



Polyrhachis sexspinosa (Latreille, 1802), a species nesting in silk nests under leaves.
(Photo © Xavier Desmier; identification: Petr Klimes).

New findings of the subfamily Euphorinae (Hymenoptera: Braconidae) from Papua New Guinea, with descriptions, illustrations and molecular data

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ABSTRACT

Here we describe 21 new species of Braconidae in the subfamily Euphorinae from five different tribes: Euphorini: *Leiophron agovauuae* n. sp., *Leiophron anthoferi* n. sp., *Leiophron barbaraee* n. sp., *Leiophron chevalieri* n. sp., *Leiophron diluae* n. sp., *Leiophron gewai* n. sp., *Leiophron keltimi* n. sp., *Leiophron kepai* n. sp., *Leiophron lilipi* n. sp., *Leiophron mellifacialis* n. sp., *Leiophron pascali* n. sp., *Leiophron tulai* n. sp., *Leiophron umai* n. sp., *Leiophron winckleriae* sp.n., *Peristenus montwilhelmi* n. sp., *Peristenus quadriplex* n. sp.; Syntretini: *Syntretus amber* n. sp.; Townesilitini: *Streblocera rugosa* n. sp., *Streblocera semirugosa* n. sp.; Perilitini: *Microctonus madang* n. sp.; and Meteorini: *Meteorus braeti* n. sp. The descriptions are based on distinct morphological characters supplemented with molecular data. We also present genetic sequences for three *Meteorus* species (*Meteorus achterbergi*, *Meteorus obscurus*, *Meteorus tarius*) previously described by Huddleston, 1983. Finally, an identification key to the Papua New Guinean species of the genus *Leiophron* is provided.

RÉSUMÉ

Nouvelles découvertes dans la sous-famille Euphorinae (Hyménoptères : Braconidae) de Papouasie-Nouvelle-Guinée, avec descriptions, illustrations et données moléculaires.

Nous décrivons ici 21 nouvelles espèces de Braconidae dans cinq tribus différentes de la sous-famille Euphorinae : Euphorini : *Leiophron agovauuae* n. sp., *Leiophron anthoferi* n. sp., *Leiophron barbaraee* n. sp., *Leiophron chevalieri* n. sp., *Leiophron diluae* n. sp., *Leiophron gewai* n. sp., *Leiophron keltimi* n. sp., *Leiophron kepai* n. sp., *Leiophron lilipi* n. sp., *Leiophron mellifacialis* n. sp., *Leiophron pascali* n. sp., *Leiophron tulai* n. sp., *Leiophron umai* n. sp., *Leiophron winckleriae* sp.n., *Peristenus montwilhelmi* n. sp., *Peristenus quadriplex* n. sp. ; Syntretini : *Syntretus amber* n. sp.; Townesilitini : *Streblocera rugosa* n. sp., *Streblocera semirugosa* n. sp.; Perilitini : *Microctonus madang* n. sp.; et Meteorini : *Meteorus braeti* n. sp. Les descriptions sont basées sur des caractères morphologiques distincts complétées par des données moléculaires. Nous présentons également des séquences génétiques pour trois espèces de *Meteorus* (*Meteorus achterbergi*, *Meteorus obscurus*, *Meteorus tarius*) décrites précédemment par Huddleston, 1983. Enfin, une clé d'identification des espèces papuaises du genre *Leiophron* est fournie.

Syntretini : *Syntretus amber* n. sp. ; Townesilitini : *Streblocera rugosa* n. sp., *Streblocera semirugosa* n. sp. ; Perilitini : *Microctonus madang* n. sp. ; et Meteorini : *Meteorus braeti* n. sp. Ces descriptions sont basées sur des caractères morphologiques distincts que complémentent des données moléculaires. Nous présentons également des séquences génétiques de trois espèces de *Meteorus* (*Meteorus achterbergi*, *Meteorus obscurus*, *Meteorus tarius*) précédemment décrites par Huddleston, 1983. Finalement, une clé d'identification des espèces du genre *Leiophron* de Papouasie-Nouvelle-Guinée est fournie.

INTRODUCTION

In 2012 the biotic inventory “Our Planet Reviewed” program was conducted on Mount Wilhelm, the highest peak of Papua New Guinea (PNG) (4509 m); and at Wanang, a lowland rainforest station near Madang (Braet 2016). Numerous new species and new records have been documented as a result of this program and are presented in the book *Insects of Mount Wilhelm, Papua New Guinea Volume I* (Robillard *et al.* 2016). In the same volume, 18 new species of Braconidae (Hymenoptera) from 6 different subfamilies were presented (Belokobylskij 2016, Braet 2016, Quicke & Butcher 2016). This study continues the study on the PNG Braconidae, with a focus on the subfamily Euphorinae.

The braconid subfamily Euphorinae is a large, cosmopolitan group of endoparasitoid wasps. The majority of euphorines attack adult hosts, but many species also attack nymphs and larval stages. Euphorines parasitize hosts from a variety of insect orders (Coleoptera, Hemiptera, Hymenoptera, Neuroptera, Psocodea, Orthoptera and Lepidoptera) although the ground plan for host preferences seems to be confined to Coleoptera (Stigenberg *et al.* 2015).

Prior to this study the knowledge of Euphorinae from Australasia was very limited. Huddleston (1983) documented 23 species of the *Meteorus* fauna from Australasia and van Achterberg & Quicke (2000) documented 22 species of the tribe Cosmophorini from the Palaeotropics. Chou (1990) and Papp (2004) revised the *Streblocera* and *Syntreus* of Taiwan, respectively. Finally, Gloag *et al.* (2009) described a new species of *Syntretus* from Australia. Regarding species of *Peristenus* and *Leiophron* there are no prior described species from PNG or Australasia. Zhang *et al.* (2018) also included sequences of six undescribed species of *Leiophron* in building the phylogeny of Euphorini, these species are herein formally described.

MATERIAL AND METHODS

All species described here were collected with Malaise traps during the “Our Planet Reviewed – Papua New Guinea” expedition, from October 25 to November 10 in 2012 at eight sites placed every 500 m along an altitudinal transect on the north-eastern face of Mount Wilhelm; and at Wanang (Swire) Research Station (175 m above sea level), a lowland forest 63 km north of Mount Wilhelm. At each sampling site, four Malaise traps were set up every 100 m following the same contour line. The samples were collected daily and stored in 90% EtOH in zip-lock bags. Samples were sorted to order, and then exported to Muséum national d’Histoire naturelle (MNHN) for further processing (Leponce *et al.* 2016).

Molecular protocol: Specimens were extracted, amplified at the Molecular Systematics Laboratory, Swedish Museum of Natural History. DNA was extracted from ethanol-preserved specimens following the Qiagen protocol from the DNeasy Tissue Kit using one or two legs (Qiagen, Valencia, CA, U.S.A.). Two markers were sequenced when possible, the mitochondrial gene cytochrome oxidase 1 (COI; 658 bp) and the D2 loop of the nuclear 28S ribosomal sequence (28S D2; 632 bp). The COI primers used were LCO and HCO (Folmer *et al.* 1994), while 28S D2 was sequenced using the fwd and rev primers used by Campbell *et al.* (1993). The PCR program for COI had an initial 5 min denaturation at 94°C, followed by 40 cycles of (94°C for 15 s, 46°C for 15 s and 72°C for 15 s), and ending with a 10 min extension period at 72°C. The PCR program for 28S D2 had an initial 4 min denaturation at 95°C, followed by 40 cycles of (94°C for 30 s, 55°C for 30 s and 72°C for 30 s), and ending with a 10 min extension period at 72°C. These genes have been successfully used in previous studies of braconid phylogenetics at various levels (Belshaw *et al.* 2000; Belshaw & Quicke 2002; Dowton *et al.* 2002; Zaldivar-Riverón *et al.* 2006; Sharanski *et al.* 2011; Stigenberg & Ronquist 2011). Product yield, specificity of amplification and contamination were investigated using agarose gel electrophoresis. DNA fragments were amplified using Ready-To-Go PCR beads (Amersham Pharmacia Biotech, Amersham, U.K.). PCR products were

purified using EXOFAP (EXO1 and FastAP). Gene regions were sequenced with the same primers, sequencing reactions were purified using the DyeEx 96 kit (Qiagen) and sequenced using Macrogen sequencing services. Gene regions were sequenced in both directions. Sequences were assembled and edited using Geneious Pro 9.1.8. The Voseq 1.7.3 database (Peña & Malm 2012) was used for storing voucher and DNA sequence data. Some sequences have been used for other publications (Stigenberg *et al.* 2015, Zhang *et al.* 2018) and thus uploaded at different times but they are formally described herein together with their voucher specimens (Table 1). We largely follow Zhang *et al.* (2018) in the downstream analyses of the Euphorini molecular data, using MAFFT server (Katoh *et al.* 2002) default settings for COI and Q-INS-I strategy for 28S which takes secondary structure into account (Katoh & Toh 2008). We conducted phylogenetic analyses of the PNG Euphorini under the maximum likelihood criterion with IQ-TREE v.1.69 (Nguyen *et al.* 2015). Additional sequences from identified specimens of *Leiophron* and *Peristenus* were supplemented from previous published studies (Stigenberg *et al.* 2015, Zhang *et al.* 2017, 2018), as well as the *Microctonus* sp. that is used as the outgroup. The best models of nucleotide substitution for both genes, and partitioning schemes based on codon positions for COI were determined with ModelFinder (Kalyaanamoorthy *et al.* 2017) in IQ-TREE: 28S, TVM+F+G4; COI_pos1, TPM3u+F+G4; COI_pos2, TPM2u+F+I+G4; and COI_pos3,

TPM2+F+R2. To assess nodal support, we performed 1000 ultrafast bootstrap replicates (UFBoot2, Hoang *et al.* 2017) were conducted using “-bb”, along with “-bnni” to reduce risk of overestimating branch supports. The resulting phylogenetic tree was modified using Adobe Illustrator. Terminology for species description follows Wharton *et al.* (1997) and Stigenberg *et al.* (2015). A character important for the genus *Meteorus* is the ocellar-ocular length, the length of lateral ocelli versus the distance to the eye, abbreviated as OOL. Specimens were photographed using a Canon D50 with a microscope objective (10X) mounted on a bellow or using a MP-E 65 mm lens, custom-made diffusers were used to reduce hot spots. Images were stacked using Zerene Stacker software. Images are that of the holotypes (n = 19), with the exception of *Meteorus achterbergi*, *M. tarius* and *M. obscurus*, where we used images from fresh specimens.

TABLE 1
Overview table of species names, voucher codes and GenBank ID numbers.

| VOUCHER CODE | SPECIES NAME | COI | 28S |
|--------------|--------------------------------|----------|----------|
| 01_Yves | <i>Streblocera semirugosa</i> | KJ591420 | KJ591205 |
| 02_Yves | <i>Streblocera rugosa</i> | KJ591421 | KJ591206 |
| 03_Yves | <i>Microctonus madang</i> | - | KJ591265 |
| 04_Yves | <i>Syntretus amber</i> | - | MH464440 |
| 05_Yves | <i>Peristenus montwilhelmi</i> | MH464428 | - |
| 07_Yves | <i>Leiophron anthoferi</i> | MG926854 | MG913702 |
| 08_Yves | <i>Leiophron mellifacialis</i> | MG926855 | MG913703 |
| 09_Yves | <i>Peristenus quadripplex</i> | MH464429 | MH464441 |
| 10_Yves | <i>Leiophron umai</i> | MG926856 | MG913704 |
| 11_Yves | <i>Leiophron tulai</i> | MH464430 | MH464442 |
| 12_Yves | <i>Leiophron chevalieri</i> | MH464431 | - |
| 13_Yves | <i>Leiophron diluae</i> | MH464432 | MH464443 |
| 14_Yves | <i>Leiophron kepai</i> | MH464433 | MH464444 |
| JS10_00532 | <i>Meteorus achterbergi</i> | KJ591543 | KJ591343 |
| JS10_00567 | <i>Meteorus braeti</i> | MH464434 | MH464445 |
| JS10_00568 | <i>Meteorus obscurus</i> | - | MH464446 |
| JS10_00571 | <i>Meteorus tarius</i> | MH464435 | MH464447 |
| JS10_00572 | <i>Meteorus braeti</i> | - | MH464448 |
| PNG_1 | <i>Leiophron agovauae</i> | MH464436 | MH464449 |
| PNG_2 | <i>Leiophron gewai</i> | MH464437 | MH464450 |
| PNG_3 | <i>Leiophron lilipi</i> | MH464438 | MH464451 |
| PNG_4 | <i>Leiophron barbaraee</i> | MH464439 | MH464452 |
| PNG_5 | <i>Leiophron keltimi</i> | MG926872 | MG913714 |
| PNG_6 | <i>Leiophron pascali</i> | MG926873 | MG913715 |
| PNG_7 | <i>Leiophron winckleriae</i> | MG926874 | MG913716 |

RESULTS AND DISCUSSION

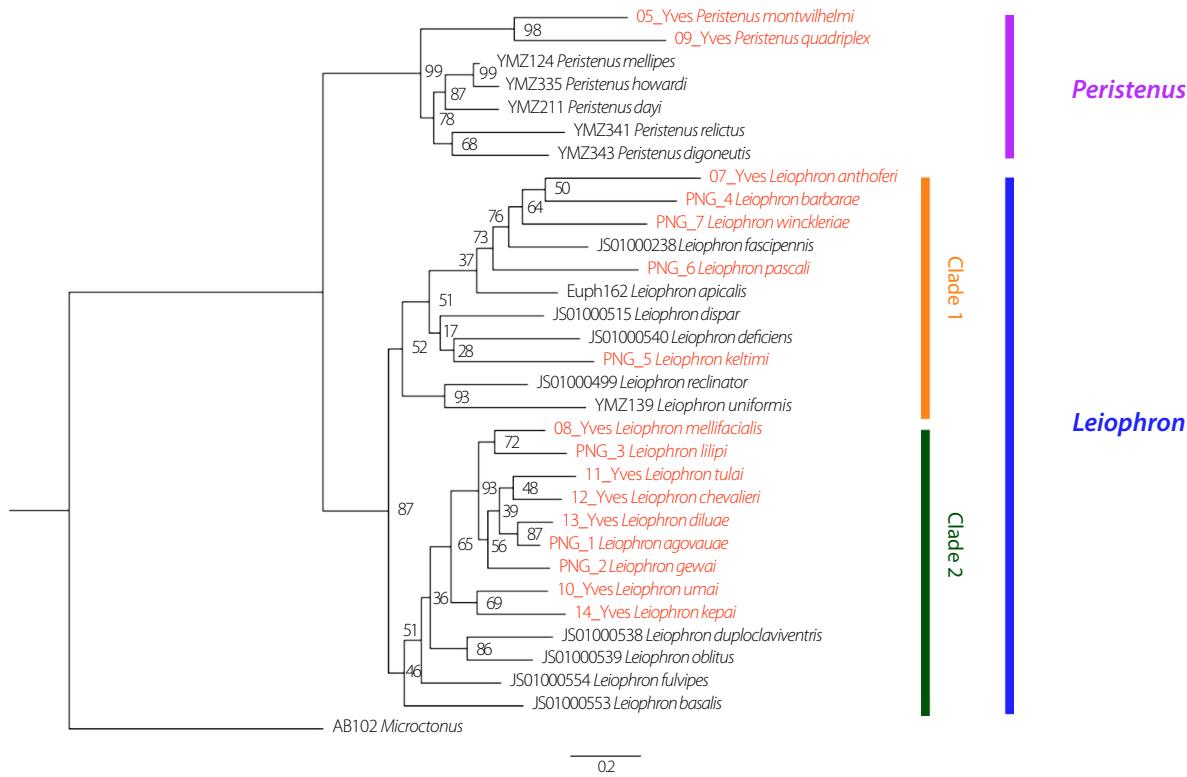
A total of 21 news species of Euphorinae (Braconidae) were identified from the PNG material, but mostly as singletons with one specimen per species. The majority of the diversity is within the tribe Euphorini, with 14 new species of *Leiophron* and 2 new species of *Peristenus*. The PNG *Leiophron* is divided into two clades (Figure 1), with Clade 1 containing specimens with infuscate wings and basal cell of fore wing totally lacking or having only few setae (*L. anthoferi*, *L. barbara*, *L. keltimi*, *L. pascali*, *L. winckleriae*). Specimens in this clade closely resembling the genus type *Leiophron apicalis*, and other western Palearctic species such as *Leiophron deficiens*. Clade 2 consists of specimens that are darker in general body colour (*L. agovauae*, *L. chevalieri*, *L. diluae*, *L. gewai*, *L. kepai*, *L. lilipi*, *L. mellifacialis*, *L. tulai*, *L. umai*), and most closely related to the western Palearctic species such as *Leiophron basalis* and *Leiophron oblitus*. However, the relationships shown within *Leiophron* in this study is not robust given the low ultrafast bootstrap support, likely resulting from the low-resolution power of 28S at the species level. The two species of PNG *Peristenus* form a strongly supported monophyletic group, and is sister to the rest of Palearctic and Nearctic *Peristenus* species (Figure 1).

