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Revision of the *Aspistomella* group of genera (Diptera: Ulidiidae: Pterocallinae: Lipsanini)

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Table of Contents

Abstract . . . 4
Introduction . . . 4
Material and Methods . . . 5
Results . . . 9
Subfamily Pterocallinae Loew, 1868 . . . 9
Tribe Lipsanini Enderlein, 1935 . . . 9
Aspistomella group of genera . . . 9
Key to adult ***Aspistomella*** and related genera . . . 10
Key to third instar larvae of ***Aspistomella*** and ***Ulivellia*** . . . 14
Genus ***Aspistomella*** Hendel, 1909 . . . 16
Aspistomella angustifrons (Hendel, 1909) comb. nov. . . . 21
Aspistomella crucifera (Hendel, 1909) comb. nov. . . . 25
Aspistomella duo Kovac, Kameneva & V. Korneyev, sp. nov. . . . 27
Aspistomella enderleini Kameneva & V. Korneyev, sp. nov. . . . 39
Aspistomella garleppi V. Korneyev & Kameneva, sp. nov. . . . 42
Aspistomella heteroptera Hendel, 1909 . . . 44
Aspistomella lobioptera Hendel, 1909 . . . 47
Aspistomella lunata (Hendel, 1909) comb. n. . . . 52
Aspistomella obliqua Kameneva, V. Korneyev & Savaris, sp. nov. . . . 54
Aspistomella pachitea Kameneva & V. Korneyev, sp. nov. . . . 58
Aspistomella quinquincisa Kameneva & V. Korneyev, sp. nov. . . . 61
Aspistomella sachavaca Smit & Kameneva, sp. nov. . . . 64
Aspistomella schnusei Kameneva & V. Korneyev, sp. nov. . . . 66
Aspistomella steyskali Kameneva & S. Korneyev, sp. nov. . . . 68
Aspistomella teresensis Araújo, V. Korneyev & Savaris, sp. nov. . . . 72
Aspistomella tres Kovac, Kameneva & V. Korneyev, sp. nov. . . . 75
Polyteloptera Hendel, 1909 . . . 81
Polyteloptera apotropa Hendel, 1909 . . . 83
Ulivellia Speiser, 1929 . . . 85
Ulivellia amnoni Smit sp. nov. . . . 88
Ulivellia arcuata Kovac & Kameneva sp. nov. . . . 90
Ulivellia inversa Speiser, 1929 . . . 94
Ulivellia laetitiae Smit sp. nov. . . . 95
Ulivellia pseudinsolita Kameneva & V. Korneyev sp. nov. . . . 98
Ulivellia tenoris Kovac & Kameneva sp. nov. . . . 102
Discussion . . . 107
Author contributions . . . 114
Acknowledgements . . . 115
References . . . 115

Abstract

Twenty-three species of the genera *Aspistomella* Hendel, 1909, *Polyteloptera* Hendel, 1909, and *Ulivellia* Speiser, 1929 occurring in South America (Colombia, Peru, Bolivia, and Brazil) form a monophyletic lineage sharing certain combinations of plesiomorphies and apomorphies with similar larval biology. The name *Aspistomella* Hendel, 1909 is a new senior subjective synonym of *Paraphyola* Hendel, 1909. The group of genera is extended by the addition of six known species, *Aspistomella angustifrons* (Hendel, 1909) comb. nov., *A. crucifera* (Hendel, 1909) comb. nov., *A. lobioptera* Hendel, 1909, *A. heteroptera* Hendel, 1909, *A. lunata* (Hendel, 1909) comb. nov., *Polyteloptera apotropa* Hendel, 1909, and *Ulivellia inversa* Speiser, 1929, and 17 previously unknown species. *Aspistomella duo* Kovac, Kameneva & V. Korneyev, **sp. nov.**, *A. enderleini* Kameneva & V. Korneyev, **sp. nov.**, *A. garleppi* Kameneva & V. Korneyev, **sp. nov.**, *A. obliqua* Kameneva, V. Korneyev & Savaris, **sp. nov.**, *A. pachitea* Kameneva & V. Korneyev, **sp. nov.**, *A. quinquincisa* Kameneva & V. Korneyev, **sp. nov.**, *A. sachavaca* Smit & Kameneva, **sp. nov.**, *A. schnusei* Kameneva & V. Korneyev, **sp. nov.**, *A. steyskali* Kameneva & S. Korneyev, **sp. nov.**, *A. teresensis* Araújo, V. Korneyev & Savaris, **sp. nov.**, *A. tres* Kovac, Kameneva & V. Korneyev, **sp. nov.**, *Ulivellia amnoni* Smit, **sp. nov.**, *U. arcuata* Kovac & Kameneva, **sp. nov.**, *U. laetitiae* Smit, **sp. nov.**, *U. pseudinsolita* Kameneva & V. Korneyev **sp. nov.**, and *U. tenoris* Kovac & Kameneva **sp. nov.** are described. A key to the genera and species is given. Among the Lipsanini, this group of genera is easily recognised by the combination of an enlarged, anteriorly produced epistome (lower part of the face) and a low clypeus (in the other lipsanine genera the clypeus is high and the epistome is not enlarged), which supports its monophyly, and the differentiated short parafrontal setulae and long and strong frontal and interfrontal setae, which is a synapomorphy of a larger monophyletic lineage that also includes *Chaetopsis* Loew, 1868 and related taxa, as well as *Amethysa* Macquart, 1835, *Euphara* Loew, 1868 and their relatives. As far as is known, most species of this larger lineage are associated with various Poaceae plants. The species included here in the *Aspistomella* group are also associated with neotropical tall grasses: bamboo (*Guadua*) and wild cane (*Gynerium*). *Aspistomella* and *Ulivellia* larvae inhabit water-filled internode cavities (= "bamboo phytotelmata") of living bamboo culms of *Guadua angustifolia*. Newly emerged larvae use tunnels made by lepidopteran borers (Crambidae caterpillars) to penetrate the hard bamboo walls. *Aspistomella* and *Ulivellia* larvae are saprophagous and adapted to an aquatic lifestyle. The last instar larvae jump easily and pupate in the soil. The external morphology, cuticular sensilla and cephalopharyngeal skeletons of the third instar larvae of five *Aspistomella* and *Ulivellia* species (one with unknown adult stage) were studied by light and scanning electron microscopy. The main features that allow the identification of larvae and puparia are the unique posterior spiracles and the structure of the abdominal creeping welts. The morphological characteristics of *Aspistomella* and *Ulivellia* larvae are compared with other Lipsanini and their feeding habits with other ulidiids. An identification key for *Aspistomella* and *Ulivellia* is given. The adaptations to life in bamboo phytotelmata found in both neotropical *Aspistomella* and *Ulivellia* and in oriental members of the closely related family Tephritidae are discussed.

Key words: Acalyptratae, Tephritoidea, taxonomy, distribution, biology, adults, larvae, identification key, bamboo, Neotropical Region

Introduction

The genera *Aspistomella* and *Paraphyola* were described by Hendel (1909b, 1910) on the basis of a dozen specimens of the four species collected by Carl-August Wilhelm Schnuse (1850–1909) and Otto Garlepp (1864–1959) during their trip to Bolivia and Peru in 1900–1903 and remained known only from the types for more than a century. Similarly, the genera *Polyteloptera* and *Ulivellia*, described on the basis of specimens collected in Santa Catarina, Brazil, were known only from their original descriptions (Hendel 1909b, 1910; Speiser 1929) because the types had been lost. Nothing was known about their biology or details of their morphology until recently, when several specimens of previously unknown or rare species were collected from local bamboo species by JTS in Peru in October 2008 and DK in Bolivia in January 2011. Most of these specimens were identified by EPK and VAK as new species of the genera *Aspistomella* and *Ulivellia*. Other specimens found in museum collections belonged to either already known or new species, and were rather distantly related to the collected species. It became clear that most of them form a cluster of much more numerous species than originally thought. New species are described and keyed, including adults, larvae and their biology.

Material and Methods

The specimens examined in this study are deposited in the following collections (curators in parentheses):
AMNH—American Museum of Natural History, New York, New York, U.S.A. (D. Grimaldi, T. Nguyen);
BMNH—Natural History Museum, London, U.K. (D. Whitmore);
CSCA—California State Collection of Arthropods, California Department of Food and Agriculture, Sacramento, California, U.S.A. (S. Gaimari, M. Hauser);
MELQ—Museu de Entomologia "Luiz de Queiroz", Piracicaba, São Paulo, Brazil (M. Savaris);
MNKB—Museum für Naturkunde Berlin, Germany (S. Marotzke, J. Pohl);
MZUSP—Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil (C. Lamas);
NHMW—Naturhistorisches Museum Wien, Austria (P. Sehnal, A. Camargo);
SMF—Senckenberg Museum Frankfurt am Main, Germany (P. Haase);
SIZK—I.I.Schmalhausen Institute of Zoology, Kyiv, Ukraine (V. Korneyev);
RMNH—Naturalis Biodiversity Center, Leiden, The Netherlands (P. Ciliberti);
TAUI—Steinhardt Museum of Natural History at Tel-Aviv University, Ramat Aviv, Israel (E. Morgulis);
USNM—National Museum of Natural History, Smithsonian Institution, Washington DC, U.S.A. (T. Dikow);
ZFMK—Museum Koenig Bonn, Germany (B. Sinclair, X. Mengual).

Lists of examined material

Type specimen labels are quoted verbatim; slash (/) is used to indicate separate lines, backslash (\) to indicate label reverse and square brackets [] are for deciphered abbreviations. The non-type material is arranged alphabetically by country name, then west to east and north to south within each country, and finally by day, month and year of collection, but usually without citation of labels verbatim.

Collection, rearing and preservation

DK's *Aspistomella* and *Ulivellia* specimens were collected from *Guadua* groves along riverbanks and streams near Buena Vista (Fig. 1A) as part of a general bamboo insect survey. Buena Vista is located in the lowlands of Bolivia, approximately 100 km from Santa Cruz de la Sierra. Sampling took place between 6 and 30 January 2011, i.e., during the wettest month of the year. The three main study sites were reached by bicycle on unpaved roads (location data: S17°29.724', W063°42.299'; S17°028.401', W063°41.531'; S17°30.054', W063°40.457' (see Disney and Kovac 2018).

Flies were collected from bamboo culms of *Guadua angustifolia* subsp. *chacoensis* (N. Rojas Acosta) S. M. Young & W. Judd. When thorny bamboo branches prevented collection with a sweep net, flies were caught by slowly placing plastic bags over them. Larvae were obtained by felling bamboo culms and then cutting open the internodes with a folding saw and a machete. Specimens were aspirated with a large pipette or picked up with soft tweezers and transferred to the laboratory in moist plastic bags.

For rearing, larvae were placed in water-filled bamboo internode containers sealed with gauze. Mature larvae were transferred to plastic boxes and allowed to pupate between moistened paper tissues. There was insufficient time, space and equipment to separate mixed larvae in the laboratory and rear them in separate containers, but individual emerged flies were kept in separate vials with their empty puparia. As the surface of the puparium consists of the last larval integument, it was possible to match puparial integuments of known species with collected larvae by comparing their posterior spiracles and creeping welts.

For preservation, larvae were immersed in boiling water for 3–5 minutes in order to keep their cuticle pale and expanded. Finally, they were transferred to 70% ethanol for permanent storage. Some adults and unboiled larvae were preserved in absolute ethanol. The reared adults were killed three days after eclosion.



FIGURE 1. Habitat, adults and larvae of bamboo-inhabiting Ulidiidae in Bolivia (*Aspistomella* sp., *Ulivellia* sp.). **A**, a stand of *Guadua angustifolia* subsp. *chacoensis* along a stream in the Buena Vista region; **B**, *Aspistomella duo* **sp. nov.** on a bamboo culm; **C**, *Aspistomella tres* **sp. nov.** on a bamboo culm; **D**, ulidiid larvae inhabit young bamboo culms that still have basal culm sheaths (arrow); **E**, entry hole made by a Crambidae (Lepidoptera) caterpillar; **F**, interior view of the bamboo internode wall showing a Crambidae caterpillar, the area eaten up by the caterpillar (a), the crambid entry hole (b) and the protective web made by the caterpillar (c); **G**, opened internode cavity of a freshly felled bamboo culm showing ulidiid larvae floating on the water surface or crawling in the terrestrial part of the internode; **H**, ulidiid larvae gathering at the bottom of a drying up internode; **I**, two ulidiid larvae and a syrphid larva floating on the water surface (the arrow points to the siphon of the syrphid larva). (All photographs by Damir Kovac.)

Morphological study

Examination of larvae: slide mounting. To study the cephalopharyngeal skeleton and the posterior spiracles, the larvae were cut transversely in three parts. The first cut was made between thorax and abdomen, and the second between the abdominal segments VII and VIII. The anterior body part (containing the cephalopharyngeal skeleton) and the posterior body part (containing the posterior spiracles) were macerated overnight in 2.5 % or 5 % potassium hydroxide (KOH) solution at room temperature according to the method of Steck & Wharton (1986) and Steck *et al.* (1990). The posterior spiracles were then cleared at 60 °C in 10 % KOH for about 1.5 h. The macerated larval parts were washed in distilled water for 1 h. in order to remove the KOH. They were then transferred to 70 % ethanol for storage. The posterior spiracles and cephalopharyngeal skeletons were mounted in a drop of glycerine on glass slides for observation under a light microscope. If necessary, the cuticle surrounding the cephalopharyngeal skeleton was removed with fine tweezers and insect pins.

Light and Scanning Electron Microscopy (*SEM*)*.* Most of the pictures of dry collection specimens of adult flies were taken with Zeiss Stemi 2000 trinocular microscope equipped with Canon PowerShot A640 camera at SIZK or Sony Alpha 7R Mark III equipped with Mitutuyo Plan Apo 5×, 7.5×, 10×, 20× or Canon MP-E macro 1–5× lenses and Novoflex Castel-Micro stacking rail system run under CaptureOne software at MNKB by VAK. In a few cases, some type specimens were photographed directly through the eyepiece of a dissecting microscope with a Canon EOS M-50 attached.

Wings were photographed from intact specimens or from temporary dry slides. Wings detached from dry specimens were then re-attached to the specimen with a tiny drop of a very liquid solution of polyacrylic or polyvinyl alcohol glue. Abdomens were removed from slightly softened specimens with tweezers and macerated in a 10 % NaOH or KOH solution for one hour in a water bath at 80–90 ºC, rinsed in a 1 % acetic acid solution and distilled water. The macerated structures were then transferred to glycerine for observation, description and photography as temporary slides under a compound light microscope, and stored in glycerol in microvials pinned under the flies after examination. Male and female terminalia structures were photographed with a Canon EOS M-50 mounted directly through the eyepieces of different compound microscopes. Stacked photographs were combined using Helicon Focus™ software (Kozub *et al.* 2023). Some specimens from the Brazilian collections (MELQ and MZUSP), were photographed under a stereomicroscope (Leica M205C) equipped with a Leica DFC 450 camera. Unless otherwise stated, the micrographs were taken and mounted by VAK.

The posterior spiracles of boiled larvae were clearly visible under the stereomicroscope, but the spinules of the creeping welts were not recognizable. However, they were visible in uncooked larvae that had turned brown and in puparia.

For scanning electron microscopy, the larvae were cut into three parts as described above, but the first cut was made between the first and second abdominal segments and the second cut was made between the fifth and sixth abdominal segments. Larval body parts were washed three times in 80 % ethanol in order to remove body substances leaking from the incisions. They were then dehydrated in 80 % and 90 % ethanol for at least one hour each and then in 100 % ethanol overnight. They were then transferred to hexamethyldisilazane (HMDS) (Nation 1983) for 1 hour, and then to fresh HMDS which was allowed to evaporate under a fume hood overnight. Dried specimens were mounted on stubs, coated with palladium gold and examined under a Hitachi scanning electron microscope (CamScan CS24). All SEM photographs were taken by DK.

Terminology and description. The suprageneric classification of the family was modified from Kameneva & Korneyev (2006), with adult morphological terminology and abbreviations generally following Cumming & Wood (2017) and larval terminology following White *et al.* (1999), Courtney *et al.* (2000), and Kovac *et al.* (2017)**.** Mouthhook measurements were made following Goyal *et al.* (2011) (Fig. 7 E). Two indices were used, namely the ratio of hook depth (f)/distance between apical tooth and ventral apodeme (e), and the ratio of the shortest distance between posterior spiracles (sd)/width of both spiracles (sw) (Fig. 7 E). Spiracular slits and groups of spiracular hairs were counted either clockwise from the ecdysial scar in the right posterior spiracles (Fig. 21 G) or counterclockwise in the left posterior spiracles, as they were arranged inversely. Larvae of *U. tenoris* were difficult to examine, because they were accidentally dried in their alcohol tubes. *Aspistomella duo* is described in detail, while for *A. tres*, *Ulivellia tenoris* and *U. arcuata* only their differences to *A. duo* are noted.

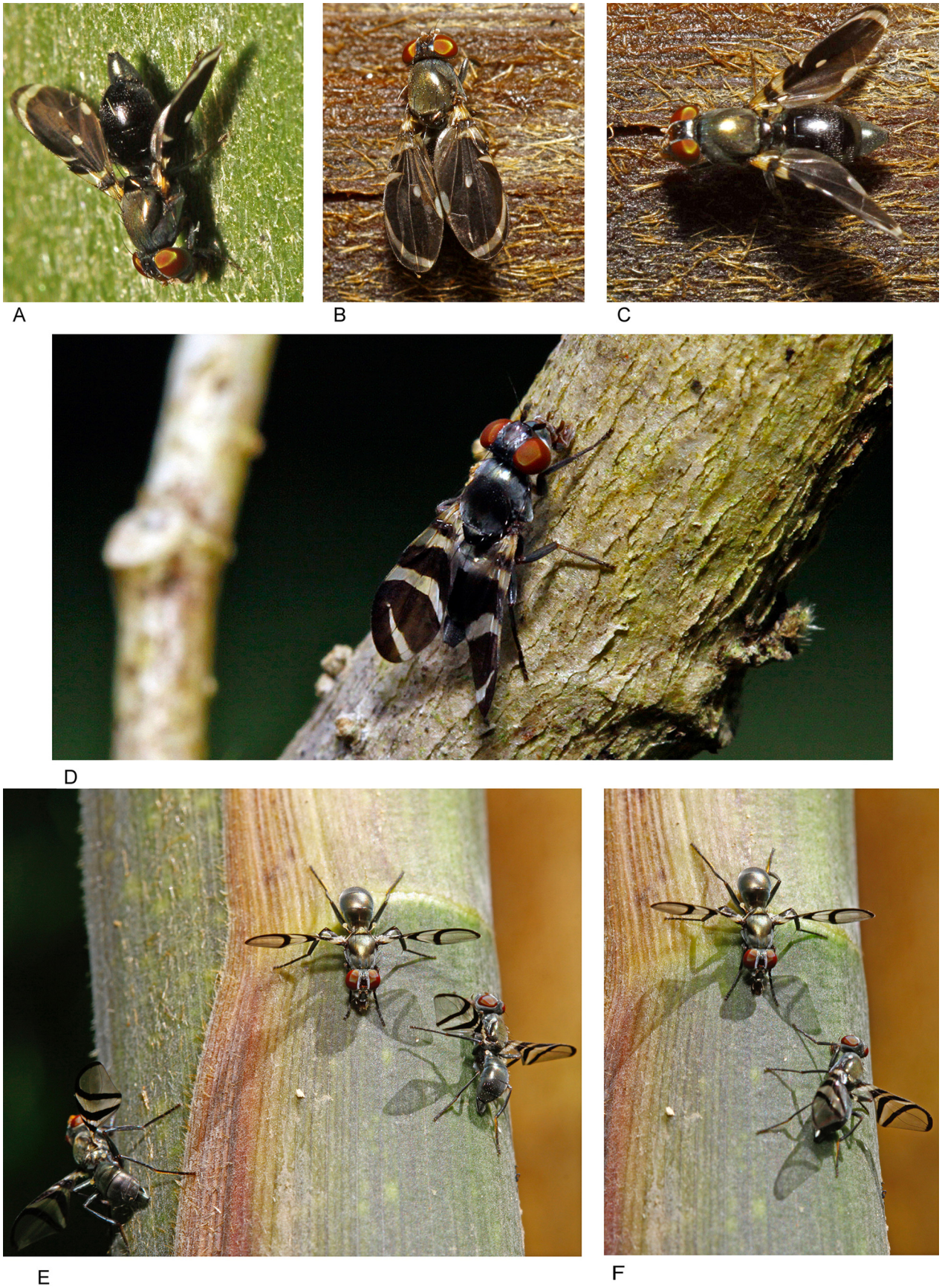

FIGURE 2. Adults of bamboo-inhabiting Ulidiidae from Peru. **A–C**, *Aspistomella lobioptera* on a bamboo culm; **D**, *Aspistomella sachavaca* **sp. nov.**; **E–F**, *Ulivellia laetitiae* **sp. nov.** on a bamboo culm showing wings during courtship or territorial behaviour. (All photographs by John T. Smit.)

Results

Subfamily Pterocallinae Loew, 1868

Tribe Lipsanini Enderlein, 1935

The picture-winged fly tribe Lipsanini contains more than 180 described species of 27 nominal genera, mainly distributed in the Neotropical region, with a few dozen of species occurring in the Nearctic, Oceania or recently introduced to the Old World (Kameneva & Korneyev 2006 and in prep.; Kameneva *et al.* 2017).

Species of Lipsanini can usually be distinguished from Pterocallini, another tribe of the Neotropical Ulidiidae, by having bodies with a greenish or bluish metallic sheen partially obscured by sparse white microtrichia, and by having only two spermathecae (both characters not found elsewhere in the family and considered synapomorphies of the tribe), whereas Pterocallini have mostly matt, often densely microtrichose bodies (very rarely with a metallic blue sheen) and three spermathecae. Lipsanini are subendemic and Pterocallini are endemic to the Neotropics and may form together a lineage opposite to the mostly Holarctic Otitinae and strictly Old World Ulidiini. Recent molecular phylogenies (e.g. Han & Ro 2016) better support the division of the Ulidiidae into three lineages, corresponding to the subfamilies Pterocallinae (incl. Lipsanini) (mostly Neotropical), Ulidiinae (only the strictly Palaearctic tribe Ulidiini) and Otitinae (with the tribes Seiopterini, Myennidini, Cephaliini, and Otitini) (Holarctic, with a few genera reaching as far as south as Southern Africa, New Guinea, and Patagonia) (Kameneva & Korneyev in prep.).

Here, we consider Lipsanini as a tribe of the subfamily Pterocallinae.

Aspistomella group of genera

Within the tribe, the genera *Aspistomella*, *Polyteloptera*, and *Ulivellia* form a group here called the *Aspistomella* group, which differs from other genera of Lipsanini by the combination of a head with a moderately or very large epistome (lower part of the face), strongly anteroventrally produced and conspicuously (usually 2×) higher than the low clypeus (synapomorphy) almost hidden in the peristomal cavity (synapomorphy).

The *Aspistomella* group of genera belongs to a broader monophyletic lineage (here called the *Amethysa* lineage) together with the taxa sharing frontal setulae modified to form long and strong frontal and interfrontal setae (synapomorphy); row of fine and short parafrontal setulae 3–5× shorter than frontal setae (synapomorphy); very long ocellar seta (usually 2× or more as long as the postpedicel); very long inner vertical seta (slightly longer than the ocellar seta); short outer vertical seta (at most half as long as inner vertical seta or vestigial) (apomorphies), often setulose vein R_1 (plesiomorphy; secondarily bare in some species); unmodified, relatively short aculeus with tergosternite 8 moderately wide and oval in section (plesiomorphy) and cercal unit oval, not flattened and bearing long setulae (plesiomorphy) (Kameneva & Korneyev, in press).

Other taxa of the *Amethysa* lineage are distinguished by the low, less produced epistome combined with a high clypeus almost as high as the epistome (except those either without epistome of a receding face (*Eumetopiella*, *Stenomyia*) or, if the epistome is antero-ventrally produced (*Steneretma*, *Zacompsia*), then with a high clypeus (Kameneva & Korneyev, in press).

The genera of Lipsanini, except those of the *Amethysa* lineage, are easily distinguished by the uniformly short, undifferentiated (plesiomorphy), subequal inner and outer vertical setae (plesiomorphy). Among them, many species assigned to *Acrosticta*, *Acrostictomyia*, *Axiologina*, *Euxesta*, and *Pareuxesta* share a very narrow and long aculeus, 1.5× longer than the oviscape (synapomorphy), and apparently form another monophyletic lineage (Kameneva & Korneyev, in press).

The species assigned here to the genera of the *Aspistomella* group often have dorsoapically setulose vein R_1 (possible plesiomorphy, occurring occasionally in different lineages of Lipsanini and Pterocallini, but very common in the Otitini and Myennidini, black halteres (possible apomorphy, not found in most other Ulidiidae), and sinuate tremae of the larval posterior spiracle (possible apomorphy of the few *Aspistomella* and *Ulivellia* whose larvae are known, but not found in the other Ulidiidae), further supporting the inclusion of the genera *Aspistomella* and *Ulivellia* in a monophyletic lineage.

The species assigned here to the genera of the *Aspistomella* group have male genital structures so diverse that they would merit numerous separate genera, but we prefer to include most of them in the genera *Aspistomella* and

Ulivellia. Morphology-based phylogenetic analysis does not provide a reliable resolution of their relationships, and the subdivision of this group into genera is tentative.

Many of the species discussed below are known from single specimens or only a few female specimens, so their descriptions lack male genitalia and can only be provisionally assigned to genera. Further study of additional material is required.

Key to adult *Aspistomella* and related genera

1 Vein r-m far proximal to R_1 apex, at level with Sc apex; postero-apical lobe of cell cua shorter or at most as long as cell width; wing < 3.5× longer than wide (Figs 4 A–G, I–K). 2

\- Vein r-m distal to R_1 apex (Figs 5, 6 A, C–H), and if slightly proximal in *Aspistomella garleppi* (Fig. 6 D), then distal to Sc apex level and wing > 3.5× longer than wide. 9

2 Epistome low, clypeus as high as epistome (Fig. 3 D). 3

\- Epistome high, at least 2× higher than clypeus (Figs 3 A, C). . . . . ***Ulivellia*** 4

3 Frontal and interfrontal setae 2–3 longer than fine parafrontal setulae (Fig. 3 D). Wing pattern as in Figs 4 I, J: subcostal crossband separated from preapical crossband in cell R_1; basicostal cell black or yellowish . . . . . ***"Euxesta" insolita*** Hendel and related undescribed taxa

\- Frontal vitta with uniformly short, undifferentiated setulae (as on Fig. 3 B). Wing pattern as on Fig. 4 K: subcostal and preapical crossbands connected in pterostigma; basicostal cell black. . . . . ***Axiologina***

4 Vein R_1 at pterostigma slightly dipping downwards, thickened and setulose; basal 0.8 of costal cell brown; vein R_{2+3} at apex close and subparallel to costa, turning towards it before very apex. Wing sexually dimorphic: male with broad brown pattern, costa strongly bent at middle; female with 4 partly fused brown bands and moderately bent costa (Figs 4 D, E) . . . . . ***U. arcuata*** **sp. nov.**

\- Vein R_1 at pterostigma straight, neither thickened nor setulose; at most basal half costal cell brown; vein R_{2+3} variable. Wing either equal in both sexes, narrowly banded, or only one sex is known, costa only slightly bent anteriorly. 5

5 Discal crossband (DB) oblique, ending just at base of vein CuA+CuP (Figs 4 F, G). 6

\- Discal crossband (DB) angulate, <-shaped, with posterior part directed posteroapically, terminating just at the apex of vein CuA+CuP (Figs 4 A–C). 7

6 Wing narrow, > 3.1× longer than wide, hyaline interspace between dark discal and preapical crossbands > 2.5× broader than discal crossband in discal cell (Fig. 4 F). Legs and halter at least partly yellow. Prescutellar acrostichal setae absent . . . . . ***U. tenoris*** **sp. nov.**

\- Wing wider, < 3.1× longer than wide, hyaline interspace between dark discal and preapical crossbands < 2× broader than discal crossband in discal cell (Fig. 4 G). Legs and halter entirely black. Prescutellar acrostichal setae present . . . . . ***U. pseudinsolita*** **sp. nov.**

7 Cell br entirely brown, connecting subbasal and discal crossbands (Fig. 4 A). . . . . ***U. amnoni*** **sp. nov.**

\- Cell br partly hyaline, subbasal and discal crossbands separated (Figs 4 B, C). 8

8 Subapical part of vein R_{2+3} almost straight, leaving arcuate hyaline area between it and connection of subapical and apical brown crossbands (Fig. 4 B). . . . . ***U. inversa*** Speiser

\- Subapical part of vein R_{2+3} conspicuously bent anteriorly, leaving no hyaline area between it and connection of subapical and apical brown crossbands (Fig. 4 C). . . . . ***U. laetitiae*** **sp. nov.**

9 Wing conspicuously widened and shortened in apical half; apical section of vein M_1 shorter than the preapical section between crossveins r-m and dm-m; postero-apical lobe of cell cua at most as long as cell width (Fig. 4 H). Vein R_1 bare. Postpedicel dorsally incised and apically pointed (Figs 48 E, F). . . . . ***Polyteloptera apotropa*** Hendel

\- Wing gradually narrowed and elongated in apical half; apical part of vein M_1 longer than the preapical part between crossveins r-m and dm-m (Figs 5, 6). Vein R_1 either setulose or bare. Postpedicel rounded apically (Fig. 3 C). ..... ***Aspistomella*** … 10

10 Pterostigma vestigial, conspicuously shorter than width of costal cell (Figs 5 A–F). 11

\- Pterostigma either longer than width of costal cell (Figs 6 B–H) or at most slightly shorter than its width (in *A. lunata*, *A. enderleini* **sp. nov.** and *A. sachavaca* **sp. nov.**) (Figs 5 G–H, 6 A). 16

11 Costal vein bent and thickened anteriorly before the apex of vein Sc; pterostigma at least slightly wider than veins Sc and R_1; vein R_1 bare or setulose dorsally; wing dark with hyaline spots, incisions or bands in the posterior half (Figs 5 B–F). 12

\- Costal vein neither bent nor thickened before the apex of vein Sc, pterostigma almost linear, narrower than veins Sc and R_1; vein R_1 bare; wing with hyaline or pale yellow anterior margin and gradually darkening towards posterior margin without hyaline spots or incisions (Fig. 5 A). . . . . ***A. pachitea*** **sp. nov.**

12 Face between antennae from lunule to epistome completely sooty black microtrichose (Fig. 25 D). Wing apex with long preapical hyaline incision from cell m only into cell $r_{2+3,}$ dividing brown area into two dark apical bands; cell m with 2 hyaline marks (Fig. 5 B). . . . . ***A. heteroptera*** Hendel

\- Face between antennae from lunule to epistome white or gray microtrichose (Figs 14 D, 22 E). Wing pattern different: cell m with 1 hyaline spot only (Figs 5 C–F). 13

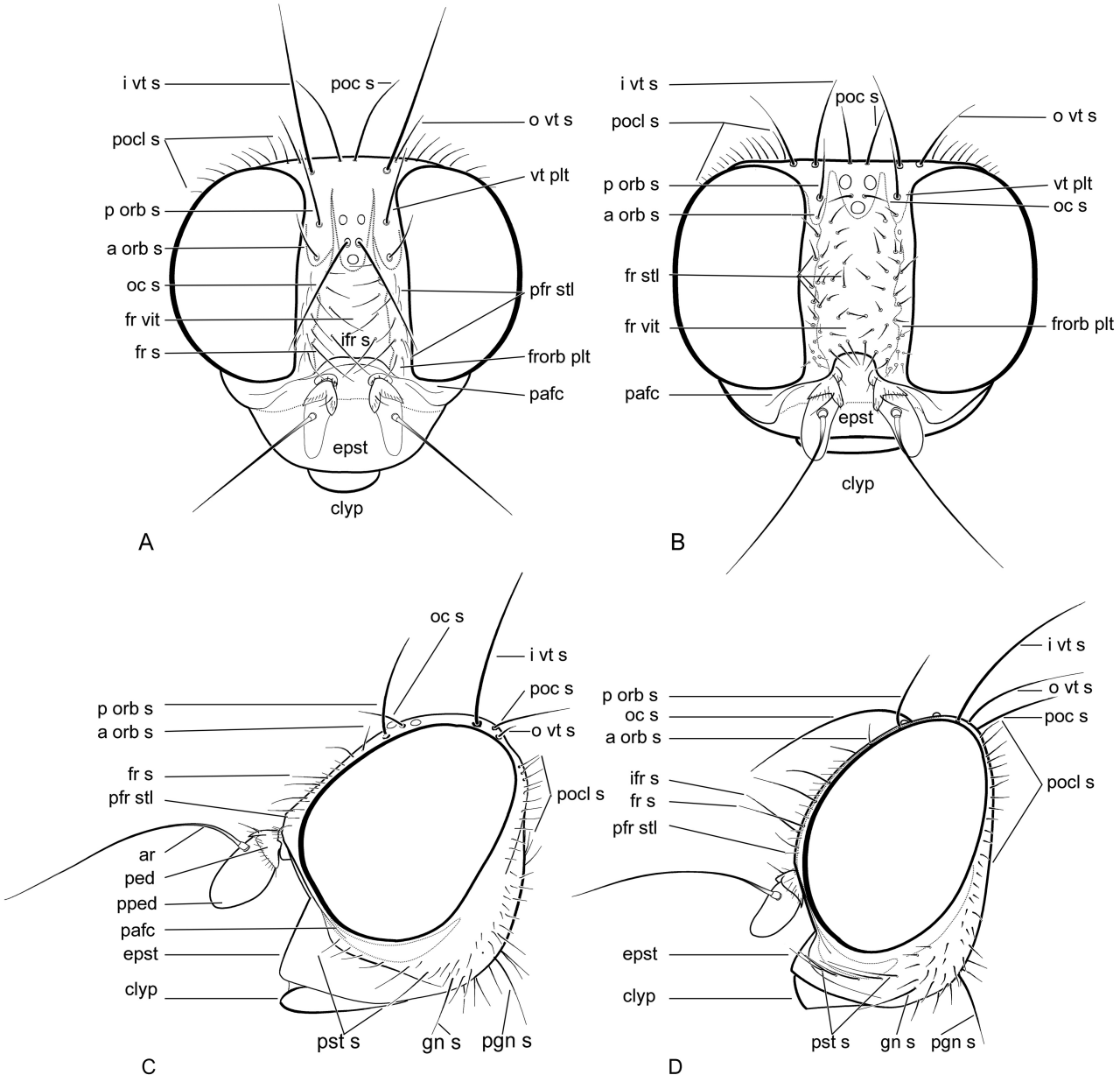

FIGURE 3. Lipsanini, head (**A–B**—dorsal, **C–D**—left lateral view). **A**, *Ulivellia amnoni* **sp. nov.**; **B**, *Euxesta quaternaria* Loew; **C**, *Aspistomella garleppi* **sp. nov.**; **D**, *"Euxesta" insolita* Hendel. Abbreviations: a orb s—anterior orbital seta; ar—arista; clyp—clypeus; epst—epistome; fr s—frontal seta; fr stl—frontal setulae; fr vit—frontal vitta; frorb plt—fronto-orbital plate; gn s—genal seta; i vt s—inner vertical seta; ifr s—interfrontal seta; o vt s—outer vertical seta; oc s—ocellar seta; p orb s—posterior orbital seta; pafc—parafacial; ped—pedicel; pfr stl—parafrontal setula; pgn s—postgenal seta; poc s—postocellar seta; pocl s—postocular setae; pped—postpedicel; pst s—perisomal setae; vt plt—vertical plate.

13 Wing apex completely dark; cell m with wide basal hyaline spot (Figs 5 C–D); vein R_1 with several setulae dorsally; prescutellar acrostichal setae absent; halter with black knob. 14

\- Wing apex with long and narrow preapical hyaline incision from apical half of cell m into cell r_1 usually reaching anterior margin of wing and separating narrow crescent-shaped brown apical band; base of cell m completely dark (Figs 5 E–F); vein R_1 bare; prescutellar acrostichal setae present; halter yellow. 15

14 Wing very narrow, > 3.5× longer than wide; anterior hyaline incision (distal to pterostigma) entering only into cell r_{2+3} basal to crossvein r-m, but not cells br, nor r_{4+5}; base of cell r_{4+5} and apex of cell dm with common oblique spot (Fig. 5 D) . . . . . ***A. tres* sp. nov.**

\- Wing somewhat wider, < 3.5× longer than wide; anterior hyaline incision (distal of pterostigma) entering dm through cells r_{2+3} and r_{4+5} distal to crossvein r-m, but apex of cell dm entirely dark (Fig. 5 C). . . . . ***A. duo* sp. nov.**

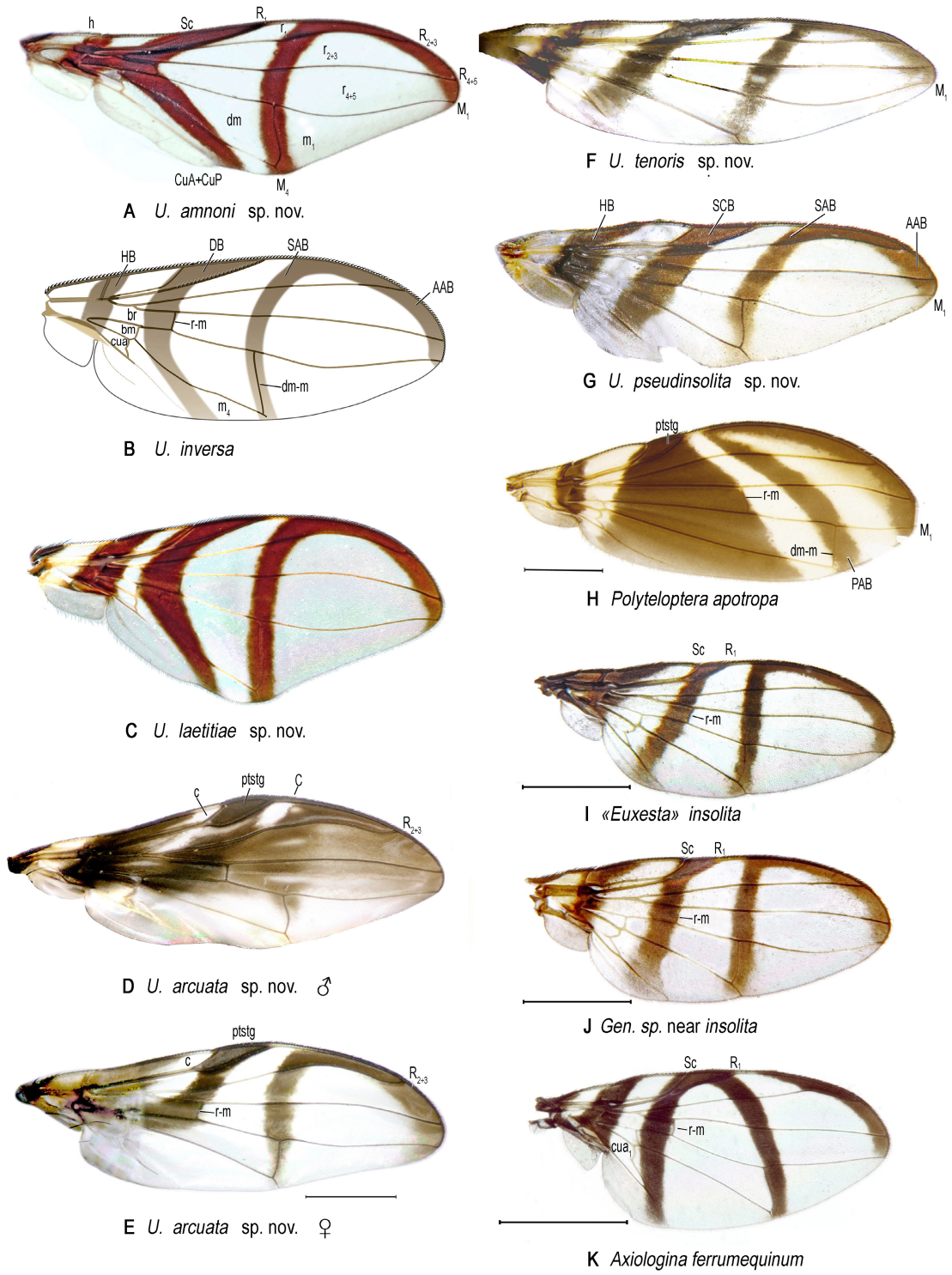

FIGURE 4. *Ulivellia*, *Polyteloptera* and similar genera, wing. **A**, *U. amnoni* **sp. nov.**; **B**, *U. inversa* Speiser; **C**, *U. laetitiae* **sp. nov.**; **D–E**, *U. arcuata* **sp. nov.** (**D**—male, **E**—female); **F**, *U. tenoris* **sp. nov.**; **G**, *U. pseudinsolita* **sp. nov.**; **H**, *P. apotropa* Hendel; **I**, *"Euxesta" insolita* Hendel; **J**, Gen. sp. near *insolita*; **K**, *Axiologina ferrumequinum* Hendel. Abbreviations. Veins and cells: bm—basal medial cell; br—basal radial cell; c—costal cell; C—costal vein; cua—anterior cubital cell; CuA+CuP—anterior branch of cubital vein + posterior branch of cubital vein; dm—discal medial cell; dm-m—discal medial crossvein; h—humeral crossvein; M_1—first branch of media; m_1—first medial cell; M_4—fourth branch of media; m_4—fourth medial cell; ptstg—pterostigma; R_1—anterior branch of radius; r_1—first radial cell; r_{2+3}—second + third radial cell; R_{2+3}—second branch of radius; R_{4+5}—third branch of radius; r_{4+5}—fourth + fifth radial cell; r-m—radial-medial crossvein; Sc—subcostal vein. Wing pattern: DB = discal band; HB = humeral band; AAB = anterior apical band; SAB = subapical band; SCB = subcostal band. Scale bar: 1 mm.

