

Revision of the genera *Microplitis* and *Snellenius* (Hymenoptera, Braconidae, Microgastrinae) from Area de Conservación Guanacaste, Costa Rica, with a key to all species previously described from Mesoamerica

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<http://zoobank.org/A7FDC588-B150-4AEB-A136-346DA36907A9>

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Abstract

Received 12 May 2015

Accepted 24 June 2015

Published 20 July 2015

Academic editor:

Dominique Zimmermann

Key Words

Microplitis

Snellenius

Microgastrinae

New World

Area de Conservación Guanacaste

taxonomic review

parasitoid wasps

caterpillars

DNA barcoding

host species

The genera *Microplitis* and *Snellenius* (Hymenoptera: Braconidae, Microgastrinae) from Area de Conservación Guanacaste (ACG), Costa Rica, are revised. A total of 28 new species are described: 23 of *Snellenius* (the first record for Mesoamerica) and five of *Microplitis*. A key is provided to all new species and five species of *Microplitis* previously described from Mesoamerica. In ACG, all *Microplitis* were reared exclusively from Sphingidae, while all *Snellenius* were reared from Noctuoidea (Noctuidae and Erebidae). All of the wasp species with known host records are unambiguously specialists, parasitizing one or a few related hosts. Biological information (wasp cocoon and caterpillar hosts) in the Neotropical region seems to differ from similar data reported in previous works for the Oriental region -but more studies on the world fauna are needed. Although the distinction between these two genera has been controversial, we consider that the available evidence, although not conclusive, suggests that these two genera are best kept as separate (based on the presence of at least a partial epicnemial carina in *Snellenius*, which is absent in *Microplitis*). The following 28 species, all authored by Fernández-Triana & Whitfield, are described as **species nova**: *Microplitis adrianguadamuzi*, *M. alexanderrojasi*, *M. francopupulini*, *M. hebertbakeri*, *M. jorgehernandez*, *Snellenius billburgeri*, *S. bobdressleri*, *S. donstonei*, *S. felipechavarriai*, *S. gerardoherrerae*, *S. irenebakerae*, *S. isidrochaconi*, *S. johnkressi*, *S. jorgecampabadali*, *S. jorgegomezlauroi*, *S. josesarukhani*, *S. kerrydresslerae*, *S. lucindamcadeae*, *S. luisdiegogomezi*, *S. mariakuzminae*, *S. mariamartachavarriai*, *S. phildevriesi*, *S. quiricojimenezi*, *S. robertoespinozai*, *S. sandyknappae*, *S. velvarudae*, *S. vickifunkae*, *S. warrenwagneri*.

Introduction

For the past 35 years and counting, the Area de Conservación Guanacaste (ACG) in northwestern Costa Rica

has been inventorying all of its species of Lepidoptera, their host plants and their parasitoids. The survey has produced 650,000+ caterpillar rearing records and thousands of parasitoid records (e.g. Janzen et al 2009, 2011,

Fernandez-Triana et al. 2014, Fleming et al. 2014, Hansson et al. 2015).

The worldwide subfamily Microgastrinae (Hymenoptera: Braconidae) is one of the main groups with species parasitizing caterpillars (Whitfield 1995, 1997). The ACG inventory has found over a thousand undescribed species of microgastrine wasps, and our goal is to describe all of them. Here we continue with the revision of the closely related genera *Microplitis* Foerster and *Snellenius* Westwood.

Microplitis is one of the largest genera of Microgastrinae, with almost 200 known species. Although found in all regions, the greatest diversity is in the Holarctic (70% of all described species). We have seen many more undescribed species in collections, especially from the Nearctic. The diversity in the Neotropics is much lower, with only six described species before this study (Yu et al. 2012).

Snellenius is a moderately diverse genus that is restricted to the tropics. It contains 12 Oriental and Australasian species (Austin and Dangerfield 1993, Luo and You 2005, Yu et al. 2012, Long and Achterberg 2013), and four Neotropical species (Peru and Argentina) (Shenefelt 1968). We have seen more species in collections; they are mostly from South America but also from Central America and several countries in Asia. At present no specimens are known from the Afrotropics.

Methods

This study is based on almost 2,000 specimens of *Microplitis* and *Snellenius* from ACG, either reared from caterpillar hosts or collected with Malaise traps. Morphology, host caterpillars and other ecological information were considered along with sequences from the 658 bp DNA barcode region of the cytochrome c oxidase I (COI) gene (Hebert et al. 2003) when available.

Also included in the key and species treatments are five species of *Microplitis* that were previously described from Mesoamerica. While some of their holotypes were not available to study, the original descriptions were sufficiently detailed (or some species features were distinctive enough) to allow us to distinguish them from the new species described here.

Specimens of the new species are deposited in the National Museum of Natural History, Smithsonian Institution, Washington DC, United States (USNM), the Canadian National Collection of Insects, Ottawa, Canada (CNC), the Natural History Museum, London, England (BMNH), the Illinois Natural History Survey, Champaign, United States (INHS), and the Instituto Nacional de Biodiversidad, Santo Domingo, Costa Rica (INBio).

Morphological terms and measurements of structures are mostly as in Mason (1981), Huber and Sharkey (1993), Whitfield (1997), Karlsson and Ronquist (2012), and Fernández-Triana et al. (2014). Some natural history information (e.g., geographical distribution, hosts species, details of wasp cocoons) is also provided in the key

whenever available. Those data are included in brackets at the end of the corresponding couplet and are intended as supplementary information that can help the user to correctly identify specimens.

Descriptions of the new species are based on the study of all female specimens that were available for study to reflect intraspecific variation, but the descriptions always include data from the holotype. A few species were described from males only (because no female specimens were available) in cases where they were distinct enough to be recognized as different; the males of those species will run through the key, but males of most species may not be readily identified unless associated with females via rearing or molecular data. A set of 31 morphological characters, including some body measurements and color characters commonly used in Microgastrinae, were used to provide uniform descriptions for all new species. The only exceptions are some *Microplitis* species that were previously extensively illustrated and described (Janzen et al. 2003); here we provide only additional measurements and do not repeat complete descriptions for them.

The descriptions are complemented by extensive photographic illustrations of every species. Photos were taken with a Keyence VHX-1000 Digital Microscope, using a lens with a range of 13–130 \times . Multiple images through the focal plane were taken of a structure and these were combined to produce a single in-focus image using software associated with the Keyence System.

Images of the holotype of *Microplitis marini* Whitfield, 2003, deposited in the NMNH, were obtained using a GT Vision EntoVision imaging system consisting of a firewire JVC KY-75 3CCD digital camera mounted on a Leica M16 zoom lens via a Leica z-step microscope stand. The camera fed a desktop computer where the Archimed software program was used to export image stacks, and the CZPBatch software program was used to generate a composite image from the exported image stacks. Composite images were edited using Adobe Photoshop CS4 to remove artifacts from stack processing and standardize background color.

DNA barcodes for all ACG inventory *Microplitis* and *Snellenius* were obtained using DNA extracts prepared from single legs using a glass fibre protocol (Ivanova et al. 2006). Briefly, total genomic DNA was re-suspended in 30 μ l of dH₂O, and a 658-bp region near the 5' terminus of the COI gene was amplified using standard primers (LepF1–LepR1) following established protocols (Smith et al. 2006, 2007, 2008). If the initial 658 bp amplification was unsuccessful, composite sequences were generated using internal primers. All information for the sequences associated with each individual specimen can be retrieved from the Barcode of Life Data System (BOLD) (Ratnasingham and Hebert 2007) by Process ID (sequence accession) or here: <http://dx.doi.org/10.5883/DS-ASMICRSN>

DNA barcode-based phenograms were constructed using either a single high-quality specimen (longest read length and fewest ambiguities) for each species (Figure 234) or

using all specimens and sequence lengths for each species (Suppl. material 1).

In the taxonomic treatment of species, we give full details of the collecting locality of only the holotype. Country and province are detailed for paratypes, followed by ACG database codes (in the format “yy-SRNP-xxxxxx” for the host caterpillar and “DHJPARxxxxxx” for an individual parasitoid specimen). These codes allow for the retrieval of detailed information of any specimen at <http://janzen.sas.upenn.edu>. Additionally, we included details on the paratype specimens in the Suppl. material 2.

The patronyms used for the new species honor a major proportion of the persons who have supported and contributed plant biology and plant taxonomic information towards understanding ACG biodiversity during the past five decades. Additional members of this group of very important people are honoured with patronyms in an upcoming paper on the microgastrine genus *Xanthomicrogaster*.

Results

The relationship between *Microplitis* and *Snellenius*

The genera *Microplitis* and *Snellenius* form one of the most morphologically distinct groups of microgastrines (Nixon 1965, Mason 1981, Walker et al. 1990, Shaw and Huddleston 1991, Austin and Dangerfield 1993). Austin and Dangerfield (1993) provided some shared diagnostic features: relatively large areolet in the fore wing, coarse sculpturing of the propodeum (which also has a strong median carina), distinctive shape of first mediotergite, poor separation of mediotergites 2 and 3, and short ovipositor and sheaths. Additional distinctive characters that we consider here include the small size of the metacoxa (metacoxa at most $2.0 \times$ as long as mesocoxa, not surpassing posterior of tergum 2 (usually not surpassing tergum 1) and its length less than $0.3 \times$ metasomal length), metatibial spurs very short (usually shorter than half length of first metatarsomere), and scutoscutellar sulcus relatively wide and deep. Only *Alloplitis* and *Philoplitis* share some of the features mentioned above, but they have either a strongly protruding scutellar disc (*Philoplitis*) or an areolated propodeum and different shape of mediotergite 1 (*Alloplitis*).

Most species of *Snellenius* are easily distinguishable from other microgastrines by having strongly excavated and sculptured notauli and scutellar disc, very wide and deep scutoscutellar sulcus, and propodeum divided into two distinct areas (faces) clearly marked by a strong angulation (observed laterally) and a transverse carina (observed dorsally). All of those features are rather unique in Microgastrinae and could be considered as autapomorphies for the genus, if not for the fact they appear to grade, from strongly excavated and sculptured notauli and scutellar disc (Figs 66, 73, 80, 93, 107, 114, 127, 134, 154, 161, 173, 187, 193, 207) to less excavated/less sculptured (a few *Snellenius*, most *Microplitis*) (Figs 16, 22, 36, 43, 51, 58, 59, 100, 121, 148, 165, 201, 214),

to basically smooth and unexcavated (some *Microplitis*) (Figs 5, 11, 30).

Another character has been pointed out to separate the two genera: the presence of an epicnemial carina in *Snellenius*, which is absent in *Microplitis* (Mason 1981, Austin and Dangerfield 1992, 1993). The presence of an epicnemial carina is extremely rare within Microgastrinae; it occurs in only one other genus (i.e., *Fornicia*) (Mason 1981, Whitfield et al. 2002). It is mostly due to this character that we are keeping the two genera as separate in this paper, although in practice it may be difficult to distinguish the epicnemial carina due to setae and/or sculpture on the epicnemium and mesopleura.

In ACG we have also found clear differences in the families of Lepidoptera used as hosts by the two genera, but that does not seem to be the case in other regions (see next section). Also, in ACG all species of *Microplitis* are gregarious parasitoids, whereas all species of *Snellenius* are solitary parasitoids (Figs 216–229).

In summary, although *Microplitis* and *Snellenius* are not likely to be confused with any other genera of Microgastrinae, the limits between them have been controversial (e.g., Nixon 1965, Mason 1981, Austin and Dangerfield 1992, 1993). The available evidence, although not conclusive, suggests that these two genera are best kept separate for the time being. A comprehensive study of the world fauna will be needed to ultimately settle the issue.

Comments on the biology of *Microplitis* and *Snellenius*

Prior to the ACG inventory rearings, the only host records known for *Snellenius* were from the Oriental Region (Austin and Dangerfield 1993, Yu et al. 2012). However, for *Microplitis* there is a wealth of information about its biology, from both temperate and tropical areas (e.g. Shaw and Huddleston 1991, Austin and Dangerfield 1993, Janzen et al. 2003, Yu et al. 2012).

The accounts from earlier works are somewhat contradictory and merit further discussion here. For example, Austin and Dangerfield (1993) postulated that overwintering of *Microplitis* in the cocoon stages is a phenomenon probably restricted to extra-tropical seasonally cold regions (where cocoons are thick and dark in coloration), while cocoons of tropical species are mostly light-coloured and thin-walled, suggesting those species ‘overwinter’ (= dormancy during dry months) as adults. However, in ACG we have found that all of the *Microplitis* and *Snellenius* have thick hard cocoons (Figs 216–229), and most individuals of all species spend the dry months dormant in the cocoon (see also Janzen et al. 2003).

Similarly, an account of all literature records of hosts for those two genera (summarized in Austin and Dangerfield 1993) found that the majority of *Microplitis* species with known hosts parasitize Noctuoidea (Noctuidae, Notodontidae and Erebidae), while the Oriental *Snellenius* were parasitoids of Noctuidae and Sphingidae. This is in stark contrast to ACG, where

all *Microplitis* were reared exclusively from Sphingidae, while all *Snellenius* were reared from Noctuoidea (Noctuidae and Erebidae).

It is hard to tell if those differences reflect a real distinction between host species in the Neotropical vs Oriental regions (e.g., distinct lineages). More host data from other Neotropical areas, and a comprehensive study of *Snellenius* hosts worldwide, are needed.

Extensive details on the biology of three *Microplitis* species in ACG were given by Janzen et al. (2003). Their major conclusions are confirmed here: all of the species are unambiguously specialists, parasitizing one or a few related species, some species are restricted to particular habitats (e.g., dry forest), and others have only been collected at specific times of the year.

Some of the *Microplitis* and *Snellenius* species described here are morphologically cryptic (i.e., morphological differences are slight, and some characters overlap between

species). However, in all cases there are consistent and clear ecological, biological and molecular differences to unambiguously recognize each individual species.

Taxonomic section

Here we describe 28 new species, 23 of *Snellenius* (the first for Mesoamerica) and five of *Microplitis*. We also refer to five previously described species of *Microplitis*: three known to occur in ACG (Janzen et al. 2003) and two from the Caribbean (Yu et al. 2012). There are a few additional ACG species in both genera, but we do not describe them until more specimens become available. We have seen in collections dozens of additional new species of *Snellenius* and *Microplitis* from the Neotropics which will be revised in future papers. An updated list of the 33 Mesoamerican species of *Microplitis* and *Snellenius*, and their hosts (where known) is shown in Table 1.

Table 1. The Mesoamerican described species of *Microplitis* and *Snellenius*. ACG: Area de Conservacion Guanacaste; OTS: Organization for Tropical Studies, Palo Verde Biological Station (for species where known distribution is restricted to those areas in Costa Rica).

Species	Hosts	Known distribution
<i>Microplitis adrianguadamuzi</i> sp. n.	Sphingidae: <i>Manduca corallina</i>	Costa Rica (ACG)
<i>Microplitis alexanderrojasi</i> sp. n.	Sphingidae: <i>Erinnyis oenotrus</i>	Costa Rica (ACG)
<i>Microplitis chacoensis</i> (Cameron, 1908)	Sphingidae: <i>Agrius cingulata</i> , <i>Erinnyis ello</i> , <i>Manduca rustica</i> , <i>M. sexta</i>	Argentina, Brazil, Paraguay, Uruguay, Trinidad, Venezuela
<i>Microplitis espinachi</i> Walker, 2003	Sphingidae: <i>Agrius cingulata</i> , <i>Lintneria merops</i> , nine species of <i>Manduca</i> but not <i>M. corallina</i>	Costa Rica (ACG)
<i>Microplitis figueresi</i> Walker, 2003	Sphingidae: <i>Erinnyis crameri</i> , <i>E. ello</i>	Costa Rica (ACG)
<i>Microplitis francopupulini</i> sp. n.	Sphingidae: <i>Xylophanes guianensis</i>	Costa Rica (ACG)
<i>Microplitis hebertbakeri</i> sp. n.	unknown	Costa Rica (ACG)
<i>Microplitis jorgehernandezii</i> sp. n.	Sphingidae: <i>Erinnyis alope</i> , <i>E. ello</i>	Costa Rica (ACG)
<i>Microplitis marini</i> Whitfield, 2003	Sphingidae: <i>Xylophanes tersa</i>	Costa Rica (ACG)
<i>Microplitis sordidus</i> (Ashmead, 1900)		Saint Vincent Island
<i>Snellenius billburgeri</i> sp. n.	unknown	Costa Rica (ACG)
<i>Snellenius bobdressleri</i> sp. n.	Erebidae: <i>Pseudobarydia crespula</i>	Costa Rica (ACG)
<i>Snellenius donstonei</i> sp. n.	Erebidae: <i>Ceromacra</i> Poole02	Costa Rica (ACG)
<i>Snellenius felipechavarriai</i> sp. n.	Erebidae: <i>Coenipeta bibitrix</i>	Costa Rica (ACG)
<i>Snellenius gerardoherrerae</i> sp. n.	unknown	Costa Rica (ACG)
<i>Snellenius irenebakerae</i> sp. n.	Noctuidae: noctJanzen01 05-SRNP-23743	Costa Rica (ACG)
<i>Snellenius isidrochaconi</i> sp. n.	Erebidae: 3 species of <i>Gonodonta</i>	Costa Rica (ACG), Panama
<i>Snellenius johnkressi</i> sp. n.	Erebidae: <i>Bulia mexicana</i>	Costa Rica (ACG)
<i>Snellenius jorgecampabadali</i> sp. n.		Costa Rica (OTS)
<i>Snellenius jorgegomezlauritoi</i> sp. n.	Noctuidae: <i>Stauropides persimilis</i>	Costa Rica (ACG)
<i>Snellenius josesarukhani</i> sp. n.	Erebidae: <i>Helia sueroides</i>	Costa Rica, Alajuela and Guanacaste Provinces
<i>Snellenius kerrydresslerae</i> sp. n.	Erebidae: <i>Orodesma pulverosa</i>	Costa Rica (ACG)
<i>Snellenius lucindamcadeadeae</i> sp. n.	unknown	Costa Rica (ACG)
<i>Snellenius luisdiegogomezii</i> sp. n.	unknown	Costa Rica, Panama
<i>Snellenius mariakuzminae</i> sp. n.	Noctuidae: <i>Concana</i> Poole01	Costa Rica (ACG)
<i>Snellenius mariamartachavarriae</i> sp. n.	Noctuidae: <i>Catephiodes trinidadensis</i>	Costa Rica (ACG)
<i>Snellenius phildevriesi</i> sp. n.	Erebidae: 3 species of <i>Gonodonta</i> , <i>Hemeroblemma schausiana</i> DHJ02	Costa Rica (ACG)
<i>Snellenius quiricojimenezii</i> sp. n.	unknown	Costa Rica
<i>Snellenius robertoespinozai</i> sp. n.	Noctuidae: <i>Melipotis cellaris</i>	Costa Rica (ACG)
<i>Snellenius sandyknappae</i> sp. n.	Erebidae: <i>Helia argentipes</i>	Costa Rica (ACG)
<i>Snellenius velvaruddae</i> sp. n.	unknown	Costa Rica (ACG)
<i>Snellenius vickifunkae</i> sp. n.	unknown	Costa Rica
<i>Snellenius warrenwagneri</i> sp. n.	unknown	Costa Rica (ACG)

Key to ACG species of *Microplitis* and *Snellenius*

[We could not examine the type of *Microplitis sordidus* (Ashmead, 1900), originally described under the genus *Apanteles* from the island of Saint Vincent. However, Muesebeck (1958) placed the species under the genus *Microplitis*. The species is excluded from the key below, but according to the original description, it has a smooth head and mesosoma (including propodeum); no other species of *Microplitis* in Mesoamerica has a smooth head or propodeum].

- 1 Epicnemial carina at least partially defined (sometimes obscured by setae and/or sculpture on epicnemium and mesopleura); scutellar disc heavily sculptured, with deeper sculpture near margins, central part appearing slightly elevated and less sculptured than margins (Figs 66, 73, 75, 93, 107, 114, 127, 134, 141, 173, 180, 187, 193, 208); anteromesoscutum heavily sculptured, with notauli wide and deeply excavated (usually with numerous crenulae) (as in Figs 73, 80, 127, 134, 173, 193); central area of anteromesoscutum usually appearing raised compared to lateral areas of anteromesoscutum (as in Figs 73, 134, 173, 187, 193); scutoscutellar sulcus very wide and deep; propodeum with anterior and posterior areas separated by transverse carina, and also defined by distinct angulation between anterior and posterior areas (observed in lateral view) (as in Figs 113, 117, 119, 128, 150, 168, 176, 185); antenna in males of many species strongly flattened, with central and posterior flagellomeres distinctly widened (as in Figs 62, 63, 65, 69, 166) [Hosts in ACG: Erebiidae, Noctuidae, Nolidae; all species in ACG are solitary parasitoids] [Genus *Snellenius*] 2
- Epicnemial carina absent; scutellar disc not so heavily sculptured, if with strong punctures, margins and central part of disc usually equally sculptured (Figs 5, 11, 18, 22, 31, 38, 43, 52, 55); anteromesoscutum less heavily sculptured (sometimes almost smooth), notauli faint or slightly defined (rarely deeply excavated) (as in Figs 5, 22, 30, 43, 51); central area of anteromesoscutum not appearing raised compared to lateral areas of anteromesoscutum; scutoscutellar sulcus relatively less wide and deep than previous couplet; propodeum usually without clear distinction between anterior and posterior areas, and often without strong angulation (observed in lateral view); antenna in males not flattened [Hosts in ACG: Sphingidae; all species in ACG are gregarious parasitoids] [Genus *Microplitis*] 24
- 2(1) T1 at least 2.8 × as long as wide at posterior margin, usually more 3
- T1 less than 2.5 × as long as wide at posterior margin (very rarely up to 2.6 ×) 11
- 3(2) Mesosoma and metasoma mostly dark reddish brown or black (rarely with some tergites yellow) (Figs 62, 63, 69, 83, 89, 90, 110, 117, 123, 129, 136, 143, 150, 156, 163, 176, 183, 189, 196, 203, 209) 4
- Mesosoma and metasoma with extensive orange or yellow areas (Figs 76, 103, 169, 170) 8
- 4(3) T1 length 4.0 × its width at posterior margin (Fig. 152); mesosoma and metasoma entirely dark reddish-brown (Figs 150–155); mesocoxa, metatrochanter and metatrochantellus entirely white-yellow, strongly contrasting with rest of leg; metatibia (entirely), most of profemur, protibia, and mesotibia reddish-brown to black (Figs 150, 151, 153) ...
Snellenius luisdiegogomezi Fernández-Triana & Whitfield, sp. n.
- T1 length at most 2.8 × its width at posterior margin; mesosoma mostly black (rarely brown-red), metasoma mostly dark brown to black (rarely with T2–T3 yellow); mesocoxa color not strongly contrasting with color of rest of leg; anterior 0.2–0.6 of metatibia light yellow, profemur, protibia, and mesotibia entirely or mostly yellow-orange 5
- 5(4) Anterior 0.6 of metatibia light yellow (Fig. 205); T2–T3 yellow (Fig. 206); fore wing with veins 2RS, r, and 3RSa yellowish-white (Fig. 204); anteromesoscutum and scutellar disc almost entirely with coarse sculpture (Figs 207, 208) *Snellenius vickifunkae* Fernández-Triana & Whitfield, sp. n.
- Anterior 0.2–0.4 of metatibia light yellow (Figs 89, 92, 143, 145, 209, 211); all tergites dark brown to black; fore wing with veins 2RS, r, and 3RSa brown (Figs 91, 210); anteromesoscutum and scutellar disc not entirely with coarse sculpture (Figs 93, 148, 214) 6
- 6(5) Metatibial spurs yellow orange (Fig. 145); anterior 0.1–0.2 of metatibia light yellow orange (Fig. 145); T1 2.8 × as long as wide; T1 width at half length of tergite 1.7 × its width at posterior margin *Snellenius lucindamcdaeeae* Fernández-Triana & Whitfield, sp. n.
- Metatibial spurs yellow white (Figs 92, 211); anterior 0.3–0.5 of metatibia yellow white (Figs 92, 209, 211); T1 at least 3.0 × as long as wide; T1 width at half length of tergite at most 1.5 × its width at posterior margin 7
- 7(6) Scape dark brown; tegula and humeral complex yellow; flagellomere 2 3.0–3.2 × as long as wide; flagellomere 14 2.5–2.7 × as long as wide *Snellenius warrenwagneri* Fernández-Triana & Whitfield, sp. n.
- Scape yellow orange; tegula and humeral complex dark brown; flagellomere 2 2.4–2.5 × as long as wide; flagellomere 14 2.0–2.3 × as long as wide *Snellenius gerardoherrerai* Fernández-Triana & Whitfield, sp. n.
- 8(3) Mesosoma partially black and partially orange (Figs 96, 100, 102); metasoma partially brown, orange, yellow and white (Figs 96, 99, 101); metafemur brown black dorsally, yellow white ventrally (Figs 96, 98, 99) [Host: undetermined Noctuidae] *Snellenius irenebakerae* Fernández-Triana & Whitfield, sp. n.
- Mesosoma and metasoma uniformly colored light yellow or yellow-orange; metafemur of different coloration 9
- 9(8) Body color light yellow to white (Figs 76–82); metatibia yellow except for posterior 0.2 which is light brown (Fig. 81); wings with light brown to golden infumation, veins and pterostigma mostly light brown to yellow (Fig. 77) [Hosts: Noctuidae, *Ceromacra* sp.] *Snellenius donstonei* Fernández-Triana & Whitfield, sp. n.

- Body color yellow-orange (Figs 103, 169, 170); metatibia mostly or entirely dark red-brown; wings with dark brown infumation, veins and pterostigma mostly dark brown (Figs 104, 171) [Hosts: Erebidae, *Gonodonta* spp.]..... 10
- 10(9) Propodeum of male with one well defined transverse carina (rarely a second one is partially visible) (Fig. 174); male with posterior margin of metascutellum not forming acute projection (Fig. 173); male with interocellar area partially black; male body length 3.8 mm, and fore wing length 3.7 mm; female similar to male [Hosts: Erebidae, *Gonodonta* spp. (caterpillars feeding on *Piper* spp. and Annonaceae) and *Hemeroblemma schausiana*DHJ02].....
..... *Snellenius phildevriesi* Fernández-Triana & Whitfield, sp. n.
- Propodeum of male with at least two (and usually three) well defined transverse carinae (Fig. 109); male with posterior margin of metascutellum medially forming acute projection (Fig. 107); male with interocellar area orange, same color as rest of head; male body length 3.5–3.6 mm, and fore wing length 3.5 mm; female unknown [Hosts: Erebidae, *Gonodonta* spp. (caterpillars feeding on *Cissampelos* spp., Menispermaceae)].....
..... *Snellenius isidrochaconi* Fernández-Triana & Whitfield, sp. n.
- 11(2) Pterostigma relatively wide (2.0 × as long as wide); and fore wing with basal cell virtually without setae (Fig. 118); and wings with most veins transparent or light yellow (except for veins r, 2RS, 3RSa, and 2M).....
..... *Snellenius jorgecampabadali* Fernández-Triana & Whitfield, sp. n.
- Pterostigma relatively narrow (2.5–3.0 × as long as wide); and/or fore wing with basal cell with setae; and/or wings with most veins brown 12
- 12(11) Entire body, including legs, mostly reddish (Figs 176, 183, 185, 187); ocellar area strongly raised, bounded by strong and coarse punctures (Figs 179, 180); smooth occiput delimited from coarsely sculptured vertex and gena by a keel resembling a carina (Figs 179, 180); fore wing (in female, sometimes also male) with veins 1RS and (RS+M) a entirely or partially transparent or light yellow (clearly much lighter than most of surrounding veins)..... 13
- Mesosoma entirely and most of metasoma black, legs partially black or partially yellow; ocellar area not strongly raised, not bounded by strong and coarse punctures; occiput only delimited from vertex and gena by different degree of sculpture, without keel resembling a carina; fore wing (in female and male) with veins 1RS and (RS+M) a brown (same color as surrounding veins) 14
- 13(12) Scutoscutellar sulcus with one carina (Fig. 187); pterostigma entirely brown (Fig. 184); T1 relatively long and wide (T1 length/width at anterior margin/maximum width/width at posterior margin: 0.66/0.30/0.34/0.25 mm); male with hyaline wings and with veins 1RS and (RS+M) a entirely or partially transparent or light yellow (clearly much lighter than most of surrounding veins) [Host: Noctuidae, *Melipotis cellaris*]..... *Snellenius robertoespinozai* Fernández-Triana & Whitfield, sp. n.
- Scutoscutellar sulcus with 3–5 carinae (Fig. 180); pterostigma with pale spot at base (Fig. 177); T1 relatively short and narrow (T1 length/width at anterior margin/maximum width/width at posterior margin: 0.48–0.51/0.17–0.20/0.21–0.23/0.19–0.20 mm); male with infumated wings and most veins brown
..... *Snellenius quiricojimenezi* Fernández-Triana & Whitfield, sp. n.
- 14(12) Metafemur entirely yellow or orange red, metatibia usually yellow to orange except for posterior 0.2 dark brown (Figs 67, 125, 131, 156, 167, 199)..... 15
- Metafemur entirely dark brown or black, almost always metatibia dark brown or black on posterior 0.5–0.8 (Figs 74, 83, 85, 110, 112, 136, 142, 192)..... 20
- 15(14) Metatibia dark brown on posterior 0.5–0.8 × (Figs 67, 158); most of metasoma brown to black dorsally (at most T2 and part of T3 orange yellow) (Figs 63, 160); tegula dark brown [Known hosts: Nolidae] 16
- Metatibia dark brown on posterior 0.2 × (Figs 125, 131, 163, 167, 199); metasoma much lighter dorsally (at least T2–T3, and usually also T1, entirely orange yellow) (Fig. 128, 132, 168, 198); tegula yellow [Known hosts: Noctuidae]. 17
- 16(15) Metafemur yellow, metatibia dark brown on posterior 0.8 (Figs 156, 158); scape dark brown; male flagellomeres not strongly flattened; fore wing with vein 2SR shorter than vein r; T1 2.2 × as long as width at posterior margin; T2 mostly brownish yellow, T3 with narrow yellow band on anterior margin (Fig. 160) [Host: Nolidae, *Concana mundissima*]..... *Snellenius mariakuzminae* Fernández-Triana & Whitfield, sp. n.
- Metafemur orange red to light brown, metatibia dark brown on posterior 0.5 (Fig. 62, 67); scape yellow; male flagellomeres strongly flattened; fore wing with vein 2SR longer than vein r; T1 2.8 × as long as width at posterior margin; T2 mostly brown, T3 with posterior half yellowish (Fig. 63, inset).....
..... *Snellenius billburgeri* Fernández-Triana & Whitfield, sp. n.
- 17(15) Metatibial spurs dark brown (Fig. 199); fore wing hyaline (Fig. 197); T1 at least 2.3 × as long as width at posterior margin *Snellenius velvaruddae* Fernández-Triana & Whitfield, sp. n.
- Metatibial spurs yellow orange or yellow-white (Figs 125, 129, 167); fore wing slightly (Figs 130, 164) to strongly infumated (Fig. 124); T1 at most 2.2 × as long as width at posterior margin 18
- 18(17) Metasoma entirely yellow orange (Fig 128); T1 2.2 × as long as width at posterior margin [Host: Noctuidae, *Stauripides persimilis*]..... *Snellenius jorgegomezlauritoi* Fernández-Triana & Whitfield, sp. n.
- Metasoma dark brown beyond T4 (Figs 132, 168); T1 2.0 × as long as width at posterior margin [Hosts: Noctuidae, *Catephiodes*, *Selenisa*]..... 19