The molecular difference between the *Leiophron* species of PNG as a group was on average 10-20 nucleotides more in comparison to the nucleotide differences among the Western Palaearctic species. The least difference among the PNG species was found between *L. diluae* and *L. agovauae* (47 nucleotides). The first author has examined the paratype material at the BMNH and concludes that the identity of *Meteorus obscurus* and *M. achterbergi* are correct. Huddleston (1983) remarks on a species very close to *M. achterbergi* that differs on “numerous enough” characters and thus he does not include it in *M. achterbergi*. We have come to the judgement that the material we have identified as *M. achterbergi* from PNG are indeed *M. achterbergi* described by Huddleston in 1983.

Given the high level of diversity of Euphorinae as a result of this limited sampling in PNG, the actual number of species for this group and in the region is likely much higher. We recommend establishing long term collaboration with the Papua New Guinean and Indonesian government to continue the sampling efforts in order to better understand the tremendous parasitoid diversity of New Guinea and their surrounding islands.

KEY TO THE SPECIES OF GENUS *LEIOPHRON* FROM PAPUA NEW GUINEA

1. Fore wings with darker band centrally (Figures 15, 78), fore wing basal cell often lacking setae. Scutellum acutely pointed (Figures 8, 74). Petiole distinctly bent and fused all of its ventral length (Figures 7, 8), yellow to brownish colour 2
- Fore wings without dark band, fore wing basal cells setate. Scutellum not acutely pointed, a more flattened appearance (Figures 2, 29). Petiole straight and only touching ventrally. Dark brown species 5
2. Larger species > 2.0 mm. Basal cell with some setae, though setae short (Figure 15). Fore and middle coxae white. Body brownish (Figure 10) *L. barbara* n. sp.
- Smaller species, < 2.0 mm. Basal cells mostly without setae (Figures 56, 78). Fore and middle coxa yellow to yellowish brown (Figures 6, 56, 72). Yellow species 3
3. Palpi brown (Figure 73). Scutellum and propodeum with acute points (Figure 74), lateral sides of mesosoma smooth, with some weak longitudinal striae but no deep structures *L. winckleriae* n. sp.
- Palpi yellow. Only scutellum with an acute point (Figures 8, 56), lateral sides of mesosoma variable, either a rugose sternaulus (Figure 6) or completely smooth (Figure 56) 4
4. Antennae apically square, lateral sides of mesosoma smooth (Figure 56). Yellow species *L. pascali* n. sp.
- Antennae apically longer than wide, lateral sides of mesosoma with a rugose sternaulus (Figure 6), yellow to brownish species *L. anthoferi* n. sp.
5. Fore and middle legs whitish, basal antennae yellowish-white (Figures 2, 16, 20, 26, 42) 6
- All legs yellowish to brown, basal antennae yellow to brown (Figures 31, 35, 47, 60, 66) 10

**FIGURE 1**

Concatenated *COI* and 28S gene tree of Euphorini including *Peristenus* (purple) and *Leiophron* (blue) using IQ-Tree, with ultrafast bootstrap (UFBoot2) nodal support. *Leiophron* is further divided into two clades (orange, green). Newly described Papua New Guinea species are in red.

6. Mandibles brown/yellow with darker teeth, clypeus brown (Figures 27, 43), basal antennae pale yellow (Figures 26, 42) 7
 - Mandibles whitish with darker teeth, clypeus white or partly white (Figures 3, 17, 21) 8
7. Hind legs whitish yellow, all coxae pale with base brown (Figure 26), notauli absent or very weakly impressed (Figure 30) *L. gewai* n. sp.
 - Hind legs yellowish brown, all coxae brown (Figure 42), notauli punctate (Figure 45) *L. lilipi* n. sp.
8. Face and clypeus white (Figure 17) *L. chevalieri* n. sp.
 - Face brown, clypeus partly brown (Figures 3, 21) 9
9. Specimen dark brown, mesosoma with weak sternaulus (Figure 2), slightly wider clypeus, 2.6X wider than high (Figure 3) *L. agovauae* n. sp.
 - Specimen light brown, without sternaulus (Figures 20, 22), clypeus 2.3X wider than high (Figure 21) *L. diluae* n. sp.
10. Notauli absent (Figure 33) 11
 - Notauli present, sometimes weak (Figures 39, 70) 12
11. Sternaulus deeply impressed (Figure 31), scape flattened, antennae 14 segmented *L. keltimi* n. sp.
 - Sternaulus absent or very weak (Figure 62), scape of normal shape, antennae 16 segmented *L. tulaii* n. sp.

12. Notauli weakly impressed as a line (Figure 53), the male has a swollen fore femur with excavated structures (Figures 54, 55) and a peculiarly small clypeus (Figure 50), mesosoma without any traces of a sternaulus (Figure 48) *L. mellifacialis* n. sp.
- Notauli visibly impressed and punctate (Figures 39, 70), clypeus normal and mesosoma with sternaulus (Figures 37, 68) 13
13. Sternaulus wide and fairly deep (Figure 37), notauli ending bluntly towards the scutellar sulcus (Figure 39) *L. kepai* n. sp.
- Sternaulus narrow and weak but present (Figure 68), notauli delicately impressed ending with a sharp point or narrow point (Figure 70) *L. umai* n. sp.

TAXONOMIC PART

Subfamily EUPHORINAE Förster, 1862

Genus ***LEIOPHRON*** Nees, 1818

Leiophron Nees, 1818: 303

Type species. *Leiophron apicalis* Haliday, 1833.

***Leiophron agovaae* n. sp.**

Figures 2–5

TYPE MATERIAL — Holotype, ♀♂, Papua New Guinea. Province Madang, Mount Wilhelm 1200 m (-5.720903, 145.2715) 1200 m, 06-07/11/2012, leg Philip, Alois, Novotny, Leponce, Plot 3, understorey; Malaise - MAL-MW1200C-13/16-d13, P1822-11346; Voucher ID: PNG_1 (MNHN). GenBank ID: MH464436 (COI), MH464449 (28S).

DIAGNOSIS — Grouped together with the other small, pale and brown *Leiophron* species from PNG, this species is characterised by a dark brown colour but having the mandibles and clypeus pale. The closely related species *L. diluae* has the same features of a pale clypeus and mandibles but the body colour is light brown and the clypeus slightly higher. *L. chevalieri* has the whole face and clypeus white.

DESCRIPTION — *Colour*. Dark brown, head black, first four segments of antennae yellow, following segments browner. Clypeus yellow, mandibles and palpi light yellow to white, mandible teeth reddish brown. Mesosoma dark brown. Wing veins and pterostigma light brown to yellow. Legs pale yellow to white, only hind coxae brown. Metasoma dark brown.

Head. Antenna 16 segmented, first flagellomere 2.75X longer than wide, the following segments longer than wide. Face 1.6X wider than long. Face weakly punctate, setose with long setae. Clypeus slightly wider than face. Clypeus 2.60X wider than clypeus height. Occipital carina interrupted, vertex smooth.

Mesosoma. Notauli present as weak punctures, mesonotum, mesopleuron smooth except sternaulus present as small rugose dots. Propodeum with median carina and propodeal areola, in between the carinae smooth. Postpectal carina strong ventrally, laterally absent.

Metasoma. Petiole rugose and sparsely striate, with spiracle slightly apical to middle, petiole not fused ventrally. Gaster 1.6X the length of petiole.

Wings. Fore wing M-Cu spectral, basal and subbasal cell less setose. Pterostigma 2X wider than R1, fore wing vein r_5 absent, 1st submarginal and 1st discal cell open.

**FIGURES 2-5**

Holotype *Leiophron agovuae* n. sp. **2**, lateral view of habitus; **3**, front view of head; **4**, dorsal view of head and mesosoma; **5**, wings. Scale bars: 0.5 mm.

Legs. Fore femur 3.4X as long as its maximum width. Hind femur 3.6X as long as its maximum width.

MEASUREMENTS — 1.6 mm in length, fore wing length 1.5 mm.

ETYMOLOGY — This species is named in honour of one of the notable Hymenoptera sorters within the project; Sharon Agovaea, from the National Agricultural Research Institute, Papua New Guinea.

***Leiophron anthoferi* n. sp.**

Figures 6-9

TYPE MATERIAL — Holotype, ♂, **Papua New Guinea**. Province Madang, Mount Wilhelm 200 m (-5.739897, 145.3297) 200 m, 31/10-01/11/2012, leg Dilu, Ray, Novotny, Leponce, Plot 1, understorey; Malaise - MAL-MW0200A-07/16-d07, P1004-11966; Voucher ID: 07_Yves (MNHN). GenBank ID: MG926854 (COI), MG913702 (28S).

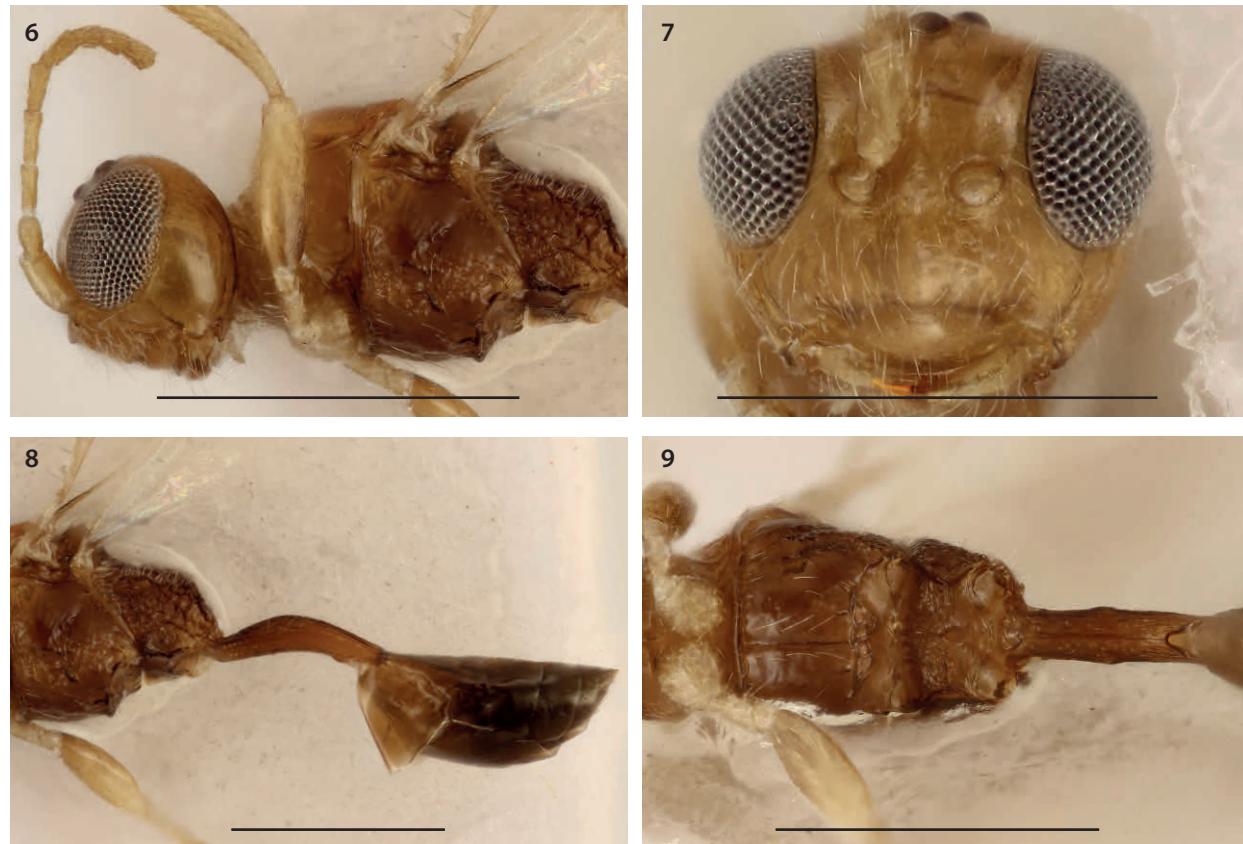
DIAGNOSIS — Differs from the similar species *L. pascali* by its slightly darker colour, the white palpi and the shape of flagellomeres, which is longer than wide.

DESCRIPTION — *Colour.* Antennae, head, forelegs and apical part of thorax yellowish and body gradually darkening distally, abdomen dark brown. All tarsi white, in contrast with rest of leg. Wings brownish infuscate, pterostigma dark brown with basal translucent area.

Head. Antenna with 16 segments, slender basally, thickening apically. First flagellomere 2.6X longer than wide. Face wide and with very short setae, 1.9X as wide as high. Clypeus 0.6X face width, clypeus 2.4X as wide as high. Malar space 1.4X width of mandible base. Occipital carina incomplete, only present laterally. Vertex with few short setae.

Mesosoma. Notauli indicated apically with carina and with few shallow punctures, mesoscutum smooth and not setate, scutellum pointed but with a blunt point. Scutellar sulcus with median carinae. Epicnemial carina and postpectal carina present. Mesopleuron irregularly rugose. Propodeum finely areolet-reticulate, not sharply angulated but smooth.

Metasoma. Petiole with longitudinal striae dorsally and ventrally. Dorso-basally the petiole is softly rugose halfway, striate afterwards. Petiole fused ventrally except basally where the triangular area is elongate. Spiracles in basal ¼. Length of petiole 4.2X its apical width. Gaster 1.3X the length of petiole.



FIGURES 6-9

Holotype of *Leiophron anthoferi* n. sp. **6**, lateral view of head and mesosoma; **7**, front view of head; **8**, lateral view of propodeum and abdomen; **9**, ventral view of mesosoma and petiole. Scale bars: 0.5 mm.

Wings. Fore wing M-Cu spectral. Most fore wing veins spectral or absent except vein 1-M which is wider than ordinary. Fore wing vein 3RS_b nebulous. Pterostigma 4.6X wider than R₁, dark brown and basally white. Wings infuscate with translucent band in the middle. Fore wing basal and subbasal cells glabrous.

Legs. Fore femur 3.0X as long as its maximum width. Hind femur 3.6X as long as its maximum width. All femurs and tibiae with 'scale like' microstructure.

MEASUREMENTS — 1.8 mm in length, fore wing length 1.3 mm.

ETYMOLOGY — This species is named in honour of Fariz Anthofer, a devoted student from the Université de Nouvelle-Calédonie who helped with sorting this material.

NOTE — This specimen was labelled as "07_Yves_Leiophron_PNG" in Zhang *et al.* (2018).

***Leiophron barbareae* n. sp.**

Figures 10-15

TYPE MATERIAL — Holotype, ♀, Papua New Guinea. Province Madang, Wanang 3 station (-5.22767, 145.0797) 175m, 24-25/11/2012, leg Basset, Plot 1, understorey; Malaise - MAL-WAN01-D07 P4906-935; Voucher ID: PNG_4 (MNHN). GenBank ID: MH464439 (COI), MH464452 (28S).

DIAGNOSIS — This beautiful and large species is distinct with its dark brown colour with contrasting white coxae. The similar species are smaller and lighter in colour.

DESCRIPTION — *Colour.* Head and clypeus brown; mandibles and three first antennal segments yellow; rest of body dark brown/black. Fore and middle coxae and trochanter white, hind coxa and femur brown but trochanter white, all tarsi yellow. Wings infuscate, pterostigma brown and basally translucent.

Head. Antenna broken after 6th segment, first flagellar segment 5X longer than wide, following two segments also slender. Face smooth, 1.3X as wide as high, sparsely setose with short setae, gena sparsely setose. Clypeus slightly wider than face, (1.05X) truncate. Vertex smooth. Malar space 0.7X width of mandible base. Occipital carina incomplete.

Mesosoma. Mesoscutum highly, roundly elevated above pronotum. Notauli absent, mesonotum largely smooth with a few umbilicate punctures. Scutellum distinctly raised to a projection past scutellar sulcus, seen as a triangle in lateral view. Epicnemial carina present. Mesopleuron with deep, rugose sternaulus that almost reaches ventrally, otherwise smooth. Postpectal carina ventrally distinct, laterally absent. Propodeum areolate-weakly rugulose.

