UNIVERSIDADE FEDERAL DO ESPÍRITO SANTO

CENTRO DE CIÊNCIAS HUMANAS E NATURAIS

PROGRAMA DE PÓS-GRADUAÇÃO EM CIÊNCIAS BIOLÓGICAS

Chalcididae (Hymenoptera) parasitoides de desfolhadores (Lepidoptera) de eucalipto (Myrtaceae) no Novo Mundo

Bruna Cortat Simoneli

Vitória, ES

Março, 2023

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Orientador: Prof. Dr. Marcelo Teixeira Tavares

Dissertação submetida ao Programa de Pós-Graduação em Ciências Biológicas (Biologia Animal) da Universidade Federal do Espírito Santo, como requisito parcial para a obtenção do grau de Mestre em Biologia Animal

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ATA DE DEFESA DE DISSERTAÇÃO DO CURSO DE MESTRADO EM BIOLOGIA ANIMAL DO PROGRAMA DE PÓS-GRADUAÇÃO EM CIÊNCIAS BIOLÓGICAS DO CENTRO DE CIÊNCIAS HUMANAS E NATURAIS DA UNIVERSIDADE FEDERAL DO ESPÍRITO SANTO - ATA Nº 220 – 10/03/2023

No dia dez do mês de março de dois mil e vinte e três, em sessão pública, através de webconferência, conforme Portaria Normativa nº 08 da Pró-Reitoria de Pesquisa e Pós-Graduação/UFES de 01 de julho de 2021, procedeu-se a avaliação da dissertação da aluna **Bruna Cortat Simoneli**. Às catorze horas, o Prof. Dr. Marcelo Teixeira Tavares (UFES), Orientador e Presidente da Comissão Examinadora de Defesa de Dissertação, deu início aos trabalhos, convidando a compor a banca o Profª. Drª. Cecília Waichert Monteiro (UFES), examinadora interna e a Profª Drª Angelica Maria Penteado Martins Dias (UFSCar), examinadora externa. A seguir, o presidente solicitou à mestranda que fizesse uma explanação de seu trabalho intitulado **"*Chalcididae (Hymenoptera) parasitoides de desfolhadores (Lepidoptera) de eucalipto (Myrtaceae) no Novo Mundo*".** Finda a apresentação, o presidente passou a palavra aos examinadores, que procederam à arguição da candidata. Ao final, a Comissão em sessão reservada deliberou pela **APROVAÇÃO** da referida dissertação nos termos do Regimento Interno do Programa de Pós-Graduação em Ciências Biológicas e alertou que a aprovada somente terá direito ao título de Mestre após entrega da versão final de sua dissertação, em meio digital, à Secretaria do Programa. Encerrada a sessão, eu, Prof. Dr. Marcelo Teixeira Tavares, presidente da Comissão Examinadora, lavrei a presente ata que vai assinada digitalmente, por mim e pelos demais componentes da Comissão.

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Profª. Drª. Cecília Waichert Monteiro (UFES)
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Profª. Drª. Angelica Maria Penteado Martins Dias (UFSCar)
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Resumo

A família Chalcididae (Hymenoptera, Chalcidoidea) está amplamente distribuída ao redor do globo e inclui cerca de 1584 espécies descritas. A família é diversificada no Novo Mundo, especialmente na região Neotropical, que engloba cerca de 472 espécies em 29 gêneros. A maioria dos calcidídeos é parasitóide primário de larvas e pupas de insetos holometábolos (incluindo lepidópteros, dípteros e coleópteros) e, alguns de seus hospedeiros têm importância como pragas agrícolas, incluindo alguns desfolhadores de eucalipto. Aqui é apresentada uma sinopse das espécies de Chalcididae parasitóides de lepidópteros pragas desfolhadores do eucalipto no Novo Mundo. Esta sinopse inclui uma *checklist* das espécies de parasitóides, seus desfolhadores hospedeiros, planta associada, distribuição geográfica, registros anteriores e inéditos para cada associação hospedeiro-parasitóide, e comentários e correções aos registros publicados. Ferramentas de identificação como diagnoses, chave de identificação e ilustrações também são apresentadas. Esta sinopse inclui 18 espécies de Chalcididae, seis pertencentes a *Brachymeria* e 12 a *Conura* (duas não descritas), 19 espécies hospedeiras e 46 associações hospedeiro-parasitóide (17 como novos registros).

Palavras chaves: Controle biológico, Chalcidoidea, interações tritróficas, inimigos naturais, vespas parasitóides.

Abstract

The family Chalcididae (Hymenoptera, Chalcidoidea) is widely distributed around the globe and assembles about 1584 described species. The family is diversified in the New World, especially in the Neotropical region, which presents about 472 species in 29 genus. Most chalcidid wasps is primary parasitoids of larvae and pupae of holometabolous insects (including lepidopterans, dipterans and coleopterous) and, some of their hosts are of importance as agricultural pests, such as some eucalyptus defoliator. Here is presented a synopsis of the species of Chalcididae parasitoid of lepidopteran defoliator pests of eucalyptus in the New World. This synopsys includes a checklist of the parasitoid species and their defoliator hosts, associated plant, geographic distribution, previously and new records to each host-parasitoid association, and comments and corrections to the records. Identification tools such as diagnoses, identification key and illustrations also are presented. This synopsys include 18 Chalcididae species, six belonging to *Brachymeria* and 12 to *Conura* (two undescribed), 19 host species and 46 host-parasitoid associations (17 as new records).

Key words: Biological control, Chalcidoidea, tritrophic interactions, natural enemies, parasitoid wasps.

Apresentação

Nesta dissertação é apresentada uma sinopse das espécies de vespas parasitoides da família Chalcididae (Hymenoptera) associadas a lepidópteros desfolhadores considerados pragas em plantio de eucalipto no Novo Mundo.

Os resultados são apresentados em forma de manuscrito que deverá ser submetido para Revista Brasileira de Entomologia, e assim, segue as normas de elaboração deste periódico.

Chalcididae (Hymenoptera) parasitoids of eucalyptus defoliators (Lepidoptera) in the New World

Introduction

The family Chalcididae (Hymenoptera, Chalcidoidea) currently includes about 1584 described species arranged in 83 genera and 8 subfamilies (Cruaud et al., 2021). The family is widely distributed around the world, except by the polar regions, and some of its genus are diversified in the New World especially in the Neotropical region (Bouček and Halstead, 1997; Cruaud et al., 2021; Delvare, 2006; Tavares and Aquino, 2014), with about 472 species in 29 genus recorded (Noyes, 2019).

Species of Chalcididae can be distinguished from others chalcidoids by their relatively larger size (body length about 1.5–2.7 mm); body generally black, yellow, brownish or orangish with dark or light marks, rarely with metallic reflections; head and mesosoma strongly sclerotized and usually with coarse sculpture on its dorsum; genal carina usually present; prepectus usually reduced and hardly visible; notauli complete; fore wing not folded longitudinally at rest; metacoxa and metafemur enlarged, the latter usually with its ventral margin toothed or serrulate; and metatibia arched (Bouček and Halstead, 1997; Cruaud et al., 2021; Delvare, 2006; Tavares and Aquino, 2014).

Most chalcidid wasps are primary parasitoid of larvae and pupae of holometabolous insects (Bouček and Halstead, 1997; Delvare, 2006; Tavares and Aquino, 2014), yet, some species of *Chalcis* Fabricius, 1787 oviposit on eggs of their soldier fly hosts (Bouček and Halstead, 1997; Delvare, 2006; Tavares and Aquino, 2014). The hosts are mostly lepidopterans, dipterans and coleopterous, however, some species parasitize Neuroptera, Strepsiptera and others hymenopterans (Delvare, 2006; Tavares and Aquino, 2014). Some chalcidid are facultative or obligate secondary parasitoids of Lepidoptera through Diptera (Tachinidae and Sarcophagidae) and Hymenoptera (Ichneumonidae and Braconidae) (Delvare, 2006; Tavares and Aquino, 2014). They attack or are associated with species of economic importance, such as pests of eucalyptus (Ohashi and Berti Filho 1988; Pedrosa-Macedo et al., 1993; Zanuncio et al., 1993; Zache et al., 2012).

The establishment of monocultures, foments the colonization of several phytophagous insects, some of them becoming pests, as usually it occurs in eucalyptus plantations (Zanuncio et al., 1991). Parasitoids are important natural enemies to control their host population and they are largely used as agents in classical biological control against insect pests and most of them are hymenopterans (Colmenarez et al., 2018; Sampaio et al., 2010).

Nevertheless, there is outdated or lack of information about the associations of Chalcididae species to important pests species, especially eucalyptus pests. Therefore, the objective of this work is to provide a commented checklist and identification tools (diagnoses, identification key, and illustrations) of the Chalcididae parasitoids of Lepidoptera defoliator pests of eucalyptus of the New World.

Material and Methods

Initially, it was carried out a search for species of defoliator lepidopterans considered as pests of eucalyptus in New World. The sources to this search was: Zanuncio et al. (1989, 1992a, 1992b, 1993a, 1993b, 1993c, 1993d, 1994, 1998, 2006); Pedrosa-Macedo et al. (1993); Alves et al. (1994); Gallo et al. (2002); Bragança et al., (2004); Santos et al. (2008); Dall'oglio et al., (2013); and Lemes and Zanuncio (2021).

Following, records of chalcidid parasitoid associated to defoliator lepidopteran of eucalyptus were searched in the literature and in online databases, such as: *Universal Chalcidoidea Database* (www.nhm.ac.uk/chalcidoids); *Biodiversity Heritage Library* (https://www.biodiversitylibrary.org/), JSTOR (https://www.jstor.org/), *Internet Archive* (https://archive.org/), *National Agricultural Library Digital Collections* of *United States Department of Agriculture* (https://naldc.nal.usda.gov/); Google Scholar (https://scholar.google.com.br/); and Periódicos CAPES (https://www-periodicos-capes-gov-br.ezl.periodicos.capes.gov.br/). As many retrieved records were secondary records, the primary source of each record was accessed and checked out whenever possible.

Finally, it was carried out a search for chalcidid specimens deposited in entomological collections and belonging to the family Chalcididae that emerged from lepidopterans species classified as eucalyptus defoliator pest in the New World. The specimens studied were provided by the following collections: **BMNH,** Natural History Museum, London, United Kingdom; **DZUP,** Coleção Entomológica Padre Jesus Santiago Moure, Departamento de Zoologia, Universidade Federal do Paraná, Curitiba, Brazil; **FIOC,** Fundação Instituto Oswaldo Cruz, Rio de Janeiro, Brazil; **INESALTA,** Instituto de Investigaciones Entomológicas Salta, Salta, Argentina; **MACN,** Museo Argentino de Ciencias Naturales, Buenos Aires, Argentina; **MLPA,** Museo de La Plata, Universidad Nacional de La Plata, La Plata, Argentina; **UFES,** Universidade Federal do Espírito Santo, Espírito Santo, Brazil; **USNM,** United States National Museum, Washington DC, United States of America; **ZSM**, The Bavarian State Collection for Zoology, Munich, Germany.

Vouchers of each retrieved record were accessed and checked out whenever possible. The voucher of *Spilochalcis flavicans* (Sauer, 1946) and *Spilochalcis hirtifemora* (Riggin et al., 1993, 1992) were analyzed through specimen images.

The data regarding Chalcididae (Hymenoptera) associated with species of the genus *Oiketicus* Guilding, 1827 (Lepidoptera, Psychidae) were not included in this work, once there is another parallel work being carried out on this guild in the Laboratório de Biodiversidade de Insetos (Departamento de Ciências Biológicas, Centro de Ciências Humanas e Naturais, Universidade Federal do Espírito Santo).

The morphological study of chalcidid specimens was carried out using the stereomicroscopes Leica M80 (10× ocular) and Leica M205 C (16× ocular with graticule of 10mm/100) with planapo 1× and a system of illumination of LED RL 5000 ring.

In the diagnoses presented the measurements is in millimeters (mm). The terminology adopted follows Gibson (1997) and *Hymenoptera Anatomy Ontology* (Yoder et al., 2010; HAO: http://portal.hymao.org/).

The terminology for the sculptures are those provided by Harris (1979), except for the punctures of mesosoma that follows Delvare, (1992). The underlined features in the diagnosis are considered the most important for the identification of the group or species, not necessarily mean that are exclusively to them. New records of host-parasitoid and parasitoid distribution is indicated by an asterisk (*). The information about the geographic distribution and biology of chalcidid species presented here is from were consulted in the *Universal Chalcidoidea Database*, in from the referenced literature and in the from specimens labels.

The illustrations were produced using an automated Leica Z16 stereomicroscope with 1.0× and 2.0× objectives, and a Leica DFG495 camera, integrated into the Leica Application Suite (LAS) system; and with JVC Digital Camera KY-F75U 3-CCO camera integrated in the Cartograph v. 6.3.0 system. The photo stacks were combined using Helicon Focus v. 5.3, and the images were treated and plates were created on Adobe Photoshop v. 24.1.1.

Results and Discussion

Eighteen species of Chalcididae parasitoids associated to defoliator lepidopterans considered pests of eucalyptus plantations, six belonging to *Brachymeria* Westwood, 1829 and 12 to *Conura* Spinola, 1837. Two species of *Conura* are undescribed. Additionally, 19 species of lepidopteran host and 46 host-parasitoid associations (17 as new records). Only two parasitoid-host interactions were not confirmed, since neither their vouchers were accessed nor specimens created from these host species were found in collections.

A checklist of species of Chalcididae (Hymenoptera, Chalcidoidea) associated with Lepidoptera defoliating pests of eucalyptus is presented below (Table 1). It also includes information of their hosts, associated plant, geographic distribution and source of each host-parasitoid association, and comments and corrections to the records is presented. Following the checklist, it is presented identification tools, such as key, diagnoses, complimentary remarks and comments to chalcidid species and records, and illustrations.

Table 1 Checklist of Chalcididae parasitoids of Lepidoptera defoliator pests of eucalyptus in the New World, including Lepidoptera host stage and species parasitized, host plant, record distribution (country and state/department/territory), and reference.

Parasitoid	Host stage	Lepidoptera host	Host plant(s)	Locality	Reference
Brachymeria					
B. annulata (Fabricius, 1793)	Pupa	*Eupseudosoma aberrans* Schaus, 1905	*Eucalyptus spp.*	Brazil (Minas Gerais and São Paulo)	Ohashi, 1984[a]; Ohashi and Berti Filho, 1988[a]; Pedrosa-Macedo et al., 1993[c]; Zanuncio et al., 1993[c]
	Pupa	*Eupseudosoma involuta* (Sepp., 1852)	*Eucalyptus spp.*	Brazil (Minas Gerais and São Paulo)	Ohashi, 1984[a]; Ohashi and Berti Filho, 1988[a]; Pedrosa-Macedo et al., 1993[c]; Zanuncio et al., 1993[c]
	Pupa	*Eupseudosoma spp.*	*Eucalyptus spp.*	Brazil	Gallo et al., 2002[c]
	Pupa	*Euselasia eucerus* Hewitson, 1872	*Eucalyptus spp.*	Brazil	Pedrosa-Macedo et al., 1993[c]; Gallo et al., 2002[c]
	Pupa	*Euselasia euploea* Hewitson, 1854	*Eucalyptus spp.*	Brazil (Minas Gerais)	Ohashi, 1978[a], 1984[b]
	Pupa	*Euselasia euploea eucerus* Hewitson, 1854	*Eucalyptus spp.*	Brazil (Minas Gerais)	Zanuncio et al., 1993[e]; *present study
	Pupa	*Euselasia sp.*	*Eucalyptus spp.*	Brazil (Minas Gerais)	De Santis 1969[a,+]
	-	*Fulgurodes sartinaria* Guenée, 1858	*Eucalyptus spp.*	Brazil (Minas Gerais)	*present study
	Pupa	*Glena sp.*	-	Brazil (Minas Gerais and São Paulo)	Ohashi, 1984[a]
	Pupa	*Iridopsis panopla* Prout, 1932	*Eucalyptus grandis*	Brazil (Mato Grosso do Sul)	Lucchetta et al., 2022[a,+]

	Pupa	*Melanolophia consimilaria* (Walker, 1960)	-	Brazil (São Paulo)	*present study
	Pupa	*Nystalea nyseus* (Cramer, 1775)	-	Brazil (Minas Gerais)	*present study
	Pupa	*Oxydia sp.*	*Eucalyptus spp.*	Brazil (Minas Gerais and São Paulo)	Ohashi, 1984[a]
	Pupa	*Sabulodes caberata* Guenée, 1857	*Persea americana*	United States of America (California)	McKenzie, 1935[a]; Thompson, 1954[b]; Peck, 1963[b]
	Pupa	*Sarsina violascens* (Herrich-Schaeffer, 1856)	*Eucalyptus spp.*	Brazil (Minas Gerais and São Paulo)	Silva et al., 1968[b]; Herting, 1976[b], 1977[b]; De Santis, 1980[b]; Ohashi, 1984[a]; Pedrosa-Macedo et al., 1993[c]; Zanuncio et al., 1993[c]; Gallo et al., 2002[c]; *present study
	Pupa	*Spodoptera frugiperda* (Smith, 1797)	*Zea mays*	United States of America, Brazil (northeast region and São Paulo), and Argentina	Parker et al., 1953[a]; De Santis, 1967[b]; Silva et al., 1968[b]; Herting, 1976[b]; Ashley, 1979[b]; Guagliumi, 1973[a]; Ohashi, 1984[a]; Grant and Shepard, 1987[a]; Molina-Ochoa et al., 2003; Tavares and Aquino, 2014[b]
	Pupa	*Thyrinteina arnobia* (Stoll, 1782)	*Corymbia citriodora*, *Eucalyptus spp.*	Brazil (Minas Gerais and São Paulo)	Ohashi, 1984[a]; Souza et al., 2016[a]; Candelária et al., 2017[a,+]
B. flavipes (Fabricius, 1793)	Pupa	*Spodoptera frugiperda* (Smith, 1797)	*Gossypium spp.*	United States Virgin Islands (Saint Croix)	Wilson, 1923[a,+]; Luginbill, 1928[b]; Burks, 1960[b], 1979[b]; Thompson, 1954[c]; Burks, 1960[b], 1979[b]; De Santis, 1979[b]; Molina-Ochoa et al., 2003[b]

B. koehleri Blanchard, 1935	-	*Euselasia eucerus* Hewitson, 1872	*Eucalyptus spp.*	Brazil (Minas Gerais)	*present study
	-	*Sarsina violascens* (Herrich-Schaeffer, 1856)	-	Brazil (Minas Gerais)	*present study
	Pupa	*Thyrinteina arnobia* (Stoll, 1782) Note: according to Candelária et al (2017), this association is a possible secondary parasitism through a puparium of a Diptera.	*Eucalyptus spp.*	Brazil (São Paulo)	Candelária et al., 2017[a,+]; *present study
B. mnestor (Walker, 1841)	-	*Euselasia euploea* Hewitson, 1854	-	Brasil (Rio Grande do Sul*)	*present study
	-	*Fulgurodes sartinaria* Guenée, 1858	*Eucalyptus spp.*	Brazil (Minas Gerais)	*present study
	-	*Nystalea nyseus* Cramer, 1775	-	Brazil (Minas Gerais)	*present study
	-	*Sarsina violascens* (Herrich-Schaeffer, 1856) Note: labeled {*parasito de larva Apechtis e de Sarsina violascens*}	-	Brazil (Rio de Janeiro)	*present study
	-	*Spodoptera frugiperda* (Smith, 1797)	-	Venezuela	Herting, 1976[b]; De Santis, 1979[b]
	Pupa	*Thyrinteina arnobia* (Stoll, 1782)	*Eucalyptus spp.*	Brazil (Bahia*, Mato Grosso do Sul*, and São Paulo)	Candelária et al., 2017[a,+]; *present study
B. pandora (Crawford, 1914)	-	*Euselasia euploea* Hewitson, 1854	-	Brazil (São Paulo*)	*present study
	Pupa	*Sabulodes caberata* Guenée, [1858]	*Macadamia sp.*	Brazil (São Paulo*)	*present study
	Pupa	*Thyrinteina arnobia* (Stoll, 1782)	*Eucalyptus spp., E. urograndis*	Brazil (Bahia, Mato Grosso do Sul*, Minas Gerais, and São Paulo*)	Souza et al., 2017[a,+]; *present study

	Pupa	*Thyrinteina leucoceraea* Rindge, 1961	*Eucalyptus urophylla*	Brazil (Minas Gerais)	Zache et al., 2012[a,+]
B. subrugosa Blanchard, 1942	-	*Sarsina violascens* (Herrich-Schaeffer, 1856)	-	Brazil (Bahia)	*present study
	-	*Thyrinteina arnobia* (Stoll, 1782)	-	Brazil (Bahia)	*present study
Brachymeria spp.	Pupa	*Fulgurodes sartinaria* Guenée, 1858	*Pinus patula*	Brazil (Minas Gerais)	Santos et al., 1993[a]
	-	*Spodoptera frugiperda* (Smith, 1797)	-	Jamaica	Thompson, 1954[b]
	Pupa	*Thyrinteina arnobia* (Stoll, 1782)	*Eucalyptus cloeziana*	Brazil (Minas Gerais)	Gonzales et al., 2017[a]
Conura					
Co. femorata (Fabricius, 1775)	Larva	*Spodoptera frugiperda* (Smith, 1797)	*Gossypium spp*., *Saccharum spp*.	United States Virgin Islands (Saint Croix) and Venezuela	Wilson, 1923[a]; Luginbill, 1928[b]; Burks, 1940[b]; Thompson, 1954[b]; Guagliumi, 1962[a]; Herting, 1976[b]; De Santis, 1979[b]; Maes, 1989[b]; Bouček and Delvare, 1992[b]; Cave, 1993[b]; Molina-Ochoa et al., 2003[b]
Co. hirtifemora (Ashmead, 1885)	Larva	*Spodoptera frugiperda* (Smith, 1797) Note: secondary parasitoid.	*Zea mays*	United States of America (Georgia)	Riggin et al., 1992[a,+], 1993[a,+]; Molina-Ochoa et al., 2003[a]
Co. igneoides (Kirby, 1883)	-	*Spodoptera frugiperda* (Smith, 1797)	*Gossypium spp*.	United States Virgin Islands (Saint Croix)	Wilson, 1923[a]; Luginbill, 1928[b]; Burks, 1940[b], 1979[b]; Muesebeck et al., 1951[b]; Thompson, 1954[b]; Peck, 1963[b]; De Santis, 1979[b]; Maes, 1989; Molina-Ochoa et al,. 2003[b]

Co. immaculata (Cresson, 1865)	-	*Spodoptera frugiperda* (Smith, 1797)	*Saccharum spp.*	Venezuela	Guagliumi, 1962[a]; Herting, 1976[b]; De Santis, 1979[b]; Maes 1989[b]; Cave, 1993[b]; Molina-Ochoa et al., 2003[b]
	Pupa	*Thyrinteina arnobia* (Stoll, 1782)	*Corymbia citriodora*, *Eucalyptus spp.*	Brazil (Bahia*, Mato Grosso do Sul*, and São Paulo)	Becchi et al., 2016[a]; Candelária et al. 2017[a,+]; *present study
Co. koehleri (Blanchard, 1935)	Cocoon	*Phobetron hipparchia* Cramer, 1777 Note: secondary parasitoid	*Ilex paraguariensis*	Argentina (Misiones)	*present study
Co. maculata (Fabricius, 1787)	-	*Nystalea nyseus* Cramer, 1775	-	Brazil (Minas Gerais*)	*present study
Co. meteori (Burks, 1940)	Larva	*Spodoptera frugiperda* (Smith, 1797) Note: secondary parasitoid through *Cotesia marginiventris* (Hymenoptera, Braconidae).	*Sorghum bicolor*, *Zea mays*	United States of America (Virginia)	Hofmaster and Greenwood, 1949[a]; Muesebeck et al., 1951[b]; Peck, 1963[b]; Herting, 1976[b], 1977[b]; Molina-Ochoa et al. 2003[b]
Co. ruffinellii (Blanchard, 1947)	Larva	*Spodoptera frugiperda* (Smith, 1797) Note: secondary parasitoid through cocoons of *Campoletis grioti* (Hymenoptera, Ichneumonidae).	*Zea mays*	Brazil (Paraná)	Lucchini and Almeida, 1980[a]
Co. side (Walker, 1843)	-	*Spodoptera frugiperda* (Smith, 1797) Note: secondary parasitoid through *Meteorus laphygmae* (Hymenoptera, Braconidae); multiparasitism with *Catolaccus aeneoviridis* (Hymenoptera, Pteromalidae) of cocoons of *M. laphygmae* on *Sp. frugiperda*.	*Cynodon dactylon*	Canada and United States of America (Texas)	Luginbill, 1928[a]; Vickery, 1929[a]; Muesebeck et al., 1951[b]; Allen, 1962[b]
Co. torvina (Cresson, 1872) Note: Most records of *Co. side* cited before Delvare (1992) refers to *Co. side* (see below).	Larva	*Spodoptera frugiperda* (Smith, 1797) Note: secondary parasitoid through cocoons of *Meteorus laphygma* (Hymenoptera, Braconidae).	-	United States of America (Texas)	Luginbill, 1928[a]; Vickery, 1929[a]; Peck 1963[b]; Burks, 1940[b], 1979[b]
Conura sp. 1	-	*Sarsina violascens* (Herrich-Schäffer)	-	Argentina (Misiones)*	*present study

	Larva	*Thyrinteina arnobia* (Stoll, 1782) Note: secondary parasitoid through Braconidae cocoons (Hymenoptera).	-	Brazil (Minas Gerais)	*present study
Conura sp. 2 *Note: misidentification of Co. flavicans* by Sauer (1946). *See note in the topic about Conura sp. 2*	Pupa	*Mimallo amilia Cramer 1780*	*Psidium guajava*	Brazil (São Paulo)	Sauer, 1946[a,+]; Costa-Lima, 1950[b], 1962[b]; Silva et al., 1968[b]; De Santis, 1980[b]
Conura spp.	Pupa	*Eacles imperialis magnifica Walker 1855* *Note: possible secondary parasitoid (Sauer 1946).*	*Mangifera indica*	Brazil (São Paulo)	Sauer, 1946[a]; Silva et al., 1968[b]
	Larva	*Spodoptera frugiperda* (Smith, 1797) *Note: secondary parasitoid through Campoletis flavicincta* (Hymenoptera, Ichneumonidae).	*Zea mays*	Brazil (Rio Grande do Sul)	Dequech et al., 2004[a]
Dubious records					
Chalcis sp. Note: this record probably refers to a species of *Brachymeria*, *Chalcis* Fabricius, 1787 is usually associated with aquatic Diptera. The identification of the parasitoid is possibly based on outdated literature, formerly *Brachymeria* was treated under *Chalcis*, and the latter under *Smiera* Spinola, 1811 until the 1920s.	*Larva*	*Eupseudosoma aberrans Schaus, 1905*	*Eucalyptus spp*	Brazil (Minas Gerais)	Ohashi and Berti Filho, 1988[a]; Zanuncio et al., 1993[b]
Conura pallens (Cresson, 1865) Note: according to Delvare (1992), this record is based on a misidentification of the parasitoid. This species belongs to the *pygmaea* group of species, it is unlikely that it attacks cocoons of Braconidae. All the information in the literature for this group shows that they attack species of Papilionoidea (Lepidoptera).	*Larva*	*Spodoptera frugiperda (Smith, 1797)* Note: recorded as secondary parasitoid through cocoons of Meteorus laphygmae (Hymenoptera, Braconidae)	-		Luginbill, 1928[a]; Vickery, 1929[b]; Peck, 1963[b]

The superscripts indicates: *****, new record; **+**, voucher checked; **a**, primary source; **b,** secondary source; **c**, author does not specify the source of the information.