- 19(18) Scutoscutellar sulcus with five carinae (Fig. 165); scape entirely yellow; T4 yellow (Fig. 168) [Host: Noctuidae, *Catephiodes trinidadensis*; found on ACG, Sector Santa Rosa, 295m, dry forest]
Snellenius mariamartachavarriae Fernández-Triana & Whitfield, sp. n.
- Scutoscutellar sulcus with one carina (Figs 133, 134); scape mostly brown; T4 dark brown to black (Fig. 132) [Host: Noctuidae, *Selenisa sueroides*; found on ACG, Sector San Cristobal, 640m, rainforest]
Snellenius josesarukhani Fernández-Triana & Whitfield, sp. n.
- 20(14) Fore wing mostly infumated (except for basal and subbasal cells) 21
- Fore wing mostly hyaline (except sometimes a small fuscus spot near areolet) 23
- 21(20) Metatibial spurs yellow white; tegula lighter in color than darker humeral complex; pro- and mesocoxa dark brown to black, same as metacoxa (at most procoxa slightly lighter) (Figs 189, 191, 192) [Hosts: Erebidae, *Helia argentipes*].....
Snellenius sandyknappae Fernández-Triana & Whitfield, sp. n.
- Metatibial spurs dark brown to black (Figs 74, 142); tegula same color as humeral complex; pro- and mesocoxa yellow-orange to reddish, clearly lighter than dark brown to black metacoxa [Hosts: Erebidae, *Orodesma*; Noctuidae, *Pseudbarydia*] 22
- 22(21) Metafemur reddish brown (partially visible in Fig. 74); T1 2.3 × as long as width at posterior margin [Host: Noctuidae, *Pseudbarydia crespula*].....
Snellenius bobdressleri Fernández-Triana & Whitfield, sp. n.
- Metafemur black (Figs 136, 142); T1 2.8 × as long as width at posterior margin [Host: Erebidae, *Orodesma pulverosa*].....
Snellenius kerrydresslerae Fernández-Triana & Whitfield, sp. n.
- 23(20) T2 relatively wide, occupying entire tergum (laterotergites not visible dorsally) (Fig. 85); T2 much wider than posterior width of T1; metafemur, most of metatibia, metatarsus and T2 red brown (Figs 83, 85, 88); scutoscutellar sulcus usually with 1 but up to 3 clearly defined carinae; T1 2.4 × as long as width at posterior margin [Host: Erebidae, *Coenipeta bibitrix*]
Snellenius felipechavarriae Fernández-Triana & Whitfield, sp. n.
- T2 quadrate, clearly defined by lateral sulcus, and relatively narrow, only occupying part of tergum (laterotergites visible dorsally) (Fig. 115); T2 narrower than posterior width of T1; metafemur, most of metatibia, metatarsus and T2 black (Figs 110, 112, 115); scutoscutellar sulcus with 3–5 (usually 4) clearly defined carinae; T1 2.4–2.6 × as long as width at posterior margin [Host: Erebidae: *Bulia mexicana*].....
Snellenius johnkressi Fernández-Triana & Whitfield, sp. n.
- 24(1) Mesosoma and metasoma entirely orange yellow [Mostly a South American species; only record for Mesoamerica is from island of Trinidad].....
Microplitis chacoensis (Cameron, 1908)
- Mesosoma and/or metasoma entirely or partially black to dark brown 25
- 25(24) T1 parallel-sided for most of its length, narrowing on posterior 0.1 (Fig. 41); T1 length more than 2.8 × its width at posterior margin; T1 strongly sculptured on posterior 0.6 or more; scutellar disc dull, uniformly sculptured by coarse punctures (Figs 43, 44)
Microplitis hebertbakeri Fernández-Triana & Whitfield, sp. n.
- T1 slightly widening towards posterior margin or barrel-shaped (Figs 6, 9, 14, 23, 32, 35, 48, 60); T1 length at most 2.5 × its width at posterior margin (usually less); T1 mostly smooth (except for median sulcus), at most with some sculpture on posterior 0.2–0.3 (rarely up to 0.5) and lateral margins; scutellar disc mostly smooth, at most with small and shallow punctures (Figs 5, 11, 18, 22, 31, 38, 52, 55) 26
- 26(25) T1 sculptured on posterior 0.3–0.5, especially near lateral margins; and fore wing with relatively large and quadrate areolet, vein 3RSa nearly as long or as long as vein r; and notauli strongly marked by relatively deep impressions [Wasp cocoons grouped in one or two large clusters dorsally on host larva. Hosts: Sphingidae, *Xylophanes*]..... 27
- T1 mostly smooth, with very few and shallow punctures near posterior 0.1–0.2 on lateral margins; fore wing with relatively small and often three-sided areolet, if areolet quadrangular then vein 3RSa much shorter than vein r; notauli usually slightly marked by relatively shallow impressions, if rarely with deeper depressions, not as marked as above [Wasp cocoons scattered dorsally over entire length of host larva. Hosts: Sphingidae, *Agrius*, *Erinnyis*, *Lintneria*, *Manduca*]..... 28
- 27(26) Metafemur and metatibia entirely yellow to yellow orange (Figs 53, 56, 57, 61); scape entirely black; body length (head to apex of metasoma) 3.0–3.4 mm (\bar{X} = 3.2 mm); fore wing length 2.5–3.2 mm (\bar{X} = 3.0 mm) [Host: Sphingidae, *Xylophanes tersa*]
Microplitis marini Whitfield, 2003
- Metafemur and metatibia entirely or mostly dark reddish brown (Figs 26, 28, 33, 34); scape entirely yellow-orange; body length (head to apex of metasoma) 3.3–4.0 mm (\bar{X} = 3.6 mm); fore wing length 3.0–3.4 mm (\bar{X} = 3.2 mm) [Host: Sphingidae, *Xylophanes guianensis*].....
Microplitis francopupulini Fernández-Triana & Whitfield, sp. n.
- 28(26) Metatibia spurs, metatarsus and all coxae black (rarely reddish-brown) (Figs 7, 8; coxae reddish brown in the specimen photographed); body length 3.3–3.4 mm; fore wing length 3.2–3.3 mm; metafemur length 1.0 mm; metatibia length 1.2–1.3 mm; metafemur length 3.3–3.5 × its width [Host: *Erinnyis oenotrus*]
Microplitis alexanderrojasi Fernández-Triana & Whitfield, sp. n.
- Metatibia spurs yellow orange, metatarsus light-brown, coxae usually reddish-yellow to light brown (rarely metacoxa dark brown to black) (Figs 1, 3, 13, 21, 46, 49); body length usually less than 3.3 mm; fore wing length usually less than 3.2 mm; metafemur length at most 0.9 mm, usually less; metatibia length at most 1.0 mm, usually less;

- metafemur length often less than $3.3 \times$ its width [Hosts: *Agrius*, *Lintneria*, *Manduca*, other species of *Erinnyis* but not *E. oenotrus*]..... 29
- 29(28) Scape, tegula, and humeral complex dark brown to black; pro- and mesocoxae light brown, metacoxa dark brown to black; metafemur dark red orange to dark red brown on more than half its length (Figs 46–49); body length 3.2–3.5 mm; metafemur length $3.2\text{--}3.4 \times$ its width [Hosts: *Erinnyis alope*, *E. ello*] *Microplitis jorgehernandez* Fernández-Triana & Whitfield, sp. n.
- Scape yellow, tegula yellow or brown, humeral complex entirely brown or partially yellow/partially brown; pro- and mesocoxae yellow to reddish-yellow, metacoxae reddish yellow to light brown; metafemur yellow orange (Figs 1, 3, 13, 21); body length usually, but not always, less than 3.2 mm; metafemur length usually less than $3.2 \times$ its width [Hosts: *Agrius*, *Lintneria*, *Manduca*, or *Erinnyis crameri* (with very few records of *E. ello*)]..... 30
- 30(29) Notauli slightly marked by fine and shallow impressions (Fig. 22) [Hosts: *Erinnyis crameri* (with very few records of *E. ello*)]..... *Microplitis figueresi* Walker, 2003
- Notauli more strongly marked by relatively deep impression and rugose anteriorly (as in Fig. 16) [Hosts: *Agrius*, *Lintneria*, *Manduca* spp.] 31
- 31(30) Fore wing with areolet relatively larger, vein 3RSa almost as long as vein r-m (Fig. 17); flagellomere 14 relatively shorter, $2.0\text{--}2.1 \times$ (rarely $2.2 \times$) as long as wide; metatibia with posterior 0.1–0.2 black [Hosts: *Agrius cingulata*, *Lintneria merops*, several species of *Manduca* but not *M. corallina* and only two records of *M. rustica*] *Microplitis espinachi* Walker, 2003
- Fore wing with areolet relatively smaller, vein 3RSa much shorter than vein r-m (Fig. 2); flagellomere 14 relatively longer, $2.3\text{--}2.6 \times$ as long as wide; metatibia with posterior 0.1 brown [Hosts: *Manduca corallina*, *M. rustica*]..... *Microplitis adrianguadamuzi* Fernández-Triana & Whitfield, sp. n.

Species descriptions

Microplitis adrianguadamuzi Fernández-Triana & Whitfield, sp. n.

<http://zoobank.org/E9C0C331-6EC0-4B25-B86A-95C0EFF439C7>

Figures 1–6

Holotype. Female (USNM). COSTA RICA, ACG, Guanacaste Province, Sector Santa Rosa, Bosque Humedo, 290m, 10.85145, -85.60801, 10.vii.1998. ACG database code: DHJPAR0013831.

Paratypes. 15♀, 3♂ (BMNH, CNC, INBio, INHS, USNM). COSTA RICA, ACG, database codes: DHJPAR0013831, DHJPAR0013873, DHJPAR0013891.

Diagnosis. The combination of smooth T1, notauli marked by relatively deep impression, areolet relatively smaller (vein 3RSa much shorter than vein r-m), scape yellow, metatibial spurs yellow orange, and metatarsus light brown differentiates this species from congeners.

Description (see Comments below). Female. Body length (head to apex of metasoma): 3.1–3.4 mm (\bar{X} = 3.3 mm). Fore wing length: 2.9–3.2 mm (\bar{X} = 3.1 mm). Antennal flagellomere 2 length/width: $2.4\text{--}2.6 \times$ (0.25–0.26/0.10–0.11 mm). Antennal flagellomere 14 length/width: $2.2\text{--}2.4 \times$ (0.17–0.19/0.07–0.08 mm). Length of flagellomere 2/length of flagellomere 14: 1.4–1.5 \times . Metafemur length/width: $3.2\text{--}3.3 \times$ (0.83–0.87/0.25–0.27 mm). Metatibia length: 1.00–1.09 mm (\bar{X} = 1.05 mm). First segment of metatarsus length: 0.44–0.47 mm (\bar{X} = 0.46 mm).

Male. As in female.

Distribution. Costa Rica, ACG.

Hosts. Sphingidae: *Manduca corallina*. Gregarious parasitoid.

Molecular data. One haplotype, three sequences (two barcode-compliant) in BOLD.

Etymology. This species is named in honour of Adrian Guadamuz in recognition of his contribution to understanding the plant biology of ACG.

Comments. This species is morphologically very similar to *M. espinachi*, which was described in detail by Janzen et al. (2003). The brief description above adds some measurements, taken from specimens included in the list of ‘**Specimens examined**’, that allow for separation of these species.

Microplitis alexanderrojasi Fernández-Triana & Whitfield, sp. n.

<http://zoobank.org/8DDD2C4C-3EF7-4EA6-B31F-BD93ED2AA130>

Figures 7–11

Holotype. Female (USNM). COSTA RICA, ACG, Guanacaste Province, Sector Santa Rosa, Area Administrativa, 295m, 10.83764, -85.61871, 17.vi.2008, ACG database code: 08-SRNP-13764.

Paratypes. 6♀, 2♂ (CNC, USNM). COSTA RICA, ACG, database codes: 08-SRNP-13764.

Diagnosis. The combination of T1 mostly smooth (with very few and shallow punctures near posterior 0.1–0.2 on lateral margins) and notauli slightly marked by relatively shallow impressions separates this species from *M. francopupulini*, *M. hebertbakeri* and *M. marini*. The dark brown to black metatibial spurs, metatarsus and coxae separate it from the rest of the ACG *Microplitis*.

Description (see Comments below). Female. Body length (head to apex of metasoma): 3.3–3.5 mm (\bar{X} = 3.4 mm). Fore wing length: 3.2–3.3 mm (\bar{X} = 3.3 mm).

Antennal flagellomere 2 length/width: $2.2\text{--}2.8 \times (0.28\text{--}0.30/0.10\text{--}0.14 \text{ mm})$. Antennal flagellomere 14 length/width: $2.1\text{--}2.4 \times (0.19\text{--}0.24/0.09\text{--}0.10 \text{ mm})$. Length of flagellomere 2/length of flagellomere 14: $1.2\text{--}1.5 \times$. Metafemur length/width: $3.3\text{--}3.6 \times (0.96\text{--}1.00/0.27\text{--}0.30 \text{ mm})$. Metatibia length: $1.20\text{--}1.26 \text{ mm}$ ($\bar{X} = 1.24 \text{ mm}$). First segment of metatarsus length: $0.51\text{--}0.55 \text{ mm}$ ($\bar{X} = 0.53 \text{ mm}$).

Male. As in female.

Distribution. Costa Rica, ACG.

Hosts. Sphingidae: *Erinnyis oenotrus*. Gregarious parasitoid.

Molecular data. One haplotype, one sequence (barcode-complaint) in BOLD.

Etymology. This species is named in honour of Alexander Rojas in recognition of his contribution to understanding the plant biology of ACG.

Comments. This species is morphologically very similar to *M. figueresi*, which was described in detail by Janzen et al. (2003). The brief description above adds some measurements, taken from specimens included in the list of 'Specimens examined', that allow for separation of these species.

Microplitis chacoensis (Cameron, 1908)

Microgaster chacoensis Cameron, 1908: 686. Original description.

Microplitis chacoensis (Cameron, 1908). De Santis & Esquivel, 1966: 49. Transfer to genus *Microplitis*.

Microplitis ayerzai Brethes, 1910. Janzen et al. 2003: 57. Junior synonym.

Holotype. Female (NHM) (examined). PARAGUAY, Chaco.

Specimens examined. In addition to the specimens from Argentina, Brazil, Paraguay, Uruguay, Trinidad and Venezuela mentioned in Janzen et al. (2003), we have also examined over 500 specimens from 2 localities of Argentina deposited in the CNC.

Diagnosis. This is the only *Microplitis* in Mesoamerica with the meso- and metasoma entirely orange yellow.

Distribution. South America: Argentina, Brazil, Paraguay, Uruguay, Trinidad, Venezuela. See comments below for further discussion.

Hosts. Sphingidae: *Agrius cingulata*, *Erinnyis ello*, *Manduca rustica*, *M. sexta*. Janzen et al. (2003) stated that the main hosts are *Manduca sexta* and *M. rustica*, with the other two host species being isolated records. Gregarious parasitoid.

Molecular data. One haplotype, two sequences (none barcode-compliant) in BOLD.

Comments. Janzen et al. (2003) provided an extensive description of this species and drawings of the wings, as well as parts of meso- and metasoma. They also mentioned that "It is not yet known how far north the distribution of *M. chacoensis* extends; the known distribution

suggests it could be present in the eastern (wetter) portions of Panama and Costa Rica. So far our rearings of the known hosts that far north have produced only the other species covered here". Additional rearings done in ACG have failed to recover *M. chacoensis*. Based on all available information, we now consider that the distribution of the species is actually restricted to South America. Nevertheless, we decided to include the species in this paper because Trinidad is technically a Caribbean island, although it has more biogeographical affinities with South America than with Mesoamerica.

Microplitis espinachi Walker, 2003

Figures 12–18, 216

Microplitis espinachi Walker, 2003: 49. Original description.

Holotype. Female (USNM, missing) (not examined). COSTA RICA: Guanacaste province, ACG, Sector Santa Rosa, Bosque San Emilio, 300m, 10.84389, -85.61384.

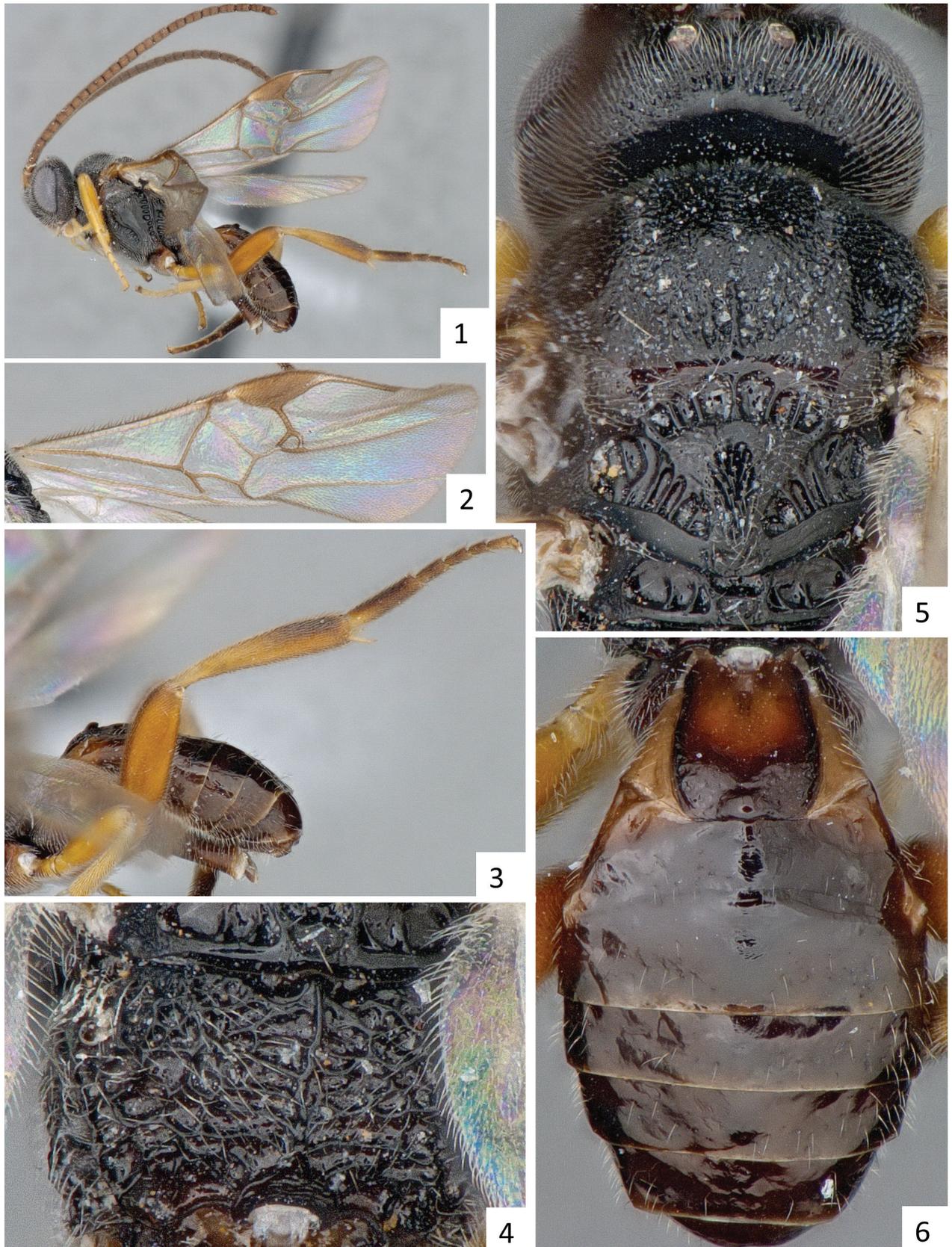
Specimens examined. 134♀, 121♂ (BMNH, CNC, INBio, INHS, USNM). COSTA RICA, ACG, database codes: DHJPAR0002885, DHJPAR0002886, DHJPAR0002888, DHJPAR0004314, DHJPAR0011916, DHJPAR0011917, DHJPAR0011919, DHJPAR0011920, DHJPAR0011921, DHJPAR0013817, DHJPAR0013818, DHJPAR0013817, DHJPAR0013332, DHJPAR0013819, DHJPAR0013820, DHJPAR0013822, DHJPAR0013829, DHJPAR0013833, DHJPAR0013846, DHJPAR0013849, DHJPAR0013857, DHJPAR0013858, DHJPAR0013863, DHJPAR0013868, DHJPAR0013871, DHJPAR0013880, DHJPAR0013884, DHJPAR0013889, DHJPAR0013890, DHJPAR0013895, DHJPAR0020150, DHJPAR0030811, DHJPAR0031061, DHJPAR0039921, DHJPAR0045166, 01-SRNP-13416, 05-SRNP-57563, 08-SRNP-13578, 08-SRNP-13740, 10-SRNP-12978.

Diagnosis. The combination of smooth T1, notauli marked by relative deep impression, areolet relatively larger (vein 3RSa as long as vein r-m), scape yellow, metatibia spurs yellow, and metatarsus brown differentiates this species from congeners.

Description (see Comments below). Female. Body length (head to apex of metasoma): $2.6\text{--}3.6 \text{ mm}$ ($\bar{X} = 3.1 \text{ mm}$). Fore wing length: $2.6\text{--}3.2 \text{ mm}$ ($\bar{X} = 2.9 \text{ mm}$). Antennal flagellomere 2 length/width: $2.2\text{--}2.4 \times (0.22\text{--}0.26/0.09\text{--}0.12 \text{ mm})$. Antennal flagellomere 14 length/width: $2.0\text{--}2.2 \times (0.14\text{--}0.19/0.07\text{--}0.09 \text{ mm})$. Length of flagellomere 2/length of flagellomere 14: $1.3\text{--}1.6 \times$. Metafemur length/width: $2.9\text{--}3.2 \times (0.72\text{--}0.88/0.24\text{--}0.29 \text{ mm})$. Metatibia length: $0.94\text{--}1.15 \text{ mm}$ ($\bar{X} = 1.01 \text{ mm}$). First segment of metatarsus length: $0.35\text{--}0.48 \text{ mm}$ ($\bar{X} = 0.41 \text{ mm}$).

Distribution. Costa Rica, ACG.

Hosts. Sphingidae: *Agrius cingulata*, *Lintneria merops*, nine species of *Manduca* but not *M. corallina* (and only two records of *M. rustica*). Gregarious parasitoid (Fig. 216).



Figures 1–6. *Microplitis adrianguadamuzi* Fernández-Triana & Whitfield. **1** Habitus, lateral view **2** Fore wing **3** Hind leg and metasoma, lateral view **4** Propodeum **5** Head and mesosoma (partially), dorsal view **6** Metasoma, dorsal view.



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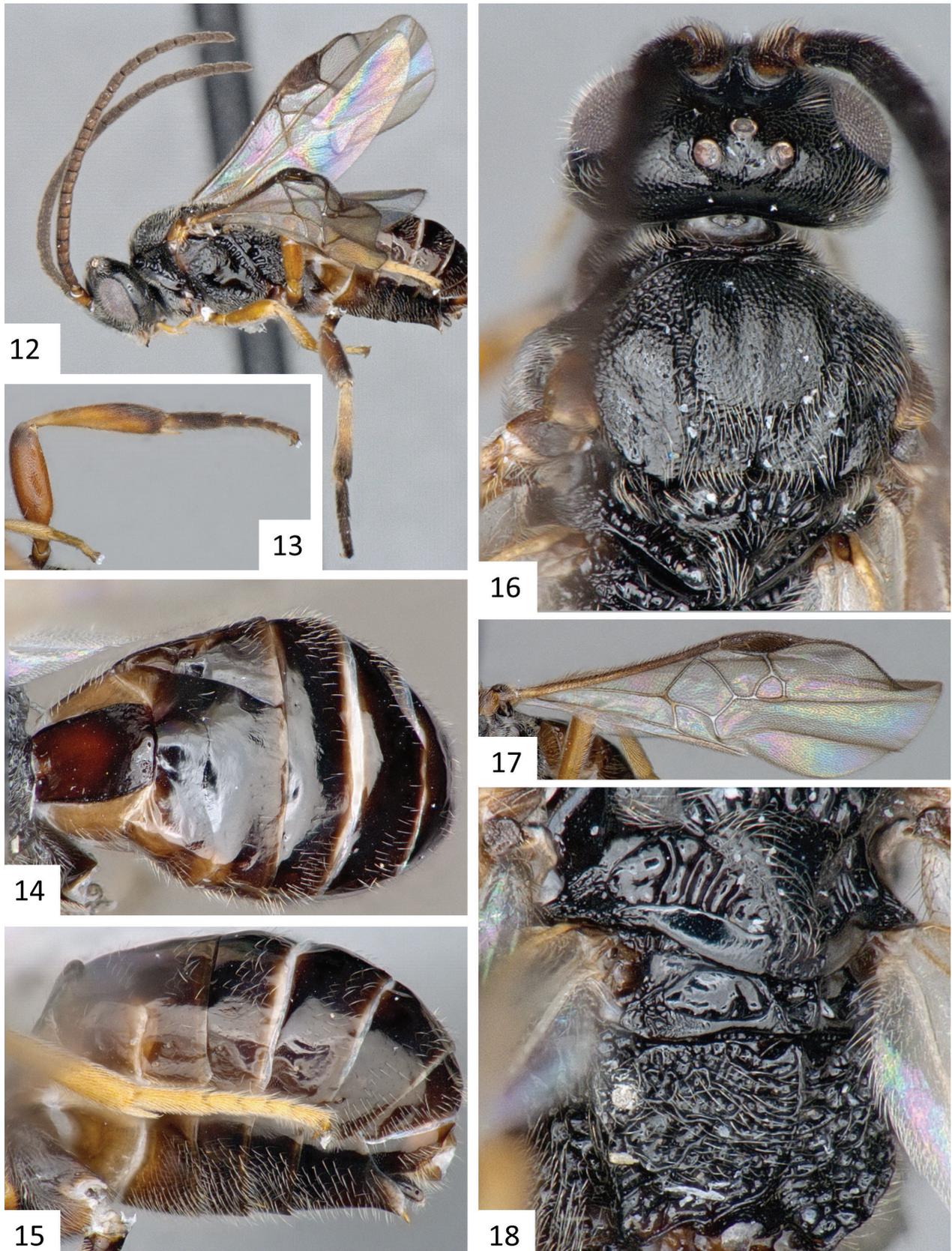


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11

Figures 7–11. *Microplitis alexanderrojasi* Fernández-Triana & Whitfield. 7 Habitus, lateral view 8 Fore wing 9 Metasoma, dorsal view 10 Head, frontal view 11 Mesosoma, dorsal view.



Figures 12–18. *Microplitis espinachi* Walker. **12** Habitus, lateral view **13** Hind leg **14** Metasoma, dorsal view **15** Metasoma, lateral view **16** Head and mesosoma (partially), dorsal view **17** Fore wing **18** Scutellar disc and propodeum, dorsal view.

Molecular data. Five haplotypes, 41 sequences (38 barcode-compliant) in BOLD.

Comments. Janzen et al. (2003) provided an extensive description and several illustrations of the species. Here we only add some measurements taken to specimens included in the list of ‘**Specimens examined**’. The broader host records mentioned by Janzen et al. (2003) are revised here due to the fact the some of them correspond to another species, *M. adrianguadamuzi*, split from the original *M. espinachi*.

Walker in Janzen et al. (2003) indicated that the holotype and an unspecified number of paratypes for *M. espinachi* were deposited in the USNM. One of us (RRK) could not locate any of the specimens. Further, unit trays do not exist for any specimen of *M. espinachi* in the USNM, and there is no record of their existence in any USNM database. It is unlikely that specimens of this species were ever deposited in the USNM; thus, they are currently either misplaced or lost. The location of the holotype for *M. espinachi* is critical for discerning its status relative to *M. adrianguadamuzi*.

Microplitis figueresi Walker, 2003

Figures 19–24, 218, 219

Microplitis figueresi Walker, 2003: 51. Original description.

Holotype. Female (USNM, missing) (not examined). COSTA RICA: Guanacaste province, ACG, Sector Santa Rosa, Cafetal, 280m, 10.85827, -85.61089.

Specimens examined. 107♀, 101♂ (BMNH, CNC, INBio, INHS, USNM). COSTA RICA, ACG, database codes: DHJPARG0005013, DHJPARG0011918, DHJPARG0013826, DHJPARG0013827, DHJPARG0013830, DHJPARG0013834, DHJPARG0013835, DHJPARG0013838, DHJPARG0013840, DHJPARG0013841, DHJPARG0013843, DHJPARG0013844, DHJPARG0013845, DHJPARG0013847, DHJPARG0013848, DHJPARG0013853, DHJPARG0013854, DHJPARG0013856, DHJPARG0013860, DHJPARG0013861, DHJPARG0013862, DHJPARG0013864, DHJPARG0013869, DHJPARG0013872, DHJPARG0013877, DHJPARG0013884, DHJPARG0013887, DHJPARG0013888, DHJPARG0013892, DHJPARG0013894, DHJPARG0013895, DHJPARG0013897, DHJPARG0013898, DHJPARG0039906, DHJPARG0039908, DHJPARG0039909, DHJPARG0039910, DHJPARG0039911, DHJPARG0039912, DHJPARG0039913, DHJPARG0039914, DHJPARG0039915, DHJPARG0039916, DHJPARG0039917, DHJPARG0039918, DHJPARG0039919, DHJPARG0039920, 98-SRNP-1900, 98-SRNP-1901, 98-SRNP-1902, 98-SRNP-1920, 98-SRNP-1931, 98-SRNP-1949, 98-SRNP-8040, 98-SRNP-8112, 98-SRNP-8116, 99-SRNP-8701, 05-SRNP-17809, 05-SRNP-18059, 08-SRNP-13373, 08-SRNP-13374, 08-SRNP-13375, 08-SRNP-13587, 08-SRNP-13590, 08-SRNP-13594, 13-SRNP-15983.