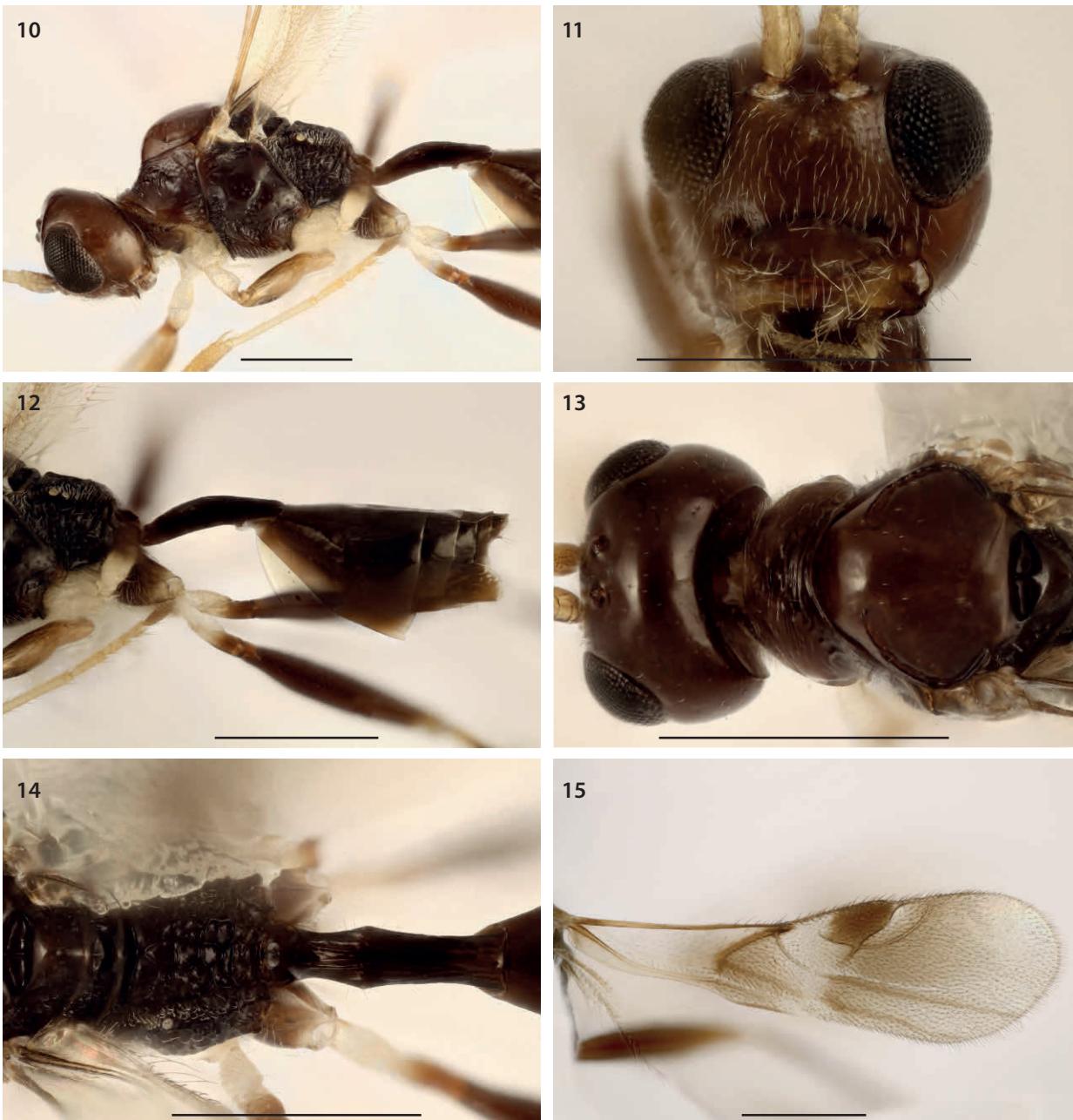
Metasoma. Petiole slender with long sparse striae, spiracles situated in basal ⅓. Length of petiole 3.5X its apical width, fused ventrally. Gaster 1.5X length of petiole.

Wings. Fore wing M-Cu spectral, basal and subbasal cell sparsely setose. Vein r absent, 1st submarginal and 1st discal cell open distally. Pterostigma 3.3X wider than R₁.

Legs. Fore femur 4.4X as long as its maximum width. Hind femur 5X as long as its maximum width.

MEASUREMENTS — 2.4 mm in length, fore wing length 2.0 mm.

ETYMOLOGY — Named in honour of Dr Barbara Sharadowski, the PhD advisor of the second author, for her guidance and patience.

**FIGURES 10-15**

Holotype *Leiophron barbara* n. sp. **10**, lateral view of mesosoma; **11**, front view of head; **12**, lateral view of metasoma; **13**, dorsal view of head and mesosoma; **14**, dorsal view of propodeum and petiole; **15**, fore wing. Scale bars: 0.5 mm.

Leiophron chevalieri n. sp.

Figures 16-19

TYPE MATERIAL — Holotype, ♀, Papua New Guinea. Province Madang, Mount Wilhelm 1200 m (-5.721022, 145.2703) 1200 m, 03-04/11/2012, leg Philip, Alois, Novotny, Leponce Plot 2, understorey; Malaise - MAL-MW1200B-10/16-d10, P1803-11328; Voucher ID: 12_Yves (MNHN). GenBank ID: MH464431 (COI), N/A (28S).

DIAGNOSIS — Very peculiar species with a white face, a character not so common among the Braconidae.

**FIGURES 16-19**

Holotype *Leiophron chevalieri* n. sp. **16**, lateral view of habitus; **17**, front view of head; **18**, lateral view of mesosoma; **19**, fore wing. Scale bars: 0.5 mm.

DESCRIPTION — *Colour.* Specimen with brown head, mesosoma and abdomen. Face, mandibles (except teeth) and legs white, only last tarsomerore slightly brownish. Antennal segments basally white, darkening gradually apically. Pterostigma light dark brown with basal translucent area.

Head. Antenna with 16 segments, stout. Face 1.1X as wide as high, flat, dense with long setae. Clypeus as wide as face, 2.5X wider than high. Malar space 0.75X width of mandible base. Occipital carina incomplete, only present laterally. Vertex with long setae. Upper mandible tooth long, 3X longer than lower tooth.

Mesosoma. Notauli punctate, mesoscutum smooth with long setae, scutellum flattened. Epicnemial carina present. Postpectal carina present and distinct. Mesopleuron smooth. Propodeum with median latitudinal carina, smooth in between, gently sloping towards petiole.

Metasoma. Petiole with dorsope, dorsally with few longitudinal striae. Petiole not fused ventrally. Length of petiole 2.0X its apical width. Gaster 1.8X the length of petiole.

Wings. Fore wing M-Cu spectral. Fore wing vein r absent, 1st submarginal and 1st discal cell open distally. Wings translucent. Pterostigma 1.8X wider than R1.

Legs. Fore femur 2.9X as long as its maximum width, hind femur 3.9X as long as its maximum width.

MEASUREMENTS — 1.8 mm in length, fore wing length 1.8 mm.

ETYMOLOGY — This species is named in honour of Dr. Cyril Chevalier who happily volunteers to any expedition.

***Leiophron diluae* n. sp.**

Figures 20-25

TYPE MATERIAL — Holotype, ♀, Papua New Guinea. Province Madang, Mount Wilhelm 1200 m (-5.720874, 145.2695) 1200 m, 05-06/11/2012, leg Philip, Alois, Novotny, Leponce Plot 4, understorey; Malaise - MAL-MW1200D-12/16-d12, P1837-11340; Voucher ID: 13_Yves (MNHN). GenBank ID: MH464432 (COI), MH464443 (28S).

DIAGNOSIS — Belonging to the pale-legged *Leiophron* group, but also with a pale-brown clypeus, this species is similar to *L. agovauae* but lacks the deep brown colour and the sternaulus.

DESCRIPTION — *Colour.* Reddish-brown, antennae light yellow basally and darkening apically, wing veins and pterostigma yellow, legs white. Posterior half of metasoma brown. Mandible white with brown teeth.

Head. Antenna 16 segmented, first flagellomere 3.6X longer than wide, the following segments longer than wide. Head 1.4X as wide as long. Face 1.6X as wide as long, evenly setose with long hairs, not appressed. Clypeus flat, 2.25X wider than high. Clypeus just slightly wider than face (1.1X). Height of malar space 0.7X that of basal width of mandible. Vertex smooth. Occipital carina incomplete. Only occiput and stemmaticum with few setae, length of setae twice the diameter of ocelli.

Mesosoma. Notauli present apically, mesoscutum sparsely setose. Scutellar sulcus with distinct fovea, with one median longitudinal carina. Epicnemial carina present. Mesopleuron largely smooth, sternaulus very shallow. Postpectal carina strong. Propodeum areolate, smooth in between carinae.

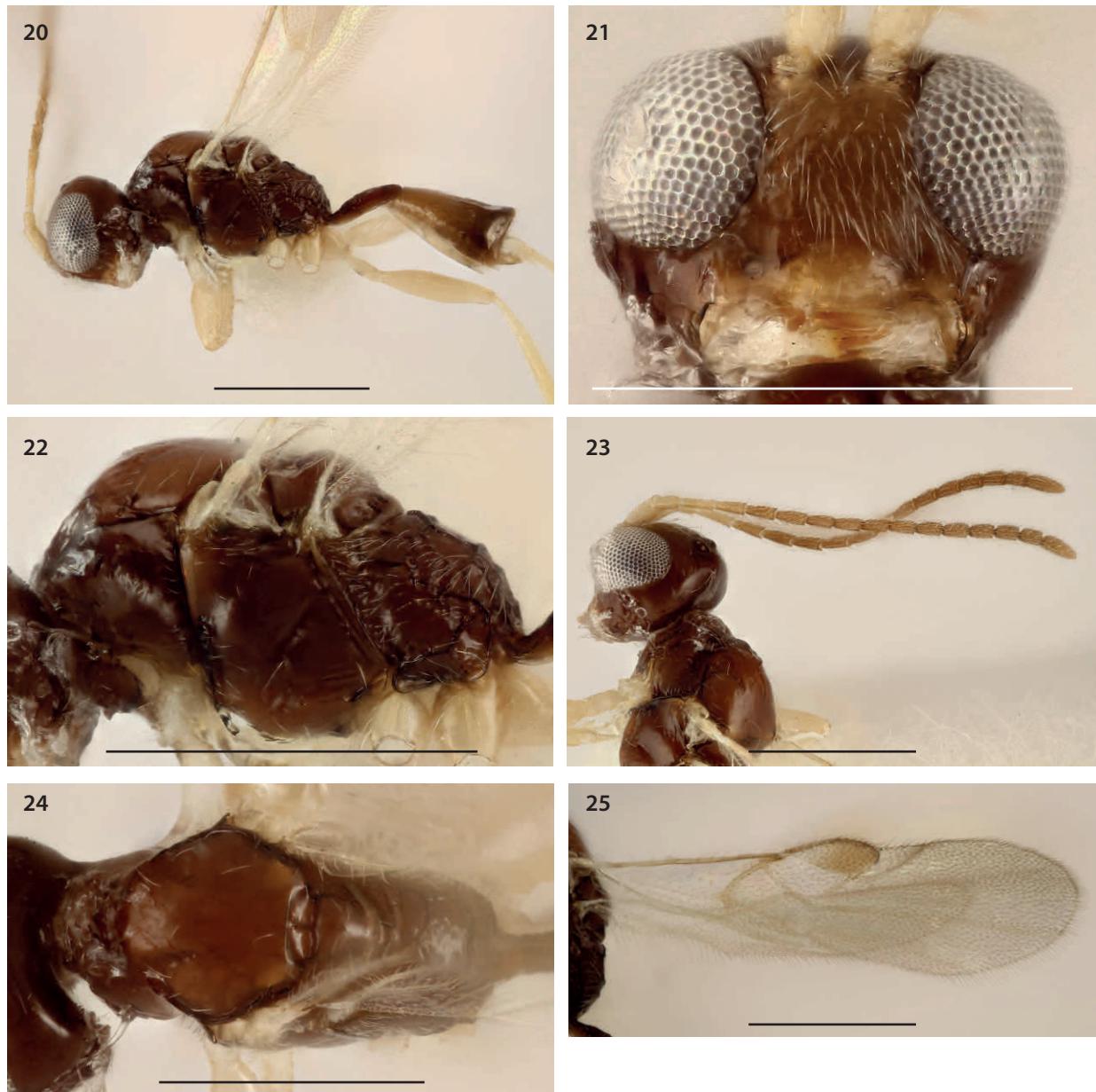
Metasoma. Petiole rugulose, dorsope present, with spiracular tubercle in basal 1/2. Sparsely setate (< 5 setae) surrounding the spiracle. Length of petiole 3.0X its apical width, not touching in ventral view. Gaster 1.5X the length of petiole.

Wings. Fore wing M-Cu weakly spectral, basal and subbasal cell sparsely setose. r, r-m, absent, 1st submarginal and 1st discals cell incomplete. Vein 2RS spectral. Hindwing basal cell complete, subbasal cell absent.

Legs. Fore femur 3.1X as long as its maximum width. Hind femur 4.0X as long as its maximum width.

MEASUREMENTS — 1.6 mm in length, fore wing length 1.6 mm.

ETYMOLOGY — This species is named after Mary Dilu, a member of the New Guinea Binatang Research Center who participated in this project and contributed with sorting material.



FIGURES 20-25

Holotype *Leiophron diluae* n. sp. **20**, lateral view of habitus; **21**, front view of head; **22**, lateral view of mesosoma; **23**, lateral view of head and antennae; **24**, dorsal view of mesosoma; **25**, fore wing. Scale bars: 0.5 mm.

Leiophron gewai n. sp.

Figures 26-30

TYPE MATERIAL — Holotype, ♀, Papua New Guinea. Province Madang, Mount Wilhelm 700 m (-5.732698, 145.2556) 700 m, 26-27/10/2012, leg Keltim, Uma, Novotny, Leponce, Plot 2, understorey; Malaise - MAL-MW0700B-02/16-d02, P1405-11987; Voucher ID: PNG_2 (MNHN). GenBank ID: MH464437 (COI), MH464450 (28S).



FIGURES 26-30

Holotype *Leiophron gewai* n. sp. **26**, lateral view of habitus; **27**, front view of head; **28**, lateral view of abdomen; **29**, lateral view of head and mesosoma; **30**, dorsal view of head and mesosoma. Scale bars: 0.5 mm.

DIAGNOSIS — This species is characterised by a dark brown colour with mandibles yellow with dark teeth and clypeus brown. The closely related species *L. gewai*, *L. agovauae* and *L. diluae* all have a paler clypeus.

DESCRIPTION — *Colour*. Generally, mesosoma black, clypeus dark brown, mandibles brownish yellow. Antennae yellow, first four segments pale yellow. Wing colour infuscate, venation and pterostigma brownish, pterostigma basally translucent. Legs pale yellow, hind coxae brown. Metasoma dark brown.

Head. Antenna 16 segmented, first flagellomere 4.3X longer than wide, the following segments longer than wide. Face as wide as long, sparsely setose with long setae, length of setae > clypeus height, setae shorter nearer the eyes. Clypeus slightly wider than face, 2.8X wider than high. Antennae basally long and slender. Occipital carina incomplete, vertex smooth.

Mesosoma. Notauli present with faint punctures and a few long setae, mesonotum smooth. Epicnemial carina present, laterally associated with rugosity.

Metasoma. Petiole dorsally with small dorsope and rugulose structure, length of petiole 3X its apical width, minute spiracles situated before middle. Gaster 1.8X the length of petiole.

Wings. Fore wing M-Cu spectral, basal and subbasal cell less setose. 1st submarginal and 1st discal cell open distally. Pterostigma 3X wider than R1, fore wing vein r absent.

Legs. Fore femur 3.2X as long as wide (1.6 long/0.5 wide). Hind femur 3.8X as long as wide.

MEASUREMENTS — 1.9 mm in length, fore wing length 1.9 mm.

ETYMOLOGY — This species is named in honour of one of the notable hymenoptera sortes within the project, Bradley Gewa from the Binatang Research Center, Papua New Guinea.

Leiophron keltimi n. sp.

