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Revision of New World Spalangiinae (Hymenoptera: Pteromalidae)

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Abstract

Spalangia Latreille and *Playaspalangia* Yoshimoto, the only two genera classified in Spalangiinae (Chalcidoidea: Pteromalidae) are revised for the New World. Thirty-one species of *Spalangia* and a single species of *Playaspalangia*, *P. rothi* Yoshimoto, are recognized from the New World. One further name, *Spalangia tarsalis* Brèthes, is treated as a ***nomen dubium***. European species of *Spalangia* not yet known from the New World are also discussed and illustrated relative to regional species, but are not treated formally. The following new synonymies are proposed: *Spalangia erythromera brachyceps* Bouček under *Spalangia erythromera* Förster **n. syn.**, *Spalangia bakeri* Kieffer under *Spalangia chontalensis* Cameron **n. syn.**, and *Spalangia lanaiensis* Ashmead under *Spalangia impunctata* Howard **n. syn.** *Spalangia simplex* Perkins is newly recorded from the New World and the following 13 species are described as new: *Spalangia alyxia* **n. sp.**, *Spalangia flavicrus* **n. sp.**, *Spalangia imitator* **n. sp.**, *Spalangia innuba* **n. sp.**, *Spalangia leiopleura* **n. sp.**, *Spalangia masneri* **n. sp.**, *Spalangia nigroides* **n. sp.**, *Spalangia noyesi* **n. sp.**, *Spalangia plaumanni* **n. sp.**, *Spalangia rugosifrons* **n. sp.**, *Spalangia stictocephala* **n. sp.**, *Spalangia stictocyla* **n. sp.**, and *Spalangia xanthoscapa* **n. sp.** The 2 genera and the 32 regional species of Spalangiinae are keyed, described and illustrated, and regional hosts and distributions are summarized for each species. Distribution maps document the known range of each of the species in the New World. For purposes of comparison of morphologically similar species, 7 informal species groups are recognized in *Spalangia* to include 29 of the 31 New World species: the *attae*-group (*S. attae* Burks, *S. rugosifrons*, *S. stictocyla* and *S. stictocephala*), the *cameroni*-group (*S. cameroni* Perkins, *S. longepetiolata* Bouček and *S. gemina* Bouček), the *drosophilae*-group (*S. bethyloides* Bouček, *S. drosophilae* Ashmead, *S. flavicrus*, *S. impunctata*, *S. innuba*, *S. leiopleura* and *S. plaumanni*), the *endius* group (*S. endius* Walker and *S. nigripes*), the *nigra*-group (*S. alyxia*, *S. chontalensis*, *S. masneri*, *S. nigra* Latreille, *S. nigroides* and *S. nigroaenea* Curtis), the *noyesi*-group (*S. noyesi* and *S. xanthoscapa*), and the *subpunctata*-group (*S. erythromera*, *S. fuscipes*, *S. haematobiae* Ashmead, *S. imitator* and *S. subpunctata* Förster).

Key words: Chalcidoidea, *Spalangia*, *Playaspalangia*, Diptera pupal parasitoids

Introduction

The subfamily Spalangiinae (Pteromalidae) includes just two genera, *Spalangia* Latreille, 1805 and *Playaspalangia* Yoshimoto, 1976. The type species of the monotypic genus *Playaspalangia* was described from Mexico, whereas Noyes (2003) lists 51 valid species for the cosmopolitan genus *Spalangia*. Because of a very distinctive habitus individuals of Spalangiinae and *Spalangia* are among the most easily identifiable of the 31 currently accepted subfamilies and the almost 600 world genera of Pteromalidae listed by Noyes (2003). Except sometimes for the legs, specimens are black or dark brown without obvious metallic luster and the antennae are inserted widely apart at the extreme anterior margin of the head above the base of each mandible (e.g. Figs 1, 10). Furthermore, the antenna is only 10-segmented and the flagellum lacks differentiated anelli, consisting of 7 funicular segments and an unsegmented clava (e.g. Figs 12, 14, 73, 76). Because individuals are so easily recognized, Spalangiinae and/or *Spalangia* usually is differentiated within the first few choices of keys to Pteromalidae (e.g. Graham 1969; Bouček and Rasplus 1991; Bouček and Heydon 1997) and sometimes the group has even been treated as its own family (see Bouček 1963; Bouček 1988b). A cladistic analysis of 90 morphological features by Török and Abraham (2002) retrieved *Spalangia* as the sister group of other Pteromalidae and the molecular analyses of Campbell *et al.* (2000) and Desjardin *et al.* (2007) indicated a comparatively basal position for *Spalangia* within a non-monophyletic Pteromalidae, though subfamilial relationships within Pteromalidae remain poorly substantiated,.

Type material of *Playaspalangia rothi* Yoshimoto was collected in the intertidal zone of coastal Mexico on algae-covered rocks with small barnacles (Yoshimoto 1976). Its host has yet to be determined, but undoubtedly is some fly (Diptera) associated with the shore-line environment. When determined reliably through rearing, species of *Spalangia* have been shown to be either primary parasitoids of Diptera puparia or, much more rarely, hyperparasitoids of Diptera puparia through Hymenoptera primary parasitoids or hyperparasitoids of non-dipteran hosts through Tachinidae (Diptera) primary parasitoids. Because of their dipteran

hosts many species of *Spalangia* are economically important and there is a huge literature on their parasitism of fruit flies (Drosophilidae, Tephritidae) and such filth-breeding flies as the house fly, *Musca domestica* L., stable fly, *Stomoxys calcitrans* (L.), horn fly, *Haematobia irritans* (L.), and face fly, *Musca autumnalis* DeGeer (Diptera: Muscidae) (Blume 1986). These ubiquitous pests have been transported around the world with livestock and there has been and continues to be extensive research into their control using parasitoid wasps. Species of *Spalangia* and *Muscidifurax* Girault & Sanders (Pteromalidae) have been the most intensively studied and utilized wasps for fly control and several species of *Spalangia* have been commercialized for inundative control and/or have been accidentally or intentionally transported around the world for classical biological control.

Legner *et al.* (1976) published a matrix identification system for six species of *Spalangia* that commonly parasitize filth-breeding flies in North America and Rueda and Axtell (1985) included five *Spalangia* species in what perhaps is the most often used published key to the pupal parasitoids of synanthropic flies in North America. Gibson (2000) also provided an unpublished Internet key that included 11 species of *Spalangia* known to parasitize filth flies in North America north of Mexico. As part of a review of the world species of *Spalangia*, Bouček (1963) gave separate keys to the then known Holarctic species as well as to those known from Central and South America. He listed a combined total of 15 species names for the New World, including 7 for North America and 11 for Central and South America, though 3 of the names were known to him only from original descriptions and 2 of the names are now recognized as junior synonyms. Noyes (2003) lists 19 species names for the New World, including 11 valid species in the Nearctic region and 15 names for the Neotropical region. Bouček's (1963) Neotropical key includes only 8 of the 15 species names that Noyes (2003) lists for this region, but because of the preponderance of Holarctic species in the Nearctic region his list of 7 species for North America is more complete. Bouček's (1963) treatment of *Spalangia* outside of the Palaearctic region was primarily literature-based and he examined only about 50 specimens from the New World. The present study is based on over 9,500 regional specimens and is intended as a comprehensive revision of New World *Spalangia*.

Material

The acronyms used for collections containing specimens on which this study is based and/or containing listed type material are as follows, with the names of individuals who assisted in the loan of material given in parenthesis.

AEIC American Entomological Institute, Gainesville, FL, USA (D. Wahl).

AMNH American Museum of Natural History, Department of Entomology, New York, NY, USA (C. LeBeau).

ANIC Australian National Insect Collection, Canberra, ACT, Australia.

BMNH The Natural History Museum, Department of Entomology, London, England (J. Noyes and C. Taylor).

BPBM Bernice P. Bishop Museum, Department of Entomology, Honolulu, HI, USA (G. Nishida).

CASC California Academy of Sciences, Department of Entomology, San Francisco, CA, USA (R. Zuparko).

CLEV Cleveland Museum of Natural History, Cleveland, OH, USA (J. Keiper).

CNC Canadian National Collection of Insects, Agriculture and Agri-Food Canada, Ottawa, ON, Canada.

CSCA California State Collection of Arthropods, California Department of Food and Agriculture, Sacramento, CA, USA (J. Kishmirian)

CUAC Clemson University Arthropod Collection, Entomology Department, Clemson University, Clemson, SC, USA (I. Stocks).

CUIC Cornell University Insect Collection, Department of Entomology, Cornell University, Ithaca, NY, USA (J. Liebherr).

DEBU Department of Environmental Biology, Insect Collection, University of Guelph, Guelph, ON, Canada (M. Buck).

DENH Department of Zoology, University of New Hampshire, Durham, NH, USA (D. Chandler).

EMEC Essig Museum of Entomology, University of California, Berkeley, CA, USA (R. Zuparko).

FSCA Florida State Collection of Arthropods, Division of Plant Industry, FL, Gainesville, USA (J. Wiley).

HNHM Hungarian Natural History Museum, Budapest, Hungary.

INBIO Instituto Nacional de Biodiversidad, San José, Costa Rica (M. Solís).

INHS Illinois Natural History Survey Insect Collection, Champaign, IL, USA (D. Webb).

IRCW Insect Research Collection, Department of Entomology, University of Wisconsin, Madison, WI, USA (S. Krauth).

LACM Los Angeles County Museum of Natural History, Insect Collection, Los Angeles, CA, USA (R. Snelling).

MACN Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", e Instituto Nacional de Investigación de las Ciencias Naturales, Buenos Aires, Argentina.

MCSN Museo Civico di Storia Naturale "Giacomo Doria", Genoa, Italy.

MCZH Entomology Department, Museum of Comparative Zoology, Harvard University, Cambridge, MA, USA (P. Perkins).

MLPA Universidad Nacional de La Plata, Facultad de Ciencias Naturales y Museo, La Plata, Argentina (M. Loiácono, N. Díaz).

MNHN Muséum national d'Historie naturelle, Laboratoire d'Entomologie, Paris, France.

MRSN Museo Regionale di Scienze Naturali, Torino, Italy.

MZCR Museo de Zoología, Escuela de Biología, Universidad de Costa Rica, La Selva, Costa Rica (P. Hanson).

NCSU North Carolina State University Insect Collection, Department of Entomology, Raleigh, NC, USA (B. Blinn).

NHME Natuurhistorisch Museum, Maastricht, Netherlands

NHMW Naturhistoriska Museum, Vienna, Austria.

NMPC National Museum, Natural History Museum, Prague, Czech Republic (P. Jansta).

OSAC Oregon State Arthropod Collection, Department of Zoology, Oregon State University, Corvallis, OR, USA (C. Marshall).

OSUC C.A. Triplehorn Insect Collection, The Ohio State University, Columbus, OH, USA (L. Musetti and N. Johnson).

OXUM Hope Entomological Collections, Oxford University Museum, Oxford, England.

QMBA Queensland Museum, Queensland Culture Centre, Queensland, Australia.

ROME Royal Ontario Museum, Department of Entomology, Toronto, ON, Canada (C. Darling, B. Hubley).

TAMU Texas A&M University, Department of Entomology, College Station, TX, USA (E. Riley).

UATV Universidad Autonoma De Tamaulipas, Unidad Academica Multidisciplinaria Agronomia y Ciencias, Victoria, Tamulipas, Mexico (J. Luna Salas).

UCDC The Bohart Museum of Entomology, University of California, Davis, CA, USA (S. Heydon).

UCFO University of Central Florida Collection of Arthropods, Department of Biology, Orlando, FL, USA (S. Fullerton).

UCRC UCR Entomological Teaching and Research Collection, University of California, Riverside, CA, USA (D. Yanega).

UFES Universidade Federal do Espírito Santo, Coleção Entomológica do Espírito Santo, Vitória, Espírito Santo, Brazil (C. Azevedo).

UMRM W.R. Enns Entomology Museum, University of Missouri, Columbia, MO, USA (R. Sites).

UNAL Universidad Autónoma de Nuevo León, Laboratorio de Entomología, Monterrey, Nuevo León, Mexico (A. González Hernández).

UNCL University of Nebraska State Museum, Division of Entomology, Lincoln, NE, USA (B. Ratcliffe).

USNM United States National Entomological Collection, U.S. National Museum of Natural History, Washington, DC, USA (M. Gates).

WFBM W.F. Barr Entomological Collection, University of Idaho, Moscow, ID, USA (J. Johnson).

WSUC James Entomological Collection, Department of Entomology, Washington State University, Pullman, WA (R. Zack)

ZMUSP Zoology Museum, University of São Paulo, São Paulo State, Brazil.

ZSMC Zoologische Staatssammlung, Munich, Germany (S. Schmidt).

Methods

Observations were made using a halogen light source and a Nikon SMZ-U microscope fitted with a 10 mm ocular grid having 100 divisions. A piece of translucent mylar tracing acetate was taped to the objective between the light source and specimen to reduce glare (see "viewing specimens" in Gibson 2000). Regardless of the type of light used it is absolutely essential that some type of translucent film be used to reduce glare in order to observe the often very fine sculpture described.

Structure. Terms for structure are modified from Gibson (1997) and Bouček (1963). The anterior surface of the head, or **face**, is divided into several regions. The **scrobal depression** is the typically triangular depressed region (Figs 1, 2: scd) above the antennal insertions, the **toruli** (Figs 1, 2: tor). The scrobal depression is differentiated into variably sculptured, dorsally convergent or subparallel **scrobes** (Figs 1, 2: scb) on either side of a slightly convex, usually smoother and shinier **interantennal region** (Figs 1, 2: ir), and includes an inclined surface lateral to each scrobe that merges with the **parascrobal region** (Figs 1, 2: psr), the region of the face between the scrobal depression and inner margin of the eye. The **upper face** (Fig. 1: uf) is the region of the face above the level of the scrobal depression, which includes the **ocellar triangle**, the region occupied by the ocelli. The ocellar triangle is partly delimited by sulci in some *Spalangia* and usually a median sulcus extends between the anterior ocellus and the scrobal depression so as to often form a Y-shaped sulcus on the upper face (e.g. Figs 52, 149, 183, 239). The **lower face** is the very short region below each torulus on either side of the labrum. The lower face is often acutely angled under the torulus in *Spalangia* so that in lateral view each antenna appears to insert into a short tube that projects anterior to the base of the mandible (*cf*. Figs 299, 300). Because the lower face is reflexed at an angle of 90° or greater below the toruli it is not visible in anterior view and **head height** is measured from the top of the head to the level of the ventral margin of the toruli (Fig. 1: HH). Head width is measured either in anterior (Fig. 1: HW) or dorsal (Fig. 304: HW) view depending on whether the dimension is being compared to head height (Fig. 1) or head length (Fig. 304: HL), which is measured in dorsal view. The **gena** (Fig. 3: gen) is the lateral surface of the head below the lower margin of the eye, which sometimes is longitudinally subdivided by the **malar sulcus** (Fig. 2: ms). **Genal length** (Fig. 3: GL) is the maximum distance in lateral view between the lower margin of the eye and the anterior margin of the lobe that terminates in the torulus. The **temple** (Figs 3, 4, 116: tmp) is the lateral surface of the head posterior and dorsolateral to the eye, which in most *Spalangia* is differentiated from the **postgena** (Figs 4, 116: pgn) by a ∩-shaped **occipital carina** (Figs 4, 116: oc) on the posterior of the head. When present, the occipital carina also delimits the posterior margin of the **vertex** (Fig. 4: vtx) between itself and the level of the posterior ocelli.

The flagellum consists of the **funicle**, the basal seven segments, and the **clava** (Fig. 8: cl), the apical flagellar segment. Most *Spalangia* are sexually dimorphic in flagellar structure with females usually having the

first funicular segment (Fig. 8: fu_1) shorter than or at most as long as the **pedicel** (Fig. 8: pdl) and males usually having fu_1 conspicuously longer than the pedicel (e.g. Figs 126, 163, 300). Measurement of the length of any funicular segment (Fig. 8, insert: L) does not include the 'pedicel' of the funicular segment (Fig. 8: pdf), unless stated otherwise. Most often the pedicel appears as an abruptly narrowed tubular section that separates one segment from another, but males with elongate funicular segments often have a tapered, conical apical part rather than an abruptly narrowed tube (Fig. 8: *cf.* ♂, ♀). Width of any antennal segment does not include obviously projecting setae. Length of the **scape** (Fig. 8: scL) is the maximum length excluding the **radicle** (Fig. 8: rad) and scape width is the maximum width.

The pronotum almost always has a circumpronotal furrow (Fig. 4: cf) that anteriorly differentiates the collar (Figs 4, 5: cl) from the neck (Figs 4, 5: nk) and laterally the collar from the lateral panel (Fig. 4: lp). The circumpronotal furrow is almost always interrupted anterolaterally by a vertical circumpronotal band (Fig. 4: cb) that sometimes extends dorsally across the pronotum as a ridge or carina (e.g. Figs 350–352). Sculpture of the pronotal collar is highly variable and important for species identification, particularly the presence or absence of a differentiated crenulate band posteriorly, the cross-line (Figs 4, 5: pcl) *sensu* Bouček (1963). Regardless of whether there is a distinct cross-line there is always a smooth, bare, transverse region along the posterior margin of the pronotal collar (e.g. Figs 4, 51, 155). The mesonotum is divided into an anterior mesoscutum and posterior scutellar-axillar complex by the transscutal articulation (Fig. 5: tsa). The mesoscutum is further divided into a median lobe (Fig. 5: mml) and lateral lobes (Fig. 5: mll) by complete notauli (Fig. 5: nt). In *Spalangia*, the median lobe typically has an anterior convex region (Figs 4, 5: acr) and a flatter and usually more conspicuously sculptured internotaular region (Fig. 5: inr) posteriorly. Sculpture of the anterior convex region is often partly concealed because the pronotal collar is moveable relative to the mesothorax and often overrides the anterior convex region to some extent. Anteriorly convergent scutoscutellar sutures on the scutellar-axillar complex segregate triangular axillae (Fig. 5: ax) on either side of the scutellum (Fig. 5: sct). The scutellum usually has a complete or partial frenal line (Fig. 5: frl) that differentiates an apical frenum (Figs 5, 6: fr).

The **mesopleuron** of *Spalangia* has several diagnostic features, including two depressions or 'scrobes' named by Bouček (1963, fig. 3). An anterior region he termed the anterior oblique impression (Bouček 1963, fig. 3: a) is here called the **subalar scrobe** (Fig. 6: ss) because the sculptured region varies in shape but is always below the base of the fore wing. The **acropleuron** (Fig. 6: ac) is the usually more or less longitudinally carinate region anterodorsal to the subalar scrobe. The longitudinal sculpture of the acropleuron often extends posteriorly over the **alar shelf** (Fig. 6: as), an almost horizontal dorsal surface of the mesepimeron under the base of the wings. Ventral to the acropleuron and anterior to the subalar scrobe is a usually smoother **pectal region** (Fig. 6: pr). Almost all species of *Spalangia* have a single seta near the posteroventral angle of the pectal region (e.g. Figs 27, 34), though there sometimes appear to be more if the **ventral setal line** (Fig. 6: vsl) of the lower mesepisternum extend anteriorly below the pectal region (e.g. Fig. 139). A more or less central depression on the mesopleuron posterior to the subalar scrobe was called the **episternal scrobe** by Bouček (1963, fig. 3: es) and that term is retained here (Fig. 6: es). The episternal scrobe sometimes extends anteriorly toward the subalar scrobe as a narrower, variably sculptured **episternal line** (Fig. 6: epl). The **precoxal scrobe** (Fig. 6: ps) is a third depression on the mesopleuron anterior to the mesocoxa. The precoxal scrobe sometimes extends toward the episternal scrobe as a narrower, variably sculptured **precoxal line** (Fig. 6: pxl). These scrobes and lines of sculpture subdivide the lateral surface of the mesopleuron into the **mesepimeron**, the region posterior to the acropleuron dorsal to the episternal and precoxal lines, and the **upper mesepisternum** (Fig. 6: ues), the region posterior to the pectal region and subalar scrobe ventral to the episternal and precoxal lines. The **lower mesepisternum** (Fig. 6: les) is the ventral surface of the mesothorax, which is often distinguished from the upper mesepisternum by a longitudinal **transepisternal line** (Fig. 6, tsl) and/or adjacent ventral setal line (Fig. 6: vsl). The transepisternal line, when present, typically consists of a line of punctures or crenulae that ventrally often form a carina or ridge above the line of setae (Fig. 6). The mesepimeron

is also subdivided, usually incompletely, by the episternal scrobe into an anterior **upper mesepimeron** (Fig. 6: uep) and posterior **lower mesepimeron** (Fig. 6: lep).

In *Spalangia*, the propodeum usually has a more or less crenulate **postspiracular sulcus** (Fig. 7: pss) behind the **spiracle** (Fig. 7: sp) that separates a usually coarsely sculptured and setose **callus** (Fig. 7: cal) lateral to a median **plical region**. The plical region is almost always subdivided by **paramedian crenulate furrows** (Fig. 7: pcf) that between them differentiate a median carina (Fig. 7) or wider, posteriorly tapered smooth (e.g. Figs 56, 57) or sculptured (e.g. Fig. 104) band. Another region of sculpture, the **supracoxal band** (Fig. 7: spb), usually extends along the posterolateral margin of the propodeum between the postspiracular sulcus and paramedian crenulate furrows. The **propodeal panel** (Fig. 7: pp) is the typically smooth and shiny region delineated between the postspiracular sulcus, supracoxal band of sculpture, and paramedian crenulate furrow. A convex posteromedian region of the propodeum anterior to the propodeal foramen is the **nucha** (Fig. 7: nuc).

The first segment of the metasoma, the **petiole** (Fig. 7: ptl), is almost pentagonal in *Playaspalangia* (Fig. 18) and elongate-tubular in *Spalangia* (e.g. Fig. 7) so that the seven post-petiolar segments, the **gaster**, is petiolate. Petiole length is maximum length measured in dorsal view (Fig. 7: L) and petiole width is measured medially (Fig. 7: W).

Terms for fore wing venation and setal lines follow Gibson (2004). Spalangiinae characteristically have a very short **postmarginal vein** and **stigmal vein** relative to a long **marginal vein** (Fig. 9, insert). The **submarginal vein** (Fig. 9: smv) is the proximal part of the venation that is separated slightly from the leading margin of the wing. The **parastigma** (Fig. 9: pst) is the distally thickened part of the submarginal vein that is separated from the base of the marginal vein by a hyaline break. A **basal cell** (Fig. 9: bc) is delimited behind the submarginal vein by a longitudinal convex fold, the **mediocubital fold** (Fig. 9: mcf), and by another convex fold, the **basal fold** (Fig. 9: bf), that extends obliquely between the parastigma and mediocubital fold. The presence or absence of setae on the upper surface of the wing on the mediocubital fold and in the basal cell is important for species recognition.

Sculpture. Terms for sculpture are modified from Eady (1968). **Coriaceous** is a more or less isodiametric mesh-like pattern of cells defined by fine impressed lines as if the surface of the cuticle was scratched by a pin (e.g. Fig. 18: petiole; Fig. 44: posterior half of upper mesepisternum; Fig. 226: upper mesepisternum; Fig. 433: pectal area). If the impressed grooves are so deep that the surface of the cells appear convex rather than flat then the sculpture is termed **coriaceous-granular** (e.g. Fig. 183: scrobes). **Alutaceous** is similar to coriaceous except that the cells forming the sculpture are obviously elongated and aligned in one axis (e.g. Fig. 42: anterior part of anterior convex region; Figs 213, 226, 257: upper mesepimeron). If the elongate cells are delineated by deeply impressed grooves rather than fine impressed lines then it is termed **strongly alutaceous** (e.g. Figs 55, 56: upper mesepimeron). **Reticulate** is a mesh-like pattern of flat-bottomed cells defined by raised ridges (e.g. Fig. 6: subalar scrobe; Figs 56, 57: petiole) rather than impressed lines. Reticulate sculpture is very similar to **rugose** or finer **rugulose** sculpture, which consists of very irregular ridges or **rugae** that form an interconnected pattern (e.g. Fig. 33: internotaular region; Fig. 44: anterior half of upper mesepisternum; Figs 67, 275: pronotal collar laterally; Fig. 127: scape). **Punctate** is a series of pits or depressions (e.g. Fig. 2: upper face; Fig. 4: lateral panel of pronotum; Fig. 27: alar shelf and subalar scrobe) that when large are concave rather than flat-bottomed. Setiferous punctures are designated as **distinct** if they are comparatively large obviously concave (e.g. Fig. 5: pronotal collar), but **pinprick-like** if tiny and more pore-like (e.g. Fig. 5: axillae and scutellum). Very small but distinct punctures are termed **micropunctate** (e.g. Figs 39, 40: head). Punctures can be **multisided** when very closely crowded (e.g. Fig. 1: parascrobal region; Fig. 195: gena) and then are very similar to reticulations. **Carinate** (e.g. Figs 7, 137: petiole) or finer **striate** (e.g. Fig. 35: upper mesepimeron; Figs 92, 313: scape) sculpture consists of more or less straight, parallel ridges separated by furrows, whereas **strigose** consists of more irregular ridges aligned along a similar axis (e.g. Fig. 19: upper mesepimeron; Figs 154, 155: presumptive pronotal cross-line; Fig. 179: upper mesepisternum). Strongly

alutaceous sculpture with narrow cells separated by deep grooves resembles strigose sculpture. **Crenulate** is either an elongate depression or furrow subdivided by ridges or **crenulae** (e.g. Fig. 5: frenal line; Fig. 6: anterior margin of pectal region; Fig. 7: paramedian furrows of propodeum; Fig. 256: frenal line) or a single row of crowded punctures separated only by ridges (e.g. Fig. 83: pronotal cross-line). The different types of described sculpture typically intergrade and this is implied by connecting with a hyphen any two relevant terms.

Species treatments. Species concepts in *Spalangia* have historically been based primarily on females, though males and females usually are quite similar except for antennal structure. I therefore describe the sexes separately, but for males include only differences relative to the female, first describing the antennae and then other differences. Except for the purportedly introduced species *S. longepetiolata* Bouček, descriptions are based solely on New World specimens and illustrations are based on New World specimens unless noted otherwise in the figure captions.

Several conventions are used to reduce the length of 'Material examined'. Records with host data are included for all treated species, but complete collection records are not listed for very common species that in the past usually were identified correctly. The complete records can be obtained from the author and were databased using FoxPro so as to generate distribution maps using ArcView 3.2. Specimens cited without an associated collection acronym are in the CNC, but listed records from other institutions are indicated by their collection acronym. The number of females and males examined is also included except for host-parasite surveys or other rearings that resulted in large numbers of specimens. Except for holotypes of newly described species, dates are standardized so that the collection year consists of just the last two numerals unless collected prior to 1908. For multiple records with similar collection data, a "—" separates identical label data from unique label data, with different records being separated by a semicolon. Countries are listed alphabetically under Nearctic, which is treated as North America north of Mexico, and Neotropical, which is the remainder of the New World. To better complement the distribution data given in Bouček (1963) and Noyes (2003), countries are also subdivided alphabetically in 'Distribution' for North America (Canada, USA and Mexico) and the following three Neotropical subdivisions: Central America, West Indies, and South America. Distribution also includes reference to extralimital records listed by Noyes (2003). The 'Biology' section for species with extensive published host records only includes those host taxa indicated by label data of observed specimens and does not repeat the host lists or literature citations available under the subheadings "associates", "biology" and "economic" in Noyes (2003). The family names included for host taxa are all Diptera except where stated otherwise.

Most *Spalangia* species require a combination of features to correctly identify specimens, in part because diagnostic features usually vary in degree of development or visibility because of specimen size, sex or method of specimen preparation. Twenty-nine of the 31 recognized New World species of *Spalangia* are segregated into 7 informal species groups for discussion of similarity and the likelihood of misidentification. The seven species groups include most of the species, but in different combinations, that Bouček (1963: 489) included in four species groups that he recognized, an unnamed group and the *nigra*-, *nigroaenea*-, and *fuscipes*-group. His *nigroaenea*- and *nigra*-groups included species with coarse pronotal sculpture and, respectively, with or without a distinct pronotal cross-line, whereas his *fuscipes*- and unnamed species group included species with a relatively smooth pronotal collar and, respectively, a complete or incomplete frenal line. My key is constructed so that most of the species I include in any of the seven species groups key closely together, though this is not always possible because of variation. No attempt is made to assign extralimital species from other regions to any of the seven recognized species groups and my key should be used with extreme caution if identifying specimens from regions other than the New World. The features I use to unite members of the respective species groups are given under 'Recognition' for the nominative species of the group. 'Recognition' also includes discussion of variation within each species and features that differentiate it from other species or from similar New World specimens that I do not identify to species. It sometimes also

includes discussion of species from other biogeographic regions, primarily from Europe. Although I do not formally treat European species that are not known in the New World, I do discuss and illustrate putative differential features in the eventuality that they are introduced accidentally in the future. My concepts of names that were established originally in Europe are based primarily on Bouček (1963), but also on examination of identified specimens in the BMNH and authoritatively identified specimens borrowed from other museums. The museum location and label data of non-type specimens that helped form my concept of uncommon species not present in the New World is given in 'Recognition'. The synonymy section for each treated species indicates those names for which type material was examined. Type data information given between square brackets is additional to that included in the original description.

Descriptive Taxonomy

Spalangiinae Haliday, 1833

Diagnosis. Body, excluding legs, uniformly brown to black without obvious metallic luster. Head with antennae inserted widely apart at apparent anterior margin of oral cavity above base of each mandible (Figs 1, 10). Antenna 10-segmented; flagellum without differentiated ring-like basal segment (anellus), consisting of 7 funicular segments and an unsegmented clava (e.g. Fig. 8). Mandible (except male *S. dozieri*) bidentate with 2 similar teeth (Bouček 1963, fig. 4; Gibson and Reigada 2009, fig. 11). Mesonotum with complete notauli (Fig. 5). Mesopleuron with posterior margin separated from and raised slightly above level of metapleuron (e.g. Fig. 17) and with a slender band of often fringed membrane between posterodorsal margin and metapleuron (e.g. Figs 87, 122: mpm). Individuals macropterous (except some *P. rothi*, Fig. 16); fore wing with marginal cilia and with long marginal vein and subequally short stigmal and postmarginal veins (Fig. 9, insert).

Key to genera and species of New World Spalangiinae

1 Petiole pentagonal, only about as long as maximum width, and smooth or only very finely coriaceous dorsally (Fig. 18); body with head (Fig. 10), dorsum of thorax (Fig. 16), and propodeum (Fig. 17) finely coriaceous with setae not originating from punctures; wings sometimes reduced (*cf*. Figs 15, 16) ..... ***Playaspalangia rothi* Yoshimoto**

– Petiole distinctly longer than wide, tubular, and mostly longitudinally carinate to reticulate-rugulose dorsally; body usually with some distinct setiferous punctures; wings always extending to apex of metasoma..... ***Spalangia* Latreille**...2

2(1) Male only: legs conspicuously modified, the femora robustly enlarged (Figs 110, 111) and mesotibia strongly compressed with slightly concave, mostly bare anterior surface (Fig. 113) and long setae projecting from edges (Fig. 112); head with face, including scrobal depression, densely and conspicuously setose but without distinct punctures or sculpture (Fig. 99)..... ***Spalangia dozieri* Burks**

– Both sexes: legs not unusually modified, the femora not conspicuously enlarged and mesotibia slender and uniformly setose; head with face variably distinctly setose, but at least scrobal depression bare and usually with distinct punctures or other sculpture when conspicuously setose 3

3(2) Pronotal collar with median sulcus and well separated circular setiferous punctures, but without distinctly differentiated cross-line posteriorly (Fig. 102); propodeum with posteriorly narrowed, more or less heart-shaped, reticulate-rugose median band of sculpture (Fig. 104)..... ***Spalangia dozieri* Burks**

– Pronotal collar variably sculptured but at least without distinct median sulcus; propodeum with median carina or if with median lanceolate band then band usually flat and shiny (e.g. Figs 57, 244, 264) 4

4(3) Mesosoma with complete crenulate frenal line on scutellum, the punctures of similar size and depth so as to form quite a uniform transverse line across scutellum (e.g. Figs 5, 26, 68, 334, 412), **and** pronotal collar with distinct crenulate cross-line and/or with distinct setiferous punctures (e.g. Figs 4, 67, 134, 287, 332, 412) or rarely so coarsely sculptured that separate punctures obscure (e.g. Fig. 320)..... 5

– Mesosoma with frenal line on scutellum either separated medially (e.g. Figs 53, 186, 255, 391) or obviously shallowed and tapered toward midline (e.g. Fig. 442) **or**, if complete as described above (e.g. Figs 153–155), then pronotal collar smooth and shiny (e.g. Figs 119, 153, 439) or at most micropunctate-reticulate (Figs 41, 42) or finely wrinkled to longitudinally strigose posteriorly (e.g. Fig. 154) 24

5(4) Pronotal collar, excluding bump-like setal origins, smooth and shiny anterior to crenulate cross-line (Figs 411, 412) **and** mesoscutal median lobe with single median puncture posterior to transverse row of setiferous punctures (Figs 412, 413); male scape with conspicuously long setae ventrally (Figs 421, 423) ..... ***Spalangia simplex* Perkins**

– Pronotal collar usually extensively punctate to rugose anterior to crenulate cross-line or at least distinctly roughened or wrinkled anteriorly, but if rarely smooth and shiny except for setae then mesoscutal median lobe with different sculpture pattern (e.g. Fig. 69); male scape with ventral setae not conspicuously longer than dorsal setae (e.g. Figs 77, 316) 6

6(5) Petiole extensively setose laterally, with several long setae projecting from either side over at least anterior half (e.g. Figs 28, 90, 291, 311, 355) .....[*nigra*-group species]...7

– Petiole bare or with only 1 or 2 setae projecting dorsally or from either side 17

7(6) Female: flagellum with fu_1 usually shorter but at most as long as pedicel (e.g. Figs 29, 312) 8

– Male: flagellum with fu_1 much longer than pedicel (e.g. Figs 30, 315) 13

8(7) Mesopleuron with sculpture of subalar scrobe extending broadly along transepisternal line as posteroventrally tapered triangular region (Figs 310, 370); fore wing with at least a few setae on mediocubital fold; pronotal collar rounded to neck anteriorly (Figs 306, 367) 9

– Mesopleuron with subalar scrobe usually widest medially and narrowed ventrally such that posterior margin abruptly angled relative to transepisternal line, though sometimes posterior margin more or less vertical (Figs 27, 87, 290, 354); fore wing without setae on mediocubital fold and/**or** pronotal collar with transverse, often undulating, anterior ridge or margin (Figs 83–85, 350–352) differentiating vertical surface of collar above neck (Figs 84, 351) 10

9(8) Scutellum low convex and more or less uniformly covered with distinct setiferous punctures lateral to median smooth band (Fig. 308); pronotal collar in dorsal view with crowded punctures mostly separated by less than own width and sometimes punctures multisided or punctate-rugose (Figs 306, 308); internotaular region completely punctate-rugose (Fig. 308); head in lateral view ovoid with vertex convexly rounded (Fig. 300) and in dorsal view less than 2x as wide as long (Fig. 304); scape at least 8x as long as greatest width (Figs 312–314) ..... ***Spalangia nigra* Latreille**

– Scutellum flat and mostly smooth with a few shallow or pinprick-like setiferous punctures (Fig. 369); pronotal collar in dorsal view with circular punctures mostly separated by distance about equal to own width except laterally (Fig. 369); internotaular region punctate-rugose medially but laterally with small punctures separated by smooth interstices (Fig. 369); head in lateral view comparatively flat with vertex almost acutely angled (Fig. 367) and in dorsal view more transverse (Fig. 368), about 2.0–2.1x wider than long; scape less than 7x as long as wide (Figs 371–373)..... ***Spalangia nigroides* n. sp.**

10(8) Pronotal collar anterolaterally with carina or ridge extending vertically from circumpronotal furrow and more or less conspicuously across collar as transverse or undulating margin separating dorsal surface from vertical surface above neck (Figs 84, 351, 352) 11

– Pronotal collar usually without distinct vertical carina anterolaterally, but at least not margined anteriorly the dorsal surface smoothly rounded to neck (Figs 24, 25, 287, 288)..... 12

11(10) Fore wing with mediocubital fold bare and basal cell with at most a few inconspicuous setae distally; petiole smooth and shiny or transversely carinate to reticulate-rugose between longitudinal carinae (Fig. 355); scape with setiferous punctures on outer surface (Fig. 362) and inner surface with bare, smooth and shiny band over at least basal half (Fig. 361)..... ***Spalangia nigroaenea* Curtis**

– Fore wing with at least a few setae on mediocubital fold and often conspicuously setose behind submarginal vein; petiole with minute pore-like punctures between longitudinal carinae (Fig. 89); scape with outer and inner surfaces longitudinally strigose-punctate (Figs 92, 93)..... ***Spalangia chontalensis* Bouček**

12(10) Head with lower face projecting as acutely angled lobe lateral to torulus (Figs 22, 23); alar shelf punctate-rugulose similar to propodeum (Fig. 27); pronotal collar rugulose anteromedially and punctate laterally, but extensively smooth dorsally anterior to cross-line (Figs 24, 25) ..... ***Spalangia alyxia* n. sp.**

– Head with lower face not projecting beyond torulus, in lateral view torulus originating from variably conspicuous tube-like extension of lower face (Fig. 286); alar shelf longitudinally carinate in contrast to punctate-rug-

ulose propodeum (Fig. 290); pronotal collar more or less uniformly covered with circular punctures anterior to cross-line and often with distinct median smooth band extending between neck and cross-line (Figs 287, 288) ..... ***Spalangia masneri* n. sp.**

13(7) Pronotal collar anterolaterally with at least fine carina extending vertically from circumpronotal furrow and more or less conspicuously across collar as Λ-like or undulating margin or carinate ridge (Figs 84, 351, 352); mesopleuron usually with subalar and episternal scrobes separated by smooth cuticle or only very fine sulcus (Figs 88, 354)..... 14

– Pronotal collar anterolaterally without vertical carina and anteriorly collar smoothly merged with or rounded to neck (Figs 31, 289); mesopleuron with subalar and episternal scrobes connected by distinct crenulate furrow or line (Figs 34, 35, 290, 310) 15

14(13) Mesopleuron with episternal scrobe a lunate furrow, the furrow usually subdivided into slender anterior and posterior depressions (Fig. 354); petiole reticulate-rugulose between longitudinal carinae (Fig. 356); propodeum with paramedian crenulate furrows more or less parallel and uniformly tapered posteriorly, the anterior cell not conspicuously differentiated from more posterior cells (Fig. 356); pronotal collar in dorsal view with uniform, low, Λ-like margin or ridge anteriorly (Fig. 350) ..... ***Spalangia nigroaenea* Curtis**

– Mesopleuron with episternal scrobe a single subcircular to oval or triangular depression (Fig. 88); petiole with minute pore-like punctures between longitudinal carinae (Fig. 90); propodeum with paramedian crenulate furrows usually conspicuously widened anteriorly, the anterior cell usually obviously larger and wider than more posterior cells (Fig. 90); pronotal collar usually with higher, undulating, sometimes paramedially crest-like ridge anteriorly (Fig. 83) ..... ***Spalangia chontalensis* Bouček**

15(13) Anterior convex region of mesoscutal median lobe completely coriaceous-strigose (Figs 31–33)..... ..... ***Spalangia alyxia* n. sp.**

– Anterior convex region of mesoscutal median lobe smooth and shiny except sometimes narrowly coriaceous adjacent to internotaular region (Figs 289, 309) 16

16(15) Fore wing with at least a few setae along mediocubital fold; pronotal collar variably coarsely sculptured, but at least completely sculptured anteriorly and often more or less rugose anteriorly and/or laterally (Figs 306, 307); mesopleuron with sculpture of subalar scrobe usually extending obviously along transepisternal line as a more or less triangular region (Fig. 310) ..... ***Spalangia nigra* Latreille**

– Fore wing with mediocubital fold bare; pronotal collar with smooth median band extending from neck to cross-line and otherwise quite uniformly covered with circular, though sometimes crowded punctures (Figs 287–289); mesopleuron with posterior margin of subalar scrobe directed anteroventrally and abruptly angled relative to transepisternal line (Fig. 290) ..... ***Spalangia masneri* n. sp.**

17(6) Pronotal collar with or without differentiated cross-line but more or less uniformly covered by circular punctures even if crowded anteriorly and laterally (Figs 134, 135, 332, 334); propodeum with paramedian crenulate furrows either parallel-sided or only slightly widened anteriorly with the anterior-most cell of similar width to other cells (Figs 136, 137, 336, 337); head with scrobes coriaceous (Fig. 132, 327) and fore wing of male with line of setae on mediocubital fold and setae distally in basal cell..... [*endius*-group species]...18

– Pronotal collar with differentiated cross-line but without well separated circular punctures, varying from almost smooth to roughened or rugose or with crowded, mostly irregular punctures separated by ridges (Figs 67, 198, 275); propodeum with paramedian crenulate furrows usually distinctly widened anteriorly, broadly V- or Y-like, the anterior-most cell(s) obviously larger than others and usually tapered posteriorly (Figs 70, 202); head with scrobes punctate-crenulate (Figs 63, 196) and fore wing of male bare behind submarginal vein (except for *S. longepetiolata*) ..... [*cameroni*-group species] ... 19

18(17) Pronotal collar with distinctly differentiated crenulate cross-line posterior to circular punctures (Figs 134, 135); mesopleuron with anterior margin of pectal region crenulate (Figs 138, 139); fore wing of female often bare behind submarginal fold but at most with 3 setae on mediocubital fold ..... ***Spalangia endius* Walker**

– Pronotal collar without distinctly differentiated cross-line, more or less uniformly covered with separate circular punctures (Figs 332, 334); mesopleuron with pectal region uniformly smooth and shiny (Fig. 335); fore wing of female with several setae on mediocubital fold and in distal half of basal cell .... ***Spalangia nigripes* Curtis** [part, see couplet 43]

19(17) Female: flagellum clavate and with fu_1 at most about as long as pedicel (Figs 73, 205, 279) 20

– Male: flagellum filiform and with fu_1 much longer than pedicel (Figs 76, 204, 282)..... 22

20(19) Gena with tiny setiferous punctures separated by flat interstices and with linear malar sulcus except near oral margin (Fig. 273); propodeal callus completely punctate-rugose (Fig. 278); mesopleuron with subalar and

episternal scrobes connected by distinct punctate-crenulate line (Fig. 277) . ***Spalangia longepetiolata* Bouček**

– Gena usually coarsely sculptured with deep setiferous punctures separated by ridges (Figs 65, 195), but at least without linear malar sulcus; propodeal callus with elongate smooth and shiny region adjacent to postspiracular sulcus over about anterior half (Figs 70, 202); mesopleuron with subalar and episternal lobes separated by smooth cuticle (Figs 72, 203) 21

21(20) Head with parascrobal region and inclined lateral surface of scrobal depression uniformly coarsely reticulate-rugose (Fig. 196) and more finely reticulate-rugose behind outer orbit (Fig. 199); mesopleuron with longitudinal carinae extending from subalar area ventrally over almost all of upper mesepimeron, subalar scrobe extending posteroventrally along transepisternal line, and episternal scrobe at most only obscurely connected to precoxal scrobe (Fig. 203); eye comparatively large, malar space only about 0.8x eye height and at most equal to eye width (Fig. 195) ..... ***Spalangia gemina* Bouček**

– Head with at least inclined lateral surface of scrobal depression and behind outer orbit with distinct circular punctures (Figs 63, 65); mesopleuron with longitudinal carinae of subalar area extending onto upper mesepimeron only dorsally, subalar scrobe usually angled anteroventrally, and episternal scrobe and precoxal scrobes connected by distinct punctate line so as to form anteriorly directed V-like groove (Fig. 72); eye comparatively small, malar space at least slightly longer than eye and at least 1.5x eye width (Fig. 65) ..... ***Spalangia cameroni* Perkins**

22(19) Fore wing at least with several setae distally in basal cell toward parastigma and sometimes more extensively setose; gena comparatively smooth and shiny with tiny setiferous punctures and distinct malar sulcus (Fig. 274); mesopleuron with subalar and episternal scrobes connected by punctate-crenulate line (Fig. 277); petiole in dorsal view minimally 3x as long as medial width (Fig. 278) ..... ***Spalangia longepetiolata* Bouček**

– Fore wing completely bare behind submarginal vein, even adjacent to parastigma; gena variably coarsely sculptured but without linear malar sulcus (Figs 66, 197); mesopleuron with subalar and episternal scrobes separated by smooth cuticle (Figs 72, 203); petiole in dorsal view at most only slightly more than 2x as long as medial width (Figs 71, 201)..... 23

23(22) Head with parascrobal region, inclined lateral surface of scrobal depression, and behind outer orbit reticulate-rugose (Figs 196, 199); malar space at most 0.6x eye height and 0.8x eye width (Fig. 197); mesopleuron with upper mesepimeron at least finely longitudinally carinate to episternal scrobe (Fig. 203)..... ***Spalangia gemina* Bouček**

– Head with parascrobal region or at least inclined lateral surface of scrobal depression and behind outer orbit with circular punctures (Figs 64, 66); malar space minimally about 0.7x eye height and as long as eye width (Fig. 66); mesopleuron with upper mesepimeron longitudinally carinate only dorsally, largely smooth between subalar and episternal scrobes (Fig. 72) ..... ***Spalangia cameroni* Perkins**

24(4) Head with at least parascrobal region, gena and temple densely micropunctate-reticulate (Figs 39, 40, 423, 424, 429, 430) or reticulate-rugose (Figs 400, 401) [only females known, but males likely with similar sculpture] ..... [*attae*-group species] ... 25

– Head smooth and shiny with setae originating from tiny bumps or from variably crowded circular punctures, the punctures sometimes separated only by linear ridges 28

25(24) Head partly micropunctate-reticulate but upper face coriaceous with setae originating from tiny pinprick-like depressions and temple with comparatively smooth region posterior to outer orbit (Figs 429, 430) ..... ***Spalangia stictocyla* n. sp.**

– Head completely, uniformly micropunctate-reticulate (Figs 423, 424) or reticulate-rugose (Figs 400, 401) ... 26

26(25) Head reticulate-rugose with each seta originating from minute bump within irregularly shaped cell (Figs 400, 401) ..... ***Spalangia rugosifrons* n. sp.**

– Head micropunctate-reticulate, the reticulations so small that origin of setae not obvious (Figs 39, 423) 27

27(26) Pronotal collar finely, uniformly coriaceous (Fig. 425); interantennal region strongly coriaceous-granular, but not distinctly smoother or shinier compared to micropunctate-reticulate face; scutellum very finely coriaceous (Fig. 426) ..... ***Spalangia stictocephala* n. sp.**

– Pronotal collar micropunctate-reticulate (Figs 41, 42); interantennal region finely coriaceous at least medially and obviously smoother and shinier than face (Fig. 39); scutellum smooth and shiny anterior to frenum (Fig. 43) ..... ***Spalangia attae* Burks**

28(24) Propodeal plical region smooth and shiny or at most with only very faint longitudinal striae indicating effaced median band (Fig. 381); head in anterior view elongate-rectangular with subparallel sides and smooth, shiny, and only inconspicuously setose (Fig. 374); head in lateral view with malar space, eye and temple above eye

all about same height (Fig. 379); pronotum without circumpronotal furrow differentiating collar from neck, in dorsal view combined neck and collar ∩-shaped with neck evident only as transverse coriaceous region anterior to smooth and shiny collar (Figs 378, 379) ..... [*noyesi*-group species]... 29

– Propodeal plical region with distinct paramedian crenulate furrows; head in anterior view more or less ovoid with gena converging below eyes and usually obviously sculptured and/or setose, but at least in lateral view malar space and/or height of eye distinctly greater than height of temple above eye; pronotum with distinct circumpronotal furrow differentiating anteriorly narrowed neck from variably sculptured collar 30

29(28) Antenna uniformly dark; head with parascrobal region finely, obliquely strigose-alutaceous (Figs 374, 376) ... . ***Spalangia noyesi* n. sp.**

– Antenna with scape and pedicel bright yellow, contrasting with dark flagellum; head with parascrobal region smooth and shiny except for sparse, pinprick-like setiferous punctures (Fig. 377) ..... ***Spalangia xanthoscapa* n. sp.**

30(28) Pronotal collar with obvious crenulate cross-line and distinct though shallow circular setiferous punctures dorsally (Figs 255, 256); mesopleuron with pectal region smooth and shiny and with only 1 posteroventral seta, upper mesepisternum obliquely strigose, and mesepimeron strongly alutaceous (Fig. 257); frenal line interrupted over about medial third (Fig. 255); upper face, parascrobal region and gena with distinct setiferous punctures (Fig. 253) ..... ***Spalangia innuba* n. sp.**

– Pronotal collar usually without evident cross-line, but if with shallow furrow then lacking distinct setiferous depressions anterior to cross-line (Figs 391, 392), the setae often originating from tiny bumps (Fig. 393), and pectal region uniformly sculptured and with at least a few though often inconspicuous setae (Figs 54, 395); other features variable but sometimes upper mesepisternum and mesepimeron quite shiny, only finely coriaceous-alutaceous, frenal line sometimes complete, and head capsule sometimes without distinct punctures, at least on gena 31

31(30) Propodeum with variably wide and obvious, posteriorly tapered, lanceolate to somewhat heart-shaped median band differentiated between Y- to broadly V-shaped paramedian crenulate furrows (Figs 56, 57, 118, 120, 243, 244, 263–265), the median band usually smooth and shiny but sometimes sculptured .... [*drosophilae*-group species]... 32

– Propodeum with a median carina differentiated between subparallel or only narrowly V-like paramedian crenulate furrows (Figs 157–159, 186, 214, 215, 227, 228, 443) 42

32(31, 44) Female 33

– Male 38

33(32) Propodeum often without distinct postspiracular sulcus (Fig. 243), but at least callus with shiny longitudinal band extending posteriorly from anterior margin lateral to spiracle (Figs 243, 244)..... ..... ***Spalangia impunctata* Howard**

– Propodeum with crenulate postspiracular sulcus and with callus either completely punctate-reticulate or quite smooth only posterior to level of spiracle (Figs 53, 120, 394) 34

34(33) Gena with quite crowded, flat-bottomed setiferous punctures (Figs 177, 388, 390); mesopleuron either with pectal region uniformly setose and sculptured (Fig. 395) or legs yellowish beyond coxae..... 35

– Gena variably conspicuously rugulose-roughened near oral margin but otherwise smooth and shiny except for malar sulcus and setae originating from pinprick-like pores or tiny bumps (Figs 48, 115, 260); mesopleuron with at least dorsal half of pectal region [not to be confused with longitudinally sculptured acropleuron] bare (Figs 54, 122, 266) and usually smooth (Figs 54, 122), and legs dark except for tarsi 36

35(34) Pronotal collar with variably distinct furrow paralleling posterior margin (Figs 391–393); legs dark except basal tarsal segments usually yellowish; mesopleuron with pectal region uniformly sculptured and setose (Fig. 395) ..... ***Spalangia plaumanni* n. sp.**

– Pronotal collar without furrow paralleling posterior margin (Fig. 178); legs yellowish beyond coxae; mesopleuron with dorsal half of pectal region smooth, shiny and bare (Fig. 179) .... ***Spalangia flavicrus* n. sp.**

36(34) Upper mesepisternum obliquely strigose and distinguished from smooth lower mesepisternum by finely carinate transepisternal line (Fig. 54); fore wing with line of at least 6 setae on mediocubital fold and line of setae in basal cell [not known north of Mexico] ..... ***Spalangia bethyloides* Bouček**

– Upper mesepisternum mostly smooth and shiny (Fig. 122) to coriaceous-granular (Fig. 266) but smoothly merged with lower mesepisternum except sometimes below subalar scrobe; fore wing often bare or almost bare behind submarginal fold, the mediocubital fold with at most 4 setae 37

37(36) Clava slender, at least 3x as long as wide (Fig. 269); scrobal depression with smooth, setose, inclined surface

lateral to elongate-slender coriaceous scrobes (Fig. 261); acropleuron very finely striate, the longitudinal sculpture ventrally merging with smoother, though often finely coriaceous pectal region (Fig. 266); mesoscutal median lobe with transverse region of coriaceous-alutaceous sculpture near middle (Fig. 263); flagellum with fu_2 at most slightly transverse and subsequent funicular segments subquadrate to slightly longer than wide (Fig. 269) ..... ***Spalangia leiopleura* n. sp.**

– Clava quite stubby, at most 2.7x as long as wide (Fig. 124); scrobal depression more broadly coriaceous, the sculpture more or less obviously extending over inclined lateral surface onto inner half of parascrobal region above torulus (Fig. 114); acropleuron usually more distinctly longitudinally striate-carinate, but at least with ventral, usually curved stria/carina obliquely angled toward base of tegula abruptly differentiating acropleuron from smooth and shiny pectal region (Fig. 122); mesoscutal median lobe usually with puncture or small region of punctures posterior to transverse coriaceous-alutaceous region (Figs 118, 119); flagellum often with fu_2 and sometimes subsequent funicular segments conspicuously transverse (Fig. 124) ..... ***Spalangia drosophilae* Ashmead**

38(32) Flagellum with fu_1 subquadrate, shorter than triangular pedicel and at most only slightly longer than fu_2, and subsequent funicular segments distinctly transverse (Fig. 247) ..... ***Spalangia impunctata* Howard**

– Flagellum with fu_1 several times longer than either subglobular pedicel or fu_2 and subsequent funicular segments oblong to elongate (Figs 60, 125, 268, 398) 39

39(38) Flagellum with setae usually much shorter than width of respective segment and fu_1 comparatively compact and robust, at most about 3x as long as wide (Figs 398, 399); mesopleuron with pectal region sparsely setose and uniformly sculptured (Fig. 396); gena usually with flat-bottomed setiferous punctures (Fig. 390) though sometimes punctures sparse and very shallow ..... ***Spalangia plaumanni* n. sp.**

– Flagellum with conspicuous setae about as long as width of segment and fu_1 usually elongate-tubular, at least 3.5x as long as wide (Figs 60, 125, 126, 268); mesopleuron with at least dorsal half of pectal region [not to be confused with longitudinally sculptured acropleuron] bare and usually smooth (Figs 55, 123, 267); gena usually smooth and shiny except for malar sulcus and setae originating from pinprick-like punctures or tiny bumps (Figs 50, 117, 262) 40

40(39) Pronotal collar posteriorly with variably distinct, sometimes medially incomplete, transverse furrow or band of coriaceous sculpture (Fig. 51); upper mesepisternum obliquely strigose and distinguished from lower mesepisternum by finely carinate transepisternal line (Fig. 55); fore wing conspicuously setose behind submarginal vein, with line(s) of setae in basal cell and on mediocubital fold..... ***Spalangia bethyloides* Bouček**

– Pronotal collar uniformly smooth and shiny or very finely coriaceous (Figs 119, 263); upper mesepisternum smooth and shiny (Fig. 123) or coriaceous (Fig. 267) but smoothly merged into lower mesepisternum; fore wing sometimes bare or almost bare behind submarginal vein 41

41(40) Mesonotal median lobe at most finely coriaceous-alutaceous near middle (Fig.263); acropleuron finely, longitudinally striate, the sculpture not differentiated ventrally and merging with smoother, though often finely coriaceous pectal region (Fig. 267); fore wing bare behind submarginal vein..... ***Spalangia leiopleura* n. sp.**

– Mesonotal median lobe usually with at least a couple of punctures posterior to coriaceous-alutaceous region (Figs 118, 119); acropleuron usually more or less distinctly longitudinally striate-carinate, but at least with ventral stria/carina obliquely angled or anteriorly recurved toward base of tegula and abruptly differentiating acropleuron from smooth and shiny pectal region (Fig. 123); fore wing sometimes with 1 or more setae on mediocubital fold and/or basal cell extensively setose..... ***Spalangia drosophilae* Ashmead**

42(31) Scutellum with frenal line a complete, strongly transverse ∩-like, subequally slender crenulate sulcus consisting of transverse portion across scutellum and abruptly recurved, obliquely angled lateral portion (Figs 153–155) 43

– Scutellum with frenal line usually obviously separated medially (Figs 184, 214, 224), but if more or less complete then punctures broadest laterally and progressively smaller toward middle so sulcus tapered and usually shallowed (effaced) toward midline (Fig. 442) 44

43(42) Male only: head, including gena, with distinct setiferous punctures, and extensively coriaceous over scrobes and inner half of parascrobal region (Fig. 331); antenna with inner and ventral surface of scape coriaceous-granular and fu_1 at least 3.5x as long as wide (Figs 343, 344); tarsi uniformly dark ..... ***Spalangia nigripes* Curtis** [part, see couplet 18]

– Female or, if male: head sometimes with distinct punctures on upper face but not on gena (Fig. 152), and at most finely coriaceous within scrobes; antenna with inner and ventral surface of scape smooth and shiny to finely alutaceous (Fig. 163); tarsi often distinctly yellowish ..... ***Spalangia erythromera* Förster**

44(42) Mesopleuron at least with upper and lower mesepimeron quite conspicuously sculptured, strongly, obliquely alutaceous to striate-strigose (Figs 122, 123), and often upper mesepisternum also strongly, obliquely strigose (Figs 54, 55, 179, 257, 395, 396); pronotal collar sometimes with variably distinct transverse furrow posteriorly (Figs 51, 256, 391, 392); gena sometimes with setae originating from distinct, flat-bottomed punctures (Figs 177, 388, 390); callus micropunctate-reticulate to reticulate-rugose (Figs 56, 57, 394); petiole without seta laterally ..... return to 32

– Mesopleuron with at least upper and lower mesepimeron quite shiny, finely alutaceous to alutaceous-striate, and upper mesepisternum often distinctly strigose at most only anteriorly (Figs 185, 212, 213, 225, 226, 440, 441); pronotal collar smooth without furrow posteriorly (Figs 184, 211, 224, 439); gena with setae originating from only tiny pinprick-like punctures or bumps (Figs 208–210, 436, 437); callus sometimes smooth and shiny at least posterior to level of spiracle toward postspiracular sulcus (Figs 214, 215, 227, 228); petiole sometimes with at least one seta laterally (Figs 186, 188) .....[*subpunctata*-group species]... 45

45(44) Female: flagellum clavate and fu_1 shorter than pedicel (Figs 216, 231, 444, 445) 46

– Male: flagellum filiform and fu_1 distinctly longer than pedicel (Figs 217, 232, 448)..... 49

46(45) Mesopleuron with subalar scrobe a narrow, vertical or anteroventrally angled crenulate-rugose furrow, and upper mesepisternum smooth and shiny (Fig. 225); Nearctic specimens with callus smooth and shiny except along extreme anterior margin (Fig. 227) ..... ***Spalangia imitator* n. sp.**

– Mesopleuron with subalar scrobe broadened ventrally, the posteroventral margin not distinct so coarse sculpture extends over upper mesepisternum anteriorly, and upper mesepisternum more or less obliquely strigose-rugose anteriorly to obliquely alutaceous or coriaceous posteriorly (Figs 185, 212, 440); callus usually more extensively reticulate-rugulose, at least anterior to level of posterior margin of spiracle (Figs 186, 442) 47

47(46) Scutellum with frenal line broadly interrupted medially, with only 1–3 distinct punctures laterally (Figs 211, 214); fore wing without setae on mediocubital fold; pronotal collar smooth and shiny, at least mediolongitudinally in bare region (Fig. 211); callus usually smooth posterior to level of spiracle over at least posterior half (Fig. 214); upper mesepisternum obliquely strigose to rugose-strigose anteriorly and alutaceous-coriaceous posteriorly (Fig. 214)..... ***Spalangia haematobiae* Ashmead**

– Scutellum with frenal line usually consisting of several increasingly shallower and smaller punctures forming tapered though variably extensive sulcus (Fig. 439, 442), and almost always with at least 1 setae on mediocubital fold (Figs 191, 193), but if frenal line as described above and mediocubital fold bare then pronotal collar completely coriaceous (Fig. 438), callus more or less completely rugose (Fig. 442), and upper mesepisternum quite uniformly, finely coriaceous except near subalar scrobe (Fig. 441)..... 48

48(47) Fore wing with up to 7 setae on mediocubital fold and with setae in basal cell extending proximally at most to level of most distal seta on mediocubital fold (Fig. 193); funicle usually with at least fu_2 and sometimes all except apical segments quadrate to oblong (Fig. 444); petiole with at most 1 seta .... ***Spalangia subpunctata* Förster**

– Fore wing with at least 7 setae on mediocubital fold and with setae in basal cell extending proximally obviously beyond level of most distal seta of mediocubital fold (Fig. 191); funicle with fu_2 and all subsequent segments obviously transverse (Figs 187, 189); petiole with 2 or more setae, though setae sometimes difficult to see (Fig. 186) ..... ***Spalangia fuscipes* Nees**

49(45) Mesopleuron with narrow, vertical subalar scrobe, and upper mesepisternum, pectal region and mesepimeron similarly, finely, mesh-like coriaceous (Fig. 226); upper face, scutellum and propodeal panels (Fig. 228) very finely mesh-like coriaceous ..... ***Spalangia imitator* n. sp.**

– Mesopleuron with subalar scrobe not as distinctly differentiated and upper mesepisternum obliquely strigose to reticulate-roughened relative to pectal region (Figs 185, 213, 441); upper face, scutellum and propodeal panels smooth and shiny 50

50(49) Scutellum with frenal line consisting of only 1 or 2 coalesced punctures forming obliquely angled depression at extreme lateral margin (Figs 211, 214); fore wing with at most 2 setae on mediocubital fold .... ***Spalangia haematobiae* Ashmead**

– Scutellum sometimes with frenal line complete, but at least consisting of several punctures narrowed and shallowed toward middle (Figs 184, 439, 442); fore wing with at least 4 setae on mediocubital fold 51

51(50) Fore wing with numerous setae behind submarginal vein on mediocubital fold and basal cell, the setae of basal cell extending in 2 rows conspicuously beyond level of most distal seta on mediocubital fold (Fig. 192); petiole with 2 or more setae, though setae sometimes difficult to observe (Fig. 188) [no specimens yet known from New World]..... ***Spalangia fuscipes* Nees**

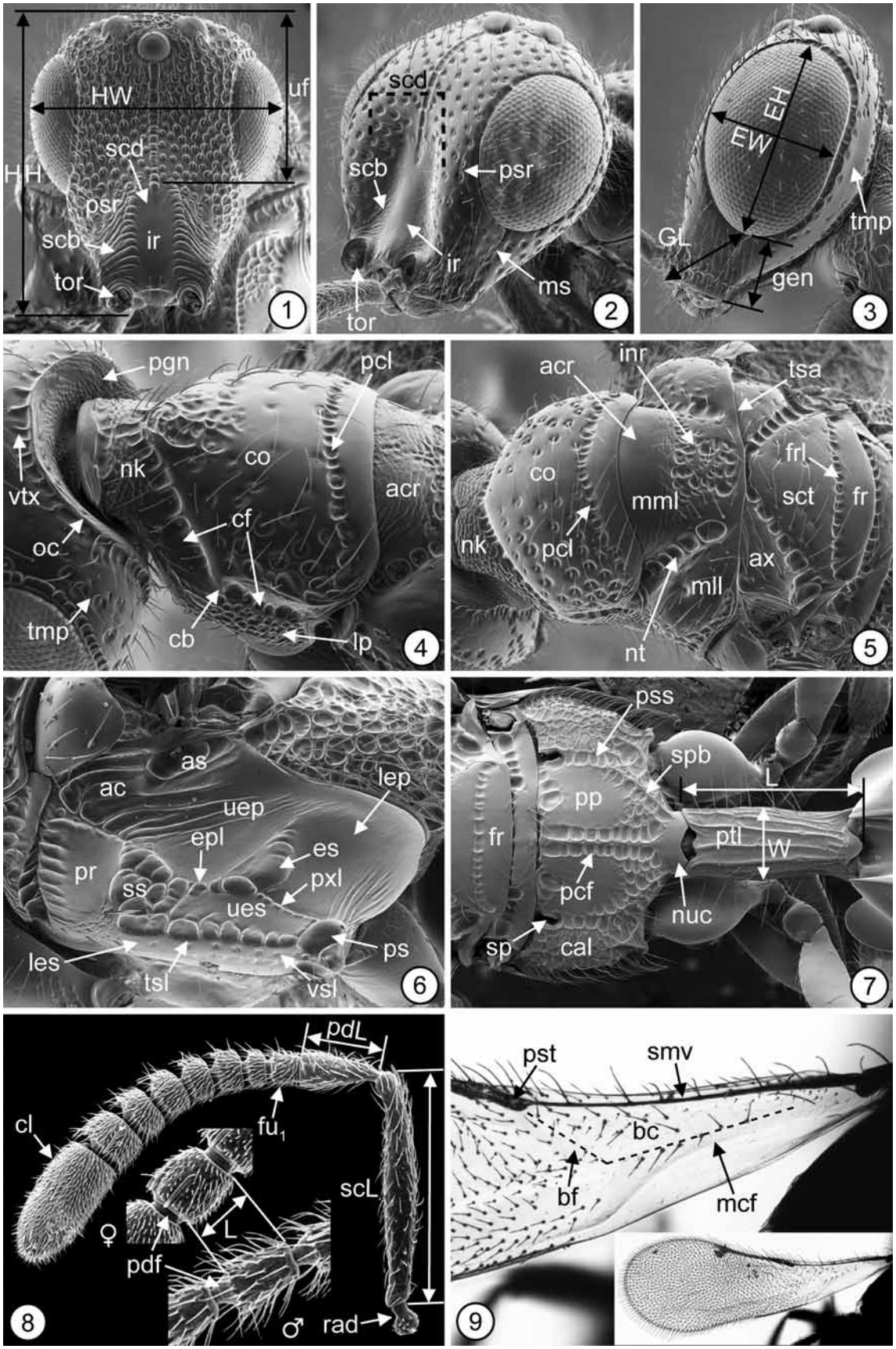
Fore wing variably setose behind submarginal vein, but setae in basal cell in single line if extending obviously beyond level of most distal seta of mediocubital setal line (Fig. 194); petiole with at most 1 seta .... ***Spalangia subpunctata*** **Förster**

Playaspalangia Yoshimoto, 1976

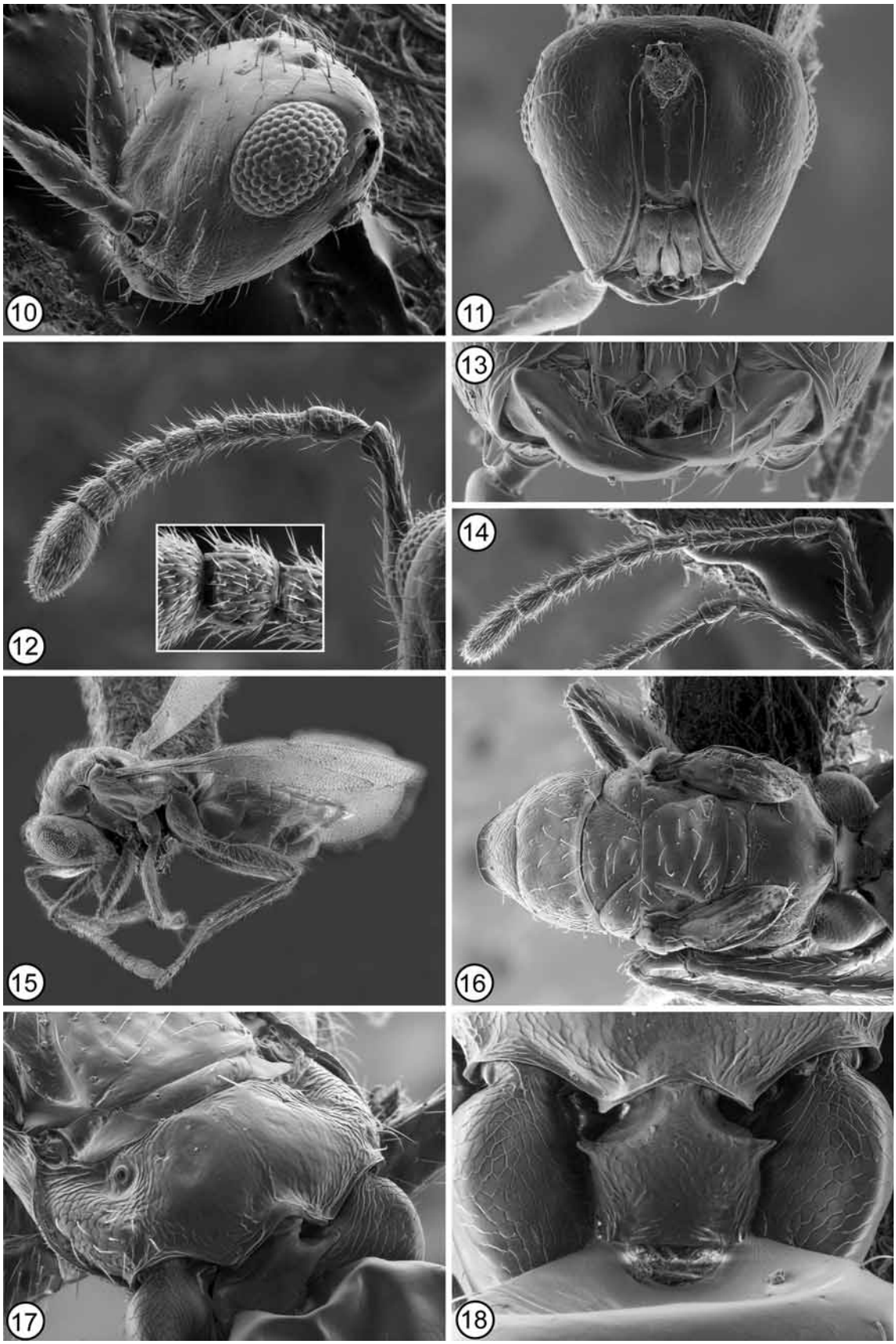
Playaspalangia Yoshimoto, 1976: 475–477. Type species: *Playaspalangia rothi* Yoshimoto, by original designation.

Diagnosis. Head (Fig. 10), pronotal collar and mesonotum (Fig. 16) coriaceous without setiferous punctures or crenulae, but with quite long and conspicuous, curved, brownish setae (Figs 15, 16). Head without occipital carina (Fig. 11); lower face bent at about 90° angle to torulus, in lateral view rim of torulus slightly raised into very short tube but not lobe-like projecting beyond level of base of mandible (Fig. 10). Maxillary and labial palpi 1-segmented (Fig. 13). Wings fully developed (Fig. 15) to strongly reduced (Fig. 16); fully developed fore wing uniformly setose. Mesopleuron, including pectal region, bare; with shallow furrow indistinctly differentiating mesepimeron from upper mesepisternum, but acropleuron and pectal region not distinctly differentiated and upper mesepisternum smoothly merged into lower mesepisternum without transepisternal line or line of setae (Fig. 19). Propodeum (Fig. 17) variably finely coriaceous, without distinct postspiracular sulcus; plical region without paramedian crenulate furrows. Petiole (Fig. 18) smooth to very finely coriaceous, only about as long as maximum width, pentagonal, and with acutely pointed anterolateral angles directed laterally. Gaster with tergites not strongly sclerotized, more or less collapsed in air dried specimens, with conspicuous, long, curved, brown setae (Fig. 20); Gt_1 broadly and shallowly concave anteriorly, but depressed area not carinately margined (Figs 18, 20); tergites posterior to Gt_1 all of similar length (Fig. 20).

Relationships. Yoshimoto (1976) established *Playaspalangia* for his new species *P. rothi*. Although monotypic, several putatively plesiomorphic features suggest that *P. rothi* is the sister group of *Spalangia* rather than just a secondarily highly modified species that renders *Spalangia* paraphyletic. The petiole is comparatively short and smooth, and although it has acute anterolateral angles these project laterally (Fig. 18) rather than anteriorly so that the petiole and posterolateral margins of the propodeal foramen do not interdigitate to the same extent as in *Spalangia* (e.g. Figs 71, 89, 201, 355). Furthermore, the body (Fig. 15) is not only comparatively lightly sclerotized but also more or less uniformly coriaceous (including the propodeum, Fig. 17), the gastral tergites are subequal in length (Fig. 20), and Gt_1 (Figs 16, 20) lacks the deep, carinately margined anteromedian depression that is correlated with the longer tubular petiole of *Spalangia* (e.g. Figs 121, 229, 230). The mesepimeron and upper mesepisternum are differentiated by a shallow furrow (Fig. 19) that appears to be intermediate in structure between the oblique femoral depression of many Pteromalidae and the more distinct longitudinal episternal line and/or episternal scrobe that characterizes *Spalangia* (e.g. Fig. 6). Furthermore, the other mesopleural regions that characterize *Spalangia* are only obscurely differentiated by slight sculptural differences in *P. rothi*, the bare pectal region (Fig. 19) lacks even the single posteroventral seta that characterizes *Spalangia* (e.g. Figs 34, 44, 54), and the upper and lower mesepisternum are not differentiated by either a transepisternal line or a line of setae (Fig. 19). The head also lacks an occipital carina (Fig. 11) and the lower face is not acutely angled under the face so that in lateral view the toruli are not tube-like extended beyond the base of the mandible (Fig. 10), though this is also true for some *Spalangia*, particularly males. Based on comparison with other Pteromalidae, most of the above features of *Playaspalangia*, including probably absence of an occipital carina, likely are symplesiomorphic features. However, the 1-segmented maxillary and labial palpi of *Playaspalangia* (Fig. 13) undoubtedly are apomorphic relative to the 2-segmented palpi of *Spalangia* (Fig. 116, insert).



Figs 1–9. Morphological terms used for Spalangiinae (see Appendix for abbreviations). **1–3**, head: **1**, *Spalangia nigra* ♀, **2**, *S. nigripes* ♀, **3**, *S. longepetiolata* ♂; **4**, head and pronotum, *S. alyxia* ♀; **5**, pro- and mesonotum, *S. endius* ♀; **6**, mesopleuron, *S. alyxia* ♀; **7**, propodeum and petiole, *S. nigroaenea* ♂; **8**, antenna, *S. imitator* ♀ (inserts: *S. subpunctata* ♀, *S. drosophilae* ♂); **9**, fore wing, *S. fuscipes* ♀.



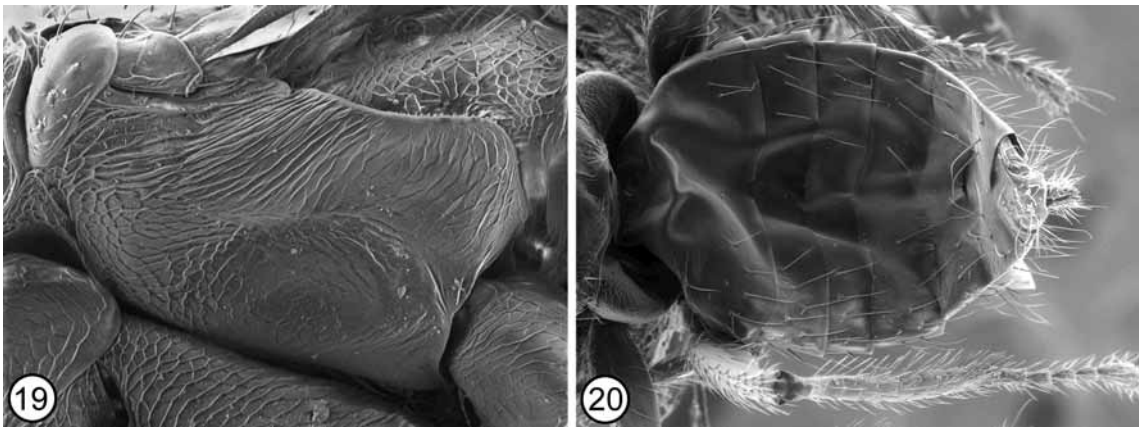
Figs 10–18. *Playaspalangia rothi* Yoshimoto. **10 & 11**, ♂ head: **10**, frontolateral view, **11**, posterior view; **12**, ♀ antenna (insert: fu_7); **13**, ♂ mouthparts, ventral view; **14**, ♂ antenna; **15**, lateral habitus of macropterous ♀; **16**, micropterous ♂ mesosoma, dorsal view; **17**, ♀ scutellum–petiole, posterolateral view; **18**, ♂ petiole, dorsal view.

***Playaspalangia rothi* Yoshimoto, 1976**
(Figs 10–21)

Playaspalangia rothi Yoshimoto, 1976: 478; holotype ♀ (AMNH, not examined).

Description. *Female*. Length = 1.2–1.4 mm. Body, including appendages, uniformly dark brown. Head in anterior view without distinct median sulcus on upper face or sulci delineating ocellar triangle (Fig. 10); upper face finely coriaceous to almost smooth, and scrobes and parascrobal region similarly finely coriaceous-alutaceous. Head in lateral view with malar space about 0.9x eye height and about 1.2x eye length; gena without malar sulcus (Fig. 10). Antenna (Fig. 12) with scape (Figs 10, 12) distinctly bulbous subbasally and narrowed subapically, the inner and outer surfaces smooth to partly alutaceous but shiny and similarly sparsely setose; flagellum clavate with semierect setae similar to scape; pedicel subequal in length to fu_1; funicle with fu_1 about 2.0–2.2x as long as wide and subsequent segments quadrangular basally to slightly transverse apically; clava about 1.8–2.0x as long as wide.

Pronotum with shallow, inconspicuous circumpronotal furrow differentiating similarly coriaceous neck and collar (Fig. 16), but without circumpronotal band anterolaterally (Fig. 15). Mesoscutum (Fig. 16) uniformly coriaceous; median mesoscutal lobe not differentiated into anterior convex region and internotaular region; notauli deep but not crenulate. Scutellum (Figs 16, 17) more obscurely sculptured than mesoscutum and with frenum indistinctly delineated by obscure transverse furrow, the furrow usually more or less effaced medially or evident only under some angles of light. Mesopleuron (Fig. 19) mostly coriaceous-alutaceous except acropleuron and alar shelf longitudinally strigose and upper mesepimeron sometimes variably distinctly longitudinally to obliquely strigose-alutaceous. Fore wing of fully winged or brachypterous individuals slightly embrowned. Petiole (Figs 17, 18) bare. Gaster (Fig. 20) uniformly setose or variably broadly bare medially.



Figs 19–20. *Playaspalangia rothi* Yoshimoto ♀. **19**, mesopleuron; **20**, metasoma, dorsal view.

Male. Length 1.0–1.3 mm. Antenna (Fig. 14) similarly clavate with spindle-shaped scape as female, but flagellum with sparser semierect setae; fu_1 about 1.5–1.8x as long as pedicel and about 3.6–5.1x as long as medial (narrowest) width, with subsequent funicular segments all oblong, about 1.6–2.6x as long as wide; clava about 2.5–2.9x as long as wide. Otherwise similar to female.

Material examined. *Neotropical* (4♀, 5♂ paratypes). **MEXICO**: South of Punta Cirio, 15.V.75, V. Roth, ex among algae mixed with tiny barnacles (1♂ BMNH; 2♀, 2♂); Puerto Peñasco, 31º47'N 113º30'W, 7.VI.75, W. Brown (2♀, 2♂).

Distribution. This species has not been reported since the type series was collected in northwestern Mexico in coastal areas of the Gulf of California (Fig. 21), but the CNC has a single brachypterous male from the

Oriental region labelled “CEYLON [Sri Lanka], Nugegoda, W. Prov., 7.VII.1970, P.B. Karunaratne”. This specimen likely represents a valid distribution record because Nugegoda is a coastal locality and, if so, *P. rothi* is indicated to have a much wider, possibly circumtropical coastal distribution.

Fig. 21. Distribution of *Playaspalangia rothi* Yoshimoto.

Biology. Unknown, but hosts undoubtedly some Diptera associated with an intertidal shore-line habitat. Both sexes of the type series were observed walking over algae-covered rocks at low tide (Yoshimoto 1976). Extreme wing length dimorphism characterizes both sexes of *P. rothi* (*cf.* Figs 15, 16), the only species of the subfamily known to vary noticeably in wing length. Furthermore, individuals have unusually long setae on the head and dorsum of the meso- and metasoma (Fig. 15). *Urolepis rufipes* (Ashmead) (Pteromalidae: Pteromalinae) is also unusually densely setose for a pteromaline (Gibson 2000) and females have been observed searching underwater for their Ephydridae aquatic hosts (Howarth and Polhemus 1991). Because both sexes of *P. rothi* are dimorphic in wing length and are conspicuously setose the features may be adaptations correlated with adult emergence or accidental submergence while searching for mates or hosts in the intertidal zone.

Spalangia Latreille, 1805

Spalangia Latreille, 1805: 227–228. Type species: *Spalangia nigra* Latreille, by monotypy.
Prospalangia Brèthes, 1915: 314. Type species: *Prospalangia platensis* Brèthes, by original designation.

Diagnosis. Head, pronotal collar and/or mesonotum usually with some setiferous punctures or crenulae (e.g. Figs 1–7), but if not then mostly smooth and shiny with short, sparse setae (e.g. Figs 374–378). Head with occipital carina (e.g. Figs 4, 116), at least dorsally, except for *noyesi*-group species (Fig. 375); lower face often acutely angled under torulus so in lateral view torulus appears to be at apex of short tube extending beyond level of base of mandible (e.g. Figs 22, 286, 367). Maxillary and labial palpi 2-segmented (Fig. 116, insert). Wings fully developed, bare or variably densely setose behind submarginal vein but usually obviously

less setose than disc (e.g. Figs 9, 191–194). Mesopleuron with variably sculptured subalar scrobe, episternal scrobe/line and precoxal scrobe/line differentiating upper and lower mesepimeron from upper mesepisternum posterior to acropleuron and pectal region (e.g. Fig. 6); pectal region with at least 1 seta posteroventrally; upper and lower mesepisternum usually differentiated by transepisternal line and/or variable number of setae in line anterior to mesocoxa (e.g. Figs 34, 44, 54). Propodeum with paramedian crenulate furrows (e.g. Fig. 7) except smooth and shiny in *noyesi*-group species (Fig. 381). Petiole much longer than wide, longitudinally carinate-strigose to reticulate-rugose, and with acutely pointed anterolateral angles directed anteriorly so as to form W-like depression for posterolateral margins of propodeal foramen (e.g. Figs 71, 89, 201, 355). Gaster with tergites strongly sclerotized, often flattened but not collapsed in air dried specimens, and with comparatively inconspicuous, sparse setae dorsally (Figs 121, 229, 230); Gt_1 deeply, uniformly concave anteriorly with depressed region carinately margined laterally (e.g. Figs 121, 229, 230), and Gt_3 usually conspicuously larger than Gt_2 and Gt_4.

1. *Spalangia alyxia* n. sp.
(Figs 22–38)

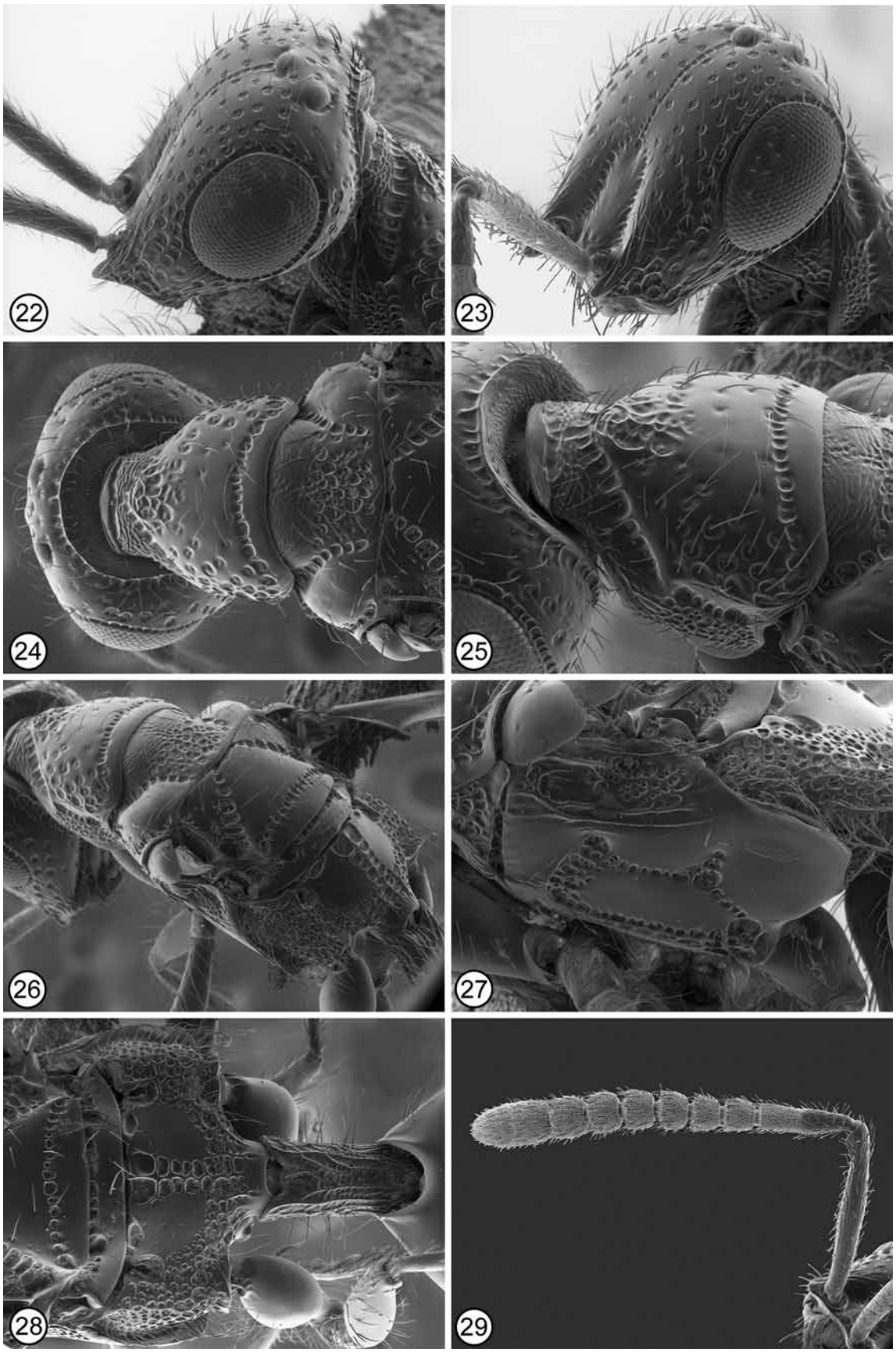
Type material. HOLOTYPE (♀, TAMU). "[USA] TEXAS: Walker Co., Ellis Prison Unit, May 3, 1980, ex suction trap, D.A. Dean / CNCI, JDR-specm 2007-032". Condition: point-mounted, entire but detached and glued to point are right antenna beyond scape, and left fore and hind wing.

