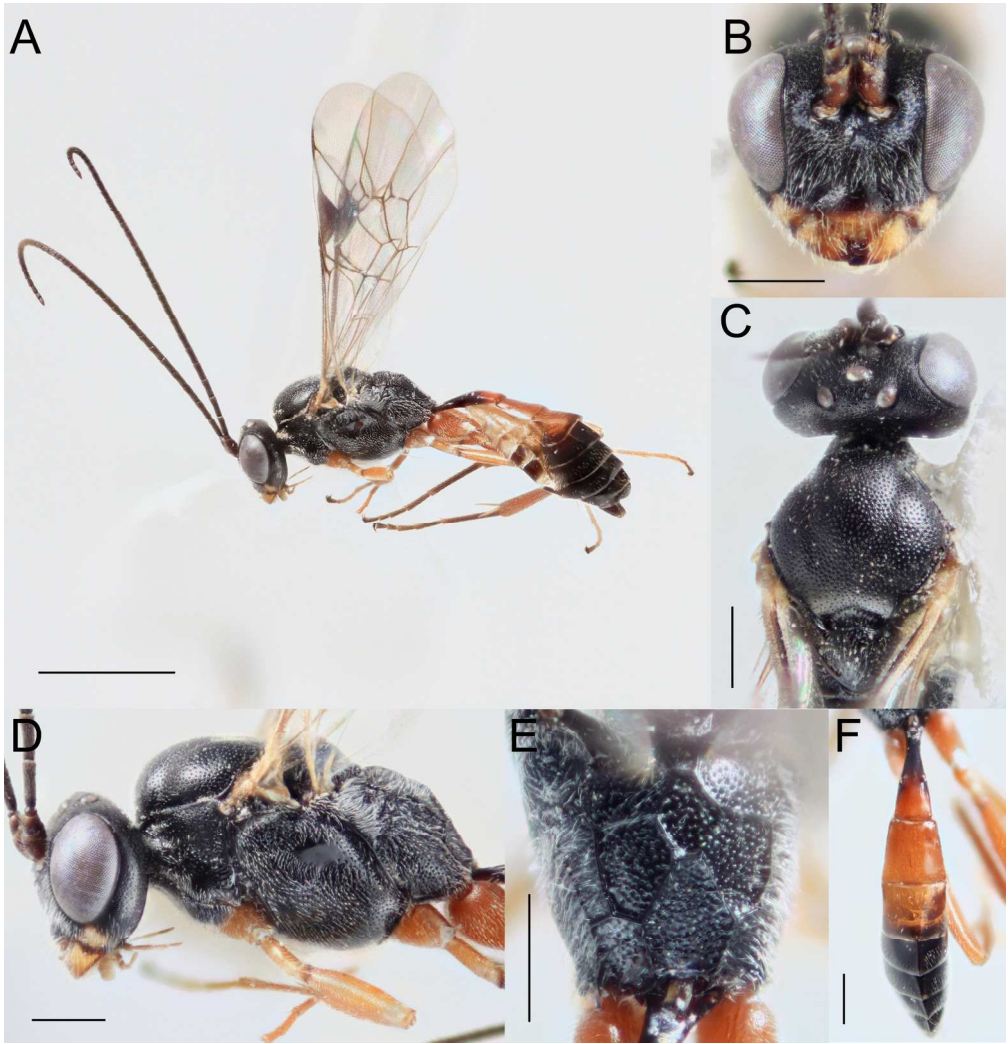
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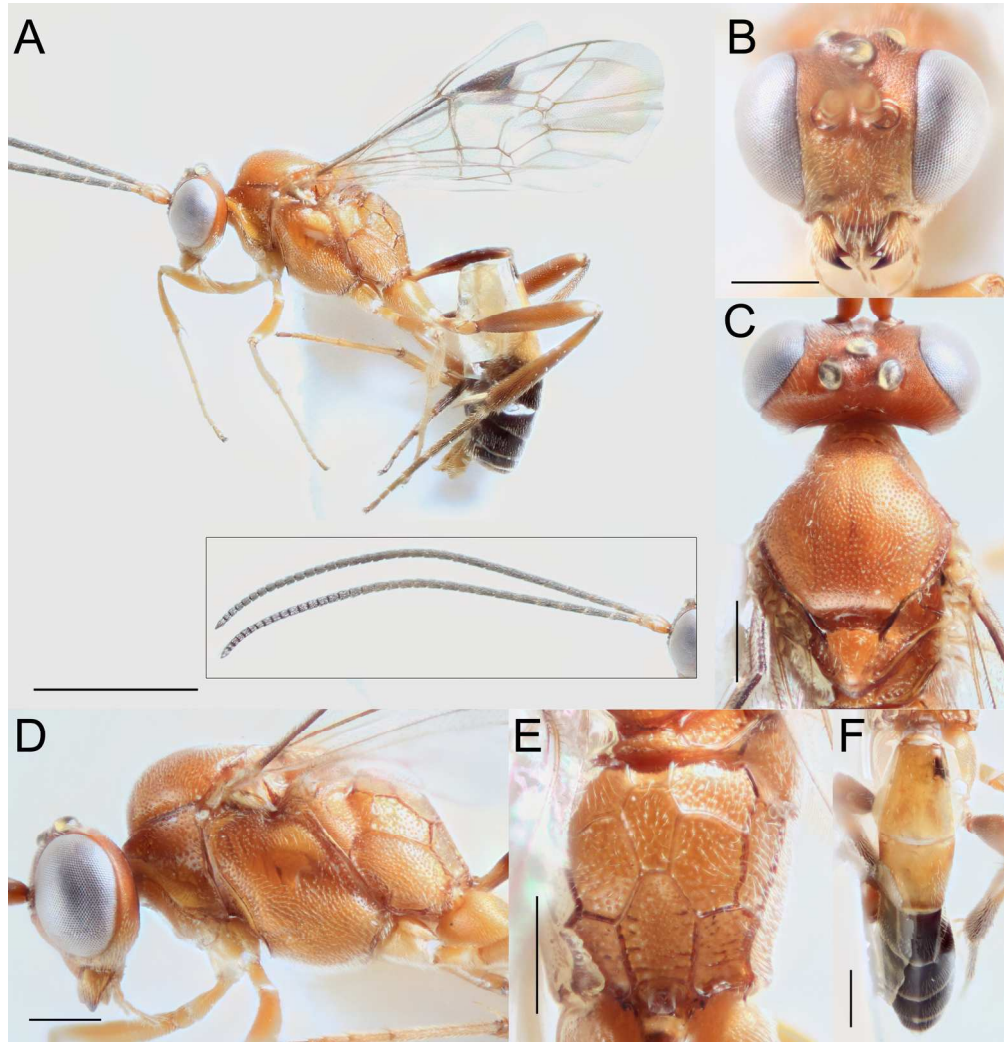