Figures 31-34

TYPE MATERIAL — Holotype, ♀, **Papua New Guinea**. Province Madang, Mount Wilhelm 3200 m (-5.806944, 145.0721) 3200 m, 20-21/10/2012, leg Dahl, Kaupa, Novotny, Leponce, Plot 3, understorey; Malaise - MAL-MW3200C-05/16-d05, P3374-8873; P3374; Voucher ID: PNG_5 (MNHN). GenBank ID: MG926872 (COI), MG913714 (28S).

DIAGNOSIS — *L. keltimi* has a unique appearance regarding shape of the head, the flattened shape of the scape and the colour of all the legs.

DESCRIPTION — *Colour*. Dark specimen with black body, antennae basally yellow and darkening apically. Femur and coxae brown otherwise legs pale yellowish to brown. Wings infuscate, pterostigma brown with small translucent basal spot.

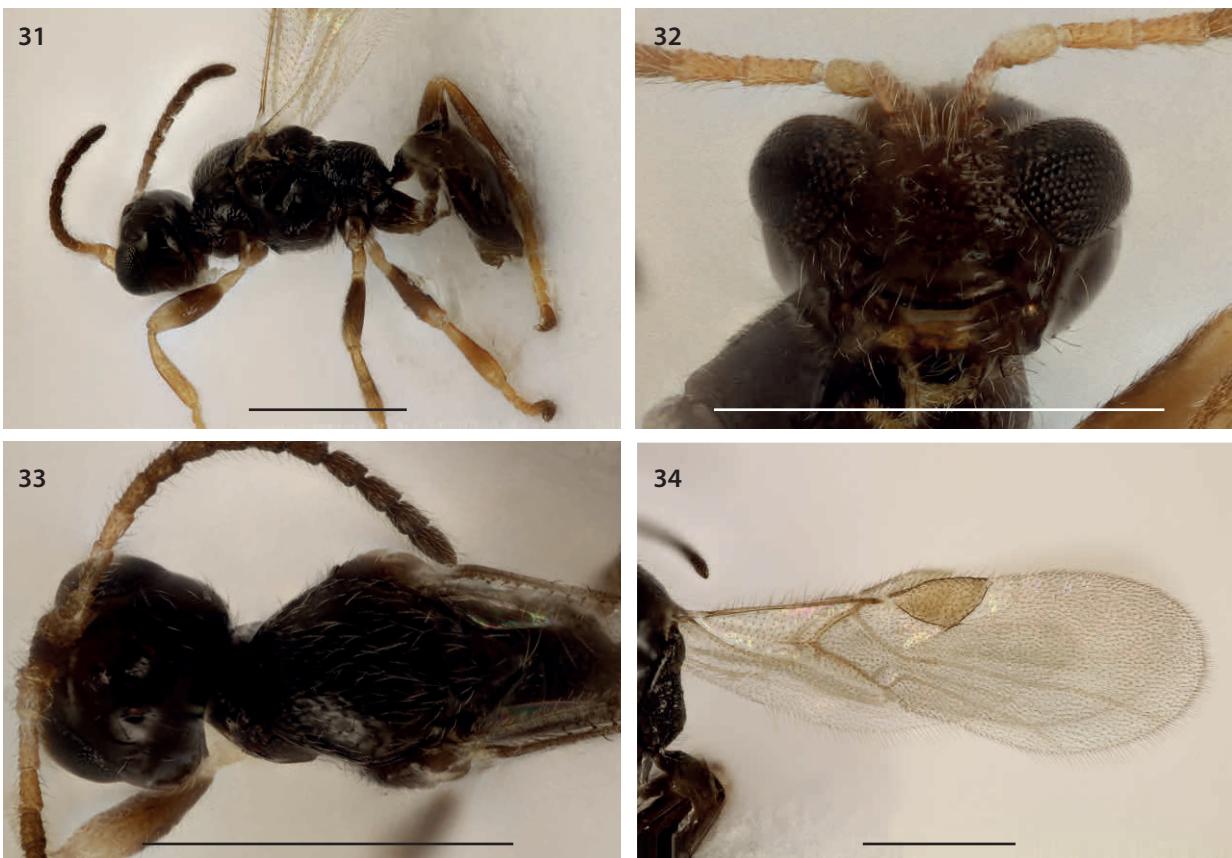
Head. Antenna with 14 segments, first segment (scape) flattened, spoon-like. Face with small punctures originating from the setae, 1.1X as wide as high. Clypeus as wide as face, clypeus with a protruding ventral rim and clypeus 2.5X as wide as high. Malar space 0.6X width of mandible base. Occipital carina incomplete. Vertex setate.

Mesosoma. Notauli absent, mesothorax punctate and setate. Epicnemial carina present. Postpectal carina absent. Mesopleuron with short, spot-like sternaulus, otherwise smooth. Propodeum reticulate rugose.

Metasoma. Petiole with dorsope and longitudinal striae mixed with rugose structure. Petiole not fused ventrally, 1.9X as long as apically wide.

Wings. Fore wing M-Cu spectral, basal and subbasal cell sparsely setose. Fore wing vein r absent, 1st submarginal and 1st discal cell open distally. Wings infuscate except marginal cell. Pterostigma 4.5X wider than R1.

Legs. Fore femur 3.0X as long as its maximum width. Fore tibia with a ridge running almost all its length. Hind femur 3.6X as long as its maximum width. Tarsi very shortened.

**FIGURES 31-34**

Holotype *Leiophron keltimi* n. sp. **31**, lateral view of habitus; **32**, front view of head; **33**, dorsal view of head and mesosoma; **34**, fore wing. Scale bars: 0.5 mm.

MEASUREMENTS — About 2.0 mm in length, fore wing length 2.5 mm.

ETYMOLOGY — This species is named in honour of one of the notable sorters within the project, Martin Keltim, at the Binatang Research Center, Papua New Guinea.

NOTE — This specimen was labelled as “PNG_5_Leiophron” in Zhang *et al.* (2018).

***Leiophron kepai* n. sp.**

Figures 35-41

TYPE MATERIAL — Holotype, ♀, Papua New Guinea. Province Madang, Mount Wilhelm 3200 m (-5.807419, 145.0736) 3200 m, 28-29/10/2012, leg Dahl, Kaupa, Novotny, Leponce, Plot 2, understorey; Malaise - MAL-MW3200B-13/16-d13; P3366-9155; Voucher ID: 14_Yves (MNHN). GenBank ID: MH464433 (COI), MH464444 (28S).

DIAGNOSIS — *L. kepai* has a wide sternalus and deep notaui that ends in a U-shape.

DESCRIPTION — *Colour*. Dark brown, almost black. Mandibles, antennal segments and legs brown. Pterostigma light brown with pale base.

Head. Antenna with 16 segments, basally slender, first segment (scape) 2.5X longer than widest point, first flagellar segment 2.6X longer than wide, apical segments as wide as long. Face wide, 1.25X as wide as high, with scattered long setae. Clypeus as wide as face, and 1.3X wider than its median height. Malar space 1.15X width of mandible base. Occipital carina interrupted dorsally. Vertex with few setae. Face with a notch where from striae emerges horizontally towards the eyes.

Mesosoma. Notauli present, anterior part of mesonotal lobe with few scattered setae, otherwise mesoscutum smooth. Scutellum rather flattened. Mesopleuron smooth, with sternalus. Epicnemial carina present. Postpectal carina present and the medioventral area reticulate-rugose. Propodeum reticulate areolate.

Metasoma. Petiole with longitudinal striae, with dorsope. Petiole not fused ventrally. Length of petiole 2.8X its apical width. Gaster 1.6X the length of petiole.

Wings. Fore wing M-Cu spectral. Fore wing vein r absent, 1st submarginal and 1st discal cell open distally, the veins 2SR and m-cu spectral, basal and subbasal cells with normal density of setae. Pterostigma 2.0X wider than R1.

Legs. Fore femur 3.8X as long as its maximum width. Hind femur 3.6X its maximum width.

MEASUREMENTS — 2.4 mm in length, fore wing length 2.4 mm.

ETYMOLOGY — This species is named after Jonathan Kepa, a member of the New Guinea Binatang Research Center who participated in this project and contributed by sorting material.

Leiophron lilipi n. sp.

Figures 42-46

TYPE MATERIAL — Holotype, ♀, **Papua New Guinea**. Province Madang, Mount Wilhelm 3200 m (-5.807419, 145.0736) 3200 m, 26-27/10/2012, leg Dahl, Kaupa, Novotny, Leponce, Plot 2, understorey; Malaise - MAL-MW3200B-11/16-d11, P3364-9151; Voucher ID: PNG_3 (MNHN). GenBank ID: MH464438 (COI), MH464451 (28S).

DIAGNOSIS — The species is most similar to *L. gewai*, but is separated by the brown coxae and the presence of notaui.

DESCRIPTION — *Colour*. Dark brown, first three segments of antennae yellow, following segments brown. Clypeus brown as face, mandibles yellow-brown. Wing veins and pterostigma yellow. Legs yellow, hind leg dark yellow, all tarsi and coxae brown.

Head. Antenna with 16 segments, first flagellomere 4.3X longer than wide, the following segments longer than wide. Face as wide as long, punctate, densely setose. Clypeus 1.3X wider than face. Mandible with upper tooth 6 times longer than lower tooth. Occipital carina incomplete, vertex smooth.

Mesosoma. Notauli present as weak punctures, mesonotum smooth. Epicnemial carina present, postpectal carina strong medially, without any associated rugosity, laterally absent. Sternalus wide.

Metasoma. Petiole dorsally with weakly rugose basal half, apically punctate. Dorsope shallow, spiracles situated just before middle. Length of petiole 2.5X its apical width, petiole not fused ventrally, gaster 1.53X the length of petiole.

Wings. Fore wing M-Cu spectral, basal and subbasal cell less setose. 1st submarginal and 1st discal cell open distally. Pterostigma 2.8X wider than R1, fore wing vein r absent.

Legs. Fore femur 3.6X as long as its maximum width. Hind femur 4.3X as long as its maximum width.



FIGURES 35-41

Holotype *Leiophron kepai* n. sp. **35**, lateral view of habitus; **36**, front view of head; **37**, lateral view of mesosoma; **38**, dorsal view of head; **39**, dorsal view of mesosoma; **40**, dorsal view of propodeum and petiole; **41**, fore wing. Scale bars: 0.5 mm.

MEASUREMENTS — 1.6 mm in length, fore wing length 2.0 mm.

ETYMOLOGY — This species is named in honour of one of the notable sorters within the project, Roll Lilip, senior staff member at the Binatang Research Center, Papua New Guinea.



FIGURES 42-46

Holotype *Leiophron lilipi* n. sp. **42**, lateral view of habitus; **43**, front view of head; **44**, lateral view of mesosoma; **45**, dorsal view of head and mesosoma; **46**, dorsal view of propodeum and abdomen. Scale bars: 0.5 mm.

***Leiophron mellifacialis* n. sp.**

Figures 47-55

TYPE MATERIAL — Holotype, ♂, Papua New Guinea. Province Madang, Mount Wilhelm 1700 m (-5.759269, 145.2356) 1700 m, 27-28/10/2012, leg Valeba, Tulei, Novotny, Leponce, Plot 1, understorey; Malaise - MAL-MW1700A-03/16-d03, P2170-8755; Voucher ID: 08_Yves (MNHN). GenBank ID: MG926855 (COI), MG913703 (28S).

DIAGNOSIS — This species can be separated from all other Papua New Guinea species by the presence of swollen fore femur with excavated structures and the oral cavity which resembles a cyclostome.

DESCRIPTION — *Colour*. Body colour reddish-brown, antennae, legs, wing veins and pterostigma yellow. Tarsal claws and posterior half of metasoma brown. Mandible yellow.

Head. Antenna 16 segmented, the flagellomeres slender. First flagellomere 3.5X longer than wide. Face 1.3X as wide as long, evenly setose with long appressed hairs. Clypeus strongly deflexed, almost as wide as face, 6X wider than its median height. Malar space 1.2X width of mandible base. Occipital carina widely incomplete. Vertex smooth. A slight pit in front of fore ocelli.

Mesosoma. Mesoscutum highly, roundly, elevated above pronotum. Notauli present as a shallow impression, sparsely setose. Scutellar sulcus with distinct fovea, with incomplete median longitudinal carina. Mesopleuron largely smooth, sternaulus shallow and lineate. Epicnemial carina present and sharp, postpectal carina short (only ventrally) and thin. Propodeum thinly areolate-rugose, rather smooth in between the areola.

Metasoma. Petiole rugulose and sparsely striae, with dorsope and with fine spiracular tubercle in basal 1/2. Length of petiole 3.0X its apical width, not touching in ventral view. Gaster 1.7X the length of petiole.

Wings. Fore wing M-Cu spectral. Fore wing vein r absent, 1st submarginal and 1st discal cell incomplete, open distally, RS+M, 3RS spectral, the veins 2RS partially spectral, m-cu absent, basal and subbasal cells with normal density of setae. Pterostigma 2.7X wider than R1. Hindwing basal cell complete, subbasal cell absent.

Legs. Fore femur swollen medially with strange structure, ventrally concave, with lamella at the posterior surface. Fore femur 2.3X as long as its maximum width. Hind femur 3.9X as long as its maximum width.

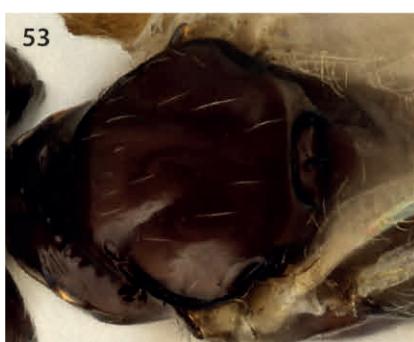
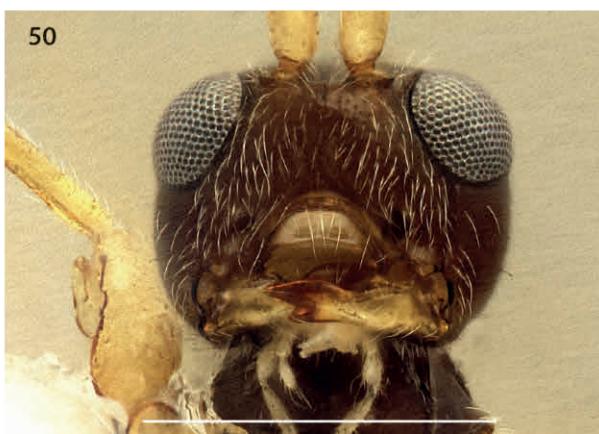
MEASUREMENTS — 1.8 mm in length, fore wing length 1.8 mm.

ETYMOLOGY — *melli* -latin for sweet, *facialis* -face, this species has a sweet, cute face.

NOTE — This specimen was labelled as “08_Yves_Leiophron_PNG” in Zhang *et al.* (2018).

FIGURES 47-55

Holotype *Leiophron mellifacialis* n. sp. **47**, ventral view of habitus; **48**, ventral head and mesosoma; **49**, dorsal propodeum and abdomen; **50**, front view of head. **51**, dorsal view of head; **52**, Wings; **53**, dorsal view of mesosoma; **54**, Dorso-lateral view of fore leg; **55**, ventral view of fore leg. Scale bars: 0.5 mm.



Leiophron pascali n. sp.