PARATYPES (3♂, CNC). *Nearctic*. **CANADA**: ***Alberta***, Aden, Gilchrist Ranch, 28.VI.56, O. Peck, swept from grass range. Manyberries, 4.VI.56, O. Peck. **USA**: ***Texas***, [San] Patricio Co., Welder Wildlife Refuge, 4.xii.99, L. Masner.

Etymology. From the Greek word *alyxis*, meaning "an escape", in reference to the holotype locality.

Description. *Female*. Length = 2.3 mm. Legs dark except knees and extreme apices of tibiae slightly lighter and basal 4 tarsal segments yellow. Head in anterior view about 1.1x as high as wide; in dorsal view about 1.7x as wide as long; in lateral view with malar space about 0.9x eye height and about 1.4x eye width. Head capsule smooth and shiny with distinct setiferous punctures as follows: with complete median sulcus extending ventrally to elongate-triangular scrobal depression (Fig. 23), otherwise upper face and parascrobal region with circular punctures separated by obviously more than own diameter except toward inner orbit and on parascrobal region toward lower inner orbit where more crowded, mostly separated only by ridges; scrobal depression (Fig. 23) with punctate-crenulate scrobes, but interantennal region and inclined lateral surface of depression mostly smooth; in lateral view lower face projecting conspicuously beyond torulus as acutely angled lobe lateral to torulus (Figs 22, 23); gena punctate without distinct malar sulcus but with fine parallel carinae forming groove in region of presumptive sulcus; temple with well separated circular punctures. Antenna (Fig. 29) with scape about 8x as long as greatest width, shiny and finely sculptured, the outer surface setose and finely strigose-alutaceous, but inner surface bare mediolongitudinally where more distinctly though finely longitudinally striate (Fig. 29); pedicel about 2.3x as long as apical width and about 1.3x as long as fu_1; funicle with fu_1 about 1.7x as long as wide; fu_2 very slightly longer than wide and subsequent segments subquadrate to slightly transverse; clava about 2.3x as long as wide.

Pronotal collar in lateral view quite flat, abruptly but only slightly raised above neck; with a short, vertical smooth bar interrupting crenulate circumpronotal furrow anterolaterally and anteriorly with a slender, smooth and shiny inclined surface above furrow (Figs 22, 23, 25), but not carinately margined anteriorly even though in dorsal view anterolateral margins quite distinctly Λ-like convergent; with distinct crenulate cross-line posteriorly (Figs 24–26) and with rugose region anteromedially, but mostly smooth and shiny medially and laterally with circular punctures, the punctures increasingly crowded toward side where fine, irregular lateral



Figs 22–29. *Spalangia alyxia* Gibson ♀. **22 & 23**, head: **22**, dorsolateral view, **23**, frontolateral view; **24**, pronotum and mesoscutum, dorsal view; **25**, pronotum, dorsolateral view; **26**, mesosoma, dorsolateral view; **27**, mesopleuron; **28**, frenum–petiole, dorsal view; **29**, antenna.

carina differentiates dorsal surface of collar from smooth and shiny lateral surface above lateral panel (Fig. 25). Mesoscutal median lobe (Figs 24, 26) with exposed part of anterior convex region variably coriaceous to transversely strigose or punctate-coriaceous; internotaular region completely punctate-rugose without evident median carina. Axillae (Fig. 26) smooth and shiny except for sparse, pinprick-like setiferous punctures. Scutellum (Fig. 26) smooth and shiny except for a few pinprick-like setiferous punctures laterally; frenum (Figs 26, 28) differentiated by complete crenulate frenal line. Mesopleuron (Fig. 27) smooth and shiny except as follows: pectal region very inconspicuously and shallowly crenulate along anterior margin and bare except for 1 posteroventral seta; acropleuron punctate-rugulose anterodorsally but more distinctly longitudinally carinate posteriorly; alar shelf punctate-rugulose above longitudinal carinae extending from acropleuron; subalar scrobe punctate-rugulose with posterior margin angled anteroventrally so as to form acute angle with transepisternal line; episternal scrobe a short, almost vertical punctate-rugulose depression connected to subalar and precoxal scrobes by similar punctate lines; upper and lower mesepisternum differentiated by complete punctate-crenulate transepisternal line and adjacent line of setae (Fig. 27). Fore wing hyaline; mostly bare behind submarginal vein but with 3 or 4 setae in line on mediocubital fold and with a few setae distally in basal cell near parastigma. Propodeum (Figs 26, 28) with large depression surrounding spiracle but otherwise postspiracular sulcus not well differentiated from sculpture of callus or supracoxal band; callus completely punctate-rugulose similar to subalar region; plical region with only slightly widened paramedian crenulate furrows delineating median carina, but anterior-most cell obviously larger than more posterior cells; supracoxal band contiguous with paramedian crenulate furrows; propodeal panels smooth and shiny.

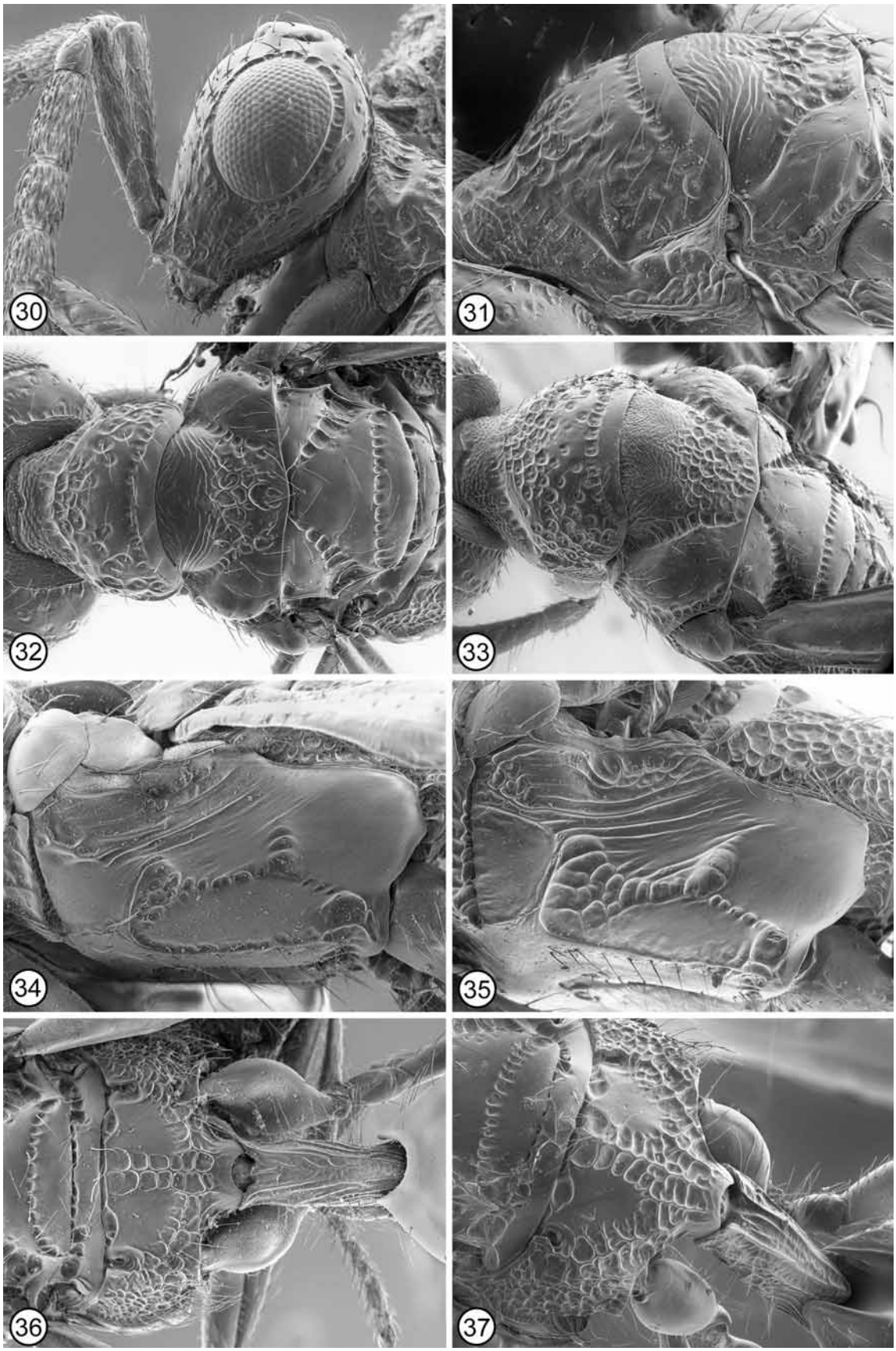
Petiole (Fig. 28) about 2.3x as long as medial width; punctate-reticulate between longitudinal, anteriorly irregular carinae; with several long setae laterally along length. Gaster with tergites smooth and shiny.

Male. Length = 1.7–2.9 mm. Antenna (Fig. 30) with scape about 6x as long as broad, the surfaces similarly alutaceous or outer surface sometimes distinctly coriaceous; pedicel up to about 1.3x as long as greatest width, but subglobular; flagellum with setae much shorter than width of respective segment; fu_1 about 1.9–2.3x as long as wide and about 1.9–2.5x length of pedicel, and subsequent funicular segments up to about 1.5x as long as wide but at least slightly oblong. Otherwise similar to female except as follows. Legs with only basal 1 or 2 tarsal segments bright yellow and subsequent segments increasingly yellowish-brown to dark brown. Head in anterior view about 1.1x as wide as high; in lateral view (Fig. 30) lower face not projecting as conspicuous angulate lobe beyond torulus, malar space about 0.84–0.89x eye height and about 1.1x eye width, and gena sometimes without any indication of malar sulcus. Pronotal collar (Figs 31–33) with distinct crenulate cross-line and anterior punctate-rugose region similar to female, but anteriorly more smoothly rounded to neck and laterally sculpture often coarser without well separated circular punctures except posteromedially, the sculpture sometimes smoothly rounded to lateral panel without horizontal carina differentiating dorsal and lateral surfaces (Fig. 33). Mesoscutal median lobe (Figs 31–33) with anterior convex region more strongly sculptured than for female and internotaular region more distinctly reticulate-rugose. Mesopleuron (Figs 34, 35) with acropleuron sometimes completely longitudinally carinate, upper mesepimeron sometimes longitudinally carinate similar to acropleuron, subalar scrobe more distinctly reticulate-rugose (Figs 34, 35), and upper mesepisternum sometimes obscurely sculptured along transepisternal line. Fore wing hyaline; mediocubital fold and basal cell sometimes extensively setose over at least distal half. Petiole (Figs 36, 37) about 2.1–2.6x as long as medial width. Propodeum (Figs 36, 37) similar to female except callus more distinctly rugose because interstices narrower and anterior cells of paramedian crenulate furrows sometimes not differentiated in size from more posterior cells.

Distribution. Nearctic (Fig. 38).

Biology. Unknown.

Recognition. I include *S. alyxia* as one of six species in the *nigra* species group as discussed under *S. nigra*. The only known female of *S. alyxia* is differentiated from all other *Spalangia* by its lower face, which projects conspicuously as an acutely angled lobe under and beyond the torulus (Figs 22, 23). Within the *nigra*-



Figs 30–37. *Spalangia alyxia* Gibson ♂. **30**, head, lateral view; **31**, pronotum and mesoscutum, dorsolateral view; **32 & 33**, thorax: **32**, dorsal view, **33**, dorsolateral view; **34 & 35**, mesopleuron; **36 & 37**, frenum–petiole: **36**, dorsal view, **37**, dorsolateral view.

group it also uniquely has an extensively punctate-rugulose alar shelf (Fig. 27) and the anterior convex region of the mesoscutal median lobe completely sculptured (Figs 24–26). The three males I identify as *S. alyxia* also have the anterior convex region sculptured (Figs 31–33) and the alar shelf is punctate-rugulose at least dorsally (Figs 34, 35), but the lower face does not project into an angulate lobe (Fig. 30). The pronotal collar of the Texas male does not have such distinct circular punctures and is more rugose laterally than for the female, but like the female has a rugose region anteromedially (Figs 31, 32) and laterally quite a distinct longitudinal carina that differentiates vertical and lateral portions of the collar (Fig. 31). Pronotal sculpture of the two males from Alberta is similar to either the Texas male or female, except both males from Alberta have the pronotal collar smoothly rounded to the circumpronotal furrow laterally (Fig. 33) and therefore similar to the pronotal collar of many *S. nigra* males (Fig. 309). The mesopleural sculpture of one of the Alberta males is also similar to many *S. nigra* males, having a large reticulate-rugose subalar scrobe and with the upper mesepisternum obscurely sculptured along the transepisternal line (Fig. 35).

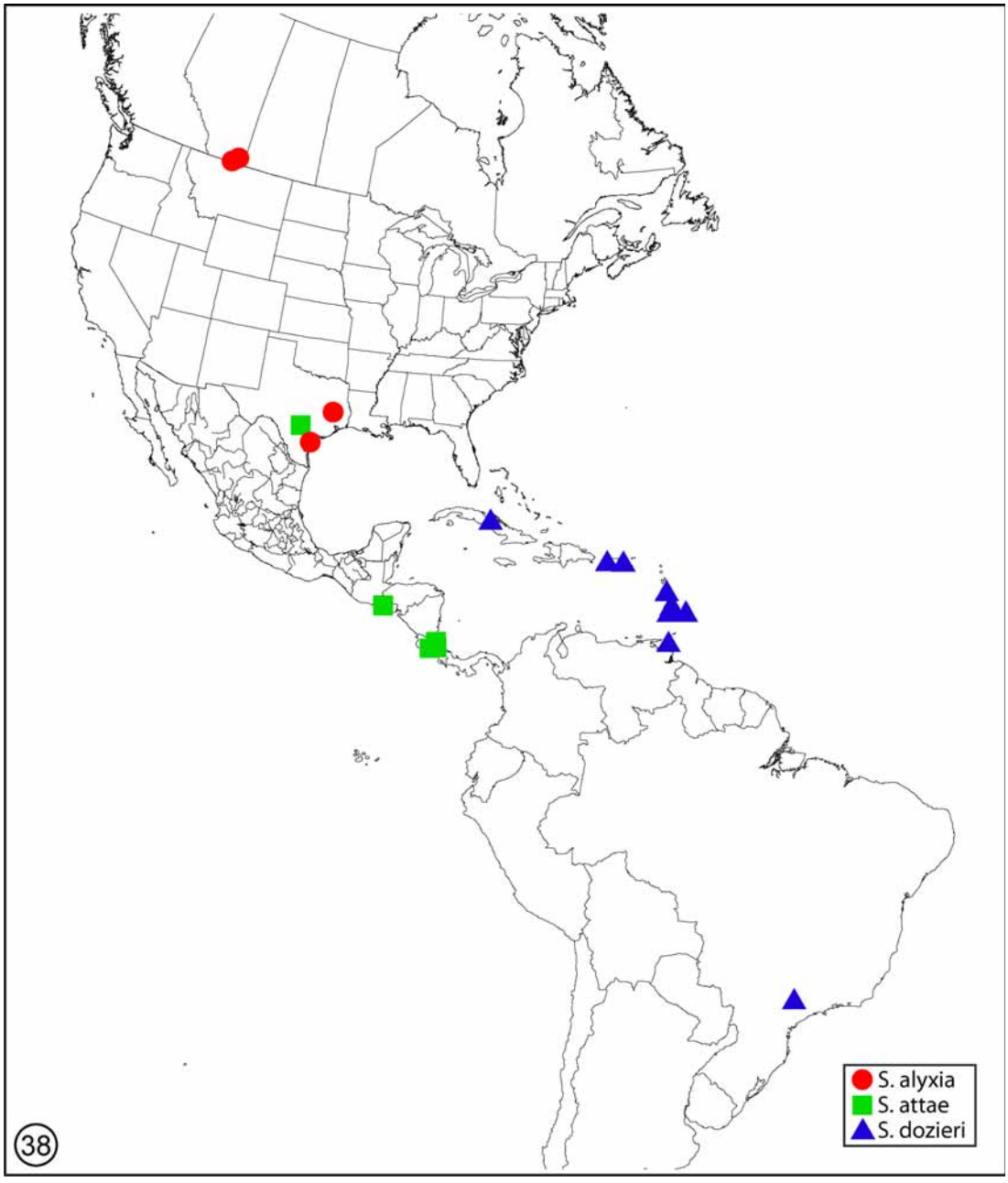


Fig. 38. Distribution of *Spalangia alyxia* Gibson, *S. attae* Burks and *S. dozieri* Burks.

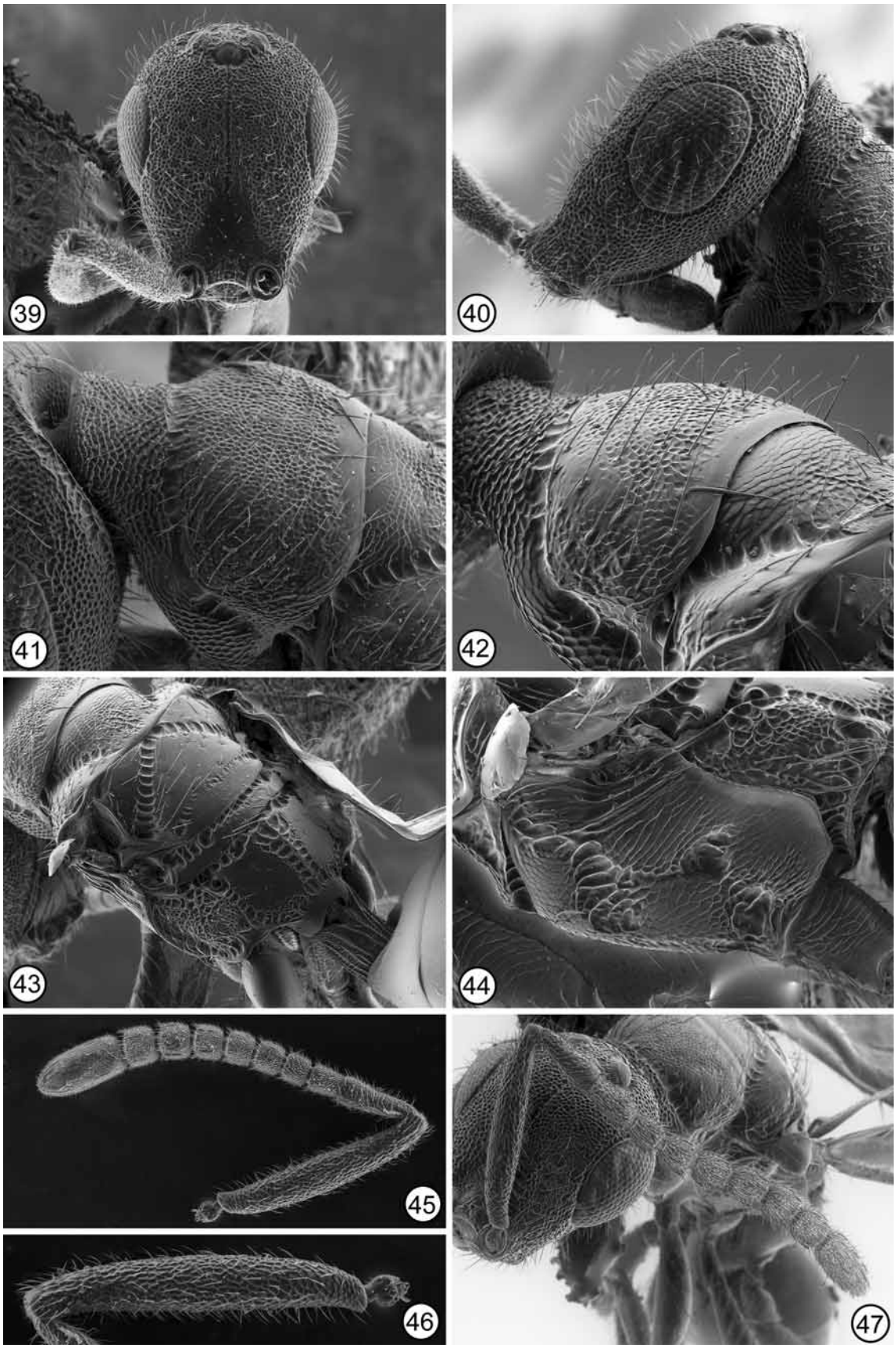
2. *Spalangia attae* Burks, 1969
(Figs 38–47)

Spalangia attae Burks, 1969: 1–2; holotype ♀ (USNM, examined). Type data: El Salvador, San Salvador, 2-25.VI.58, O. L. Cartwright; in debris ex nest of *Atta mexicana* (F. Sm.).

Description. *Female*. Length = 1.1–1.6 mm. Legs dark with knees sometimes lighter in color and basal 3 or 4 tarsal segments yellow. Head in anterior view (Fig. 39) about 1.3x as high as wide; in dorsal view about 1.6–1.7x as wide as long; in lateral view (Fig. 40) with malar space about 1.0–1.1x eye height and about 1.4–1.6x eye width. Head capsule (Figs 39, 40, 47) dull and uniformly micropunctate-reticulate with setae originating from at most only very shallow and obscure depressions overlaying microreticulation (Fig. 39) except as follows: with complete, though variably distinct, median sulcus extending ventrally to elongate-triangular scrobal depression; scrobal depression, excluding inclined lateral surface, much more finely coriaceous-reticulate and variably smooth and shiny medially on interantennal region; gena at most with obscure linear malar sulcus. Antenna (Fig. 45) with scape about 5.8–6.6x as long as wide, the inner (Fig. 46) and outer surfaces uniformly setose and reticulate-rugulose; pedicel about 2.5–2.6x as long as apical width and about 2.1–2.6x as long as fu_1; funicle with fu_1 about 1.1–1.3x as long as wide and subsequent segments quadrate to variably distinctly transverse; clava about 2.1–2.3x as long as wide.

Pronotal collar in lateral view only very low convex behind neck (Fig. 40), without distinct circumpronotal band anterolaterally and anteriorly smoothly rounded to neck (Figs 41, 42); smooth and shiny near posterior margin but otherwise micropunctate to micropunctate-reticulate, the sculpture sometimes finer or shallower than on head, and uniformly setose over sculptured region except mediolongitudinally. Mesoscutal median lobe (Figs 41, 42) with anterior convex region variably coriaceous to coriaceous-granular or strongly alutaceous; internotaular region more distinctly reticulate-rugose medially (Fig. 43). Axillae (Fig. 43) smooth and shiny except for pinprick-like setiferous punctures. Scutellum (Fig. 43) smooth and shiny except for sparse pinprick-like setiferous punctures laterally; frenum at least differentiated by 2 or 3 distinct punctures laterally and sometimes by virtually complete, though shallow crenulate line (Fig. 43), and then sometimes finely coriaceous adjacent to frenal line. Mesopleuron (Fig. 44) completely sculptured as follows: pectal region coriaceous and bare except for 1 posteroventral seta; acropleuron longitudinally carinate, the carinae extending posteriorly onto alar shelf; subalar scrobe a more or less vertical, longitudinally crenulate to reticulate-crenulate depression; episternal scrobe a subcircular or somewhat vertical punctate to crenulate-reticulate depression connected to subalar scrobe and reticulate-rugulose precoxal scrobe by variably distinct, linear episternal and precoxal sulci; upper and lower mesepimeron mostly coriaceous to obliquely alutaceous but upper mesepimeron sometimes coriaceous-granular ventrally and lower mesepimeron often quite smooth and shiny dorsally; upper and lower mesepisternum differentiated only by setal line rather than distinct transepisternal line, the upper mesepisternum at least very finely coriaceous but shiny similar to mesepimeron (Fig. 44). Fore wing hyaline; mediocubital fold with 1–4 setae and basal cell/fold with 3–5 setae distally. Propodeum (Fig. 43) with distinct postspiracular sulcus; callus variably extensively reticulate-rugose anteriorly and micropunctate-reticulate posteriorly or quite smooth and shiny posterior to level of spiracle; plical region with only slightly widened paramedian crenulate furrows delineating median carina, and either with anterior-most cells not differentiated in size from more posterior cells or with irregular sculpture anteriorly (Fig. 43); supracoxal band variably wide and either contiguous with paramedian crenulate furrows or separated by distinct smooth band at nucha; propodeal panels smooth and shiny except usually for small anterior region of coriaceous sculpture adjacent to paramedian crenulate furrows (Fig. 43).

Petiole (Fig. 43) about 1.8x as long as medial width; microreticulate between longitudinal carinae; with or without 1 short seta anterolaterally. Gaster with Gt_1 smooth or with only extremely obscure coriaceous sculpture and Gt_2 and Gt_3 very finely coriaceous.



Figs 39–47. *Spalangia attae* Burks. **39 & 40**, ♀ head: **39**, anterior view, **40**, lateral view; **41**, ♀ pronotum, dorsolateral view; **42**, ♂ pronotum, posterodorsal view; **43**, ♀ mesosoma, posterodorsal view; **44**, ♂ mesopleuron; **45**, ♀ antenna; **46**, ♀ scape, inner view; **47**, ♂ antenna.

Male. Length = 1.5–1.6 mm. Antenna (Fig. 47) with scape about 5.2–5.6x as long as wide; pedicel about 2.6x as long as wide; flagellum with setae much shorter than width of segment; funicle with fu_1 about 1.9x as long as wide and 0.7x as long as pedicel, and subsequent funicular segments very slightly longer than wide to subquadrate apically. Otherwise similar to female except as follows. Head in anterior view about 1.1x as high as wide; in lateral view malar space about 0.7–0.8x eye height and about 1.0–1.1x eye width. Pronotal collar (Fig. 47) reticulate-punctate medially to more distinctly coriaceous or partly smooth and shiny laterally, but sculpture obviously finer than on face. Fore wing with slight brownish tinge and more extensively and conspicuously setose behind submarginal vein. Petiole about 2.2x as long as medial width.

Material examined. *Nearctic* (1♀). **USA**: ***Texas***, San Antonio, 16.I.35, E. V. Walter, ex nest of *Atta texana*, taken 7 ft. below surface (1♀ USNM).

Neotropical (7♀, 2♂). **COSTA RICA**: Carta, Monumento Nacional Guayabo, A.C. Amistad, 1100 m., VI.94, G. Fonseca (1♀ INBIO). Heredia, Pto. [Puerto] Viejo, OET-La Selva, 100 m., I.93, Hanson & Godoy (1♀ MZCR). Puntarenas Prov., Res. Biol. Carara, Est. Quebrada Bonita, 50 m. — I.94, M. Guzmán (1♂ INBIO); II.93, II.94, VII.92, J.C. Saborio (4♀, 1♂ INBIO). **EL SALVADOR** (♀ holotype).

Distribution. From about 30ºN in southern Texas through Central America (Costa Rica, El Salvador) (Fig. 38).

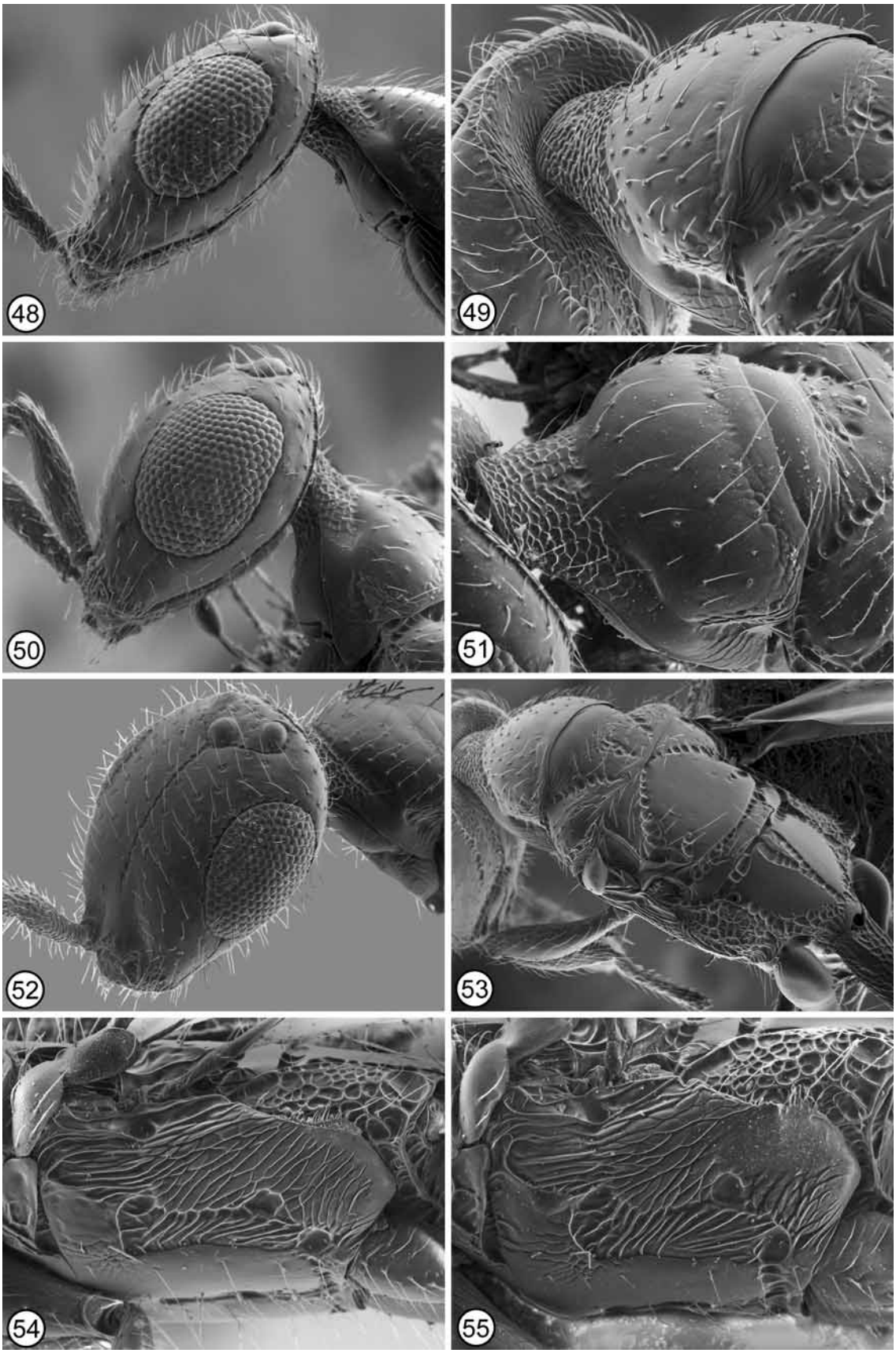
Biology. Unknown, but apparently a parasitoid of some Diptera associated with ant nests. The holotype was taken along with other insects from debris of a nest of the leaf-cutter ant, *Atta mexicana* (Smith) and another female was taken from a next of *Atta texana* (Buckley) (Hymenoptera: Formicidae).

Recognition. I include *S. attae* along with *S. rugosifrons*, *S. stictocyla* and *S. stictocephala* in the *attae* species group based on the species having the head at least partly micropunctate-reticulate (Figs 39, 40, 423, 424, 429, 430) to reticulate-rugose (Figs 400, 401). In other New World *Spalangia* the head is variably smooth and shiny with pinprick-like (e.g. Figs 148, 209) to distinct, though sometimes very crowded punctures (e.g. Fig. 299). *Spalangia attae* is most similar to *S. stictocephala* and *S. stictocyla* because the head of all three species is partly or completely micropunctate-reticulate (*cf.* Figs 39, 423, 430), whereas that of *S. rugosifrons* is more rugose (Figs 400, 401). The former three species are differentiated from each other primarily by different sculpture patterns of the head and pronotal collar. *Spalangia attae* has both the head and pronotal collar similarly micropunctate-reticulate, whereas *S. stictocephala* and *S. stictocyla* have the head variably extensively micropunctate-reticulate and the pronotal collar coriaceous with the setae originating from obscure bumps or depressions. The head is completely micropunctate-reticulate in *S. stictocephala* (Figs 423, 424) similar to *S. attae* (Figs 39, 40), whereas *S. stictocyla* has the upper face and a small region behind the eye coriaceous (Figs 429, 430). It is certainly possible that these and other minor differences given in the key and respective descriptions of the three putative species represent intraspecific variation of a single species whose head and pronotal sculpture is highly varied. However, additional specimens are required to determine this confidently (see further under *S. stictocyla*).

3. *Spalangia bethyloides* Bouček, 1965
(Figs 48–61)

Spalangia bethyloides Bouček, 1965: 601–602; holotype ♀ (BMNH, examined). Type data: Brazil, Nova Teutonia, 27º11' s. w. 52º23' w. l., 16.VII.1957, Fritz Plaumann.

Description. *Female*. Length = 1.0–2.2 mm. Legs usually dark except at least basal 3 tarsal segments yellow and sometimes knees and apices of tibiae yellowish, but rarely legs completely yellow beyond coxae except for apical 1 or 2 tarsal segments. Head in anterior view about 1.1–1.2x as high as wide; in dorsal view about 1.9–2.1x as wide as long; in lateral view (Fig. 48) with malar space about 0.6–0.8x eye height and 1.0–1.2x



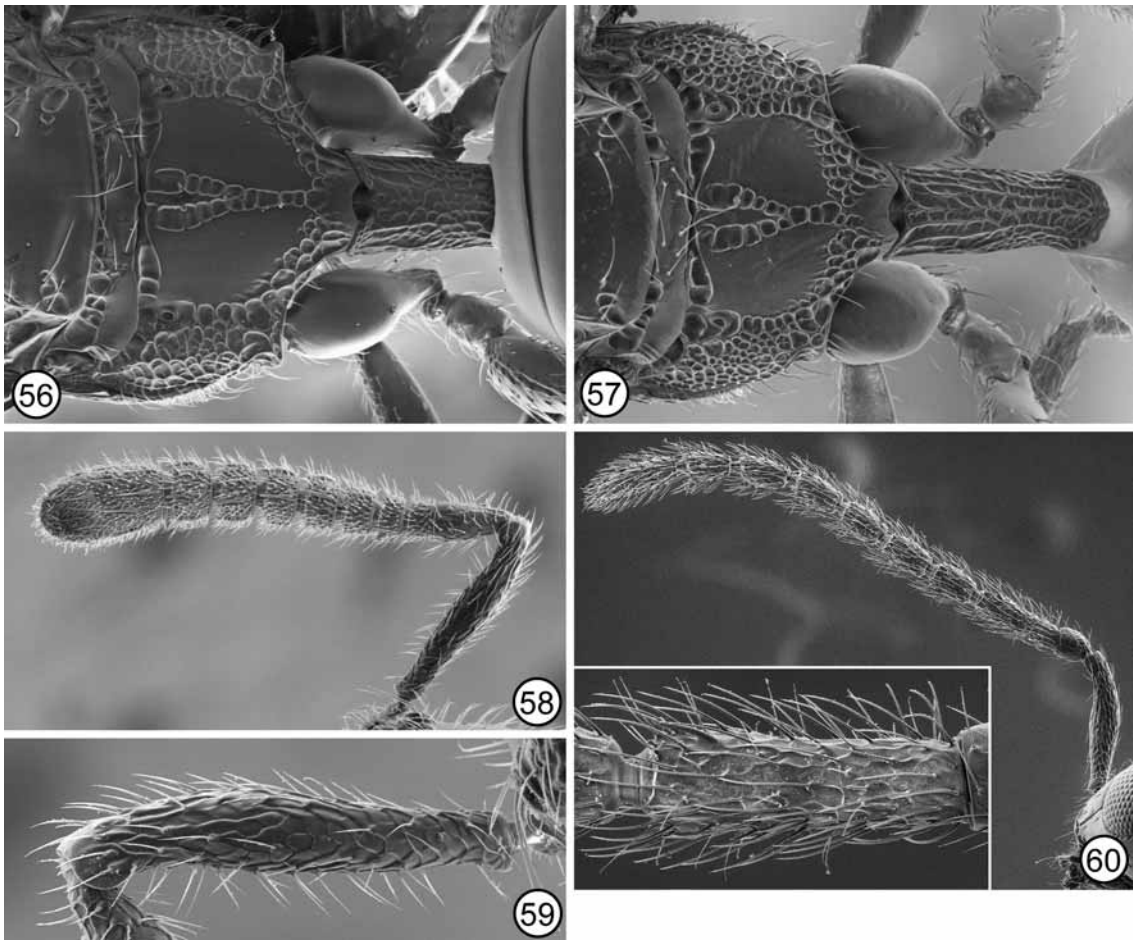
Figs 48–55. *Spalangia bethyloides* Bouček. **48**, ♀ head, lateral view; **49**, ♀ pronotum, posterodorsal view; **50**, ♂ head, lateral view; **51**, ♂ pronotum, dorsolateral view; **52**, ♀ head, frontolateral view; **53**, ♀ mesosoma, posterodorsal view. **54 & 55**, mesopleuron: **54**, ♀, **55**, ♂.

eye width. Head capsule (Figs 48, 50, 52) smooth and shiny except for setiferous punctures as follows: with complete median sulcus extending ventrally to level of lower orbit, usually within equilateral-triangular or more transverse-oval scrobal depression, otherwise upper face and parascrobal region with pinprick-like punctures or more commonly with distinct, often flat-bottomed punctures usually separated by at least one and mostly by two or more puncture diameters (Fig. 52); scrobal depression differentiated primarily by absence of punctures, variably distinctly coriaceous above each torulus but otherwise smooth and shiny; gena punctate-reticulate to rugose near oral margin and with linear malar sulcus, but otherwise mostly smooth except for setae often originating from tiny bumps (Fig. 48); temple usually smooth, sometimes with sparse, shallow punctures. Antenna (Fig. 58) with scape about 4.8–5.7x as long as wide, the inner and outer surfaces usually punctate-reticulate to rugose, but inner surface sometimes with finer sculpture (Fig. 59); pedicel about 1.9–2.5x as long as apical width and about 2.3–3.7x as long as fu_1; funicle with fu_1 about 0.8–1.6x as wide as long, though usually quadrate to slightly longer than wide except in smallest specimens, and subsequent segments all obviously transverse with fu_7 about 1.3–1.8x as wide as long; clava about 1.7–2.1x as long as wide. Pronotal collar in lateral view only very low convex behind neck (Fig. 48) and with circumpronotal band anterolaterally, but anteriorly smoothly rounded to neck (Fig. 51); without distinct crenulate cross-line posteriorly but often with at least very shallow furrow and/or partly to completely coriaceous or longitudinally strigose-coriaceous in transverse band posteriorly, otherwise smooth, shiny, and uniformly conspicuously setose except mediolongitudinally, the setae often originating from small bumps (Fig. 49). Mesoscutal median lobe (Figs 49, 53) with anterior convex region smooth and shiny or very finely coriaceous to transversely alutaceous posteriorly; internotaular region mostly smooth and shiny but with setae often originating from small bumps lateral to variably distinctly roughened-rugulose mediolongitudinal depression, the depression sometimes divided by a median carina. Axillae (Fig. 53) shiny with setae originating from at most minute pinprick-like punctures. Scutellum (Fig. 53) flat and shiny but variably extensively setose laterally, the setae originating from at most pinprick-like punctures; frenum (Figs 53, 56, 57) with crenulate frenal line interrupted over at least medial third. Mesopleuron (Fig. 54) mostly with distinct sculpture as follows: pectal region sometimes extensively coriaceous though usually at least dorsal half comparatively smooth and shiny, and bare except for 1 posteroventral seta; acropleuron longitudinally striate-strigose and differentiated from pectal region by obliquely angled or curved carina directed toward base of tegula; subalar and episternal scrobes shallow depressions connected by a shallow, linear furrow; upper mesepimeron quite strongly coriaceous-granular or more commonly strongly, obliquely alutaceous, the sculpture becoming more coriaceous-alutaceous ventrally on lower mesepimeron; upper and lower mesepisternum differentiated by finely carinate transepisternal line and adjacent line of setae, the upper mesepisternum striate-strigose with striae obliquely angled anteriorly but more longitudinal posteriorly (Fig. 54). Fore wing hyaline or, especially disc, variably distinctly embrowned; mediocubital fold with line of at least 6 setae and basal cell with additional line of setae. Propodeum with distinct postspiracular sulcus; callus punctate-reticulate to rugulose; plical region with narrowly V- or Y-shaped paramedian crenulate furrows sometimes delineating median carina, but usually delineating at least very slender, flat, smooth or slightly roughened, lanceolate median band (Figs 53, 56), and furrows united into single crenulate line over at least posterior half; supracoxal bands contiguous with paramedian crenulate furrow; panels smooth and shiny.

Petiole (Fig. 56) about 1.7–2.0x as long as medial width; punctate-reticulate to reticulate-rugulose between variably distinct longitudinal carinae; bare. Gaster shiny and with Gt_1 smooth, but at least Gt_2 and Gt_3 in part very finely coriaceous.

Male. Length = 1.4–2.0 mm. Antenna (Fig. 60) with scape about 4.4–5.2x as long as wide; pedicel about 1.2–1.8x as long as wide; flagellum with conspicuous decumbent setae about as long as width of respective segment; funicle with fu_1 (Fig. 60, insert) about 3.0–5.0x as long as wide and about 1.6–3.9x as long as pedicel, and subsequent segments all obviously longer than wide, with fu_7 about 1.4–2.3x as long as wide. Otherwise similar to female except as follows. Head in anterior view about 1.0–1.1x as wide as high; in lateral view

(Fig. 50) with malar space about 0.5–0.6x eye height and about 0.7–0.9x eye width. Pronotal collar always with at least fine transverse band of coriaceous-alutaceous sculpture posterolaterally (Fig. 51), and often with complete, sometimes longitudinally strigose-coriaceous transverse band. Scutellum sometimes with almost complete, but at least medially tapered and effaced frenal line. Mesopleuron (Fig. 55) sometimes with sculpture partly effaced on lower mesepimeron. Propodeum (Fig. 57) much more commonly with paramedian crenulate furrow only very narrowly V-like so as to differentiate a median carina or only very slender, posteriorly tapered median band. Petiole (Fig. 57) about 1.4–3.0x as long as medial width.



Figs 56–60. *Spalangia bethyloides* Bouček. **56 & 57**, frenum–petiole, dorsal view: **56**, ♀, **57**, ♂; **58**, ♀ antenna; **59**, ♀ scape, inner surface; **60**, ♂ antenna (insert: fu_1).

Material examined. *Neotropical* (125♀, 75♂). **BOLIVIA**: Santa Cruz, 5 km. SSE Buena Vista, 17º29.925S 63º39.128W, 440 m., Hotel Fauna y Flora, 6-15.XII.03, S. & J. Peck (2♂). **BRAZIL**: M. [Mato] Grosso, Rio Caraguata, 27.III.53, F. Plaumann (1♀ BMNH). Paraná — Curitiba, UFPR, Politéc. campus, 25º25'S 49º15'W, 913 m., 29.XI-I.XII.03, rainfor., D. Bickel (1♂); Rondon, VIII.52, 1, 4, 23.X.52, F. Plaumann (2♀, 2♂ BMNH). R. G. Sul. [Rio Grande do Sul], Fortaleza, viii.51, F. Plaumann (1♀ BMNH). S Bocaina, S. José Barreiro, 1650 m., XI.68, M. Oliveira (1♀). Sierra de Bocaina, S. Paulo, 1650 m., XI.68, M. Alvarenga (1♂). Santa Catarina, Nova Teutonia, F. Plaumann — 11.IV.41 (1♀ AEIC), 9, 13, 22.V.41, 9, 10, 19.VI.41, 12.VIII.41, 18.VII.43, 26.VIII.43, 5, 7, 10, 13, 14, 18, 28.VIII.44, 15, 16, 18, 25, 26, 27.IX.44, 19.X.44, 2, 17, 20, 22, 24, 25, 26, 27, 28.II.50, 6, 8, 26.III.50, 5, 21, 29.IV.50, 11, 18.XII.51, 13.XII.51, 8.VIII.52, 5.XI.55 (53♀, 36♂ BMNH), 8.X.65 (1♀ MCZH); 27º11'S 52º23'W, VII.57 (1♀ paratype, BMNH), 300-500 m., IV.71, IX.71, V.72, VI.72, VII.72, VIII.72, VIII-II.72, IX.72, X.72, XI.72, I.73 (30♀, 14♂). **COSTA RICA**: Alajuela, 5 km. W San Ramón, 1200 m., XI.76, O. Castro & P. Hanson (1♀ MZCR). Car-

tago, Turrialba, Café, 650 m., V-VI.94, M. Cerda & P. Hanson (1♂ MZCR). Guanacaste Prov., P. N. Guanacaste, 9 km. S Sta. Cecilia, Est. Pitilla, 700 m., 24.VIII-11.IX.92, P. Rica (1♀ INBIO). Heredia, Chilamate, 75 m., 25.III.89, Hanson & Godoy (1♀ MZCR). Pta. La Selva, 50 m., II.80, W. Mason (1♀). Puntarenas, Golfo Dulce, P. Hanson — W Piedras Blanca, 100 m., III-V.89, VI-VII.89 (3♀ MZCR); SW Rincon, 10 m., VI.91 (1♀ MZCR). Puntarenas, Los Patos, Par. Nac. Corcovado, 8º33'N 83º30'W, 200 m., II.00, 1-9.III.00, J.S. Noyes & M.A. Asofeifa (2♀ UCDC). Puntarenas Prov., Res. Biol. Carara, Est. Quebrada Bonita, 50 m., VI.92, J.C. Saborio (1♂ INBIO). San José, San Antonio Escazú, 1300 m., VIII.73, W. Eberhard & P. Hanson (1♀ MZCR). **DOMINICA**: 1.7 mi. E Pont. Cassé, 2000 ft, 4-11.III.65, H.E. Evans (1♀ USNM). Holmwood Est., 19.VII.65, D.L. Jackson (1♀ USNM). S Chiltern Est., 2.II.65, W.W. Wirth (1♂ USNM). St. Paul Parish, Springfield Estate, 505 m., 20-27.XII.94, L. Masner (2♀, 1♂). St. Peter Parish, Morne Diablotin, 700-900 m., 26.XII.94, vir. for., L. Masner (1♂). **ECUADOR**: Napo, Limoncocha, 250 m., 15-28.VI.76, S. & J. Peck (1♂). Pichincha, S. & J. Peck — Sto. Domingo, VI-VIII.85 (1♀); Tinalandia, 500 m., 4-14.VI.76 (1♀, 1♂). **FRENCH GUIANA**: Kaw Mountains, 4º33.562' N 52º12.425'W, 3-27.III.07, K. Sarv (1♀). **JAMAICA**: Ocho Rios, Fern Gully, 19.II-1.III.84, D.H. Lindeman (1♀). **MEXICO**: Quintana Roo, Chetumal, 350 ft, 15.VII.83, R. Anderson (1♂). **PANAMA**: Canal Zone, Barro Colorado Is. — III.40, J. Zetek no. 4645, Rf. *Heliconia mariae* flrs. (1♀, 2♂ USNM); XI.41, J. Zetek no. 4920, *Calathea violacea* (2♀, 4♂ USNM); IX.42, X. Zetek no. 5027, fls. *Anthurium* (1♂ USNM); 16.II.76, A. Newton, external refuse deposit of *Atta columbica* AFN3 (3♀ MCZH); 29.II.55, nest *Eciton*, C.W. Rettenmeyer (1♀ USNM). Panama [city], 3 km. N Torti, Rio Torti, 8º05.96'N 78º23.77'W, 150 m., 18.I.01, J.L. Garcia (1♂). [Las] Sabanas, 2.IV.23, R.C. Shannon (1♂ USNM). **ST. VINCENT**: H.H. Smith, 207 (1♂ USNM). Charlotte, Montreal, 8.VII.76, J.S. Noyes (1♀ BMNH). **VENEZUELA**: Aragua, Parque Nat. H. Pittier — Portachuelo Pass, 1021'N 6741'W, 1100 m., 14.V.98, S. Ashe & R. Brooks (2♀, 1♂); Rancho Grande env., 1100 m., 9-10.IV.94 (3♀); La Trilla, 200 m. 11-14.IV.94 (1♀), L. Masner. Mérida, 3 km. N La Azulita, 8.IV.88, A. Finamore (1♀).

Distribution. Neotropical (Fig. 61), from Yucatán Peninsula (Mexico) through Central America (Costa Rica, Panama), West Indies (Dominica, Jamaica, St. Vincent) and South America (Bolivia, Brazil, Ecuador, French Guiana, Venezuela).

Biology. Diptera hosts unknown, but collected near the nests of *Atta columbica* (Guerin) and *Eciton* (Hymenoptera: Formicidae).

Recognition. I include *S. bethyloides* as one of seven species in the *drosophilae* species group as discussed under *S. drosophilae*. The species has not been mentioned in non-catalog literature since its original description and when identified usually was misidentified as *S. drosophilae* in collections. These two species and *S. plaumanni* are the most common of the seven *drosophilae*-group species. *Spalangia bethyloides* is the only one of the three to have the pectal region extensively smooth, shiny and bare, more or less mirror-like reflective, as well as the upper mesepisternum obliquely striate-strigose and delineated from the lower mesepisternum by both a fine transepisternal ridge and adjacent line of setae (Figs 54, 55). *Spalangia drosophilae* has a mirror-like reflective pectal region, but its upper mesepisternum is comparatively smooth and shiny to coriaceous-granular or finely reticulate, and it merges indistinguishably with the lower mesepisternum except for a variably complete line of setae (Figs 122, 123) (see further under *S. drosophilae*). *Spalangia plaumanni* uniquely has a completely sculptured and setose pectal region (Fig. 395), though only sparsely setose in some males (Fig. 396).

I have not seen any specimens of *S. bethyloides* collected north of the isthmus of Tehunatepec, Mexico. Most individuals from Dominica have the legs completely yellow beyond the coxae similar to *S. flavicrus*, but one male and female have the front and hind femora variably distinctly brown. The Dominica specimens also have an unusually distinct, broad cross-band of coriaceous sculpture on the pronotal collar, but I found no other differences between these specimens and *S. bethyloides* from elsewhere. Currently, I consider the two differences that characterize Dominican specimens of *S. bethyloides* as only regional (island) differences.

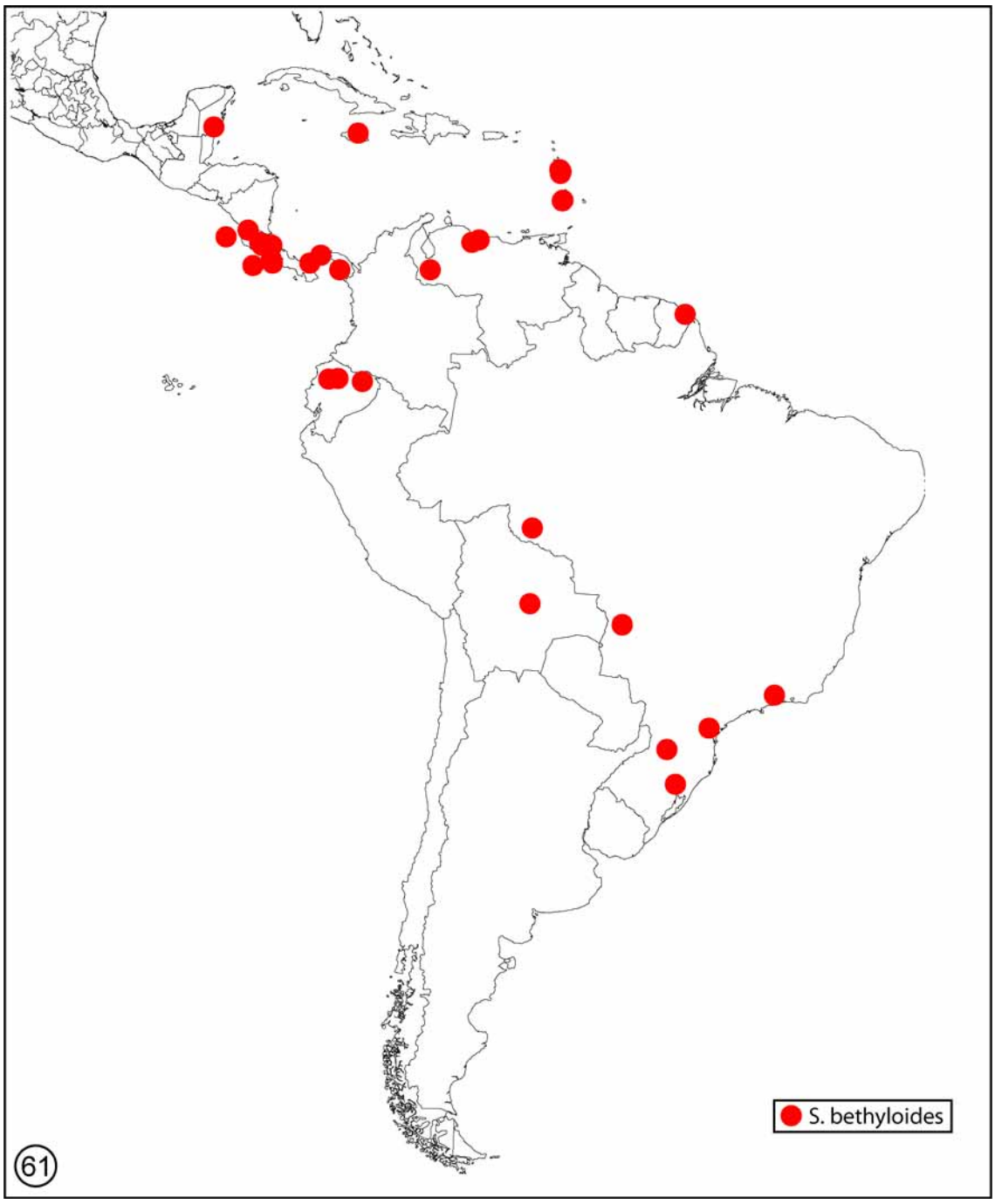


Fig. 61. Distribution of *Spalangia bethyloides* Bouček.

4. *Spalangia cameroni* Perkins, 1910
(Figs 62–79)

Spalangia cameroni, Perkins, 1910: 656; syntype ♀ (BPBM; examined). Type data: Oahu, Hawaii, Molokai and no doubt all the islands.

Spalangia philippinensis Fullaway, 1917: 292–294; lectotype ♂ (BPBM; examined) designated by Gibson (2006: 7). Type data: Honolulu, H.T., D.T. Fullaway collector, Insectary. Synonymy by Gibson (2006: 7); prior synonymy with *S. endius* Walker by Bouček (1963: 458).

Spalangia muscidarum texensis Girault, 1920: 213; lectotype ♂ (USNM; ♀ and ♂ paralectotype examined) designated by Burks (1969: 6). Type data: Hunter No. 2970, B.18, Dallas, TX [Texas], 24.XI.12, par. of *Stomoxys calcitrans*.

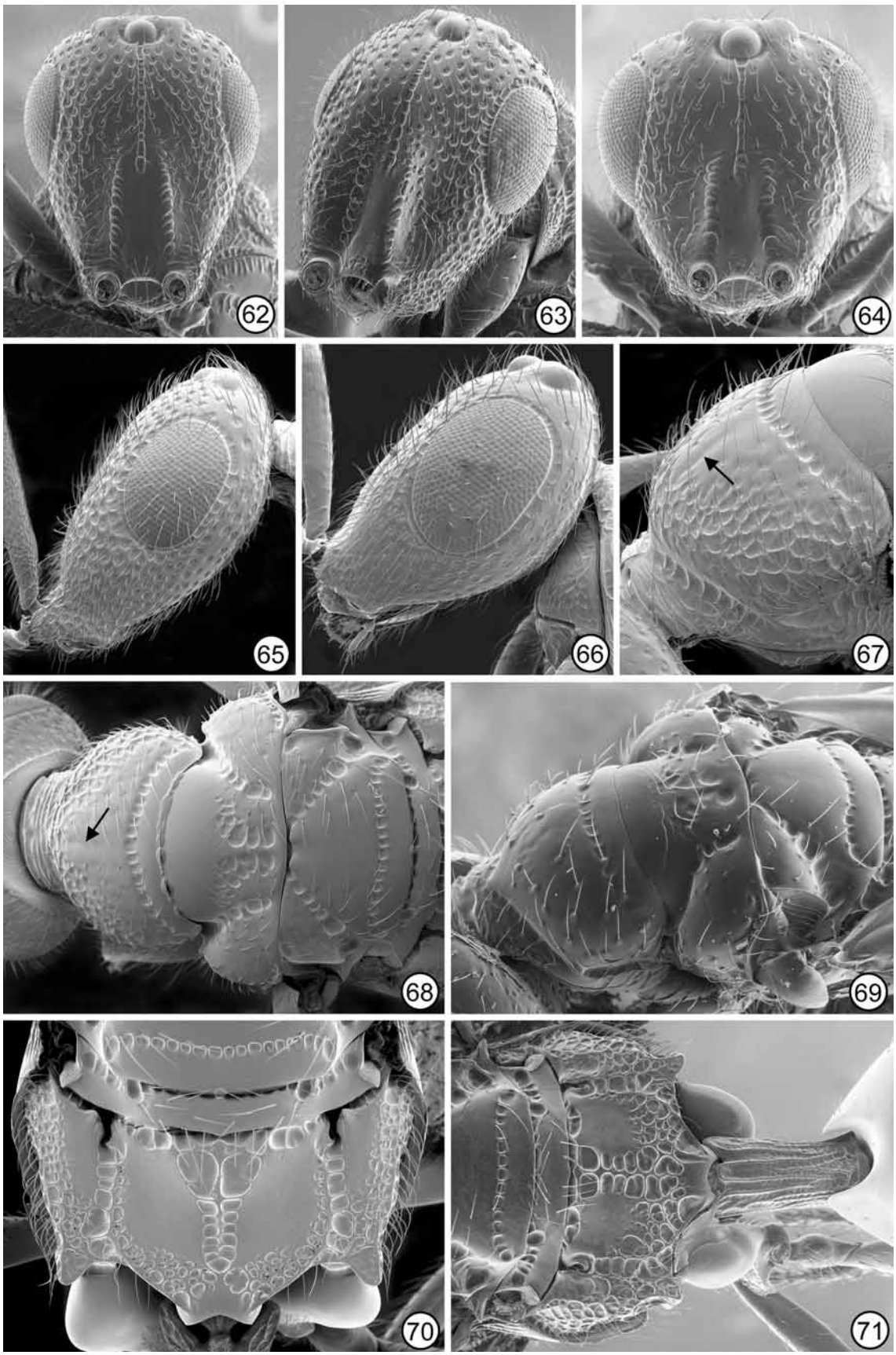
Synonymy by Burks (1969: 6); prior synonymy with *S. endius* Walker by Bouček (1963: 458).

Spalangia melanogastra Masi, 1940: 295–297; holotype ♂ (MCSN, not examined) (single male incorrectly designated as lectotype by Viggiani 1967: 3). Type data: [Somalia] Villaggio Duca degli Abruzzi, leg. G. Russo. Tentative synonymy by Bouček (1963: 454) confirmed by Viggiani (1967: 3).

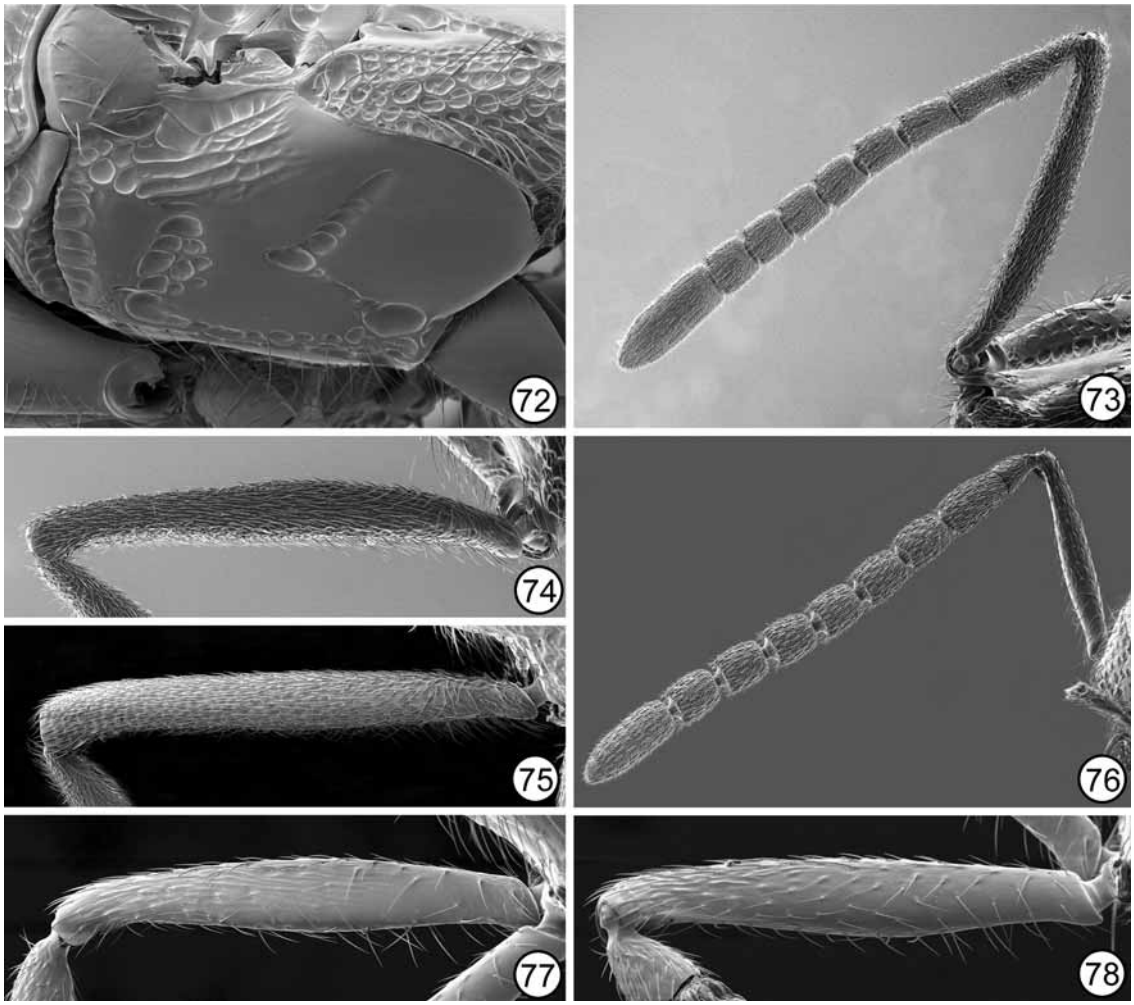
Spalangia atherigonae Risbec, 1951: 361–363; lectotype ♀ (MNHN, not examined) designated by Bouček (1963: 454). Type data: Senegal, M'Bambey, ex *Atherigona quadripunctata*, J. Risbec. Synonymy by Bouček (1963: 454).

Description. *Female*. Length = 1.7–3 mm. Legs dark except at least basal 3 tarsal segments yellow. Head in anterior view (Fig. 62) about 1.2–1.3x as high as wide; in dorsal view about 1.6–1.8x as wide as long; in lateral view (Fig. 65) with malar space about 1.1–1.3x eye height and about 1.6–1.7x eye width. Head capsule (Figs 62–66) smooth and shiny except for distinct setiferous punctures as follows: with complete median sulcus extending ventrally to elongate-triangular scrobal depression, otherwise upper face and parascrobal region variably densely punctate, the punctures sometimes widely separated by flat interstices but even when closely crowded more or less circular rather than multisided (Figs 62, 63); scrobal depression with punctate-crenulate scrobes, smooth and shiny interantennal region, and inclined surface of scrobal depression with circular punctures separated by flat interstices (Figs 62, 63); gena without malar sulcus, variably densely punctate but often with crowded circular punctures (Fig. 65) and rarely reticulate-rugose; temple variably densely punctate but with distinct circular punctures. Antenna (Fig. 73) with scape about 8.0–8.6x as long as greatest width, the inner (Fig. 74) and outer (Fig. 75) surfaces uniformly setose and strongly punctate-strigose; pedicel about 2.0–2.5x as long as apical width and about 1.5–2.1x as long as fu_1; funicle with fu_1 about 1.1–1.7x as long as wide, subsequent segments variably oblong to sometimes only slightly longer than wide basally and slightly transverse apically, but at least fu_4–fu_7 less than 1.4x as wide as long and often almost quadrate; clava about 2.4–3.1x as long as wide.

Pronotal collar in lateral view convexly arched behind neck (Fig. 87) and anterolaterally with vertical carinate ridge interrupting circumpronotal furrow, but anteriorly smoothly rounded to neck (Fig. 67); with distinct crenulate cross-line posteriorly and variably extensively reticulate-rugose with setae originating from irregular multisided cells anteriorly and dorsolaterally, but with variably large smoother region anterior to cross-line often having a few circular setiferous punctures and/or a shallow mediolongitudinal furrow (Figs 67, 68: arrow). Mesoscutal median lobe (Fig. 68) with anterior convex region largely smooth and shiny, but sometimes finely coriaceous posteriorly; internotaular region variably extensively, irregularly punctate-rugose except often smooth laterally or posterolaterally and almost always with distinct median smooth band extending posteriorly from anterior convex region (Fig. 68). Axillae (Fig. 68) smooth and shiny except for a few pinprick-like setiferous punctures. Scutellum (Fig. 68) smooth and shiny except for a few pinprick-like setiferous punctures laterally; frenum (Fig. 68) differentiated by complete crenulate frenal line. Mesopleuron (Fig. 72) smooth and shiny except as follows: pectal region crenulate along anterior margin and bare except for 1 posteroventral seta; acropleuron longitudinally carinate to punctate-reticulate but with carinae extending posteriorly onto alar shelf, the alar shelf also usually variably extensively and conspicuously punctate-reticulate at least dorsally; subalar scrobe higher than wide and crenulate or punctate-rugose with posteroventral margin angled anteriorly so as to form acute angled with transepisternal line; episternal scrobe, precoxal scrobe and precoxal line forming anteriorly directed V-like groove, the oblique episternal scrobe usually consisting of larger punctures than precoxal line but not extending completely to subalar scrobe; upper and lower mesepisternum differentiated by punctate-crenulate transepisternal line and adjacent line of setae (Fig. 72). Fore wing hyaline; bare behind submarginal vein. Propodeum (Fig. 70) with distinct postspiracular sulcus; callus with elongate smooth and shiny region along at least basal half of postspiracular sulcus, but punctate- or reticulate-rugose laterally and posteriorly; plical region with abruptly widened, usually more or less Y-shaped paramedian crenulate furrows delineating median carina, and with anterior-most cell much larger than more posterior cells and either subcircular or tapered posteriorly (sometimes less obvious if the cell divided by finer transverse carina); supracoxal bands contiguous with paramedian crenulate furrows; propodeal panels smooth and shiny.



Figs 62–71. *Spalangia cameroni* Perkins. **62 & 63**, ♀ head: **62**, anterior view, **63**, frontolateral view; **64**, ♂ head, anterior view; **65 & 66**, head, lateral view: **65**, ♀, **66**, ♂; **67**, ♀ pronotum, dorsolateral view; **68**, ♀ thorax, dorsal view; **69**, ♂ pronotum and mesoscutum, dorsolateral view; **70**, ♀ frenum–propodeum, dorsal view; **71**, ♂ frenum–petiole, dorsal view. Arrow points to median furrow of pronotum in Figs 67, 68.



Figs 72–78. *Spalangia cameroni* Perkins. **72**, ♀ mesopleuron; **73**, ♀ antenna; **74 & 75**, ♀ scape: **74**, inner view, **75**, outer view; **76**, ♂ antenna; **77 & 78**, ♂ scape: **77**, inner view, **78**, outer view.

Petiole about 1.7–2x as long as medial width; transversely carinate to reticulate between longitudinal carinae; bare. Gaster smooth and shiny.

Male. Length = 1.3–3.1 mm. Antenna (Fig. 76) with scape about 6.3–8.6x as long as wide with inner (Fig. 77) and outer (Fig. 78) surfaces comparatively smooth and shiny, only partly and very finely longitudinally strigose apically, and inner surface sometimes with more distinct mediolongitudinal bare region; pedicel subglobular, at most about 1.3x as long as wide; flagellum with setae much shorter than width of respective segment; funicle with fu_1 about 1.4–2.3x as long as wide and about 1.4–2x as long as pedicel, and subsequent funicular segments sometimes quadrate in smaller specimens but usually oblong, the apical segments up to about 1.5x as long as wide. Otherwise similar to female except as follows. Tarsi with basal segment yellow, but one or more subsequent segments sometimes brownish-yellow. Head in anterior view (Fig. 64) about 1.0–1.1x as wide as high; in lateral view (Fig. 66) with malar space about 0.7–0.9x eye height and about 1.0–1.2x eye width. Head capsule sometimes more sparsely punctate than female and with extremely shallow punctures, the punctures evident only as circle around seta originating from tiny bump; gena without linear malar sulcus but sometimes with fine longitudinal striae in region of presumptive sulcus. Pronotal collar always with distinct cross-line but sometimes rugose-roughened only anteriorly or completely smooth and shiny anterior to cross-line except for setae originating from tiny bumps (Fig. 69). Mesopleuron with alar shelf usually more distinctly longitudinally carinate than carinate-reticulate. Propodeum (Fig. 71) with callus lacking smooth and shiny region adjacent to postspiracular sulcus. Petiole (Fig. 71) about 2.2–2.7x as long as medial width.

Material examined. Nearctic and Neotropical (2,023 specimens in AMNH, BMNH, CASC, CNC, CSCA, CUAC, CUIC, DENH, FSCA, INBIO, INHS, LACM, MCZH, MLPA, NCSU, OSAC, ROME,

TAMU, UATV, UCRC, USNM). Complete collection records are not provided; those with host data: *Nearctic*. **CANADA**: ***New Brunswick***, 4.IX.65, Legner, lab. reared in Riverside, IX.65, *M. domestica* (UCRC). ***Ontario***, Fitzroy Harbour, Weir farm, 45º29.349'N 76º11.938'W, 11.IX.01, G. Gibson & L. Bartels, ? *Physiphora demandata*. Ottawa vicinity, various localities and dates 2000 and 2001, G. Gibson & L. Bartels, *M. domestica* and *S. calcitrans* (see Gibson and Floate 2004). ***Prince Edward Island***, various records 2003, ex *M. domestica* and *S. calcitrans* (see Noronha *et al.* 2007). **USA**: ***California***, Los Angeles Co., Chatsworth, 24.VII.51, *S. calcitrans* (LACM). Sonoma Co., 24.X.63, 13.XII.63, *M. domestica* (USNM). ***Florida***, S. Florida, 1907, M.H. Muma, *Anastrepha suspensa* (USNM). Alachua Co., — Gainesville, VII.74, 8.III.75, 6.V.75, 19, 20, 22, 26.VI.75, 20, 31.VII.75, 12.VIII.75, R.L. Escher, *H. irritans* (FSCA); High Springs, 19.XII.74, *M. domestica* (FSCA). Colombia Co., 6.8 mi. NE Fort White, 8, 14, 21, 27.IV.83, 6, 12, 16, 18, 25.V.83, 16, 24.VI.83, 1, 7, 15.VII.83, J.T. Vaughan, *S. calcitrans* (FSCA). Union Co., Lake Butler, V.73, C. Morgan, *M. domestica* (FSCA, LACM). ***Indiana***, Carroll Co., Pyrmont, 27.VII.82, M. Merchant, *M. domestica* (INHS). ***Mississippi***, Starkville, 26.VII.72, K.L. Watts, *H. irritans* (USNM). State College, 30.X.68, J. Roberson, *Phaenicia* sp. (USNM). ***New York***, Kings Ferry, 18.VIII.87, C. Henderson, *M. domestica* (CUIC). Sullivan Co., 6.VIII.87, C. Henderson, *M. domestica* (CUIC). ***North Carolina***, Wake Co., Raleigh, 10.VIII.81, 10.X.83, *M. domestica* (NCSU). Wilkes Co., N. Wilkesboro, 14.IX.77, *M. domestica* (NCSU). D.A. Rutz, *M. domestica* (NCSU) — Duplin Co., 19.X.76; Granville Co., Oak Hill, 26X.76, T.D. Edwards, *M. domestica* (CUIC) — Alamance Co., Mandale, 28.IX.77; Lenoir Co., Deep Run, 21.IX.77; Orange Co., Hillsborough, 28.IX.77; Wake Co., Raleigh, 29.VIII.77. ***South Carolina***, Clemson, 17.VII.68, lab. reared Riverside, IX.68 (UCRC). Oconee Co., South Union, 12.VI.73, J.R. Ables, *M. domestica*. ***Texas***, Brazos Co., College Station, 26-29.III.85, R.R. Blume, *Orthellia caesarion* (TAMU). Cuero, V.40, L.F. Hitchcock, *H. irritans* (USNM). Dallas, 1, 24.XI.12, 8.XII.12, H. Pinkus, *S. calcitrans* (USNM). Gainesville, 29.III.13, *S. calcitrans* (USNM).

Neotropical. **PERU**: Lima, 25.I.78, W. Dale, *Musca* (UCRC). **PUERTO RICO**: Añasco, 25.VIII.80, B. Hawkins, *M. domestica* (UCRD). Cabo Rojo, 7.II.50, ? *Musca domestica* (USNM). Cayey, 26.VIII.80, B. Hawkins, *M. domestica* (UCRC). Hormigüeros, 28.II.50, H.K. Plank, *M. domestica* (USNM). Mayaguez, *H. irritans* — 9.V.36, H.L. Dozier (USNM); 20.V.40, K.A. Bartlett (USNM). **TRINIDAD**: Curepe, 7.VIII.63, E.F. Legner, *M. domestica* (USNM).

Distribution. A very common cosmopolitan species that Noyes (2003) records from all six biogeographic regions. Within the New World (Fig. 79) I saw specimens from North America (Canada, USA, Mexico), Central America (Belize, Costa Rica, Nicaragua, Panama), West Indies (Bermuda, Dominica, Dominican Republic, Jamaica, Puerto Rico, Trinidad) and South America (Argentina, Brazil, Colombia, Ecuador, Galapagos Islands, Paraguay, Peru, Uruguay, Venezuela). Additional unconfirmed records based on Noyes (2003) and De Santis (1979) include Chile, Grenada, and St. Vincent & Grenadines.

Biology. Noyes (2003) lists *S. cameroni* as a primary parasitoid of at least 35 species in 9 families of Diptera and as a hyperparasitoid of *Bombyx mori* (L.) (Lepidoptera: Bombycidae). Almost all host records I saw from the New World were from the three principal filth-fly pests of livestock, the house fly, stable fly and horn fly. I also saw specimens labelled as reared from the Caribbean fruit fly, *Anastrepha suspensa* (Loew) (Tephritidae), *Neomyia cornicina* (Fabricius) (= *Orthellia caesarion*) (Muscidae) and *Phaenicia* sp. (Calliphoridae). The tentative host identification of *Physiphora demandata* (Fabricius) (Otitidae) by Gibson and Floate (2004) was based on pupal remains correlated with flies emerged from similar puparia.

Recognition. I include *S. cameroni*, *S. longepetiolata* and *S. gemina* in the *cameroni* species group. Species of the *cameroni*-group, like *nigra*-group species, have a coarsely sculptured pronotal collar and a complete frenal line, but unlike *nigra*-group species have the petiole bare or with only one or two comparatively short and inconspicuous setae laterally. Individuals of *S. cameroni* are most similar to those of *S. gemina*. In addition to the differential features given in the key, the funicular segments are usually longer in both sexes of *S. cameroni* (Figs 73, 76) than in *S. gemina* (Figs 205, 206), which Bouček (1963) used as a key character to separate the species. A single USNM female labelled "San Juan, Puerto Rico, April 1967, in mite colony in

lab., I. Fox" that I identify as *S. cameroni* has an unusually short flagellum. The first funicular segment is only 1.2x as long as wide, the subsequent segments are obviously transverse (about 1.5x as wide as long), and the clava is only about 1.7x as long as wide, which is more typical of *S. gemina*. The subalar scrobe is also widened ventrally so that its posterior margin forms an almost right angle with the transepisternal line, though it is not extended posteriorly along the transepisternal line. The sculpture pattern is therefore intermediate between that typical of *S. cameroni* (Fig. 72) and *S. gemina* (Fig. 203). The female lacks a mediolongitudinal furrow from the pronotal collar, but a furrow is not evident in all *S. cameroni* females, and it is typical in other sculptural and structural features for *S. cameroni*, including relative malar space-eye dimensions, mostly smooth upper mesepimeron, and having the parascrobal region, inclined surface of the scrobal depression, and temple punctate. Further collections from Puerto Rico are necessary to better evaluate the significance of this specimen, but it was not excluded from the description of *S. cameroni*.

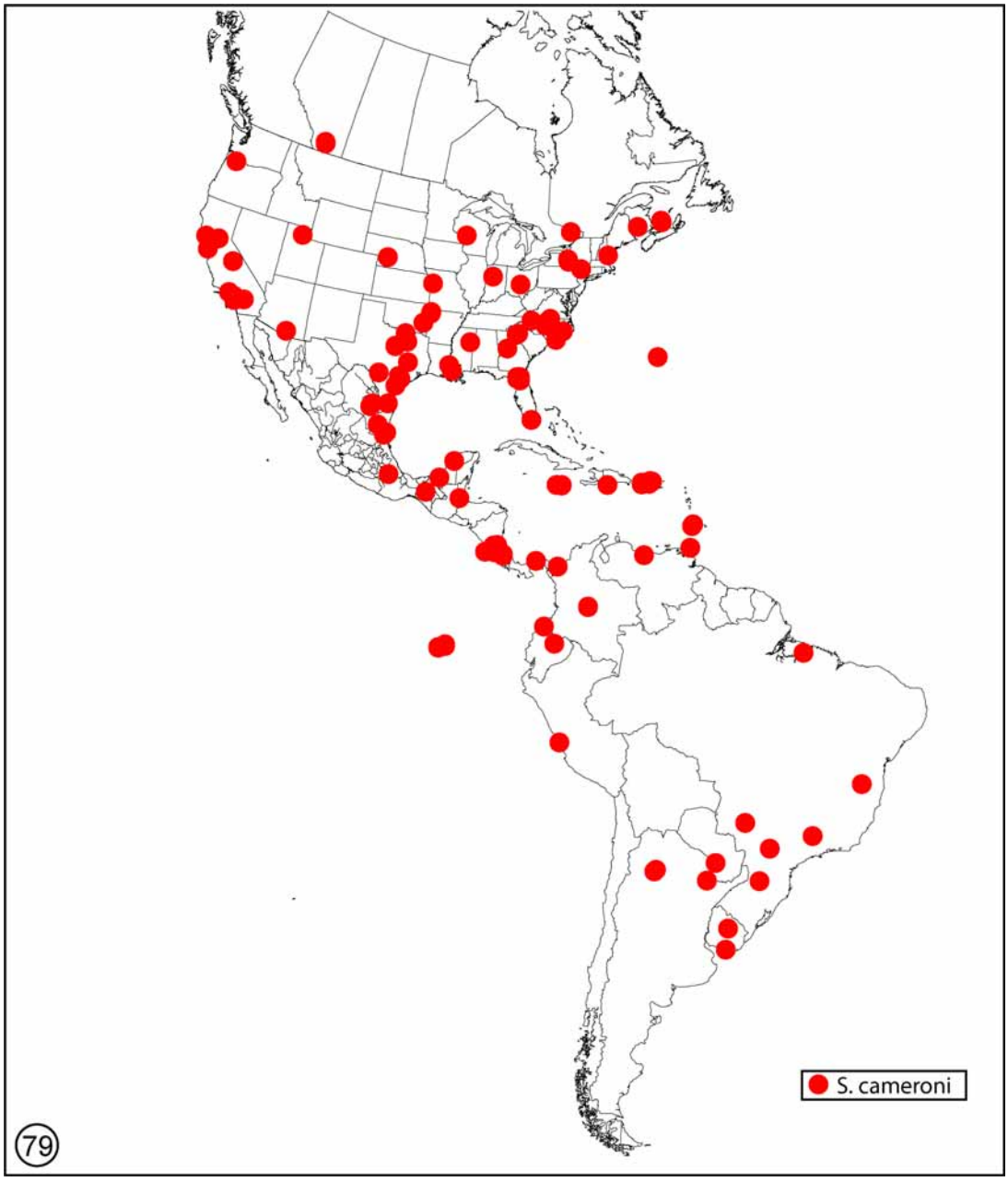


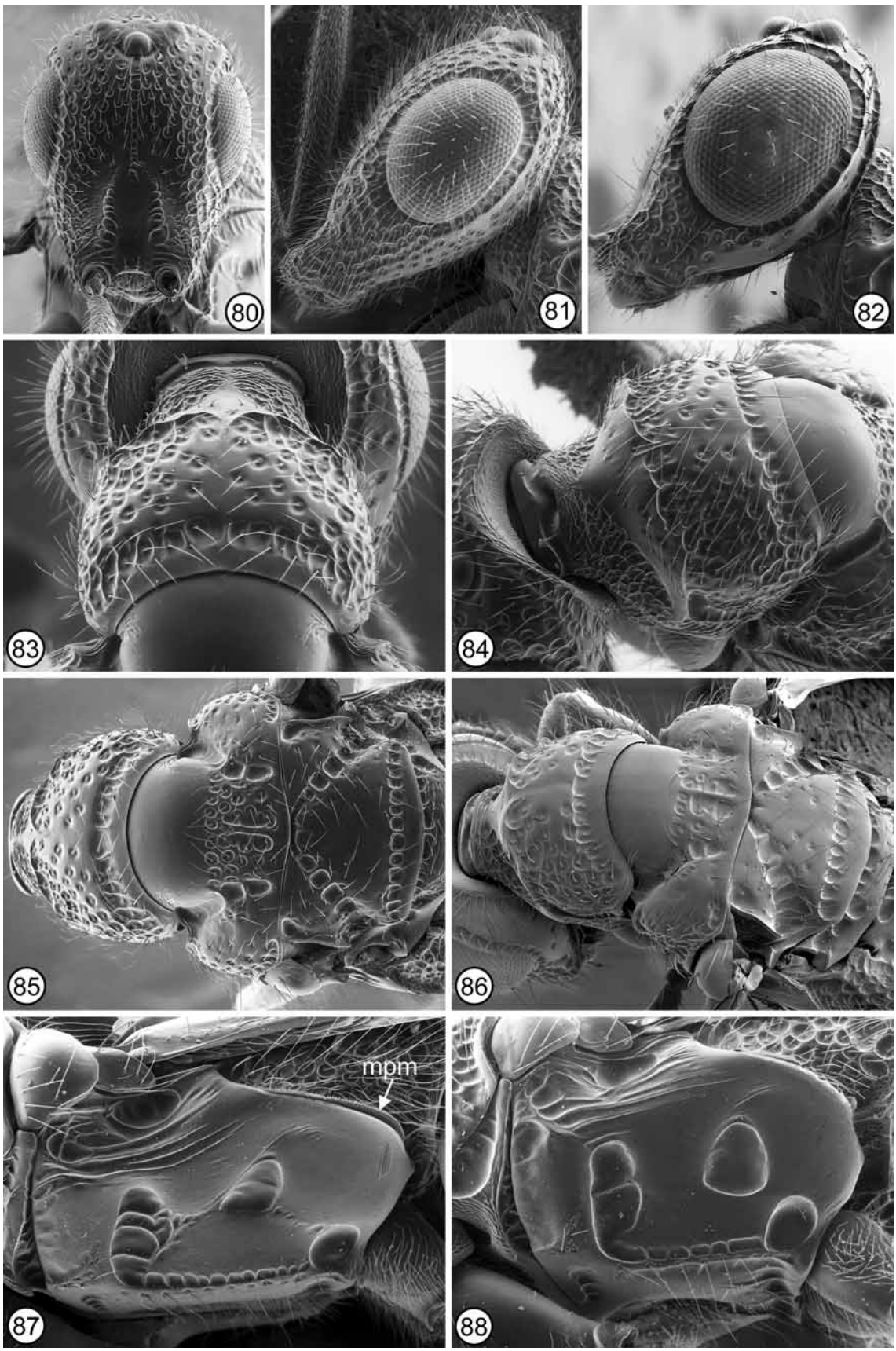
Fig. 79. Distribution of *Spalangia cameroni* Perkins.

5. *Spalangia chontalensis* Cameron, 1884
(Figs 80–97)

Spalangia chontalensis Cameron, 1884: 110; holotype ♀ (BMNH, examined). Type data: Nicaragua, Chontales, Janson.
Spalangia brasiliensis Ashmead, 1904: 502; holotype ♀ (USNM, examined). Type data: [Brazil] Santarem ?; H.H. Smith coll. Synonymy by Burks (1969: 2).
Spalangia bakeri Kieffer, 1910: 347–348; holotype ♂ (*nec* ♀) lost. Type data: Brazil, near Pará, M. Baker. **New synonymy**.