Key to species of Chalcididae parasitoids of Lepidoptera defoliating pest of eucalyptus of the New World

1. Body almost always black or dark-brown with tegula and part of the legs white or yellow; mesopleuron with mesepisternum side faced and delimited anteriorly by epicnemial carina (Fig. 5b); metafemur without row of large setae on inner face ventrally; hind tarsal claw with falciform process (Fig. 2c); gaster sessile, petiole short, rarely visible in dorsal view or visible as a transverse narrow strip (***Brachymeria*** Westwood, 1829) **2**

1'. Body usually yellow, orange or reddish with black marks, if body mainly black (or dark-brown), then, pale marks not restrict to tegula and legs; mesopleuron with mesepisternum faced forward and not delimited anteriorly by epicnemial carina; metafemur with row of large setae on inner side; hind tarsal claw without falciform process; gaster most often petiolate, petiole slightly transverse to very long (***Conura*** Spinola, 1837) **7**

2 (1). Preorbital carina absent; postorbital carina absent or poorly developed (Fig. 1c); interantennal projection pilose, developed into thick lamina (Fig. 1b); metacoxa in female with ventral tooth or tubercle (Fig. 2a) **3**

2'. Preorbital and postorbital carinae present; metacoxa in female without ventral tooth or tubercle **6**

3 (2). Occiput without carina delimiting foraminal depression dorsally (Fig. 1d); postorbital carina present near genal carina, not reaching malar carina (Fig. 1c); male F2–F6 ventral face with trichoid sensilla parallel to the flagellomere surface, dilated and compressed at apex (Figs. 2d, 2e); lower face punctulate (Figs. 1b, 1c); mesoscutellum with arched profile (Fig. 1a), as long as wide (Figs. 2e, 2f); frenal carina with straight or rounded median margin (Fig. 2f) ..... ***B. annulata*** **(Fabricius, 1793)**

3'. Occiput with carina delimiting foraminal depression dorsally (Fig. 4c); postorbital carina absent; male antenna with ventral funicular sensory bristle like, not dilated or compressed distaly (Figs. 3e, 4f, 6a); frenal carina with margin forming two lobes or emarginate (Figs. 4d, 5e) **4**

4(3). Male F3–F4 with ventral bristles distinctly long and dense (Fig. 3e); metafemur with outer face with interstice coriarious at least on upper margin, ventrally with obtuse basal tooth, distinctly larger than than following ones (Fig. 3d); metatibia coriarious with shallow punctures (Fig. 3d)..... ..... ***B. flavipes*** **(Fabricius, 1793)**

4'. Male flagellum with at least four flagellomeres with distinctly long and dense ventral bristles; metafemur with outer face with interstice smooth and shiny, ventrally with basal tooth acute (Figs. 4e, 5f); metatibia with coarse and dense punctuation giving it a rugose aspect (Figs. 4e, 5f) **5**

5(4). Male F3–F6 with ventral bristles distinctly long and dense (Fig. 4f); lower face with minute piliferous punctures; mesoscutellum outline angled on posterior third (Fig. 4a), umbilicate foveae larger than those on mesoscutum, interstice narrower than half of foveae diameter (Fig. 4d); frenal carina with two lobes (Fig. 4d); metafemur slightly elongate (Fig. 4e), without inner median-ventral tooth .... ***B. mnestor*** **(Walker, 1841)**

5'. Male F1–F6 with ventral bristles distinctly long and dense (Fig. 6a); lower face with coarse and spaced piliferous punctures (Fig. 5c); mesoscutellum with outline arched on posterior third, umbilicate foveae similar to those on mesoscutum, interstice larger than half of foveae diameter at least in the central portion (Figs. 5d, 5e); frenal carina emarginate (Fig. 5e); metafemur with dorsal outline arched (Fig. 5f), in females with inner median-ventral tooth, sometimes present as an elevation .... ***B. pandora*** **(Crawford, 1914)**

6. Preorbital carinae present on the upper third of the parascrobal area and convergent to form a interocelar carina in front of lateral ocellus(Fig. 7c); antennal scrobe with margin completely carinate (Fig. 7b), carina touching lateral margin of median ocellus (Fig. 7c); torullus at eye line level; interantennal projection as a short carina; male antenna with short bristles; adtorular rugae conspicuous and usually touching the eye (Fig. 7d); subtorular rugae conspicuous and complete (Fig. 7d); metafemur subelliptic , with minute piliferous punctures, ventrally with 8–10 teeth, basal one smaller than following ones (Fig. 7f); hypopygium conspicuously emarginated; mandibular formula 2:3; frenal carina slightly emarginate .... ***B.subrugosa*** **Blanchard, 1942**

6'. Preorbital carina not developed as an interocelar carinae; antennal scrobe with margin carinate on its lower two-thirds, but median ocellus separated from antennal scrobe by a short, straight and conspicuous carina (Fig. 8b); postorbital carina absent on the upper quart of eye height; antennal scrobe with margin not carinate on upper quart (Fig. 8b); torullus distinctly above the level of the eyes line; internatennal projection pilose, developed as a conspicuous carina, with a rectangular profile; male F2–F6 with ventral bristles distinctly long and dense; adtorular and subtorular rugae absent; mandibular formula 2:2; dorsum of pronotum and mesoscutum coriarious, interstice about half of umbilicus diameter (Fig. 7c); mesoscutellum convex (Fig. 7a), interstice smooth and shiny, with a median longitudinal elevated band, without punctures (Fig. 7c); frenal carina well developed, bilobed; metafemur ovate, with coarse and dense piliferous punctures, ventrally with triangular teeth (Fig. 7d), inner basal tooth absent; gaster acuminate, T1 smooth an shiny dorsally ..... ***B. koehleri*** **Blanchard, 1935**

7(2). Mesonotum with pilosity erect and long (Fig. 24a); notauli deep, broad and crenulate (Fig. 24d), occasionally narrow (Fig. 22d) **8**

7'. Mesonotum with pilosity decumbent, not long (Fig. 12a); notauli normal, neither deep, broad or crenulate (Fig. 12e)..... **11**

8(7). Body mainly black, with yellow and brown marks, mesoscutellum yellow (Figs. 30a, 30d); carina bordering gena posteriorly continued as occipital carina; mesoscutum with deep umbilicate foveae (Fig. 30d); propodeum with posterior costula irregular, adpetiolar area hardly distinct (Fig. 30e); hind wing with three hamuli (Figs. 30f, 31a); metafemur ventrally with outer apical teeth larger and broader than the basal ones (Fig. 31b), without inner basal tooth; tarsal claws tickly pectinate; petiole in female about 2.44 × as long as hight (Fig. 30a), in male 1.94 ×..... ***Co. koehleri*** **(Blanchard, 1935)**

8'. Body mainly yellow or orangish, with dark marks carina bordering gena posteriorly not continued as occipital carina; mesoscutum foveate-strigose (Fig. 24d) to strigose (Fig. 22d); propodeum with posterior costula straight, adpetiolar area well delimited (Fig. 22e); metafemur ventrally with outer basal tooth slightly larger than the following teeth; tarsal claws not pectinate; petiole at most 1.88 × as long as hight (Fig. 22a) **9**

9(8). Front vertex with numerous horizontal carinae almost reaching eye margin (Fig. 22b); scrobe shallow; interantenal projection indistict, median carina reaching about 3/4 of the height of scrobe; malar sulcus with internal carina complete (Fig. 22c); notauli narrow; mid lobe of mesoscutum with shallow, irregular and inconspicuous umbilicate foveae more evident laterally (Fig. 22d); parapetiolar apophyses sharp, long and visible dorsally (Fig. 22e); metafemur ventrally with small inner tubercle near base (Fig. 23a) .....
..... ***Co. igneoides*** **(Kirby, 1883)**

9'. Frontovertex with numerous oblique and down arched carinae (Figs. 24b, 26b); scrobe deep (Fig. 24b); interantenal projection convex median carina different (Figs. 24b, 26b); malar sulcus with internal carina near mouth (Fig. 24c) or evanescent towards eye (Fig. 26c); notauli broad; mid lobe of mesoscutum with deep irregular umbilicate foveae (Fig. 24d); parapetiolar apophyses absent; metafemur without inner tooth **10**

10(9). Male, scape slightly enlarged distally (Fig. 25b); both sex, malar sulcus with internal carina near mouth only; propodeum rugose, with strong median carina developed from anterior margin to near petiole cavity (Fig. 24e); petiole with ventral basal lamina reduced, dorsal one developed, and with lateral

longitudinal sulcus; gaster in female elliptic (Fig. 24a), 1.02–1.09 × as long as mesosoma; epipygium 0,70–0,94 × as long as wide ..... ***Co. maculata*** **(Fabricius, 1787)**

10'. Male, scape with ventral subapical indentation (Figs. 27b, 27c); both sex, malar sulcus with internal carina evanescent towards eye; propodeum smooth and shiny with sparse rugae, with two pair of submedian carinae forming irregular areolae on its medial part (Fig. 26e); petiole with basal laminae hardly developed, and with lateral longitudinal sulcus absent; epipygium 1.58-2.13 × as long as wide (Figs. 26a, 27a) .... ***Co. sp.2***

11(7). Antennal scrobe very deep (Fig. 9b); interantennal projection compressed into narrow translucid lamina (Fig. 9b); malar sulcus broad (Fig. 9c); pronotal collar with evident preapical carina (Fig. 9d); mesoscutum with umbilicate foveae (Fig. 9d); frenal carina with sublateral lobes; propodeum with anterosublateral area areolate (Fig. 9e); metafemur ventrally with outer basal tooth sharp and much longer than following teeth (Fig. 9f), inner basal tooth sharp (Fig. 10a); in female, metatrochanter, metafemur distally, and epipygium black (Fig. 9a) ..... ***C. femorata*** **(Fabricius, 1775)**

11'. Antennal scrobes shallow (Fig. 14b); interantennal projection as a weak carina (12b); malar sulcus absent or narrow and superficial (Fig. 12c); pronotal collar without preapical carina; mesoscutum rugose, rugose-strigose or reticulate-strigose; frenal carina without sublateral lobes; propodeum with anterosublateral area not areolate; metafemur ventrally with outer basal tooth slightly larger than the following teeth (fig. 13a), inner basal tooth small or indicated as a convexity; color pattern different from above **12**

12(11). Body mostly black, with yellow and brownish marks; malar sulcus absent; mesoscutum rugose or reticulate-strigose (Fig. 32c); frenal carina laminate (Figs 34c- d) **13**

12'. Body mostly yellow or orange with black marks; malar sulcus narrow and superficial, but present (Figs 12c, 14c); mesoscutum rugose (Fig. 16e) or rugose-strigose (Fig. 14d); frenal carina not laminate **14**

13(12). Male scape greatly enlarged, about twice as wide as flagellum, exceeding vertex, its external outline in frontal view hardly arched, with longitudinal sensillar area on inner side reaching more than one half of its length (Figs 33b–c); petiole in female about 1.48 × as long as hight (Fig. 32a), in male 1.81–2.19 × (Fig. 33a); gaster in female about 1.27–1.61 × as long as mesosoma (Fig. 32a) ..... ***Co. side*** **(Walker 1843)**

13'. Male scape enlarged, about as wide as flagellum, almost to slightly reaching vertex, its external outline in frontal view arched, with longitudinal sensillar area on inner side slightly longer than pedicel (Figs 35a–b); petiole in female about 2.11–2.14 × as long as hight (Fig. 34a), in male 2.40–2.73 × (Fig. 34f); gaster in female about 0.7–1.16 × as long as mesosoma (Fig. 34a) ..... ***Co. torvina*** **(Cresson, 1872)**

14(12). Ventral margin of antennal torulus only slightly above lower eye line; malar sulcus superficial, hardly visible, internal carina present near mouth only (Fig. 18c); propodeum with anterosublateral area rugulose (Fig. 18e) **15**

14'. Ventral margin of antennal torulus distinctly above lower eye line; malar sulcus broad, at least external carina present and conspicuous (Figs 20c, 22c); propodeum with anterosublateral area from coriarious anteriorly to smooth and shiny (Fig. 20e) or coriarious-imbricate to rugulose (Fig. 16f) **16**

15(14). Pronotal dorsum and mesoscutum with pale pilosity (Fig. 12b); in male, scape with elongate latero-ventral sensillar area on distal third, flagellomeres with thick, dark and erect bristles on outer and dorsal faces (Fig. 12d); gena without umbilicate foveae (Fig. 12c); propodeum with anterosublateral area rugulose with conspicuous transverse rugae arising from median carina, median carina developed from anterior margin of propodeum to near petiole cavity (Fig. 12f); gaster in female obtuse, as long as mesosoma .... ***C. hirtifemora*** **(Ashmead, 1885)**

15'. Pronotal dorsum and mesoscutum with thick dark pilosity (Figs 18a–b); in male, scape with rounded sensillar area distally, flagellomeres with scattered, thick, dark and erect bristles on outer and dorsal faces (Fig. 18c); gena with shallow, inconspicuous and sparse umbilicate foveae (Fig. 18c); propodeum with anterosublateral rugulose, median carina present on anterior half of its length (Fig. 18e); gaster in female acuminate, 1.1–1.3 × as long as mesosoma (Fig. 18a) ..... ***C. ruffinellii*** **(Blanchard, 1947)**

16(14). Ocellar-ocular groove absent;scape exceeding vertex by at least one third of its lenght; male, scape with ventral sensillar area elongate and extending over most of scape length; male, flagellomeres with thick and erect bristles on outer and dorsal faces; postorbital sulcus not delimited by postorbital carina in the lower 2/3 of eye margin; male, mid leg with two distal tarsi compressed; metacoxa on laterodorsal face and metafemur on outer face smooth and shiny; petiole in female about 2 × as long as high, in male 3 × as long as high; gaster in female acuminate, about 1.30 × as long as mesosoma, in male 0.90 × .... ***Co. immaculata*** **(Cresson, 1865)**

16'. Ocellar-ocular groove present (Fig. 18d); scape below to exceeding dorsal margin of median ocellus, scape in male broader or not, sensillar area different from above (Figs 16b, 20c); flagellomeres with bristles not scattered, thick, dark or erect (Fig. 20b); postorbital sulcus delimited by postorbital carina in the lower 2/3 of eye margin (Fig. 20c); mid leg with tarsi not compressed; metacoxa and metafemur different from above; petiole at least 2–3 × as long as high (Figs 16a, 20a); gaster in female obtuse, shorter than mesosoma length (Fig. 20a) **17**

17(16). Meso and metasoma yellow, with brown and black marks (Figs 16a, e); scrobe without carina dorsal to interantennal projection (Fig. 16b); male, scape slightly exceeding vertex, not broadened, with small and oval sensillar area distally (Fig. 16b); mesoscutum and mesoscutellum rugose with shallow and irregular foveae (Fig. 16e); propodeum; with median carina developed on the anterior ¾ of propodeal length; adpetiolar area small (Fig. 16f); petiole broadened in the middle of its length (Fig. 16a), with dorsal row and some ventral bristles, in female about 3 × as long as height and in male about 5.5 × .... ***Co. meteori*** **(Burks, 1940)**

17'. Meso and metasoma yellow-orangish (Figs 20a, d) except by a light brown to black mark on mesoscutellum distally; scrobe with carina dorsal to interantennal projection reaching about 2/3 of scrobe height (Fig. 20b); male, scape usually not reaching dorsal margin of median ocellus, broadened (Fig. 20b), sensillar area elongate and extending over most of ventral lenght of scape (Fig. 21b); mesoscutum and mesoscutellum rugose-strigate, without foveae (Fig. 20d); propodeum with median carina developed on the anterior 2/3 of propodeal length, adpetiolar area large (Fig. 20e); petiole not broadened in the middle of its length, glabrous, in both sexes about 2–3 × as long as height (Figs 20a, 21a)..... ***Co. sp. 1***

1 . *Brachymeria* Westwood, 1829

***Brachymeria* Westwood, 1829**

Genus diagnosis. Body almost always black or dark-brown with tegula and part of the legs white or yellow; parascrobal area not produced anteriorly into horn; torulus usually above or at the lower eye line, if below, never close to the clypeus; frenum reflexed and always anteriorly delimited by frenal carina; metafemur without row of large setae on inner face ventrally; metatibia obliquely truncate at apex and with a single spur; hind tarsal claw with falciform process; gaster sessile, petiole short, rarely visible in dorsal view or visible as a transverse narrow strip (Brachymeriinae); genal carina if prolonged into occipital carina, the later not recurved toward occipital foramen; subtorular carina, if present, curved towards eye; mesopleuron with mesepisternum side faced and delimited anteriorly by epicnemial carina; umbilicate foveae always present on pronotal collar and mesoscutum.

1.1 The *annulata* group

Group diagnosis. Interocelar and preorbital carinae absent; postorbital carina if present, not connected to malar carina; parascrobal area narrower than 0.5 × scrobe width; interantennal projection pilose, developed as thick lamina; funicular segments in male with conspicuous dense and long ventral bristles or trichoid sensilla ventrally; adtorular and subtorular carinae absent; scrobe with lower margin aligned or above eye level; mandibular formula 2.3; mesoscutellum with frenal carina with variable margin,

generally emarginate; metacoxa in female with ventral tooth or tubercle; metafemur usually with outer face with interstice smooth and shiny.

1.1.1 *Brachymeria annulata* (Fabricius, 1793)

Figs 1a–f, 2a–e.

Chalcis annulata Fabricius, 1793: 197.

Chalcis ovata Say, 1824: 326–327.

Chalcis annulipes Walker, 1834: 29–30 (synonymized by Schmiedeknecht, 1909: 26).

Chalcis (Brachymeria) annulata (Fabricius): Blanchard, 1840: 255 (combination).

Oncochalcis Jörgensenii Cameron, 1909: 430–431 (synonymized by De Santis, 1967: 208).

Chalcis ovata abiesae Girault, 1917: 19 (variety).

Chalcis abiesae Girault: Rohwer, 1918: 18 (status reviewed).

Brachymeria annulata (Fabricius): Waterston, 1923: 103 (combination).

Brachymeria abiesae (Girault): Essig, 1926: 849 (combination).

Brachymeria ovata (Say): Essig, 1926: 849–850 (combination).

Brachymeria abiesiae (Girault): Thompson, 1954: 195 (misspelling).

Brachymeria (Brachymeria) ovata (Say): Burks, 1960: 258–261 (combination).

Brachymeria ovata ovata (Say): Peck, 1963: 859–863.

Brachymeria (Brachymeria) joergenseni (Cameron): De Santis, 1967: 208 (combination, misspelling).

Brachymeria (Brachymeria) annulata (Fabricius): De Santis, 1979: 57

Diagnosis. Occiput without carina delimiting foraminal depression dorsally; postorbital carina present near genal carina, not reaching malar carina; ventral margin of antennal torulus aligned to lower eye line; male F2–F6 ventral face with trichoid sensilla parallel to the flagellomere surface, dilated and compressed at apex; lower face punctulate; mesoscutellum with arched profile, as long as wide, umbilicated fovea similar to those of midlobe of mesoscutum, interstice wider than 1/2 × fovea diameter; frenal carina with straight or rounded median margin; metafemur with arched profile, outer face punctulate, interstice smooth; metafemur ventrally with basal tooth slightly obtuse, more developed following teeth, without inner median-ventral tooth; metatibia with coarse and dense punctuation giving it a rugose aspect.

Biology. Primary and idiobiont endoparasitoid of pupae of Lepidoptera (Burks, 1960; Ohashi 1984; Noyes, 2019). Ohashi (1984) classified it as saprophytic [sic.] facultative parasitoid, since this parasitoid developed in dead pupae. There are over 100 host species recorded from at least 22 families (Noyes, 2019). It mainly attacks Lepidoptera from the families Arctiidae (Peck, 1963; Herting, 1976; Ohashi and Berti Filho, 1988; Noyes, 2019), Gelechiidae (Peck, 1963; De Santis, 1967; Herting, 1975; Noyes, 2019), Geometridae (Thompson, 1954; Peck, 1963; Herting, 1976; Noyes, 2019), Hesperiidae (Thompson, 1954; De Santis, 1979; Herting, 1976; Noyes, 2019), Lymantriidae (Thompson, 1954; Peck, 1963; Herting, 1976; De Santis, 1980; Noyes, 2019), Noctuidae (Thompson, 1954; Peck, 1963; De Santis, 1967, 1979; Herting, 1976; Noyes, 2019), Nymphalidae (Thompson, 1954; Peck, 1963; De Santis, 1979, 1980; Noyes, 2019), Papilionidae (Thompsom, 1954; De Santis, 1967, 1979, 1980; Noyes, 2019), Pyralidae (Peck, 1963; De Santis, 1967; De Santis, 1979, 1980, 1989; Noyes, 2019), and Tortricidae (Thompson, 1954; Peck 1963; Herting 1975; Noyes, 2019). The record cited by Herting (1977, 1978) of *B. annulata* as a secondary parasitoid of Tachinidae (Diptera) through *Apechthis sarsinae* (Hymenoptera, Ichneumonidae) is very likely a case of misidentification of the parasitoid. Until today, no case of secondary parasitism has ever been reported involving this species as a secondary parasitoid. Several of its hosts are agricultural pests (McKenzie, 1935; Thompson, 1954; De Santis, 1969; Ohashi, 1984; Grant and Sheppard, 1987; Ohashi and Berti Filho, 1988; Pedrosa-Macedo et al., 1993; Zanuncio et al., 1993e; Gallo et al., 2002; Lucchetta et al., 2022; Noyes, 2019). According to Ohashi and Berti Filho (1988) this species has shown to be efficient because of the natural control of *Eupseudosoma aberrans* and *Ep. involuta* because of its high rate of parasitism. Also, Pedrosa-Macedo et al. (1993) and Gallo et al. (2002) recommended it to the biological control of *Eupseudosoma spp*, *Ep. aberrans*, *Ep. involuta*, *Euselasia. eucerus*, and *S. violascens*. However, *B. annulata* seems not to be interested in *Psorocampa denticulata* (Notodontidae, Lepidoptera), that is another eucalyptus pest (Pereira et al., 2001; Santos et al., 2008).

Distribution. From Canada (Ontario and Québec) to Argentina and Uruguay. It was recorded in Finlândia (Europe) by Jussila (1980) (Noyes, 2019).

Note. According to recent studies of the team of the Laboratório de Biodiversidade de Insetos (DCBio/CCHN/UFES), the species *Brachymeria ovata* (Say, 1824) is a synonymy of *B. annulata* (Fabricius, 1793) (M.T. Tavares, personal communication). Therefore, all the records or citations about *B. ovata* here are referred to as *B. annulata*. Most of the published records surveyed refer to this species under the name *B. ovata*: McKenzie (1935), Thompson (1954), Peck (1963), Silva et al. (1968), De Santis (1969, 1980), Herting (1976, 1977), Ohashi (1978, 1984), Ashley (1979), Jussila (1980), Grant and Sheppard (1987), Ohashi and Berti Filho (1988), Pedrosa-Macedo et al. (1993), Zanuncio et al. (1993e), Gallo et al. (2002), and Molina-Ochoa et al. (2003).

Material examined. **Brazil**. *Mato Grosso do Sul*: 4#f 1#m. Ribas do Rio Pardo, FRIGG, 28.V.2019. ex pupae of *Iridopsis panopla* in plantation of eucalyptus, F.F.Pereira and J.T.Lucchetta col. (UFES). *Minas Gerais*: 10#f 4#m., Itamarandiba, IX.2014. ex *Fulgurodes sartinaria* on eucalyptus, J.C.Zanuncio col. (UFES); 1#f, Mesquita, 6.V.1977. ex *Euselasia euploea eucerus*, Moraes col. (MLPA); 1#m, Ipatinga, 22.VI.2016. ex *Nystalea nyseus*, A.B.Horta col. (UFES); 2#f 3#m, Belo Horizonte, IV.1969. ex chrysalid of *Euselasia sp.* in plantation of *Eucalyptus spp.*, C.Valle col. (MLPA). *São Paulo*: 2#f 1#m,

Borebi, IX.2015. ex. *Thyrinteina arnobia*, M.C.Candelária col. (UFES); 2#m, Lençóis Paulistas, 23.VI.2011. ex pupa of *Melanolophia consimilaria*, B.Zaché col. (UFES).

1.1.2 *Brachymeria flavipes* (Fabricius, 1793)

Figs 3a–e.

Chalcis flavipes Fabricius, 1793: 197–198.

Chalcis robusta Cresson, 1865: 101 (synonymized by Bouček and Delvare, 1992: 25).

Brachymeria flavipes (Fabricius): Rye, 1870: 183 (combination); Bouček and Delvare, 1992: 25 (taxonomia).

Chalcis robustella Wolcott, 1924: 56–57 (synonymized by Bouček and Delvare, 1992: 25).

Brachymeria robusta (Cresson): Luginbill, 1928: 74 (combination).

Brachymeria robustella (Wolcott): Russo, 1927: 60.

Brachymeria (Brachymeria) robusta (Fabricius): Burks, 1960: 255–257 (combination).

Diagnosis. Occiput with carina delimiting foraminal depression dorsally; postorbital carina absent; male F3–F4 with ventral funicular sensory bristle like, not dilated or compressed distally, distinctly long and dense; lower face with coarse and sparse punctures; mesoscutellum with angled profile in the posterior third, umbilicated fovea similar to those of midlobe of mesoscutum, interstice narrower than 1/2 fovea diameter; frenal carina with well developed margin, forming two lobes; metafemur slightly elongated, outer face puncticulate, interstice coriarious, at least on upper margin; metafemur ventrally with obtuse basal tooth, distinctly larger than than following ones, without inner median-ventral tooth; metatibia puncticulate with shallow punctures, interstice coriariou.

Biology. Primary parasitoid of pupae of Lepidoptera from the families Arctiidae (Thompson, 1954; Peck, 1963; Herting, 1976; Burks, 1979; Noyes, 2019), Hyblaeidae (Thompson, 1954; De Santis, 1979; Noyes, 2019), Megalopygidae (Peck, 1963; Burks, 1979; De Santis, 1979; Noyes, 2019), Noctuidae (Thompson, 1954; Burks, 1979; De, Santis 1979; Noyes, 2019), Nymphalidae (Burks, 1979; Noyes, 2019), Papilionidae (Peck, 1963; Burks, 1979; Herting, 1976; Noyes, 2019), Pyralidae (De Santis, 1989; Noyes, 2019), and Sphingidae (Thompson, 1954; Burks, 1979; De Santis, 1979; Noyes, 2019). It attacks species of economic interest, such as *Alabama argillacea*, *Helicoverpa zea*, *Mocis latipes*, and *Spodoptera frugiperda* (Noctuidae) (Wilson, 1923; Burks, 1960; De Santis, 1979).

Distribution. United States of America (Florida), Mexico, Puerto Rico, British Virgin Islands, Cuba, Dominican Republic, Jamaica, Virgin Islands of the United States of America (Saint Croix), and

Cayman Islands. According to Burks (1960), *Brachymeria flavipes* was introduced in Hawaii (United States of America), however, it did not become established.

Note. The voucher of *B. flavipes* (*Chalcis robusta*) emerged from *Spodoptera frugiperda* recorded by Wilson (1923) was verified, the identity of the species of the parasitoid is confirmed.

Material examined. **United States of America.** *Virgin Islands of the United States of America*: 1#f, Saint Croix, 30.X.1920, ex pupa of *Spodoptera frugiperda* on *Gossypium spp*., C.E.Wilson col. (USNM).

1.1.4 *Brachymeria mnestor* (Walker, 1841)

Figs 4a–f.

Chalcis Mnestor Walker, 1841: 219.

Chalcis Orseis Walker, 1842: 338–339 (synonymized by Bouček, 1992: 90).

Chalcis comitator Walker, 1862: 350–351 (synonymized by Bouček, 1992: 90).

Chalcis pendator Walker, 1862: 351–352 (synonymized by Bouček, 1992: 90).

Chalcis vicaria Walker, 1862: 183 (synonymized by Bouček, 1992: 90).

Brachymeria comitator (Walker): Sauer, 1946: 13 (combination).

Brachymeria (Brachymeria) comitator (Walker): Burks, 1960: 257–258 (combination).

Brachymeria orseis (Walker): Guagliumi, 1962: 622 (combination).

Brachymeria (Brachymeria) mnestor (Walker): De Santis, 1967: 208 (combination).

Brachymeria (Brachymeria) pendator (Walker): De Santis, 1979: 61 (combination).

Brachymeria (Brachymeria) orseis (Walker): De Santis, 1979: 59 (combination).

Brachymeria (Brachymeria) vicaria (Walker): De Santis, 1980: 253 (combination).

Brachymeria mnestor (Walker): Bouček, 1992: 90.

Brachymeria (Brachymeria) minestor (Walker): Campos-Farinha and Pinto, 1996: 165–167 (misspelling).

Diagnosis. Occiput with carina delimiting foraminal depression dorsally; postorbital carina absent; male F3–F6 with ventral funicular sensory bristle like, not dilated or compressed distaly, distinctly long and dense; lower face with minute piliferous punctures; mesoscutellum outline angled on posterior third, umbilicate foveae larger than those on mesoscutum, interstice narrower than half of foveae diameter;

frenal carina with median margin emarginate, occasionally forming two lobes; metafemur slightly elongated, outer face punctulate, interstice smooth; metafemur ventrally with basal tooth acute, slightly more developed than the following teeth, without inner median-ventral tooth; metatibia with coarse and dense punctuation giving it a rugose aspect.

Biology. Gregarious primary parasitoid of Lepidoptera. It attacks species from the families Hesperiidae (Herting, 1976; Noyes, 2019), Noctuidae (Herting, 1976; De Santis, 1979, 1980; Noyes, 2019), Papilionidae (De Santis, 1979; Tavares, Navarro-Tavares and Almeida, 2006; Noyes, 2019), Pieridae (De Santis, 1980; Noyes, 2019), Pyralidae (De Santis, 1979, 1980; Noyes, 2019), and Syntomidae (Herting, 1976; Burks, 1979; Noyes, 2019). *Brachyemria mnestor* atacks hosts of economic important, for example: *Alabama argillacea*, *Spodoptera frugiperda* (Noctuidae) (Herting, 1976; De Santis, 1979, 1980), and *Ceramidia butleri* (Syntomidae) (Burks, 1979). De Santis (1980) cites *B. mnestor* parasitizing a Braconidae of the genus *Hormius* (Hymenoptera), however it was not possible to confirm this information.