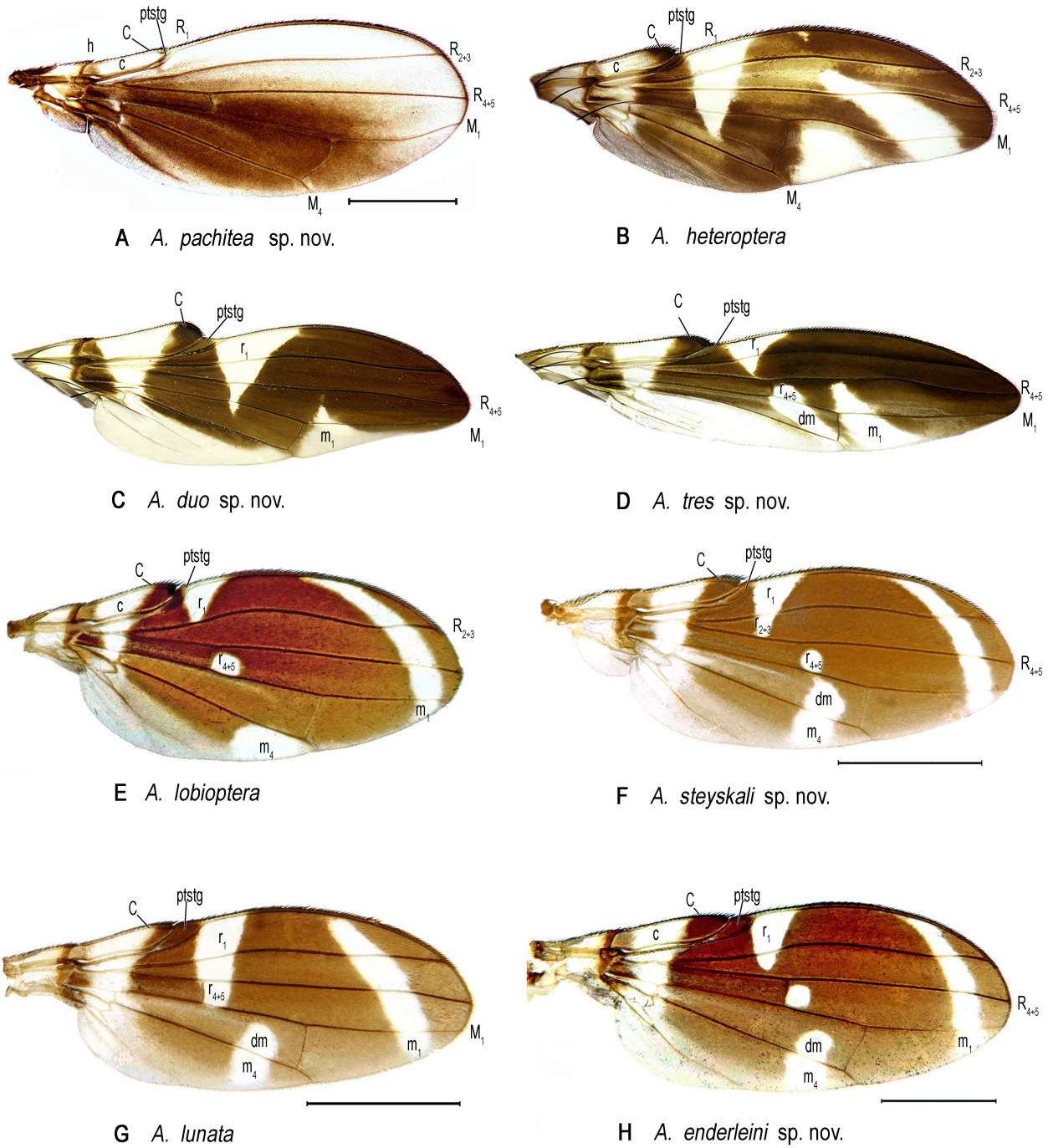

FIGURE 5. *Aspistomella*, wing. **A**, *A. pachitea* **sp. nov.**; **B**, *A. heteroptera* Hendel; **C**, *A. duo* **sp. nov.**; **D**, *A. tres* **sp. nov.**; **E**, *A. lobioptera* Hendel; **F**, *A. steyskali* **sp. nov.**; **G**, *A. lunata* (Hendel); **H**, *A. enderleini* **sp. nov.** Abbreviations: C—costal vein; c—costal cell; dm—discal medial cell; h—humeral crossvein; M_1—first branch of media; M_4—fourth branch of media; m_1—first medial cell; m_4—fourth medial cell; ptstg—pterostigma; R_1—anterior branch of radius; r_1—first radial cell; R_{2+3}—second branch of radius; R_{4+5}—third branch of radius; r_{4+5}—fourth + fifth radial cell. Scale bar: 1 mm.

15 Cell dm entirely dark in apical half (Fig. 5 E). Male genitalia: surstyli with short lobes and slightly thickened setae; lobes of phallic guide unmodified; phallus thick and extremely long, densely trichose (Fig. 29). . . . . ***A. lobioptera*** Hendel

- Cell dm apically of r-m level with hyaline spot connected to hyaline spot in cell m_4 (=cua_1) (Fig. 5 F). Male genitalia: outer surstylus with elongate anteroventral lobe and wide rounded posterior lobe, inner surstylus with 3–4 thick prensisetae and posteriorly produced; lobes of phallic guide sclerotised and apically truncated; phallus non-modified, moderately developed (Figs 41 A–F). . . . . ***A. steyskali* sp. nov.**

16 Cell r_1 with 2 hyaline marks (Figs 5 G, H) (if in *A. sachavaca* **sp. nov.** with unclear indentation from cell r_{2+3} (Fig. 6 A), then wing short oval) or almost entirely hyaline with 1–2 narrow dark marks (Fig. 6 B). 17

- Cell r_1 with 1 hyaline mark (Figs 6 D, G, H). 23

17 Wing wide oval, <2.6× (2.3–2.5×) longer than wide (Figs 5 G, H). 18

- Wing long, >2.6× (2.7–4×) longer than wide (Figs 6 B, E, F). 20

18 First hyaline mark in cell r_1 reaching at most vein M_1 and isolated from hyaline mark at posterior margin of the wing (Figs 5 G, H). Face entirely white or grey microtrichose (Figs 22 E, 31 C). Vein R_1 bare. 19

- First hyaline mark in cell r_1 complete, reaching posterior margin of the wing (Fig. 6 A). Face below lunule sooty black microtrichose (Fig. 38 C). Vein R_1 setulose dorsoapically. . . . . ***A. sachavaca* sp. nov.**

19 First hyaline incision distal to pterostigma long, extending into cell r_{4+5} distally of crossvein r-m (Fig. 5 G). Male genitalia not examined. . . . . ***A. lunata* (Hendel)** comb. nov.

- First hyaline incision distal to pterostigma short, extending at most into cell r_{2+3} and isolated from round hyaline spot in cell r_{4+5} distally of crossvein r-m (Fig. 5 H). Male genitalia: surstyli ventrally obtuse, with short denticles on posterior margin, but without expressed lobes and prensisetae, only with slightly thickened setae on surstyli, lobes of phallic guide laterally triangular and moderately sclerotised (Figs 23 B–E). . . . . ***A. enderleini* sp. nov.**

20 Wing apex mostly hyaline, with two narrow oblique dark crossbands (Fig. 39 A). Epistome conspicuously produced anteriorly beyond antennae (Fig. 39 D). Abdominal tergites 1–4 covered with moderately long and dense microtrichia, matt (Figs 39 E, G). . . . . ***A. schnusei* sp. nov.**

- Wing apex broadly dark (Figs 6 C, E, F). Epistome shorter, not produced anteriorly beyond antennae (Figs 10 B, 36 D, 42 D). Abdominal tergites subshining. 21

21 Wing with crescent-shaped subapical hyaline mark; posterior margin dark, without triangular hyaline incisions or spots in cell m_4 (Fig. 6 C). Femora largely black. . . . . ***A. angustifrons*** (Hendel) comb. nov.

- Wing apex with subapical hyaline marks in cells r_1 and m_1 isolated; posterior margin with hyaline marginal mark in cell m_4 (Figs 6 E, F). Femora yellow. 22

22 Distal hyaline mark in cell r_1 reaching anterior half of cell r_{4+5}; cell m_1 with rounded submarginal hyaline mark extending to vein M_1 (Fig. 6 E). . . . . ***A. crucifera*** (Hendel) comb. nov.

- Distal hyaline mark in cell r_1 posteriorly reaching only middle of cell r_{2+3}; cell m_1 with cuneiform hyaline mark extending middle of cell r_{4+5} (Fig. 6 F). . . . . ***A. quinquincisa* sp. nov.**

23 Cell r_1 with hyaline marginal incision extending only to cell dm (Fig. 6 G). Vein R_1 bare. . . . . ***A. teresensis* sp. nov.**

- Hyaline interspace distally to pterostigma continuous, reaching posterior margin of wing (Figs 6 D, H). Vein R_1 setulose in apical part. 24

24 Wing 3.2–3.3× longer than wide; dark subapical crossband uniformly narrow, cell m_1 with hyaline area in basal half (Fig. 6 H). Face below lunule with medial black spot, partly silvery microtrichose (Fig. 32 G). Ocellar seta very long (Figs 32 C, D). Mid tibia ventroapically with 2 long spur-like setae. . . . . ***A. obliqua* sp. nov.**

- Wing 3.8–4× longer than wide; wing apex from crossvein dm-m uniformly brown, including cell m_1; hyaline area between it and pterostigma wide, covering entire area between r-m and dm-m (Fig. 6 D). Face entirely silvery microtrichose, without black spot. Ocellar seta short, at most 1/3 as long as orbital seta (Figs 3 C, 24 D). Mid tibia ventroapically with 1 long spur-like seta. . . . . ***A. garleppi* sp. nov.**

Key to third instar larvae of *Aspistomella* and *Ulivellia*

1. Creeping welt of abdominal segment I (CW1) composed of three spinule rows (Figs 21 A, 47 A) . . . . . ***Aspistomella***...2
- Creeping welt of abdominal segment I composed of five spinule rows (Figs 58 B, 60 A) . . . . . ***Ulivellia***…4
2. Creeping welts CW3–CW8 with single row of large spinules in rows d (Figs 21 C, D); posterior spiracles: edges of yellow spiracular slit stripes distally blurred, as in Fig. 9 A. . . . . ***Aspistomella duo* sp. nov.**
- Creeping welts CW3–CW8 with double row of large spinules in rows d (Figs 47 C, D), posterior spiracles: edges of yellow spiracular slit stripes sharp. 3
3. Posterior spiracles close together (sd/sw ratio: ca. 0.05), spiracular slits with 12–15 turns, yellow slit stripes narrow, as in Fig. 9 B. . . . . ***Aspistomella tres* sp. nov.**
- Posterior spiracles: distance between spiracles larger (sd/sw ratio: 0.19), yellow spiracular slits with 3–4 turns, yellow slit stripes wide, as in Fig. 9 F. . . . . ***Aspistomella*** sp.
4. Creeping welts CW3–CW8 with single row of large spinules in rows d, central row c continuous (Figs 58 D, E); posterior spiracles: spiracular slits with 5–6 turns, yellow slit stripes narrow proximally and wide distally, resembling the silhouette of a bowing person, as in Fig. 9 D. . . . . ***Ulivellia arcuata* sp. nov.**
- Creeping welts CW3–CW8 with double row of large spinules in rows d, central row c discontinuous (Figs 60 C, D); posterior spiracles: spiracular slits with 8–11 turns, yellow slit stripes almost equally wide proximally and distally, as in Fig. 9 C . . . . . ***Ulivellia tenoris* sp. nov.**

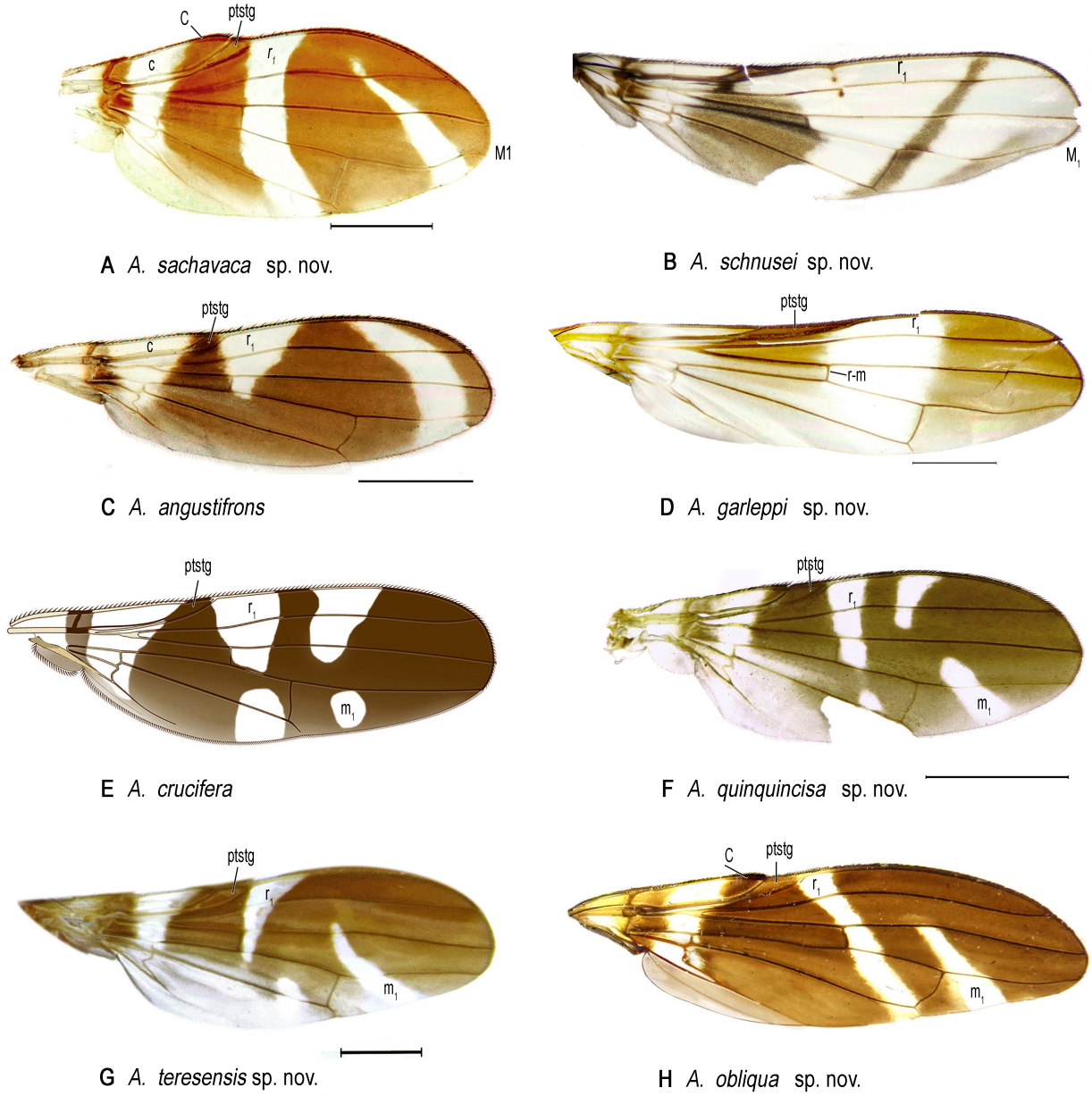

FIGURE 6. *Aspistomella*, wing. **A**, *A. sachavaca* **sp. nov.**; **B**, *A. schnusei* **sp. nov.**; **C**, *A. angustifrons* (Hendel); **D**, *A. garleppi* **sp. nov.**; **E**, *A. crucifera* (Hendel); **F**, *A. quinquincisa* **sp. nov.**; **G**, *A. teresensis* **sp. nov.**; **H**, *A. obliqua* **sp. nov.** Abbreviations: C—costal vein; c—costal cell; M_1—first branch of media; m_1—first medial cell; ptstg—pterostigma; r_1—first radial cell; r-m—radial-medial crossvein. Scale bar: 1 mm.

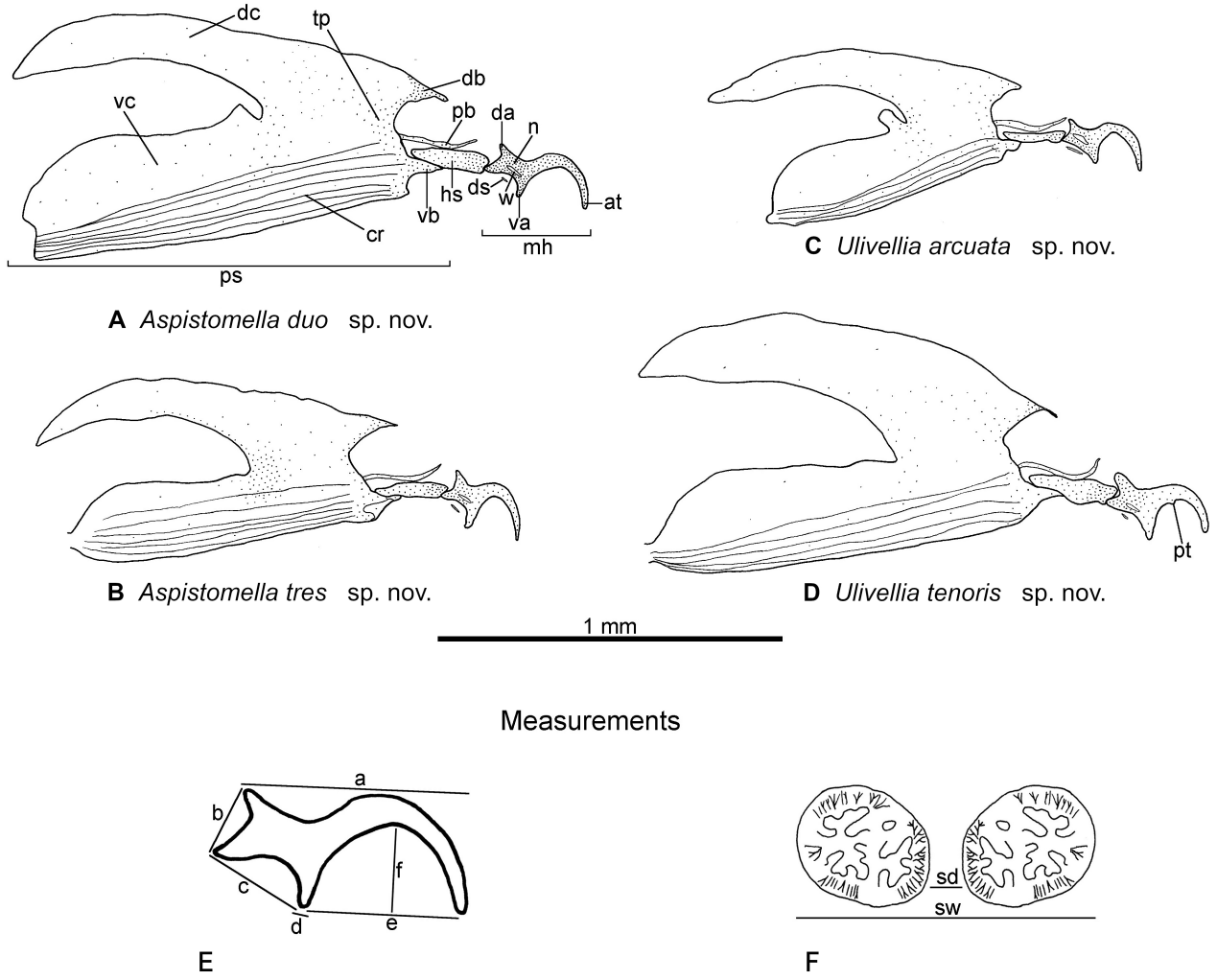

FIGURE 7. Cephalopharyngeal skeletons of *Aspistomella* (**A–B**) and *Ulivellia* (**C–D**) and scheme for measuring the mouthhook and posterior spiracles (**E–F**). **A**, *Aspistomella duo* **sp. nov.**; **B**, *A. tres* **sp. nov.**; **C**, *Ulivellia arcuata* **sp. nov.**; **D**, *U. tenoris* **sp. nov.**; **E**, mouthhook measurements; **F**, posterior spiracles measurements. The scale of **A–D** is the same. Abbreviations: at—apical tooth, cr—cibarial ridge, da—dorsal apodeme, db—dorsal bridge, dc—dorsal cornu, ds—dental sclerite, hs—hypopharyngeal sclerite, mh—mouth hook, n—neck, pb—parastomal bars, ps—pharyngeal sclerite, pt—preapical tooth, tp—tentorial phragma, va—ventral apodeme, vb—ventral bridge, vc—ventral cornu, w—light window. Measurements: sd—shortest distance, sw—spiracular width,—a–e, see Material and Methods. (All figures by Alexander Schneider.)

Genus *Aspistomella* Hendel, 1909

Aspistomella Hendel 1909b: 265.
Type species: *Aspistomella lobioptera* Hendel, 1909, by original designation.
Aspistomella: Hendel 1910: 10, 47; Steyskal 1968: 54.14.
Paraphyola Hendel 1909b: 261, syn. nov.
Type species: *Paraphyola angustifrons* Hendel, 1909, by subsequent designation of Hendel (1910: 46).
Paraphyola: Hendel 1910: 40, 46; Steyskal 1968: 54.20.

Diagnosis. This genus has all the diagnostic characters of the tribe Lipsanini: head and body with silver, greenish or cyan metallic sheen, sparsely whitish microtrichose, ocellar seta strong; phallus bare or covered with fine microtrichia, apically without glans; hypandrium symmetrical, with deep phallic guide, two areas of trichoid sensilla (corresponding to the pregonites and postgonites); female abdominal tergites 4–6 without anteromedial apodemes; only two spermathecae present.

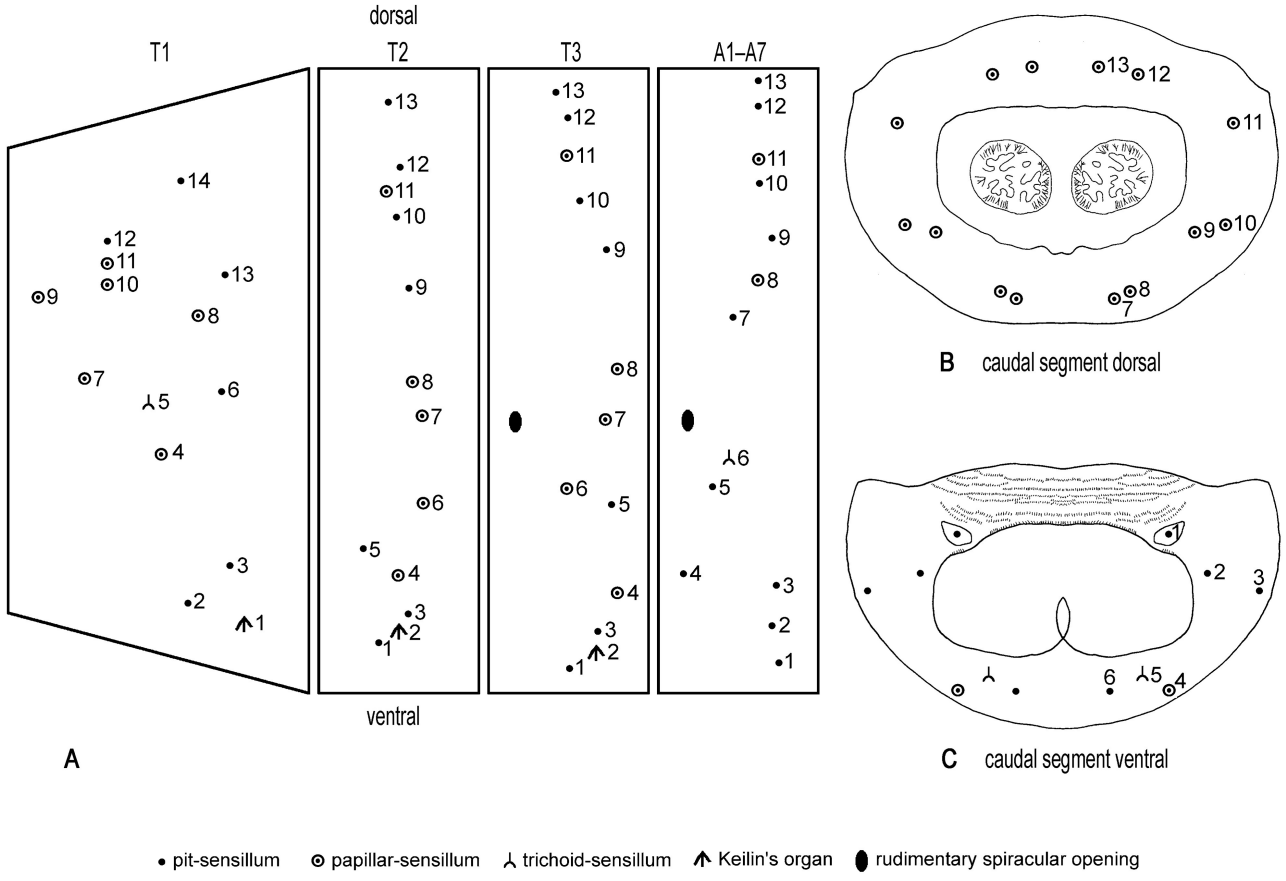

FIGURE 8. Schematic representation of the types of cuticular sensilla and their distribution on thoracic and abdominal segments (**A**) and caudal segment (**B**, **C**) of *Ulivellia tenoris* **sp. nov.** (identical to other *Ulivellia* and *Aspistomella* species). Abbreviations: T1–T3 = thoracic segments 1–3, A1–A7 = abdominal segments 1–7. Legend of sensilla types in the figure. (All figures by Alexander Schneider.)

Aspistomella species can be easily distinguished from other Lipsanini species by the combination of the following characters: epistome high, at least 2× higher than clypeus; frontal and interfrontal setae well differentiated, longer than fine and short parafrontal setulae; crossvein r-m distal to the apex of vein R_1 or at most very slightly proximal of it. *Aspistomella duo*, *A. heteroptera*, *A. lobioptera*, *A. pachitea*, *A. steyskali*, and *A. tres* also differ by the very narrow pterostigma formed by the approximate, subparallel veins Sc and R_1; costal vein more or less thickened, often strongly arcuate and bearing thickened marginal setulae before the apex of the subcostal vein. *Aspistomella duo*, *A. heteroptera*, *A. obliqua*, *A. sachavaca*, and *A. tres* can be distinguished by the presence of setulose vein R_1, which is rarely found in other groups of Lipsanini.

From the monotypic genus *Polyteloptera*, the species here assigned to *Aspistomella* differ by having an apically rounded postpedicel and a gradually narrowing wing with the long ultimate section of vein M_1 (*P. apotropa* has an antenna with a dorsally incised and apically pointed postpedicel and an apically broadened wing, with the short ultimate section of vein M_1).

The species of *Aspistomella* are distinguished from the superficially similar, elongate and moderately large metallic greenish flies of the genus *Ulivellia*, by the crossvein r-m distal to the apex of vein R_1 (at the level of vein Sc or basal to it in *Ulivellia*).

Description

Adult. Body mostly dark brown or black, usually with a metallic sheen, sometimes faint greenish or cyan, partly obscured by sparse whitish or silvery white microtrichia (Figs 10 A, B, 14 A, E, 24 A–F, 25 A–C, 34 A–C, 38 D, 44 A–C, and others).

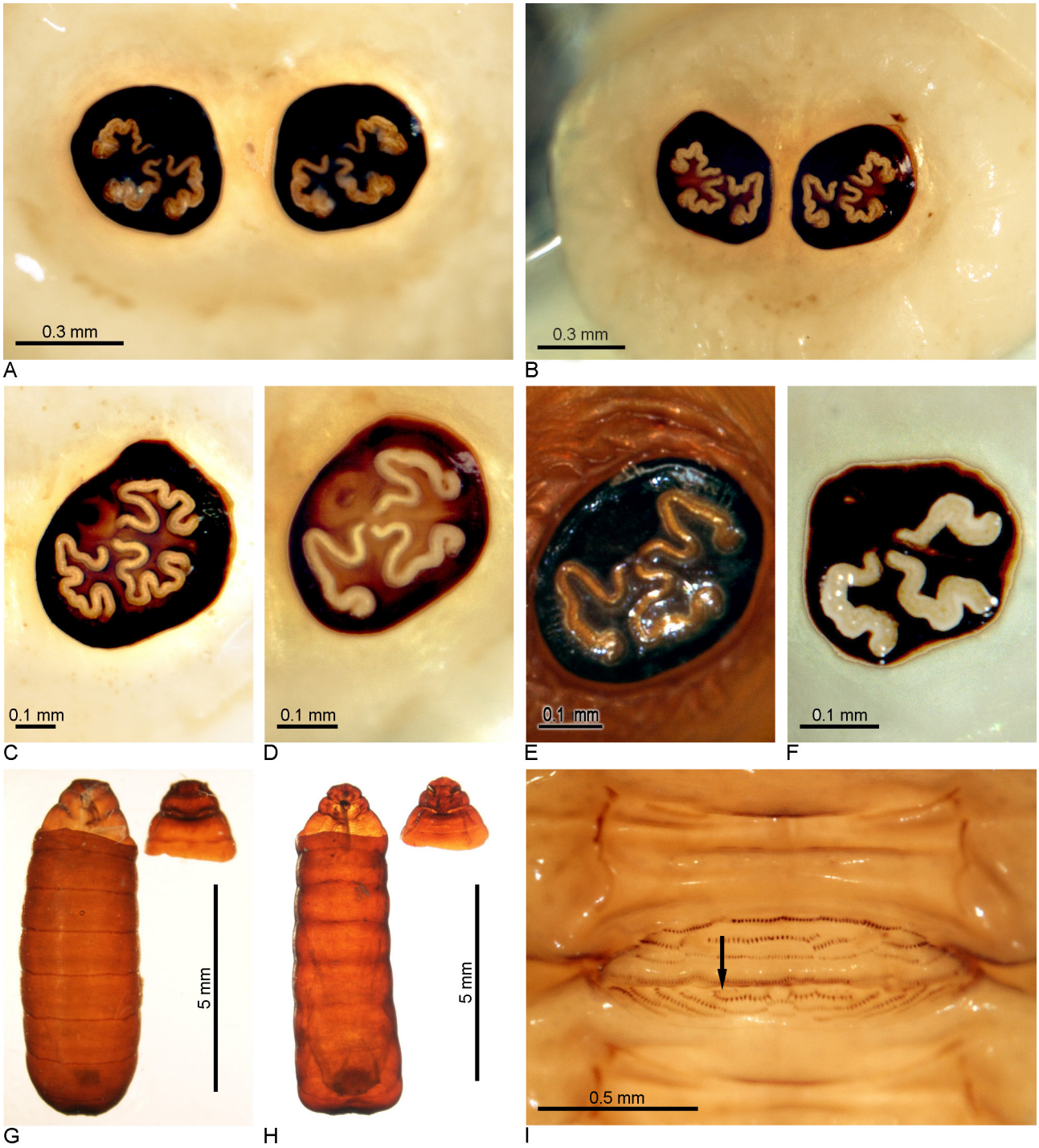

FIGURE 9. Larvae and puparia of *Aspistomella* (**A–B**, **F–G**, **I**) and *Ulivellia* (**C–E**, **H**). **A**, *A. duo* larva, posterior spiracles; **B**, *A. tres* larva, same; **C**, *U. tenoris* larva, right posterior spiracle; **D**, *U. arcuata* larva, right posterior spiracle; **E**, *U. arcuata* puparium, right posterior spiracle; **F**, *Aspistomella* sp. larva, right posterior spiracle; **G**, *A. duo*, empty puparial exuvium; **H**, *U. tenoris* empty puparial exuvium; **I**, *A. duo* larva, creeping welt on fifth abdominal segment. Arrow indicates an incomplete second row of large spinules. (All photographs by Damir Kovac.)

Head at most slightly higher than long. Frons narrow (1.05× longer than wide in *A. pachitea* and 1.1× *A. schnusei*) to wide (0.65× in *A. duo*, 0.9× in *A. lobioptera*), conspicuously narrowed towards vertex, reddish or brownish-yellow with black, often greenish shining vertical plates and ocellar triangle (Figs 10 D, 14 C and others); frontal vitta smooth or with fine longitudinal wrinkles (Fig. 15 G, left), frontal plates with 4–8 short pro-

or lateroclinate parafrontal setulae on each side (Figs 13–18), 2–6 frontal setae and 1–3 interfrontal setae (Figs 10 C, D, 15 A, 22 E, 24 C, 25 D, 27 B, 28 C, 31 C, 32 G, 34 D, E, 36 C, 38 B, C, 39 C, 40 A, 42 F, 44 D); vertex and orbits with dense, proclinate, slightly thickened, short white microtrichia (Fig. 15 G, right). Vertical plates with 1 long orbital seta, and usually with a second vestigial reclinate seta anterior to it; ocellar triangle with ocelli forming an elongated acute triangle and a pair of usually very long ocellar setae, 4–10× longer than frontal setae (Figs 14 B, 22 D, 25 C, and others) or, in *A. garleppi*, 1–1.5× longer than frontal setae (Fig. 24 D). Face dorsally flat, covered with white or black, dense, inclinate, curled and appressed microtrichia (Figs 15 F, 25 D, 38 C and others), and with ventral portion conspicuously produced antero-ventrally, forming a large, often metallically shining epistome, covered with sparse, thin, erect whitish microtrichia (Figs 14 C, 15 I and others). Parafacial usually brownish-yellow, densely white microtrichose (Fig. 15 H). Gena widened posteriorly, brownish, sparsely white microtrichose, bearing 1–2 strong genal setae and 4–6 moderately or very long, proclinate peristomal setulae (Figs 25 C, 27 B, 28 B, C). Occiput black or dorsomedially and lateroventrally brown to yellow, densely white microtrichose. Scape short, dorsally with 6–8 marginal setulae; pedicel with rectangular incision; one long pedicellar seta and 20–25 setulae, the longest ventral, almost as long as pedicel width (Fig. 15 D and others). Postpedicel oval, 2.0–2.2× longer than wide, rounded at apex, densely microtrichose; arista 3-segmented (Figs 15 D, E). Palp elongate, 4–4.5× longer than wide and almost twice as long as postpedicel, white microtrichose, with 15–25 ventral and ventromedial setae almost as long as palp width and 1–2 apical setae 1.5–2× longer than the rest (Fig. 15 B). Clypeus much lower than epistome, convex, densely microtrichose, almost entirely hidden in oral cavity. Proboscis with prementum and labellum moderately large, with long, often slightly curled, thin setulae (Fig. 15 B).

Thorax mostly black or brown, with faint bluish, greenish or golden sheen and moderately dense, thin, semierect white microtrichia not completely hiding shining cuticle. Postpronotal lobe with 1 seta and 5–15 setulae; proepisternum with 1 short proepiesternal seta (sometimes absent or indistinct) and 5–20 fine subequal setulae on proepiesternal ridge. Prosternum higher than wide, with distinct longitudinal suture and shallow ventral incision, sparsely microtrichose, without conspicuous setae. Mesonotum steel shining, with slight green or bluish sheen of cuticle not entirely obscured by sparse or moderately thick white microtrichia (Figs 14 E, 16 A); scutum setulose, except prescutellar area posterior to dorsocentral setae; dorsocentral setulae forming distinct row, with 8–18 poorly ordered rows of setulae between them; 1 postpronotal, 2 notopleural, 1 postsutural supra-alar, 1 intra-alar and 1 postalar, 2 dorsocentral and 1 acrostichal seta present, strong (in *A. crucifera*, *A. lobioptera*, *A. lunata*, *A. obliqua*, *A. quinquincisa*, *A. sachavaca*, *A. steyskali*, and *A. teresensis*), weak (in *A. schnusei*,) or absent (in *A. angustifrons*, *A. duo*, *A. garleppi*, *A. heteroptera* Hendel, *A. pachitea*, and *A. tres*). Anepisternum setulose almost entirely anterior to vertical squama, with one strong seta and 5–12 shorter setae at posterior margin. Katepisternum with one strong posterodorsal seta. Scutellum subtriangular, slightly convex, smooth, with 2 pairs of scutellar setae, no setulae on disc and margins, sparsely microtrichose. Subscutellum matt, microtrichose. Mediotergite smooth, sparsely or densely microtrichose.

Wing moderately wide, 2.6–2.8× longer than wide (in *A. lobioptera*, *A. lunata*, *A. enderleini*, and *A. steyskali*) to strongly elongate, 3.5–3.75× longer than wide (in *A. tres*), largely dark with hyaline incisions or round spots or hyaline with darker crossbands (Figs 5, 6). Venation modified, pterostigma shorter than wide in *A. duo, A. heteroptera, A. lobioptera, A. pachitea, A. steyskali,* and *A. tres*), and costal vein conspicuously bent and thickened before apex of subcostal vein, so that apical portion of costal cell conspicuously lobed with thick setulae on costal vein (Figs 5 B–F, 16 E, F), or, in other species, as long as or longer than wide. Vein R_1 dorsally with 3–10 setulae (*A. duo*, *A. heteroptera*, *A. obliqua*, *A. sachavaca*, and *A. tres*) to entirely bare. Crossvein r-m apical to R_1 apex in most species, except in line with R_1 apex in *A. lunata, A. sachavaca,* and *A. schnusei* or slightly basal of it in *A. garleppi* Cell r_{4+5} slightly or conspicuously narrowed apically. Vein CuA Z-shaped, cell cua with moderately short (in most species) to long (in *A. obliqua* and *A. sachavaca*) posteroapical lobe along vein CuP. Calypters white, with white cilia. Halter creamy white (in most species) to brown with black or brown knob (in *A. duo* and *A. tres*).

Legs variably coloured; coxae usually yellow to brown, femora yellowish brown to entirely brown or black, tibiae and tarsi yellow to brown. Fore femur with 2 posterodorsal rows of setae; posteroventrally with row of 3–5 setae (in *A. duo* and *A. tres*), often conspicuously thickened and spinulose, in *A. pachitea* without postero-ventral row; fore tibia antero-apically as well as basal fore tarsomere with brush of short pale setulae. Mid femur on anterior and posterior surfaces with row of moderately long, antero- and postero-ventrally directed setulae. Mid tibia apicoventrally with strong spur-like seta 1.5–3× longer than tibia width, in *A. duo*, *A. obliqua* and *A. tres* with additional seta (Fig. 16 N) 0.7–1× longer than longest seta. Hind femur with 2–3 to 4–5 preapical setae dorsally.

Abdomen subshining brown to black, in *A. heteroptera* with syntergite 1+2 broadly yellow (Figs 25 A, B); tergites and sternites with metallic silver, green or yellow sheen, sparsely white microtrichose (Figs 10 G, 16 C, D, 34 B, 36 G, H). Male and female abdomen with 5 visible tergites, of which tergites 3–5 subequal in length; female tergite 6 hidden beneath posterior margin of tergite 5. Sternites 3–5 not modified, subrectangular (Figs 11 A, 12 A, 18 A, 23 A, 35 A, 37 A, 41 G).