Diagnosis. The combination of smooth T1, notauli marked by relative fine and shallow impressions, areolet

relatively larger (vein 3RSa as long as vein r-m), and host (*Erinnyis* spp.) differentiates this species from congeners.

Description (see Comments below). **Female.** Body length (head to apex of metasoma): 2.7–3.3 mm (\bar{X} = 3.1 mm). Fore wing length: 2.6–3.2 mm (\bar{X} = 3.0 mm). Antennal flagellomere 2 length/width: 2.1–2.4 × (0.21–0.25/0.09–0.12 mm). Antennal flagellomere 14 length/width: 2.0–2.4 × (0.16–0.19/0.08 mm). Length of flagellomere 2/length of flagellomere 14: 1.3–1.5 x. Metafemur length/width: 2.8–3.4 × (0.73–0.90/0.21–0.30 mm). Metatibia length: 0.95–1.19 mm (\bar{X} = 1.04 mm). First segment of metatarsus length: 0.36–0.46 mm (\bar{X} = 0.41 mm).

Distribution. Costa Rica, ACG.

Hosts. Sphingidae: *Erinnyis crameri*, *E. ello*. Gregarious parasitoid (Figs 218, 219).

Molecular data. Six haplotypes, 57 sequences (51 barcode-compliant) in BOLD.

Comments. Janzen et al. (2003) provided an extensive description and several illustrations of the species. Here we only add some measurements taken from specimens included in the list of ‘**Specimens examined**’. The host records are revised due to the fact that two additional species, *M. alexanderrojasi* and *M. jorgehernandezii*, are here split from the original *M. figueresi* described in Janzen et al. (2003).

Walker in Janzen et al. (2003) indicated that the holotype and an unspecified number of paratypes for *M. figueresi* were deposited in the USNM. One of us (RRK) could not locate these specimens in the USNM as described above for *M. espinachi*. Similarly, the location of the holotype for *M. figueresi* is critical for discerning its status relative to *M. alexanderrojasi* and *M. jorgehernandezii*.

Microplitis francopupulini Fernández-Triana & Whitfield, sp. n.

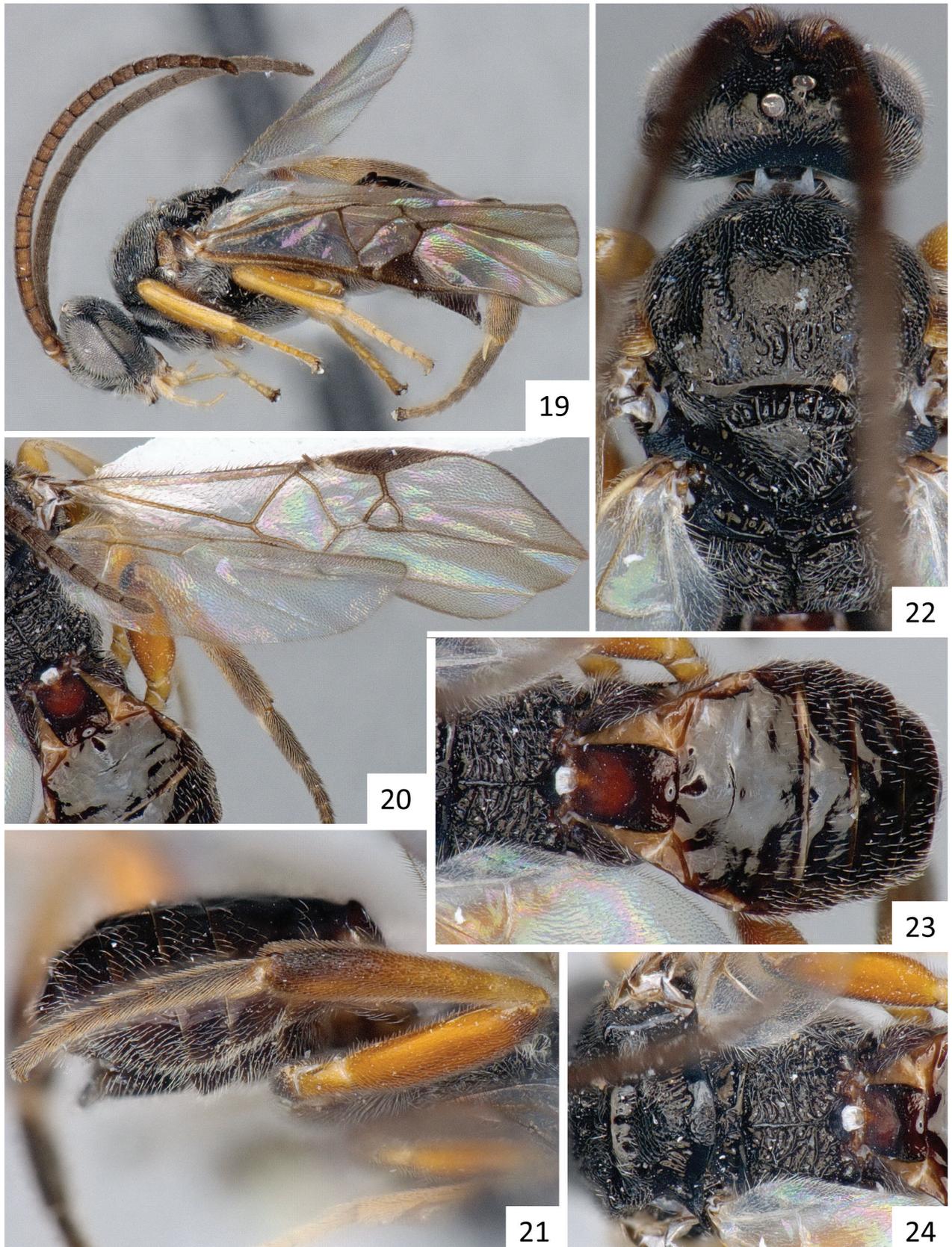
<http://zoobank.org/2DE6F635-B697-41CA-9414-8454886C88BF>

Figures 25–38, 217

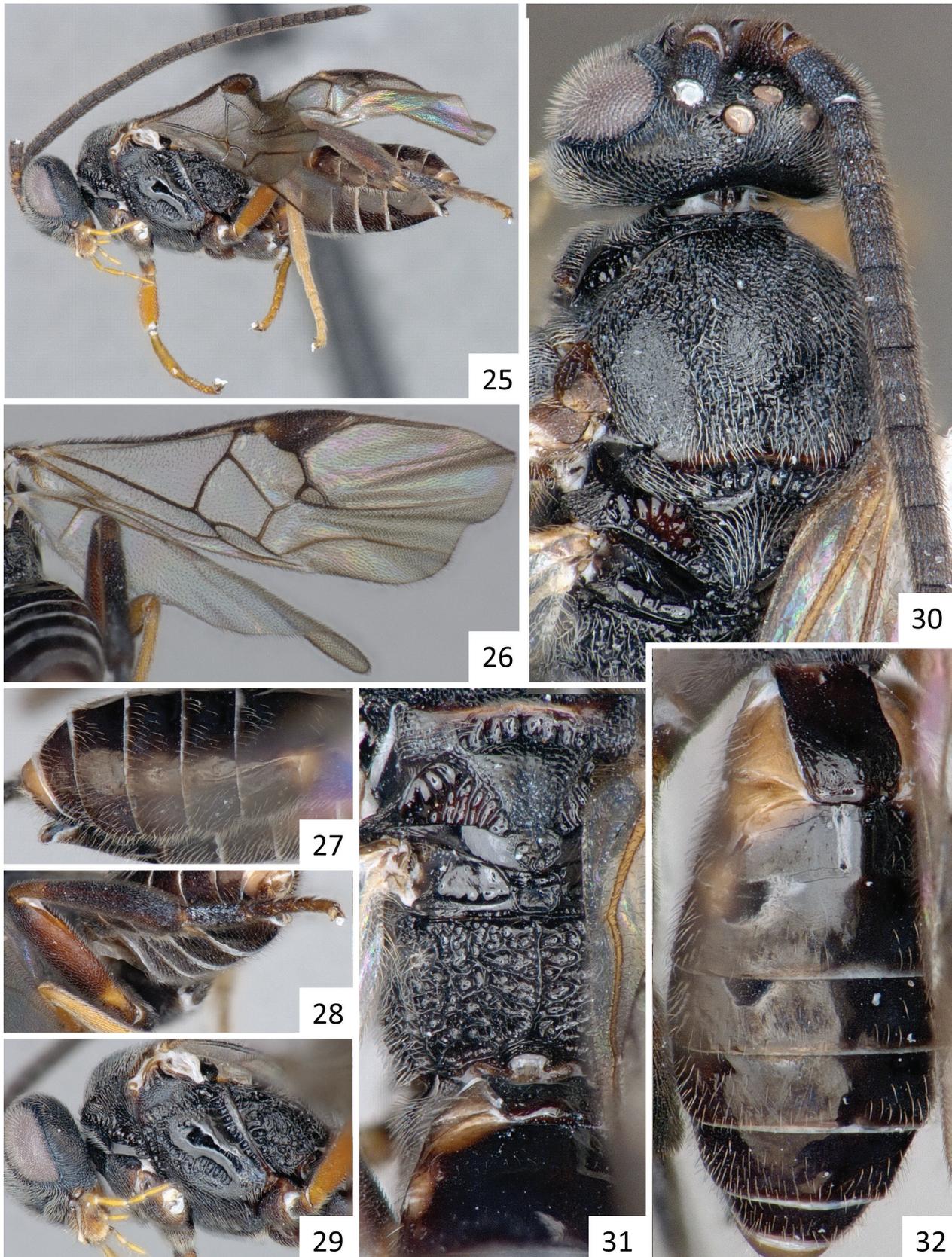
Holotype. ♀ in USNM. COSTA RICA, ACG, Alajuela Province, Sector Rincon Rain Forest, Finca Esmeralda, 123m, 10.93548, -85.25314, 10.viii.2013. ACG database code: 13-SRNP-77147.

Paratypes. 44♀, 42♂ (BMNH, CNC, INBio, INHS, USNM). COSTA RICA, ACG, database codes: DHJPARG0004093, DHJPARG0011922, DHJPARG0034274, DHJPARG0039905, DHJPARG0041831, DHJPARG0047252, DHJPARG0053775, 09-SRNP-75263, 11-SRNP-67447, 12-SRNP-75032, 13-SRNP-77147, 13-SRNP-77149.

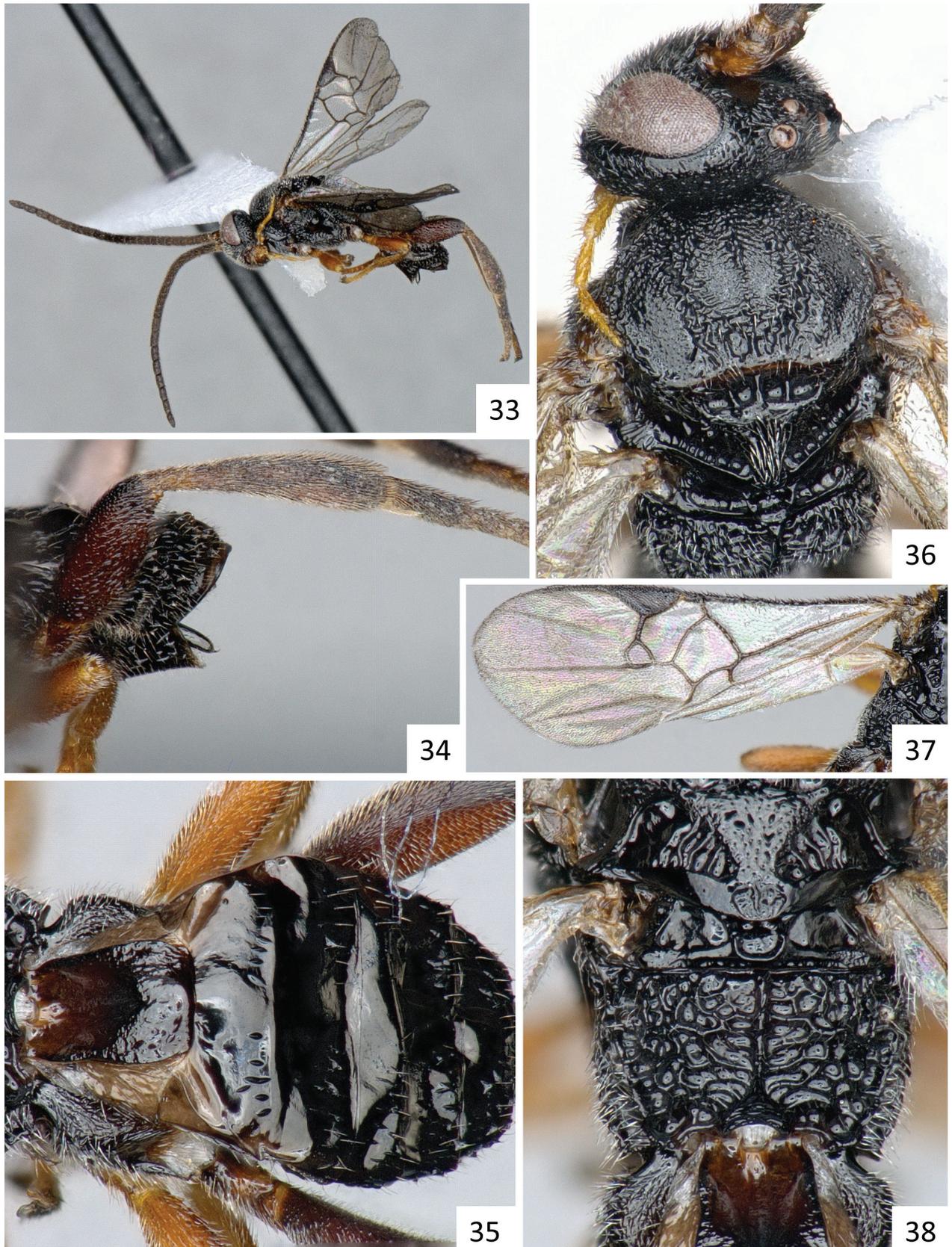
Diagnosis. The combination of T1 sculptured on posterior 0.3–0.5 (especially near lateral margins), notauli marked by relatively deep impressions, areolet relatively larger (vein 3RSa as long as vein r-m), metafemur and metatibia entirely or mostly dark reddish-brown, scape entirely yellow orange, body and fore wing length, wasp cocoons grouped in one or two large clusters dorsally on the host larva, and host species differentiates this species from congeners.



Figures 19–24. *Microplitis figueresi* Walker, 2003. 19 Habitus, lateral view 20 Wings 21 Hind leg and metasoma, lateral view 22 Head and metasoma, dorsal view 23 Propodeum and metasoma, dorsal view 24 Mesosoma (partially) and mediotergite 1, dorsal view.



Figures 25–32. *Microplitis francopupulini* Fernández-Triana & Whitfield (paratype specimen). 25 Habitus, lateral view 26 Wings 27 Metasoma, lateral view 28 Hind leg 29 Head and mesosoma (partially), lateral view 30 Head and mesosoma (partially), dorsal view 31 Scutellar disc and propodeum, dorsal view 32 Metasoma, dorsal view.



Figures 33–38. *Microplitis francopupulini* Fernández-Triana & Whitfield (holotype specimen). 33- Habitus, lateral view. 34 Hind leg 35 Metasoma, dorsal view 36 Head and mesosoma (partially), dorsal view 37 Fore wing 38 Scutellar disc and propodeum, dorsal view.

Description. Female. Scape color: Yellow-orange. Mesosoma color: Black. Metasoma color: Dark brown to black. Coxae color (pro-, meso-, metacoxa): Yellow, yellow, dark brown to black. Femora color (pro-, meso-, metafemur): Yellow, yellow, dark reddish-brown (usually with posterior 0.1–0.2 black). Tibiae color (pro-, meso-, metatibia): Yellow, yellow, dark reddish-brown (usually mostly black dorsally). Metatibia spurs color: Yellow. First segment of metatarsus color: Dark brown. Tegula and humeral complex color: Brown, brown. Wings: Hyaline. Pterostigma color: Dark brown. Fore wing veins 1RS and (RS+M)a: Brown (same color as surrounding veins). Body length (head to apex of metasoma): 3.3–4.0 mm (\bar{X} = 3.6 mm). Fore wing length: 3.0–3.4 mm (\bar{X} = 3.2 mm). Antennal flagellomere 2 length/width: 2.3–2.5 × (0.28–0.29/0.11–0.12 mm). Antennal flagellomere 14 length/width: 2.0–2.3 × (0.19–0.21/0.08–0.10 mm). Length of flagellomere 2/length of flagellomere 14: 1.3–1.5 x. Antenna in males: Of normal appearance, not flattened. Epicnemial carina: Absent. Anteromesoscutum: With relatively shallow and sparse sculpture, central area not appearing elevated compared to lateral areas of anteromesoscutum, notauli strongly excavated. Scutellar disc sculpture: With margins and central part of disc equally sculptured. Number of carinae in scutoscuteellar sulcus: Three to five. Metafemur length/width: 2.5–2.6 × (0.85–0.90/0.33–0.34 mm). Metatibia length: 1.12–1.16 mm (\bar{X} = 1.14 mm). First segment of metatarsus length: 0.48–0.50 mm (\bar{X} = 0.49 mm). Mediotergite 1 sculpture: Mostly sculptured.

Male. Unknown.

Distribution. Costa Rica, ACG.

Hosts. Sphingidae: *Xylophanes guianensis*. Gregarioid parasitoid (Fig. 217).

Molecular data. One haplotype, nine sequences (nine barcode-compliant) in BOLD.

Etymology. This species is named in honour of Franco Pupulin in recognition of his contribution to understanding the plant biology of ACG.

Comments. This species is morphologically very similar to *M. marini*, which was described in detail by Janzen et al. (2003). The brief description above only adds some measurements, taken from specimens included in the list of ‘**Specimens examined**’, that allow for separation of these species. Additionally, both species differ in up to 43 base pairs (> 6.5 %) in the barcoding region.

***Microplitis hebertbakeri* Fernández-Triana & Whitfield, sp. n.**

<http://zoobank.org/BC67551E-B226-425F-94D6-69A844ED62A7>

Figures 39–45

Holotype. ♀ in USNM. COSTA RICA, ACG, Guanacaste Province, Sector El Hacha, Sendero Bejuquilla, 280m, 11.03004, -85.52699, 17.v.1999. ACG database code: DHJPAR0012604.

Paratypes. 3♀, 7♂ (CNC, USNM). COSTA RICA, ACG, database codes: DHJPAR0012581, DHJPAR0012591, DHJPAR0012603, DHJPAR0012609, DHJPAR0012610, DHJPAR0012611, DHJPAR0012612, DHJPAR0012614, DHJPAR0013339, DHJPAR0031721.

Diagnosis. This is the only ACG species of *Microplitis* with T1 parallel-sided for most of its length, narrowing on posterior 0.1, its length more than 3.0 × its width at posterior margin; and scutellar disc dull, uniformly sculptured by coarse punctures.

Description. Female. Scape color: Black. Mesosoma color: Black. Metasoma color: Dark reddish-brown. Coxae color (pro-, meso-, metacoxa): Yellow, yellow, reddish-brown. Femora color (pro-, meso-, metafemur): Yellow, yellow, orange-brown (darker dorsally). Tibiae color (pro-, meso-, metatibia): Yellow, yellow, mostly orange-brown (anterior 0.2 yellow-white, central 0.6 orange-brown, posterior 0.2 dark brown). Metatibia spurs color: White. First segment of metatarsus color: Dark brown. Tegula and humeral complex color: Yellow, yellow and brown. Wings: Hyaline. Pterostigma color: Brown with pale spot at base. Fore wing veins 1RS and (RS+M)a: Brown (same color as surrounding veins). Body length (head to apex of metasoma): 2.8–2.9 mm. Fore wing length: 2.6–2.7 mm. Ocular-ocellar line/posterior ocellus diameter: 2.0 x. Interocellar distance/posterior ocellus diameter: 1.6 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: 0.15/0.07/0.11 mm. Antennal flagellomere 2 length/width: 3.1 × (0.25/0.08 mm). Antennal flagellomere 14 length/width: 2.4 × (0.17/0.07 mm). Length of flagellomere 2/length of flagellomere 14: 1.5 x. Antenna in males: Of normal appearance, not flattened. Epicnemial carina: Absent. Anteromesoscutum: Slightly sculptured, with smooth areas, central area not appearing elevated compared to lateral areas of anteromesoscutum, notauli faint or poorly defined. Scutellar disc sculpture: With margins and central part of disc equally sculptured. Number of carinae in scutoscuteellar sulcus: Five. Metafemur length/width: 3.3–3.6 × (0.72–0.77/0.20–0.23 mm). Metatibia length: 0.97–1.03 mm (\bar{X} = 1.00 mm). First segment of metatarsus length: 0.41–0.43 mm (\bar{X} = 0.42 mm). Mediotergite 1 length/width at posterior margin: 2.9–3.1 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.42–0.44/0.19–0.20/0.20–0.22/0.13–0.16 mm. Mediotergite 1 sculpture: Mostly sculptured.

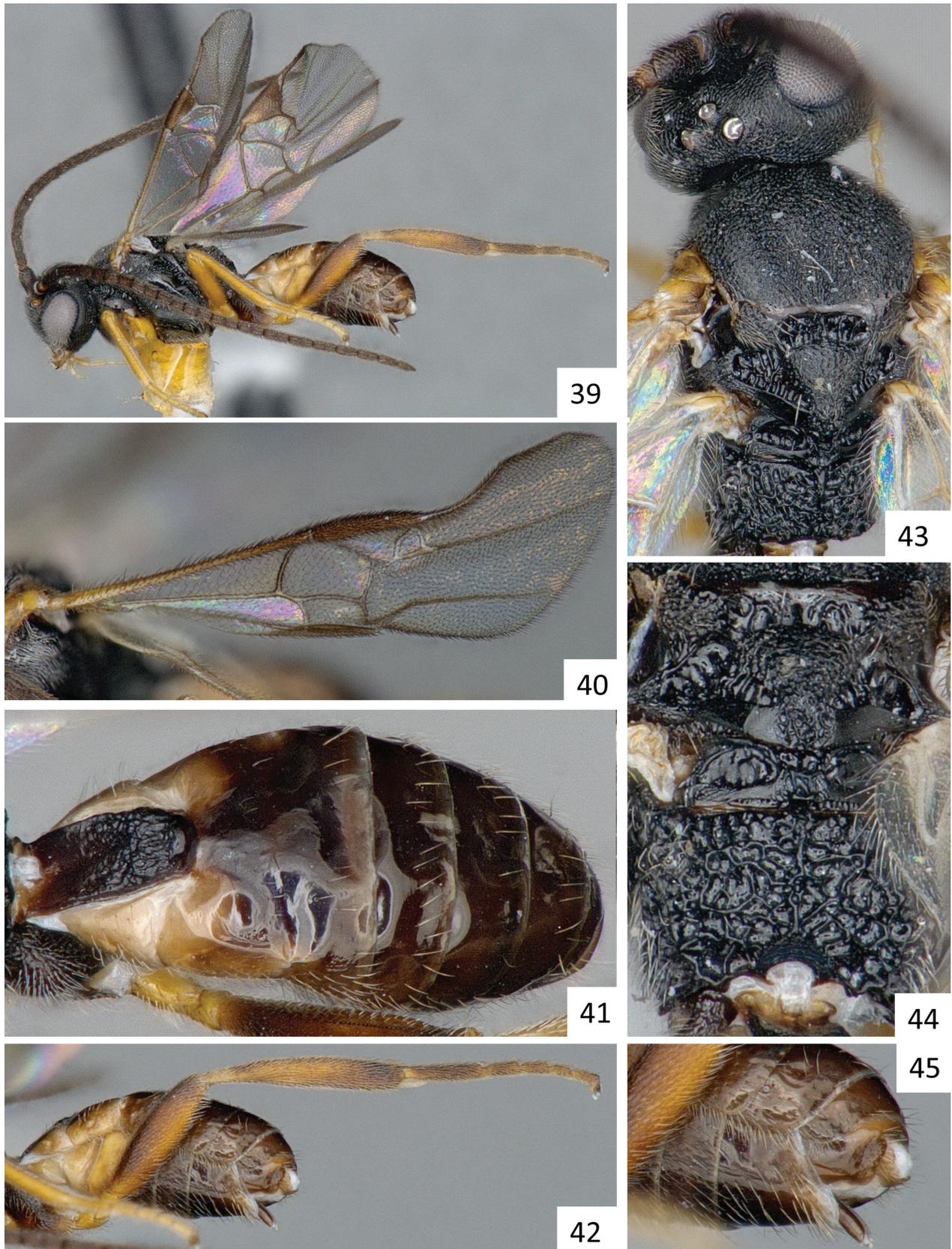
Male. As in female.

Distribution. Costa Rica, ACG.

Hosts. Unknown.

Molecular data. Three haplotype, 11 sequences (11 barcode-compliant) in BOLD.

Etymology. This species is named in honour of Hebert Baker in recognition of his contribution to understanding the plant biology of ACG.



Figures 39–45. *Microplitis hebertbakeri* Fernández-Triana & Whitfield. 39 Habitus, lateral view 40 Fore wing 41 Metasoma, dorsal view 42 Hind leg and metasoma, lateral view 43 Head and mesosoma, dorsal view 44 Scutellar disc and propodeum, dorsal view 45 Detail of hypopygium and ovipositor sheaths.

***Microplitis jorgehernandezii* Fernández-Triana & Whitfield, sp. n.**

http://zoobank.org/A3CFFF36-B263-428F-8A8E-034D670A9C66
 Figures 46–52

Holotype. ♀ in USNM. COSTA RICA, ACG, Sector Santa Rosa, Cuesta Canyon Tigre, 270m, 10.81703, -85.64366, 20.vi.2013. ACG database code: 13-SRNP-15964.

Paratypes. 4♀, 5♂ (BMNH, CNC, INBio, INHS, USNM). COSTA RICA, ACG, database codes: DHJPAR0049814, DHJPAR0052940, 12-SRNP-12247, 13-SRNP-15964.

Diagnosis. The combination of smooth T1, notauli marked by relative fine and shallow impressions, and color of scape, tegula, and humeral complex (dark brown to black), pro- and mesocoxae (light brown), metacoxa (dark brown to black), and metafemur (dark red-orange to brown on more than half its length) differentiates this species from congeners.

Description (see Comments below). Female. Body length (head to apex of metasoma): 3.1–3.5 mm (\bar{X} = 3.3 mm). Fore wing length: 2.9–3.3 mm (\bar{X} = 3.1 mm). Antennal flagellomere 2 length/width: 2.4–2.6 × (0.25–0.27/0.10–0.11 mm). Antennal flagellomere 14 length/width: 2.1–2.3 × (0.18–0.20/0.08–0.09 mm). Length of flagellomere 2/length of flagellomere 14: 1.3–1.4 x. Metafemur length/width: 3.2–3.4 × (0.90–0.96/0.27–0.28 mm). Metatibia length: 1.12–1.21 mm (\bar{X} = 1.15 mm). First segment of metatarsus length: 0.45–0.46 mm (\bar{X} = 0.46 mm).

Male. As in female, except legs slightly lighter in color.

Distribution. Costa Rica, ACG.

Hosts. Sphingidae: *Erinnyis alope*, *E. ello*. Gregarious parasitoid.

Molecular data. One haplotype, five sequences (four barcode-compliant) in BOLD.

Etymology. This species is named in honour of Jorge Hernández in recognition of his contribution to understanding the plant biology of ACG.

Comments. This species is morphologically very similar to *M. figueresi*, which was described in detail by Janzen et al. (2003). The brief description above only adds some measurements, taken to specimens included in the list of ‘Specimens examined’, that allows for separation of these species.

***Microplitis marini* Whitfield, 2003**

Figures 53–61, 220, 221, 230–233

Microplitis marini Whitfield, 2003: 52. Original description.

Holotype. Female (USNM) (examined). COSTA RICA: Guanacaste province, ACG, Sector Cacao, Sendero Arenales, 1080m, 10.92471, -85.46738.

Specimens examined. 56♀, 42♂ (BMNH, CNC, INBio, INHS, USNM). COSTA RICA, ACG, data-

base codes: DHJPAR0004756, DHJPAR0005012, DHJPAR0013865, DHJPAR0013882, DHJPAR0013883, DHJPAR0013885, DHJPAR0020898, DHJPAR0030925, DHJPAR0030931, DHJPAR0034178, DHJPAR0034207, DHJPAR0047037, DHJPAR0052976, DHJPAR0052977, 08-SRNP-6882, 08-SRNP-72721, 12-SRNP-69030, 13-SRNP-42973, 13-SRNP-76897.

Diagnosis. The combination of T1 sculptured on posterior 0.3–0.5 (especially near lateral margins), notauli marked by relatively deep impressions, areolet relatively larger (vein 3RSa as long as vein r-m), metafemur and metatibia entirely yellow to yellow orange, scape entirely black, body and fore wing length, wasp cocoons grouped in one or two large clusters dorsally on the host larva, and host species differentiates this species from congeners.

Description (see Comments below). Female. Body length (head to apex of metasoma): 3.0–3.4 mm (\bar{X} = 3.2 mm). Fore wing length: 2.5–3.2 mm (\bar{X} = 3.0 mm). Antennal flagellomere 2 length/width: 2.9–3.0 × (0.24–0.27/0.08–0.09 mm). Antennal flagellomere 14 length/width: 2.2–2.4 × (0.17–0.18/0.07–0.08 mm). Length of flagellomere 2/length of flagellomere 14: 1.4–1.5 x. Metafemur length/width: 3.2–3.5 × (0.79–0.82/0.23–0.26 mm). Metatibia length: 1.00–1.16 mm (\bar{X} = 1.05 mm). First segment of metatarsus length: 0.35–0.38 mm (\bar{X} = 0.37 mm).