Description. *Female*. Length = 1.7–4.2 mm. Legs dark with at least basal 3 tarsal segments yellow and tibiae sometimes narrowly yellow apically. Head in anterior view (Fig. 80) about 1.1–1.2x as high as wide; in dorsal view about 1.6–1.8x as wide as long; in lateral view (Fig. 81) with malar space about 0.5–0.7x eye height and about 0.7–1.0x eye width. Head capsule (Figs 80, 81) smooth and shiny except for distinct setiferous punctures as follows: with complete median sulcus extending ventrally to elongate-triangular scrobal depression (Fig. 80), otherwise upper face with variably crowded punctures, the punctures sometimes separated by distance obviously greater than own diameter in smaller specimens but usually mostly separated by own diameter or less in larger specimens, except punctures more closely crowded toward inner orbit and on parascrobal region toward lower inner orbit where usually separated by ridges except in smaller specimens; scrobal depression with punctate-crenulate scrobes (in smaller specimens sometimes distinct only near torulus), smooth and shiny interantennal region, and variably smooth to punctate inclined surface of depression (Fig. 80); gena sometimes partly smooth in smaller specimens but usually variably densely punctate to longitudinally striate-punctate without distinct malar sulcus (Fig. 81), though sometimes with depressed row of contiguous punctures in region of presumptive sulcus; temple variably densely punctate similar to face. Antenna (Fig. 91) with scape about 6.0–7.5x as long as greatest width, the inner (Fig. 92) and outer (Fig. 93) surfaces similarly longitudinally strigose-punctate, but outer surface uniformly setose and inner surface with variably large and conspicuous mediolongitudinal bare region; pedicel about 1.8–2.3x as long as apical width and about 1.0x–1.6x as long as fu_1; funicle with fu_1 about 1.2–2.0x as long as wide, fu_2 usually oblong, up to about 1.4x as long as wide but at least very slightly longer than wide, and apical segments usually quadrate though sometimes slightly transverse; clava about 1.9–2.5x as long as wide.

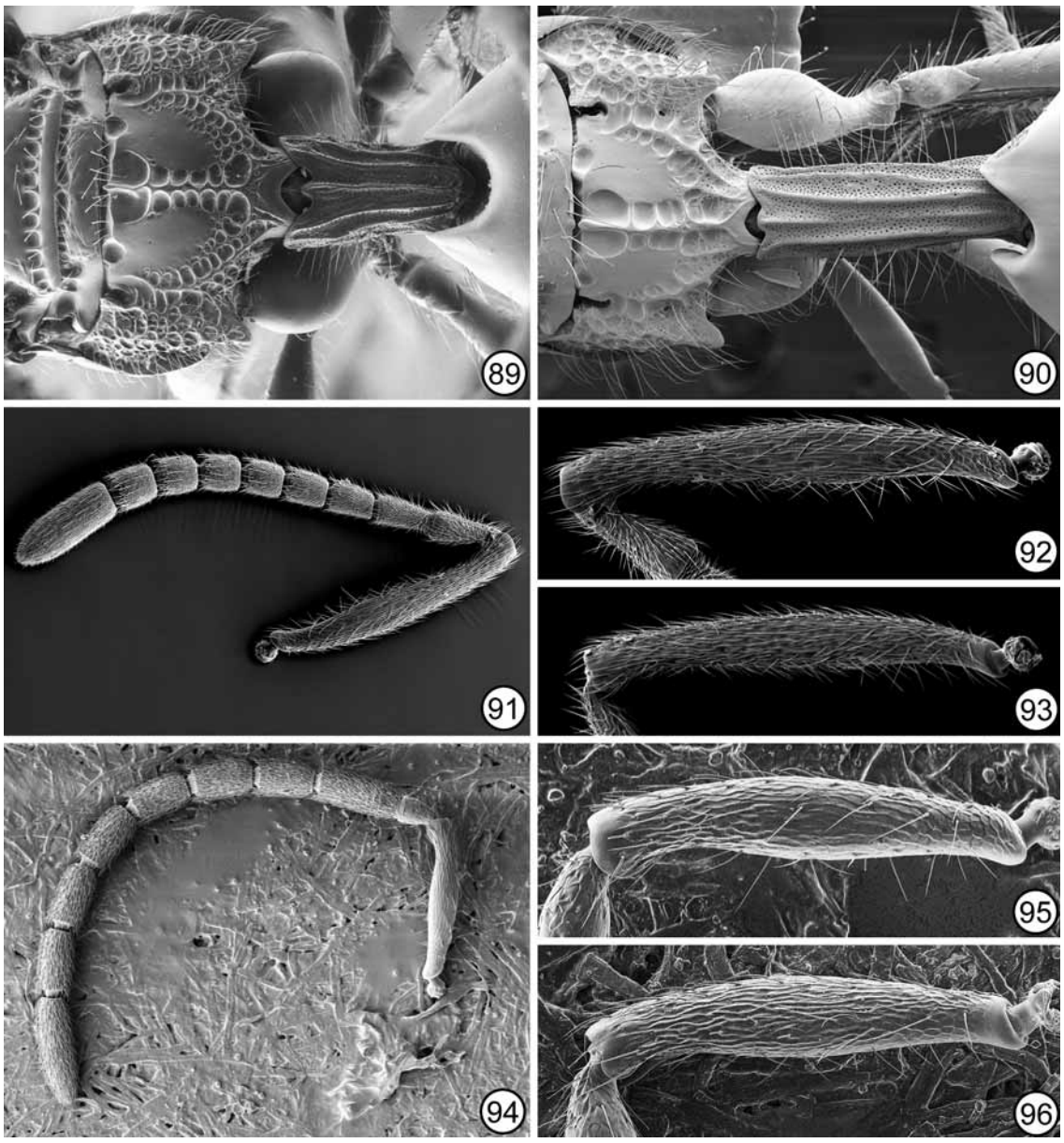
Pronotal collar in lateral view abruptly raised behind neck and anterolaterally with carinate ridge extending vertically from circumpronotal furrow and across collar as irregular, undulating carina or stronger crest that is medially discontinuous (Fig. 85) and sometimes more or less tooth-like raised paramedially (Fig. 83), but which delimits an anterior, mostly smooth and shiny vertical surface of collar above neck (Fig. 84); with distinct crenulate cross-line posteriorly but otherwise variably densely punctate, the setiferous punctures usually mostly circular even if quite dense except often multisided to rugose laterally (Fig. 84), and usually with smooth (Fig. 85), sometimes shallowly furrow-like (Fig. 86) median band. Mesoscutal median lobe with anterior convex region smooth and shiny (Figs 84–86); internotaular region completely but variably sculptured, more or less rugose or with longitudinally aligned circular to irregular setiferous punctures and often with median smooth band or carina (Figs 85, 86). Axillae (Figs 85, 86) variably densely punctate, mostly smooth and shiny to extensively covered with distinct setiferous punctures. Scutellum (Figs 85, 86) variably densely and conspicuously punctate, almost completely smooth except for a few pinprick-like setiferous punctures laterally to almost uniformly covered with distinct, circular punctures except for median smooth band; frenum (Figs 85, 86) differentiated by complete crenulate frenal line. Mesopleuron (Figs 87, 88) smooth and shiny except as follows: pectal region variably distinctly crenulate along anterior margin and bare except for 1 posteroventral seta; acropleuron longitudinally carinate, the carinae extending posteriorly onto alar shelf and sometimes extending as fine longitudinal striae on upper mesepimeron; subalar scrobe usually quite deep and subdivided by one to several longitudinal carinae, higher than wide and either more or less vertical (Fig. 87) or tapered posteriorly and then somewhat rugose toward episternal scrobe, but posteroventral margin abruptly



Figs 80–88. *Spalangia chontalensis* Cameron. **80 & 81**, ♀ head: **80**, anterior view, **81**, lateral view; **82**, ♂ head, lateral view; **83 & 84**, ♀ pronotum: **83**, dorsal view, **84**, dorsolateral view; **85 & 86**, mesosoma, dorsal view: **85**, ♀, **86**, ♂; **87 & 88**, mesopleuron: **87**, ♀, **88**, ♂.

angled relative to transepisternal line (Fig. 87); episternal scrobe usually a deep, subcircular to triangular or vertically ovate depression and precoxal scrobe usually a subcircular depression, but scrobes separated by smooth cuticle (Fig. 88) or at most connected by fine, non-crenulate episternal and precoxal lines (Fig. 87); upper and lower mesepisternum differentiated by punctate-crenulate transepisternal line and adjacent line of setae (Fig. 87). Fore wing hyaline or with variably distinct yellowish tinge; mediocubital fold with line of at least 3 setae and usually mediocubital fold and basal cell much more extensively and conspicuously setose. Propodeum (Fig. 89) with distinct postspiracular sulcus; callus completely punctate-rugose; plical region with variably conspicuously widened paramedian crenulate furrows delineating median carina, but at least anterior-most cell much longer and larger than more posterior cells; supracoxal band contiguous with paramedian crenulate furrows; propodeal panels smooth and shiny.

Petiole (Fig. 89) about 2.3–2.8x as long as medial width; with minute, though sometimes obscure, pore-like punctures between longitudinal carinae; with several setae laterally along length. Gaster with tergites smooth and shiny.



Figs 89–96. *Spalangia chontalensis* Cameron. **89 & 90**, propodeum and petiole, dorsal view: **89**, ♀, **90**, ♂; **91**, ♀ antenna; **92 & 93**, scape: **92**, inner view, **93**, outer view; **94**, ♂ antenna; **95 & 96**, ♂ scape: **95**, inner view, **96**, outer view.

Male. Length = 1.9–4.1 mm. Antenna (Fig. 94) with scape about 6x as long as wide, the sculpture similar to female though sometimes finer (Figs 95, 96); pedicel about 1.3–1.8x as long as wide; flagellum with setae much shorter than width of segment; funicle with fu_1 about 2.1–3.4x as long as wide and 1.5–2.7x as long pedicel, and subsequent funicular segments at least oblong and usually distinctly (up to about 2x) longer than wide. Otherwise similar to female except as follows. Tibiae sometimes extensively or completely yellowish and tarsus sometimes completely yellow except for arolium. Head in anterior view about as wide as high; in lateral view (Fig. 82) with malar space about 0.4–0.5x eye height and about 0.6–0.7x eye width. Fore wings more often with distinct yellowish tinge and always conspicuously setose behind submarginal vein. Petiole (Fig. 90) about 3.4–4.3x as long as medial width.

Material examined. *Neotropical* (430 specimens in AEIC, AMNH, BMNH, CASC, CNC, EMEC, INBIO, MCZH, MZCR, OSAC, TAMU, UCRC, UNAL, USNM). Complete collection records are not provided; none with host data.

Distribution. South of USA (Fig. 97) from Mexico throughout Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama,), West Indies (Dominica, Jamaica, Saint Lucia, Saint Vincent, Trinidad, Tobago) and South America (Argentina, Bolivia, Brazil, Colombia, Ecuador, Paraguay, Uruguay, Venezuela). Additional unconfirmed records based on Noyes (2003) and De Santis (1979) include Grenada, Puerto Rico, Chile, and Peru.

Biology. De Santis (1979) reported Muscidae and Tachinidae as hosts presumably based on reared specimens he identified using Bouček (1963). I have seen only two reared males (USNM) from unidentified dipteran puparia. The variation in size of specimens of *S. chontalensis* suggests a wide host range including different species of flies of greatly different sizes.

Recognition. I include *S. chontalensis* as one of six species in the *nigra* species group as discussed under *S. nigra*. Individuals of *S. chontalensis* uniquely have their longitudinally carinate petiole covered with minute pore-like punctures (Figs 89, 90), though this is not always obvious in smaller individuals. The other five species of the group have a longitudinally carinate-strigose petiole that is quite smooth and shiny or has transverse ridges or reticulate-rugose sculpture between the longitudinal carinae. *Spalangia chontalensis* could be mistaken for *S. nigroaenea* because the petiolar difference is not always conspicuous and the two species have a similar pronotal sculpture. Both species have a vertical carina or ridge anterolaterally on the pronotal collar that extends dorsally and across the collar so as to segregate an anteriorly faced, mostly smooth and shiny vertical surface of the collar above the neck (Figs 84, 351). Development of the transverse margin across the collar is usually different in specimens of similar size of the two species. The margin is usually higher and more distinctly undulating as well as often posteriorly curved (Fig. 86) and/or crest- or tooth-like paramedially (Fig. 83) in *S. chontalensis* as compared to a lower, usually more uniform, more or less Λ-like margin (Fig. 350) in *S. nigroaenea*. However, smaller individuals of *S. chontalensis* usually are less coarsely sculptured than larger individuals and may have the transverse carina less developed as well as obscure pores on the petiole. Such individuals are distinguished by their more or less triangular to oval episternal scrobe (Figs 87, 88) as compared to a lunate episternal scrobe that usually is quite obviously differentiated into a horizontal anterior portion and a more vertically directed posterior portion (Fig. 354) in *S. nigroaenea*. Additional, but variable, differential features for *S. chontalensis* compared to *S. nigroaenea* include often much more conspicuously setose fore wings and sometimes extensively yellowish tibiae in males, and in both sexes a propodeum with the anterior-most cell of the paramedian crenulate furrows conspicuously wider and larger than the more posterior cells. This propodeal sculpture pattern (Figs 89, 90) resembles that of *S. cameroni*-group species (e.g. Figs 70, 71) and because males of *S. chontalensis* have quite a long petiole they could be mistaken for those of *S. longepetiolata* if the petiolar setae are not observed (*cf*. Figs 90, 278).

As discussed by Bouček (1963), the original description of the antenna for *S. bakeri* Kieffer (scape equal in length to two subsequent segments, pedicel not longer than wide, fu_3–fu_6 twice as long as wide) shows that the type specimen was a male rather than the stated female. Bouček (1963) further suggested that *S. bakeri*

might be a junior synonym of *S. chontalensis* based on described pronotal sculpture (punctured along sides and anterior margin) and comparatively long petiole (3–4x as long as wide). Pronotal sculpture indicates that the species is either a *cameroni*- or *nigra*-group species. Although the petiole was not described as being setose, males of *S. cameroni*, the only likely *cameroni*-group species to have been captured, have oblong flagellar segments (at most about 1.5x as long as wide), a petiole that is less than 3x as long as wide, and they do not have the tibiae obviously yellow apically. The original description of *S. bakeri* states that the tibiae are yellow apically and although it is stated that the wings are "barely tinted", at least there was enough color to observe. Males of *S. chontalensis* not only have flagellar segments up to about twice as long as wide and a petiole at least three times as long as wide, but the tibiae are variably extensively yellow apically and the wings are often distinctly tinted. For these reasons, I concur with Bouček (1963) that among possible species the description of *S. bakeri* Kieffer best fits *S. chontalensis* Cameron and therefore formally synonymize the names.

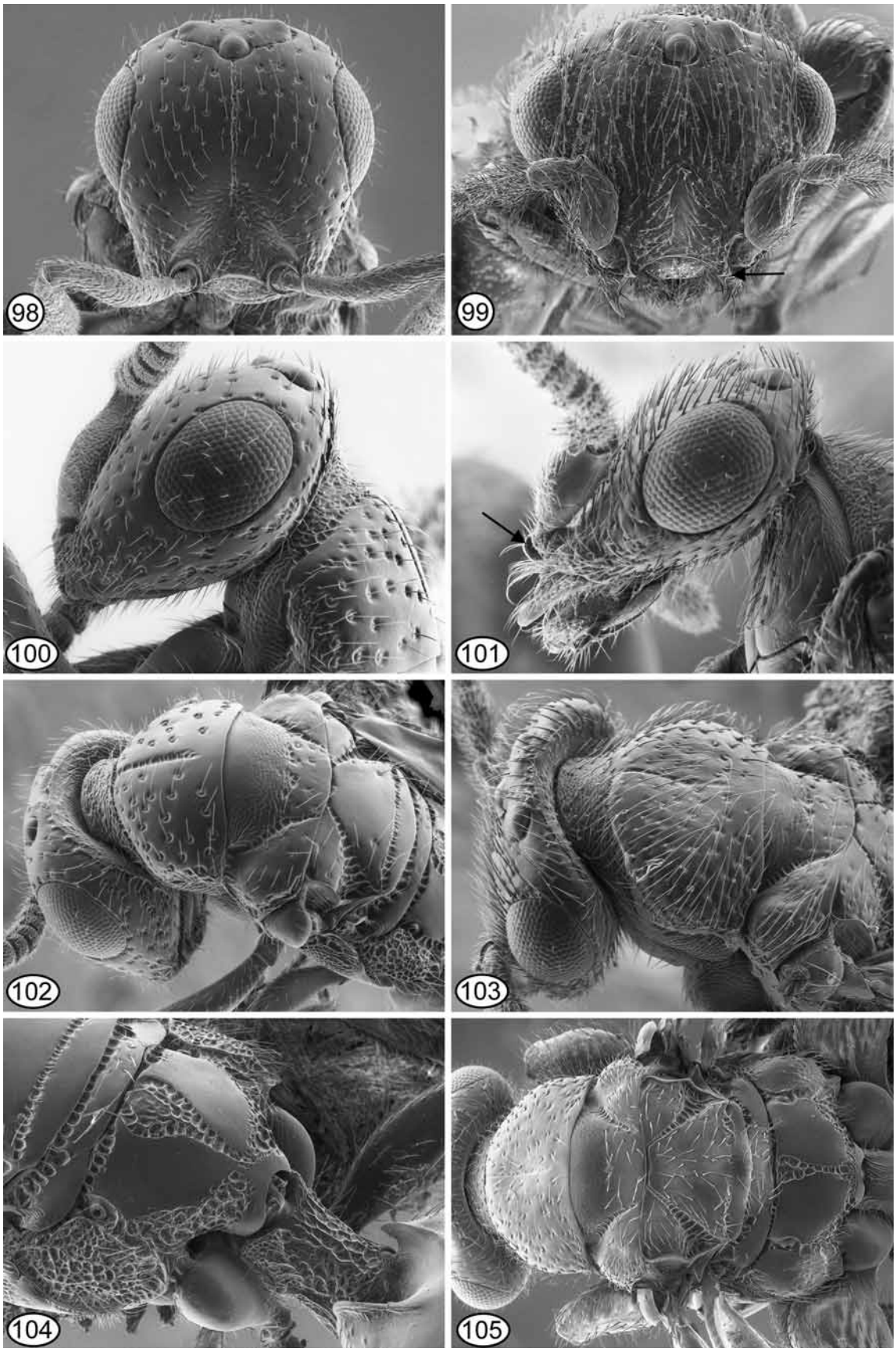
Fig. 97. Distribution of *Spalangia chontalensis* Cameron.

6. *Spalangia dozieri* Burks, 1969
(Figs 38, 98–113)

Spalangia dozieri Burks, 1969: 3; holotype ♀ (USNM, examined). Type data: Mayaguez, P.R. [Puerto Rico], Aug. 26, 1936, H.L. Dozier; [from pupa of] *Sarcodexia sternodontis.*

Description. *Female* (Gibson and Reigada 2009, fig. 2). Length = 1.2–2.4 mm. Legs dark except basal 4 tarsal segments yellow and knees sometimes yellowish. Head in anterior view (Fig. 98) about 0.9–1.0x as high as wide; in dorsal view about 1.5–1.9x as wide as long (Gibson and Reigada 2009, fig. 7); in lateral view (Fig. 100) with malar space about 0.9–1.0x as long as eye height and about 1.1–1.2x eye width. Head capsule (Figs 98, 100) smooth and shiny except for setiferous punctures as follows: with complete median sulcus extending ventrally to equilateral or elongate-triangular scrobal depression, otherwise upper face and parascrobal region with distinct punctures always separated by at least own diameter (Fig. 98) but larger specimens more densely punctate than smaller specimens; scrobal depression with variably finely coriaceous scrobes, the sculpture sometimes extending laterally over inclined surface of depression and then transversely coriaceous-alutaceous, but with smooth, shiny, bare interantennal region (Fig. 98); gena without malar sulcus but with distinct punctures (Fig. 100); temple with similar sculpture as gena and upper face. Antenna (Fig. 108) with scape about 5.0–5.6x as long as wide, the outer surface alutaceous to alutaceous-rugulose but inner surface usually more finely alutaceous; pedicel about 1.6–2.0x as long as apical width and about 2.3–3.7x as long as fu_1; funicle with fu_1 about 1.0–2.0x as wide as long and subsequent segments distinctly transverse with fu_7 about 1.8–2.5x as wide as long; clava about 1.7–2.2x as long as wide. Mandible bidentate (Gibson and Reigada 2009, fig. 11).

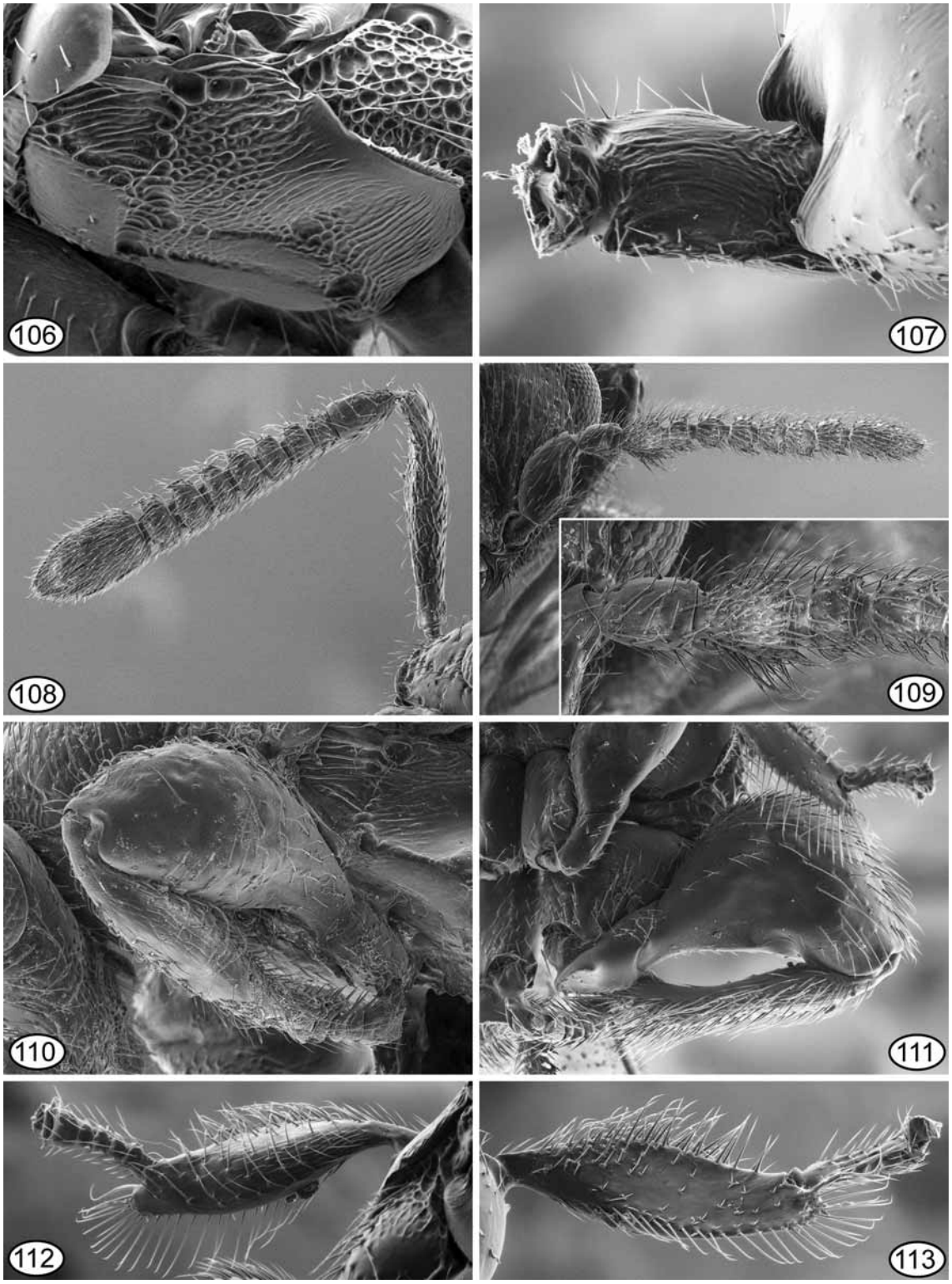
Pronotal collar in lateral view only low convex behind neck (Fig. 100) and with circumpronotal band anterolaterally, but anteriorly smoothly rounded to neck; with median sulcus over at least anterior two-thirds and distinct, well separated circular setiferous punctures dorsally, but without differentiated cross-line posteriorly (Fig. 102). Mesoscutal median lobe (Fig. 102) with anterior convex region coriaceous to coriaceous-granular; internotaular region only extremely obscurely coriaceous or smooth and shiny except for scattered setiferous punctures bordering anterior convex region and laterally near notauli (Fig. 102). Axillae (Fig. 102) smooth and shiny except for sparse setae originating from at most pinprick-like punctures. Scutellum (Fig. 102) low convex and shiny except for sparse setae laterally originating from at most pinprick-like punctures; frenum (Figs 102, 104) differentiated by at least extensive crenulate frenal line, the line often tapered and shallowed toward midline but only sometimes narrowly separated medially. Mesopleuron (Fig. 106) mostly with distinct sculpture as follows: pectal region smooth and shiny or only very obscurely coriaceous and bare except for 1 posteroventral seta; acropleuron longitudinally carinate-strigose, but alar shelf and most of upper mesepimeron reticulate-rugulose or more finely strigose-reticulate in smaller specimens, and lower mesepimeron obliquely alutaceous to strigose-alutaceous; subalar scrobe a vertical, strigose- to reticulate-rugose depression connected to variably distinct, reticulate-rugose episternal scrobe by a shallow, linear furrow; upper mesepisternum reticulate-rugose anteriorly to smooth and shiny posteriorly, and often differentiated from lower mesepisternum by fine transepisternal ridge anteriorly but with only 2 ventral setae, one near ventral margin of subalar scrobe and one below precoxal scrobe (Fig. 106). Legs normal, including elongate, slender, and comparatively inconspicuously setose femora and tibiae (Gibson and Reigada 2009, fig. 2); tarsi slender, at least 0.75x as long as respective tibia with basal tarsal segment about as long as combined length of subsequent 3 or 4 segments (Burks 1969, fig. 1; Gibson and Reigada 2009, fig. 23), and with long, curved tarsal claws (Burks 1969, fig. 2; Gibson and Reigada 2009, fig. 20). Fore wing hyaline; mediocubital fold bare but basal cell at least with several setae and usually extensively setose in distal half. Propodeum (Fig. 104) with distinct postspiracular sulcus; callus reticulate-rugose; plical region with Y-shaped paramedian crenulate furrows delineating broadly lanceolate, reticulate-rugose median region, though furrows only inconspicuously



Figs 98–105. *Spalangia dozieri* Burks. **98 & 99**, head, anterior view: **98**, ♀, **99**, ♂; **100 & 101**, head, lateral view: **100**, ♀, **101**, ♂; **102 & 103**, head and mesosoma, dorsolateral view: **102**, ♀, **103**, ♂; **104**, ♀ frenum–petiole, dorsolateral view; **105**, ♂ mesosoma, dorsal view. Arrow points to lateral margin of torulus in Figs 99, 101.

differentiated from remaining sculpture; supracoxal bands continuous with or only narrowly separated from paramedian crenulate furrows; panels smooth and shiny.

Petiole (Fig. 104) about 1.5–1.7x as long as medial width; reticulate-rugose; with at least 3 and usually several lateral setae. Gaster shiny but at least Gt_3 and subsequent tergites finely coriaceous.



Figs 106–113. *Spalangia dozieri* Burks. **106**, ♀ mesosoma, lateral view; **107**, ♀ petiole, dorsolateral view; **108**, ♀ antenna; **109**, ♂ antenna (insert: pedicel–fu_3); **110**, ♂ foreleg, outer view; **111**, ♂ middle leg, inner view; **112 & 113**, ♂ mesotibia and tarsus: **112**, outer view, **113**, inner view.

Male (Gibson and Reigada 2009, figs 3, 4). Length = 1.1–1.9 mm. Antenna (Fig. 109) with scape short, about 1.7–2.0x as long as wide, ovate in lateral view and thick, the outer and inner surfaces smooth and shiny except for setae; pedicel about 1.1–1.5x as long as wide; flagellum with distinct, semierect, curved setae; funicle with fu_1 slightly transverse to slightly longer than wide but at most about as long as pedicel, widened distally and ventrally with distally curved setae (Fig. 109, insert) longer than on other segments, and subsequent funicular segments slightly transverse to quadrate, more or less moniliform. Also dissimilar to female in many other respects as follows. Legs uniformly brown to yellowish-brown but lighter in color than body. Head in anterior view (Fig. 99) obviously transverse, about 1.3x wider than high; in dorsal view much more strongly transverse than for female, about 2.6–2.9x as wide as long (Gibson and Reigada 2009, fig. 8); in lateral view (Fig. 101) with malar space about 0.8–0.9x as long as eye height and about 1.1–1.2x eye width. Head capsule with only very fine and inconspicuous median sulcus and face, including scrobal depression, uniformly densely setose with setae originating from minute punctures or tiny bumps; scrobal depression shallow but extending broadly between toruli and with lateral margin of torulus raised into short lobe projecting slightly beyond level of ventral margin of torulus (Figs 99, 101: arrow); gena and temple similarly densely setose as face. Mandible unidentate, tapered to apex (Gibson and Reigada 2009, fig. 12).

Pronotal collar in lateral view flatter than in female (*cf.* Figs 102, 103), with median sulcus but much more densely setose and with setae originating from smaller and usually less distinct punctures. Mesoscutum and scutellar-axillar complex (Fig. 105) similar to female except more densely and uniformly setose. Mesopleuron similar to female except more finely sculptured and shinier; alar shelf and upper mesepimeron anteriorly longitudinally strigose to punctate-strigose, lower mesepimeron smooth to finely alutaceous posteriorly, and upper mesepisternum finely coriaceous to smooth. Legs conspicuously modified (Gibson and Reigada 2009, figs 3, 4): femora, particularly pro- (Fig. 110) and metafemur (Fig. 111), bulbously enlarged, the metafemur with ventral margin concave; pro- (Fig. 110) and metatibia (Fig. 111) robust-tubular and strongly setose, the metatibia with ventral margin concave; mesotibia strongly compressed with anterior surface (Fig. 113) concave and mostly bare except for short, sparse setae, but posterior surface (Fig. 112) convex and conspicuously setose with long, dense setae dorsally, and with row of very long, distally curved setae along ventral margin and apical lobe; tarsi short and robust, less than half as long as respective tibia with basal tarsal segment much shorter than combined length of subsequent 3, distinctly transverse segments (Figs 110–113; Gibson and Reigada 2009, figs 22, 24), and with short, lobular tarsal claws (Gibson and Reigada 2009, fig. 21). Fore wing with cubital area bare but otherwise setose behind submarginal vein, including line of setae on vannal fold. Propodeum (Fig. 105) with posteriorly tapered median band usually smaller and less distinctly sculptured than for female; callus with about anterior half smooth and shiny. Petiole (Fig. 107) similar to female except with finer longitudinal striae.

Material examined. *Neotropical* (103♀, 8♂). **BARBADOS**: Turner Hall Woods, 21.II.79, S. Peck, dung trap (2♀). **BRAZIL**: São Paulo, Botucatu, Edgardia Farm, C. Reigada, 16-23.II.06, *Lucilia eximia* (1♀, 2♂), 13-20.IV.06, *Lucilia sericata* (21♀, 2♂), 9-16.III.07, *Chrysomya albiceps* (5♀), 16-23.II.06, *Chrysomya putoria* (7♀) (CNC, ZMUSP). **CUBA**: Centrale Portugalata, II.28, C.R. Stahl (1♀ paratype, USNM). **DOMINICA**: St. Mark Parish, Scott's Headpoint, 2.XII.94, L. Masner, grassland (2♀). **PUERTO RICO**: Mayaguez, 26.VIII.36, H.L. Dozier (holotype ♀, 15♀ paratypes and 3♂ and 7 broken ♀ with same data as holotype but not included in original type series, USNM); 1♀ paratype (BMNH). Punta Arenas, 12.III.63, E.F. Legner, bait trap (1♀ paratype, USNM). **ST. LUCIA**: Praslin, 13º52.9'N 60º53.9'W, 50 m., 11-28.VII.07, lowland woodland ravine, intercept trap (38♀). **ST. VINCENT**: St. David, Richmond Beach, 10.VII.76, J.S. Noyes (1♂ BMNH). **TRINIDAD**: Caroni Brasso, 17.VII.76, J.S. Noyes (1♀ BMNH).

Distribution. West Indies (Barbados, Cuba, Dominica, Puerto Rico, St. Lucia, St. Vincent, Trinidad) and South America (Brazil) (Fig. 38).

Biology. The type series was reared from *Sarcodexia lambens* (Wiedemann) (= *Sarcodexia sternodontis* Townsend) (Sarcophagidae) and Gibson and Reigada (2009) reared *S. dozieri* as a gregarious puparial parasi-

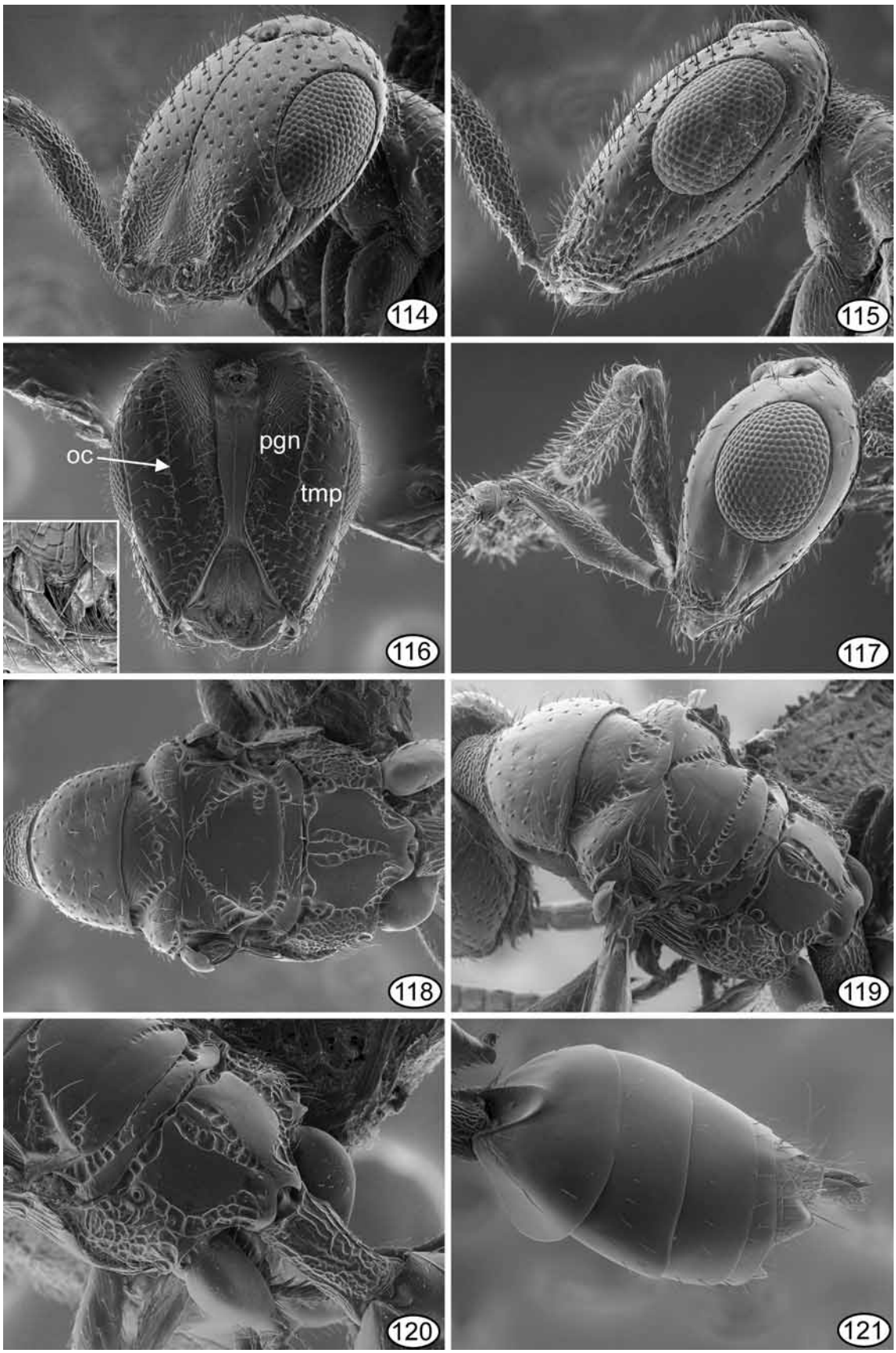
toid from four blowfly species, *Chrysomya albiceps* (Wiedemann), *Chrysomya putoria* (Wiedemann), *Lucilia eximia* (Wiedemann) and *Lucilia sericata* (Meigen) (Calliphoridae). *Spalangia dozieri* is the only member of the subfamily that is not normally a solitary parasitoid. Gibson and Reigada (2009) postulated that most of the unusual structural modifications of *S. dozieri* males are adaptations for grasping and holding, suggesting that males are phoretic on adults of their fly hosts or, possibly, that they exhibit aggressive or other atypical behavior with siblings correlated with being gregarious.

Recognition. Gibson and Reigada (2009) described and illustrated diagnostic features for females of *S. dozieri* when they newly described the male. Females are differentiated from all other New World *Spalangia* by their unique pronotal collar sculpture, which resembles that of *S. nigripes* (Fig. 334) except for the presence of a distinct median sulcus (Fig. 102). Two species described from Madagascar, *S. sulcifera* Bouček (1963, fig. 71) and *S. seyrigi* Risbec (1952), have a very similar pronotal sculpture pattern. I have not seen any specimens that I identify as *S. seyrigi*, but two CNC females labelled "Reunion, IS: St. André, 29.XII.1971, Y. Gormy, sift rotten fruits" that I identify as *S. sulcifera* are differentiated from *S. dozieri* females by several features. The propodeum of the two females has a median carina rather than a reticulate-rugose median band, the longitudinal carinae of the acropleuron extend over the alar shelf rather than the alar shelf and at least the anterior half of the upper mesepimeron being more or less reticulate-rugose, and the petiole lacks setae. Individuals of *S. dozieri* are similar to *nigra*-group species in that the petiole is setose laterally (Figs 104, 107), but in most other features *S. dozieri* more closely resembles *drosophilae*-group species, including sculptural features of the scrobes, propodeum and mesopleuron. Males of *S. dozieri* are readily differentiated from other *Spalangia* by their unique leg structure and several other features, including unidentate mandibles, as discussed in detail by Gibson and Reigada (2009).

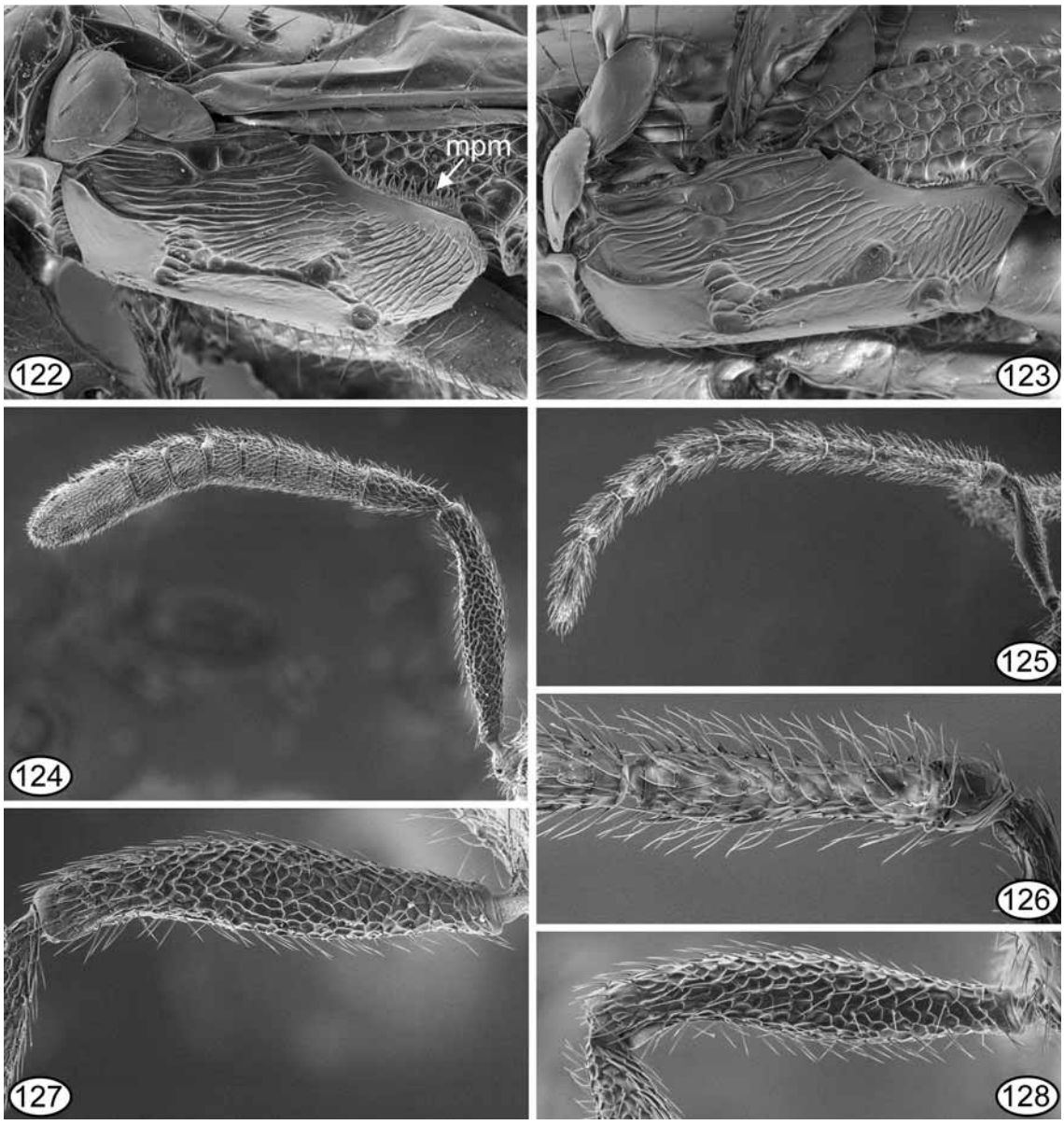
7. *Spalangia drosophilae* Ashmead, 1887
(Figs 114–129)

Spalangia drosophilae Ashmead, 1887: 199; holotype ♀ (USNM, examined). Type data: Jacksonville, Fla. [Florida].

Description. *Female*. Length = 1.0–2.1 mm. Legs dark except sometimes knees and usually basal 3 or 4 tarsal segments yellow. Head in anterior view about 1.2–1.3x as high as wide; in dorsal view about 2.0–2.5x as wide as long; in lateral view (Fig. 115) with malar space about 0.8–1.0x as long as eye height and about 1.2–1.6x as eye width. Head capsule (Figs 114, 115) smooth and shiny except for setiferous punctures as follows: with complete median sulcus extending ventrally to level of lower orbit, usually within elongate-triangular to slightly transverse-oval scrobal depression, otherwise upper face and parascrobal region usually with widely scattered, minute pinprick-like punctures, though sometimes punctures quite deep and distinct even though only slightly larger than base of seta; scrobal depression (Fig. 114) delineated by coriaceous to coriaceous-granular scrobes on either side of smooth and shiny interantennal region, the coriaceous sculpture variably conspicuously extending laterally onto inner half of parascrobal region above torulus and with setae often extending partly over coriaceous sculpture from parascrobal region, but scrobal depression without distinctly inclined or convex lateral surface; gena (Fig. 115) rugulose-roughened near oral margin and with linear malar sulcus, but otherwise smooth with setae originating from at most pinprick-like punctures or tiny bumps; temple smooth with setae originating from pinprick-like punctures. Antenna (Fig. 124) with scape about 4.6–6.4x as long as wide, the inner (Fig. 127) and outer (Fig. 128) surfaces coriaceous-alutaceous to quite strongly rugose and uniformly setose; pedicel about 2.0–2.1x as long as apical width and about 1.8–3.0x as long as fu_1; funicle with fu_1 transverse to obviously (about 0.8–1.2x) longer than wide, fu_2 sometimes only about 1.3x as wide as long but usually more conspicuously transverse (at least 1.5x as wide as long), and subsequent segments usually at least slightly and often obviously transverse with fu_7 about 1.0–2.0x as wide as long; clava about 1.9–2.7x as long as wide.



Figs 114–121. *Spalangia drosophilae* Ashmead. **114–116**, ♀ head: **114**, frontolateral view, **115**, lateral view, **116**, posterior view; **117**, ♂ head, lateral view; **118 &119**, ♀ mesosoma: **118**, dorsal view, **119**, posterodorsal view; **120**, ♂ scutellum–petiole, posterodorsal view; **121**, ♀ gaster.



Figs 122–128. *Spalangia drosophilae* Ashmead. **122 & 123**, mesopleuron: **122**, ♀, **123**, ♂; **124 & 125**, antenna: **124**, ♀, **125**, ♂; **126**, ♂ pedicel and fu_1; **127 & 128**, ♀ scape: **127**: inner view, **128**: outer view.

Pronotal collar in lateral view (Fig. 115) only very low convex behind neck and with circumpronotal band anterolaterally, but anteriorly smoothly rounded to neck (Figs 118, 119); smooth and shiny to extensively coriaceous, but without cross-line posteriorly and variably densely and conspicuously setose except mediolongitudinally (Figs 118, 119). Mesoscutal median lobe (Figs 118, 119) with transverse band of coriaceous-alutaceous sculpture near midlength and usually with at least a couple of irregular punctures forming more coarsely sculptured region posterior to coriaceous band, but otherwise smooth and shiny except for setae near notauli. Axillae (Figs 118, 119) shiny except for setae. Scutellum (Figs 118, 119) flat and shiny, variably extensively but sparsely setose with setae originating from at most pinprick-like setiferous punctures; frenum with frenal line usually interrupted over at least medial third (Fig. 118) or punctate-crenulate line at least tapered medially if sometimes virtually complete (Figs 119, 120). Mesopleuron (Figs 122, 123) at least partly distinctly sculptured as follows: pectal region smooth and shiny, mirror-like, and bare except for 1 posteroventral seta; acropleuron longitudinally striate-carinate and with stronger or at least obliquely angled or curved carina directed toward base of tegula abruptly differentiating acropleuron from pectal region; subalar and

episternal scrobes variably shallow depressions connected by a linear furrow; upper mesepimeron longitudinally to obliquely striate or strongly alutaceous, with lower mesepimeron more coriaceous-alutaceous; upper and lower mesepisternum sometimes differentiated anteriorly by transepisternal line, but mostly smoothly merged except for partial or rarely complete line of setae, the upper mesepisternum smooth and shiny to coriaceous. Fore wing hyaline to slightly embrowned; sometimes bare behind submarginal vein but often mediocubital fold with 1–5 setae and sometimes with setae in basal cell and/or on basal fold near parastigma. Propodeum (Figs 118–120) with distinct postspiracular sulcus; callus punctate-reticulate to rugulose or sometimes more finely sculptured or with small smooth and shiny region posterior to spiracle adjacent to postspiracular sulcus; plical region with more or less Y-shaped paramedian crenulate furrows sometimes essentially delineating a median carina, but usually with a variably broad and distinct median lanceolate band, the band usually smooth and shiny though rarely finely punctate, and furrows united into single crenulate line over at least posterior half; supracoxal bands usually separated from paramedian crenulate furrow, sometimes connected by region of minute punctures; panels smooth and shiny.

Petiole about 1.9–2.3x as long as medial width; punctate-reticulate to partly longitudinally carinate; bare. Gaster (Fig. 121) sometimes smooth and shiny but usually at least Gt_2 and Gt_3 variably distinctly coriaceous.

Male. Length = 0.9–1.8 mm. Antenna (Fig. 125) with scape about 4.9–6.2x as long as wide; pedicel subglobular (Fig. 126), only about as long or slightly longer than wide; flagellum with conspicuous, semierect setae about as long as width of segment; funicle with fu_1 (Fig. 126) about 3.5–5.6x as long as wide and about 2.0–4.3x as long as pedicel, and subsequent segments all obviously longer than wide, with fu_7 about 1.3–2.2x as long as wide. Otherwise similar to female except as follows. Head in anterior view as wide as or slightly wider than long; in lateral view (Fig. 117) with malar space about 0.8–0.9x eye height and 1.0–1.2x eye width; scrobal depression sometimes with quite narrow coriaceous scrobes and smooth, convex, sparsely setose surface lateral to scrobes. Fore wing sometimes more extensively setose behind submarginal vein. Petiole (Fig. 120) about 2.0–2.5x as long as wide.

Material examined. Nearctic and Neotropical (998 specimens in AEIC, AMNH, BMNH, CNC, CSCA, CUAC, CUIC, DEBU, DENH, EMEC, FSCA, INBIO, INHS, LACM, MCZH, MLPA, MZCR, NCSU, ROME, TAMU, UATV, UCDC, UCFO, UCRC, USNM). Complete collection records are not provided; those with host data: *Nearctic*. **CANADA**: ***Alberta***, Lethbridge, 10, 30.VIII.61, R. Depner, *H. irritans* (L.). ***Ontario***, Belleville, VII.42, VIII.42, F.J. Simmonds, *Oscinella frit* (INHS, USNM). Kars, First Line Road, Acres farm, 45º12.155'N 75º41.642'N, 26.VII.01, G. Gibson & L. Bartels, *M. domestica*. Yorks Corners Road, S Kenmore, Donevelyn farm, 45º11.758'N 75º23.547'W, 22.VIII.00, 26.VII.01, G. Gibson & L. Bartels, *M. domestica*. **USA**: ***Arizona***, Oak Creek Canyon, coll. 3.IX.69, em. 16.X.69, *Rhagoletis juglandis* puparum - possibly not natural host and from Portal, Ariz. (USNM). ***Arkansas***, Scott Co., nr Ione, Hyw. 23 & US71, 25.VI.75, H.N. Greenbaum, Chloropidae pupa, 21.VII.75, in 2nd year cone *Pinus taeda* (FSCA). ***California***, IX.62, T. Finlayson, *Hippelates collusor.* Mariposa Co., Lake Tenaya, 22.VII.49, Dom. Par. Lab., *Recurvaria milleri*. Riverside Co., Riverside, 7.IX.62, E.C. Bay, *Hippelates collusor.* ***Florida***, Dade Co., Homestead, 24.II.87, H. Glenn, lonchaeid in *Euglenia* fruit (USNM). ***Maryland***, [?], 7, 10, 20, 24, 30.III.1898, *Oscinis longipes* Loew (USNM). Bell, 18.XI.26, W.L. McAtte (USNM). ***North Carolina***, Wade Co., Raleigh, L.M. Rueda, *M. domestica* in chicken manure (NCSU). ***North Dakota***, Beach, 10.XII, C.N. Ainslie, house fly infested wheat (USNM). Fargo, 21.VII.22, R.L. Webster, Oscinid puparium (USNM). ***Ohio***, Kent, 28.XI.66, *Pseudocalliope flaviceps* (Loew) (USNM). ***South Dakota***, Elk Point, 13.VIII.14, C.N. Ainslie, Webster no. 11867, Oscinids (USNM). ***Texas***, Laredo, 1.V.43, I.A. Lane, Otitid pupa (USNM). Uvalde, 27.X.33, A.W. Lindquist, Bishopp no.20042 (USNM). ***Virginia***, Montgomery Co., 18.VI.70, W.A. Allen, *O. frit* pupa (USNM).

Neotropical. **PANAMA**: Canal Zone, Balboa Heights, VI-VII.28, J. Zetek, *Anastrepha fraterculus*. Taboga Island, 29.IX.26, J. Zetek, ? *Drosophila ampelophila* (USNM). **PUERTO RICO**: Lake Guanica, 22.IX.36, K.A. Bartlett, *H. irritans* puparium (USNM). Punta Arenas, IV.63, *Hippelates pusio*, E.F. Legner (USNM). **TRINIDAD**: VII.27, S.C. Bruner, *Theresia claripalpis* pupa in *Diatraea* (USNM).

Fig. 129. Distribution of *Spalangia drosophilae* Ashmead.

Distribution. *Spalangia drosophilae* is a widespread native New World species (Fig. 129). I have seen specimens from North America (Canada, USA, Mexico), Central America (Costa Rica, Guatemala, Panama), West Indies (Barbados, Cuba, Dominica, Dominican Republic, Jamaica, Puerto Rico, St. Vincent, Trinidad, Virgin Islands), and South America (Argentina, Brazil, Colombia, Ecuador, French Guiana, Peru, Venezuela). Additional unconfirmed records based on Noyes (2003) include Bermuda and British Virgin Islands. De San-

tis (1967, 1979) and De Santis and Fidalgo (1994) also reported *S. drosophilae* from various localities in Central and South America, but males and females in AEIC from Nova Teutonia (Santa Catarina) that De Santis identified as *S. drosophilae* are a mixture of *S. drosophilae* and *S. plaumanni*, indicating his records for *S. drosophilae* likely reflect more than one species.

Spalangia drosophilae was also introduced into Russia and Latvia from Canada for biological control of the frit fly, *Oscinella frit* (L.) (Chloropidae) (Marshakov 1983). Vago (2002) reported the species from Morocco, but I cannot confirm this record.

Biology. Noyes (2003) lists *S. drosophilae* as a primary parasitoid of about 20 species in 6 different families of Diptera and also as a primary or hyperparasitoid of species in 3 families of Hymenoptera and 2 families of Lepidoptera. The species was described originally by Ashmead (1887) from a specimen reared from *Drosophila* sp. (Drosophilidae) and Simmonds (1944) stated that he reared it for six generations on the common fruit fly, *D. melanogaster* Meigen. I did not see voucher specimens for the latter, but did see specimens reared in Panama from two other drosophilids, the South American fruit fly, *Anastrepha fraterculus* (Wiedemann), and what was questionably identified as *Drosophila ampelophila* Loew. Based on rearing records, *S. drosophilae* may more commonly parasitize species of Chloropidae than Drosophilidae. Chloropid hosts indicated through label data include the frit fly as well as *Liohippelates collusor* (Townsend), *Leohippelates pusio* Loew, and *Stenoscinis longipes* (Loew). Noyes (2003) additionally lists *Incertella minor* (Adams), *Meromyza americana* Fitch, *Rhopalopterum carbonaria* (Loew) and *Rhopalopterum soror* (Macquart), all based on Simmonds (1952). Simmonds studied the life history of *S. drosophilae* as a parasitoid of the frit fly in several papers (see Noyes 2003), including describing and illustrating the immature stages and reporting rearing it once as a hyperparasitoid through a *Hexacola* sp. (Hymenoptera: Figitidae) pupa and twice through two other unidentified primary parasitoids (Simmonds 1952). Simmonds (1954) also stated that it develops rarely as a hyperparasitoid through *Losotropa* sp. (Hymenoptera: Diapriidae), but in the laboratory he could not induce it to parasitize either *Hexacola* or *Spaniopus* (Hymenoptera: Pteromalidae), all larval parasitoids of the frit fly (Simmonds 1944). Lindquist (1936) also reported *S. drosophilae* as a parasitoid and a hyperparasitoid of *H. irritans* through *Gnathopleura ridibunda* (Say) (Hymenoptera: Ichneumonidae) and *Eucoila rufocincta* (Kieffer) (Hymenoptera: Figitidae), but it is possible that these records may be associated with *S. leiopleura* because voucher specimens show that both species were reared (see further under with *S. leiopleura*). A female was reared as a hyperparasitoid of *Diatraea* (Lepidoptera: Pyralidae) through *Paratheresia claripalpis* (van der Wulp) (Tachinidae) in Trinidad and De Santis (1967) reported the sugarcane borer, *Diatraea saccharalis* (Fabricius), as a host in Brazil. The latter record and the female labelled as reared from the lodgepole needle miner, *Recurvaria milleri* Busck. (Lepidoptera: Gelechiidae), likely also result from hyperparasitism through a tachinid primary parasitoid. According to Simmonds (1952), *S. drosophilae* is not normally a hyperparasitoid and is so only when unparasitized hosts are very few. Other indicated Diptera hosts based on label data are *M. domestica*, *Pseudocalliope flaviceps* (Loew) (Lauxaniidae), possibly *Rhagoletis juglandis* Cresson (Tephritidae), and unidentified species of Lonchaeidae and Otitidae. Marchiori (2001, 2002) also reported *Sarcophagula occidua* (Fabricius) (Sarcophagidae) and *Archisepsis scabra* (Loew) and *Palaeosepsis* sp. (Sepsidae) as hosts in Brazil. Legner (1967) studied three "strains" of *S. drosophilae* from California, Jamaica and Puerto Rico and showed developmental differences between them. I did not find voucher material to determine whether more than one species may have been involved, but a single female in the USNM that was reared by Legner from cow dung in Puerto Rico is *S. impunctata*, a morphologically very similar species.

Recognition. I include *S. drosophilae* along with *S. bethyloides*, *S. flavicrus*, *S. impunctata*, *S. innuba*, *S. leiopleura* and *S. plaumanni* in the *drosophilae* species group. These seven species are united by a combination of pronotal, propodeal and mesopleural sculpture patterns, though not all of the diagnostic features are exhibited by all of the species or necessarily by all individuals of a species. Most *drosophilae*-group species have quite a smooth pronotal collar that at least lacks distinct setiferous punctures and, except for *S. innuba*, a distinctly crenulate cross-line as compared to *cameroni*- and *nigra*-group species (see further under *S. plau-*

manni). Most species are also characterized by a propodeum with a variably broadly lanceolate, smooth and shiny or sculptured (Figs 53, 118–120, 243, 244, 263–265) median band rather than a carina. However, width of the median propodeal band varies in most of the species, particularly in males, and sometimes is very narrow or essentially a carina (Figs 180, 245, 258, 391, 394). The key is constructed to first segregate those *drosophilae*-group individuals with an obviously lanceolate median propodeal band (couplet 31), and then those with only a very slender band or median carina from *subpunctata*-group species (couplet 44). Most importantly of the secondary features used to differentiate those *drosophilae*-group species with a median carina is mesopleural sculpture. Except for *S. impunctata* (Fig. 242), *drosophilae*-group species have at least the upper and lower mesepimeron (Figs 122, 123), and often also the upper mesepisternum (e.g. Figs 54, 55), more strongly sculptured than *subpunctata*-group species (e.g. Figs 160, 212, 225, 440), which also have a smooth pronotal collar and always a median propodeal carina. Some *drosophilae*-group species males are further characterized by not only having elongate-slender funicular segments but also conspicuously long, semierect setae (Figs 60, 126).

Individuals of *S. drosophilae* are morphologically most similar to those of *S. impunctata* and *S. leiopleura*, as discussed under the later species. Its comparatively finely sculptured upper mesepisternum differentiates *S. drosophilae* from *S. bethyloides*, *S. plaumanni* and *S. flavicrus*, which have an obliquely striate-strigose upper mesepisternum. Individuals of *S. drosophilae* could be mistaken for *S. bethyloides* if sculpture of the upper mesepisternum is not visible because both species lack setiferous punctures from the gena. However, *S. bethyloides* is not known north of the isthmus of Tehunatepec, Mexico, and individuals have at least 6 setae on the mediocubital fold and additional setae within the basal cell. Neotropical specimens of *S. drosophilae* typically have the fore wings bare behind the submarginal vein. I saw a single UCFC female labelled "Florida: Orange Co., Orlando, MacKay Tract, 2.VI.99, R. Russell & S. Fullerton" that would key to *S. drosophilae* except that it has about 40 setae behind the marginal vein. It also has a complete crenulate frenal line and a petiole that is more distinctly longitudinally carinate than for females of *S. drosophilae*. In other respects this female is similar to *S. drosophilae*, though its lanceolate median propodeal band is distinctly, irregularly punctate, and it has unusually long, quadrate funicular segments. This specimen almost certainly represents a distinct species from any I include within the *drosophilae*-group, but additional specimens are required to better assess variation before description.

8. *Spalangia endius* Walker, 1839

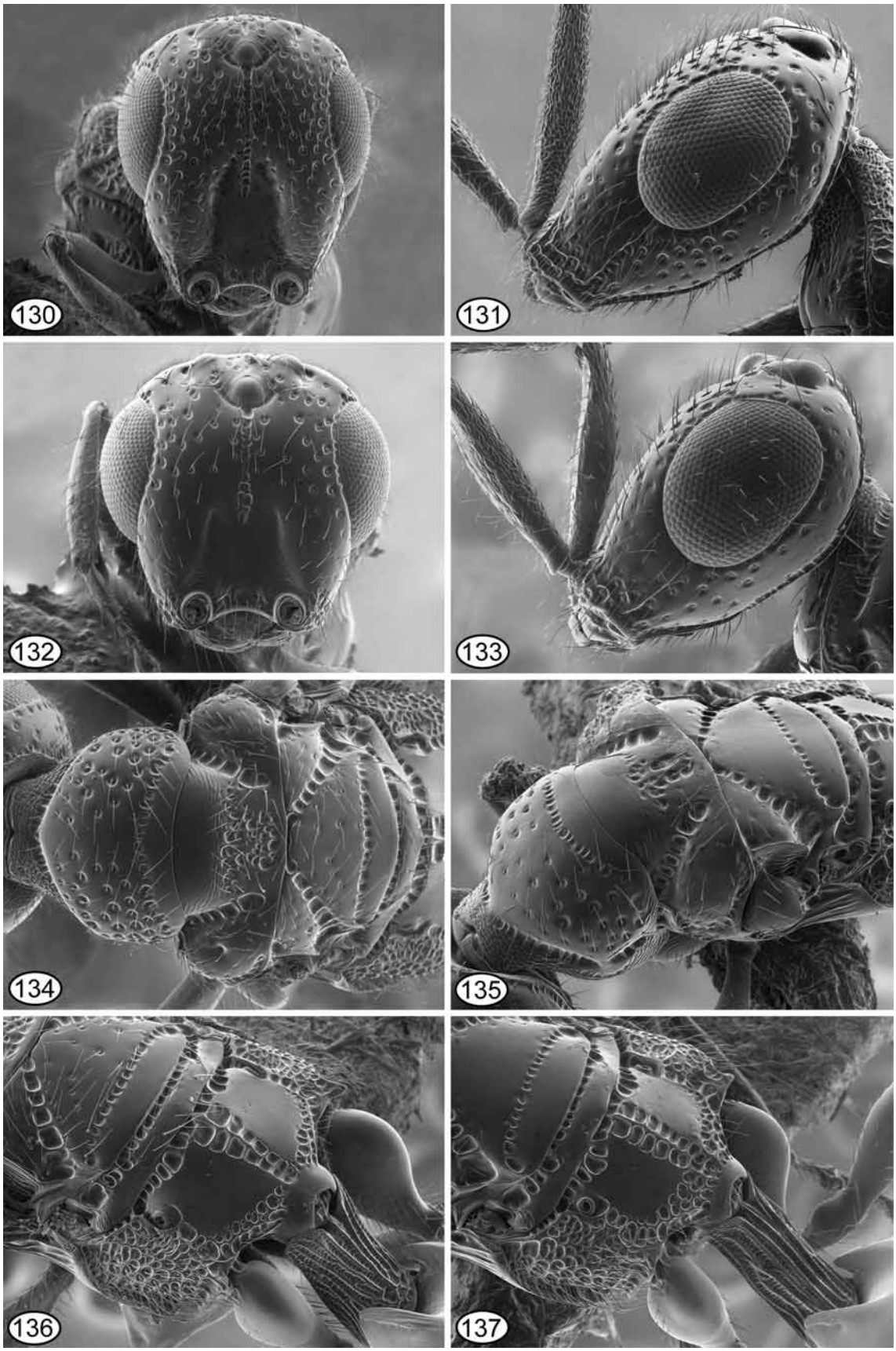
(Figs 130–146)

Spalangia endius Walker, 1839: 96; holotype ♂ (BMNH, examined). Type data: [Chile], James's Isle.

Spalangia muscidarum var. *stomoxysiae* Girault, 1916: 57–58; 2 syntype ♀ (USNM, examined). Type data: Hunter No. 2970, B.18, Dallas TX [Texas], 24.XI.12, par. of *Stomoxys calcitrans*. Synonymy by Bouček (1963: 458).

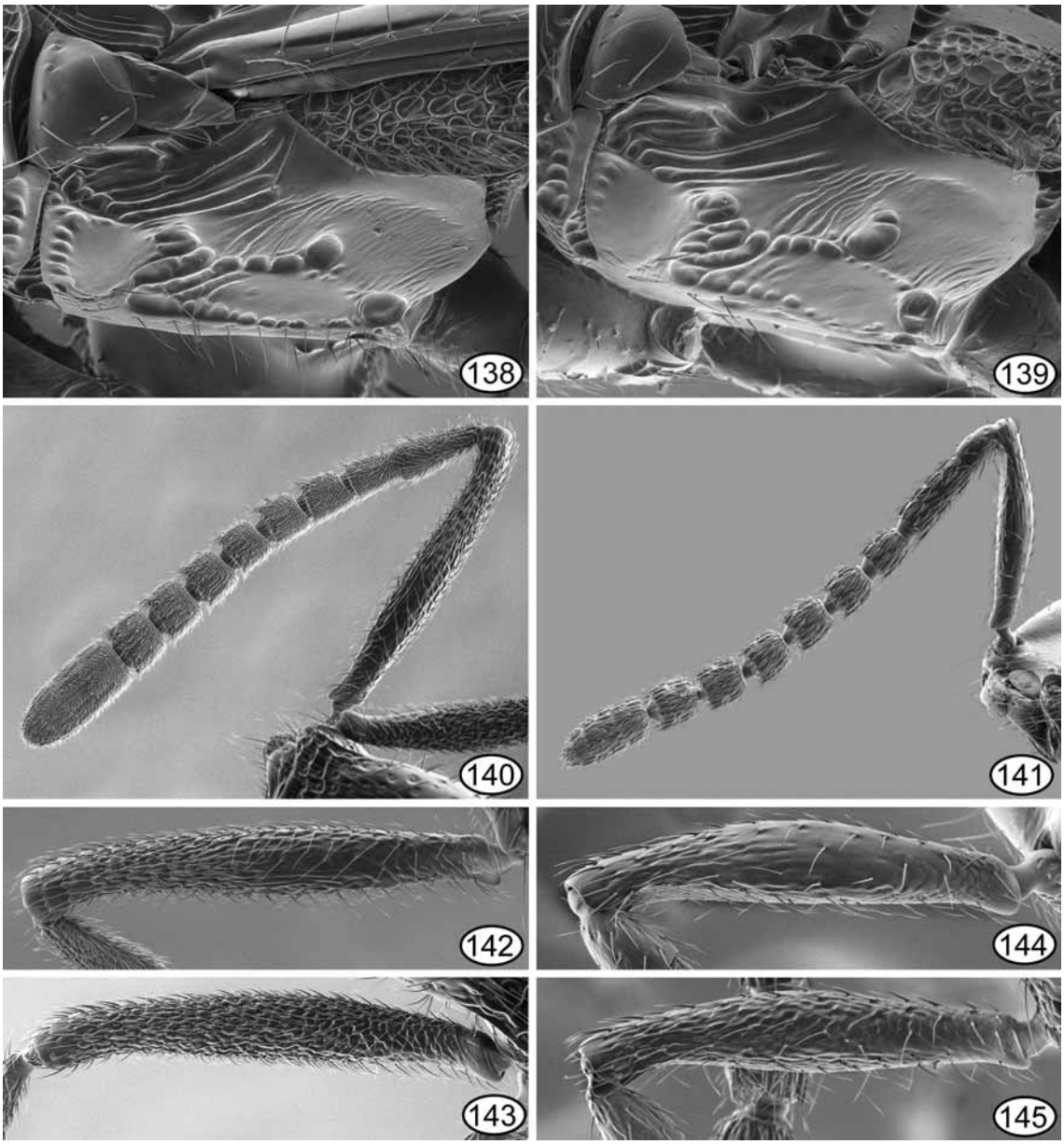
Spalangia orientalis Graham, 1932: 21: holotype ♀ (BMNH, examined). Type data: Western Australia, Wyndham, 24th June, 1930, T.G. Campbell. Synonymy by Bouček (1963: 458).

Description. *Female*. Length = 1.5–2.9 mm. Legs dark except basal 3 or 4 tarsal segments yellow. Head in anterior view (Fig. 130) about 1.1–1.2x as high as wide; in dorsal view about 1.7–1.8x as wide as long; in lateral view (Fig. 131) with malar space about 0.8–0.9x eye height and about 1.2–1.3x eye width. Head capsule (Figs 130–133) smooth and shiny except for setiferous punctures as follows: with complete median sulcus extending ventrally to elongate-triangular scrobal depression, otherwise upper face and parascrobal region with distinct circular punctures often separated by at least own diameter medially but more crowded laterally along inner orbit (Fig. 130); scrobal channel with distinctly coriaceous scrobes on either side of smooth and shiny interantennal region, and with inclined surface of depression smooth except for seta originating from small or pinprick like punctures (Figs 130, 132); gena with linear malar sulcus and scattered punctures (Fig.



Figs 130–137. *Spalangia endius* Walker. **130 & 131**, ♀ head: **130**, anterior view, **131**, lateral view; **132 & 133**, ♂ head: **132**, anterior view, **133**, lateral view; **134**, ♀ thorax, dorsal view; **135**, ♂ thorax, dorsolateral view; **136 & 137**, scutellum–petiole, posterodorsal view: **136**, ♀, **137**, ♂.

131), the punctures often shallower than on face; temple punctate similar to face. Antenna (Fig. 140) with scape about 6.1–7.7x as long as wide, the inner (Fig. 142) and outer (Fig. 143) surfaces uniformly setose and rugulose-strigose or inner surface variably distinctly smoother and less setose mediolongitudinally over about basal half; pedicel about 2.3–2.6x as long as apical width and about 1.8–2.2x as long as fu_1; funicle with fu_1 slightly transverse to about 1.6x as long as wide and subsequent segments usually slightly longer than wide basally and quadrate to transverse apically, but rarely all segments distinctly transverse with fu_4–fu_7 rarely up to about 1.5x as wide as long; clava about 2.0–2.4x as long as wide.



Figs 138–145. *Spalangia endius* Walker. **138 & 139**, mesopleuron: **138**, ♀, **139**, ♂; **140**, ♀ antenna; **141**, ♂ antenna; **142 & 143**, ♀ scape: **142**: inner view, **143**, outer view; **144 & 145**, ♂ scape: **144**, inner view, **145**, outer view.

Pronotal collar in lateral view convexly arched behind neck and with circumpronotal band anterolaterally, but anteriorly smoothly rounded to neck; with distinctly differentiated crenulate cross-line posteriorly and usually with broad, smooth and shiny mediolongitudinal band anterior to cross-line, but elsewhere with distinct circular setiferous, the punctures mostly separated by shiny interstices at least about equal to own diameter medially and circular even if more densely crowded anteriorly and laterally (Figs 134, 135). Mesoscutal median lobe (Figs 134, 135) with anterior convex region smooth and shiny or only very narrowly coriaceous

posteriorly; internotaular region usually without distinct median smooth line, punctate-rugose medially with punctures of different sizes and shapes, and variably distinctly smooth and shiny laterally posterior to transverse anterior line of sculpture. Axillae (Figs 134, 135) shiny with scattered setiferous punctures. Scutellum (Figs 134–136) variably distinctly punctate, smooth and shiny with only a few pinprick-like setiferous punctures laterally or more extensively but sparsely punctate behind axillae; frenum (Figs 134–137) differentiated by complete crenulate frenal line. Mesopleuron (Fig. 138) smooth and shiny except as follows: pectal region punctate-crenulate along anterior margin and bare except for 1 posteroventral setae; acropleuron longitudinally carinate, the carinae extending posteriorly onto alar shelf; subalar scrobe variably distinctly rugose with at least with some cross ridges if primarily obliquely carinate and usually the sculpture finer posteroventrally and extending variably extensively along transepisternal line; episternal scrobe usually a large circular to oval depression but sometimes not distinctly differentiated from punctate episternal line connecting episternal and subalar scrobes; precoxal scrobe usually connected to episternal scrobe by fine, sometimes almost effaced punctate line; upper and lower mesepimeron variably distinctly sculptured, usually at least very finely coriaceous and often extensively, obliquely coriaceous-alutaceous to coriaceous-strigose; upper and lower mesepisternum differentiated by punctate-crenulate transepisternal line and adjacent line of setae, the upper mesepisternum variably extensively sculptured but usually more or less obliquely strigose anteriorly and more finely coriaceous to smooth posteriorly. Fore wing hyaline; often bare behind submarginal vein but sometimes mediocubital fold with 1–3 setae. Propodeum (Figs 136, 137) with distinct postspiracular sulcus; callus reticulate-rugose; plical region with variably distinctly widened paramedian furrows delineating median carina, the carina in lateral view flat or only slightly convex, and with anterior-most cell sometimes longer but not abruptly wider than more posterior cells; supracoxal bands contiguous with paramedian crenulate furrows; propodeal panels smooth and shiny.

Petiole (Fig. 136) about 1.6–1.9x as long as medial width; transversely carinate to reticulate between longitudinal carinae; bare or with 1 or 2 short setae laterally within anterior half. Gaster smooth and shiny or Gt_2 and/or subsequent tergites very finely and obscurely coriaceous.

Male. Length = 1.3–2.6 mm. Antenna (Fig. 141) with scape about 5.0–5.9x as long as wide, the inner (Fig. 144) and outer (Fig. 145) surfaces usually more finely sculptured than female, with outer surface often rugose-granular and inner surface smooth and shiny mediolongitudinally within at least basal half, and with ventral and dorsal setae of similar length; pedicel about 1.5–1.6x as long as wide; flagellum with setae much shorter than width of respective segment; funicle with fu_1 about 1.9–2.9x as long as wide and about 1.3–2.1x as long as pedicel, and subsequent funicular segments subquadrate to slightly longer than wide, with fu_7 about 0.9–1.3x as long as wide. Otherwise similar to female except as follows. Head in anterior view (Fig. 132) about 0.9–1.0x as high as wide; in lateral view (Fig. 133) with malar space about 0.6–0.8x eye height and about 0.8–0.9x eye width. Pronotal collar always with distinct crenulate cross-line, but small males sometimes with only very sparse and shallow, indistinct setiferous punctures anterior to cross-line. Mesoscutal median lobe internotaular region usually with wider smooth and shiny region adjacent to notauli (Fig. 135). Fore wing often with variably distinct brownish tinge; often extensively setose behind submarginal vein but at least mediocubital fold with line of several setae over at least distal half and basal cell with a few setae distally. Petiole (Fig. 137) about 2.3–2.5x as long as medial width.

Material examined. Nearctic and Neotropical (929 specimens in CASC, CNC, CSCA, CUAC, CUIC, DEBU, EMEC, FSCA, LACM, MZCR, NCSU, ROME, TAMU, UATV, UCDC, UCRC, UNAL, USNM). Complete collection records are not provided; those with host data: *Nearctic*. **CANADA**: ***Ontario***, Guelph, *Delia antiqua* (DEBU). Ottawa, Central Exptl. Farm, 20.IX.01, *M. domestica*. Ottawa vicinity, various localities and dates 2000 and 2001, G. Gibson & L. Bartels, *M. domestica* and *S. calcitrans* (see Gibson and Floate 2004). **USA**: ***California***, Los Angeles Co., Chatsworth, 24.VII.54, *S. calcitrans* (LACM). Riverside, *M. domestica* — 15.VII.38, R.H. DeBach (USNM); 31.XII.63, S.V. Rao (UCRC). Sonoma Co., Schulz Ranch, coll. 30.X.63, em. 24.XI.63, J.R. Anderson, *M. domestica* (EMEC). ***Florida***, Alachua Co., Gainesville —

VII.73, P.B. Morgan, *M. domestica* (USNM); 19.VI.75, R.L. Escher, *H. irritans* (FSCA); 16.IV.79, J. Hogsette, *Ophyra aenescens* lab. culture (FSCA). Columbia Co., 6.8 mi. NE Fort White, 27.IV.83, 6, 12, 18.V.83, 7, 15.VII.83, J.T. Vaughan, *S. calcitrans* (FSCA). Dade Co., Homestead, 10.VI.68, R.W. Swanson, *Anastrepha suspensa* Loew (FSCA). S. Florida, 1967, M.H. Muma, *Anastrepha suspensa* (USNM). Union Co., Lake Butler, V.73, C. Morgan, *Fannia canicularis* (L.) and *M. domestica* (FSCA, UCRC). ***Maryland***, Beltsville, 18.VII.71, C.H. Schmidt, *S. calcitrans* (USNM). ***Nebraska***, Lincoln, G.M. Stokes — 8.V.62, calliphorid pupae (USNM); 1.VII.62, *S. calcitrans* (USNM). ***New Jersey***, New Brunswick, 23.I.67, D. Shibles, *M. domestica* (USNM). Woodfern, 5.VII.67, D. Shibles, *M. domestica* (USNM). ***North Carolina***, Craven Co., Spring Hope, host collected, 22.VIII.77, T.D. Edwards, *M. domestica* (CUIC). Davie Co., Mocksville, 10.VII.81, T. D. Edwards, *M. domestica* (CUIC). Duplin Co., 19.X.76, D.A. Rutz, *M. domestica* (NCSU). Raleigh, 10.XI.83, L.M. Rueda, lab. reared, *M. domestica* (NCSU). Wake Co., 16VIII.81, *M. domestica* (NCSU). ***South Carolina***, Oconee Co., 10.VI.73, C.R. Ables, *M. domestica* (CUAC, USNM). Clemson, 17.VII.68, E. Legner, *M. domestica* (UCRC). ***Texas***, Brazos Co., College Station, 13.VIII.79, K.C. Stafford, *M. domestica* (TAMU).

Neotropical. **BOLIVIA**: Chochabamba, 9.VI.69, F.A. Squire, *M. domestica* (USNM). **BRAZIL**: São Paulo, Botucatu, Edgardia Farm, 22-29.VI.01, C. Reigada, *Chrysomya putoria*. **MEXICO**: Veracruz, Mpio, Xalapa, XI.88, M. Lopez O., *Anastrepha ludens* lab culture (TAMU). **NICARAGUA**: Esteli, 28.V.02, *M. domestica* (MZCR). **PERU**: reared VIII.29, New Orleans, LA, H.A. Jaynes, *Paratheresia* puparia (USNM); reared 15.III.78 in lab., Riverside, CA, *M. domestica* (UCRC). **PUERTO RICO**: Cayey, 26.VIII.80, B. Hawkins, *M. domestica* (UCRC). Rio Piedras, 11.IV.63, E.F. Legner, *M. domestica* (UCRC, USNM). **TRINIDAD**: 1.X.70, F.D. Bennett, *M. domestica* (UCRC). **URUGUAY**: Montivideo So. Am. Par. Lab, B. Parker, ? *M. domestica* (USNM). **U.S. VIRGIN ISLANDS**: St. Croix, near Christiansted, 4.VIII.75, P. Morgan, *M. domestica* (FSCA).

Distribution. A cosmopolitan species that Noyes (2003) records from all six biogeographic regions. Within the New World (Fig. 146) I saw specimens from North America (Canada, USA, Mexico), Central America (Belize, Guatemala, Nicaragua), West Indies (Dominica, Dominican Republic, Puerto Rico, St. Vincent, Trinidad, U.S. Virgin Islands) and South America (Bolivia, Brazil, Chile, Colombia, Galapagos Islands, Peru, Uruguay). Additional unconfirmed records based on Noyes (2003) include Argentina, British Virgin Islands, Costa Rica, Ecuador, and Venezuela.

Biology. Noyes (2003) lists *S. endius* as a primary parasitoid of at least 50 different host species in 9 families of Diptera and as a hyperparasitoid of *Bombyx mori* (L.) (Lepidoptera: Bombycidae) and *Diatraea* sp. (Lepidoptera: Pyralidae). Most records I saw from the New World were from the house fly, but also the stable fly and horn fly as well as the onion maggot, *Delia antiqua* (Meigen) (Anthomyiidae), *Chrysomya putoria* (Wiedemann) (Calliphoridae), the little house fly *Fannia canicularis* (L.) (Fanniidae), the black dump fly, *Hydrotaea* (= *Ophyra*) *aenescens* (Wiedemann) (Muscidae), *Paratheresia* sp. (Tachinidae), and the Mexican fruit fly, *Anastrepha ludens* (Loew) and Caribbean fruit fly, *Anastrepha suspensa* (Loew) (Tephritidae).

Recognition. I include *S. endius* along with *S. nigripes* in the *endius* species group. Both species are characterized by a pronotal collar with isolated circular punctures separated by shiny interstices. The two species are most easily differentiated by the presence in *S. endius* (Figs 134, 135) and absence in *S. nigripes* (Figs 332, 334) of a punctate-crenulate cross-line on the pronotal collar, plus other features given in the key. Sculpture of the internotaular region also differs slightly between the two species. The internotaular region is mostly smooth and shiny lateral to the median punctate-rugose region in *S. endius* (Figs 134, 135), whereas in *S. nigripes* there are distinct circular punctures lateral to the median punctate-rugose region (Figs 332, 334). Individuals of *S. endius* also have brighter yellow tarsi (excluding the apical segment), the median propodeal carina in lateral view is flat or low convex rather than angulate subbasally, and the subalar depression is more obviously rugose than in *S. nigripes* (*cf.* Figs 138, 139 with Fig. 335), although these differences are not always obvious.

The original description of *S. orientalis* stated that the types were deposited in ANIC, but the holotype is in the BMNH. Females in AEIC identified by De Santis from Nova Teutonia (Santa Catarina) as *S. endius* are a mixture of *S. drosophilae*, *S. plaumanni*, and *S. bethyloides*.

Fig. 146. Distribution of *Spalangia endius* Walker.

9. *Spalangia erythromera* Förster, 1850
(Figs 147–167, 173)

Spalangia erythromera Förster, 1850: 512–513; lectotype ♀ (NHMW, not examined) by Bouček (1963: 466). Type data: [Germany] Aachen [lectotype: ♀ Or. Ex., Collect. G. Myer].

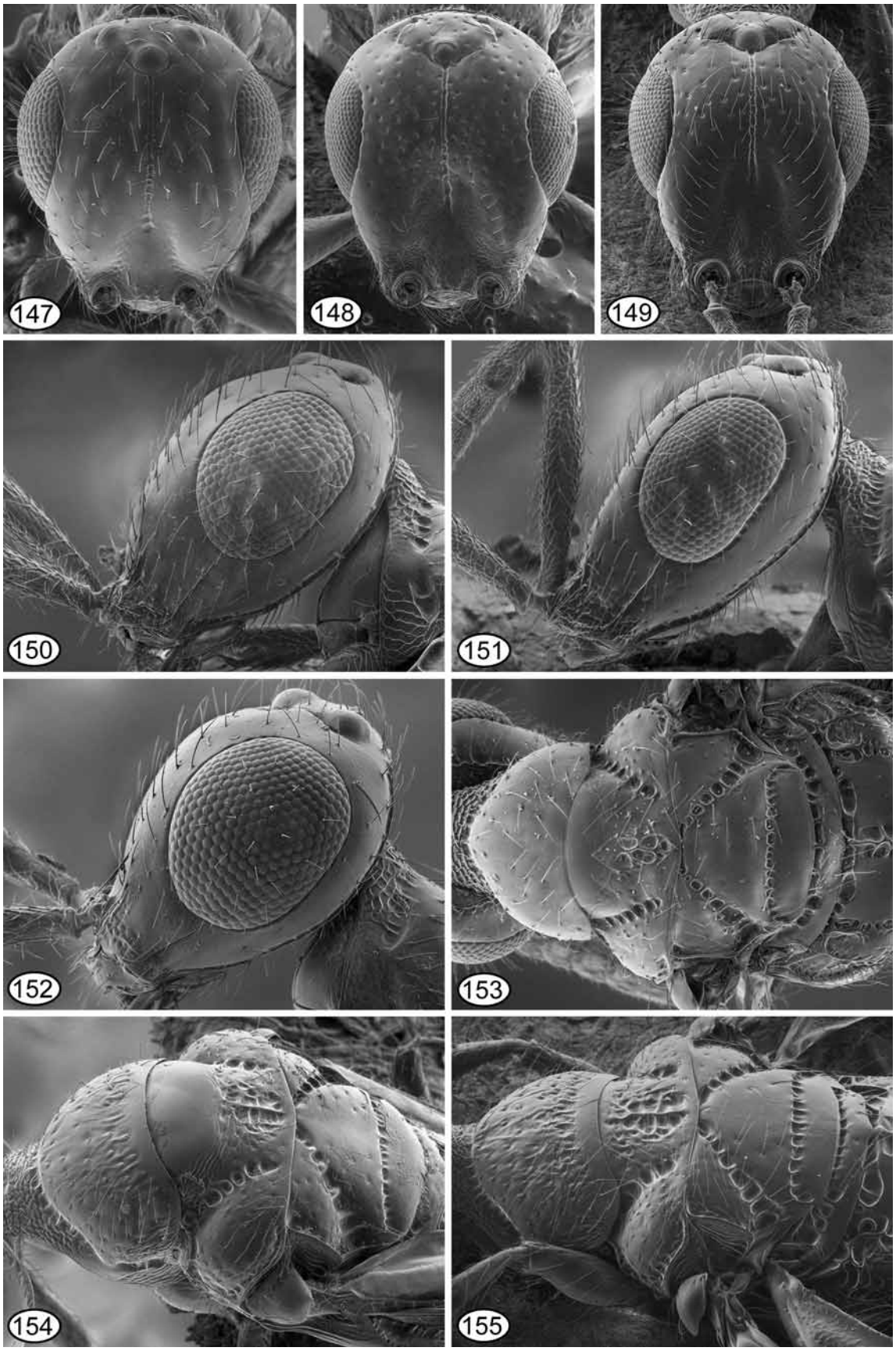
Spalangia umbellatarum Förster, 1850: 513–515; lectotype ♂ (NHMW, not examined) by Bouček (1963: 467). Type data: [Germany] Aachen, Cologne, and between Eupen and Malmedy [lectotype: Collect. G. Mayr]. Synonymy by Bouček (1963: 466).