Male postabdomen. Sternite 8 setulose, with 2 longer setulae. Epandrium moderately setulose. Surstyli of variable shape, often species-specific, fused with epandrium, usually wide basally, narrowed and curved mesally towards apex, often with small, mesoapically directed pimple-like process (Figs 26 E, 35 C, 46 E: pi p), in *A. angustifrons*, very narrow and curved (Figs 11 C, F), in *A. quinquincisa*, blunt with smooth margins (Figs 37 B–F), in *A. enderleini*, blunt with serrate posterior margin (Figs 23 B–D), in *A. lobioptera* and *A. steyskali*, bilobate (Figs 29 D–G, 41 A–D). Cerci low, moderately protruding posteriorly, flattened and almost round in *A. duo* and *A. tres* (Figs 16 B, D, 46 A, B: cerc), elongate and bilobate, partly connected in *A. heteroptera, A. obliqua*, and *A. pachitea* (Figs 26 C, D, 33 A, B, D, 35 C, D), short, button-like in *A. angustifrons* (Fig. 11 E), flat in *A. enderleini*, *A. lobioptera*, *A. quinquincisa*, and *A. steyskali* (Figs 23 B, D, 29 D–F, 37 E, F, 41 A–E), moderately long setulose. Subepandrial sclerite short, horseshoe-shaped, with ventral arms entirely integrated into surstylus, bearing a row of mesally directed setulae anteriorly (Figs 23 B, 29 D, E), without thickened tooth-like setulae (prensisetae), or with 3–4 sharp thickened subapical setae (in *A. quinquincisa* and *A. steyskali*) (Figs 37 E, F, 41 A, B) or with 1–2 thickened and 2–3 fine setulae (in *A. heteroptera*) (Fig. 26 E). Hypandrium narrow, U-shaped, joined to basiphallus by thin membrane; phallapodeme with paired and rather long, sagitally flattened anterior arms, continuing into a pair of ventrally directed ridges or folds, forming a gutter-like phallic guide on both sides of basiphallus and basal part of distiphallus (Figs 23 D–F, 29 F, 35 G, 37 E, F, 41 A, D, E); phallapodeme itself usually very short (Fig. 46 C). Pregonites plate-like, almost symmetrical, antero-medially attached to phallapodeme and latero-ventrally to hypandrium by membrane, each bearing 4–6 setulae (Fig. 33 E); in *A. obliqua* very strongly displaced and posterior to postgonites (Figs 11 H, 23 D, 26 F, 29 F, 37 F, 41 D). Postgonites symmetrical, reduced to oval sensillar plates, bearing 4–5 setulae located on membrane on lateral sides of phallic guide at level of anterior part of basiphallus (Figs 11 H, 23 D, 26 F, 29 F, 33 E, 37 F, 41 D).

Phallus simple, band-like or tubular, moderately short in most species, usually 2–5× longer than epandrium (Figs 11 B, C, 17 K, 23 B, C, 26 A, B, 33 B, 35 C, D, 37 B, C, 41 A–F, 46 A, B), in *A. lobioptera* very long, 6–8× longer than epandrium, with moderately large ring of basiphallus (Figs 23 B, D, 29 F) and simple distiphallus represented is a bare or short spinulose, densely trichose in *A. lobioptera* (Fig. 29 C), flattened tube with a pair of narrow sclerotised stripes.

Ejaculatory apodeme usually with fan-shaped apical part 2–3 as long as moderately developed sperm pump (Figs 17 J, 23 C, 26 G, 29 B, 35 E, 37 C).

Female terminalia. Oviscape short, usually half as long as abdomen. Eversible membrane (Figs 12 A, 18 B) as long as aculeus, with 2 pairs of bare taeniae reaching its posterior 4/5; membrane finely microspinulose in anterior half. Aculeus (Figs 12 B, 18 C) narrow and moderately long, 8–11× longer than wide, with elongate oval cercal unit bearing 2–3 pairs of long setae (basal dorsal, subapical lateroventral and somewhat shorter apicodorsal) and several shorter setulae on ventral and latero-ventral sides; anal opening (slit) on dorsal side of cerci (Figs 12 B, 18 D); sternite 8 well sclerotised, with indistinct setulae on each side. Vagina (Fig. 30 D) with simple, finger-like, apically rounded ventral receptacle as in all other Ulidiidae. Two spherical or somewhat elongated spermathecae (Figs 12 C, 18 E, 30 B, 43 E); short, invaginated "necks" at junctions of spermathecae with ducts.

Preimaginal stages

Egg known only for *A. lobioptera,* elongate oval, 4.5× longer than wide, slightly wider than aculeus, without stalks or tapering rear end (Fig 30 C).

Third instar larvae. *Aspistomella* larvae are known from *A. duo*, *A. tres* and an unidentified third species. Larva whitish, maggot-like, medium-sized (7.5–12 mm long) and mostly smooth. Pseudocephalon with deep incision between cephalic lobes. Facial mask with 20–28 laterally bifurcated or double bifurcated furrows separating subparallel oral ridges, each with fringe of blunt scales (Figs 19 C, D). Creeping welts on abdominal segments I–VII and caudal segment with spinules, anterior spiracles fan-shaped. Caudal segment posterodorsally truncate,

with sclerotised, slightly elevated, rounded posterior spiracles. Each spiracular plate with three very long, sinuous spiracular slits, spiracular plate mostly dark, but yellowish along spiracular slits (= yellow slit stripes) (Figs 9 A, B). **Cephalopharyngeal skeleton** (Figs 7 A, B). Mouthhook with elongated base with semitransparent window, long and thin, ventrally curved apical tooth and moderately long and narrow, ventrally produced ventral apodeme, moderately short hypopharyngeal sclerite.

Puparium (Fig. 9 G) elongate cylindrical, reddish brown, strongly tapering anteriorly and broadly truncate posteriorly; anterior spiracles, posterior spiracles and creeping welts as described for third instar larva.

Habitat. The larvae of *Aspistomella duo*, *A. tres* and *A.* sp. live in the water-filled internodes of young bamboo culms of *Guadua angustifolia*. The biology of *Aspistomella* is described in the Biology section of *A. duo*.

Remarks. The monophyly of the genus is doubtful, and the results of a morphology-based phylogenetic analysis neither strongly support nor refute it. Here we include in *Aspistomella* all species that do not have the diagnostic characters of *Polyteloptera* and / or *Ulivellia*. There is no evidence that they are nested within *Aspistomella*, and we consider them to be separate genera.

The diagnostic character proposed by Hendel (1909b, 1910) to separate *Paraphyola* from *Aspistomella*, namely a narrow wing with almost parallel anterior and posterior margins, shows a similar condition with a gradual transition to "moderately oval" wings in *A. duo*, *A. crucifera*, *A. garleppi*, *A. obliqua*, *A. quinquincisa*, *A. schnusei*, *A. teresensis*, and *A. tres*, so we prefer to place them all in *Aspistomella* together with *Paraphyola angustifrons* rather than separating them into two genera for ease of identification. As male genitalia are not examined in many species and molecular data are not available to provide more robust results, we consider the current generic classification to be tentative.

Steyskal (1968: 54.20) erroneously stated *P. angustifrons* to be the type species of *Paraphyola* by monotypy. However, Hendel (1909a) originally described two species, but did not designate any of them as the name-bearing type. It was only in the later published generic synopsis of the ulidiids in the series “Genera Insectorum” (Hendel, 1910) that he clearly stated that his type species was *Paraphyola angustifrons* Hendel, 1909. The latter is therefore the type species of the genus according to the later designation by Hendel (1910).

The unknown ulidiid larva found by DK in water-filled bamboo internodes probably belonged to *Aspistomella*, because CW1 had three rows of spinules (and not five as in *Ulivellia*) and all other details of its creeping welts resembled *A. tres*. The spiracular slits of the unknown *Aspistomella* sp. larvae were clearly identifiable as belonging to a distinct species, because they had only a few turns and the yellow area above the spiracular slits was very wide compared to the larvae of other ulidiid species (Fig. 9 F). Furthermore, the shape of the anterior spiracles was more angular than in *Aspistomella duo* and *A. tres*.

Aspistomella angustifrons (Hendel, 1909) comb. nov.

Figs 6 C, 10–12.

Paraphyola angustifrons Hendel 1909b: 261; Hendel 1910: 46, 47; Steyskal 1968: 54.20.

Material examined. Type. Lectotype ♀: **Peru**: “Peru Meshagua / 11.X.03 / Urubamba fl.” [Schnuse leg.] “Paraphyola \ angustifrons H. / det. Hendel” “Type” [dark red paper], “coll. Hendel” (NHMW). **Paralectotypes**: **Peru**: 1 ♂ [1 wing missing], “Peru Meshagua / 11.X.03 / Urubamba fl.” [Schnuse leg.] “Paraphyola \ angustifrons H. / det. Hendel”, “coll. Hendel” (NHMW); 1♀: “Peru—Pichis / XII.03 / Pto. Bermudes” [Schnuse leg.] “Paraphyola \ angustifrons H. / det. Hendel” (SMTD).

Non-type. Peru: “Peru-150 m / 12.11.[19]03 / Pachitea-Münd”, 1♀ (dissected), idem, 26.11.[19]03, 1♂ [dissected] (SMTD); Huanuco, Tingo Maria, 800 m, 21–23.08.1971, 1♀ (C. & M. Vardy) (BMNH: BM 1971-533); **Bolivia**: Mapiri, Sarampioni, 700 m, 01.1903, 1♀ (Schnuse) (SMTD).

Diagnosis. *Aspistomella angustifrons* differs from most species of the genus by the combination of its wing venation (costal vein almost straight, pterostigma moderately long) and wing pattern (wing posterior margin mostly dark, except for a crescent-shaped subapical hyaline area in cell m_1). It shares with *A. crucifera* and *A. teresensis* a comparatively short head, narrow frons and wings, as well as chaetotaxy and wing venation, but differs in coxae, femora and tarsi, which are mostly black (entirely yellow in *A. crucifera* and *A. teresensis*) and wing pattern with subapical crescentic hyaline incision and otherwise dark posterior half (in *A. crucifera*, *A. quinquincisa*, and *A. teresensis*, with entirely dark subapical area and marginal hyaline spot in cell m_4). It differs from *A. schnusei* by

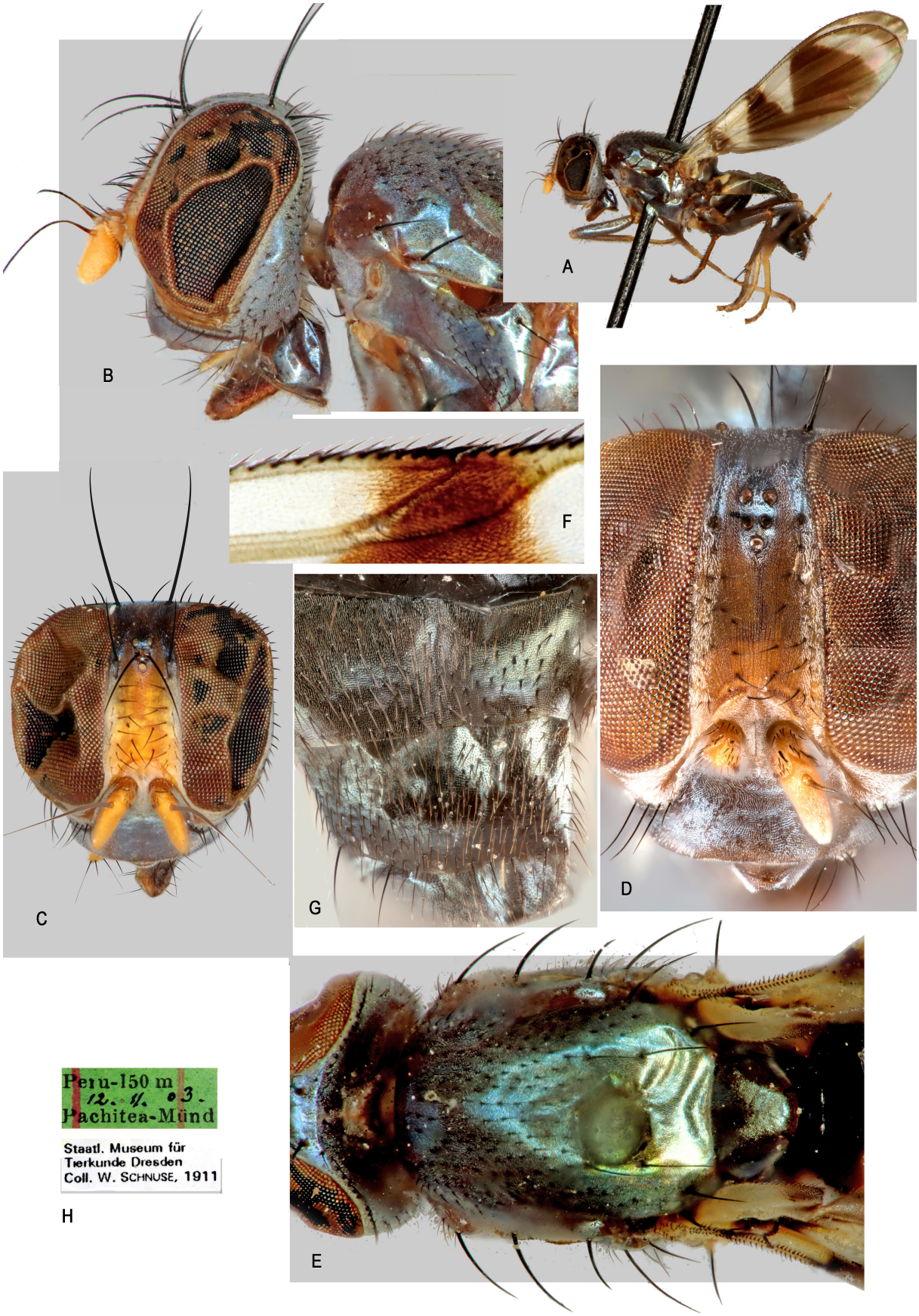

FIGURE 10. *Aspistomella angustifrons* (Hendel) lectotype ♂ (A–C, E, F) and non-type ♀, BMNH (D, G, H). **A**, habitus, left; **B**, head left; **C**, head, dorsal; **D**, frons, dorsal; **E**, mesonotum, dorsal; **F**, pterostigma; **G**, abdomen, dorsal; **H**, labels.

having a shorter epistome and a wing widely dark in the apical half (in *A. schnusei*, epistome strongly produced anteriorly and wing widely hyaline with narrow bands apically). It also differs from all the species of the *Aspistomella* group for which the male genitalia have been examined by the long and narrow, posteroventrally curved surstyli.

Description. Male. **Head** (Figs 10 B–D) ratio (length : height : width) = 1 : 1.4 : 1.6, frons, face above transverse fold, parafacial, and gena reddish or yellowish brown, face and occiput mostly black. Frons very narrow, slightly narrowed posteriorly (Figs 10 C, D), 0.85× as long (from lunule to anterior ocellus) or 2× (from lunule to inner vertical seta) as wide (at lunule), with subshining, brown or black ocellar triangle and brown vertical plates; orbits, vertex, gena and occiput silver-white microtrichose; parafacial narrow, 0.25–0.3× broader than postpedicel, reddish-yellow, sparsely white microtrichose. Frontal plates with 6–7 pairs of short proclinate parafrontal setulae and 6–8 frontal seta on each side, frontal vitta whitish microtrichose, with 2–3 proclinate or inclinate interfrontal setae (Fig. 10 D). Eye 1.4–1.6× higher than long. Face with upper part separated from epistome by shallow fold; yellow, white microtrichose; epistome moderately produced anteriorly, brown laterally and anteroventrally to black medially, sparsely white microtrichose, with metallic bluish sheen. Clypeus brown to black, sparsely white microtrichose, subshining, 0.25–0.3× higher than epistome. Gena brownish yellow, with long genal seta and 6–8 additional long peristomal setae anterior to genal seta, 0.6–0.8× longer than the latter one. Occiput black, except postgena partly brown, with cyan metallic sheen, greyish microtrichose.

Antenna yellow; scape and pedicel with black setulae; postpedicel yellow, whitish microtrichose, twice as long as wide, apically rounded; arista black except yellow at base, almost bare. Mouthparts brown to black, prementum black, sparsely microtrichose. Palp yellow, narrowly crescent, apically rounded, with 8–12 moderately strong black setulae, of them 4–5 subapical setulae 1.5–2× longer than other setulae.

Thorax (Fig. 10 E) brown to black, with bluish sheen and sparse white and brown microtrichia not hiding underlying cuticle. Mesonotal scutum 1.3–1.4× longer than wide; black setulose, with 6–8 rows of setulae between rows of dorsocentral setulae; acrostichal prescutellar seta present, 0.4–0.5× longer than posterior dorsocentral seta; prescutellar area with 2 setulae between posterior dorsocentral setae. Scutellum dorsally very slightly convex, brown, apically yellow, subshining, sparsely microtrichose, devoid of setulae, with silver or bronze sheen. Subscutellum shining, black, sparsely microtrichose. Mediotergite shining black, non-microtrichose medially. All the setae and setulae black.

Wing (Fig. 6 C) 3.6–4.7 mm (♀) long, 3.0–3.4× longer than wide; basicostal cell hyaline; costal cell 6–6.5× longer than wide, brown in basal and apical 1/8 of length, with costa straight, forming very inconspicuous cleft before apex of vein Sc; pterostigma entirely brown, narrow triangular, 1.6–1.9× longer than wide, vein R_1 bare, ending slightly proximally of crossvein r-m level in both sexes; vein R_{2+3} slightly arcuate in basal half, almost straight at apex. Crossvein r-m proximally of middle of cell dm. Cell r_{4+5} 5.5–6.5× longer than wide. Cell m_1 narrowly triangular; ultimate section of M_1 3.0× longer than crossvein dm-m and 0.9–1.0× longer than penultimate section. Vein CuA Z-shaped, forming moderately short posteroapical lobe of cell cua along vein CuP, 1.25× longer than its anterior shoulder. Wing pattern with short subbasal crossband from humeral vein through cell cua into alula joined with large dark brown mark from apical part of costal cell to wing subapical portion, with 2 hyaline triangular incisions: from costal cell into cell cua and from cell r_1 through cell into base of cell r_{4+5} distally of crossvein r-m, and entirely dark from anal cell to base of cell m_1 and narrow crescent incision from apex of cell m_1 into cell r_1 parallel to wing apex and a narrow brown crescent band along apex (Figs 6 C, 10 A). Cell cup and anal lobe half as wide as cell cua. Alula 4× longer than wide, grey, darkened in apical half. Calypters white, with white cilia. Halter yellow.

Legs (Fig. 10 A) with black coxae and femora except apices and bases of femora yellow; tibiae brown; tarsi brownish yellow; black setose and setulose. Fore femur uniformly setulose, with subapical row of 2–4 posteroventral setae as long as femur width. Mid femur anteriorly with short suberect setulae; mid tibia ventrally with single spur-like seta 5–7× longer than tibia width.

Abdomen brown to black, sparse black setulose, with faint purplish or greenish metallic sheen.

Male genitalia (Figs 11 A–H) with short hemispherical, separated cerci (Fig. 11 E); epandrium densely setulose, wide ovoid, with narrow, posteromesally directed surstyli having no lobes, and bearing 2 groups of 2–3 setulae on postero-medial surface at base and apex, and also one thicker, pimple-like apical process (Figs 11 B–D, G, H). Phallus rather short, 2–3 times as long as epandrium high, sparsely trichose (Figs 11 B, C). Hypandrium with phallic guide somewhat bilobate, with short suboval lobes projecting posteriorly, pair of oval, anteriorly directed postgonites just anterior to basiphallus ring, and symmetrical pregonites anterolateral to them, both with groups of 5–6 trichoid sensilla.

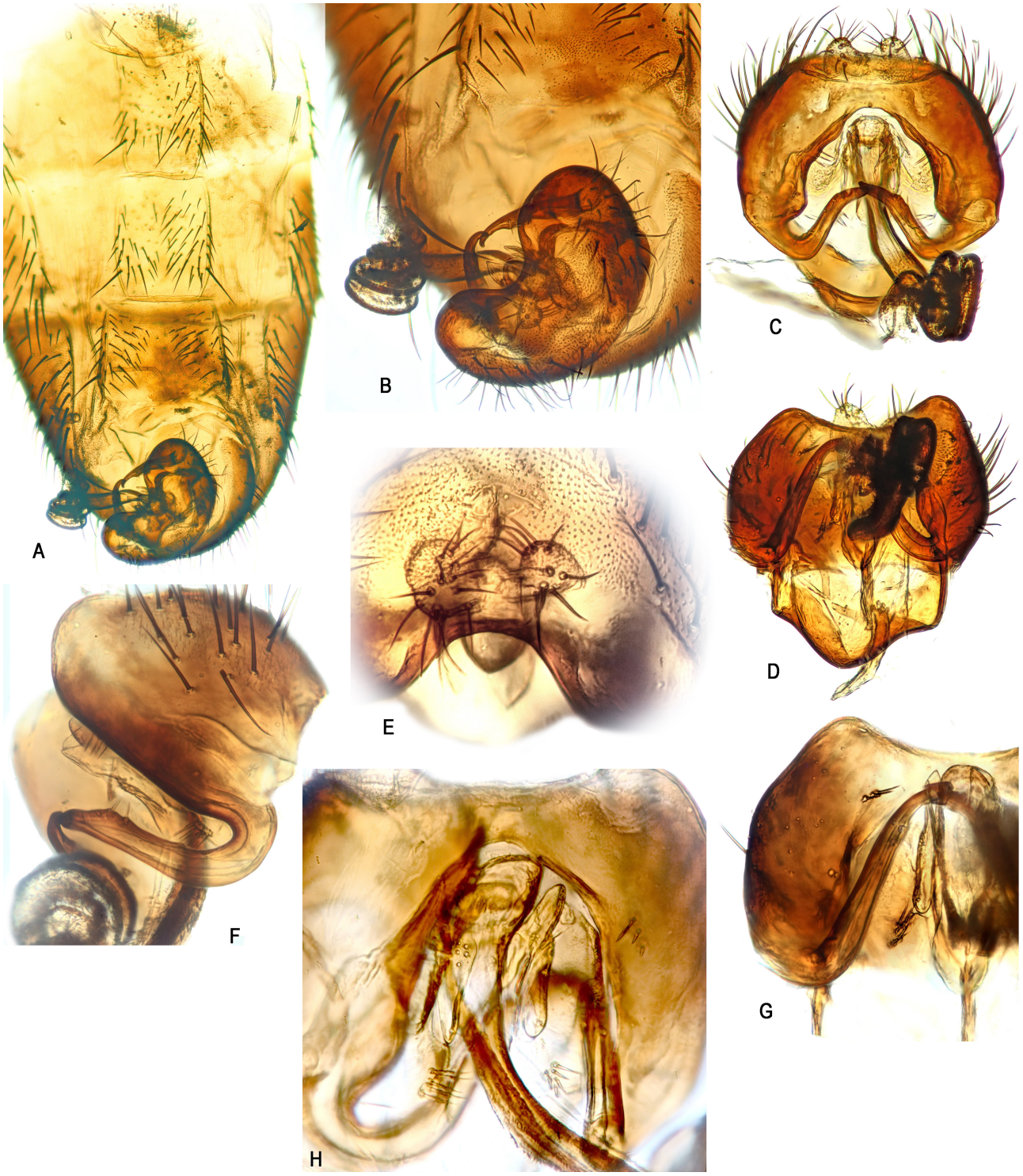

FIGURE 11. *Aspistomella angustifrons* (Hendel) ♂. **A**, abdomen ventral; **B**, postabdomen; **C**, genitalia, postero-ventral; **D**, same, anteroventral; **E**, cerci; **F**, surstylus, latero-ventral; **G**, genitalia, ventral; **H**, hypandrium, ventral.

Female terminalia: aculeus with ovoid, long-setulose cercal unit (Figs 12 A, B); 2 globose spermathecae (Fig. 12 C).

Remarks. Hendel (1909b) mentioned 9♂♀ from "Peru (Meshagua, Oktober; Pichis, Dezember)", but only three specimens matching this record were found in the SMTD and NHMW collections. We suspect in this case that Hendel's list of type localities may be based on a few specimens from the whole series.

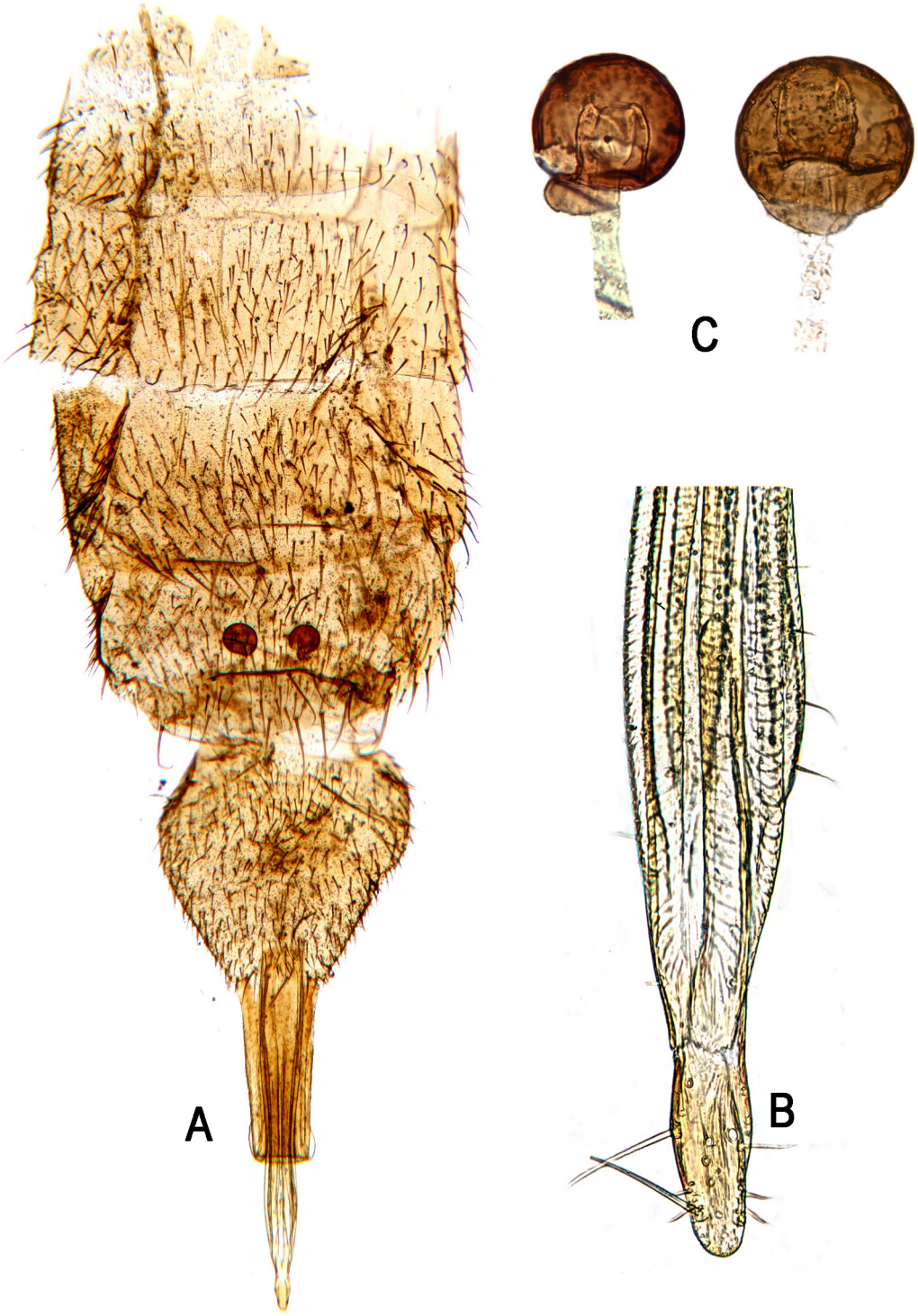

FIGURE 12. *Aspistomella angustifrons* (Hendel) ♀. **A**, abdomen, ventral; **B**, apex of aculeus; **C**, spermathecae.

***Aspistomella crucifera* (Hendel, 1909) comb. nov.**
Figs 6 E, 13.

Paraphyola crucifera Hendel 1909b: 262, 1910: 47; Steyskal 1968: 54.20.

Material examined. Type. Holotype ♀**: Peru**: "Peru—Meshagua / 29.9.03 / Urubambafl." [Schnuse leg.], "Paraphyola \ crucifera H. / det. F. Hendel" (SMTD).

Diagnosis. *Paraphyola crucifera* shares with *P. angustifrons*, *P. quinquincisa*, and *P. teresensis* a comparatively short head, narrow frons and wings, a wing pattern with a widely dark apical half, as well as wing venation, and chaetotaxy, It differs from *P. angustifrons* in having yellow coxae, femora and tarsi (in *P. angustifrons*, largely black) and hyaline spot in posterior margin of cell m_4. It is most similar to *P. quinquincisa* in having wing pattern with apical dark, differing from it by having 4 hyaline incisions: cell r_1 with 2 marginal hyaline marks narrowed posteriorly, and the hyaline mark in cell m_1 only reaching vein M_1 (in, *P. quinquincisa*, crossing vein M_1 to the middle of cell r_{4+5}). It differs from *P. teresensis* by cell r_1 with 2 marginal hyaline marks, the first one reaching vein M_1, the second one reaching the anterior half of cell r_{4+5} and cell m_1 with submarginal hyaline mark reaching only vein M_1 (in *P. teresensis*, cell r_1 with one cuneiform hyaline incision extending into cell dm and cell m_1 with cuneiform hyaline incision extending at least to vein R_{4+5} or even into cell r_{2+3}).

It also differs from *P. schnusei* by short epistome and wing apical half widely dark (in *P. schnusei*, epistome strongly produced anteriorly and wing widely hyaline with narrow bands apically).

Description. Male. **Head** (Figs 13 B–C) ratio (length : height : width) = 1 : 1.5 : 2, frons, face above transverse fold, parafacial, and gena reddish or yellowish brown, epistome and occiput mostly black. Frons very narrow, slightly narrowed posteriorly, 0.95× as long (from lunule to anterior ocellus) or 1.8× (from lunule to inner vertical seta) as wide (at lunule), with subshining, brown or black ocellar triangle and brown vertical plates; orbits, vertex, gena and occiput silver-white microtrichose; parafacial narrow, 0.25–0.3× broader than postpedicel, reddish-yellow, sparsely white microtrichose. Frontal plates with 8–9 tiny parafrontal setulae and 5–7 frontal setae on each side, frontal vitta sparsely whitish microtrichose, with 2–4 pro- or inclinate interfrontal setae (Fig. 13 C). Eye 1.5× higher than long. Face; yellow, white microtrichose above epistome; epistome moderately produced anteriorly and separated from upper part of face by shallow fold, brown, sparsely white microtrichose, with metallic bluish sheen. Clypeus brown, sparsely white microtrichose, subshining, 0.2× higher than epistome height. Gena brownish yellow, with long genal seta and 6–7 additional long peristomal setae anterior of it, 0.5–0.7× longer than genal seta (Fig. 13 B). Occiput black, with cyan metallic sheen, greyish microtrichose. Antenna yellow; scape and pedicel with black setulae; postpedicel yellow, whitish microtrichose, 1.9× longer than wide, apically rounded; arista black except yellow at base, almost bare. Mouthparts brown to black, prementum black, sparsely microtrichose. Palp yellow to brown, as described for *P. angustifrons*.

Thorax brown to black, silvery subshining, with sparse white microtrichia not hiding underlying cuticle. Mesonotal scutum (Fig. 13 D) 1.4–1.5× longer than wide; black setulose, with 6–7 rows of setulae between rows of dorsocentral setulae; acrostichal prescutellar seta present, 0.4–0.5× longer than posterior dorsocentral seta (prescutellar area partly destroyed with pin). Other setae as described for the genus, black. Scutellum dorsally very flattened, brown, subshining, sparsely microtrichose, devoid of setulae, with silver sheen. Subscutellum and mediotergite as in *P. angustifrons*.

Wing (Fig. 6 E) about 4 mm (♀) long (holotype with both wings broken off), 3.3× longer than wide; basicostal cell hyaline; costal cell straight, 5.2× longer than wide, brown in basal 1/8 of length; pterostigma entirely brown, narrow triangular, 2.7–3× longer than wide, vein R_1 bare, ending proximally of crossvein dm-m level; vein R_{2+3} slightly arcuate in basal half, straight at apex. Crossvein r-m distally of middle of cell dm. Cell r_{4+5} 6.5× longer than wide. Cell m_1 narrow triangular; ultimate section of M_1 4.7× longer than crossvein dm-m and 3.2× longer than penultimate section. Vein CuA Z-shaped, forming moderately short posteroapical lobe of cell cua along vein CuP, 1.25× longer than its anterior shoulder. Wing pattern with short subbasal crossband from humeral vein through cell cua into alula; wing distally of cells c, bm, cua and radial fork dark brown with 4 large hyaline areas: 2 hyaline subtriangular incisions at anterior margin from cell r_1 through cell r_{2+3} into base of cell r_{4+5} distally of crossvein r-m and 2 rounded or subrectangular hyaline spots in apical parts of cells dm and cua_1 and basal part of cell m_1; dark pattern separating these hyaline areas having shape of cross; wing apex dark without hyaline marks. Calypters white, with white cilia. Halter yellow.

Legs (Fig. 13 A) yellow; black setose and setulose. Fore femur uniformly setulose, with subapical row of 2–4 posteroventral setae as long as femur width. Mid femur anteriorly with short suberect setulae; mid tibia ventrally with single spur-like seta 3–5× longer than tibia width.

Abdomen brown to black, sparsely setulose.

Male: not known.

Female terminalia (not dissected): aculeus with ovoid, long-setulose cercal unit (partly exposed).

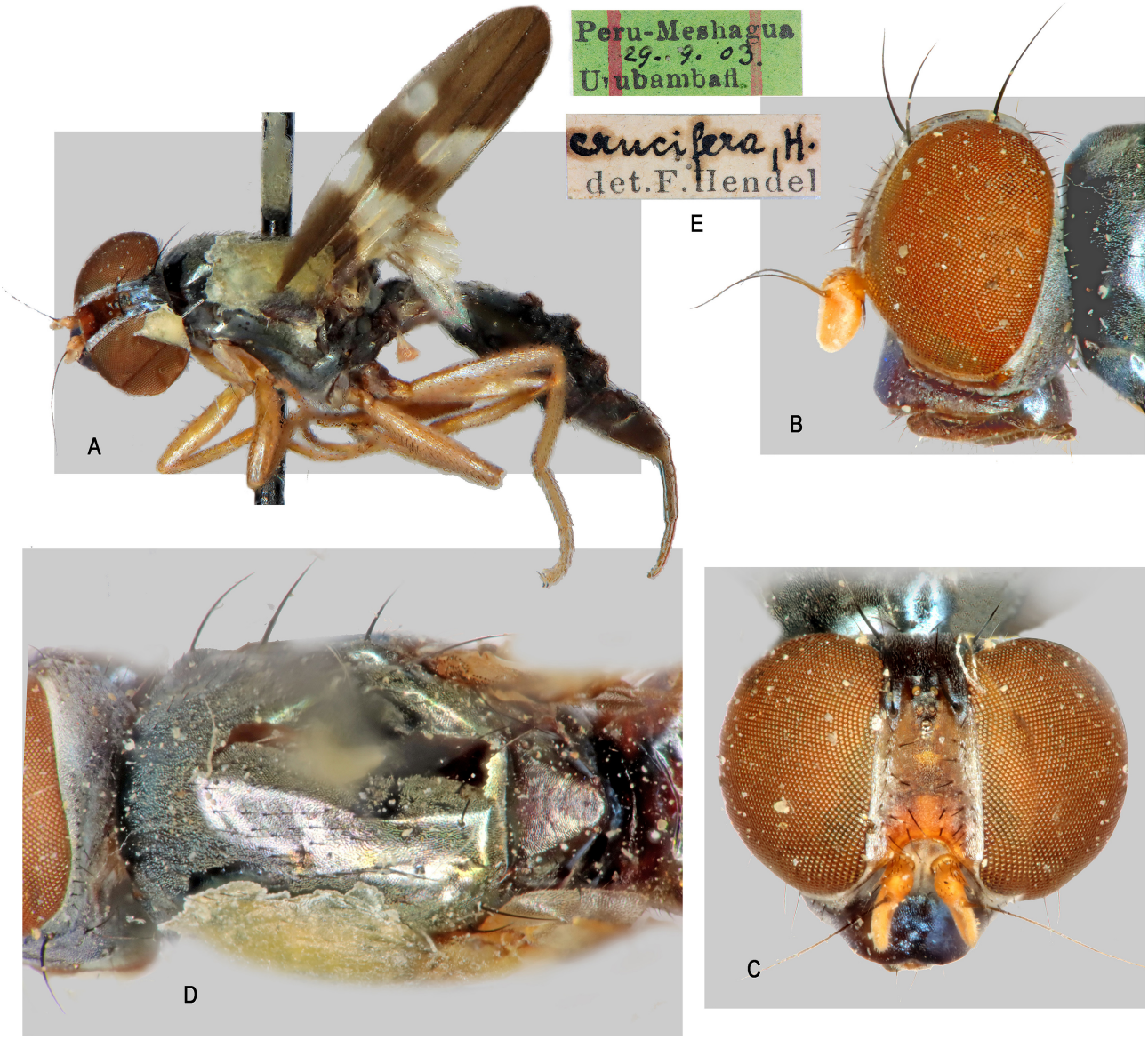

FIGURE 13. *Aspistomella crucifera* (Hendel) holotype ♀. **A**, habitus, left; **B**, head left; **C**, head, dorsal; **D**, mesonotum, dorsal; **E**, labels.

Remarks. The specimen is partially damaged: both wings are broken off. A pencil sketch of the wing pattern was drawn by VK in 2001, before the curator glued it back to the thorax with fish glue as in the photo (Figs 13 A, D); it was later redrawn as in Fig. 6 E.

***Aspistomella duo* Kovac, Kameneva & V. Korneyev, sp. nov.**
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Figs 1 B, 5 C, 7 A, 9 A, G, 14–21

Material. Type. Holotype ♂: "**Bolivia**: Buena Vista, near Santa Cruz [El Cairo, 17.5009S, 63.6743W]; on upright bamboo culm (*Guadua chacoensis*, last year); 29.i.2011; Bol 91/11 leg. D. Kovac" (SMF). **Paratypes**: 2♂, 1♀ (1♂, 1♀ dissected); **Bolivia**: same data as for holotype (D. Kovac leg.) (SIZK); 2♀, same data as for holotype (D. Kovac leg.); larva in bamboo internode (*Guadua chacoensis*, last year), emerging on 8.ii.2011, Bol 156/111, (leg. D. Kovac) (SMF).