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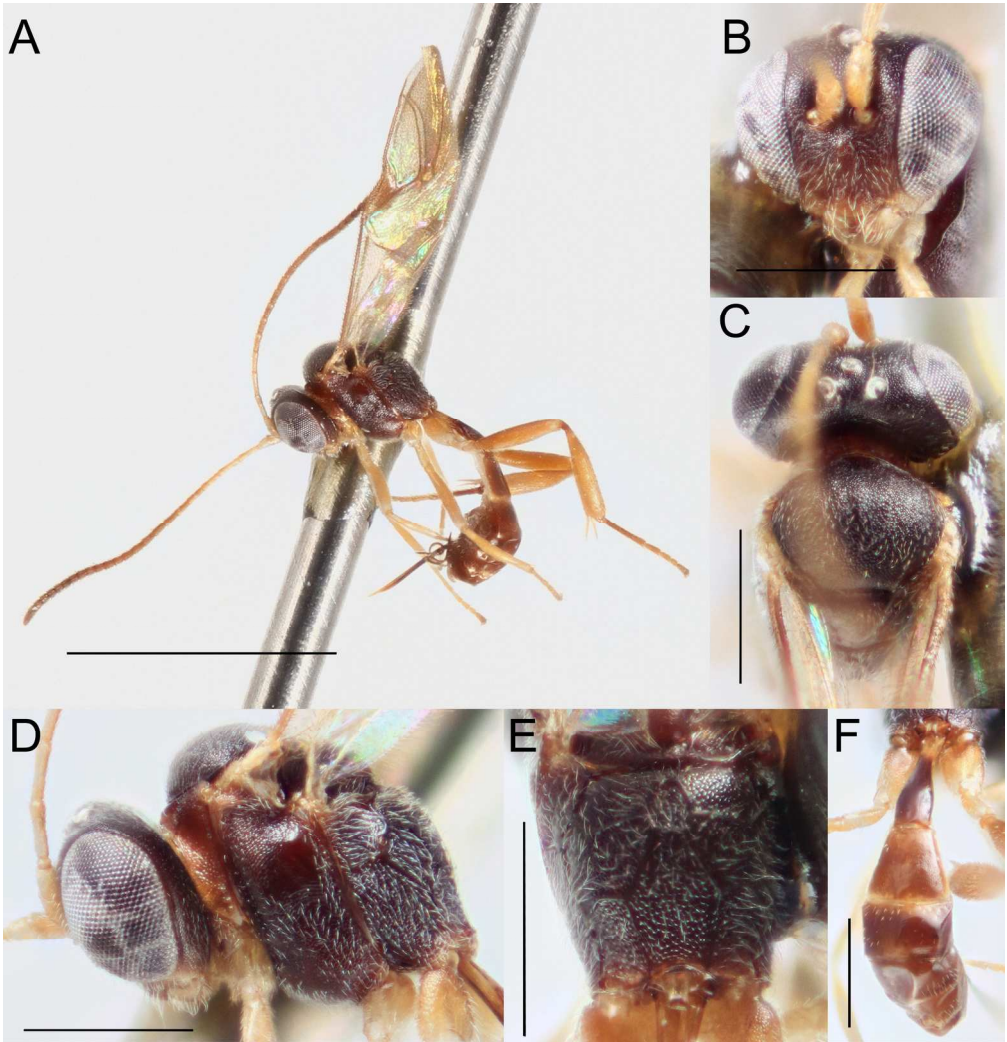