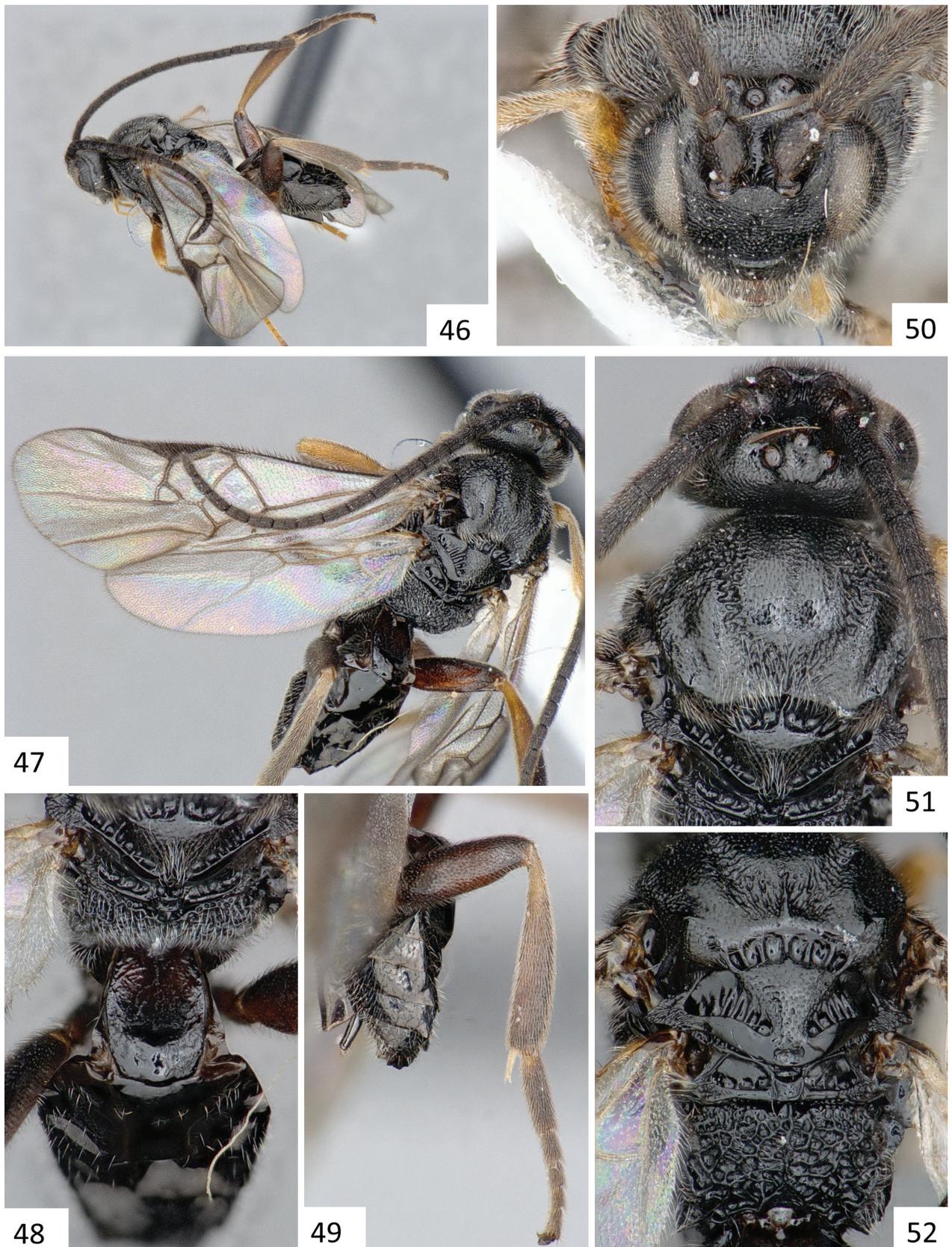
Distribution. Costa Rica, ACG.

Hosts. Sphingidae: *Xylophanes tersa*. Gregarious parasitoid (Figs 220, 221).

Molecular data. Four haplotypes, 13 sequences (11 barcode-compliant) in BOLD.

Comments. Janzen et al. (2003) provided an extensive description and several illustrations of this species. Here we only add some measurements taken from specimens included in the list of ‘Specimens examined’, as well as additional color pictures of the holotype (Figs 230–233). *Microplitis marini* is morphologically similar to *M. francopupulini*, but differs in some morphological, biological and molecular traits (see **Comments** for *francopupulini* above).

The host record for *M. marini* is here limited to *Xylophanes tersa*. Janzen et al. (2003: 54) included in the original description of the species a series of 14 females and one male from Arizona (USA), reared from *X. falco*, although those specimens were left out of type series. Based on our experience with the Microgastrinae fauna of ACG, and the significant number of morphologically cryptic species found (which mostly differ in host ranges and molecular data such as DNA barcodes) we consider it unlikely that the specimens from Arizona are conspecific with those from ACG. A morphological re-examination of the US material, and (ideally) obtaining DNA barcodes for those specimens would be needed before concluding in that regard, but for now we exclude them (and their associated host record) from the species concept of *M. marini* as presented here.



Figures 46–52. *Microplitis jorgehernandezii* Fernández-Triana & Whitfield. **46** Habitus, lateral view **47** Wings and body, dorsal view **48** Mesosoma (partially) and metasoma, dorsal view **49** Hind leg and metasoma, lateral view **50** Head, frontal view **51** Head and mesosoma (partially), dorsal view **52** Scutellar disc and propodeum, dorsal view.

***Microplitis sordidus* (Ashmead, 1900)**

Apanteles sordidus Ashmead, 1900: 279. Original description.
Microplitis sordidus (Ashmead, 1900). Muesebeck 1958:
427. Transfer to genus *Microplitis*.

Microplitis carinata Ashmead, 1900: 293. Synonymized
under *sordidus* by Muesebeck (1958: 427).

Holotype. Male (BMNH) (not examined).

Hosts. Unknown.

Distribution. Saint Vincent Island.

Comments. No molecular or biological data are available for this species. The original description mentions that the type has smooth head and mesosoma (including propodeum). No other species of *Microplitis* in Mesoamerica has a smooth head or propodeum.

***Snellenius billburgeri* Fernández-Triana & Whitfield, sp. n.**

<http://zoobank.org/A83FF860-2BC9-44B3-BF4F-B5C3B514EDDC>
Figures 62–68

Holotype. ♂ in CNC. COSTA RICA: ACG, Guanacaste Province, Santa Rosa National Park headquarters, 200m, Malaise trap, 27-30.vi.1997, L.J. van der Ent.

Diagnosis. The color combination (metafemur orange-red, metatibia dark brown on posterior 0.5, scape yellow, T2 mostly brown, T3 with posterior half yellowish), fore wing with vein 2SR longer than vein r, and T1 2.8 × as long as width at posterior margin differentiates this species from congeners.

Description. Male. Scape color: Yellow. Mesosoma color: Dark reddish-brown. Metasoma color: Reddish-brown except for T2–T3 partially yellow. Coxae color (pro-, meso-, metacoxa): Yellow, yellow, reddish-brown. Femora color (pro-, meso-, metafemur): Yellow, yellow, reddish-brown. Tibiae color (pro-, meso-, metatibia): Yellow, yellow, anterior 0.3 yellow-white, median 0.3 orange, posterior 0.3 dark brown. Metatibia spurs color: Yellow. First segment of metatarsus color: Dark reddish-brown. Tegula and humeral complex color: Yellow, and basally yellow/posteriorly brown. Wings: Hyaline. Pterostigma color: Brown with pale spot at base. Fore wing veins 1RS and (RS+M)a: Brown (same color as surrounding veins). Body length (head to apex of metasoma): 3.4 mm. Fore wing length: 3.0 mm. Ocular-ocellar line/posterior ocellus diameter: 1.6 x. Interocellar distance/posterior ocellus diameter: 2.0 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: 0.14/0.10/0.18 mm. Antenna in males: Strongly flattened. Epicnemial carina: Present. Anteromesoscutum: With strong, coarse sculpture, central area appearing elevated compared to lateral areas of anteromesoscutum, notauli wide and deeply excavated, with numerous crenulae. Scutellar disc sculpture: With deeper sculpture near margins, central part appearing slightly elevated and less sculptured. Number of carinae in scutoscutellar sulcus:

One centrally, with other four smaller and partially defined carinae. Metafemur length/width: 3.0 × (0.86/0.29 mm). Metatibia length: 1.10 mm. First segment of metatarsus length: 0.45 mm. Mediotergite 1 length/width at posterior margin: 2.8 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.54/0.29/0.27/0.19 mm. Mediotergite 1 sculpture: Fully sculptured.

Female. Unknown.

Distribution. Costa Rica, ACG.

Hosts. Unknown.

Molecular data. None.

Etymology. This species is named in honour of Bill Burger in recognition of his contribution to understanding the plant biology of ACG.

***Snellenius bobdressleri* Fernández-Triana & Whitfield, sp. n.**

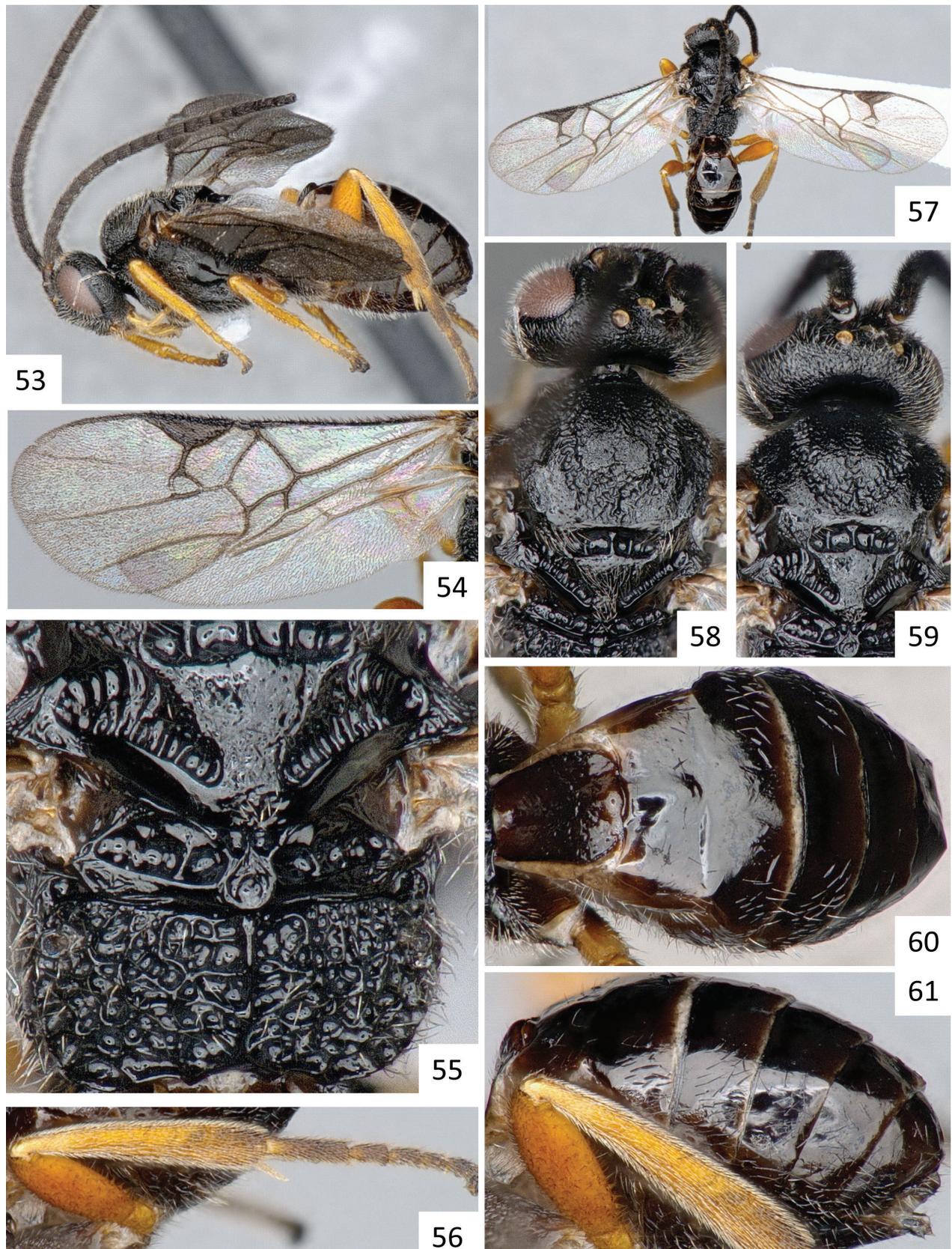
<http://zoobank.org/D281F37C-693D-4552-9D12-1855EF5BF3E5>
Figures 69–75, 226

Holotype. ♀ in USNM. COSTA RICA: ACG, Guanacaste Province, Sector El Hacha, Animas, 195m, 11.05011, -85.58663, 16.iv.2013. ACG database code: DHJPAR0052256.

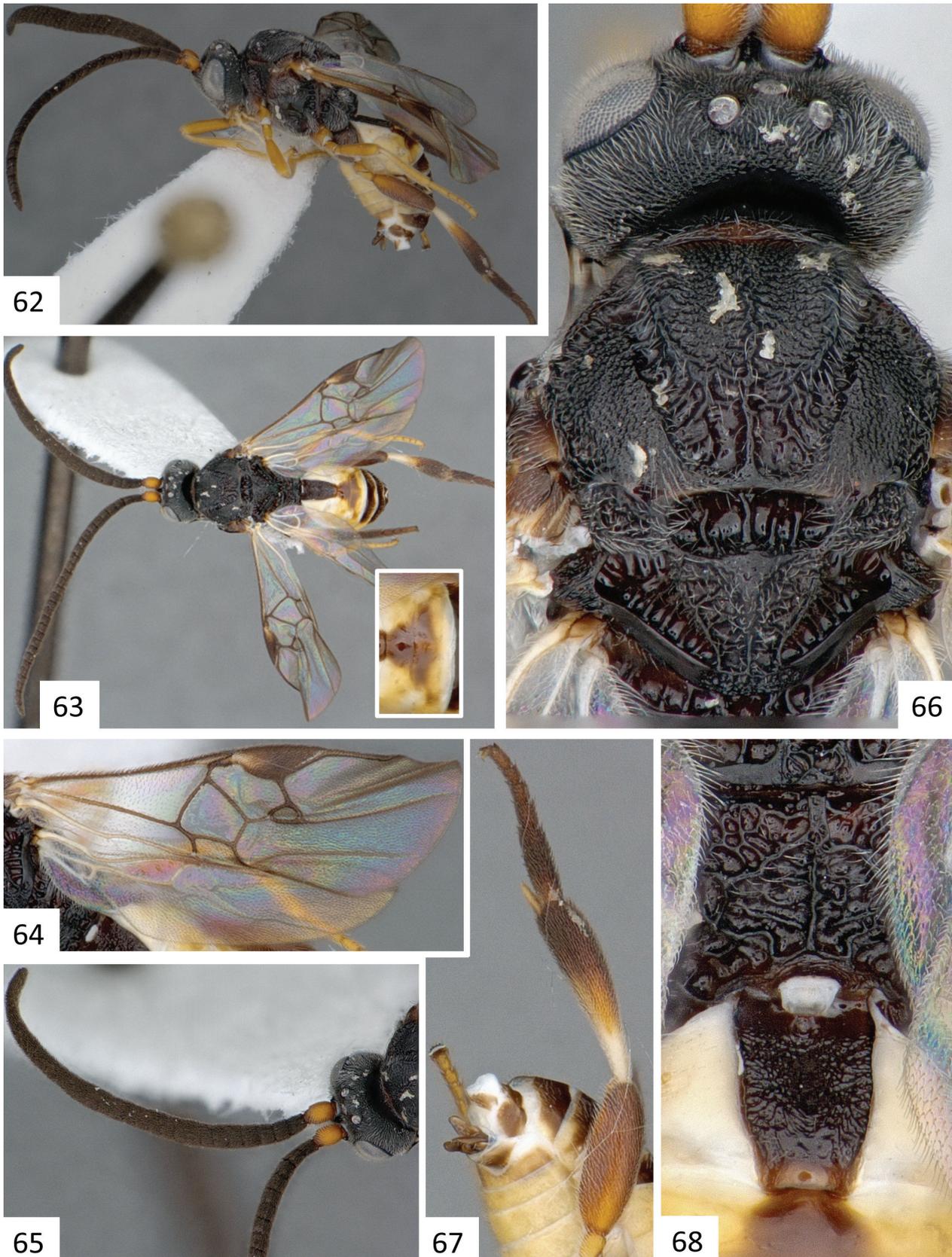
Paratypes. 1♀, 1♂ (CNC). COSTA RICA, ACG, database codes: DHJPAR0052334, DHJPAR0053888.

Diagnosis. The fore wing mostly infumated, dark reddish-brown metafemur, and T1 2.3 × as long as width at posterior margin differentiates this species from congeners.

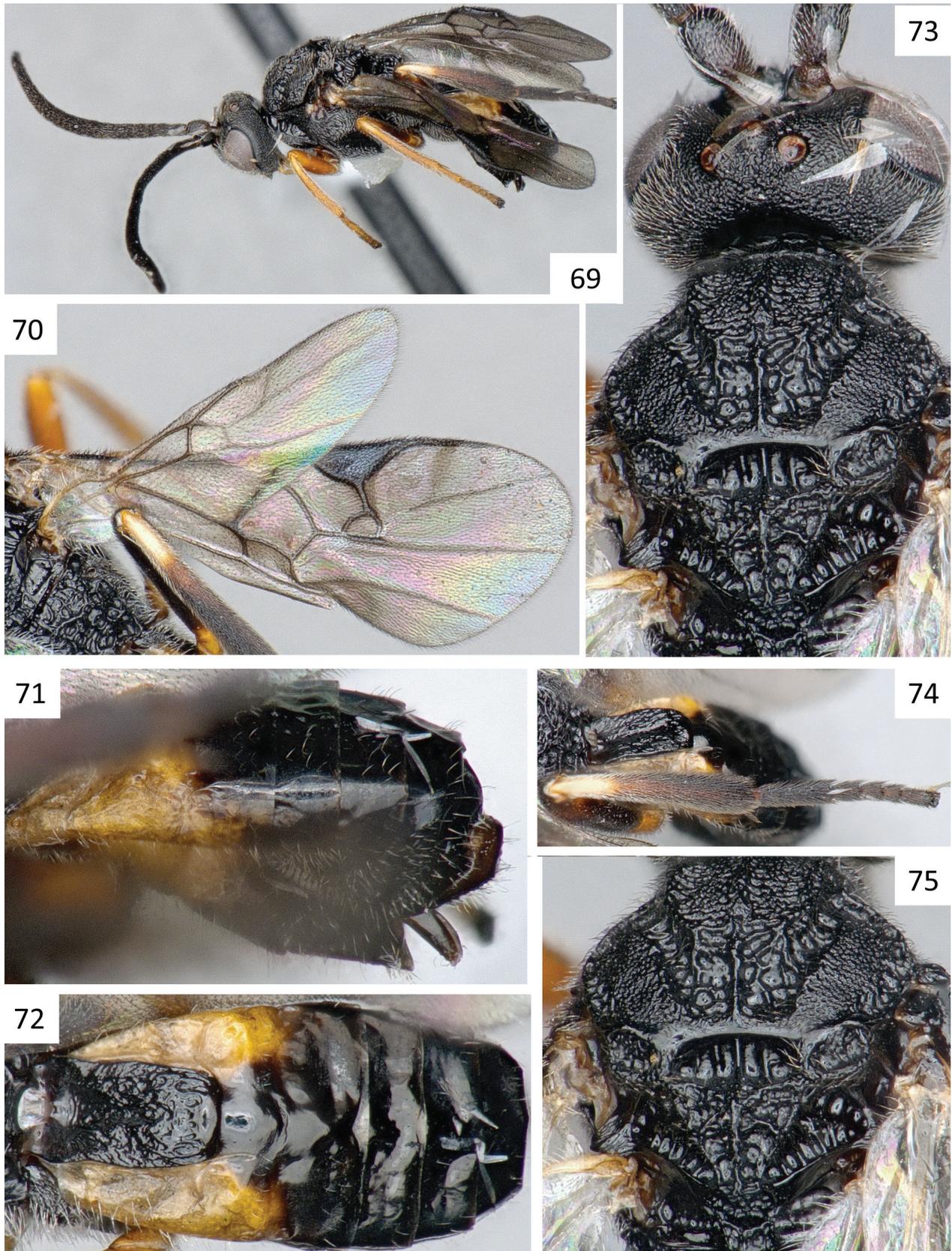
Description. Female. Scape color: Black. Mesosoma color: Black. Metasoma color: Dark brown to black. Coxae color (pro-, meso-, metacoxa): Yellow, yellow, black. Femora color (pro-, meso-, metafemur): Yellow, orange-brown, dark reddish-brown. Tibiae color (pro-, meso-, metatibia): Yellow, yellow, yellow-white on anterior 0.2–0.3 and dark brown to black on posterior 0.7–0.8. Metatibia spurs color: Black. First segment of metatarsus color: Black. Tegula and humeral complex color: Black, black. Wings: Mostly infumated. Pterostigma color: Dark brown. Fore wing veins 1RS and (RS+M)a: Brown (same color as surrounding veins). Body length (head to apex of metasoma): 3.5–3.6 mm. Fore wing length: 3.0 mm. Ocular-ocellar line/posterior ocellus diameter: 1.9–2.1 x. Interocellar distance/posterior ocellus diameter: 1.8–1.9 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: 0.19/0.09–0.10/0.17–0.18 mm. Antennal flagellomere 2 length/width: 2.6 × (0.29–0.31/0.11–0.12 mm). Antennal flagellomere 14 length/width: 1.6–1.7 × (0.19–0.20/0.12 mm). Length of flagellomere 2/length of flagellomere 14: 1.5–1.6 x. Antenna in males: Strongly flattened. Epicnemial carina: Present. Anteromesoscutum: With strong, coarse sculpture, central area appearing elevated compared to lateral areas of anteromesoscutum, notauli wide and deeply excavated, with numerous crenulae. Scutellar disc sculpture: With deeper sculpture near margins, central part appearing slightly elevated and less



Figures 53–61. *Microplitis marini* Whitfield, 2003. 53 Habitus, lateral view 54 Wings 55 Scutellar disc and propodeum, dorsal view 56 Hind leg 57 Habitus, dorsal view. 58, 59 Head and mesosoma (partially), dorsal view, images taken under slightly different angles.



Figures 62–68. *Snellenius billburgeri* Fernández-Triana & Whitfield. **62** Habitus, lateral view **63** Habitus, dorsal view (inset: details of mediotergites 2 and 3) **64** Fore wing **65** Male antenna **66** Head and mesosoma (partially), dorsal view **67** Hind leg and metasoma (partially), lateral view **68** Propodeum (partially) and mediotergite 1, dorsal view.



Figures 69–75. *Snellenius bobdressleri* Fernández-Triana & Whitfield. **69** Habitus, lateral view **70** Wings **71** Metasoma, lateral view **72** Metasoma, dorsal view **73** Head and mesosoma (partially), dorsal view **74** Hind leg and mediotergite 1, dorsal view **75** Anteromesoscutum and scutellar disc, dorsal view.

sculptured. Number of carinae in scutoscutellar sulcus: One centrally, with other 2–4 smaller and partially defined carinae. Metafemur length/width: $3.5 \times (0.97/0.28 \text{ mm})$. Metatibia length: 1.26 mm. First segment of metatarsus length: 0.49 mm. Mediotergite 1 length/width at posterior margin: 2.2–2.3 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.58–0.60/0.30–0.31/0.30–0.32/0.26–0.27 mm. Mediotergite 1 sculpture: Fully sculptured.

Male. As female but with all femora orange, metatibia mostly orange (only posterior 0.2 dark brown), T3 entirely yellow, and T2 light brown.

Distribution. Costa Rica, ACG.

Hosts. Erebididae: *Pseudbarydia crespula*. Solitary parasitoid (Fig. 226).

Molecular data. Two haplotypes, three sequences (three barcode-compliant) in BOLD.

Etymology. This species is named in honour of Bob Dressler in recognition of his contribution to understanding the plant biology of ACG.

***Snellenius donstonei* Fernández-Triana & Whitfield, sp. n.**

<http://zoobank.org/3F8DEBCE-DE88-4F19-9951-08AA42CF18C0>
Figures 76–82

Holotype. ♀ in USNM. COSTA RICA: ACG, Guanacaste Province, Sector Pitilla, Amonias, 390m, 11.04249, -85.40339. ACG database code: DHJP0050115.

Paratypes. 1♀ (CNC). COSTA RICA, ACG, database code: DHJP0050129.

Diagnosis. The unique color pattern characterizes this species: body color light yellow to white; metatibia mostly yellow, wings with golden infumation, veins and pterostigma mostly yellowish.

Description. Female. Scape color: Yellow. Mesosoma color: Yellow. Metasoma color: Yellow. Coxae color (pro-, meso-, metacoxa): Yellow, yellow, yellow. Femora color (pro-, meso-, metafemur): Yellow, yellow, yellow. Tibiae color (pro-, meso-, metatibia): Yellow, yellow, mostly yellow with posterior 0.1–0.2 brown. Metatibia spurs color: Yellow. First segment of metatarsus color: Brown. Tegula and humeral complex color: Yellow, yellow. Wings: Infumated. Pterostigma color: Light brown. Fore wing veins IRS and (RS+M)a: Entirely or partially transparent or light yellow (but most other veins also same color). Body length (head to apex of metasoma): 3.6–3.7 mm. Fore wing length: 3.6 mm. Ocular-ocellar line/posterior ocellus diameter: 2.0 x. Interocellar distance/posterior ocellus diameter: 1.8 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: 0.16/0.08/0.14 mm. Antennal flagellomere 2 length/width: $2.4 \times (0.31/0.13 \text{ mm})$. Antennal flagellomere 14 length/width: $2.1 \times (0.21/0.10 \text{ mm})$. Length of flagellomere 2/length of flagellomere 14: 1.5 x. Epicnemial carina: Present. Anteromesoscutum: With strong, coarse sculpture, central area appearing elevated compared to lateral areas of

anteromesoscutum, notauli wide and deeply excavated, with numerous crenulae. Scutellar disc sculpture: With deeper sculpture near margins, central part appearing slightly elevated and less sculptured. Number of carinae in scutoscutellar sulcus: One. Metafemur length/width: $3.5 \times (0.97/0.28 \text{ mm})$. Metatibia length: 1.30 mm. First segment of metatarsus length: 0.51 mm. Mediotergite 1 length/width at posterior margin: 2.7 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.52/0.20/0.16/0.19 mm. Mediotergite 1 sculpture: Partially sculptured.

Male. Unknown.

Distribution. Costa Rica, ACG.

Hosts. Erebididae: *Ceromacra* sp. (with interim name *Ceromacra* Poole02). Solitary parasitoid.

Molecular data. None.

Etymology. This species is named in honour of Don Stone in recognition of his contribution to understanding the plant biology of ACG.

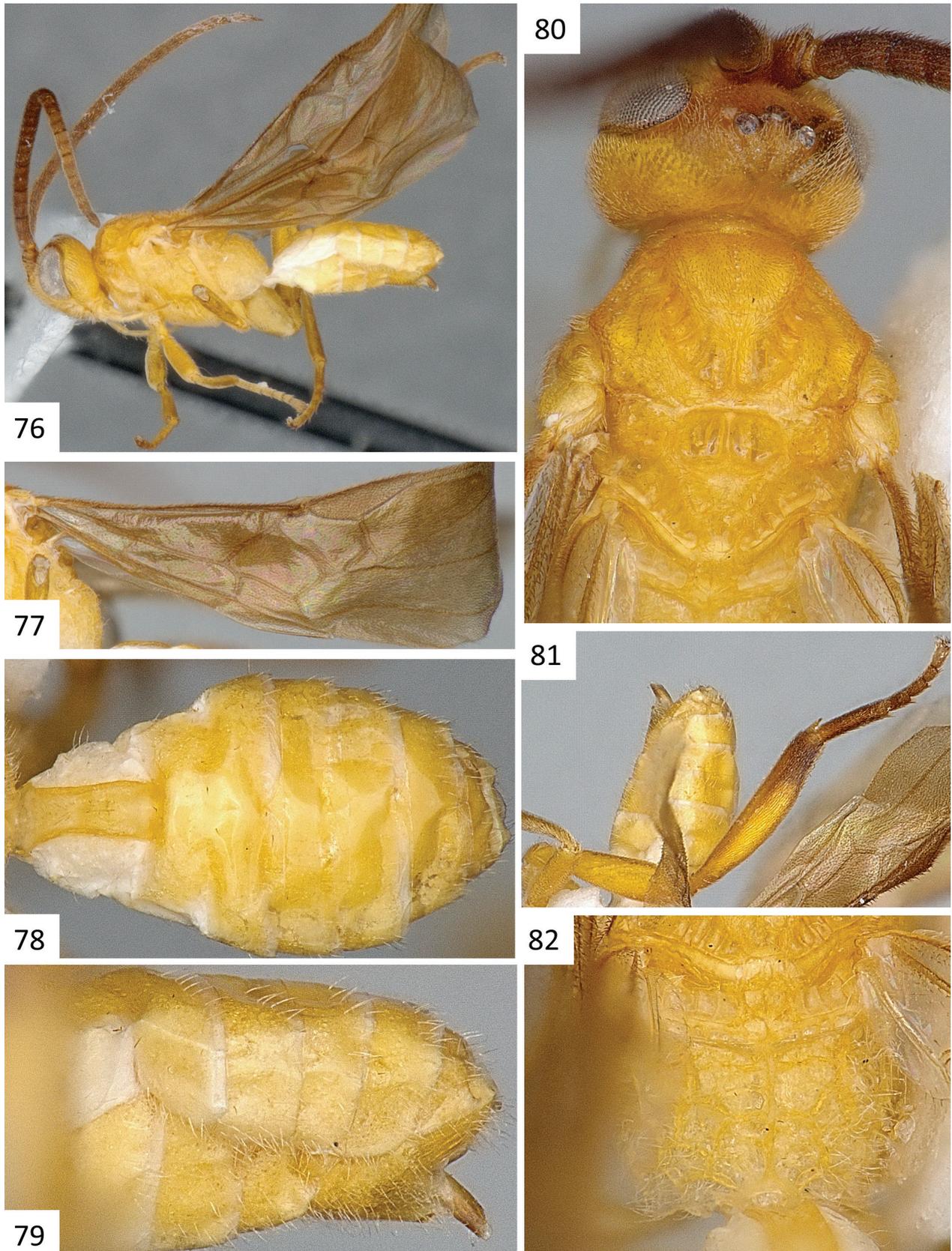
***Snellenius felipechavarriai* Fernández-Triana & Whitfield, sp. n.**

<http://zoobank.org/4639DDBE-D5BB-4213-816D-B4238BC783AA>
Figures 83–88, 222

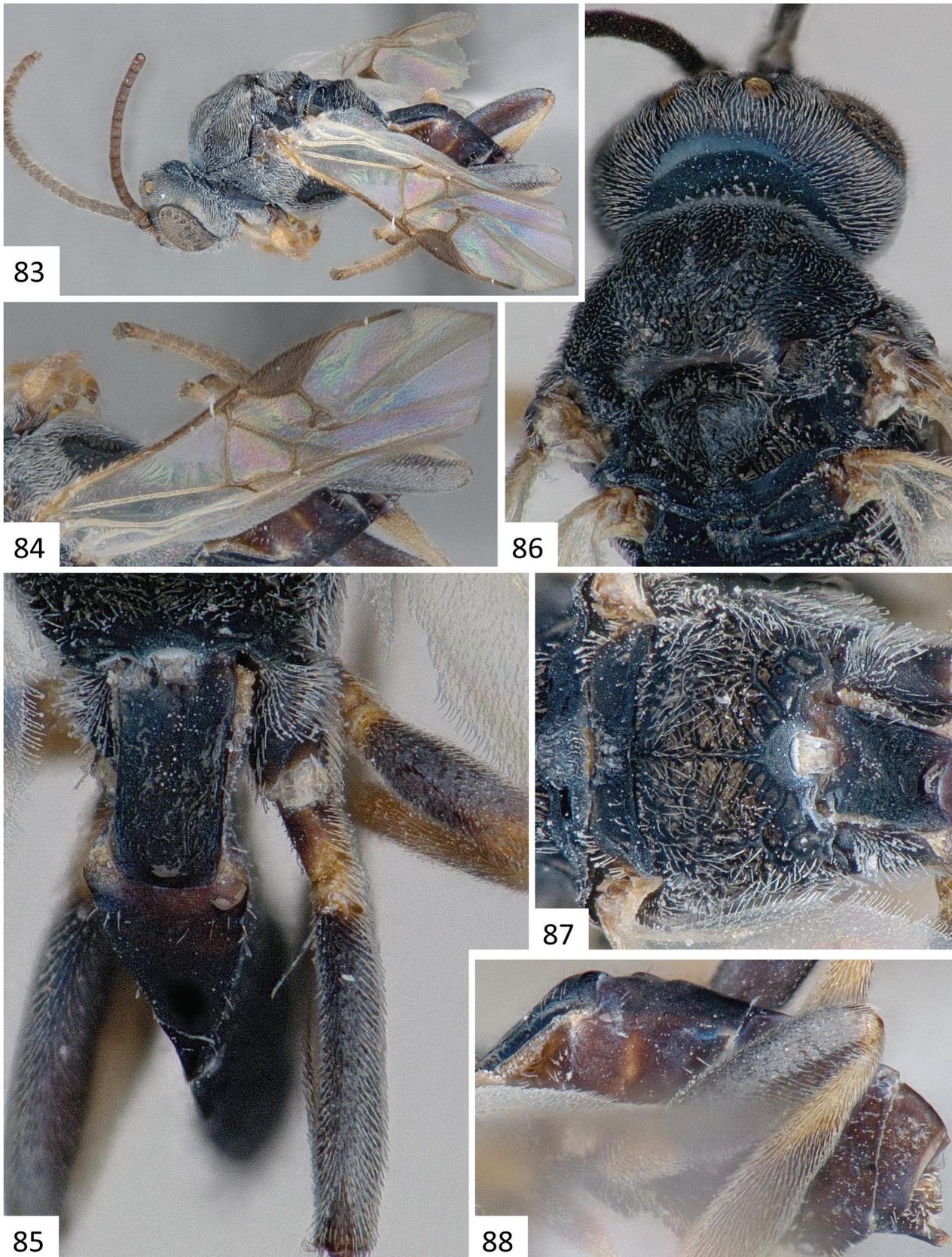
Holotype. ♀ in CNC. COSTA RICA: ACG, Guanacaste Province, Sector Santa Rosa, Area Administrativa, 295m, 10.83764, -85.61871. ACG database code: DHJP0004293.