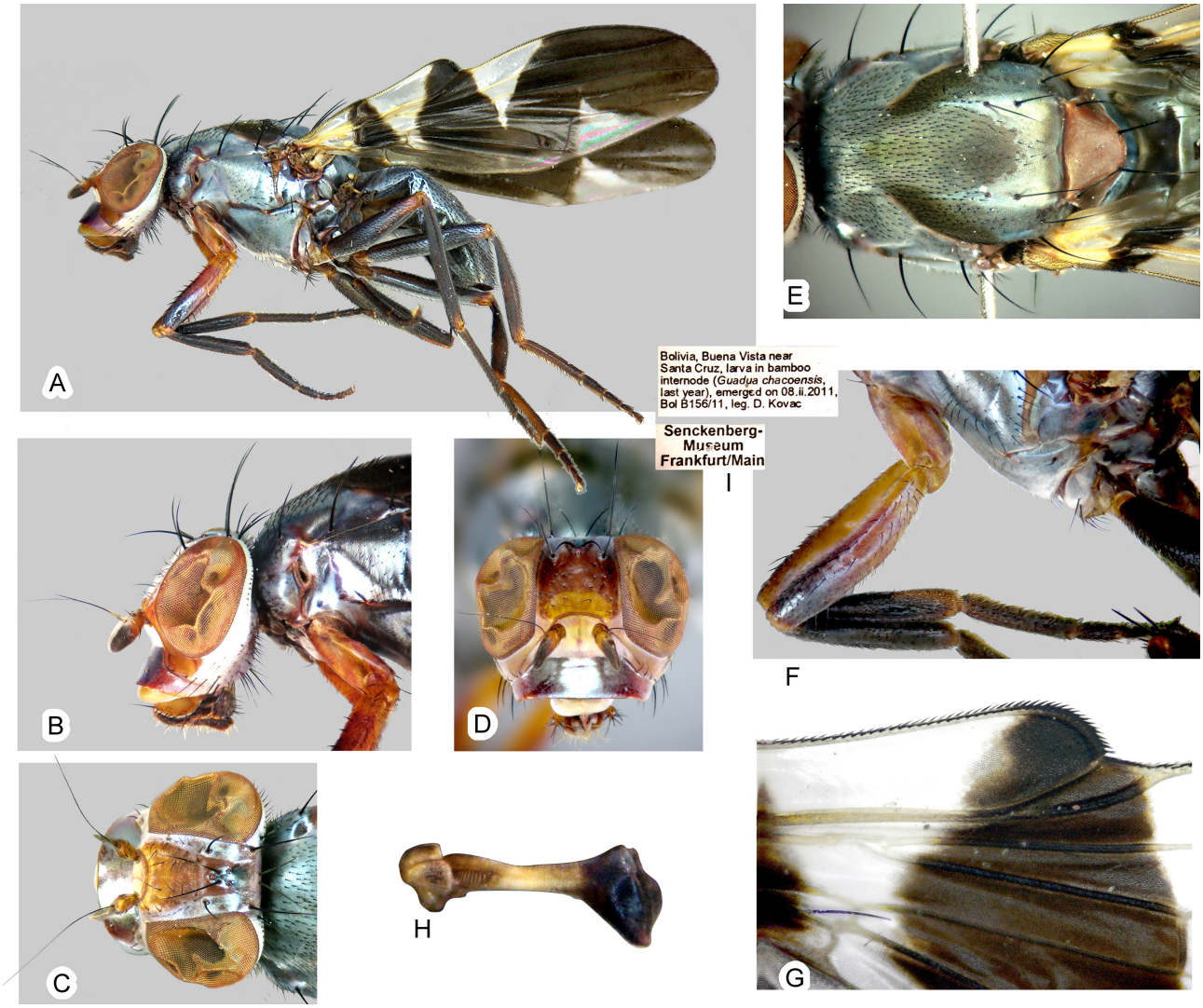

FIGURE 14. *Aspistomella duo* **sp. nov.** holotype ♂. **A**, habitus, left; **B**, head, left; **C**, head, dorsal; **D**, head, anterior; **E**, mesonotum, dorsal; **F**, fore legs; **G**, wing, anterobasal part; **H**, halter; **I**, labels.

Non-type. Bolivia: Buena Vista, near Santa Cruz (El Cairo); [17.4734S, 63.6922W], 1.xii.2007, Bol.76.07; 1 ♂ (alcohol collection) (D. Kovac leg.) (SMF); 1.12.2007, Bol.77.07, 5♂; (alcohol collection) (SMF); same label, 1♂, (SEM stub) (SMF); same label, 1♂ (SIZK).

Larvae. Bolivia: Buena Vista, 6.ii.2011, BolZ32/11, 6 larvae (D. Kovac leg.) (SMF).

Diagnosis. *Aspistomella duo* is similar to other species of the genus having a very short pterostigma, shorter than the width of the costal cell (Fig. 5 C), but differs from them in details of the wing pattern: apical quarter of cell r_{4+5} completely dark (in *A. heteroptera*, *A. enderleini*, *A. lobioptera*, *A. lunata*, *A. steyskali*, crossed by crescent hyaline incision); *Aspistomella duo* is similar to *A. tres* in having wing apex without hyaline incisions crossing cell r_{4+5} and vein R_1 dorsoapically setulose, but differs from it in having cell dm between crossveins r-m and dm-m completely dark and a conspicuously narrower wing.

Description. Adult. Male. **Head** (Figs 14 B–D) ratio (length : height : width) = 1 : 1.4 : 1.75, frons, parafacial and gena reddish or yellowish brown, except anterior part of frons. Lunule and face between antennae yellow. Occiput mostly black, at least in dorso-lateral part. Frons (Fig. 14 D, C, 15 A) 1.15× longer than wide, with shiny, partly brown or black ocellar triangle and brown vertical plates; orbits silver-white microtrichose; parafacial narrow, 0.2–0.3× broader than postpedicel, white microtrichose. Frontal setulae short, moderately strong, black, proclinate and partly inclined, forming three irregular rows of 2–6 setulae on each side, anteriormost setulae longer than others and as long as outer vertical seta; 1 very long orbital seta, 1.3× longer than ocellar seta, 0.75× longer than inner

vertical seta and 2.5× longer than outer vertical seta; postocellar seta long, 0.4× longer than inner vertical seta; outer vertical seta short, 0.3–0.4× longer than inner vertical seta and 2–3× longer than postocular setae forming one row, allied by 8–9 dorsal and 13–19 ventral occipital setae. Lunule very narrow, indistinct, orange. Eye 1.5–1.7× higher than long. Face (above suture) 0.5× higher than wide at transverse fold, yellow to brownish yellow, densely white microtrichose; epistome reddish brown to black (medially), sparsely white microtrichose, with metallic greenish or golden sheen, strongly produced anteriorly and separated from upper part of face by deep suture. Clypeus yellow, densely white microtrichose, matt, 0.5–0.6× higher than epistome. Gena brownish yellow, with long genal seta and 5–6 additional setae anterior to it, 0.6–0.8× longer than genal seta. Occiput black, except postgena brownish-yellow, with yellowish to cyan metallic sheen, moderately densely covered with greyish microtrichia partly hiding underlying cuticle; ventral part of occiput (postgena) with 4–6 setae almost as long as genal seta. Antenna brownish yellow; scape and pedicel with black setulae; postpedicel brown, often blackish apically, whitish microtrichose, 2–2.2× longer than wide, apically rounded; arista black except yellow at base, almost bare. Mouthparts black, prementum black, shiny. Palp yellow, narrowly crescent-shaped, apically rounded, with 10–12 strong black setulae, of which 2–3 subapical setulae 1.5–2× longer than other setulae.

Thorax (Figs 14 E, 16 A) brown to black, with bluish sheen and sparse white microtrichia not obscuring underlying cuticle. Mesonotal scutum 1.3× longer than wide; presutural area with large black patch and brown margin, including postpronotal lobes and notopleuron; 3 pairs of black vittae: short submedially, reaching posteriorly only to level of postsutural supra-alar seta, intra-alar and supra-alar vittae fused anteriorly at transverse fold and reaching level of intra-alar setae and yellow to dark brown prescutellar area; black setulose, with 10–14 rows of setulae between rows of dorsocentral setulae; acrostichal prescutellar setae present (in 3 of 6 specimens examined), absent (in 2 of 6 specimens examined), or present on one side only (in 1 specimen examined); prescutellar area medially setulose and without setulae around dorsocentral setae. Scutellum dorsally very slightly convex, orange to reddish brown, matt, sparsely microtrichose, without setulae, laterally sometimes with inconspicuous silvery sheen. Subscutellum subshining, dark brown. Mediotergite shiny black, sparsely microtrichose. Other setae as described for the genus. All the setae and setulae black.

Wing (Fig. 5 C) 6.1–7.7 mm (♂), 5.7–7 mm (♀) long, 2.9–3.5× longer than wide; basicostal cell hyaline; costal cell lobed, 4× longer than wide, brown in basal and apical quarters of length, with costa conspicuously curved posteriorly and covered with slightly longer setulae before apex of vein Sc; pterostigma entirely brown, narrowly triangular, 0.4–0.5× longer than wide, vein R_1 with 3–4 setulae dorsally, ending slightly proximal of crossvein dm-m level in both sexes (Fig. 14 G); vein R_{2+3} almost straight, subparallel to costa to very apex. Crossvein r-m slightly distal to center of cell dm in both sexes. Cell r_{4+5} 7–8× longer than wide, apically narrowed. Cell m_1 narrowly triangular; ultimate section of M_1 4–5× longer than crossvein dm-m and 2–2.5× longer than penultimate section. Vein CuA Z-shaped, cell cua with moderately short posteroapical lobe along vein CuP. Wing pattern with short subbasal crossband from humeral vein to base of cell cua and large dark brown, Z- or 2-shaped mark widely from apical lobe of costal cell almost to base of cell dm and longitudinal fold of cell m_4, and 2 wide triangular incisions from cell r_1 into cell dm distally from crossvein r-m and from base of cell m_1 into cell r_{4+5}. Calypters white, with white ciliae. Halter brown with black or brown knob (Figs 14 H, 16 G, H).

Legs (Figs 14 A, F, 16 I–O) with yellow or brownish-yellow coxae and trochanters, femora entirely yellow to entirely brown; tibiae and tarsi either brownish yellow or brown, in 2 specimens contrasting with yellow femora, black setose and setulose, without conspicuous microtrichia or metallic sheen in examined specimens. Fore femur with 2 rows of posterodorsal and posterior setae, and 3–4 preapical posteroventral setae, all slightly shorter than femur width. Mid femur anteriorly and posteriorly with short setulae, but without long erect setae; mid tibia ventrally with two subequal spur-like setae 2–2.5× longer than tibia width (Fig. 16 K). Tarsi as on Figs 17 J–O.

Abdomen moderately elongate (Fig. 16 C) brown to completely black, syntergite 1+2 often brownish-yellow; tergites finely sparsely microtrichose, with faint cyan metallic sheen, except tergite 5 of ♂ brown or black without metallic sheen; setulae and setae black. Male tergites 3, 4 and 5 of subequal length. Female tergite 6 short, hidden underneath tergite 5; sternite 6 transverse; oviscape as long as tergites 4–6 combined.

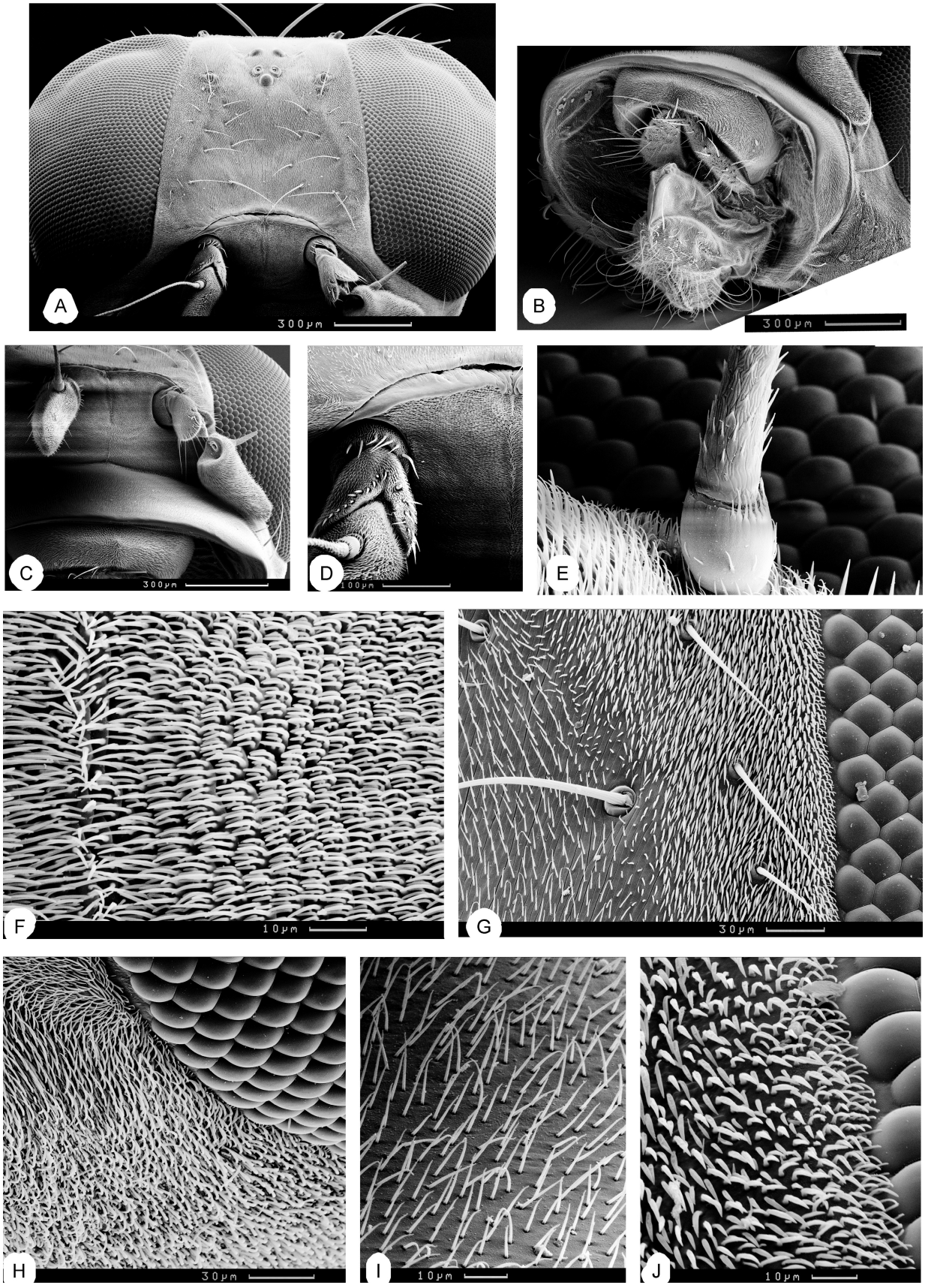

FIGURE 15. *Aspistomella duo* **sp. nov.** SEM views ♂. **A**, frons, anterior; **B**, peristomal cavity and mouthparts, anteroventral; **C**, face, clypeus and antennae; **D**, stipe, pedicel, base of postpedicel and arista; **E**, base of arista; **F**, macrotrichia on dorsal part of frons; **G**, frontal vitta, fronto-orbital plate and compound eye: microtrichia and setae; **H**, parafacial and compound eye: microtrichia; **I**, epistome, microtrichia; **J**, gena, microtrichia. (All photographs by Damir Kovac.)

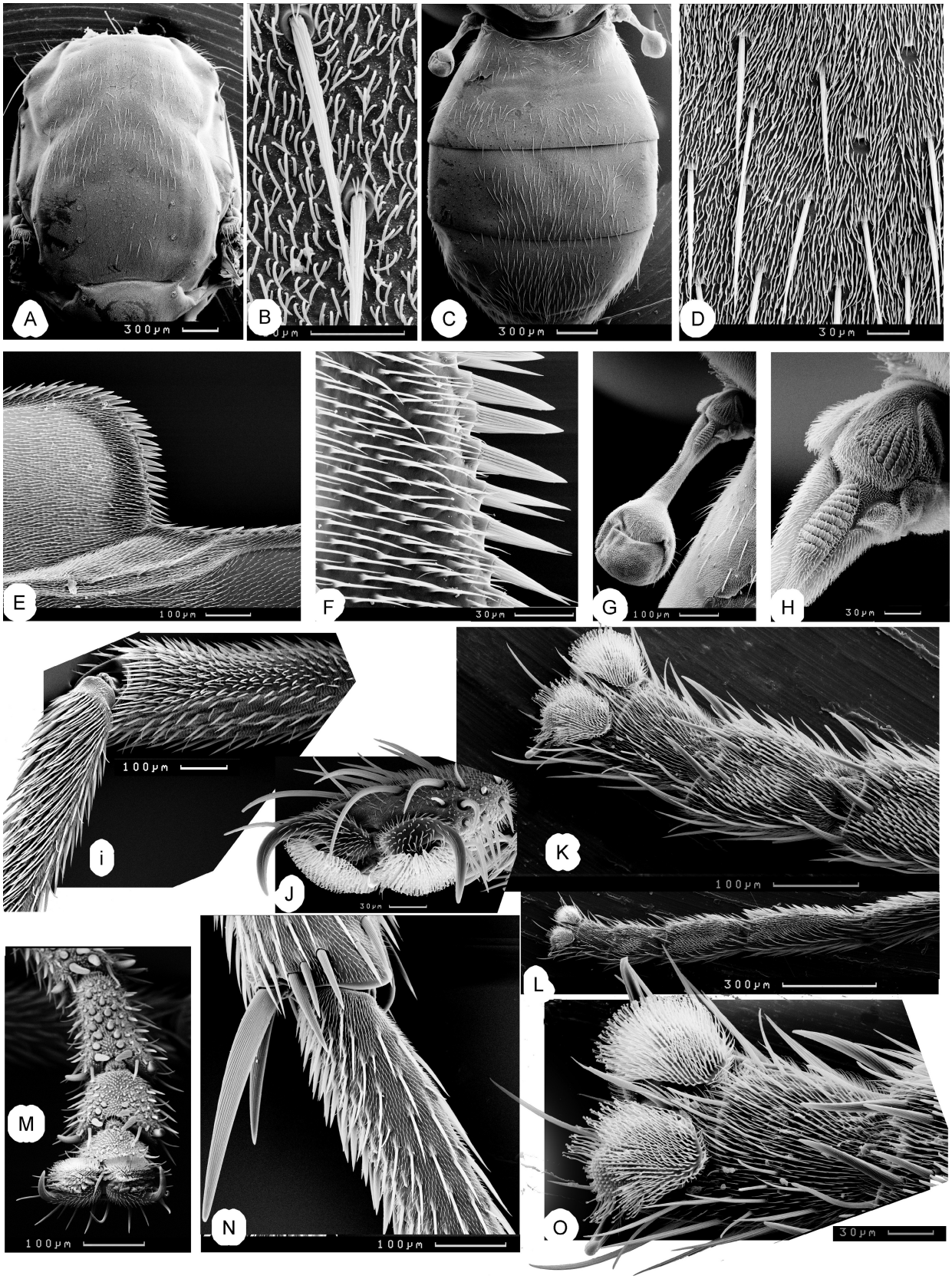

FIGURE 16. *Aspistomella duo* **sp. nov.** SEM views ♂. **A**, mesonotum (setae broken off); **B**, mesonotal setulae and microtrichia, enlarged; **C**, abdominal tergites, dorsal; **D**, abdominal setulae and microtrichia, enlarged; **E**, lobe of costal cell and pterostigma; **F**, microtrichia and spinulose setulae on costal vein; **G**, halter; **H**, base of halter, enlarged; **I**, fore tarsus and fore tibia, part; **J**, fore tarsus, apical tarsomere, claws and pulvilla; **K–L**, **O**, mid tarsus, dorsal, different magnifications; **M**, hind tarsus, apicoventral; **N**, mid tibia, apex, and mid basitarsus, basal part. (All photographs by Damir Kovac.)

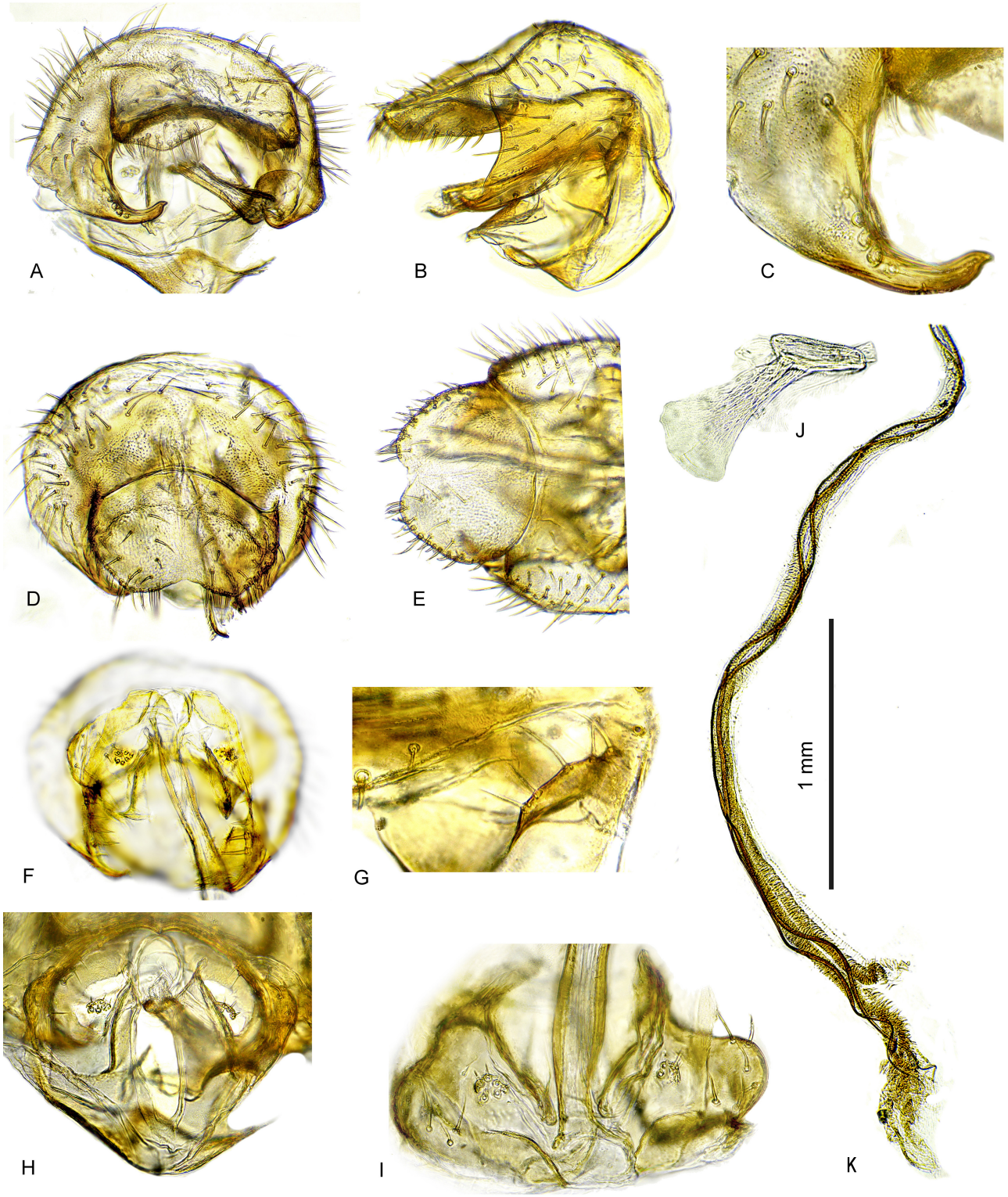

FIGURE 17. *Aspistomella duo* **sp. nov.** ♂ genitalia. **A**, epandrium and hypandrium, posterior; **B**, same, lateral and left view; **C**, left surstylus, posterior; **D**, epandrium and cerci, posterodorsal; **E**, cerci, dorsal; **F**, hypandrium, anterior; **G**, pregonite, lateral; **H**, hypandrium, posterior; **I**, same, antero-ventral; **J**, ejaculatory apodeme; **K**, phallus. Scale bar same for **A**, **B**, **D**, **E**, **J**, **K**.

Postabdomen. Cerci short setulose, dorso-ventrally flattened and broadly fused, posteriorly very shallowly bilobate (Figs 17 D, E). Epandrium short setulose, with setulae 3–6 × narrower than base of surstylus (Figs 17 A, B). Each surstylus basally broad, gradually curved mesally, with a row of five shortened setulae on its mesal surface,

two of which conspicuously thickened, but not strongly sclerotised (Fig. 17 A). Pregonites symmetrical, slightly lobed, with 5 setulae ventro-mesally, conspicuously anterior to postgonites (Figs 17 F, G, I). Postgonites rounded, with 5–6 small trichoid sensilla (Figs 17 F, H, I). Phallus basally short microtrichose, apically with numerous lamellar cuticular sclerotisation, about 3.5 mm long; in rest, coiled on right side of abdomen (Fig. 17 K).

Female: all taeniae 0.66× longer than eversible membrane (Fig. 18 B); aculeus not flattened (Fig. 18 C), with long setulose ovoid cercal unit and (Fig. 18 C), 1.9 mm long; 2 subglobose spermathecae (Fig. 18 A, E).

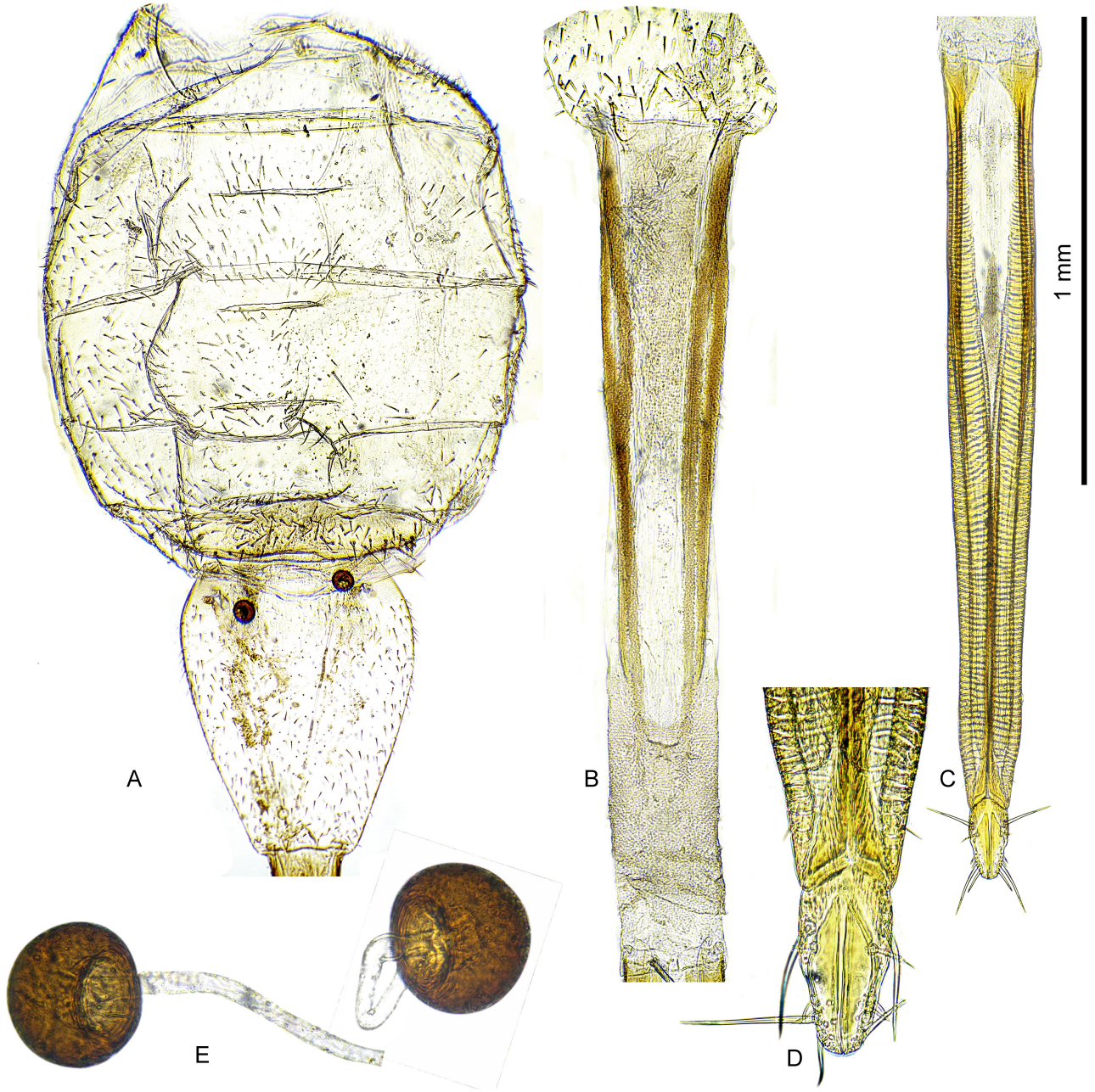

FIGURE 18. *Aspistomella duo* **sp. nov.** ♀. **A**, preabdomen, oviscape and spermathecae, ventral; **B**, eversible membrane; **C**, aculeus; **D**, cercal unit; **E**, spermathecae.

Third instar larva. General structure. Mature larva whitish, muscidiform, length 7.5–11.2 mm (median: 8.45 mm; n = 8), width 1.8–2.5 mm (median: 2.4 mm; n = 8), anteriorly conical, posteriorly rounded, broadest at caudal segment (or sometimes posterior end of abdominal segment VII), surface largely smooth except of spinules of the locomotory creeping welts on ventral abdominal segments I–VII and caudal segment, anterior spiracles fan-shaped, roundish spiracular discs dark, bearing three spiracular openings radiating in a sinuous line out from ecdysial scar.

Pseudocephalon (Figs 19 A–F) flat ventrally, rounded dorsally, deep incision between cephalic lobes, ventral half of incision connected to oral cavity (Fig. 19 A). Antenna three-segmented, located dorso-laterally on cephalic lobe near head apex; basal segment broad and round, second segment slightly conical when extended and surface covered by two finger-like extensions of the epidermis, apical segment conical with rounded apex (often collapsed in SEM specimens) (Figs 19 A–C, E). Maxillary sense organs located on ventral side of cephalic lobes, maxillary palpus contains three papillary sensilla and two knob sensilla enclosed by an incomplete cuticular fold, dorsolateral group of sensilla contains two papillary sensilla (Fig. 19 F).

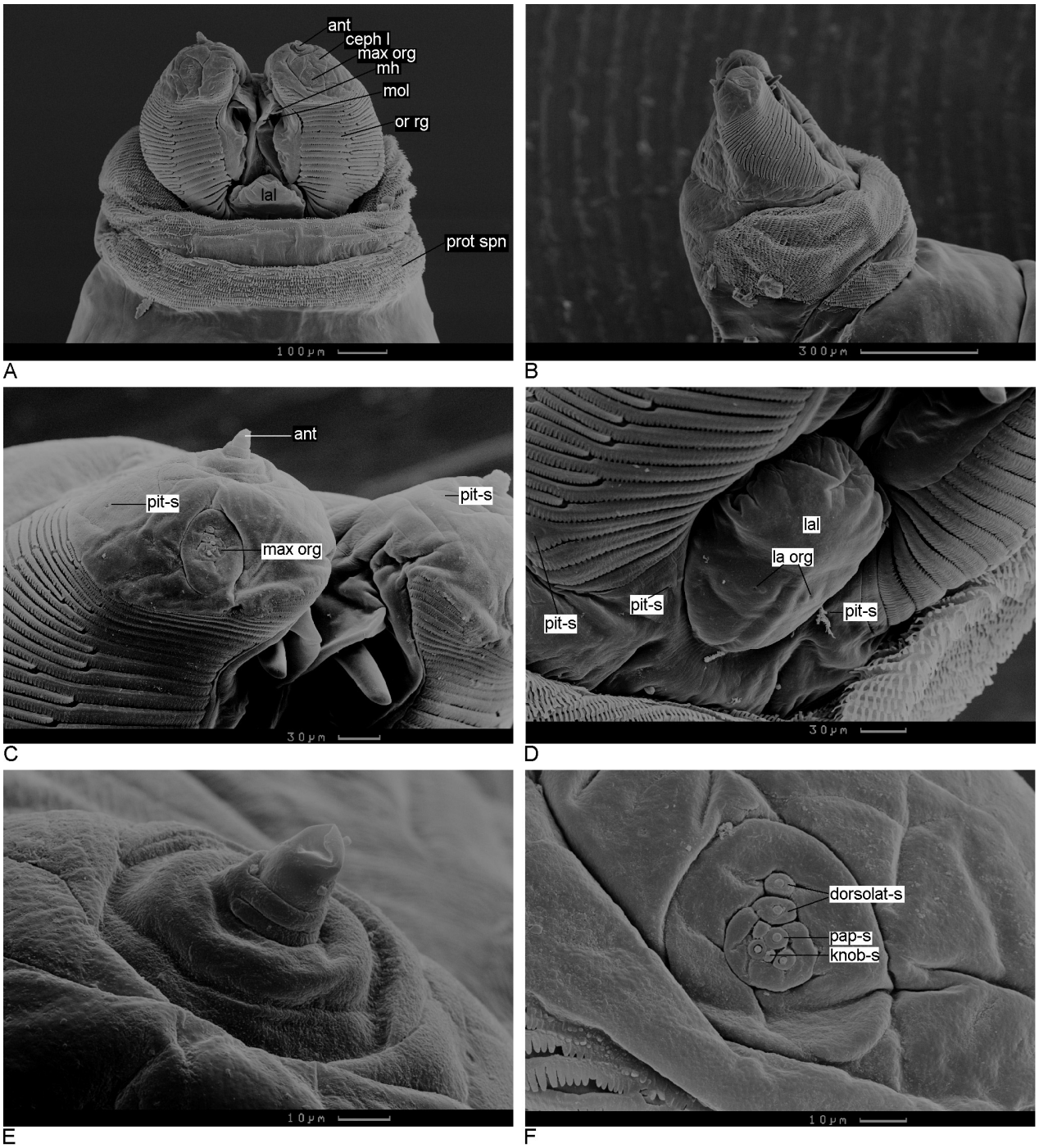

FIGURE 19. *Aspistomella duo* **sp. nov.**, SEM views of pseudocephalon and thoracic segment I . **A**, pseudocephalon and anterior portion of thoracic segment I, ventral view; **B**, pseudocephalon and thoracic segment I, lateral view; **C**, cephalic lobes and oral cavity; **D**, labial lobe; **E**, antenna; **F**, maxillary sense organ. Abbreviations: ant—antenna, ceph l—cephalic lobe, dorsolat-s—dorsolateral sensilla, knob-s—knob sensillum, lal—labial lobe, la org—labial organ, max org—maxillary organ, mh—mouthhook, mol—median oral lobe, or rg—oral ridges, pap-s papillary sensillum, pit-s—pit sensillum, prot spn—prothoracic spinules. (All photos by Damir Kovac.)

Mandibles completely smooth with flattened apices, separated from each other by two median oral lobes (Fig. 19 C). Facial mask occupies flat ventral area of pseudocephalon as well as semicircular lateral area (Figs 19 A, B). Central oral ridges adjacent to oral cavity wide, narrowing laterally, narrow part often interrupted by a single narrow gap. Additional short, narrow lateral oral ridges present in lateral semicircular area, protruding between the longer central oral ridges (Figs 19 A, B). Oral ridges regularly dentate, teeth densely stacked, with rounded tips. Twenty-eight central oral ridges adjacent to oral cavity, identical on both sides of the body (n = 2 larvae). Caudal region of oral cavity closed by labial lobe bearing two rounded indentations (labial organ, Fig. 19 D). Four pairs of pseudocephalic cuticular pit-sensilla, one pair between the antennae, one pair laterally on the cephalic lobes, one pair in the latero-caudal part of the oral ridges and one pair flanking the labial lobe (Figs 19 C, D).

Cephalopharyngeal skeleton (Fig. 7 A) total length = 1.6–1.7 mm (n = 2). Base of mouthhooks dark brown with elongate, light brown window, long, thin, curved apical tooth lighter brown than base of mouthhook, indentation between tips of apical tooth and ventral apodeme 0.57–0.60× as deep as wide; neck well developed; preapical tooth absent; ventral apodeme large, ventrally oriented; dorsal apodeme oriented posterodorsally. Small dental sclerites visible. Hypopharyngeal sclerite 4.0–4.5× longer than high, anterior part dark brown, posterior part light brown. Hypopharyngeal bridge slightly anterior to the mid-length of the hypopharyngeal sclerite. Labial and epipharyngeal sclerites located between the anterior parts of the lateral plates of the hypopharyngeal sclerite. Parastomal bars light brown, slightly curved, about as long as hypopharyngeal sclerite. Pharyngeal sclerite light brown, darker brown in area of tentorial phragma, dorsal bridge, ventral bridge and connection of dorsal and ventral cornua; dorsal and ventral cornua hyaline to light brown, nearly equal length, ventral part of pharyngeal sclerite with cibarial ridges. Dorsal and ventral bridges distinctly protruding. Anterior sclerite absent.

Thoracic segments I–III. Paired anterior spiracles on thoracic segment I, each spiracle contains fan-shaped arranged tubules with slit-like openings at the apex (Figs 20 A, B), 17–27 tubules per row (median = 20.5, n = 19 rows of tubules from 10 larvae). The number of tubules on the sides of the same larva often differs by one to three tubules. The anterior margin of the first thoracic segment is covered with numerous rows of trumpet-shaped bristles, except on the dorsal part (Figs 20 A, C). Paired rudimentary spiracular openings laterally on third thoracic segment (Figs 20 I, 8 A).

The first thoracic segment bears 14 cuticular sensilla and the second and third thoracic segments bear 13 cuticular sensilla on each side of the body. Cuticular sensilla include pit-, papilla-, "hair"- and trifid (Keylin's organ) sensilla (Figs 20 D–H). Spatial pattern of thoracic cuticular sensilla as in Fig. 8 A.

Abdominal segments I–VII. Abdominal segments I–VII bear 13 cuticular sensilla on each side of the body and a pair of rudimentary lateral spiracles (as in Fig. 8 A). Creeping welts of abdominal segments I–VII (CW1–7) consist of several rows of pointed, more or less curved and symmetrical to asymmetrical spinules, the row pattern varies between different abdominal segments. CW1 (Fig. 21 A): three rows of spinules of approximately equal size, first and third row continuous, middle row consists of short, slightly curved row parts shifted relative to each other. All spinules directed posteriorly. CW2 (Fig. 21 B): Two discontinuous or incomplete rows (rows b) followed by a continuous central row (row c); below that short rows with large spinules placed on raised ridges (rows d) arranged as follows: two short horizontal central rows, each consisting of two groups of large spinules each, seven to nine large spinules in each group, between them ca. three large spinules, horizontal central rows laterally flanked by six inclined curved rows angled to the body midline with spinules becoming smaller towards the midline, posterior row of creeping welt (row e) with continuous small spinules; all spinules of abdominal segment II directed posteriorly. CW3–CW7 (Fig. 21 C): similar to CW2, but additional anterior row (row a) with anteriorly directed spinules, all other spinules directed posteriorly. The inset in Fig. 21 C shows that large spinules in row d form only a single row, but sometimes there is a trace of a second row at the lateral edges of the two central parts on raised ridges (Fig. 9 I, arrow).

Caudal segment bearing 13 cuticular sensilla on each body side (Figs 21 E, 8 B, C). Caudal creeping welt CW8 similar in structure like CW3–CW7, but the last row is arranged along the an terior margin of the perianal pad with anteriorly oriented spinules. Large bristles not as regularly distributed as in previous creeping welts, and oriented upward rather than posteriorly (Fig. 21 D).

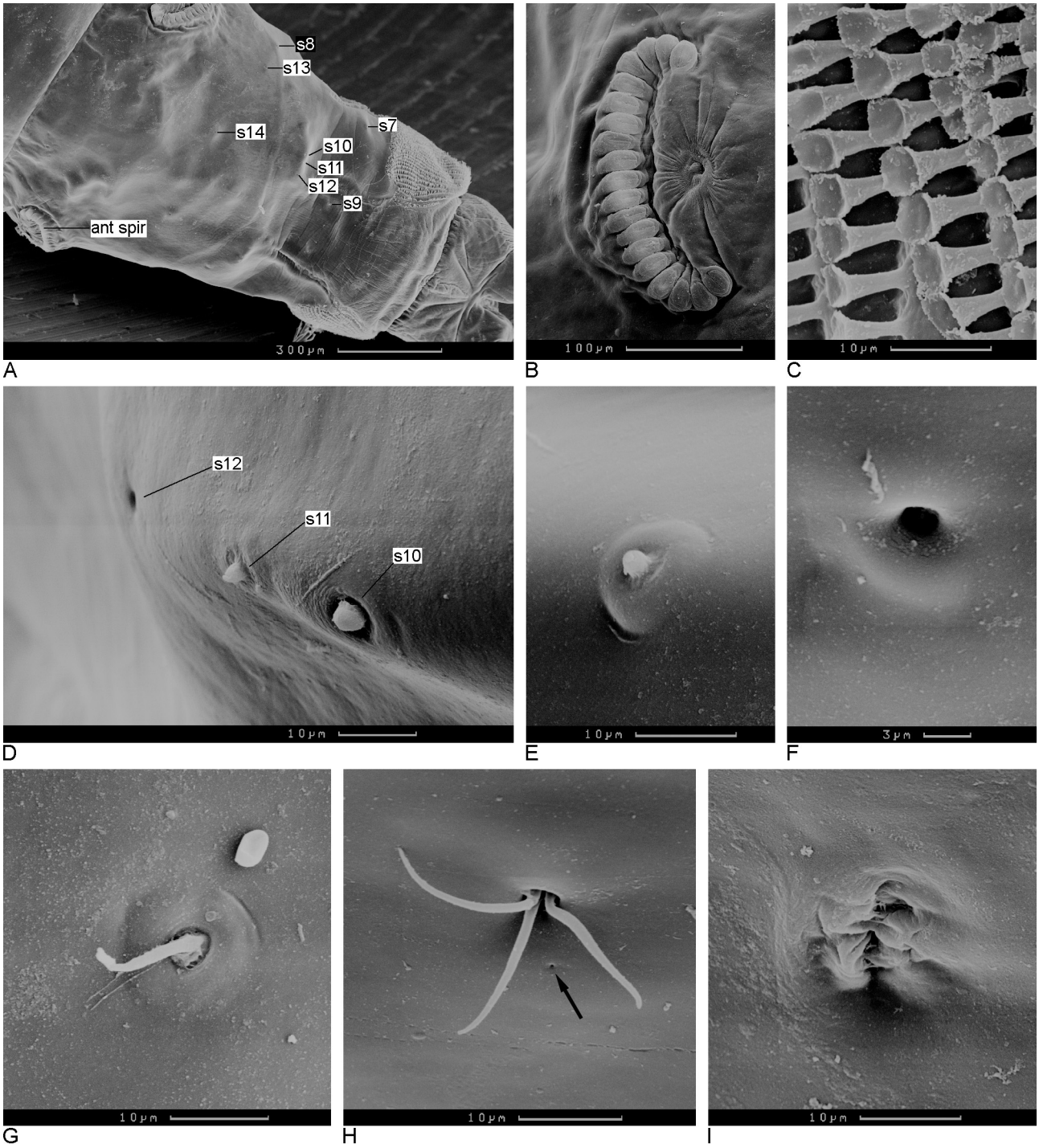

FIGURE 20. *Aspistomella duo* **sp. nov.**, SEM views of thoracic segment and associated cuticular sensilla. **A**, thoracic segment I, dorsal view, showing distribution of cuticular sensilla on the left side of the body; **B**, anterior spiracle; **C**, trumpet-shaped spinules on anterior portion of thoracic segment I; **D**, cuticular sensilla s10–s12 on thoracic segment I; **E**, papillar-sensillum s9 on thoracic segment I; **F**, pit-sensillum s3 on thoracic segment I; **G**, trichoid-sensillum (s5) on thoracic segment I; **H**, Keilin's organ on thoracic segment I, left side, occasionally with an indentation resembling a small pit sensillum (arrow); **I**, rudimentary spiracular opening on abdominal segment I. Abbreviations: ant spir—anterior spiracle, s7–s14—cuticular sensilla 7–14. (All photographs by Damir Kovac.)