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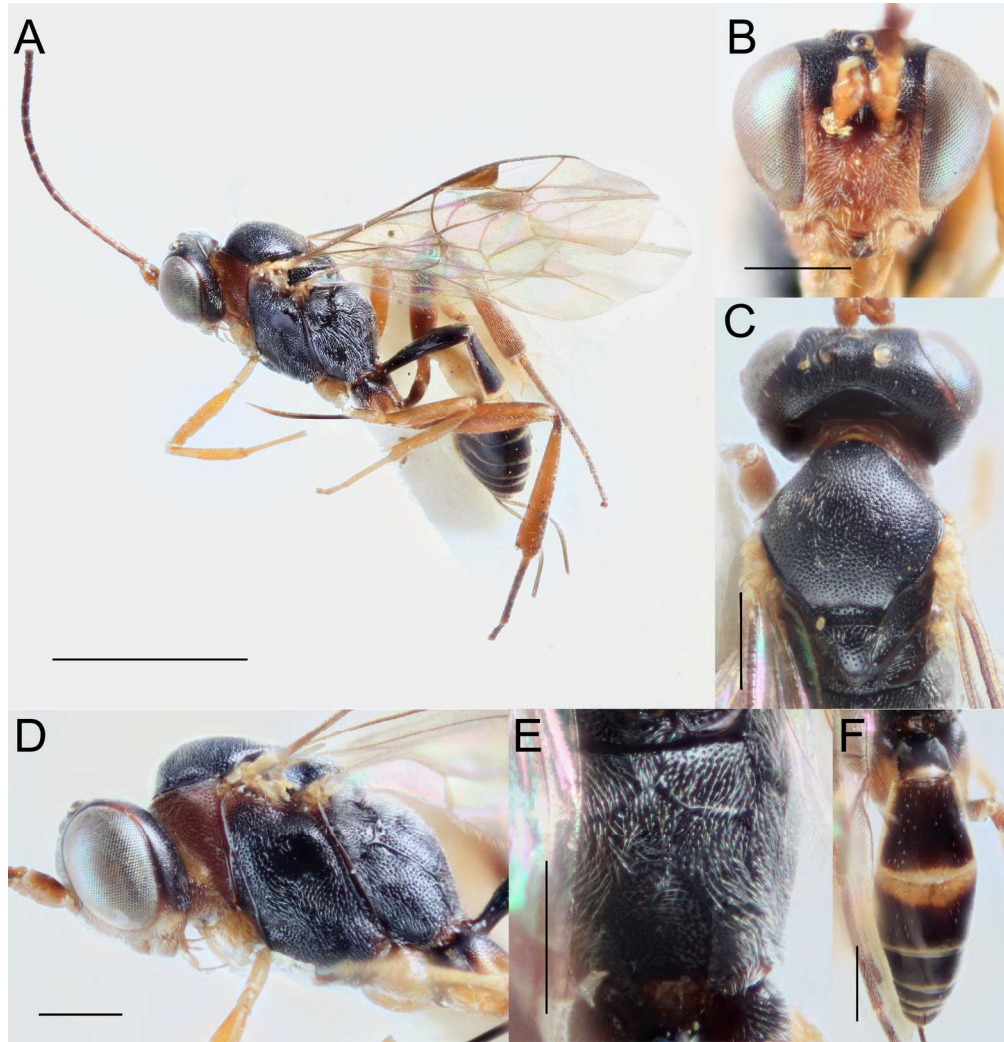
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