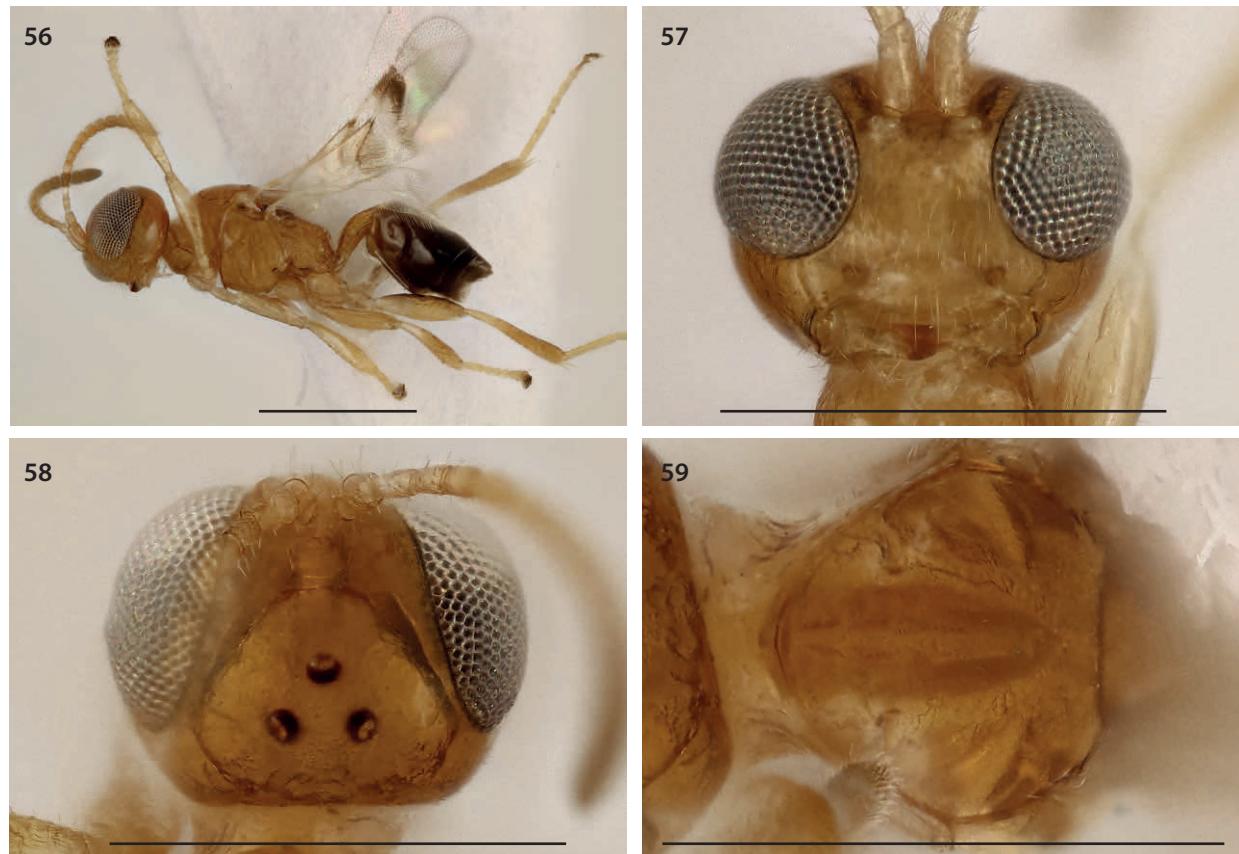
Figures 56-59

TYPE MATERIAL — Holotype, ♀ **Papua New Guinea**. Province Madang, Wanang 3 station (-5.22767, 145.0797) 175 m, 18-19/11/2012, leg Bassett, Plot 3, understorey; Malaise - MAL-WAN03-D01 P4932, P4932-9227; Voucher ID: PNG_6 (MNHN). GenBank ID: MG926873 (COI), MG913715 (28S).

DIAGNOSIS — Differs from the very similar species *L. anthoferi* by having flagellomeres as high as wide and a much smoother mesosoma.

DESCRIPTION — *Colour*. Whole specimen generally yellow except abdomen which is brown. Antennal tip, hind legs with brownish-yellow. Wings brownish infuscate, pterostigma dark brown with basal $\frac{1}{3}$ translucent.

Head. Antenna with 15 robust segments, pedicel equal in length as first flagellomere, first flagellomere 1.6X longer than wide. Face with very short setae, 1.2X as wide as high. Clypeus 1.2X wider than face, clypeus 2.3X as wide as high. Malar space 0.8X width of mandible base. Occipital carina incomplete only present laterally. Vertex sparsely setate with very short setae.

**FIGURES 56-59**

Holotype *Leiophron pascali* n. sp. **56**, lateral view of habitus; **57**, front view of head; **58**, dorsal view of head; **59**, dorsal view of meso-soma. Scale bars: 0.5 mm.

Mesosoma. Notauli absent, mesoscutum smooth and not setate, scutellum pointed. Epicnemial carina present. Postpectal carina thin and only present medially. Mesopleuron totally smooth. Propodeum weakly reticulate rugose.

Metasoma. Petiole with longitudinal striae dorsally and ventrally. Petiole fused ventrally. Length of petiole 3.7X its apical width. Gaster 1.5X the length of petiole.

Wings. Most fore wing veins spectral or absent except vein 1-M which is wider than ordinary. Pterostigma 5.2 times wider than R1, dark brown except translucent basal $\frac{1}{3}$. Wings darkly infuscate with translucent band in the middle. Basal cell glabrous.

Legs. Fore femur 3.5X as long as its maximum width. Hind femur 3.3X as long as its maximum width.

MEASUREMENTS — 1.5 mm in length, fore wing length 1.1 mm.

ETYMOLOGY — This species is named in honour of Olivier Pascal who contributed with the organisation of all the Pla-
nète Revisitée expeditions.

NOTE — This specimen was labelled as “PNG_6_Leiophron” in Zhang *et al.* (2018).

***Leiophron tulai* n. sp.**

Figures 60-65

TYPE MATERIAL — Holotype, ♀, Papua New Guinea. Province Madang, Mount Wilhelm 2700 m (-5.815272, 145.1565) 2700 m, 20-21/10/2012, leg Kua, Yalang, Novotny, Leponce, Plot 4, understorey; Malaise - MAL-MW2700D-05/16-d05, P3000-8822; Voucher ID: 11_Yves (MNHN). GenBank ID: MH464430 (COI), MH464442 (28S).

DIAGNOSIS — A smooth species, similar to *L. kepai* and *L. umai* but lacking notaui.

DESCRIPTION — *Colour*. Brown. Mandibles, basal antennal segments yellowish, apically brown, legs brown. Pterostigma light brown with pale base.

Head. Antenna with 16 segments, first segment (scape) 2.6X longer than widest point, first flagellar segment 3.3X longer than wide. Face and clypeus in profile flat. Face 1.2X as wide as high, setate. Clypeus 1.3X wider than face, and 4X wider than its median height. Malar space equal to width of mandible base. Occipital carina widely interrupted dorsally. Frons with a long setae.

Mesosoma. Notauli not present, mesoscutum smooth and with long setae. Scutellum evenly, weakly convex. Mesopleuron smooth, with short sternaulus. Epicnemial carina present. Postpectal carina not present. Propodeum areolate-reticulate.

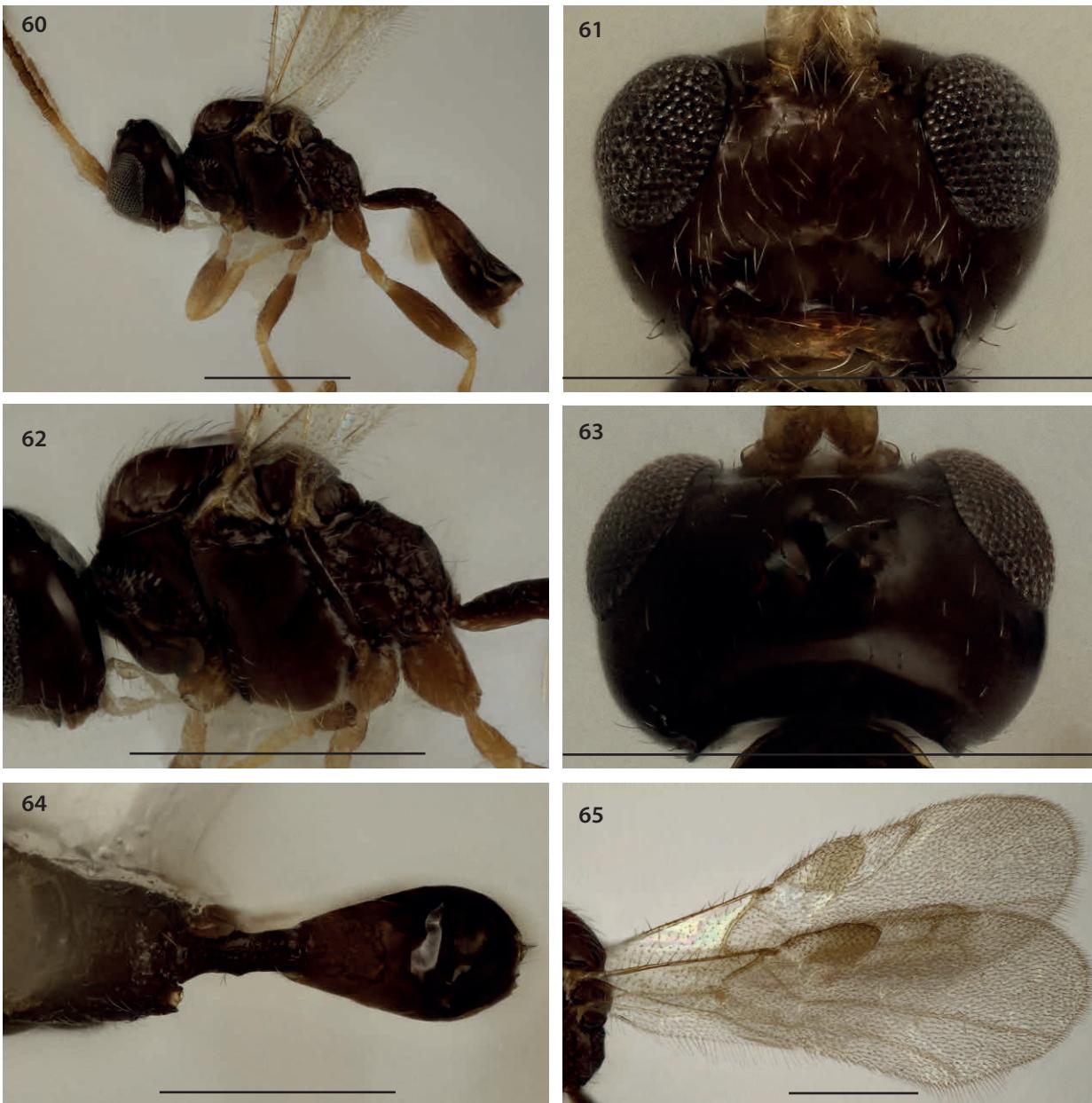
Metasoma. Petiole rugose and with deep dorsope, parallel sided, spiracles situated just before middle. Petiole not fused ventrally. Length of petiole 23.5X its apical width. Gaster 1.5X the length of petiole.

Wings. Fore wing M-Cu spectral. Fore wing vein r absent, 1st submarginal and 1st discal cell open distally. Wings translucent. Pterostigma 1.9X wider than R1.

Legs. Fore femur 3.5X as long as its maximum width. Hind femur 4.1X as long as its maximum width.

MEASUREMENTS — 1.5 mm in length, fore wing length 1.9 mm.

ETYMOLOGY — This species is named in honour of one of the notable sorters within the project, Salape Tulei, at the Binatang Research Center, Papua New Guinea.

**FIGURES 60-65**

Holotype *Leiophron tulai* n. sp. **60**, lateral view of habitus; **61**, front view of head; **62**, lateral view of mesosoma; **63**, dorsal view of head; **64**, dorsal view of abdomen; **65**, fore wings. Scale bars: 0.5 mm.

***Leiophron umai* n. sp.**

Figures 66-71

TYPE MATERIAL — Holotype, ♀, Papua New Guinea. Province Madang, Mount Wilhelm 2700 m (-5.814968, 145.1580) 2700 m, 18-19/10/2012, leg Kua, Yalang, Novotny, Leponce, Plot 4, understorey; Malaise - MAL-MW2700D-03/16-d03, P2998-8817; Voucher ID: 10_Yves (MNHN). GenBank ID: MG926856 (COI), MG913704 (28S).

DIAGNOSIS — A very “ordinary” looking *Leiophron* but with an apically elongated pronotum.

DESCRIPTION — *Colour*. Brown. Mandibles, basal antennal segments and coxae yellowish-brown, legs yellow. Pterostigma light brown with pale base. Fore wing vein SR1 white.

Head. Antenna with 16 segments, basally slender, first segment (scape) 2.8X longer than widest point, first flagellar segment 5X longer than wide. Face narrow, higher than wide, 0.8X as wide as high, with scattered long setae. Clypeus 1.2X wider than face, and 2.8X wider than its median height. Malar space 0.8X width of mandible base. Occipital carina interrupted dorsally. Vertex with a few setae.

Mesosoma. Notauli present, anterior part of mesonotal lobe with few scattered setae, otherwise mesoscutum smooth. Scutellum rather flattened. Mesopleuron smooth, with sternaulus and with very few but rather long setae. Epicnemial carina present. Postpectal carina not present but the medioventral area reticulate-rugose. Propodeum areolate, smooth in between.

Metasoma. Petiole basally smooth, apically with longitudinal striae. Petiole not fused ventrally. Length of petiole 2.3X its apical width. Gaster 1.6X the length of petiole.

Wings. Fore wing M-Cu spectral. Fore wing vein r absent, 1st submarginal and 1st discal cell open distally. Wings infuscate except marginal cell. Pterostigma 1.9X wider than R1.

Legs. Fore femur 3.4X as long as its maximum width.

ETYMOLOGY — This species is named in honour of one of the notable sorters within the project, Collin Uma, at the Binatang Research Center, Papua New Guinea.

MEASUREMENTS — 1.2 mm in length, fore wing length 2.3 mm.

NOTE — This specimen was labelled as “10_Yves_Leiophron_PNG” in Zhang *et al.* (2018).

***Leiophron wincklerae* n. sp.**

Figures 72-78

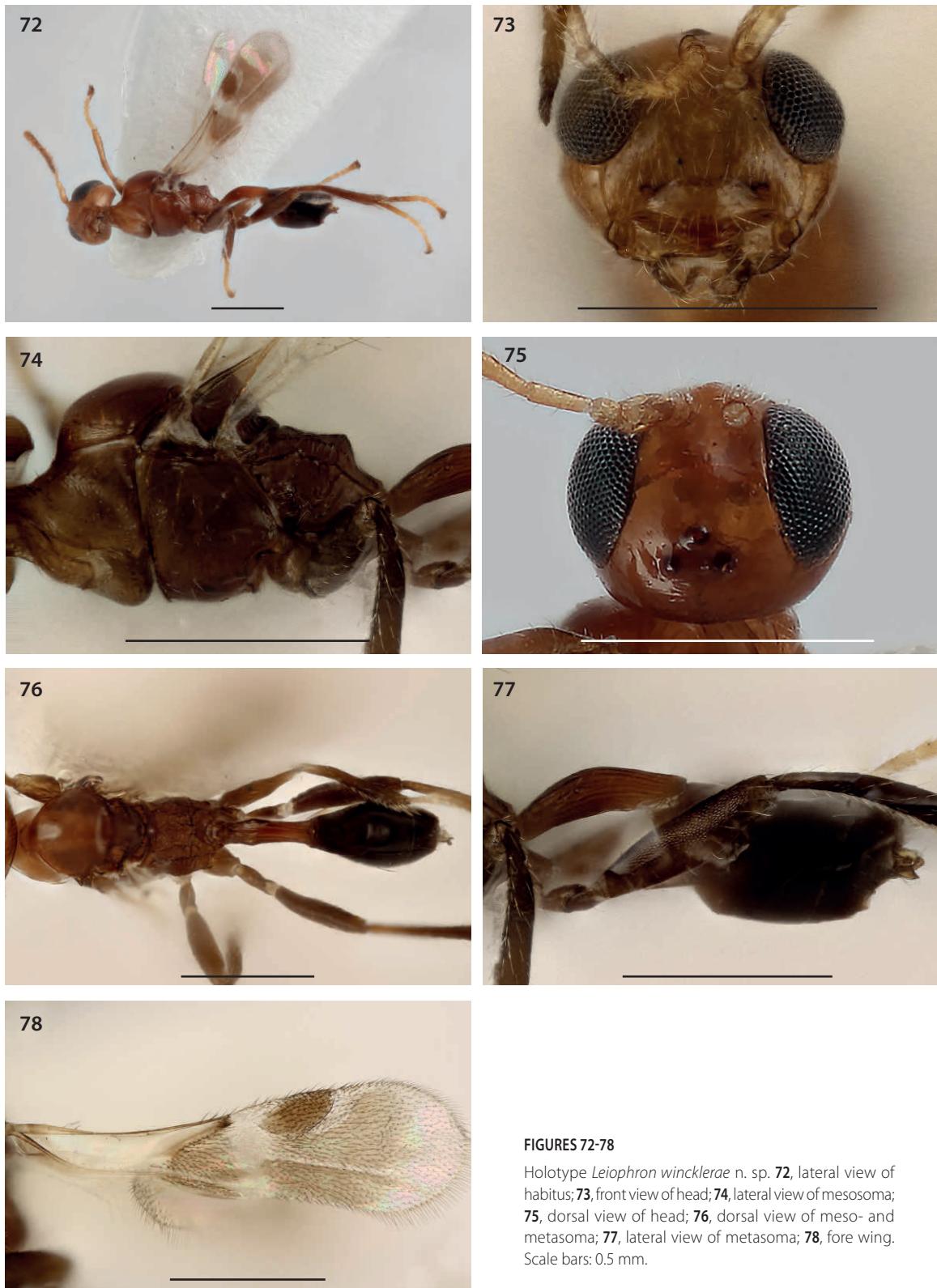
TYPE MATERIAL — Holotype, ♂, Papua New Guinea. Province Madang, Wanang 3 station (-5.22767, 145.0797) 175m, 02-03/12/2012, leg Basset, Plot 1, understorey; Malaise - MAL-WAN01-D15 P4914, P4914-18147; Voucher ID: PNG_7 (MNHN). GenBank ID: MG926874 (COI), MG913716 (28S).