Distribution. From the United States of America (New York, New Jersey, Texas and Florida) to Brazil (Amazonas, Bahia*, Mato Grosso Do Sul*, Minas Gerais, Rio de Janeiro, São Paulo, and Rio Grande do Sul*), Uruguay, and Argentina (Buenos Aires).

Material examined. **Brazil**. *Bahia*: 1#f, Porto Seguro, Caravelas Florestal, 2015. ex. *Thyrinteina arnobia*, (UFES). *Mato Grosso do Sul*: 1#f, Três Lagoas, 16.V.2017,. ex. *Thyrinteina arnobia* in plantation of eucalyptu, A.B.Horta col. (UFES). *Minas Gerais*: 2#f 2#m, Itamarandiba, XI.2014, ex. *Fulgurodes sartinaria* on *Eucalyptus*, J.C.Zanuncio col. (UFES); 1#f, Ipatinga, 22.VI.2016, ex. *Nystalea nyseus*, A.B.Horta col. (UFES). *Rio de Janeiro*: 2#f 3#m, Petrópolis, Vale do Cuiabá, São Joaquim farm, 2.X.1950 and 4.X.1950, ex. *Apechthis* and *Sarsina violascens*, A.Silva col. (FIOC). *São Paulo*: 4#f 5#m. Borebi, IX.2015. ex. *Thyrinteina arnobia*, M.C.Candelária col. (UFES, LaBI nº43570-43578). *Rio Grande do Sul*: 1#m. Guaíba, 5.VII.1985. ex. *Euselasia euploea*, A.Bressan col. (UFPR).

1.1.5 *Brachymeria pandora* (Crawford, 1914)

Figs 5a–f, 6a.

Chalcis pandora Crawford, 1914: 87–88.

Brachymeria (Brachymeria) pandora (Crawford): De Santis, 1979: 60 (combination).

Diagnosis. Occiput with carina delimiting foraminal depression dorsally; postorbital carina absent; male F1–F6 with ventral funicular sensory bristle like, not dilated or compressed distaly, distinctly long and dense; lowe face with coarse and sparse punctures; mesoscutellum with outline arched on posterior third, umbilicate foveae similar to those on mesoscutum, interstice larger than half of foveae diameter at least in the central portion; frenal carina with median margin emarginate; metafemur with dorsal outline

arched, outer face punctuate, interstice smooth; metafemur ventrally with basal tooth acute, slightly more developed than the following teeth, in females with inner median-ventral tooth, sometimes present as an elevation of the tegument; metatibia with coarse and dense punctuation giving it a rugose aspect.

Biology. Gregarious primary parasitoid of Lepidoptera. It attacks species from the families Geometridae (Zaché et al., 2012, Noyes, 2019); Hesperiidae (Tinôco et al., 2012; Tavares and Aquino, 2014; Noyes, 2019), Nymphalidae (Gil-Santana and Tavares, 2005; Tavares and Aquino, 2014; Noyes, 2019), and Riodinidae*. It parasitizes both larvae and pupae of its hosts (Tinôco et al., 2012).

Distribution. Venezuela, Guyana, and Brazil (Pará, Bahia, Mato Grosso do Sul*, Minas Gerais, Rio de Janeiro, São Paulo* and Rio Grande do Sul).

Material examined. **Brazil**. *Bahia*: 4#f 4#m, Inhambupe, 09.X.2001, ex. *Thyrinteina arnobia* on *Eucalyptus urograndis*, R.C.Pereira col. (UFES); 1#m, Eunápolis, 30.I.2017, ex *Thyrinteina arnobia* on *Eucalyptus sp.*, M.M.Moreira col.; 3#f, Mucuri, -18.003994S -39.604039W, 30.V.2015, ex. *Thyrinteina arnobia*, N. dos Anjos col. (UFES). *Mato Grosso do Sul*: 27#f. 5#m, Três Lagoas, 16.V.2017, ex. *Thyrinteina arnobia* on eucalyptus plantation, A.B.Horta col. (UFES). *Minas Gerais*: 1#f 2#m, Itamarandiba, emerged on 13.III.2017, ex *Thyrinteina arnobia* em *Eucalyptus cloeziana*, C.J.Gonzales col.; 4#f, Sete Lagoas, 1.III.2010, ex. *Thyrinteina leucoceraea* on *Eucalyptus urophylla*, B.Zache col. (UFES); 1#f 1#m, Viçosa, 10.XI.2006, ex. pupa of *Thyrinteina arnobia*, R.Pinto col. (UFES). *São Paulo*: 2#f 1#m, Vargem Grande do Sul, 20.VII.1995, ex. pupa of *Sabulodes caberata caberata* on macadamia, E.B. Bernardi col. (UFES); 1#f, Mogi Guaçu, Champion Papel e Celulose, 14.VII.1982, ex. crisálida of *Thyrinteina arnobia*, E.P.Teixeira col. (UFES); 1#m, Bofete, 22.IV.1995, ex. *Thyrinteina arnobia* on *Eucalyptus*, E.Berti-Filho col. (UFES). *Rio Grande do Sul*: 1#m, Guaíba, 5.VIII.1985, ex. *Euselasia euploea*, A.Bressan col. (UFES).

1.2 The *conica* group

Group diagnosis. Vertex with angled outline; interocelar carina present, if inconspicuous medially it is indicated by narrow band without punctures and by a bulge in front of lateral ocelli, connected with preorbital carina; preorbital and postorbital carinae present; parascrobal area narrower than 0.5 × scrobe width; interantennal projection vary; funicular segments with short bristles; adtorular carina usually present; subtorular carina present; scrobe with marginal carina complete or not, lower margin below eye level; mandibular formula 2:3 or 2:2; mesoscutellum with variable frenal carina, generally elongate and emarginate; metacoxa without ventral tooth or tubercle; metafemur with outer face with variable interstice.

1.2.1 *Brachymeria subrugosa* Blanchard, 1942

Figs 7a–b.

Brachymeria subrugosa Blanchard, 1942: 116.

Brachymeria (Brachymeria) subrugosa Blanchard: De Santis, 1967: 208.

Diagnosis. Preorbital carina present on upper third of eye height, developed into inverted U-shaped interocelar carina; postorbital carina present; male funicle without trichoid sensilla or differentiated ventral pilosity; scrobe with carinate margin touching lateral margin of median ocellus; ventral margin of antennal torulus aligned to lower eye line; interantennal projection as a short carina; lower face coriarious; adtorular carina conspicuous, usually touching eye; subtorular carina conspicuous and complete; mandibles formula 2:3; propodeum without sublateral projections; metacoxa without ventral tubercle or tooth; metafemur subeliptic, outer face coriarous with diminute puntures, with 8–10 teeth, basal one smaller than others; hypopygium at apex conspicuously emarginate.

Biology. Usually, *B. subrugosa* is a primary solitary parasitoid of pupae of lepidopterans (Aquino et al., 2015; Noyes, 2019). It attacks species from the families Gelechiidae (De Santis, 1967, 1980; Herting, 1975; Tavares and Aquino, 2014; Aquino et al., 2015; Noyes, 2019), Hesperiidae (Aquino et al., 2015; Noyes, 2019), Megalopygidae (Aquino et al., 2015), Noctuidae (De Santis, 1967; Herting, 1976; Tavares and Aquino, 2014; Aquino et al., 2015), Oecophoridae (De Santis, 1979; Aquino et al., 2015; Noyes, 2019), Pyralidae, and Tortricidae (Aquino et al., 2015; Noyes, 2019). It can also parasite puparium of dipterans from the families Muscidae (Tavares and Aquino, 2014) and Tachinidae (De Santis, 1967; Herting, 1978; Tavares and Aquino, 2014. Aquino et al., 2015), occasionally acting as a secondary parasitoid of lepidopterans through Tachinidae (Herting, 1976, 1978; Aquino et al., 2015; Noyes, 2019). Some of its host presents an economic importance, for example: *Alabama argillacea* (Noctuidae) (De Santis, 1967; Herting, 1976, 1978; Aquino et al., 2015), *Hypsipyla grandella* (Pyralidae), and *Stenoma spp*. (Oecophoridae) (Aquino et al., 2015).

Distribution. From the United States of America (Texas) to Argentina (Salta, Chaco, Tucumán and Santa Fe), and Uruguay. New record are presented here for the state of Bahia, in Brazil.

Material examined. **Brazil.** *Bahia*: 1#f, Alagoinhas, X.2016, ex. *Sarsina violascens*, A.B.Horta col. (UFES); 1#m, Mucuri, -18.003994S -39.604039W, 30.V.2015,ex. *Thyrinteina arnobia*, N. dos Anjos col. (UFES).

1.3 The *podagrica* group

Group diagnosis. Interocelar carina absent; preorbital carina present, usually extending from the malar carina to above half height of eye; postorbital carina present; parascrobal area wide, at least 0.5 × scrobe width; interantennal projection eventually very reduced, if present it can be laminar, dentiform or in form of a carina; F2-F6 in male with conspicuous dense and long ventral bristles; adtorular and subtorular carinae absent; scrobe with lower margin distinctly above eye level; mandibular formula 2:2, lower tooth larger than upper; mesoscutellum with frenal carina generally elongate and with bilobed margin; metacoxa without ventral tooth or tubercle.

1.3.1 *Brachymeria koehleri* Blanchard, 1935

Figs 8a–d.

Brachymeria koehleri Blanchard, 1935: 105–107.

Brachymeria (Brachymeria) koehleri Blanchard: De Santis, 1967: 208 (combination).

Diagnosis. Vertex usually with angled outline; median ocellus separated from scrobe by short straight carina; preorbital carina present on the lower 3/4 of eye height; postorbital absent on the upper quart of eye height, reaching genal carina; antennal scrobe with margin not carinate on upper quart; torullus ventral margin distinctly above the level of the eyes line; male F2–F6 with ventral pilosity distinctly long and dense; interantennal projection pilose, as tall conspicuous carina, with rectangular profile; pronotum and mesonotum interstice coriarious, about 1/2 of foveae diameter; mesoscutellum convex with elevated median longitudinal band without punctures, interstice smooth; frenal carina well developed, forming two lobes; metafemur ovate, outer face with coarse and dense punctures, interstice smooth and shiny; metafemur ventrally with triangular teeth, without inner tooth; gaster acuminate, T1 dorsally smooth and shiny.

Biology. Solitary larval-pupal secondary parasitoid of lepidopterans through dipterans Sarcophagidae (De Santis, 1967; Herting, 1978; Tavares and Aquino, 2014; Noyes, 2019) and Tachinidae (Thompson, 1954; De Santis, 1967; Herting, 1978; Tavares, Navarro-Tavares and Almeida, 2006; Tinôco et al., 2012; Tavares and Aquino, 2014; Noyes, 2019). It associated with species from the families Geometridae (Geometridae) (Candelária et al., 2017), Lymantriidae (Tavares et al., 2013; Noyes, 2019), Noctuidae (Herting, 1976, 1978; De Santis, 1979, 1989; Noyes, 2019), Nymphalidae (Tinôco et al., 2012; Noyes, 2019), and Papilionidae (Tavares, Navarro-Tavares and Almeida, 2006; Noyes, 2019). Some of those lepidopterans are of economic important, such as *Alabama argillacea*, *Mocis latipes* (Noctuidae) (De Santis, 1979), and *Thyrinteina arnobia* (Geometridae) (Candelária et al., 2017).

Distribution. Venezuela, Brazil (Pará, Minas Gerais, Rio de Janeiro, and São Paulo), and Argentina (Chaco and Santa Fé).

Material examined. **Brazil.** *Minas Gerais*: 1#f, IX.1967 [no additional data],. ex *Euselasia eucerus* em *Eucalyptus*. (USNM); 2#m, Carangola, VII.1978. ex *Sarsina violascens*, Zanuncio col. (MLPA). *São Paulo*: 1#f, Borebi, IX.2015, ex *Thyrinteina arnobia*, M.C.Candelária col. (UFES); 2#m, Itatinga, 15.IX.1992, ex pupa of *Thyrinteina arnobia*, L.Batista col. (UFES).

2. *Conura* Spinola, 1837

Genus diagnosis. Body usually yellow, orange or reddish with black marks, if body mainly black (or dark-brown), then, pale marks not restrict to tegula and legs; parascrobal area not produced anteriorly into horn; torulus at most slightly below lower eye line, never close to the clypeus; frenum reflexed and almost always anteriorly delimited by frenal carina; metatibia obliquely truncate at apex and with a single spur; hind tarsal claw without falciform process; gaster most often petiolate, petiole slightly transverse to very long (Chalcidinae); mesopleuron with mesepisternum faced forward and not delimited anteriorly by epicnemial carina; metafemur with row of large setae on inner side; hypopygium without median portion narrowly; extended posteriorly; mandibles with two or three teeth

2.1 The *femorata* group

Group diagnosis. Body yellow or orange with black marks; back of head with foraminal depression, not delimited by carina; antennal scrobes somewhat deep; interantennal projection usually not convex, but compressed into narrow translucid lamina; mandibles sharp, formula 2:3, rarely 3:3; malar space distinctly shorter than a height of eye; malar sulcus broad, with internal and external carinae; malar bristles absent; carina bordering gena posteriorly rarely expanded into lamina, not continued as occipital carina; mesonotum with decumbent and not long pilosity; notauli normal, neither deep, broad or crenulate; mesoscutum usually with umbilicate foveae; mesoscutellum with frenal carina laminate, with sublateral lobes; mestascutellum convex, bare, smooth and shiny, distinct from lateral parts of metanotum; propodeum with anterosublateral area areolate; metafemur ventrally with outer basal tooth sharp and much longer than following teeth and inner basal tooth sharp; tarsal claws not pectinate.

2.1.1 *Conura femorata* (Fabricius, 1775)

Fig 9ª–f, 10a–d.

Chalcis fasciata Olivier 1791: 439–440.
Chalcis punctata (Fabricius): Fabricius, 1787: 272; Gmelin, 1790: 2743 (erroneous record for Europe, this species certainly is from South America); Olivier, 1791: 439 (erroneous record for Europe); Fabricius, 1793: 196 (valid species); Fabricius, 1804: 161 (valid species).
Conura femorata (Fabricius): Bouček and Delvare, 1992: 21–23 (combination).
Conura punctata (Fabricius): Sichel, 1866: 360, 392 (combination).
Conura (*Spilochalcis*) *femorata* (Fabricius): Bouček and Delvare, 1992: 21–23 (combination); Delvare, 1992: 367 (valid species).
Crabro femoratus Fabricius, 1775: 375 (valid species by Fabricius, 1781: 472; valid species by Fabricius, 1787: 297; combined by Kirby, 1883: 66; combined by Bouček and Delvare, 1992: 21–23).
Smicra dorsivittata Cameron, 1884: 90 (synonymized by Riley, Ashmead and Howard, 1894: 79).
Smicra femorata (Fabricius): Kirby, 1883: 53–78 (combination).
Smicra geniculata Cameron, 1884: 93 (synonymized by Bouček and Delvare, 1992: 21-23).
Smicra maculicollis Cameron, 1884: 88 (synonymized by Bouček and Delvare, 1992: 21-23).

Smicra nigropicta Cresson, 1872: 29-60.
Smicra punctata (Fabricius): Cresson, 1872: 57 (misspelling).
Smicra subpunctata Walker, 1834: 25.
Smiera dimota Walker, 1864: 196 (synonymized by Kirby, 1883:66; synonymized by Bouček and Delvare, 1992: 21–23).
Smiera femorata (Fabricius): Kirby, 1883: 66 (misspelling).
Smiera multinotata Costa, 1864: 51 (synonymized by Bouček and Delvare, 1992: 21–23).
Smiera nigropicta Cresson, 1872: 29–60 (misspelling) (synonymized by Kirby, 1883: 66).
Smiera punctata (Fabricius): Cresson, 1872: 29–60 (misspelling) (combined by Cresson, 1872: 57).
Smiera subpunctata Walker, 1834: 25 (misspelled by Cresson, 1872: 29–60; synonymized by Bouček and Delvare, 1992: 21–23).
Sphex femorata (Fabricius): Christ, 1791: 291–292 (combination); Bouček and Delvare, 1992: 21–23 (synonymization).
Sphex punctata Fabricius, 1781: 446 (combined by Fabricius, 1787: 272; combined by Sichel, 1866: 349–396).
Spilochalcis dimota (Walker): Ashmead, 1904: 417 (combination); Schmiedeknecht, 1909: 39 (valid species).
Spilochalcis femorata (Fabricius): Bouček and Delvare, 1992: 21-23 21–23 (synonymization).
Spilochalcis femoratus (Fabricius): Riley, Ashmead and Howard, 1894: 79 (synonymization).
Spilochalcis geniculata (Cameron): Burks, 1977: 386 (combination); De Santis, 1979: 7, 46 (combination).
Spilochalcis maculicollis (Cameron): De Santis, 1979: 7, 48 (combination).
Spilochalcis melanura Cameron, 1913: 108 (synonymized by Bouček and Delvare, 1992: 21–23).
Spilochalcis multinotata (Costa): Ashmead, 1904: 419 (combination); Schmiedeknecht, 1909: 40 (valid species).
Spilochalcis nigrum Brèthes: De Santis, 1980: 269 (misspelling).
Spilochalcis t-nigrum Brèthes, 1927: 332 (synonymized by Bouček and Delvare, 1992: 21–23).
Vespa (*Crabro*) *femorata* (Fabricius): Gmelin, 1790: 2765 (combination).

Diagnosis. Body yellow with darkened marks, as follows: midlobe of mesoscutum with a "T"-shaped black mark; propodeum at most with median anterior black mark; metacoxa with dorsolateral black spot medially; metatrochanter with black mark; metafemur with small black spot distally; epipygium in female with black mark. Vertex, dorsum of pronotum collar and mesoscutum with pale pilosity; frontovertex with shallow foveae; antennal scrobe very deep; interantennal projection compressed into narrow translucid lamina; antenna in male with all segments shorter than in female; in female, scape slightly exceeding vertex; in male, scape reaching or slightly exceeding vertex, with small sensillar area on inner face; mandibular formula 2:3; malar sulcus with complete external carina but carina not prolonged behind eye; preorbital sulcus and carina not so evident along the inner orbit; carina bordering gena posteriorly developed into short lamina; pronotal collar with evident preapical carina; mid lobe of mesoscutum and mesoscutellum with deep umbilicate foveae; propodeum with median carina present on anterior half of the length of propodeum; anterior and posterior costulae conspicuous, posterior one in an obtuse angle;

adpetiolar area with pentagonal areola; metacoxa with dorsolateral face smooth and shine, ventral face with shallow umbilicate foveae; metafemur with outer face with interstice smooth at least on lower half; petiole in female 1.03–1.28 × as long as height, in male 1.96–2.39 ×; gaster in female acuminated, pointed at apex, about 1.13–1.26 × as long as mesosoma, in male 0.81–0.95 ×; epipygium in female about 2 × as long as wide.

Remarks. *Conura femorata* is very close to *Co. attacta* (Walker, 1864) (Fig. 11), both widespread and very common in Neotropical region, and belonging to the *femorata* group of species. They can be distinguished by their color pattern. *Conura femorata* has black marks on metatrochanter, distal part of metafemur, epipygium, and propodeum at most with a median anterior black mark; while *Co. attacta* has no marks on metatrochanter and metafemur, epipygium usually without black spot, and propodeum presents a median black strip. Additionally, in *Co. femorata* the preorbital sulcus and carina are not so evident along the inner orbit, pronotal collar has an evident preapical carina, and metafemur on outer face with interstice smooth at least on lower half; whereas in *Co. attacta* the preorbital sulcus and carina are evident along inner orbit, pronotal collar has the preapical carina irregular or absent, and metafemur has outer surface with interstice coriarious.

Biology. Primary parasitoid of Lepidoptera pupae (Bouček and Delvare 1992; Tavares and Aquino, 2014; Noyes, 2019), attacking hosts belonging to the following families: Gelechiidae, Hyblaeidae, Momphidae, Noctuidae, Psychidae and Pyralidae (Noyes, 2019). Some of its hosts presents economic importance, such as *Helicoverpa zea* (De Santis, 1979), *H. armigera* (Noctuidae) (Thompson 1954) and *Oiketicus kirbyi* (Psychidae) (Herting 1975; De Santis, 1979; Maes 1989).

Distribution. From the United States of America (North Carolina, Texas, Georgia, and Florida) to Argentina. New record is presented here for the state of Minas Gerais, in Brazil.

Material examined. **Brazil**. *Amazonas*: 1#f 1#m. Manaus, Reserva Ducke, 30.XI.1981-9.III.1982. malaise, J.A. Rafael col. (UFES); 1#m. Manaus, Reserva Ducke, 28.VIII.1990, malaise, J. Vidal col. (UFES). *Goiás*: 1#m. Itumbiara, 31.I.2002, Marchiori, C. H. & eq. col. (UFES). *Minas Gerais*: 2#f. Araporã, 21.III.2002, Marchiori, C. H. & eq. col. (UFES)

2.2 The *immaculata* group

Group diagnosis. Body yellow or orange with black marks; back of head without any evident foraminal depression; antennal scrobes shallow; interantennal projection not convex, reduced as a weak carina; mandible sharp, formula 2:3; malar space distinctly shorter or almost half of height of eye; malar sulcus often narrow and superficial, but present; malar bristles absent; carina bordering gena posteriorly not expanded into lamina and present near mouth only, or expanded into narrow lamina and reaching about 2/3 of height of eye; mesonotum with pilosity decumbent, not long; notauli normal, neither deep, broad or crenulate; mesoscutum rugose or rugose-strigose; mesoscutellum with frenal carina not laminate, without sublateral lobes; metascutellum not convex, barely distinct from lateral parts of metanotum; propodeum with anterosublateral area not areolate, median carina bifurcate into posterior costulae; metafemur ventrally

with outer basal tooth slightly larger than the following teeth, with small inner basal tooth or convexity; tarsal claws not pectinate.

2.2.1 *Conura hirtifemora* (Ashmead, 1885)

Figs 11a–f, 12a.

Conura hirtifemora (Ashmead): Santos et al., 2000: 76–77 (earliest use of the name.)
Conura (Ceratosmicra) hirtifemora (Ashmead): Delvare, 1992: 215 (combination).
Smicra hirtifemora Ashmead, 1885: X (misspelling).
Spilochalcis hirtifemora (Ashmead): Wilson, 1932: 39 (combination).
Spilochalcis syrphidis Wolcott, 1924: 57 (synonymized by Burks, 1940: 295).

Diagnosis. Body mainly yellow, with darkened marks on mesonotum, mesopleuron, mesopleuron and venter of metathorax. Upper part of parascrobal area and vertex with dark pilosity, but dorsum of pronotum, mesoscutum and mesoscutum with pale pilosity; ocellar-ocular groove present; inner eye margin distinctly converging ventrally; ventral margin of antennal torulus only slightly above lower eye line; interantennal projection with median carina reaching about 2/3 of the height of scrobe; scape reaching about vertex, in male with elongate latero-ventral sensillar area on distal third; flagellomeres in male with scattered, thick, dark and erect bristles on outer and dorsal faces; mandibles normal in length; malar sulcus superficial, hardly visible, internal carina present near mouth only, external one absent; postorbital sulcus narrow; mesoscutum and mesoscutellum rugose with shallow and irregular fovea; gena without umbilicate foveae; propodeum without darkened marks, anterosublateral area rugulose with conspicuous transverse rugae arising from median carina; median carina developed from anterior margin to near petiole cavity; posterior costula obtuse; adpetiolar area with two areolae; mid leg with tarsi not compressed; metacoxa on laterodorsal side coriarious-imbricate; metafemur ventrally with inner tooth, outer face coriarious; petiole rugulose to coriarius dorsally, and coriarious-imbricate laterally, not broadened in the middle of its length, with dorsolateral row of bristles; in female, petiole about 3 × as long as height, in male 3.5 ×, ventral basal lamina similar to dorsal one; gaster in female obtuse, as long as mesosoma, in male about 0.8 × mesosoma length.

Biology. Secondary parasitoid of lepidopterans larvae through pupae of *Apanteles spp*. (Hymenoptera: Braconidae) (Thompson, 1954; Peck 1963; De Santis, 1979; Burks, 1979, Noyes, 2019) and *Diadegma insulare* (Hymenoptera: Ichneumonidae) (Cordero and Cave, 1992; Noyes, 2019). It is associated with lepidopterans from the Noctuidae (Peck, 1963; Riggin et al., 1992, 1993; Molina-Ochoa et al., 2003), Pyralidae (De Santis, 1979), Sphingidae (McNeil and Rabb, 1973), and Yponomeutidae families (Cordero and Cave, 1992). Cordero and Cave (1992) classified this parasitoid as facultative hyperparasitoid, based on the observations of *Co. hirtifemora* parasitizing pupae of *Diadegma insulare* (Ichneumonidae) on pupae of *Plutella xylostella* (Lepidoptera: Plutellidae).

Distribution. From the United States of America (Illinois, Ohio, District of Columbia, Virginia, Tennessee, North Carolina, Texas, Louisiana, South Carolina, Georgia, and Florida) to Brazil (Goiás*).

Note. The image of the *voucher* from Riggin et al. (1992, 1993) work was analyzed. The morphological characteristics match with the type image of the female of *Spilochalcis syrphidis* provided by the NMNH online database, and with an exemplar of a male used in this work to analyze morphological features. However, the comparison with the male exemplar shows a difference in the basal lamina of the petiole, which is not developed in the male but is developed in both images of the females. This difference can be sexual dimorphism, nonetheless it was not possible to verify it in the type image also provided by the NMNH of the male of *Smicra hiritfemora* because the low image quality made it difficult to do a detailed observation of the specimen.

Material examined. **Brazil.** *Goiás*: 1#m, Itumbiara, 10.II.2002 ex puparium on corn, C.H. Marchiori col. (UFES).

2.2.2 *Conura immaculata* (Cresson, 1865)

Figs 14a–f, 15a–c.

Ceratosmicra argentina Blanchard, 1942: 120 (synonymized by Delvare, 1992: 217; combined by De Santis and Fidalgo, 1994: 7).
Ceratosmicra immaculata (Cresson): Burks, 1940: 350 (combination).
Ceratosmicra inmaculata (Cresson): De Santis, 1983: 4 (misspelling).
Conura immaculata (Cresson): Delvare, 1993: 349–372 (earliest use of name).
Conura (Ceratosmicra) immaculata (Cresson): Delvare, 1992: 217 (combination).
Smicra fulvomaculata Cameron: Dalla Torre, 1898: 377 (emendation).
Smicra fulvo-maculata Cameron, 1884: 93 (synonymized by Delvare, 1992: 217–218).
Smicra immaculata Cresson, 1872: 55 (misspelling).
Smiera immaculata Cresson, 1865: 97 (combined by Burks, 1940: 350; combined by Delvare, 1992: 217).
Spilochalcis argentina (Blanchard): De Santis and Fidalgo, 1994: 7 (combination).
Spilochalcis fulvomaculata (Cameron): OILB, 1971: 18 (earliest use of name).
Spilochalcis immaculata (Cresson): De Santis and Fidalgo, 1994: 8 (earliest use of name).
Spilochalcis tucumana Kreibohm de la Vega, 1940: 167 (synonymized by Delvare, 1992: 217–218).
Spilochalcis tucumana Blanchard, 1942: 119 (synonymized by Delvare, 1992: 217–218).

Diagnosis. Body mainly yellow, without darkened marks, except on scape in male with darkened longitudinal band on ventral side; ocellar-ocular groove absent or inconspicuos; inner eye margin distinctly converging ventrally; ventral margin of antennal torulus distinctly above lower eye line; interantennal projection without carina; scape in female distinctly exceeding vertex, in male longer and broader, on ventral side with sensillar area elongate extending over most of the length; flagellomeres in males with thick erect bristles on outer and dorsal faces; mandibles normal in length; malar sulcus broad, internal carina

present near mouth only, external one conspicuous, not prolonged behind eye; postorbital sulcus broad; gena without umbilicate punctures; mesoscutellum and mesoscutellum rugose-strigate, latter with shallow, irregular and inconspicuous foveae propodeum with anterosublateral area from coriarious anteriorly to smooth and shiny posteriorly, with sparse, short and fine rugae; median carina on anterior half of the propodeum length; posterior costula obtuse; adpetiolar area with or without pentagonal areola, which can be inconspicuous; mid leg in male with two distal tarsi compressed; metacoxa on laterodorsal side smooth and shiny; metafemur ventrally with a inner tooth indicated by a convexity, outer face smooth and shiny; petiole smooth and shiny, not broadened in the middle of its length, with dorsolateral row of bristles, ventral basal lamina more developed than dorsal one, in female about 2 × as long as height, in male 3 ×; gaster in female acuminate, about 1.30 × as long as mesosoma, in male 0.90 ×.