Diagnosis. The combination of hyaline wings, mesosoma and metasoma mostly black or dark reddish brown, and metafemur and metatibia (posterior 0.6) dark brown, separates this species from all other ACG *Snellenius*, except for *S. johnkressi*. It is distinguishable from the latter species by wider T2 and scutoscutellar sulcus with only one clearly defined carina (3–5 carinae in *S. johnkressi*).

Description. Female. Scape color: Brown. Mesosoma color: Black. Metasoma color: Dark brown to black, except for reddish-brown T2–T3. Coxae color (pro-, meso-, metacoxa): Light brown, brown, brown. Femora color (pro-, meso-, metafemur): Orange, dark brown, dark brown. Tibiae color (pro-, meso-, metatibia): Orange, orange-brown, anterior 0.2 yellow-white, posterior 0.8 dark brown. Metatibia spurs color: Yellow-white. First segment of metatarsus color: Dark brown. Tegula and humeral complex color: Black, dark brown to black. Wings: Hyaline. Pterostigma color: Brown. Fore wing veins IRS and (RS+M)a: Brown (same color as surrounding veins, although slightly lighter). Body length (head to apex of metasoma): 2.9 mm. Fore wing length: 2.6 mm. Ocular-ocellar line/posterior ocellus diameter: 1.6 x. Interocellar distance/posterior ocellus diameter: 2.0 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: 0.14/0.09/0.18 mm. Antennal flagellomere 2 length/width: $(0.21/0.08 \text{ mm})$. Antennal flagellomere 14 missing. Epicnemial carina: Present but weakly defined. Anteromesoscutum: With relatively shallower and



Figures 76–82. *Snellenius donstonei* Fernández-Triana & Whitfield. **76** Habitus, lateral view **77** Fore wing **78** Metasoma, dorsal view **79** Metasoma, lateral view **80** Head and mesosoma (partially), dorsal view **81** Hind leg and metasoma (partially), lateral view **82** Propodeum (partially), dorsal view.



Figures 83–88. *Snellenius felipechavarriai* Fernández-Triana & Whitfield. **83** Habitus, dorso-lateral view **84** Wings **85** Propodeum (partially) and mediotergite 1, dorsal view **86** Head and mesosoma (partially), dorsal view **87** Propodeum and mediotergite 1, dorsal view **88** Metasoma lateral view.

sparser sculpture, central area not appearing elevated compared to lateral areas of anteromesoscutum, notauli slightly to strongly excavated. Scutellar disc sculpture: With deeper sculpture near margins, central part appearing slightly elevated and less sculptured. Number of carinae in scutoscutellar sulcus: One centrally, with other 4 smaller and partially defined carinae. Metafemur length/width: $3.3 \times (0.75/0.23 \text{ mm})$. Metatibia length: 0.98 mm. First segment of metatarsus length: 0.35 mm. Mediotergite 1 length/width at posterior margin: 2.0 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.52/0.28/0.26/0.26 mm. Mediotergite 1 sculpture: Partially sculptured.

Male. Unknown.

Distribution. Costa Rica, ACG.

Host. Erebiidae: *Coenipeta bibitrix*. Solitary parasitoid (Fig. 222).

Molecular data. One haplotype, four sequences (none barcode-compliant) in BOLD.

Etymology. This species is named in honour of Felipe Chavarría in recognition of his contribution to understanding the plant biology of ACG.

***Snellenius gerardoherrerai* Fernández-Triana & Whitfield, sp. n.**

<http://zoobank.org/CFF3F012-1792-4D88-8A6F-E869FC4E7A3A>

Figures 89–95

Holotype. ♀ in USNM. COSTA RICA: ACG, Guanacaste Province, Sector Santa Rosa, Bosque San Emilio, 300m, 10.84389, -85.61384. ACG database code: DHJPAR0013326.

Paratypes. 6♀ (BMNH, CNC). COSTA RICA, ACG, database codes: DHJPAR0012579, DHJPAR0012580, DHJPAR0012583, DHJPAR0012584, DHJPAR0012608, DHJPAR0013330.

Diagnosis. The combination of T1 length at least 3.0 × its width at posterior margin, body mostly dark reddish-brown to brown, metatibia dark brown on posterior 0.8, and metatibial spurs yellow-white separates this species from all other ACG *Snellenius*, except for *S. warrenwagneri*. It is distinguishable from the latter species by having scape yellow-orange, tegula and humeral complex dark brown, and relatively shorter flagellomeres (flagellomere 2 2.4–2.5 × as long as wide, flagellomere 14 2.0–2.3 × as long as wide).

Description. Female. Scape color: Yellow-orange. Mesosoma color: Dark reddish-brown. Metasoma color: Dark reddish-brown. Coxae color (pro-, meso-, metacoxa): Yellow, yellow-brown, dark brown. Femora color (pro-, meso-, metafemur): Yellow, yellow, dark reddish-brown. Tibiae color (pro-, meso-, metatibia): Yellow, yellow, anterior 0.2 yellow-white and posterior 0.8 dark brown. Metatibia spurs color: Yellow-white. First segment of metatarsus color: Dark brown to black. Tegula and humeral complex color: Half pale, half dark. Wings: Hyaline. Pterostigma color: Brown with pale spot at base. Fore wing veins IRS

and (RS+M)a: Brown (same color as surrounding veins). Body length (head to apex of metasoma): 2.9–3.2 mm ($\bar{X} = 3.0 \text{ mm}$). Fore wing length: 2.5–2.8 ($\bar{X} = 2.6 \text{ mm}$). Ocular-ocellar line/posterior ocellus diameter: 1.8–2.0 x. Interocellar distance/posterior ocellus diameter: 1.7–1.9 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: 0.16/0.15/0.08–0.09 mm. Antennal flagellomere 2 length/width: 2.3–2.5 × (0.23–0.25/0.10 mm). Antennal flagellomere 14 length/width: 1.9–2.0 × (0.17–0.18/0.09 mm). Length of flagellomere 2/length of flagellomere 14: 1.3–1.4 x. Antenna in males: Strongly flattened. Epicnemial carina: Present. Anteromesoscutum: With strong, coarse sculpture, central area appearing elevated compared to lateral areas of anteromesoscutum, notauli wide and deeply excavated, with numerous crenulae. Scutellar disc sculpture: With deeper sculpture near margins, central part appearing slightly elevated and less sculptured. Number of carinae in scutoscutellar sulcus: One centrally, with other 2–4 smaller and partially defined carinae. Metafemur length/width: $32.3 \times (0.75\text{--}0.80/0.23\text{--}0.25 \text{ mm})$. Metatibia length: 0.96–0.99 mm. First segment of metatarsus length: 0.35–0.36 mm. Mediotergite 1 length/width at posterior margin: 3.0–3.1 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: (0.43–0.45/0.22–0.24/0.22/0.14–0.15 mm). Mediotergite 1 sculpture: Fully sculptured.

Male. As female but with T2–T3 mostly yellow.

Distribution. Costa Rica, ACG.

Host. Unknown.

Molecular data. Three haplotypes, seven sequences (seven barcode-compliant) in BOLD.

Etymology. This species is named in honour of Gerardo Herrera in recognition of his contribution to understanding the plant biology of ACG.

***Snellenius irenebakerae* Fernández-Triana & Whitfield, sp. n.**

<http://zoobank.org/0ED1F02A-99BE-4EDD-A7D3-5490060E82A9>

Figures 96–102

Holotype. ♀ in USNM. COSTA RICA: ACG, Guanacaste Province, Sector Santa Rosa, Bosque San Emilio, 300m, 10.84389, -85.61384. ACG database code: DHJPAR0013323.

Paratypes. 5♀, 3♂ (BMNH, CNC, INBio, INHS, USNM). COSTA RICA, ACG, database codes: DHJPAR0013315, DHJPAR0013316, DHJPAR0013319, DHJPAR0013320, DHJPAR0013325, DHJPAR0024714; 1♂, Costa Rica, ACG, Guanacaste, Santa Rosa National Park, 300m, regenerating woodland less than 10 years old, 5-26.vii.1986, I. Gauld; 1♂, Costa Rica, ACG, Guanacaste, Cerro El Hacha, NW of Volcan Orosi, 300m, 1988.

Diagnosis. This is one of the most easily identifiable species of *Snellenius* in the region, based on the unique color pattern of mesosoma and hind legs.

Description. Female. Scape color: Orange-brown. Mesosoma color: Partially orange (mostly on anterome-

soscutum and parts of propleuron, pronotum, mesopleuron, scutellar complex, metascutellum). Metasoma color: Dark brown, except for light yellow T2. Coxae color (pro-, meso-, metacoxa): Yellow, yellow, yellow. Femora color (pro-, meso-, metafemur): Yellow, yellow, mostly reddish-brown (except for yellow ventrally). Tibiae color (pro-, meso-, metatibia): Yellow, yellow, dark brown (except for anterior 0.1 which is yellow-orange). Metatibia spurs color: Yellow-white. First segment of metatarsus color: Dark brown. Tegula and humeral complex color: Yellow, yellow. Wings: Hyaline. Pterostigma color: Brown, with very small pale spot at base. Fore wing veins 1RS and (RS+M)a: Brown (same color as surrounding veins). Body length (head to apex of metasoma): 3.2–3.4 mm. Fore wing length: 3.1–3.2 mm. Ocular-ocellar line/posterior ocellus diameter: 1.9 x. Interocellar distance/posterior ocellus diameter: 1.8–1.9 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: 0.13–0.15/0.07–0.08/0.13–0.14 mm. Antennal flagellomere 2 length/width: $3.0 \times (0.27/0.09–0.10 \text{ mm})$. Antennal flagellomere 14 length/width: $2.2 \times (0.20–0.21/0.09–0.10 \text{ mm})$. Length of flagellomere 2/length of flagellomere 14: 1.3–1.4 x. Antenna in males: Of normal appearance, not flattened. Epicnemial carina: Present but weakly defined. Anteromesoscutum: With relatively shallower and sparser sculpture, central area not appearing elevated compared to lateral areas of anteromesoscutum, notauli strongly excavated. Scutellar disc sculpture: With margins and central part of disc equally sculptured. Number of carinae in scutoscutellar sulcus: Three or four. Metafemur length/width: $3.3 \times (0.86–0.87/0.25–0.26 \text{ mm})$. Metatibia length: 1.08–1.12 mm ($\bar{X} = 1.10 \text{ mm}$). First segment of metatarsus length: 0.38–0.41 mm ($\bar{X} = 0.40 \text{ mm}$). Mediotergite 1 length/width at posterior margin: 3.0–3.1 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.45–0.48/0.26–0.24/0.22–0.20/0.15–0.16 mm. Mediotergite 1 sculpture: Fully sculptured.

Male. As in female.

Distribution. Costa Rica, ACG.

Host. Noctuidae: An undetermined species with interim name ‘noctJanzen01 05-SRNP-23743’. Solitary parasitoid.

Molecular data. Two haplotypes, nine sequences (nine barcode-compliant) in BOLD.

Etymology. This species is named in honour of Irene Baker in recognition of her contribution to understanding the plant biology of ACG.

***Snellenius isidrochaconi* Fernández-Triana & Whitfield, sp. n.**

<http://zoobank.org/FB2EFE89-5F12-456B-AA76-6935A3F58D98>

Figures 103–109, 227

Holotype. ♂ in CNC. COSTA RICA: ACG, Guanacaste Province, Sector Pitilla, Amonias, 390m, 11.04249, -85.40339. ACG database code: DHJP0020741.

Paratypes. 2♂ (CNC, USNM). COSTA RICA, ACG, database codes: DHJP0049417, 08-SRNP-31574.

Other specimen examined. 1♀, DNA voucher code: CNCHYM 07055, Panama, Gamboa, Canal Zone, vii.1967, W&M Wirth.

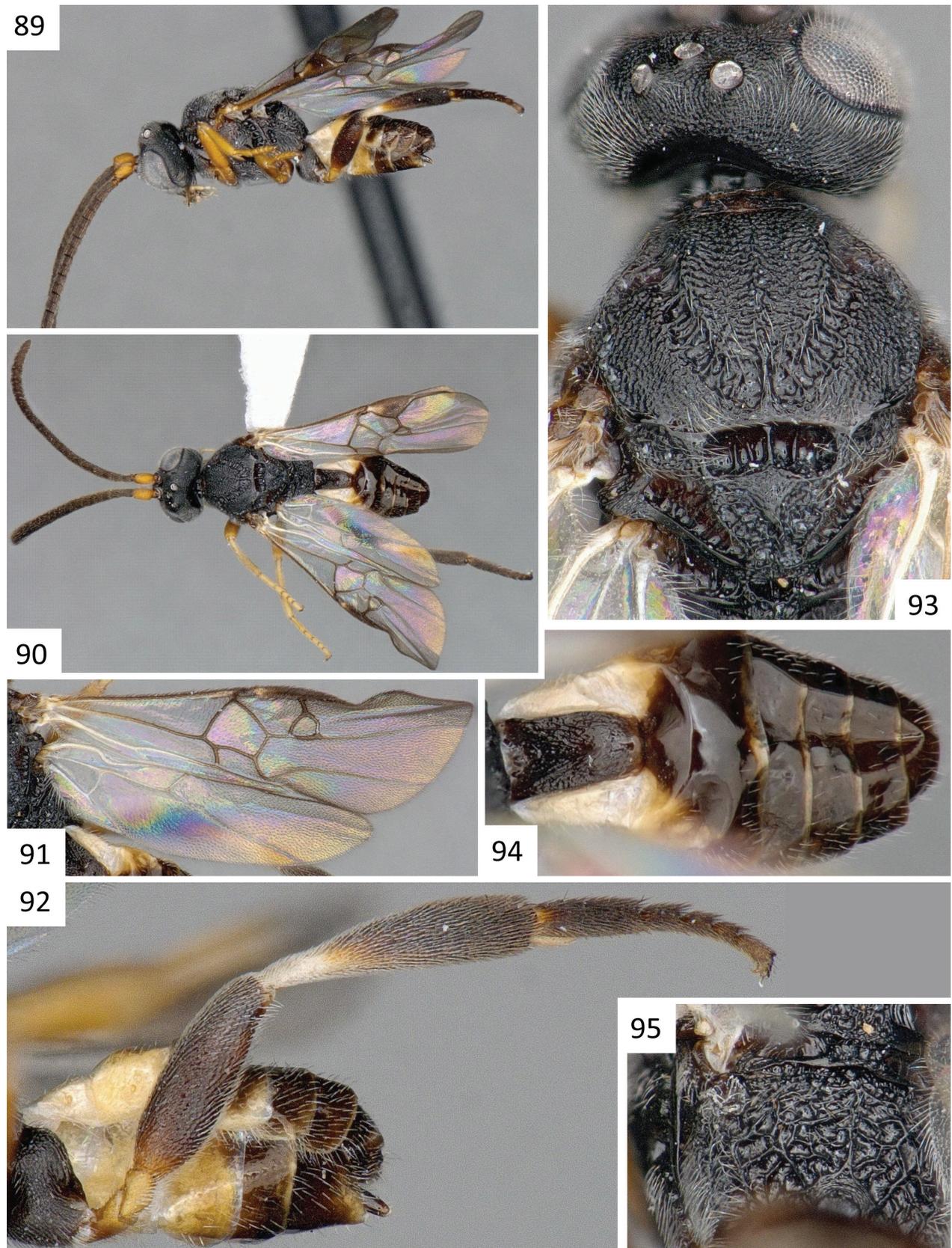
Diagnosis. The combination of body color (yellow orange), metatibia (mostly or entirely dark red brown) and wings (with dark brown infumation, veins and pterostigma mostly brown), as well as hosts (Erebidae, *Gonodonta* spp.) separates this species from all other ACG *Snellenius* except for *S. phildevriesi*. No female specimens are known from *S. isidrochaconi* but males are distinguishable from *S. phildevriesi* by slight differences in size, interocellar area color, carination pattern in the propodeum, and the presence of a rather acute projection on the posterior margin of the metascutellum. Additionally, the two species have over 4 % of base pair differences in the barcoding region, and the caterpillars that they parasitize, although belonging to the same genus (*Gonodonta*), feed on host plants in different families.

Description. Male. Scape color: Partially brown, partially yellow. Mesosoma color: Yellow orange. Metasoma color: Yellow orange. Coxae color (pro-, meso-, metacoxa): Yellow, yellow, yellow. Femora color (pro-, meso-, metafemur): Yellow, yellow, yellow. Tibiae color (pro-, meso-, metatibia): Yellow, yellow, anterior 0.8 reddish orange and posterior 0.2 dark brown to black. Metatibia spurs color: Brown. First segment of metatarsus color: Dark brown to black. Tegula and humeral complex color: Yellow, yellow. Wings: Infumated. Pterostigma color: Dark brown. Fore wing veins 1RS and (RS+M)a: Brown (same color as surrounding veins). Body length (head to apex of metasoma): 3.5–3.6 mm (3.6 mm). Fore wing length: 3.5 mm. Antenna in males: Flattened on central and apical segments. Epicnemial carina: Present. Anteromesoscutum: With strong, coarse sculpture, central area appearing elevated compared to lateral areas of anteromesoscutum, notauli wide and deeply excavated, with numerous crenulae. Scutellar disc sculpture: With deeper sculpture near margins, central part appearing slightly raised and less sculptured. Number of carinae in scutoscutellar sulcus: One. Metafemur length: 0.94–0.97 mm ($\bar{X} = 0.96 \text{ mm}$). Metatibia length: 1.24–1.30 mm ($\bar{X} = 1.27 \text{ mm}$). First segment of metatarsus length: 0.48–0.50 mm (0.49 mm). Mediotergite 1 length/width at posterior margin: 3.4–3.7 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.55–0.58/0.21–0.22/0.17–0.18/0.15–0.17 mm). Mediotergite 1 sculpture: Partially sculptured.

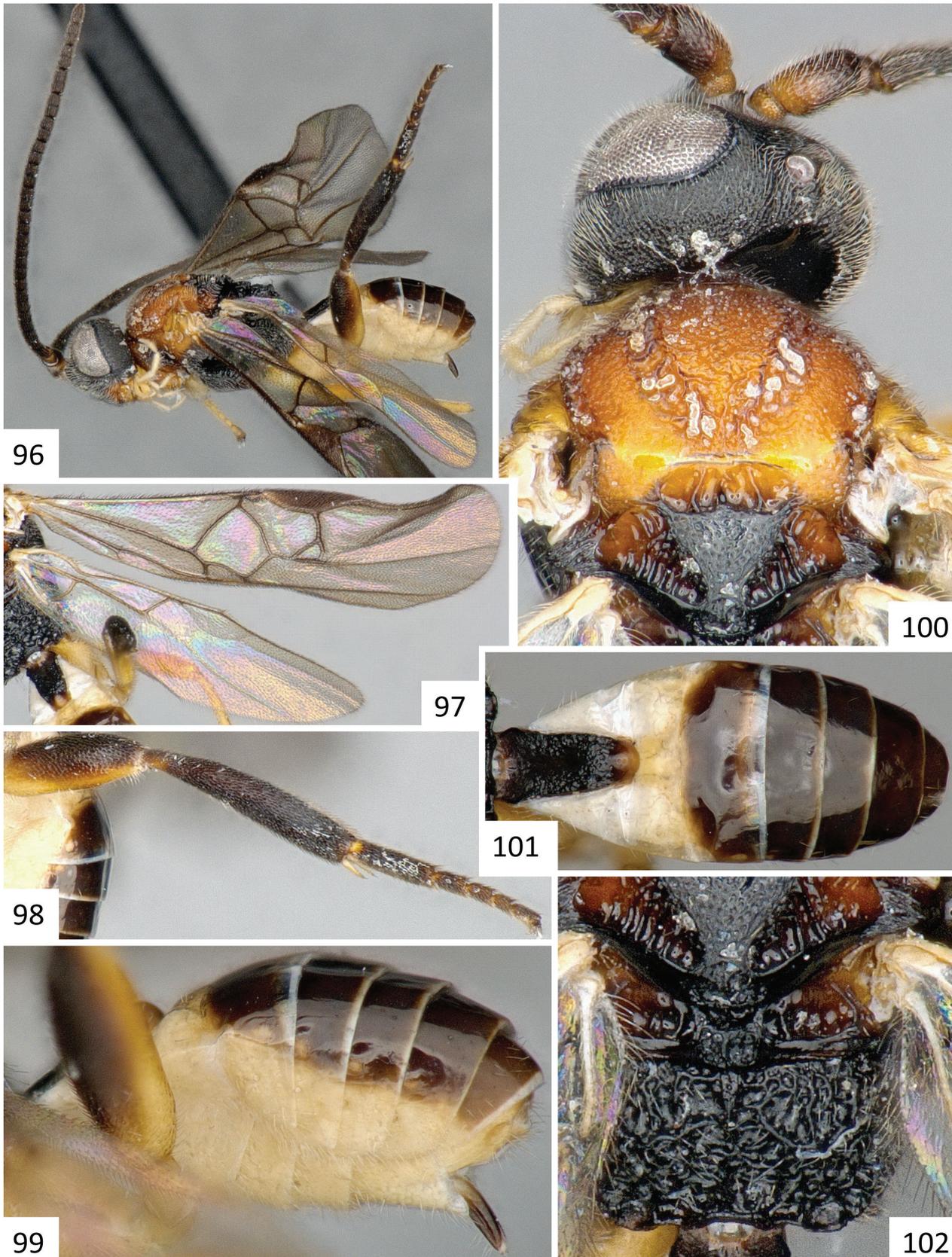
Female. One female specimen, from Panama, is associated with the male specimens with some question due to the fact it is from a different country and there is no other known female associated with this species. Thus, it is excluded from the type series and was not used to characterize the species.

Distribution. Costa Rica (ACG) and Panama.

Host. Erebidae: three species of *Gonodonta* feeding on *Cissampelos* spp. (Menispermaceae). Solitary parasitoid (Fig. 227).



Figures 89–95. *Snellenius gerardoherrerai* Fernández-Triana & Whitfield. **89** Habitus, lateral view **90** Habitus, dorsal view **91** Wings **92** Hind leg and metasoma, lateral view **93** Head and mesosoma (partially), dorsal view **94** Metasoma, dorsal view **95** Propodeum (partially), dorsal view.



Figures 96–102. *Snellenius irenebakerae* Fernández-Triana & Whitfield. **96** Habitus, lateral view **97** Wings **98** Hind leg and metasoma (partially), lateral view **99** Metasoma, lateral view **100** Head and mesosoma (partially), dorsal view **101** Metasoma, dorsal view **102** Scutellar disc (partially) and propodeum, dorsal view.



103



107



104



108



105



106



109

Figures 103–109. *Snellenius isidrochaconi* Fernández-Triana & Whitfield. **103** Habitus, lateral view **104** Fore wing **105** Metasoma, lateral view **106** Middle and hind legs **107** Head and mesosoma (partially), dorsal view **108** Metasoma, dorsal view **109** Propodeum, dorsal view.

Molecular data. One haplotype, seven sequences (five barcode-compliant) in BOLD.

Etymology. This species is named in honour of Isidro Chacón in recognition of his contribution to understanding the plant biology of ACG.

Comments. Only males were available to describe this species (but see comment on a female above), and they were almost indistinguishable from males of the morphologically similar *S. phildevriesi*. Thus, the description provided above only includes those characters that differ from males of *S. phildevriesi*.

***Snellenius johnkressi* Fernández-Triana & Whitfield, sp. n.**

<http://zoobank.org/9897EF83-1F78-464C-9985-6343956A9669>

Figures 110–116

Holotype. ♀ in USNM. COSTA RICA: ACG, Guanacaste Province, Sector Santa Rosa, Argelia, 5m, 10.78004, -85.66405. ACG database code: DHJPAR0053098.

Paratypes. 10♀, 11♂ (BMNH, CNC, INBio, INHS, USNM). COSTA RICA, ACG, database codes: DHJPAR0053008, DHJPAR0053009, DHJPAR0053012, DHJPAR0053015, DHJPAR0053018, DHJPAR0053042, DHJPAR0053048, DHJPAR0053068, DHJPAR0053072, DHJPAR0053074, DHJPAR0053077, DHJPAR0053078, DHJPAR0053081, DHJPAR0053085, DHJPAR0053087, DHJPAR0053091, DHJPAR0053097, DHJPAR0053103, DHJPAR0053104, DHJPAR0053113.

Diagnosis. The combination of hyaline wings, mesosoma and metasoma mostly black or dark reddish brown, metafemur and metatibia (posterior 0.6) dark brown separates this species from all other ACG *Snellenius* except for *S. felipechavarriai*. It is distinguishable from the latter species by narrower T2 and scutoscutellar sulcus with 3–5 carinae (only one clearly defined carina in *S. felipechavarriai*).

Description. Female. Scape color: Dark brown. Mesosoma color: Black. Metasoma color: Dark brown to black. Coxae color (pro-, meso-, metacoxa): Orange, orange brown, black. Femora color (pro-, meso-, metafemur): Orange, dark brown, black. Tibiae color (pro-, meso-, metatibia): Orange, orange brown, yellow white on anterior 0.2 and dark brown to black on posterior 0.8. Metatibia spurs color: Yellow white. First segment of metatarsus color: Dark brown to black. Tegula and humeral complex color: Dark orange to dark brown, brown to black. Wings: Hyaline. Pterostigma color: Brown. Fore wing veins 1RS and (RS+M)a: Brown (same color as surrounding veins). Body length (head to apex of metasoma): 3.0 mm (2.9–3.0 mm). Fore wing length: 2.8 mm (2.8–2.9 mm). Ocular-ocellar line/posterior ocellus diameter: 1.8–2.0 x. Interocellar distance/posterior ocellus diameter: 2.0–2.1 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: 0.14–0.16/0.07–0.09/0.15–0.18 mm. Antennal flagellomere 2 length/width: 2.7–3.1 × (0.26–

0.28/0.08–0.10 mm). Antennal flagellomere 14 length/width: 1.8–2.0 × (0.14–0.18/0.07–0.10 mm). Length of flagellomere 2/length of flagellomere 14: 1.6–1.9 x. Antenna in males: Of normal appearance, not flattened. Epicnemial carina: Present. Anteromesoscutum: With strong, coarse sculpture, central area appearing elevated compared to lateral areas of anteromesoscutum, notauli wide and deeply excavated, with numerous crenulae. Scutellar disc sculpture: With deeper sculpture near margins, central part appearing slightly elevated and less sculptured. Number of carinae in scutoscutellar sulcus: Three complete, two incomplete. Metafemur length/width: 3.4–3.6 × (0.77–0.86/0.23–0.25 mm). Metatibia length: 1.11 mm (1.07–1.15) mm. First segment of metatarsus length: 0.44 mm (0.42–0.45 mm). Mediotergite 1 length/width at posterior margin: 2.3–2.4 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.50–0.53/0.30/0.27–0.29/0.21–0.23 mm. Mediotergite 1 sculpture: Fully sculptured.

Male. As in female but scape and T1 orange yellow, and T2 partially yellow, orange yellow, or light brown.

Distribution. Costa Rica, ACG.

Hosts. Erebidae: *Bulia mexicana*. Solitary parasitoid.

Molecular data. Six haplotypes, 20 sequences (20 barcode-compliant) in BOLD.