Spalangia spuria Förster, 1850: 515–516; lectotype ♀ (NHMW, not examined) by Bouček (1963: 468). Type data: [Germany] 6 individuals around Aachen and 1 between Eupen and Malmedy [lectotype: ♀ Or. Ex., Collect. G. Myer]. Synonymy by Bouček (1963: 466).

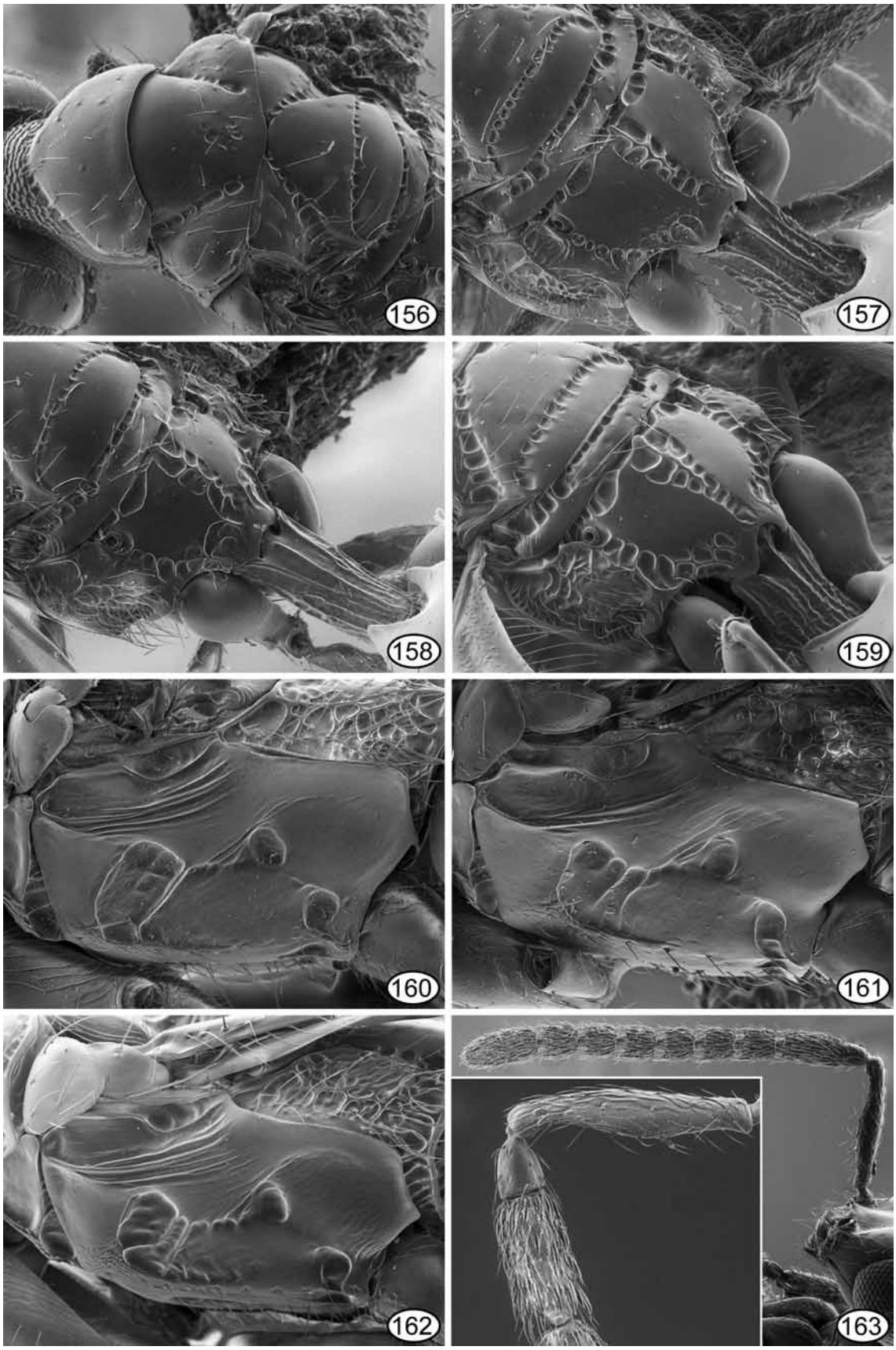
Spalangia erythromera brachyceps Bouček, 1963: 471–472; holotype ♀ (NMPC, not examined). Type data: Czechoslovakia, Deblík Hill S of Ústí nad Lab., 15.VI.1957, Bouček. **New synonymy**.

Description. *Female*. Length = 1.2–2.7 mm. Legs dark except sometimes knees and almost always basal 3 or 4 tarsal segments yellow, but very rarely tarsi uniformly brown or with only basal segment of front leg yellow. Head in anterior view (Figs 147–149) about 1.0–1.2x as high as wide; in dorsal view about 1.6–1.8x as wide as long; in lateral view (Figs 150, 151) with malar space about 0.7–0.9x as long as eye height and about 0.9–1.2x eye width. Head capsule (Figs 147–152) smooth and shiny except for setiferous punctures as follows: with complete median sulcus extending ventrally to elongate scrobal depression, otherwise upper face and parascrobal region with at most widely spaced, pinprick-like punctures; scrobal depression with finely coriaceous to coriaceous-granular scrobes on either side of more finely coriaceous to smooth and shiny interantennal region, and with setae extending over smooth, inclined surface of depression from parascrobal region, the setae sometimes originating from tiny bumps near torulus; gena usually rugulose-roughened near oral margin and with linear malar sulcus, but otherwise smooth except for setae; temple mostly smooth except for very sparse setae. Antenna (Figs 164, 165) with scape about 6.4–7.8x as long as wide, the outer surface (Fig. 167) punctate-rugulose to rugulose-roughened but inner surface (Fig. 166) usually more finely sculptured, more or less alutaceous-coriaceous; pedicel about 1.6–2.5x as long as apical width and about 1.9–2.3x as long as fu_1; funicle at with least apical four segments transverse with fu_7 about 1.3–2.0x as wide as long, and sometimes all funicular segments transverse in smaller specimens, but fu_1 about 0.9–1.3x as long as wide and fu_2 often subquadrate; clava about 1.8–2.4x as long as wide.

Pronotal collar in lateral view only very low convex behind neck and with circumpronotal band anterolaterally, but anteriorly smoothly rounded to neck; without cross-line posteriorly, smooth and shiny except for setae at most originating from tiny bumps rather than obvious circular depressions (Fig. 153) or variably extensively and conspicuously coriaceous to longitudinally strigose posteriorly in region of presumptive cross-line (Fig. 154) and/or sometimes strigose-rugose posterolaterally. Mesoscutal median lobe (Figs 153, 154) with anterior convex region finely coriaceous to transversely alutaceous posteriorly; internotaular region smooth and shiny to distinctly coriaceous lateral to median punctate-rugose region extending virtually to transscutal articulation, the sculptured region usually divided by irregular median carina (Fig. 154). Axillae (Figs 153, 154) smooth and shiny except for setae. Scutellum (Figs 153, 154) low convex, usually shiny but rarely coriaceous laterally adjacent to scutoscutellar suture, and sparsely though variably extensively setose with setae originating from at most pinprick-like setiferous punctures; frenum (Figs 153–159) with complete, uniformly developed crenulate frenal line, the punctures of similar depth and width so as to form strongly transverse ∩-shape, including an obliquely angled to almost longitudinal lateral puncture abruptly recurved from transverse portion across scutellum. Mesopleuron (Figs 160–162) comparatively smooth and shiny except as follows: pectal region bare except for 1 posteroventral seta; acropleuron longitudinally striate-carinate with ridges extending posteriorly onto alar shelf; subalar scrobe sometimes a largely smooth, distinctly concave, vertical depression delimited from upper mesepisternum by one or more oblique carinae, but often more extensively longitudinally to obliquely carinate or strigose and not distinctly differentiated from upper



Figs 147–155. *Spalangia erythromera* Förster. **147–149**, head, anterior view: **147 & 148**, N♀, **149**, P♀; **150 & 151**, head, lateral view: **150**, N♀, **151**, P♀; **152**, N♂ head, lateral view; **153**, N♀ mesosoma, dorsal view; **154 & 155**, thorax, dorsolateral view, **154**, N♀, **155**, P♀. Abbreviations, N = Nearctic, P = Palaearctic.



Figs 156–163. *Spalangia erythromera* Förster. **156**, N♂ thorax, dorsolateral view; **157–159**, frenum–petiole, posterodorsal view: **157**, N♀, **158**, N♂, **159**, P♀; **160–162**, mesopleuron: **160**, N♀, **161**, N♂, **162**, P♀; **163**, N♂ antenna (insert: scape–fu_1). Abbreviations, N = Nearctic, P = Palaearctic.

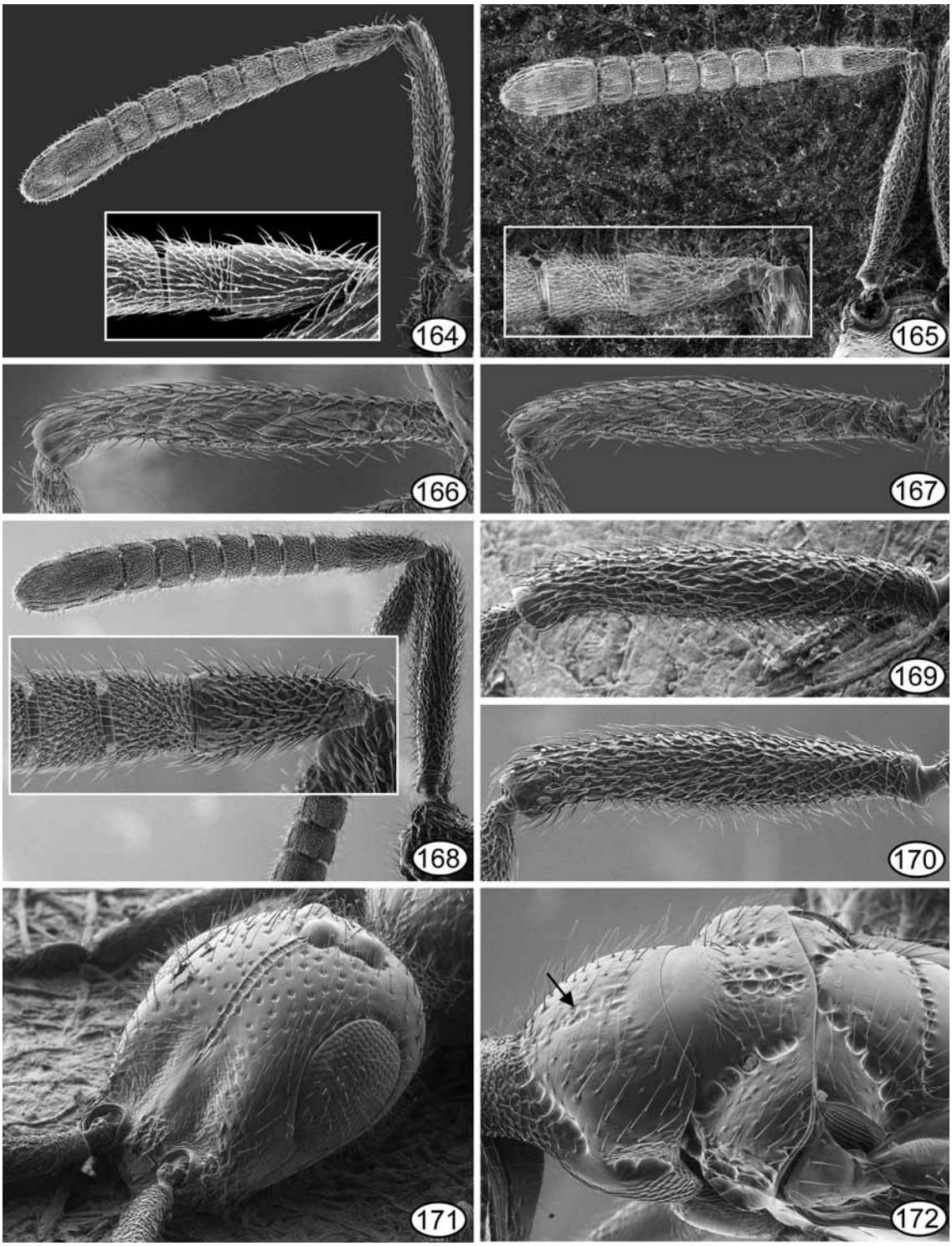
mesepisternum; episternal scrobe quite a distinct depression connected to subalar scrobe by a linear furrow; upper and lower mesepimeron smooth or upper mesepimeron in part finely strigose-alutaceous and lower mesepimeron in part coriaceous-alutaceous; upper and lower mesepisternum differentiated by complete line of closely spaced setae and by carinate transepisternal line over at least anterior half (Figs 160, 161), the upper mesepisternum variably extensively, obliquely carinate-strigose anteriorly and smooth and shiny or sometimes finely mesh-like coriaceous posteriorly. Fore wing hyaline; sometimes extensively setose behind submarginal vein except for vannal region, but mediocubital fold with at least 4 and usually several setae in one or two partial lines and basal cell with 1 or more lines of setae. Propodeum (Figs 157–158) with distinct postspiracular sulcus; callus usually completely reticulate-rugose, rarely with smooth and shiny region adjacent to postspiracular sulcus posterior to level of spiracle; plical region with narrowly V-shaped paramedian crenulate furrows delineating median carina, the carina in lateral view usually distinctly convex except is small specimens; supracoxal bands continuous with paramedian crenulate furrow; panels smooth and shiny.

Petiole (Figs 159, 161) about 1.6–1.9x as long as medial width; longitudinally carinate or punctate-reticulate between carinae; without or only rarely with 1 seta laterally. Gaster smooth and shiny or with very fine coriaceous sculpture on at least Gt_2 and Gt_3.

Male. Length = 1.2–2.0 mm. Antenna (Fig. 163) with scape about 4.7–6.5x as long as wide, the sculpture similar to female except inner and ventral surfaces (Fig. 163, insert) smooth and shiny to finely alutaceous and ventrally with variably conspicuous line of setae, but setae at most about as long as width of scape; pedicel often subglobular, but sometimes up to about 1.8x as long as wide; flagellum with setae much shorter than width of respective segment; funicle with fu_1 (Fig. 163, insert) about 1.4–3.0x as long as wide and about 1.3–2.5x as long as pedicel, and subsequent segments sometimes slightly transverse in small specimens but usually subquadrate to distinctly longer than wide, with fu_7 about 0.8–1.4x as long as wide. Otherwise similar to female except as follows. Head in anterior view about 0.9–1.1x as wide as long; in lateral view (Fig. 152) with malar space about 0.6–0.7x eye height and about 0.8–1.0x eye width; scrobal depression sometimes completely smooth and shiny or with scrobes only very finely coriaceous. Mesoscutal median lobe sometimes with internotaular region only obscurely sculptured (Fig. 156). Fore wing sometimes with slight yellowish-brown tinge. Petiole (Fig. 158) about 2.4–2.9x as long as medial width.

Material examined. *Nearctic* (178♀, 71♂). **CANADA**: ***Alberta***, Clyde, 7 mi. NE, 10-17.VIII.88, T. Thormin (3♀, 1♂). Magrath, 16 km. S, McIntyre Ranch, 26.VIII-9.IX.90, D. Griffith (1♀). Menaik, 15.VIII.61, K.R. Depner (7♀, 5♂). Midnapore, 26.VII.61, K.R. Depner, *Haematobia irritans* (1♂). Rocky Mountain House, 28.VIII.61, K.R. Depner (1♀). Tod Cr., 4.IX.60, K.R. Depner, *Haematobia irritans* (1♂). Wagner Bog, 4 km. W Edmonton, 9.VIII.84, T. Thormin (1♂). Writing-on-Stone Prov. Pk., 0.5 km. W, 31.VIII.81, D. McCorquodale (1♀). ***British Columbia***, Anahim Lk to Redstone, 1000-1500 m., 17.VII.88, S. & J. Peck (3♀, 3♂). Blue Lk, Hwy 97, 34 km. NW Williams Lake, 17.VIII.78, P. Arnaud (1♀ CASC). Cassiar Hwy, Boyar Lk to Stikene R., 6.VIII.98, S. & J. Peck (7♀, 3♂). Osoyoos, Mt. Kobau, 370 m., 24-28.VIII.91, D. Blades & C. Maier (1♀). Sorrento, 17-20.VI.91, H. Goulet (1♂). ***Manitoba***, 17 km. N Woodridge on Hwy 210, Sandilands Prov. For., 5-12. (5♀), 12-19. (1♀), 19-26. (1♀, 2♂) VII.87, 26.VII-2.VIII.87 (1♀), R. Roughley. ***New Brunswick***, York Co., Fredericton, 14, 20, 25.VIII.98, 6.IX.98, D. O'Shea (1♀, 3♂). Kouchibouguac Nat. Pk., 2, 23.VIII.78, S.J. Miller (1♀, 1♂). ***Ontario***, Almonte — 3 km. N, 17-24.VI.86, 12-20.VIII.86, 25.IX-2.X.86, Denis & Dumouchel (3♀); 5 km. NW, 5-12.VII.86, H. Goulet (1♀). Constance Bay — 6-13.VII.73, 13-20.VI.73, G. Gibson (8♀, 1♂); 20-27.VII.73, 3-10.VIII.73, L. Masner (2♀); 28.VIII-9.IX.83, M. Sanborne (2♀). Deerlock, 19.VII.60, S.M. Clark (1♀). London, 1-7.IX.82, 18.IX-1.X.82, A. Tomlin (2♀). Guelph, 24.VII.95, J.M. Dow, composter (3♀ DEBU). Nepean — Pine Glen, 20-26.VII.89, L. Masner (1♀); Slack Road, 5-10.VIII.92, L. Masner (1♀, 1♂). Ottawa — 19.VI.1895, P.G. (1♀); 29.VIII.40, 17.VII.41, O. Peck (2♀); VIII.91, J.R. Vockeroth (1♂); 45º21.365'N 75º42.416'W, 5-8.X.08, H. Goulet (1♀). St. Lawrence Is. Nat. Pk., Grenadier Is., 2.VIII.75, E. Sigler (1♀). Thunder Bay, 10 km. NW Lk Superior, Law Rd, 29.VIII.80, M. Kaulbars (1♀, 1♂). ***Prince Edward Island***, Harrington, 29.VIII.88, 17.IX.92, M.E. Smith

(2♀). ***Quebec***, Gatineau Pk. — 21.VIII.80, D.C. Darling (1♂ ROMT); King Mt., 27.IX-4.X.00, L. LeSage (1♀). Kazabazua, 7 km. N., 8.VIII.92, A. Davis, ex mushrooms (4♀). Luskville Falls, 17-24.VII.86, Denis & Dumouchel (1♂). Perkins, 24.VIII.77, J.C. Cumming (1♀ DEBU). ***Saskatchewan***, Snowden, 28.VII.44, O. Peck (1♀, 1♂). **USA**: ***Alaska***, Chena Hot Sprs., 20.VII.85, H. Andersen (1♀ UCRC). Hope, 27.VII.85, H. Andersen (1♀ UCRC). No. Birchwood, 28.VII.85, H. Anderson (1♀ UCRC). ***Arizona***, Graham's Mts., Hospital Flats campground, 8500', 17.VIII.90, L. Masner (3♀, 3♂). ***California***, Marin Co., Mill Valley, 7.XI.55, H.B. Leech, on rotting tomatoes with *Drosophila* and other flies (1♀ CASC). Modoc Co., Saddle Blkt. Flat, 20.V.71, J. Schuh, ex pack rat nest (1♀ FSCA). Riverside Co., Lake Fulmor, IV-VIII.69, D. Hagstrum (1♀ UCRC). San Louis Obispo Co., 8 mi. ESE Simmier, San Diego Cr., T30S R28E sect. 8, 22-30.VI.87, D.B. Wahl (1♂). Sierra Co., Yuba Pass, 21 km. S Portola, 2060 m., 2.VIII.98, S. Heydon (1♀ UCDC). Yolo Co., 2 mi. N Rumsey, 10.VI.79 (1♂ UCDC). ***District of Columbia***, Rock Cr. Pk., 20.IX.24, under rotten fungi (2♀ USNM). ***Florida***, Tallahasse, 18-23.V.86, H. Howden (1♀). ***Georgia***, Rabun Co., Chatahochee St. For. nr Turnerville, 5-25.VI.84, S. Marshall (1♀). ***Illinois***, Algonquin — 26.VIII.94-98 (1♀ INHS); 4.VI.09, Nason (1♀ INHS). McLean Co., Towanda, 10.IX.87, J. Pinto (1♀). ***Maine***, York Co., West Lebanon, 17-23.VII.90, 21-27.VIII.90, D.W. Barry (2♀ DENH). ***Maryland***, Calvert, 7 km. S Prince Frederick, 24.IX-14.XI.87, BRC Hym. team (4♀). Plummers Island, 14.X.1906, E.A. Schwarz (1♂ USNM). Prince George's Co., Hillcrest Hghts., 11-16.IX.79, dung trap (7♀ USNM). ***Michigan***, Marquette Co., 28.VI.52, R.R. Dreisbach (1♀ USNM). ***Minnesota***, Lac qui Parle, LQP County Park, 6.IX.85, P. Hanson (1♀ OSAC). Olmsted Co., 14.VI.1905, C.N. Ainslie (1♂ USNM). ***Missouri***, Harrison Co., 6 mi. SE Bethany, 28.VI.87, D.S. Chandler (1♀ DENH). Wayne Co., Williamsville, VI.87 (1♀), 1-19.VI.87 (1♀), X.87 (3♀), J.T. Becker. ***Montana***, Babb, 27.VI.88, H. Andersen (1♀ UCRC). Missoula, 15 km. SSW Lolo Hot Springs, 15.IX.95, L.A. Baptiste (1♀ UCDC). ***New Hampshire***, Carr Co. — 1 mi. N Wonalancet, E Fk. Spring Brk., 1900 ft, 18.IX-1.X.85, D.S. Chandler (1♀ DENH); The Bowl, 2.5 mi. NW Wonalancet, 18-23.VII.85, 14-21.VIII.85, 29.VIII-5.IX.85, D.S. Chandler (4♀ DENH). Strafford Co. — Durham, 10.VIII.54 (1♀ DENH), 11.VII.55 (1♀ USNM), R.L. Blickle; 4 mi. W Durham, 14-17.VI.82, R.M. Reeves (1♀ DENH); 3 mi. SW Durham, Spruce Hole, 21.VIII-2.IX.87, D.S. Chandler (1♀ DENH). ***New Mexico***, Bluff Spring, Lincoln Nat. For., 26-30.VII.77 (1♂). ***New York***, Essex Co., Keene Valley, 1200 ft, 20.VII.62, J.G. Chillcott (1♂). Milford Center, 20.VIII.35, H.K. Townes (1♂ AEIC). ***North Carolina***, Jackson Co., Whiteside Mt. — 13.IX.87, L. Masner (1♂); nr Highlands, 1600 m., VII-13.IX.87, BRC Hym team (1♂). Macon Co., Whiteside Mt., 1600 m., 20.VII.87, BRC Hym. team (1♂). McDowell Co., 37º00'N 81º30'W, 9.VII-17.IX.87 (14♀, 14♂), 9.IX-29.XI.87 (2♀, 5♂), BRC Hym. team. Northampton Co., 7 km. S Jackson, 1-7.VII.87 (1♂). ***Oklahoma***, Latimer Co., Red Oak, X.90, K. Stephan (1♀). ***Oregon***, Crook Co., Ochoco Nat. For., 25 mi. E Prineville, Hwy 26, 31.VII.85, A. Finnamore (1♀). Linn Co., McKenzie Pass, Mt. Washington wilderness, 20.VIII.84, Grissell & Schauff (1♂ USNM). Warrenton, 8.VIII.40, H. & M. Townes (1♂ AEIC). Wasco Co., Clear Cr. Cmpgd., NE Warm Spring Jct., 8.VII.86, P. Hanson (1♀ OSAC). ***Pennsylvania***, Cambria Co., 3 km. N Wilmore, 650 m. 30.V.91, L. Masner (1♂). ***South Carolina***, Anderson Co., Pendleton, 250 m., 8-10.VI.87 (6♀), 10-17.VI.87 (2♀, 1♂), 17-27.VI.87 (5♀), 1.VII.87 (2♀), 1-7.VII.87 (4♀), 23-29.VII.87 (1♀, 1♂), 6-14.VIII.87 (2♀), 15-20.VIII.87 (2♀), 14.VIII-9.IX.87 (1♀), 29.VIII-2.IX.87 (1♀), BRC Hym. team. ***Tennessee***, Benton Co., 29.VI.62, 21.VII.52, T.J. Walker (2♀ USNM). ***Utah***, Cache Co., Logan Canyon, 15-31.IX.76, 15-31.IX.76, G.F. Knowlton, ex cow dung (2♀ USNM). Summit Co., Bear R. Wasatch Nat. For., 1-11.VIII.79, 8400 ft, S. & J. Peck (1♀). ***Virginia***, Clarke Co., Blandy Exptl. Farm, 2 mi. S. Boyce, 12.IX-3.X.95, D.R. Smith (1♀). Montgomery Co., 8 km. NW Blacksburg, 1-8.VII.87 (1♂), 1-17.VIII.87 (2♀), BRC Hym. team. Warren Co., Shenandoah Nat. Pk. — Big Meadows, 8VII-20.VIII87, 1300 m., BRC Hym. team (1♀); Compton Gap, 800 m., VII-23.VIII.87, 800 m., BRC Hym. team (1♀, 1♂). ***Washington***, Ashford, 13.VII.40, H. & M. Townes (1♂ AEIC). ***Wyoming***, Sublette Co., Wind River Mts., Big Sandy Cmpgd., 27.VIII.85, P. Hanson (1♂ OSAC).



Figs 164–172. Figs 164–167, *Spalangia erythromera* Förster. **164 & 165**, ♀ antenna (inserts: pedicel and fu_1); **166 & 167**, ♀ scape, **166**, inner view; **167**, outer view. **Figs 168–172**, *Spalangia crassicornis* Bouček. **168**, ♀ antenna (insert: pedicel and fu_1); **169 & 170**, ♀ scape, 169, inner view; **170**, outer view; **171**, ♀ head, frontolateral view; **172**, ♀ pronotum and mesonotum, dorsolateral view. Arrow points to median furrow of pronotum in Fig. 172.

Neotropical (1♀). **VENEZUELA**: Araugua, Maracay, Rancho Grande, cloud forest, 1200 m., 1-10.VIII.87, Borden & Peck (1♀).

Distribution. Common throughout western Europe (Noyes 2003) and in the Nearctic region extending from Alaska to at least southern USA and possibly into South America (Fig. 173) (see further under Recognition).

Biology. The horn fly, *H. irritans*, is the only confirmed New World host record based on voucher specimens of Depner (1968). Noyes (2003) also listed *Muscina* sp. (Muscidae) and several other hosts in Anthomyiidae, Lonchaeidae, Phoridae and Sepsidae in Europe.

Recognition. I include *S. erythromera* as one of five species in the *subpunctata* species group as discussed under *S. subpunctata*. Individuals of *S. erythromera* are differentiated from all other New World *Spalangia* by a combination of two features: pronotal collar lacking distinct circular setiferous punctures or a crenulate cross-line (species-group feature), but scutellum having a uniformly developed, strongly transverse, ∩-like frenal sulcus (Figs 153–159). Other New World species with a similarly smooth pronotal collar (mostly other *subpunctata*-group and *drosophilae*-group species) have the frenal line obviously interrupted medially or the punctures that form the line are largest laterally and become progressively smaller medially so that even if the line is complete it is tapered and usually effaced toward the midline (Figs 442, 443).

Almost all observed New World specimens of *S. erythromera* have mostly yellow tarsi, though I saw two females from Quebec and one from New Brunswick as well as males from British Columbia that have uniformly brownish tarsi except sometimes for the basal segment of the front leg. This darker tarsal color pattern is similar to that described for the morphologically very similar European species, *S. crassicornis* Bouček, which is a parasitoid of myrmecophilous Diptera associated with *Lasius fuliginosus* Latreille (Formicidae) (Bouček 1963). My concept of *S. crassicornis* is based on the four female paratypes deposited in the BMNH by Bouček (1963) and a female identified as *S. crassicornis* in NMPC labelled "Austria: Lienz, Lavant, 22.VII.86, A. Kofler". The features given by Bouček (1963) to differentiate individuals of *S. crassicornis* from *S. erythromera* either are not exhibited by all specimens, including tarsal color and presence of a median longitudinal rugose groove on the pronotal collar (Fig. 172: arrow), or are relative features, such as thickness of the legs and antennae (*cf*. Bouček 1963, figs 35, 40, 43). However, the very few females of *S. crassicornis* I saw do have an obviously thicker and more strongly sculptured scape (Figs 168–170), and the scrobal depression is more extensively coriaceous to transversely coriaceous-strigose above the toruli (Fig. 171) than for females of *S. erythromera*. I have not seen any males or any specimens from the New World that I identify as *S. crassicornis*, though the single New World male with a head that I tentatively identify as *S. nigripes* has the scrobes and inner half of the parascrobal region sculptured similar to female *S. crassicornis*. Individuals, particularly males, of *S. nigripes* are quite similar to *S. erythromera* except for typically being larger and having circular setiferous punctures on both the pronotal collar and gena (see further under *S. nigripes*).

Individuals of *S. erythromera* with dark tarsi could also be mistaken for *S. subpunctata*, but in addition to the difference in structure of the frenal line have an even shinier mesopleuron with a more extensively carinate transepisternal line and closely spaced line of ventral setae (Figs 160, 161) than for most *S. subpunctata* (Figs 440, 441). Furthermore, even though the pronotal collar of *S. subpunctata* is extensively coriaceous (Fig. 438), it is not partly roughened (longitudinally strigose to strigose-rugulose) as in most *S. erythromera* with an obviously sculptured pronotal collar (Fig. 154).

When Bouček (1963) differentiated his new subspecies *S. brachyceps erythromera* from *S. e. erythromera* he described the pronotal collar of the nominate subspecies as having "sparse punctures, these usually lengthened to rugose and dense in a cross-belt before hind margin, here in a shallow transverse impression" (Bouček 1963: 408, fig. 39). This pronotal sculpture describes most specimens of *S. erythromera* I examined from Europe (Fig. 155), whereas specimens from most parts of North America, including the three from Canada (CNC) that Bouček (1963) tentatively assigned to *S. brachyceps erythromera*, have quite a smooth and shiny pronotal collar (Figs 153, 156). Comparatively few North American specimens have some distinct longitudinal wrinkling or rugae posterolaterally or in a slender band in the region of the presumptive pronotal cross-line (Fig. 154). Such specimens tend to be larger, have a more distinctly elongate fu_1 (Fig. 165, insert), and a slightly more elongate head (Fig. 148) than specimens with a smooth pronotal collar, which agrees with the key differential features given by Bouček (1963: 468) to separate *S. e. erythromera* from *S. brachyceps erythromera*. However, as noted by Bouček (1963), the differences could all be correlated with size and possibly to

parasitism of different hosts. I could not find additional quantifiable differences and therefore recognize only one species, *S. erythromera*. Graham (1969) discussed *S. erythromera brachyceps* but did not include subspecies in his list of synonymy for *S. erythromera*, whereas Noyes (2003) listed *S. erythromera brachyceps* as a synonym of *S. erythromera* in his Internet database. This synonymy has been followed by other online catalogs but the names have never before been synonymized formally.

Fig. 173. Distribution of *Spalangia erythromera* Förster.

The female I identify as *S. erythromera* from Venezuela is anomalous because it is the only one I have seen south of the USA, but I cannot differentiate it from other females I assign to the species. I do not include in *S. erythromera* or describe as a new species a CNC male labelled "Ecuador: Napo Prov., El Chaco, 2000m, 11.II.83, M. Sharkey & L. Masner" that has a smooth and shiny pronotal collar, a complete frenal line, and a shiny mesopleuron similar to *S. erythromera*. Although this male keys to *S. erythromera*, it has a conspicuously longer flagellum with fu_1 about 4.7x as long as wide, fu_2 the shortest segment but still twice as long as wide, and the subsequent segments all more than twice as long as wide. The legs are brown with the trochanters, knees, tibiae apically, and basal four tarsal segments yellowish. The fore wing also has a yellowish-brown tinge and is extensively setose behind the submarginal vein, including the vannal region, and the petiole is about 4x as long as its medial width. I have little doubt that this male does not belong to *S. erythromera*, but I prefer not to describe it as a new species until it can be associated with females and these differentiated from *S. erythromera* females.

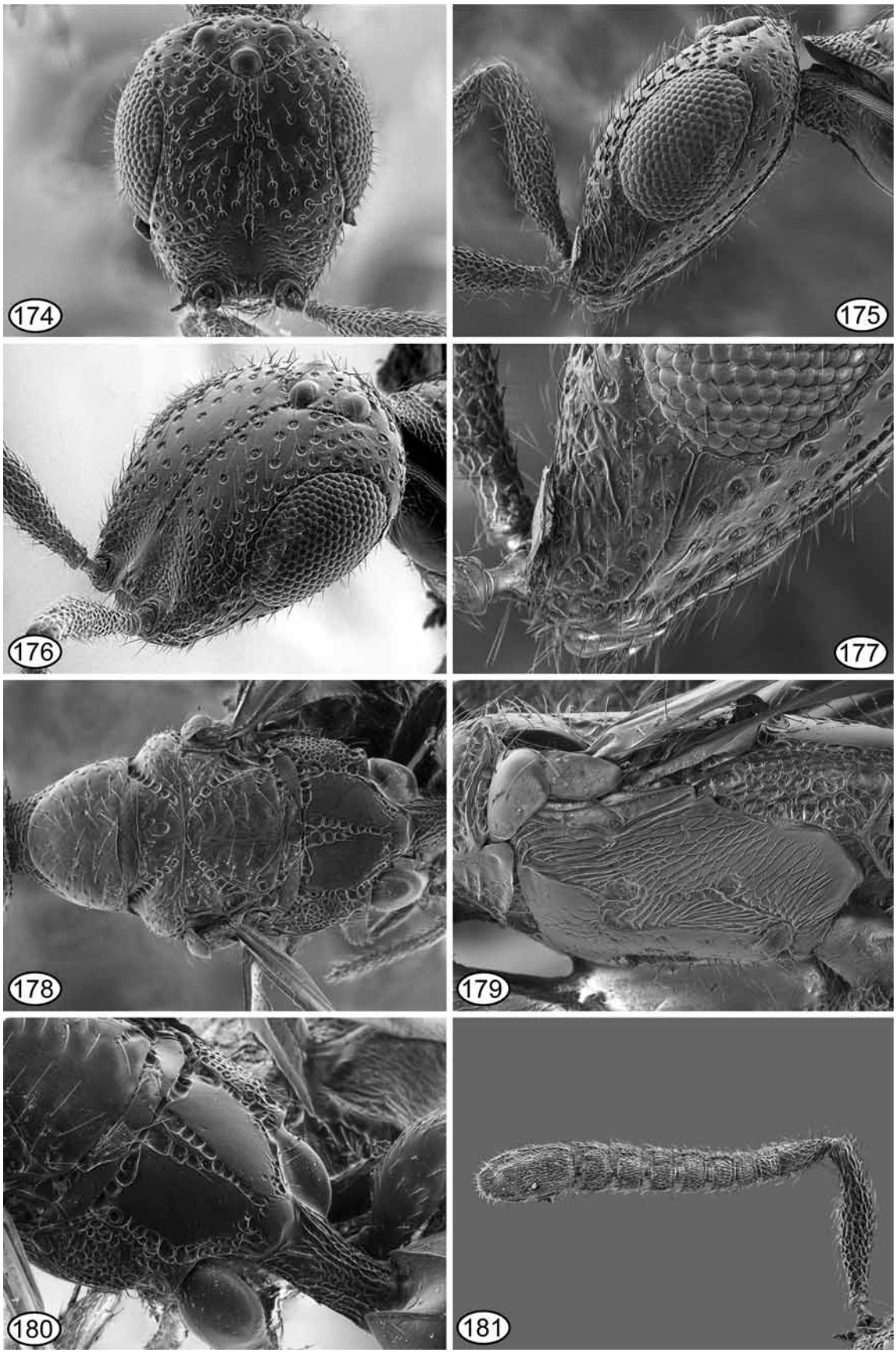
10. *Spalangia flavicrus* n. sp.
(Figs 174–182)

Type material. HOLOTYPE (♀, CNC no. 23884). "DOMINICAN REPUBLIC: La Vega National Park, A. [Armando] Bermudez, Cienaga, 19.vii-2.viii.1995, 1100m, S. & J. Peck / CNCI, LB-specm 2007-039". Condition: point-mounted, entire.

PARATYPES (4♀, CNC). *Neotropical*. **DOMINICAN REPUBLIC**: La Vega, Parque Nac. Armando Bermudez, nr La Ciénaga, 1100 m., 12-22.I.99, L. Masner (1♀). Prov. Pedernales — 23.5 km. N Cabo Rojo, VIII.90, L. Masner (2♀); Sra. [Sierra de] Baoruco, 1450 m., 16-18.VII.90, L. Masner (1♀).

Etymology. A combination of the Latin words *flavus*, meaning "yellow", and *crus*, meaning "leg", in reference to the completely yellow legs that in part differentiate the species.

Description. *Female*. Length = 1.3–1.8 mm. Legs yellow beyond coxae except apical tarsal segment and sometimes metafemur slightly darker, light brownish-yellow. Head in anterior view (Fig. 174) about 1.1–1.2x as high as wide; in dorsal view about 1.9–2.0x as wide as long; in lateral view (Fig. 175) with malar space about 0.6–0.7x eye height and subequal to eye width. Head capsule (Figs 174–176) smooth and shiny except for distinct, flat-bottomed setiferous punctures as follows: with complete median sulcus extending ventrally to level of lower orbit, usually within equilateral-triangular scrobal depression, otherwise upper face and parascrobal region with punctures mostly separated by shiny interstices of one or more puncture diameters medially on upper face, but more closely crowded on parascrobal region near torulus; scrobal depression with smooth and shiny interantennal region and distinctly coriaceous-granular scrobes, the sculpture extending laterally onto parascrobal region where partly obscuring punctures and more rugulose- or punctate-strigose (Fig. 176); gena (Fig. 177) rugose near oral margin but otherwise with distinct setiferous punctures similar to parascrobal region, and with fine linear malar sulcus unless obscured by very closely crowded punctures; temple with distinct punctures similar to gena and upper face. Antenna (Fig. 181) with scape about 4.5–5.5x as long as wide, the inner and outer surfaces uniformly setose and punctate-rugose; pedicel about 1.8–2.1x as long as apical width and about 2.2–3.0x as long as fu_1; funicle with fu_1 quadrate to about 1.3x wider than long and subsequent segments all distinctly transverse with fu_7 about 1.4–1.5x as wide as long; clava about 1.9–2.3x as long as wide.



Figs 174–181. *Spalangia flavicrus* Gibson ♀. **174–176**, head: **174**, anterior view, **175**, lateral view, **176**, frontolateral view; **177**, gena; **178**, mesosoma, dorsal view; **179**, mesopleuron; **180**, frenum–petiole, posterodorsal view; **181**, antenna.

Pronotal collar in lateral view only very low convex behind neck and with circumpronotal band anterolaterally, but anteriorly smoothly rounded to neck; smooth and shiny except often coriaceous posterolaterally and sometimes very faintly and obscurely coriaceous posteromedially, but without differentiated cross-line posteriorly (Fig. 178), and uniformly setose except for median bare band over about posterior two-thirds, with each seta originating from extremely shallow puncture or often from tiny bump partly surrounded by circular line. Mesoscutal median lobe (Fig. 178) with anterior convex region smooth and shiny anteriorly and coriaceous to transversely alutaceous posteriorly; internotaular region with 1 or 2 punctures or rugulose band medially posterior to coriaceous-alutaceous region, but extensively smooth laterally with setae originating from pinprick-like punctures. Axillae (Fig. 178) shiny but variably densely setose, with each seta originating from a tiny bump and/or pinprick-like puncture. Scutellum (Fig. 178) flat, smooth and shiny except for a few pinprick-like setiferous punctures laterally; frenum (Figs 178, 180) with frenal line interrupted over at least medial two-thirds. Mesopleuron (Fig. 179) mostly with distinct sculpture as follows: pectal region smooth and shiny or only very finely and inconspicuously coriaceous but not crenulate anteriorly and bare except for 1 posteroventral seta; acropleuron longitudinally striate-strigose and differentiated from pectal region by obliquely angled or curved carina directed toward base of tegula; subalar and episternal scrobes shallow depressions connected by a shallow, linear furrow; upper and lower mesepimeron quite strongly coriaceous to obliquely alutaceous-coriaceous, the sculpture sometimes effaced on lower mesepimeron posteriorly and dorsally; upper and lower mesepisternum differentiated by fine transepisternal carina and adjacent line of setae, with upper mesepisternum striate-strigose, the striae oblique anteriorly but more longitudinal posteriorly. Fore wing hyaline; mediocubital fold and basal cell with line of several setae. Propodeum (Fig. 180) with distinct postspiracular sulcus; callus punctate-reticulate to rugulose; plical region usually with narrowly V- or Y-shaped paramedian crenulate furrows delineating at least very slender, flat, smooth lanceolate median band, and furrows united into single crenulate line over at least posterior half; supracoxal bands contiguous with paramedian crenulate furrow; panels smooth and shiny.

Petiole (Fig. 180) about 1.8–2.0x as long as medial width; punctate-reticulate to reticulate-rugose between variably distinct longitudinal carinae; bare. Gaster shiny with Gt_1 smooth but at least Gt_2 and Gt_3 in part finely coriaceous.

Male. Unknown.

Distribution. Known only from the Dominican Republic (Fig. 182).

Biology. Unknown.

Recognition. I include *S. flavicrus* as one of seven species in the *drosophilae* species group as discussed under *S. drosophilae*. Although the median lanceolate band on the propodeum of the five known females of *S. flavicrus* is quite narrow and sometimes is essentially carinate (Figs 178, 180), individuals have a conspicuously sculptured mesopleuron (Fig. 179) like most other species assigned to the *drosophilae*-group. Females most closely resemble *S. plaumanni* because both species have distinct setiferous punctures on the gena as well as the face (Figs 174–177, 387–390), but unlike *S. plaumanni* the pectal region is extensively smooth, shiny and bare (*cf.* Fig. 179 with Figs 395, 396), and the pronotal collar has at most a very shallow and obscure transverse depression paralleling its posterior margin (*cf.* Fig. 178 with Figs 391–393). Females of *S. flavicrus* also have yellow legs, a color pattern otherwise possessed only by individuals of *S. bethyloides* from Dominica. Individuals of *S. bethyloides* lack setiferous punctures from the gena (Figs 48, 50) and have less strongly coriaceous scrobes restricted to the scrobal depression (Fig. 52). Individuals of *S. flavicrus* have more strongly and extensively coriaceous scrobes with the sculpture extending onto and partly obscuring the sculpture of parascrobal region (Fig. 174).

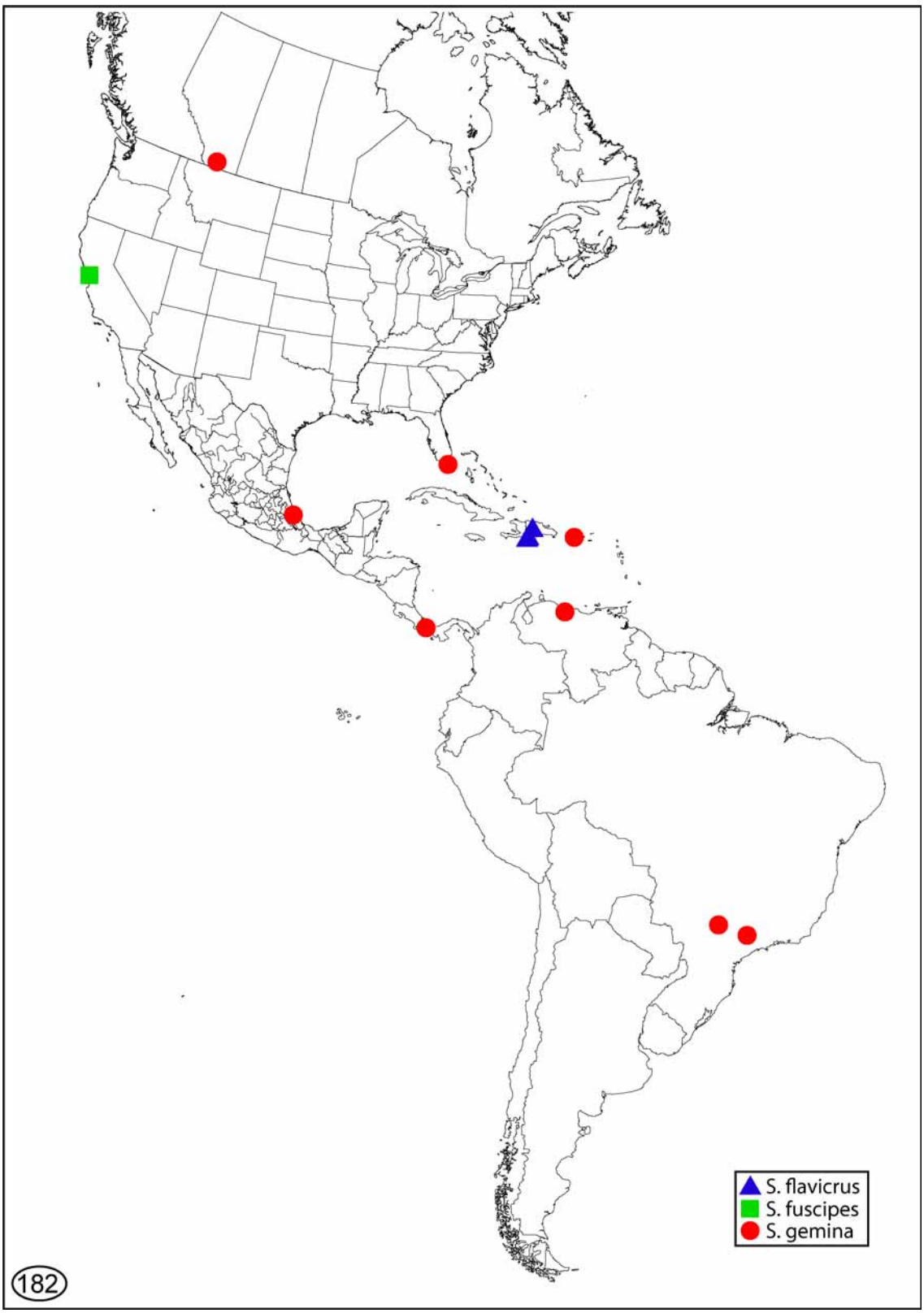


Fig. 182. Distribution of *Spalangia flavicrus* Gibson, *S. fuscipes* Nees and *S. gemina* Bouček.

11. *Spalangia fuscipes* Nees, 1834
(Figs 182–192)

Spalangia fuscipes Nees, 1834: 270; ♀, ♂ syntypes lost (Bouček 1963: 476). Type data: [Germany].

Description. *Female*. Length = 1.6 mm. Legs, including tarsi, dark. Head in anterior view about 1.1x as high as wide; in dorsal view 1.8x as wide as long; in lateral view with malar space about 0.8x as long as eye height and about 1.2x eye width. Head capsule (Fig. 183) smooth and shiny except for setiferous punctures as follows: with complete median sulcus extending ventrally to elongate-triangular scrobal depression, otherwise upper face and parascrobal region with widely spaced, small but distinct punctures; scrobal depression, including interantennal region, coriaceous to coriaceous-granular except inclined lateral surface smooth with setae originating from pinprick-like punctures; gena rugulose-roughened near oral margin and with linear malar sulcus, but otherwise smooth except for setae; temple mostly smooth except for a few pinprick-like setiferous punctures. Antenna (Figs 187, 188) with scape about 6.7x as long as wide, the outer surface rugulose but inner surface more finely coriaceous-alutaceous; pedicel about 2.0x as long as apical width and about 2.5x as long as fu_1; funicle with fu_1 quadrate and subsequent segments transverse, with fu_2 about 1.5x as wide as long and fu_7 about 1.4x as wide as long; clava about 2.5x as long as wide.

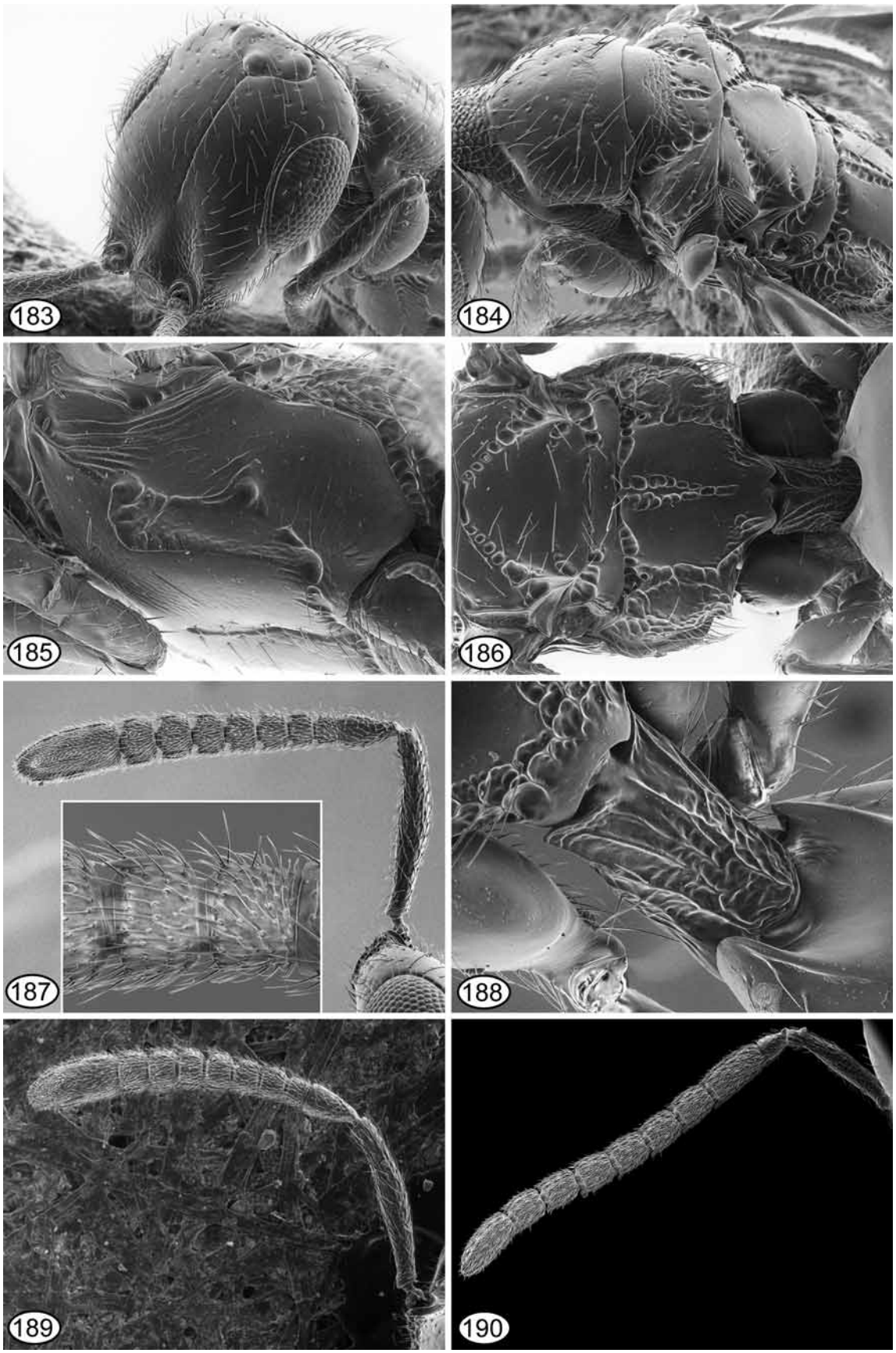
Pronotal collar in lateral only very low convex behind neck (Fig. 184) and with circumpronotal band anterolaterally, but anteriorly smoothly rounded to neck; comparatively smooth without distinct furrow posteriorly but with transverse band of coriaceous sculpture in region of presumptive cross-line, and with setae originating from tiny bumps within at most exceedingly shallow and tiny depressions. Mesoscutal median lobe (Fig. 184) with anterior convex region shiny anteriorly and transversely alutaceous posteriorly; internotaular region smooth and shiny except for a couple of setae posterolaterally, but rugose anterolaterally adjacent to notauli and with narrow median band of rugose sculpture divided by an irregular median carina. Axillae (Figs 184, 186) smooth and shiny except for sparse setae. Scutellum (Figs 184, 186) low convex, shiny and sparsely setose laterally with setae originating from pinprick-like punctures; frenum (Figs 184, 186) with frenal line consisting of 3 or 4 punctures over about lateral quarter, the punctures largest laterally so as to form medially tapered line (Fig. 184). Mesopleuron (Fig. 185) shiny and comparatively finely sculptured as follows: pectal region smooth and bare except for 1 posteroventral seta; acropleuron longitudinally striate-carinate, the ridges extending posteriorly onto alar shelf; subalar scrobe not distinctly differentiated from upper mesepisternum, the combined region obliquely strigose anteriorly but more extensively and finely coriaceous-alutaceous posteriorly; episternal scrobe quite a distinct depression connected to subalar scrobe by a shallow, linear furrow; upper and lower mesepimeron very finely obliquely alutaceous, the lower mesepimeron somewhat more strongly sculptured posteroventrally; upper and lower mesepisternum differentiated by finely carinate transepisternal line extending to precoxal scrobe and line of 3 widely spaced setae adjacent to transepisternal line. Fore wing hyaline; mediocubital fold with line of 6 setae and basal fold with about 15 setae extending distinctly beyond level of most distal seta on mediocubital fold (Fig. 191). Propodeum (Fig. 186) with distinct postspiracular sulcus; callus mostly rugulose but smoother medially; plical region with narrowly V-shaped paramedian crenulate furrows delineating median carina, the carina in lateral view not distinctly convex; supracoxal bands separated from paramedian crenulate furrow; panels smooth and shiny.

Petiole (Fig. 186) with length not measurable accurately; punctate-reticulate between longitudinal carinae; with 2 long setae (at least on right side). Gaster shiny with Gt_2 and subsequent tergites finely coriaceous.

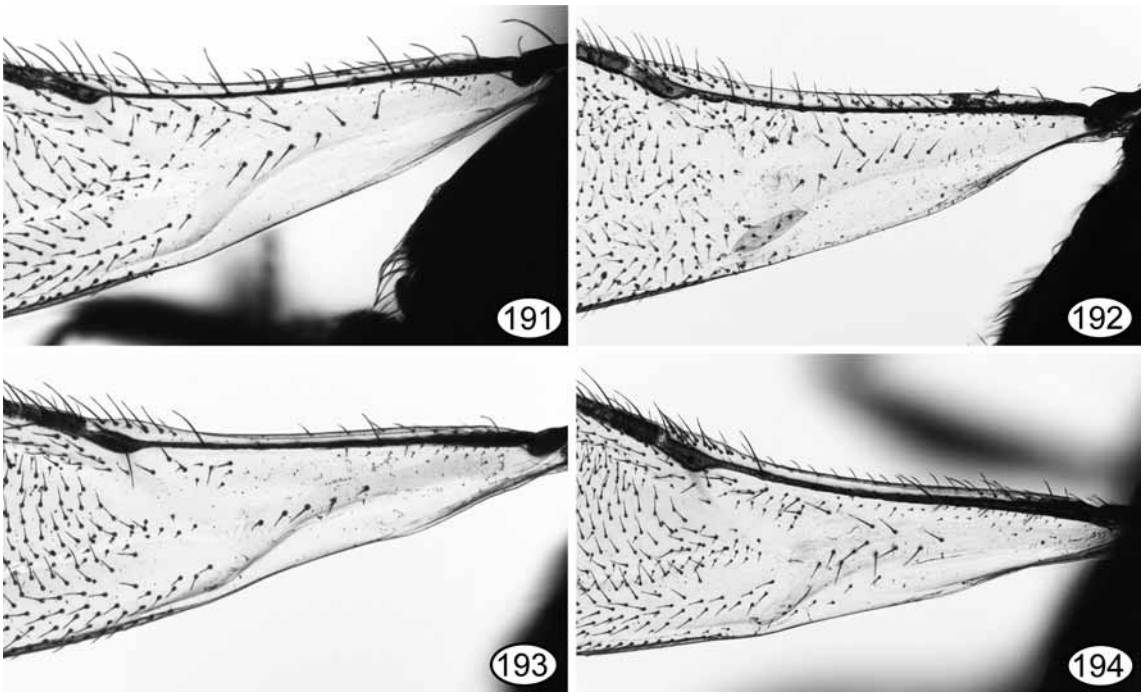
Male. Unknown from region (see Recognition).

Material examined. *Nearctic* (1♀). **USA**: ***California***, Alameda Co., Coyote Hills Regional Park, junction Bayview & Meadowlark trails, 15.VI.04, R.L. Zuparko, ex sedge (EMEC).

Distribution. Presence of *S. fuscipes* in the Nearctic region is based on a single female from California (Fig. 182). Otherwise, the species is primarily Palaearctic (western Europe, northern Africa, and islands east of Morocco), though Noyes (2003) also lists India and Malaysia.



Figs 183–190. *Spalangia fuscipes* Nees. **183–187**, Nearctic ♀: **183**, head, frontolateral view, **184**, mesosoma, dorsolateral view, **185**, mesopleuron, **186**, scutellum–petiole, dorsal view, **187**, antenna (insert: fu_1 and fu_2). **188–190**, Palaearctic: **188**, ♂ petiole; **189**, ♀ antenna; **190**, ♂ antenna.



Figs 191–194. Basal cell of fore wing. **191 & 192**, *Spalangia fuscipes* Nees: **191**, ♀; **192**, ♂. **193 & 194**, *Spalangia subpunctata* Förster: **193**, ♀; **194**, ♂.

Biology. Noyes (2003) reported *S. fuscipes* as a parasitoid of two genera of Cecidomyiidae and of *Oscinella* spp., including the frit fly and *O. pusilla* (Meigen) (Chloropidae). The single North American female was reared from "sedge", which suggests a possible chloropid host.

Recognition. I include *S. fuscipes* as one of five species in the *subpunctata* species group as discussed under *S. subpunctata*. Peck (1963: 908) previously reported this Old World species as one of several "unverified Nearctic records of exotic species" in North America. Peck's listing is based on a catalog record of "USA" in Thompson (1958: 621), which is based on Richardson (1913). The only mention of *S. fuscipes* in Richardson (1913) is in a list of world species arranged by geographic region, in which *S. fuscipes* is listed under Europe (p. 516), and in a list of the hosts that does not include geographic reference (p. 517). Furthermore, the list of species and the key to species of *Spalangia* in North America given by Richardson (1913) does not include *S. fuscipes*. Consequently, previous reports of *S. fuscipes* in North America are erroneous and its reported presence here is tenuous based on only a single female I tentatively identify and describe above as *S. fuscipes*.

Bouček (1963) stated that he could not reliably distinguish some specimens of *S. fuscipes* from *S. subpunctata*. I am equally uncertain regarding reliable features to differentiate the two species, partly because I have seen too few specimens from Europe to confidently assess or supplement the observations of Bouček (1963). My concept of *S. fuscipes* in Europe is based on 1 USNM female and male (Morocco), 1 ZSMC female (Hungary) and male (Switzerland), and 5 females and 5 males (Czech Republic, Moldavian S.S.R., Slovakia) in the NMPC that were identified as *S. fuscipes*, plus 11 CNC females (France, Italy, Spain) that I identify as *S. fuscipes*. As noted by Bouček (1963), females of *S. subpunctata* tend to be larger than those of *S. fuscipes* and have a comparatively longer flagellum with longer funicular segments. However, body size varies substantially in most *Spalangia* species and smaller individuals tend to have shorter or more transverse funicular segments than larger specimens of the same species. Females from Europe that I consider are *S. fuscipes* have fu_1 subquadrate and all subsequent funicular segments transverse, with fu_7 at least about 1.4x as wide as long (Fig. 189). They also have the fore wings extensively setose behind the submarginal vein, with

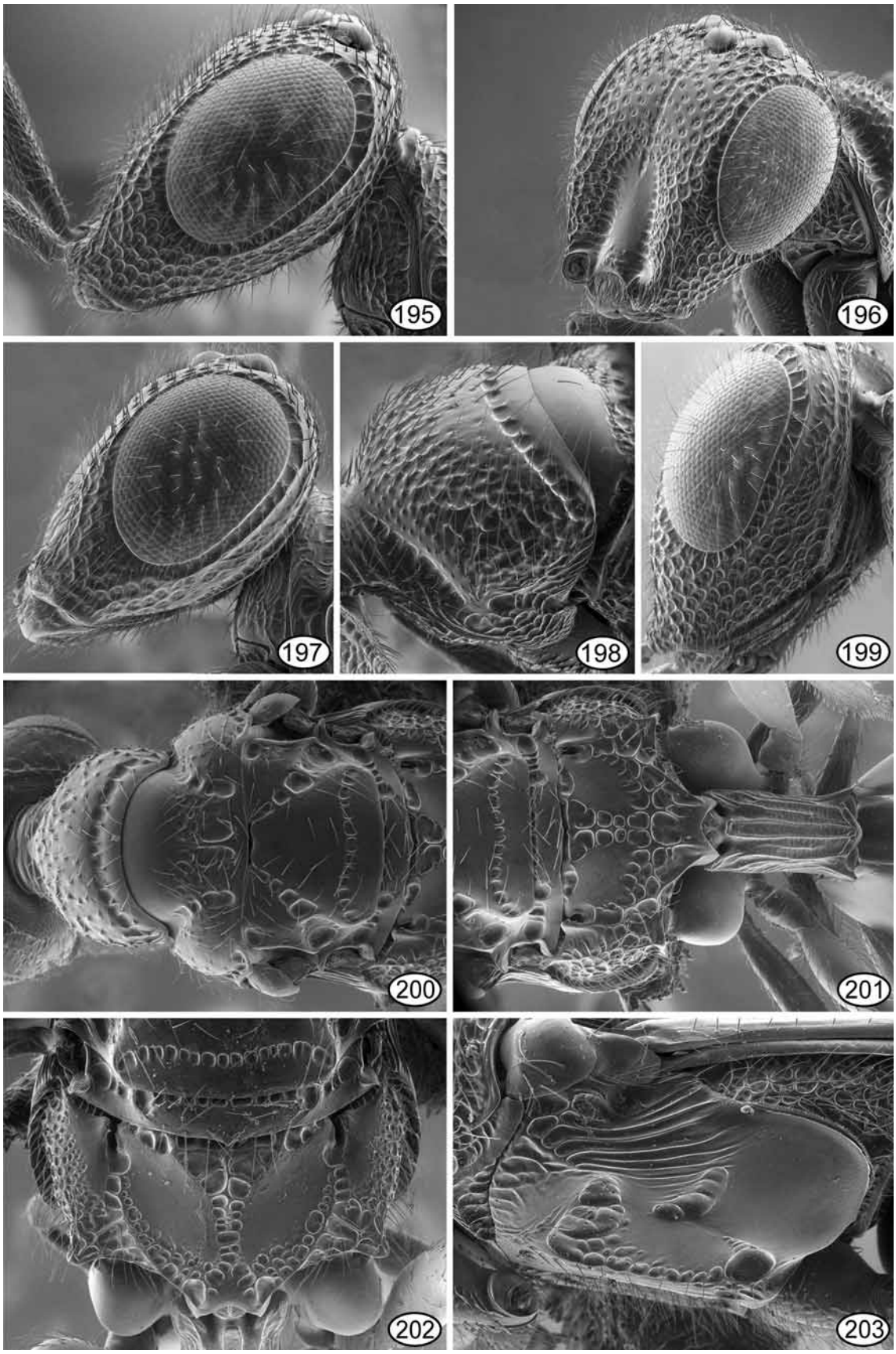
the setae in the basal cell extending beyond the level of the most distal setae on the mediocubital fold. At least most specimens also have two or more setae laterally on the petiole (Fig. 188) and at least some have quite a distinct transepisternal ridge extending to or almost to the precoxal scrobe. However, because of the condition and the way some are mounted on cards I cannot be certain whether either basal cell or petiolar setation is diagnostic for all European *S. fuscipes*. Individuals of *S. subpunctata* have at most one seta laterally on the petiole and an evident transepisternal ridge only anteriorly below the distinctly strigose-rugose portion of the combined subalar scrobe and upper mesepisternum (Fig. 440). Most females I assign to *S. subpunctata* from North America also have at least fu_1 and fu_2 oblong and the more distal segments subquadrate rather than distinctly transverse (Fig. 444). However, some smaller females have shorter, more transverse funicular segments (Fig. 445) that resemble the flagellar structure of *S. fuscipes* (Fig. 189). I assign these females to *S. subpunctata* primarily because of their fore wing setation. They have only a single line of setae on the mediocubital fold and the setae in the basal cell do not extend proximally to the level of the most distal seta on the mediocubital fold (Fig. 193). The single female I identify as *S. fuscipes* from California has a flagellar structure (Fig. 187) and fore wing setal pattern (Fig. 191) similar to European *S. fuscipes* females as well as a fine but distinct transepisternal ridge extending to the precoxal scrobe (Fig. 185) and two setae on the right side of the petiole (Fig. 186). The single seta on the left side of the petiole likely results from one seta being broken. I have not seen any males from North America that I identify as *S. fuscipes*. The flagellum of European males of *S. fuscipes* are slightly more robust than that of North American males of *S. subpunctata*, but the funicular segments are often similarly oblong in both species (*cf.* Figs 190, 448) and some smaller North American *S. subpunctata* males have even shorter, quadrate funicular segments. As for several other *Spalangia* species, males of *S. subpunctata* often have more setae behind the submarginal vein than females. Some males have up to about 20 setae (Fig. 194), but as for females the setae on the upper surface of the wing in the basal cell form more or less of a single line (Fig. 194) rather than two quite distinct lines as in European *S. fuscipes* males (Fig. 192). At least most European *S. fuscipes* males also have more than one seta on the petiole. Additional morphological and molecular investigations are necessary to better clarify the species status of *S. subpunctata* and *S. fuscipes* and verify the presence of *S. fuscipes* in North America.

12. *Spalangia gemina* Bouček, 1963

(Figs 182, 195–207)

Spalangia gemina Bouček, 1963: 484–485; holotype ♀ (BMNH, examined). Type data: Mauritius, no. 537, 14.II.1959, L.A. Moutia, ex tomato and citrus infested by *Pardalaspis cyanescens*.

Description. *Female*. Length = 2.7–3.3 mm. Legs dark except at least basal 4 tarsal segments yellow. Head in anterior view only about as high as wide; in dorsal view about 1.7–2.0x as wide as long; in lateral view (Fig. 197) with malar space about 0.6–0.8x eye height and about 0.9–1.0x eye width. Head capsule (Figs 195–197) smooth and shiny except for distinct setiferous punctures as follows: with complete median sulcus extending ventrally to elongate-triangular scrobal depression (Fig. 196), otherwise upper face with crowded but mostly circular punctures often separated by distance similar to own diameter medially but by narrower, often ridge-like interstices laterally and even more closely crowded ventrally on parascrobal region and inclined surface of scrobal depression where uniformly, coarsely punctate- or reticulate-rugose (Fig. 196); scrobal depression with punctate-crenulate scrobes on either side of smooth and shiny interantennal region; gena densely punctate without malar sulcus, the punctures separated by linear ridges and often multisided or more or less reticulate-rugose; temple irregularly reticulate-rugose without distinct circular punctures (Fig. 199). Antenna (Fig. 204) with scape about 6.8–7.1x as long as greatest width, the inner (Fig. 206) and outer (Fig. 207) surfaces

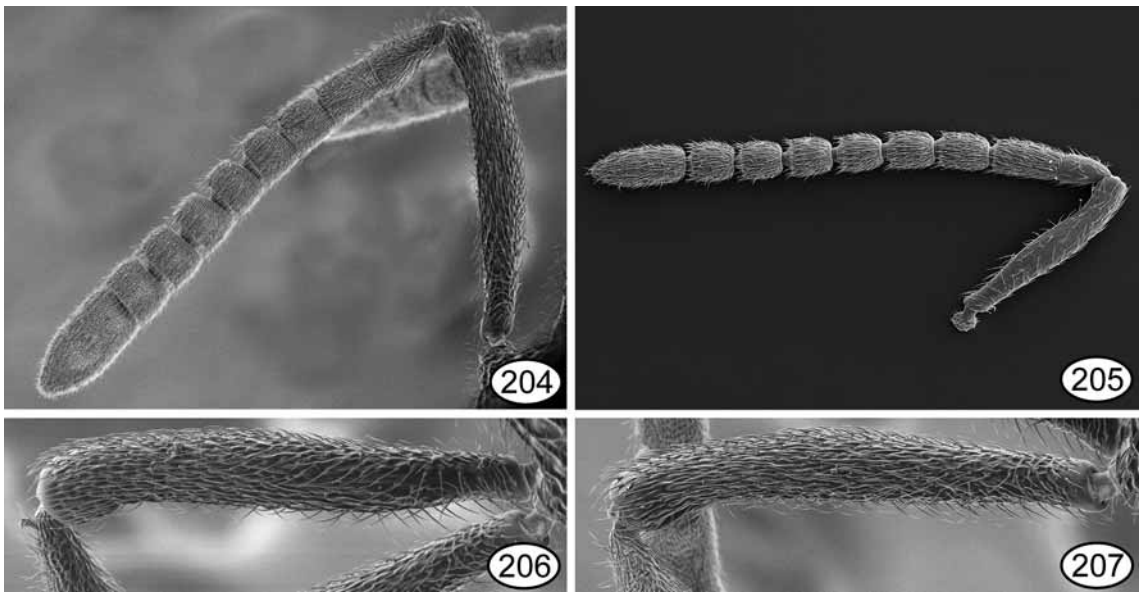


Figs 195–203. *Spalangia gemina* Bouček. **195–197**, head: **195**, lateral view ♀, **196**, frontolateral view ♀, **197**, lateral view ♂; **198**, ♀ pronotum, dorsolateral view; **199**, ♀ gena and temple; **200**, ♂ thorax, dorsal view; **201**, ♂ frenum–petiole, dorsal view; **202**, ♀ frenum–propodeum, dorsal view; **203**, ♀ mesopleuron.

uniformly setose and strongly, longitudinally punctate-strigose; pedicel about 1.9–2.4x as long as apical width and about 1.3–1.6x as long as fu_1; funicle with fu_1 about 1.3–1.5x as long as wide and subsequent segments quadrate basally to distinctly transverse apically, with fu_7 usually about 1.6–1.7x but rarely only about 1.3x wider than long; clava about 1.9–2.2x as long as wide.

Pronotal collar in lateral view convexly arched behind neck and anterolaterally with vertical carinate ridge interrupting circumpronotal furrow, but anteriorly smoothly rounded to neck; with distinct crenulate cross-line posteriorly and otherwise extensively reticulate-rugose except for smoother region posteromedially anterior to cross-line (Fig. 198), the rugose sculpture often partly aligned into short longitudinal rugae or wrinkles but without mediolongitudinal furrow. Mesoscutal median lobe (Fig. 200) with anterior convex region smooth and shiny or only very finely coriaceous posteriorly, but extending posteriorly as narrow median smooth band through punctate-reticulate or reticulate-rugose internotaular region. Axillae (Fig. 200) smooth and shiny except for a few pinprick-like setiferous punctures. Scutellum (Fig. 200) smooth and shiny except for a few pinprick-like setiferous punctures laterally; frenum (Figs 200–202) differentiated by complete crenulate frenal line. Mesopleuron (Fig. 203) smooth and shiny except as follows: pectal region crenulate along anterior margin and bare except for 1 posteroventral seta; acropleuron longitudinally carinate with carinae extending posteriorly onto alar shelf and ventrally over upper mesepimeron to or almost to episternal scrobe; subalar scrobe a vertical to somewhat triangular reticulate-rugose depression, the posteroventral margin usually quite obviously angled posteriorly with sculpture extending along transepisternal line; episternal scrobe a deep and distinct, oblique to lunate crenulate depression either not connected to subalar scrobe or at most by a fine furrow or line of minute punctures; upper and lower mesepisternum differentiated by punctate-crenulate transepisternal line and adjacent line of setae. Fore wing hyaline; bare behind submarginal vein. Propodeum (Figs 201, 202) with distinct postspiracular sulcus; callus with elongate smooth and shiny region along at least basal half of postspiracular sulcus, but punctate to reticulate-rugose laterally and posteriorly; plical region with abruptly widened, Y-shaped paramedian crenulate furrows delineating median carina, and with anterior-most cell(s) obviously transverse; supracoxal bands contiguous with crenulate furrows; propodeal panels smooth and shiny.

Petiole about 1.7–1.8x as long as medial width; almost smooth to finely, transversely carinate between longitudinal carinae; bare. Gaster smooth and shiny.



Figs 204–207. *Spalangia gemina* Bouček. **204 & 205**, antenna: **204**, ♀, **205**, ♂; **206 & 207**, ♀ scape: **206**, inner view, **207**, outer view.

Male. Length = 2.1–3.1 mm. Antenna (Fig. 205) with scape about 6.5–7.6x as long as wide, the inner and outer surfaces finely, longitudinally strigose and shiny, and inner surface smoother than outer surface; pedicel about 1.3–1.8x as long as wide; flagellum with setae much shorter than width of respective segments; funicle with fu_1 about 1.7–2.31x as long as wide and about 1.5–2.2x as long as pedicel, and subsequent funicular segments at least slightly oblong basally to quadrate or slightly longer than wide apically, with fu_7 at most about 1.2x longer than wide. Otherwise similar to female except as follows. Head in anterior view about 1.1x wider than high; in lateral view (Fig. 197) with malar space about 0.5–0.6x eye height and about 0.7–0.8x eye width. Pronotal collar sculpture similar to female but sometimes with obscure mediolongitudinal furrow. Mesopleuron always with large subalar scrobe, but sometimes sculpture less distinctly extended posteriorly along transepisternal line. Propodeal callus completely reticulate-rugose or with only small smooth region lateral to spiracle (Fig. 201). Petiole (Fig. 201) about 1.9–2.2x as long as medial width.

Material examined. *Nearctic* (4♀, 1♂). **CANADA**: ***Alberta***, nr Raymond, feedlot Hwy 52, 26.V-2.VI.00, K. Floate, sentinel house fly pupa (1♀). **USA**: ***Florida***, Dade. Co., Homestead, Subtropical Exptl. Sta., 10.XII.68, R.W. Swanson, *Anastrepha suspensa* pupa (3♀, 1♂ FSCA).

Neotropical (38♀, 35♂). **BRAZIL**: Sao Paulo — Piracicaba, Biol. Control Lab., XII.86, E. Berti-Filho, *Musca domestica* (17♀, 17♂ USNM; 2♀ BMNH; 5♀, 4♂ FSCA); Bastos, V.89, lab. reared *Musca domestica* (4♀, 3♂ USNM). **MEXICO**: Veracruz, Mpio. Xalap, XI.98, M. Lopez O., lab culture on *Anastrepha ludens* (1♀, 4♂ TAMU). **PANAMA**: El Cermeno, em. VII-VIII.41, J. Zetek, ex fruit *Labatia standleyana* (1♀, USNM). **PUERTO RICO**: Juana Diaz, 7.VII.37, K.A. Bartlett, *Anastrepha acidusa* on *Jobo* (1♀, 1♂ USNM). **VENEZUELA**: ex *Anastrepha*, P. Guagliumi (1♀, 1♂ USNM). Maracay — 450 mts., III.51, H.E. Box, *Metagonistylum minense* Towns. (1♀ paratype, 5♀, 3♂ USNM); 1963, P. Guagliumi, CIE 18886, *Drosophila* (2♂ BMNH).

Distribution. Noyes (2003) lists *S. gemina* from the Afrotropical, Australasian, Oriental, and Neotropical region (Brazil). The northern limit of *S. gemina* in the New World is uncertain. Morgan *et al.* (1991), Geden (1996) and Sivinski *et al.* (1998) reported that a culture of *S. gemina* that was established in Gainesville, Florida, from specimens collected in Brazil, was kept for about 36 generations over 5 years. The "lab. reared" specimens from Mexico listed above definitely originated from this culture (Sivinski *et al.* 1998) and the same may be true for the Florida specimens. The record from Alberta (Fig. 182) is certainly anomalous, but the female was sent to me as part of a parasitoid survey.

Biology. Regional hosts indicated through label data for *S. gemina* include *M. domestica*, *Drosophila* sp., *Anastrepha acidusa* (Walker), *A. ludens* (Loew) and *A. suspensa* (Loew) (Tephritidae), and *Metagonistylum minense* Townsend (Tachinidae). Noyes (2003) also lists species of Micropezidae as well as Noctuidae and Tortricidae (Lepidoptera) as primary hosts and *Diachasmimorpha longicaudata* (Ashmead) (Hymenoptera: Braconidae) as a parasitoid host. The record of *D. longicaudata* is based on Sivinski *et al.* (1998), who stated that *S. gemina* did not discriminate between unparasitized *A. suspensa* and those parasitized by *D. longicaudata*, but it is possible that the *S. gemina* larva killed rather than developed in the *D. longicaudata* larva. Sivinski *et al.* (1998) were able to rear *S. gemina* from only *A. suspensa* and *M. domestica* but not another eight host Diptera offered, including *A. ludens* and a species of *Drosophila*, even though label data of observed specimens suggest that both species can be parasitized by *S. gemina*. The apparent rearing of *S. gemina* from *M. minense* also suggests that the two purported lepidopteran host records, *Adisura atkinsoni* Moore (Noctuidae) and *Cryptophlebia pallifrimbriana* Bradley (Tortricidae) result from hyperparasitism through primary tachinid parasitoids, as suggested by Bouček (1963).

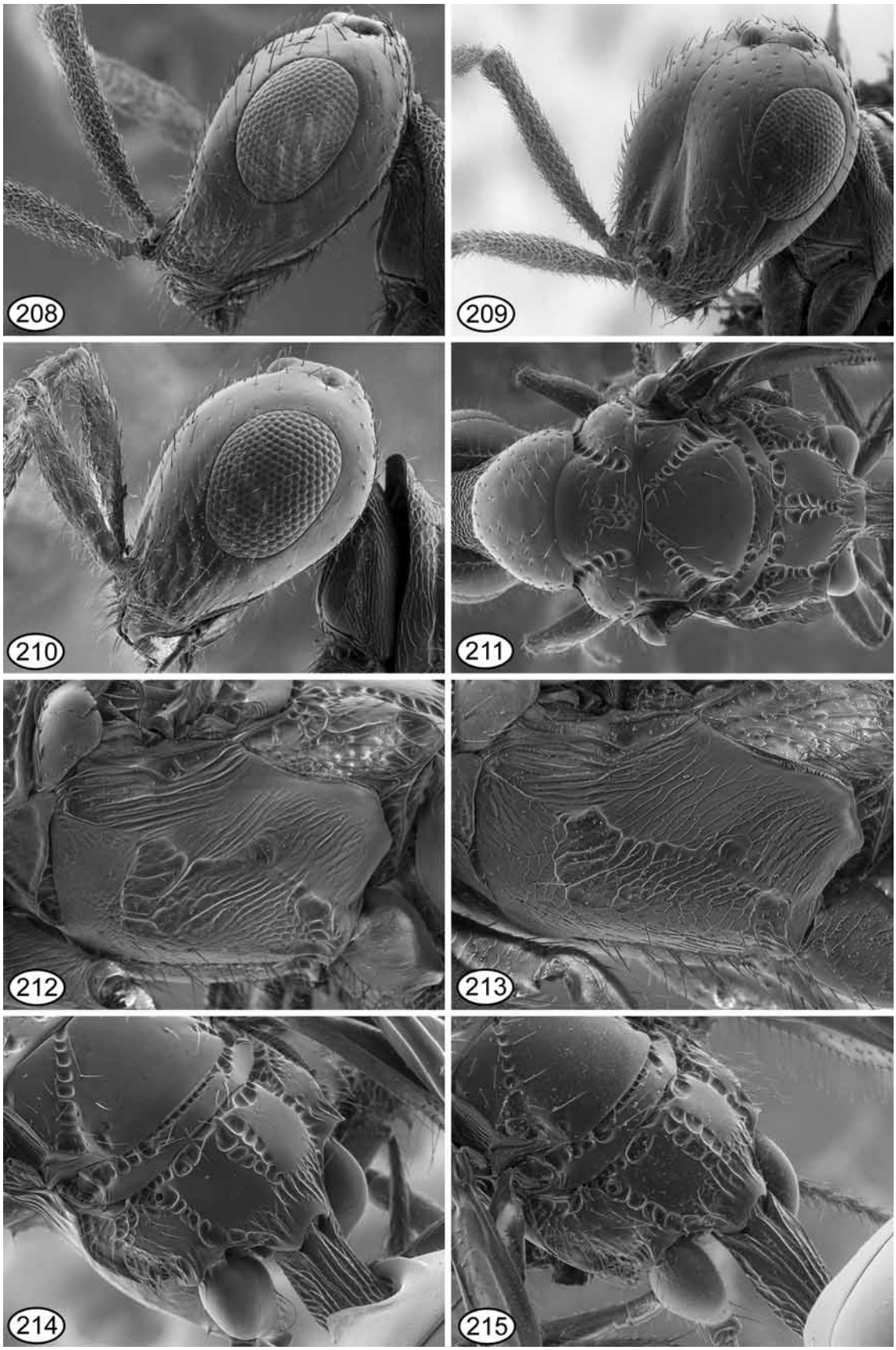
Recognition. I include *S. gemina* as one of three species in the *cameroni* species group as discussed under *S. cameroni*. Among the three species, *S. gemina* uniquely has the parascrobal region, and particularly the inclined surface of the scrobal depression (Fig. 196) and the temple behind the outer orbit (Fig. 199) punctate-rugose to reticulate-rugose rather than with separate circular punctures. Individuals of *S. gemina* also have the upper mesepimeron (Fig. 203) much more extensively carinate than those of *S. cameroni* (Fig. 72), though this is a relative feature. Other differential features are discussed under *S. cameroni*.

13. *Spalangia haematobiae* Ashmead, 1894
(Figs 208–220)

Spalangia haematobiae Ashmead, 1894: 37; holotype ♀ (USNM, examined). Type data: [Warrenton, Virginia,] 4285/24, Sept. 13.9 [1889], [Dr. Riley, from *Haematobia serrata* larva].

Description. *Female*. Length = 1.0–2.5 mm. Legs usually completely dark but tarsi sometimes yellowish-brown. Head in anterior view about 1.1–1.2x as high as wide; in dorsal view 1.5–1.7x as wide as long; in lateral view (Fig. 208) with malar space about 0.9–1.0x as long as eye height and about 1.4–1.6x eye width. Head capsule (Figs 208–210) smooth and shiny except for setiferous punctures as follows: with complete median sulcus extending ventrally to elongate-triangular scrobal depression, otherwise upper face and parascrobal region usually with pinprick-like punctures or punctures at least small and widely spaced if distinct, with setae extending over smooth inclined surface of scrobal depression and often quite dense and originating from tiny bumps ventrally toward torulus; scrobal depression with finely coriaceous to coriaceous-granular scrobes and smooth and shiny interantennal region; gena (Figs 208, 209) rugulose-roughened near oral margin and with linear malar sulcus, but otherwise smooth except for setae originating from at most tiny bumps; temple smooth except for setae similar to gena. Antenna (Fig. 216) with scape about 5.8–7.3x as long as wide, the outer surface (Fig. 218) punctate-rugulose roughened but inner surface usually more finely sculptured, more or less alutaceous; pedicel about 1.7–2.5x as long as apical width and about 1.7–2.0x as long as fu_1; funicle with fu_1 about 1.0–1.5x as long as wide, subsequent segments sometimes all distinctly transverse in small specimens but often subquadrate to slightly longer than wide basally and quadrate to only slightly wider than long apically in large specimens, with fu_7 about 1.0–1.5x as wide as long; clava about 2.4–3.1x as long as wide.