Biology. Gregarious primary parasitoid of Lepidoptera pupae (Delvare, 1992; Tavares and Aquino, 2014), and secondary solitary parasitoid of lepidopterans through Braconidae and Ichneumonidae (Hymenoptera) (Lourenção, Carvalho and Lasca, 1989; Delvare, 1992; Tavares and Aquino, 2014). It attacks lepidopterans from the following families: Dalceridae (Lourenção, Carvalho and Lasca, 1989; De Santis and Fidalgo, 1994; Noyes, 2019), Geometridae*, Hesperiidae (De Santis, 1967; Herting, 1976; Noyes, 2019), Limacodidae (Delvare 1992; Noyes, 2019), Noctuidae (De Santis, 1967, 1979, 1989; Herting, 1976; Noyes, 2019), Nymphalidae (Delvare, 1992; Noyes, 2019), Oecophoridae (De Santis, 1980; Noyes, 2019), Pieridae (De Santis, 1980; Noyes, 2019), and Tineidae (Delvare, 1992; Noyes, 2019). Its body size varies according to the host size, for instance, specimens emerged from Lepidoptera and Ichneumonidae usually are larger and those ones emerged from Braconidae (Delvare, 1992). According to Delvare (1992), *Co. immaculata* is a common species and displays an economic interest because some of its hosts are agricultural pests, i.g . *Alabama argillacea* (Herting, 1976) and *Mocis latipes* (Noctuidae) (De Santis, 1979).

Distribution. From the United States of America (Texas) to Argentina. New record for state of Pará, in Brazil, is presented here.

Material examined. **Brazil.** *Mato Grosso do Sul*: 3#f, Três Lagoas, 16.V.2017 ex. *Thyrinteina arnobia* on plantation of eucalyptus, A.B.Horta col.; *São Paulo*: 2#f, Borebi, IX. 2005 ex. *Thyrinteina arnobia*, M.C.Candelaria col.

2.2.3 *Conura meteori* (Burks, 1940)

Figs 16a–f, 17a.

Ceratosmicra meteori Burks, 1940: 346 (combined by Delvare, 1992: 219).
Conura meteori (Burks): Frana and O'Neil, 1994: 399–404 (Earliest use of name).
Conura (Ceratosmicra) meteori (Burks): Delvare, 1992: 219 (combination).

Diagnosis. Body mainly yellow, with darkened marks: mid lobe of mesoscutum with a chalice shape mark; axilla with a spot; mesoscutellum with broad median longitudinal band; propodeum with a

band on anterior margin that extends over median carina; metafemur not entirely darkened on half; petiole with a mark medially; gastral tergites with darkened transverse bands. Ocellar-ocular groove present; eye inner margin distinctly converging ventrally; ventral margin of antennal torulus distinctly above lower eye line; interantennal projection without carina; scape in female exceeding dorsal margin of median ocelli, in male slightly exceeding vertex and not enlarged at apex; flagellomeres with bristles not scattered, thick, dark or erect; mandibles normal in length; malar sulcus broad, internal carina developed and complete, external one conspicuous, not prolonged behind eye; postorbital sulcus broad, delimited by postorbital carina in the lower 2/3 of eye margin; gena without umbilicate punctures; mesoscutum and mesoscutellum rugose with shallow and irregular fovea; propodeum coriarious-imbricate to rugulose; median carina developed from anterior margin to near petiole cavity; posterior costula acute; adpetiolar area without areola; mid leg with tarsi not compressed; metacoxa on laterodorsal side coriarious-imbricate; metafemur ventrally with inner tooth; outer face coriarious dorsally to coriarious-imbricate ventrally; petiole smooth and shiny dorsally to coriarious-imbricate laterally and ventrally, dorsally smooth and shiny or inconspicuously coriarious, with dorsal row and some ventral bristles, ventral basal lamina similar to dorsal one, broadened in the middle of its length, in female about 3 × as long as height, in male about 5.5 ×; gaster in female obtuse, about 0.90 × as long as mesosoma, in male 0.70–0.80 ×.

Biology. Secondary parasite of Lepidoptera through Braconidae (Herting, 1976; Noyes, 2019) and Ichneumonidae (Hymenoptera) (Herting, 1977; Noyes, 2019). It is associated with lepidopteran from the families Arctiidae (Peck, 1963; Noyes, 2019), Lymantriidae (Peck, 1963; Herting, 1976, 1977; Noyes, 2019), Noctuidae (Muesebeck, Krombein and Townes, 1951; Peck, 1963; Herting, 1976, 1977; Molina-Ochoa et al., 2003; Noyes, 2019) and Notodontidae (Fry, 1989; Noyes, 2019).

Distribution. From the United States of America (Arkansas and Texas) to Argentina. New record is present here for the state of Minas Gerais, in Brazil.

Material examined. **United States of America.** *Florida*: 2#m, Naples, VIII. 1987 (AMNH).

2.2.4 *Conura ruffinellii* (Blanchard, 1947)

Figs18a–f, 19a–c.

Conura (Ceratosmicra) ruffinellii (Blanchard): Delvare, 1992: 216 (combination).
Spilochalcis ruffinellii Blanchard, 1947: 6 (combined by Delvare, 1992: 216).

Diagnosis. Body mainly orangish yellow, with darkened orange marks; upper part of the parascrobal area, vertex, dorsum of pronotum, and mesoscutum with thick dark pilosity; ocellar-ocular groove present; inner eye margin converging ventrally; ventral margin of antennal torulus only slightly above lower eye line; interantennal projection with carina reaching about 2/3 of the height of scrobe; scape slightly reaching median ocellus to reaching vertex, in males with rounded ventral plaque with sensilar area on inner side; flagellomeres in males with thick, dark and erect bristles on outer and dorsal faces; malar sulcus superficial, hardly visible, internal carina present near mouth only, external one absent; postorbital

sulcus absent; gena with shallow, inconspicuous and sparse umbilicate fovea; mesoscutum and mesoscutellum rugose with shallow and irregular fovea; propodeum from entirely yellow to dark brown on anterior margin, anterosublateral with shor rugae; median carina present on anterior half of the length of propodeum; posterior costula obtuse; adpetiolar area sometimes with irregular areola; mid leg with tarsi not modified; metacoxa on laterodorsal side coriarious imbricate; metafemur ventrally with inner tooth indicated by a convexity, outer face coriarious dorsally to coriarious-imbricate ventrally; petiole coriarious-imbricate, not broadened in the middle of its length, with dorsolateral row of bristles, ventral basal lamina more developed than dorsal one, long in female about 2–2.6 × as long as height, in male 3.5 ×; gaster in female acuminate, 1.1–1.3 × as long as mesosoma, in male 0.6–1 ×.

Biology. Secondary parasitoid of Lepidoptera through Braconidae (Herting, 1977; De Santis, 1979; Noyes, 2019) and Ichneumonid (Herting, 1977; De Santis, 1979, 1989; Lucchini and Almeida, 1980; Noyes, 2019) (Hymenoptera). There are only four associations with lepidopterans recorded in the literature, all from the family Noctuidae, and all species of economic importance: *Plusia nu* (Herting, 1976, 1977; Noyes, 2019), *Rachiplusia nu* (De Santis, 1979; Noyes, 2019), and *Spodoptera frugiperda* (Lucchini and Almeida, 1980; Noyes, 2019).

Distribution. Brazil (Paraná) and Uruguay.

Material examined. **Brazil.** *Paraná*: 2#m, Curitiba, V.1977 ex *Spodoptera frugiperda*, Fucchini col. (MLPA). *Uruguay*: 5#f, Rocha, 29.XII.2014-26.II.2015, malaise, E. Castiglioni and eq. col.

2.2.5 *Conura sp. 1*

Figs 20ª–f, 21a–b.

Diagnosis. Body mainly yellow-orangish without dark marks, except by: transversal darkened band on frontovertex, sometimes absent and more common in males, and light brown to black mark on mesoscutellum. Ocellar-ocular groove present; inner eye margin distinctly converging ventrally; ventral margin of antennal torulus distinctly above lower eye line; interantennal projection with carina reaching about 2/3 of scrobe; scape below to exceeding dorsal margin of median ocellus, in male broader, sensillar area elongate extending over most of ventral face; flagellomeres with bristles not scattered, thick, dark or erect; malar sulcus broad, internal carina absent, external one conspicuous, prolonged behind eye; postorbital sulcus broad, delimited by postorbital carina in the lower 2/3 of eye margin; gena without umbilicate punctures; mesoscutum and mesoscutellum rugose-strigate without fovea; propodeum with anterosublateral area from coriarious-imbricate anteriorly to smooth and shiny posteriorly, with sparse, short and fine rugae; median carina, posterior costula and areolae conspicuous; median carina on anterior half of the propodeum length; posterior costula obtuse; adpetiolar area with pentagonal areola; mid leg with tarsi not compressed; metacoxa on laterodorsal side inconspicuously coriarious basally to smooth and shiny distally; metafemur ventrally with inner tooth indicated by a convexity, outer face with interstice

inconspicuously coriarious; petiole smooth and shiny, glabrous, ventral basal lamina more developed than dorsal one, not broadened in the middle of its length, in both sexes about 2–3 × as long as height; gaster in female obtuse, about 0.87–1 × as long as mesosoma, in male 0.58–0.88 ×.

Remarks. This is an undescribed species and it belongs to the *immaculata* group of species. Delvare (1992) has divided the *immaculata* group into three subgroups, *fulvovariegata*, *immaculata* and *delicata*. The new species shares features of the *fulvovariegata* and *immaculata* subgroups. The features shared with the *fulvovariegata* subgroup are the torulli slightly above lower eye margin, the length of the male scape, and male petiole not very long. The features shared with species of the *immaculata* subgroup are the malar sulcus broad with external carina, malar space shorter, and propodeum smoother on anterosublateral area. Anyway, *Co. sp 1* differs from species of *immaculata* group by the diagnostic features given above.

Biology. Secondary parasite of Lepidoptera larvae through Braconidae cocoons (Hymenoptera), and of *Thyrinteina arnobia* (Lepidoptera, Geometridae) through Braconidae.

Distribution. Brazil (Minas Gerais and São Paulo) and Argentina (Missiones).

Material examined. **Brazil**. *São Paulo*: 4#f 5#m. Piracicaba, 14.I.-30.VI.1995 ex Braconidae on larvae of Lepidoptera, J.A. Cerignoni, col. (UFES).

2.3 The *maculata* group

Group diagnosis. Body yellow or orange with black marks; back of head with a foraminal depression, not delimited by carina or sharp edge; antennal scrobes somewhat deep; interantenal projection slightly convex; mandibles sharp, formula 2:3 exceptionally 3:3; malar space shorter than half of height of eye; malar sulcus usually narrow with internal carina evanescent toward eye, and external carina complete but not prolonged behind eye, exceptionally broad with complete internal carina; malar briestles present, longer in males; carina bordering gena posteriorly expanded into narrow lamina, generally not continued as occipital carina; mesonotum with pilosity erect and long; notauli deep, broad and crenulate, occasionally narrow; mesoscutum foveate-strigate to strigate; mesoscutellum with frenal carina not laminate or sublateral lobes; metascutellum not convex, barely distinct from lateral parts of metanotum; propodeum with anterosublateral area not areolate, median carina bifurcate into posterior costulae; metafemur ventrally with outer basal tooth slightly larger than the following teeth, with small inner basal tubercle or convexity; tarsal claws not pectinate.

2.3.1 *Conura igneoides* (Kirby, 1883)

Figs 22a–f, 23a–b.

Conura (Conura) igneoides (Kirby): Delvare, 1992: 251 (combination).
Smicra igneoides Kirby, 1883: 71 (combined by Burks, 1940: 291, 301; combined by Delvare, 1992: 251).

Smicra vittata Ashmead, 1885: x (combined by Gossard, 1905: 288, 295; synonymized by Burks, 1940: 301; synonymized by Delvare, 1992: 251–252).
Spilochalcis igneoides (Kirby): Burks, 1940: 291, 301 (combination).
Spilochalcis mesillae Cockerell, 1897: 403 (synonymized by Burks, 1940: 301; synonymized by Delvare, 1992: 251–252).
Spilochalcis vittata (Ashmead): Gossard, 1905: 288, 295 (combination).

Diagnosis. Body yellow or reddish orange with black marks; vertex without deep triangular fovea on its median line; frontovertex with numerous horizontal carinae, restricted or more evident in the superior part, reaching near eye margin; scrobe shallow, inconspicuously carinate near toruli; interantenal projection reduced, median carina reaching about 3/4 of the height of scrobe; scape in female slightly to evidently exceeding vertex, in male distinctly exceeding vertex; malar sulcus with internal carina complete; mandibular formula 2:3; notauli narrow; mid lobe of mesoscutum strigate with shallow, irregular and inconspicuous umbilicate fovea more evident laterally; propodeum rugose to coriarious-imbricate, with strong median carina on anterior half of its length, adpetiolar area with 3 areolae, central one elongated; parapetiolar apophyses sharp, long and visible dorsally; metafemur ventrally with small inner tubercle near base; petiole smooth and shiny dorsally to coriarious- imbricate laterally and ventrally, ventral basal lamina more developed than dorsal one, lateral carina, if present, short; in female, petiole about 1.15–1.88 × as long as height; gaster in female acuminate, about 1.26–1.52 × as long as mesosoma; epipygium short, about as long as wide.

Biology. Primary parasitoid of lepidopteran belonging to the families Gelechiidae (Miller 1963; Noyes, 2019), Noctuidae (Thompson, 1954; Peck, 1963; De Santis, 1979; Noyes, 2019), Psychidae (Peck, 1963; Burks, 1979; Noyes, 2019), Pyralidae (Thompson, 1954; Peck 1963; Herting, 1975; Burks, 1979; Noyes, 2019), and Tortricidae (Thompson, 1954; Noyes, 2019). It attacks species of economic importance, for example, *Helicoverpa zea* (De Santis, 1979), *Heliothis armigera* (Thompson, 1954) and *Heliothis zea* (Noctuidae) (Peck, 1963; Burks, 1979). It is also cited as a parasitoid of the dipteran *Paratheresia claripalpis* (Tachinidae) (De Santis, 1979; Noyes, 2019), and as a secondary parasitoid of *Diatraea sp*. through this same tachinid mentioned (Herting, 1978).

Distribution. From Canada Canada (Alberta), through the United States of America, to Mexico, Virgin Islands of United States of America (Santa Cruz), British Virgin Islands, and Venezuela. New record is presented here for the state of Iowa, in the United States of America.

Material examined. **United States of America.** *Iowa*: 1#f, Earlville, 5.VII.1977, R. Robinson col. (ZSM); *Tennessee*: 1#f, Madison, 8.VIII. 1967, P.P.Bably col. (ZSM).

2.3.2 *Conura maculata* (Fabricius, 1787)

Figs 24a–f, 25a–b.

Chalcis maculata Fabricius, 1787: 273 (valid species by Fabricius, 1793: 198; combined by Cresson, 1872: 57; combined by Bouček and Delvare, 1992: 26–27).
Conura maculata (Fabricius): Bouček and Delvare, 1992: 26–27 (combination).
Smicra maculata (Fabricius): Cresson, 1872: 57 (misspelling).
Smiera disposita Walker, 1864: 196 (combined by Ashmead, 1904: 41; synonymized by Bouček and Delvare, 1992: 26).
Smiera erythrina Walker, 1862: 179 (combined by Burks, 1977: 386; synonymized by Bouček and Delvare, 1992: 26).
Smiera maculata (Fabricius): Cresson, 1872: 57 (combination).
Smiera pielus Walker, 1838: 470 (combined by Ashmead, 1904: 420; synonymized by Bouček and Delvare, 1992: 26).
Spilochalcis disposita (Walker): Ashmead, 1904: 417 (combination); Schmiedeknecht, 1909: 39 (valid species).
Spilochalcis erythrina (Walker): Burks, 1977: 386 (combination).
Spilochalcis kanti Girault, 1913: 63 (combined by Bouček and Delvare, 1992: 26).
Spilochalcis maculata (Fabricius): De Santis, 1980: 265 (combination).
Spilochalcis pielus (Walker): Ashmead, 1904: 420 (combination); Schmiedeknecht, 1909: 41 (valid species).
Tetrasmicra maculata (Fabricius): Ashmead, 1904: 456 (combination); Schmiedeknecht, 1909: 41 (valid species).

Diagnosis. Body yellow, with black marks; vertex without deep triangular fovea on its median line; frontovertex with numerous oblique arched shaped carinae; scrobe deep, inconspicuously carinate near toruli; interantenal projection convex; scape reaching to slightly exceeding vertex, in male slightly enlarged distally; malar sulcus with internal carina near mouth only; mandibular formula 2:3; notauli broad; mid lobe of mesoscutum strigate with irregular umbilicate fovea, more evident laterally; propodeum mostelly smooth and shiny, with some short rugae, median carina strong, developed from anterior margin to near petiole cavity; adpetiolar area with usually two arelae; parapetiolar apophyses absent; metafemur without inner tooth; petiole smooth and shiny, with lateral sulcus, ventral basal lamina reduced, dorsal one developed; in female petiole about 0.88–1.11 × as long as height, in male 1.11–1.57 ×; gaster in female elliptic, 1.02–1.09 × as long as mesosoma, in male 0.91-1.14 ×; epipygium about 0,70–0,94 × as long as wide.

Biology. Gregarious parasitoide of Lepidoptera. It attacks several species from the Nymphalidae (Bouček and Delvare, 1992; Tavares and Aquino, 2014; Noyes, 2019). Here, it is registered for the first time the association of *Co. maculata* with *Nystalea nyseus* (Notodontidae). According to Bouček and Delvare (1992), this species has shown an economic importance especially for the oil palm plantation once it attacks its pests, such as *Brassolis sophorae* (Fabricius) and *Opsiphanes cassina* Felder (Nymphalidae).

Distribution. From the United States of America (Arkansas and Texas) to Brazil (Amazonas, Minas Gerais*, Rio de Janeiro, and São Paulo), Paraguay, and Argentina.

Material examined. **Brazil..** *Minas Gerais*: 6#f 5#m, Ipatinga, 22.VI.2016 ex. *Nystalea nyseus*, A.B Horta col.

2.3.3 *Conura sp. 2*

Figs 26ª–f, 27a–c.

Diagnosis. Body yellow, with black marks; vertex without deep triangular fovea on its median line; frontovertex with numerous oblique arched shaped carinae; scrobe deep, inconspicuously carinate near toruli, lower lateral margin carinate; interantenal projection convex, prominent; scape in female slightly to evidently exceeding vertex; in male, scape slightly exceeding vertex and enlarged distally, with ventral subapical indentation; malar sulcus with internal carina evanescent towards eye; mandibular formula 2:3; notauli broad; mid lobe of mesoscutum strigate with irregular umbilicate fovea, more evident laterally; propodeum smooth and shiny with sparse rugae, with two pair of submedian carinae forming irregular areolae on its medial part; adpetiolar area with about 3-5 irregular areolae; parapetiolar apophyses absent; metafemur ventrally without inner tooth; petiole smooth and shiny, basal laminae hardly developed, lateral carina inconspicuous; in female, petiole about 0.50–0.57 × as long as height, in male 0.92-0.94 ×; gaster in female acuminate, about 1.63–1.76 × as long as mesosoma, in male about 1.03 × as long as mesosoma; epipygium long, about 1.58-2.13 × as long as wide.

Note. *Conura sp.* 2 was recorded by Sauer (1946) as *Conura flavicans*, emerged from pupae of *Mimallo amilia* (Lepidoptera, Mimallonidae) collected in the State of São Paulo (Brazil). Images of the voucher specimens of Sauer (1946), deposited in the USNM, were analyzed to confirm the identity of the species. The same record was cited subsequently by: Costa-Lima (1950, 1962), Silva et al. (1968), and De Santis (1980). Beside the morphological features, *C. flavicans* seems to be restricted to the Amazonian region (unpublished data).

Remarks. This is a new species and it belongs to the *maculata* group of species. It's similar to *Co. flavicans* (Fig. 28) and *Co. magistrettii* (Fig. 29). The new species can be distinguished from these species by the following features. It has a darkened median stripe connecting median ocellus and the black mark on the occiput, darkened spots on external side and below lateral ocelli, and a broad darkened mark on the scrobe reaching median ocellus; scrobe with lower lateral margin carinate; interantenal projection convex and protuberant; notauli broad; propodeum rugose, with two pair of submedian carinae forming irregular areolae in its medial part, adpetiolar area with about 3–5 irregular areolae; gaster in female long, 1.63–1.76 × as long as mesosoma; epipygium long, about 1.58-2.13 × as long as wide. While, *Co. flavicans* has a darkened marking on the scrobe connecting or not to a spot below lateral ocelli, the latter can vary from evenescet to evident, and darkened spots on the external side of lateral ocelli sometimes present; scrobe with lateral edges proeminent; interantenal projection protuberant, slightly compressed; propodeum smoother, with some rugae, median carina and posterior costula strong; median carina reaching about ⅓ anterior of the length of propodeum; adpetiolar area with 3 areolae, central one pentagonal and elongate reaching the other 2/3 posterior of the length of propodeum; gaster in female longer, 2.26–2.72 × as long

as mesosoma; epipygium longer, 2.26–2.72 × as long as wide. In *Co. magistrettii* the face has one sublateral light darkened marks; scrobe yellow, occasionally with darkened mark but extensively yellow, lateral margin carinate in the lower 2/3; interantenal projection projeção interantenal reduced; notauli narrow; propodeum with very irregular median carina reaching about 1/3 of the distance from anterior margin to petiolar cavity, adpetiolar area with 3 irregular areolae, central one elongate reaching the other 2/3 of the distance; gaster in female gaster shorter, 1.17–1.38 × as long as mesosoma; epipygium shorter, 1.26-1.36 × as long as wide.

Biology. Parasitoid of pupae of the *Mimallo sp.* and *Mimallo amilia* (Lepidoptera, Mimallonidae).

Distribution. Brazil (São Paulo and Rio de Janeiro).

Material examined. **Brazil.** *São Paulo*: 5#f 2#m, III.1951 [no additional data] ex. *Mimallo* (FIOC).

2.4 The *nigricornis* group

Group diagnosis. Body yellow or orange with black marks, or black with yellow and brown marks; back of head with a foraminal cavity, at least dorsally delimited by carina; antennal scrobe very deep; interantennal projection prominent; mandible strong, with blunt teeth, formula 2:3 or 3:3; malar sulcus with external carina conspicuous but not prolonged behind eye; malar space shorter than a height of eye; malar sulcus narrow, external carina conspicuous but not prolonged behind eye, internal one absent or present near mouth only; malar bristles absent; carina bordering gena posteriorly expanded into narrow lamina, usually continued as occipital carina; mesonotum with pilosity erect and long; notauli deep, broad and crenulate; mesoscutum with deep umbilicate foveae; mesoscutellum with frenal carina not forming a developed lamina or sublateral lobes; mestascutellum not convex, barely distinct from lateral parts of metanotum; propodeum areolate or strongly rugose, with strong irregular carinae, adpetiolar area hardly distinct; metacoxa elongate; metafemur ventrally with outer apical teeth larger and broader than the basal ones, with or without inner basal tooth; tarsal claws often thickly pectinate.

Conura koehleri (Blanchard, 1935)

Figs. 30a–f, 31a–e.

Conura (Conura) koehleri (Blanchard): Delvare, 1992: 237 (combination).
Spilochalcis koehleri Blanchard, 1935: 118 (combined by Delvare, 1992: 237)

Diagnosis. Body black with yellow and brown marks, mesoscutellum yellow; eye with inner margins slightly converging ventrally; genal carina prolonged into an occipital carina; lateral ocelli with impress on outer side; transverse carina below median ocellus present; scrobe deep and carinate near toruli; interantennal projection prominent; toruli distinctly above lower eye margin, about half eye height level; in

female, scape exceeding vertex; in males, scape longer, rounded sensillar area on inner ventral surface distally; malar sulcus with internal carina present near mouth only; postorbital sulcus emarginate by carina on the upper 2/3 of eye height; mandibular formula 2:3; mesoscutellum without median sulcus; propodeum inclined at angle of about 45° to the body axis, areolate with irregular areolae, lateral apophysis not developed and not visible dorsally; hind wing with 3 hamuli; metacoxa smooth and shiny, elongate, about 0.78–0.79 × as long as mesosoma; metafemur robust, elongated about 2.30 × as long as wide, outer face smooth and shiny, without inner tooth or convexity; metatibia with oblique striations; petiole in female about 2.44 × as long as hight, in male 1.94 ×; gaster in female ovate, ovipositor sheath occult dorsally, about 1.04-1.05 × as long as mesosoma, in male 0.89 ×.

Biology. There is one host recorded in the literature: *Acharia nesea* (Lepidoptera: Limacodidae) (De Santis, 1967; Tavares and Aquino, 2014). There were two new records among the material examined, *Thagona shadei* (Lepidoptera: Erebidae) e *Phobetron hipparchia* (Limacodidae), the latter being an eucalyptus pest.

Distribution. Brazil (Minas Gerais, Espírito Santo, Rio de Janeiro)* and Argentina (Misiones).

Material examined. **Argentina**. *Misiones*: 2#f 2#m. Loreto, 21.III.1929. ex. caccons fo *Phobetron hipparchia* cr. (parasita secundário) on mate herb, A.A.Oglobin col. (BMNH).

2.5 The *side* group

Group diagnosis. Body mostly black, with yellow and brownish marks; back of head without any evident foraminal depression; antennal scrobe shallow; interantennal projection slightly convex, reduced as weak carina; mandibles sharp, formula 2:3, sometimes 3:3; malar space relatively to distinctly long, usually about 0.49–0.7x the eye height; malar sulcus and carina absent; malar bristles absent; carina bordering gena posteriorly present near mouth only, not expanded into narrow lamina; mesonotum with pilosity decumbent, not long; notauli normal, neither deep, broad or crenulate; mesoscutum rugose or reticulate-strigose, rarely punctured; mesoscutellum with frenal carina laminate, without sublateral lobes; mestascutellum not convex, distinct from lateral parts of metanotum; propodeum coriarious with irregular carinae, anterosublateral area not areolate; metafemur ventrally with inner tooth or convexity near base; tarsal claws not pectinate.

2.5.1 *Conura side* (Walker, 1843)

Figs 32a–f, 33a–c.

Conura (Ceratosmicra) side (Walker): Delvare, 1992: 225–226 (combination).
Smicra decepunctata Ashmead: Burks, 1940: 331 (synonymization); Delvare, 1992: 225 (emendation).
Smicra decem-punctata Ashmead, 1881: xxix (Invalid spelling) (synonymized by Delvare, 1992: 225).
Smicra delira Cresson, 1872: 41(synonymized by Burks, 1940: 331; synonymized by Delvare, 1992: 225).

Smicra flavopicta Cresson. 1872: 41 (misspelling).
Smicra side Walker: Cresson, 1872: 55 (misspelling).
Smiera flavopicta Cresson, 1865: 99 (combined by Burks, 1940: 331; synonymized by Delvare, 1992: 225).
Smiera side Walker, 1843: 145 (combined by Procter, 1938: 424; combined by Delvare, 1992: 225–226).
Spilochalcis delira (Cresson): Thompson, 1955: 205 (earliest use of name).
Spilochalcis flavopicta (Cresson): Burks, 1940: 331 (combination).
Spilochalcis side (Walker): Procter, 1938: 424 (combination); Burks, 1940: 336-339 (misidentification of *Conura torvina*); Peck, 1963: 886–888 (misidentification of *Conura torvina*); Burks, 1979: 868 (misidentification of *Conura torvina*).

Diagnosis. Face dark, except by: yellow marking on interantenal projection and malar space, better developed in males; sometimes a stripe in front of lateral ocelli; in female, yellow-orangish spot on inner eye margin; gaster mostly reddish with yellow transverse submedian bands on tergites. Distance between lateral ocellus and eye at least as long as ocellar diameter; ventral margin of antennal torulus at lower eye line; scape in female hardly reaching median ocellus, in male scape greatly enlarged, about twice as wide as flagellum, exceeding vertex, its external outline in frontal view hardly arched; scape with longitudinal sensillar area on its inner reaching about half of its length; malar space in female about 0.53–0.60 × as long as eye height, in male about 0.65–0.79 ×; lower face coriarious with small piliferous punctures, in male completely yellow; mandibles normal, not long, formula 2.3; mid lobe of mesoscutum without lateral bumps; mesoscutum and mesoscutellum convex, rugose to rugose-reticulate with irregular shallow fovea; propodeum coriarious with short rugae; metafemur ventrally with inner basal tooth; petiole in female about 1.48 × as long as hight, in male 1.81–2.19 ×; gaster in female about 1.27–1.61 × as long as mesosoma, in male about 0.90–1.15 ×.

Note. See the note in *Co. torvina*.