Etymology. This species is named in honour of John Kress in recognition of his contribution to understanding the plant biology of ACG.

***Snellenius jorgecampabadali* Fernández-Triana & Whitfield, sp. n.**

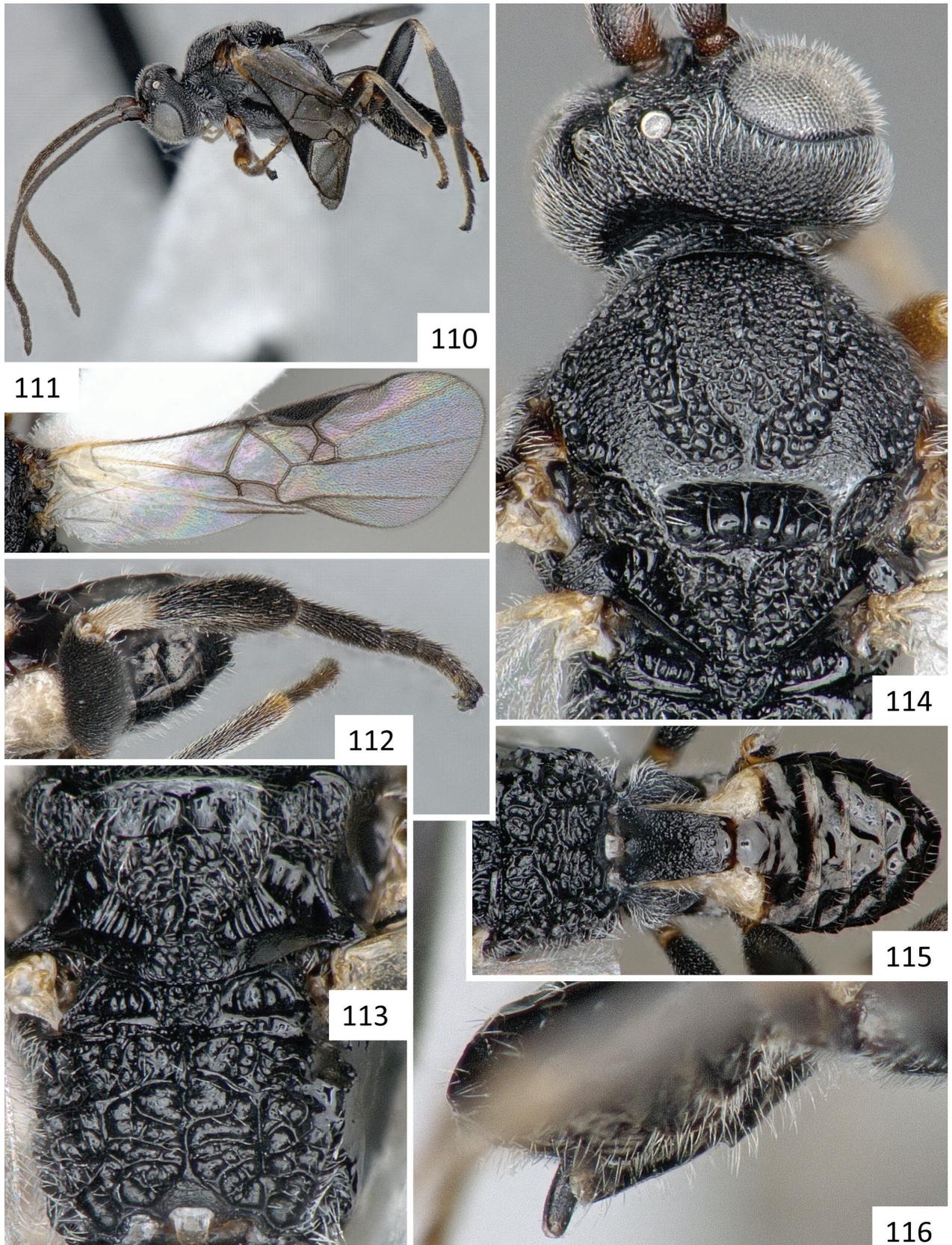
<http://zoobank.org/FD2FD00D-76AB-46C9-89F3-4D293CEA0EED>

Figures 117–122

Holotype. ♀ in INBio. COSTA RICA: Guanacaste Province, OTS Palo Verde Biological Station, 10m, 25.iii–21. iv.1992, A. Gutierrez coll. Second label with code: INBio CRI000 874631.

Diagnosis. The combination of pterostigma relatively wider (2.0 × as long as wide), fore wing with basal cell virtually without setae, wings with most veins transparent or light yellow (except for veins r, 2RS, 3RSa, and 2M), and T1 length 2.6 × its width at posterior margin separate this species from all other ACG *Snellenius*.

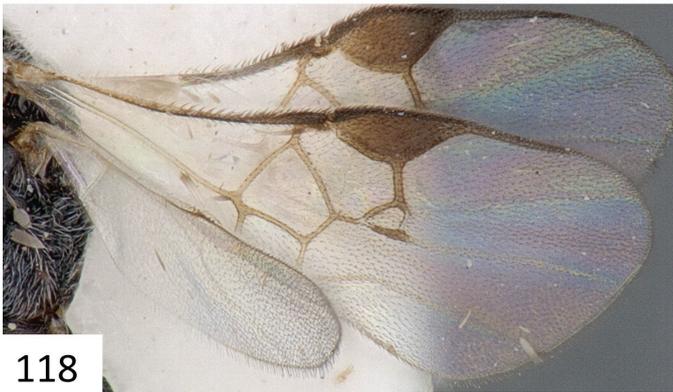
Description. Female. Scape color: Yellow brown. Mesosoma color: Black. Metasoma color: T2 yellow brown, T1 and T3+ dark reddish brown. Coxae color (pro-, meso-, metacoxa): Yellow brown, yellow brown, dark brown to black. Femora color (pro-, meso-, metafemur): Yellow, mostly brown, brown. Tibiae color (pro-, meso-, metatibia): Yellow, yellow, anterior 0.4 yellow and posterior 0.6 dark brown. Metatibia spurs color: Yellow. First segment of metatarsus color: Brown. Tegula and humeral complex color: Half pale, half dark. Wings: Hyaline. Pterostigma color: Brown. Fore wing veins 1RS and (RS+M)a: Entirely or partially transparent or light yellow (clearly much lighter than most of surrounding



Figures 110–116. *Snellenius johnkressi* Fernández-Triana & Whitfield. **110** Habitus, lateral view **111** Wings **112** Hind leg and metasoma (partially), lateral view **113** Scutellar disc and propodeum, dorsal view **114** Head and mesosoma (partially), dorsal view **115** Propodeum and metasoma, dorsal view **116** Detail of hypopygium and ovipositor sheaths.



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Figures 117–122. *Snellenius jorgecampabadali* Fernández-Triana & Whitfield. **117** Habitus, lateral view **118** Wings **119** Head and mesosoma, lateral view **120** Propodeum and metasoma, dorsal view **121** Head and mesosoma (partially), dorsal view **122** Hind leg and metasoma, lateral view.

veins). Body length (head to apex of metasoma): 3.0 mm. Fore wing length: 2.5 mm. Ocular-ocellar line/posterior ocellus diameter: 1.6 x. Interocellar distance/posterior ocellus diameter: 2.0 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: 0.14/0.09/0.18 mm. Antennal flagellomere 2 length/width: $2.8 \times (0.22-0.08 \text{ mm})$. Antennal flagellomere 14 length/width: $1.7 \times (0.10/0.06 \text{ mm})$. Length of flagellomere 2/length of flagellomere 14: 2.2 x. Epicnemial carina: Present but weakly defined. Anteromesoscutum: With strong, coarse sculpture, central area appearing elevated compared to lateral areas of anteromesoscutum, notauli wide and deeply excavated, with numerous crenulae. Scutellar disc sculpture: With strong, coarse sculpture, central area appearing elevated compared to lateral areas of anteromesoscutum, notauli wide and deeply excavated, with numerous crenulae. Number of carinae in scutoscutellar sulcus: One. Metafemur length/width: $3.3 \times (0.72/0.22 \text{ mm})$. Metatibia length: 0.98 mm. First segment of metatarsus length: 0.32 mm. Mediotergite 1 length/width at posterior margin: 2.6 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.58/0.23/0.22/0.22 mm. Mediotergite 1 sculpture: Fully sculptured.

Male. Unknown.

Distribution. Costa Rica, Guanacaste Province, OTS Biological Station.

Host. Unknown.

Molecular data. None.

Etymology. This species is named in honour of Sr. Jorge R. Campabadal (RIP), the first Costa Rican administrator of the Organization for Tropical Studies, in recognition of his key role in founding the OTS Palo Verde Biological Field Station.

***Snellenius jorgegomezlauritoid* Fernández-Triana & Whitfield, sp. n.**

<http://zoobank.org/E303F53F-6DC1-4F33-BA87-75F8EBF47C3A>
Figures 123–128

Holotype. ♀ in CNC. COSTA RICA: ACG, Guanacaste Province, Sector Santa Rosa, Area Administrativa, 295 meters, 10.83764, -85.61871. ACG database code: 90-SRNP-2193.

Diagnosis. The combination of metasoma entirely light orange yellow, the metasoma black, and wings infumated separate this species from all other ACG *Snellenius*.

Description. Female. Scape color: Light brown yellow. Mesosoma color: Black. Metasoma color: Light orange yellow. Coxae color (pro-, meso-, metacoxa): Yellow, yellow, yellow. Femora color (pro-, meso-, metafemur): Yellow, yellow, yellow. Tibiae color (pro-, meso-, metatibia): Yellow, yellow, mostly light yellow brown (with only posterior 0.1 brown). Metatibia spurs color: Light yellow brown. First segment of metatarsus color: Brown. Tegula and humeral complex color: Yellow, light brown yellow.

Wings: Infumated. Pterostigma color: Brown. Fore wing veins IRS and (RS+M)a: Brown (same color as surrounding veins). Body length (head to apex of metasoma): 3.2 mm. Fore wing length: 3.2 mm. Ocular-ocellar line/posterior ocellus diameter: 1.9 x. Interocellar distance/posterior ocellus diameter: 1.6 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: 0.17/0.09/0.14 mm. Antennal flagellomere 2 length/width: $2.8 \times (0.28/0.10 \text{ mm})$. Antennal flagellomere 14 length/width: $2.0 \times (0.20/0.10 \text{ mm})$. Length of flagellomere 2/length of flagellomere 14: 1.4 x. Epicnemial carina: Present. Anteromesoscutum: With strong, coarse sculpture, central area appearing elevated compared to lateral areas of anteromesoscutum, notauli wide and deeply excavated, with numerous crenulae. Scutellar disc sculpture: With deeper sculpture near margins, central part appearing slightly elevated and less sculptured. Number of carinae in scutoscutellar sulcus: One complete, four partial. Metafemur length/width: $3.8 \times (0.88/0.23 \text{ mm})$. Metatibia length: 1.15 mm. First segment of metatarsus length: 0.48 mm. Mediotergite 1 length/width at posterior margin: 2.2 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.52/0.24/0.26/0.24 mm. Mediotergite 1 sculpture: Mostly sculptured.

Male. Unknown.

Distribution. Costa Rica, ACG.

Host. Noctuidae: *Stauropides persimilis*. Solitary parasitoid.

Molecular data. None.

Etymology. This species is named in honour of Jorge Gómez Laurito in recognition of his contribution to understanding the plant biology of ACG.

***Snellenius josesarukhani* Fernández-Triana & Whitfield, sp. n.**

<http://zoobank.org/88177F35-0806-4187-B171-538B52970444>
Figures 129–135

Holotype. ♂ in CNC. COSTA RICA: ACG, Alajuela Province, Sector San Cristobal, Estacion San Cristobal, 640m, 10.87097, -85.39144. ACG database code: 98-SRNP-6841.

Paratype. 1♂ (CNC). COSTA RICA, Guanacaste Province, 3 km W of Arenal, 500m, 23.ix.1972. DNA Voucher code: CNCHYM 07141.

Diagnosis. The combination of metasoma with T2–T3 entirely yellow and dark brown beyond T4, relatively wide T2 ($1.9 \times$ as long as wide at posterior margin), wings slightly infumated, metatibia spurs yellow white, metafemur entirely yellow orange, and metatibia mostly light in color (yellow orange, with anterior 0.2 yellow white, and only posterior 0.2 brown), separate this species from all other ACG *Snellenius*, except for *S. mariamartachavarriae*. It is distinguishable from the latter species by having one carina in the scutoscutellar sulcus, scape mostly brown, T4 dark brown to black, and host species (*Selenisa* sp.) found in rainforest.

Description. Male. Scape color: Mostly dark brown. Mesosoma color: Black. Metasoma color: Dark reddish brown, except for yellow T2–T3. Coxae color (pro-, meso-, metacoxa): Yellow, yellow, yellow brown. Femora color (pro-, meso-, metafemur): Yellow orange, yellow orange, yellow orange. Tibiae color (pro-, meso-, metatibia): Yellow orange, yellow orange, mostly yellow orange (but with anterior 0.2 yellow white, and posterior 0.2 brown). Metatibia spurs color: Yellow white. First segment of metatarsus color: Brown. Tegula and humeral complex color: Yellow, mostly brown. Wings: Slightly infumated. Pterostigma color: Brown, with very small pale spot at base. Fore wing veins 1RS and (RS+M)a: Brown (same color as surrounding veins). Body length (head to apex of metasoma): 3.0–3.2 mm. Fore wing length: 2.8–3.0 mm. Ocular-ocellar line/posterior ocellus diameter: 2.1 x. Interocellar distance/posterior ocellus diameter: 2.1 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: 0.17/0.08/0.17 mm. Antenna in males: Flattened. Epicnemial carina: Present. Anteromesoscutum: With strong, coarse sculpture, central area appearing elevated compared to lateral areas of anteromesoscutum, notauli wide and deeply excavated, with numerous crenulae. Scutellar disc sculpture: With deeper sculpture near margins, central part appearing slightly elevated and less sculptured. Number of carinae in scutoscutellar sulcus: One. Metafemur length/width: $3.2 \times (0.80/0.25 \text{ mm})$. Metatibia length: 1.02 mm. First segment of metatarsus length: 0.41 mm. Mediotergite 1 length/width at posterior margin: 1.9 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.48/0.25/0.24/0.25 mm. Mediotergite 1 sculpture: Fully sculptured.

Female. Unknown.

Distribution. Costa Rica, Guanacaste Province.

Host. Erebidae: *Helia sueroides*. Solitary parasitoid.

Molecular data. One haplotype, one sequence (not barcode-compliant) in BOLD.

Comments. The paratype has a partial barcode (275 bp) that does not match any other *Snellenius* in BOLD.

Etymology. This species is named in honour of José Sarukhan in recognition of his contribution to understanding the plant biology of ACG.

***Snellenius kerrydresslerae* Fernández-Triana & Whitfield, sp. n.**

<http://zoobank.org/47049BFE-C223-4A22-95BF-6350955D2B0F>
Figures 136–142, 223

Holotype. ♀ in USNM. COSTA RICA: ACG, Guanacaste Province, Sector Santa Elena, Vado Quebrada Calera, 305m, 10.86677, -85.6465. ACG database code: DHJPAR0013881.

Paratypes. 7♀, 3♂ (BMNH, CNC, USNM). COSTA RICA, ACG, database codes: DHJPAR0004092, DHJPAR0004095, DHJPAR0004309, DHJPAR0004310, DHJPAR0004311, DHJPAR0004312, DHJPAR0004313, DHJPAR0013821, DHJPAR0013899, 03-SRNP-14142.

Diagnosis. The fore wing mostly infumated, black metafemur, and T1 $2.8 \times$ as long as width at posterior margin differentiates this species from congeners.

Description. Female. Scape color: Dark brown. Mesosoma color: Black. Metasoma color: Black. Coxae color (pro-, meso-, metacoxa): Yellow, brown, dark brown to black. Femora color (pro-, meso-, metafemur): orange yellow, mostly brown, black. Tibiae color (pro-, meso-, metatibia): orange yellow, orange yellow, anterior 0.2 orange yellow and posterior 0.8 dark brown to black. Metatibia spurs color: Dark brown to black. First segment of metatarsus color: Dark brown to black. Tegula and humeral complex color: Dark, dark. Wings: Infumated. Pterostigma color: mostly dark, with small pale spot at base. Fore wing veins 1RS and (RS+M)a: Brown (same color as surrounding veins). Body length (head to apex of metasoma): 3.4–3.6 mm ($\bar{X} = 3.5 \text{ mm}$). Fore wing length: 3.1–3.2 mm ($\bar{X} = 3.1 \text{ mm}$). Ocular-ocellar line/posterior ocellus diameter: 2.0 x. Interocellar distance/posterior ocellus diameter: 2.0 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: 0.18/0.09/0.18 mm. Antennal flagellomere 2 length/width: $2.5\text{--}2.7 \times (0.32/0.12\text{--}0.13 \text{ mm})$. Antennal flagellomere 14 length/width: $1.5\text{--}1.6 \times (0.19/0.12\text{--}0.13 \text{ mm})$. Length of flagellomere 2/length of flagellomere 14: 1.7 x. Antenna in males: Strongly flattened. Epicnemial carina: Present. Anteromesoscutum: With strong, coarse sculpture, central area appearing elevated compared to lateral areas of anteromesoscutum, notauli wide and deeply excavated, with numerous crenulae. Scutellar disc sculpture: With deeper sculpture near margins, central part appearing slightly elevated and less sculptured. Number of carinae in scutoscutellar sulcus: Three. Metafemur length/width: $3.7 \times (0.95/0.26 \text{ mm})$. Metatibia length: 1.25–1.30 mm. First segment of metatarsus length: 0.48–0.50 mm. Mediotergite 1 length/width at posterior margin: 2.7 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.59–0.60/0.28–0.29/0.27/0.22 mm. Mediotergite 1 sculpture: Fully sculptured.

Male. As female but with T2 (entirely) and T3 (partially) yellow to light yellow brown.

Distribution. Costa Rica, ACG.

Host. Erebidae, *Orodesma pulverosa*. Solitary parasitoid (Fig. 223).

Molecular data. One haplotype, ten sequences (10 barcode-compliant) in BOLD.

Etymology. This species is named in honour of Kerry Dressler in recognition of her contribution to understanding the plant biology of ACG.

***Snellenius lucindamcdadeae* Fernández-Triana & Whitfield, sp. n.**

<http://zoobank.org/FFB42CDD-1C15-47D2-8D34-C30A73B89E67>
Figures 143–149

Holotype. ♀ in USNM. COSTA RICA: ACG, Guanacaste Province, Sector Santa Rosa, Bosque San



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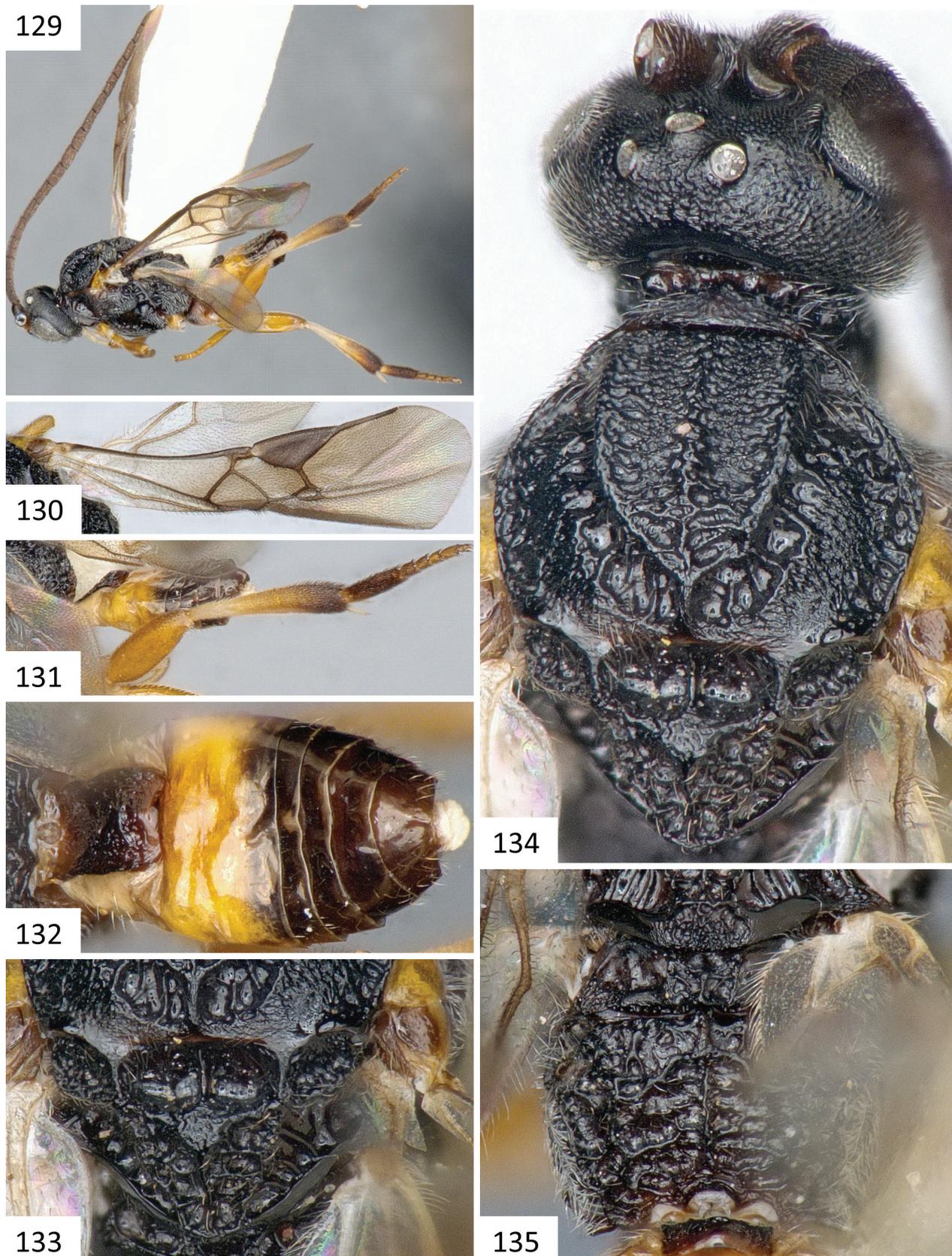


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Figures 123–128. *Snellenius jorgegomezlauritoi* Fernández-Triana & Whitfield. 123 Habitus, lateral view 124 Wings 125 Middle and hind legs 126 Metasoma, lateral view 127 Hind leg and metasoma (partially), lateral view 128 Propodeum and metasoma, dorsal view.



Figures 129–135. *Snellenius josesarukhani* Fernández-Triana & Whitfield. **129** Habitus, lateral view **130** Wings **131** Hind leg and metasoma (partially), lateral view **132** Metasoma, dorsal view **133** Scutellar disc, dorsal view **134** Head and mesosoma (partially), dorsal view **135** Propodeum, dorsal view.



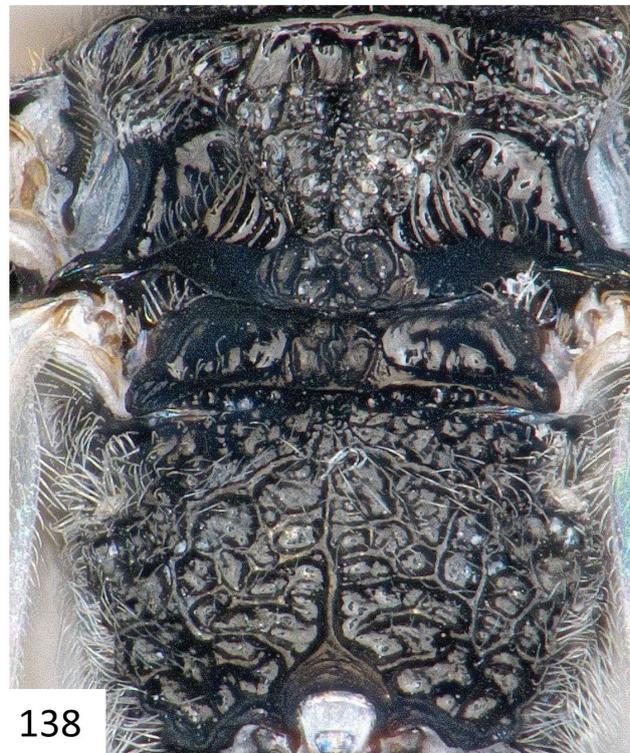
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142

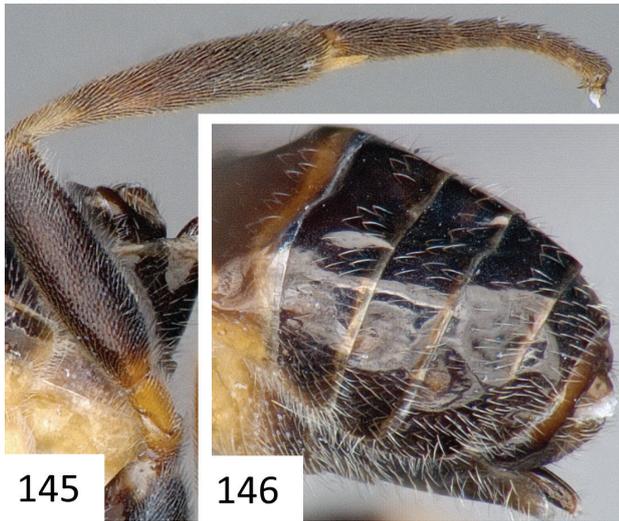
Figures 136–142. *Snellenius kerrydresslerae* Fernández-Triana & Whitfield. **136** Habitus, lateral view **137** Wings **138** Scutellar disc and propodeum, dorsal view **139** Metasoma, dorsal view **140** Habitus, dorsal view **141** Head and mesosoma (partially), dorsal view **142** Hind leg and metasoma (partially), lateral view.



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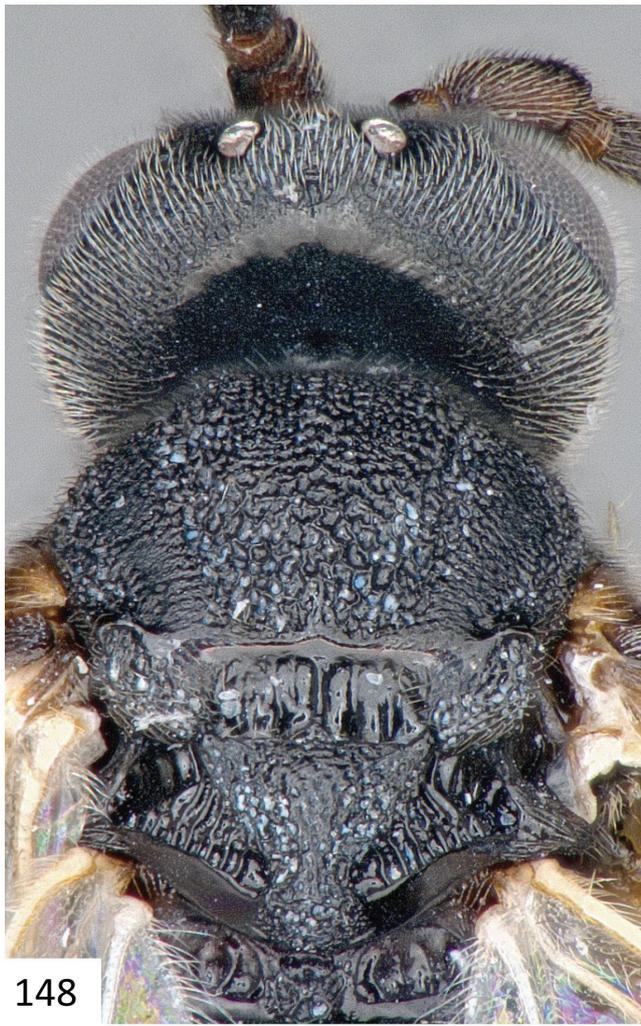
145



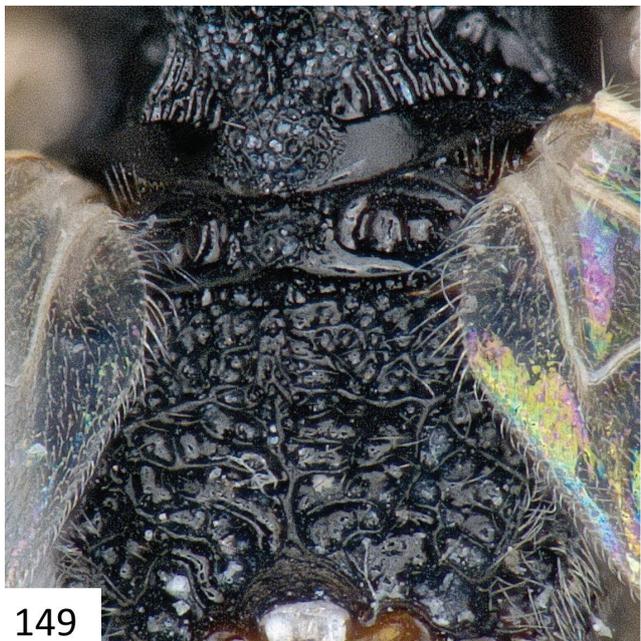
146



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Figures 143–149. *Snellenius lucindamcdadeae* Fernández-Triana & Whitfield. 143 Habitus, lateral view 144 Fore wing 145 Hind leg 146 Metasoma (partially), lateral view 147 Metasoma, dorsal view 148 Head and mesosoma (partially), dorsal view 149 Scutellar disc (partially) and propodeum, dorsal view.

Emilio, 300m, 10.84389, -85.61384. ACG database code: DHJPAR0013314.

Paratypes. 1♀, 4♂ (CNC, USNM). COSTA RICA, ACG, database codes: DHJPAR0013318, DHJPAR0013321, DHJPAR0013336, DHJPAR0013340, DHJPAR0013341.

Diagnosis. The combination of dark brown to black body, T1 length $2.8 \times$ its width at posterior margin, mostly brown metatibia, and fore wing with veins 2RS, r, and 3RSa brown, differentiates this species from congeners.