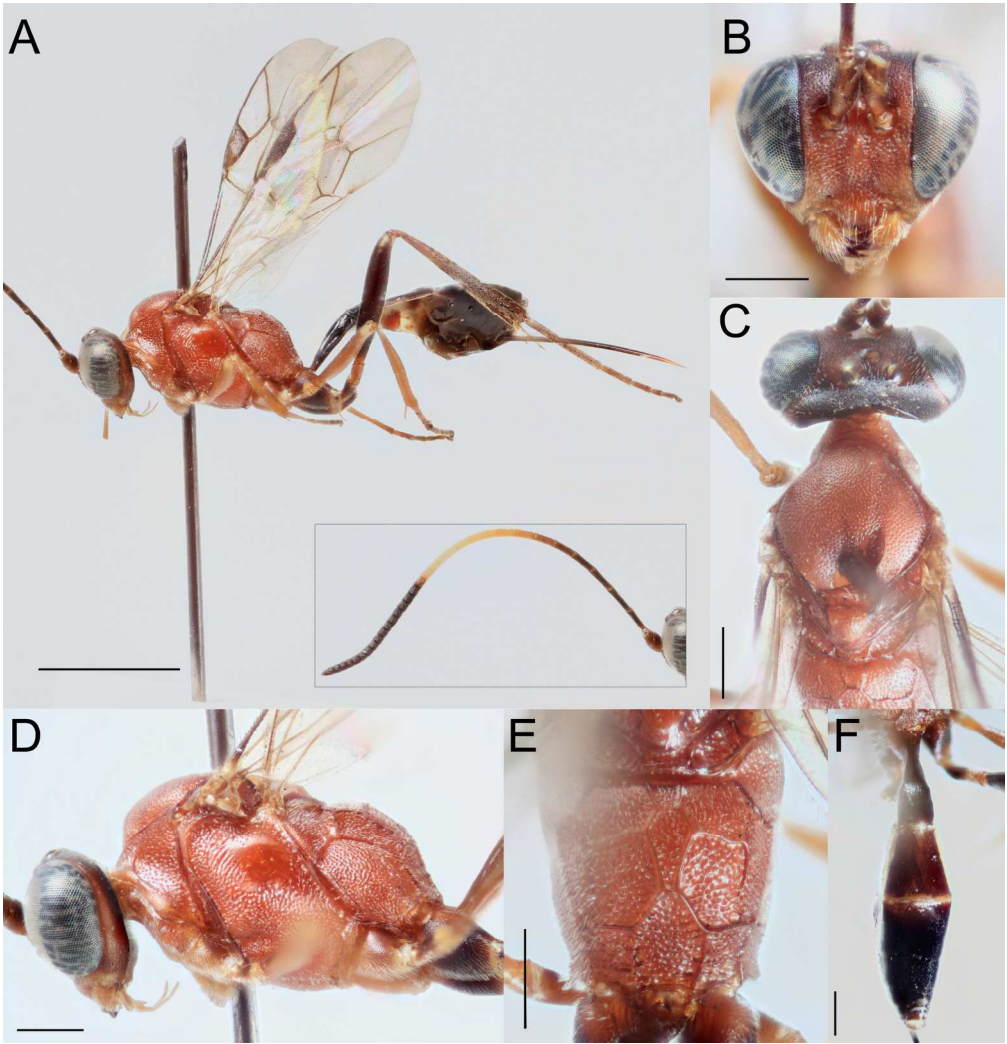
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