Biology. Secondary parasitoid of Lepidoptera through Braconidae and Ichneumonidae (Hymenoptera) (Thompson, 1955; Herting, 1977; Noyes, 2019). It is associated with several lepidopterans families, specially Noctuidae (Herting, 1976, 1977; Noyes, 2019), Pyralidae (Herting, 1976, 1977; De Santis, 1979; Noyes, 2019) and Tortricidae (Thompson, 1955; Herting, 1975; Noyes, 2019). It is not clear which of these hosts records are reliable (see note in *Co. torvina*).

Distribution. Mostly Nearctic, distributed through Canada, United States and Mexico. Cited for Bahamas (De Santis, 1979), Cuba (De Santis, 1979; De Santis and Fidalgo, 1994), and Dominican Republic (De Santis, 1989). It is not clear which of these records are reliable (see note in *Co. torvina*).

Material examined.**United States of America.** *Pennsylvania*: 1#f. Bucks, 10.VII.1965. J. and W. Ivie col. (USNM); *Tennessee*: 1#f. Davidson, 14.VI.1967. P.P. Bably col. (ZSM); *Florida*: 1#f 1#m. Fort Myers, 6.V.1967. P. P. Bably col. (ZSM).

2.5.1 *Conura torvina* (Cresson, 1872)

Figs 34a–f, 35a–b.

Conura torvina (Cresson): Burks, 1940: 336–339 (misidentified as *Conura side*); Peck, 1963: 886–888 (misidentified as *Conura side*); Burks, 1979: 868 (misidentified as *Conura side*); Delvare, 1992: 226 (combination).
Smicra torvina Cresson, 1872: 40 (combined by Webster, 1895: 38; combined by Delvare, 1992: 226;).
Spilochalcis torvina (Cresson): Webster, 1895: 38 (combination); Titus, 1905: 39 (valid species).

Diagnosis. Face dark, except by: yellow marking on interantenal projection; yellow-orangish spot in front of lateral ocelli; in female, yellow marking on inner eye margin; in male, lower face yellow except by supraclypeal area; gaster mostly reddish with yellow transverse submedian bands on tergites. Distance between lateral ocellus and eye about as long as ocellar diameter; ventral margin of antennal torulus at lower eye line; scape in female not reaching median ocellus, in male scape enlarged, about as wide as flagellum, almost to slightly reaching vertex, its external outline in frontal view arched; scape with longitudinal sensillar area on its inner side slightly longer than pedicel; malar space 0.45–0.50 × as long as eye height; lower face coriarious with small piliferous punctures, in male completely yellow; mandibles normal, not long, formula 2:3; mid lobe of mesoscutum without lateral bumps; mesoscutum and mesoscutellum convex, rugose to rugose-reticulate with irregular shallow fovea; propodeum coriarious; metafemur ventrally with inner basal tooth or convexity; petiole in female about 2.11–2.14 × as long as hight, in male 2.40–2.73 ×; gaster in female about 0.7–1.16 × as long as mesosoma, in male 0.8–0.90 ×.

Note. According to Delvare (1992), *Conura torvina* was misidentified as *Co. side* (as *Spilochalcis side*) for a long period, because of the misidentification of some authors. Burks (1940, 1979) realized the mistake, however, did not mention the change in his papers. Most records of *Co. side* before Delvare (1992) actually refers to *Co. torvina*. Here it is considered that the records of *Co. side* in Burks (1940, 1979) and Peck (1963) papers are referring to *Co. torvina*. It was not possible to verify the vouchers of this species that emerged from *Spodoptera frugiperda*.

Remarks. *Conura torvina* can be distinguished from *Co. albifrons* (Fig. 36) especially by the male morphology. The male of *Co. torvina* has the interantennal region and lower face yellow; and scape has sensillar area longer than pedicel. While in *Co. albifrons*, the male has a mark in form of an inverted "V" on lower face; and the and scape has a sensillar area shorter than pedicel.

Biology. Secondary parasitoid of Lepidoptera trough Braconidae (McDonald and Kok, 1992; Gaines and Kok, 1995; Noyes, 2019) and Ichneumonidae (Hymenoptera) (Rethwisch and Manglitz, 1986; Noyes 2019). It is associated with the three lepidopteran families: Noctuidae (Luginbill, 1928; Vickery, 1929), Pieridae (McDonald and Kok, 1992; Noyes, 2019), and Pyralidae (Gaines and Kok, 1995; Noyes, 2019). Probably there are more hosts associations of *Co. torvina* as *Spilochalcis side* (see note).

Distribution. Nearctic, distributed through Canada and the United States of America. There is a possibility of other records as *Spilochalcis side* (see note).

Material examined.**United States of America.** *Arizona*: 1#f. Cochise, 28.VIII.2001. J. G. Rozen & V. Giles col. (USNM) *Tennessee*: 1#m. Davidson, 14.VI.1967. P.P. Bably col. (ZSM); *Florida*: 1#f. Fort Myers, 20.V.1967. P. P. Bably col. (ZSM).

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Ilustrações

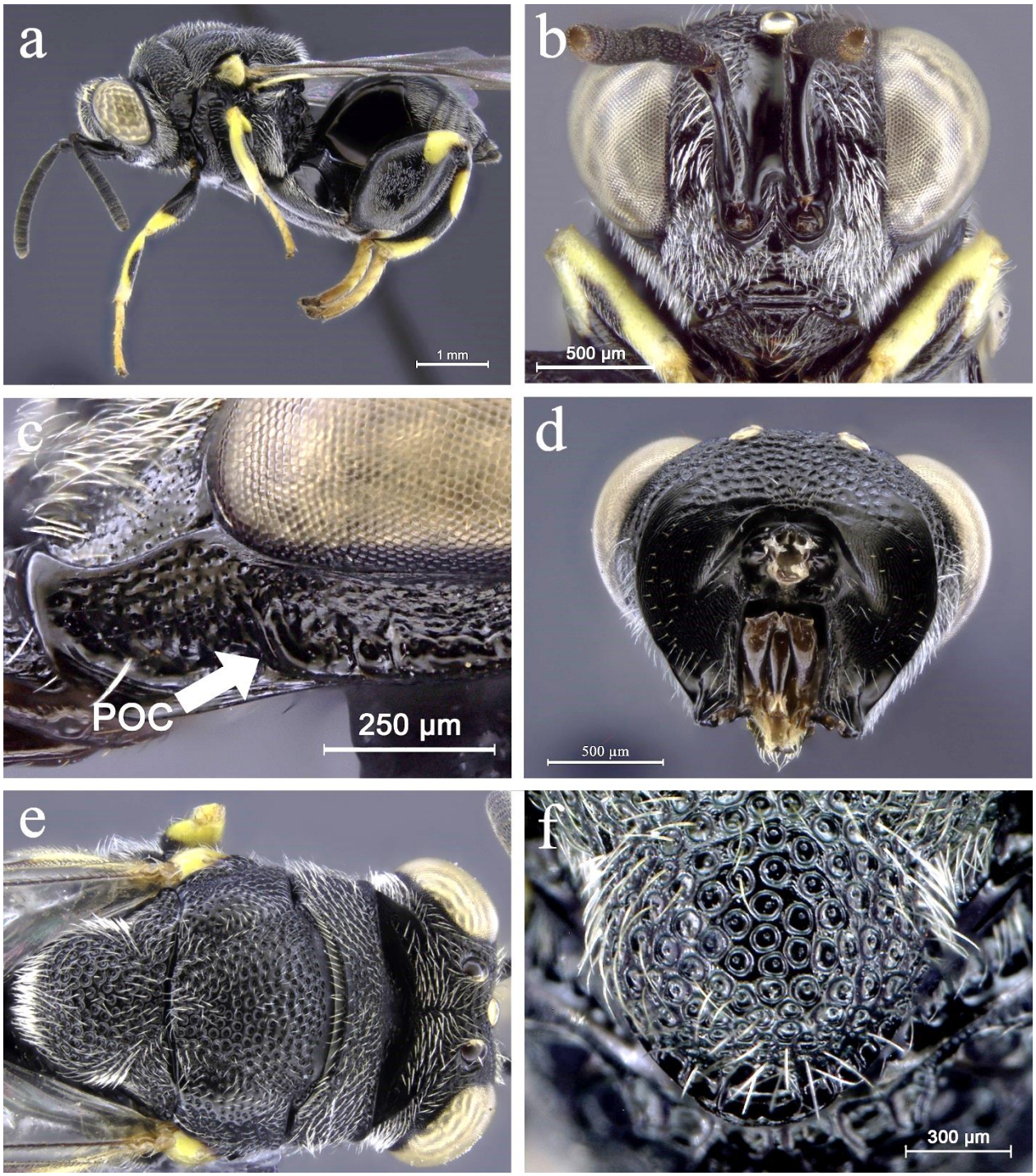

Figure 1. *Brachymeria annulata*. **a**, female, lateral habitus; **b**, head, frontal; **c**, malar space, lateral (setae removed); **d**, head, back; **e**, head and mesoscutum, dorsal; **f**, mesoscutellum, dorsal (setae removed). Abbreviation: **POC**, postorbital carina.

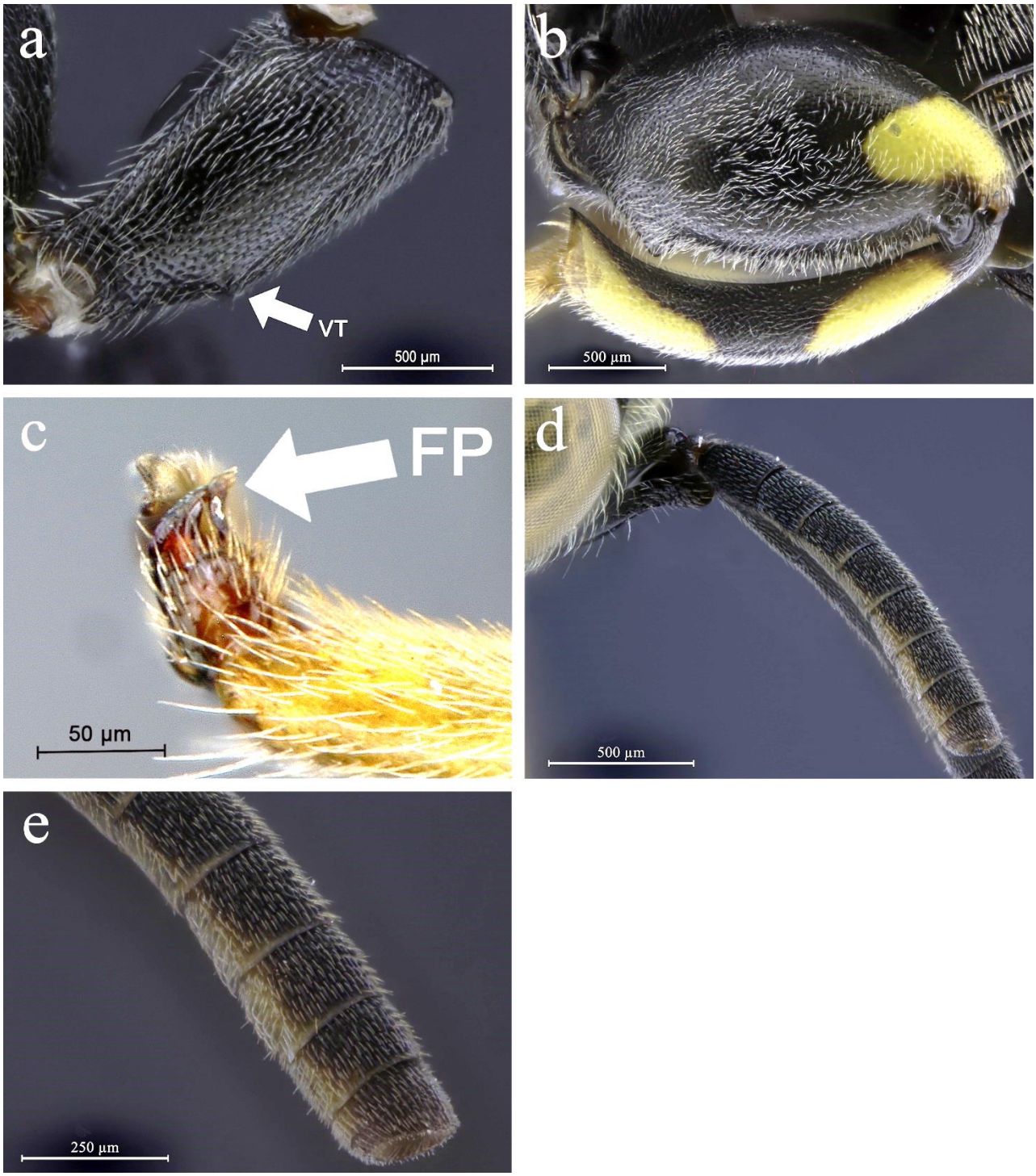

Figure 2. *Brachymeria annulata*. **a**, metacoxa, lateral (setae removed); **b**, metafemur, outer face; **c**, metatarsal claws; **d**, male antenna; **c**, male antennal funicle. Abbreviations: **VT**, ventral tooth; **FP**, falciform process.

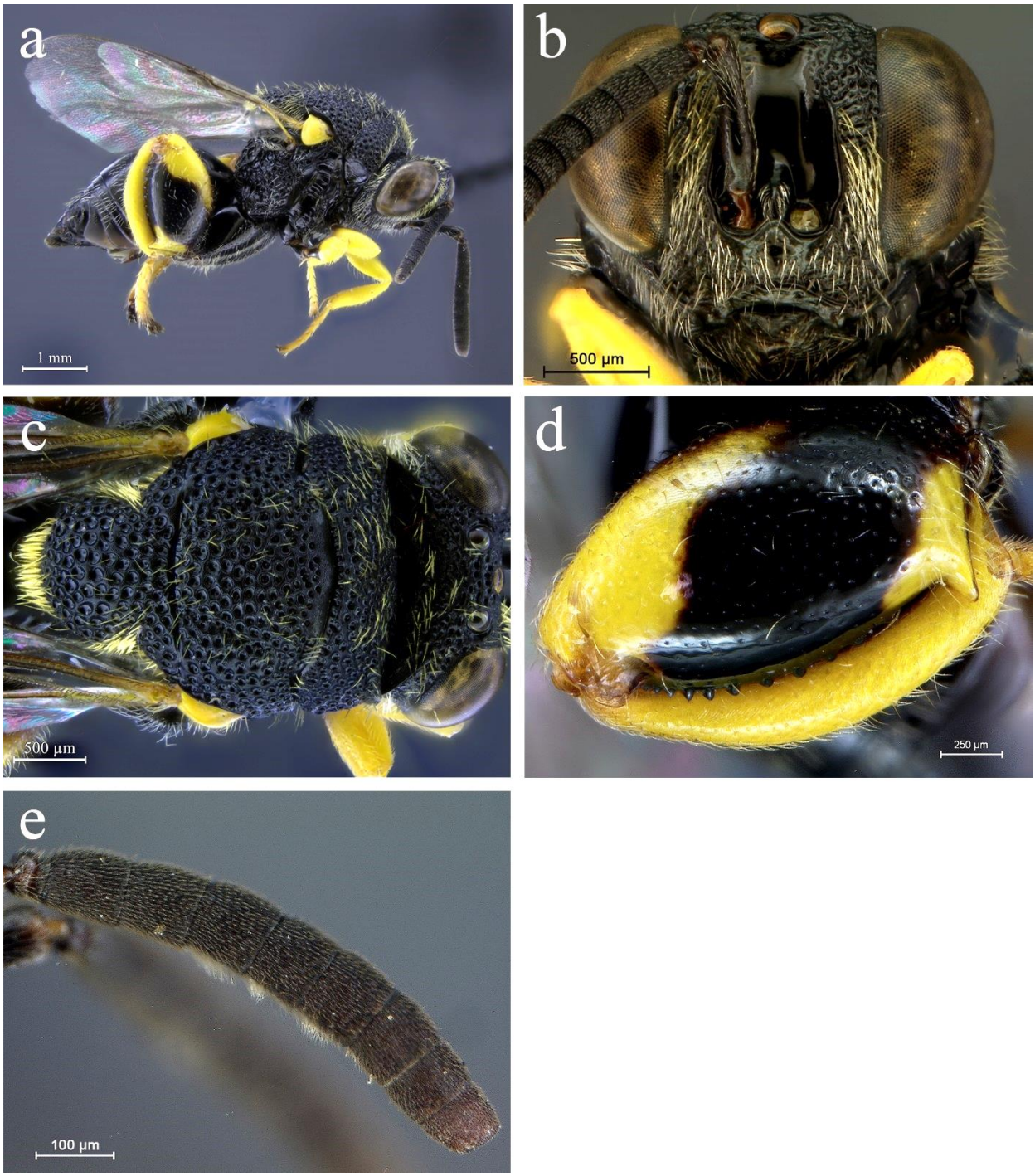

Figure 3. *Brachymeria flavipes*. **a**, female, lateral habitus; **b**, head, frontal; **c**, head and mesoscutum, dorsal; **d**, metafemur, outer face; **e**, male antennal funicle.

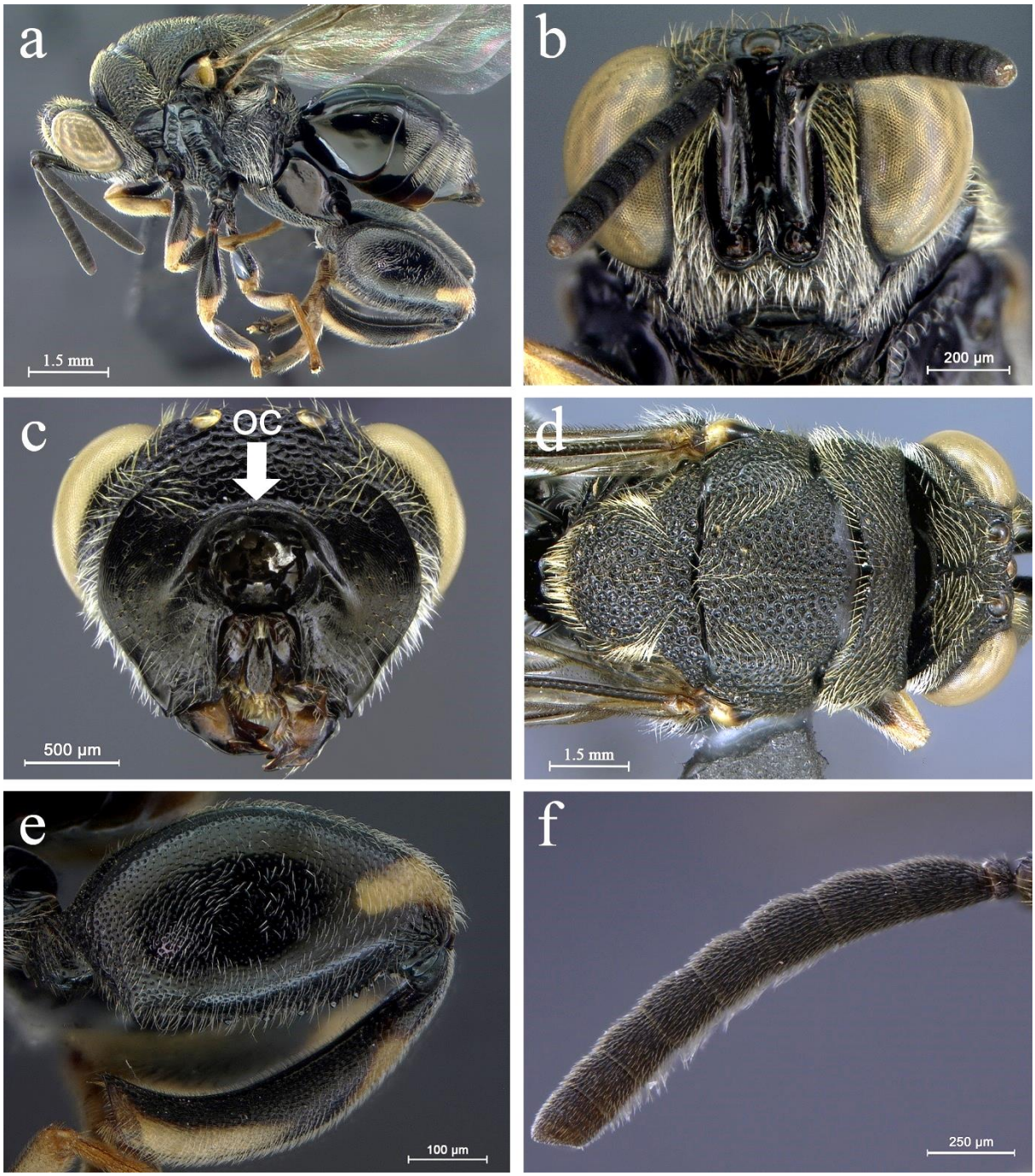

Figure 4. *Brachymeria mnestor*. **a**, female, lateral habitus; **b**, head, frontal; **c**, head, back; **d**, head and mesoscutum, dorsal; **e**, metafemur, outer face; **f**, male antennal funicle. Abbreviation: **OC**, occipital carina.

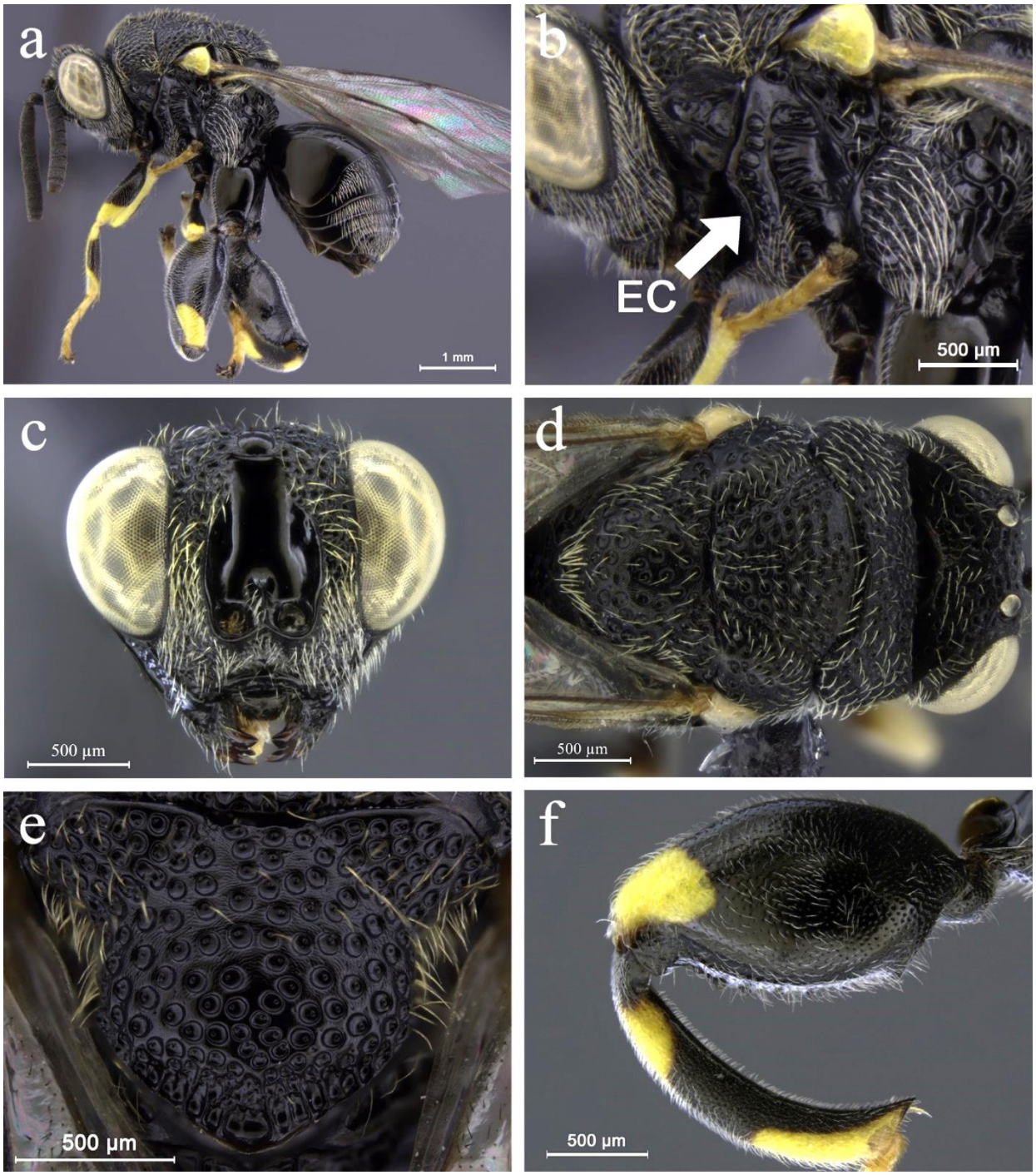

Figure 5. *Brachymeria pandora*. **a**, female, lateral habitus; **b**, mesopleuron; **c**, head, frontal (antennae an setae removed); **d**, head and mesoscutum, dorsal; **e**, mesoscutellum, dorsal (setae removed); **f**, metafemur, outer face. Abbreviation: **EC**, epicnemium carina.

Figure 6. *Brachymeria pandora*. **a**, male antennal funicle.

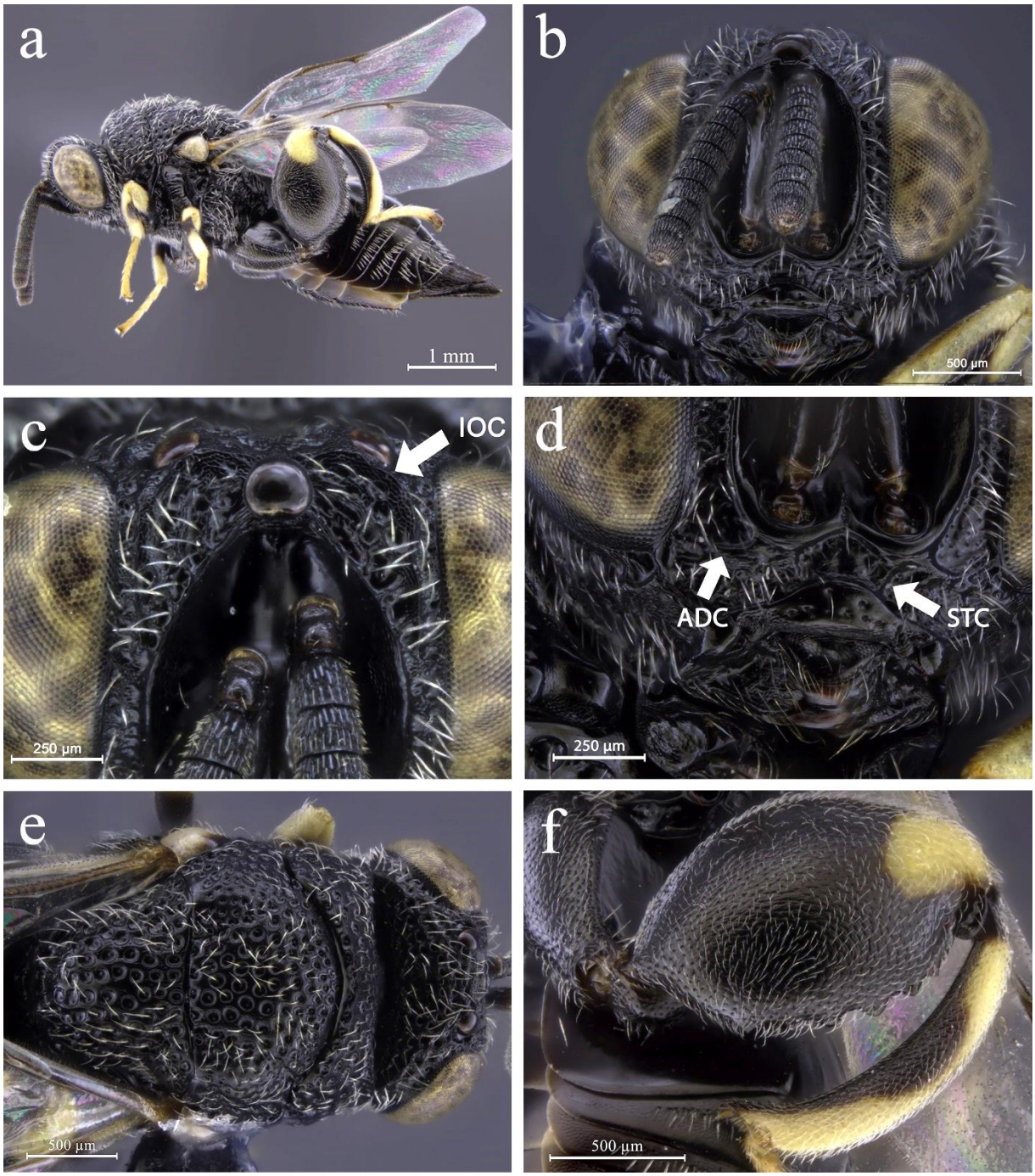

Figure 7. *Brachymeria subrugosa*. **a**, female, lateral habitus; **b**, head, frontal; **c**, vertex; **d**, lower face; **e**, head and mesoscutum, dorsal; **f**, metafemur, outer face. Abbreviations: **IOC**, interocelar carina; **ADC**, adtorular carina; **STC**, subtorular carina.