Description. Female. Scape color: Dark brown. Mesosoma color: Black. Metasoma color: Dark brown to reddish brown. Coxae color (pro-, meso-, metacoxa): Yellow, yellow, dark brown. Femora color (pro-, meso-, metafemur): Yellow, yellow, dark brown. Tibiae color (pro-, meso-, metatibia): Yellow, yellow, anterior 0.2 yellow and posterior 0.8 dark brown. Metatibia spurs color: Yellow orange. First segment of metatarsus color: Dark brown. Tegula and humeral complex color: Yellow, half yellow and half brown. Wings: Hyaline. Pterostigma color: Brown with pale spot at base. Fore wing veins 1RS and (RS+M)a: Brown (same color as surrounding veins). Body length (head to apex of metasoma): 3.1–3.2 mm. Fore wing length: 2.9–3.0 mm. Ocular-ocellar line/posterior ocellus diameter: 1.9 x. Interocellar distance/posterior ocellus diameter: 1.9 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: 0.17/0.09/0.17 mm. Antennal flagellomere 2 length/width: $3.3 \times (0.30/0.09 \text{ mm})$. Antennal flagellomere 14 length/width: $2.1 \times (0.17/0.08 \text{ mm})$. Length of flagellomere 2/length of flagellomere 14: 1.8 x. Antenna in males: Of normal appearance, not flattened. Epicnemial carina: Present. Anteromesoscutum: With relatively shallower and sparser sculpture, central area not appearing elevated compared to lateral areas of anteromesoscutum, notauli slightly to strongly excavated. Scutellar disc sculpture: With deeper sculpture near margins, central part appearing slightly raised and less sculptured. Number of carinae in scutoscuteellar sulcus: Four to five. Metafemur length/width: $3.8 \times (0.98/0.26 \text{ mm})$. Metatibia length: 1.30 mm. First segment of metatarsus length: 0.57–0.58 mm. Mediotergite 1 length/width at posterior margin: 2.8 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.62/0.29–0.30/0.30–0.31/0.22 mm. Mediotergite 1 sculpture: Fully sculptured.

Male. As in female.

Distribution. Costa Rica, ACG.

Host. Unknown.

Molecular data. Three haplotypes, six sequences (six barcode-compliant) in BOLD.

Etymology. This species is named in honour of Lucinda McDade in recognition of her contribution to understanding the plant biology of ACG.

***Snellenius luisdiegomezi* Fernández-Triana & Whitfield, sp. n.**

<http://zoobank.org/F7C3E5C0-011C-49D0-B477-2D0683A9EDDA>
Figures 150–155

Holotype. ♀ in CNC. COSTA RICA: San Vito, Las Cruces, 17.viii-12.ix.1988, B. Gill. Second Label: DNA Voucher code CNCHYM 07140.

Paratypes. 3♀, 5♂, Costa Rica: Puntarenas, Golfo Dulce, 15 km W of Piedras Blancas, 100m, xi.1990 and xii.1990, P. Hanson; 2♀, 1♂, Costa Rica, Limon, 16 km W of Guapiles, 400m, i-iii and iv-v.1989, P. Hanson; 1♀, Costa Rica: Limon, 4 km NE of Bribri, 50m, ix-xi.1989, P. Hanson; Panama, Gamboa, Canal Zone, Pipeline Road, vii.1967, Malaise trap, W.W.Wirth, DNA Voucher CNCHYM 07044.

Diagnosis. The unique combination of dark reddish brown body and relatively long and thin T1 (its length $4.0 \times$ its width at posterior margin), separate this species from all other ACG *Snellenius*.

Description. Female. Scape color: Dark brown. Mesosoma color: Dark reddish brown. Metasoma color: Dark reddish brown. Coxae color (pro-, meso-, metacoxa): Brown, white, brown. Femora color (pro-, meso-, metafemur): Mostly brown, mostly brown, dark reddish brown. Tibiae color (pro-, meso-, metatibia): Mostly brown, mostly brown, dark reddish brown. Metatibia spurs color: Orange brown. First segment of metatarsus color: Reddish brown. Tegula and humeral complex color: Brown, brown. Wings: Infumated. Pterostigma color: Brown with pale spot at base. Fore wing veins 1RS and (RS+M)a: Brown (same color as surrounding veins). Body length (head to apex of metasoma): 2.4–2.9 mm ($\bar{X} = 2.7 \text{ mm}$). Fore wing length: 2.4–3.0 mm ($\bar{X} = 2.7 \text{ mm}$). Ocular-ocellar line/posterior ocellus diameter: 1.9 x. Interocellar distance/posterior ocellus diameter: 1.6 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: 0.13/0.07/0.11 mm. Antennal flagellomere 2 length/width: $3.8\text{--}3.9 \times (0.23\text{--}0.27/0.06\text{--}0.07 \text{ mm})$. Antennal flagellomere 14 length/width: $2.3\text{--}2.6 \times (0.23\text{--}0.27/0.16\text{--}0.18 \text{ mm})$. Length of flagellomere 2/length of flagellomere 14: 1.4–1.5 x. Antenna in males: Of normal appearance, not flattened. Epicnemial carina: Present. Anteromesoscutum: With strong, coarse sculpture, central area appearing elevated compared to lateral areas of anteromesoscutum, notauli wide and deeply excavated, with numerous crenulae. Scutellar disc sculpture: With deeper sculpture near margins, central part appearing slightly raised and less sculptured. Number of carinae in scutoscuteellar sulcus: One. Metafemur length/width: $3.8\text{--}3.9 \times (0.71\text{--}0.78/0.18\text{--}0.20 \text{ mm})$. Metatibia length: 0.98–1.00 mm. First segment of metatarsus length: 0.38–0.40 mm. Mediotergite 1 length/width at posterior margin: 3.9–4.2 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.41–0.44/0.15–0.16/0.12–0.13/0.10–0.11 mm. Mediotergite 1 sculpture: Fully sculptured.

Male. Some males have middle coxa, trochanter and trochantellus darker.

Distribution. Costa Rica, Panama.

Host. Unknown.

Molecular data. One haplotype, one sequence (not barcode-compliant) in BOLD.

Etymology. This species is named in honour of Luis Diego Gómez in recognition of his contribution to understanding the plant biology of ACG.

***Snellenius mariakuzminae* Fernández-Triana & Whitfield, sp. n.**

<http://zoobank.org/1B2DC50E-3426-48D6-8CF5-6B8FDB61CBE5>
Figures 156–162

Holotype. ♂ in CNC. COSTA RICA: ACG, Guanacaste Province, Sector Santa Rosa, Area Administrativa, 295m, 10.83764, -85.61871. ACG database code: DH-JPAR0031634.

Diagnosis. The color combination (metafemur yellow, metatibia dark brown on posterior 0.8, scape brown, T2 and part of T3 light yellow brown), fore wing with vein 2SR shorter than vein r, and T1 2.2 × as long as width at posterior margin, differentiates this species from congeners.

Description. Male. Scape color: Brown. Mesosoma color: Black. Metasoma color: Dark brown, except for light yellow brown T2 and part of T3. Coxae color (pro-, meso-, metacoxa): Yellow, yellow, dark brown. Femora color (pro-, meso-, metafemur): Yellow, yellow, yellow. Tibiae color (pro-, meso-, metatibia): Yellow, yellow, anterior 0.2 white and posterior 0.8 brown. Metatibia spurs color: Yellow. First segment of metatarsus color: Brown. Tegula and humeral complex color: Dark, half pale and half dark. Wings: Mostly hyaline. Pterostigma color: Brown with pale spot at base. Fore wing veins 1RS and (RS+M)a: Brown (same color as surrounding veins). Body length (head to apex of metasoma): 2.8 mm. Fore wing length: 2.4 mm. Ocular-ocellar line/posterior ocellus diameter: 1.6 x. Interocellar distance/posterior ocellus diameter: 1.8 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: (0.14/0.09/0.16 mm). Antenna in males: Slightly flattened. Epicnemial carina: Present. Anteromesoscutum: With strong, coarse sculpture, central area appearing elevated compared to lateral areas of anteromesoscutum, notauli wide and deeply excavated, with numerous crenulae. Scutellar disc sculpture: With deeper sculpture near margins, central part appearing slightly elevated and less sculptured. Number of carinae in scutoscuteellar sulcus: One. Metafemur length/width: 3.5 × (0.70/0.20 mm). Metatibia length: 0.90 mm. First segment of metatarsus length: 0.31 mm. Mediotergite 1 length/width at posterior margin: 2.2 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.48/0.23/0.24/0.22 mm. Mediotergite 1 sculpture: Sculptured on posterior 0.5.

Female. Unknown.

Distribution. Costa Rica, ACG.

Host. Noctuidae: *Concana* Poole01. Solitary parasitoid.

Molecular data. Two haplotypes, two sequences (one barcode-compliant) in BOLD.

Comments. We have only seen one specimen, which has a full barcode (658 bp). In BOLD there is another partial sequence for a specimen we have not been able to study for this paper.

Etymology. This species is named in honour of María Kuzmin in recognition of her contribution to understanding the plant biology of ACG.

***Snellenius mariamartachavarriae* Fernández-Triana & Whitfield, sp. n.**

<http://zoobank.org/CDBE2D1E-B1C4-4DAF-BEC6-4BF0B15319FA>
Figures 163–168

Holotype. ♂ in CNC. COSTA RICA: ACG, Guanacaste Province, Sector Santa Rosa, Casona Santa Rosa, 295m, 10.83381, -85.61271. ACG database code: 91-SRNP-864.

Diagnosis. The combination of metasoma with T2–T3 entirely yellow and dark brown beyond T4, relatively wide T2 (1.9 × as long as wide at posterior margin), wings slightly infumated, metatibia spurs yellow white, metafemur entirely yellow orange, and metatibia mostly light in color (yellow orange, with anterior 0.2 yellow white, and only posterior 0.2 brown), separate this species from all other ACG *Snellenius*, except for *S. josesarukhani*. It is distinguishable from the latter species by having five carinae in the scutoscuteellar sulcus, scape and T4 entirely yellow, and host species (*Catephiodes* sp.) found in dry forest.

Description. Male. Scape color: Yellow. Mesosoma color: Reddish brown. Metasoma color: Mostly yellow orange, with only T5+ dark brown to black. Coxae color (pro-, meso-, metacoxa): Yellow, yellow, yellow. Femora color (pro-, meso-, metafemur): Yellow, yellow, yellow. Tibiae color (pro-, meso-, metatibia): Yellow, yellow, anterior 0.8 yellow and posterior 0.2 brown. Metatibia spurs color: Yellow. First segment of metatarsus color: Brown. Tegula and humeral complex color: Yellow, half pale and half dark. Wings: Hyaline. Pterostigma color: Brown with pale area centrally. Fore wing veins 1RS and (RS+M)a: Brown (same color as surrounding veins). Body length (head to apex of metasoma): 2.8 mm. Fore wing length: 2.7 mm. Ocular-ocellar line/posterior ocellus diameter: 1.8 x. Interocellar distance/posterior ocellus diameter: 1.3 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: 0.18/0.10/0.13 mm. Antenna in males: Strongly flattened. Epicnemial carina: Present. Anteromesoscutum: With relatively shallower and sparser sculpture, central area not appearing elevated compared to lateral areas of anteromesoscutum, notauli slightly to strongly excavated. Scutellar disc sculpture: With deeper sculpture near margins, central part appearing slightly elevated and less sculptured. Number of carinae in scutoscuteellar sulcus: Five. Metafemur length/width: 3.3 × (0.77/0.23 mm). Metatibia length: 0.98 mm. First segment of metatarsus length: 0.40 mm. Mediotergite 1 length/width at posterior margin: 2.0 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.49/0.24/0.27/0.24 mm. Mediotergite 1 sculpture: Fully sculptured.



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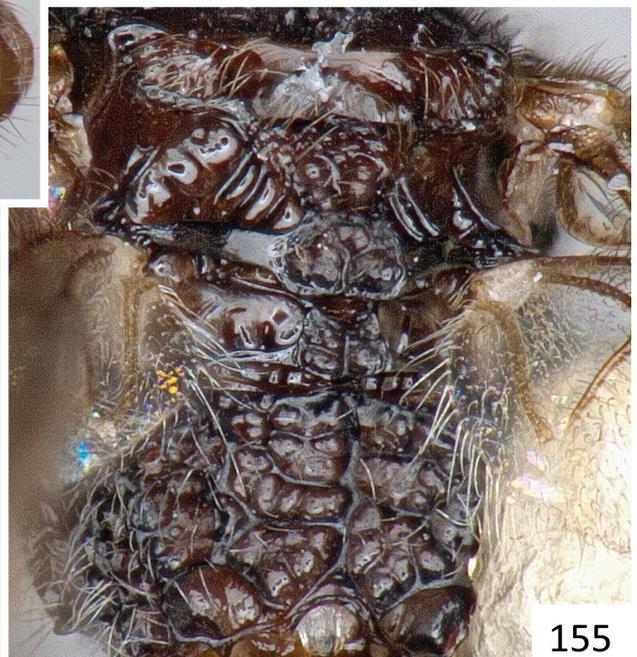
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Figures 150–155. *Snellenius luisdiegogomezi* Fernández-Triana & Whitfield. **150** Habitus, lateral view **151** Fore wing **152** Metasoma, dorsal view **153** Metasoma, lateral view **154** Head and mesosoma (partially), dorsal view **155** Scutellar disc and propodeum, dorsal view.



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Figures 156–162. *Snellenius mariakuzminae* Fernández-Triana & Whitfield. **156** Habitus, lateral view **157** Fore wing **158** Hind leg **159** Metasoma, lateral view **160** Propodeum and metasoma (partially), dorsal view **161** Head and mesosoma (partially), dorsal view **162** Scutellar disc and propodeum, dorsal view.



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Figures 163–168. *Snellenius mariamartachavarriae* Fernández-Triana & Whitfield. **163** Habitus, lateral view **164** Fore wing **165** Head and mesosoma (partially), dorsal view **166** Antenna (male) **167** Hind leg **168** Propodeum and metasoma, dorsal view.

Female. Unknown.

Distribution. Costa Rica, ACG.

Host. Noctuidae: *Catephiodes trinidadensis*. Solitary parasitoid.

Molecular data. None.

Etymology. This species is named in honour of María Marta Chavarría in recognition of her contribution to understanding the plant biology of ACG.

***Snellenius phildevriesi* Fernández-Triana & Whitfield, sp. n.**

<http://zoobank.org/2D4F837F-1457-46E3-907C-854297231E38>

Figures 169–175, 228, 229

Holotype. ♀ in USNM. COSTA RICA: ACG, Guanacaste Province, Sector Del Oro, Bosque Aguirre, 620m, 11.00060, -85.43800. ACG database code: DHJPAR0041580.

Paratypes. 3♀, 4♂ (BMNH, CNC, USNM, INBio, INHS). COSTA RICA, ACG, database codes: DHJPAR0005014, DHJPAR0040510, DHJPAR0040517, DHJPAR0041587, DHJPAR0041956, DHJPAR0045347.

Diagnosis. The combination of body color (yellow orange), metatibia (mostly or entirely dark red brown) and wings (with dark brown infumation, veins and pterostigma mostly brown), as well as hosts (Erebidae, *Gonodonta* spp) separates this species from all other ACG *Snellenius* except for *S. isidrochaconi*. No female specimens are known from *S. isidrochaconi* but males of both species are distinguishable by slight differences in size, interocellar area color, carination pattern in the propodeum, and the absence in *S. phildevriesi* of a rather acute projection on the posterior margin of the metascutellum. Additionally, the two species have over 4 % of base pair differences in the barcoding region, and the caterpillars that they parasitize, although belonging to the same genus (*Gonodonta*), feed on host plants in different families.

Description. Female. Scape color: Partially brown, partially yellow. Mesosoma color: Yellow orange. Metasoma color: Yellow orange. Coxae color (pro-, meso-, metacoxa): Yellow, yellow, yellow. Femora color (pro-, meso-, metafemur): Yellow, yellow, yellow. Tibiae color (pro-, meso-, metatibia): Yellow, yellow, anterior 0.8 reddish orange and posterior 0.2 dark brown to black. Metatibia spurs color: Brown. First segment of metatarsus color: Dark brown to black. Tegula and humeral complex color: Yellow, yellow. Wings: Infumated. Pterostigma color: Dark brown. Fore wing veins IRS and (RS+M)a: Brown (same color as surrounding veins). Body length (head to apex of metasoma): 3.8 mm. Fore wing length: 3.6–3.7 mm (\bar{X} = 3.7 mm). Ocular-ocellar line/posterior ocellus diameter: 1.9 x. Interocellar distance/posterior ocellus diameter: 1.3–1.6 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: 0.17/0.09/0.12–0.14 mm. Antennal flagellomere 2 length/width: 2.2–2.3 × (0.32–0.33/0.14–0.15 mm). Antennal flagellomere 14 length/width: 1.9–2.1 × (0.21–0.22/0.10–

0.11 mm). Length of flagellomere 2/length of flagellomere 14: 1.4–1.6 x. Antenna in males: Flattened on central and apical segments. Epicnemial carina: Present. Anteromesoscutum: With strong, coarse sculpture, central area appearing elevated compared to lateral areas of anteromesoscutum, notauli wide and deeply excavated, with numerous crenulae. Scutellar disc sculpture: With deeper sculpture near margins, central part appearing slightly elevated and less sculptured. Number of carinae in scutoscuteellar sulcus: One. Metafemur length/width: 3.7–4.1 × (0.95–0.98/0.24–0.26 mm). Metatibia length: 1.40 mm. First segment of metatarsus length: 0.45–0.50 mm. Mediotergite 1 length/width at posterior margin: 3.2–3.5 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.57–0.59/0.19–0.20/0.16–0.17/0.17–0.18 mm. Mediotergite 1 sculpture: Partially sculptured.

Male. Similar to female. The following morphological details are provided to allow for comparison against the morphologically similar *S. isidrochaconi* (see Comments below). Body length (head to apex of metasoma): 3.8 mm. Fore wing length: 3.6–3.7 mm (\bar{X} = 3.7 mm). Metafemur length: 0.98–1.00 mm. Metatibia length: 1.30–1.40 mm. First segment of metatarsus length: 0.52–0.56 mm. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.57–0.58/0.21–0.22/0.17–0.20/0.17–0.19 mm.

Distribution. Costa Rica, ACG.

Host. Erebidae: three species of *Gonodonta* (feeding on *Piper* and Annonaceae), and *Hemeroblemma schausiana* DHJ02. Solitary parasitoid (Figs 228, 229).

Molecular data. Five haplotypes, 10 sequences (10 barcode-compliant) in BOLD.

Etymology. This species is named in honour of Phil deVries in recognition of his contribution to understanding the plant biology of ACG.

Comments. One male specimen was significantly much smaller than the rest (3.2 mm of body and fore wing lengths), and it was excluded from the description provided above.

***Snellenius quiricojimenezzi* Fernández-Triana & Whitfield, sp. n.**

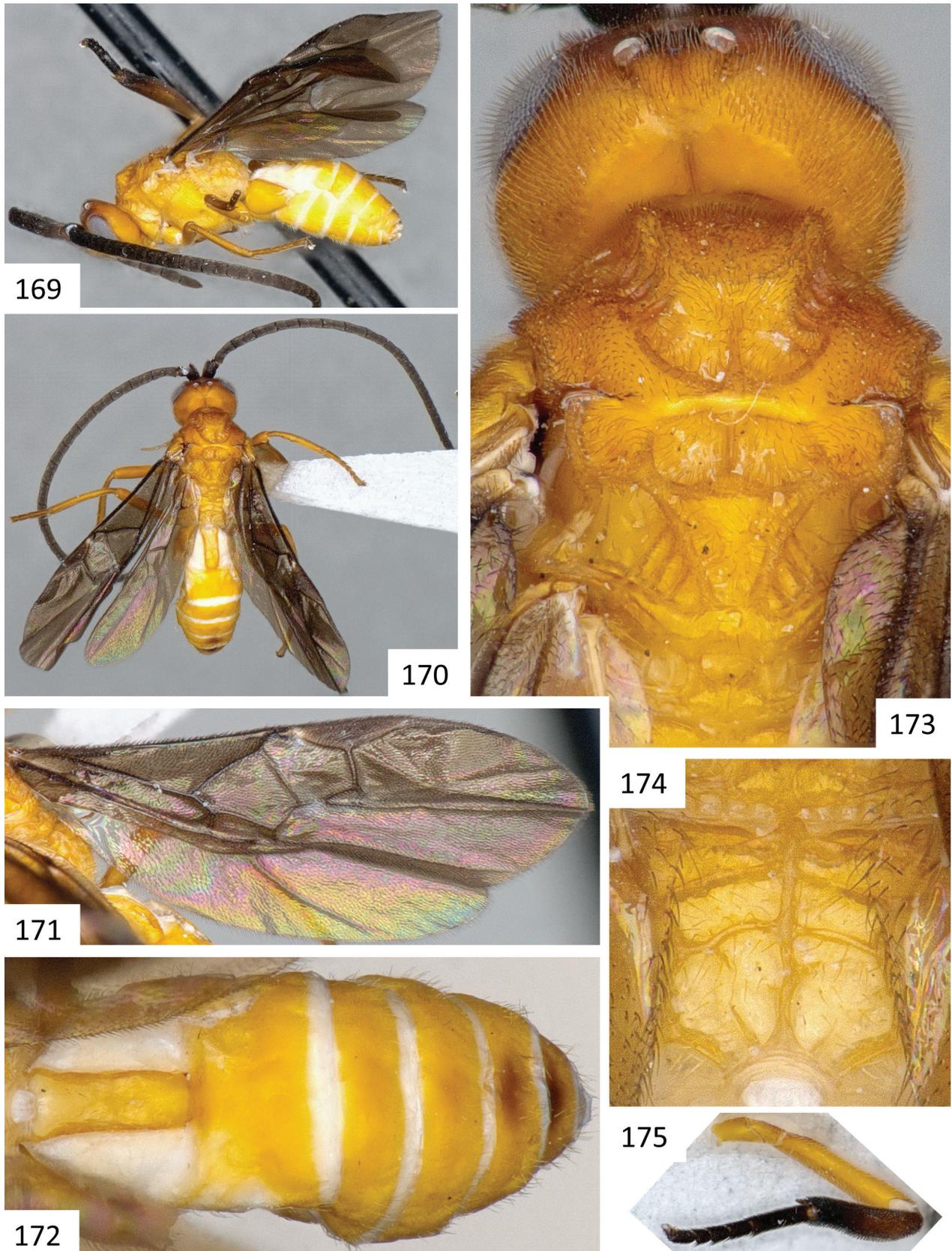
<http://zoobank.org/E3A50C2F-7983-46FE-8B19-60DFC45CC9D9>

Figures 176–182

Holotype. ♀ in CNC. COSTA RICA: ACG, Guanacaste Province, Cerro El Hacha, NW Volcan Orosi, 300, 1988.

Paratypes. 4♀, 11♂ (BMNH, CNC, USNM, INBio, INHS). COSTA RICA, from the following localities (provinces): ACG, Santa Rosa Headquarters, Cerro El Hacha, and Hacienda El Vieja (Guanacaste), Chiles de Agua (Alajuela), Rincon, Golfo Dulce (Puntarenas), La Selva (Heredia), Turrialba (Cartago), and San Jose.

Diagnosis. This species is characterized by T1 length 2.6 × or less its width at posterior margin, fore wing veins IRS and (RS+M)a light yellow (clearly much lighter



Figures 169–175. *Snellenius phildevriesi* Fernández-Triana & Whitfield. **169** Habitus, lateral view **170** Habitus, dorsal view **171** Wings **172** Metasoma, dorsal view **173** Head and mesosoma (partially), dorsal view **174** Propodeum, dorsal view **175** Hind leg.



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Figures 176–182. *Snellenius quiricojimenezi* Fernández-Triana & Whitfield. **176** Habitus, lateral view **177** Fore wing **178** Hind leg. **179, 180** Head and mesosoma (partially), dorsal view, images taken under slightly different angles **181** Metasoma, dorsal view **182** Metasoma, lateral view.

than most of surrounding veins), body color dark reddish brown, ocellar area strongly raised (bounded by strong and coarse punctures), and smooth occiput delimited from coarsely sculptured vertex and gena by a keel resembling a carina. The only ACG *Snellenius* that might be confused with *S. quiricojimenezi* is *S. robertoespinozai*, but the latter has a relatively longer and wider T1, pterostigma entirely brown (pterostigma brown with pale spot at base in *S. quiricojimenezi*), and scutoscuteellar sulcus with one carina (scutoscuteellar sulcus with three to five carinae in *S. quiricojimenezi*).

Description. Female. Scape color: Brown to dark brown. Mesosoma color: Dark reddish brown. Metasoma color: Dark reddish brown. Coxae color (pro-, meso-, metacoxa): Yellow brown, brown, brown. Femora color (pro-, meso-, metafemur): Yellow, partially yellow and partially brown, brown. Tibiae color (pro-, meso-, metatibia): Yellow, yellow, brown. Metatibia spurs color: Yellow. First segment of metatarsus color: Dark brown. Tegula and humeral complex color: Brown, brown. Wings: Hyaline. Pterostigma color: Brown with pale spot at base. Fore wing veins 1RS and (RS+M)a: Entirely or partially transparent or light yellow (clearly much lighter than most of surrounding veins). Body length (head to apex of metasoma): 2.9–3.1 mm (\bar{X} = 3.0 mm). Fore wing length: 2.9–3.1 mm (\bar{X} = 3.0 mm). Ocular-ocellar line/posterior ocellus diameter: 2.1–2.3 x. Interocellar distance/posterior ocellus diameter: 2.0 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: 0.15/0.07/0.13–0.14 mm. Antennal flagellomere 2 length/width: 3.3–3.5 × (0.28/0.08 mm). Antennal flagellomere 14 length/width: 2.1–2.4 × (0.17/0.07–0.08 mm). Length of flagellomere 2/length of flagellomere 14: 1.6 x. Antenna in males: Of normal appearance, not flattened. Epicnemial carina: Present. Anteromesoscutum: With strong, coarse sculpture, central area appearing elevated compared to lateral areas of anteromesoscutum, notauli wide and deeply excavated, with numerous crenulae. Scutellar disc sculpture: With deeper sculpture near margins, central part appearing slightly raised and less sculptured. Number of carinae in scutoscuteellar sulcus: Three to five (some incomplete laterally). Metafemur length/width: 4.2–4.3 × (0.85–0.87/0.20 mm). Metatibia length: 1.16–1.20 mm. First segment of metatarsus length: 0.45–0.47 mm. Mediotergite 1 length/width at posterior margin: 2.6 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.48–0.51/0.18–0.20/0.21–0.23/0.19–0.20 mm. Mediotergite 1 sculpture: Fully sculptured.

Male. As female except for wings mostly infumated.

Distribution. Costa Rica.

Host. Unknown.

Molecular data. None.

Etymology. This species is named in honour of Quirico Jiménez in recognition of his contribution to understanding the plant biology of ACG.

Comments. The apparent sexual dimorphism observed (females with hyaline wings, males with infuma-

ted wings, specimens from the same locality) is unique among all species of *Snellenius* and *Microplitis* studied in this paper.

***Snellenius robertoespinozai* Fernández-Triana & Whitfield, sp. n.**

<http://zoobank.org/73597BFB-0527-4CA9-83C7-D2A42D819C8D>

Figures 183–188

Holotype. ♂ in CNC. COSTA RICA: ACG, Guanacaste Province, Sector Santa Rosa, Argelia, 5m, 10.78004, -85.66405. ACG database code: 94-SRNP-1817.

Diagnosis. This species is characterized by T1 length 2.6 × its width at posterior margin, fore wing veins 1RS and (RS+M)a light yellow (clearly much lighter than most of surrounding veins), body color reddish brown, ocellar area strongly raised (bounded by strong and coarse punctures), and smooth occiput delimited from coarsely sculptured vertex and gena by a keel resembling a carina. The only ACG *Snellenius* that might be confused with *S. robertoespinozai* is *S. quiricojimenezi*, but the latter has a relatively shorter and narrower T1, pterostigma brown with pale spot at base (pterostigma brown in *S. robertoespinozai*), and scutoscuteellar sulcus with three to five carinae (scutoscuteellar sulcus with one carina in *S. robertoespinozai*).

Description. Male. Scape color: Light brown. Mesosoma color: Reddish brown. Metasoma color: Reddish brown. Coxae color (pro-, meso-, metacoxa): Yellow, yellow, reddish yellow. Femora color (pro-, meso-, metafemur): Yellow, yellow, light reddish yellow. Tibiae color (pro-, meso-, metatibia): Yellow, yellow, reddish brown. Metatibia spurs color: White yellow. First segment of metatarsus color: Brown. Tegula and humeral complex color: Brown, brown. Wings: Hyaline. Pterostigma color: Brown. Fore wing veins 1RS and (RS+M)a: Entirely or partially transparent or light yellow (clearly much lighter than most of surrounding veins). Body length (head to apex of metasoma): 3.6 mm. Fore wing length: 3.4 mm. Ocular-ocellar line/posterior ocellus diameter: 1.6 x. Interocellar distance/posterior ocellus diameter: 1.7 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: 0.14/0.09/0.15 mm. Antenna in males: Strongly flattened (but posterior half of antenna missing). Epicnemial carina: Present. Anteromesoscutum: With strong, coarse sculpture, central area appearing elevated compared to lateral areas of anteromesoscutum, notauli wide and deeply excavated, with numerous crenulae. Scutellar disc sculpture: With deeper sculpture near margins, central part appearing slightly raised and less sculptured. Number of carinae in scutoscuteellar sulcus: One. Metafemur length/width: 3.7 × (1.00/0.27 mm). Metatibia length: 1.24 mm. First segment of metatarsus length: 0.47 mm. Mediotergite 1 length/width at posterior margin: 2.6 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.66/0.30/0.34/0.25 mm. Mediotergite 1 sculpture: Fully sculptured.

Female. Unknown.

Distribution. Costa Rica, ACG.

Host. Noctuidae: *Melipotis cellaris*. Solitary parasitoid.

Molecular data. None.

Etymology. This species is named in honour of Roberto Espinoza in recognition of his contribution to understanding the plant biology of ACG.

***Snellenius sandyknappae* Fernández-Triana & Whitfield, sp. n.**

<http://zoobank.org/04C5EDAC-BDF0-4C7F-B260-4CAD89A5137C>
Figures 189–195, 224, 225

Holotype. ♀ in USNM. COSTA RICA: ACG, Guanacaste Province, Sector Pitilla, Pasmompa, 440m, 11.01926, -85.40997. ACG database code: DHJPAR0020763.

Paratypes. 11♀, 6♂ (BMNH, CNC, USNM, INBio, INHS). COSTA RICA, ACG, database codes: DHJPAR0020493, DHJPAR0020585, DHJPAR0020586, DHJPAR0020587, DHJPAR0020588, DHJPAR0020589, DHJPAR0020759, DHJPAR0020760, DHJPAR0020761, DHJPAR0020762, DHJPAR0020764, DHJPAR0020766, DHJPAR0020767, DHJPAR0020768, DHJPAR0020769, DHJPAR0030871, 07-SNRP-33753.

Diagnosis. The unique combination of wings slightly infumated, body mostly black (at the lightest dark brown), tegula clearly lighter in color than darker humeral complex, all coxae dark brown to black, metatibial spurs yellow white, and host (*Helia argentipes*) separate this species from all other ACG *Snellenius*.