Pronotal collar in lateral view only very low convex behind neck and with circumpronotal band anterolaterally, but anteriorly smoothly rounded to neck; smooth and shiny to sometimes very finely coriaceous laterally or posterolaterally, but without distinct cross-line posteriorly and uniformly setose except mediolongitudinally (Fig. 211), the setae at most originating from tiny bumps sometimes partly surrounded by impressed circular line. Mesoscutal median lobe (Fig. 211) with anterior convex region smooth and shiny anteriorly and finely coriaceous to transversely alutaceous posteriorly; internotaular region smooth and shiny to distinctly coriaceous lateral to median punctate-rugose region, the region extending virtually to transscutal articulation and usually divided by irregular median carina. Axillae (Figs 211, 214) smooth and shiny except for setae. Scutellum (Figs 211, 214) low convex, shiny and variably extensively but sparsely setose with setae originating from at most pinprick-like setiferous punctures; frenum (Figs 211, 214) with frenal line broadly interrupted, consisting of only 1–3 distinct punctures laterally. Mesopleuron (Fig. 212) comparatively shiny and finely sculptured as follows: pectal region at least shiny and bare except for 1 seta ventrally, usually smooth except sometimes finely coriaceous dorsally or rarely completely, very finely coriaceous-alutaceous; acropleuron longitudinally striate-carinate, the ridges extending posteriorly onto alar shelf; subalar scrobe not distinctly differentiated from upper mesepisternum, the combined region variably extensively longitudinally or obliquely strigose to reticulate- or rugose-strigose anteriorly and obliquely alutaceous-coriaceous posteriorly; episternal scrobe quite a distinct depression connected to subalar scrobe by a shallow, linear furrow; upper mesepimeron finely, obliquely alutaceous and lower mesepimeron obliquely alutaceous anteriorly to coriaceous or coriaceous-granular posteroventrally; upper and lower mesepisternum differentiated primarily by partial or complete line of ventral setae, though sometimes with fine transepisternal line within anterior half below strongly strigose portion and/or with fine sulcus ventral to setal line. Fore wing hyaline or sometimes very slightly embrowned; bare behind submarginal vein except for a few setae distally near parastigma. Propodeum (Figs 211, 214) with distinct postspiracular sulcus; callus reticulate-rugulose at least anterior to level of spiracle, but variably extensively smooth and shiny posteriorly beside postspiracular sulcus; plical

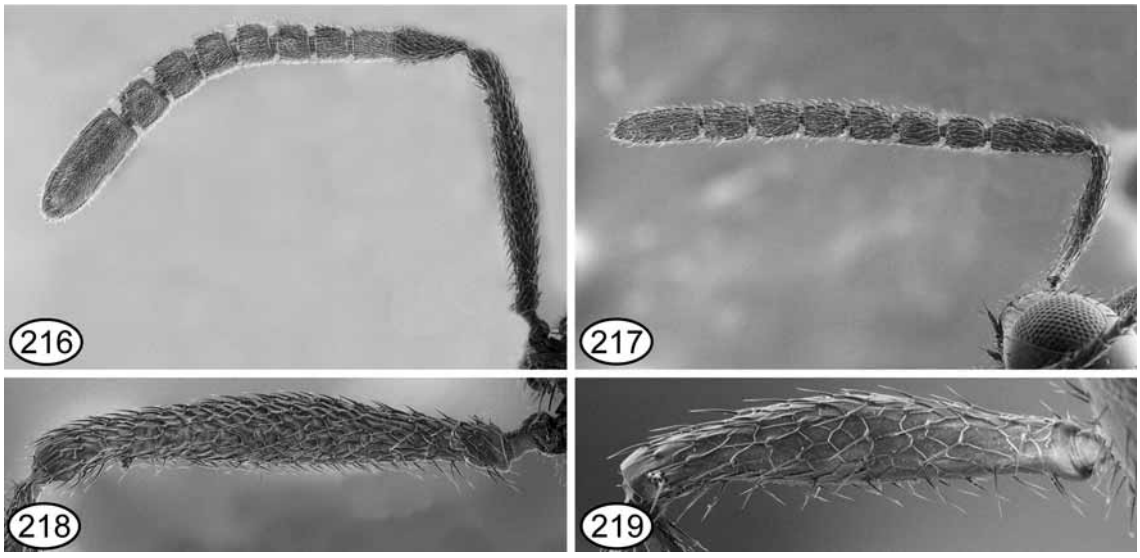


Figs 208–215. *Spalangia haematobiae* Ashmead. **208–210**, head: **208**, lateral view ♀, **209**, frontolateral view ♀, **210**, lateral view ♂; **211**, ♀ mesosoma, dorsal view; **212 & 213**, mesopleuron: **212**, ♀, **213**, ♂; **214 & 215**, scutellum–petiole, posterodorsal view: **214**, ♀, **215**, ♂.

region with narrowly V-shaped paramedian crenulate furrows delineating median carina, the carina in lateral view usually distinctly convex except is small specimens; supracoxal bands usually continuous with paramedian crenulate furrow; panels smooth and shiny.

Petiole (Fig. 214) about 1.2–1.7x as long as medial width; punctate-reticulate between longitudinal carinae; with 1 seta laterally. Gaster shiny with fine coriaceous sculpture on at least Gt_2 and Gt_3.

Male. Length = 0.9–1.6 mm. Antenna (Fig. 217) with scape about 4.9–5.4x as long as wide, the inner and outer (Fig. 219) surfaces similar to female except often more finely sculptured; pedicel about 1.5–1.7x as long as wide; flagellum with setae much shorter than width of respective segment; funicle with fu_1 about 1.7–2.5x as long as wide and about 1.1–2.1x as long as pedicel, and subsequent funicular segments sometimes quadrate in smallest specimens but usually oblong, with fu_7 about 1.1–1.5x as long as wide. Otherwise similar to female except as follows. Head in anterior view about 1.0–1.1x as high as wide; in lateral view (Fig. 210) with malar space about 0.7–0.8x eye height and about 1.0–1.2x eye width. Pronotal collar sometimes completely, very finely coriaceous. Mesonotal median lobe internotaular region sometimes without distinct punctate-rugose median region. Mesopleuron (Fig. 213) with pectal region completely, finely, coriaceous-alutaceous, the sculpture conspicuously different from more irregular, obliquely strigose to alutaceous-reticulate upper mesepisternum (Fig. 213). Fore wing rarely with 1 or 2 setae on mediocubital fold. Petiole (Fig. 215) about 2.2–2.5x as long as medial width.



Figs 216–219. *Spalangia haematobiae* Ashmead. **216 & 217,** antenna: **216,** ♀**, 217,** ♂**; 218 & 219**, scape, outer view: **218,** ♀**, 219,** ♂**.**

Material examined. *Nearctic* (75♀, 45♂). **CANADA**: ***Alberta***, Cypress Hills Prov. Pk., 14.VIII.80, G. Gibson (1♂). Haney's feedlot, 10.VI.97, K. Floate (1♀). Lethbridge Research Centre — 13-25.V.97, 24.VI.97, K. Floate (3♀); late May-early June, 1998/1999/2000, K. Floate, cow pats from pasture (7♀, 1♂); Macleod, 19.VI.50, W.A. Nelson, *Siphona irritans* (2♂). Onefour, 1.VI.56, O. Peck (1♀). Magrath, 16 km. S, McIntyre Ranch, 26.VIII-9.IX.90, D. Griffith (7♂). Writing-on-Stone Prov. Pk. — 10-16, 20-30.VIII.90, M. Klassen (2♀); 6-12.VI.94, D. McCorquodale (1♀); 0.5 mi. E, 27.VI-5.VII.81 (1♀, 1♂), 30.VII-5.VIII.81, 22-30.VIII.81, 8-17.IX.87, D. McCorquodale (3♀, 4♂); east, 27.VII-4.VIII.82, G. Gibson (1♂). ***British Columbia***, Anahim Lk to Redstone, 17.VII.88, 1000-1500 m., S. & J. Peck (6♀). ***New Brunswick***, Fredericton, Acadia Exp. Sta., 14.VII.70, C.M. Yoshimoto (1♀). ***Ontario***, Constance Bay — 1.X.53, J.F. McAlpine, ex cow manure (1♂); 31.VII.59 (1♂). Merivale, 18.VI.45, O. Peck (1♀). Ottawa, 3-10.VI.86 (1♀), 6-17.VII.86 (1♂ UCRC), 17-27.VII.86 (1♂), H. Goulet. ***Prince Edward Island***, N Tryon, 26.VI.91, M.E. Smith (1♀). ***Quebec***, Eardley, Jct. Hwy 148 & Eardley Marsham Rd, 7.VII.92, J. Heraty (1♀ UCRC). Gatineau Pk., 30.VIII.86, J. Denis & G. Gibson (1♀). **USA**: ***California***, Alpine Co., along Monitor Cr., 9 km. SE Markleeville, 38º40'N

119º42'W, 22.VIII.98, S.L. Heydon (1♀ UCDC). Lassen Co., Hallelujah Jct., 2.VII.80, J.A. Skinner (1♀ UCDC). Marin Co., VIII (1♀ USNM). Modoc Co., Warner Mts., 4 mi. W Cedar Pass Cmpgd., 5900', 23.VII.92, J. Pinto & G. Platner (1♂). Orange Co., Ortega Hwy, 4.3 mi. NE Hwy 5, 9.IV.82, H. Anderson (1♀, 1♂ UCRC). Riverside Co., Gilman Hot Spgs., 8.I.77, K.W. Copper, ex pack rat nest (10♀, 5♂ UCRC). San Bernardino Co., 7 mi. E Phelan, 15-30.IV.82, J. Huber (1♀ UCRC). Sonoma Co., 1.5 m. W Bloomfield, 29.IX.70, P. Rubtzoff, ex cow pat (1♀ CASC). Tuolumne Co., Stan. Nat. For., Eagle Meadow, 38º17'14"N 119º50'05"W, 7509 ft, 9.VII.06, S. Fullerton et al. (1♀ UCFO). ***Colorado***, Grand Co., Hwy 40 & Rd 27, 22 km. NNW Kremmling at Chimney Rock, 40º15'N 106º27'W, 4.VIII.99, S.L. & S.M.L. Heydon (1♀ UCDC). Nunn, 21.VI.71, K. Kumar (1♀ USNM). ***Illinois***, Algonquin, 3.VIII.1907, Nason (1♀, INHS). ***Michigan***, Ing. [Ingham] Co., 12.X.73, J. Johnson (1♀ UCDC). ***New Hampshire***, Durham, 6, 15, 27, 29.VII.54, 2.VIII.54, 31.V.55, 16.VI.55, 1.VII.55, R.L. Blickle (12♀ DENH; 1♀ USNM). ***New York***, Ithaca, 16.VII.66, I. Vafiela, cow dung (1♀ USNM). Washington Co., Coon road, 43º10.362'N 73º30.025'W, 28.VII.99, K. Hamilton (12♂). ***Oregon***, Lake Co., Bull Cr. Cmpgd., 15 km. NE Lakeview, 20.VII.94, S.L. Heydon (1♀ UCDC). Curry Co., Mt. Bolivar area, 9.VI.85, P. Hanson (1♀ OSAC). Wasco Co., Clear Cr. Cmpgd., NE Warm Spring Jct., 8.VII.86, P. Hanson (1♂ OSAC). ***South Carolina***, Anderson Co., Pendleton, Tanglewood Spring, 34º38.7'N 82º47.1'W, 225 m., 15-30.X.87, J. Morse (1♀). ***Utah***, Cache Co., Logan Canyon between 3rd Dam & Temple Fork Rd, 15.VI.00, P.J. Russell (1♀, 3♂ UCFO). Garfield Co., Henry Mts., Lonesome Beaver Cmpgd., 27.VIII.81, E.E. Grissell, sweeping *Artemesia* (1♂ USNM). ***Virginia***, [Warrenton], 13.IX.1889, 4285/24, [Riley, ex horn fly larva, *Haematobia serrata*] (holotype ♀, USNM). Winchester, 16.VI.64, O. Peck (2♀). ***Washington***, Grant Co., O'Sullivan Dam, 22.V.54, M.T. James (1#m WSUC). Whitman Co., Pullman, 23.VII.1908, W.W. Mann (1♀ USNM). ***Wyoming***, Chugwater Cr., 10.VIII.86, J. Pinto (1♀).

Neotropical (2♀). **COSTA RICA**: Heredia, La Selva Biol. Station, VII-VIII.98, 50 m., N. Franz (1♀). **DOMINICAN REPUBLIC**: Pedernales, Cabo Rojo, Compañia Alcoa, 17.I.89, L. Masner (1♀).

Distribution. *Spalangia haematobiae* is widely distributed in the Nearctic region at least between about 53º–33ºN, but apparently also extends further south into Central America and West Indies (Fig. 220). The previous distribution record for Costa Rica in Noyes (2003) as well as those for the Caribbean, Mexico, Puerto Rico and U.S. Virgin Islands are based on Burks (1979) and De Santis (1979), which were based on specimens in the USNM that are all *S. imitator* (see below). The record from Hawaii in Noyes (2003) is also incorrect because it is based on Bouček's (1963: 494) statement that *S. lanaiensis* (= *S. impunctata*) might be found to be conspecific with *S. haematobiae*, which is incorrect.

Biology. Noyes (2003) lists hosts of *S. haematobiae* in Anthomyiidae, Muscidae, Sarcophagidae and Sepsidae, but the horn fly, *H. irritans*, is the only host confirmed through examination of voucher specimens. Most of the host records in Noyes (2003) were provided by Blume (1987), including rearings from *Gymnodia* (= *Brontaea*) *debilis* (Williston), *Gymnodia delecta* (Wulp) (= *B. arcuata*), *Gymnodia quadristigma* (Thomson) (= *B. cilifera*) (Muscidae), *Adia cinerella* (Fallén) (Anthomyiidae), *Ravinia derelicta* (Walker) (Sarcophagidae), *Sepsis neocynipsea* Melander and Spuler (Sepsidae), and *Coproica setulosa* (Duda) (Sphaeroceridae). Of the Blume (1987) records, I only saw voucher specimens reared from *A. cinerella* and *R. derelicta* and all are *S. imitator* rather than *S. haematobiae*. Voucher specimens also indicate all host records for *S. haematobiae* in Figg *et al.* (1983) are incorrect, with females reared from *A.* (= *Paregle*) *cinerella* and *Ravinia* sp. being *S. leiopleura* and those reared from *Sepsis biflexuosa* Strobl and *Saltella sphondylii* (Schrank) (Sepsidae) being *S. imitator.*

Recognition. I include *S. haematobiae* as one of five species in the *subpunctata* species group as discussed under *S. subpunctata*. It is most likely to be confused with either *S. imitator* or *S. subpunctata* as discussed under these species. Bouček (1963) included *S. haematobiae* in his key to the Holarctic species and as a valid species (p. 475), but he stated that it might represent only a form of *S. subpunctata* and therefore listed it as a questionable synonym under *S. subpunctata* (p. 473). Likely because of this, both Graham (1969: 55) and Wall (1972: 7) questionably placed *S. haematobiae* under synonymy with *S. subpunctata*.

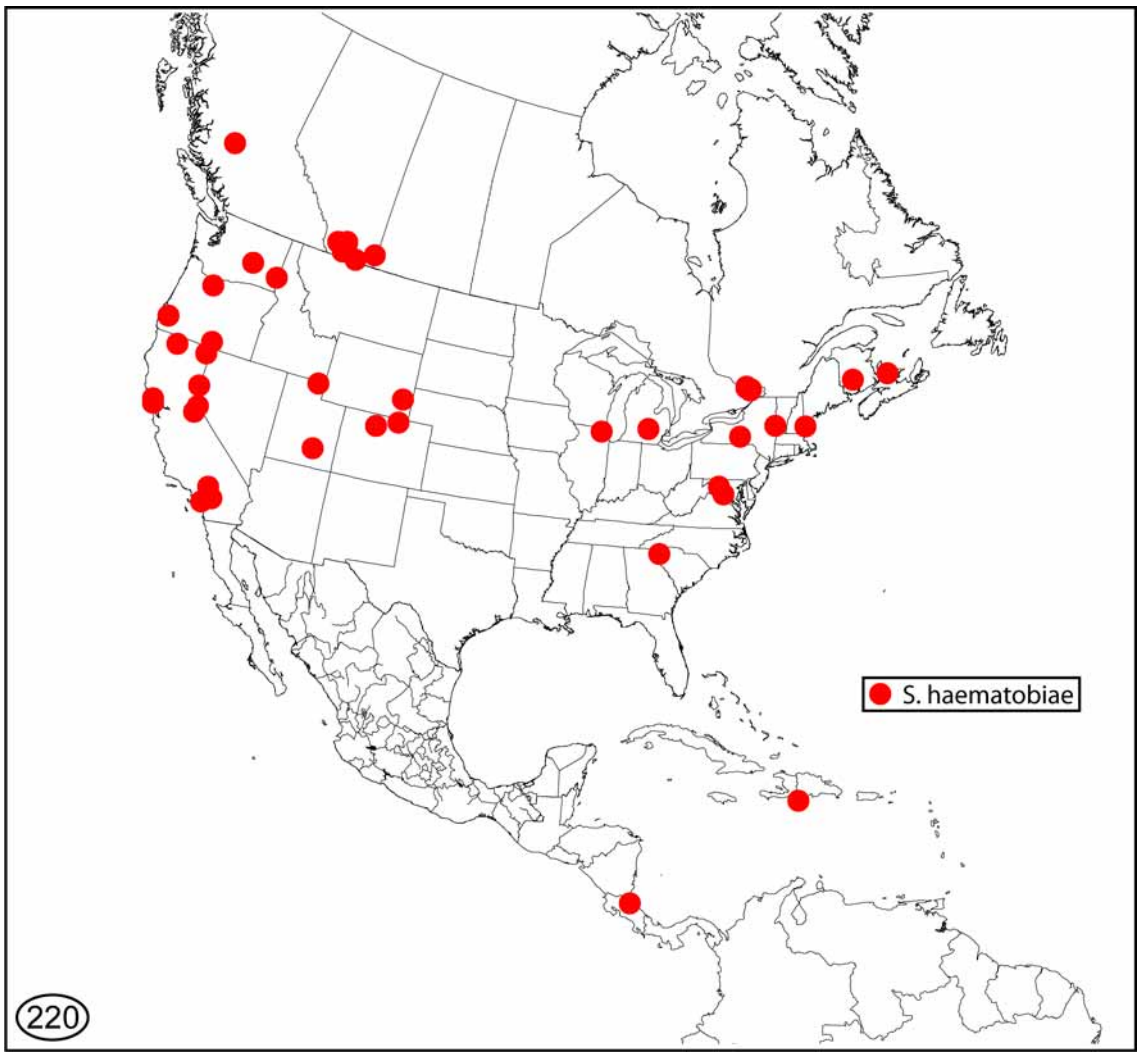


Fig. 220. Distribution of *Spalangia haematobiae* Ashmead.

14. *Spalangia imitator* n. sp.
(Figs 221–237)

Type material. HOLOTYPE (♀, CNC no. 23885). "VENEZUELA: MERIDA, Tabay Mucuy, 1900m, Send. Lag. Suero, 18.VI-2.VIII.1989, S. & J. Peck". Condition: point-mounted, entire.

PARATYPES (242♀, 97♂). *Nearctic* (97♀, 36♂). **USA**: ***California***, Imperial Co., NW Salton Sea Beach, 26.IX.77, V.B. Roth (1♂). San Luis Obispo Co., 8 mi. ESE Simmier, San Diego Cr., T30S R28E sect. 8, 22-30.VI.87, D.B. Wahl (1♀). ***Florida***, Alachua Co., Gainesville — 6.V.75, 22.VI.75, 6.VII.75, 20.VII.75, 27.VII.75, 16.VIII.75, 17.VIII.75, 31.VIII.75, 7.IX.75, 14.IX.75, 26.X.75, 16.XI.75, 30.XI.75, R.L. Escher, *Haematobia irritans* (43♀, 15♂ FSCA); 4.VII.79, S. Dyby, ex flowers of fennel (1♀ FSCA); AEI, 20.VIII-14.IX.87, D.B. Wahl (1♀). Columbia Co., 6.8 mi. NE Fort White, 7.VII.83. J.T. Vaugan, *Stomoxys calcitrans* pupa (1♀ FSCA). Highlands Co., Archbold Biol. Station, 1-18.IX.98, D.B. Wahl (1♀). Manatee Co., Bradenton, 19-26.X.85, C. Yoshimoto (4♀). Monroe Co., Big Pine Key, 15.XII.86, Klimaszewski & Peck, horse manure (5♀). ***Maryland***, Chesapeake Beach, 16.IX.21, Barber & Schwarz (1♂ USNM). ***Mississippi***, Starkville, 22.VI.72, K.J. Watts, horn fly (1♂ USNM). ***Missouri***, Boone Co., 7, 11.IX.71, C. Wingo (2♀ UMRM). Boone Co., Columbia, D.E. Figg — 12.X.81, Anthomyiidae (1♀ UMRM); 23.IX.81, *Saltella* sp.

(3♀ UMRM); 24.VI.81, 28.IX.81, 12.X.81, *Sepsis biflexuosa* (2♀, 1♂ UMRM); 24.VI.81, 6.VII.81, 8, 9, 28.IX.81, 9.X.81, *Sepsis* sp. (7♀, 2♂ UMRM). Taney Co., Protem, 12.VII.75, S. Peck (1♂). Wayne Co., Williamsville, VIII.87 (1♂), X.87 (1♀), 1.XI-10.XII.87 (1♀), J.T. Becker. ***Oklahoma***, Latimer Co., VI.94 (1♀), X.01 (1♀), K. Steffan. ***Texas***, VI.40, L.F. Hitchcock, on dung (2♀ USNM). Brazos Co., College Station, R.L. Blume — 3.V.85, *Ravinia derelicta* in cow manure (7♀, 7♂ USNM); 6-9.V.85, *Hylemia* (*Paregle*) *cinerella* (8♀, 5♂ USNM). Brewster Co., Big Bend Nat. Pk., Maple Canyon, 6200', 30.VI-8.VII.82, G. Gibson (1♀). Cameron Co., Rancho Viejo/Olmito, 3-9.III.96, D.F. Gumz (1♂). Culberson Co., 3.6 mi, S Pine Springs, Old Guadalupe Pass Rd nr Guadalupe Springs, 5200', 20-22.VII.82, sweeping flowering *Acacia constricta*, G. Gibson (1♀). Jeff Davis Co., 12 km. NNE Ft. Davis, 15.VIII.96, L.A. Baptiste (1♀ UCDC). Ward Co., Monahans St. Pk., 6 mi. NE Monahans, 3000', 21-22.VI.82, G. Gibson (1♀).

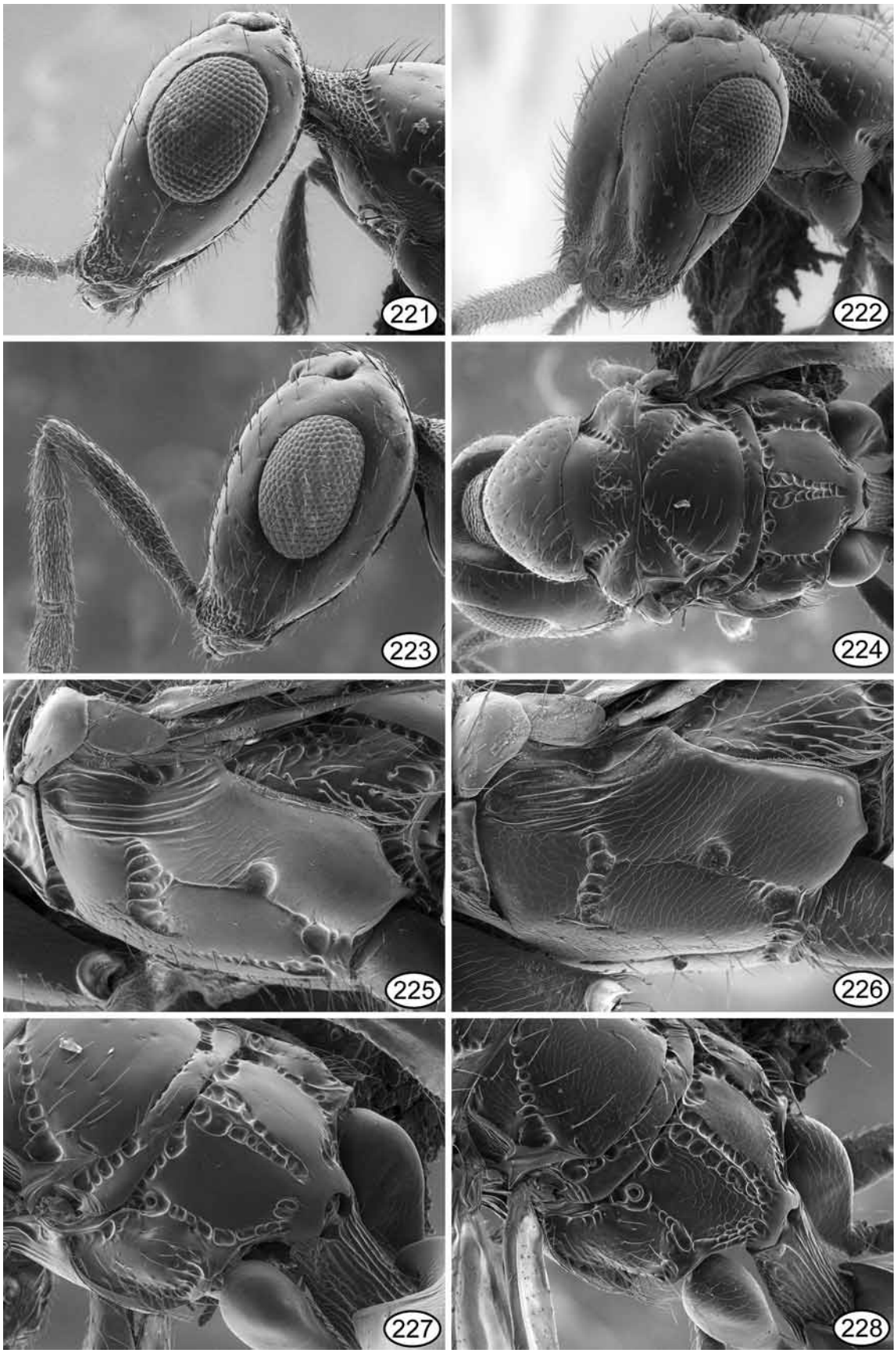
Neotropical (144♀, 61♂). **ARGENTINA**: Misiones, Santa Ana, 14.III.90, Cordo, Sarcophagidae (2♀ MLPA). Tucumán — Horco Molle, 16.I.96, M. Sharkey (4♂); Tucumán, 15.I.96, M. Sharkey (1♀). **BAHAMAS**: Nassau (on plane, Miami Point of Entry), 28.XII.66, Stegmaier (1♀ USNM). **BOLIVIA**: Santa Cruz, 5 km. SSE Buena Vista, 17º29.925'S 63º39.128'W, 440 m., 6-15.XII.03 (2♀), 24-31.XII.03 (1♀), S. & J. Peck. **BRAZIL**: Nova Teutonia, F. Plaumann — 9.VI.41 (1♀, 5♂, BMNH), 10.XI.52 (3♀, BMNH); 27º11'S 52º23'W, 300-500 m., I.73 (1♀). **COSTA RICA**: Alaju. Prov., Caño Negro, R.N.V.S. Caño Negro, 20 m., 6-29.III.93, K. Flores (1♀ INBIO). Alajuela, Chiles de Aguas, Zarcas, Café, 300 m., XII.89, R. Céspedes (1♀ MZCR). Limón, 4 km. NE Bribri, 50 m., IX-XI.89, P. Hanson (1♂ MZCR). Puntarenas, Pen. Osa, 5 km. N Pto. Jiménez, 10 m., Hanson & Godoy (1♀ MZCR); Puntarenas Prov., Res. Biol. Carara, 50 m. — Esta. Quebrada Bonita, III.93, R. Guzmán (1♀ INBIO); Estac. Quebrada Donita, VIII-IX.89, P. Hanson (1♀ MZCR). San Jose, San Antonio de Escazu, 1300 m., VI.88, W. Eberhard (1♀ MZCR). Santo Domingo, INBIO, 6-7.III.96, L. Masner (1♂). Turrialba, 24.III.65, original R-65-40-A, E.F. Legner (1♀ UCRC; 1♀ USNM). **DOMINICA**: Glasham, 25.VIII.65, D.L. Jackson (1♂ USNM). **DOMINICAN REPUBLIC**: Barahona — 4 km. N Paraiso, 150 m., 22.III.91, L. Masner (3♀, 3♂); 7 km. NW Paraiso, 200 m., 27.XI.91, L. Masner & S. Peck (2♀, 1♂). Duarte, 20 km. NE San Francisco de Macoris, Loma Quita Espuela, 300 m., 18.III.91 (1♀, 1♂). Pedernales, Cabo Rojo — 10 m., 28.XI-2.XII.91, L. Masner & S. Peck, (1♀); 13.5 km. N, 140 m., 21.VIII-10.IX.88, M.A. Ivie (1♀); 20 km. N, Las Mercedes turnoff, 21.VIII.88, for. litter, M.R. Iviee, T.K. Philips & K.A. Johnson (1♀, 3♂); 26 km. N, 730 m., L. Masner (1♀). Pedernales — 4 km. W Oviedo, 10 m., Parque Nat. Jaragua, 28.XI-4.XII.81, L. Masner & S. Peck (4♀); Sierra Bahoruco, Alcoa Rd, km. 23-26, 530-750 m., 14.VII.90, L. Masner (1♀). 12 km. W Sanchez Samana, 9.VIII.78, R.O. Schuster (1♂ UCDC). San Cristobal, 20 km. NW San Cristobal Manomatuey, 500 m., 23.III.91, L. Masner (1♀). **ECUADOR**: Napo. Prov. — Baeza, Tena Rd, 12 km. S Jondachi, 18.II.86, Thormin & Wocjicki (2♀); Tena, 18.II.86, A. Finnamore (1♂). Tinalandia nr Sta. Domingo, II.83, Masner & Sharkey (2♀). **GUATEMALA**: Zacapa, San Lorenzo — 17.VII.86, L. LeSage (1♂); 750 m., IX.86 (3♀), 800 m., 10.VII.86 (1♂), M. Sharkey. **GUYANA**: Region 8, Iwokrama For. Res., 4º40'19"S 58º41'04"W, 100-200 m., V-VI.01, R. Brooks & Z. Falin (2♂). **MEXICO**: (Brownsville Point of Entry), 7.XII.51 (1♀ USNM). Baja Cal. Sur, Las Barracas, 16, 17.V.85, P. DeBach (2♀ UCRC). Colima, Manzanillo, 8.VIII.84, G. Gordh (1♀ UCRC). Jalisco, IX.65, N.L. Krauss (2♀ USNM). Michoacán, La Posta, Tarimbaro, 2.X.87, S. Diaz F. (1♀ UNAL). Morelos — Amatlan, 14 km. N Yautepec, 29.X.82, A. Gonzales (1♀ UCRC); Cuernavaca, V.45, ex pupa, fly no.295 (1♀ USNM), IX.65 (1♀ USNM), N.L. Krauss. Nuevo León — Mun Escobedo, Hda., El Canada, 12.VII.83, G. Gordh (1♀ UCRC); San Juan, Río San Juan, 14.VII.83, A. Gonzales (2♀ UCRC). San Luis Potosí, Del Maiz, 3000', 23.VIII.54, J.G. Chillcott (1♂). Tamaulipas — Reynosa, 10.V.05 (2♀), 3, 10, 17, 24.V.05 (24♀, 13m), 17, 24.IV.06 (2♀, 1♂), 5, 27, 29.VI.06 (4♀, 3♂), VI-VIII.06 (4♀, 4♂), 6, 27.VI.06 (5♀, 3♂), 3, 10, 17.VIII.06 (7♀, 6♂), J.F. Luna Salas (CNC, UATV); Cañón Del Novillo, Victoria, 22.V.87, A. González (1♀ UNAL); 3 mi. S Ciudad Victoria on Hwy 85, 1.XI.82, J. Huber & A. González (1♀ UCRC); Valle del Libramiento, Cd. Victoria, 20.XII.87, C. Hernandez (1♀ UNAL). **NICARAGUA**: 5.5 mi. NE Nandaime, 24.VIII.72, G.F. & S. Hevel (1♂ USNM). **PUERTO RICO**: Mayagüez, 11.VIII.35 (Bishopp no. 23540) (1♀ USNM), 13.XII.35 (Bishopp

no. 23661 USNM) (1♀), H.L. Dozier. **ST. VINCENT**: H.H. Smith (2♀ BMNH, 1♂ USNM); St. Andrew, Maloney, 12.VII.76, J.S. Noyes (BMNH, 1♀); St. George, Belmont, 6.VII.76 (BMNH, 1♀). **TRINIDAD**: 8 km. N Arima, Simia Research Station, 240 m., 6-10.VI.93 (2♀), 260 m., 14-24.VI.93 (3♀), S. & J. Peck. Tunapuna Mt., St. Benedict, 500 m., 5-21.VI.93, S. & J. Peck (1♀). **VENEZUELA**: Aragua, H. Pittier Nat. Pk., Portachuelo Pass, 10º21'N 67º41'W, 14.V.88, 1100 m., S. Ashe & R. Brooks (1♀). Merida — Santa Rosa, 1800 m., 15.VIII.81, A. Bricino (1♀); 2000 m., 1.V.81, L. Masner (1♀). Merida — Tabay Mucuy, Send. Lag. Suero, 1900 m., 18.VI-2.VIII.89, S. & J. Peck (11♀, 1♂); Tabay LaMucuy, 1900 m., 18.VI-2.VIII.89, S. & J. Peck (8♀, 1♂). Miranda, 28 km. N Altagracia, Guatopo NP, El Lucero, 700 m., 14.VI-5.VIII.87, S. & J. Peck (1♀). Portuguesa, 10 km. N Biscucuy, 9.IV.81, sweeping *Baccharis*, E.E. Grissell (1♀ USNM). Zulia — Hwy 6 at Rio Lora, 79 km. S Machiques, 12.IV. 81, Grissell (1♀ USNM); 20 km. SE Maracaibo, 30.V.82, Eleodoro E. & E. Rubio E. (1♀ USNM). **VIRGIN ISLANDS**: St. Croix, Longford, VI, IX.38, H.A. Beatty (1♀ USNM).

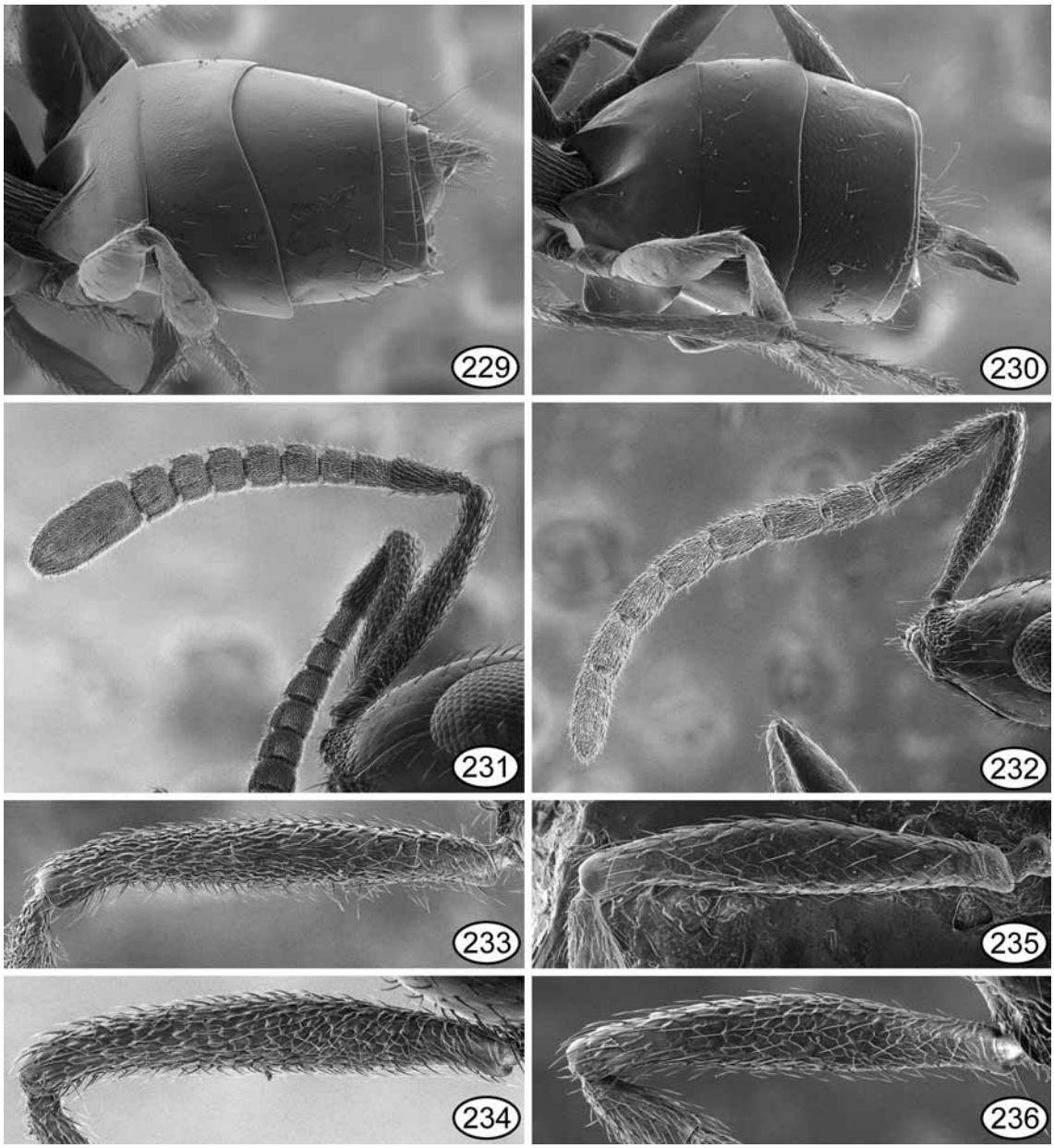
Etymology. The Latin word *imitator*, meaning "mimic", in reference to the close morphological similarity with *S. haematobiae*.

Description. *Female*. Length = 1.0–2.3 mm. Legs dark except basal 1–3 tarsal segments usually yellow in distinct contrast to apical segments, though tarsi sometimes more or less uniformly yellowish-brown to dark. Head in anterior view about 1.1–1.3x as high as wide; in dorsal view 1.6–1.9x as wide as long; in lateral view (Fig. 223) with malar space about 0.8–1.2x as long as eye height and about 1.2–1.5x eye width. Head capsule (Figs 221–223) smooth and shiny except for setiferous punctures as follows: with complete median sulcus extending ventrally to elongate-triangular scrobal depression, otherwise upper face and parascrobal region usually with pinprick-like punctures or punctures at least small and widely spaced if distinct, with setae extending over smooth inclined surface of scrobal depression and often quite dense and originating from tiny bumps ventrally toward torulus; scrobal depression with finely coriaceous to coriaceous-granular scrobes and smooth and shiny interantennal region; gena (Figs 221, 222) rugulose-roughened near oral margin and with linear malar sulcus, but otherwise smooth except for setae originating from at most tiny bumps; temple smooth except for setae similar to gena. Antenna (Fig. 231) with scape about 7.0–8.2x as long as wide, the outer surface (Fig. 234) punctate-rugulose roughened but inner surface (Fig. 233) usually more finely sculptured, more or less alutaceous; pedicel about 2.1–2.4x as long as apical width and about 1.9–3.0x as long as fu_1; funicle with fu_1 about 1.0–1.5x as long as wide, subsequent segments sometimes all distinctly transverse in small specimens but usually subquadrate to slightly longer than wide basally and quadrate to wider than long apically, with fu_7 about 1.1–1.6x as wide as long; clava about 1.7–2.5x as long as wide.

Pronotal collar in lateral view (Fig. 221) only very low convex behind neck and with circumpronotal band anterolaterally, but anteriorly smoothly rounded to neck; smooth and shiny to finely coriaceous posteriorly or medially, but without distinct cross-line posteriorly and uniformly setose except mediolongitudinally (Fig. 224), the setae sometimes originating from tiny bumps. Mesoscutal median lobe (Fig. 224) with anterior convex region smooth and shiny anteriorly and finely coriaceous to transversely alutaceous posteriorly; internotaular region usually smooth and shiny to distinctly coriaceous lateral to median punctate-rugose region (sometimes only obscurely punctate in very small specimens), the region usually extending virtually to transscutal articulation and usually divided by irregular median carina. Axillae (Fig. 224) smooth and shiny except for setae. Scutellum (Figs 224, 227) low convex, shiny and variably extensively but sparsely setose with setae originating from at most pinprick-like setiferous punctures; frenum (Figs 224, 227) with frenal line broadly interrupted, consisting of only 1–3 distinct punctures laterally. Mesopleuron (Fig. 225) comparatively shiny and finely sculptured as follows: pectal region sometimes finely coriaceous dorsally but bare except for 1 posteroventral seta; acropleuron longitudinally striate-carinate, the ridges extending posteriorly onto alar shelf; subalar scrobe a vertical or lunate, crenulate-rugose furrow differentiated from upper mesepisternum (Figs 225, 226); episternal scrobe quite a distinct depression connected to subalar scrobe by a shallow, linear furrow; upper and lower mesepimeron variably finely coriaceous-alutaceous to almost smooth; upper and lower



Figs 221–228. *Spalangia imitator* Gibson. **221–223**, head: **221**, lateral view ♀, **222**, frontolateral view ♀, **223**, lateral view ♂; **224**, ♀ mesosoma, dorsal view; **225 & 226**, mesopleuron: **225**, ♀, **226**, ♂; **227 & 228**, scutellum–petiole, posterodorsal view: **227**, ♀, **228**, ♂.



Figs 229–236. *Spalangia imitator* Gibson. **229 & 230**, gaster: **229**, ♀, **230**, ♂, **231 & 232**, antenna: **229**, ♀, **230**, ♂; **233 & 234**, ♀ scape: **233**, inner view, **234**, outer view; **235 & 236**, ♂ scape: **235**, inner view, **236**, outer view.

mesepisternum differentiated by line of variably widely spaced setae and often a fine sulcus ventral to the line of setae, with upper mesepisternum smooth and shiny similar to pectal region. Fore wing hyaline or sometimes very slightly embrowned; bare behind submarginal vein except for 1 or more setae distally near parastigma or, in some Neotropical specimens, mediocubital fold with 1 or 2 setae and rarely line of 1–3 setae in basal cell. Propodeum (Figs 224, 227) with distinct postspiracular sulcus; callus smooth and shiny at least posterior to level of spiracle beside postspiracular sulcus, and almost completely smooth except along extreme anterior margin in Nearctic specimens; plical region with narrowly V-shaped paramedian crenulate furrows delineating median carina, the carina in lateral view usually distinctly convex except is small specimens; supracoxal bands usually continuous with paramedian crenulate furrow; panels smooth and shiny.

Petiole (Fig. 227) about 1.8–2.2x as long as medial width; punctate-reticulate between longitudinal carinae; with 1 seta laterally. Gaster (Fig. 229) shiny with fine coriaceous sculpture on at least Gt_2 and Gt_3.

Male. Length = 1.0–1.7 mm. Antenna (Fig. 232) with scape about 5.0–6.0x as long as wide, the inner (Fig. 235) and outer (Fig. 236) surfaces similar to female except usually more finely sculptured; pedicel about

1.4–2.0x as long as wide; flagellum with setae much shorter than width of respective segment; funicle with fu_1 about 1.8–3.0x as long as wide and about 1.0–2.0x as long as pedicel, and subsequent funicular segments sometimes quadrate in smallest specimens but usually oblong, with fu_7 about 1.0–1.3x as long as wide. Otherwise similar to female except as follows. Head in anterior view about 1.0–1.1x as high as wide; in lateral view (Fig. 223) with malar space about 0.6–1.0x eye height and about 0.8–1.4x eye width. Upper face and parascrobal region, pronotal collar, and scutellum (Fig. 228) very finely coriaceous. Mesopleuron (Fig. 226) with pectal region and upper mesepisternum similarly coriaceous, the upper and lower mesepimeron more obliquely alutaceous-coriaceous. Propodeum (Fig. 228) with propodeal panel sometimes smooth adjacent to postspiracular sulcus but otherwise variably conspicuously coriaceous. Fore wing sometimes distinctly embrowned; often extensively setose behind submarginal vein, including 1 or more lines of setae in basal cell, but rarely mediocubital fold with only 3 setae. Petiole (Fig. 228) about 2.1–3.0x as long as medial width.

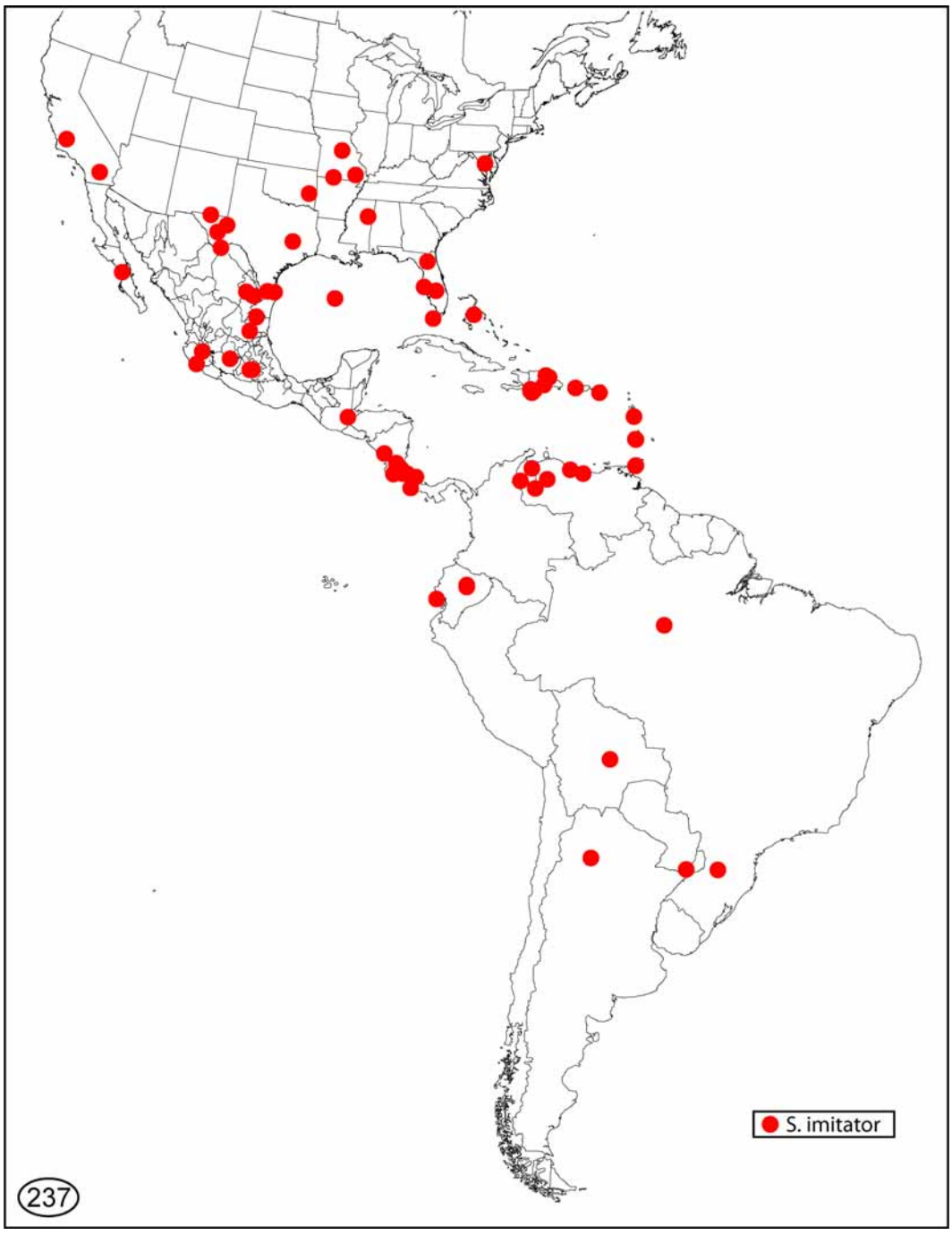


Fig. 237. Distribution of *Spalangia imitator* Gibson.

Distribution. *Spalangia imitator* is a native New World species that extends south from about 40°N in North America through Mexico and Central America (Costa Rica, Guatemala, Nicaragua), West Indies (Bahamas, Dominica, Dominican Republic, Grenada, Puerto Rico, St. Vincent, Trinidad, Virgin Islands) and South America (Argentina, Bolivia, Brazil, Ecuador, Guyana, Venezuela) (Fig. 237).

Biology. A parasitoid of the horn fly and stable fly as well as *Adia cinerella*, *Ravinia derelicta*, *Sepsis biflexuosa* and *Saltella sphondylii*, and possibly also of *Gymnodia arcuata*, *G. debilis*, *G. quadristigma*, *Coproica setulosa*, and *Sepsis neocynipsea* (see Biology under *S. haematobiae*). Loera-Gallardo *et al.* (2008) reared *S. imitator* as *Spalangia* n. sp. 2 from bovine manure in Mexico, but did not determine actual hosts.

Recognition. I include *S. imitator* as one of five species in the *subpunctata* species group as discussed under *S. subpunctata*. *Spalangia imitator* was previously misidentified as *S. haematobiae* when identified in collections. Both species have a frenal line that is widely separated medially (*cf.* Figs 214, 227) and are otherwise very similar except for sculpture of the mesopleuron. In both sexes of *S. haematobiae* the posterior limit of the subalar scrobe is indistinct ventrally so that the subalar scrobe and upper mesepisternum form a single region that is more or less obliquely reticulate- or rugose-strigose anteriorly and obliquely alutaceous-coriaceous posteriorly (Figs 212, 213). Both sexes of *S. imitator* have a more distinctly delineated, vertical to anteroventrally angled (lunate) subalar scrobe, and females have the upper mesepisternum smooth and shiny, mirror-like reflective (Fig. 225), whereas males have the upper mesepisternum finely coriaceous similar to the pectal region (Fig. 226). Furthermore, *S. imitator* males have the head, scutellum, and propodeal panels (Fig. 228) at least in part finely coriaceous, whereas they are smooth and shiny in *S. haematobiae* (Fig. 215) and other *subpunctata*-group males. Most *S. imitator* have partly yellow tarsi, though females from more northern localities can have more or less uniformly yellowish-brown to dark tarsi which is similar to most *S. haematobiae*. Females of *S. imitator*, particularly those from the Nearctic region, have the callus almost completely smooth, though Neotropical females often have the callus reticulate-rugose to about the level of the posterior margin of the propodeal spiracle similar to individuals of *S. haematobiae*. Females of *S. imitator* also sometimes have one or two seta on the mediocubital fold and males often have the mediocubital fold and basal cell quite conspicuously setose, more similar to *S. subpunctata* than *S. haematobiae*.

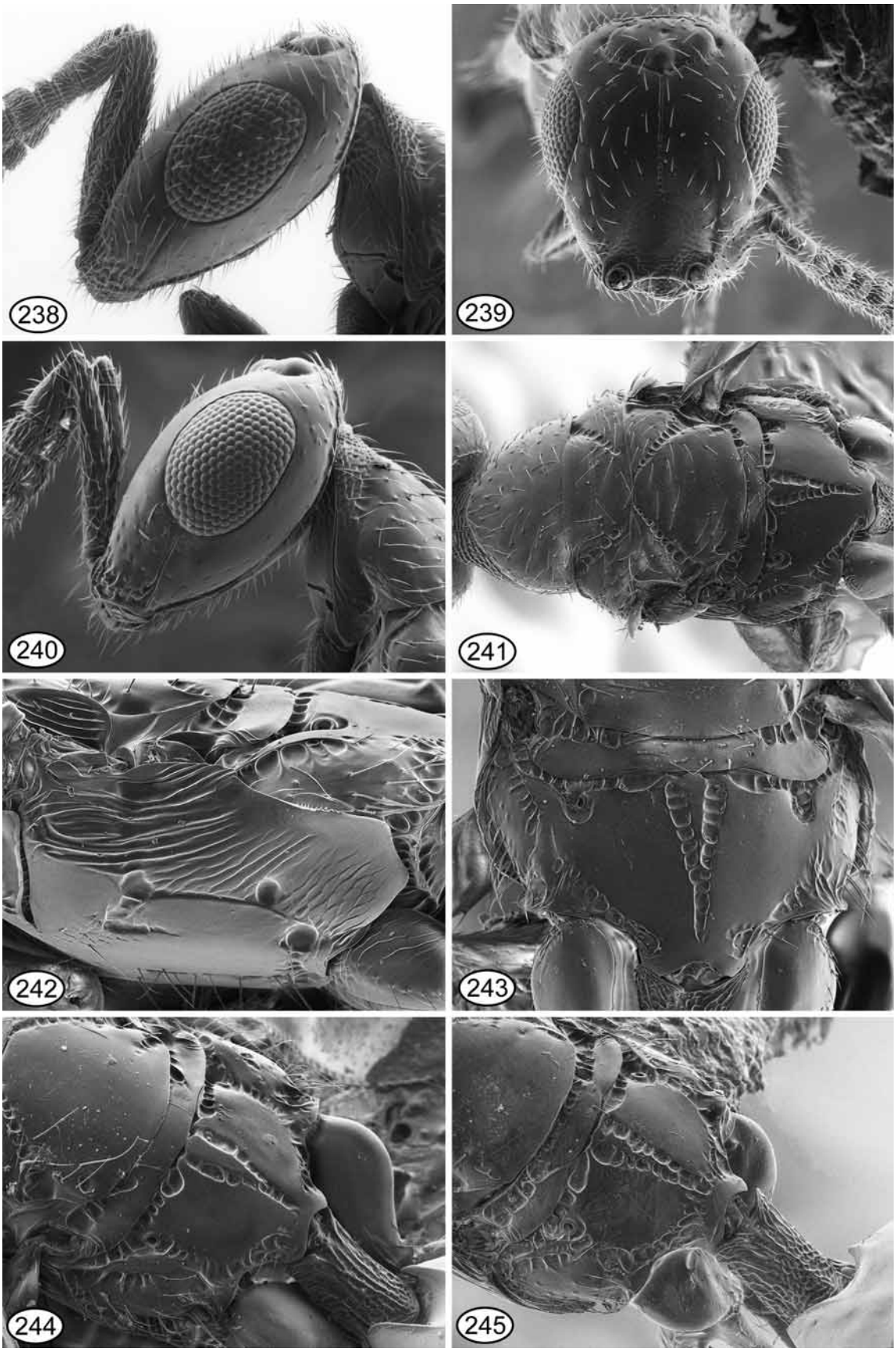
15. *Spalangia impunctata* Howard, 1897

(Figs 238–252)

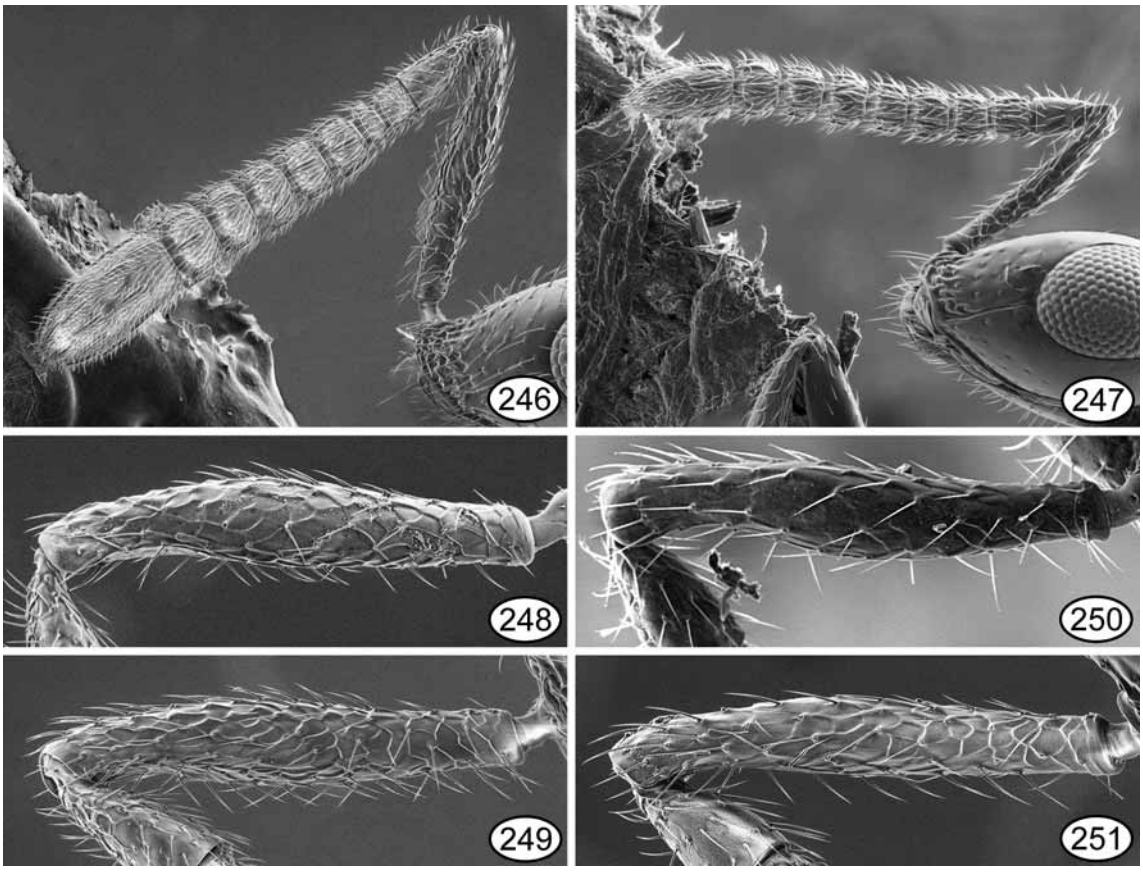
Spalangia impunctata Howard, 1897: 140–141; holotype ♀ (BMNH, examined). Type data: Grenada, Balthazar [Windward side], March 5, 250 ft. [H. H. Smith; 6; W. Indies. 99-331].

Spalangia lanaiensis Ashmead, 1901: 325–326; 1♀, 1♂ (BMNH, examined), 1♀ (USNM, examined). Type data: [Hawaii] Lanai, 2000 feet, [Perkins, 1.1894; Sandwich Is., 1912-215]. **New synonymy.**

Description. *Female*. Length = 1.2–1.7 mm. Legs dark except basal 3 or 4 tarsal segments yellow. Head in anterior view (Fig. 239) about 1.1–1.3x as high as wide; in dorsal view about 2.0–2.2x as wide as long; in lateral view (Fig. 238) with malar space about 0.8–0.9x eye height and about 1.2–1.4x eye width. Head capsule (Figs 238–240) primarily smooth and shiny as follows: with fine but complete median sulcus extending ventrally to level of lower orbit, sometimes to within slightly elongate-triangular scrobal depression, otherwise upper face and parascrobal region with setae originating from at most minute pinprick-like punctures or sometimes tiny bumps on lower parascrobal region, and with setae extending over smooth inclined surface of scrobal depression; scrobal depression usually with variably finely coriaceous to coriaceous-granular scrobes on either side of very slender, smooth and shiny interantennal region, but sometimes completely sculptured; gena punctate-reticulate to rugose near oral margin and with linear malar sulcus, but otherwise smooth except for setae toward eye; temple punctate similar to face. Antenna (Fig. 246) with scape about 5.9–6.0x as long as wide, the inner (Fig. 248) and outer (Fig. 249) surfaces coriaceous- to reticulate-rugose, though inner surface



Figs 238–245. *Spalangia impunctata* Howard. **238–240**, head: **238**, lateral view H♀, **239**, anterior view PR♂, **240**, lateral view H♂; **241**, PR♀ mesosoma, dorsal view; **242**, H♀ mesopleuron; **243**, PR♀ propodeum, dorsal view; **244 & 245**, scutellum–petiole, postero-dorsal view: **244**, H♀, **245**, PR♂. Abbreviations, H = Hawaii, PR = Puerto Rico.



Figs 246–251. *Spalangia impunctata* Howard. **246 & 247**, antenna: **246**, H♀, **247**, PR♂; **248 & 249**, H♀ scape: **248**: inner view, **249**, outer view; **250 & 251**, ♂ scape: **250**, PR, inner view, **251**, H, outer view. Abbreviations, H = Hawaii, PR = Puerto Rico.

often with somewhat finer sculpture; pedicel about 1.7–2.3x as long as apical width and about 2.8–3.8x as long as fu_1; funicle with fu_1 slightly transverse, about 1.2–1.3x as wide as long, fu_2 strongly transverse and ring-like, at least 2x as wide as long, and all subsequent segments strongly transverse, with fu_7 about 1.7–2.0x as wide as long; clava about 1.8–2.1x as long as wide.

Pronotal collar in lateral view (Fig. 238) only very low convex behind neck and with circumpronotal band anterolaterally, but anteriorly smoothly rounded to neck; smooth and shiny without cross-line posteriorly, and conspicuously and uniformly setose except bare mediolongitudinally (Fig. 241). Mesoscutal median lobe (Fig. 241) smooth and shiny except for transverse band of coriaceous-alutaceous sculpture near midlength and setae posterior to sculptured region. Axillae (Fig. 241) shiny with setae originating from at most pinprick-like punctures. Scutellum (Figs 241, 244) flat and shiny, sparsely setose laterally with setae originating from at most pinprick-like punctures; frenum (Figs 241, 244) with frenal line very broadly interrupted, consisting only of 1 or 2 punctures laterally. Mesopleuron (Fig. 242) quite shiny and finely sculptured as follows: pectal region shiny and bare except for 1 posteroventral seta; acropleuron finely, longitudinally striate-strigose and differentiated from pectal region by horizontal stria ventrally; subalar and episternal scrobes shallow depressions connected by a shallow, linear furrow; upper mesepimeron finely, obliquely alutaceous to obliquely carinate-alutaceous, but lower mesepimeron more coriaceous-alutaceous to partly smooth and shiny; upper and lower mesepisternum smoothly merged except for short anterior sulcus connected to vertical subalar depression, without complete transepisternal line or ventral line of setae, with upper mesepisternum at most only very finely and obscurely coriaceous. Fore wing hyaline; mediocubital fold with 3 or 4 setae but basal cell bare. Propodeum (Figs 241, 243, 244) without postspiracular sulcus except for sculptured region posteriorly adjacent to metacoxal flange; callus variably distinctly reticulate-rugose anterolaterally but with smooth and

shiny longitudinal band extending from anterior margin adjacent to spiracle, the smooth band continuous with smooth and shiny propodeal panel posterior to spiracle; plical region with Y-shaped paramedian crenulate furrows delineating distinct, flat, shiny, lanceolate median band, and furrows united into single crenulate line over about posterior half; supracoxal band a singe crenulate line to lateral margin of nucha.

Petiole (Fig. 244) about 1.3–1.4x as long as medial width; punctate-reticulate; bare. Gaster smooth and shiny or one or more tergites in part very finely coriaceous.

Male. Length = 1.1–2.2 mm. Antenna (Fig. 247) with scape about 6.0–6.7x as long as wide with similar sculpture (Figs 250, 251) as female; pedicel about 1.9–2.2x as long as wide; flagellum with setae much shorter than width of segment; funicle with fu_1 about 0.9–1.2x as long as wide and about 0.4–0.6x as long as pedicel, and subsequent funicular segments all transverse, with fu_7 about 1.4–1.7x as wide as long. Otherwise similar to female except as follows. Head in anterior view about 1.0–1.2x as high as wide; in lateral view (Fig. 240) with malar space about 0.7–0.9x eye height and about 0.9–1.3x eye width. Fore wing with 1–5 setae on mediocubital fold. Propodeum (Fig. 245) with complete postspiracular sulcus separating propodeal panel from callus; callus sometimes more or less uniformly finely roughened, and sometimes with median lanceolate band rugulose or very narrow (essentially an irregular median carina). Petiole (Fig. 245) about 1.5–1.8x as long as medial width.

Material examined. *Neotropical* (7♀, 7♂). **GRENADA**: (♀ holotype). **MEXICO**: San Jose del Boca, Lower California, 19.IV.49, Correa coll. (3♀, 6♂ USNM). **PANAMA**: Canal Zone, Ancon, 10.XI.21, J. Zetek, Z-1563, pars. of *Araecerus fasciculatus* (De Geer) (1♀, 1♂ USNM). **PUERTO RICO**: Piedras, 13.III.63, E.F. Legner, em. ex cow dung (1♀ USNM). Unknown locality: So. Amer. Par. Lab., 25.VIII.45, no. 1336.27 (1♀ USNM).

Distribution. Likely a circumtropical species because in addition to the type material of *S. lanaiensis* and other specimens from Hawaii, I have seen individuals that I at least tentatively identify as *S. impunctata* from Australia: Queensland (UCDC), Cape Verde Island (USNM), India (USNM), Japan (USNM), Mauritius (USNM), Thailand (UCDC) and Borneo: Sarawak (UCDC).

Biology. The host record of the coffee bean weevil, *Araecerus fasciculatus* (DeGeer) (Coleoptera: Curculionidae) is perplexing unless the specimen was actually reared through an unrealized tachinid primary parasitoid. UCRC has a series of both sexes from Honolulu, Hawaii, reared from unidentified *Drosophila* puparia, March and July, 1918. A female from Japan that was intercepted at Jacksonville, Florida, has the information "soil w. potatoes", and a female from India is labelled "*Dacus cuc*. mat." (undoubtedly *Dacus cucurbitae* Coquillett (Trypetidae)). The Mauritius record is based on two males that were laboratory reared in Florida on *S. calcitrans*, from material obtained from a laboratory colony in Reduit, Mauritius.

Recognition. I include *S. impunctata* as one of seven species in the *drosophilae* species group as discussed under *S. drosophilae*. Unlike other *drosophilae*-group species (e.g. Figs 54, 122) the mesopleuron of *S. impunctata* is only quite finely sculptured and shiny (Fig. 242) similar to *subpunctata*-group species, though individuals of *S. drosophilae* and *S. leiopleura* also have quite a finely sculptured (Fig. 122) or at least not an obliquely striate-strigose upper mesepisternum (Fig. 266). Females of *S. impunctata* and *S. drosophilae* are very similar except for propodeal sculpture. Females that I identify as *S. impunctata* lack a complete postspiracular sulcus and have the callus lateral to the spiracle smooth and shiny like the propodeal panels so that the smooth regions are continuous behind the spiracle (Fig. 243). All New World males of *S. impunctata* I have seen have a complete postspiracular sulcus and the smooth band lateral to the spiracle is sometimes obscure, though the propodeal callus is always less conspicuously sculptured (Fig. 244) than for males of *S. drosophilae* (Fig. 120). However, males of *S. impunctata* are readily differentiated from males of all other *drosophilae*-group species by flagellar structure. They have a comparatively short, clavate flagellum (Fig. 247) with a subquadrate to oblong fu_1 that is obviously shorter than the pedicel. Other *Spalangia* males usually have the first funicular segment obviously longer than the pedicel (e.g. Figs 60, 126). Antennal structure of male *S. impunctata* is additionally similar to females (*cf*. Figs 246, 247) because fu_2–fu_7 are obviously transverse and the ter-

minal segment is quite conspicuously differentiated as a clava. Because of their similar antennal structure the sexes of *S. impunctata* can quite easily be mistaken for one another. Males of *S. drosophilae* are readily differentiated both from conspecific females and from males of *S. impunctata* because they have much more elongate flagellar segments with conspicuously long, semierect setae (Figs 125, 126).

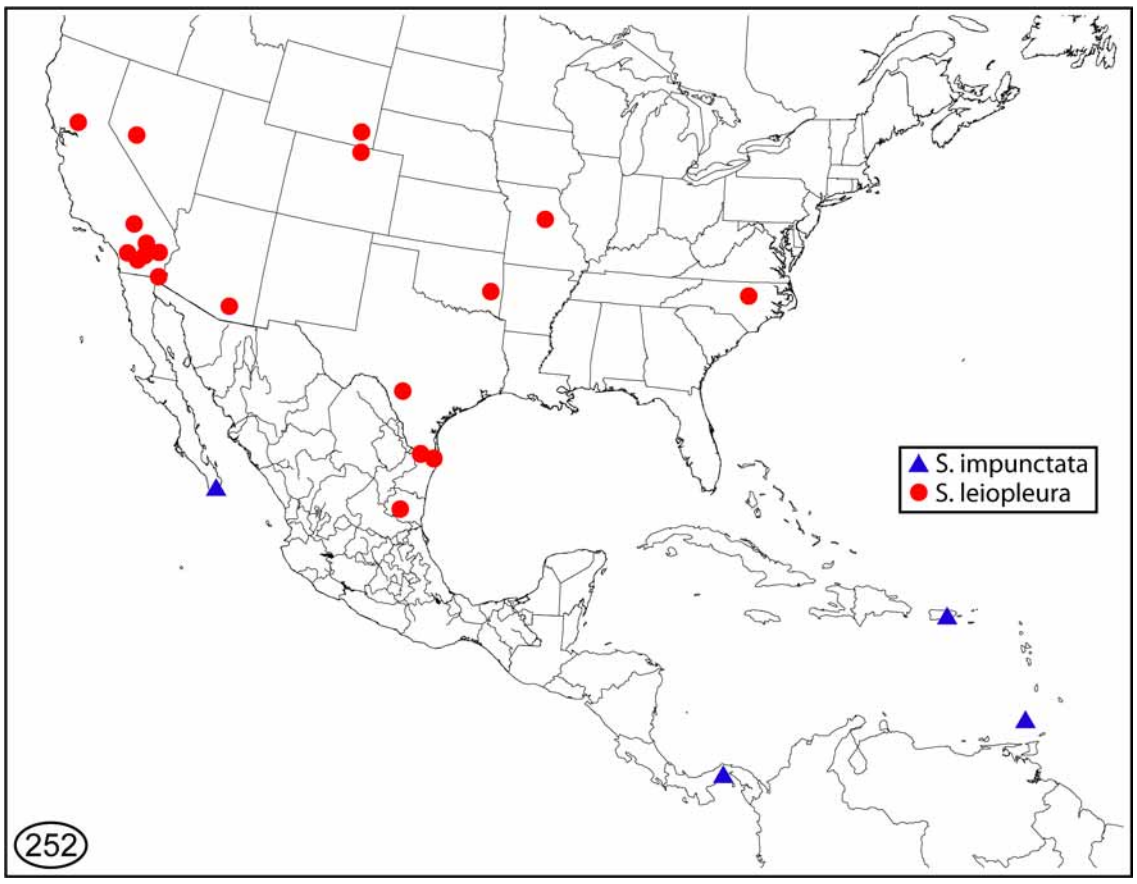


Fig. 252. Distribution of *Spalangia impunctata* Howard and *S. leiopleura* Gibson.

My description of *S. impunctata* is based only on specimens from the New World and either does not adequately encompass morphological variation for the species or there are sibling species in what I interpret as *S. impunctata* from elsewhere. I tentatively identify a female from India as *S. impunctata* based on the combination of an obviously lanceolate median propodeal band and finely sculptured, shiny mesopleuron. However, this female has a complete postspiracular sulcus and mostly punctate-reticulate callus similar to females of *S. drosophilae* and some *S. impunctata* males. The two reared males originating from Mauritius also have an unusually long fu_1 compared to other known males of the species, being about 1.4x as long as the pedicel, though the subsequent flagellar segments are similar to other male *S. impunctata*.

Ashmead (1901) described *S. lanaiensis* based on both sexes collected in Hawaii. The two female syntypes of *S. lanaiensis* plus another BMNH female labelled "Hawaii, Honolulu, R.C.L Perkins coll." are larger than other females of *S. impunctata* examined from Hawaii or the New World and have a longer flagellum with fu_1 distinctly oblong, fu_2 quadrate or only about 1.5x as wide as long, and the subsequent funicular segments almost quadrate or only slightly transverse, and the clava about 2.7–2.9x as long as wide. Furthermore, the callus lateral to the spiracle is not as smooth as in other observed females and at least the non-syntype female has a distinct postspiracular sulcus (*cf.* Fig. 244). The slightly infuscate fore wing of the female syntype has a line of at least seven setae on the mediocubital fold and eight setae in a line in the basal cell. The male syntype lacks its head and the principal diagnostic feature for the species, its antennae, but it has quite a smooth and shiny upper and lower mesepimeron and although the wings obscure the sculpture of the callus

the propodeum has a distinctly lanceolate median smooth band. Another female I saw from Australia (UCDC) is similar to the female syntypes of *S. lanaiensis*, but other males and females I have seen from Hawaii (UCRC) are similar to what I interpret as *S. impunctata* from the New World.

The unique female holotype of *S. impunctata* lacks its head and antennae, is glued to a point such that its mesopleural sculpture is not clearly visible, and except for the right hind femur and tibia its legs are either in the glue or are missing. The right wings are also mostly missing and the gaster is detached and glued to the point. However, the characteristic propodeal sculpture of females is clearly visible and the left fore wing has six setae on the mediocubital fold. When Howard described the species, he accurately stated that it is "closely related to *S. drosophilae*", whereas Bouček (1963: 475) questionably placed *S. impunctata* under synonymy with *S. haematobiae*. This tentative synonymy apparently was based on two BMNH females that are labelled "St. Vincent, W.I. [West Indies], H.H. Smith" and that bear Z. Bouček identification labels with "? *S. impunctata* Howard 1896" and "*S. impunctata* (? = *haematobiae* Ashm.)". Both of these females are specimens of *S. imitator.*

16. *Spalangia innuba* n. sp.
(Figs 253–259)

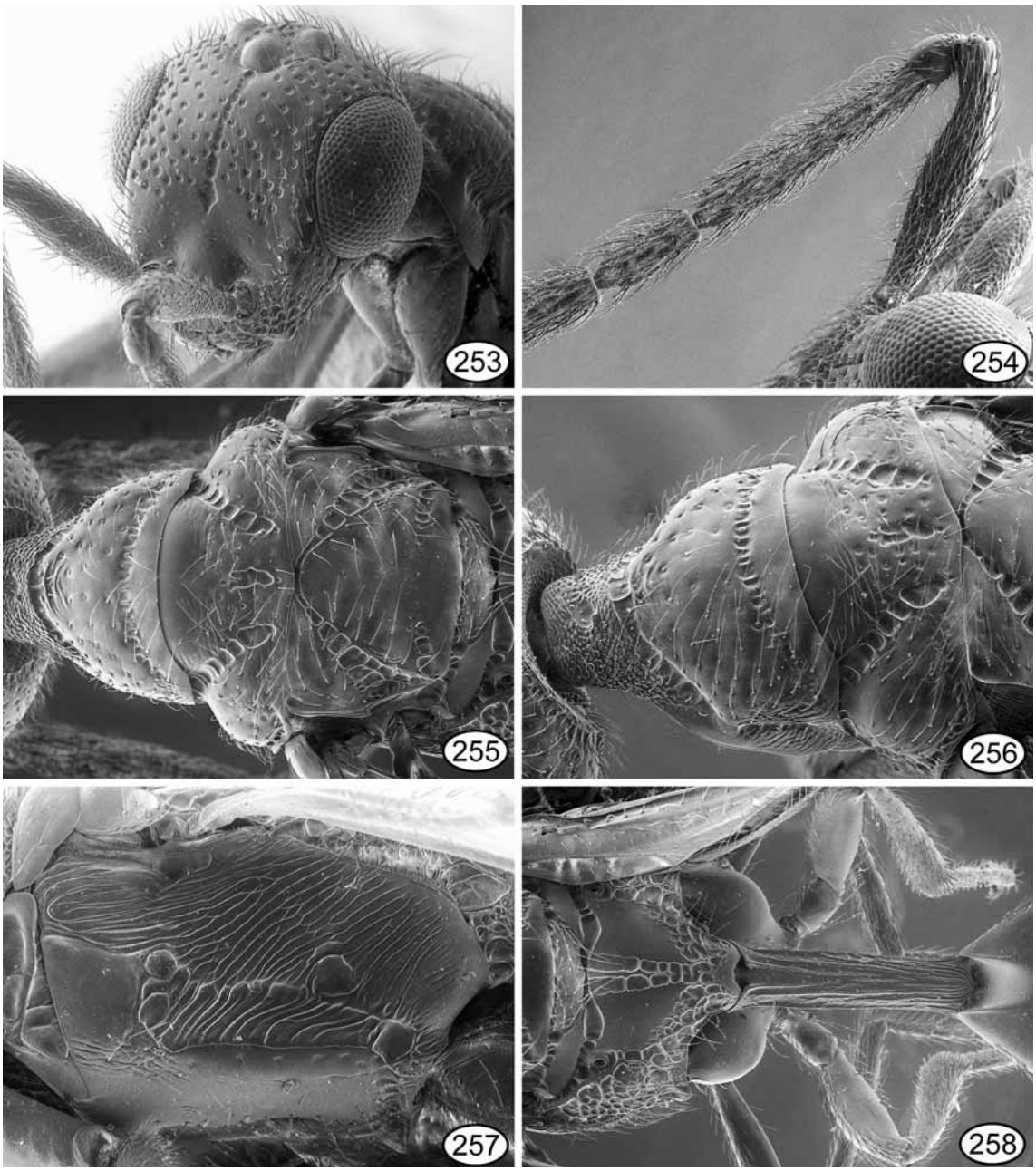
Type material. HOLOTYPE (♂, CNC no. 23886). "BOLIVIA: La Paz, Chulumani, Apa-Apa, 18º22'S 67º30'W, 1-4.V.1997, 1800m., L. Masner, YPT B9-11 / LB-specm 2008-133". Condition: point-mounted, entire.

Etymology. From the Latin word *innubus*, meaning "unmarried", in reference to the species being known only from a male.

Description. *Male*. Length = 2.6 mm. Legs dark except knees and tarsi slightly lighter in color, yellowish-brown. Head in anterior view about 1.1x as wide as high; in dorsal view about 2x as wide as long; in lateral view with malar space about 0.6x eye height and about 0.9x eye width. Head capsule (Fig. 253) smooth and shiny except for setiferous punctures as follows: with complete median sulcus extending ventrally to transverse-oval scrobal depression, otherwise upper face and parascrobal region with distinct circular punctures mostly separated by about 1–2 puncture diameters (punctures somewhat sparser medially); scrobal depression smooth and shiny except very finely coriaceous-alutaceous scrobes above torulus; gena with malar sulcus and closely crowded circular punctures; temple punctate similar to face. Antenna with scape (Fig. 254) about 5.1x as long as greatest width, the inner and outer surfaces uniformly setose but outer surface reticulate-rugose (Fig. 254) and inner surface smoother, more coriaceous-reticulate; pedicel subglobular, only very slightly longer than wide; flagellum conspicuously elongate-filiform with hair-like decumbent setae longer than width of respective segment; funicle with fu_1 (Fig. 254) about 6.9x as long as wide and about 5.3x as long as pedicel, and subsequent segments all more than 2x as long as wide, with fu_2 (Fig. 254) about 2.4x and fu_7 about 3.1x as long as wide (all measurements include tapered distal pedicel of respective segment); clava about 4x as long as wide.

Pronotal collar in lateral view with collar almost flat and slightly below plane of neck anteriorly; with comparatively fine but distinct punctate-crenulate cross-line posteriorly, transversely strigose-carinate anteromedially posterior to circumpronotal furrow (Fig. 255), and with well separated, shallow but distinct circular setiferous punctures dorsomedially except laterally coriaceous-roughened to posteriorly coriaceous (Fig. 256). Mesoscutal median lobe (Figs 255, 256) with anterior convex region smooth and shiny anteriorly to transversely coriaceous-alutaceous posteriorly; internotaular region more or less completely punctate except for irregular median rugose furrow. Axillae (Figs 255, 256) shiny but with setiferous punctures similar to internotaular region. Scutellum (Fig. 255) smooth and shiny except for a few setiferous punctures laterally; frenum (Fig. 255) with crenulate frenal line interrupted over about medial third, the line tapered and shallowed toward

midline (Fig. 255). Mesopleuron (Fig. 257) mostly with distinct sculpture as follow: pectal region smooth, shiny and bare except for 1 posteroventral seta; acropleuron longitudinally carinate-striate, the ridges extending posteriorly onto alar shelf; subalar scrobe a vertical, crenulate-rugose furrow not distinctly differentiated from upper mesepisternum, the combined region obliquely strigose; episternal scrobe a shallow depression connected to subalar and precoxal scrobes by sulcate furrows; upper and lower mesepimeron strongly, obliquely alutaceous; upper and lower mesepisternum differentiated by complete carinate transepisternal line and adjacent line of setae. Fore wing with distinct yellowish-brown tinge; uniformly setose, including behind submarginal vein except for vannal area proximally. Propodeum (Fig. 258) with distinct postspiracular sulcus; callus reticulate-rugose; plical region with narrowly V-shaped paramedian crenulate furrows delineating median carina, and with anterior-most cell not distinctly differentiated from more posterior cells; supracoxal band contiguous with paramedian crenulate furrows; pronotal panels smooth and shiny.



Figs 253–258. *Spalangia innuba* Gibson ♂. **253**, head, frontolateral view; **254**, scape–fu_3; **255**, thorax, dorsal view; **256**, pronotum and mesoscutum, dorsolateral view; **257**, mesopleuron; **258**, propodeum and petiole, dorsal view.

Fig. 259. Distribution of *Spalangia innuba* Gibson and *S. plaumanni* Gibson.

Petiole (Fig. 258) about 4.6x as long as medial width; longitudinally carinate-strigose; with 1 short seta anterolaterally on left side and laterally near middle on right side. Gaster with tergites smooth and shiny except Gt_3 extremely obscurely coriaceous.

Female. Unknown.

Distribution. Known only from Bolivia (Fig. 259).

Biology. Unknown.

Recognition. I include *S. innuba* as one of seven species in the *drosophilae* species group as discussed under *S. drosophilae*. The key is constructed based on the assumption that sculptural features of the unknown female are similar to those of the holotype male. Even though the male has a median propodeal carina (Fig. 258) and the pronotum quite a distinct crenulate cross-line (Figs 255, 256), I include *S. innuba* in the *drosophilae*-group because of its comparatively strong, obliquely strigose to strigose-alutaceous mesopleural sculpture (Fig. 257) and conspicuously elongate-gracile flagellum with long, hair-like setae (Fig. 254). Pronotal sculpture is intermediate between that of *cameroni*- or *nigra*-group species and some other *drosophilae*-group species, such as *S. plaumanni*, which has quite a deep though at most only inconspicuously crenulate pronotal cross-line (Figs 391, 392). Individuals of *S. plaumanni* are readily differentiated from *S. innuba* by their sculptured and setose pectal region (Figs 395, 396). Males of *S. plaumanni* are further differentiated by their comparatively short flagellar segments and setae (Figs 398, 399), and much shorter petiole (Fig. 394) than the holotype of *S. innuba*. Additional specimens of *S. innuba* are required to determine whether other features of the holotype, such as its comparatively large body size, anteromedially transversely strigose-carinate pronotal collar (Fig. 255), quite dark tarsal segments, and distinctly tinted and setose fore wings are additional differential features characteristic of males or both sexes of *S. innuba*.

17. *Spalangia leiopleura* n. sp.
(Figs 252, 260–271)

Type material. HOLOTYPE (♀, CNC no. 23887). "MEXICO: Tamaulipas, Reynosa, R-3, 6.vii.2006, -25, Juan F. Luna Salas". Condition: point-mounted, entire.

PARATYPES (21♀, 21♂). *Nearctic* (15♀, 11♂). **USA**: ***Arizona***, Pima Co., Colossal Caves Co. Pk., 27.X.71, D.S. Chandler, sifting rotting Saguaro (2♀ UCDC). ***California***, Imperial Co., Imperial Valley, IV-V.91, J.D. Pinto, agric. fields (1♂). Inyo Co., Independence Oak Cr. Camp, 38º50'31"N 118º15'37"W, 4770 ft, 7.V.03, E.F. Drake, riparian sweeping (1♂ UCRC). Riverside Co., 13 mi. NE Desert Center, 22.V.80, K.W. Cooper, ex pack rat nest (1♀ UCRC); Vail Lake, 18.XI.82, K.W. Cooper, ex pack rat nest (1♀ UCRC); Box Canyon, 10 mi. E Mecca, 5.VII.78, K.W. Cooper, ex berlese *Neotoma* nest at base of mesquite (1♀). San Bernardino Co. — Sheephole Summit, 19.V.83, K.W. Cooper, ex pack rat nest at base of Joshua tree (1♀); Twentynine Palms, 8.V.84, J. Huber (1♂). San Diego Co., Borrego Vly., 9.IV.70, E.E. Grissell & R.F. Denno (1♂ UCDC). Yolo Co., Fazio Wldlf. Area, 3km. E Davis, 11.VI.99, S.L. Heydon (1♀ UCDC). ***Colorado***, Nunn, 7.VII.72, grassland, R. Kumar (1♀ USNM). ***Missouri***, Boone Co., Columbia, D.E. Figg — 25.V.81, *P. cinerella* (1♀ UMRM); 24.VI.81, *Ravinia* spp. (1♀ UMRM). ***North Carolina***, Raleigh, 8.IV.67, A.L. Kyles, squirrel nest (3♀ ROMT; 1♀ USNM). ***Oklahoma***, Latimer Co., 1 mi. E Panola, 3.VII.87, sift hay litter, D. Chandler & K. Stephan (1♀ DENH). ***Texas***, Uvalde, 26.V.33, 15.VIII.33, 30.VIII.33, 31.VIII.33 (Bishopp nos. 20033, 20060, 20061, 20063), A.W. Lindquist (6♂ USNM). ***Wyoming***, Chugwater Cr., 10.VIII.56, J. Pinto (1♂).

Neotropical (6♀, 10♂). **MEXICO**: Z. Norte, Reynosa, R-Tomas, Villarreal, 10.V.05, 17.V.05, J.F. Luis Salas (2♀, 1♂ CNC; 1♀, 1♂ UATV). Tamaulipas — Gomez Farías, 23º02'51"N 99º09'20"W, 14.II.01, D. Yanega (1♂ UCRC); El Monte, Brownsville P.O.E. [point of entry], 23.IV.62, in truck with wood (1♂ USNM); similar data as holotype except collected 22.VI.06, 3.VIII.06, 17.VIII.06 (3♀, 6♂).

Etymology. A combination of the Greek words *leios*, meaning "smooth, bald" and *pleura*, meaning "side", in reference to the more finely striate, comparatively smooth acropleuron that differentiates individuals from those of *S. drosophilae* and similar species.