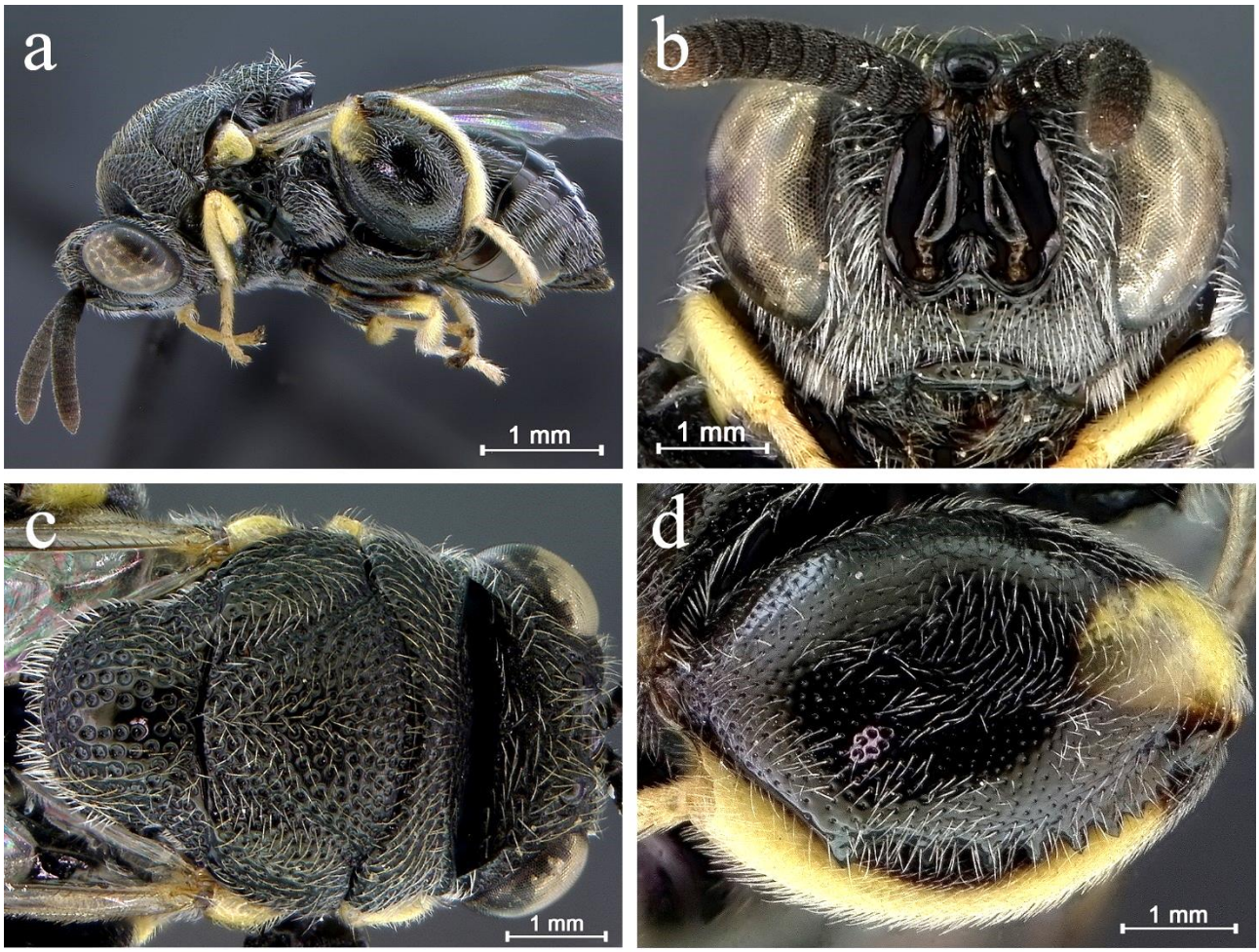

Figure 8. *Brachymeria koehleri*. **a**, female, lateral habitus; **b**, head and mesoscutum, dorsal; **d**, metafemur, outer face.

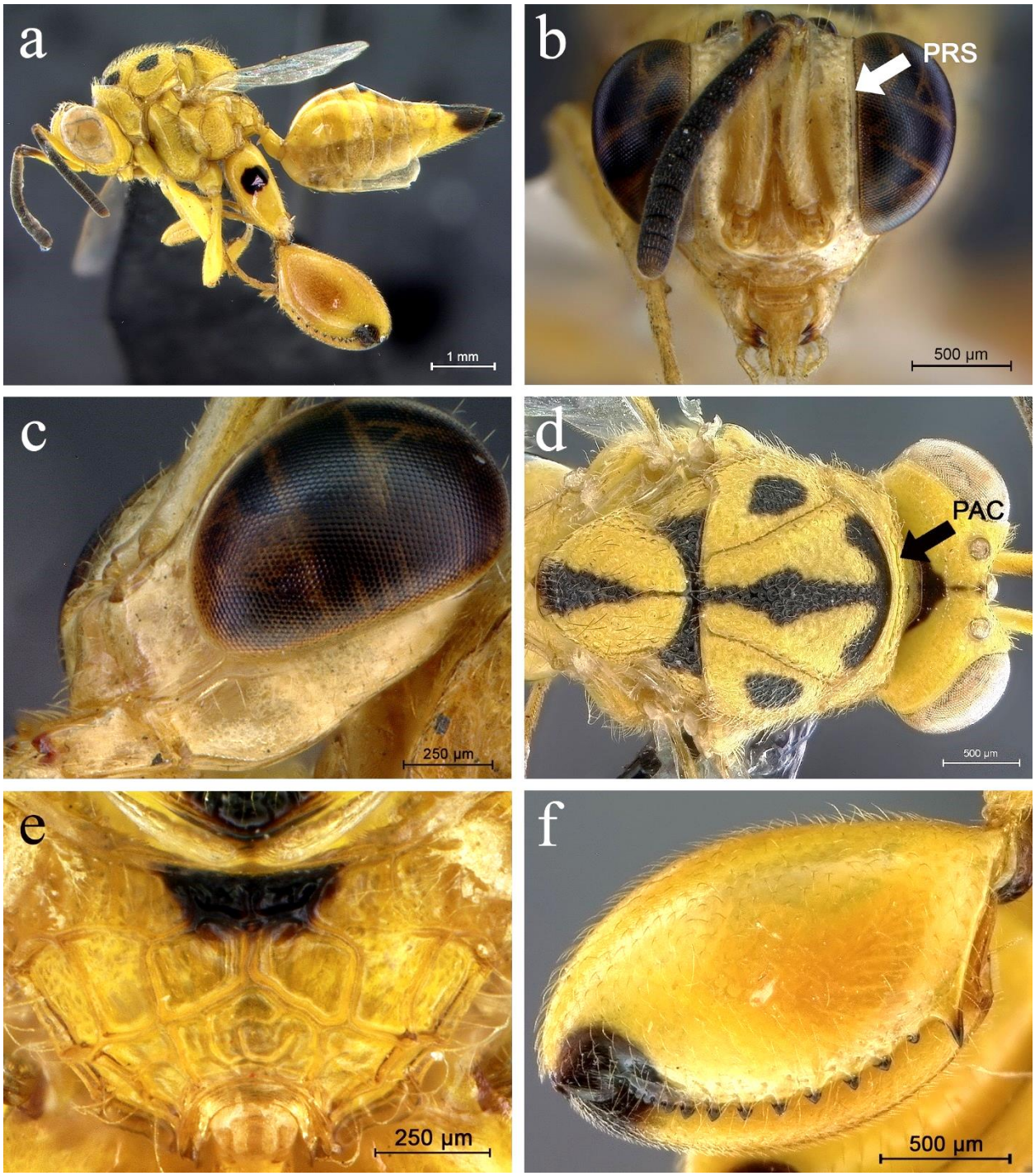

Figure 9. *Conura femorata*. **a**, female, lateral habitus (left fore wing removed); **b**, female head, frontal (left flagellum removed); **c**, head, lateral; **d**, head and mesoscutum, dorsal; **e**, propodeum, dorsal; **f**, metafemur, outer face. Abbreviations: **PRS**, preorbital sulcus; **PAC**, preapical carina.

Figure 10. *Conura femorata*. **a**, metafemur, inner face; **b**, epipygium, dorsal; **c**, male, lateral habitus; **e**, male, head, frontal (left antenna removed). Abbreviation: **IT**, inner tooth.

Figure 11. *Conura attacta*. **a**, female, lateral habitus; **b**, female head, frontal; **c**, head and mesoscutum, dorsal; **d**, propodeum, dorsal; **e**, metafemur, outer face.

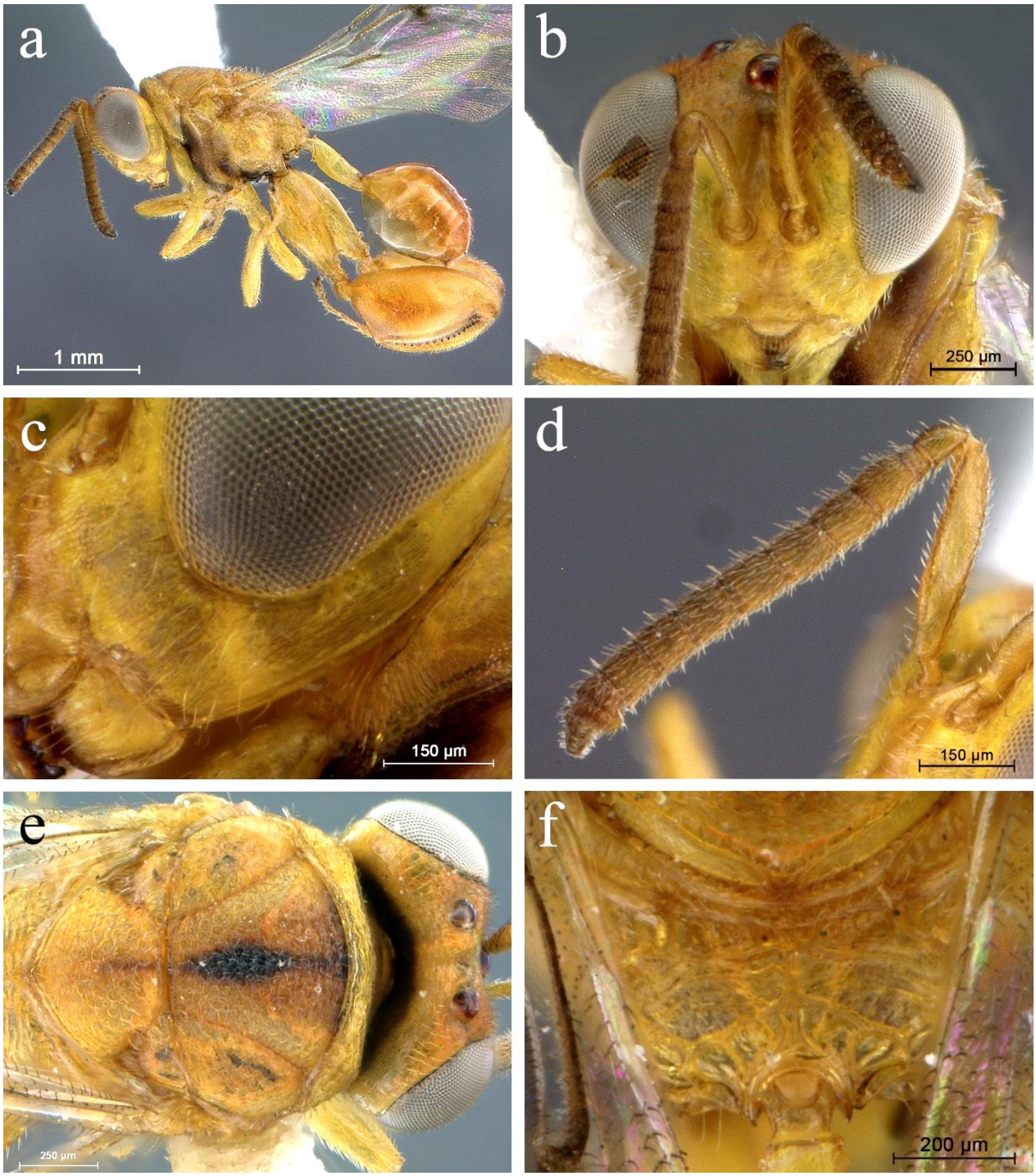

Figure 12. *Conura hirtifemora*. **a**, male, lateral habitus; **b**, male head, frontal; **c**, head, lateral; **d**, male antenna; **e**, head and mesoscutum, dorsal; **c**, propodeum, dorsal.

Figure 13. *Conura hirtifemora*. **a**, metafemur, outer face.

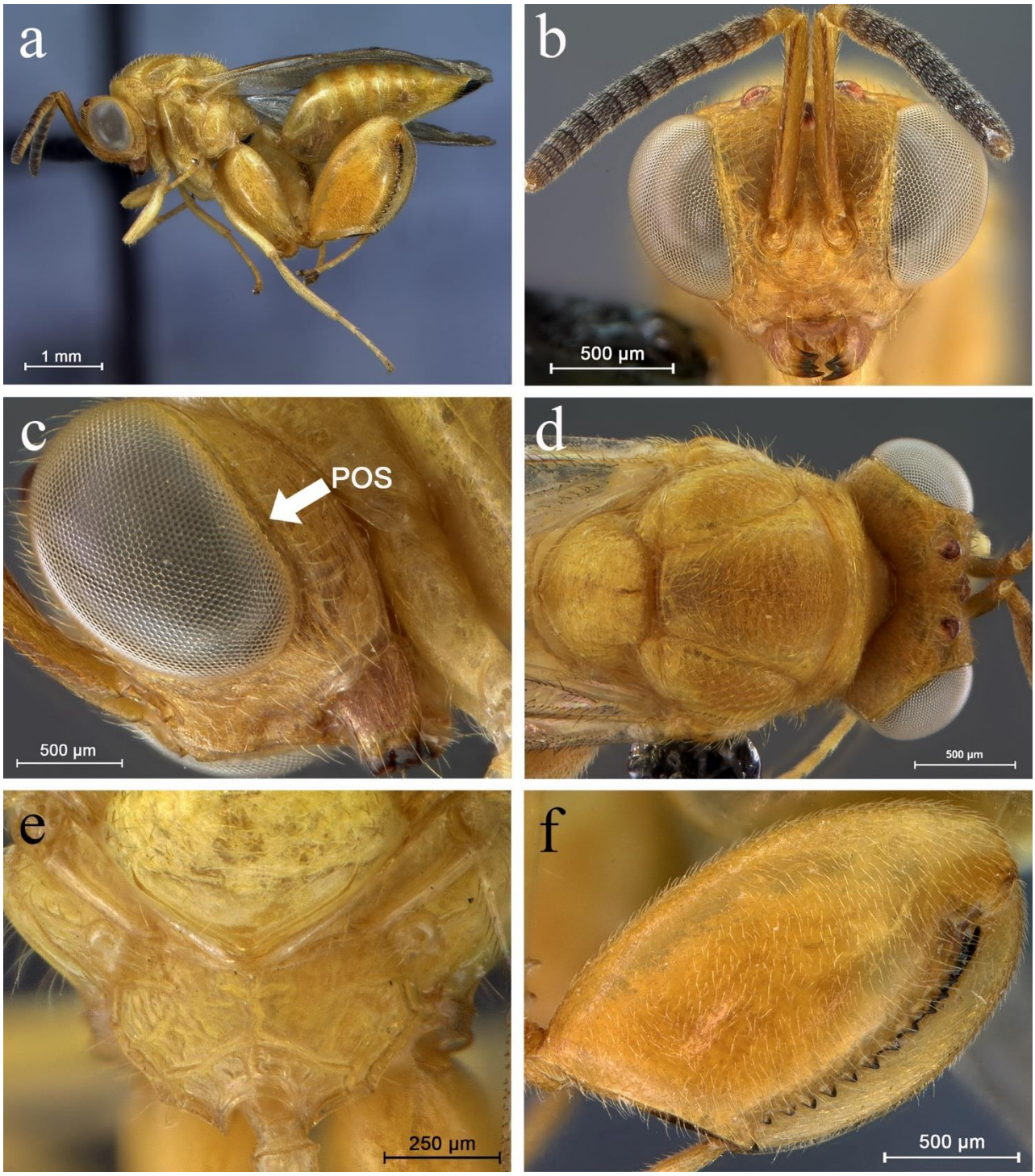

Figure 14. *Conura immaculata*. **a**, female, lateral habitus; **b**, female head, frontal; **c**, head, lateral; **d**, head and mesoscutum, dorsal; **e**, propodeum, dorsal; **f**, metafemur, outer face. Abbreviation: **POS**, postorbital sulcus.

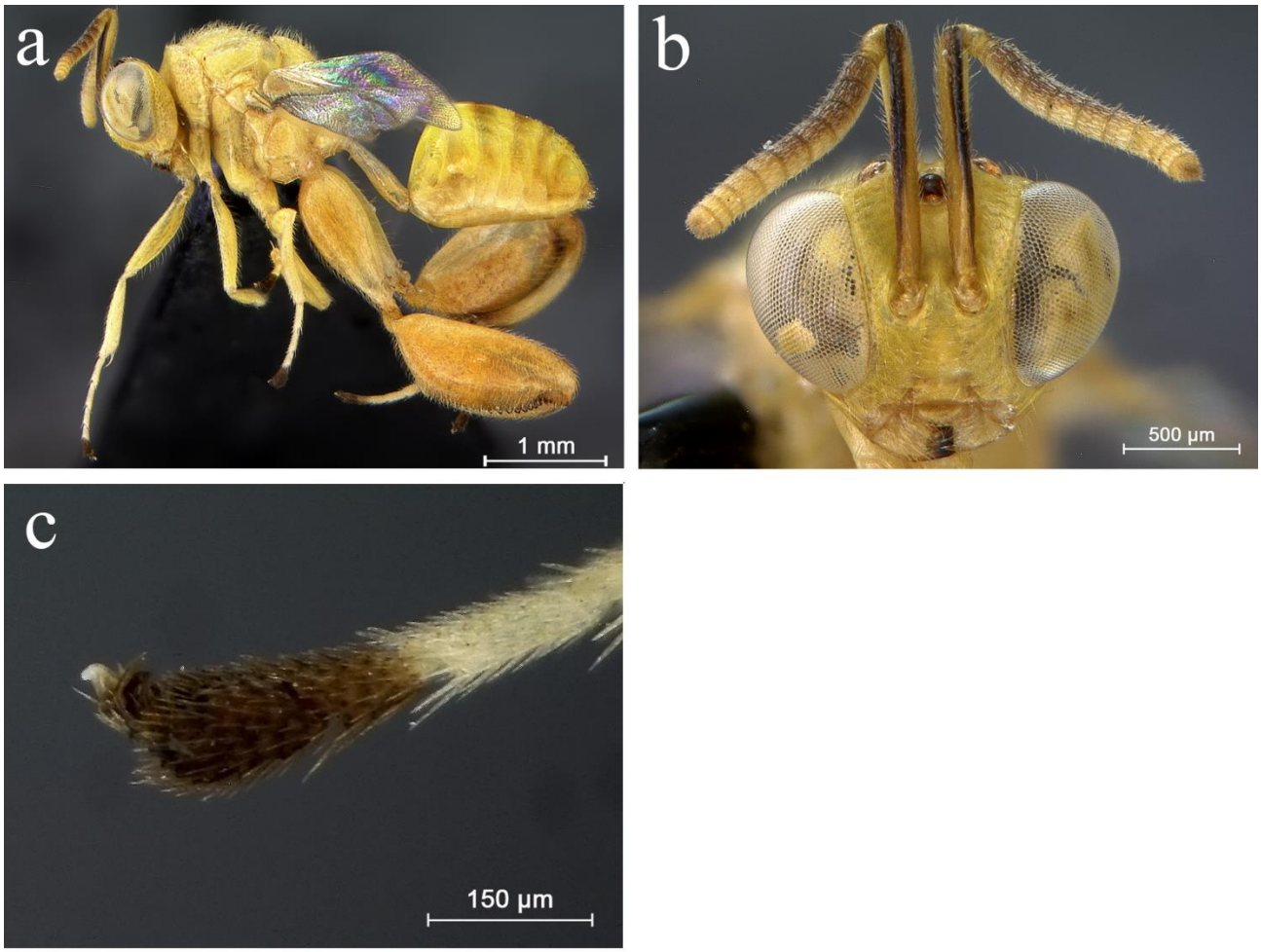

Figure 15. *Conura immaculata*. **a**, male, lateral habitus; **b**, male head, frontal; **c**, male mid leg distal tarsal segments.

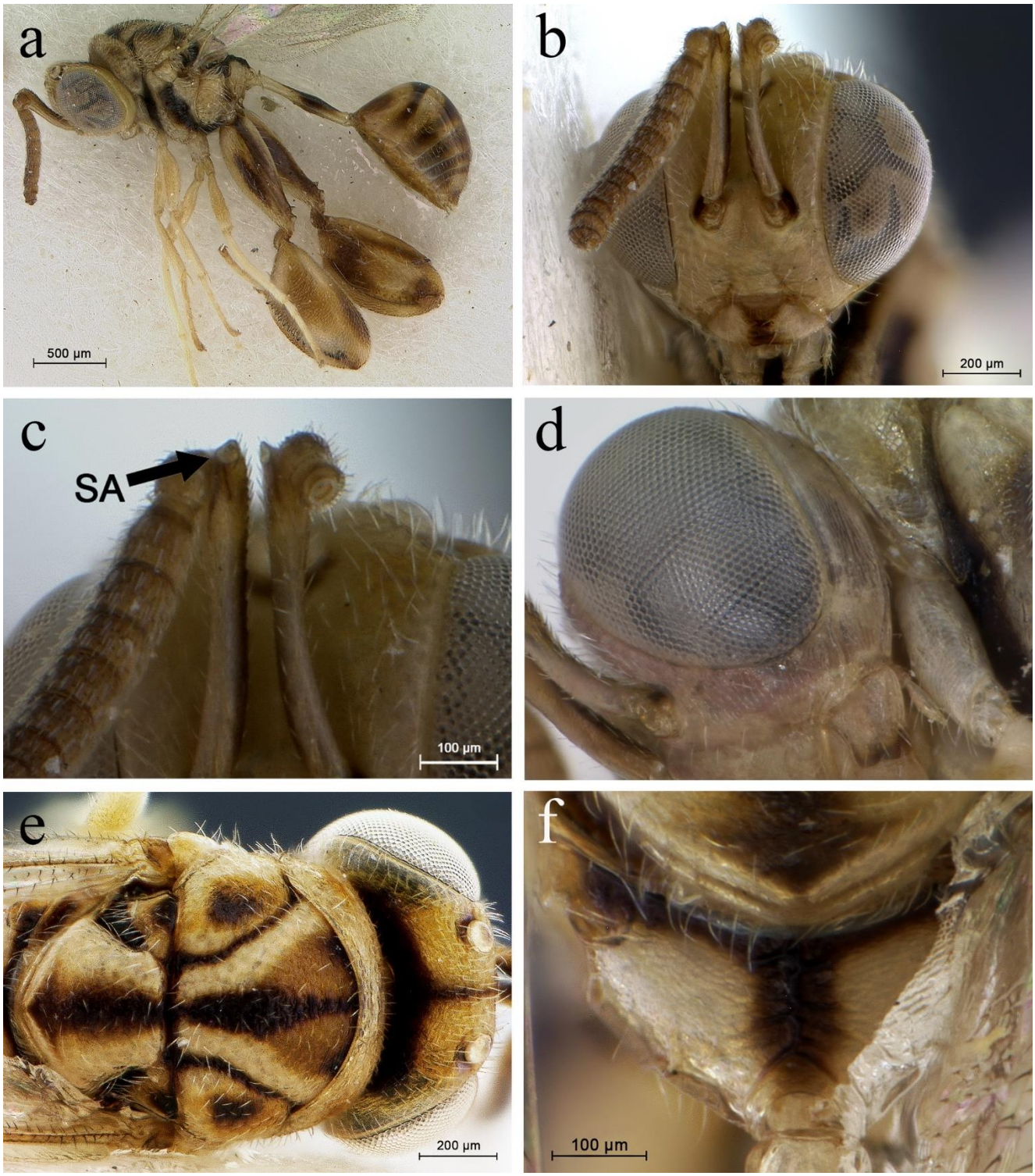

Figure 16. *Conura meteori*. **a**, male, lateral habitus; **b**, male head, frontal (left flagellum removed); **c**, male escape (left flagellum removed); **d**, head, lateral; **e**, head and mesoscutum, dorsal; **f**, propodeum, dorsal. Abbreviation: **SA**, sensillar area.

Figure 17. *Conura meteori*. **a**, metafemur, outer face.

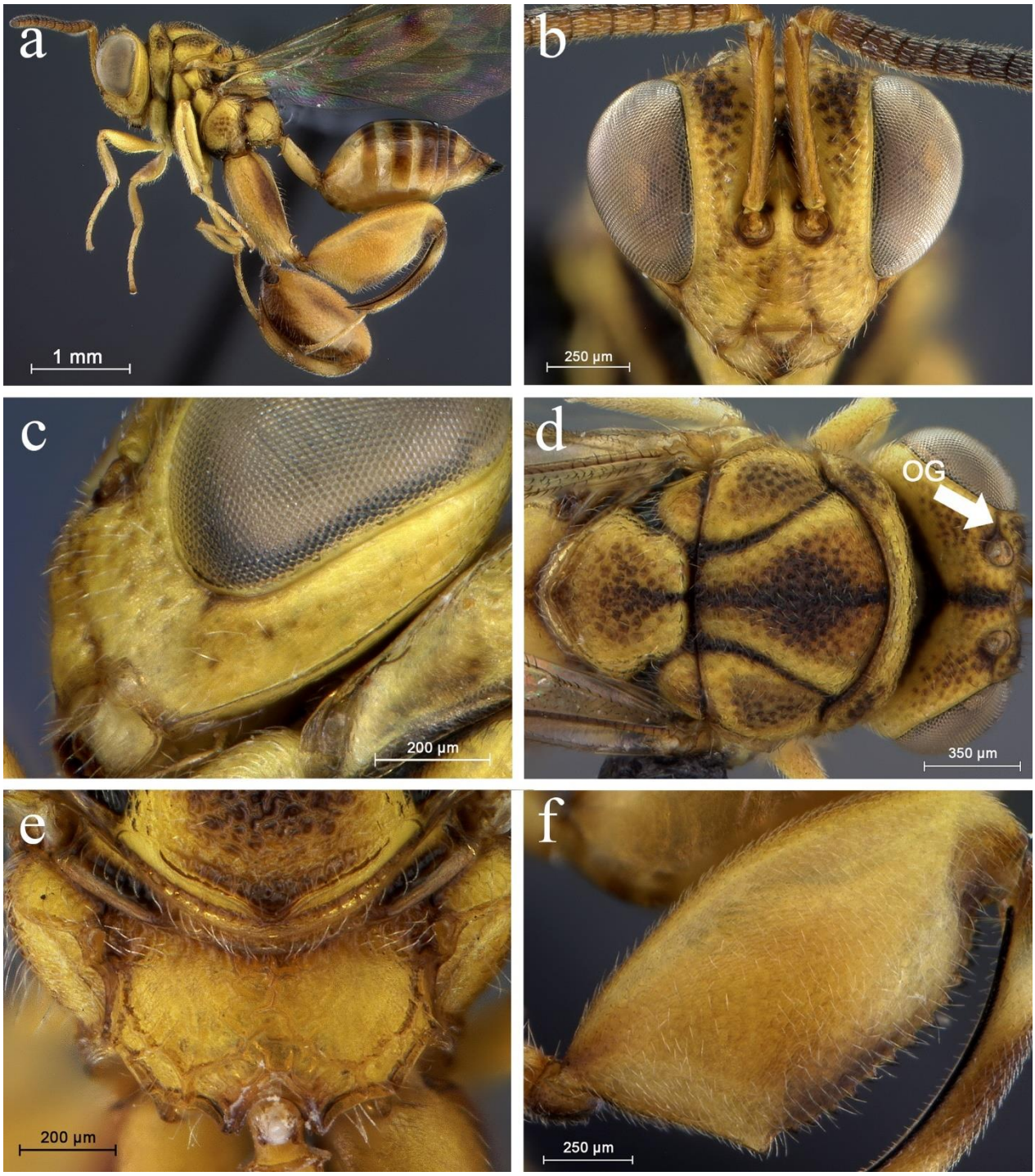

Figure 18. *Conura ruffinellii*. **a**, female, lateral habitus; **b**, female head, frontal; **c**, head, lateral; **d**, head and mesoscutum, dorsal; **e**, propodeum, dorsal; **f**, metafemur, outer face. Abbreviation: **OG**, ocellar-ocular groove.