Description. Female. Scape color: Dark brown to black. Mesosoma color: Black. Metasoma color: Dark brown to black. Coxae color (pro-, meso-, metacoxa): Brown, black, black. Femora color (pro-, meso-, metafemur): Yellow brown, brown, black. Tibiae color (pro-, meso-, metatibia): Yellow brown, brown, black (except for anterior 0.1–0.2 white). Metatibia spurs color: Yellowish white. First segment of metatarsus color: Dark brown to black. Tegula and humeral complex color: Brown, dark brown. Wings: Slightly infumated. Pterostigma color: Brown. Fore wing veins IRS and (RS+M)a: Brown (same color as surrounding veins). Body length (head to apex of metasoma): 3.2–3.4 mm. Fore wing length: 2.8–3.1 mm. Ocular-ocellar line/posterior ocellus diameter: 2.3–2.4 x. Interocellar distance/posterior ocellus diameter: 2.0–2.1 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: 0.16–0.17/0.07/0.14–0.15 mm. Antennal flagellomere 2 length/width: 3.1–3.2 × (0.28–0.29/0.09 mm). Antennal flagellomere 14 length/width: 2.2–2.3 × (0.19–0.20/0.08–0.09 mm). Length of flagellomere 2/length of flagellomere 14: 1.4–1.5 x. Antenna in males: Strongly flattened. Epicnemial carina: Present. Anteromesoscutum: With strong, coarse sculpture, central area appearing elevated compared to lateral areas of anteromesoscutum, notauli wide and deeply excavated, with numerous crenulae. Scutel-

lar disc sculpture: With deeper sculpture near margins, central part appearing slightly elevated and less sculptured. Number of carinae in scutoscutellar sulcus: One. Metafemur length/width: 3.7–3.8 × (0.90–0.93/0.24–0.25 mm). Metatibia length: 1.20 mm (1.18–1.22 mm). First segment of metatarsus length: 0.44–0.45 mm. Mediotergite 1 length/width at posterior margin: 1.8 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.46–0.47/0.25–0.26/0.24/0.25–0.26 mm. Mediotergite 1 sculpture: Fully sculptured.

Male. As female but T2 yellow or light brown.

Distribution. Costa Rica, ACG.

Host. Erebididae, *Helia argentipes*. Solitary parasitoid (Figs 224, 225).

Molecular data. One haplotype, 18 sequences (18 barcode-compliant) in BOLD.

Etymology. This species is named in honour of Sandy Knapp in recognition of her contribution to understanding the plant biology of ACG.

***Snellenius velvaruddae* Fernández-Triana & Whitfield, sp. n.**

<http://zoobank.org/2DE877BC-E0F0-4460-B051-512982E87D63>
Figures 196–202

Holotype. ♀ in CNC. COSTA RICA: ACG, Guanacaste Province, Sector Santa Rosa, Bosque San Emilio, 300m, 10.84389, -85.61384. ACG database code: DHJPAR0013342.

Paratype. ♀ (CNC). COSTA RICA, ACG, database code: DHJPAR0013338.

Diagnosis. The combination of metasoma color (T1–T2 orange yellow, T3 yellow, T4 light brown, T5+ brown), metatibia spurs orange brown, fore wing hyaline, and T1 length at least 2.3 × its width at posterior margin separate this species from all other ACG *Snellenius*.

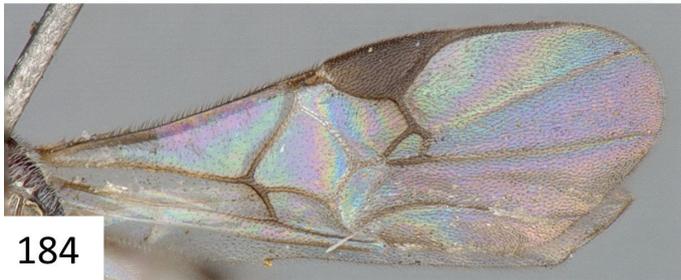
Description. Female. Scape color: Half yellow, half brown. Mesosoma color: Black. Metasoma color: T1–T2 orange yellow, T3 yellow, T4 light brown, T5+ brown. Coxae color (pro-, meso-, metacoxa): Yellow, light brown, brown. Femora color (pro-, meso-, metafemur): Orange yellow, orange yellow to light brown, brown. Tibiae color (pro-, meso-, metatibia): Orange yellow, orange yellow, mostly orange yellow (but with anterior 0.2 yellow white and posterior 0.2 brown). Metatibia spurs color: Orange brown. First segment of metatarsus color: Brown. Tegula and humeral complex color: Yellow, half yellow and half brown. Wings: Hyaline. Pterostigma color: Brown. Fore wing veins IRS and (RS+M)a: Brown (same color as surrounding veins). Body length (head to apex of metasoma): 3.2–3.3 mm. Fore wing length: 2.9–3.0 mm. Ocular-ocellar line/posterior ocellus diameter: 1.9 x. Interocellar distance/posterior ocellus diameter: 1.7 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: 0.17–0.18/0.08–0.09/0.15 mm. Antennal flagellomere 2 length/width: 2.6–2.8 × (0.25–0.26/0.09–0.10 mm). Antennal flagellomere 14 length/



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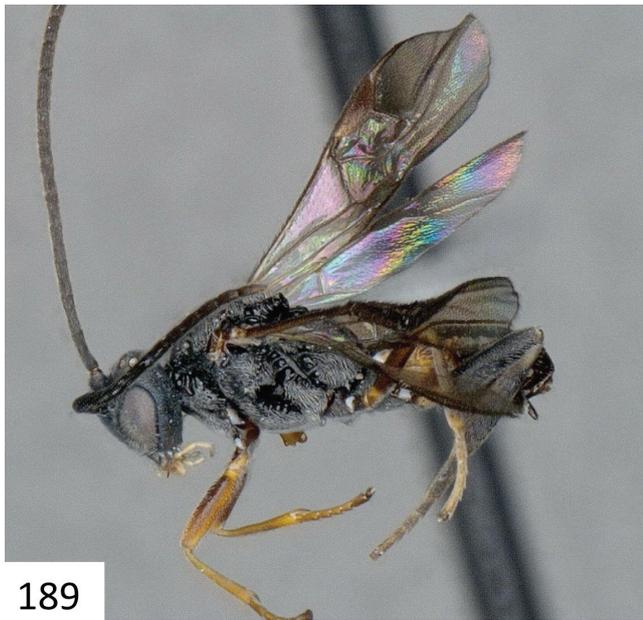


188

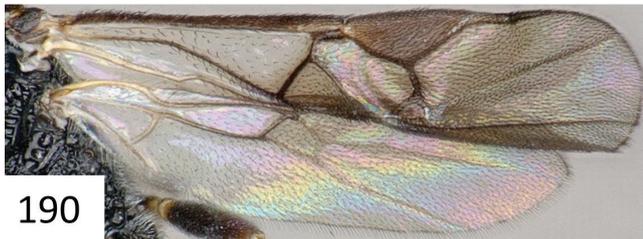


186

Figures 183–188. *Snellenius robertoespinozai* Fernández-Triana & Whitfield. **183** Habitus, lateral view **184** Fore wing **185** Mesosoma, lateral view **186** Hind leg and metasoma (partially), lateral view **187** Head and mesosoma (partially), dorsal view **188** Propodeum and metasoma, dorsal view.



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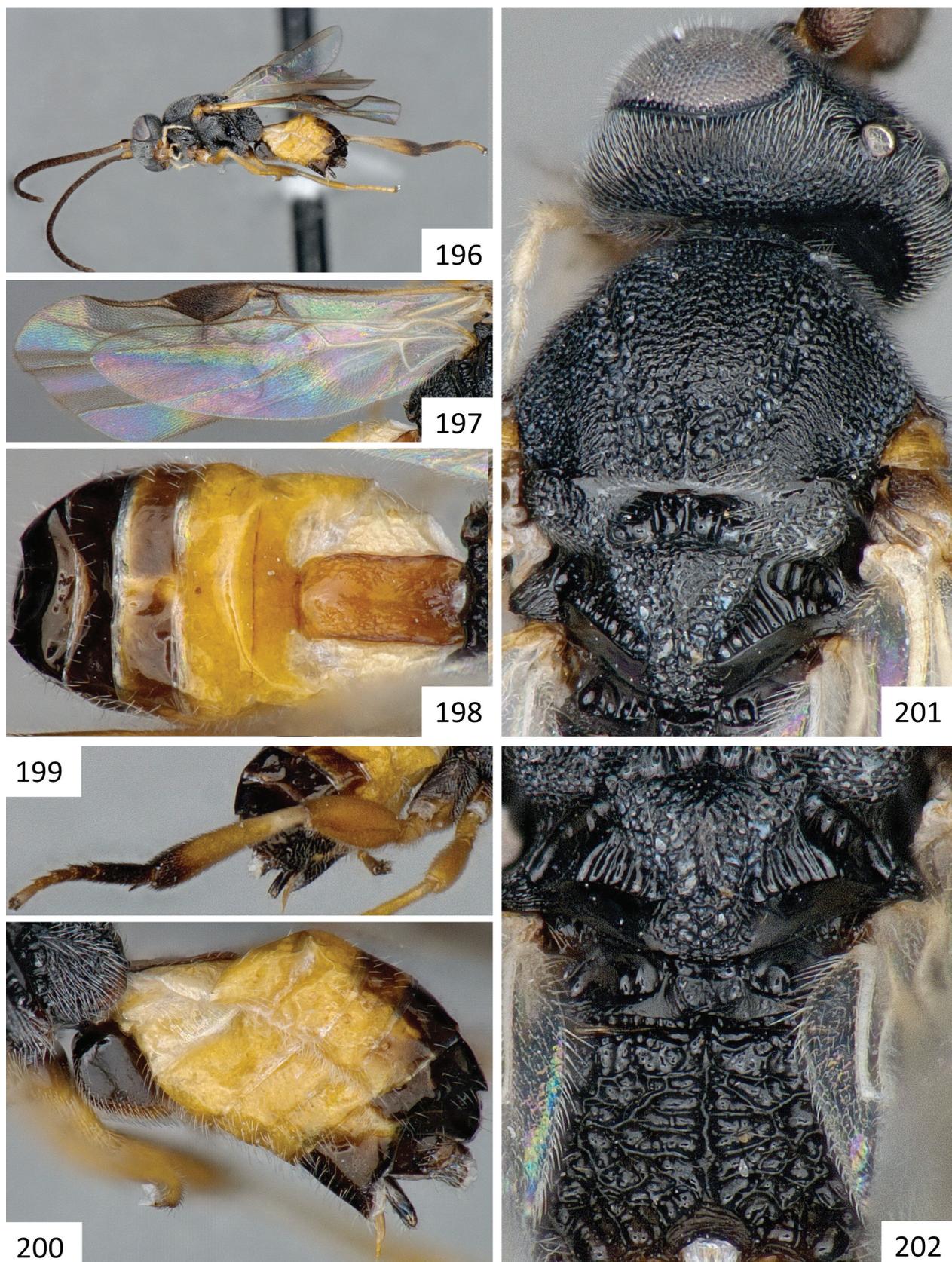


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Figures 189–195. *Snellenius sandyknappae* Fernández-Triana & Whitfield. **189** Habitus, lateral view **190** Wings **191** Head and mesosoma (partially), lateral view **192** Hind leg and metasoma (partially), lateral view **193** Head and mesosoma (partially), dorsal view **194** Propodeum, dorsal view **195** Metasoma, dorsal view.



Figures 196–202. *Snellenius velvaruddae* Fernández-Triana & Whitfield. **196** Habitus, lateral view **197** Wings **198** Metasoma, dorsal view **199** Hind leg and metasoma (partially), lateral view **200** Metapleuron and metasoma, lateral view **201** Head and mesosoma (partially), dorsal view **202** Scutellar disc and propodeum, dorsal view.

width: $2.1\text{--}2.3 \times (0.17/0.07\text{--}0.08 \text{ mm})$. Length of flagellomere 2/length of flagellomere 14: 1.5 x. Epicnemial carina: Present. Anteromesoscutum: With relatively shallower and sparser sculpture, central area not appearing elevated compared to lateral areas of anteromesoscutum, notauli slightly to strongly excavated. Scutellar disc sculpture: With deeper sculpture near margins, central part appearing slightly elevated and less sculptured. Number of carinae in scutoscuteellar sulcus: One centrally, with four other smaller and partially defined carinae. Metafemur length/width: $3.2\text{--}3.4 \times (0.86\text{--}0.87/0.25\text{--}0.27 \text{ mm})$. Metatibia length: 1.07 mm (1.05–1.10 mm). First segment of metatarsus length: 0.42 mm (0.41–0.43 mm). Mediotergite 1 length/width at posterior margin: 2.3–2.4 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.52–0.54/0.26–0.27/0.25–0.26/0.22–0.24 mm. Mediotergite 1 sculpture: Fully sculptured.

Male. Unknown.

Host. Unknown.

Molecular data. One haplotype, two sequences (two barcode-compliant) in BOLD.

Etymology. This species is named in honour of in recognition of Velva Rudd in recognition of her contribution to understanding the plant biology of ACG.

***Snellenius vickifunkae* Fernández-Triana & Whitfield, sp. n.**

<http://zoobank.org/248221A4-E63A-426F-A757-474D20808749>
 Figures 203–208

Holotype. ♀ in USNM. COSTA RICA: ACG, Guanacaste Province, Sector Santa Rosa, Bosque Humedo, 290m, 10.85145, -85.60801. ACG database code: DHJPAR0024695.

Paratypes. 1♀ (CNC) COSTA RICA, ACG, database code: DHJPAR0013327; 1♀ (CNC) Costa Rica: San Jose, Ciudad Colon, 800m, xii.1989-i.1990, L. Fournier.

Diagnosis. The combination of body color (mesosoma dark brown to black, metasoma with T1 reddish brown with posterior 0.1 orange brown, T2-T3 yellow, rest of metasoma dark brown), anterior 0.6 of metatibia light yellow, and fore wing veins 1RS and (RS+M)a transparent or light yellow (clearly much lighter than most of surrounding veins) separate this species from all other ACG *Snellenius*.

Description. Female. Scape color: Dark brown. Mesosoma color: Dark brown to black. Metasoma color: T1 reddish brown with posterior 0.1 orange brown, T2-T3 yellow, rest of metasoma dark brown. Coxae color (pro-, meso-, metacoxa): Brown, brown, dark brown (holotype) or yellow, yellow, dark brown (paratype). Femora color (pro-, meso-, metafemur): Yellow, yellow (but partially brown), dark brown. Tibiae color (pro-, meso-, metatibia): Orange yellow, orange yellow, anterior 0.6 light yellow and posterior 0.4 dark brown. Metatibia spurs color: Yellow. First segment of metatarsus color: Dark brown. Te-

gula and humeral complex color: Dark brown, dark brown (holotype) or dark brown, yellow (paratype). Wings: Hyaline. Pterostigma color: Brown with small pale spot at base. Fore wing veins 1RS and (RS+M)a: Entirely or partially transparent or light yellow (clearly much lighter than most of surrounding veins). Body length (head to apex of metasoma): 2.5–2.6 mm. Fore wing length: 2.2–2.3 mm. Ocular-ocellar line/posterior ocellus diameter: 2.1–2.2 x. Interocellar distance/posterior ocellus diameter: 1.8–2.0 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: 0.13–0.14/0.06/0.11–0.13 mm. Antennal flagellomere 2 length/width: $2.7\text{--}3.0 \times (0.21/0.07\text{--}0.08 \text{ mm})$. Antennal flagellomere 14 length/width: 2.5 x (0.15/0.06 mm). Length of flagellomere 2/length of flagellomere 14: 1.4 x. Epicnemial carina: Present. Anteromesoscutum: With relatively shallower and sparser sculpture, central area not appearing elevated compared to lateral areas of anteromesoscutum, notauli slightly to strongly excavated. Scutellar disc sculpture: With deeper sculpture near margins, central part appearing slightly raised and less sculptured. Number of carinae in scutoscuteellar sulcus: Four to five. Metafemur length/width: $4.0\text{--}4.1 \times (0.70\text{--}0.72/0.17\text{--}0.18 \text{ mm})$. Metatibia length: 0.93–1.00 mm. First segment of metatarsus length: 0.39–0.40 mm. Mediotergite 1 length/width at posterior margin: 2.7–2.8 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.36–0.40/0.18–0.20/0.19–0.22/0.13–0.15 mm. Mediotergite 1 sculpture: Mostly sculptured.

Male. Unknown.

Distribution. Costa Rica.

Host. Unknown.

Molecular data. Two haplotypes, two sequences (two barcode-compliant) in BOLD.

Comments. One of the paratypes (DHJPAR0013327), which is in bad condition, has a brown metafemur. However, the holotype, which is in good condition, has a black metafemur.

Etymology. This species is named in honour of Vicki Funk in recognition of her contribution to understanding the plant biology of ACG.

***Snellenius warrenwagneri* Fernández-Triana & Whitfield, sp. n.**

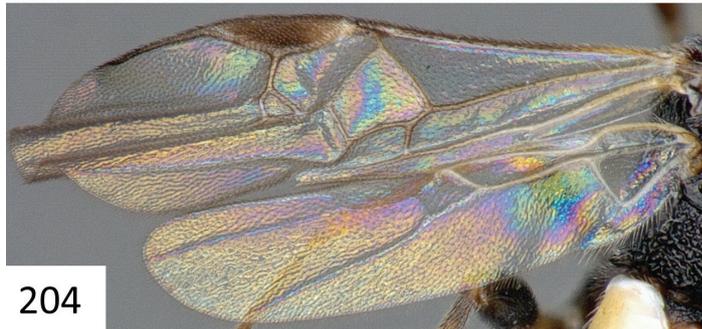
<http://zoobank.org/B6D76719-7AB6-4609-9041-F736534A6F6A>
 Figures 209–215

Holotype. ♀ in USNM. COSTA RICA: ACG, Guanacaste Province, Sector Santa Rosa, Bosque San Emilio, 300m, 10.84389, -85.61384. ACG database code: DHJPAR0013328.

Paratypes. 5♀, 5♂ (BMNH, CNC, USNM, INBio, INHS). COSTA RICA, ACG, database codes: DHJPAR0012601, DHJPAR0013317, DHJPAR0013329, DHJPAR0013331, DHJPAR0013333, DHJPAR0013334, DHJPAR0013335, DHJPAR0013337, DHJPAR0024712, DHJPAR0024713.



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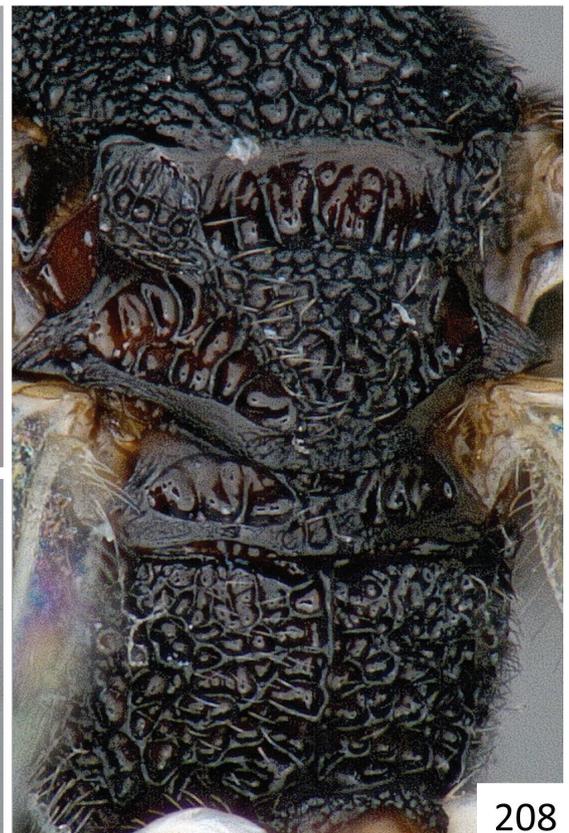
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Figures 203–208. *Snellenius vickifunkae* Fernández-Triana & Whitfield. **203** Habitus, lateral view **204** Wings **205** Middle and hind legs and metasoma (partially), lateral view **206** Metasoma, dorsal view **207** Head and mesosoma (partially), dorsal view **208** Scutellar disc and propodeum, dorsal view.



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Figures 209–215. *Snellenius warrenwagneri* Fernández-Triana & Whitfield. **209** Habitus, lateral view **210** Wings **211** Hind leg and metasoma (partially), lateral view **212** Metasoma, lateral view **213** Metasoma, dorsal view **214** Head and mesosoma (partially), dorsal view **215** Propodeum, dorsal view.



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Figures 216–229. Host parasitized larvae and cocoons of *Microplitis* and *Snellenius* species of Area de Conservación de Guanacaste, Costa Rica. **216** *Microplitis espinachi* Walker **217** *Microplitis francopulini* Fernández-Triana & Whitfield.



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Figures 218–225. 218–219 *Microplitis figueresi* Walker, 2003 220–221 *Microplitis marini* Whitfield, 2003 222 *Snellenius felipechavarriai* Fernández-Triana & Whitfield 223 *Snellenius kerrydresslerae* Fernández-Triana & Whitfield 224–225 *Snellenius sandyknappae* Fernández-Triana & Whitfield



Figures 226–227. 226 *Snellenius bobdressleri* Fernández-Triana & Whitfield 227 *Snellenius isidrochaconi* Fernández-Triana & Whitfield.



Figures 228–229. *Snellenius phildevriesi* Fernández-Triana & Whitfield.



Figures 230–233. *Microplitis marini* Whitfield, 2003, female holotype; all scale bars are 1 mm. **230** Habitus, lateral view **231** Habitus, dorsal view **232** Wings **233** Head, frontal view.

Diagnosis. The combination of T1 length at least $3.0 \times$ its width at posterior margin, body mostly dark reddish brown to brown, metatibia dark brown on posterior 0.8, and metatibial spurs yellow white separates this species from all other ACG *Snellenius*, except for *S. gerardoherreirai*. It is distinguishable from the latter species by having scape dark brown, tegula and humeral complex yellow, and relatively longer flagellomeres (flagellomere $2.3.0\text{--}3.2 \times$ as long as wide, flagellomere 14 $2.5\text{--}2.7 \times$ as long as wide).

Description. Female. Scape color: Dark brown to black. Mesosoma color: Black. Metasoma color: Dark brown. Coxae color (pro-, meso-, metacoxa): Yellow,

yellow, reddish brown. Femora color (pro-, meso-, metafemur): Yellow, orange brown, dark reddish brown. Tibiae color (pro-, meso-, metatibia): Yellow, yellow, yellow white on anterior 0.4 and dark brown on posterior 0.6. Metatibia spurs color: White. First segment of metatarsus color: Dark brown. Tegula and humeral complex color: Yellow, yellow (rarely yellow, partially yellow and partially brown). Wings: Hyaline. Pterostigma color: Brown with small pale spot at base. Fore wing veins 1RS and (RS+M)a: Brown (same color as surrounding veins). Body length (head to apex of metasoma): $2.9\text{--}3.2$ mm ($\bar{X} = 3.0$ mm). Fore wing length: $2.5\text{--}2.7$ mm ($\bar{X} = 2.6$ mm). Ocular-ocellar

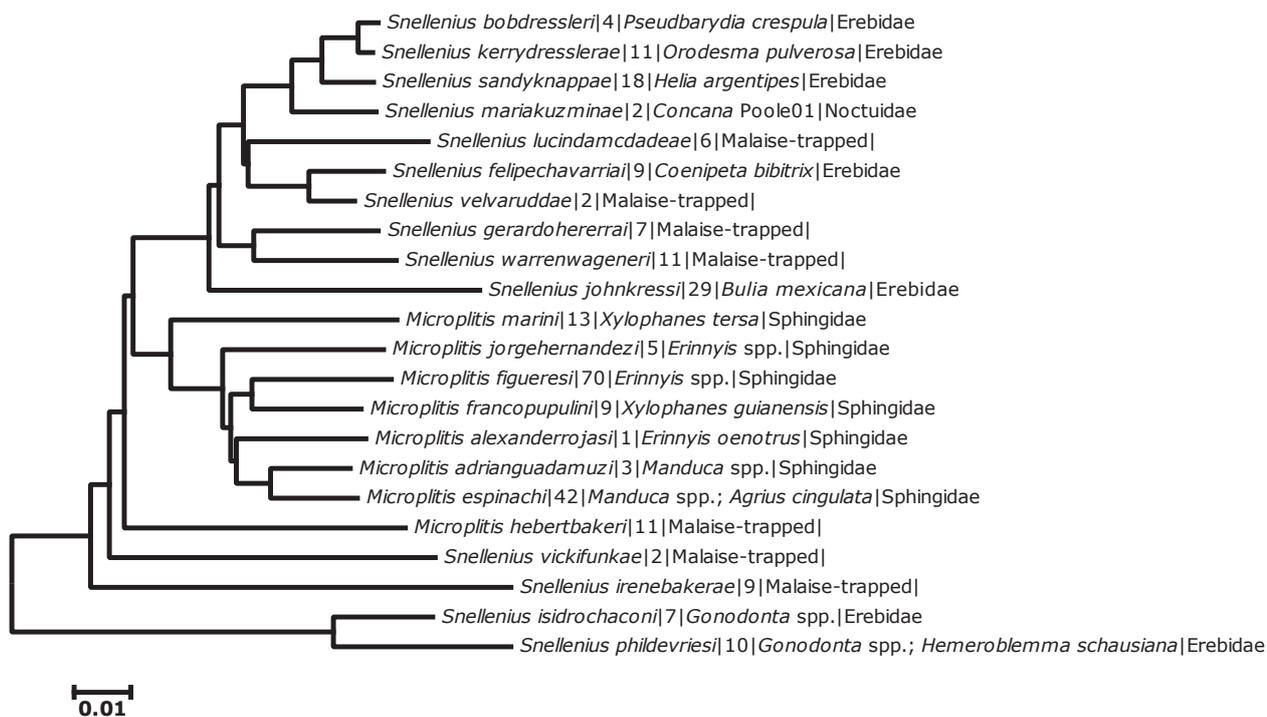


Figure 234. Interspecific variation of DNA barcodes among species of ACG *Microplitis* and *Snellenius* displayed using the Neighbor-Joining method (Saitou and Nei 1987) with distances computed using the Kimura 2-parameter method (Kimura 1980) conducted in MEGA6 (Tamura et al 2013). When there was more than one sequence available for each species, the representative sequence was selected based on quality (longest read length with the fewest ambiguities). Tip labels are the species name|number of barcoded specimens in the ACG database at the time of writing |host species|host family.

line/posterior ocellus diameter: 1.9–2.0 x. Intero-cellular distance/posterior ocellus diameter: 1.7–1.8 x. Ocular-ocellar line/posterior ocellus diameter/interocellar distance: 0.14–0.15/0.07–0.08/0.12–0.14 mm. Antennal flagellomere 2 length/width: 3.0–3.1 × (0.24–0.25/0.08 mm). Antennal flagellomere 14 length/width: 2.2–2.7 × (0.15–0.16/0.06–0.07). Length of flagellomere 2/length of flagellomere 14: 1.5–1.7 x. Antenna in males: Of normal appearance, not flattened. Epicnemial carina: Present (partially visible). Anteromesoscutum: With strong, coarse sculpture, central area appearing elevated compared to lateral areas of anteromesoscutum, notauli wide and deeply excavated, with numerous crenulae. Scutellar disc sculpture: With deeper sculpture near margins, central part appearing slightly elevated and less sculptured. Number of carinae in scutoscutellar sulcus: One complete and up to four incomplete. Metafemur length/width: 3.6–3.8 × (0.80/0.21–0.22 mm). Metatibia length: 1.05–1.08 mm. First segment of metatarsus length: 0.38–0.40 mm. Mediotergite 1 length/width at posterior margin: 2.5–2.7 x. Mediotergite 1 length/width at anterior margin/maximum width/width at posterior margin: 0.43–0.46/0.20/0.19–0.20/0.17 mm. Mediotergite 1 sculpture: Fully sculptured.

Male. As in female but with lighter coloration on metafemur.

Distribution. Costa Rica, ACG.

Host. Unknown.

Molecular data. Four haplotypes, 10 sequences (10 barcode-compliant) in BOLD.

Etymology. This species is named in honour of Warren Wagner in recognition of his contribution to understanding the plant biology of ACG.

Acknowledgements

We emphatically and gratefully acknowledge the support of the ACG parataxonomist team (Janzen et al. 2009, Janzen and Hallwachs 2011) in finding and rearing these caterpillars, their parasites and their hyperparasites, and Area de Conservacion Guanacaste (ACG) for preserving the forests in which they live, and the Guanacaste Dry Forest Conservation Fund, the Wege Foundation, the International Conservation Fund of Canada, the JRS Biodiversity Foundation, Jessie Hill, Steve Stroud, Permian Global, and the University of Pennsylvania for funding portions of the research. This study was also supported by NSF DEB 0515699 to DHJ and by a Natural Sciences and Engineering Research Council of Canada (NSERC) Discovery Grant to MAS. Laboratory analyses of these sequences were funded by the Government of Canada through Genome Canada and the Ontario Genomics Institute (2008-0GI-ICI-03). JBW would like to acknowledge the USDA NRI program for support from two grants, awarded in 2000 and 2003, which supported earlier work

on some of the species in this study. Mention of trade names or commercial products in this publication is solely for the purpose of providing specific information and does not imply recommendation or endorsement by the USDA. USDA is an equal opportunity provider and employer.

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Supplementary material 1

Interspecific variation of DNA barcodes among species of ACG *Microplitis* and *Snellenius*

Authors: Jose L. Fernandez-Triana, James B. Whitfield, M. Alex Smith, Robert R. Kula, Winnie Hallwachs, Daniel H. Janzen
Data type: K2P tree based on DNA barcodes.

Explanation note: Interspecific variation of DNA barcodes among species of ACG *Microplitis* and *Snellenius* displayed using the Neighbor-Joining method (Saitou and Nei 1987) with distances computed using the Kimura 2-parameter method (Kimura 1980) conducted in BOLD (Ratnasingham and Hebert 2007). Tip labels are the species name|sample accession|sequence length and number of ambiguities|host species|.

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Supplementary material 2

Additional information for paratype specimens of the new species of *Microplitis* and *Snellenius*

Authors: Jose L. Fernandez-Triana, James B. Whitfield, M. Alex Smith, Robert R. Kula, Winnie Hallwachs, Daniel H. Janzen
Data type: Specimens data.

Explanation note: Additional information for paratype specimens of the new species of *Microplitis* and *Snellenius* described from Area de Conservacion Guanacaste, Costa Rica.

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