DIAGNOSIS — Differs from other similar species by having a pointy scutellum but also by a pointy angulated propodeum.

DESCRIPTION — *Colour*. Whole specimen generally reddish brown except abdomen (dark brown). Antennal tip, palpi, hind and middle legs dark brown. Wings brownish infuscate, pterostigma dark brown with basal translucent area.

**FIGURES 66-71**

Holotype *Leiophron umai* n. sp. **66**, lateral view of habitus; **67**, front view of head; **68**, lateral view of mesosoma; **69**, dorsal view of head; **70**, dorsal view of mesosoma and metasoma; **71**, fore wing. Scale bars: 0.5 mm.

**FIGURES 72-78**

Holotype *Leiophron wincklerae* n. sp. **72**, lateral view of habitus; **73**, front view of head; **74**, lateral view of mesosoma; **75**, dorsal view of head; **76**, dorsal view of meso- and metasoma; **77**, lateral view of metasoma; **78**, fore wing. Scale bars: 0.5 mm.

Head. Antenna with 15 segments, slender basally. Face wide and with very short setae, 1.4X as wide as high. Clypeus 1.1X wider than face, clypeus 2.5X as wide as high. Malar space 1.4X width of mandible base. Occipital carina incomplete, only present laterally. Vertex with no setae.

Mesosoma. Notauli absent, mesoscutum smooth and not setate, scutellum acutely pointed. Scutellar sulcus without any carina. Epicnemial carina and postpectal carina present. Mesopleuron smooth but with minute punctures and minute striae lateral-ventrally. Propodeum weakly areolate-reticulate, sharply angulated.

Metasoma. Petiole with longitudinal striae dorsally and ventrally. Petiole fused ventrally except basally. Length of petiole 3.9X its apical width. Gaster 1.3X the length of petiole.

Wings. Most fore wing veins spectral or absent except vein 1-M which is wider than ordinary. Pterostigma 4.8 times wider than R1, dark brown and basally white. Fore wing vein 3RSb tubular but vestigial towards R1. Wings darkly infuscate with translucent band in the middle. Basal cell glabrous.

Legs. Hind femur 3.7X as long as its maximum width. All femur and tibia with 'scale like' microstructure.

MEASUREMENTS — 1.8 mm in length, fore wing length 1.4 mm.

ETYMOLOGY — Named after Amandine Winckler, a devoted student that helped with sorting the material. During this sorting Amandine Winckler was a student at the Université de Nouvelle-Calédonie. The species name also has a Swedish etymology as "vinkel" means angle and the species has two sharp angles dorsally.

NOTE — This specimen was labelled as "PNG_7_Leiophron" in Zhang *et al.* (2018).

Genus **PERISTENUS** Förster, 1862

Peristenus Förster, 1862.

Type species. *Microctonus barbiger* Wesmael (=*Leiophron pallipes* Curtis). Original designation. Lectotype designation by Loan (1974).

***Peristenus montwilhelmi* n. sp.**

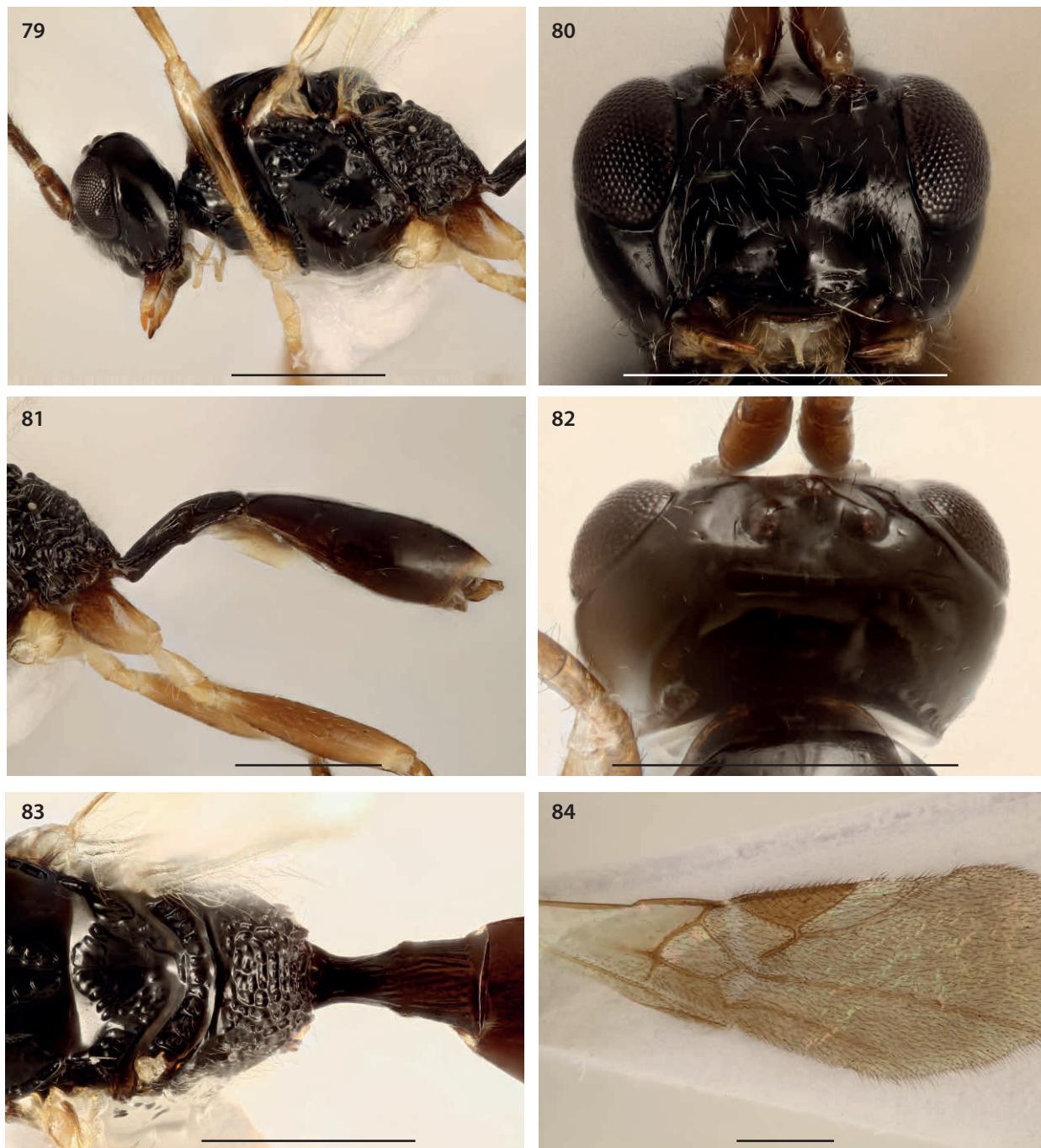
Figures 79-84

TYPE MATERIAL — Holotype, ♂, Papua New Guinea. Province Madang, Mount Wilhelm 2700 m (-5.814968, 145.1580) 2700 m, 23-24/10/2012, leg Kua, Yalang, Novotny, Leponce, Plot 2, understorey; Malaise - MAL-MW2700B-08/16-d08, P2971-8833; Voucher ID: 05_Yves (MNHN). GenBank ID: MH464428 (COI), N/A (28S).

DIAGNOSIS — Fore wing basal cells basally glabrous, distally with few setae. Fore wing slightly infuscated.

DESCRIPTION — *Colour.* Black, a tinge of brown on dorsal corners of scutellum. Antennae brown, legs and mandibles yellowish brown, palpi light yellow. Wings infuscate with light brown tone, pterostigma light brown. Fore wing vein SR1 white.

Head. Antenna with 28 segments, slender, first flagellomere 3.3X longer than widest point. Face wide and with few setae, 1.9X as wide as high. Face 2.4X wider than clypeus, clypeus 1.75X as wide as high. Malar space 0.9X width of mandible base. Occipital carina interrupted dorsally. Vertex with a few setae.

**FIGURES 79-84**

Holotype *Peristenus montwilhelmi* n. sp. **79**, lateral view of mesosoma; **80**, front view of head; **81**, lateral view of abdomen; **82**, dorsal view of head; **83**, dorsal view of propodeum and petiole; **84**, fore wing. Scale bars: 0.5 mm.

Mesosoma. Notauli present and strongly impressed, mesoscutum smooth and not setate. Epicnemial carina present. Postpectal carina present. Mesopleuron smooth but with sternaulus and episternal scrobe. Propodeum weakly areolate-reticulate, no distinct carina, smoothly rounded.

Metasoma. Petiole with longitudinal striae dorsally. Petiole fused ventrally. Length of petiole 2.0X its apical width. Gaster 1.1X the length of petiole.

Wings. All wing veins distinct, pterostigma 2.3X wider than R₁, pterostigma light brown, wings infuscate. Basal cells distally with a few setae, basally glabrous.

Legs. Fore femur 4.8X as long as its maximum width, hind femur 4.6X as long as its maximum width.

MEASUREMENTS — 2.8 mm in length, fore wing length 3.2 mm.

ETYMOLOGY — Named after the mountain where it was found.

***Peristenus quadriplex* n. sp.**

Figures 85-90

TYPE MATERIAL — Holotype, ♂, **Papua New Guinea**. Province Madang, Mount Wilhelm 1700 m (-5.759269, 145.2356) 1700 m, 29-30/10/2012, leg Valeba, Tulei, Novotny, Leponce, Plot 1, understorey; Malaise - MAL-MW1700A-05/16-d05, P2172-8760; Voucher ID: 09_Yves (MNHN). GenBank ID: MH464429 (COI), MH464441 (28S).

DIAGNOSIS — Can be separated from the *Peristenus montwilhelmi* by the smaller size, and the four teeth on the ventral border of the clypeus seen from a lateral aspect.

DESCRIPTION — *Colour*. Brown; mandible, antennae, legs straw coloured. Wings clear, veins and pterostigma light brown. Eyes iridescently silver. Posterior half of metasoma darker brown.

Head. Antenna 16 segmented, first flagellomere 4.5X longer than wide, the following segments longer than wide. Width of face 1.5X as wide as high, evenly setose with appressed hairs. Width of face 1.2X that of the clypeus width, and 3.8X its median height. Clypeus setose along the ventral margin. Vertex smooth. Gena with setae limited to the ventral edge. Height of malar space 1.2X that of basal width of mandible. Occipital carina incomplete.

Mesosoma. Mesoscutum highly, roundly elevated above pronotum. Notauli present, shallow but complete. Scutellar sulcus with 2 distinct fovea. Epicnemial carina present, postpectal carina present only medially, but disjunct. Mesopleuron largely smooth, with a few setae on mesosternum. Sternaulus present as short, shallow rugae. Propodeum areolate, smooth in between.

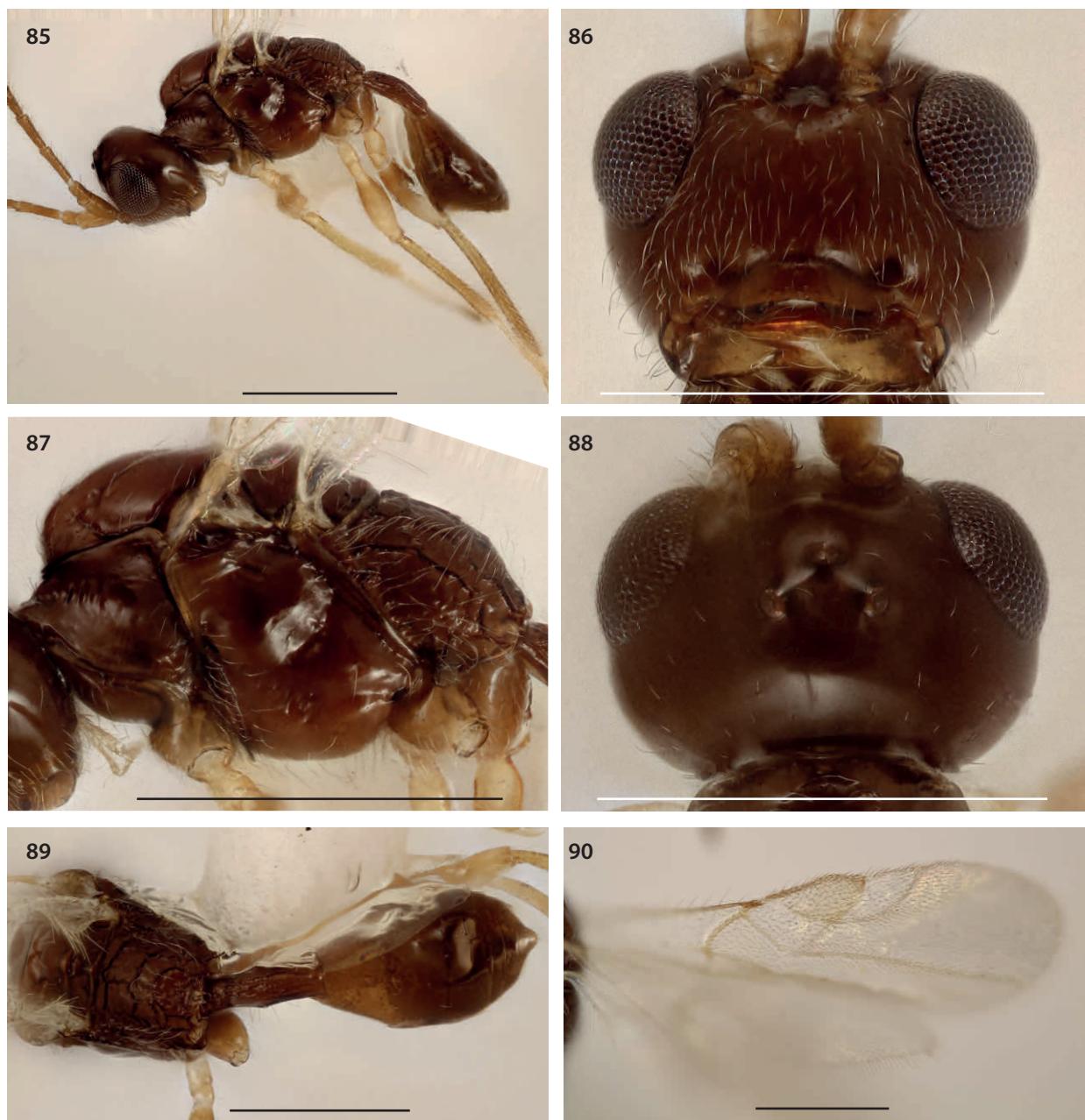
Metasoma. Petiole rugulose and sparsely striae, dorsope with fine spiracular tubercle in basal ⅓. Length of petiole 2.9X its apical width, basally touching anteriorly in ventral view. Gaster 1.8X length of petiole.

Wings. Fore wing M-Cu nebulous/spectral, basal and subbasal cell setose. Fore wing veins r and r-m absent, 1st submarginal and 1st discal cell incomplete, open distally. RS+M, 3RS tubular. 2RS tubular but very short. Hind wing basal cell complete, subbasal cell absent.

Legs. Fore femur 3.6X as long as its maximum width. Hind femur 4.6X as long as its maximum width.

MEASUREMENTS — 1.8 mm in length, fore wing length 1.9 mm.

ETYMOLOGY — Quadriplex - the clypeus has four small teeth when seen from a lateral aspect.

**FIGURES 85-90**

Holotype *Peristenus quadriplex* n. sp. **85**, lateral view of habitus; **86**, front view of head; **87**, lateral view of mesosoma; **88**, dorsal view of head; **89**, dorsal view of abdomen; **90**, fore wing. Scale bars: 0.5 mm.