Description. *Female*. Length = 1.2–1.6 mm. Legs dark except at least basal tarsal segment yellow, the more apical segments yellowish to brown. Head (Fig. 261) in anterior view about 1.2–1.4x as high as wide; in dorsal view about 1.6–1.7x as wide as long; in lateral view (Fig. 260) with malar space about 1.0–1.4x as long

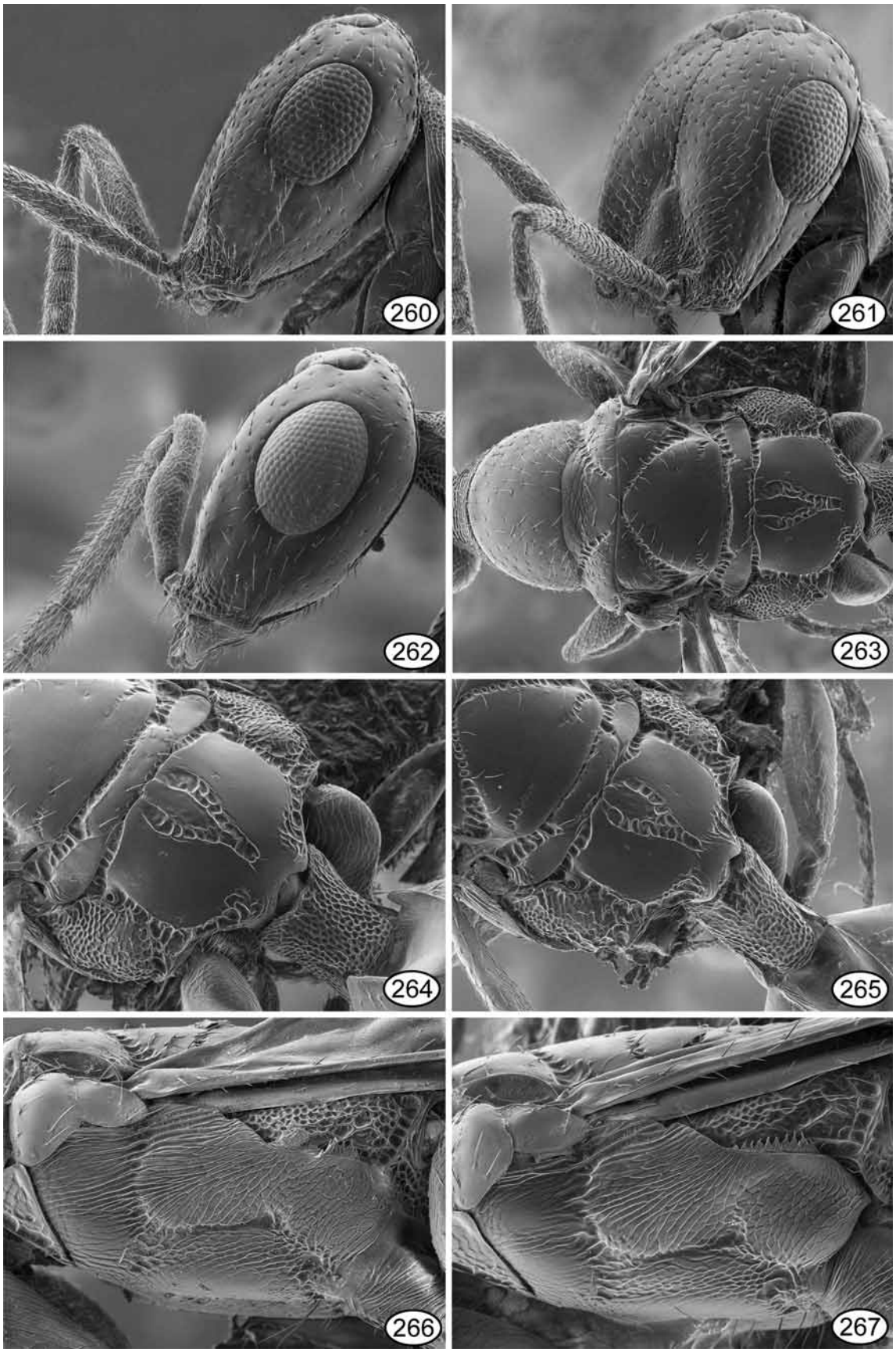
as eye height and about 1.5–2.2x as eye width. Head capsule (Figs 260–262) smooth and shiny except for setiferous punctures as follows: with complete median sulcus extending ventrally to level of lower orbit, usually within slightly elongate-triangular scrobal depression, otherwise upper face and parascrobal region usually with widely scattered, minute pinprick-like punctures, though sometimes punctures quite deep and distinct even though only slightly larger than base of seta, and with setae extending over smooth, inclined surface of scrobal depression; scrobal depression (Fig. 261) with slender, finely coriaceous to coriaceous-granular scrobes and smooth and shiny interantennal region; gena (Fig. 260) rugulose-roughened near oral margin and with linear malar sulcus, but otherwise smooth with setae originating from pinprick-like punctures; temple smooth with setae originating from pinprick-like punctures. Antenna (Fig. 269) with scape about 6.4–8.1x as long as wide, the inner (Fig. 270) and outer (Fig. 271) surfaces uniformly setose and coriaceous-alutaceous or outer surface sometimes more strongly sculptured, alutaceous-strigose; pedicel about 2.3–2.6x as long as apical width and about 2.0–2.8x as long as fu_1; funicle with fu_1 about 1.0–1.9x as long as wide and subsequent segments usually subquadrate, slightly transverse to slightly elongate both basally and apically, but with fu_2 at most 1.3x as wide as long and fu_7 about 1.0–1.3x as long as wide; clava about 3.0–4.0x as long as wide.

Pronotal collar in lateral view only very low convex behind neck and with circumpronotal band anterolaterally, but anteriorly smoothly rounded to neck; usually smooth and shiny (Fig. 263), without distinct crossline but rarely with transverse band of very fine, obscure coriaceous sculpture posteriorly, and uniformly setose except mediolongitudinally. Mesoscutal median lobe (Fig. 263) with transverse band of coriaceous-alutaceous sculpture near midlength but otherwise smooth and shiny except for setae near notauli. Axillae (Fig. 263) shiny except for setae. Scutellum (Figs 263, 265) flat and shiny, variably extensively but sparsely setose with setae originating from at most pinprick-like setiferous punctures; frenum (Figs 263–265) with frenal line interrupted over at least medial third. Mesopleuron (Fig. 266) with distinct sculpture as follows: pectal region usually finely coriaceous but sometimes smooth, and bare except for 1 posteroventral seta; acropleuron very finely, longitudinally striate, the striae all of similar strength and direction, almost indistinguishably merging with pectal region ventrally; subalar and episternal scrobes shallow depressions connected by a shallow, linear furrow; upper mesepimeron, at least anteriorly, finely, longitudinally striate similar to acropleuron, though sometimes strongly, obliquely alutaceous or coriaceous posteriorly and lower mesepimeron obliquely striate to coriaceous-alutaceous; upper and lower mesepisternum smoothly merged without transepisternal line and at most with line of ventral setae posteriorly near mesocoxa, the upper mesepisternum coriaceous to longitudinally coriaceous-alutaceous or coriaceous-reticulate at least dorsally. Fore wing hyaline; bare behind submarginal vein except for at most with 1–3 setae on basal fold near parastigma. Propodeum (Figs 263, 264) with distinct postspiracular sulcus; callus punctate-reticulate to rugulose though sometimes more coriaceous posteriorly adjacent to postspiracular sulcus; plical region with Y-shaped paramedian crenulate furrows delineating quite a broad and distinct median lanceolate band, the band sometimes smooth and shiny but often roughened to almost rugose, and furrows united into single crenulate line posteriorly; supracoxal bands well separated from paramedian crenulate furrow; panels smooth and shiny.

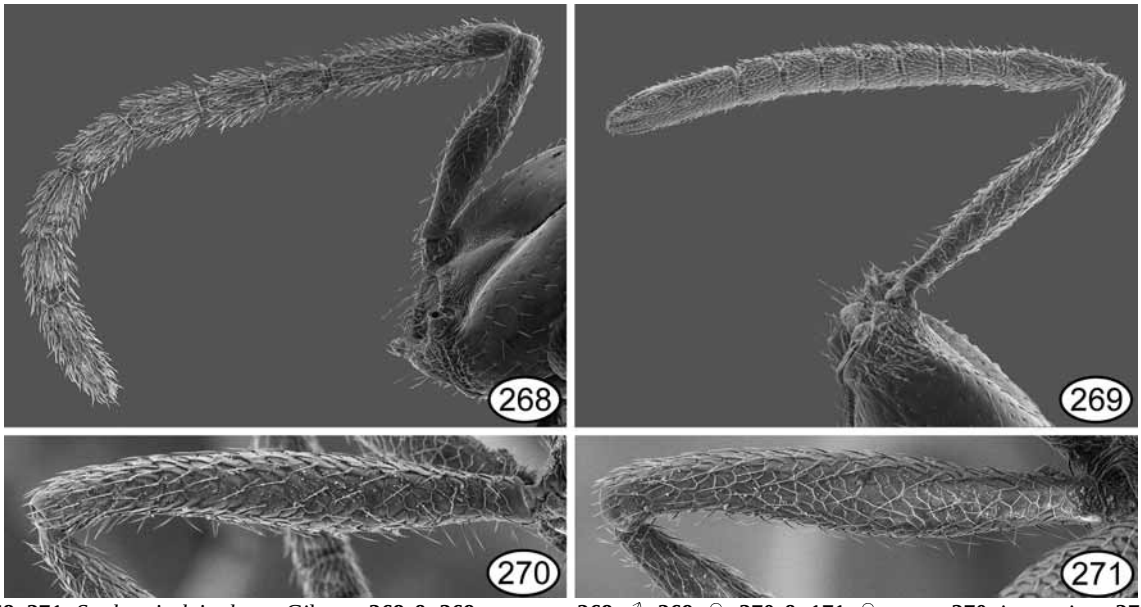
Petiole (Fig. 264) about 1.3–1.5x as long as medial width; punctate-reticulate; bare. Gaster smooth and shiny or some tergites with very fine and obscure coriaceous sculpture.

Male. Length = 1.0–1.4mm. Antenna (Fig. 268) with scape about 5.3–6.3x as long as wide, but similarly sculptured as female; pedicel about 1.3–1.7x as long as wide; flagellum with conspicuous, semierect setae obviously shorter than or only about as long as width of segment; funicle with fu_1 about 4.2–7.5x as long as wide and about 2.3–3.3x as long as pedicel, and subsequent funicular segments all obviously longer than wide, with fu_7 about 1.5–2.6x as long as wide. Otherwise similar to female except as follows. Head in anterior view about 1.0–1.1x as long as wide; in lateral view (Fig. 262) with malar space about 0.8–1.0x eye height and 1.1–1.3x eye width; scrobal depression sometimes with setae not or only partly extending over inclined lateral surface. Pronotum usually more sparsely setose. Petiole (Fig. 265) about 1.5–1.9x as long as wide.

Distribution. North America from about 40ºN in USA into northern Mexico (Fig. 252).



Figs 260–267. *Spalangia leiopleura* Gibson. **260–262**, head: **260**, lateral view ♀, **261**, frontolateral view ♀, **262**, lateral view ♂; **263**, ♀ mesosoma, dorsal view; **264 & 265**, scutellum–petiole, posterodorsal view: **264**, ♀, **265**, ♂; **266 & 267**, mesopleuron: **266**, ♀, **267**, ♂.



Figs 268–271. *Spalangia leiopleura* Gibson. **268 & 269**, antenna: **268**, ♂, **269**, ♀; **270 & 171**, ♀ scape: **270**, inner view, **271**, outer view.

Biology. The six males with Bishopp numbers from Uvalde, Texas (May and August) are undoubtedly voucher specimens from Lindquist (1936) that were reared from *H. irritans* and misidentified as *S. drosophilae*. Three other specimens dated October are *S. drosophilae* (see under this species). Because of the mixed series it is unknown which or both of *S. drosophilae* and *S. leiopleura* can also act as hyperparasitoids of *H. irritans* through *Gnathopleura ridibunda* and *Eucoila rufocincta* as discussed under *S. drosophilae*. The two rearing records from Missouri are voucher specimens that were misidentified as *S. haematobiae* in Figg *et al.* (1983) and include *Adia* (= *Paregle*) *cinerella* (Fallén) and either *Oxysarcodexia ventricosa* (Wulp), *Ravinia derelicta* (Walker) or *R. latisetosa* Parker as hosts. Figg *et al.* (1983) stated that these three species of Sarcophagidae could not be distinguished based on the puparium and were all treated as *Ravinia* spp. Loera-Gallardo *et al.* (2008) also reared *S. leiopleura* from bovine manure in Mexico as *Spalangia* n. sp. 1, but did not determine actual hosts.

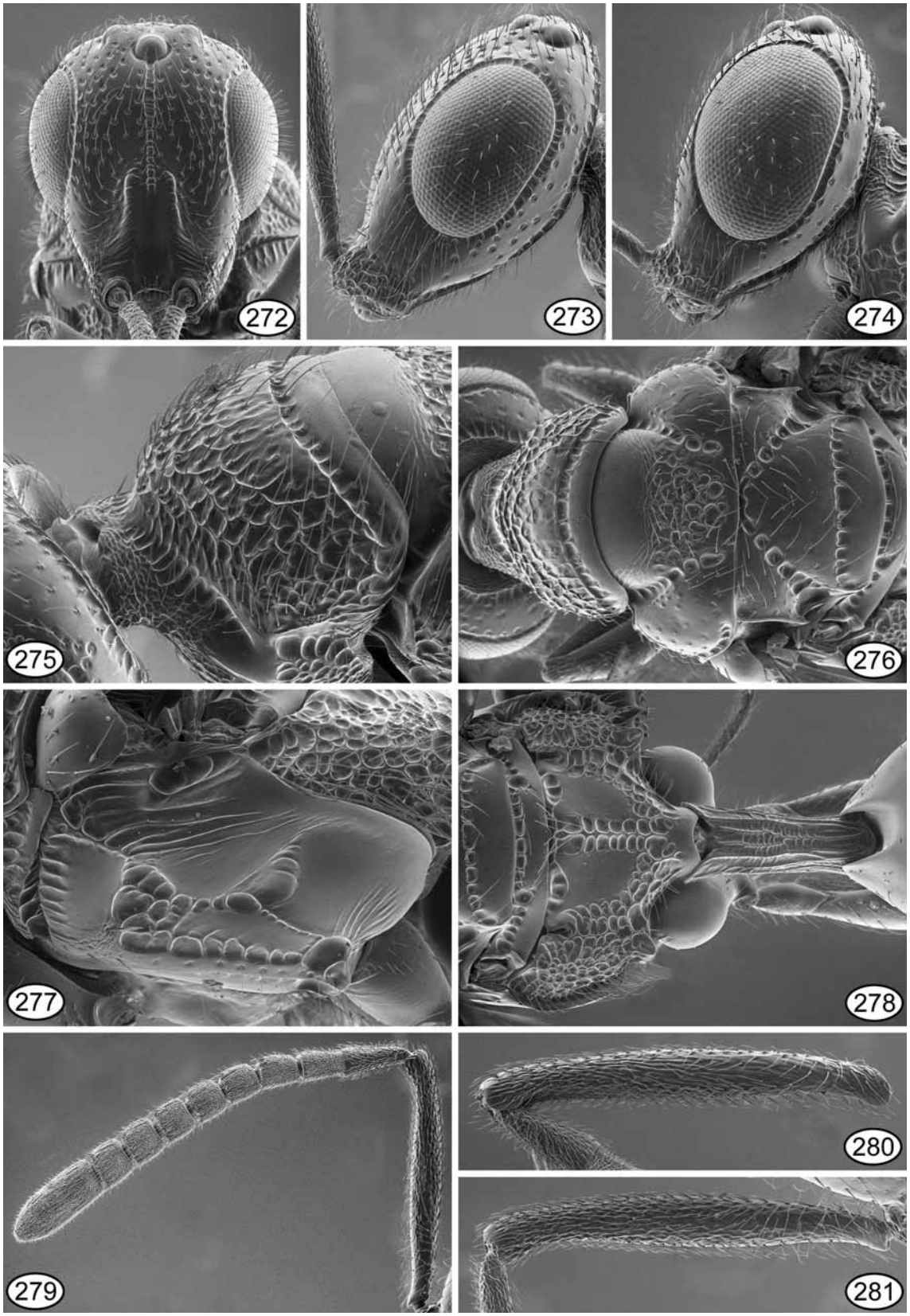
Recognition. I include *S. leiopleura* as one of seven species in the *drosophilae* species group as discussed under *S. drosophilae*. Individuals of *S. leiopleura* are very similar to those of *S. drosophilae* except for the comparatively subtle differences given in the key. All known individuals have an obvious, though often variably sculptured median lanceolate band on the propodeum, and the fore wings completely bare behind the submarginal vein.

18. *Spalangia longepetiolata* Bouček, 1963
(Figs 272–181)

Spalangia longepetiolata Bouček, 1963: 487–488; holotype ♂ (HNHM, not examined); allotype ♀ and paratype ♂ (BMNH, examined). Type data: [Ethiopia] Abyssinia, Lake Dembel, I.1912, Kovács coll.

Description. *Female*. Length = 2.7–3.1 mm. Legs dark except basal 3 tarsal segments yellow or tarsal segments increasingly darker apically. Head in anterior view (Fig. 272) about 1.2x as high as wide; in dorsal view about 1.7x as wide as long; in lateral view (Fig. 273) with malar space about 0.7–0.9x eye height and about 0.9–1.3x eye width. Head capsule (Figs 272–274) smooth and shiny except for setiferous punctures as follows: with complete median sulcus extending ventrally to elongate-triangular scrobal depression (Fig. 272), otherwise at least upper face with distinct circular punctures mostly separated by about 1–2 puncture diame-

ters, the punctures on parascrobal region often smaller and sparser and sometimes pinprick-like ventrally; scrobal depression with scrobes transversely strigose ventrally to strigose-coriaceous dorsally, the strigose



Figs 272–281. *Spalangia longepetiolata* Bouček (UCRC culture, Kenya). **272–274**, head: **272**, anterior view ♀, **273**, lateral view ♀, **274**, lateral view ♂; **275**, ♀ pronotum, dorsolateral view; **276**, ♂ thorax, dorsal view; **277**, ♂ mesopleuron; **278**, ♂ frenum–petiole, dorsal view; **279**, ♀ antenna; **280 & 281**, ♀ scape: **280**, inner view, **281**, outer view.

sculpture often extending laterally onto inclined surface of depression at least ventrally above torulus (Fig. 272), but inclined surface otherwise with circular punctures similar to parascrobal region, and interantennal region smooth and shiny; gena rugose-punctate near oral margin and with linear malar sulcus, but otherwise quite smooth with punctures similar to parascrobal region; temple with distinct punctures similar to upper face. Antenna (Fig. 279) with scape about 7.6–9.1x as long as greatest width, the inner (Fig. 280) and outer (Fig. 281) surfaces uniformly setose, but outer surface mostly punctate-rugose and inner surface mostly longitudinally strigose except apically; pedicel about 2.4–2.5x apical width and about 1.4–1.6x as long as fu_1; funicle with fu_1 about 1.6–1.9x as long as wide and subsequent segments oblong basally to quadrate or slightly transverse apically, with fu_4–fu_7 at most about 1.3x as wide as long; clava about 2.4–3.0x as long as wide.

Pronotal collar in lateral view convexly arched behind neck and anterolaterally with vertical carinate ridge interrupting crenulate circumpronotal furrow, but anteriorly smoothly rounded to neck (Fig. 275); with distinct punctate-reticulate cross-line posteriorly and otherwise extensively reticulate-rugose, the sculpture variably distinctly aligned into irregular transverse rows or ridges anteriorly and smoother posteromedially, but without any indication of mediolongitudinal furrow. Mesoscutal median lobe with anterior convex region largely smooth and shiny except finely coriaceous posteriorly; internotaular region punctate-rugose (Fig. 276) except usually with very slender, often linear, median smooth band. Axillae (Fig. 276) smooth and shiny except for pinprick-like setiferous punctures. Scutellum (Fig. 276) smooth and shiny except for a few setiferous punctures laterally; frenum (Figs 276, 278) differentiated by complete crenulate frenal line. Mesopleuron (Fig. 277) smooth and shiny except as follows: pectal region crenulate along anterior margin and bare except for 1 posteroventral seta; acropleuron longitudinally carinate with carinae extending posteriorly onto alar shelf; subalar scrobe often with posterior margin angled posteroventrally or not distinctly differentiated from upper mesepisternum such that sculpture extends obviously along transepisternal line; episternal scrobe an anteriorly tapered or lunate crenulate furrow connected to episternal scrobe by punctate-crenulate line and to precoxal scrobe by much finer punctate line; upper mesepimeron sometimes with fine striae dorsally extending from acropleuron and lower mesepimeron variably extensively, obliquely striate dorsal to precoxal scrobe; upper and lower mesepisternum differentiated by punctate-crenulate transepisternal line and adjacent line of setae. Fore wing hyaline; bare behind submarginal vein. Propodeum (Fig. 278) with distinct postspiracular sulcus; callus completely punctate-rugose; plical region with abruptly widened, usually more or less Y-shaped paramedian carinate furrows delineating median carina, but at least anterior-most cell much larger than more posterior cells; supracoxal bands contiguous with paramedian crenulate furrows; propodeal panels smooth and shiny.

Petiole about 2x as long as medial width; transversely carinate to reticulate between longitudinal carinae; bare or with 1 short, inconspicuous seta laterally near middle. Gaster smooth and shiny.

Male. Length = 2.6–3.1 mm. Antenna (Fig. 282) with scape about 4.6–6.7x as long as wide, the inner (Fig. 283) and outer (Fig. 284) surfaces similar to female except outer surface sometimes more reticulate-rugose or longitudinally strigose and inner surface with more distinct mediolongitudinal bare region and finer sculpture, sometimes almost smooth in bare region; pedicel about 1.3–1.6x as long as wide; flagellum with setae much shorter than width of respective segment; funicle with fu_1 about 2.4–2.7x as long as wide and about 2.0x as long as pedicel, and subsequent segments distinctly oblong, about 1.5–1.7x as long as wide. Otherwise similar to female except as follows. Head in anterior view only about as high as wide; in lateral view (Fig. 274) with malar space about 0.5–0.6x eye height and about 0.8–0.9x eye width. Mesoscutal median lobe internotaular region without (Fig. 276) or with less distinct median carina. Mesopleuron with lower mesepimeron sometimes only very inconspicuously obliquely striate to coriaceous ventrally (Fig. 277). Fore wing setation variable, sometimes bare behind submarginal vein except for a few setae distally in basal cell or also with 1 or a few sparse, white, inconspicuous setae on mediocubital fold and/or basal cell, but sometimes mediocubital fold and basal cell with quite dense and conspicuous brown setae. Petiole (Fig. 278) about 3.3–4.0x as long as medial width and with 1 or 2 short setae on either side medially.

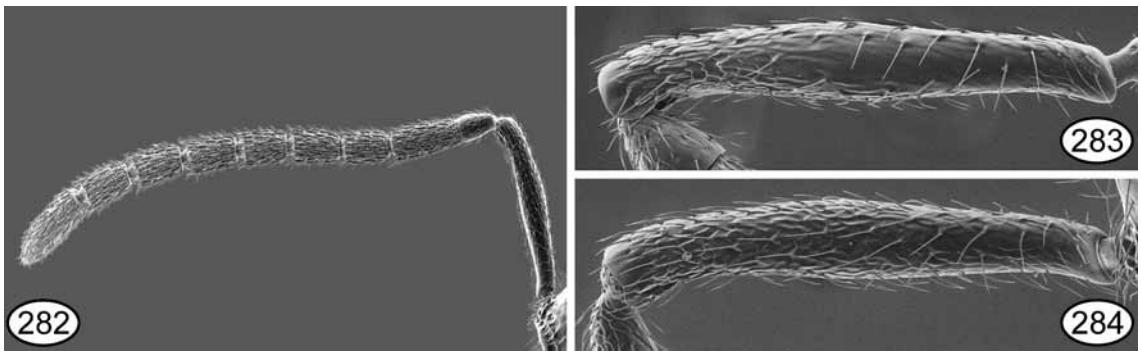
Material examined. None from region. The above description is based on UCRC specimens that were collected originally in Kenya and subsequently cultured at UCRC, plus four females from South Africa (CNC, UCRC, USNM), one USNM female from Uganda and one CUIC male labelled Belgian Congo [Democratic Republic of Congo].

Distribution. In addition to the Afrotropical countries listed for *S. longepetiolata* by Noyes (2003), the species was collected in Kenya and Uganda to establish a laboratory colony for subsequent release in California in 1967 and 1968 (Legner 1978). Legner (1978) originally stated that the species was established in California, but later stated that "although thousands were released and breeding was observed at the release sites none have become prominent in the California parasitoid complex" (Legner 1995: 74). Live material was also sent to Virginia (Legner 1978) and the species was recorded from the Lesser Antilles (West Indies) by De Santis (1979) and from Trinidad and Chile by De Santis (1983). The record of De Santis (1979) likely is based on Greathead (1971: 118), who stated that the species was to be released in the West Indies, whereas the records of De Santis (1983) likely are based on Legner (1978: 350), who stated the species was introduced to Trinidad in 1967 and to Chile in 1967 and 1968. More recently, Hernández *et al.* (2004) reported they reared *S. longepetiolata* from cattle manure in Aguascalientes, Mexico. I have not seen voucher specimens to confirm their identification or any *S. longepetiolata* collected in the New World and therefore cannot confirm presence of the species in the region.

Biology. A parasitoid of the house fly and stable fly (Legner 1978).

Recognition. I include *S. longepetiolata* as one of three species in the *cameroni* species group as discussed under *S. cameroni*. Among the three species, both sexes of *S. longepetiolata* uniquely have a linear malar sulcus (Figs 273, 274) and the subalar and episternal scrobes connected by a distinct punctate-crenulate line (Fig. 277), though individuals are similar to *S. gemina* in having sculpture extending posteroventrally along the transepisternal line from the subalar scrobe (*cf.* Figs 203, 277). Females are also differentiated from *S. cameroni* and *S. gemina* by their completely punctate-reticulate callus (*cf.* Fig. 278 with Figs 70, 202), and males by having at least some setae in the basal cell toward the parastigma. The parascrobal region and inclined surface of the scrobal depression of both sexes is also much less coarsely sculptured (Fig. 272) than in *S. cameroni* (Fig. 62) or *S. gemina* (Fig. 196) and the species differ in relative head and antennal dimensions. Observed females uniquely have the lower mesepimeron obliquely striate adjacent to the precoxal scrobe, but this not obvious in all males (Fig. 277) and I have seen too few specimens to be certain that it is diagnostic for all females.

One of the males from South Africa is similar to the described holotype in having a conspicuously elongate-slender petiole (about 4x as long as wide), the fore wings with quite dense and conspicuous brown setae behind the submarginal vein, and a somewhat longer malar space relative to the eye compared to other males, which have a shorter petiole, usually only whitish setae distally in the basal cell, and larger eyes relative to the malar space. This variation is similar to that noted by Bouček (1963) except that it does not appear to be correlated directly with size.



Figs 282–284. *Spalangia longepetiolata* Bouček ♂ (UCRC culture, Kenya). **282**, antenna; **283 & 284**, scape: **283**, inner view; **284**, outer view.

19. *Spalangia masneri* n. sp.
(Figs 285–298)

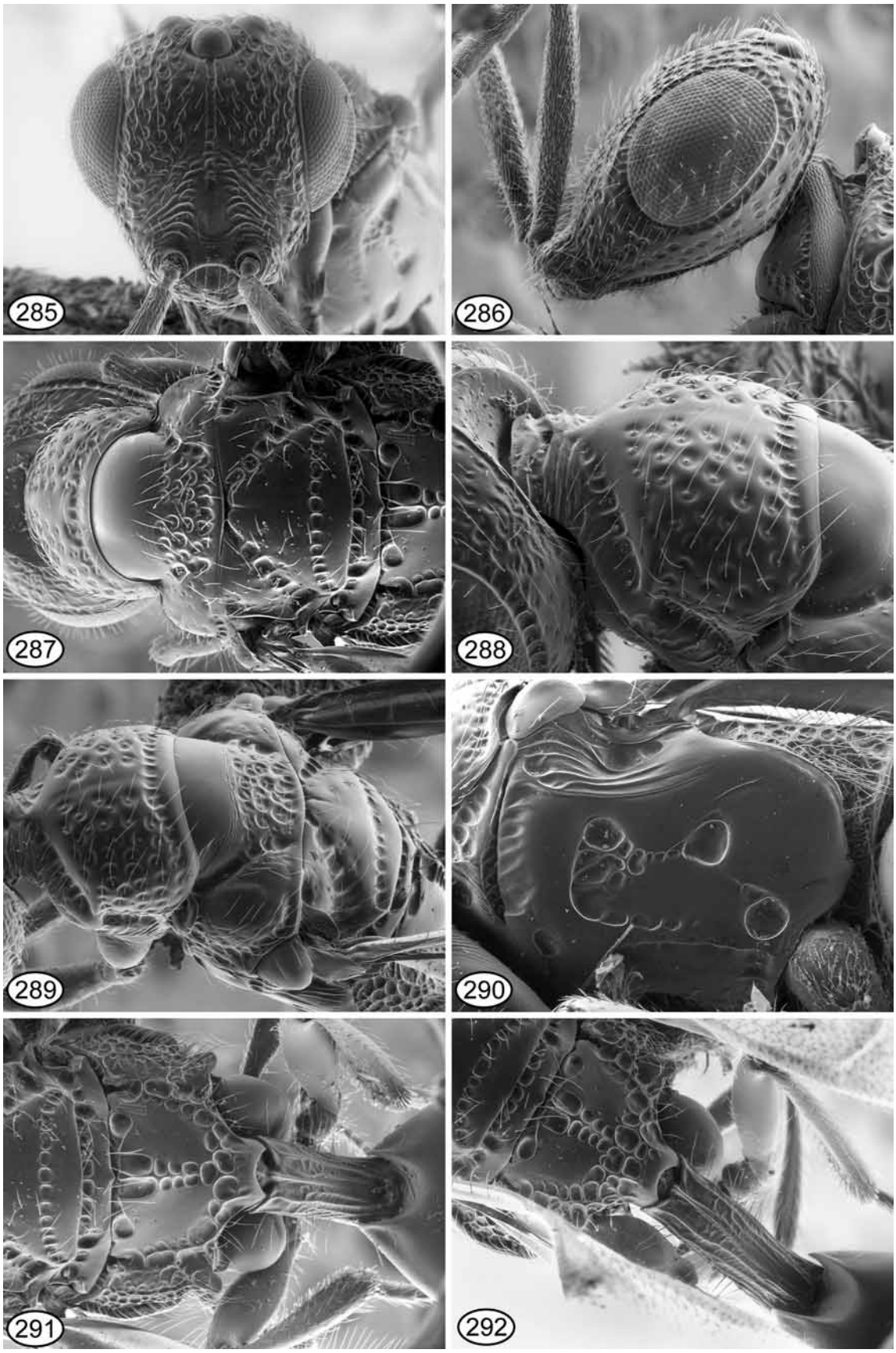
Type material. HOLOTYPE (♀, CNC no. 23888). "DOMINICAN REPUBLIC: Prov. Pedernales, Sra. Baharuco, 23 km. N. Cabo Rojo, 540 m., VII.1990, L. Masner / CNCI, JDR-specm 2007-335". Condition: point-mounted, entire.

PARATYPES (2♀, 4♂, CNC). *Neotropical*. **DOMINICAN REPUBLIC**: Pedernales, Sierra de Baharuco, Alcoa road, km. 25, 700 m., 18.I.1989, L. Masner, dry montane for. (1♀). Barahona, 4 km. N Paraiso, 150 m., 22.III.1990, L. Masner (4♂). **PUERTO RICO**: Caguas, 18º12'53"N 66º02'17"W, 20-21.VI.2008, J. Fernandez (1♀).

Etymology. Named after Dr. Lubomir Masner, who defines the word collector and through his many innovative collecting techniques and trips has increased immeasurably the value of this and many other taxonomic revisions.

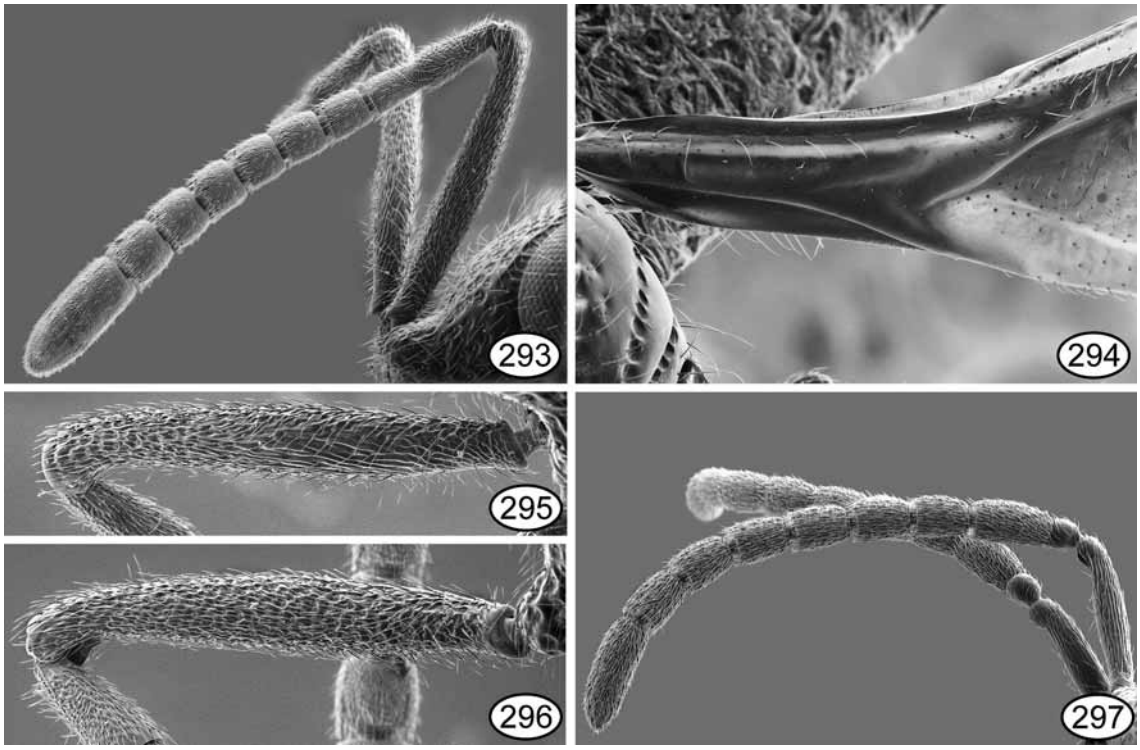
Description. *Female*. Length = 2.7–3.2 mm. Legs dark except tibiae sometimes narrowly yellow apically and basal 3 or 4 tarsal segments yellow. Head in anterior view about 1.1x as high as wide; in dorsal view about 1.7x as wide as long; in lateral view (Fig. 286) with malar space about 0.8–0.9x eye height and about 1.1–1.2x eye width. Head capsule smooth and shiny except for setiferous punctures as follows: with complete median sulcus extending ventrally to elongate-triangular scrobal depression, otherwise upper face with circular punctures mostly separated by narrow interstices less than own diameter and even more closely crowded toward inner orbit and on parascrobal region where mostly separated by ridges; scrobal depression with scrobes varying from punctate-crenulate line not extending height of interantennal region to broadly, transversely crenulate band on either side of narrow, smooth and shiny interantennal region (Fig. 285), but inclined lateral surface with closely crowded punctures similar to parascrobal region; gena without distinct malar sulcus, punctate similar to parascrobal region; temple punctate similar to upper face. Antenna (Fig. 293) with scape about 6.8–8.0x as long as greatest width, the inner (Fig. 295) and outer (Fig. 296) surfaces uniformly setose and punctate-rugulose except inner surface bare mediolongitudinally where also more distinctly longitudinally strigose; pedicel about 2.3–2.5x as long as apical width and about 1.6x as long as fu_1; funicle with fu_1 about 1.4–1.6x as long as wide, fu_2 at least very slightly longer than wide, and subsequent segments quadrate to slightly transverse apically; clava about 2.3–2.6x as long as wide.

Pronotal collar in lateral view convexly arched behind neck, anterolaterally with a vertical smooth ridge interrupting circumpronotal furrow and extending dorsally as a variably distinct carina onto collar but not across collar such that anteriorly collar smoothly rounded to neck, though with smooth and shiny inclined surface above furrow (Fig. 288); with variably distinctly differentiated crenulate cross-line posteriorly and with or without median smooth band between neck and cross-line, but otherwise more or less uniformly covered by circular punctures, the punctures somewhat more crowded laterally but sculpture smoothly rounded to circumpronotal furrow above lateral panel (Figs 288, 289). Mesoscutal median lobe (Fig. 287) with anterior convex region smooth and shiny; internotaular region with circular to slightly irregular setiferous punctures and without or with only very slender and obscure smooth median carina. Axillae (Fig. 287) smooth and shiny except for pinprick-like setiferous punctures. Scutellum (Fig. 287) smooth and shiny except for a few pinprick-like or shallow setiferous punctures laterally; frenum (Figs 287, 291) differentiated by complete crenulate frenal line. Mesopleuron (Fig. 292) smooth and shiny except as follows: pectal region variably distinctly crenulate along anterior margin and bare except for 1 posteroventral seta; acropleuron longitudinally carinate, the carinae extending posteriorly onto alar shelf; subalar scrobe a rugose, usually quite deep, often more or less vertical depression, its posteroventral margin usually forming abrupt or acute angle with transepisternal line but at least sculpture not extending posteriorly obviously along transepisternal line; episternal scrobe a subcircular depression or more vertical crenulate furrow at abrupt angle to punctate-crenulate episternal line



Figs 285–292. *Spalangia masneri* Gibson. **285 & 286**, head: **285**, anterior view ♂, **286**, lateral view ♀; **287 & 288**, ♀ pronotum: **287**, dorsal view, **288**, dorsolateral view; **289**, ♂ thorax, frontolateral view; **290**, ♀ mesopleuron; **291 & 292**, frenum–petiole, dorsal view: **291**, ♀, **292**, ♂.

joining subalar and episternal scrobes, but not or only inconspicuously connected to large precoxal scrobe by precoxal line; upper and lower mesepisternum differentiated at least by complete ventral line of setae, but evident transepisternal line variably extensive, sometimes present only anteriorly ventral to subalar scrobe. Fore wing hyaline; bare behind submarginal vein except basal cell/fold with 3 or 4 setae distally near parastigma (Fig. 294). Propodeum with crenulate postspiracular sulcus differentiated from callus; callus completely punctate- or reticulate-rugose; plical region with variably distinctly widened paramedian crenulate furrows delineating median carina, the anterior-most cell at least much longer (Fig. 291) and sometimes wider than more posterior cells; supracoxal band contiguous with paramedian crenulate furrows; propodeal panels smooth and shiny.



Figs 293–297. *Spalangia masneri* Gibson. **293**, ♀ antenna; **294**, ♂ basal cell; **295 & 296**, ♀ scape: **295**, inner view, **296**, outer view; **297**, ♂ antenna.

Petiole (Fig. 291) about 2.4x as long as medial width; minutely punctate to rugulose between longitudinal carinae or striae; with at least 10 setae laterally. Gaster with tergites smooth and shiny.

Male. Length = 2.3–3.2 mm. Antenna (Fig. 297) with scape about 6x as long as wide and much less coarsely sculptured than for female, the outer surface uniformly distinctly striate (Fig. 297) and setose but inner surface more finely striate to smooth and shiny and very sparsely setose medially and longitudinally striate and setose apically; pedicel subglobular, at most only slightly longer than wide; flagellum with setae much shorter than width of respective segment; funicle with fu_1 about 1.9–2.2x as long as wide and about 2.2–2.8x as long as pedicel, and subsequent funicular segments all longer than wide, with both fu_2 and fu_7 about 1.2–1.6x as long as wide. Otherwise similar to female except as follows. Head in anterior view (Fig. 285) about 0.9–1.0x as high as wide; in lateral view with malar space only 0.6–0.7x eye height and about 0.8x eye width. Upper face often with more crowded punctures separated only by linear ridges and sometimes longitudinally strigose-punctate dorsally between ocelli and inner orbit; scrobes broadly, transversely crenulate (Fig. 285) in all specimens examined. Pronotum in all specimens examined with distinct median smooth band extending between neck and cross-line (Fig. 289). Mesoscutal median lobe anterior convexity mostly smooth and shiny but transversely strigose adjacent to internotaular region (Fig. 289). Scutellum sometimes more or less uniformly covered with setiferous punctures. Petiole (Fig. 292) about 3x as long as medial width.

Distribution. Restricted to two adjacent islands in the West Indies (Fig. 298).

Biology. Unknown.

Recognition. I include *S. masneri* as one of six species in the *nigra* species group as discussed under *S. nigra* and *S. alyxia*. Pronotal sculpture of *S. masneri* is somewhat intermediate between that of *S. nigroaenea* + *S. chontalensis* and that of *S. alyxia* + *S. nigra* + *S. nigroides*. The pronotal collar of at least female *S. masneri* has quite a distinct vertical carina anterolaterally similar to the first two species, but like the last three species the collar anteriorly is smoothly rounded to the neck rather than being margined. Smaller individuals of *S. nigroaenea* that have the pronotal collar less obviously margined could be mistaken for *S. masneri*, but the two species differ in structure of the episternal scrobe, male fore wing setation, and female scape sculpture. Females of *S. masneri* differ from those of *S. alyxia*, *S. chontalensis*, *S. nigra* and *S. nigroides* in having the fore wing bare behind the submarginal vein rather than having at least a few setae in a line on the mediocubital fold. If petiolar setation is not visible, *S. masneri* is more likely to be mistaken for *S. endius* or *S. nigripes* because of pronotal sculpture. All three species have well separated circular setiferous punctures on the pronotal collar (*cf.* Figs 134, 288, 334). However, both sexes of *S. masneri* have the basal cell bare (Fig. 294), whereas both sexes of *S. nigripes* and males of *S. endius* have some setae on at least the mediocubital fold. Although females of *S. endius* are similar to those of *S. masneri* in having basally bare fore wings, yellowish tarsal segments, and a differentiated pronotal cross-line, they differ by having the subalar scrobe obviously widened posteroventrally along the transepisternal line and the upper mesepimeron more or less distinctly obliquely strigose (Fig. 138), unlike females of *S. masneri* (Fig. 290). Other sculptural differences between *S. masneri* and *S. endius* are given in the respective descriptions.

20. *Spalangia nigra* Latreille, 1805

(Figs 298–317)

Spalangia nigra Latreille, 1805: 228; lectotype ♀ (MRSN, not examined) designated by Bouček (1963: 445). Type data: [France] Paris.

Spalangia hirta Haliday, 1833: 334; lectotype ♀ (OXUM, not examined) designated by Graham (1969: 52). Type data: England. Synonymy by Bouček (1963: 443).

Spalangia rugosicollis Ashmead, 1894: 35, 36; holotype ♀ (USNM, examined). Type data: Missouri. Synonymy by Bouček (1963: 443).

Description. *Female*. Length = 2.1–3.6 mm. Legs dark except at least basal 3 tarsal segments yellow and sometimes knees and apex of tibiae narrowly yellow. Head in anterior view (Fig. 299) about 1.1–1.2x as high as wide; in dorsal view (Fig. 304) about 1.6–1.9x as wide as long; in lateral view (Fig. 300) with malar space about 0.9–1.0x eye height and about 1.2–1.4x eye width. Head capsule smooth and shiny except for setiferous punctures as follows: with complete median sulcus extending ventrally to elongate-triangular scrobal depression, otherwise upper face and parascrobal region densely punctate, the punctures sometimes separated by about own diameter but more often by less than own diameter and sometimes so crowded as to be more or less multisided with ridge-like interstices, at least laterally; scrobal depression with scrobes broadly, transversely to obliquely carinate-crenulate at least ventrally above torulus (Fig. 299), the inclined lateral surface of depression otherwise punctate similar to parascrobal region, but interantennal region smooth and shiny; gena without distinct malar sulcus, with crowded punctures separated by linear ridges; temple variably densely punctate similar to upper face. Antenna (Fig. 312) with scape about 8.3–9.2x as long as greatest width, the outer surface (Fig. 314) uniformly setose and longitudinally strigose, but inner surface (Fig. 313) bare mediolongitudinally where usually more distinctly longitudinally striate; pedicel about 2.2–2.7x as long as apical width and about 1.4–1.8x as long as fu_1; funicle with fu_1 about 1.3–1.9x as long as wide, fu_2 at least quadrate and usually at least slight longer than wide, and apical segments quadrate to up to about 1.4x as wide as long; clava about 2.3–2.6x as long as wide.

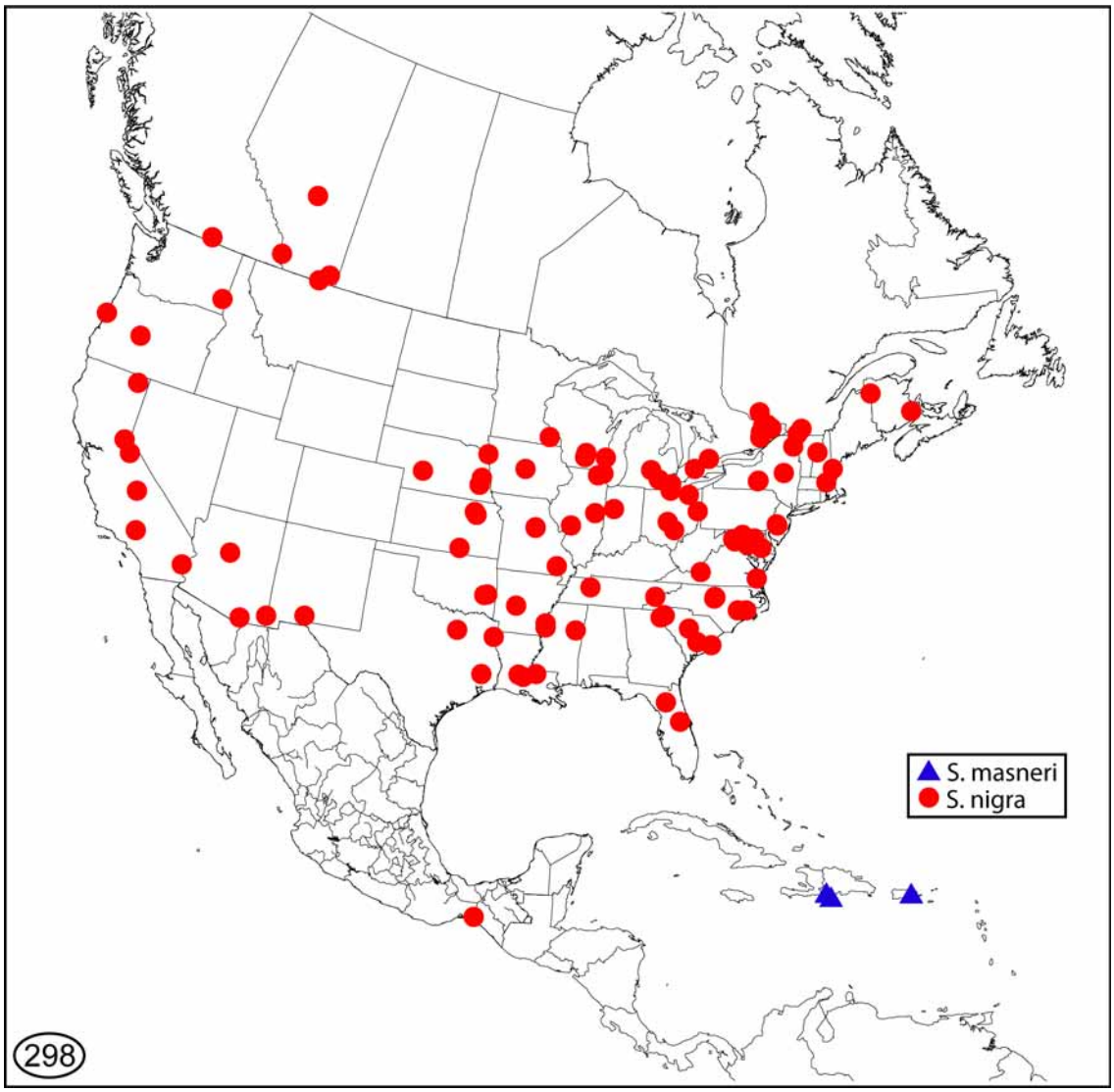
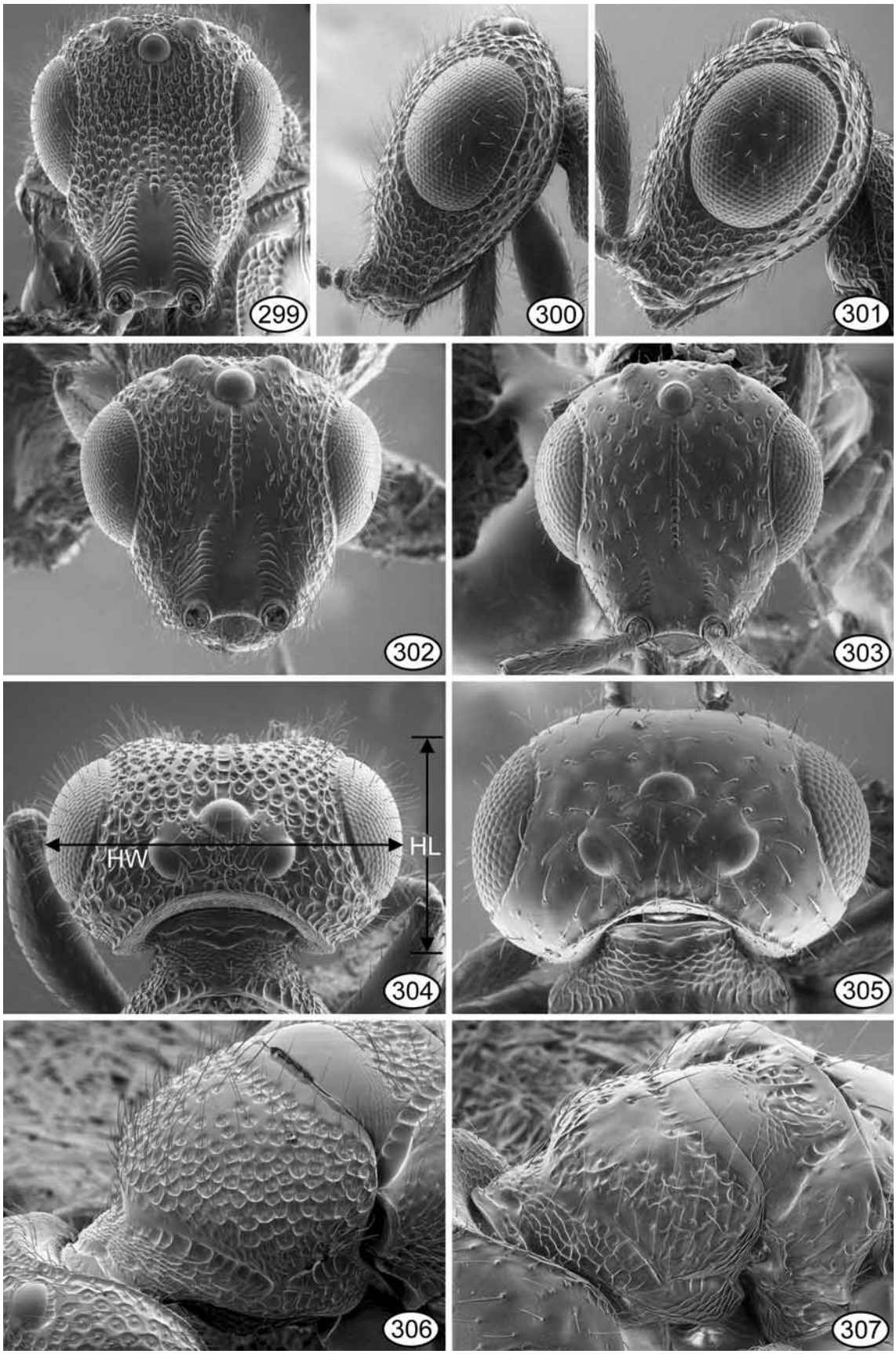
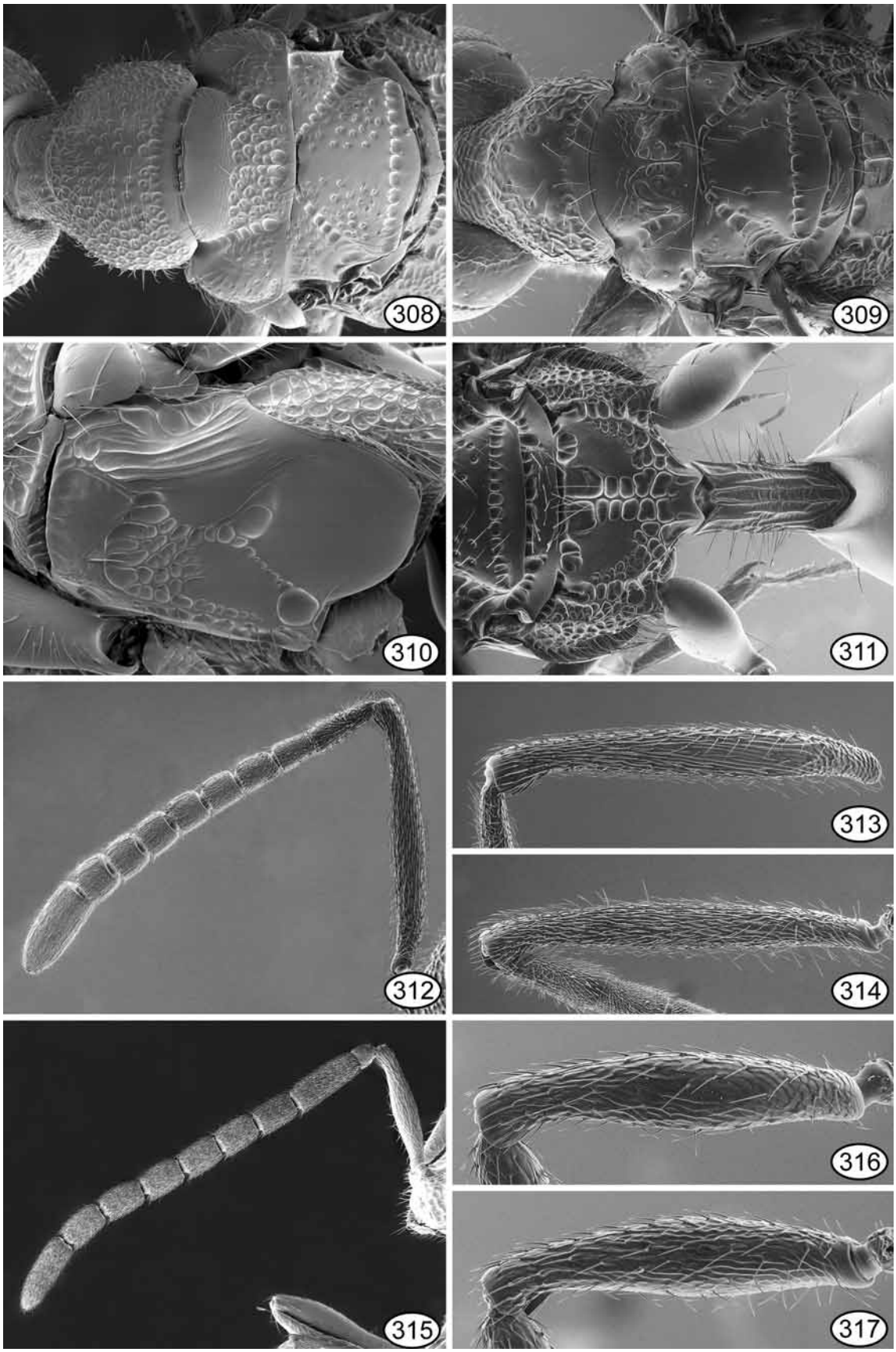


Fig. 298. Distribution of *Spalangia masneri* Gibson and *S. nigra* Latreille.

Pronotal collar in lateral view convexly arched behind neck and anterolaterally with a short smooth bar interrupting circumpronotal furrow, but anteriorly smoothly rounded to neck; usually completely or almost completely punctate without distinctly differentiated cross-line posteriorly, except often medially where collar smooth or at least less densely punctate anterior to cross-line (Fig. 306), and dorsally with punctures becoming increasingly crowded so as to be more or less multisided or rugose anteriorly and/or laterally, but laterally sculpture smoothly rounded to circumpronotal furrow above lateral panel. Mesoscutal median lobe (Fig. 308) with anterior convex region mostly smooth and shiny, though sometimes finely coriaceous posteriorly; internotaular region completely punctate-rugose except often for irregular median carina. Axillae (Fig. 308) usually with distinct punctures but sometimes setae originating from only pinprick-like pores. Scutellum (Fig. 308) more or less uniformly covered by distinct, circular setiferous punctures lateral to median smooth band; frenum (Fig. 308) differentiated by complete crenulate frenal line. Mesopleuron (Fig. 310) smooth and shiny except as follows: pectal region crenulate along anterior margin and bare except for 1 posteroventral seta; acropleuron longitudinally carinate, the carinae extending posteriorly onto alar shelf and variably extensively, sometimes completely, over upper mesepimeron; subalar scrobe a large, reticulate-rugose, triangular region widened posteroventrally along transepisternal line; episternal scrobe an arcuate, crenulate-reticulate furrow connected to subalar scrobe by punctate-crenulate episternal line and to precoxal scrobe by punctate precoxal



Figs 299–307. *Spalangia nigra* Latreille. **299–305**, head: **299**, anterior view ♀, **300**, lateral view ♀, **301**, lateral view ♂, **302**, anterior view ♂, **303**, anterior view ♂, **304**, dorsal view ♀, **305**, dorsal view ♂; **306 & 307**, pronotum, dorsolateral view: **306**, ♀, **307** ♂.



Figs 308–317. *Spalangia nigra* Latreille. **308 & 309**, thorax, dorsal view: **308**, ♀, **309**, ♂; **310**, ♀ mesopleuron; **311**, ♂ frenum–petiole, dorsal view; **312**, ♀ antenna; **313 & 314**, ♀ scape: **313**, inner view, **314**, outer view; **315**, ♂ antenna; **316 & 317**, ♂ scape: **316**, inner view, **317**, outer view.

line; upper and lower mesepisternum differentiated by punctate-crenulate transepisternal line and adjacent line of setae. Fore wing hyaline; variably extensively setose behind submarginal vein but mediocubital fold with at least a few setae. Propodeum (Fig. 311) with crenulate postspiracular sulcus differentiated from callus; callus completely punctate-rugose; plical region with variably distinctly widened paramedian crenulate furrows delineating median carina, but at least anterior-most cell obviously wider and larger than more posterior cells; supracoxal band contiguous with paramedian crenulate furrows; propodeal panels smooth and shiny.

Petiole about 2x as long as medial width; transversely carinate to reticulate-rugulose between longitudinal carinae; with several setae laterally. Gaster with tergites smooth and shiny or with only extremely obscure coriaceous sculpture.

Male. Length = 1.5–2.9 mm. Antenna (Fig. 315) with scape about 5.2–7.1x as long as wide, the sculpture usually less distinctly strigose, particularly outer surface (Fig. 317) often more coriaceous-rugulose and inner surface (Fig. 316) sometimes smooth and shiny medially; pedicel subglobular, at most about 1.3x as long as wide; flagellum with setae much shorter than width of respective segment; funicle with fu_1 about 1.7–2.6x as long as wide and about 1.5–3.6x as long as pedicel, and subsequent funicular segments usually all obviously (about 1.5x) longer than wide, but in small individuals middle or most segments sometimes only slightly longer than wide. Otherwise similar to female except as follows. Head in anterior view (Figs 302, 303) about 0.9x as high as wide; in lateral view (Fig. 301) with malar space only about 0.6–0.7x eye height and about 0.8–1.0x eye width. Head capsule sometimes much more sparsely punctate than female, upper face and parascrobal region sometimes with punctures separated by up to about 3x own diameter (Fig. 303) and gena sometimes smooth and shiny near lower orbit but without malar sulcus. Pronotum often with quite large smooth region posteromedially and therefore with more distinctly differentiated cross-line than most females, but at least rugose-punctate anteriorly and laterally (Figs 307, 309). Scutellum quite commonly with relatively few, often tiny setiferous punctures laterally (Fig. 309). Petiole (Fig. 311) about 2.2–2.8x as long as medial width.

Material examined. Nearctic and Neotropical (884 specimens in AEIC, CASC, CLEV, CNC, CUAC, CUIC, DEBU, DENH, FSCA, IRCW, MCZH, NCSU, OSAC, OSUC, ROME, TAMU, UCDC, UCFC, UCRC, UMRM, UNML, USNM, WSUC). Complete collection records are not provided; those with host data: *Nearctic*. **CANADA**: ***New Brunswick***, Moncton, St-Léonard-Parent Beaupré Farm, 26.VI.03, 9, 18, 30.VII.03, T. Levesque, *M. domestica*. ***Ontario***, Guelph, 18.IX.78, D. Levin, *Hylemyia antiqua* (DEBU). Fitzroy Harbour, Weir farm, 45º29.349'N 76º11.938'W, G. Gibson & L. Bartels — 26.VI.01, 7.VIII.01, ? *Hydrotaea* (*Ophyra*) *leucostoma*; 11.IX.01 (dissected 13.XI.01), ? *Phormia regina*. Ottawa, Merivale Rd, 45º18.926'N 75º42.762'W, 23.VIII.01 (1 dissected 26.X.01), G. Gibson & L. Bartels, ? *Phormia regina*. Ottawa, Prince of Wales Dr., McEwen farm, 45º18.763'N 75º42.193'W, 14.VI.01, 9.VIII.01 (dissected 6.XI.01), 16.VIII.01 (dissected 15.X.01), G. Gibson & L. Bartels, ? *Hydrotaea* (*Ophyra*) *leucostoma*. Ottawa vicinity, various localities and dates 2000 and 2001, G. Gibson & L. Bartels, *M. domestica* and *S. calcitrans* (see Gibson and Floate 2004). Styles Side Rd NW West Carleton, Clarence farm, 45º26.622'N 76º10.296'W, dissected 4.XII.01, G. Gibson & L. Bartels, ? *Phormia regina*. Yorks Corners Road, S Kenmore, Donevelyn farm, 45º 11.758'N 75º 23.547'W, 5.VII.01, G. Gibson & L. Bartels, ? *Hydrotaea* (*Ophyra*) *leucostoma*. ***Quebec***, Luskville, Alary farm, 45º31.655'N 76º02.898'W, 28.VIII.01 (dissected 29.X.01), G. Gibson & L. Bartels, ? *Hydrotaea* (*Ophyra*) *leucostoma*. St. Jean, 15, 22.IX.53, P. Perron, *Hylemyia antiqua*. **USA**: ***Florida***, Alachua Co., Gainesville, 19.VI.75, R.L. Escher, *H. irritans* (FSCA). ***Illinois***, Libertyville — 25.VII.68, E. Legner, *Stomoxys* sp. (UCRC); reared in lab., CES Riverside, VIII, IX.68, *M. domestica* (UCRC). ***Kansas***, Wellington, 2.XI.12, *S. calcitrans* (USNM). ***Mississippi***, Starkville, 11.VIII.72, K.J. Watts, *Ravinia derelicta* (USNM). ***Missouri***, Boone Co., Columbia, D.E. Figg, voucher specimens (UMRM) — 8, 14, 18, 25, 28.IX.81, *Orthellia caesarion*; 23.IX.81, *Paregle cinerella*; 14, 17.VIII.81, 2.X.81, *Ravinia* sp.; 14, 23, 25.IX.81, Anthomyiidae. ***Nebraska,*** Lincoln, 1962, C. McCoy, *M. domestica* (USNM). ***New York***, Cayuga Co., 14.V.86, 1, 3, 16.VII.86, L. Smith, *M. domestica* (USNM). Tompkins Co., 8.IX.87, C. Henderson, *M.*

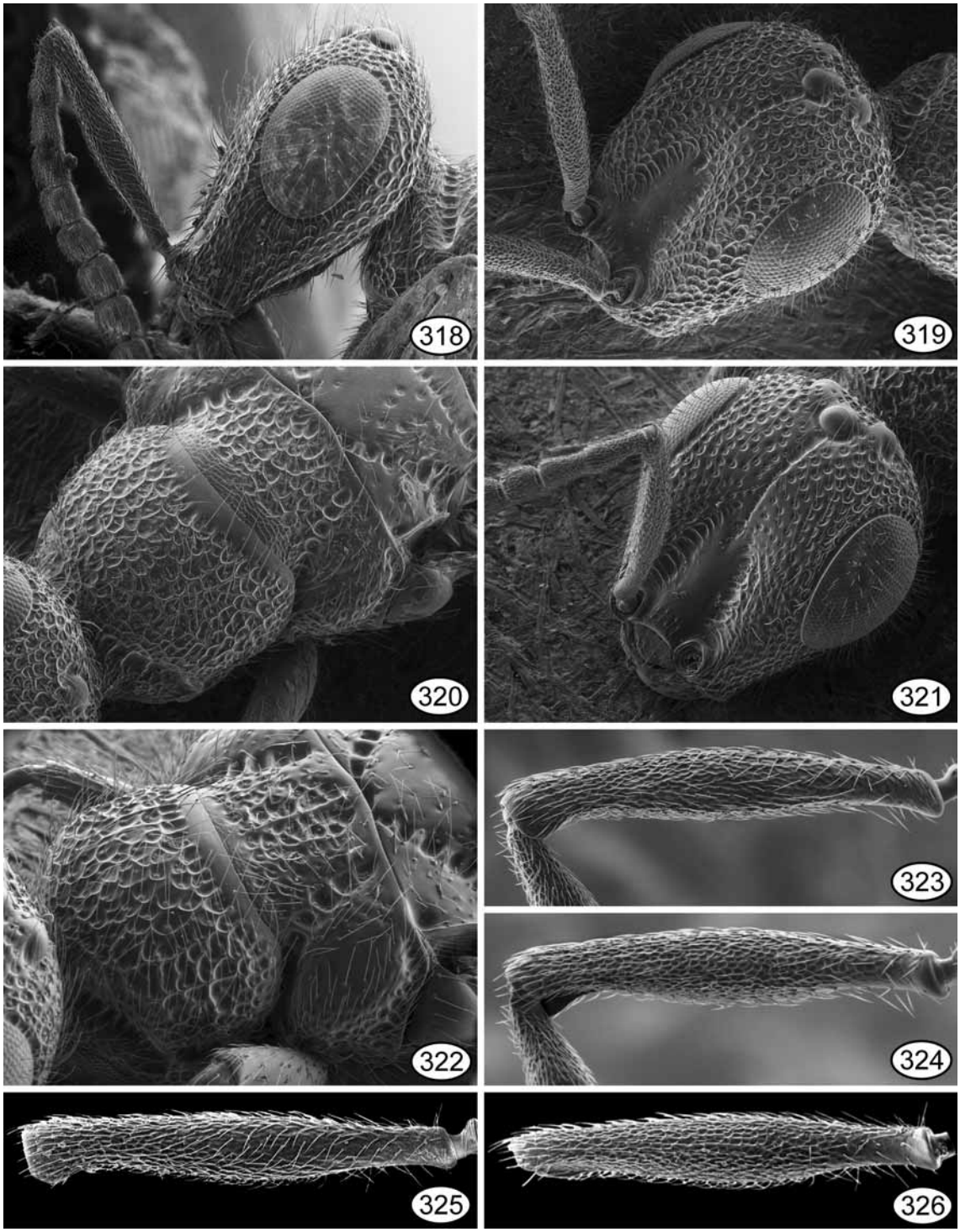
domestica (CUIC). ***North Carolina***, Alamance Co., Sutphin, 18.VIII.78, T.D. Edwards, *M. domestica* (CUIC). Chatham Co., Silk Hope, 29.IX.76, D.A. Rutz, *M. domestica* (CUIC). Lenoir Co., Deep Run, 24.VIII.78, T.D. Edwards, *M. domestica* (CUIC). ***South Carolina***, Oconee Co., South Union, 12.VI.73, *M. domestica* (CUAC). ***Texas***, Dallas, 1, 24.XI.12, *S. calcitrans* (USNM). Gainesville, 31.V.13, *S. calcitrans* (USNM). ***Virginia***, Blacksburg, 10.VIII.67, R.P. Burton, *Musca autumnalis* (USNM).

Distribution. A cosmopolitan species that Noyes (2003) records from all six biogeographic regions, including West Indies (Barbados, St. Vincent & Grenadines, Trinidad & Tobago) and South America (Brazil, Chile, Peru). However, I only saw specimens from North America (Fig. 298), including just a single specimen from south of the USA labelled "Mexico: Nuevo Leon, Mun. Guadalupe, Rincón de la Sierra, 11.VII.83, A. Gonzalez H." (UCRC). The absence of specimens from the extensive rearings by Loera-Gallardo *et al.* (2008) in northeastern Mexico near Guadalupe suggests that *S. nigra* is at most a very rare naturally occurring species south of the USA.

Biology. Noyes (2003) lists *S. nigra* as a primary parasitoid of at least 30 species in 10 families of Diptera plus other taxa in Coleoptera, Lepidoptera and Hymenoptera, likely as hyperparasitoids through Tachinidae primary parasitoids. Specimens I saw from the New World indicate *S. nigra* is a parasitoid of the three principal filth-fly pests of livestock, the house fly, stable fly and horn fly, as well as the face fly, *Musca autumnalis* De Geer, the onion maggot, *Delia* (= *Hylemia*) *antiqua* (Meigen), and *Neomyia cornicina* (Fabricius) (= *Orthellia caesarion*), *Adia* (= *Paregle*) *cinerella* (Fallén) and *Ravinia derelicta* (Walker). The tentative records of *Hydrotaea* (*Ophyra*) *leucostoma* (Wiedemann) and *Phormia regina* (Meigen) by Gibson and Floate (2004) were based on comparison of pupal remains correlated with flies emerged from similar puparia.

Recognition. I include *S. nigra* along with *S. alyxia*, *S. chontalensis*, *S. masneri*, *S. nigroides* and *S. nigroaenea* in the *nigra* species group. These six New World species share a coarsely sculptured pronotum and a petiole with several setae laterally, in contrast to *cameroni*-group species, which have a coarsely sculptured pronotum but a bare petiole. *Spalangia simplex* and *S. dozieri* also have a laterally setose petiole, but *S. simplex* is distinguished by its pronotal collar being smooth anterior to the cross-line and by its unique internotaular sculpture pattern (Fig. 412). *Spalangia dozieri* is more similar to such species as *S. drosophilae* because it has a median sculptured propodeal band (Fig. 104) and its mesopleuron is extensively sculptured (Fig. 106). *Spalangia nigra* and the other five species of the group have a median propodeal carina and the mesopleuron is mostly smooth and shiny between the various scrobes and connecting lines of sculpture except sometimes for a longitudinally carinate upper mesepimeron.

Within the group of six species, *S. nigra* and *S. nigroides* have the subalar scrobe extending broadly along the transepisternal line so that it is more or less triangular in shape (Figs 310, 370). Other *nigra*-group species have a more vertical subalar scrobe or one that is widest medially and narrowed anteroventrally so that its posteroventral margin and transepisternal line form an abrupt or acute angle (Figs 34, 35, 87, 88, 290). Males of *S. nigroides* are unknown, but *S. nigra* females differ from those of *S. nigroides* mostly only in the relative features given in the key. The pronotum of *S. nigroides* in lateral view is also flatter and anteriorly less strongly convex (Fig. 367) than for *S. nigra* females (Fig. 306). Most females of *S. nigra* also have the anterior-most cell of the paramedian crenulate furrows larger and more obviously differentiated from the more posterior cells than for the two known females of *S. nigroides*. If mesopleural sculpture is not visible, *S. nigra* could be mistaken for *S. chontalensis* or *S. nigroaenea*, both of which sometimes have a coarsely punctate scutellum. However, unlike the latter species the pronotal collar of *S. nigra* lacks a distinct vertical carina anterolaterally and anteriorly is evenly rounded to the neck (Figs 306, 307). Both sexes of *S. nigra* have at least some setae on the mediocubital fold and the anterior convex region of the median mesoscutal lobe smooth and shiny except sometimes posteriorly adjacent to the sculptured internotaular region (Figs 306, 307), whereas both sexes of *S. masneri* have the mediocubital fold bare and both sexes of *S. alyxia* have the mesoscutal median lobe anterior convex region completely sculptured (Figs 31, 33).



Figs 318–326. Figs 318–320, *Spalangia rugulosa* Förster ♀. **318**, head, lateral view; **319**, head, frontolateral view; **320**, pronotum and mesoscutum, frontodorsal view. **Figs 321–324**, *Spalangia irregularis* Bouček ♀. **321**, head, frontolateral view; **322**, pronotum and mesoscutum, frontodorsal view; **323 & 324**, scape: **323**, inner view, **324**, outer view. **Figs 325 & 326**, *S. rugulosa* ♀, scape: **325**, inner view, **326**, outer view.

Bouček (1963) included in his *nigra*-group *S. irregularis* Bouček and *S. rugulosa* Förster, two other Old World species that are very similar to *S. nigra*. My concept of S. *irregularis* is based on the one female and two male paratypes from Cyprus deposited in the BMNH by Bouček (1963), two ZSMC females (Switzerland: Collonge-Bellerive, 23.VII.66, P.P. Babiv; Corsica: Taravotal, 3 km NE Porto Pollo, 27.II.68), one NMPC female (Cyprus: Platus, 18.VIII.37, Mavromoustakis) and one CNC male (France: Montpellier,

14.IV.78, J. Huber), whereas my concept of *S. rugulosa* is based on one NMPC female (Serbia: Ruma, Dr. Hensch.), one ZSMC female (Germany: Munich, 18.V.66, W. Schacht), and one USNM male (France: Yvelines, Bouafle, 21.VI.79, CHOUX Lab.: 13.VII). As described by Bouček (1963: 447), the "antennal socket [is] abruptly raised" in *S. nigra* but not in *S. rugulosa* or *S. irregularis*. Females of *S. nigra* have the torulus at the end of a short but quite distinct, obliquely projecting tube formed in part from the lower face (Fig. 300), whereas females of *S. rugulosa* (Fig. 318) and *S. irregularis* have the lower face at almost a right angle to the face so that the torulus is only rim-like and non-protuberant. This feature is not as obvious for males because males of *S. nigra*, like males of most species, do not have the lower face protruding as conspicuously into a lobe as for females (*cf.* Figs 300, 301). The pronotal collar of *S. rugulosa* (Fig. 320) and *S. irregularis* (Fig. 322) is also more coarsely sculptured than that of *S. nigra* (Fig. 306), being more uniformly reticulate-rugulose with all the setiferous punctures, even posteromedially, irregular and separated by linear ridges. Furthermore, individuals of *S. nigra* that have crowded punctures on the face similar to the densely punctate to punctate-rugose face of *S. irregularis* or *S. rugulosa* have the scrobes and inclined surface of the scrobal depression above the scrobes transversely to obliquely carinate-crenulate (Figs 299, 302), whereas the latter two species have the scrobes only narrowly crenulate ventrally so that the inclined portion of the scrobal depression is reticulate-rugose even above the toruli (Figs 319, 321). However, sculpture of the scape probably most readily distinguishes females of *S. nigra* from those of *S. rugulosa* and *S. irregularis*. Both surfaces of the scape of female *S. nigra* (Figs 313, 314), but particularly the bare inner surface (Fig. 313), are distinctly longitudinally striate-strigose, whereas the scape is punctate-rugose to reticulate-punctate in *S. rugulosa* (Figs 325, 326) and *S. irregularis* (Figs 323, 324) as observed originally by Bouček (1963).

21. *Spalangia nigripes* Curtis, 1839

(Figs 327–345)

Spalangia nigripes Curtis, 1839: folio 740; type ♀ lost (Bouček 1963: 461). Type data: [England], taken by Mr. Shuckard.

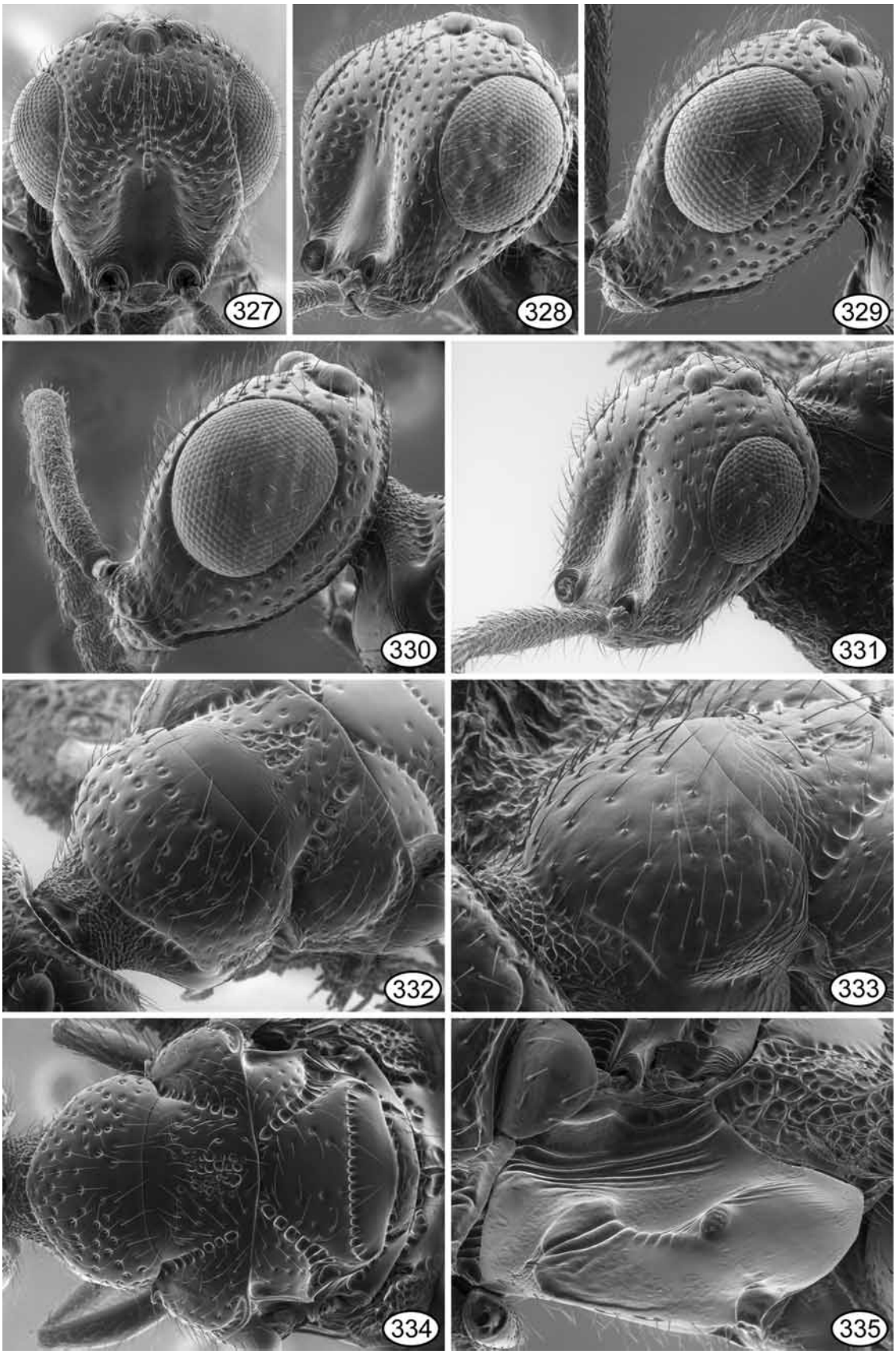
Spalangia hyaloptera Förster, 1850: 509–511; lectotype ♀ (NHMW, not examined) designated by (Bouček 1963: 461). Type data: [Germany], Aachen [lectotype: Or. Ex.]. Synonymy by Bouček (1963: 461).

Spalangia formicaria Kieffer, 1905: 1–2; holotype ♀ (NHME, not examined). Type data: Luxembourg, May, E. Wasmann, in nest of *Lasius fuliginosus*. Synonymy by Bouček (1963: 461).

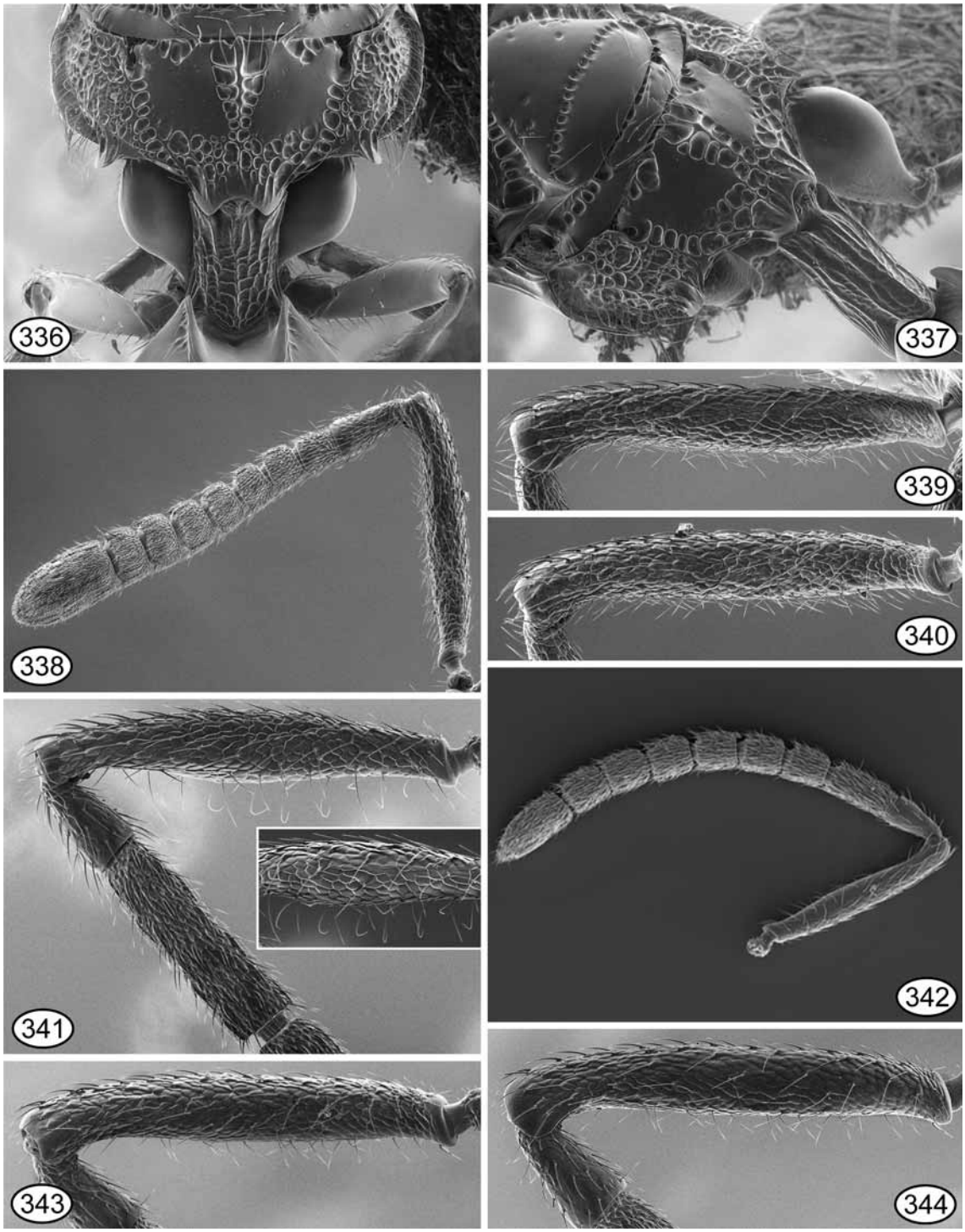
Spalangia muscarum Girault, 1920: 213–214; holotype ♀ (USNM, examined). Type data: 39589 [Urbana, Illinois, reared from muscid puparia, Illinois State Laboratory of Natural History]. Synonymy by Bouček (1963: 461).

Description. *Female*. Length = 2.6–3.1 mm. Legs dark with tarsi at least not bright yellow, usually with only basal segment of fore tarsus yellowish but sometimes both fore and middle tarsi with basal segments yellowish and hind tarsus with middle three segments somewhat lighter than basal and apical segments. Head in anterior view (Fig. 327) about 0.9–1.0x as high as wide; in dorsal view about 1.7–1.8x as wide as long; in lateral view (Fig. 329) with malar space about 0.7x eye height and about 0.9–1.0x eye width. Head capsule (Figs 327–331) smooth and shiny except for setiferous punctures as follows: with complete median sulcus extending to elongate-triangular scrobal depression, otherwise upper face and parascrobal region with crowded circular punctures mostly separated by about own diameter or less; scrobal depression with dorsally tapered, coriaceous-granular scrobes on either side of smooth and shiny interantennal region, and inclined lateral surface punctate similar to parascrobal region (Figs 327, 328); gena with scattered, often shallower punctures than on face but with linear malar sulcus; temple with slightly larger and often somewhat more multisided punctures than on face, at least posteriorly near occipital carina and dorsally toward upper orbit. Antenna (Fig. 338) with scape about 5.5–6.9x as long as greatest width, the inner (Fig. 339) and outer (Fig. 340) surfaces setose and similarly coriaceous-granular to strongly alutaceous or somewhat longitudinally strigose; pedicel about 2.1–2.4x as long as apical width and about 1.7–1.9x as long as fu_1; funicle with fu_1 about 1.1–1.4x as

long as wide, fu_2 subquadrate and subsequent segments increasingly transverse apically with fu_7 about 1.4–1.7x as wide as long; clava about 1.8–2.0x as long as wide.



Figs 327–335. *Spalangia nigripes* Förster (Palaearctic). **327–331**, head: **327**, anterior view ♀, **328**, frontolateral view ♀, **329**, lateral view ♀, **330**, lateral view ♂, **331**, frontolateral view ♂; **332 & 333**, ♂ pronotum and mesoscutum, dorsolateral view; **334**, ♀ thorax, dorsal view; **335**, ♀ mesopleuron.