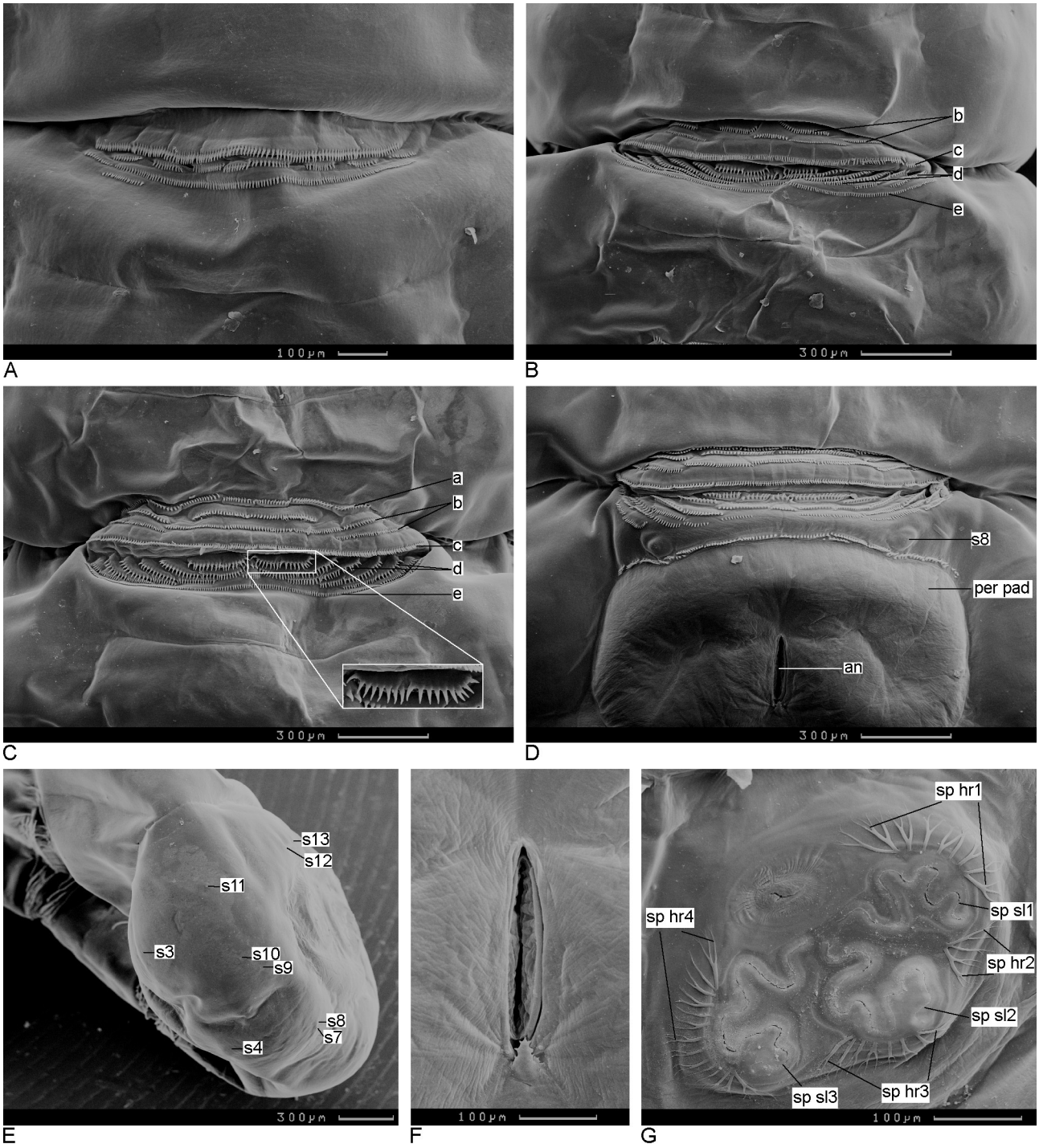

FIGURE 21. *Aspistomella duo* **sp. nov.**, SEM views of abdominal creeping welts (**CW**) and caudal segment . **A**, creeping welt CW1 on abdominal segment I, ventral view; **B**, CW2 on abdominal segment II, ventral view; **C**, CW4 on abdominal segment IV, magnified area shows a single row of large spinules; **D**, CW8 on abdominal (caudal) segment VIII; **E**, caudal segment showing the spatial pattern of cuticular sensilla on the left side; **F**, anal slit; **G**, right posterior spiracle. Abbreviations: a–e—creeping welt rows a–e; an—anus; per pad—perianal pad; s1–s10—cuticular sensilla 1–10; sp hr 1–4—spiracular hair groups 1–4; sp sl 1–3—spiracular slits 1–3. (All photographs by Damir Kovac.)

Posterior spiracles (Figs 9 A, 21 G) sclerotised, slightly elevated, oval-angular, length 0.4–0.5 mm (median = 0.44, n = 12), width 0.36–0.48 mm (median = 0.42, n = 12), shortest distance between spiracles 0.06–0.18 mm (n = 19). Spiracular plate with roundish ecdysial scar and three very long spiracular slits meandering from area of the ecdysial scar to the edge of the spiracular plate in about 9–15 turns, terminal turns forming a large loop ending in a small roundish hook, large loop less pronounced in spiracular slit 1 (Fig. 21 G); spiracles usually black (paler in newly molted larvae), but yellowish along spiracular slits, yellow area (stripe) gradually widening from ecdysial scar to edge of spiracular plate, becoming club-shaped at large terminal loop and with blurred margins (Fig. 9 A). The spiracular slits are surrounded by four groups of bifurcate spiracular hairs that branch 2–3 times and end in acute tips (Fig. 21 G). Most hair groups consist of central unbranched hair trunks and two outer branched hair trunks (i.e., two hair trunks originating from the same place), number of hairs as follows (n = 4 spiracles): Hair group 1: 7–8 hair trunks (double trunks count as one hair), Hair group 2: 1 double trunk, Hair group 3: 5–6 hair trunks, Hair group 4: 10–11 hair trunks; Hair groups 1, 3, and 4 located along the central parts of the spiracular slits, group 2 located between spiracular slits 1 and 2 and slightly closer to the center of the spiracle. The number of hairs on the right or left spiracle of the same specimen often differs.

Anal complex: perianal pad rectangular, anal hook at posterior end of anal slit with sharp points (Fig. 21 F), spinules other than those of CW8 absent.

Puparium (Fig. 9 G). Length 6–9.2 mm; maximum width at abdominal segments 3 and 4 = 1.9–2.9 mm (n = 3); reddish to reddish brown, darker at both ends; oblong, strongly tapering at anterior end, broad at posterior end; anterior spiracles, posterior spiracles and creeping welts as in third instar larva.

Etymology. The species name means “two” in Latin and is used as a noun in apposition; it reflects the wing pattern, which resembles the number “2”.

Remarks. *Aspistomella duo* larva differed from *A. tres* by having only one row of large spinules in the central part of rows d (Fig. 21 C, see inset), whereas *A. tres* had a double row of spinules (Fig. 47 C, see inset). The posterior spiracles of *A. duo* and *A. tres* were relatively similar, but in *A. duo* the yellow meandering line above the spiracular slits ended in a club-shaped structure with blurred margins (Fig. 9 A), whereas in *A. tres* the widening of the yellow line was less pronounced and its edges remained distinct (Fig. 9 B). Furthermore, the spiracular slits 1 and 2 of *A. tres* were usually symmetrical and the distance between the spiracles was much smaller than in *A. duo* (see sd/sw index, Table 2).

Biology. Adult *Aspistomella duo* were often seen walking up and down on the surface of upright bamboo stems of *Guadua angustifolia* subsp. *chacoensis* (Figs 1 B, C). Occasionally, they dabbed at the bamboo surface with their proboscis and spent particularly long periods feeding on plant wounds caused by saws or knives, for example on felled bamboo culms. When approached, the flies would retreat to the opposite side of the bamboo culm or fly away.

Larvae of *Aspistomella duo* inhabited water-filled bamboo internode cavities of young bamboo culms that had emerged during the previous bamboo shoot season (Fig. 1 D). They used small holes made by moth larvae of Crambidae (Lepdidoptera, Figs 1 E, F) to enter the internodes. They were not found in older bamboo culms or in culms with large holes, possibly made by beetles (oval holes, about 6 × 3 mm), woodpeckers (slit-like holes, about 10 × 3 mm) or other animals.

Each infested internode was inhabited by a single crambid larva and had only one entrance tunnel. The crambid larvae spanned a protective web inside the internode cavity and fed near the web on the surface layer of the inner bamboo wall. As they developed, the larvae gradually enlarged their entrance tunnel transforming it into an exit hole before pupating inside the internode.

The culms of *Guadua angustifolia* were about 10 m high (n = 2). Each infested culm contained several internodes punctured by Crambidae. The length of the infested internodes was 20–40 cm (n = 3), the diameter was 9 cm (n = 1) and the thickness of the bamboo walls was 17–40 mm (n = 2). The crambid entrance tunnels were round and located in the upper half of the internodes (10.5–28 cm above the internode base, n = 3). The outer diameter of the entrance tunnels ranged from 0.42 to 0.93 mm (n = 5), the inner diameter from 1.64 to 3.93 (n = 4). Internodes inhabited by *A. duo* and other Ulidiidae were found at heights between 2.5 and 8.5 m (n = 8).

Larvae of *Aspistomella duo* were easily identified in the field by their white colour, muscoid shape with a broad posterior end, and especially by the roundish black spiracles (Fig. 1 H, I). In water-filled internodes, larvae remained on wet bamboo walls near the water surface, walked along the bottom of the internode while submerged, or floated with their posterior spiracles attached to the water surface (Fig. 1 G). Larvae were positively buoyant and

could quickly rise to the water surface to obtain fresh air. Floating larvae occasionally began to swim by vigorously bending their bodies up and down. When walking on land or submerged in water, the larvae constantly moved their mouthparts. In some cases, the internode cavities were dried up, causing the larvae to congregate at the bottom of the internode, where they formed a clump until the next rainfall (Fig. 1 H). Mature larvae were able to jump and leave their internodes through the enlarged crambid holes to pupariate. The number of larvae inhabiting a single internode often exceeded 100 individuals, but sometimes they belonged to different *Aspistomella* or *Ulivellia* species.

Aspistomella duo larvae shared their habitat with larvae of Crambidae, sometimes also with other Ulidiidae (*A. tres*, *Ulivellia tenoris*, *U. arcuata*), aquatic dipteran larvae of Phoridae, Syrphidae (Fig. 1 I), an unidentified pear-shaped aquatic dipteran and terrestrial larvae of Nitidulidae (Coleoptera).

Aspistomella enderleini Kameneva & V. Korneyev, sp. nov.

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Figs 5 H, 22–23

Material examined. Type. Holotype ♂: **Colombia**: "Cordill.[eren] v.[on] Columbien / terra temporada / Thieme S." (MNKB). **Paratype**: 1♀: same label as in holotype, "69", "Euxesta lunata Enderlein det." (MNKB).

Diagnosis. *Aspistomella enderleini* is similar to *A. lobioptera*, *A. lunata*, and *A. steyskali* in that the wing apex has a long, narrow and oblique preapical hyaline incision from the apical half of cell r_1 into cell m, usually reaching the anterior margin of the wing and separating a narrow crescent-shaped brown apical band from the rest of the dark pattern, with the base of cell m completely dark (Fig. 5 H), vein R_1 bare, prescutellar acrostichal setae present and halter yellow; it is similar to *A. lobioptera* and *A. steyskali* in that the costal vein is bent anteriorly before the apex of vein Sc, the costal cell is lobed (though less than in the compared species), the costal vein is slightly thickened before the apex of the subcostal vein, forming a more or less conspicuous cleft, and differs from them in that the pterostigma is only moderately short, almost as long as the width of the costal cell (Figs 5 H, 22 F). It shares the wing pattern very similar to *A. steyskali*: both differ from *A. lobioptera* by the cell dm apically of r-m with hyaline spot connected to the hyaline spot in cell m_4 and by the phallus not modified, moderately developed (in *A. lobioptera* cell dm entirely dark and phallus very long and trichose). It can be distinguished from *A. steyskali* only by the structure of surstyli, which are ventrally blunt, with short denticles on the posterior margin, but without expressed lobes and prensisetae, only with slightly thickened setae (in *A. steyskali*, outer surstylus with two well developed lobes, inner surstylus with 3–4 thick prensisetae); it also differs from *A. steyskali* by a pterostigma almost as long as wide (in *A. steyskali*, pterostigma very narrow); but the variability of this character has not been studied. *Aspistomella enderleini* is similar to *A. lunata* in having pterostigma almost as long as wide, but differs from it in that the hyaline incision distal to the pterostigma is short, extending at most into cell r_{2+3} and isolated from the round hyaline spot at the base of cell r_{4+5} (in *A. lunata*, it extends into cell r_{4+5} distally from crossvein r-m).

Description. Male. **Head** (Figs 22 D–E) ratio (length : height : width) = 1 : 1.5 : 1.9; frons, face above transverse fold, parafacial, and gena reddish or yellowish brown, epistome and occiput mostly black. Frons moderately wide, slightly narrowed posteriorly (Fig. 22 E), as long (from lunule to anterior ocellus) or 1.4× (from lunule to inner vertical seta) as wide at lunule; vertex black, steel shining, sparsely microtrichose; orbits, vertex, gena and occiput silver-white microtrichose; parafacial narrow, 0.2–0.3× broader than postpedicel, reddish-yellow, sparsely white microtrichose. Frontal plates with 8–9 pairs of parafrontal setulae, 3–5 pairs of inclinate frontal setae slightly shorter than outer vertical seta, frontal vitta whitish microtrichose, with 2–4 shorter, proclinate or inclinate interfrontal setulae (Fig. 22 E). Lunule very narrow, indistinct, reddish-yellow. Eye 1.4× higher than long. Epistome widely black medially, reddish brown laterally and anteroventrally, sparsely white microtrichose, with metallic bluish sheen, strongly produced anteriorly and separated from upper part of face by deep fold; face above epistome brownish yellow, white microtrichose. Clypeus yellow to brown, sparsely white microtrichose, subshiny, 0.38× higher than epistome. Gena brownish yellow, with long genal seta and 5–7 additional long peristomal setae anterior of it, 0.3–0.8× longer than genal seta. Occiput black, except postgena partly brown, with cyan metallic sheen, greyish microtrichose.

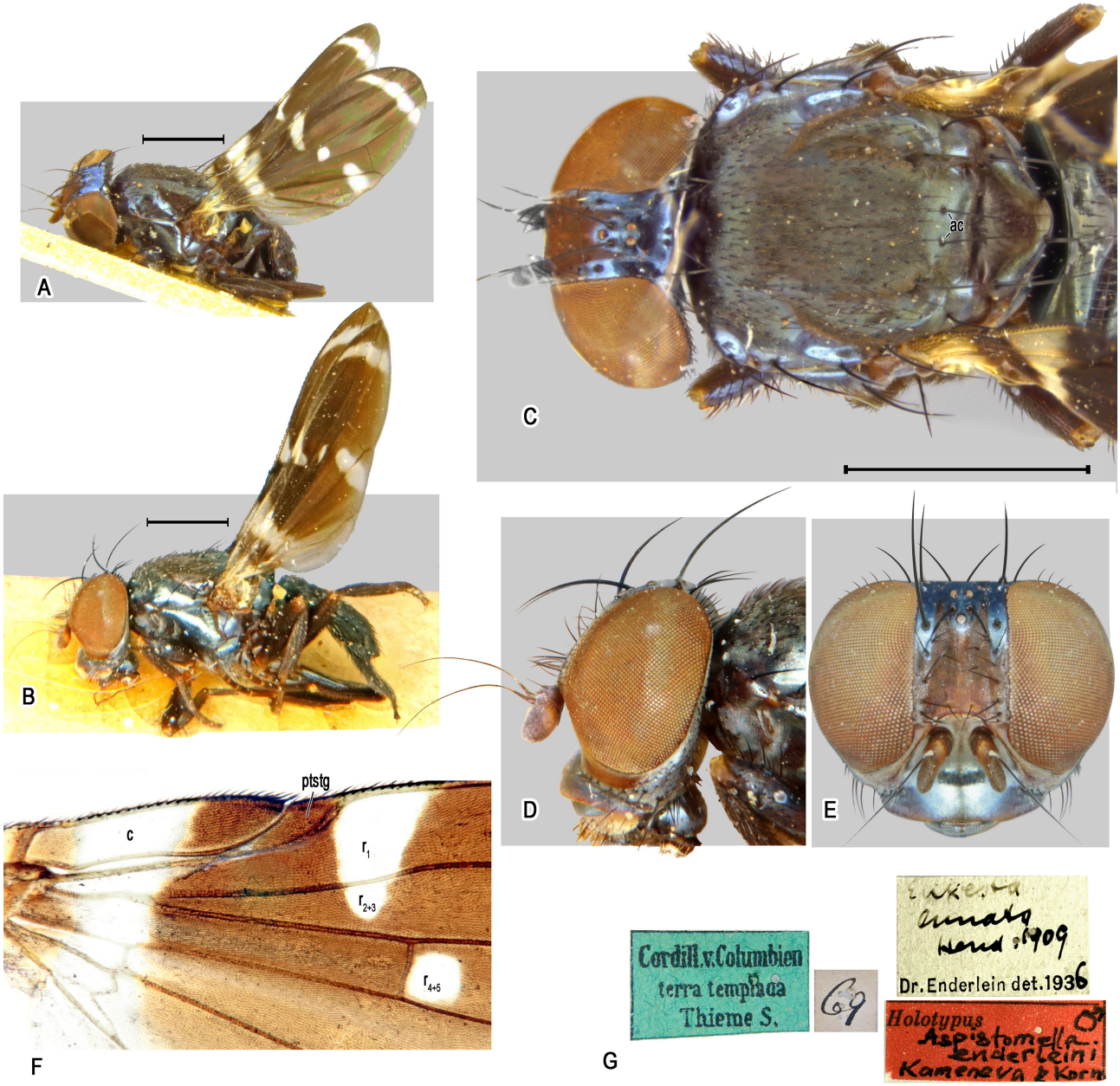

FIGURE 22. *Aspistomella enderleini* **sp. nov.** holotype ♂ (**A**, **C–G**) and paratype ♀ (**B**). **A**, **B**, habitus, left; **C**, head and thorax, dorsal; **D**, head left; **E**, same, anterior; **F**, wing, anterobasal part; **G**, labels. Abbreviations: c—costal cell; ptstg—pterostigma; r_1—first radial cell; r_{2+3}—second + third radial cell; r_{4+5}—fourth + fifth radial cell. Scale bar: 1 mm (same for **C**, **D**, and **E**).

Antenna brown; scape and pedicel with black setulae; postpedicel yellowish brown, 1.6× longer than wide, darker apico-dorsally, whitish microtrichose, twice as long as wide, apically rounded; arista black except yellow at base, almost bare. Mouthparts black, prementum black, shiny. Palp yellow or yellowish brown, narrowly crescent-shaped, apically rounded, with 10–12 strong black setulae, of which 3–4 subapical setulae 1.6–2× longer than other setulae.

Thorax (Fig. 22 C) brown to black, with bluish sheen and sparse white and brown microtrichia not obscuring underlying cuticle. Mesonotal scutum 1.2× longer than wide; black setulose, with 6–12 irregular rows of setulae between rows of dorsocentral setulae; acrostichal prescutellar seta present; prescutellar area with 4–6 rows of setulae between posterior dorsocentral setae. Scutellum dorsally very slightly convex, brown to black, subshining, sparsely microtrichose, without setulae, with golden, silver or bluish sheen. Subscutellum shiny, dark brown to black. Mediotergite shiny black, medially not microtrichose. Other setae as described for the genus. All the setae and setulae black.

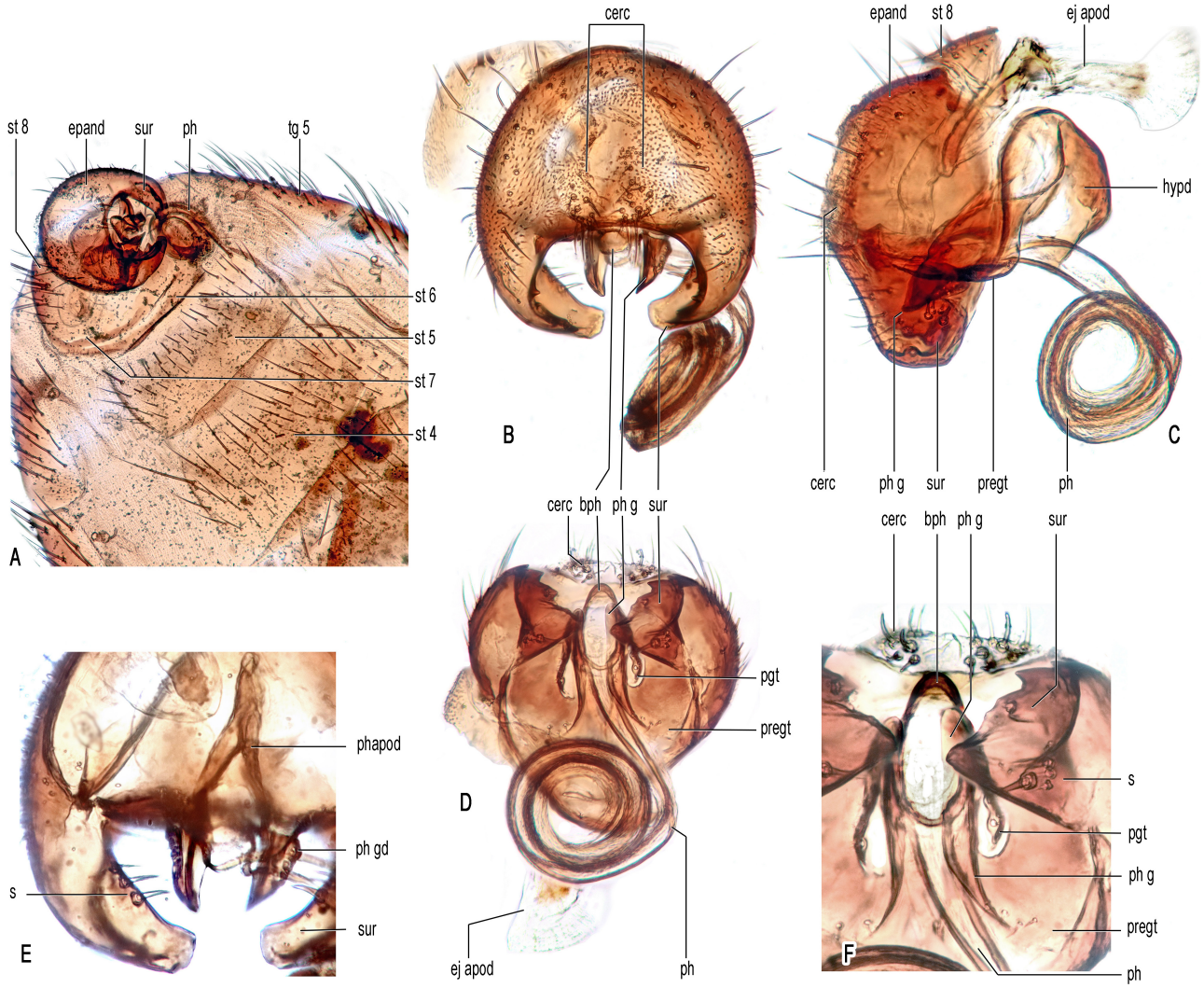

FIGURE 23. *Aspistomella enderleini* **sp. nov.** ♂ genitalia. **A**, postabdomen and part of abdomen, ventral; **B**, postabdomen, posterior; **C**, same, lateral; **D**, same, ventral; **E**, surstylus and hypandrium, posterior; **F**, cerci, surstylus, and hypandrium, ventral. Abbreviations: bph—basiphallus; cerc—cerci; ej apod—ejaculatory apodeme; epand—epandrium; hypd—hypandrium; pgt—postgonite; ph g—phallic guide; ph—phallus; phapod—phallapodeme; pregt—pregonite; s—seta; st 4— fourth sternite; st 5— fifth sternite; st 6— sixth sternite; st 7— seventh sternite; st 8—eighth sternite; sur—surstylus; tg5—fifth tergite.

Wing (Figs 5 H, 22 A, B, F) 3.5–4.2 mm (♀) long, 2.4–2.5× longer than wide; basicostal cell hyaline; costal cell lobed, 5× longer than wide, brown in basal and apical quarter of length, with costa conspicuously curved, posteriorly covered with longer setulae and forming conspicuous cleft before apex of vein Sc; pterostigma entirely brown, narrow triangular, 1.3–1.4× longer than wide and as long as costal cell width, vein R_1 bare, ending proximally of crossvein r-m level in both sexes; vein R_{2+3} slightly sinuate. Crossvein r-m distally of middle (at 0.6) of cell dm width. Cell r_{4+5} 5× longer than wide, apically narrowed. Cell m_1 subtriangular; ultimate section of M_1 = 2.4–2.8× longer than crossvein dm-m and 1.5× longer than penultimate section. Vein CuA Z-shaped, forming moderately short posteroapical lobe of cell cua along vein CuP, 1.7–1.9× longer than its anterior shoulder. Wing pattern with short subbasal crossband from humeral vein through cell cua into alula, and large dark brown mark from apical part of costal cell to wing apex, with 4 hyaline marks: incision from cell r_1 into cell r_{2+3} basal to of crossvein r-m, oval spot in base of cell r_{4+5} and hyaline incision in apex of cell m_4 extending into apical half of cell dm, and long and narrow crescent-shaped or arcuate incision from apex of cell m_1 into cell r_1 parallel to wing apex (Fig. 5 H). Cell cup (anal cell sensu Kameneva & Korneyev 2010) and anal lobe as wide as cell cua. Alula twice as long as wide, uniformly pale grey or darkened in apical half. Calypters white, with white ciliae. Halter yellow.

Legs (Figs 22 B, C): coxae and trochanters, apices of femora and tibiae brown, fore femur yellowish brown, otherwise black; tibiae mostly black; tarsi brown, black setose and setulose. Fore femur with row of 6–7 posterodorsal and 4–5 posteroventral setae. Mid femur anteriorly with short suberect setulae; mid tibia apically not visible, hidden by glue.

Abdomen brown to black, sparsely black setulose, metallic sheen inconspicuous in type specimens.

Male genitalia (Figs 23 A–F) with short non-projecting cerci, wide ventrally blunt surstyli, with two short denticles on posterior margin, without expressed lobes and prensisetae, 3–5 unmodified setulae (one on inner surstylus, of which one twice as long and thick as the others; phallus moderately large, at most twice as long as epandrium height, short and sparsely trichose (Figs 23 B–D). Hypandrium: phallic guide with laterally triangular and moderately sclerotised lobes (Figs 23 D–F) forming conspicuous posterior projections, bearing pair of oval postgonites just anterior to basiphallus ring, and symmetrical pregonites anterolateral to them (Figs 23 D, F).

Female terminalia: oviscape 1.3× longer than tergite 5; aculeus with ovoid, long-setulose cercal unit; not dissected.

Etymology. The species is named after the German entomologist and microbiologist Prof. Günter Enderlein, curator of the Diptera collection of the Humboldt University of Berlin in 1907–1942.

Remarks. The type specimens were misidentified by Enderlein as *"Euxesta lunata"* in the MNKB collection.

Aspistomella garleppi V. Korneyev & Kameneva, sp. nov.

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Figs 6 D, 24

Material examined. Type. Holotype ♂: **"**Peru / Madre De Dios / O. Garlepp c.", "Coll. W. Schnuse / 1911-3", "Euxesta s. (nova)" [pencil hadwritten label of W. Hennig]; (right antenna, left wing and left mid leg missing; abdominal segments 4–5 missing, apparently removed by W. Hennig for preparation in 1938–1939 and lost) (SDEI). Paratypes: 1 specimen [sex unknown] (both antennae, hind legs, mouthparts and abdomen missing), 1 ♂ (both antennae, mouthparts and ventral part of abdomen including all sternites, pleural membrane and genitalia missing), same labels as in holotype (SMTD).

Diagnosis. *Aspistomella garleppi* are moderately large flies (WL > 6.0–6.4 mm), differing from all other species of the group of genera by the combination of the very long pterostigma, straight costal cell, vein R_1 dorsoapically setulose, crossvein r-m slightly proximal to the level of R_1 apex but far distal from Sc apex, head with narrow frons, face uniformly grey or silvery microtrichose, epistome strongly developed, ocellar and outer vertical seta short, 0.2–0.3× longer than orbital and inner vertical seta, prescutellar acrostichal seta absent, wing extremely elongated, 3.8–4× longer than wide; with pattern of narrow subbasal and wide discal crossband separated from the entirely dark apex by hyaline interspace covering the entire area of cell dm between crossveins r-m and dm-m; and mid tibia ventroapically with 1 long spine.

Description. Male. **Head** (Figs 3 C, 24 B–D) ratio (length : height : width) = 1 : 1.1–1.2 : 1.6; frons, parafacial, and gena reddish brown, most of epistome and occiput dark brown to black; face below lunule white microtrichose. Frons moderately wide, slightly narrowed posteriorly (Fig. 24 C), 1–1.1× as long (from lunule to anterior ocellus) or 1.6–2× (from lunule to inner vertical seta) as wide (at lunule), with black, steel shining, sparsely microtrichose vertex; orbits in posterior half, parafacial, narrow transverse band on face above fold, gena and occiput silver-white microtrichose; parafacial less than half as wide as postpedicel. Vertical plates with 1 strong and 1 setula-like orbital setae. Frontal plate with 10–12 short lateroclinate parafrontal setulae, frontal vitta sparsely whitish microtrichose, with 6–7 moderately developed frontal and 3–5 stronger interfrontal setae on each side (Fig. 24 C). Eye 1.3× higher than long. Face white microtrichose above epistome; epistome black to brown, sparsely white microtrichose, with metallic bluish sheen. Clypeus black, sparsely white microtrichose, with metallic sheen, 0.3× higher than epistome. Gena brownish yellow, narrowly white microtrichose along orbit, with 1–2 long genal setae and 4–6 additional long peristomal setae anterior to it, shorter than genal seta. Occiput brown to black, silver-grey microtrichose.

Antenna yellow to reddish brown, inserted below the middle of the eye; scape with black setulae; postpedicel moderately long, rounded, 1.8–2.0× longer than wide; arista brown apically, yellow in basal 1/4, 2-segmented, bare. Mouthparts brown to black, prementum black, sparsely microtrichose. Palp yellow to reddish brown, apically rounded, with 10–15 black setulae, of which 5–6 subapical setulae twice as long as other setulae.

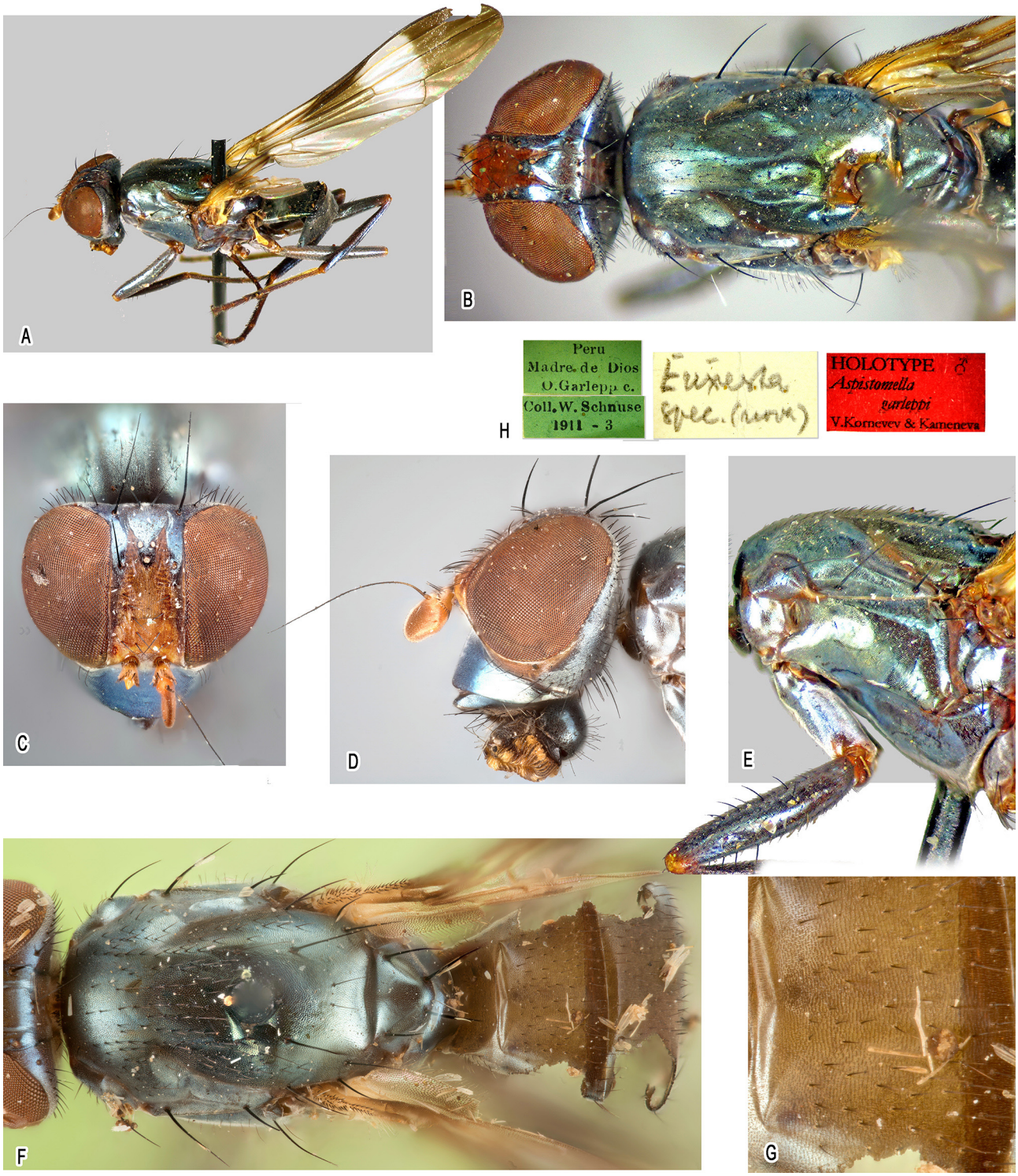

FIGURE 24. *Aspistomella garleppi* **sp. nov.** holotype ♂ (**A–E**, **H**) and paratype (sex unknown) (**F–H**). **A**, habitus, left; **B**, head and thorax, dorsal; **C**, head, antero-dorsal; **D**, head left; **E**, thorax and fore femur, left; **F**, thorax and base of abdomen, dorsal; **G**, abdominal syntergite 1+2, setae and microtrichia; **H**, labels.

Thorax (Figs 24 E, F) black, on pleura with silvery sheen and sparse grey and brown (posterior of transverse suture and in supraalar area) microtrichia not hiding underlying cuticle. Mesonotal scutum (Fig. 24 F) 1.6–1.7× longer than wide; black setulose, with 12–14 rows of setulae between rows of dorsocentral setulae; acrostichal prescutellar seta absent; prescutellar area with 2–4 rows of setulae between posterior dorsocentral setae. Scutellum

dorsally slightly convex, black, subshining, very sparsely white microtrichose, apically shagreened, without setulae. Subscutellum and mediotergite shining black. All the setae and setulae black.

Wing (Fig. 6 D) 6.5–6.7 mm long, 3.8–4× longer than wide; basicostal cell hyaline; costal cell straight, 5–6× longer than wide, pale brownish or yellowish at base and apex; pterostigma entirely brown, triangular, 6–8× longer than wide, vein R_1 with 12–14 setulae dorsally, ending slightly distal to level of crossvein r-m level; costal vein between apices of R_1 and R_{2+3} slightly arcuate; vein R_{2+3} inconspicuously undulate. Crossvein r-m at proximal 2/5 of cell dm. Cell r_{4+5} 4.0–4.5× longer than wide, apically narrowed. Cell m_1 narrow triangular, with pointed apex; ultimate section of M_1 3.6× longer than crossvein dm-m and 1.2–1.4× longer than penultimate section. Vein CuA Z-shaped, forming moderately long posteroapical lobe of cell cua along vein CuP, 1.8× longer than its anterior shoulder. Wing pattern with short pale brown subbasal crossband from humeral vein through cell cua into alula, wide discal crossband from apex of costal cell and pterostigma into basal half of cell dm, with wide hyaline interspace covering the entire area of cell dm between crossveins r-m and dm-m separating entirely dark apex by hyaline; cell m_1 entirely pale brown (Fig. 6 D). Cell cup and anal lobe 0.7–0.8× broader than cell cua_1. Alula 2.4× longer than wide, grey. Calypters white, with long white cilia. Halter yellow.

Legs (Figs 24 A, E) long and narrow, mostly black, except tarsi brown; femora with metallic sheen, sparsely grey microtrichose. Fore femur with 2 rows of posterodorsal and posterior setae 0.6× longer than femur width, and 2–4 moderately strong posteroventral setulae in apical half. Mid femur anteriorly with short suberect setulae; mid tibia moderately thickened, ventrally with one spur-like setae 2× longer than tibia width.

Abdomen black, short black setulose, with rows of whitish microtrichia (as on Fig. 24 G).

Genitalia missing in all specimens.

Etymology. The species is named after its collector, Otto Garlepp (1864–1959).

Remarks. The holotype and paratypes are damaged: abdominal segments 4–5 of the holotype were detached by Willi Hennig in 1938–1939, but no slides can be found either in SDEI, or in MNKB. The paratype specimens are partially eaten by psocids and the abdomens are partly postabdomens completely or completely missing. The generic position of the species is provisional, as it requires more detailed analysis of the male genitalia, morphology- and / or molecular-based phylogenetic analysis.

Aspistomella heteroptera Hendel, 1909

Figs 5 B, 25–26

Aspistomella heteroptera Hendel 1909b: 266, 1910: 49; Steyskal 1968: 54.14.

Material examined. Type. Lectotype [here designated] ♀: “Peru - Meshagua / 13.10.03 / Urubambafl.” [Schnuse leg.] “Aspistomella \ heteroptera H. / det. Hendel” [one wing missing] (SMTD). **Paralectotype**: 1♀: “Peru - Meshagua / Urubamba/ 11.X.03” [Schnuse leg.] (NHMW).