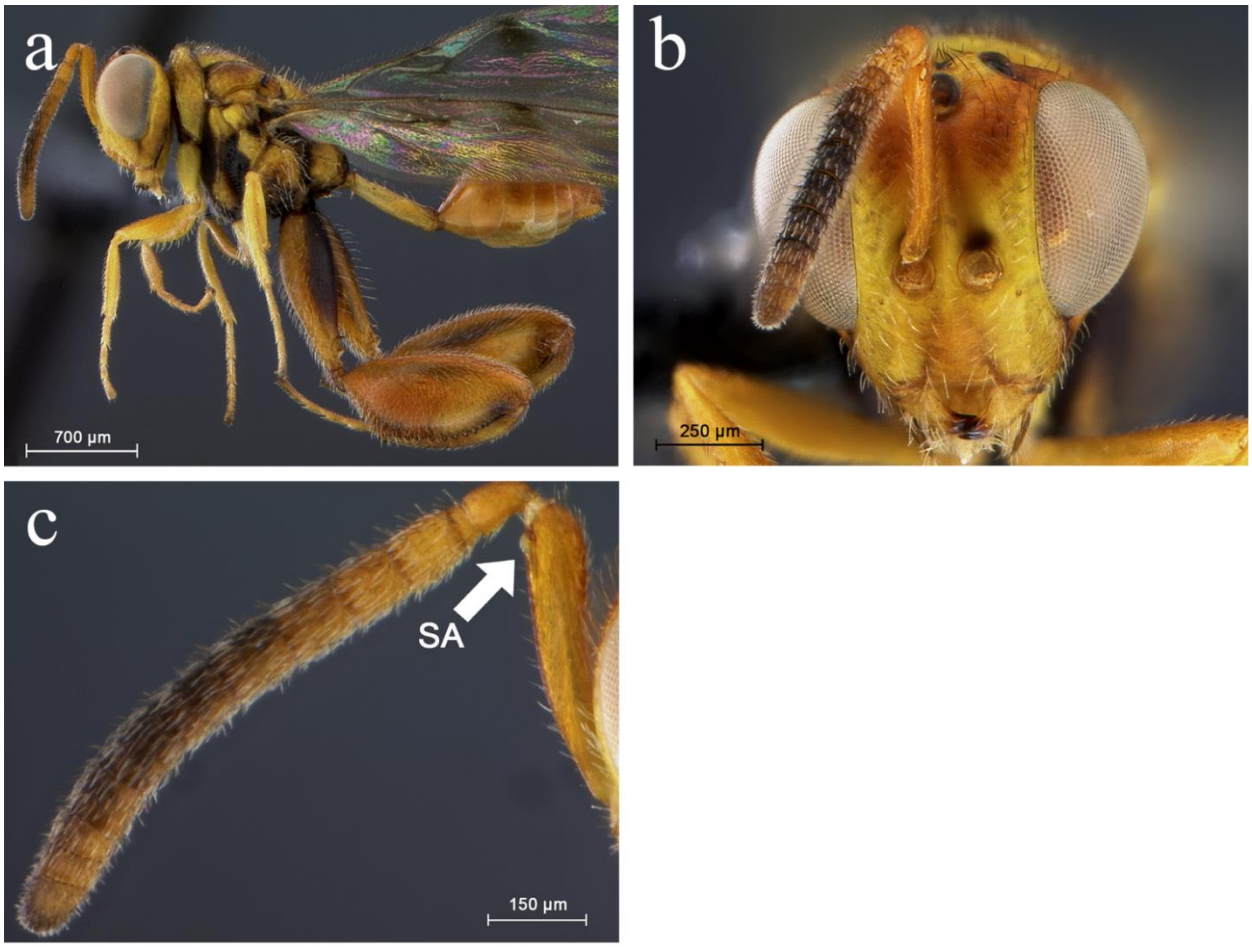

Figure 19. *Conura ruffinellii*. **a**, male, lateral habitus; **b**, male head, frontal (right antenna removed); **c**, male antenna. Abbreviation: **SA**, sensillar area.

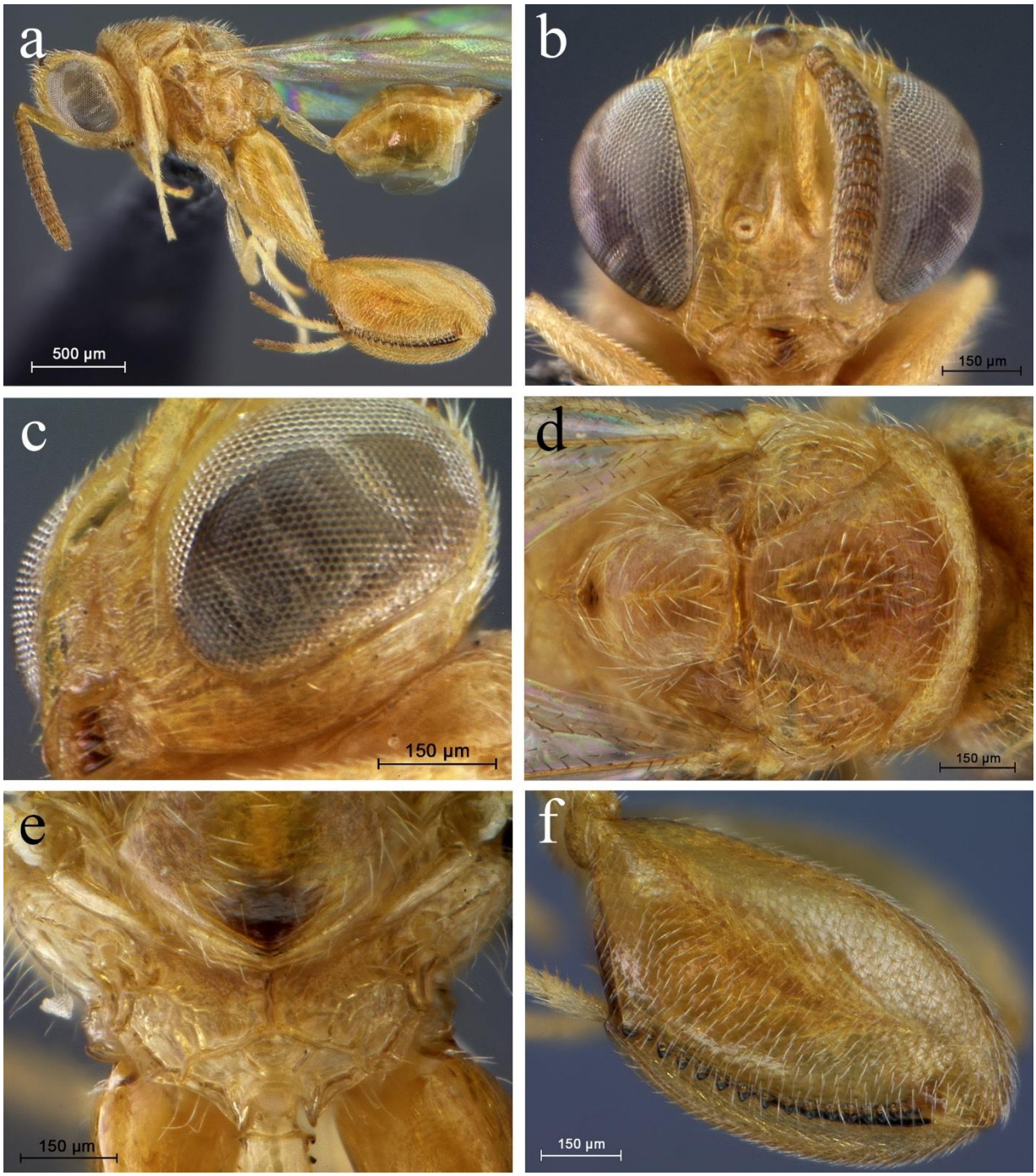

Figure 20. *Conura sp. 1*. **a**, female, lateral habitus; **b**, female head, frontal (right antena removed); **c**, head, lateral (right antenna removed); **d**, mesoscutum, dorsal; **e**, propodeum, dorsal; **f**, metafemur, outer face.

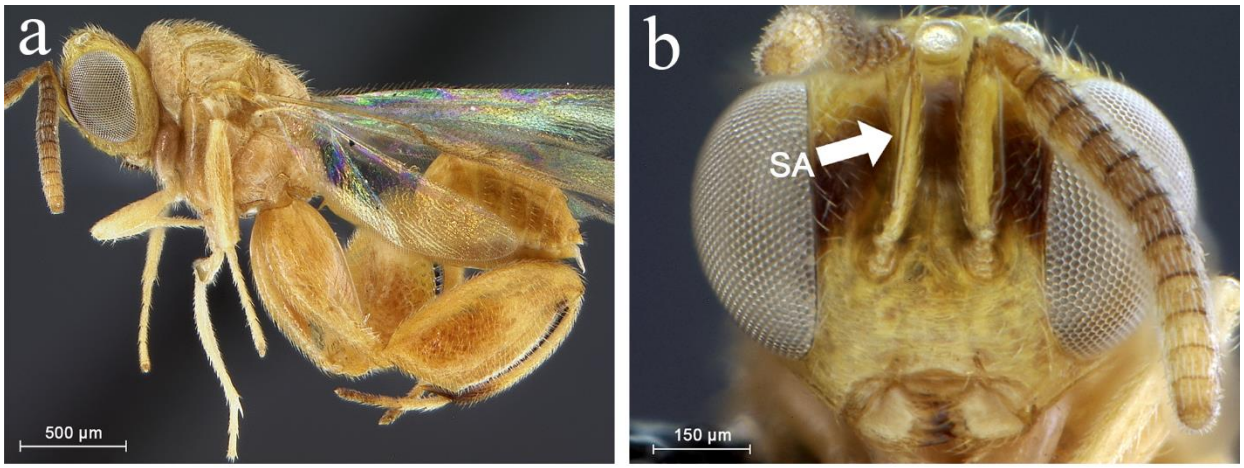

Figure 21. *Conura sp. 1*. **a**, male, lateral habitus; **b**, male head, frontal. Abbreviation: **SA**, sensillar area.

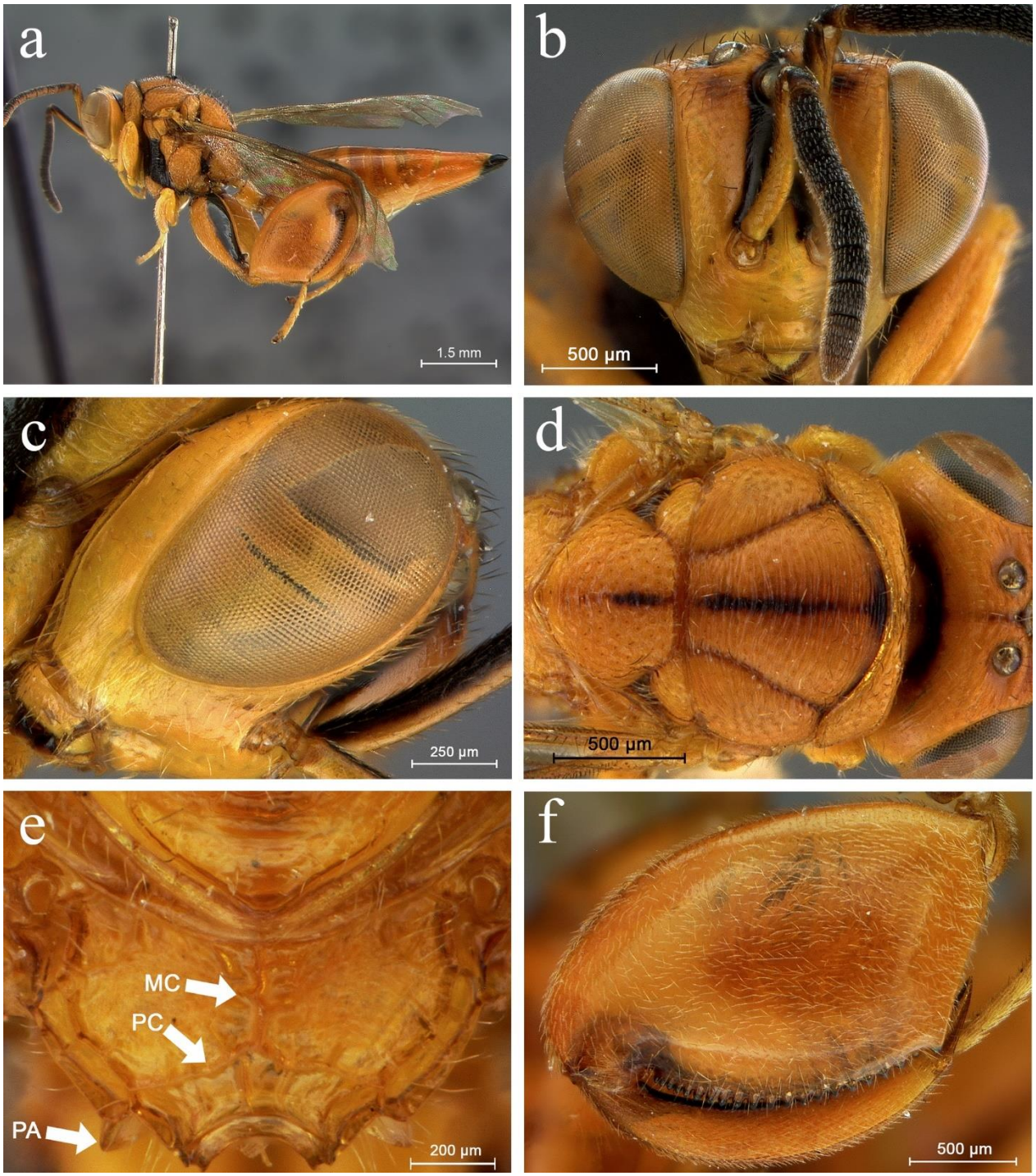

Figure 22. *Conura igneoides*. **a**, female, lateral habitus; **b**, female head, frontal; **c**, head, lateral; **d**, head and mesoscutum, dorsal; **e**, propodeum, dorsal; **f**, metafemur, outer face. Abbreviation: **MC**, median carina; **PC**, posterior costula; **PA**, parapetiolar apophyses.

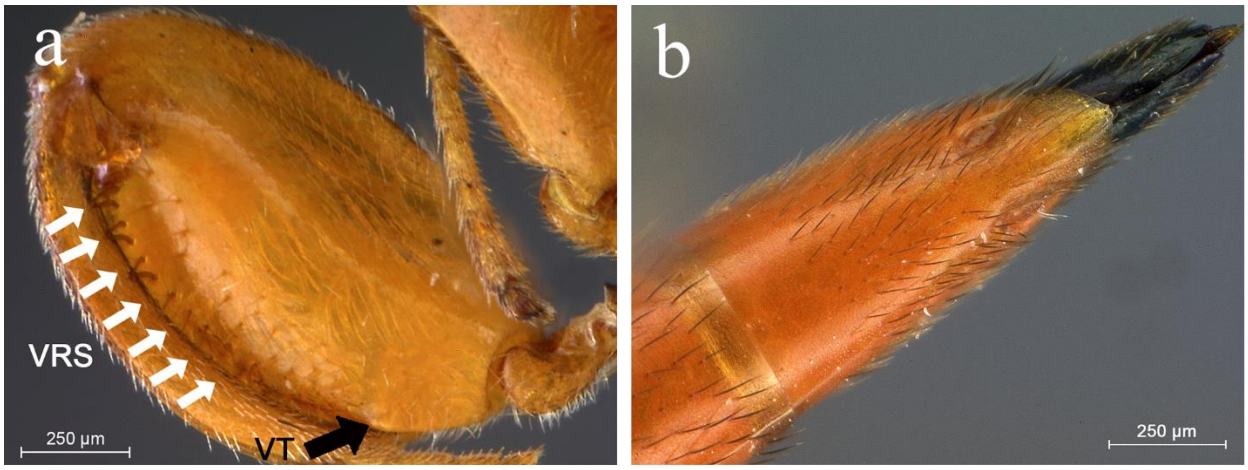

Figure 23. *Conura igneoides*. **a**, metafemur, outer face; **b**, epipygium. Abbreviation: **VRS**, ventral row of setae (also indicated by white setae); **VT**, ventral tooth.

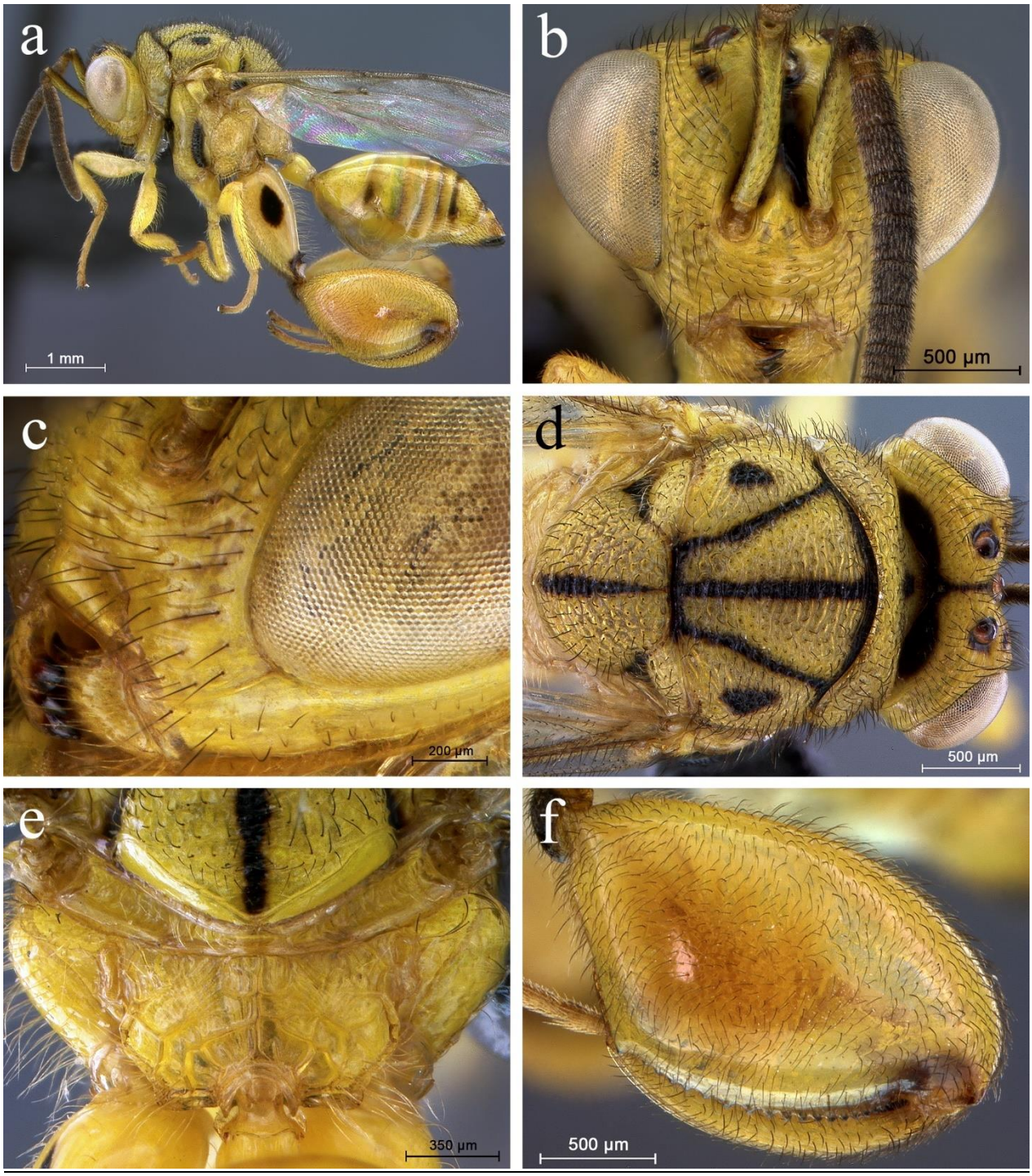

Figure 24. *Conura maculata*. **a**, female, lateral habitus; **b**, female head, frontal; **c**, head, lateral; **d**, head and mesoscutum, dorsal; **e**, propodeum, dorsal; **f**, metafemur, outer face.

Figure 25. *Conura maculata*. **a**, male, lateral habitus; **b**, male head, frontal (right flagellum removed).

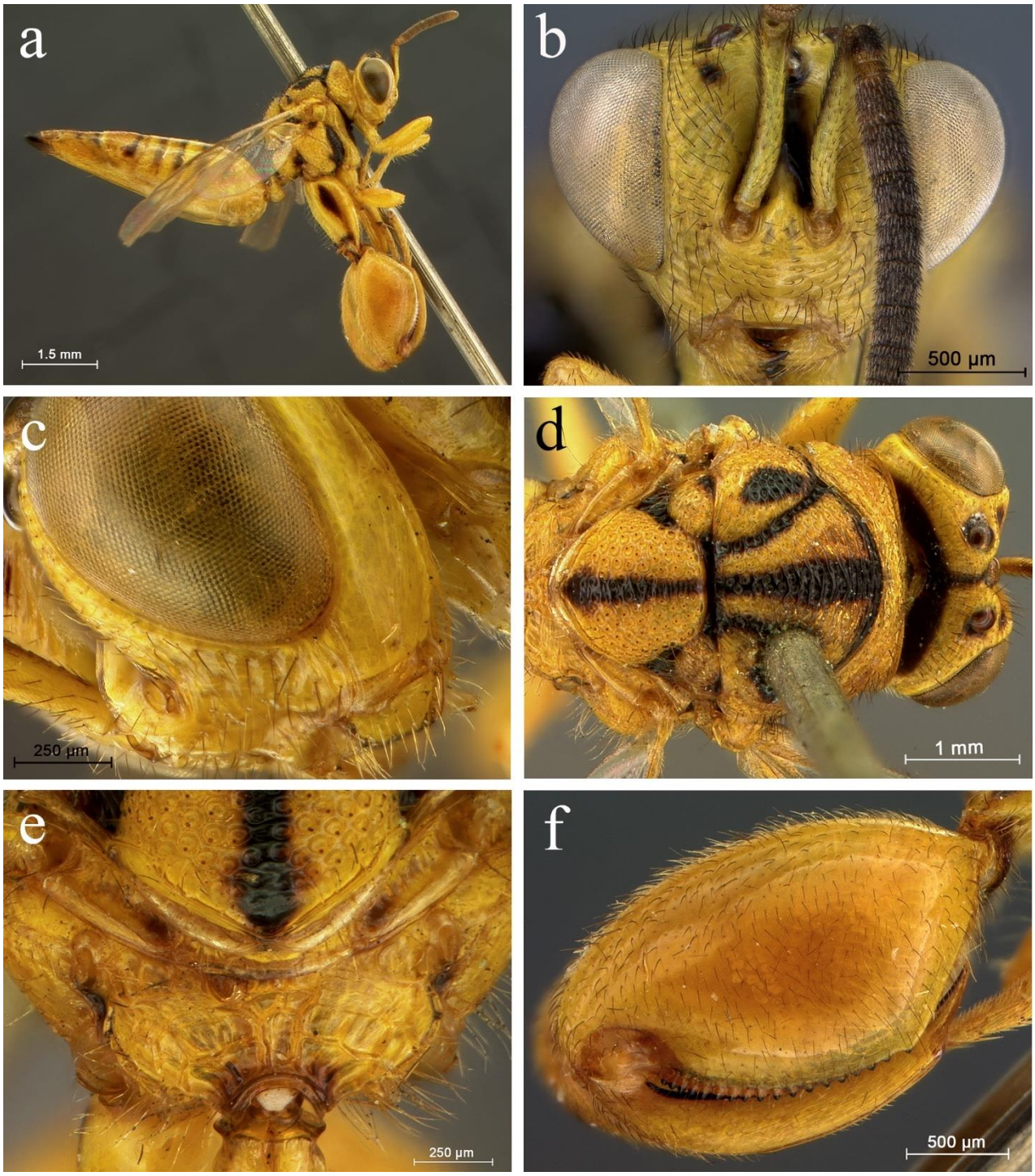

Figure 26. *Conura sp. 2*. **a**, female, lateral habitus; **b**, female head, frontal; **c**, head, lateral (left scape removed); **d**, head and mesoscutum, dorsal; **e**, propodeum, dorsal; **f**, metafemur, outer face.

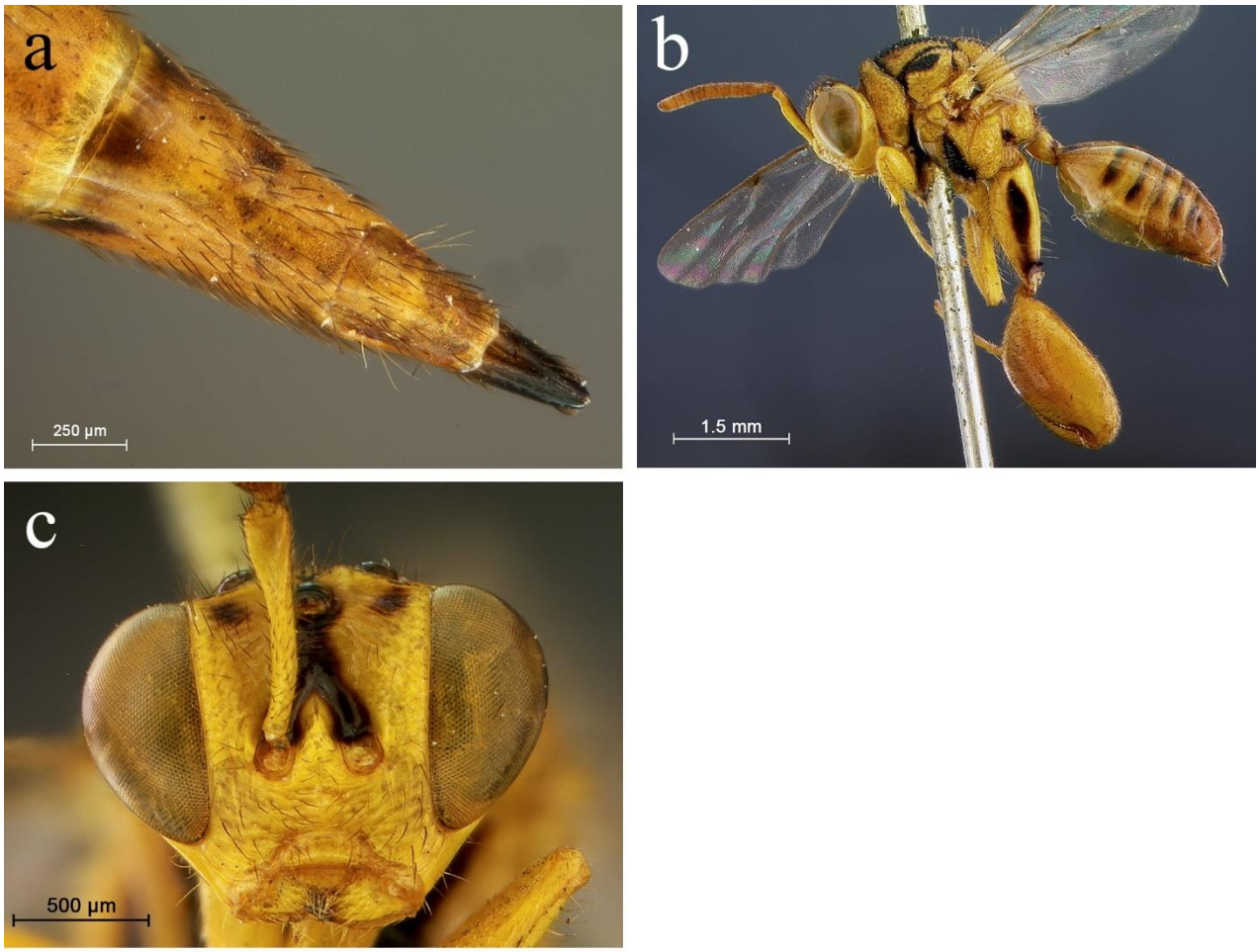

Figure 27. *Conura sp. 2*. **a**, epipygium; **b**, male, lateral habitus; **c**, male head, frontal (left scape removed).