Figs 336–344. *Spalangia nigripes* Förster. **336**, P♀ propodeum and petiole, dorsal view; **337**, P♂ frenum–petiole, posterodorsal view; **338**, P♀ antenna; **339 & 340**, P♀ scape: **339**, inner view, **340**, outer view; **341**, N♂ scape, outer view, and fu_1 (insert: median portion of scape, inner view); **342**, P♂ antenna; **343 & 344**, P♂ scape: **343**, inner view; **344**, outer view. Abbreviations, N = Nearctic, P = Palaearctic.

Pronotal collar in lateral view convexly arched behind neck and anterolaterally with vertical ridge interrupting circumpronotal furrow, but anteriorly smoothly rounded to neck; more or less uniformly covered by setiferous punctures without distinctly differentiated cross-line posteriorly, the punctures often sparser medially but circular even if separated by shiny interstices of less than own diameter anteriorly and laterally (Figs 332, 334). Mesoscutal median lobe (Figs 332, 334) with anterior convex region smooth and shiny or only very narrowly coriaceous posteriorly; internotaular region with distinct circular setiferous punctures lateral to more

punctate-rugose medial region having punctures of different sizes and shapes and often slender median smooth line (Fig. 334). Axillae (Fig. 334) shiny but with scattered setiferous punctures. Scutellum (Fig. 334) smooth and shiny mediolongitudinally but with distinct circular setiferous punctures in region behind axillae; frenum (Figs 334, 337) differentiated by complete crenulate frenal line. Mesopleuron (Fig. 335) smooth and shiny as follows: pectal region bare except for 1 posteroventral seta; acropleuron longitudinally carinate, the carinae extending posteriorly onto alar shelf and ventrally, often as weaker striae, over at least dorsal half of upper mesepimeron; subalar scrobe longitudinally to obliquely carinate dorsally, but much more finely roughened-wrinkled to rugose-wrinkled ventrally where at least obscurely extending posteriorly along transepisternal line; episternal scrobe a vertically oval to somewhat lunate, usually longitudinally carinate depression connected to subalar scrobe by punctate-crenulate line; precoxal scrobe tapered dorsally but not extending as distinct line to episternal scrobe; lower mesepimeron often with a few fine longitudinal striae dorsal to and sometimes ventral to episternal scrobe; upper and lower mesepisternum differentiated by carinate transepisternal line over about anterior half and by complete line of adjacent setae (Fig. 335). Fore wing hyaline; mediocubital fold with line of several setae and basal cell variably extensively setose distally. Propodeum (Fig. 336) with distinct postspiracular sulcus; callus reticulate-rugose; plical region with only slightly widened paramedian crenulate furrows delineating median carina, the carina highest near anterior third so in lateral view obviously angulate, and with anterior-most cell often longer but at least of similar width as other cells (Fig. 336); supracoxal bands contiguous with paramedian crenulate furrows; propodeal panels smooth and shiny.

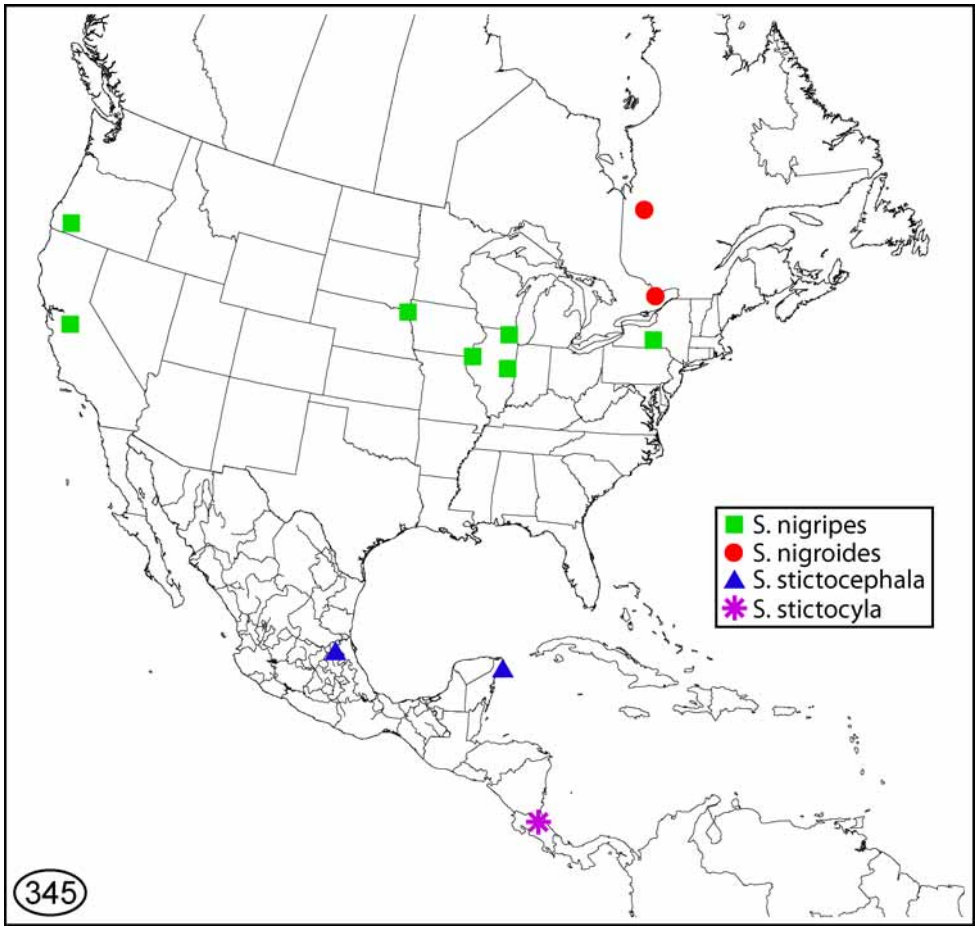


Fig. 345. Distribution of *Spalangia nigripes* Curtis, *S. nigroides* Gibson, *S. stictocephala* Gibson and *S. stictocyla* Gibson.

Petiole (Fig. 336) about 1.6–1.8x as long as medial width; transversely carinate to reticulate between longitudinal carinae; bare. Gaster smooth and shiny or Gt_2 and/or Gt_3 very finely and obscurely coriaceous.

Male. Length = 2.1–2.8 mm. Antenna with scape about 5.5–5.9x as long as wide, the inner and outer sur-

faces similarly sculptured as female but ventrally with long, apically curved setae at least as long as greatest width of scape (Fig. 341); pedicel about 1.8–1.9x as long as wide; flagellum (Fig. 342) with setae much shorter than width of respective segment; funicle with fu_1 about 3.5–3.8x as long as wide (Fig. 341) and about 2.1–2.2x as long as pedicel, and subsequent funicular segments quadrate or slightly longer than wide, with fu_7 about 1.0–1.2x as long as wide. Otherwise similar to female except as follows. Tarsi dark. Head (Fig. 331) in anterior view as wide as high; in lateral view with malar space subequal in length to eye height and about 1.3x eye width; upper face and parascrobal region more sparsely punctate, the punctures separated by interstices distinctly greater than own diameter; scrobal depression with scrobes and inclined lateral surface of depression distinctly coriaceous to coriaceous-granular (Fig. 331). Pronotal collar somewhat longitudinally punctate-strigose and/or coriaceous posterolaterally, with setae arising from small bumps within variably distinct and crowded punctures varying from very shallow depressions only slightly larger than setal origin (Fig. 333) to distinct and closely crowded depressions (*cf.* Fig. 332), but with for smooth, bare median band. Mesoscutal median lobe (Fig. 333) with anterior convex region more extensively coriaceous posteriorly, the coriaceous sculpture sometimes extending more finely over internotaular region; internotaular region with narrower median punctate-rugulose region but with separate, circular setiferous punctures laterally similar to female. Fore wing with brownish tinge along mediocubital fold. Propodeum (Fig. 337) with median carina in lateral view low angulate, projecting less distinctly in anterior third than for female. Petiole (Fig. 337) about 2.7–2.9x as long as medial width; with 1–3 setae laterally.

Material examined. *Nearctic* (20♀, 2♂). **USA**: ***California***, Stanislaus Co., Turlock, 12.II.55. R.R. Snelling (1♂ EMEC). ***Illinois***, 16117, 39573 (2♀ INHS), 39589 (holotype, USNM). Algonquin, 8.VII.1894, 29.IV.1895, 5.III.1896, 15, 16, 24.IV.1896, 8.V (3♀ INHS, 6♀ USNM). Urbana, 23.XI.13 (1♀ INHS). ***New Hampshire***, Durham, 20.V.55, R.L. Blickle (1♀ DENH). ***New York***, Schuyler Co., Huston 6, 8.VII.86, L. Smith, pupa *M. domestica* in dairy manure (2♀ USNM); Huston 2, 19.IX.85 (3♀ CUIC). ***Oregon***, Jackson Co., Murphy Gulch, 42º32.183'N 123º04.044'W, 2,600 ft, 29.III.07, E.F. Drake (1♂). ***South Dakota***, Elk Point, 1915, C.N. Ainslie, reared from *H. unipunctata* hyper on *Apanteles* (Webster no. 8856) (1♀, USNM).

Distribution. *Spalangia nigripes* is a native Palaearctic species (Noyes 2003) that I only tentatively record as present in the Nearctic region (Fig. 345) as discussed below. Burks (1979) recorded *S. nigripes* from Arkansas and Colorado, presumably based on specimens in the USNM, but I did not see any to confirm these state records.

Biology. In addition to *M. domestica*, Noyes (2003) lists *S. calcitrans* and species of *Fannia* Robineau-Desvoidy (Muscidae) as well as *Lucilia* sp. (Calliphoridae) as hosts, but the type specimen of the junior synonym *S. formicaria* was taken from an ant nest of *Lasius fuliginosus* (Latreille) (Formicidae). The host record of *H. unipunctata* from South Dakota undoubtedly refers to *Hypagyrtis unipunctata* (Haworth) (Lepidoptera: Geometridae) and the label implies that it was reared as a hyperparasitoid through *Apanteles* Förster (Hymenoptera: Braconidae).

Recognition. I include *S. nigripes* and *S. endius* in the *endius* species group as discussed under *S. endius*. However, presence of *S. nigripes* in the New World and synonymy of *S. muscarum* Girault under *S. nigripes* Curtis are both questionable. Males and females of what I tentatively identify as *S. nigripes* in North America are either incorrectly associated or they represent a morphologically very similar but separate species from true European *S. nigripes*. There does appear to more than one species in Europe that keys to *S. nigripes* using Bouček (1963). A CNC female labelled "Italy: Sicily, PA, near Piana degli Athanesi, 7.VI.92, J.D. Pinto" and a USNM male labelled "Cyprus: Argaki, 22.XII.64, H.G. Walker" almost certainly represent a similar but different species. The two individuals have pronotal and mesopleural sculpture patterns similar to typical *S. nigripes*, plus a linear malar sulcus, coriaceous scrobes, completely dark tarsi and a basally setose fore wing, but there are 5 or 6 long white setae on either side of the petiole in about its anterior third similar to *nigra*-group species. The pronotal collar is also less distinctly transverse (width only about 1.4–1.5x medial length compared to about 1.8x medial length in typical *S. nigripes*), the mesoscutal median anterior convexity is

completely, strongly coriaceous, the median propodeal carina is almost flat rather than distinctly angulate, the head in anterior view is longer with less strongly convergent genae, and the scape is quite smooth and shiny in both sexes. The female also has quadrate apical funicular segments and a more elongate-slender clava (about 2.7x as long as wide) as well as a more elongate-lanceolate gaster. The gaster is about 2.4x as long as wide and has the ovipositor sheaths projecting for a distance slightly greater than length of the basal segment of the hind tarsus, but with Gt_3 only about 1.5x as long as Gt_2. A fully inflated gaster of a typical *S. nigripes* female is only about 1.7x as long as wide and the ovipositor sheaths project only slightly. As noted by Bouček (1963), *S. nigripes* females also have Gt_3 conspicuously (at least 2.5x) longer than Gt_2. The male of the unidentified species has oblong funicular segments about 1.4x as long as wide. However, both the Cyprus male and typical European males of *S. nigripes* have undifferentiated setae on the scape (Figs 343, 344) and fu_1 at most about 2.5x as long as wide (Fig. 342).

I only have two males that I tentatively identify as *S. nigripes* from North America and one lacks its head though one of its antennae is glued to the point. The scape is distinctly coriaceous-granular or, particularly the outer surface (Fig. 341), more longitudinally strongly alutaceous so as to be somewhat strigose. Although this sculpture pattern is similar to European *S. nigripes* males (Figs 343, 344), the North American male has long, distally curved setae ventrally on the scape and fu_1 is at least 3.5x as long as wide (Fig. 341). Furthermore, the North American male with a head has smaller eyes than European *S. nigripes* males (*cf*. Figs 330, 331). Because of this, both the malar space (Fig. 331) and fu_1 (Fig. 341) are subequal in length to the height of the eye and the malar space is obviously longer than the width of the eye (about 1.3x) in the North American male, whereas European males of *S. nigripes* have the malar space only about 0.6x the height and about 0.7–0.8x the width of the eye (Fig. 330) and the height of the eye is about twice the length of fu_1 (Fig. 342). Both North American males also have the pronotal collar partly coriaceous posterolaterally and the Oregon male has atypically shallow setiferous punctures, the setae arising from tiny bumps within only very slight depressions (Fig. 333). The California male has much more distinct and crowded punctures, which posteriorly are aligned so as to be somewhat longitudinally punctate-strigose posterolaterally. This sculpture pattern is intermediate between that of typical European *S. nigripes* males and those *S. erythromera* males with a strongly sculptured pronotum (Figs 154, 155). Bouček (1963: 462) correctly observed that *S. nigripes* "belongs morphologically in the neighborhood of *S. erythromera*". Individuals of the two species are very similar except that the pronotum of *S. erythromera* lacks circular setiferous depressions, varying from completely smooth and shiny to more or less longitudinally strigose or strigose-rugulose anterior to a smooth band along the posterior margin (Figs 153–155). *Spalangia erythromera* males also have a much smoother, only finely alutaceous scape and shorter fu_1 (Fig. 163), and a comparatively smooth and shiny head (Figs 147–152) compared to European or the two North American males (Fig. 331) that I tentatively identify as *S. nigripes*. In particular, *S. erythromera* males have at most only very finely coriaceous scrobes whereas the North American *S. nigripes* male with a head not only has the scrobes but also the inclined lateral surface of the scrobal depression distinctly coriaceous (Fig. 331). The latter sculpture pattern is very similar to at least females of the European species *S. crassicornis*, though pronotal sculpture of *S. crassicornis* is more similar to those *S. erythromera* having a distinctly sculptured pronotum than to typical *S. nigripes* (see further under *S. erythromera*).

I am quite confident that the males I identify as *S. nigripes* in North America and Europe represent different species. However, I am much less confident that the two males from western USA and the females from South Dakota and northeastern USA (Fig. 345) are correctly associated. I could not find any features to differentiate European and North American females that I identify as *S. nigripes*. Consequently, either *S. nigripes* is parthenogenetic in North America and the males from California and Oregon belong to some other species or what I interpret as *S. nigripes* in North America is very similar to but a different species than European *S. nigripes*. The latter hypothesis might be supported by the apparent rarity of "*S. nigripes*" in North America.

22. *Spalangia nigroaenea* Curtis, 1839
(Figs 346–365)

Spalangia nigroaenea Curtis, 1839: folio 740; holotype ♂ (ANIC, not examined). Type data: [England], in Mr. Shuckard's collection.

Spalangia homalaspis Förster, 1850: 505–507; lectotype ♂ (NHMW, not examined) designated by Bouček (1963: 451). Type data: [Germany], Aachen and Boppard [lectotype: Or. Ex., Boppard Or. Ex. ♂]. Synonymy by Bouček (1963: 450).

Spalangia astuta Förster, 1851: 1–2; lectotype ♀ (NHMW, not examined) designated by Bouček (1963: 451). Type data: [Germany], Aachen [lectotype: ♀ Or. Ex., Collect. G. Mayr]. Synonymy by Bouček (1963: 450).

Spalangia muscidarum Richardson, 1913: 38–39; holotype ♂ (USNM; 1♀, 3♂ paratypes examined). Type data: Forest Hills, Mass. [Massachusetts], XII 1912. Synonymy by Bouček (1963: 450).

Prospalangia platensis Brèthes, 1915: 315–317; ♀, ♂ syntypes (MLPA, not examined) (2♂ syntypes remain according to Loiácono *et al.* 2007). Type data: [Argentina], Général Urquiz, near Buenos Aires, ex *Musca domestica* L., *Stomoxys calcitrans*, etc. Synonymy by Bouček (1965: 600).

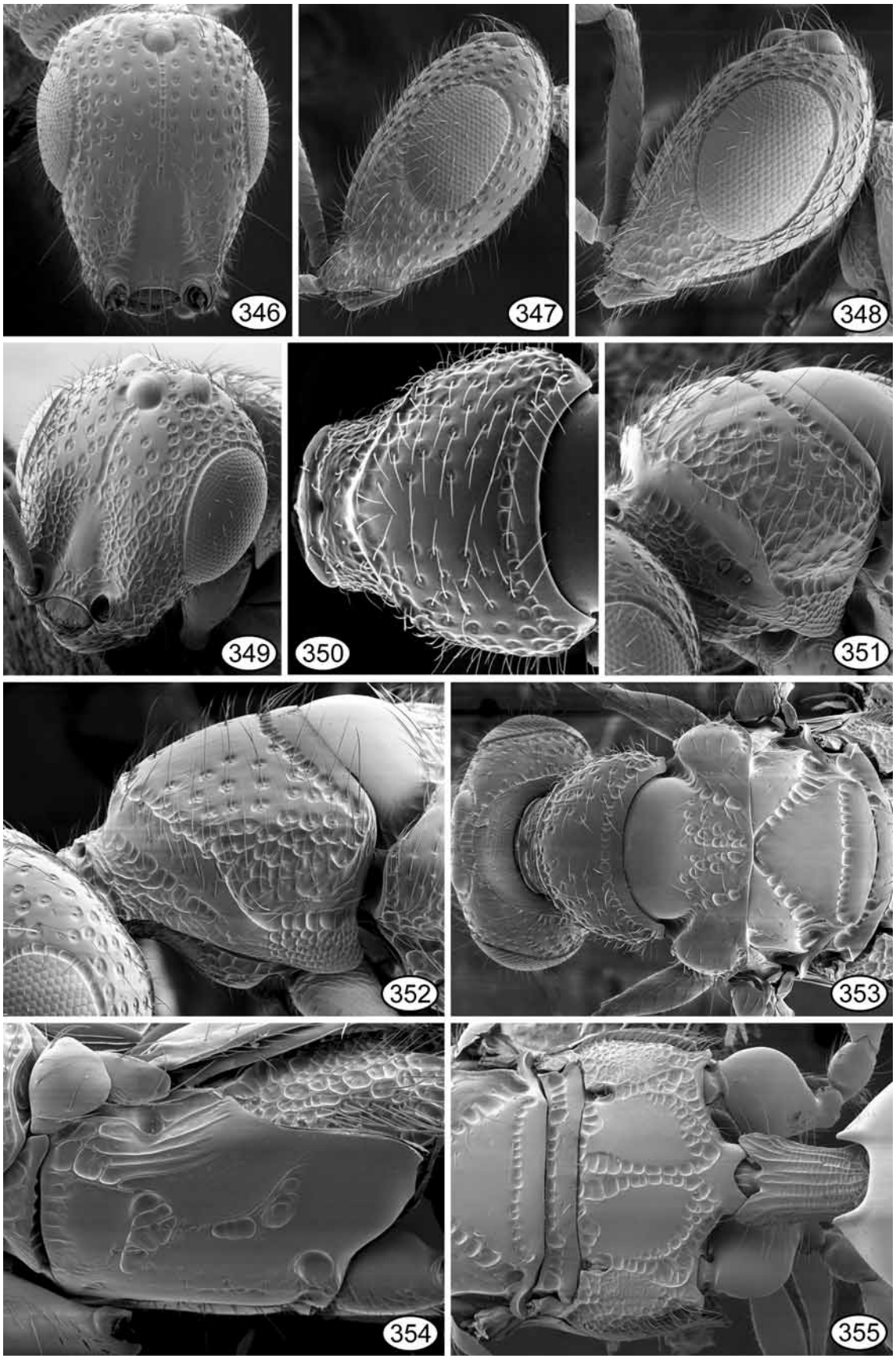
Spalangia abenabooi Girault, 1932: 1; ♀ syntypes (QMBA, not examined). Type data: W. Aust. to Queensland, Johnston and Tiegs, 1921. Tentative synonymy by Bouček (1963: 448) confirmed by Bouček (1988a: 342).

Spalangia sundaica Graham, 1932: 22; holotype ♀ (BMNH, examined). Type data: Java, Buitenzorg, 12th November, 1929, G.L. Windred. Synonymy by Bouček (1963: 450).

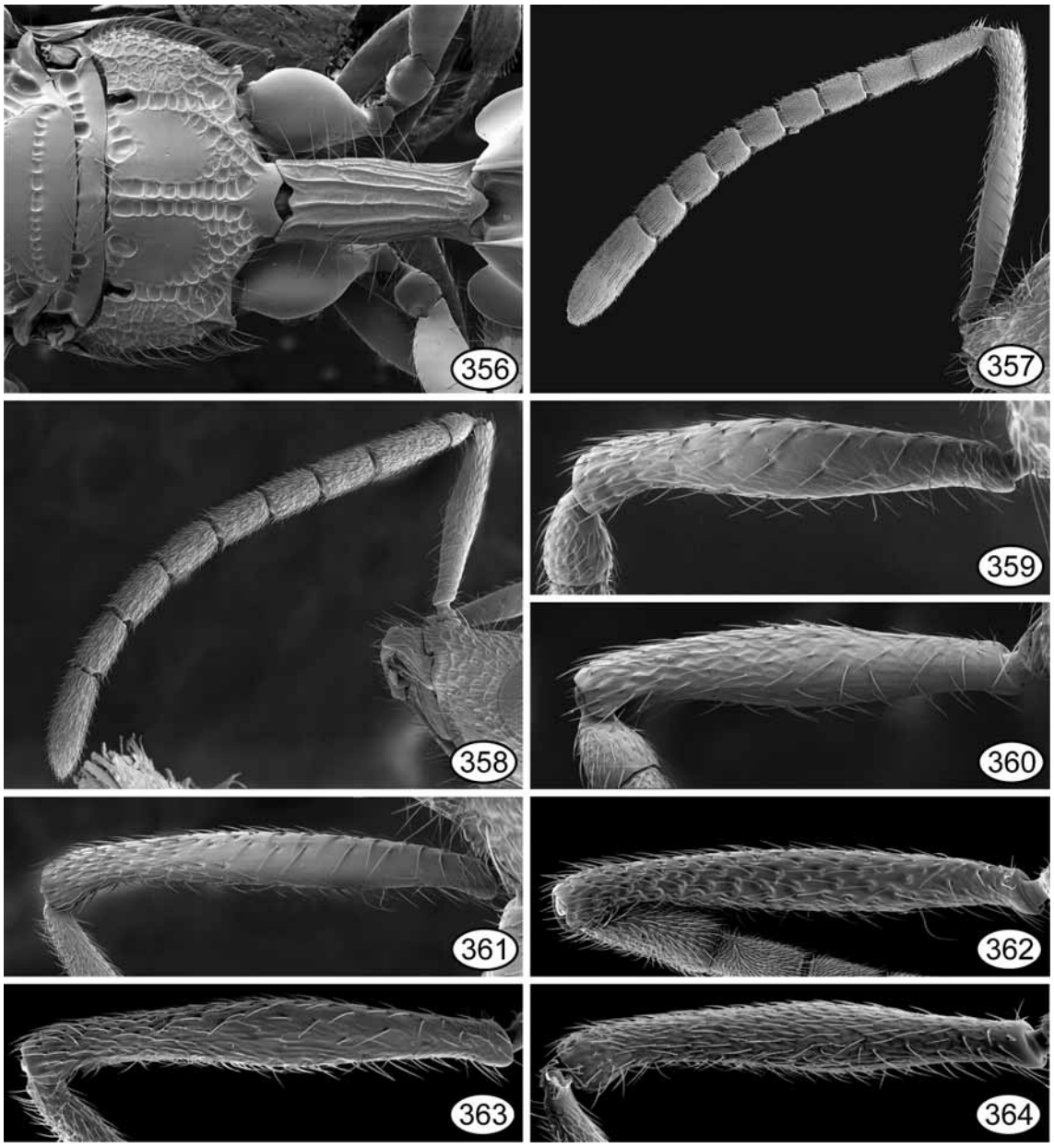
Spalangia mors Girault, 1933: 1; lectotype ♀ (QMBA, not examined) designated by Bouček (1988a: 342). Type data: [Australia], Mackay, III, W.A. McDougall. Synonymy with *S. abenabooi* by Girault (1934: 3); tentative synonymy with *S. nigroaenea* by Bouček (1963: 448) confirmed by Bouček (1988a: 342).

Description. *Female*. Length = 2.0–3.5 mm. Legs dark except at least basal 3 tarsal segments yellow and sometimes knees and apex of tibiae narrowly yellow. Head in anterior view (Fig. 346) about 1.2–1.3x as high as wide; in dorsal view about 1.5–1.7x as wide as long; in lateral view (Fig. 347) with malar space about 0.7–0.8x eye height and about 1.0–1.1x eye width. Head capsule (Figs 346, 347) smooth and shiny except for setiferous punctures as follows: with complete median sulcus extending to elongate-triangular scrobal depression, otherwise upper face and parascrobal region with distinct but variably dense circular punctures, the punctures relatively sparse and separated by about 2–3x own diameter in smaller specimens but in larger specimens mostly only by about own diameter medially and even more crowded laterally toward inner orbit where usually separated by less than own diameter; scrobal depression usually with scrobes punctate-crenulate or in smaller specimens more reticulate-rugulose and sometimes distinct only near torulus, with smooth and shiny interantennal region, and inclined lateral surface of depression punctate similar to parascrobal region; gena without distinct malar sulcus, with distinct circular to oval punctures often separated by almost own diameter but at least by narrow, flat interstices; temple with distinct circular punctures similar to face and gena. Antenna (Fig. 357) with scape about 7.0–9.0x as long as greatest width, the inner surface bare, smooth, and shiny mediolongitudinally over at least basal half, but longitudinally strigose apically (Fig. 361) and outer surface uniformly setose and punctate (Fig. 362); pedicel about 2.4–2.9x as long as apical width and about 1.5–1.9x as long as fu_1; funicle with fu_1 about 1.3–1.8x as long as wide, fu_2 at least very slightly longer than wide, and apical segments quadrate to slightly longer than wide; clava about 2.0–3.1x as long as wide.

Pronotal collar in lateral view quite abruptly but comparatively low convex behind neck, anterolaterally with vertical carina or ridge extending from circumpronotal furrow onto collar (Figs 351, 352) and, more or less conspicuously, across collar as low, almost uniform, usually crenulate but medially interrupted margin (Figs 351, 352), the margin differentiating a mostly smooth and shiny vertical surface of collar above neck and in dorsal view usually appearing Λ-like (Fig. 350); with distinct cross-line posteriorly, sometimes with very shallow mediolongitudinal furrow (Fig. 351), and smooth and shiny medially anterior to cross-line, but otherwise with mostly well separated circular setiferous punctures except laterally where sometimes rugose (Figs 350, 352), but the sculpture smoothly rounded to circumpronotal furrow above lateral panel (Fig. 351). Mesoscutal median lobe (Fig. 353) with anterior convex region and median band of internotaular region smooth and shiny, the internotaular region otherwise with crowded, circular to irregular setiferous punctures.



Figs 346–355. *Spalangia nigroaenea* Curtis. **346–349**, head: **346**, anterior view ♀, **347**, lateral view ♀, **348**, lateral view ♂, **349**, frontolateral view ♂; **350–352**, pronotum: **350**, dorsal view ♀, **351**, frontolateral view ♂, **352**, dorsolateral view ♀; **353** ♂ thorax, dorsal view; **354**, ♂ mesopleuron; **355**, ♀ frenum–petiole, dorsal view.



Figs 356–364. Figs 356–362, *Spalangia nigroaenea* Curtis. **356**, ♂ frenum–petiole, dorsal view; **357 & 358**, antenna: **357**, ♀, **358**, ♂; **359 & 360**, ♂ scape: **359**, inner view, **360**, outer view; **361 & 362**, ♀ scape: **361**, inner view, **362**, outer view. **Figs 363 & 364**, *Spalangia slovaca* Bouček, ♀ scape: **363**, inner view; **364**, outer view.

Axillae (Fig. 355) mostly smooth and shiny to extensively covered with shallow setiferous punctures. Scutellum (Fig. 353) usually smooth and shiny except for a few pinprick or shallow setiferous punctures laterally; frenum (Figs 353, 355) differentiated by complete crenulate frenal line. Mesopleuron (Fig. 354) smooth and shiny except as follows: pectal region variably distinctly crenulate along anterior margin and bare except for 1 posteroventral seta; acropleuron longitudinally carinate, the carinae extending posteriorly onto alar shelf and sometimes dorsally onto upper mesepimeron; subalar scrobe reticulate-rugulose and more or less vertical or narrowed ventrally such that its posteroventral margin and transepisternal line form abrupt angle (Fig. 354); episternal scrobe a lunate depression usually differentiated into a horizontal anterior portion and more vertically directed posterior portion, and either separated from subalar and precoxal scrobes or connected by only very shallow, inconspicuous furrow or line of minute punctures; upper and lower mesepisternum distin-

guished by complete line of setae and variably developed, sometimes almost completely effaced transepisternal line (Fig. 354). Fore wing hyaline; bare behind submarginal vein except sometimes basal cell with a few setae distally. Propodeum (Fig. 355) with crenulate postspiracular sulcus differentiated from callus; callus punctate-rugose anteriorly and posteriorly but centrally with effaced sculpture, sometimes almost smooth; plical region with subparallel or narrowly widened paramedian crenulate furrows delineating median carina, and with anterior-most cell either transverse or if elongate then of same width as more posterior cells; supracoxal band contiguous with paramedian crenulate furrows; propodeal panels smooth and shiny or only rarely slightly wrinkled-roughened.

Petiole (Fig. 355) about 2x as long as medial width; transversely carinate to reticulate-rugose between longitudinal carinae; with several setae laterally. Gaster shiny and with Gt_1 smooth but at least Gt_3 very finely coriaceous.

Male. Length = 1.4–3.7 mm. Antenna (Fig. 358) with scape about 6x as long as wide, the inner surface smooth and shiny and either bare or with single medial line of setae over at least basal half (Fig. 359) and outer surface coriaceous to coriaceous-strigose apically but lacking distinct setiferous punctures (Fig. 360); pedicel subglobular or at most about 1.4x as long as apical width; flagellum with setae much shorter than width of respective segment; funicle with fu_1 about 2.0–3.4x as long as wide and about 1.4–2.3x as long as pedicel, and subsequent funicular segments all oblong. Otherwise similar to female except as follows. Head in anterior view subequal in height and width; in lateral view (Fig. 348) with malar space about 0.5–0.6x eye height and about 0.7–0.8x eye width; inclined lateral surface of scrobal depression and parascrobal region (Fig. 349) as well as gena (Fig. 348) sometimes more or less reticulate-rugose, with crowded, multisided punctures separated by linear ridges. Fore wing with at least 3 setae in line on mediocubital fold or basal cell extensively setose. Petiole (Fig. 356) 1.8–2.5x as long as medial width.

Material examined. Nearctic and Neotropical (1830 specimens in AMNH, BMNH, BPBM, CASC, CISC, CNC, CUAC, CUIC, FSCA, IRCW, LACM, MLPA, NCSU, TAMU, UATV, UCRC, USNM, WFBM). Complete collection records are not provided; those with host data: *Nearctic*. **CANADA**: ***Alberta***, Leduc, 18.IX.80, R. Medved, *M. domestica* (UCRC, USNM). ***Ontario***, Ottawa vicinity, various localities and dates 2000 and 2001, G. Gibson & L. Bartels, *M. domestica* and *S. calcitrans* (see Gibson and Floate 2004). Yorks Corners Road, S Kenmore, G. Gibson & L. Bartels, ? *Physiphora demandata* — Donevelyn farm, 45º 11.758'N 75º 23.547'W, 30.VIII.01; Melenhorst farm, 45º 12.996'N 75º 24.452'W, 16, 30.VIII.01. **USA**: ***Arizona***, Tucson, 4.VI.80, R. Medved, *M. domestica* (UCRC). ***California***, Imperial Co., IX.23, N.J. Osborne, *H. irritans* (BPBM). Los Angeles Co., 24.VII.51, *S. calcitrans* (LACM). ***Colorado***, R. Medved, *M. domestica* — Boulder, 19.IX.80 (UCRC, USNM); Lafayette, 19, 20.IX.80 (UCRC, USNM); Parker, 23.IX.80 (UCRC). ***Florida***, Alachua Co. — Gainesville, VII.74, 13.III.75, 6.V.75, 15, 19.VI.75, 31.VII.75, 14.IX.75, R.L. Escher, *H. irritans* (FSCA); High Springs, 19.XII.74, *M. domestica* (FSCA). Bradford Co., Starke, 14.XI.74, em. 18.XI.74, R.D. Kramer, *M. domestica* (FSCA). Columbia Co., 6.8 mi. NE Fort White, 27.IV.83, 6.V.83, 16, 24.VI.83, 1, 7, 15.VII.83, 27.VIII.83, J.T. Vaughan, *S. calcitrans* (FSCA). Union Co., Lake Butler, V.73, C. Morgan, *M. domestica* (FSCA, LACM). ***Illinois,*** Bloomington, IX.09, *M. domestica*. ***Minnesota***, St. Paul, 21.VIII.80, A.M. Paprocki, *M. domestica* (UCRC). ***Mississippi***, Starkville, 12.VII.72, K.J. Watts, *H. irritans* (USNM). ***Missouri***, Boone Co., Columbia, 12.X.81, D.E. Figg, Anthomyiidae (UNML). ***Nebraska***, Lincoln, VII.58, C.M. Jones, *S. calcitrans* (USNM). ***New Jersey***, Woodfern, 5.VII.67, D. Shibles, *M. domestica* (USNM). ***New York***, Cayuga Co., L. Smith, *M. domestica* (CUIC) — LI, 5.IX.84; Waterman 4, 9.VIII.84. Cornell University, Exp. 841, *M. domestica* (CUIC). Sullivan Co., 24.IX.87, C. Henderson, *M. domestica* (CUIC). ***North Carolina***, Craven Co., Spring Hope, 29.VI.77, T.D. Edwards, *M. domestica* (CUIC). Wake Co., 15, 23.VIII.83, *M. domestica* (NCSU). Wilkes Co., N. Wilkesboro, 17.VIII.77, T.D. Edwards, *M. domestica* (CUIC). ***Ohio***, Columbus — 25.XI.16, *Muscina assimilis* (USNM); 22.II.17, ? *L. serricata* (USNM); 26.II.17, *M. domestica* (USNM). ***Pennsylvania***, Wannamakers, 19.VIII.66, J. Drea, *Ravinia querula* (USNM). ***South Carolina***, Clemson, 17.VII.68, E.F. Legner, *M. domestica* (UCRC). Oconee Co., South Union,

12VI.73, J.R. Ables, *M. domestica* (CUAC). ***Texas***, Cuero, V.40, L.F. Hitchcock, *H. irritans* (USNM). Dallas, 8.XII.12, *S. calcitrans* (USNM). Laredo, 26.III.29, R.A. Roberts, *M. domestica* (USNM). ***Virginia***, Blacksburg, 25.VIII.67, R.P. Burton, *Orthellia caesarion* (USNM). ***Wisconsin***, Neillsville, 7.IX.65, E.F. Legner, *Trichopria* (?) sp., original (UCRC).

Neotropical. **BRAZIL:** Goias, Santa Isabel, Ilha do Bananal, Rio Araguaia, 15-20.VII.57, *M. domestica* (CASC). **CHILE**: Santiago, 1958, prob. *M. domestica* (USNM). **MEXICO:** Morelos, Cuernavaca, S end, 4500', 7.IV.59, H.E. Evans, *M. domestica* (CUIC). **PUERTO RICO**: Añasco, 25.VIII.80, B. Hawkins, *M. domestica* (UCRC). Cayey, 26.VIII.80, B. Hawkins, *M. domestica* (UCRC). Hormigueros, 28.II.50, H.K. Plank, *M. domestica* (USNM). Juana Diaz, 25.VIII.80, B. Hawkins, *M. domestica* (UCRC). Mani, 22.VIII.80, B. Hawkins, *M. domestica* (UCRC). Mayaguez, 27.III.50, W. Gaud, *M. domestica* (USNM). Naguabo, 10.VII.36, H.L. Dozier, *Sarcophagula occidua* (USNM). Parguera, 23.VIII.80, B. Hawkins, *M. domestica* (UCRC).

Distribution. A cosmopolitan species that Noyes (2003) records from all six biogeographic regions. Within the New World (Fig. 365) I saw specimens from North America (Canada, USA, Mexico), Central America (Costa Rica, Guatemala), West Indies (Puerto Rico, Santa Lucia) and South America (Argentina, Brazil, Chile, Peru).

Biology. Noyes (2003) lists *S. nigroaenea* as a parasitoid of about 50 species in 8 families of Diptera and, probably as a hyperparasitoid, from *Diatraea saccharalis* (Pyralidae). Almost all of the host records I saw from the New World were from the three principal filth-fly pests of livestock, the house fly, stable fly and horn fly, but I also saw specimens labelled as reared from ? *Lucilia serricata* (Meigen), *Muscina levida* (Harris) (= *M. assimilis*) and *Neomyia cornicina* (Fabricius) (= *Orthellia caesarion*) (Muscidae), plus *Ravinia querula* (Walker) and *Sarcophagula occidua* (Fabricius) (Sarcophagidae), and ? *Trichopria* sp. (Hymenoptera: Diapriidae). The Missouri Anthomyiidae record is based on one male voucher specimen from Figg *et al.* (1983) that was incorrectly identified as *S. nigra*. I did not see voucher specimens from Figg *et al.* (1983) for *Gymnodia arcuata* (Stein) (Muscidae) or *Ravinia* spp., which were the two listed host records for *S. nigroaenea*. The tentative record of *Physiphora demandata* (Fabricius) by Gibson and Floate (2004) was based on comparison of pupal remains correlated with flies emerged from similar puparia. The tentative *Trichopria* record suggests that *S. nigroaenea* can sometimes develop as a hyperparasitoid of flies through hymenopterous primary parasitoids.

Recognition. I include *S. nigroaenea* as one of six species in the *nigra* species group as discussed under *S. nigra*. It is most likely to be mistaken for *S. chontalensis* because both species share an anteriorly margined pronotal collar (see under latter species), but it might also be mistaken for *S. masneri* or *S. nigroides* if the sometimes only obscurely developed collar margin is missed (see under respective species for differential features). Among the six *nigra*-group species, only females of *S. nigroaenea* have the outer surface of the scape distinctly punctate-setiferous (Fig. 362) and the inner surface smooth and shiny over at least its basal half (Fig. 361). It is also the only species of the group that is sexually dimorphic in fore wing setation, the mediocubital fold being bare in females but males having a line of at least a few setae. Also characteristic of *S. nigroaenea* is its usually obviously subdivided, lunate episternal scrobe (Fig. 354), and the median smooth and shiny band that extends from the anterior convex region of the mesoscutal median lobe through the internotaular region (Fig. 353).

Spalangia nigroaenea is also very similar to the European species *S. slovaca* Bouček. My concept of *S. slovaca* is based on a NMPC female paratype and specimens from Kazakhstan and Russia that were compared with other *nigra*-group species in Taylor *et al.* (2006). Males of *S. slovaca* lack any setae on the mediocubital fold, which differentiates them from *S. nigroaenea* males, whereas a different sculpture pattern of the scape differentiates females of the two species. Female *S. slovaca* have the outer surface of the scape rugulose-strigose (Fig. 364; Taylor *et al.* 2006, figs 9, 15), lacking the distinct setiferous punctures that characterize *S. nigroaenea* females (Fig. 362; Taylor *et al.* 2006, figs 11, 13). Furthermore, the inner surface is at least finely

(Fig. 363; Taylor *et al.* 2006, figs 10, 16) and sometimes distinctly longitudinally striate rather than smooth and shiny medially as in *S. nigroaenea* (Fig. 361; Taylor *et al.* 2006, figs 12, 14).

Fig. 365. Distribution of *Spalangia nigroaenea* Curtis.

23. *Spalangia nigroides* n. sp.
(Figs 345, 366–373)

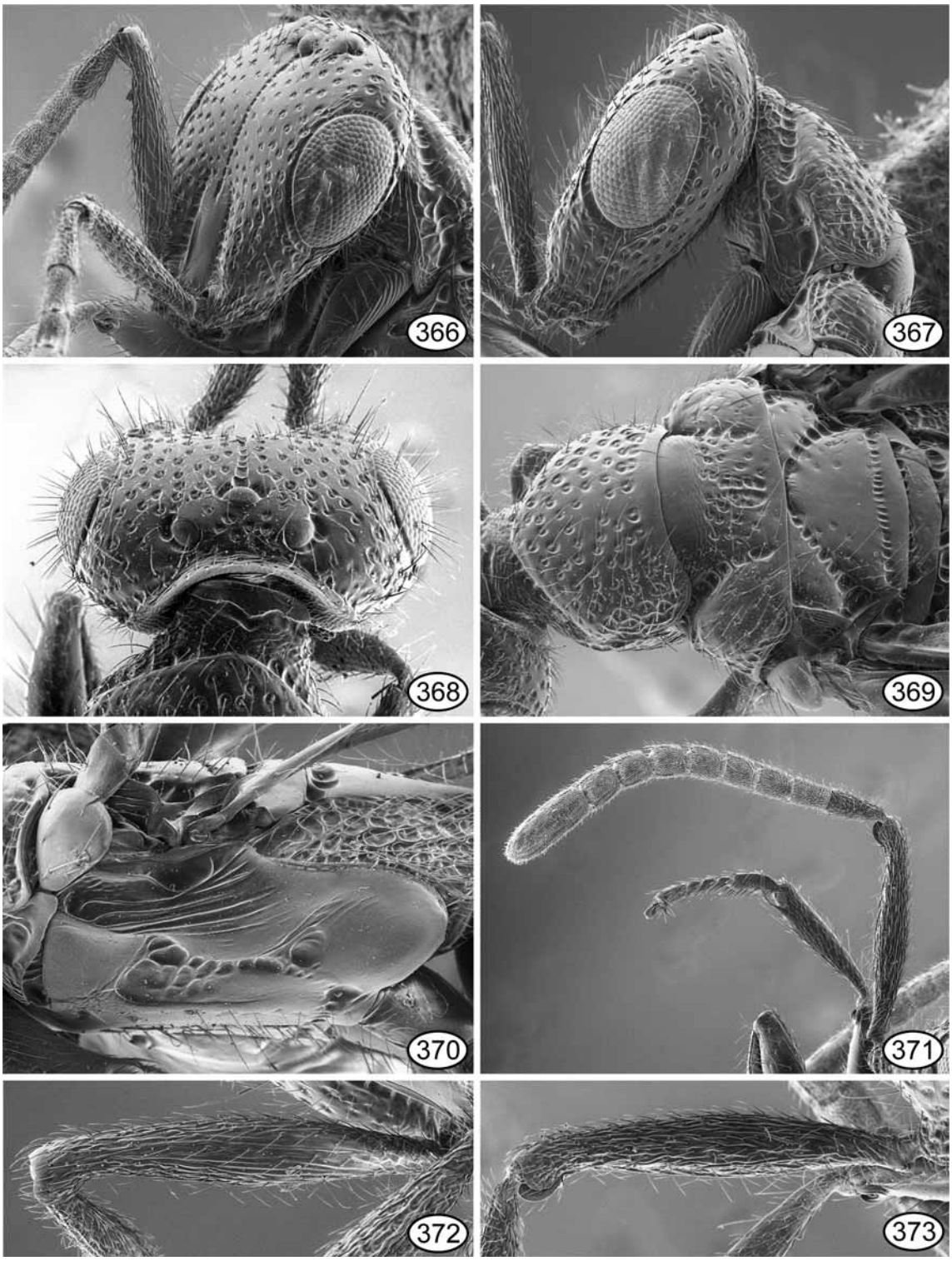
Type material. HOLOTYPE (♀, CNC no. 23889). "CANADA: PQ, James Bay Hwy, VI.1985, H. Goulet / CNCI, LB-specm 2007-128". Condition: point-mounted, entire.

PARATYPE (♀, CNC). *Nearctic*. **CANADA**: Ontario, Lanark Co., Middleville, White Lake Road, 13.V.1986, S. Peck and H. Goulet.

Etymology. A combination of the species name *nigra* and the suffix *oides*, meaning "like", in reference to the similarity among females of the two species.

Description. *Female*. Length = 2.1–2.4 mm. Legs dark except tarsi variably yellowish, at least basal segment yellow and apical segment brown but other segments yellowish to brown. Head in anterior view about 1.2x as high as wide; in dorsal view (Fig. 368) about 2.0–2.1x as wide as long; in lateral view (Fig. 367) with malar space about 0.91–0.97x eye height and about 1.3–1.4x eye width. Head capsule (Figs 366–368) smooth and shiny except for setiferous punctures as follows: with complete median sulcus extending ventrally to elongate-triangular scrobal depression, otherwise upper face with circular punctures separated by interstices mostly equal to or slightly greater than own diameter medially, but even more crowded on parascrobal region where mostly separated by ridges (Fig. 366); scrobal depression with ventrally striate-crenulate to dorsally punctate-crenulate scrobes on either side of smooth and shiny interantennal region, the sculpture extending onto inclined lateral surface of depression above torulus where somewhat obliquely punctate-strigose; gena with crowded punctures and sometimes with malar sulcus (Fig. 367); temple punctate similar to upper face. Antenna (Fig. 371) with scape about 6.2–6.6x as long as wide, shiny, the outer surface (Fig. 373) uniformly setose and irregularly strigose with obscure setiferous punctures but inner surface (Fig. 372) bare mediolongitudinally and more distinctly longitudinally striate; pedicel about 2.1–2.2x as long as apical width and about 1.4–1.5x as long as fu_1; funicle with fu_1 about 1.4–1.8x as long as wide and fu_2 and subsequent segments slightly longer than wide; clava about 2.7–2.9x as long as wide.

Pronotal collar in lateral view (Fig. 367) only low convex behind neck and anterolaterally with short smooth bar interrupting circumpronotal furrow, but anteriorly smoothly rounded to neck; more or less uniformly punctate anterior to smooth band along posterior margin, without distinctly differentiated cross-line posteriorly, the circular punctures mostly separated by about own diameter dorsomedially but more crowded anteriorly and laterally where more or less distinctly punctate-rugose, and laterally sculpture smoothly rounded to circumpronotal furrow above lateral panel. Mesoscutal median lobe (Fig. 369) with anterior convex region mostly smooth and shiny but finely coriaceous posteriorly; internotaular region with circular setiferous punctures separated by flat interstices lateral to median punctate-rugulose band (Fig. 369). Axillae (Fig. 369) shiny with a few pinprick-like setiferous punctures. Scutellum (Fig. 369) shiny with a few pinprick-like or very shallow setiferous punctures laterally; frenum (Fig. 369) differentiated by complete crenulate frenal line. Mesopleuron (Fig. 370) smooth and shiny except as follows: pectal region bare except for 1 posteroventral seta; acropleuron longitudinally carinate, the carinae extending posteriorly onto alar shelf and dorsally or completely over upper mesepimeron; subalar scrobe a large, reticulate-rugose region extending posteroventrally along transepisternal line; episternal scrobe a lunate to obliquely oval reticulate-rugose depression connected to subalar scrobe by distinct crenulate-reticulate line and to precoxal scrobe by variably distinct punctate line; upper and lower mesepisternum differentiated by carinate transepisternal line over at least anterior half and by complete line of adjacent setae (Fig. 370). Fore wing hyaline except basal cell with variably distinct brownish tinge; basal cell extensively setose over at least distal two-thirds. Propodeum with crenulate postspiracular sulcus differentiated from callus; callus completely punctate-rugose; plical region with subparallel or only narrowly V-like paramedian crenulate furrows delineating median carina, and with anterior-most cell larger but not conspicuously differentiated from more posterior cells; supracoxal band contiguous with paramedian crenulate furrows; propodeal panels smooth and shiny.



Figs 366–373. *Spalangia nigroides* Gibson ♀. **366–368**, head: **366**, frontolateral view, **367**, lateral view, **368**, dorsal view; **369**, thorax, dorsolateral view; **370**, mesopleuron; **371**, antenna; **372 & 373**, scape: **372**, inner view; **373**, outer view.

Petiole about 2x as long as medial width; transversely carinate to minutely reticulate between longitudinal carinae; with several setae laterally. Gaster with tergites smooth and shiny or with only extremely obscure coriaceous sculpture.

Male. Unknown.

Distribution. Known only from eastern Canada (Fig. 345).

Biology. Unknown.

Recognition. I include *S. nigroides* as one of six species in the *nigra* species group as discussed under *S. nigra*. The two known females are most similar to those of *S. nigra*, but are differentiated by those features given in the key and discussed under *S. nigra*. Females might be mistaken for *S. nigroaenea* because of their relatively sparsely punctate and flat pronotal collar, but the fore wings of *S. nigroaenea* do not have setae on the mediocubital fold.

24. *Spalangia noyesi* n. sp.
(Figs 374–376, 378–384, 386)

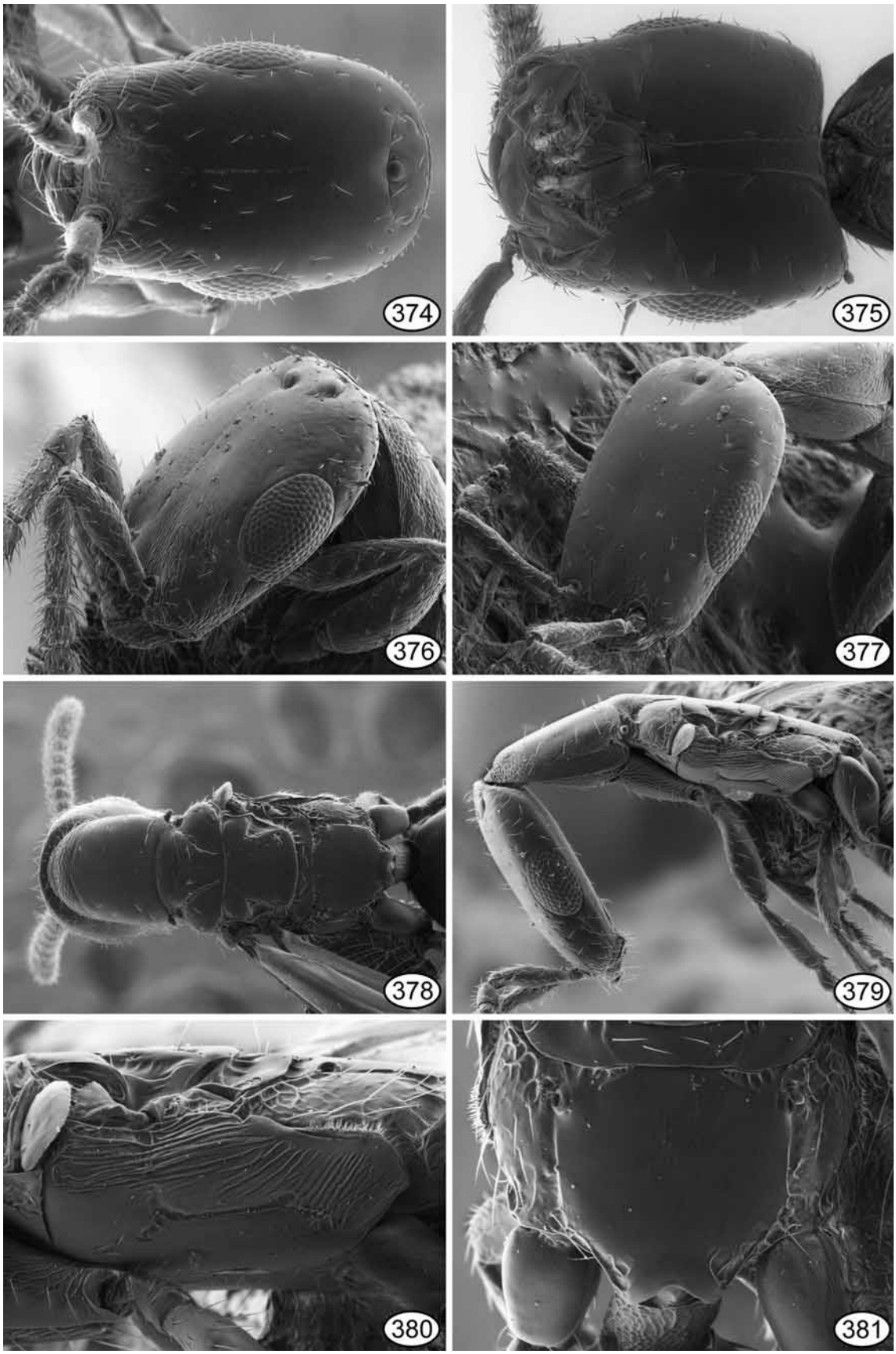
Type material. HOLOTYPE (♀, CNC no. 23890). "USA: [GEORGIA] GA, McIntosh Co., Sapelo Island, 20.VI-18.VII, 1987, BRC Hym. team, FIT [flight intercept trap], live oak forest". Condition: point-mounted, entire.

PARATYPES (5♀, 1♂). *Nearctic*. **USA**: ***California***, Nevada Co., Sagehen Cr., 16.VII.70 (1♀ UCDC), 20.VIII.70 (1♂ UCDC), R.M. Bohart. ***Florida***, Alachua Co., Gainesville, AEI, 1.V-14.VII.1987, oak forest, BRC Hym. team (1♀). ***Georgia***, McIntosh Co., Sapelo Island, 20.VI-18.VII.87 (live oak for.), 29.V-6.VI.87, 26.VI-18.VII.87 (savanna), BRC Hym. team (3♀).

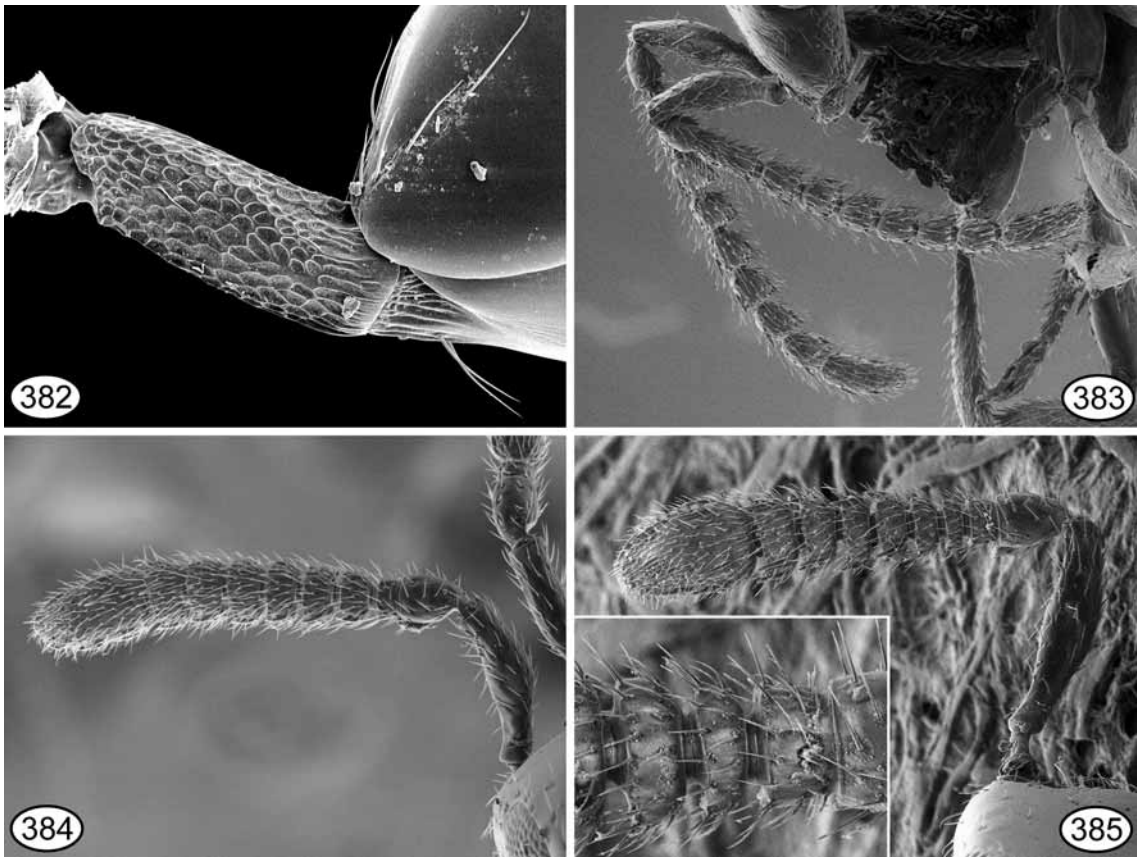
Etymology. This outstanding species is named in honor of John Noyes, who through his Universal Chalcidoidea Database has made systematics research on Chalcidoidea immeasurably easier and thereby made a significant contribution to lessening the taxonomic impediment.

Description. *Female*. Length = 1.4–1.9 mm. Antenna and body uniformly brown, except legs sometimes lighter in color and at least basal 4 tarsal segments and sometimes apex of metatibia yellow. Head in anterior (Fig. 374) view about 1.3–1.4x as high as wide, elongate-rectangular with subparallel sides and small eyes occupying about middle third; in dorsal view about 2.5–2.8x as wide as long; in lateral view (Fig. 379) about 3.3–3.5x as high as long and malar space about 1.7–1.8x eye width, with malar space, eye and temple above eye all about equal height; in posterior view without occipital carina (Fig. 375). Head capsule mostly smooth and shiny as follows: with variably distinct and complete median sulcus extending between about level of upper and lower orbits and parascrobal region obliquely strigose-alutaceous (Fig. 376), but upper face smooth and almost bare, with line of very sparse, short, variably conspicuous setae laterally near inner orbit and paramedially, the setae sometimes originating from minute pores or more distinct pinprick-like punctures; scrobal depression delineated by convergent, usually slightly depressed, coriaceous scrobes on either side of smoother interantennal region; gena mostly smooth but with partial malar sulcus near eye and with sparse setiferous punctures; temple smooth and similarly setose as gena. Antenna (Fig. 384) with scape about 3.8–4.2x as long as wide, the inner and outer surfaces shiny but finely alutaceous; pedicel about 1.1–1.5x as long as apical width and about 1.7–2.3x as long as fu_1; funicle sometimes with fu_1 obviously (about 1.1–1.2x) longer than wide or fu_2, but usually all segments distinctly transverse with fu_1 about 1.3–1.5x as wide as long and subequal in length to fu_2, and subsequent segments increasingly wider and longer, with fu_7 about 1.3–1.7x as wide as long; clava about 1.1–1.9x as long as wide.

Pronotum in lateral view (Fig. 379) uniformly low convex without evident circumpronotal furrow differentiating collar from neck or lateral panel; in dorsal view (Fig. 378) ∩-shaped without narrower neck, the neck differentiated only as finely coriaceous and inconspicuously setose transverse region occupying about anterior third, with posterior two-thirds smooth and shiny or at most obscurely coriaceous, and only very sparsely setose laterally and posteriorly, the inconspicuous setae originating from minute pores. Mesoscutal median lobe (Fig. 378) variably extensively coriaceous to transversely alutaceous anteriorly, but at least smooth and shiny posterior to level of setae; mesoscutal lateral lobe uniformly finely coriaceous-alutaceous. Axillae (Fig. 378) smooth and shiny except for sparse setae. Scutellum (Fig. 378) smooth and shiny except for



Figs 374–381. Figs 374–376, *Spalangia noyesi* Gibson ♀, head: **374**, anterior view, **375**, ventral view, **376**, frontolateral view. **Fig. 377**, *Spalangia xanthoscapa* Gibson ♀, head, frontolateral view. **Figs 378–381**, *S. noyesi* ♀. **378**, mesosoma, dorsal view; **379**, head and mesosoma, lateral view; **380**, mesopleuron; **381**, propodeum, dorsal view.



Figs 382–385. Figs 382–384, *Spalangia noyesi* Gibson: **382**, ♀ petiole, lateral view; **383**, ♂ antenna; **384**, ♀ antenna. **Fig. 385**, *Spalangia xanthoscapa* Gibson ♀ antenna (insert: fu_1–fu_3).

single setiferous puncture posterolaterally. Mesopleuron (Fig. 380) shiny and quite finely sculptured as follows: pectal region smooth and bare except for 1 posteroventral seta; acropleuron longitudinally striate-carinate, the striae extending posteriorly onto alar shelf; subalar scrobe a posteriorly curved, sulcate furrow joined to shallow episternal scrobe by a straight, sulcate furrow; upper and lower mesepimeron similarly, finely, obliquely alutaceous-coriaceous; upper mesepisternum indistinguishably merged into lower mesepisternum, with single seta anterior to mesocoxa but without transepisternal line or ventral line of setae, the upper mesepisternum smooth. Fore wing hyaline; sometimes only very inconspicuously setose behind submarginal vein but usually with at least 15 setae partly aligned in 2 rows. Propodeum (Fig. 381) with variably distinct postspiracular sulcus; callus mostly very finely coriaceous to smooth and shiny but finely reticulate-rugose anteriorly; plical region smooth and shiny but often with faint irregular longitudinal striae or short paramedian furrows indicating effaced lanceolate median band of sculpture; sometimes with slender but distinct supracoxal band of sculpture extending to nucha.

Petiole about 1.9–2.0x as long as wide (accurate measurements not possible); reticulate-rugose (Fig. 382); bare or with 1 lateral seta projecting ventrally. Gaster shiny but Gt_2 and subsequent tergites finely coriaceous.

Male. Length similar to female (gaster missing in single known specimen). Antenna (Fig. 383) with scape about 3.9x as long as wide; pedicel about 1.3x as long as wide; flagellum with conspicuous semierect setae of similar length to width of segment; funicle with fu_1 about 2.5x as long as wide and about 1.5x as long as pedicel; fu_2 slightly (about 1.1x) longer than wide and subsequent segments quadrate to slightly longer than wide, with fu_7 about 1.3x longer than wide. Otherwise similar to female except as follows. Head in anterior view about 1.2x as high as wide; in dorsal view about 2.6x as wide as long; in lateral view about 3.2x as high as long. Fore wing even more conspicuously setose behind submarginal vein, including complete line of setae along mediocubital fold and 2 lines of setae in basal cell.

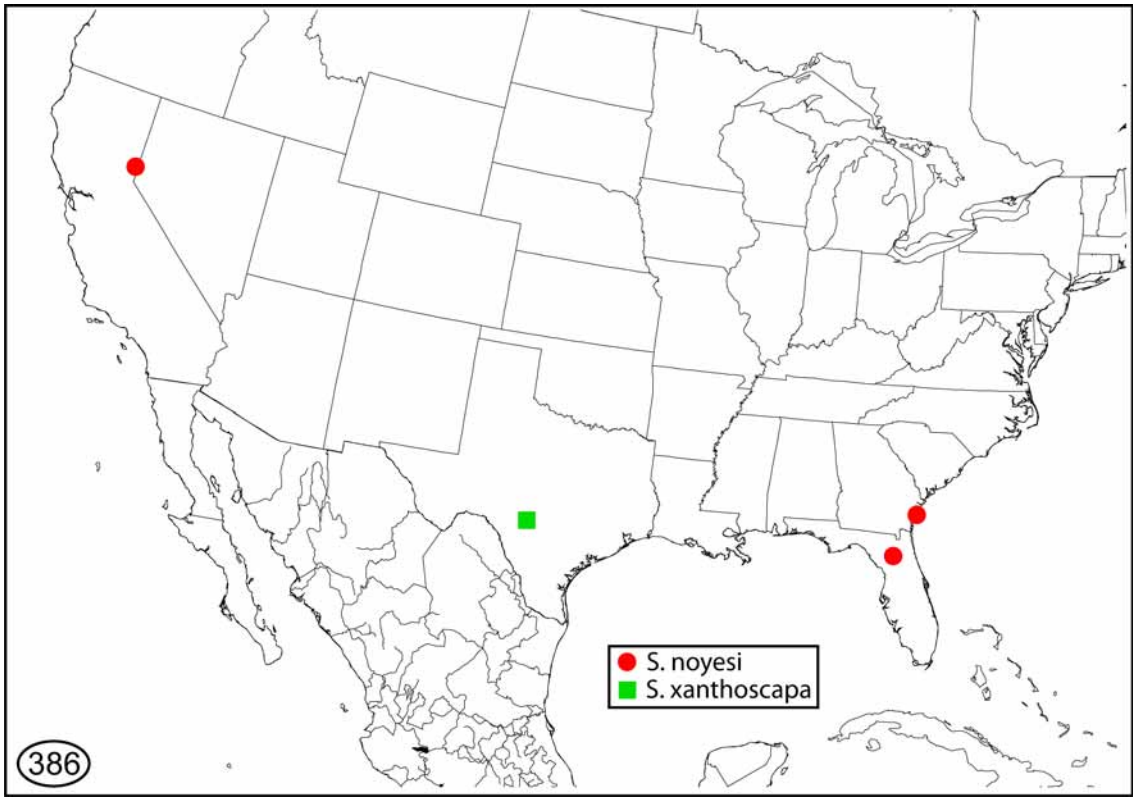


Fig. 386. Distribution of *Spalangia noyesi* Gibson and *S. xanthoscapa* Gibson.

Distribution. Southern USA (Fig. 386).

Biology. Unknown, but based on morphology probably a parasitoid of Diptera associated with ant nests.

Recognition. I include *S. noyesi* and *S. xanthoscapa* as the only two species in the *noyesi* species group, though the two putative species likely are only highly modified species related to some *drosophilae*-group species. This hypothesis is based on a slight indication of a median lanceolate band on the propodeum of some specimens of *S. noyesi*, and the comparatively long flagellar setae of males (Fig. 383). Also, the upper mesepisternum is not differentiated from the lower mesepisternum by a transepisternal line or adjacent line of setae (Fig. 380), which is similar to some *drosophilae*-group species. The two *noyesi*-group species are distinguished from *drosophilae*-group and other *Spalangia* species in part by the propodeum having at most an extremely effaced median lanceolate band and an unusually flat and elongate-slender head and mesosoma (Figs 378, 379). Individuals also uniquely lack an occipital carina (Fig. 375) within *Spalangia* as well as having a ∩- or bell-shaped pronotum without a distinctly differentiated neck (Figs 378, 379). Both of these features are undoubtedly correlated with their unusually flat body (Fig. 379).

The single female from California differs from the Florida and Georgia females in having fu_1 obviously longer than wide and apparently the fore wing less extensively setose behind the submarginal vein. The male from California has the fore wing even more setose than females, which is characteristic of several other *Spalangia* species.

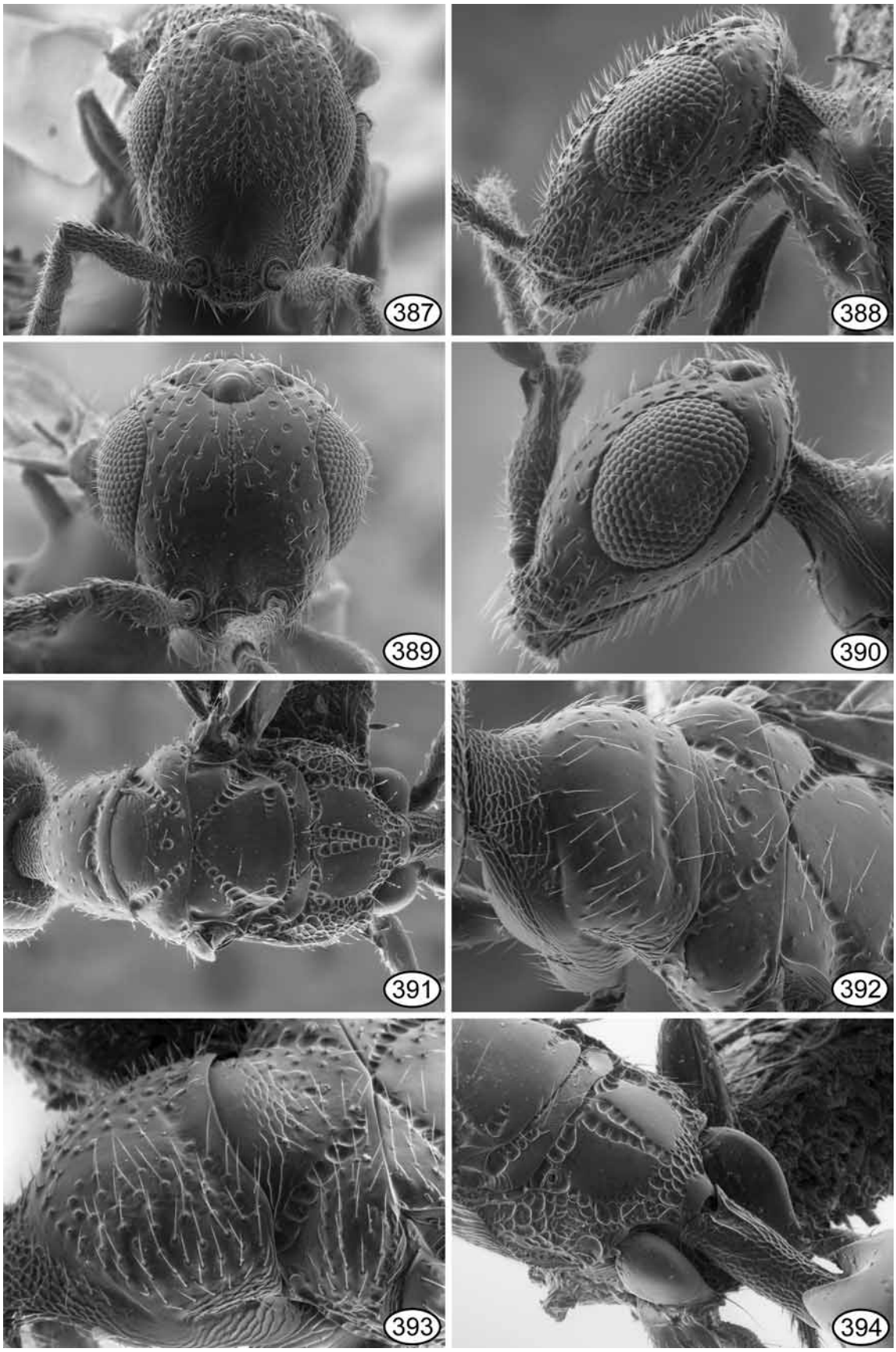
The unique female of *S. xanthoscapa* differs conspicuously from females of *S. noyesi* only in its bicolored antennae. It also has a completely smooth and shiny (Fig. 377) rather than obliquely strigose-alutaceous (Fig. 377) parascrobal region, but this as well as a generally slightly finer body sculpture and somewhat more strongly transverse funicular segments (Fig. 385) may be correlated with its slightly smaller body size.

25. *Spalangia plaumanni* n. sp.
(Figs 259, 387–399)

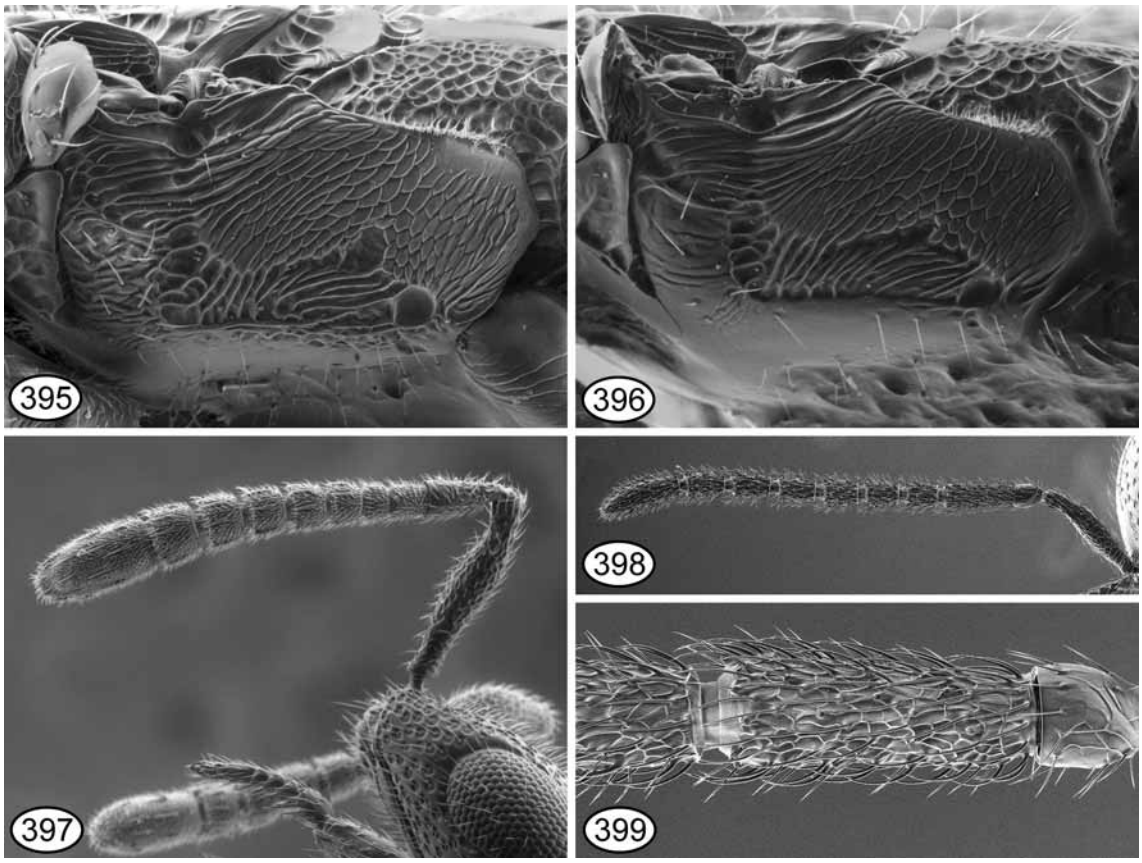
Type material. HOLOTYPE (♀, CNC no. 23891). "BRAZIL: Nova Teutonia, 27º11'S 52º23'W, 300–500 m., IX.1972, Fritz Plaumann". Condition: point-mounted, entire.

PARATYPES (282♀, 200♂). *Neotropical*. **BELIZE**: CAYO, Las Cuevas Res. Sta., Chiquibul For. Rsrv., 80 km. S Santa Elena, VI.95, T. King & A. Howe (2♀ UCDC). **BOLIVIA**: Dpto. Santa Cruz, 5 km. SSE Buena Vista Hotel, Fauna y Flora, 17º29.925'S 63º39.128'W, 440 m., 6-15.XII.03, S. & J. Peck, for. FIT (1♀, 1♂). **BRAZIL**: M. [Mato] Grosso, Rio Caraguata, 27, 29, 30.III.53, F. Plaumann (2♀, 1♂ BMNH). Paraná, Rondon, VIII.52 (2♀, 5♂ BMNH), 22.VIII.52 (4♀, 2♂ BMNH), 24.VIII.52 (1♀ BMNH), 28.VIII.52 (1♂ BMNH), 31.VIII.52 (1♀ BMNH), 5.X.52 (1♂ BMNH), 6.X.52 (1♂ BMNH), 17.X.52 (1♀, 3♂ BMNH), 18.X.52 (1♂ BMNH), 20.X.52 (1♂ BMNH), 21.X.52 (2♀ BMNH), 22.X.52 (6♀, 4♂ BMNH), 23.X.52 (1♀ BMNH), 25.X.52 (3♀, 4♂ BMNH), 26.X.52 (3♀ BMNH), 27.X.52 (6♀, 2♂ BMNH), 28.X.52 (2♀, 2♂ BMNH), 29.X.52 (1♀ BMNH), 30.X.52 (1♀, 1♂ BMNH), 6.XI.52 (2♀, 2♂ BMNH), 7.XI.52 (3♀, 1♂ BMNH), F. Plaumann. Rio Caraguatà, 21º48'S 52º27'W, 26.III.53, F. Plaumann (1♂). R. G. Sol. [Rio Grande do Sul], Fortaleza, VIII.51, F. Plaumann (4♂ BMNH). Sao Paulo, Teodoro Sampaio, XII.77, M. Alvarenga (1♀). Santa Catarina, Nova Teutonia, F. Plaumman — 20.III.41 (1♂ BMNH), 22.III.41 (1♂ BMNH), 26.III.41 (1♀, 1♂ BMNH), 29.III.41 (3♀, 1♂ AEIC), 1.IV.41 (5♀ AEIC), 3.IV.41 (1♀, 1♂ BMNH), 8.IV.41 (2♀, 1♂ AEIC), 10.IV.41 (1♀ BMNH), 11.IV.41 (1♀ AEIC), 12.IV.41 (3♀, 6♂ AEIC), 19.IV.41 (9♀, 1♂ BMNH), 21.IV.41 (1♂ BMNH), 29.IV.41 (4♀ BMNH), 1.V.41 (1♂ BMNH), 2.V.41 (1♀, 1♂ AEIC), 9.V.41 (1♀ BMNH), 9.VI.41 (1♀, 1♂ BMNH), 19.VI.41 (2♀, 1♂ BMNH), 23.VI.43 (1♀ BMNH), 17.VII.44 (1♀ BMNH), 7.VIII.44 (1♀ BMNH), 10.VIII.44 (1♀ BMNH), 13.VIII.44 (1♀ BMNH), 28.VIII.44 (1♀ BMNH), 20.IX.44 (3♂ BMNH), 27.IX.44 (2♀ BMNH), 30.IX.44 (1♀ BMNH), 13.X.44 (3♀, 1♂ BMNH), 14.X.44 (6♀, 2♂ BMNH), 19.X.44 (1♂ BMNH), 30.X.44 (1♀ BMNH), 2.II.50 (1♀, 2♂ BMNH), 3.II.50 (3♀ BMNH), 5.II.50 (2♀ BMNH), 78.II.50 (1♀ BMNH), 11.II.50 (1♀ BMNH), 13.II.50 (1♂ BMNH), 15.II.50 (1♀ BMNH), 17.II.50 (2♀, 1♂ BMNH), 22.II.50 (1♂ BMNH), 24.II.50 (21♀, 14♂ BMNH), 25.II.50 (1♀ BMNH), 26.II.50 (6♀, 3♂ BMNH), 27.II.50 (6♀, 7♂ BMNH), 28.II.50 (2♂ BMNH), 1.III.50 (6♀, 7♂ BMNH), 3.III.50 (4♀, 6♂ BMNH), 5.III.50 (13♀, 15♂ BMNH), 6.III.50 (37♀, 11♂ BMNH), 7.III.50 (10♀, 9♂ BMNH), 8.III.50 (9♀, 9♂ BMNH), 24.III.50 (1♀, 3♂ BMNH), 26.III.50 (6♀, 6♂ BMNH), 5.IV.50 (3♀, 3♂ BMNH), 4.X.52 (1♀ BMNH), 1.XI.52 (1♀ BMNH), 6.XI.55 (1♀ BMNH), 7.XI.55 (1♂ BMNH), 10.X.56 (1♂ BMNH), 18.X.56 (1♀, 1♂ BMNH), 21.X.56 (1♂ BMNH), 8.X.65 (1♂ MCZH), X.65 (2♀ MCZH); same data as holotype (15♀, 20♂) or collected VII.57 (1♀ BMNH), IV.71 (3♀), VIII.71 (1♀), IX.71 (1♀), X.72 (7♀, 3♂), VIII-II.73 (1♀), XI.73 (4♀, 2♂), 1973 (2♀, 1♂). **COSTA RICA**: Cartago, Turrialba, IICA, 13.IV.76, M. Wasbaurer, MT (1♂ EMEC). Guanacaste P. N., Santa Rosa, 200 m., I.91, P. Hanson (1♂ MZCR). Her. Santo Domingo, INBIO, 6-7.III.96, L. Masner (1♂). San Jose, Ciudad Colón, 800 m., XII.89-I.90, L. Founier (1♀ MZCR). **ECUADOR**: Sucumbios, Napo R., Sacha Lodge, 0º30'S 76º30'W, 270 m., 4-14.III.94, P. Hibbs, MT (1♀). **PANAMA**: Canal Zone, Barro Colorado Is., IX.40, JasZetek no. 4690, bred from fls *Heliconia platystachys* (1♂ USNM). El Cermeno, em. VII-VIII.41, JZetek 4857 42-20632, ex fruit *Labatia standleyana* (1♀ USNM). **PERU**: Madre de Dios, Cocha Cashu, 350 m., 17-19.X.00, R. Brooks, FIT (1♀). Rio Perene, 25.III.10, C.H.T. Townsend (1♀ USNM). **VENEZUELA**: Aragua, Cuyagua, 600 m., 10.VIII.87, S. & J. Peck, coastal thorn-scrub, soil washing (1♂). Conuco, El Mirador, Caripe, 10.VI.73, S. Peck (1♂).

Etymology. Named in honor of the late Fritz Plaumann, who collected the majority of the specimens comprising the type series.



Figs 387–394. *Spalangia plaumanni* Gibson. **387–390**, head: **387**, anterior view ♀, **388**, lateral view ♀, **389**, anterior view ♂, **390**, lateral view ♂; **391**, ♂ mesosoma, dorsal view; **392 & 393**, pronotum and mesoscutum, dorsolateral view: **392**, ♂, **393**, ♀; **394**, ♂ frenum–petiole, dorsolateral view.



Figs 395–399. *Spalangia plaumanni* Gibson. **395 & 396**, mesopleuron: **395**, ♀, **396**, ♂; **397 & 398**, antenna: **397**, ♀, **398**, ♂; **399**, ♂ fu_1.

Description. *Female*. Length = 1.5–2.0 mm. Legs dark except at least basal tarsal segments yellow and one or more of subsequent 3 segments yellow or brown. Head in anterior view (Fig. 387) about 1.2–1.3x as high as wide; in dorsal view about 1.8–2.0x as wide as long; in lateral view (Fig. 388) with malar space about 0.6–0.8x eye height and about 0.9–1.3x eye width. Head capsule smooth and shiny except for crowded setiferous punctures as follows: with complete median sulcus extending ventrally to level of lower orbit, usually within equilateral-triangular or more transverse-oval scrobal depression, otherwise upper face and parascrobal region with distinct, flat-bottomed punctures, the punctures sometimes separated by about 1–2 puncture diameters on upper face (Fig. 387) but at least more densely crowded on parascrobal region where separated only by linear ridges; scrobal depression with finely coriaceous to coriaceous-granular scrobes on either side of smooth and shiny interantennal region, the sculpture extending over inclined lateral surface of depression and sometimes partly obscuring punctures on parascrobal region near torulus (Fig. 387); gena with distinct crowded punctures similar to lower parascrobal region (Fig. 388), the subcontiguous punctures sometimes aligned in rows and then often obscuring linear malar sulcus; temple with distinct punctures similar to gena. Antenna (Fig. 397) with scape about 4.6–5.1x as long as wide, the inner and outer surfaces uniformly setose and punctate-rugose; pedicel about 1.9–2.6x as long as apical width and about 2.4–2.6x as long as fu_1; funicle with fu_1 about 0.8–1.2x as long as wide, but usually at least quadrate, and subsequent segments transverse or subquadrate basally to transverse apically, with fu_7 about 1.2–1.6x as wide as long; clava about 1.8–2.3x as long as wide.

Pronotal collar in lateral view only very low convex behind neck and with circumpronotal band anterolaterally, but anteriorly smoothly rounded to neck; with variably distinct cross-furrow posteriorly (Figs 391–393), the furrow sometimes coriaceous or if obscurely crenulate then at least setae originating from tiny

bumps within furrow (Fig. 393), and variably, often quite densely setose with setae originating from distinct bumps anterior to furrow except mediolongitudinally, but otherwise smooth and shiny. Mesoscutal median lobe (Fig. 391, 392) with anterior convex region smooth and shiny anteriorly and coriaceous to transversely alutaceous posteriorly; internotaular region with setae often originating from bumps lateral to 1 or 2 median punctures or depressions (Fig. 393). Axillae (Fig. 392) shiny with setae originating from at most minute pinprick-like punctures. Scutellum (Fig. 391) flat and shiny but variably extensively setose laterally, the setae originating from pinprick-like punctures; frenum (Figs 391, 394) with crenulate frenal line interrupted over at least medial third. Mesopleuron (Fig. 395) completely, distinctly sculptured as follows: pectal region coriaceous-granular to rugose-roughened and more or less uniformly covered with several though often inconspicuous setae; acropleuron longitudinally striate-strigose; subalar and episternal scrobes shallow depressions connected by a shallow, linear furrow; upper mesepimeron quite strongly, obliquely alutaceous-coriaceous, the sculpture becoming more coriaceous-alutaceous on lower mesepimeron ventrally; upper and lower mesepisternum differentiated by variably distinctly carinate transepisternal line and adjacent line of setae, the upper mesepisternum obliquely to posteriorly more longitudinally striate-strigose (Figs 395, 396). Fore wing hyaline; at least with line of several setae on mediocubital fold. Propodeum with distinct postspiracular sulcus; callus punctate-reticulate to rugulose; plical region with narrowly V- or Y-shaped paramedian crenulate furrows sometimes delineating a median carina (Fig. 391), but usually with at least a very slender, flat, smooth lanceolate median band, and furrows united into single crenulate line over about posterior half (Fig. 394); supracoxal bands contiguous with paramedian crenulate furrow; panels smooth and shiny.