Non-type. **Bolivia**: Santa Cruz, near Buena Vista (El Cairo), on cut culm of *Gineurium sagittatum*, 18.i.2011, Bol B42/11, 5♀ (leg. D. Kovac), idem, near on freshly cut culm of *Gineurium sagittatum*, 21.i.2011, Bol G28/11, 1♂ (leg. D. Kovac) (dissected) (SMF; SIZK); Mapiri, Sarampioni, 700 m, 4.01.1903, 1♀, idem, 13.02.1903, 1♀ (Schnuse) (SMTD). **Peru**: Meshagua, Urubambafl[uss], 150 m, 28.09.1903, 1♀, idem, 30.09.1903, 2♂; Pachitea, 23.11.1903, 1 ♀ [headless]; Pamchamayo, 15.01.1904 (Schnuse), “heteroptera / det. F.Hendel \ Aspistomella” (SMTD).

Diagnosis. *Aspistomella heteroptera* differs from the species of the genus in the combination of the face between the antennae pitchy black (also in *A. sachavaca*) and the costal vein bent anteriorly before the apex of vein Sc, the costal cell is conspicuously lobate, and the pterostigma very short, shorter than the width of the costal cell (also in *A. duo*, *A. lobioptera*, *A. steyskali*, and *A. tres*), differing from them by details of the wing pattern: the apical quarter of cell r_{4+5} with triangular incision extending only into cell r_{2+3} (in *A. lobioptera* and *A. steyskali* it extends into cell r_1, whereas in *A. duo* and *A. tres* it is entirely dark); differing from *A. duo*, *A. sachavaca*, and *A. tres* by the bare vein R_1. The male genitalia are similar to those of *A. duo* and *A. tres* (surstylus directed mesally, with the pimple-like apical projection and cerci moderately elongate), differing mainly by the cerci fused only at the base.

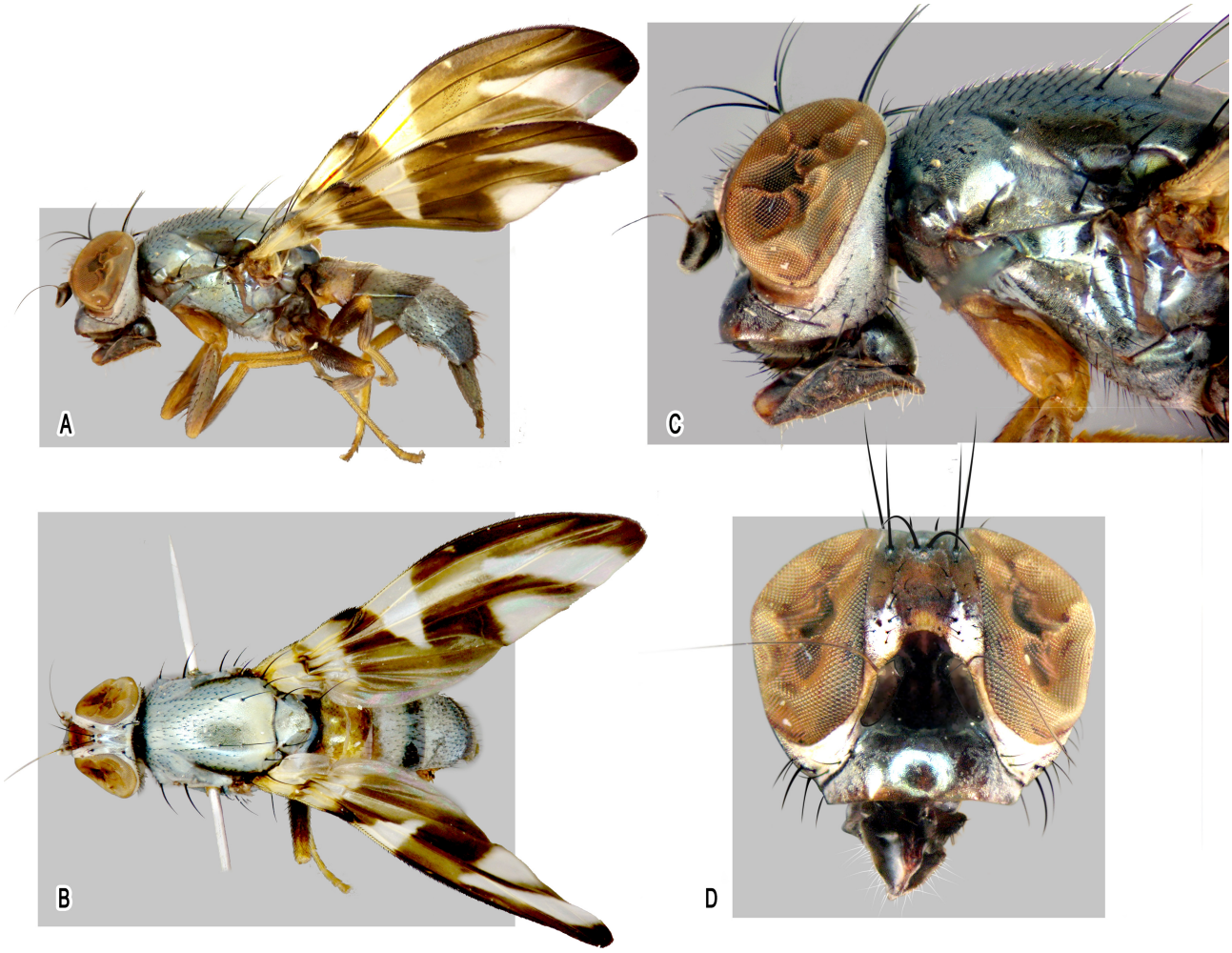

FIGURE 25. *Aspistomella heteroptera* Hendel, ♀. **A**, habitus, left; **B**, same, dorsal; **C**, head and thorax, left; **D**, head anterior.

Description. Male. **Head** (Figs 25 C–D) ratio (length : height : width) = 1 : 1.3 : 1.5, frons, parafacial, and gena reddish or yellowish brown, face and occiput mostly black. Frons conspicuously narrowed posteriorly (Figs 25 B, D), 1.5–1.7× longer than wide at lunule and 2.3–2.5× longer than wide at vertex, with subshiny, partly brown or black ocellar triangle and brown vertical plates; orbits, vertex, gena and occiput silver-white microtrichose; parafacial narrow, 0.2–0.4× broader than postpedicel, sparsely white microtrichose. Frontal setulae short, moderately strong, black, proclinate and partly inclinate, forming three irregular rows of 4–6 setulae on each side; 3 interfrontal setae, anteriormost crossing, longer than other setae and as long as outer vertical seta; 1 very long orbital seta, 1.1–1.2× longer than ocellar seta, 0.8× longer than inner vertical seta and 4× longer than outer vertical seta; postocellar seta long, 0.4× longer than inner vertical seta; outer vertical seta short, 0.4× longer than inner vertical seta and as long as postocular setae, forming one row, allied by 4–5 dorsal and 5–6 ventral occipital setae. Lunule very narrow, indistinct, orange. Eye 1.5–1.6× higher than long. Face (above epistome) 0.8× higher than wide at transverse fold, black, densely black microtrichose; epistome dark brown to black, sparsely white microtrichose, with metallic greenish sheen, strongly produced anteriorly and separated from upper part of face by deep suture. Clypeus brown, sparsely white microtrichose, subshiny, 0.2–0.25× higher than epistome. Gena brownish yellow, with long genal seta and 3–4 additional setae anterior to it, 0.4–0.6× longer than genal seta. Occiput black, except postgena partly brown, with cyan metallic sheen, greyish microtrichose; ventral part of occiput (postgena) with 5–7 setae almost 0.5–0.6× longer than genal seta.

Antenna brown to black; scape and pedicel with black setulae; postpedicel brown, whitish microtrichose, 2–2.2× longer than wide, apically conspicuously narrowed; arista black except yellow at base, almost bare. Mouthparts black, prementum black, shiny. Palp brown to black, narrowly crescent-shaped, apically rounded, with 10–12 strong black setulae, of which 2–3 subapical setulae 1.5–2× longer than other setulae.

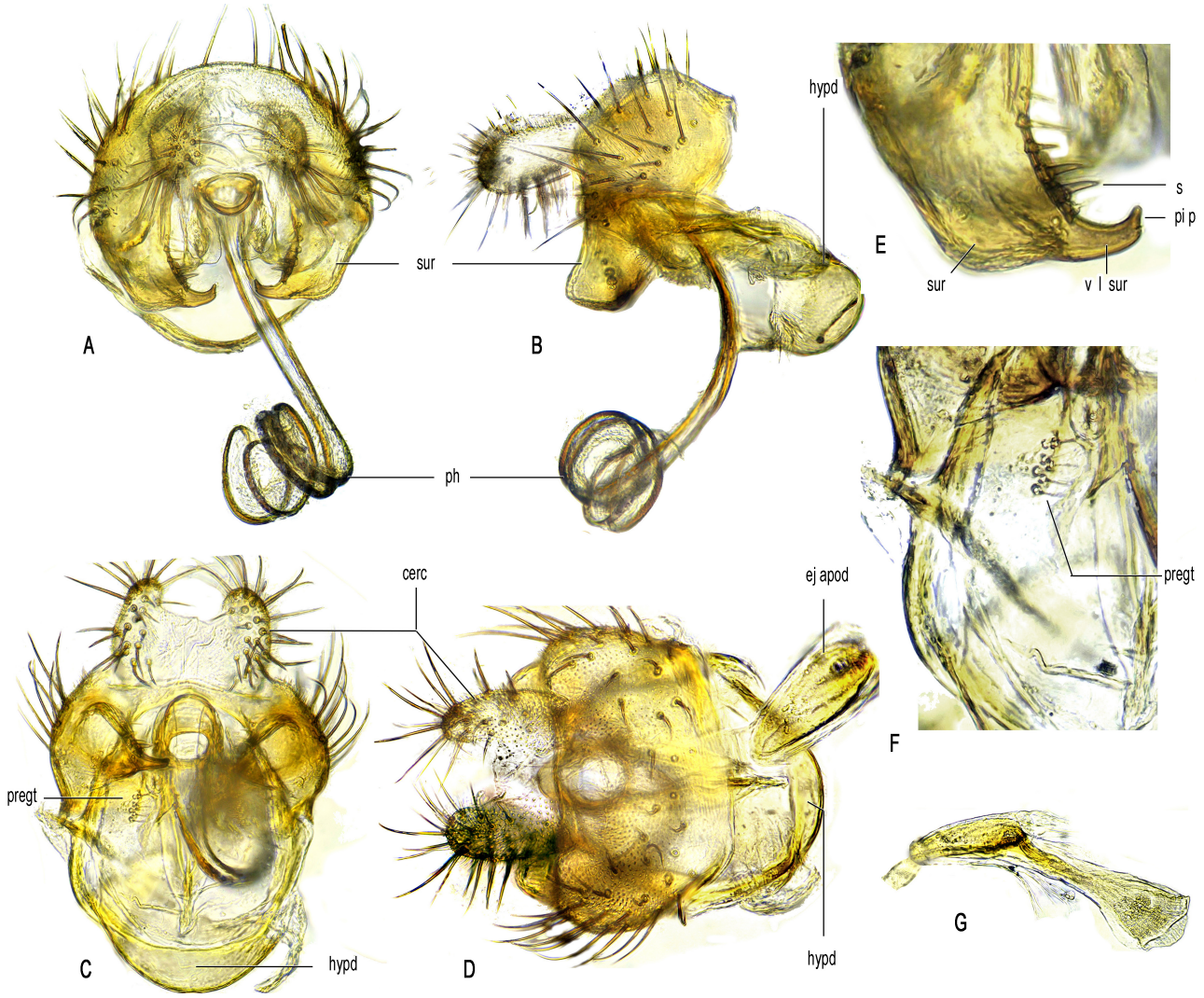

FIGURE 26. *Aspistomella heteroptera* Hendel, ♂ genitalia. **A**, postabdomen, posterior; **B**, same, lateral; **C**, same, ventral; **D**, same, dorsal; **E**, surstylus, posterior; **F**, part of hypandrium and pregonite, ventral; **G**, ejaculatory apodeme. Abbreviations: cerc—cerci; ej apod—ejaculatory apodeme; hypd—hypandrium; ph—phallus; pi p—pimple-like process; pregt—pregonite; s—seta; sur—surstylus; v l sur—ventral lobe of surstylus.

Thorax (Figs 25 A–C) brown to black (in teneral specimens with brownish-yellow postpronotal lobe, notopleural triangle and scutellum), with bluish sheen and sparse white microtrichia not obscuring underlying cuticle. Mesonotal scutum 1.3×as long as wide; setulose black, with 6–8 rows of setulae between rows of dorsocentral setulae; acrostichal prescutellar setae absent in all specimens examined; prescutellar area without setulae behind anterior dorsocentral setae. Scutellum dorsally very slightly convex, orange to black, subshiny, sparsely microtrichose, without setulae, laterally with silver or bluish sheen. Subscutellum subshiny, dark brown to black. Mediotergite shiny black, not microtrichose. Other setae as described for the genus. All the setae and setulae black.

Wing (Fig. 5 B) 5.5 mm (♂), 4.8–5.7 mm (♀) long, 2.9–3.5× longer than wide; basicostal cell hyaline; costal cell lobed, 4× longer than wide, brown in basal and apical quarter of length, with costa conspicuously curved posteriorly and covered with slightly longer setulae before apex of vein Sc; pterostigma entirely brown, narrowly triangular, 0.4–0.5× longer than wide, vein R_1 bare dorsally, ending slightly proximally of crossvein dm-m level in both sexes; vein R_{2+3} almost straight, subparallel to costa to very apex. Crossvein r-m at middle (in ♂) or slightly proximal to middle of cell dm (in ♀). Cell r_{4+5} 5.5–7× longer than wide, apically narrowed. Cell m_1 narrowly triangular and strongly narrowed in apical half, as ultimate section of M_1 sinuate subapically; the latter 3–4× longer than crossvein dm-m and 2–2.5× longer than penultimate section. Vein CuA Z-shaped, forming moderately short

posteroapical lobe of cell cua along vein CuP, 1.2–1.5× longer than its anterior shoulder. Wing pattern with short subbasal crossband from humeral vein through cell cua into alula, and large dark brown mark from apical lobe of costal cell to whole cell m_4 except its very base, and 3 wide triangular incisions: from cell r_1 through cell dm distally from crossvein r-m to vein M_4, in base of cell m_1 and from apex of cell m_1 into cell r_{2+3}. Cell cup (anal cell sensu Kameneva & Korneyev 2010) and anal lobe narrower than cell cua. Alula 2× longer than wide, darkened in apical half. Calypters white, with white cilia. Halter yellow.

Legs (Fig. 25 A) with yellow or brownish-yellow coxae and trochanters, femora entirely yellow in Bolivian specimens to largely black in Peruvian syntypes (then greenish subshining with sparse microtrichia) except anterior surface of fore tibiae and all knees yellow; tibiae either mostly dark brown to entirely yellow (in teneral or discoloured specimens) and tarsi entirely yellow, black setose and setulose. Fore femur with 2 rows of posterodorsal and posterior setae slightly shorter than femur width, and short and thin posteroventral setulae. Mid femur anteriorly with short suberect setulae; mid tibia ventrally with single spur-like seta 1.5–2× longer than tibia width. Hind femur in apical 0.6–0.7 of its length with 2 suberect dorsal setae.

Abdomen moderately elongate (Figs 25 A, B) brown to black, syntergite 1+2 broadly yellow, tergite 3 sometimes yellow basally; tergites 3–4 sparsely microtrichose, appearing less microtrichose in apical third, with faint cyan or greenish metallic sheen, except tergite 5 of both ♂ and ♀, which shines brown to black without metallic sheen; setulae and setae black; tergite 6 of ♀ short, completely hidden beneath tergite 5. Tergites 4, 5 and 6 of ♂ subequally long.

Male genitalia. Cerci wide oval, fused at base, short setulose, moderately flattened dorso-ventrally, bilobate posteriorly (Figs 26 A–D). Epandrium short setulose, with setulae 3–6× shorter than base of surstylus (Fig. 26 A). Each surstylus broad basally, gradually narrowing without additional lobes and curved mesally, with a row of five shortened setulae on its mesal surface, two of which are conspicuously thickened, but not strongly sclerotised (Figs 26 A, E). Pregonites symmetrical, slightly lobed, with 5 setulae ventro-mesally, conspicuously anterior to the postgonites (Figs 26 C, E). Postgonites rounded, with 5–6 small trichoid sensilla. Phallus moderately long and narrow, about about 3–3.5× longer than epandrium high, basally short microtrichose (Figs 26 A, B), apically with numerous lamellar cuticular sclerotisations, in rest coiled on right side of abdomen.

Female terminalia: taeniae 0.66 as long as eversible membrane; aculeus not flattened, with cercal unit oval and long setulose, 1.9 mm long; 2 subglobose spermathecae.

Remarks. Originally Hendel (1909b: 266) mentioned 8♀ from Peru (Meshagua, October and January), which were the syntypes; in fact only 2 of the 4 specimens in SMTD and NHMW collected in January and October fully correspond to the original locality data,; we also considered them all as syntypes (except 1♀ collected on 15.01.1904 is from Pamchamayo) and here designate them as lectotype and paralectotype. The other 2♂ and 4♀ specimens from SMTD were collected by Schnuse in February, September and November in Peru—Pachitea and Bolivia and were not included in the type series. We suspect in this case that Hendel's list of localities may have been based on a few specimens from the whole series, and that Hendel merely read only a few labels.

Aspistomella lobioptera Hendel, 1909

Figs 2 A–C, 5 E, 27–29

Aspistomella lobioptera Hendel 1909b: 264, 1910: 47, 49; Steyskal 1968: 54.14.

Material examined. Type. Lectotype ♀: **Bolivia**: "Bolivia-Mapiri / 17.I.03 / Chimate 650 m", "Coll. W. Schnuse / 1911-03", "Aspistomella \ lobioptera H. / det. Hendel" (SMTD) [here designated]; **Paralectotypes**: 1♀: "Bolivia Mapiri / 2.IV.03 / Sarampioni 700 m." [Schnuse leg.], "Aspistomella \ lobioptera H. / det. Hendel" [one wing missing; abdomen dissected and attached in microvial] (SMTD); 1♀: **Peru**: "Peru-Ukayali-fl. / Unini 21.X.03" [Schnuse leg.] "Aspistomella \ lobioptera H. / det. Hendel", "Type" [dark red paper], "coll. Hendel" (NHMW).

Non-type: **Bolivia**: La Paz, near Mapiri Arroyo Tuhiri, 9–12.IV.2004, 15.2805ºS, 68.25ºW, 500 m Malaise trap, 1♀ (B. Brown) (CSCA); **Ecuador**: Napo Province, Huahua Sumaco, km 45, on Hollin-Loreto rd Mal.[aise] trap, 20.12.1989, 1♀ [head detached and glued separately] (M. & J. Wasbauer, H. Real leg.) (CSCA). **Peru**: "Meshagua, Urubambafl.", 3.10.1903, 1♀ [W. Schnuse leg.] ("Aspistomella / lobioptera H. / det. Hendel); idem, 27.09.1903; "Pachitea-Münd 150 m", 7.11.1903, 1♂ [abdomen dissected], 1♀; idem, 26.11.1903, 1♀ [O. Garlepp leg.]

(SMTD); Madre de Dios, Rio Tambopata Sachavacayoc centre, 162 m, Malaise trap, 12º50'59.6"S 69º22'07.7"W, 18.06.–23.07.2009, 1♀ (J.T.Smit) (CSCA); Madre de Dios, Rio Tambapata, Sachavacayoc Centre, New Chacra, 12º50'59.9"S 69º22'08.3"W, 182 m a.s.l., Malaise trap, 2–10.06.2010, 1♀ (J.T.Smit); idem, Old Chacra, 12º51'15.5"S 69º21'56.6"W, 195 m a.s.l., 28.04.2010, 1♀ (dissected: Fig. 30), idem, 12º51'10.7"S 69º22'02.4"W, 195 m a.s.l., 28.04.2010, 1♀ (J.T.Smit) (RMNH).

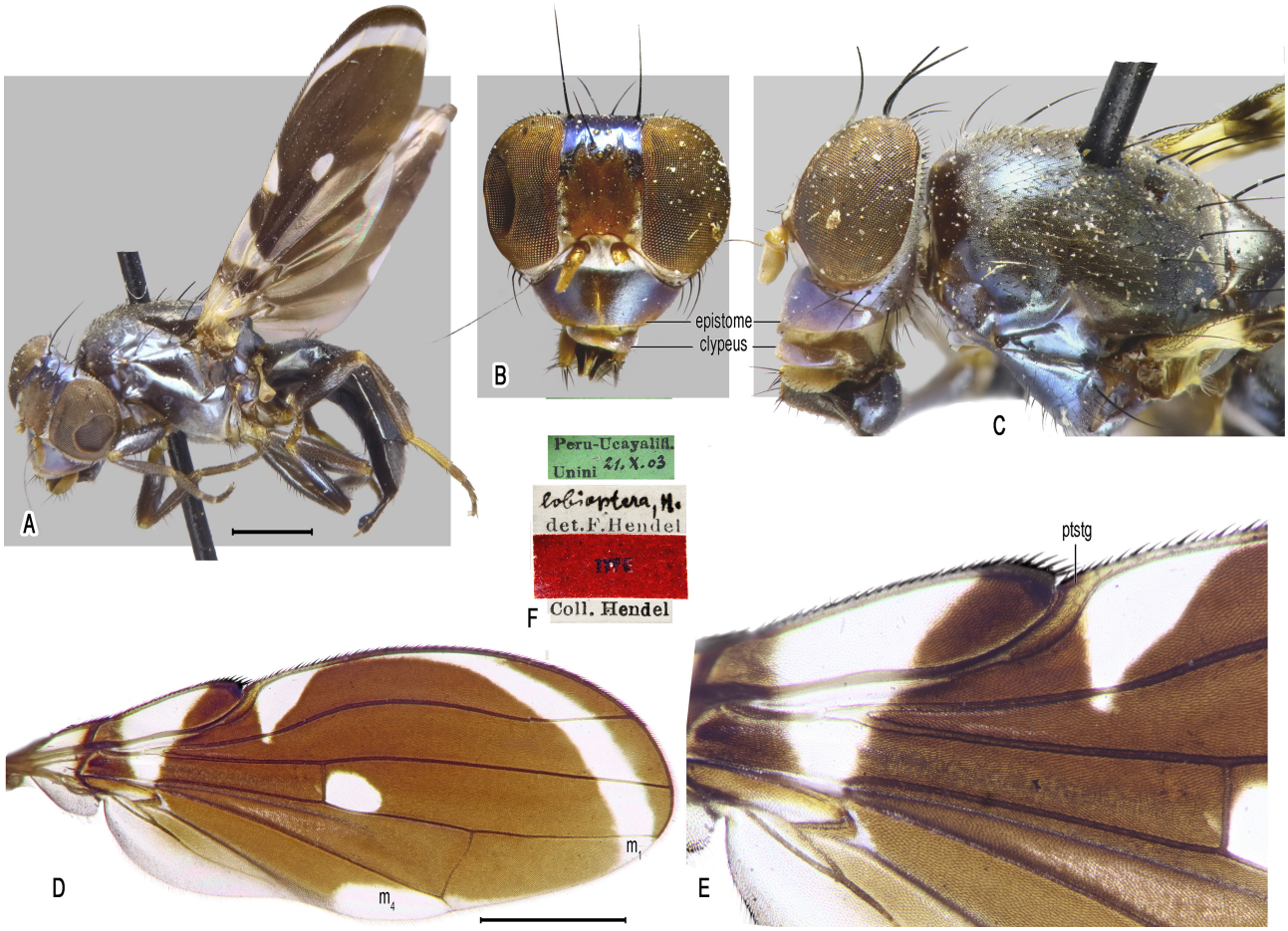

FIGURE 27. *Aspistomella lobioptera* Hendel, paralectotype ♀ (NHMW). **A**, habitus, left; **B**, head, anterior; **C**, head and thorax, left; **D**, wing; **E**, wing, anterobasal part; **F**, labels. Abbreviations: ptstg—pterostigma; m_1—first medial cell; m_4—fourth + fifth medial cell. Scale bars: 1 mm.

Diagnosis. *Aspistomella lobioptera* resembles *A. duo*, *A. enderleini*, *A. heteroptera*, *A. steyskali*, and *A. tres* in that the costal vein is bent anteriorly before the apex of vein Sc, the costal cell is lobed, the costal vein is thickened before the apex of the subcostal vein, forming a conspicuous cleft, and the pterostigma is very short, shorter than the width of the costal cell (Figs 5 B–F, 27 E, 28 D), and differs from them in details of the wing pattern: The apical quarter of cell r_{4+5} is crossed by a long crescent-shaped incision extending into cell r_1 (in *A. duo* and *A. tres* the apical quarter of cell r_{4+5} completely dark; in *A. heteroptera* the triangular incision extends only into cell r_{2+3}). In addition, *A. lobioptera* is similar to *A. enderleini*, *A. lunata* and *A. steyskali* in having a wide oval wing shape (2.5–2.9× longer than wide) and in the similar pattern: apex with long crescent-shaped incision extending into cell r_1, differing from them by the cell dm apically of r-m entirely dark (in *A. enderleini* and *A. steyskali*, with hyaline spot connected to the hyaline area in cell m_4); furthermore, *A. lobioptera* is similar to *A. enderleini* and *A. steyskali* in having an epandrium with short nonprojecting cerci on both sides of the anus, differing in having moderately narrowed, simple surstyli with short but distinct antero-ventral and postero-ventral lobes and a row of 4–5 thin setulae on the mesal surface, the 2 ventralmost longer than dorsal (in *A. enderleini*, single ventral lobe blunt triangular, and in *A. steyskali* two very conspicuous lobes, and in addition, an inner surstylus with strongly sclerotised prensisetae).



FIGURE 28. *Aspistomella lobioptera* Hendel, non-type specimens ♂ (**A**, **B**, **E**, **F**) and ♀ (**C**, **D**, **G**) (SMTD). **A**, habitus, left; **B**, head and thorax, left; **C**, head, anterior; **D**, wing, anterobasal part; **E**, abdomen, left; **F**, **G**, labels.

Description. Male. **Head** (Figs 27 B, C, 28 B, C) ratio (length : height : width) = 1 : 1.4 : 1.9, frons, face above transverse fold, parafacial, and gena reddish or yellowish brown, face and occiput mostly black. Frons slightly narrowed posteriorly (Figs 27 C, 28 B), 1.25–1.5× longer than wide at lunule and 1.3–1.6× longer than wide at vertex, with subshiny, brown or black ocellar triangle and brown vertical plates; orbits, vertex, gena and occiput silver-white microtrichose; parafacial narrow, 0.2–0.3× broader than postpedicel, reddish-yellow, sparsely white microtrichose. Frontal plates with 5–7 parafrontal setulae and 2–5 frontal setae on each side as long as outer vertical seta, frontal vitta whitish microtrichose, with 2–5 shorter, proclinate or inclinate interfrontal setae (Fig.

28 C). Lunule very narrow, indistinct, orange. Eye 1.3–1.45× higher than long. Upper part of face yellow, white microtrichose (above epistome); epistome strongly produced anteriorly, reddish brown laterally and anteroventrally to black medially, sparsely white microtrichose, with metallic bluish sheen. Clypeus yellow to brown, sparsely white microtrichose, subshiny, 0.4–0.5× higher than epistome. Gena brownish yellow, with long genal seta and 3–5 long peristomal setae anterior of it, 0.4–0.8× longer than genal seta. Occiput black, except postgena partly brown, with metallic cyan sheen, greyish microtrichose.

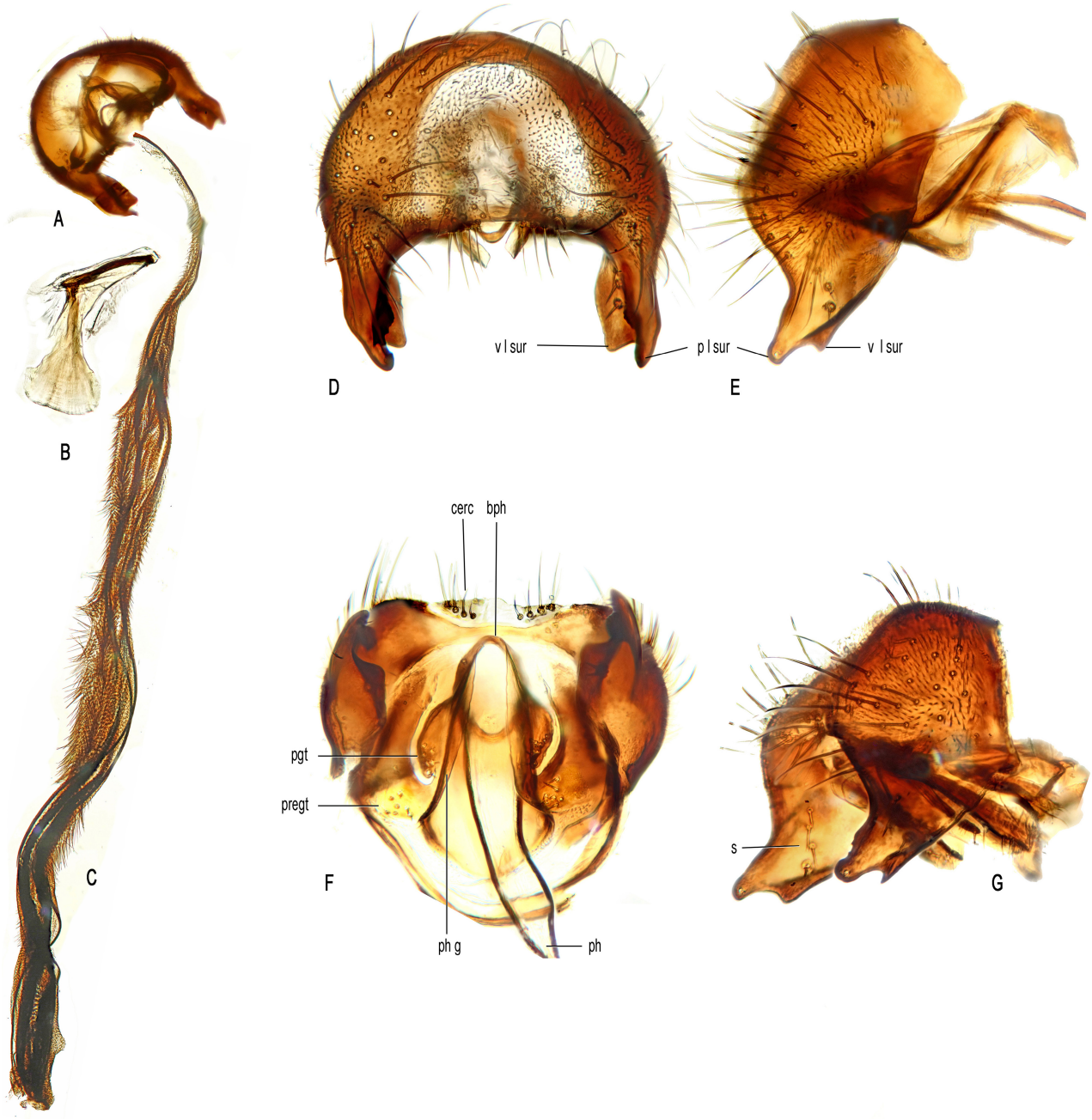

FIGURE 29. *Aspistomella lobioptera* Hendel, ♂ genitalia (SMTD). **A**, epandrium; **B**, ejaculatory apodeme; **C**, phallus; **D**, postabdomen, posteriorly; **E**, same, lateral; **F**, same, ventral; **G**, same, lateroventral. Abbreviations: bph—basiphallus; cerc—cerci; ph g—phallic guide; ph—phallus; phapod—phallapodeme; pregt—pregonite; p l sur—posterior lobe of surstylus; s—seta; v l sur—ventral lobe of surstylus.

Antenna brown to yellow; scape and pedicel with black setulae; postpedicel yellowish brown, blackish apicodorsally, whitish microtrichose, twice as long as wide, apically rounded; arista black except yellow at base, almost bare. Mouthparts black, prementum black, shining. Palp yellow or yellowish brown, narrowly crescent-shaped, apically rounded, with 7–10 strong black setulae, of which 4–5 subapical setulae 1.5–2× longer than other setulae.

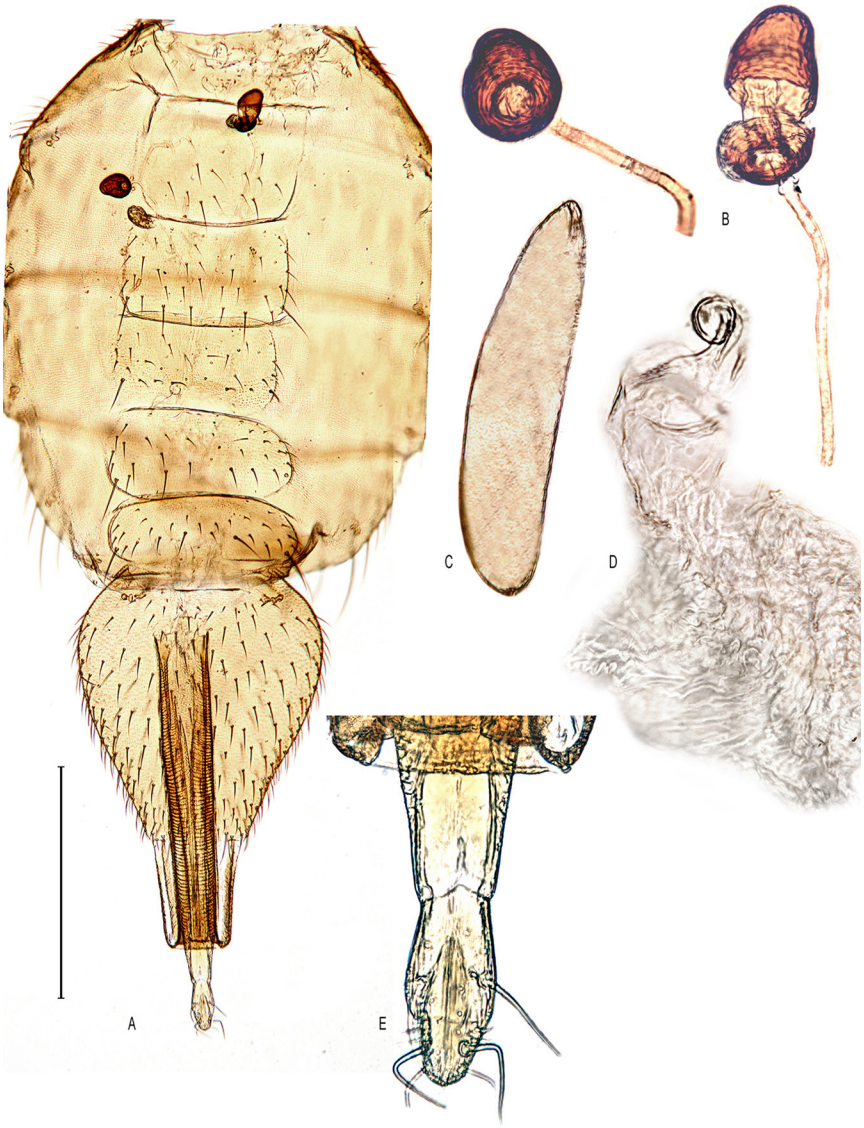

FIGURE 30. *Aspistomella lobioptera* Hendel, ♀ abdomen and genitalia (RMNH). **A**, abdomen, ventral; **B**, spermathecae; **C**, egg; **D**, vagina and ventral receptacle; **E**, cercal unit of the aculeus, enlarged. Scale bar: 0.5 mm.

Thorax (Fig. 27 C) brown to black, with bluish sheen and sparse white and brown microtrichia not hiding underlying cuticle. Mesonotal scutum 1.3× longer than wide; black setulose, with 8–14 rows of setulae between rows of dorsocentral setulae; acrostichal prescutellar seta present; prescutellar area with 4 rows of setulae between posterior dorsocentral setae. Scutellum dorsally very slightly convex, brown to black, subshining, sparsely microtrichose, devoid of setulae, with golden, silver or bluish sheen. Subscutellum shining, dark brown to black. Mediotergite shining black, non-microtrichose medially. Other setae as described for the genus. All the setae and setulae black.

Wing (Figs 5 E, 27 D, E, 28 A, D) 2.9–3.4 mm (♀) long, 2.5–2.9× longer than wide; basicostal cell hyaline; costal cell lobate, 4× longer than wide, brown in basal and apical quarter of length, with costa conspicuously curved, posteriorly covered with longer setulae and forming conspicuous cleft before apex of vein Sc; pterostigma entirely brown, narrow triangular, 0.3–0.5× longer than wide and 0.3× longer than costal cell width, vein R_1 bare, ending far proximally of crossvein r-m level in both sexes; vein R_{2+3} sinuate, at apex bent anteriorly to costa. Crossvein r-m distally of middle of cell dm. Cell r_{4+5} 6–7× longer than wide, apically narrowed. Cell m_1 subtriangular; ultimate section of M_1 2.5–2.6× longer than crossvein dm-m and 1.2× longer than penultimate section. Vein CuA Z-shaped, forming moderately short posteroapical lobe of cell cua along vein CuP, 1–1.2× longer than its anterior shoulder.

Wing pattern with short subbasal crossband from humeral vein through cell cua into alula, and large dark brown mark from apical lobe of costal cell to wing apex, with 4 hyaline marks: incision from cell r_1 into cell r_{2+3} basally of crossvein r-m, two oval spots in base of cell r_{4+5} and in apex of cell m_4 and long and narrow crescent or arcuate incision from apex of cell m_1 into cell r_1 parallel to wing apex. Cell cup (anal cell sensu Kameneva & Korneyev 2010) and anal lobe as wide as cell cua. Alula 1.7–2× longer than wide, uniformly pale grey or darkened in apical half. Calypters white, with white ciliae. Halter yellow.

Legs (Figs 27 A, 28 A, E): coxae and trochanters, apices of femora and tibiae yellow, fore femur brownish-yellow, otherwise black; tibiae mostly black; tarsi yellowish brown; black setose and setulose. Fore femur with row of 6–7 posterodorsal and 4–5 posteroventral setae. Mid femur anteriorly with short suberect setulae; mid tibia ventrally with single spur-like seta 1.6–1.8× longer than tibia width.

Abdomen brown to black, sparsely black setulose, sometimes with faint purplish or greenish metallic sheen.

Male genitalia (Figs 29 A–G) with short cerci, moderately narrowed, simple surstyli having short antero-ventral and postero-ventral lobes and one row of 4–5 thin setulae on mesal surface, with 2 ventralmost longer than dorsal (Figs 29 D, E, G). Phallus extremely large, thickened, 8–9 times as long as epandrium high, densely trichose (Fig. 29 C). Hypandrium: phallic guide with suboval lobes forming conspicuous posterior projections, bearing pair of oval postgonites just anterior of basiphallus ring, and symmetrical pregonites anterolateral of them (Fig. 29 F).

Female terminalia (Figs 30 A, B, D, E): oviscape 1.5–1.7× longer than tergite 5; aculeus with ovoid, long-setulose cercal unit; ventral receptacle simple, finger-like, apically enlarged; 2 subglobose, slightly elongated spermathecae.

Preimaginal stages unknown except for egg as on the Fig. 30 C.

Remarks. Originally, Hendel (1909b) mentioned 3 syntypes, 2 of them in SMTD (one of which is here designated as lectotype for the stability) and one in NHMW. The other specimens in SMTD were not mentioned in the type series.

Aspistomella lunata (Hendel, 1909) comb. n.

Figs 5 G, 31

Euxesta lunata Hendel 1909a: 157, 1910: 47, 49; Steyskal 1968: 54.18.

Material examined. Type. Holotype ♀: “Peru-Meshagua, 27.9.[19]03 Urubambafl.”, [W. Schnuse leg.], “Euxesta \ lunata H. / det. F. Hendel”, “coll. W. Schnuse, 1911-3”, “HOLOTYPUS ♀ / Euxesta / lunata Hendel / E. Kameneva des. 2022” (left wing detached by Hendel for slide apparently missing; right wing re-attached after photography) (SMTD).

Non-type. **Peru**: labels as in holotype, 1 ♂ (antennae, one wing, abdominal sternites and terminalia missing) (SMTD).