Genus *MICROCTONUS* Wesmael, 1835

Microctonus Wesmael, 1835: 54.

Type species. *Perilitus aethiops* Nees, designated by Förster (1862). Neotype designation by Loan (1975).

Microctonus madang n. sp.

Figures 91-97

TYPE MATERIAL — Holotype, ♀, **Papua New Guinea**. Province Madang, Mount Wilhelm 1200 m (-5.720874, 145.2695) 1200 m, 08-09/11/2012, leg Philip, Alois, Novotny, Leponce Plot 2, understorey; Malaise - MAL-MW1200D-15/16-d15, P1840-11384; Voucher ID: 03_Yves (MNHN). GenBank ID: N/A (COI), KJ591265 (28S).

DIAGNOSIS — Very deep notauli, almost round pedicel and strongly angulated ovipositor.

DESCRIPTION — *Colour*. Dark brown, palpi, fore and middle legs yellow.

Head. Antenna with 33 segments, slender, first flagellomere 3.3X longer than widest point. Face 1.5X as wide as high and with short setae (setae about 0.25X clypeus height). Face 1.5X wider than clypeus, and clypeus 1.7X as wide as high. Malar space 1.1X width of mandible base. Occipital carina dorsally slightly incomplete.

Mesosoma. Notauli deeply impressed and rugose, mesopleuron with deep sternalulus. Epicnemial carina present. Propodeum strongly reticulate.

Metasoma. Petiole completely rugose dorsally with a median carina running along major central part of petiole. Petiole not fused ventrally. Length of petiole 2.1X its apical width. Spiracular tubercle positioned just basal to middle of petiole. Gaster 1.5X the length of petiole.

Wings. All wing veins distinct except fore wing RS+M and RS which are absent. Fore wing vein R1 about equal to pterostigma length. Both fore and hind wing normally setate. Wings slightly infuscate.

Legs. Fore femur slender, 5.2X as long as its maximum width, hind femur 4.8X as long as its maximum width. Hind femur with a little hump ventrally near tibial joint.

MEASUREMENTS — 4.9 mm in length, fore wing length 3.2 mm.

ETYMOLOGY — Named after the province where it was found.

Genus *SYNTRETUS* Förster, 1862

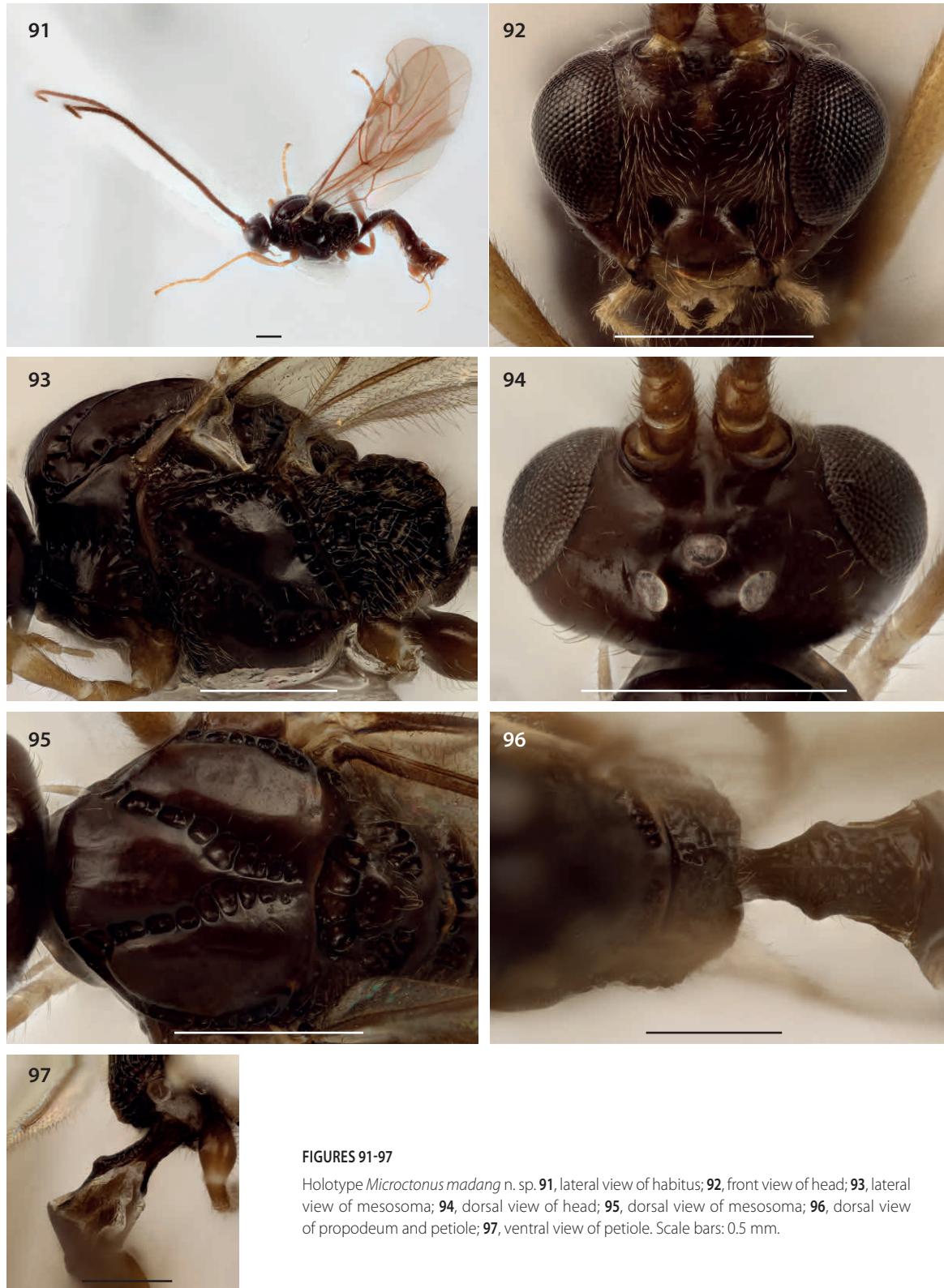
Syntretus Förster, 1862: 251.

Type species. *Microctonus vernalis* Wesmael, 1835.

Syntretus amber n. sp.

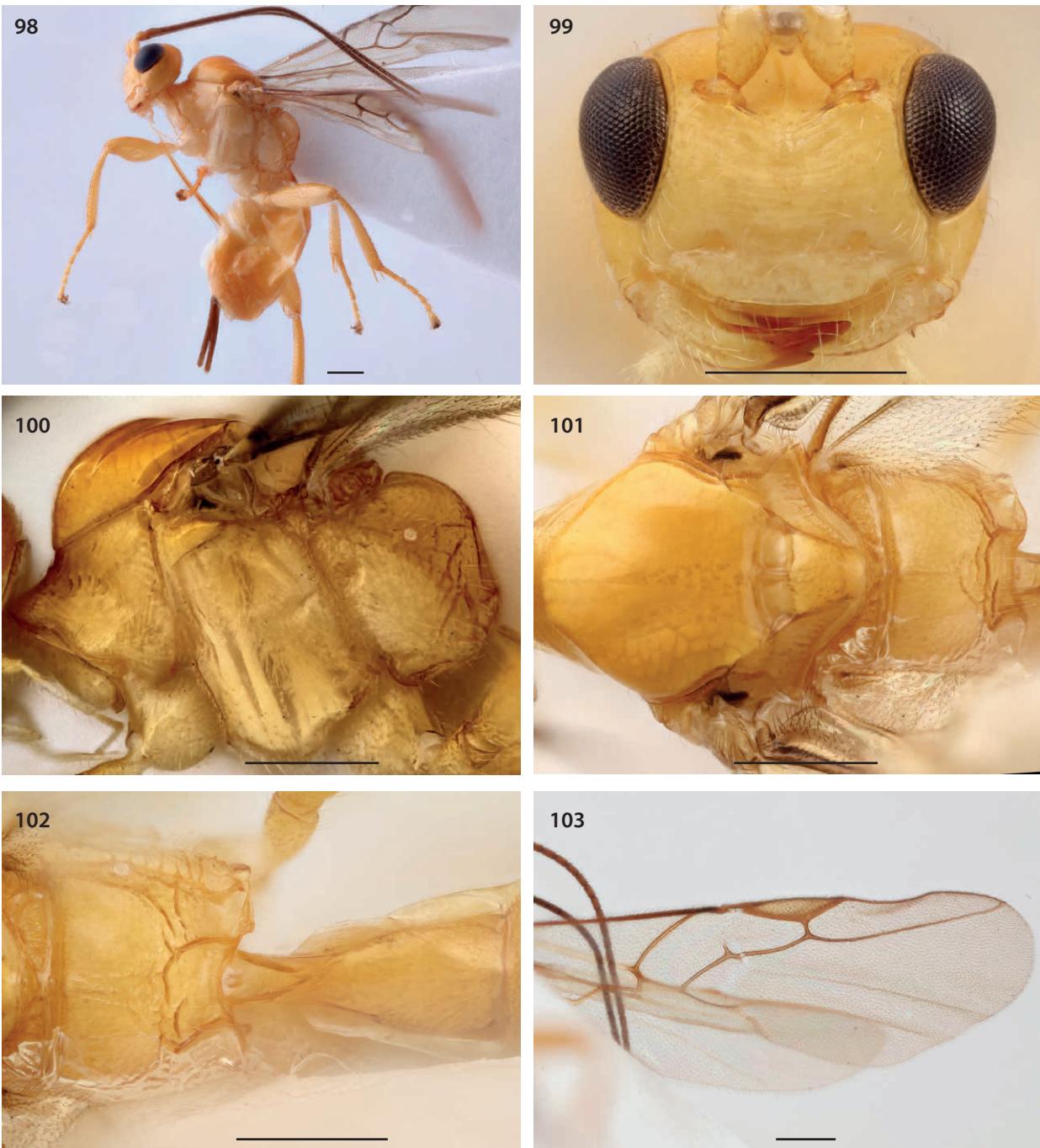
Figures 98-103

TYPE MATERIAL — Holotype, ♀, **Papua New Guinea**. Province Madang, Mount Wilhelm 1200 m (-5.720903, 145.2715) 1200 m, 05-06/11/2012, leg Philip, Alois, Novotny, Leponce Plot 2, understorey; Malaise - MAL-MW1200C-12/16-d12, P1821-11343; Voucher ID: 04_Yves (MNHN). GenBank ID: N/A (COI), MH464440 (28S).



FIGURES 91-97

Holotype *Microctonus madang* n. sp. **91**, lateral view of habitus; **92**, front view of head; **93**, lateral view of mesosoma; **94**, dorsal view of head; **95**, dorsal view of mesosoma; **96**, dorsal view of propodeum and petiole; **97**, ventral view of petiole. Scale bars: 0.5 mm.



FIGURES 98-103

Holotype *Syntretus amber* n. sp. **98**, lateral view of mesosoma; **99**, front view of head; **100**, lateral view of abdomen; **101**, dorsal view of mesosoma; **102**, dorsal view of propodeum and petiole; **103**, fore wing. Scale bars: 0.5 mm.

DIAGNOSIS — The lack of notauli, the carinae of the propodeum and the length of the ovipositor are some of the characters to distinguish this species from other *Syntretus* species that might be occurring in Australasia.

DESCRIPTION — *Colour*. Dorsally yellow, ventral colour, including meso- and metapleuron, light yellow to white. Antennae, ovipositor sheaths, mandible teeth, wing veins brown. Pterostigma yellow in the center, brown towards edges.

Head. Antenna with 40 segments, slender, first flagellomere 2.0X longer than widest point. Face wide and with few setae along inner border of eye, face 1.9X as wide as high. Clypeus 1.1X wider than face, and 3.2X as wide as high. Malar space 0.8X width of mandible base. Occipital carina complete.

Mesosoma. Notauli absent, mesoscutum and mesopleuron smooth. Epicnemial carina present, postpectal carina absent. Propodeum on dorsal surface with a short longitudinal carina surrounded with weak rugosity. Posterior part of propodeum with large areola.

Metasoma. Petiole completely smooth dorsally, laterally with deep and long laterope. Petiole fused ventrally. Length of petiole 2.1X its apical width. Gaster 1.9X the length of petiole.

Wings. All fore wing veins distinct except fore wing 3M and 3Cu which are nebulous, M+Cu spectral. Vein RS+M present but incomplete, only 1/4th of its intended length. Fore wing vein R1 1.3X longer than pterostigma. Both fore and hind wing normally setate.

Legs. Fore femur 3.2X as long as its maximum width, hind femur 3.2X as long as its maximum width.

MEASUREMENTS — 4.6 mm in length, fore wing length 4.4 mm.

ETYMOLOGY — Named after the amber colour of this species.

Genus *STREBLOCERA* Westwood, 1833

Streblocera Westwood, 1833, 342.

Type species. *Streblocera fulviceps* Westwood, 1833.

Streblocera semirugosa n. sp.

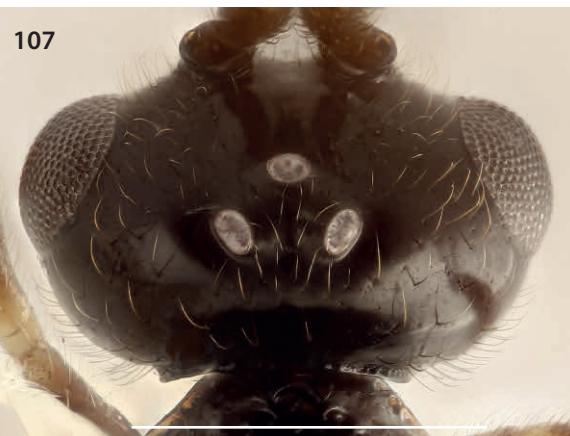
Figures 104-111

TYPE MATERIAL — Holotype, ♀, **Papua New Guinea**. Province Madang, Mount Wilhelm 1700 m (-5.760916, 145.2353) 1700 m, 07-08/11/2012, leg Valeba, Tulei, Novotny, Leponce, Plot 3, understorey; Malaise - MAL-MW1700C-14/16-d14, P2213-8794; Voucher ID: 01_Yves (MNHN). GenBank ID: KJ591420 (COI), KJ591205 (28S).

DIAGNOSIS — A punctate ventral rim of clypeus and a very long, slender and smooth petiole together with a punctate mesopleuron. Differs from *S. rugosa* by not being so rugose.

DESCRIPTION — *Colour*. Face, thorax, hind coxae and petiole dark brown, mandibles, pedicel, femur and tibia yellowish brown.

Head. Antenna with 28 segments, slender, first flagellomere 5.6X longer than widest point. Base of antennae prominent. Eyes with very few, hardly noticeable, tiny setae (<5). Face 1.4X as wide as high. Face 1.3X wider than clypeus, and clypeus 2.0X as wide as high. Malar space 1.2X width of mandible base. Gena punctate. Occipital carina dorsally slightly interrupted. Whole head setate, the setae slightly longer than longest ocellar diameter.



Mesosoma. Notauli deeply impressed, punctate, mesopleuron with punctate sternalus, apical part of mesoscutum towards pronotum with vaguely punctate surface. Sides of pronotum punctate. Scutellar sulcus wide and deep with a medial longitudinal carina and some reticulate structures, sides of scutellum wide and rugose. Epicnemial carina present. Postpectal carina absent. Propodeum reticulate-rugose and smoothly sloping.

Metasoma. Petiole smooth dorsally with a median incision with small punctures in a line, apically slightly widening with vague striae. Petiole solidly fused ventrally. Length of petiole 4.6X its apical width. Spiracular tubercle positioned at middle of petiole. Gaster 1.2X the length of petiole. Ovipositor 0.25X petiolar length.

Wings. All wing veins distinct except fore wing 3M that is not tubular and RS+M which is absent. Fore wing vein R1 equal to pterostigma length. Both fore and hind wing normally setate. Wings not infuscate.

Legs. Fore femur slender, 5.3X as long as its maximum width, hind femur 5.5X as long as its maximum width.

MEASUREMENTS — 3.4 mm in length, fore wing length 3.4 mm.

ETYMOLOGY — Named by the degree of sculpture on the specimen.

***Streblocera rugosa* n. sp.**

Figures 112-118

TYPE MATERIAL — Holotype, ♀, Papua New Guinea. Province Madang, Mount Wilhelm 1200 m (-5.720903, 145.2715) 1200 m, 09-10/11/2012, leg Philip, Alois, Novotny, Leponce, Plot 3, understorey; Malaise - MAL-MW1200C-16/16-d16, P1825-11334; Voucher ID: 02_Yves (MNHN). GenBank ID: KJ591421 (COI), KJ591206 (28S).