Petiole about 1.7–1.8x as long as medial width; punctate-reticulate to reticulate-rugulose; bare. Gaster shiny with Gt_1 smooth, but at least Gt_2 and Gt_3 in part very finely coriaceous.

Male. Length = 1.2–1.6 mm. Antenna (Fig. 398) with scape about 4.2–4.9x as long as wide, and often with finer sculpture than for female; pedicel about 1.2–1.4x as long as wide; flagellum with strongly curved setae, but setae not extending from surface for distance obviously equal to width of segment; funicle with fu_1 (Fig. 399) about 2.3–3.1x as long as wide and about 1.7–2.5x as long as pedicel, and subsequent funicular segments all longer than wide, with fu_7 about 1.3–1.9x as long as wide. Otherwise similar to female except as follows. Head in anterior view (Fig. 389) about 0.9–1.0x as wide as high; in lateral view (Fig. 390) with malar space about 0.6–0.7x eye height and about 0.8–0.9x eye width. Head usually less densely punctate than for female (*cf*. Fig. 389 with 387, Fig. 390 with 388); gena sometimes with very shallow punctures. Pronotal collar (Figs 391, 392) always with conspicuous, often medially quite distinctly crenulate cross-furrow, but otherwise smoother and shinier with sparser setae arising from less distinct bumps (*cf*. Fig. 392 with 393). Mesopleuron with pectal region at least sparsely setose dorsally to acropleuron, but sometimes only finely coriaceous and quite shiny (Fig. 396). Propodeum (Fig. 394) more commonly with only very narrowly divergent, V-like paramedian crenulate furrows differentiating irregular median carina (Fig. 391). Petiole (Fig. 394) about 2.1–2.3x as long as medial width, often longitudinally carinate-strigose anteriorly and punctate-reticulate posteriorly.

Distribution. Central America (Belize, Costa Rica, Panama) and South America (Bolivia, Brazil, Ecuador, Peru, Venezuela) (Fig. 259).

Biology. Hosts unknown, but associated with the flowers of *Heliconia platystachys* Baker (Heliconiaceae) and fruit of *Labatia standleyana* (Pittier) (Sapotaceae), perhaps indicating fruit fly (Tephritidae, Drosophilidae) hosts.

Recognition. I include *S. plaumanni* as one of seven species in the *drosophilae* species group as discussed under *S. drosophilae*. It is differentiated from all other species of *Spalangia* by its uniquely setose and sculptured pectal region (Fig. 395) and from all other *drosophilae*-group species except *S. flavicrus* by the presence of distinct, flat-bottomed setiferous punctures at least on the gena (Figs 388, 390), though both features (Figs 396, 390) are less conspicuous for some small males. Leg color readily differentiates *S. plaumanni* from *S. flavicrus*. Males of *S. plaumanni* also have less conspicuously long flagellar setae (Figs 398, 399) than other

known *drosophilae*-group males, though flagellar structure and setation of *S. flavicrus* males likely is similar to *S. plaumanni*. Both sexes of *S. plaumanni* have quite a distinct though at most only obscurely crenulate furrow on the pronotal collar (Figs 391–393), which is less distinct than the cross-furrow in *S. innuba* (Figs 255, 256) but more conspicuous than in *S. bethyloides* (Fig. 51).

26. *Spalangia rugosifrons* n. sp.

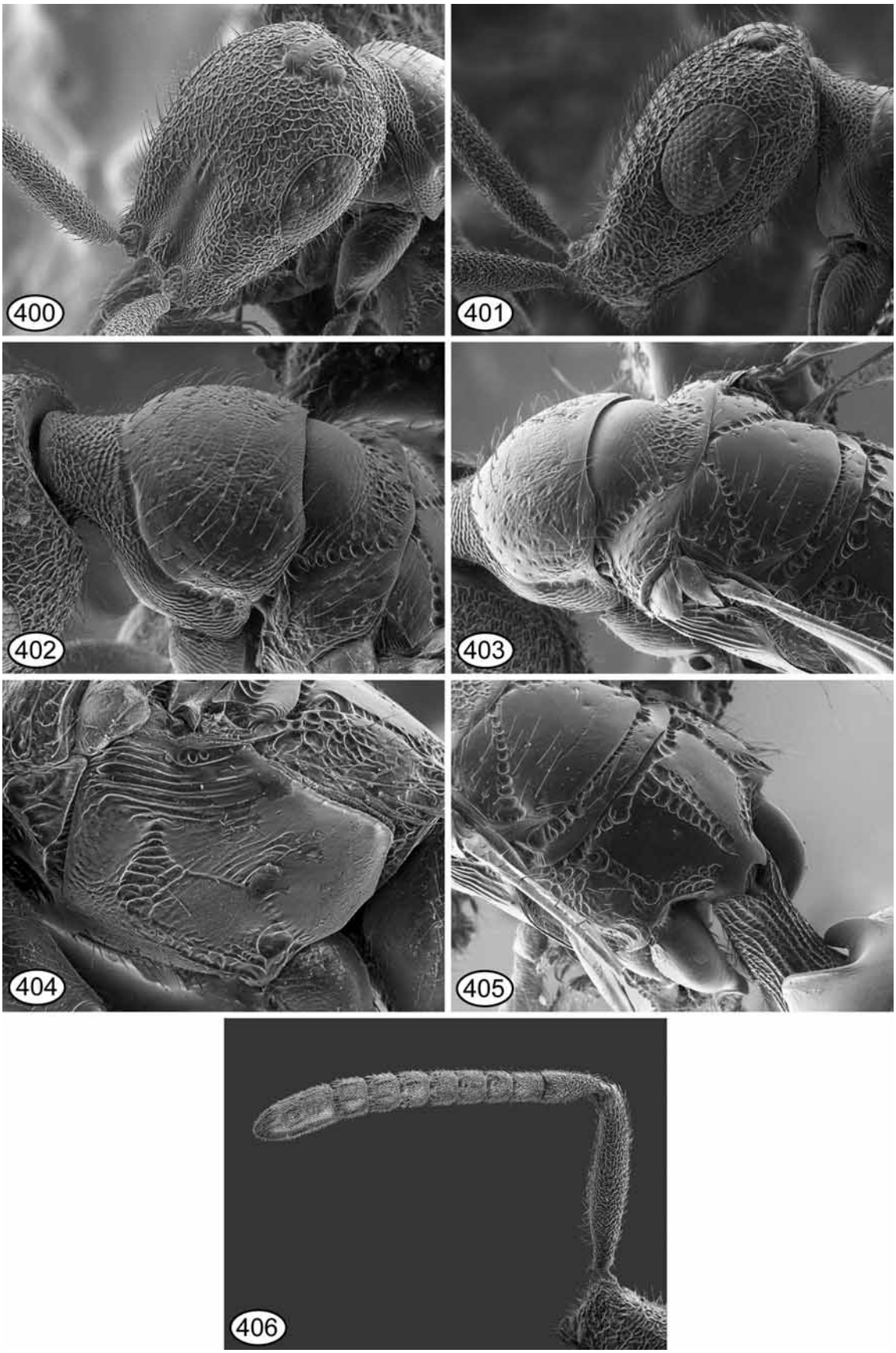
(Figs 400–407)

Type material. HOLOTYPE (♀, CNC no. 23892). "BRAZIL: Sao Paulo, Sao Carlos State Univ., 6.I.1996, M. Sharkey / LB-specm 2007-037". Condition: point-mounted, entire.

Etymology. A combination of the Latin words *rugosus*, meaning "wrinkled", and *frons*, meaning "forehead", in reference to the unique sculpture of the head that differentiates this species from all other New World *Spalangia*.

Description. *Female*. Length = 1.8 mm. Legs dark except knees slighter lighter in color and basal 3 or 4 tarsal segments more distinctly yellow. Head in anterior view about 1.3x as high as wide; in dorsal view about 1.7x as wide as long; in lateral view (Fig. 401) with malar space about 1.3x eye height and about 1.6x eye width. Head capsule reticulate-rugose with setae originating from minute bump within each irregularly shaped cell (Figs 400, 401), except as follows: upper face with complete median sulcus extending ventrally to elongate-triangular scrobal depression; scrobal depression mostly coriaceous-granular but smoother and shinier mediolongitudinally except anteriorly between toruli (Fig. 400); gena without malar sulcus. Antenna (Fig. 406) with scape about 6x as long as wide, the inner and outer surfaces uniformly setose and reticulate-rugose; pedicel about 2x as long as apical width or fu_1; funicle with fu_1 about 1.1x as long as wide and subsequent segments all slightly transverse; clava about 2.4x as long as wide.

Pronotal collar in lateral view only very low convex behind neck, without distinct circumpronotal bar anterolaterally and anteriorly smoothly rounded to neck; with smooth posterior margin and very finely coriaceous and bare mediolongitudinally except anteriorly, but otherwise shallowly micropunctate-coriaceous with setae originating from shallow, obscure depressions (Figs 402, 403). Mesoscutal median lobe (Figs 402, 403) with anterior convex region smooth and shiny anteriorly to finely coriaceous posteriorly; internotaular region reticulate-rugose. Axillae (Figs 403, 405) smooth and shiny except for a few pinprick-like setiferous punctures. Scutellum (Figs 403, 405) smooth and shiny except for a few pinprick-like setiferous punctures laterally; frenum (Figs 403, 405) differentiated by oblique puncture laterally and much finer transverse line medially, and very finely and inconspicuously coriaceous adjacent to obscure frenal line. Mesopleuron (Fig. 404) comparatively shiny and finely sculptured as follows: pectal region finely coriaceous anteriorly and smooth and shiny posteriorly, but bare except for 1 posteroventral seta; acropleuron longitudinally carinate, the carinae extending posteriorly onto alar shelf; subalar scrobe a vertical, ventrally widened crenulate-rugose depression; episternal scrobe a shallow depression connected to subalar scrobe by fine linear sulcus and to precoxal scrobe by a fine, obscurely punctate line; upper mesepimeron obliquely alutaceous, more coarsely so adjacent to episternal scrobe, and lower mesepimeron smooth and shiny; upper and lower mesepisternum differentiated by a few setae and fine ridge ventral to seta, the upper mesepisternum mostly smooth and shiny except for slender, longitudinal coriaceous-rugose or roughened band extending posteriorly from subalar scrobe above fine ridge (Fig. 404). Fore wing hyaline; mediocubital fold with 3 setae and basal cell/fold distally with 3–5 setae. Propodeum (Fig. 405) with distinct postspiracular sulcus; callus reticulate-rugulose anteriorly but smoother, coriaceous to shiny posteriorly anterior to metacoxal flange; plical region with very narrowly V-like paramedian crenulate furrows delineating median carina, and with anterior-most cell not distinctly differentiated from more posterior cells; supracoxal band separated from paramedian crenulate furrows by smooth band at nucha; propodeal panels smooth and shiny.



Figs 400–406. *Spalangia rugosifrons* Gibson ♀. **400 & 401**, head: **400**, frontolateral view, **401**, lateral view; **402**, pronotum and mesoscutum, frontolateral view; **403**, pronotum and mesonotum, dorsolateral view; **404**, mesopleuron; **405**, scutellum–petiole, posterodorsal view; **406**, antenna.

Petiole (Fig. 405) about 2x as long as medial width; microreticulate between longitudinal carinae; with 1 short seta anterolaterally. Gaster with Gt_1 smooth and shiny, Gt_2 and Gt_3 finely coriaceous.

Male. Unknown.

Distribution. Southeastern Brazil (Fig. 407).

Biology. Unknown.

Recognition. I include *S. rugosifrons* as one of four species in the *attae* species group as discussed under *S. attae*. It is differentiated from all other New World species by its reticulate-rugose head (Figs 400, 401). The fine ridge on the mesepisternum ventral to the slender sculptured band and line of a few setae (Fig. 404) likely is a secondary feature that is not homologous with the transepisternal line. Rather, the dorsal margin of the slender sculptured band and line of setae should indicate the presumptive transepisternal line.

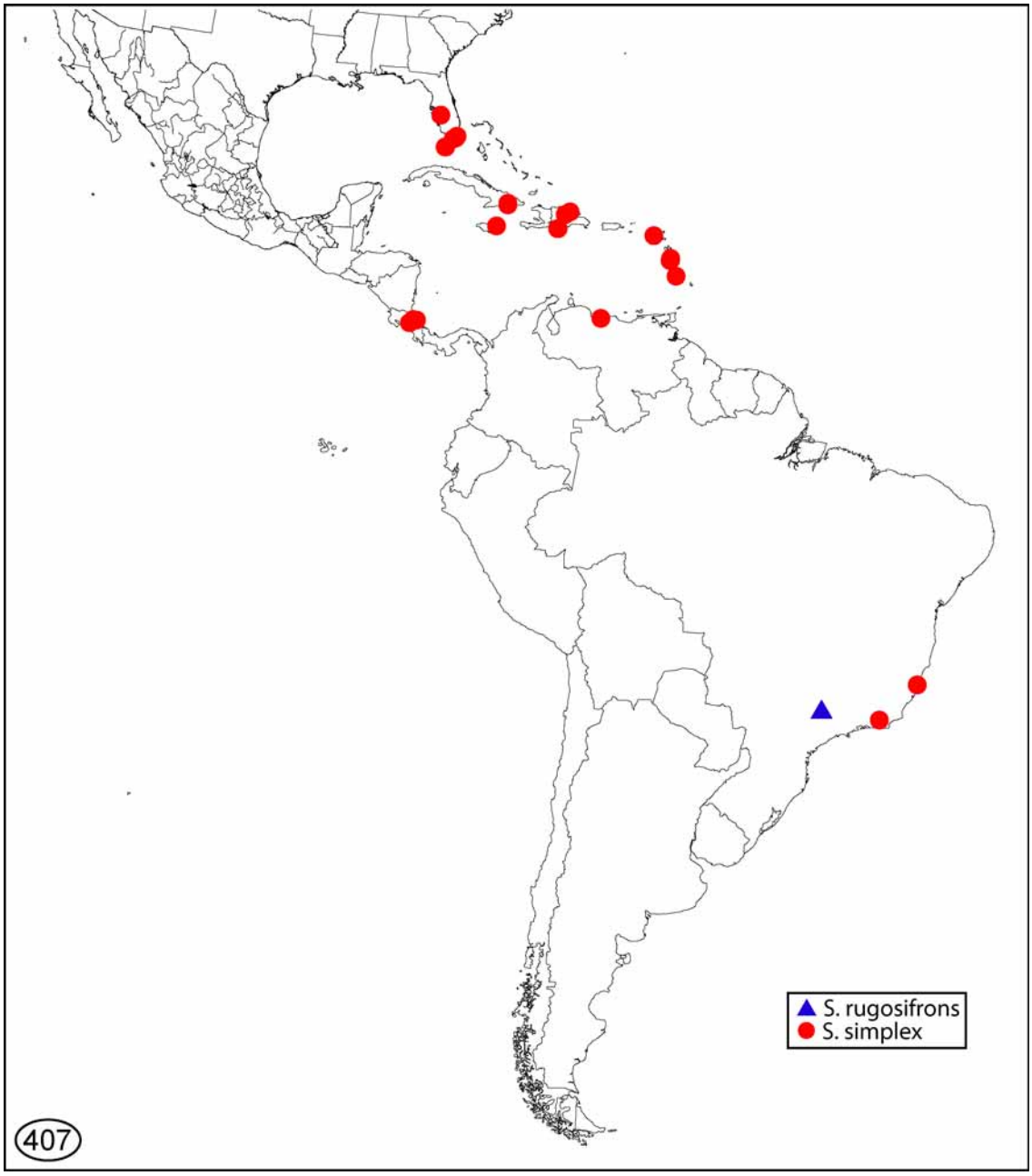


Fig. 407. Distribution of *Spalangia rugosifrons* Gibson and *S. simplex* Perkins.

27. *Spalangia simplex* Perkins, 1910
(Figs 407–422)

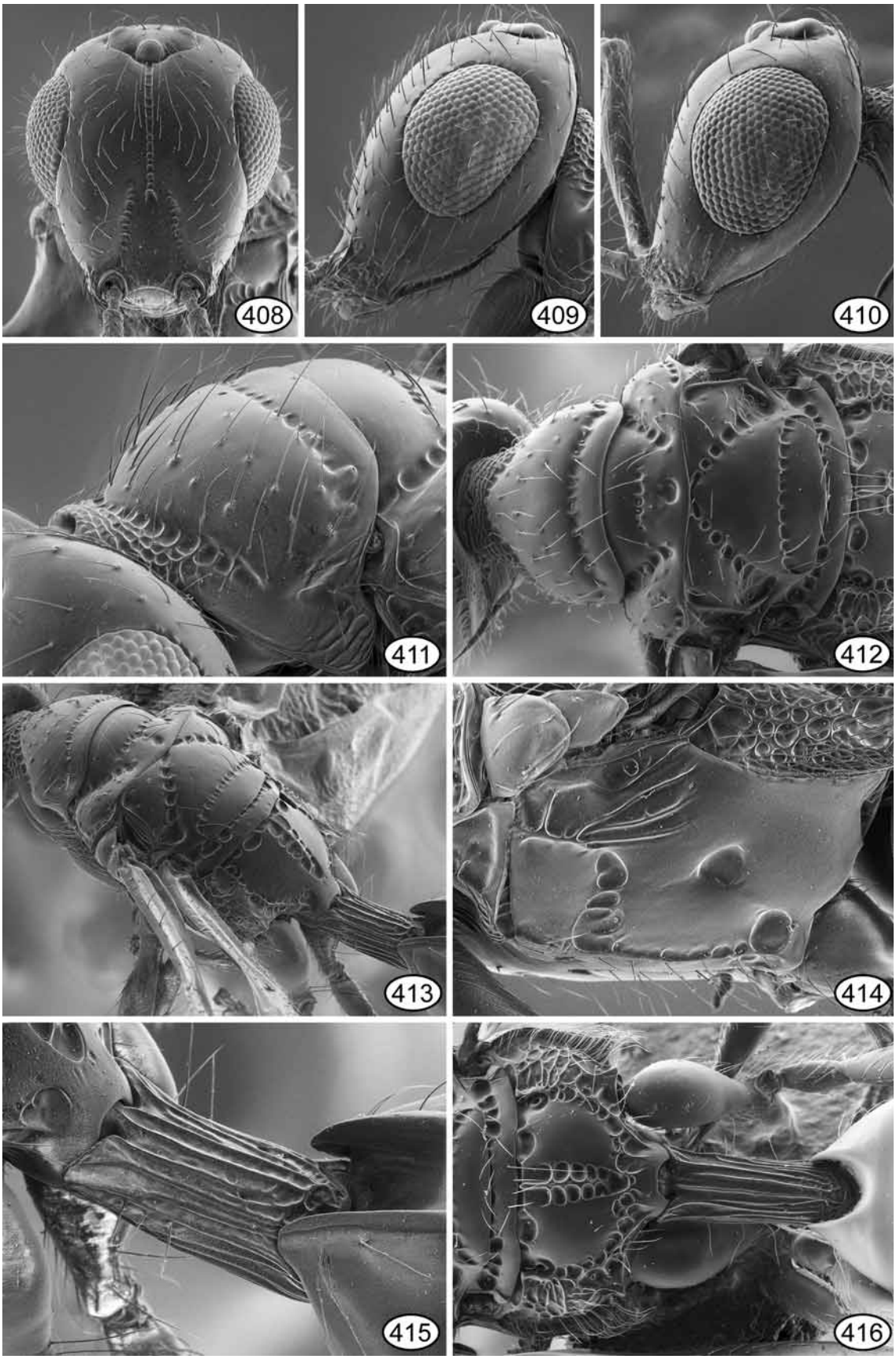
Spalangia simplex Perkins, 1910: 657; ♀, ♂ syntypes (BPBM, examined). Type data: Oahu, Honolulu.
Spalangia parasitica Girault, 1915: 346; ♀ syntypes (QMBA, not examined). Type data: Australia, Queensland, Ingham, sweeping in vicinity of canefields, Herbert River, April 2, 1914, A.P. Dodd. Tentative synonymy by Bouček (1963: 496) confirmed by Bouček (1988a: 342).

Description. *Female*. Length = 1.4–2.0 mm. Legs dark with knees and apex of tibiae narrowly, but variably distinctly yellowish and basal 4 tarsal segments yellow. Head in anterior view (Fig. 408) about 1.1–1.2x as high as wide; in dorsal view about 1.7–1.8x as wide as long; in lateral view (Fig. 409) with malar space about 0.8x eye height and about 1.4x eye width. Head capsule (Figs 408–410) smooth and shiny as follows: with complete median sulcus extending ventrally to elongate-triangular scrobal depression, the sulcus terminated ventrally by a deeper puncture (Fig. 408), otherwise upper face, parascrobal region, inclined surface of scrobal depression, gena and temples with scattered setae originating from at most tiny pinprick-like punctures; scrobal depression with linear, punctate scrobes on either side of smooth and shiny interantennal region; gena usually with linear malar sulcus, but the sulcus sometimes obliterate medially. Antenna (Fig. 417) with scape about 6.4–8.0x as long as greatest width, the inner (Fig. 418) and outer (Fig. 419) surfaces finely, longitudinally strigose, but outer surface uniformly setose and inner surface bare or at least more sparsely setose mediolongitudinally; pedicel about 2.1–2.3x as long as apical width or fu_1; funicle with fu_1 slightly longer than wide and subsequent segments quadrate or slightly transverse basally to increasingly conspicuously transverse apically; clava about 2.1–2.5x as long as wide.

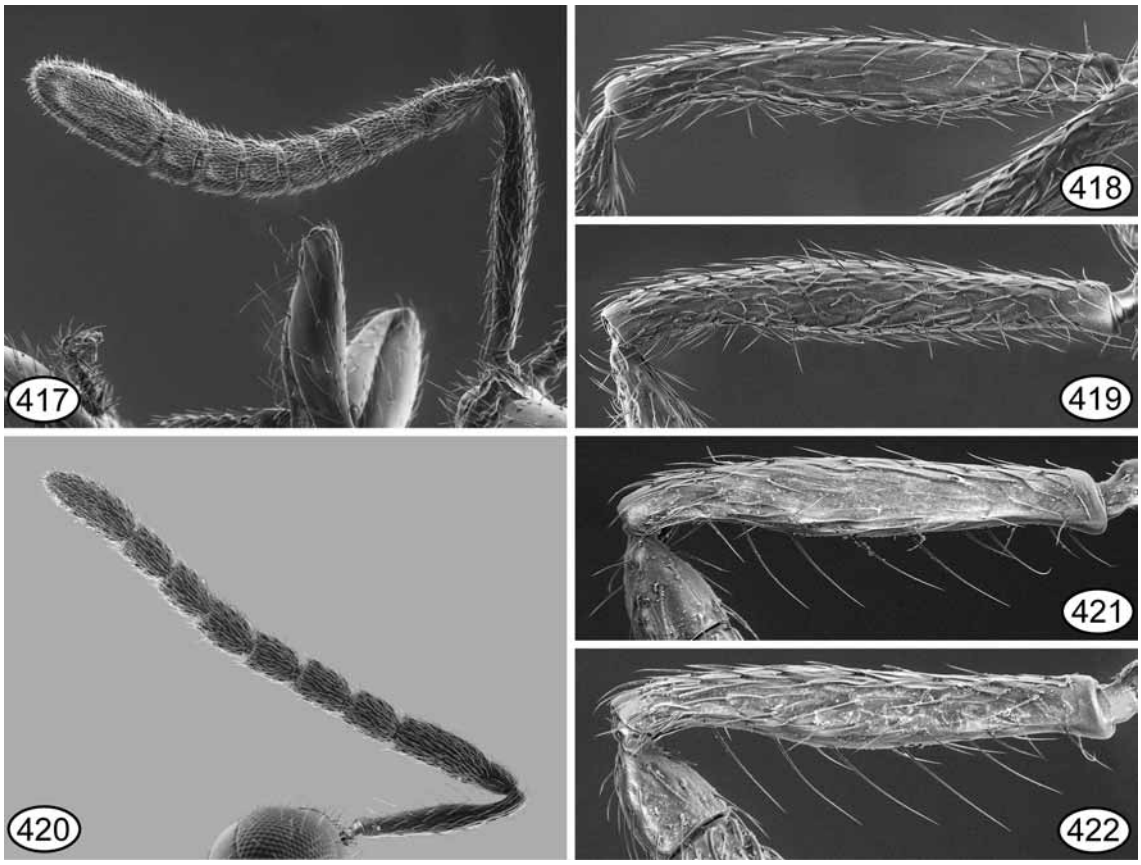
Pronotal collar in lateral view low convex behind neck and with circumpronotal band anterolaterally, but anteriorly smoothly rounded to neck; with distinct crenulate cross-line posteriorly but otherwise smooth and shiny except for scattered setae over at least anterior half, the setae usually originating from tiny bumps. Mesoscutal median lobe (Figs 412, 413) with anterior convex region and internotaular region smooth and shiny except for a single median puncture posterior to a transverse row of setiferous punctures. Axillae (Figs 412, 413) smooth and shiny except for a few setae originating from pinprick-like setiferous punctures. Scutellum (Figs 412, 413) smooth and shiny except for a few setae originating from pinprick-like setiferous punctures laterally; frenum (Figs 412, 413) differentiated by complete, uniformly developed, crenulate frenal line. Mesopleuron (Fig. 414) smooth and shiny except as follows: pectal region bare except for 1 posteroventral seta; acropleuron variably distinctly longitudinally carinate, the carinae extending posteriorly onto alar shelf; subalar scrobe a vertical, longitudinally crenulate furrow; episternal scrobe a subcircular to oval depression only sometimes connected to subalar scrobe by a fine line but not to precoxal scrobe; upper and lower mesepisternum differentiated by punctate-crenulate transepisternal line and adjacent line of setae. Fore wing hyaline; mediocubital fold with 2–4 setae and basal cell with additional setae. Propodeum (Figs 413, 416) with distinct postspiracular sulcus; callus reticulate-rugose or smoother posteriorly anterior to metacoxal flange; plical region with very narrowly V-like paramedian crenulate furrows delineating median carina, and with anterior-most cell often longer but not distinctly differentiated from more posterior cells; supracoxal band a single crenulate row extending to nucha but posteriorly separated from paramedian crenulate furrows; propodeal panels smooth and shiny.

Petiole (Fig. 413) about 1.8–2x as long as medial width; variably distinctly microreticulate between longitudinal carinae; with 2–5 long setae laterally. Gaster with tergites smooth and shiny.

Male. Length = 1.2–1.6 mm. Antenna (Fig. 420) with scape about 5.6–6.7x as long as wide, the inner (Fig. 421) and outer (Fig. 422) surfaces quite shiny but finely longitudinally strigose to almost smooth, and ventrally with line of several conspicuously long but only slightly curved setae; pedicel subglobular, at most about 1.4x as long as apical width; flagellum with setae much shorter than respective segment; funicle with fu_1 about 1.7–2.5x as long as wide and about 1.3–1.9x as long as pedicel, and subsequent funicular segments all at



Figs 408–416. *Spalangia simplex* Perkins. **408–410**, head: **408**, anterior view ♀, **409**, lateral view ♀, **410**, lateral view ♂; **411**, ♀ pronotum, frontolateral view; **412**, ♂ pronotum and mesonotum, dorsal view; **413**, ♀ mesosoma and petiole, posterodorsal view; **414**, ♀ mesopleuron; **415**, ♀ petiole, dorsolateral view; **416**, ♂ propodeum and petiole, dorsal view.



Figs 417–422. *Spalangia simplex* Perkins. **417**, ♀ antenna; **418 & 419**, ♀ scape: **418**, inner view, **419**, outer view; **420**, ♂ antenna; **421 & 422**, ♂ scape: **421**, inner view, **422**, outer view.

least slightly and usually about 1.2–1.3x as long as wide. Otherwise similar to female except as follows. Head in anterior view about 0.9–1.0x as wide as high; in lateral view (Fig. 410) with malar space about 0.6–0.7x eye height and about 0.7–0.9x eye width. Fore wing much more conspicuously setose than female, with line of several setae on mediocubital fold and in basal cell. Petiole (Fig. 416) about 2.5–2.9x as long as medial width.

Material examined. *Nearctic* (13♀, 3♂). **USA**: ***Florida***, Dade Co. — Everglades N. Pk., Long Pine Key, VIII-XII.86 (3♀), 31.VIII-9.XII.86 (7♀), S. & J. Peck, pineland for.; Homestead, T.R.E.C. T15, 20.III.87, V. Gupta (1♀); S Miami, Deering Estate, Pk. for., SW 107 St. & SW 72 Ave., 21.II-I.VI.86, young hammock, S. & J. Peck (1♂). De Soto Co., Arcadia, Desoto Pk., 19.I.06, K Hubbard, reared from damaged Citrus containing *Drosophila* & *Zaprionus* (1♂ FSCA). Monroe Co. — Big Pine Key, Watson's Hammock, 3.VI-27.VII.86, S. & J. Peck, hardwood hammock (1♀); No Name Key, 4.V-4.VIII.85, S. & J. Peck (1♀).

Neotropical (26♀, 32♂). **BRAZIL**: Espírito, Santo Linhares, IX.72, M. Alvarenga (1♀, 1♂). RJ [Rio de Janeiro], Teresópolis, Sítío Davi, 22º26'S 42º55'W, V.05, ALBG Peronti & eq. (2♀, 2♂ UFES). **COSTA RICA**: Limón, Los Diamantes, Guápilas, 200 m., 20.V.88, P. Hanson (2♀ MZCR). Santo Domingo, INBIO, 6-7.III.96, L. Masner (1♂). San Jose, Cuidad Colón, 800 m., III-IV.90, L. Fournier (1♂ MZCR). **CUBA**: Santiago Prov. — 16 km. NE Caney, 13.XII.95, 200 m., L. Masner (1♀, 9♂); Carretera Gran Piedra, km. 4, 150 m., 7.XII.95, L. Masner (1♂); Gran Piedra, Meteo Station, 1100 m., 4-17.XII.95, L. Masner (2♂). **DOMINICA**: St. Mark Parish — Scott's Headpoint, 2.XII.94, L. Masner, grassland (1♀); 1.5 km. E Soufrière, 25.XI.94, L. Masner, pasture (2♀, 3♂). St. Paul Parish, Springfield Estate, 505 m., 20-27.XII.94, L. Masner (1♂). **DOMINICAN REPUBLIC**: Barahona — 4 km. N Paraiso, 150 m., 22.III.91, L. Masner (10♀, 3♂); 7 km. NW Paraiso, 200 m., 27.XI.91 (2♀), 27.XI-4.XII.91 (2♀, 2♂), L. Masner & S. Peck. Duarte, 20 km. NE San Francisco de Macoris, Loma Quita Espuela, 300 m., 18.III.91 (1♀). La Vega Pr., PN.A. Bermudez, Cienaga, 120 m., 19.VII-2.VIII.95, S. & J. Peck, trop. evergreen for. (1♀). **JAMAICA**: Portland Parish, Paradise,

3.IV.75, E. Grissell, sweeping oranges (2♂ FSCA). **ST. KITTS**: Wingfield Mt., 1-30.XI.85, L.O. Coote (1♀). **ST. LUCIA**: 2 km. E Mon Repos, 27.II.00, L. Masner (2♂). **VENEZUELA**: Aragua, Parc Nac. H. Pittier, La Trilla, 200 m., 11-14.IV.94, L. Masner (3♂).

Distribution. Noyes (2003) lists *S. simplex* from the Australasian, Afrotropical and Oriental regions, but all the New World records (Fig. 407) are new. I saw specimens from North America (Florida), Central America (Costa Rica), West Indies (Cuba, Dominica, Dominican Republic, Jamaica, St. Kitts, St. Lucia) and South America (Brazil, Venezuela).

Biology. Hosts for *S. simplex* have not previously been reported but apparently include fruit flies. There is one New World record indicating Drosophilidae (*Drosophila* Fallén and/or *Zaprionus* Coquillett) and I have seen two females (USNM) from Malaya, Kuala Lumpur, that are labelled as a parasite of *Dacus dorsalis* Hendel (Tephritidae) on carambola, *Averrhoa carambola* L. (Oxalidaceae). Another female (USNM) from Australia, Queensland, Cairns, is labelled as ex *Dacus* sp.

Recognition. *Spalangia simplex* is distinguished by a combination of three features. The scutellum has a complete, uniformly developed crenulate frenal line (Figs 412, 413), the pronotum lacks sculpture except for a distinct crenulate cross-line posteriorly (Figs 411, 412), and the mesoscutal median lobe has a unique sculpture pattern consisting of a single median puncture posterior to a transverse row of punctures (Fig. 412). Some males of *S. cameroni* have an abnormally smooth pronotal collar (Fig. 69) that resembles that of *S. simplex* (Fig. 411), but the mesoscutal median lobe of *S. cameroni* has quite a different sculpture pattern (Fig. 69). Males of *S. simplex* are also characterized by having a comb-like row of very long setae along the ventral margin of the scape (Figs 421, 422). Bouček (1963: 496) tentatively synonymized *S. grotiusi* Girault (1913) under *S. simplex*, but later (Bouček 1988a: 342) treated the name as valid based on two non-type specimens allegedly identified by Girault as *S. grotiusi*, which Bouček stated probably belong to *S. endius*. Study of the fragmentary holotype of *S. grotiusi* (Dahms 1986: 669) is necessary to resolve the synonymy.

28. *Spalangia stictocephala* n. sp.

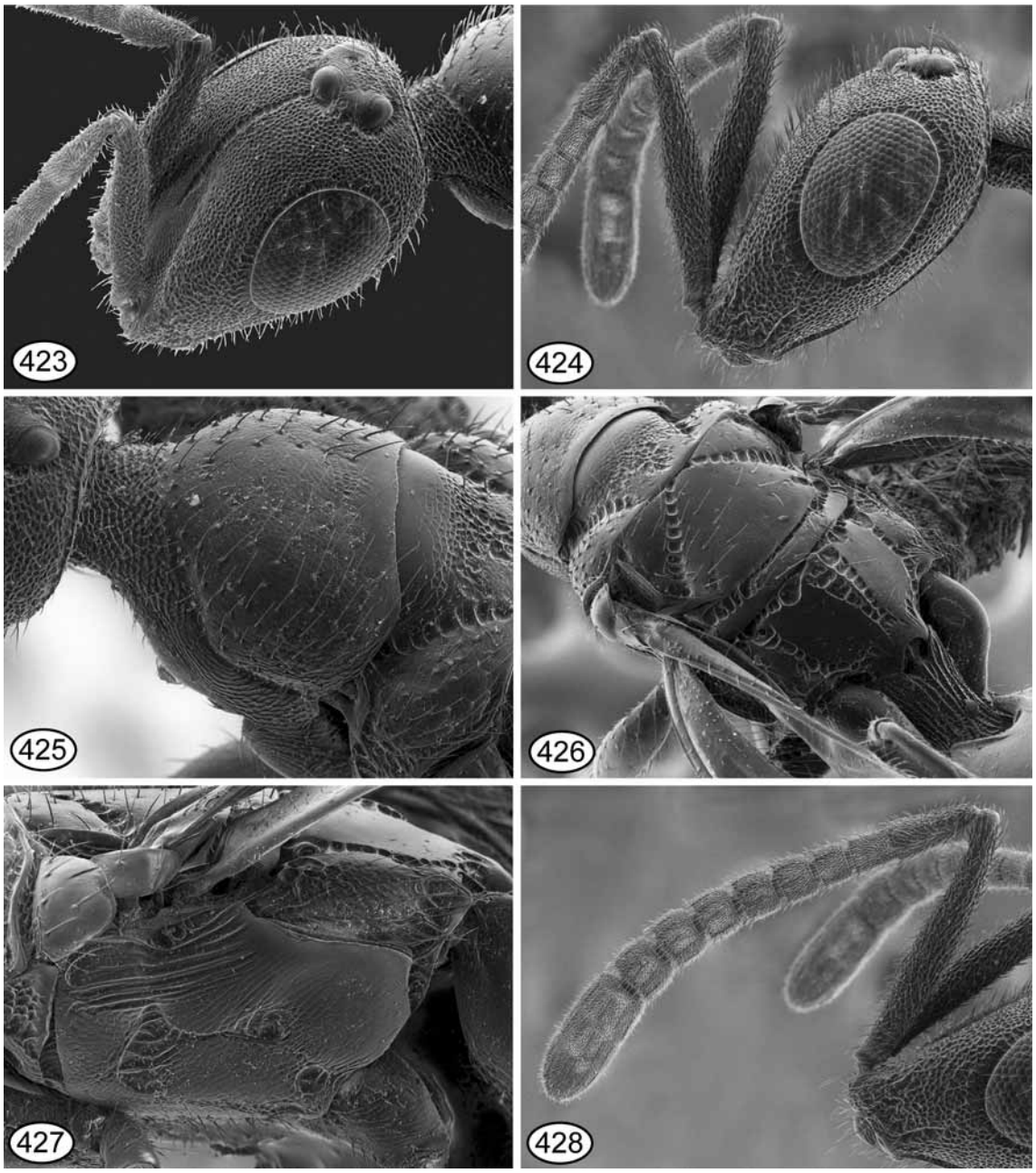
(Figs 345, 423–428)

Type material. HOLOTYPE (♀, CNC no. 23893). "MEXICO: Quintana Roo, 3 km S. Puerto Morelos, jardin botanica, 14.XII.1993, L. Masner /CNCI, LB-specm 2007-028". Condition: point-mounted, entire.

PARATYPE (1♀). **MEXICO**: Tamazunchale, S.L.P. [San Luis Potosi], 23.XI.46, F. E. Skinner (EMEC).

Etymology. A combination of the Greek words *stiktos*, meaning "punctured", and *kephale*, meaning "head", in reference to the completely micropunctate-reticulate head of this species.

Description. *Female*. Length = 1.6–2.2 mm. Legs dark with knees slightly lighter in color and at least basal tarsal segment yellow, the subsequent 2 or 3 segments yellowish or increasingly dark. Head in anterior view about 1.2x as high as wide; in dorsal view about 1.7x as wide as long; in lateral view (Fig. 424) with malar space about 0.9–1.0x eye height and about 1.3–1.5x eye width. Head capsule (Figs 423, 424) dull and uniformly micropunctate-reticulate except as follows: with complete though variably distinct median sulcus extending ventrally to elongate-triangular scrobal depression; interantennal region except for inclined lateral surface strongly coriaceous-granular and bare, but not distinctly smoother or shinier than rest of face; gena with malar sulcus (Fig. 424). Antenna (Fig. 428) with scape about 6.4–6.6x as long as wide, the inner and outer surfaces uniformly setose and reticulate-rugulose; pedicel about 1.6–2.4x as long as apical width and about 1.4–2.9x as long as fu_1; funicle with fu_1 sometimes up to about 1.3x as long as wide but at least very slightly longer than wide and subsequent segments subquadrate to distinctly transverse; clava about 1.7–2.2x as long as wide.



Figs 423–428. *Spalangia stictocephala* Gibson ♀. **423 & 424**, head: **423**, frontolateral view, **424**, lateral view; **425**, pronotum and mesoscutum, dorsolateral view; **426**, pronotum–petiole, posterodorsal view; **427**, mesopleuron; **428**, antenna.

Pronotal collar in lateral view only very low convex behind neck, without distinct circumpronotal band anterolaterally and anteriorly smoothly rounded to neck; smooth and shiny near posterior margin but otherwise very finely mesh-like coriaceous and uniformly setose over sculptured area except mediolongitudinally (Fig. 425). Mesoscutal median lobe (Figs 425, 426) with anterior convex region smooth and shiny anteriorly and finely coriaceous posteriorly; internotaular region also coriaceous laterally but more distinctly punctate-rugulose medially. Axillae (Fig. 426) smooth and shiny or only extremely obscurely coriaceous and with a few pinprick-like setiferous punctures. Scutellum (Fig. 426) uniformly but very finely mesh-like coriaceous and with scattered pinprick-like setiferous punctures paramedially; frenum (Fig. 426) differentiated only by oblique lateral puncture and similarly coriaceous as scutellum. Mesopleuron (Fig. 427) completely sculptured as follows: pectal region coriaceous and bare except for 1 posteroventral seta; acropleuron longitudinally carinate, the carinae extending posteriorly onto alar shelf; subalar scrobe a vertical, crenulate-rugose furrow;

episternal scrobe a shallow depression connected to subalar scrobe by distinct but linear sulcus and to shallow precoxal scrobe by more obscure sulcus; upper and lower mesepimeron variably finely and distinctly obliquely alutaceous or sometimes more mesh-like coriaceous on lower mesepimeron; upper and lower mesepisternum differentiated only by ventral line of setae rather than distinct transepisternal line, the upper mesepisternum variably mesh-like coriaceous to obliquely alutaceous. Fore wing hyaline; mediocubital fold with 3 or 4 setae and basal cell/fold distally with 1 or 2 setae. Propodeum (Fig. 426) with distinct postspiracular sulcus; callus reticulate-rugulose anteriorly but smoother, coriaceous to shiny posteriorly anterior to metacoxal flange; plical region with only slightly widened paramedian crenulate furrows delimiting median carina, and either with anterior-most cells not differentiated in size from more posterior cells (Fig. 426) or with irregular sculpture anteriorly; supracoxal band separated from paramedian crenulate furrows by distinct smooth band at nucha; propodeal panels smooth and shiny.

Petiole (Fig. 426) at most 2x as long as medial width (exact measurements not possible); microreticulate between longitudinal carinae; with or without 1 short seta anterolaterally. Gaster with Gt_1 smooth and shiny, Gt_2 smooth or with only extremely obscure coriaceous sculpture, and Gt_3 very finely coriaceous.

Male. Unknown.

Distribution. Mexico (Fig. 345).

Biology. Unknown, but based on presumed relationships with *S. attae* very likely a parasitoid of Diptera associated with ant nests.

Recognition. I include *S. stictocephala* as one of four species in the *attae* species group as discussed under *S. attae*.

29. *Spalangia stictocyla* n. sp.

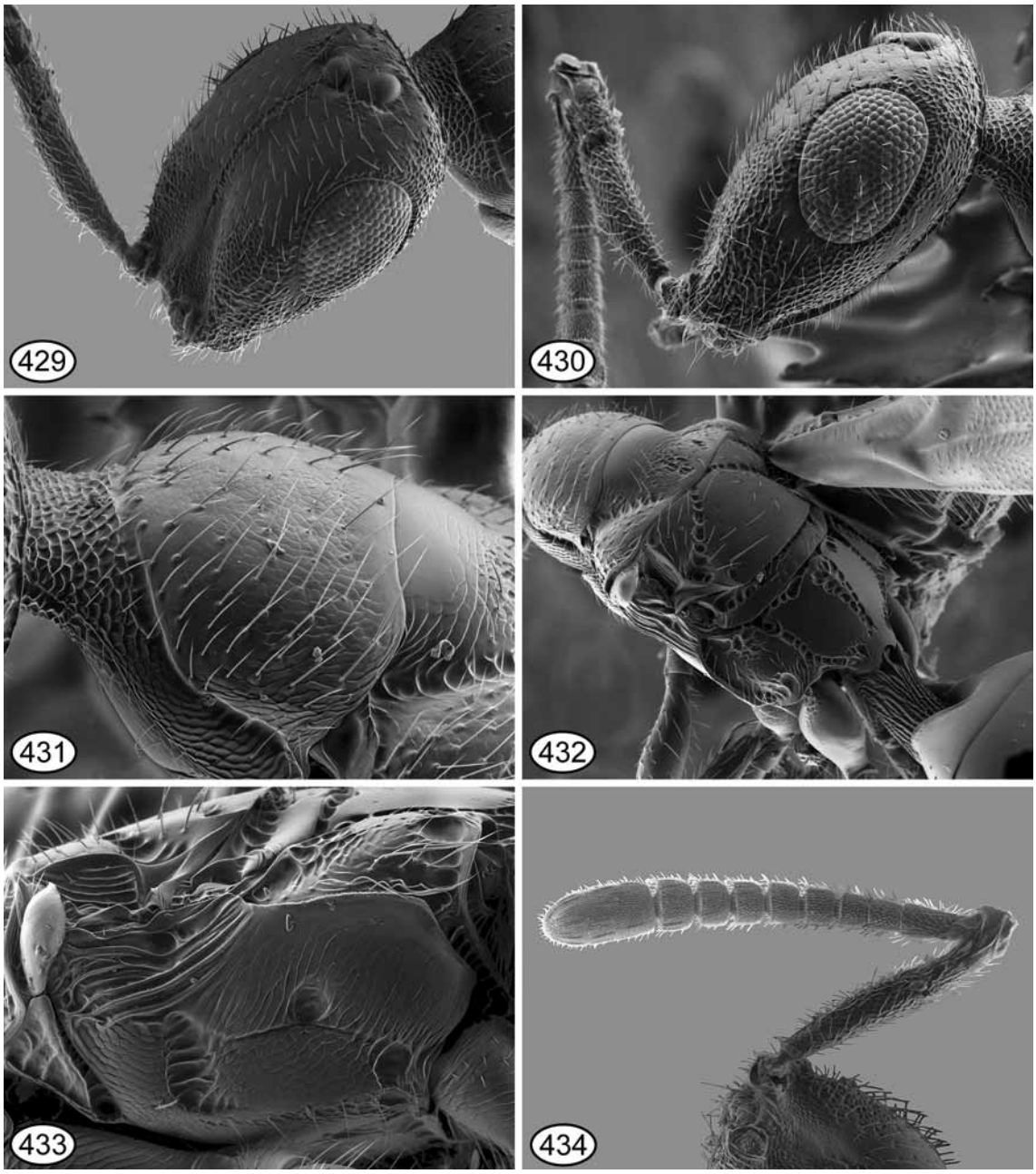
(Figs 345, 429–434)

Type material. HOLOTYPE (♀, MZCR). "COSTA RICA: Heredia Pr., La Selva Biol. Sta., 3 km. S Pto. Viejo, 10º26'N 84º01'W / 14.VI.1991, H. A. Hespenheide". Condition: point-mounted, entire.

PARATYPE (1♀). Same data as holotype except CNC.

Etymology. A combination of the Greek words *stiktos*, meaning "punctured" and *kylon*, meaning "part of the face under the eyes", in reference to the micropunctate-reticulate lower face of the species.

Description. *Female*. Length = 1.4–1.7 mm. Legs dark with knees slightly lighter in color and basal 3 or 4 tarsal segments more distinctly yellow. Head in anterior view about 1.2–1.3x as high as wide; in dorsal view about 1.6x as wide as long; in lateral view (Fig. 430) with malar space about 1.0–1.1x eye height and about 1.4–1.6x eye width. Head capsule (Figs 429, 430) partly coriaceous to micropunctate-reticulate as follows: with complete, distinct median sulcus extending ventrally to elongate-triangular scrobal depression; upper face and vertex finely mesh-like coriaceous with scattered pinprick-like setiferous punctures except sometimes with small micropunctate-reticulate region between anterior and posterior ocellus (Fig. 429); parascrobal region micropunctate-reticulate and setose similar to upper face except without distinct pinprick-like punctures; scrobal depression, including interantennal region and lateral inclined surface similarly coriaceous-granular, with scrobes and interantennal region bare; gena with variably distinct, linear malar sulcus, otherwise gena and temple dorsally to posterior margin of head behind eye micropunctate-reticulate except for smoother, coriaceous region behind outer orbit medially (Fig. 430). Antenna (Fig. 434) with scape about 6.9x as long as wide, the inner (Fig. 434) and outer surfaces uniformly setose and reticulate-rugulose; pedicel about 2.7x as long as apical width and about 2.3–3.2x as long as fu_1; funicle with fu_1 at least very slightly and sometimes up to about 1.2x as long as wide, with subsequent segments subquadrate to slightly transverse basally and more distinctly transverse apically; clava about 1.9–2.0x as long as wide.



Figs 429–434. *Spalangia stictocyla* Gibson ♀. **429 & 430**, head: **429**, frontolateral view, **430**, lateral view; **431**, pronotum and mesoscutum, dorsolateral view; **432**, pronotum–petiole, posterodorsal view; **433**, mesopleuron; **434**, antenna.

Pronotal collar in lateral view only very low convex behind neck, without distinct circumpronotal band anterolaterally and anteriorly smoothly rounded to neck; smooth and shiny near posterior margin but otherwise finely mesh-like coriaceous and uniformly setose over sculptured area except mediolongitudinally (Fig. 431). Mesoscutal median lobe (Figs 431, 432) with anterior convex region smooth and shiny anteriorly and finely coriaceous posteriorly; internotaular region also coriaceous laterally but more distinctly punctate-rugulose medially. Axillae (Fig. 432) smooth and shiny except for a few pinprick-like setiferous punctures. Scutellum (Fig. 432) finely mesh-like coriaceous to almost completely smooth and shiny with only slight indication of sculpture, but with scattered pinprick-like setiferous punctures paramedially; frenum (Fig. 432) differentiated by only 1 or 2 shallow punctures laterally and partly coriaceous similar to scutellum. Mesopleuron (Fig. 433) completely sculptured as follows: pectal region coriaceous and bare except for 1 posteroventral seta; acropleuron longitudinally carinate, the carinae extending posteriorly onto alar shelf; subalar scrobe a vertical,

longitudinally crenulate furrow; episternal scrobe a shallow depression connected to subalar scrobe by a distinct linear sulcus and to shallow precoxal scrobe by more obscure sulcus; upper and lower mesepimeron variably finely, obliquely alutaceous or sometimes more mesh-like coriaceous on lower mesepimeron; upper and lower mesepisternum differentiated only by line of ventral setae rather than distinct transepisternal line, the upper mesepisternum mesh-like coriaceous or slightly, obliquely alutaceous. Fore wing hyaline; mediocubital fold with 1–4 setae and basal cell/fold with 2–4 setae distally. Propodeum (Fig. 432) with distinct postspiracular sulcus; callus reticulate-rugulose anteriorly and smooth and shiny posteriorly; plical region with only slightly widened paramedian crenulate furrows delimiting median carina, and either with anterior-most cells not differentiated in size from more posterior cells or with irregular sculpture anteriorly (Fig. 432); supracoxal band separated from paramedian crenulate furrows by distinct smooth band at nucha; propodeal panels smooth and shiny.

Petiole (Fig. 432) about 1.8–1.9x as long as propodeum; microreticulate between longitudinal carinae; with or without 1 short seta anterolaterally. Gaster with Gt_1 smooth and shiny and Gt_2 and Gt_3 very finely coriaceous.

Male. Unknown.

Distribution. Costa Rica (Fig. 345).

Biology. Unknown, but based on presumed relationships with *S. attae* very likely a parasitoid of Diptera associated with ant nests.

Recognition. I include *S. stictocyla* as one of four species in the *attae* species group as discussed under *S. attae*. Because the upper face of *S. stictocyla* is quite smooth (Fig. 429), females are somewhat similar to *S. fallax*, which was described by Masi (1917) from Mahé, Seychelles. As illustrated by Masi (1917, fig. 2), *S. fallax* also has the lower face micropunctate-reticulate lateral to a distinctly sculptured scrobal depression. However, all *attae*-group species have a median propodeal carina (Figs 43, 405, 426, 432), whereas examination of a syntype (BMNH) of *S. fallax* shows that females have a distinct, flat, shiny median propodeal band in about the anterior third similar to most *drosophilae*-group species.

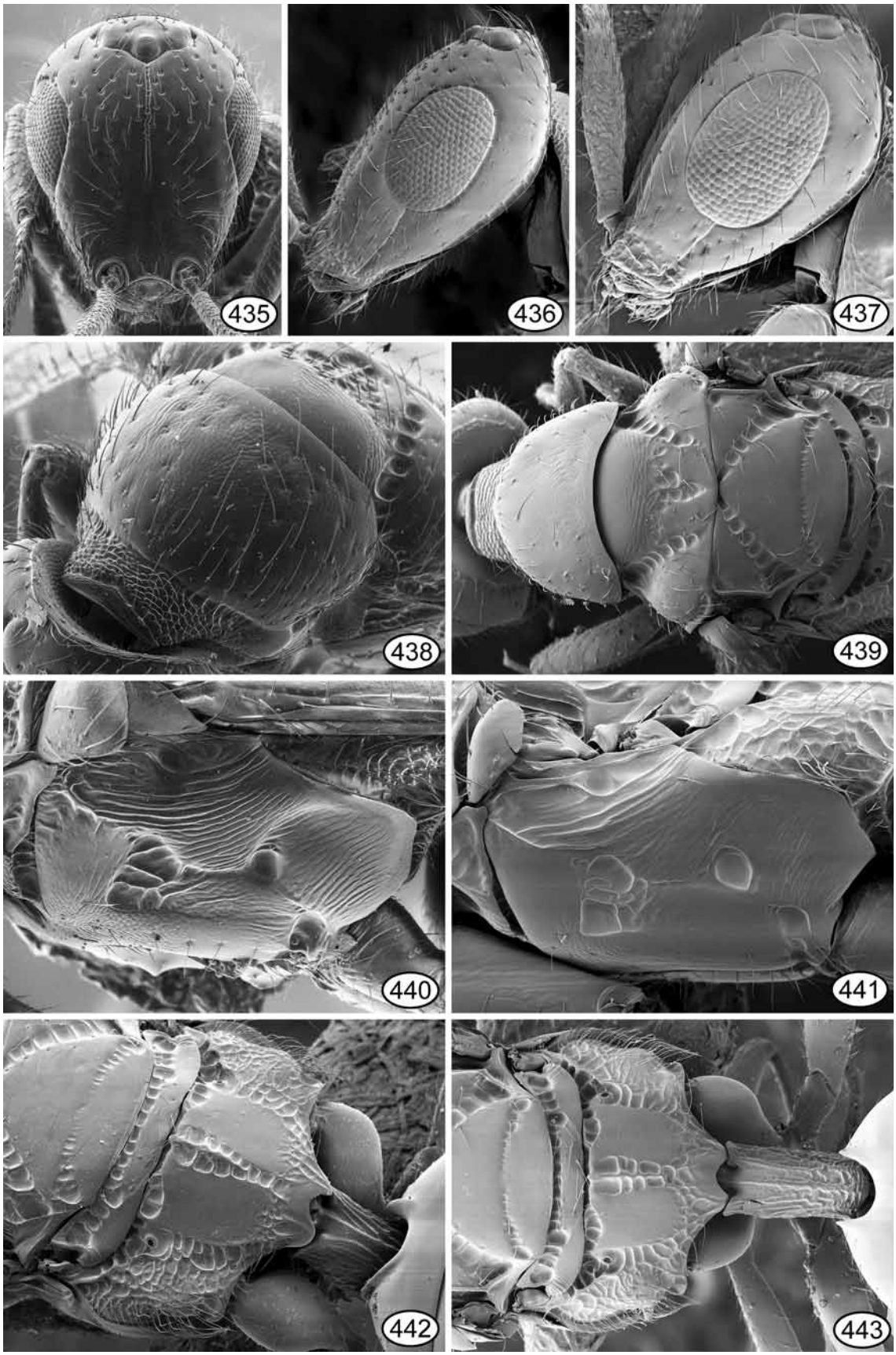
30. *Spalangia subpunctata* Förster, 1850

(Figs 193, 194, 435–450)

Spalangia subpunctata Förster, 1850: 516–518; lectotype ♀ (NHMW, not examined) designated by Bouček (1963: 473). Type data: [Germany], near Aachen [lectotype: ♀ Or. Ex., Germania, Collect. G. Mayr].

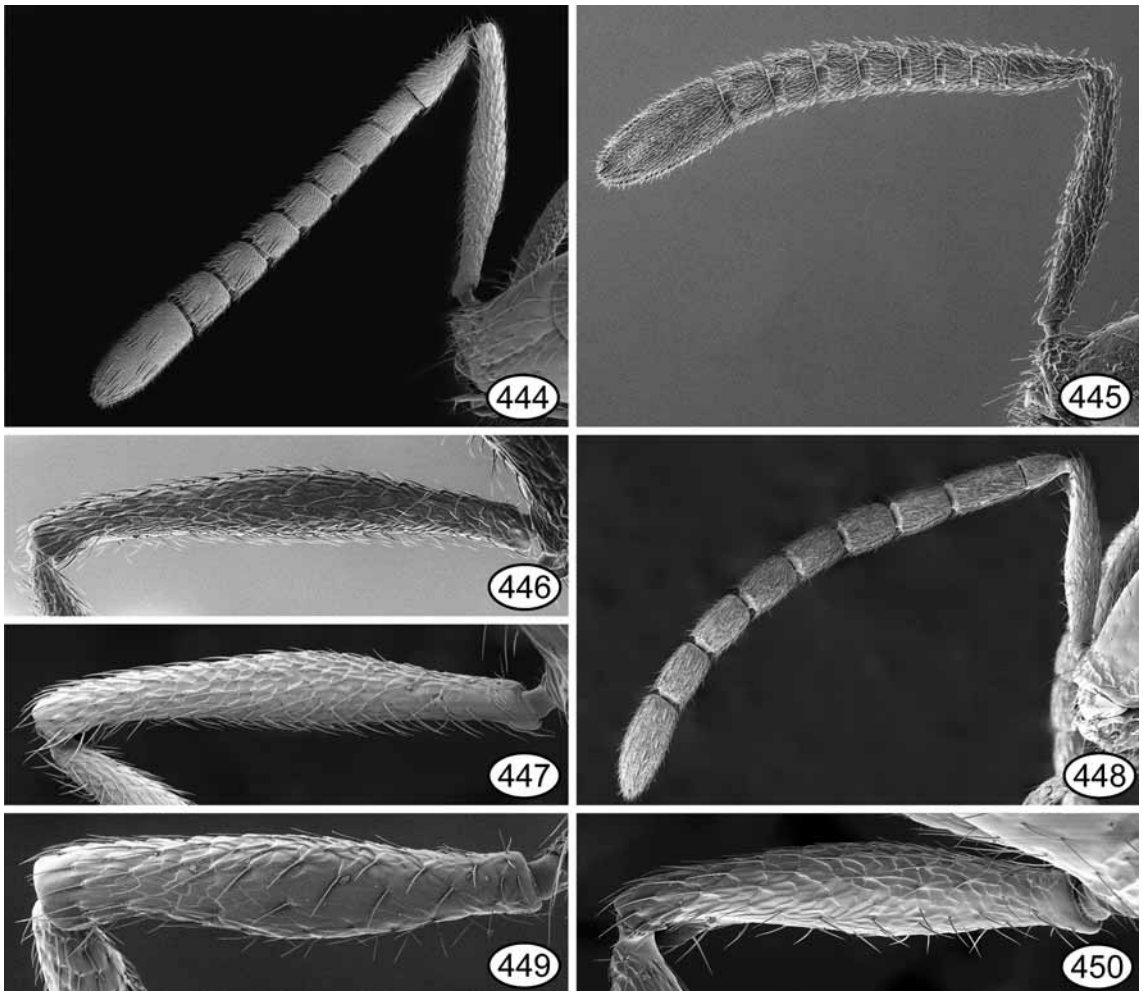
Spalangia leptogramma Förster, 1850: 511–512; lectotype ♀ (NHMW, not examined) designated by Bouček (1963: 473). Type data: [Germany], Cologne, bank of Rhine [lectotype: ♀. Or. Ex. Coeln, Collect. G. Mayr]. Synonymy by Bouček (1963: 473).

Description. *Female*. Length = 1.2–3.0 mm. Legs dark with tarsi uniformly brownish-yellow to black. Head in anterior view (Fig. 435) about 1.1–1.3x as high as wide; in dorsal view about 1.7–1.8x as wide as long; in lateral view (Fig. 436) with malar space about 0.8–1.0x as long as eye height and about 1.2–1.4x eye width. Head capsule (Figs 435–437) smooth and shiny except for setiferous punctures as follows: with complete median sulcus extending ventrally to elongate-triangular scrobal depression, otherwise upper face and parascrobal region with widely spaced, small but distinct punctures, and with setae extending over smooth inclined surface of scrobal depression and often originating from tiny bumps ventrally toward torulus; scrobal depression with finely coriaceous to coriaceous-granular scrobes on either side of more finely coriaceous to smooth and shiny interantennal region; gena (Fig. 436) rugulose-roughened near oral margin and with linear malar sulcus, but otherwise smooth except for setae originating from very shallow, pinprick-like depressions or tiny bumps; temple mostly smooth, with only a few pinprick-like setiferous punctures. Antenna (Fig. 444)



Figs 435–443. *Spalangia subpunctata* Förster. **435–437**, head: **435**, anterior view ♀, **436**, lateral view ♀, **437**, lateral view ♂; **438**, ♀ pronotum and mesoscutum, frontodorsal view; **439**, ♂ thorax, dorsal view; **440 & 441**, mesopleuron: **440**, ♀, **441**, ♂; **442 & 443**, frenum–petiole, dorsal view: **442**, ♀, **443**, ♂.

with scape about 6.7–8.1x as long as wide, the outer surface (Fig. 447) punctate-rugulose to rugulose-roughened and inner surface (Fig. 446) usually more finely sculptured, more or less coriaceous-alutaceous; pedicel about 2.1–2.9x as long as apical width and about 1.7–3.0x as long as fu_1; funicle of smaller specimens sometimes with fu_1 slightly wider than long (up to about 1.2x) and all subsequent segments, including fu_2, transverse (up to about 1.4x as wide as long), but usually with fu_1 oblong, about 1.1–1.7x as long as wide, and subsequent segments quadrate to distinctly oblong basally and quadrate to transverse apically, with fu_7 about 0.7–1.0x as wide as long; clava about 2.0–2.8x as long as wide.



Figs 444–450. *Spalangia subpunctata* Förster. **444 & 445**, ♀ antenna; **446 & 447**, ♀ scape: **446**, inner view, **447**, outer view; **448**, ♂ antenna; **449 & 450**, ♂ scape: **449**: inner view, **450**, outer view.

Pronotal collar in lateral view only very low convex behind neck and with circumpronotal band anterolaterally, but smoothly rounded to neck; without cross-line posteriorly and with setae at most originating from tiny bumps or very shallow, pinprick-like punctures, but uniformly coriaceous, including within mediolongitudinal bare region (Fig. 438). Mesoscutal median lobe (Fig. 439) with anterior convex region smooth and shiny anteriorly and finely coriaceous to transversely alutaceous posteriorly; internotaular region smooth and shiny to distinctly coriaceous lateral to median punctate-rugose region extending virtually to transscutal articulation, the sculptured region usually divided by irregular median carina. Axillae (Fig. 439) smooth and shiny except for setae. Scutellum (Figs 439, 442) low convex, shiny and variably extensively but sparsely setose with setae originating from at most pinprick-like setiferous punctures; frenum with frenal line rarely consisting of only 1 or 2 similar punctures laterally, but usually of several progressively smaller and shallower punctures forming an almost straight or slightly curved, tapered, variably complete punctate-crenulate line (Figs

439, 442). Mesopleuron (Figs 440, 441) mostly with distinct sculpture as follows: pectal region smooth, shiny and bare except for 1 seta ventrally; acropleuron longitudinally striate-carinate, the ridges extending posteriorly onto alar shelf; subalar scrobe not distinctly differentiated from upper mesepisternum, the combined region strigose-rugose or strigose-reticulate anteriorly but more extensively mesh-like coriaceous to very finely, obliquely alutaceous posteriorly; episternal scrobe quite a distinct depression connected to subalar scrobe by a shallow, linear furrow; upper and lower mesepimeron shiny but upper mesepimeron finely, obliquely alutaceous to similarly longitudinally carinate as acropleuron, and lower mesepimeron obliquely alutaceous anteriorly to coriaceous or coriaceous-granular posteroventrally; upper and lower mesepisternum differentiated primarily by a partial or complete line of ventral setae, though sometimes with carinate transepisternal line over at most anterior half below strongly strigose portion and/or with fine sulcus ventral to setal line. Fore wing hyaline or sometimes slightly embrowned; mediocubital fold almost always with 1–7 setae though rarely bare and basal cell sometimes also with several setae distally, but setae extending at most to level of most distal setae on mediocubital fold (Fig. 193). Propodeum (Figs 442, 443) with distinct postspiracular sulcus; callus completely reticulate-rugose to transversely strigose-rugose posteriorly or smooth medially; plical region with narrowly V-shaped paramedian crenulate furrows delineating median carina, the carina in lateral view usually distinctly convex except is small specimens; supracoxal bands continuous with paramedian crenulate furrow; panels smooth and shiny.

Petiole (Fig. 442) about 1.3–2.0x as long as medial width; punctate-reticulate between longitudinal carinae; with or without 1 seta laterally. Gaster shiny with fine coriaceous sculpture on at least Gt_2 and Gt_3.

Male. Length = 1.2–2.3 mm. Antenna (Fig. 448) with scape about 5.6–7.2x as long as wide, the inner (Fig. 449) and outer (Fig. 450) surfaces often more finely sculptured than for female; pedicel about 1.4–1.8x as long as wide; flagellum with setae much shorter than width of respective segment; funicle with fu_1 about 1.3–2.2x as long as wide and about 1.0–1.8x as long as pedicel, and basal funicular segments sometimes quadrate in smaller specimens but usually all variably distinctly longer than wide, with fu_7 about 1.1–1.4x as long as wide. Otherwise similar to female except as follows. Head in anterior view about 1.0–1.1x as high as wide; in lateral view (Fig. 437) with malar space about 0.7–0.8x eye height and about1.0–1.1x eye width. Fore wing with 4–11 setae on mediocubital fold and sometimes with line of setae in basal cell extending beyond level of most distal seta on mediocubital fold, but not in two distinct lines (Fig. 194). Petiole (Fig. 443) about 1.8–2.2x as long as medial width.

Material examined. *Nearctic* (579 specimens). **CANADA**: ***Alberta***, Aden, Gilchrist Ranch, 28.VI.56, O. Peck (1♀). Coleman, 7, 26.VII.61, K.R. Depner (135 specimens). Lethbridge — 1961, K.R. Depner (6♀, 8♂); 1997, K. Floate, *Physiphora demandata* (Fab.) (30♀, 5♂); Research Centre, 13-25.V.97 (3♀, 3♂), 27.V. 97 (1♀), late May-early June, ex cow pats in pasture (2♀), K. Floate. Magrath, 16 km. S, McIntyre Ranch, 24-31.V.90 (1♂), 26.VIII-9.IX.90 (2♀), D. Griffith. Medicine Hat, 20.VI.61, K.R. Depner, *Haematobiae irritans* (3♀, 4♂). Menaik — 26.VII.61 (2♀, 1♂), 15.VIII.61 (2♀), K.R. Depner, *Haematobiae irritans*; 24.VII.61, 10, 15, 22.VIII.61, K.R. Depner (176 specimens). Midnapore, 22.VIII.61, K.R. Depner (7♀, 3♂). Rocky Mountain House, 10, 28.VIII.61, K.R. Depner (109 specimens). Stavely, 28.IX.60, K.R. Depner, *Haematobiae irritans* (5♀, 6♂). Schuld's Farm, 10.VI.87, K. Floate (1♀). Tod Cr., 6.IX.60, K.R. Depner (1♂). Writing-on-Stone Prov. Pk., 6-12.VI.94, D.B. McCorquodale (1♂). ***New Brunswick***, St. Léonard-Parent, Beaupré farm, 3.VII.03, T. Levesque (1♀). ***Ontario***, Alfred, coll. 12.VI.02 manure pit, em. 6.VIII.02, Gibson & Lachance (2♀). Almonte, 5 km. NW, 27.V-3.VI.86, H. Goulet (1♀). Carter Bay, 45º37'N 82º10'W, 180 m., 22-23.VII.97, H. Goulet (2♀ UCDC). Ottawa, Prince of Wales Dr., McEwen farm, 13.IX.01 (dissected 13.XI.01), *Stomoxys calcitrans*, G. Gibson & L. Bartels (1♀). Styles Side Rd NW West Carleton, Clarence farm, 45º26.622'N 76º10.296'W, G. Gibson & L. Bartels — 4.IX.01 (1♀), 9.X.01 (4♀), 16.X.01 (1♂), *Stomoxys calcitrans*; 16.X.01, ? *Physiphora demandata* (1♀); 9.X.01 16.VIII.01 (dissected 15.X.01), ? *Physiphora demandata* (1♀), (dissected 7.II.02), *Stomoxys calcitrans* (1♀). St-Anne de Prescott, Clermont farm, 4.XI.02 (1♀), 2.VII.03 (1♀), Gibson & Lachance. ***Prince Edward Island***, Harrington, 20.VI-10.VIII.89 (1♀),

24.VII.89 (1♀), 31.VII-8.VIII.89 (1♂), M.E. Smith. PEI Nat. Park, Stanhope Cmpgd, 13.VIII.91, D.S. Chandler (1♀ DENH). ***Quebec***, Gatineau Pk., 2 km. W Chemin Pilon, 7.VII.92, J. Heraty (1♂ UCRC). Quyon, Mackechnie farm, 45º31.89'N, 76º17.26'W, coll. 16.VIII.01, dissected pupa 15.X.01, ? *Physiphora demandata* (Fab.), G. Gibson & L. Bartels (1♀). **USA**: ***California***, Inyo Co., 6 km. E Big Pine, 37º10'N 118º13'W, 24.V.94, S.L. Heydon (1♀ UCDC). Marin Co., 1 mi. SW Pt. Reyes Station, 29.VI.69, J.B. Heppner (1♀ FSCA). Modoc Co., Likely Mill, 1972 (1♀ USNM). San Benito Co., Conconi Ranch, 1 mi. NW Dunneville, 27.V.57, R.F. Smith & K.S. Hagen (1♀ EMEC). Santa Clara Co., Olivera Egg Ranch, 14.III.73, D. Whitman (1♀ EMEC). Siskiyou Co., Gazelle, 24.VI.58, J. Powell (1♀ EMEC). Solano Co., 8 km. W Winters along Putah Creek, 30.III.91 (1♀, 3♂ UCDC), 3.IV.91 (1♀ UCDC), S.L. Heydon. Sonoma Co., Zupon Ranch, 8.VIII.63, *Ophyra* sp. (1♀ USNM). Stanislaus Co. — Miniear Day Use Area, 23 km. W Patterson, 5.IV.96, L.A. Baptiste (1♂ UCDC); Patterson, 1.IV.54, K.S. Hagen (1♀ EMEC); 5 mi. N Turlock Lake, NW LaGrange, Stanislaus PG&E power plant, 9, 10, 16.III.76, J. Collins (6♂ EMEC). Tuolumne Co., 3 mi. E Chinese camp, 20.V.52, E.I Schlinger (1♀ UCDC). Yolo Co. — Fazio Wildlife Area, 3 km. E Davis, 11.VI.99, S.L. Heydon (1♂ UCDC); Rumsey, 2.VI.29, N.J. Smith (1♂ UCDC), 19.V.79, S.A. Begin (1♂ UCDC). ***Oregon***, Alkali Lk, 21.VII.94, S.L. Heydon (2♀ UCDC).

Distribution. *Spalangia subpunctata* likely is transcontinental in Canada but apparently is limited to west of the Rocky mountains over most of the USA (Fig. 451). In addition to the Nearctic region, *S. subpunctata* is also known from the Palaearctic region, including Europe, Asia as far east as Uzbekistan, and North Africa (Noyes 2003).

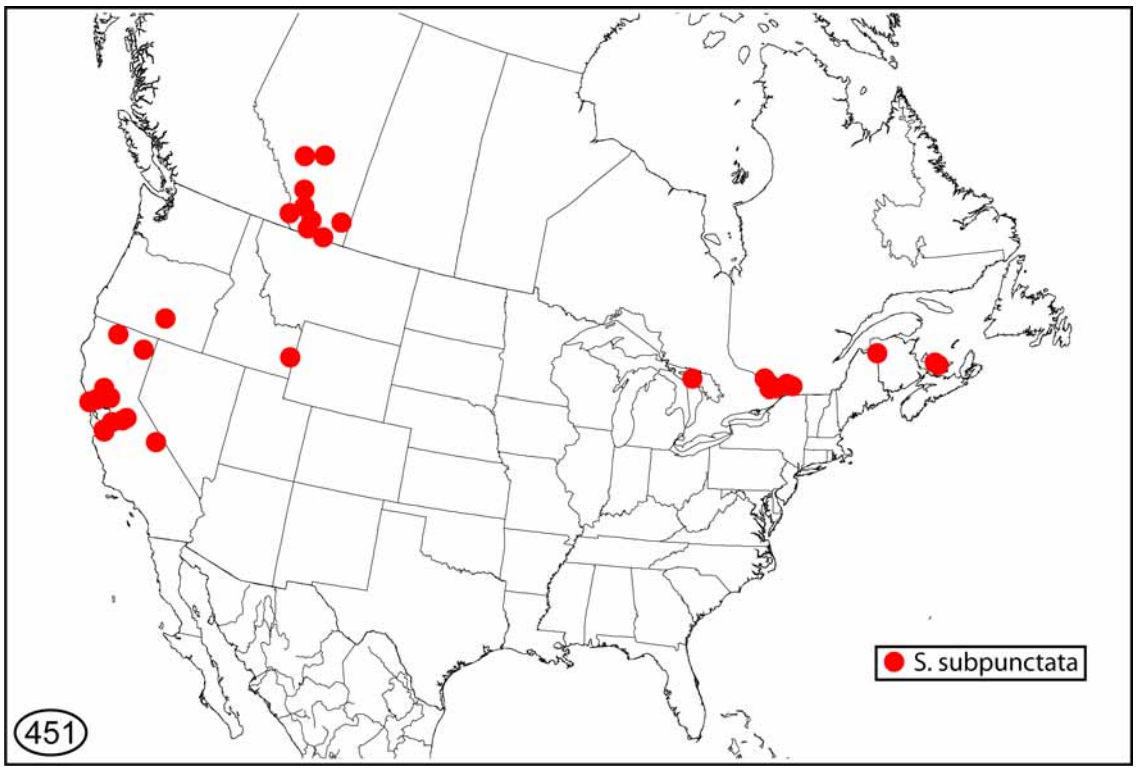


Fig. 451. Distribution of *Spalangia subpunctata* Förster.

Biology. Noyes (2003) lists only six host species in Anthomyiidae, Calliphoridae, Muscidae, Otitidae, Sarcophagidae, and Syrphidae. Regional hosts include the previously reported species *Physiphora demandata* (Fabricius), plus *H. irritans*, *S. calcitrans* and *Hydrotaea* (= *Ophyra*) sp. Interestingly, *S. subpunctata* has been reared from the stable fly and horn fly in the Nearctic region, but not from the house fly, the only muscid host listed for the species in the Palaearctic region by Noyes (2003).

Recognition. I include *S. subpunctata* along with *S. erythromera*, *S. fuscipes*, *S. haematobiae* and *S. imitator* in the *subpunctata* species group. The five species of this group have a comparatively smooth pronotum, sometimes being quite distinctly coriaceous but at least lacking punctures or a cross-line posteriorly, and always having a median carina on the propodeum. Morphological limits of the species of this group are the least well resolved and correct identification to species for some specimens is problematic. Furthermore, individuals of *drosophilae*-group species with only a very slender, more or less carinate-like median propodeal band can be mistaken for *subpunctata*-group species, though most *drosophilae*-group species have a less shiny, more strongly sculptured mesopleuron. In addition to the supplemental features given in couplet 43 to help distinguish such *drosophilae*-group specimens, *drosophilae*-group species lack a petiolar seta whereas *subpunctata*-group species, particularly those with a widely separated frenal line, often have a petiolar seta. Species assigned to the *subpunctata*-group also have quite a distinct, smooth inclined lateral portion of the scrobal depression (Figs 147–149, 183, 209, 222, 435), whereas those *drosophilae*-group species that sometimes have a more carinate-like median propodeal band typically have the sculpture of the scrobes extending over the inclined surface of the depression so as to partly obscure the sculpture of the parascrobal region near the torulus (Figs 114, 174, 176, 387, 389). Finally, other than *S. fuscipes* (Fig. 188), even small *subpunctata*-group specimens have the petiole quite distinctly longitudinally carinate (Figs 157–159, 214, 215, 227, 228), whereas *drosophilae*-group species have the petiole more or less uniformly punctate-reticulate over at least its posterior half (Figs 56, 57, 120, 394).

Structure of the scutellar frenal line forms a continuum within the *subpunctata*-group. *Spalangia erythromera* always has a complete, uniformly developed frenal line formed by a short, almost longitudinal lateral portion that is abruptly recurved from a transverse part across the scutellum. The frenal line therefore has a very strongly transverse ∩-like appearance (Figs 153, 157). Both *S. haematobiae* (Fig. 211) and *S. imitator* (Fig. 224) always have a broadly separated frenal line, composed of only 1–3 punctures laterally, and therefore both species are readily distinguished from *S. erythromera*. However, the frenal line of *S. subpunctata* is variably complete. When more or less complete the frenal line resembles that of *S. erythromera*, but the punctures forming the line are widest laterally and narrowed toward the median so that the line is tapered and often quite obviously shallower or effaced medially (Figs 439, 442). Much less commonly, the frenal line is composed of just a few widely separated punctures in *S. subpunctata* and then is more similar to *S. haematobiae*, *S. imitator* and *S. fuscipes*. Of the five species assigned to the *subpunctata* group, *S. erythromera* usually is quite readily identified by structure of its frenal line in combination with basally yellow tarsi (see further under *S. erythromera*). Individuals of *S. imitator*, particularly males, are also relatively easy to identify because of a unique sculpture pattern (see under *S. imitator*), but morphological limits of *S. haematobiae*, *S. subpunctata* and *S. fuscipes* are not well resolved. Bouček (1963: 473, 476) was uncertain whether *S. haematobiae* was a valid species or only a North American form of *S. subpunctata* and further stated that variation in *S. subpunctata* is "very wide" (p. 475) and "in a few smaller specimens it is difficult to draw a firm line" (p. 476) between *S. subpunctata* and *S. fuscipes*. I include in *S. haematobiae* females that have a bare mediocubital fold and a pronotum that is almost or completely smooth and shiny mediolongitudinally within the bare region. Females I assign to *S. subpunctata* have the pronotum more uniformly coriaceous, including medially (Fig. 438), and except for the single female from Gazelle, California, at least 1 seta on the mediocubital fold. I include this female in *S. subpunctata* because it has a frenal line consisting of 4 distinct punctures extending over the lateral third of its scutellum and the upper mesepisternum mostly finely coriaceous except for the subalar scrobe. Specimens I assign to *S. haematobiae* do not have such an extensive frenal line. Furthermore, even though most individuals of *S. haematobiae* are smaller than most *S. subpunctata*, the upper mesepisternum is slightly more coarsely sculptured, being more obliquely alutaceous-strigose or reticulate-strigose (Figs 212, 213) rather than mostly coriaceous-alutaceous as in *S. subpunctata* (Figs 440, 441). I am even less certain of reliable features to differentiate S. *subpunctata* from *S. fuscipes* because I have seen very few specimens of either species from Europe (see under *S. fuscipes*).

31. *Spalangia xanthoscapa* n. sp.
(Figs 377, 385, 386)

Type material. HOLOTYPE (♀, UCRC). "USA: TX: Bandera Co., Lost Maples State Park, lower trail; 16.IV.1989, J. M. Heraty, collector / Univ. Cal. Riverside, Ent. Res. Museum, UCRC ENT 146423 / CNCI, LB-specm 2009-009". Condition: card mounted, entire but left wings and left antenna beyond fu_2 detached from specimen on card.

Etymology. A combination of the Greek words *xanthos*, meaning "yellow", and *skapos*, meaning "stem", in reference to the yellow base of the antennae, including the scape and pedicel, which distinguishes this species from *S. noyesi* and all other *Spalangia*.

Description. *Female*. Length = 1.2 mm. Antenna with radicle, scape and pedicel bright yellow, flagellum dark; body brown except legs yellowish-brown with apex of metatibia and basal 4 tarsal segments yellow. Head in anterior view about 1.3x as high as wide, elongate-rectangular with subparallel sides and small eyes occupying about middle third; in dorsal view about 2.5x as wide as long; in lateral view (*cf*. Fig. 379) about 3.1x as high as long and malar space about 1.7x eye width, with malar space, eye and temple above eye all about equal in height; in posterior view without occipital carina (*cf*. Fig. 375). Head capsule (Fig. 377) smooth and shiny as follows: with only extremely obscure indication of median line over about middle third between level of upper and lower orbits, and almost bare, with line of very sparse, short and inconspicuous setae laterally near inner orbit and paramedially, the setae originating from only minute pores; scrobal depression obscure, delineated by convergent, coriaceous, and slightly depressed scrobes on either side of smooth interantennal region on same plane as upper face; parascrobal region smooth but with sparse setae similar to upper face; gena mostly smooth but with partial malar sulcus near eye and with sparse setiferous punctures; temple smooth and similarly setose as gena. Antenna (Fig. 385) with scape about 3.8x as long as wide, the inner and outer surfaces finely alutaceous but shiny; pedicel about 1.3x as long as apical width and about 3x as long as fu_1; funicle with all segments strongly transverse, fu_1 about 2x as wide as long and about 1.5x as long as fu_2, fu_2 the most strongly transverse and ring-like segment, about 3x as wide as long (Fig. 385, insert), and subsequent segments increasingly wider and longer, with fu_7 about 1.9x as wide as long; clava about 1.7x as long as wide.

Pronotum in lateral view (*cf*. Fig. 379) uniformly low convex without evident circumpronotal furrow differentiating collar from neck or lateral panel; in dorsal view (*cf*. Fig. 378) ∩-shaped without narrower neck, the neck differentiated only as finely coriaceous and inconspicuously setose transverse region occupying about anterior third, with posterior two-thirds smooth and shiny or at most obscurely coriaceous, and only very sparsely setose laterally and posteriorly, the inconspicuous setae originating from minute pores as on upper face. Mesoscutal median lobe (*cf*. Fig. 378) with anterior convex region largely overridden by pronotum but smooth and shiny except finely coriaceous laterally near notauli anterior to level of lateral setae; mesoscutal lateral lobe uniformly finely coriaceous-alutaceous. Axillae (*cf*. Fig. 378) smooth and shiny except for sparse setae. Scutellum (*cf*. Fig. 378) smooth and shiny except for single setiferous puncture posterolaterally. Mesopleuron (*cf*. Fig. 380) shiny and quite finely sculptured as follows: pectal region smooth, shiny and bare except for 1 posteroventral seta; acropleuron very finely, longitudinally alutaceous, almost smooth; subalar scrobe a posteriorly curved, sulcate furrow joined to shallow episternal scrobe by a straight sulcate furrow; upper and lower mesepimeron similarly, very finely, obliquely alutaceous-coriaceous; upper mesepisternum indistinguishably merged into lower mesepisternum, with single setae anterior to mesocoxa but without transepisternal line or ventral line of setae, the upper mesepisternum smooth. Fore wing hyaline; inconspicuously setose behind submarginal vein but with at least 7 setae in single line proximal to level of parastigma (exact number of setae uncertain). Propodeum (*cf*. Fig. 381) without distinct postspiracular sulcus; callus finely reticulate-rugose anteriorly but mostly very finely coriaceous to smooth and shiny; plical region smooth and shiny

with only slight indication of median line under some angles of light; without distinct supracoxal band of sculpture.

Petiole at least 1.2x as long as wide (accurate measurements not possible); finely reticulate-rugose to coriaceous; bare. Gaster apparently smooth and shiny (mostly covered by film of glue).

Male. Unknown.

Distribution. Texas (Fig. 377).

Biology. Unknown, but based on morphology probably a parasitoid of Diptera associated with ant nests.

Recognition. As discussed under *S. noyesi*, *S. xanthoscapa* is very similar to *S. noyesi* except for its antennal color pattern, which differentiates it from all other New World *Spalangia*.

Spalangia tarsalis Brèthes, 1913 *nomen dubium*

Spalangia tarsalis Brèthes, 1913: 96; holotype ♀ (MACN, ? lost). Type data: [Argentina], Buenos Aires, A. Zotta.

Recognition. The unique female on which Brèthes based his description of *S. tarsalis* could not be located in MACN and is presumed lost. The species most likely is some *nigra*-group or possibly some *cameroni*-group species based on the described umbilicate-punctate pronotum and complete, punctate frenal line, but as stated by Bouček (1963: 502) the original description includes hardly any taxonomically informative features to place the species further.

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Appendix. Abbreviations used for terms on plates of illustrations

ac	acropleuron
acr	anterior convex region of mesoscutal median lobe
as	alar shelf
ax	axilla
bc	basal cell
bf	basal fold
cal	callus
cb	circumpronotal band
cf	circumpronotal furrow
cl	clava
co	collar of pronotum
EH	eye height
epl	episternal line
es	episternal scrobe
EW	eye width
fr	frenum
frl	frenal line
fu_n	funicular segment 1–7
gen	gena
GL	genal length
HH	head height
HL	head length
HW	head width
inr	internotaular region of mesoscutal median lobe
ir	interantennal region
L	length
lep	lower mesepimeron
les	lower mesepisternum
lp	lateral panel of pronotum
mcf	mediocubital fold
mll	mesoscutal lateral lobe
mpm	mesopleural membrane
ms	malar sulcus
nk	neck of pronotum
nt	notaulus
nuc	nucha
oc	occipital carina
pcl	pronotal cross-line
pcf	paramedian crenulate furrows
pdf	pedicel of funicular segment
pdl	pedicel of antenna
pp	propodeal panel
pr	pectal region
ps	precoxal scrobe
psr	parascrobal region
pss	postspiracular sulcus
pst	parastigma
ptl	petiole
pxl	precoxal line
rad	radicle of scape
sc	scape
scb	scrobe
scd	scrobal depression
sp	spiracle
spb	supracoxal band of sculpture
ss	subalar scrobe
sct	scutellum
smv	submarginal vein
tmp	temple
tor	torulus
tsa	transscutal articulation
tsl	transepisternal line
uf	upper face
vsl	ventral setal line on mesepisternum
vtx	vertex