Diagnosis. *Aspistomella lunata* is similar to *A. enderleini*, *A. lobioptera* and *A. steyskali*, in having wing wide oval and similar wing pattern (dark pattern with hyaline base and a few hyaline marks: apex with long crescent incision extending into cell r_1; cell r_1 with cuneiform hyaline incision distally or apex of vein R_1; cell m_4 with hyaline spot apically, differing from all of them by the first incision extending posteriorly into the base of cell r_{4+5} (*A. enderleini*, *A. lobioptera* and *A. steyskali* the cuneiform incision is well separated from the round hyaline spot at the base of cell r_{4+5}); from *A. lobioptera* (which has dm apically of r-m entirely dark), it differs by dm with subapical hyaline spot connected to the hyaline area in cell m_4, as in *A. enderleini* and *A. steyskali*; from all other species of *Aspistomella*, which have a very short pterostigma (only in *A. enderleini* moderately short), it differs by a pterostigma slightly longer than the width of the costal cell (Figs 5 G, 31 F).

Redescription. Male. **Head** (Figs 31 B–D) ratio (length : height : width) = 1 : 1.5: 1.9; frons, face above transverse fold, parafacial, and gena reddish or yellowish brown, epistome and occiput mostly black. Frons moderately wide, slightly narrowed posteriorly (Fig. 31 C), 0.7× as long (from lunule to anterior ocellus) or 1.1× (from lunule to inner vertical seta) as wide at lunule; vertex black, steel shining, sparsely microtrichose; orbits, vertex, gena and occiput silver-white microtrichose; parafacial narrow, 0.1–0.3× broader than postpedicel, reddish-yellow, sparsely white microtrichose. Frontal plates with 5–6 pairs of parafrontal setulae, 2–3 pairs of inclinate frontal setae slightly shorter than outer vertical seta, frontal vitta sparsely whitish microtrichose, with 2–3 shorter, proclinate or inclinate interfrontal setulae (Fig. 31 C). Lunule indistinct. Eye 1.5–2× higher than long. Epistome black medially, reddish

brown laterally and anteroventrally, sparsely white microtrichose, with metallic bluish sheen, strongly produced anteriorly and separated from upper part of face by deep fold; face above epistome brownish yellow, white microtrichose. Clypeus brown, sparsely white microtrichose, 0.2× higher than epistome. Gena brownish yellow, with long genal seta and 4–5 additional long peristomal setae anterior of it, 0.3–0.9× longer than genal seta. Occiput black, except postgena partly brown, with cyan metallic sheen, greyish microtrichose.

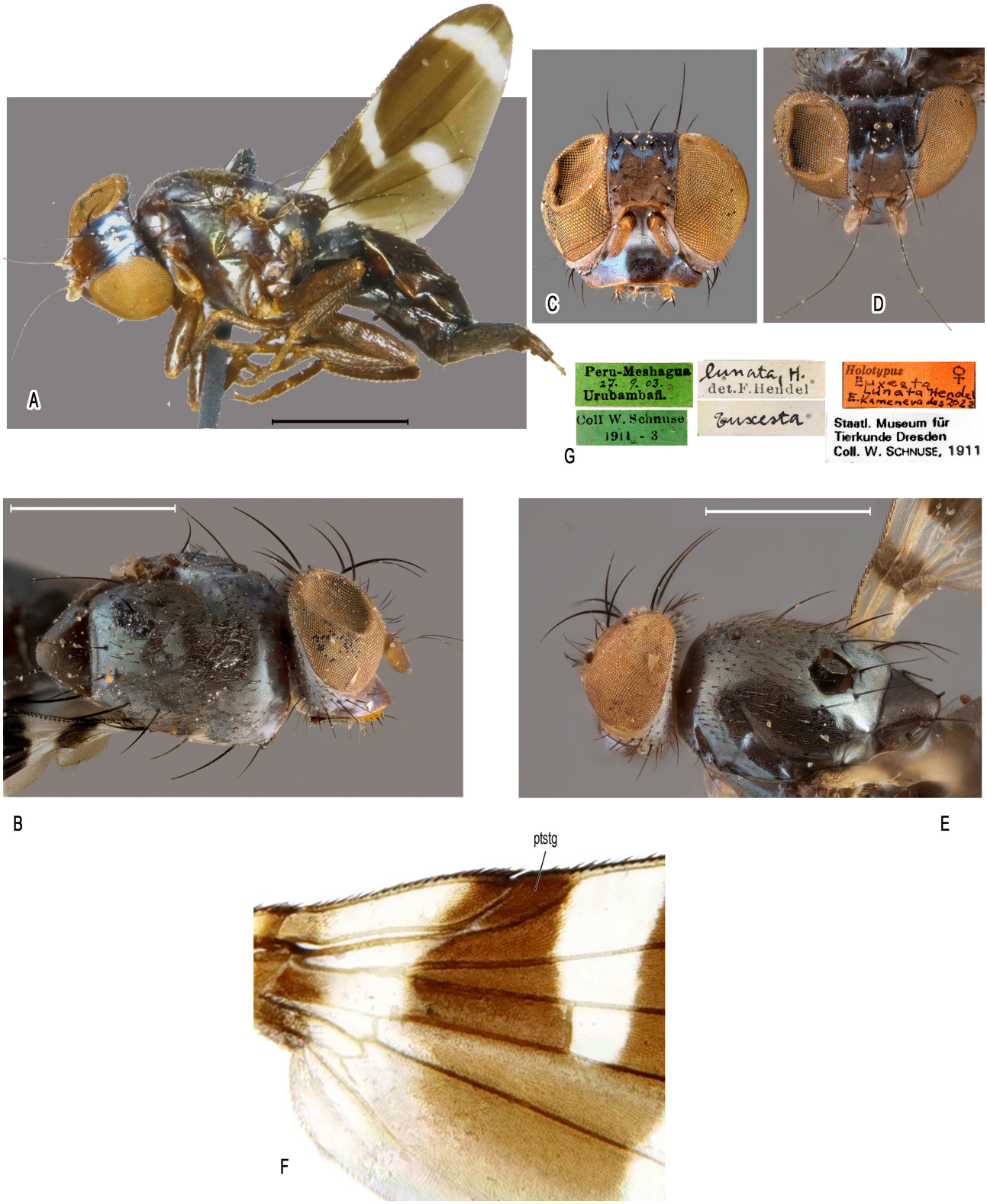

FIGURE 31. *Aspistomella lunata* (Hendel), holotype ♀ (**A–D**, **H**) and non-type ♂ (**E**, **F**) (SMTD). **A**, habitus, left; **B**, head, right, and thorax, dorsal; **C**, head, anterior; **D**, same, dorsal; **E**, head and thorax, dorsolateral; **F**, wing, anterobasal part; **G**, labels. Abbreviations: ptstg—pterostigma. Scale bars: 1 mm.

Antenna brown; scape and pedicel with black setulae; postpedicel brownish yellow, darkened apico-dorsally, whitish microtrichose, twice as long as wide, apically rounded; arista black except yellow at base, almost bare. Mouthparts black, prementum black, shining. Palp yellow or yellowish brown, narrowly crescent, apically rounded, with 9–12 black setulae, of which 3–4 subapical setulae 2–3× longer than other setulae.

Thorax (Figs 31 B, E) brown to black, with bluish sheen and sparse white and brown microtrichia not hiding underlying cuticle. Mesonotal scutum 1.3× longer than wide; black setulose, with 8–10 rows of setulae between rows of dorsocentral setulae; acrostichal prescutellar seta present; prescutellar area with 4–5 rows of setulae between posterior dorsocentral setae. Scutellum dorsally very slightly convex, brown to black, subshining, sparsely shagreened, devoid of setulae. Subscutellum shining, dark brown to black. Mediotergite shining black, non-microtrichose medially. Other setae as described for the genus. All the setae and setulae black.

Wing (Fig. 5 G) 2.9 (♂)–3.1 mm (♀) long, 2.5× longer than wide; generally as described for *A. enderleini*, costal cell 5× longer than wide, with costa very slightly curved, forming shallow cleft before apex of vein Sc; pterostigma entirely brown, narrow triangular, as long as wide and 0.25× longer than costal cell width, vein R_1 bare, ending at level of crossvein r-m level; vein R_{2+3} sinuate, at apex bent anteriorly to costa. Crossvein r-m distally of middle of cell dm. Cell r_{4+5} 6.5× longer than wide, apically slightly narrowed. Cell m_1 subtriangular; ultimate section of M_1 3.5× longer than crossvein dm-m and 1.4× longer than penultimate section. Vein CuA Z-shaped, posteroapical lobe of cell cua along vein CuP 2.5× longer than its anterior shoulder. Wing pattern with short subbasal crossband from humeral vein through cell cua into alula, and large dark brown mark from apical lobe of costal cell to wing apex, with 3 hyaline marks: incision from cell r_1 into cell r_{4+5} distal to crossvein r-m, oval spot in apex of cells dm and m_4 and long and narrow crescent or arcuate incision from apex of cell m_1 into cell r_1 subparallel to wing apex. Cell cup (anal cell sensu Kameneva & Korneyev 2010) and anal lobe slightly narrower than cell cua. Calypters white, with white ciliae. Halter yellow.

Legs (Fig. 31 A): coxae and trochanters, apices of femora and tibiae yellow, fore femora brownish-yellow ventrally, otherwise black; tibiae mostly dark brown; tarsi yellowish brown; black setose and setulose. Otherwise legs as described for *A. enderleini*.

Male and female terminalia not examined; partly exposed aculeus with ovoid, long-setulose cercal unit.

Remarks. Hendel (1909a) originally placed this species in the genus *Euxesta* because it has a non-shortened pterostigma, like in all the species he placed in that genus. However, it has an epistome more than twice as long as the height of the clypeus, like all species of *Aspistomella*, which is the diagnostic character of all the genera considered in this article. It shares a similar wing pattern with *A. lobioptera*, the type species of the latter genus and some other species. For this reason, we transfer it from *Euxesta* to *Aspistomella*.

Aspistomella obliqua Kameneva, V. Korneyev & Savaris, sp. nov.

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Figs 6 H, 32–33

Material examined. Type. Holotype: ♂: **Brazil**: [Rio de Janeiro:] "Therezopolis, Soberbo. 1000 metr. 22.1.1939. Trayassos & Oiticica", "Otitoidea (Ulidiidae)", "HOLOTYPE ♂ / Aspistomella obliqua Kameneva, V. Korneyev & Savaris" [red label] (MZUSP). Paratypes: **Brazil**: Santa Catarina**:** 2♂, 1♀: "Corupa (Corupá) / (Hansa Humboldt) / S. Cath. (Santa Catarina), Brazil /XII-1945", "A. Maller, coll. / Frank Johnson / Donor", idem, "II 1945" and "XII-1945", respectively (AMNH); 1♀: Rio de Janeiro: "Itatiya / 20. Jan. 1927 / Zikán leg.", "Lichtfang" (ZFMK); 1♂: "Itatiaia, Est. do Rio, Brasil (Estr. Agulhas Negras, K. 6 - 2000 m) Tra. & Pearson 5/6 - 2 - [1] 951 (MELQ ESALQENT001784); 1♀: "Itatiaia, Est. do Rio, Brasil (Macieira-1830 m). 9/10 - 3 - [1] 951. D. Albuquerque col." (MZUSP); 1♂: "Therezopolis, Est. do Rio, XII - [19] 39 Freitas [col.]" (MZUSP); 1♀: "Est. do Rio, Itatiaia, Faz. Serra. 2 - [1] 945. Barretto col." (MELQ ESALQENT001785); 1♀: Itatiaia. 800 ms. 12 - [1] 933, S. Lopes ET R. Cunha [col.]" (MZUSP); 1♀: "Angra-Jussaral. 2 - [1] 935, Trayassos & Oiticica F [col.]" (MZUSP).

Diagnosis. *Aspistomella obliqua* is the largest known species in this group of genera, with a wing length of almost 10 mm. It also differs from all other species of the group by the combination of the elongated pterostigma, vein R_1 dorso-apically setulose, crossvein r-m distally from R_1 apex, head with moderately wide frons, strongly developed epistome and outer vertical seta well expressed, 0.4–0.5× longer than inner vertical seta, prescutellar acrostichal seta present, wing narrow, more than 3× longer than wide; oblique hyaline interspace crossing whole wing from apex of R_1 to apex of CuA, dark subapical crossband uniformly narrow, cell m_1 with hyaline area in

basal half; face below lunule with moderately small, rhomboid black microtrichose area not reaching bases of antennae, mid tibia ventroapically with 2 long spines and hypandrium with pregonites displaced postero-laterally from postgonites.

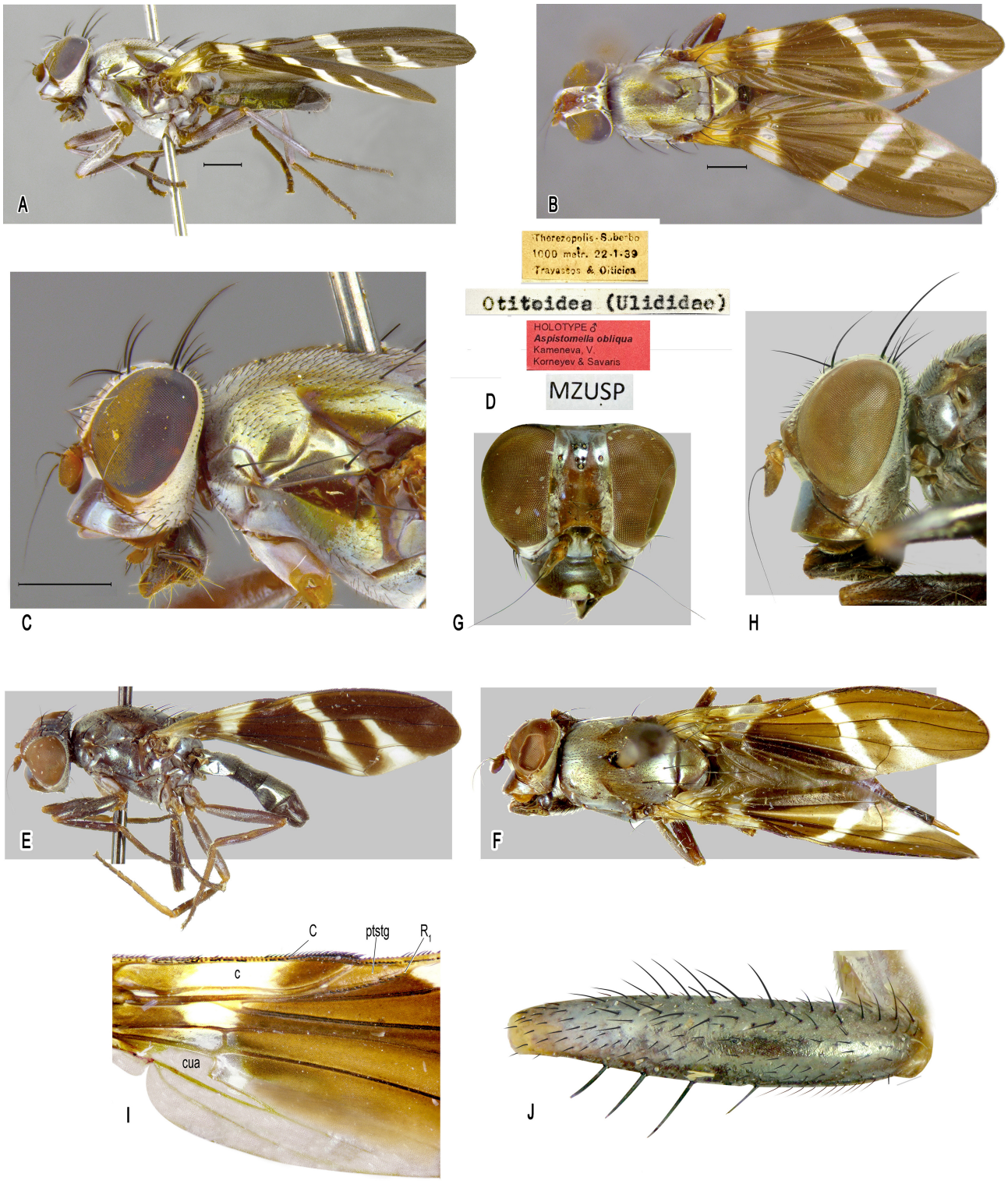

FIGURE 32. *Aspistomella obliqua* **sp. nov.**, holotype ♂ (**A–D**) (MZUSP) and paratype ♂ (**E–G**) (AMNH). **A**, **E,** habitus, left; **B**, **F**, same, dorsal; **C**, head and thorax, left; **D**, labels; **G**, head, anterior; **H**, head, left; **I**, wing, anterobasal part; **J**, fore femur. (**A–D** by Alexandre Araújo and Marcoandre Savaris.) Abbreviations: C—costal vein; c—costal cell; cua—anterior cubital cell; ptstg—pterostigma; R_1—anterior branch of radius.

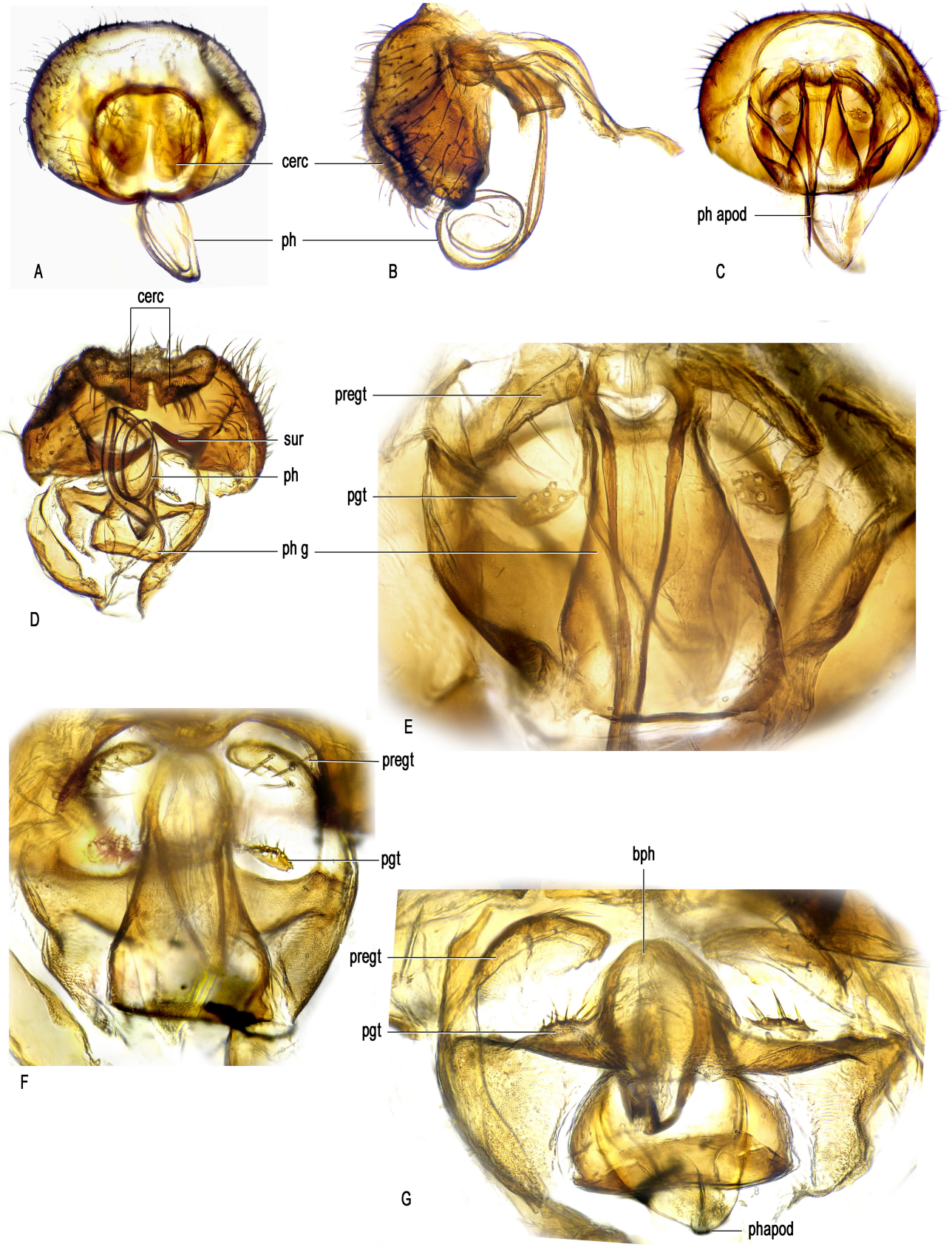

FIGURE 33. *Aspistomella obliqua* **sp. nov.**, paratype ♂ genitalia (AMNH). **A**, postabdomen, posterior; **B**, same, lateral; **C**, same, anterior; **D**, same, ventral; **E**, hypandrium, anterodorsal; **F**, same, posteroventral; **G**, same, dorsal. Abbreviations: bph—basiphallus; cerc—cerci; ph g—phallic guide; ph—phallus; phapod—phallapodeme; pgt—postgonite; pregt—pregonite; sur —surstylus.

Description. Male. **Head** (Figs 32 C, G, H) ratio (length : height : width) = 1 : 1.56 : 1.8; frons, parafacial and gena reddish or yellowish brown, epistome medially and occiput mostly brown to black; face above transverse fold brown, white microtrichose, with black rhomboid or trapezoid spot at lunule not touching antennal sockets; epistome brown to brownish yellow laterally. Frons moderately wide, slightly narrowed posteriorly (Fig. 32 G), 0.9× as long (from lunule to anterior ocellus) or 1.46× (from lunule to inner vertical seta) as wide (at lunule), with brown or black, shining, sparsely silver microtrichose vertex; orbits, gena and occiput silver-white microtrichose; parafacial narrow, snow white microtrichose. Frontal plates with 8–9 short, fine parafrontal setulae and 4–7 frontal setae on each side; frontal vitta matt brown to yellowish brown, with 1–4 interfrontal setae. Eye 1.5× higher than long. Face densely white microtrichose (above epistome) except black spot at lunule black microtrichose; epistome sparsely white microtrichose, with steel or metallic cyan sheen. Clypeus brown to yellow, sparsely white microtrichose, subshining, 0.3× higher than epistome. Gena high, 0.34× higher than eye, brownish yellow, with moderately long genal seta and 4–5 additional long peristomal setae anterior of it, 0.5–0.7× longer than genal seta. Occiput with densely steel grey to white microtrichose.

Antenna yellowish to dark brown; scape and pedicel with numerous black setulae; postpedicel yellow, apico-dorsally dark brown or blackish, white microtrichose, 1.9–2× longer than wide, apically rounded; arista entirely black, 2-segmented, bare. Mouthparts black, prementum black, shining. Palp yellowish brown, widely crescent, apically rounded, with 18–25 strong black setulae, of them 3–4 subapical setulae 1.5–2× longer than other setulae.

Thorax (Figs 32 A–C, F) brown to black, with silvery, golden or purple sheen and sparse white and brown (posterior of transverse suture and in supraalar area) microtrichia not hiding underlying cuticle. Mesonotal scutum 1.3× longer than wide; black setulose, with 14–18 rows of setulae between rows of dorsocentral setulae; acrostichal prescutellar seta strong; prescutellar area with 8 rows of setulae between posterior dorsocentral setae. Scutellum dorsally very slightly convex, brown to black, with strong silver or golden sheen, sparsely microtrichose, devoid of setulae. Subscutellum and mediotergite black, silver microtrichose. All the setae and setulae black.

Wing (Fig. 6 H) 9.2–10.2 mm long, 3.1–3.3× longer than wide; basicostal cell hyaline; costal cell straight, 8–10× longer than wide, brown in basal and apical quarters of length, with costa slightly thickened and covered with longer setulae before apex of vein Sc; pterostigma entirely brown, triangular, 2.0–2.5× longer than wide, vein R_1 with 10–12 setulae dorsally (Fig. 32 I), ending proximal to crossvein r-m level in both sexes; vein R_{2+3} arcuate, at apex bent anteriorly to costa. Crossvein r-m in distal third of cell dm or slightly proximally. Cell r_{4+5} 5.4–5.5× longer than wide, apically narrowed. Cell m_1 narrow triangular; ultimate section of M_1 2.9–3× longer than crossvein dm-m and 1.4–1.5× longer than penultimate section. Vein CuA Z-shaped, forming long posteroapical lobe of cell cua along vein CuP, 3× longer than its anterior shoulder (Fig. 32 I). Wing pattern with short but rather wide subbasal crossband from humeral vein through cell cua into alula, and large dark brown mark from apical quarter of costal cell and pterostigma into cell cua_1, with narrow and oblique hyaline crossband from apex of vein R_1 through base of cell r_{4+5} and apex of cell dm into apex of cell cua_1; middle of cell r_{4+5} above dm-m and middle of cell m_1 with oblique hyaline incision (Figs 6 H, 32 A, B, E, F). Cell cup and anal lobe as wide as cell cua (Fig. 32 I). Alula 3× longer than wide, grey, darkened in apical half. Calypters white, with very long white cilia, some almost as long as calypters. Halter yellow.

Legs mostly black, except coxae, trochanters and bases of femora brownish yellow; tibiae brown to black, fore and mid tarsus brown, hind tarsus brownish yellow; femora with metallic sheen, silvery microtrichose. Fore femur with 2 rows of posterodorsal and posterior setae half as long as femur width, and 6–8 moderately strong posteroventral setulae in apical half (Fig. 32 J). Mid femur anteriorly with short suberect setulae; mid tibia ventrally with two subequal spur-like setae 1–1.3× longer than tibia width.

Abdomen black, with tergites 5–6 brown to black, black setose and setulose, with faint golden, steel or greenish metallic sheen.

Male genitalia (Fig. 33) with moderately large, subovoid, mostly separated cerci (Figs 33 A, B, D); epandrium densely setulose, wide ovoid, with narrow, mesally directed surstyli having no lobes, and bearing only a few setulae on medial surface, and also one thicker pimple-like apical process (Fig. 33 D). Phallus rather short, bare, 1.5–2 times as long as epandrium high (Fig. 33 B). Hypandrium with very wide phallic guide forming long laterally directed lobes connected with pair of long, posteriorly projected pregonites posterior of basiphallus ring; pair of suboval postgonites laterally of basiphallus, both with groups of 5–7 trichoid sensilla, on pregonites almost twice longer than on postgonites (Figs 33 E–G).

Female terminalia: aculeus with ovoid, long-setulose cercal unit; 2 globose spermathecae.

Etymology. The species name is the Latin adjective, reflecting the presence of an oblique medial hyaline crossband, which is an essential character of this species.

Aspistomella pachitea **Kameneva & V. Korneyev, sp. nov.**
urn:lsid:zoobank.org:act:87F9EAAA-F2E1-4AFE-ADC0-01AA95ADD57A
Figs 5 A, 34–35

Material examined. Type. Holotype ♀: "**Peru**—150 m / 26.11.[19]03 / Pachitea-Münd [8.76S, 74.53W] " [Schnuse leg.] (SMTD) (left wing and apical half or right wing missing). **Paratype**: 1♂: "**Peru**—150 m / 19.11.[19]03 / Pachitea-Münd" [Schnuse leg.] [head missing; abdomen dissected and attached in microvial] (SMTD).

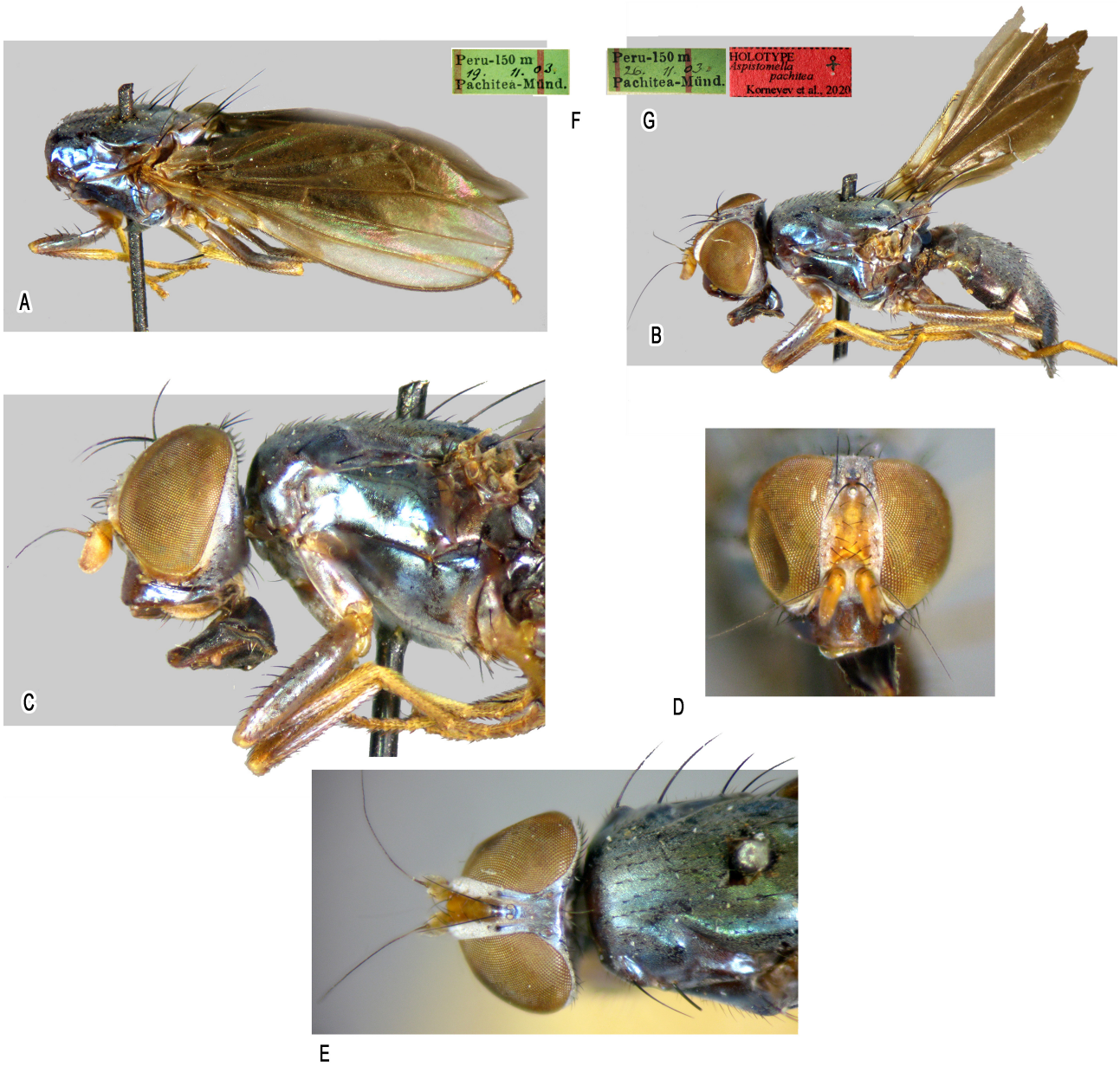

FIGURE 34. *Aspistomella pachitea* **sp. nov.**, holotype ♀ (**B–E**, **G**) and paratype ♂ (**A**, **F**) (SDEI). **A**, **B**, habitus, left; **C**, head and thorax left; **D**, head, anterior; **E**, head and thorax, dorsal; **F, G**, labels.

Diagnosis. *Aspistomella pachitea* is similar to other species of the genus in that the epistome is high, the costal vein forms a conspicuous cleft before the apex of the subcostal vein, and the pterostigma is very short, shorter than the width of the costal cell (Figs 34 C–D, 5 A), but differs from them in that the costal vein is straight, costal cell is not lobed, the vein r-m distally from the R_1 apex, and in the details of the wing pattern: wing disk gradually darkening from pale grey at anterior margin to brown at posterior margin, without any hyaline incisions, spots or bands (in other species of the genus, the costal vein is conspicuously arcuate proximally to the apex of the subcostal vein, and the wing pattern is predominantly brownish-yellow to dark brown, with hyaline triangular incisions and rounded spots). It is most similar to *A. duo*, *A. heteroptera* and *A. tres* in having very short pterostigma, brown halter, no acrostichal setae, male genitalia with the outer surstyli with narrow mesally directed ventral process ending by a tiny pimple-like process and moderately large projected cerci, differing by the narrowest frons in the group, straight, non-lobed costal cell, bare vein R_1 and different type of with pattern and venation. It also differs from the other species of *Aspistomella* by the distinctly curved apical section of vein M_1 sharing this character only with *A. heteroptera* and several species here assigned to *Ulivellia* and other genera of this group.

Description. Male. **Head** (Figs 34 C–E) ratio (length : height : width) = 1 : 1.43 : 1.62, frons, parafacial, and gena yellow to yellowish brown, face and occiput mostly dark brown to black. Frons slightly narrowed posteriorly (Figs 34 D, E), 1.06× longer than wide at lunule and 1.46× longer than wide at vertex, with subshining, brown ocellar triangle and brownish yellow vertical plates; orbits, vertex, gena and occiput silver-white microtrichose; parafacial narrow, 0.2× broader than postpedicel, yellow, sparsely white microtrichose. Frontal plates with 5 pairs of inclinate frontal and interfrontal setae as long as outer vertical seta, and one submarginal row of 5 very short parafrontal setulae; frontal vitta sparsely whitish microtrichose, with 3 shorter, frontal setulae above lunule (Fig. 34 D). Lunule indistinguishable. Eye 1.55× higher than long. Face strongly produced anteriorly, brown, densely white microtrichose (above epistome); epistome brown, sparsely white microtrichose, with metallic bluish sheen. Clypeus low, yellowish brown, sparsely white microtrichose. Gena brownish yellow, with long genal seta and 6–7 additional long peristomal setae anterior of it, 0.4–0.6× longer than genal seta. Occiput black, white to greyish microtrichose.

Antenna yellow; scape and pedicel with black setulae; postpedicel yellow, whitish microtrichose, twice as long as wide, apically rounded; arista black except basal 0.15 yellow, almost bare. Mouthparts black, prementum black, shining. Palp yellow, as in *A. lobioptera*.

Thorax (Figs 34 A–C) black, with bluish sheen and sparse white and brown microtrichia not hiding underlying cuticle. Mesonotal scutum 1.25× longer than wide; black setulose, with 5–6 rows of setulae between rows of dorsocentral setulae; acrostichal prescutellar seta absent; prescutellar area without setulae between posterior dorsocentral setae. Other setae as described for the genus. All the setae and setulae black. Scutellum dorsally flattened, yellowish brown to brown, subshining, sparsely microtrichose, devoid of setulae, with bluish sheen. Subscutellum subshining, black. Mediotergite shining black, non-microtrichose medially.

Wing (Fig. 5 A) 4.3 mm (♂) long, 2.55× longer than wide; basicostal cell hyaline; costal cell straight, 5× longer than wide, pale grey, brownish in basal 0.16 of length, with costa straight, almost uniformly setulose, slightly thickened and forming cleft before apex of vein Sc; pterostigma entirely brown, linear, vein R_1 bare, ending proximally of crossvein r-m level in both sexes; vein R_{2+3} straight. Crossvein r-m basally of middle of cell dm. Cell r_{4+5} 5× longer than wide, apically narrowed. Cell m_1 subtriangular; ultimate section of M_1 conspicuously upcurved, 2.35× longer than crossvein dm-m and 1.1× longer than penultimate section. Vein CuA Z-shaped, forming moderately short posteroapical lobe of cell cua along vein CuP, as long as its anterior shoulder. Wing uniformly grey microtrichose, subhyaline at anterior margin and apex and brown in posterior half. Cell cup (anal cell sensu Kameneva & Korneyev 2010) and anal lobe brown as wide as cell cua. Alula 2.6× longer than wide, uniformly dark grey. Calypters brownish, with pale brown ciliae. Halter brownish yellow, with brown knob.

Legs (Figs 34 A–B): coxae and trochanters, apices of femora yellow, fore femur anteriorly brownish-yellow, otherwise black; tibiae and tarsi yellow; black setose and setulose. Fore femur with 2 rows of 4–6 posterodorsal, but without strong posteroventral setae. Mid femur anteriorly with short suberect setulae; mid tibia ventrally with single spur-like seta 3× longer than tibia width.

Abdomen brown to black, sparsely black setulose.

Male genitalia (Figs 35 B–G) with short, but projected, separate cerci, moderately narrowed; surstyli simple with narrow, mesally directed ventral lobe apically bearing dorsally directed pimple-like process, but without distinct antero-ventral and postero-ventral lobes; one row of 4–5 short setulae on mesal surface of inner surstylus (Figs 35 C, F). Phallus moderately short, 2× longer than epandrium height, bare (Fig. 35 D). Hypandrium: phallic guide with suboval lobes forming no conspicuous posterior projections, bearing pair of oval postgonites anterior to basiphallus ring, and symmetrical pregonites anterolateral to them, both with groups of 5–6 trichoid sensillae (Fig. 35 G).

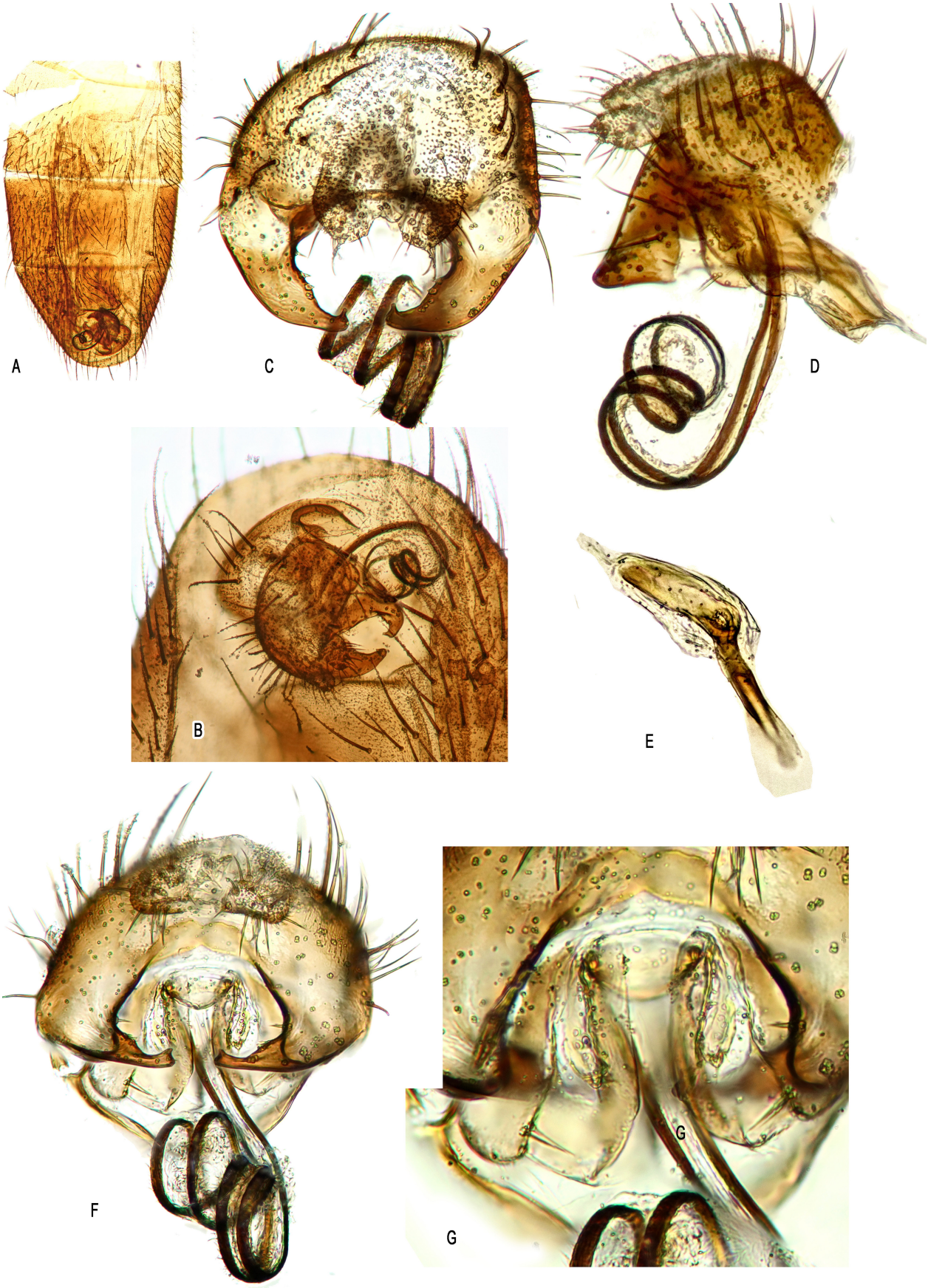

FIGURE 35. *Aspistomella pachitea* **sp. nov.**, paratype ♂ genitalia (SDEI). **A**, abdomen, ventral; **B**, postabdomen and apical part of preabdomen; **C**, postabdomen, posterior; **D**, same, lateral; **E**, ejaculatory apodeme; **F**, postabdomen, ventral; **G**, hypandrium, ventral.