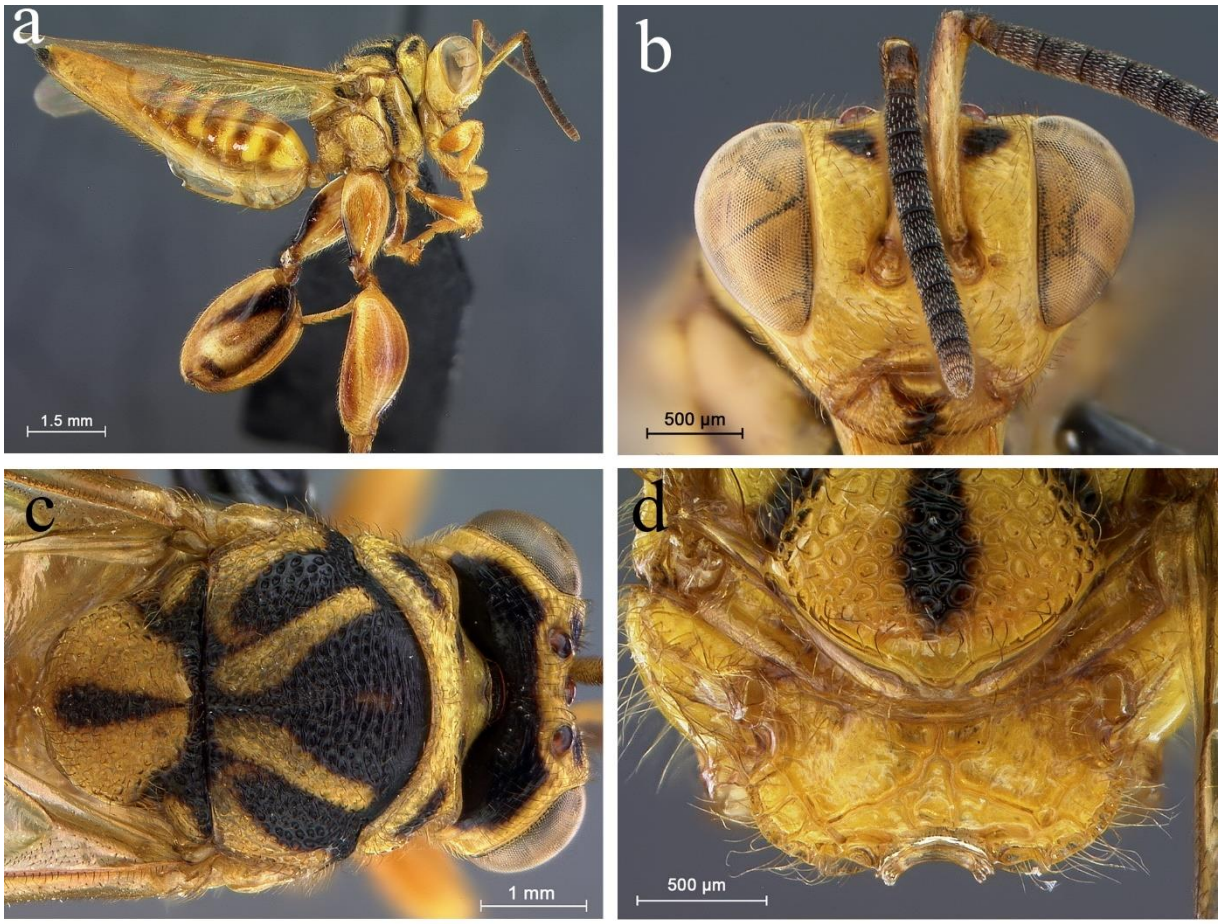

Figure 28. *Conura flavicans*. **a**, female, lateral habitus; **b**, female head, frontal; **c**, head and mesoscutum, dorsal; **d**, propodeum, dorsal (petiole removed).

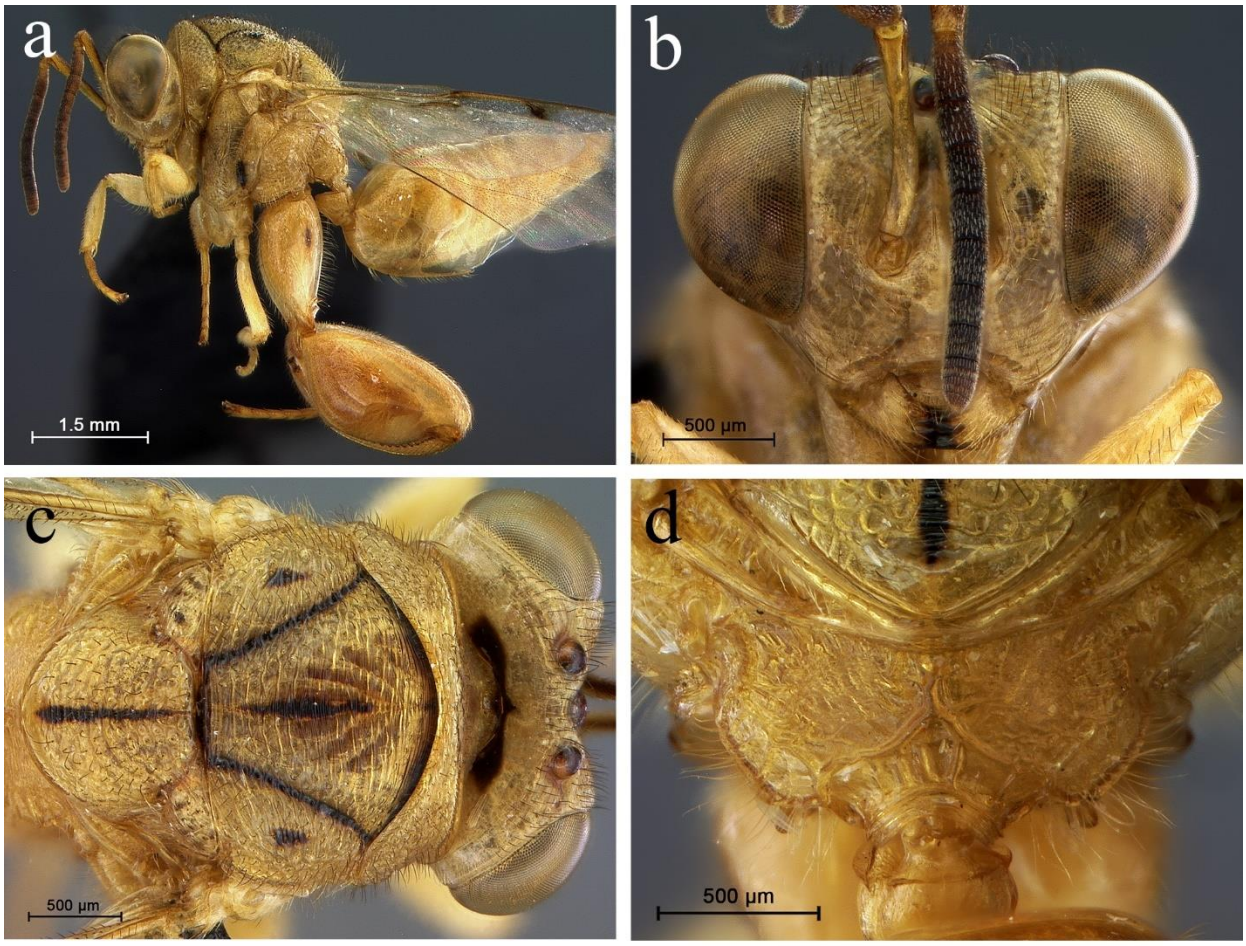

Figure 29. *Conura magistrettii*. **a**, female, lateral habitus; **b**, female head, frontal; **c**, head and mesoscutum, dorsal; **d**, propodeum, dorsal.

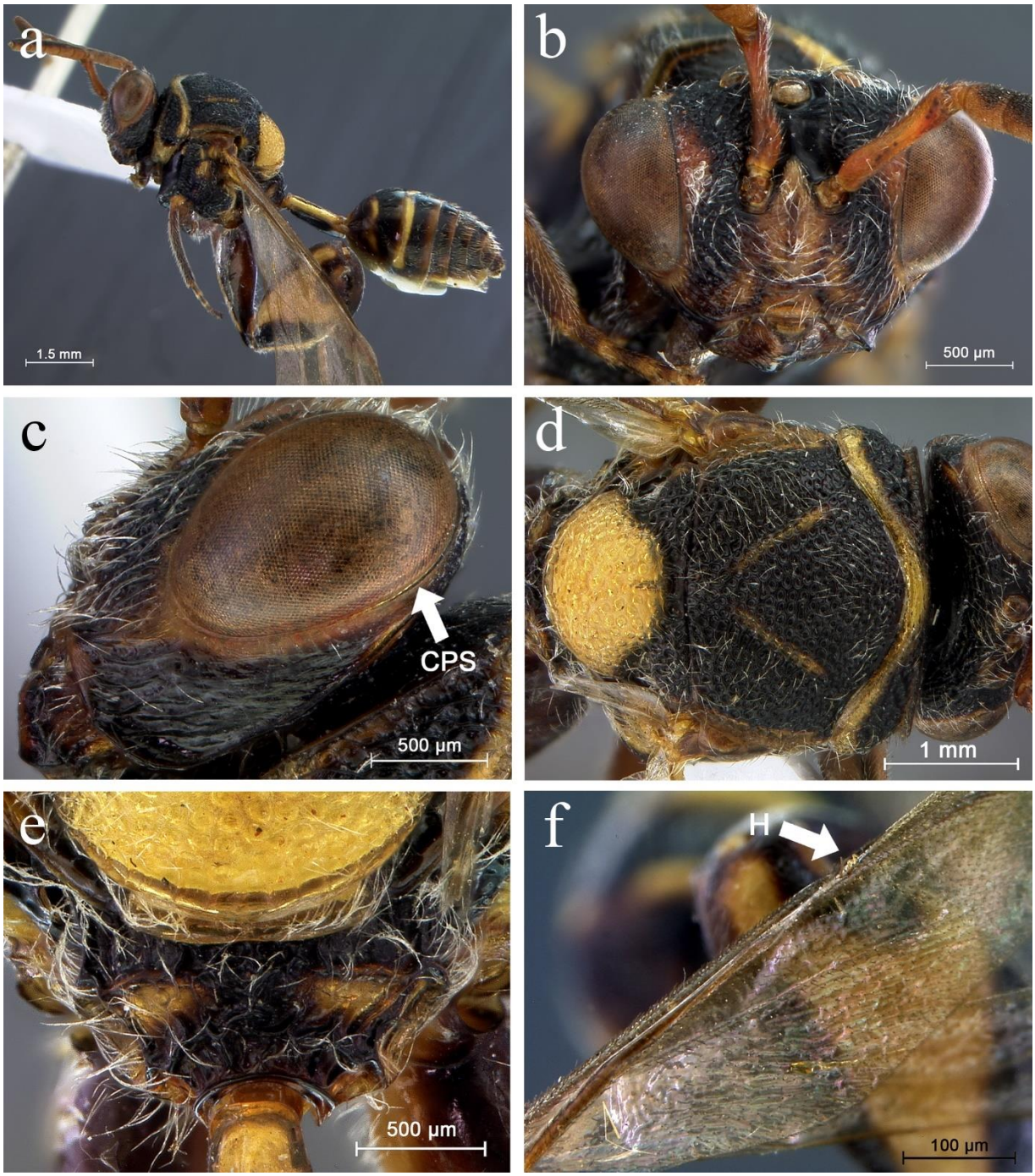

Figure 30. *Conura koehleri*. **a**, female, lateral habitus; **b**, female head, frontal; **c**, head, lateral; **d**, head and mesoscutum, dorsal; **e**, propodeum, dorsal; **f**, hind wing. Abbreviations: **CPS**, carina emarginating postorbital sulcus; **H**, hamuli.

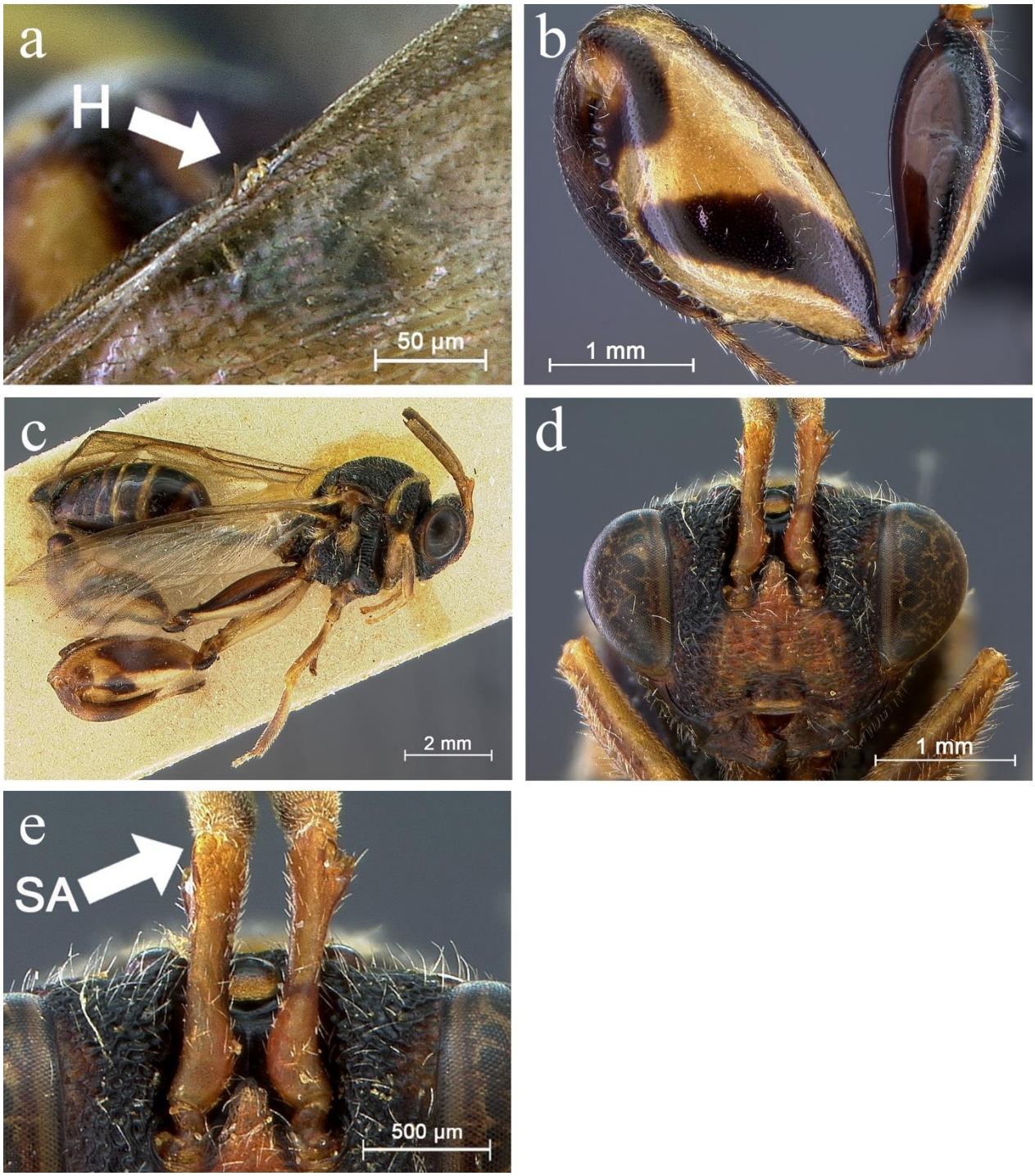

Figure 31. *Conura koehleri*. **a**, hamuli; **b**, male, lateral habitus; **c**, male head, frontal; **d**, male scape. Abbreviations: **H**, hamuli; **SA**, sensillar area.

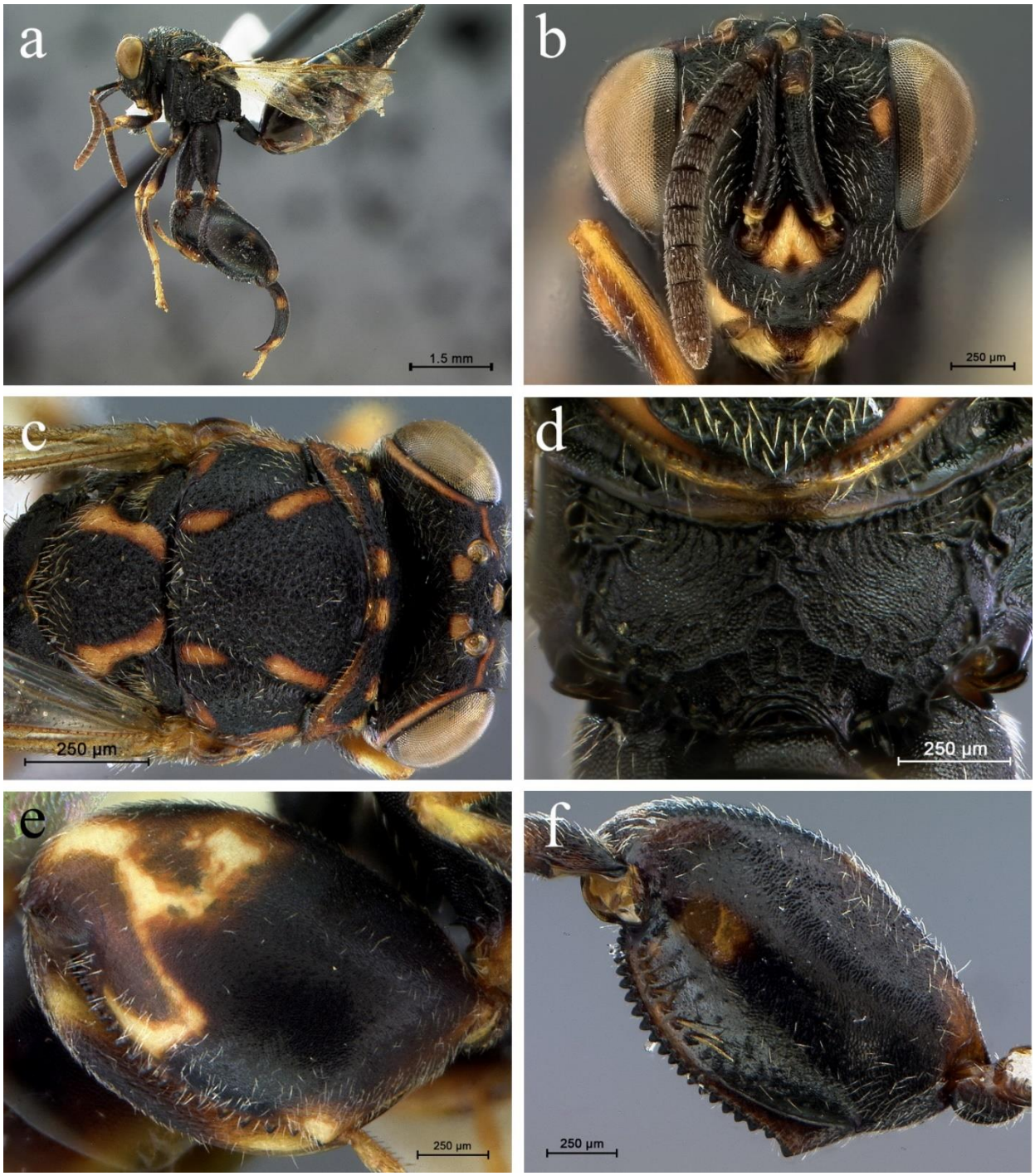

Figure 32. *Conura side*. **a**, female, lateral habitus; **b**, female head, frontal; **c**, head and mesoscutum, dorsal; **d**, propodeum, dorsal; **e**, metafemur, outer face; **f**, metafemur, inner face.

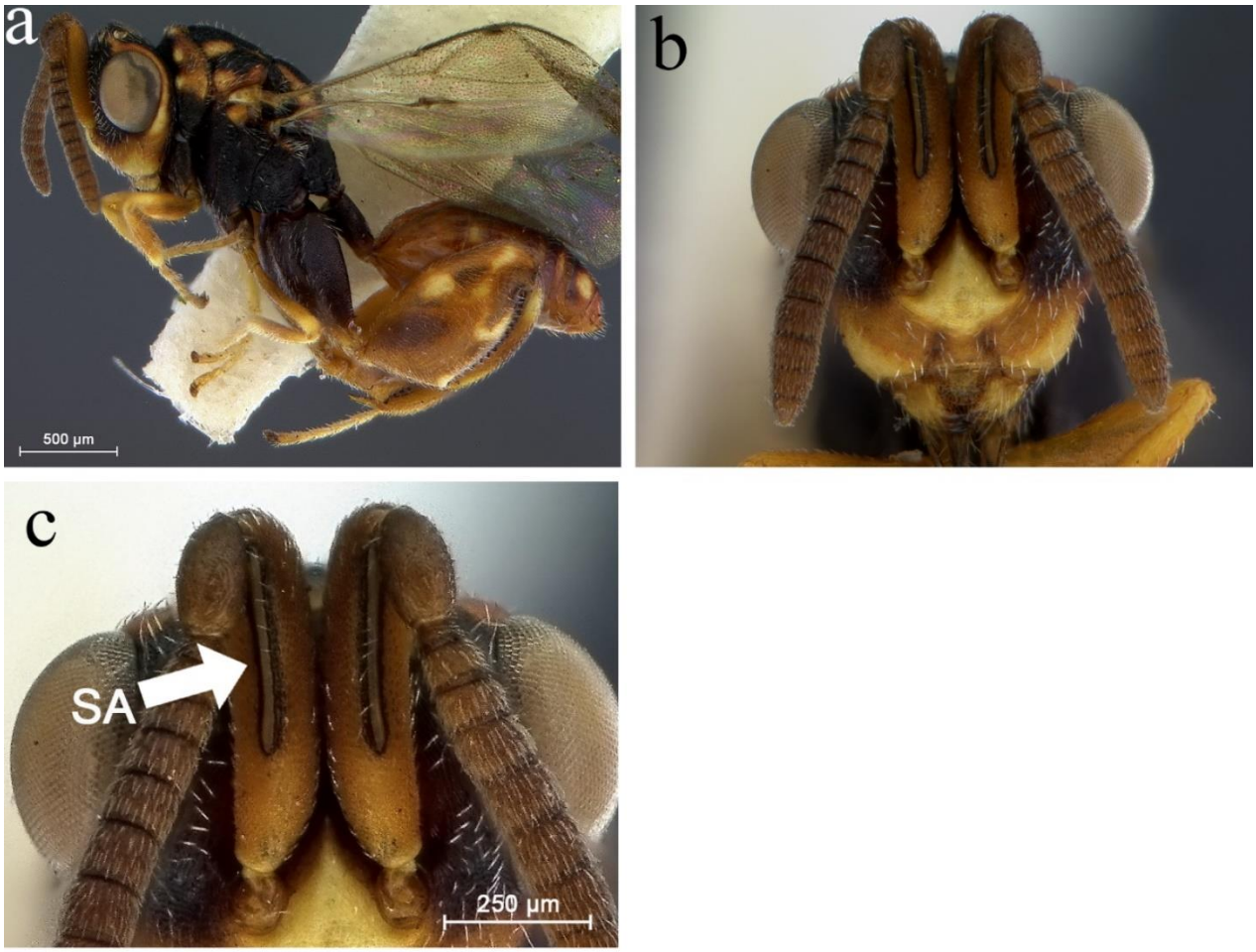

Figure 33. *Conura side*. **a**, male, lateral habitus; **b**, male head, frontal; **c**, male scape. Abbreviation: **SA**, sensillar area.

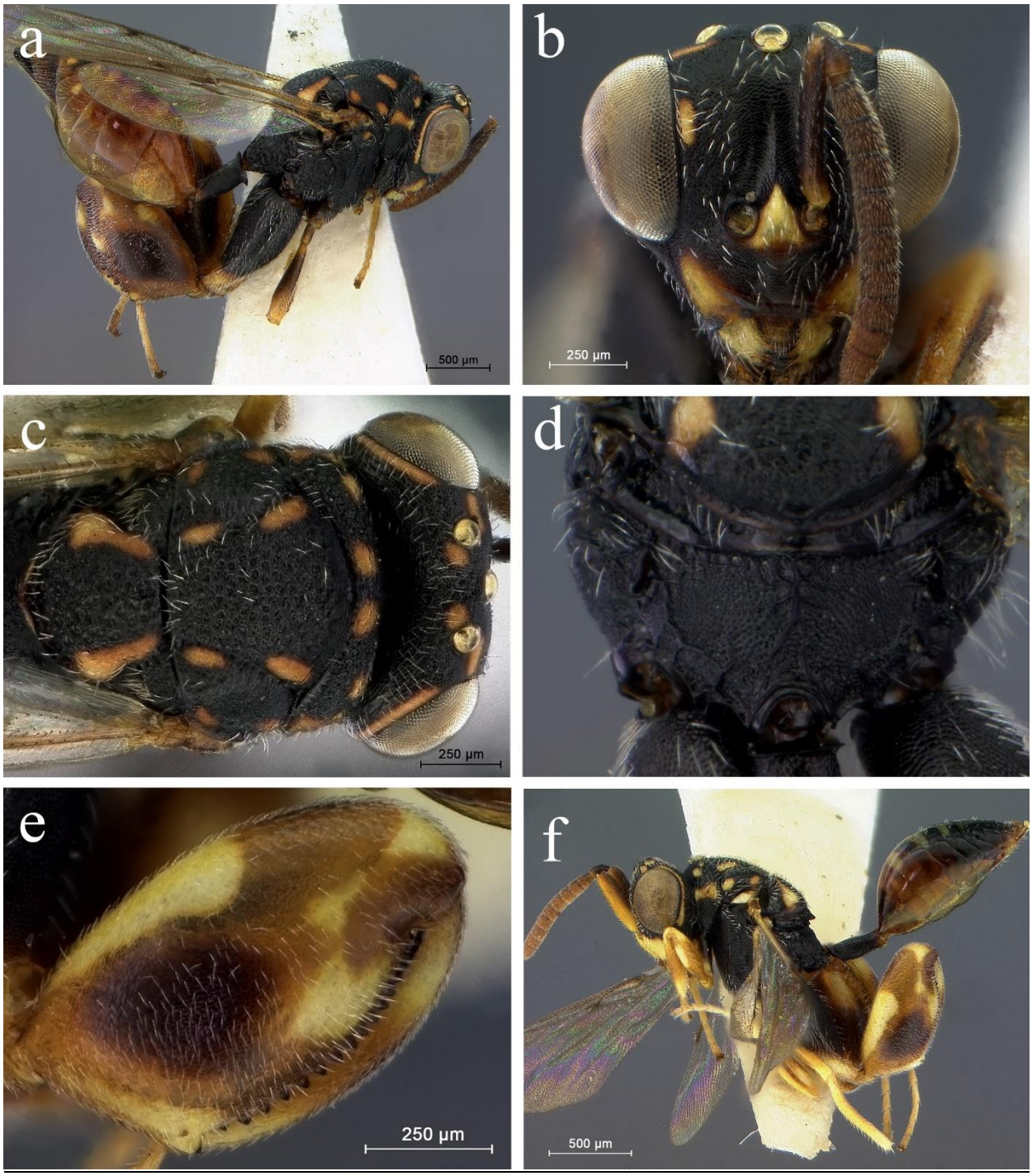

Figure 34. *Conura torvina*. **a**, female, lateral habitus; **b**, female head, frontal (right antenna removed); **c**, head and mesoscutum, dorsal; **d**, propodeum, dorsal; **e**, metafemur, outer face; **f**, male, lateral habitus.

Figure 35. *Conura torvina*. **a,** male head, frontal (left antenna removed); **b**, male scape (left antenna removed). Abbreviation: **SA**, sensillar area.

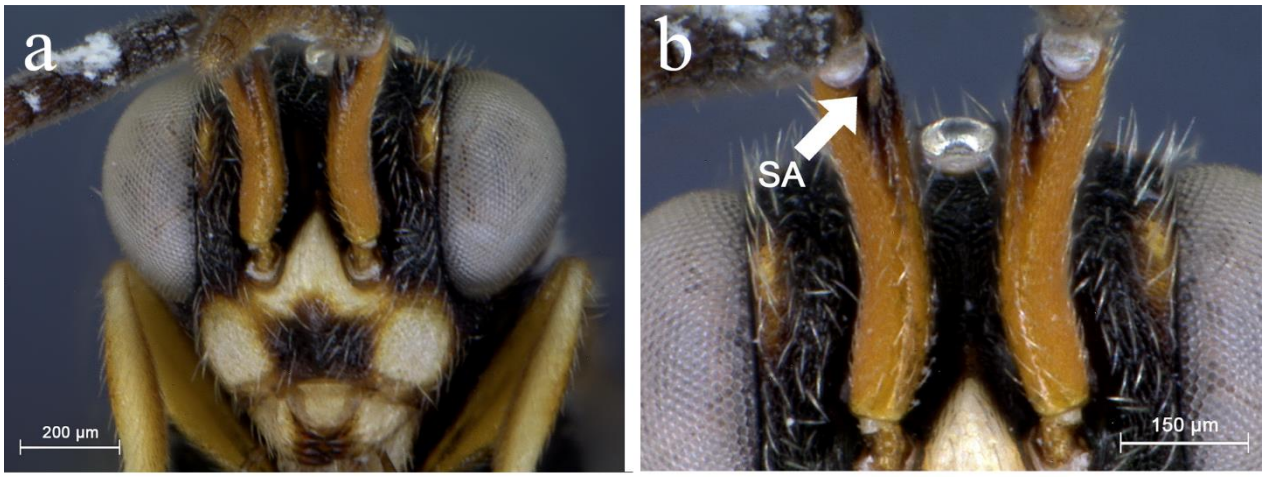

Figure 36. *Conura albifrons*. **a**, male head, frontal; **b**, male scape. Abbreviation: **SA**, sensillar area.