DIAGNOSIS — A punctate ventral rim of clypeus and a very long, slender and rugose petiole together with a reticulate-rugose, strongly sculptured mesopleuron. Differs from *S. semirugosa* by being much more sculptured and rugose.

DESCRIPTION — *Colour.* Face, thorax, hind coxae and petiole dark brown, mandibles, pedicel, femur and tibia yellowish brown.

Head. Antenna with 28 segments, slender, first flagellomere 5.2X longer than widest point. Base of antennae prominent. Eyes with very few tiny setae (< 5). Face 1.9X wider than high. Face 1.8X wider than clypeus, and clypeus 2.0X as wide as high. Malar space equal to width of mandible base. Not only gena but whole head with small punctures at every setae. Occipital carina dorsally slightly interrupted. Whole head setate, the setae slightly longer than longest ocellar diameter.

Mesosoma. Notauli deeply impressed and rugose-punctate, apical part of mesoscutum towards pronotum not smooth but with rough surface and a vague median carina. Mesopleuron with strongly rugose sternalus. Sides of pronotum with deep strong punctures. Scutellar sulcus smooth, very wide and deep with a strong medial longitudinal carina, sides of scutellum wide and rugose. Epicnemial carina, postpectal carina and medioventral suture all with very strong sculpture. Propodeum strongly reticulate-rugose and smoothly sloping.

FIGURES 104-111

Holotype *Streblocera semirugosa* n. sp. **104**, lateral view of habitus; **105**, front view of head; **106**, lateral view of abdomen; **107**, dorsal view of head; **108**, dorsal view of mesosoma; **109**, dorsal view of petiole; **110**, lateral view of ab-domem; **111**, ventral view of petiole. Scale bar represents 0.5 mm.



FIGURES 112-118

Holotype *Streblocera rugosa* n. sp. 112, lateral view of habitus; 113, front view of head; 114, lateral view of abdomen; 115, dorsal view of head; 116, dorsal view of mesosoma; 117, ventral view of mesosoma and petiole; 118, lateral view of abdomen. Scale bars: 0.5 mm.

Metasoma. Petiole striate dorsally with small punctures in between, apically slightly widening with vague striae. Petiole solidly fused ventrally with the sternite separated with a strong carina. Length of petiole 3.9X its apical width. Spiracular tubercle prominent and positioned at middle of petiole. Gaster 1.1X the length of petiole. Ovipositor 0.6X petiolar length.

Wings. All wing veins distinct except fore wing 3M that is not tubular and RS+M which is absent. Fore wing vein R1 equal to pterostigma length. Both fore and hind wing normally setate. Wings not infuscate.

Legs. Fore femur slender, 5.6X as long as its maximum width, hind femur 6.0X as long as its maximum width.

MEASUREMENTS — 3.2 mm in length, fore wing length 3.2 mm.

ETYMOLOGY — Named by the degree of sculpture and rugosity on the specimen.

Genus **METEORUS** Haliday, 1832

Meteorus Haliday, 1832: 24.

Type species. *Ichneumon pendulator* Latreille, 1799.

Here we describe one new species of *Meteorus* and add barcodes and images of three already named species.

Meteorus achterbergi Huddleston, 1983

Figures 119-124

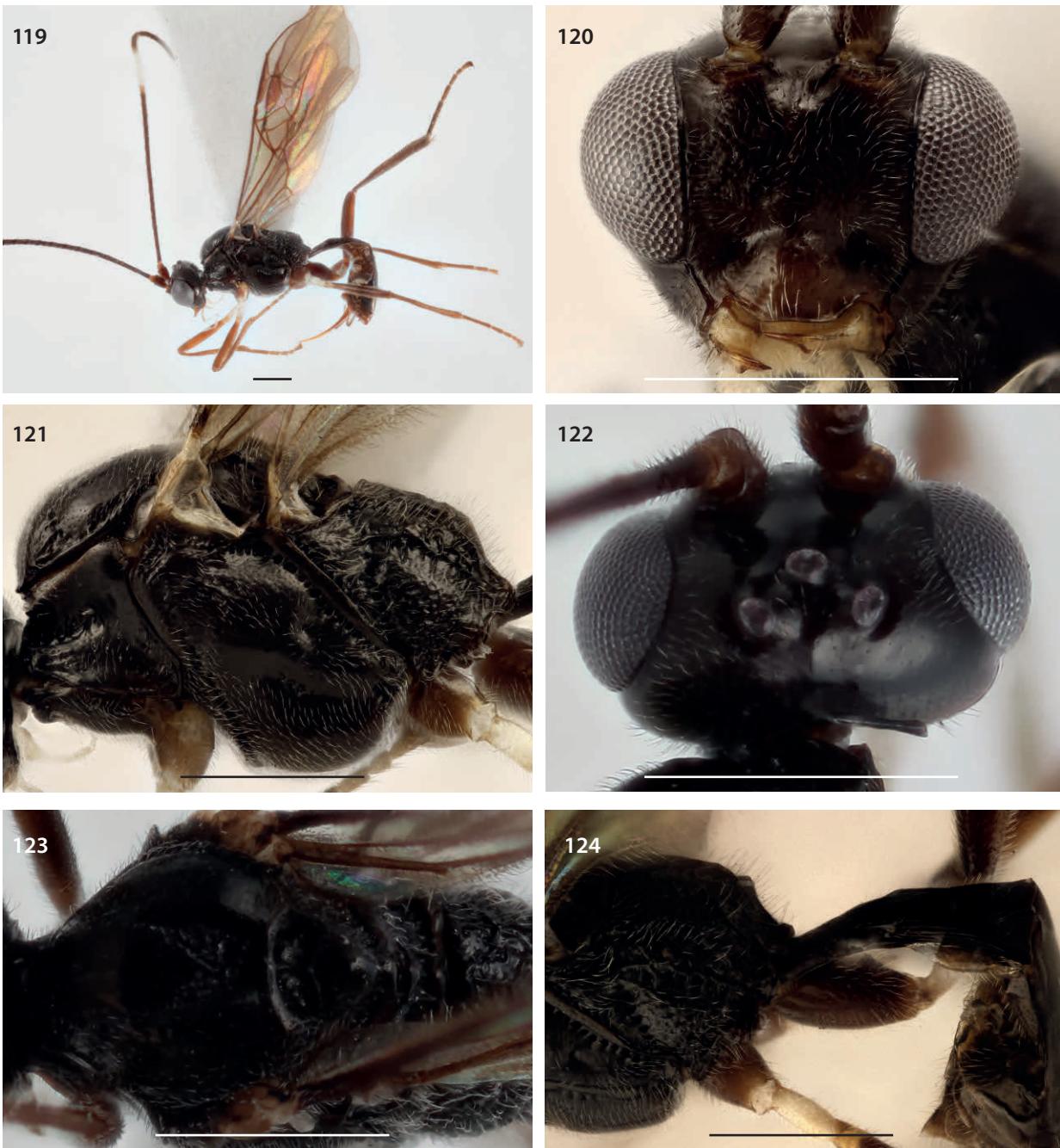
Meteorus achterbergi Huddleston, 1983: 396.

TYPE MATERIAL — 2 ♀ (paratypes) of *M. achterbergi* from BMNH examined.

MATERIAL EXAMINED — Papua New Guinea. 1 ♀, Province Madang, Mount Wilhelm 1700 m (-5.760916, 145.2353) 1700 m, 04-05/11/2012, leg Valeba, Tulei, Novotny, Leponce, Plot 3, understorey; Malaise - MAL-MW1700C-11/16-d11, P2210-8783; Voucher ID: JS10_00532. GenBank ID: KJ591543 (COI), KJ591343 (28S). 1 ♀, Province Madang, Mount Wilhelm 2200 m (-5.758987, 145.1861) 2200 m, 23-24/10/2012, leg Mogia, Lilip, Novotny, Leponce, Plot 1, understorey; Malaise - MAL-MW2200A-08/16-d08, P2565-11893; Voucher ID: JS10_00570 (MNHN). 1 ♀, Province Madang, Mount Wilhelm 2200 m (-5.760178, 145.1863) 2200 m, 17-18/10/2012, leg Mogia, Lilip, Novotny, Leponce, Plot 2, understorey; Malaise - MAL-MW2200B-02/16-d02, P2575-11905; Voucher ID: JS10_00569 (MNHN).

DISTRIBUTION — Papua New Guinea, Australia.

REMARKS — Huddleston (1983) mentions some characters that differ between the Australian and Papua New Guinean species, and we have studied two paratypes at BMNH. Our conclusion is that the PNG and Australian specimens (until molecular evidence is available) should be kept as the same species. The characters differing according to Huddleston (malar space, depth of notauli, sculpture of mesonotum), cannot be found to such degree in our PNG specimens to separate these as their own species. The colour, though, is darker on the PNG specimens than the Australian specimens, as Huddleston noted. We add an additional character that might be interesting if *M. achterbergi* gets split in the future: the propodeum is evenly reticulate in the Australian species whereas on the PNG specimens the propodeum is more carinate.



FIGURES 119-124

Meteorus achterbergi (Voucher ID: JS10_00532, fig 123 specimen JS10_00569). **119**, lateral view of habitus; **120**, front view of head; **121**, lateral view of mesosoma; **122**, dorsal view of head; **123**, dorsal view of mesosoma; **124**, dorso-lateral view of propodeum and petiole. Scale bars: 0.5 mm.

***Meteorus braeti* n. sp.**

Figures 125-130

TYPE MATERIAL — Holotype, ♀, **Papua New Guinea**. Province Madang, Wanang 3 station (-5.22767, 145.0797) 175 m, 25-26/11/2012, leg Bassett, Plot 1, understorey; Malaise - MAL-WAN01-D08, P4907-9054; Voucher ID: JS10_00567 (MNHN). GenBank ID: MH464434 (COI), MH464445 (28S). Paratype ♀, **Papua New Guinea**. Province Madang, Wanang 3 station (-5.22767, 145.0797) 175 m, 21-22/11/2012, leg Bassett, Plot 1, understorey; Malaise - MAL-WAN01-D04, P4903-9047; Voucher ID: JS10_00572 (MNHN). GenBank ID: N/A (COI), MH464448 (28S).

DIAGNOSIS — The long ovipositor, the very long, slender and smooth petiole along with the large and converging eyes defines this species. It differs from JS10_00572 by the overall smoother appearance (petiole, mesopleuron, precoxal sulcus).

DESCRIPTION — *Colour*: Black, palpi white, fore and middle legs yellow, coxa, hind leg and antennae brown.

Head. Antenna with 28 segments, slender, first flagellomere 4.0X longer than widest point. Face 1.0X as wide as high. Face 1.1X wider than clypeus, and clypeus 1.4X as wide as median height. Malar space short, 0.6X width of mandible base. Occipital carina complete. OOL=0.4. Eyes large, protruding and strongly converging, with very few short setae. Head setate.

Mesosoma. Notauli deeply impressed, mesopleuron with deep and broad precoxal sulcus. Epicnemial carina present. Propodeum with distinct longitudinal and transverse carina, in-between smooth. The apical face of scutellum abruptly sloping, giving a “pointy” scutellar appearance.

Metasoma. Petiole long and slender, dorsally with a median carina running along major length of petiole. Length of petiole 3.0X its apical width. Spiracular tubercle positioned just basal to middle of petiole. Gaster of the same length as of the petiole. Ovipositor long and straight, when exerted 1.3 mm.

Wings. Fore wing vein r 0.6X length of 3-SR. Fore wing vein R1 about equal to pterostigma length (1.2X). Both fore and hind wing normally setate. Wings slightly infuscate.

Legs. Fore femur slender 6.3X as long as its maximum width, hind femur 5.9X as long as its maximum width. Hind coxa punctate. Claws simple without basal lobe.

VARIATION — Paratype with 29 antennal segments and scutellum flatter.

MEASUREMENTS — 2.9 mm in length, fore wing length 2.3 mm.

ETYMOLOGY — Named after Yves Braet, a Belgian fellow hymenopterist who introduced us to this fantastic PNG material (a very long time ago).

***Meteorus obscurus* Huddleston, 1983**

Figures 131-137

Meteorus obscurus Huddleston, 1983: 411.

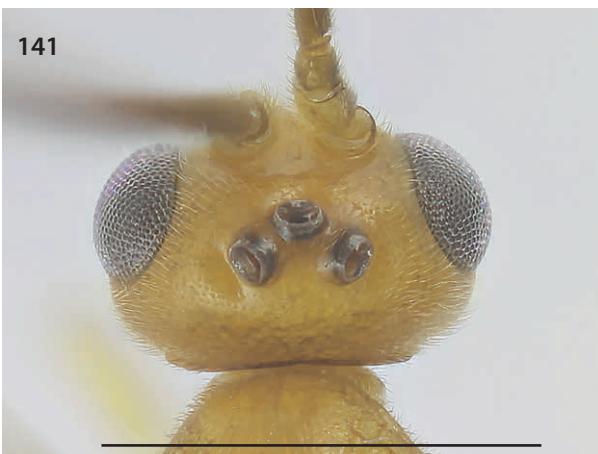
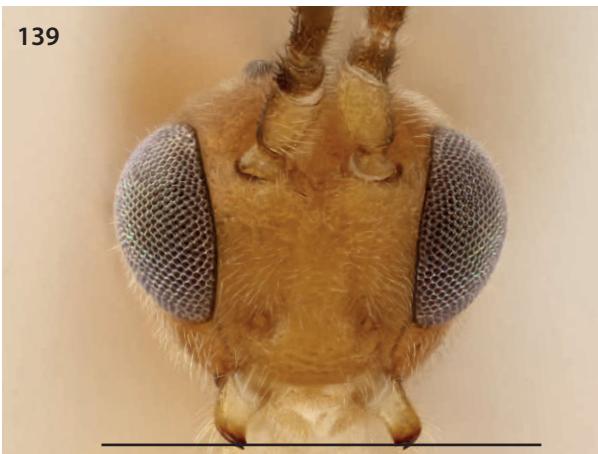
TYPE MATERIAL — Holotype, ♀, **Papua New Guinea**. Baiyer, R., 1100 m, 25.ii–9.iii.1979 (Sedlacek) (TC, Ann Arbor). [not examined]. Paratypes, 1 ♂, 1 ♀, **Papua New Guinea**. Baiyer, R., 1100 m, 27.ii–7.iii.1979 (BMNH). [♀ paratype examined]

**FIGURES 125-130**

Holotype *Meteorus braeti* n. sp. **125**, lateral view of habitus; **126**, front view of head; **127**, lateral view of mesosoma; **128**, dorsal view of head; **129**, dorsal view of mesosoma; **130**, dorsal view of propodeum and petiole. Scale bars: 0.5 mm.

**FIGURES 131-137**

Meteorus obscurus (Voucher ID: JS10_00568). **131**, lateral view of habitus; **132**, front view of head; **133**, lateral view of mesosoma; **134**, dorsal view of head; **135**, dorsal view of mesosoma; **136**, lateral view of abdomen; **137**, fore wing. Scale bars: 0.5 mm.

**FIGURES 138-143**

Meteorus tarius. 138, habitus; 139, front view of head; 140, lateral view of mesosoma; 141, dorsal view of head; 142, dorsal view of mesosoma; 143, lateral view of propodeum and petiole. Scale bars: 0.5 mm.

MATERIAL EXAMINED — Papua New Guinea. 1 ♀, Province Madang, Mount Wilhelm 1200 m (-5.721022, 145.2703) 1200 m, 02-03/11/2012, leg Philip, Alois, Novotny, Leponce Plot 2, understorey; Malaise - MAL-MW1200B-09/16-d09, P1802-11323; Voucher ID: JS10_00568 (MNHN). GenBank ID: N/A (COI), MH464446 (28S).

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Meteorus tarius Huddleston, 1983

Figures 138-143

Meteorus tarius Huddleston, 1983: 417.

TYPE MATERIAL — 1 ♀ of *M. tarius* at BMNH, not examined.

MATERIAL EXAMINED — Papua New Guinea. 1 ♀, Province Madang, Mount Wilhelm 200 m (-5.741031 145.3294) 200 m, 27-28/10/2012, leg Dilu, Ray, Novotny, Leponce, Plot 2, understorey; Malaise - MAL-MW0200B-03/16-d03, P1016-11952; Voucher ID: JS10_00571 (MNHN). GenBank ID: MH464435 (COI), MH464447 (28S).

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