Female terminalia: not examined.

Etymology. The name of the species is a noun in apposition derived from its type locality, the Pachitea River, a tributary of the Ucayali.

Aspistomella quinquincisa Kameneva & V. Korneyev, sp. nov.

urn:lsid:zoobank.org:act:ADC8FC31-03E6-4F57-83B3-198A102D8CF0

Figs 6 F, 36–37

Material examined. Type. Holotype ♂: **Brazil:** "Brasilien / St. Cath.[arina], Joinville / Schmalz S. V." (cyan paper label, no date", "Zool. Mus. Berl." (yellow label) (left wing missing, right wing detached and glued after photographing; abdomen dissected and mounted in microvial with glycerine) (NKMB).

Diagnosis. *Aspistomella quinquincisa* is most similar to *A. crucifera* in comparatively short head and less produced epistome, narrow frons and wings, as well as in wing venation, wing pattern widely dark with large subbasal and four incisions in apical dark area, differing from it by the cell r_1 with 2 marginal hyaline marks cuneiform, narrowed posteriorly, of which the second incision extends only into cell r_{2+3} (in *A. crucifera*, into cell r_{4+5}) and the hyaline mark in cell m_1 crossing vein M_1 to the middle of cell r_{4+5} (in *A. crucifera*, only reaching vein M_1). It differs from the other species of the genus as indicated in the key to species.

Description. Male. **Head** (Figs 36 C, D) ratio (length : height : width) = 1 : 1.4 : 1.7, frons, face above transverse fold, parafacial, and gena reddish or yellowish brown, epistome and occiput mostly black. Frons (Fig. 36 C) slightly narrowed posteriorly, 0.7× as long (from lunule to anterior ocellus) or 1.2× (from lunule to inner vertical seta) as wide (at lunule), with subshining black ocellar triangle and vertical plates; orbits, vertex, gena and occiput silver-white microtrichose; parafacial narrow, 0.25–0.3× broader than postpedicel, reddish-yellow, sparsely white microtrichose. Frontal plates with 4–5 fine parafrontal setulae and 3–4 frontal setae on each side, frontal vitta with shallow wrinkles, sparsely and very short microtrichose; with 1–2 pro- or inclinate interfrontal setae (Fig. 36 C). Eye 1.3× higher than long. Face yellowish brown, white microtrichose above epistome; epistome moderately produced anteriorly and separated from upper part of face by shallow fold, brown, sparsely white microtrichose, with metallic bluish sheen. Clypeus brown, sparsely white microtrichose, subshining, 0.4× higher than epistome height. Gena brownish yellow, with long genal seta and 4–5 additional long peristomal setae anterior of it, 0.4–0.6× longer than genal seta. Occiput black, with cyan metallic sheen, greyish microtrichose.

Antenna yellow; scape and pedicel with black setulae; postpedicel yellow, whitish microtrichose, 1.6× longer than wide, apically rounded; arista black except yellow at base, almost bare. Mouthparts brown to black, prementum black, sparsely microtrichose. Palp yellow to brown, as described for *A. angustifrons*.

Thorax (Figs 36 A, B, E) brown to black, silvery subshining, with sparse white microtrichia not hiding underlying cuticle. Mesonotal scutum 1.3× longer than wide; black setulose, with 2 pairs of dorsocentral setae; rows of setulae between them broken off and indistinguishable, but not more than 4; acrostichal prescutellar seta present, 0.8× longer than posterior dorsocentral seta (prescutellar area partly destroyed with pin). Other setae as described for the genus, black. Scutellum dorsally slightly convex, brown, subshining, finely chagreened, sparsely microtrichose, without setulae. Subscutellum and mediotergite as in *A. angustifrons*.

Wing (Figs 6 F, 36 F) 3.2 mm long, 2.8× longer than wide; basicostal cell hyaline; costal cell straight, 6× longer than wide, brown in basal 1/3 and 1/5 of its length; pterostigma entirely brown, narrow triangular, 2.5× longer than wide; vein R_1 bare, ending proximally of crossvein r-m level; vein R_{2+3} slightly arcuate in basal half, straight at apex. Crossvein r-m at middle of cell dm. Cell r_{4+5} 9× longer than wide. Cell m_1 narrow triangular; ultimate section of M_1 3.4× longer than crossvein dm-m and 1.9× longer than penultimate section. Vein CuA Z-shaped, forming moderately short posteroapical lobe of cell cua along vein CuP, 2× longer than its anterior shoulder. Wing pattern with subbasal crossband from humeral vein through cell cua into alula; wing distally of cells c, bm, cua and radial fork dark brown with 4 large hyaline areas: 2 hyaline incisions at anterior margin from cell r_1: proximal one through cell r_{2+3} into base of cell r_{4+5} distally of crossvein r-m and distal to middle of cell $r_{2+3;}$ and at posterior margin into apical part of cell dm (part of wing in apical part of cell m_4 missing in the holotype) and from basal part of cell m_1 ending at middle of cell r_{4+5} (Fig. 6 F). Calypters white, with white cilia. Halter yellow.



FIGURE 36. *Aspistomella quinquincisa* **sp. nov.**, holotype ♂ (MNKB). **A**, habitus, left; **B**, same, dorsal (wings detached); **C**, head, anterior; **D**, same, left; **E**, mesonotum, dorsal; **F**, wing, anterobasal part; **G**, abdomen, dorsal; **H**, third abdominal tergite, vestiture; **I**, labels. Scale bar: 1 mm.

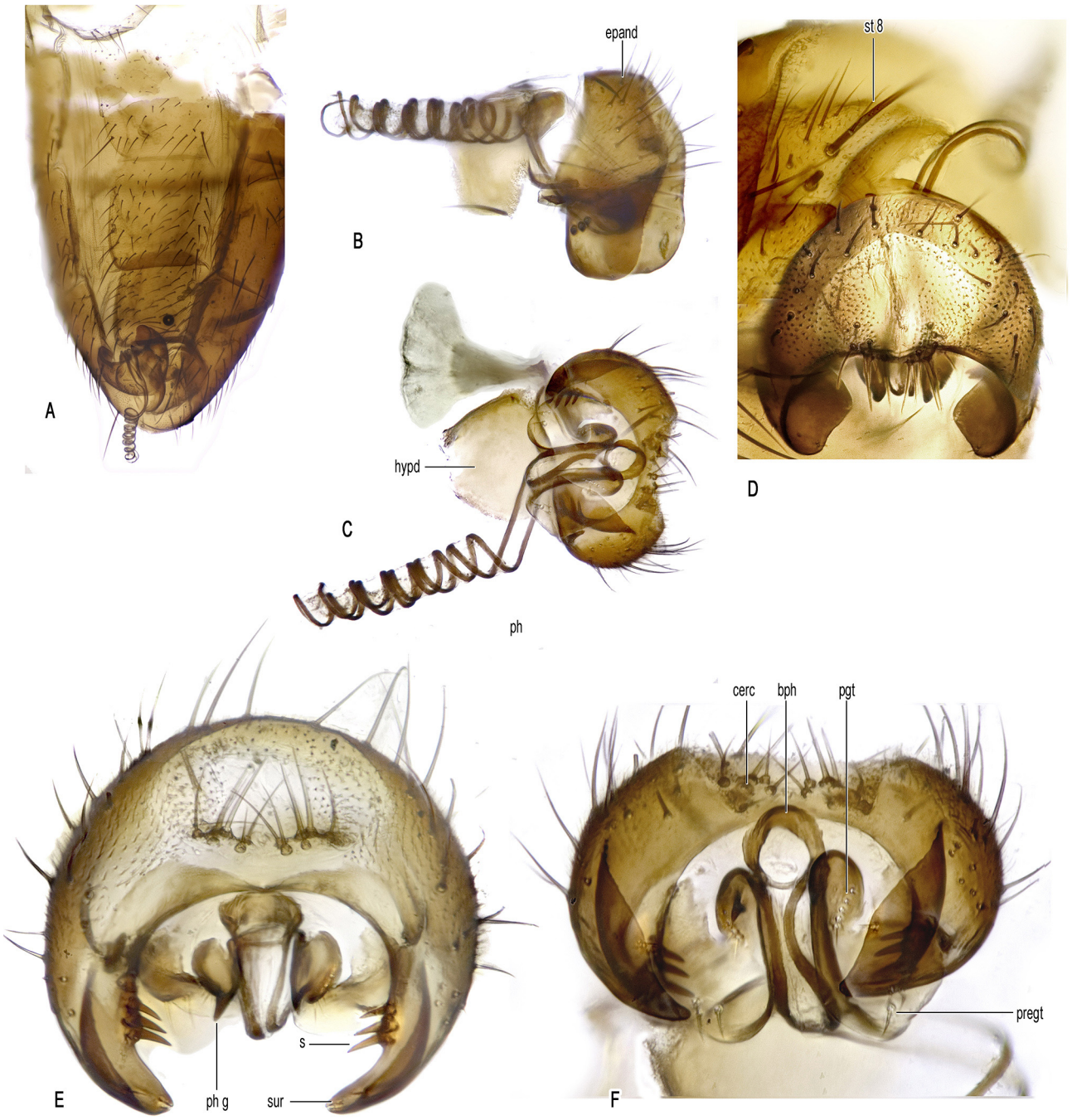

FIGURE 37. *Aspistomella quinquincisa* **sp. nov.**, holotype ♂ genitalia (MNKB). **A**, abdomen, ventral; **B**, postabdomen, lateral; **C**, same, ventral; **D**, same, postero-dorsal; **E**, same, posterior; **F**, same, ventral. Abbreviations: bph—basiphallus; cerc—cerci; epand—epandrium; hypd—hypandrium; ph g—phallic guide; ph—phallus; pgt—postgonite; pregt—pregonite; s—seta; sur —surstylus.

Legs (Fig. 36 A): fore coxa yellow, fore trochanters, femora, tibiae, and tarsi missing in holotype. Mid and hind leg brownish yellow, except hind coxa blackish brown and tarsi yellow. Mid femur anteriorly with of 8 and postero-apically with 3 suberect setulae; mid tibia ventrally with single spur-like seta 2.5× longer than tibia width. Hind femur with 2 long subapical setae dorsally.

Abdomen (Figs 36 A, B, G) subshining black, sparsely black setulose, cuticle very shallowly rugulose (Figs 36 G, H), only syntergite 1+2 and lateral margins of tergites 3–5 and sternites with sparse whitish setulae. Sternites 3–5 sparsely microtrichose, black setulose, as on Fig. 37 A. Pregenital sternite 8 microtrichose and short setulose, with 2 thicker and longer setae (Fig. 37 A).

Male genitalia (Figs 37 B–F) with short cerci, moderately narrowed, simple, blunt surstyli without lobes or serrations and one row of 3 moderately thickened setulae on mesal surface (Fig. 37 E). Phallus narrow, 2.5–3 times as long as epandrium high, bare (Figs 37 B, C). Hypandrium: phallic guide with suboval lobes forming conspicuous posterior projections, bearing pair of oval postgonites just anterior of basiphallus ring (Figs 37 D, E); pregonites symmetrical, with 2–3 setulae (Fig. 37 F).

Female terminalia: not examined.

Remarks. The specimen is in fair condition: right postpedicel, both fore legs (except fore coxae), left mid and hind leg, left wing and most mesonotal setulae missing. Right wing detached and glued to the specimen after taking picture. Abdomen dissected and kept in a microvial pinned together with specimen.

Etymology. The species name is a Latin adjective, reflecting the presence of five hyaline marginal incisions in the wing pattern, which is an essential character of this species.

Aspistomella sachavaca Smit & Kameneva, sp. nov.

urn:lsid:zoobank.org:act:7B262B5F-3A13-42C0-BA6C-4FBD097754FF
GenBank accession number PQ331196
Figs 2 D, 6 A, 38

Material examined. Type. Holotype: 1♀: "**Peru**, Madre de Dios Rio Tambopata / Sachavacayoc centre / 12º51'10.7"S 69º22'02.4"W [12.8530S, 69.3673W] / 29.x.2008, 195 m a.s.l., leg. J.T.Smit" (RMNH 556517) (both midlegs missing). Paratypes: 1♀, "Peru, Madre de Dios / Rio Tambopata Picaflor concession / 12º46'26.3"S 69º24'36.3"W [12.7740S, 69.4101W] / 16.iv.2009 Leg. J.T.Smit", 1♀, 05–10.06.2010, 1♀, 07–22.11.2010 [leg. J.T.Smit].

Diagnosis. *Aspistomella sachavaca* are smaller flies (WL < 5 mm), differing from all other species of the group of genera also by the combination of the moderately developed pterostigma, vein R_1 apically setulose, crossvein r-m at the level of R_1 apex, head with moderately wide anteriorly shining frons, face below lunule with sooty black microtrichose area extending far beyond bases of antennae, moderately produced epistome and outer vertical seta well expressed, 0.4–0.5× longer than inner vertical seta, prescutellar acrostichal seta present, wing wide, 2.3–2.4× longer than wide; almost straight perpendicular or slightly arcuate hyaline interspace crossing whole wing from apex of R_1 to apex of cell m_4, dark subapical crossband widened posteriorly, ultimate section of vein M_1 sinuate; cell m_1 with hyaline area in apical half; and mid tibia with 1 long ventroapical seta.

Description. Male. **Head** (Figs 38 B, C) ratio (length : height : width) = 1 : 1.3–1.4 : 1.95; frons, parafacial, and gena reddish brown, most of epistome and occiput dark brown to black; face below lunule almost with sooty black microtrichose area expanded ventrolaterally far beyond bases of antennae (Fig. 38 C). Frons moderately wide, slightly narrowed posteriorly (Fig. 38 B), 0.65× as long (from lunule to anterior ocellus) or 1.3× (from lunule to inner vertical seta) as wide (at lunule); vertex black, steel shining, sparsely microtrichose; orbits in posterior half, parafacial, narrow transverse band on face above fold, gena and occiput silver-white microtrichose; parafacial half as wide as postpedicel. Vertical plates with 2 orbital setae (anterior half as long as posterior). Frontal plates and anterior half of frontal vitta convex and shining, devoid of any microtrichia; with 3 white microtrichose elongate areas: 2 on orbits anterior of vertical plate and one anterior of ocellar triangle; 3–5 parafrontal setulae, 5–6 pro- and lateroclinate frontal setae in sublateral row and 2–3 long interfrontal setae on each side, on shining part of dark brown or orange frontal vitta (Figs 38 B, C). Eye 1.5× higher than long. Face above transverse fold with white microtrichose crossband. Epistome sparsely white microtrichose, with metallic cyan sheen. Clypeus brownish-yellow, laterally brown or black, densely snowy-white microtrichose, matt, 0.3× higher than epistome. Gena high, 0.33× higher than eye, dark brown to black, densely microtrichose, with moderately long genal seta and 3–4 additional long peristomal setae anterior of it, 0.3–0.8× longer than genal seta. Occiput densely grey to white microtrichose.

Antenna brown; scape and pedicel with numerous black setulae; postpedicel brown, grey microtrichose, 1.3–1.4× longer than wide, apically rounded; arista entirely black, 2-segmented, bare. Mouthparts black, prementum black, shining. Palp yellowish brown, crescent-shaped, apically rounded, with 18–25 strong black setulae, of them 3–4 subapical setulae 1.5–2× longer than other setulae.



FIGURE 38. *Aspistomella sachavaca* **sp. nov.**, holotype ♀ (RMNL). **A**, habitus, left; **B**, head, dorsal; **C**, head, anterior; **D**, mesonotum, dorsal; **E**, fore legs; **F**, wing, anterobasal part; **G**, labels. Scale bar: 1 mm.

Thorax (Figs 38 A, D) brown to black, on pleura with silvery sheen and sparse grey and brown (posterior of transverse suture and in supra-alar area) microtrichia not hiding underlying cuticle. Mesonotal scutum 1.25× longer than wide; black setulose, with 12–14 rows of setulae between rows of dorsocentral setulae; acrostichal prescutellar seta strong; prescutellar area with 2–4 rows of setulae between posterior dorsocentral setae. Scutellum

dorsally slightly convex, dark brown to black, subshining, very short and sparsely microtrichose, without setulae. Subscutellum and mediotergite shining black. All the setae and setulae black.

Wing (Figs 6 A, 38 F) 5.4–5.6 mm long, 2.6–2.7× longer than wide; basicostal cell hyaline; costal cell straight, 5–6× longer than wide, brown in basal and apical quarters of length, with costa slightly thickened and covered with longer setulae before apex of vein Sc; pterostigma entirely brown, triangular, 1.6–1.8× longer than wide, vein R_1 with 8–10 setulae dorsally, ending at level of crossvein r-m level in both sexes; costal vein between apices of R_1 and R_{2+3} conspicuously arcuate; vein R_{2+3} slightly undulate. Crossvein r-m at proximal 2/5 of cell dm. Cell r_{4+5} 4.0–4.5× longer than wide, apically narrowed. Cell m_1 narrow triangular, with pointed apex; ultimate section of M_1 2.7× longer than crossvein dm-m and 1.2–1.4× longer than penultimate section. Vein CuA Z-shaped, forming moderately long posteroapical lobe of cell cua along vein CuP, 1.7× longer than its anterior shoulder. Wing pattern with short but rather wide subbasal crossband from humeral vein through cell cua into alula, wide discal crossband from apical quarter of costal cell and pterostigma into basal half of cell cua_1, with moderately wide, somewhat arcuate, but not oblique hyaline interspace from apex of vein R_1 through base of cell r_{4+5} and apex of cell dm into apex of cell cua_1; apex of cell m_1 with oblique triangular hyaline incision reaching cell r_1 anterior of crossvein dm-m (Fig. 6 A). Cell cup and anal lobe 1.3× broader than cell cua_1. Alula 2.2× longer than wide, grey, darkened in apical half. Calypters white, with long white cilia, some almost as long as calypters. Halter yellow with knob basally brown.

Legs (Figs 38 A, E) mostly black, except fore coxa, fore trochanter and apices of femora and whole tarsi brownish yellow; femora with metallic sheen, sparsely grey microtrichose. Fore femur with 2 rows of posterodorsal and posterior setae half as long as femur width, and 3–4 moderately strong posteroventral setulae in apical half. Mid femur anteriorly with short suberect setulae; mid tibia moderately thickened, ventrally with one spur-like setae 1.2× longer than tibia width.

Abdomen black, with syntergite 1+2 silvery microtrichose, other tergites shining and very sparsely grey microtrichose, black setose and setulose.

Male unknown.

Female terminalia: not dissected; aculeus with ovoid, long-setulose cercal unit (exposed).

Etymology. The species is named after its type locality, Sachavacayoc, Madre de Dios, Peru. The name is considered to be a noun in apposition (the placename) with "yoc" elided.

Aspistomella schnusei Kameneva & V. Korneyev, sp. nov.

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Figs 6 B, 39

Material examined. Type. Holotype ♀: "**Peru**—Mapiri / 16.I.03 / Sarampioni 700 m" [Schnuse leg.], "Paraphyola", "Euxestinae / Präp. 3" [W. Hennig's handwritten labels] (SMTD).

Diagnosis. *Aspistomella schnusei* distantly reminds *A. angustifrons*, *A. crucifera*, *A. garleppi*, *A. obliqua*, and *A. terezae* in its narrow wings, and *A. angustifrons*, *A. garleppi*, and *A. pachitea* in its narrow frons, but it differs from all of them in that the epistome is conspicuously produced anteriorly and the wing is widely hyaline with narrow bands apically (in the epistome is only weakly developed anteriorly and the wing is widely brown with hyaline incisions apically). It also differs from the other species of the *Aspistomella* group of genera by its matt, finely and densely microtrichose abdominal tergites.

Description. Female. **Head** (Figs 39 A–D) ratio (length : height : width) = 1 : 1.46 : 1.85; frons, face above transverse fold, parafacial, and gena reddish to yellowish brown, epistome and occiput mostly black. Frons narrow, slightly narrowed posteriorly, 1.05× as long (from lunule to anterior ocellus) or 1.65× (from lunule to inner vertical seta) as wide (at lunule), with almost matt brown or black ocellar triangle and brown vertical plates; orbits, vertex, gena and occiput silver-white microtrichose; parafacial narrow, reddish-yellow, sparsely white microtrichose. Frontal plates with 9–10 parafrontal setulae, 6–8 frontal setae on each side; frontal vitta sparsely whitish microtrichose, with 3–5 interfrontal setae on each side (Fig. 39 C). Eye 2× higher than long, its posterior margin distinctly concave (Fig. 39 D). Face white microtrichose (above epistome); epistome brown, sparsely white microtrichose, with metallic bluish sheen. Clypeus yellow, white microtrichose, subshining, less than 1/3 as high as epistome. Gena brownish yellow, with long genal seta and 4–5 additional long peristomal setae anterior of it, as long as genal seta. Occiput black, with cyan metallic sheen, greyish microtrichose.

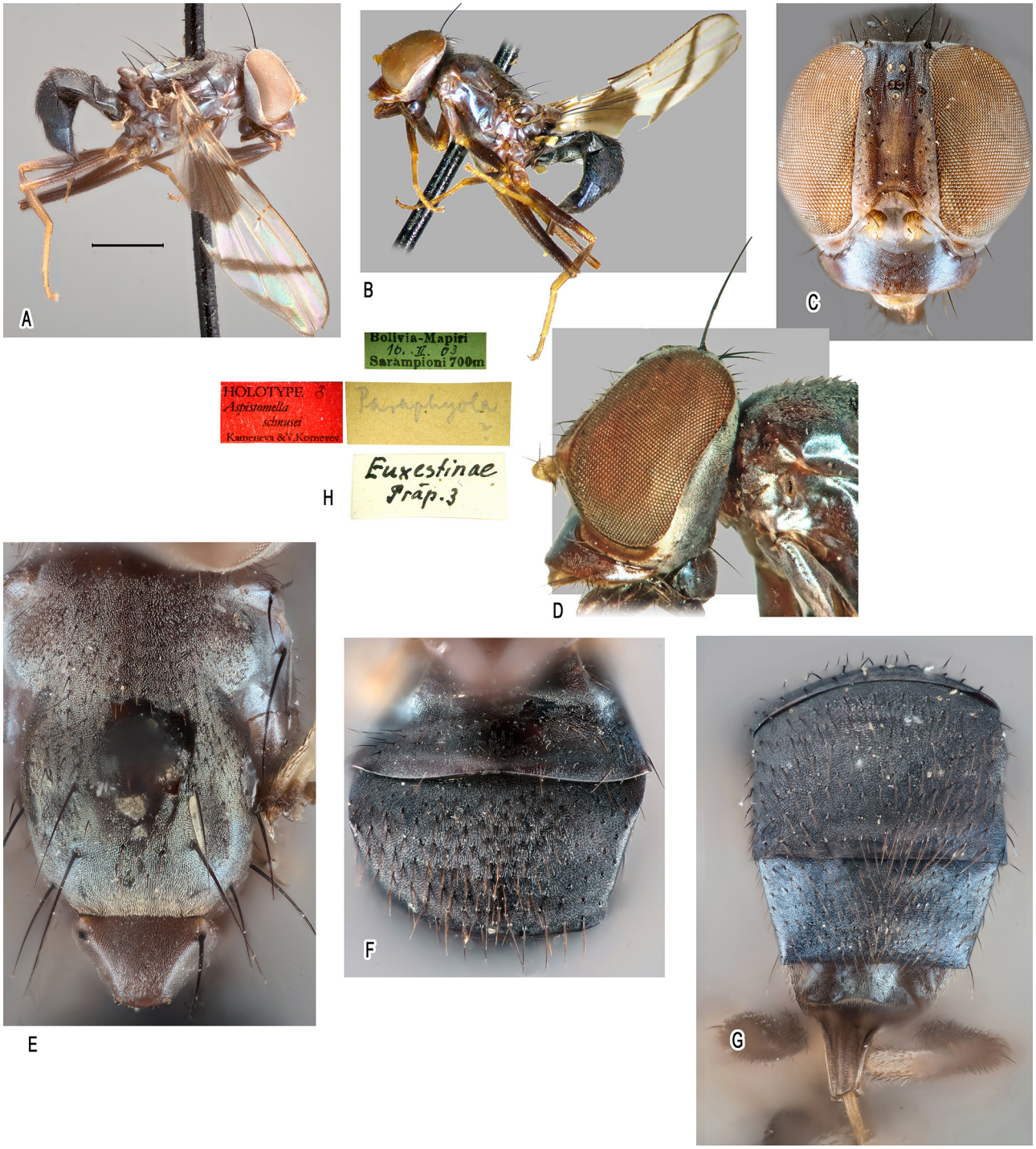

FIGURE 39. *Aspistomella schnusei* **sp. nov.**, holotype ♀ (SDEI). **A**, habitus, right; **B**, same, left; **C**, head, anterior; **D**, same, left; **E**, mesonotum, dorsal; **F**, abdominal tergites 1–3, dorsal; **G**, abdominal tergites 4–7, dorsal; **H**, labels.

Antenna yellow; scape and pedicel with black setulae; postpedicel and arista missing in the holotype.

Mouthparts brown to black, prementum black, sparsely microtrichose. Palp yellow, as described for *A. angustifrons*. Most setae missing in the holotype, except one very long inner vertical seta 17× longer than outer vertical seta; the latter 2× longer than postocular setae and 0.5× longer than postocellar seta. Alveolae of posterior orbital and ocellar setae almost as big as alveola of inner vertical seta, so these setae are supposed to be subequal to the latter one. Alveolae of ocellar setae strongly approxamated and touching.

Thorax (Figs 39 A, B, E) brown to black, silvery subshining, on pleura with suberect white microtrichia not hiding underlying cuticle. Mesonotal scutum 1.4–1.5× longer than wide; matt, shagreened and covered with curled white microtrichia; black setulose, with 7–8 rows of setulae between rows of dorsocentral setulae; acrostichal prescutellar seta absent. Other setae as described for the genus, black. Scutellum dorsally rather flattened, brown, silvery subshining, microtrichose, without setulae. Subscutellum and mediotergite black, subshining, sparsely microtrichose. Pleura smooth, shining, sparsely white microtrichose, with cyan sheen.

Wing (Fig. 6 B) 3.9 mm long (♀), 3.8× longer than wide; basicostal cell hyaline; costal cell straight, 5.1× longer than wide, brown in basal 1/6 of its length; pterostigma entirely brown, narrowly triangular, 3.5× longer than wide, vein R_1 bare, ending proximally of crossvein r-m level; vein R_{2+3} slightly arcuate in basal half, straight at apex. Crossvein r-m distal to mid-length of cell dm. Cell r_{4+5} 5.7× longer than wide. Cell m_1 narrowly triangular; ultimate section of M_1 3.3× longer than crossvein dm-m and 1.8× longer than penultimate section, posteriorly conspicuously dipping at middle. Vein CuA Z-shaped, forming moderately short posteroapical lobe of cell cua along vein CuP, 1.2× longer than its anterior shoulder. Wing pattern with short subbasal crossband from humeral vein through cell cua into alula, entirely brown pterostigma, narrow brown band crossing cell r_1 posterior of it and very large brown mark posterior of it in cell br and basal halves of cells dm and cua_1 proximally of crossvein r-m, leaving bases of these cells and cell r_{2+3} at radial fork hyaline; inconspicuous dark mark in cells r_1 and r_{2+3} distally or r-m level; apical half of wing mostly hyaline, with oblique narrow brown band from subapical part of cell r_{2+3} through oblique vein dm-m and faint band along apical parts of cells r_{4+5} and m_1 leaving very apex of wing hyaline (Fig. 6 B). Cell cup and anal lobe half as wide as cell cua. Alula 4× longer than wide, grey. Calypters white, with white cilia. Halter yellow.

Legs (Fig. 12) with fore coxa mostly black, except yellow mesal and distal 1/6, densely white microtrichose; mid and hind coxae yellow, as well as all trochaners and tarsi; femora black in basal 0.8–0.9, tibiae black in basal 0.6–0.8, apically yellow, black setose and setulose. Fore femur uniformly setulose, without strong erected setae. Mid femur anteriorly with short suberect setulae; mid tibia ventrally with single spur-like seta 3.8× longer than tibia width. Hind femur without dorsal setae.

Abdomen matt black, tergites fine shagreened, black setulose; tergite 5 shagreened, subshining; oviscape sparsely white microtrichose and black setulose, shining.

Male: not known.

Female terminalia (not dissected): aculeus with ovoid, long-setulose cercal unit (partly exposed).

Etymology. The species is named in honour of Karl August Wilhelm Schnuse (1850–1909), a German entomologist, who collected the type specimen and many other specimens of the species mentioned in this paper.

Remarks. The left wing of the holotype has been removed (obviously by W. Hennig in the late 1930s during the preparation of the volumes of "Die Fliegen der Palaearktischen Region). At that time he was working with the picture-winged flies and illustrated most of his monographs with wing photographs; only a few slides were in the MNKB, but certainly not of the South American Ulidiidae. He has never described this specimen or used the photograph of its wing elsewhere. Several specimens, apparently borrowed from the Schnuse collection, were found among unsorted material at the SDEI, where Hennig worked in the late 1930s.

We tentatively place this species in *Aspistomella*, based on distant similarity to the species previously assigned to *Paraphyola*, and transferred here. As the male genitalia are unknown, its relationships to the other taxa in this group of genera remain rather unclear. It differs from all the species assigned here in that the abdominal tergites are matt and densely covered with dense rows of very fine and short microtrichia (shiny and sparsely microtrichose in most other species of the group).

Aspistomella steyskali Kameneva & S. Korneyev, sp. nov.

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Figs 5 F, 40–41

Material examined. Type. Holotype ♂**:** "**Ecuador**: Napo Province / Huahua Sumaco, km 45, on Hollin-Loreto rd / Mal.[aise] trap, XII-14-[19]89 / M. J. Wasbauer, H. Real" [leg.] (CSCA). **Paratypes**: **Ecuador**: Napo Province, Huahua Sumaco, km 45, on Hollin-Loreto rd Mal.[aise] trap, 13.12.1989, 1♀, 14.12.1989, 8♀, 15.12.1989, 1♂ [dissected], 7♀, 16.12.1989, 3♀, 17.12.1989, 1♂, 10♀, 18.12.1989, 2♂, 7♀, 20.12.1989, 6♂, 12♀, 21.12.1989, 1♂, 3♀, 22.12.1989, 3♀ [1♀ dissected] (M. & J. Wasbauer, H. Real leg.) (CSCA, SIZK, MNKB); Past Province, Puyo,

18.05.1977, 1♀; Napo Province, Tena, 24.05.1977, 2 ♀ (D. & S.S Vincent) (USNM). **Bolivia**: Province La Paz, Mapiri, Arroyo Tuhuri, 508 m, -15.290556 (S), -68.262778 (W), 10.IV.2004, 1♀ (S.D. Gaimari) (CSCA). **Brazil**: Mato Grosso, base camp, 12º50'S, 51º45'W, gallery forest, 10–27.03.1968, 1♂, 1♀ (dissected) (B.E.Freeman) (BMNH).

Diagnosis. *Aspistomella steyskali* is similar to *A. enderleini*, *A. lobioptera*, and *A. lunata* in having wing wide oval with similar pattern (hyaline base, widely dark wing disc and apex with long crescent-shaped incision extending from cell r_1 into cell m_1; cell r_1 with cuneiform hyaline incision distally or apex of vein R_1. It differs from *A. lunata* by the first incision extending posteriorly only into cell r_{2+3} (*A. lunata*, into base of cell r_{4+5}), from *A. lobioptera* by hyaline subapical mark in cell dm (in *A. lobioptera*, cell dm entirely dark) and non-modified, moderately developed phallus (in *A. lobioptera*, phallus is extremely long and densely trichose). *Aspistomella steyskali* is most similar to *A. enderleini* in the wing shape and pattern: apex with long crescent incision extending into cell r_1, differing from it by the slightly shorter pterostigma and structure of male genitalia: outer surstylus with elongate anteroventral lobe and wide rounded posterior lobe, inner surstylus with 3–4 thick prensisetae (in *A. enderleini*, surstyli ventrally blunt, with posterior margin short dentate, without expressed lobes and with slightly thickened setae, but no prensisetae).

Description. Male. **Head** (Figs 40 A, B) ratio (length : height : width) = 1 : 1.6 : 1.9, colouration as described for *A. lobioptera*. Frons slightly narrowed posteriorly, 1.4–1.5× longer than wide at lunule and 1.5–1.6× longer than wide at vertex; orbits, vertex, gena and occiput silver-white microtrichose; parafacial narrow, 0.2–0.4× broader than postpedicel, reddish-yellow, sparsely white microtrichose. Frontal plates at each side with 4–6 parafrontal setulae and 2–3 inclinate frontal setae as long as outer vertical seta, frontal vitta whitish microtrichose, with 2–8 shorter, proclinate or inclinate interfrontal setae (Fig. 40 A). Lunule very narrow. Eye 1.36–1.46× higher than long. Face as in *A. lobioptera*. Gena with long genal seta and 4–5 additional long peristomal setae anterior of it, 0.5–0.8× longer than genal seta. Occiput with cyan metallic sheen, greyish microtrichose. Antenna: postpedicel twice as long as wide, apically rounded; arista almost bare. Palp narrowly crescent-shaped, apically rounded, as in *A. lobioptera*.

Thorax (Figs 40 B, C) colouration as described for *A. lobioptera*, with bluish sheen and sparse white and brown microtrichia not hiding underlying cuticle. Mesonotal scutum 1.25–1.3× longer than wide; black setulose, with 10–14 rows of setulae between rows of dorsocentral setulae; acrostichal prescutellar seta present, strong; prescutellar area with 4 rows of setulae between posterior dorsocentral setae. Scutellum dorsally slightly convex, subshining, sparsely microtrichose, without setulae, with silver or bluish sheen. Subscutellum shining. Mediotergite shining, non-microtrichose medially.

Wing (Figs 5 F, 40 F) 2.95–3.36 mm long, 2.6–2.9× longer than wide; basicostal cell hyaline; costal cell lobate, 4× longer than wide, brown in basal and apical quarters of length, with costa conspicuously curved, posteriorly covered with longer setulae and forming conspicuous cleft before apex of vein Sc; pterostigma entirely brown, narrow triangular, 0.3–0.6× longer than wide and 0.25–0.5× longer than costal cell width, vein R_1 bare, ending far proximally of crossvein r-m level in both sexes; vein R_{2+3} sinuate, at apex bent anteriorly to costa. Crossvein r-m distally of middle of cell dm. Cell r_{4+5} 5.5–7× longer than wide, apically narrowed. Cell m_1 subtriangular; ultimate section of M_1 2.5–3.5× longer than crossvein dm-m and 1.3–1.7× longer than penultimate section. Vein CuA Z-shaped, forming moderately short posteroapical lobe of cell cua along vein CuP, 1.1–1.2× longer than its anterior shoulder. Wing pattern with short subbasal crossband from humeral vein through cell cua into alula, and large dark brown mark from apical lobe of costal cell to wing apex, with 4 hyaline marks: incision from cell r_1 through cell into cell r_{2+3} basally of crossvein r-m, two oval spots in base of cell r_{4+5} and in apex of cell m_4 and long and narrow crescent or arcuate incision from apex of cell m_1 into cell r_1 parallel to wing apex (Fig. 5 F). Cell cup (anal cell sensu Kameneva & Korneyev 2010) and anal lobe as wide as cell cua. Alula, calypters and halter as in *A. lobioptera*.

Legs as in *A. lobioptera*.

Abdomen brown to black, sparsely black setulose.

Male genitalia (Figs 41 A–F) with short, non-projecting cerci, trilobate surstyli having short, bidentate antero-ventral, narrow elongate meso-ventral and thin, wide, rounded posterior lobes and one to three thick dentate prensiseta on mesal surface. Phallus moderately long and thick, at most 3 times as long as epandrium high, sparsely trichose. Hypandrium with phallic guide forming pair of partly sclerotised, blade-like posteriorly directed projections exceeding level of surstyli, pair of postgonites with 5 trichoid sensilla on lateral surface of phallic guide and pregonites with 3–5 trichoid sensillae at antero-medial side (Figs 41 D, E).

Female terminalia: aculeus with ovoid, long-setulose cercal unit (Fig. 41 H); 2 globose spermathecae (Fig. 41 I).

Etymology. Named in honour of George Constance Steyskal (1909–1996), the American dipterist, who first recognised it as a separate species in his manuscript keys.

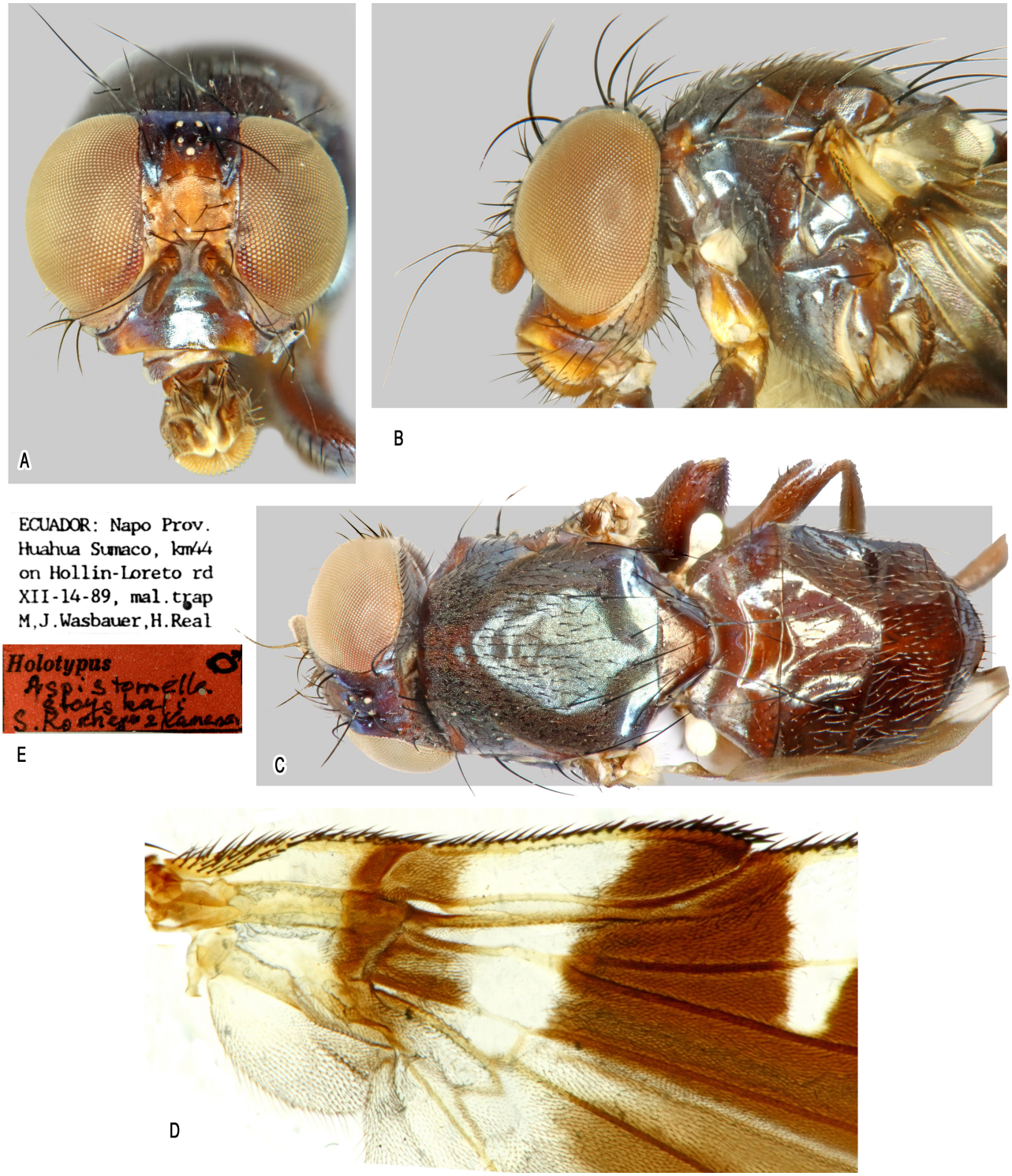

FIGURE 40. *Aspistomella steyskali* **sp. nov.**, holotype ♂ (**A**–**C**) (CSCA) and paratype ♂ (**D**, **E**) (SIZK). **A**, head, anterior; **B**, head and thorax, left; **C**, head, thorax and abdomen, dorsal; **D**, wing, anterobasal part; **E**, labels.

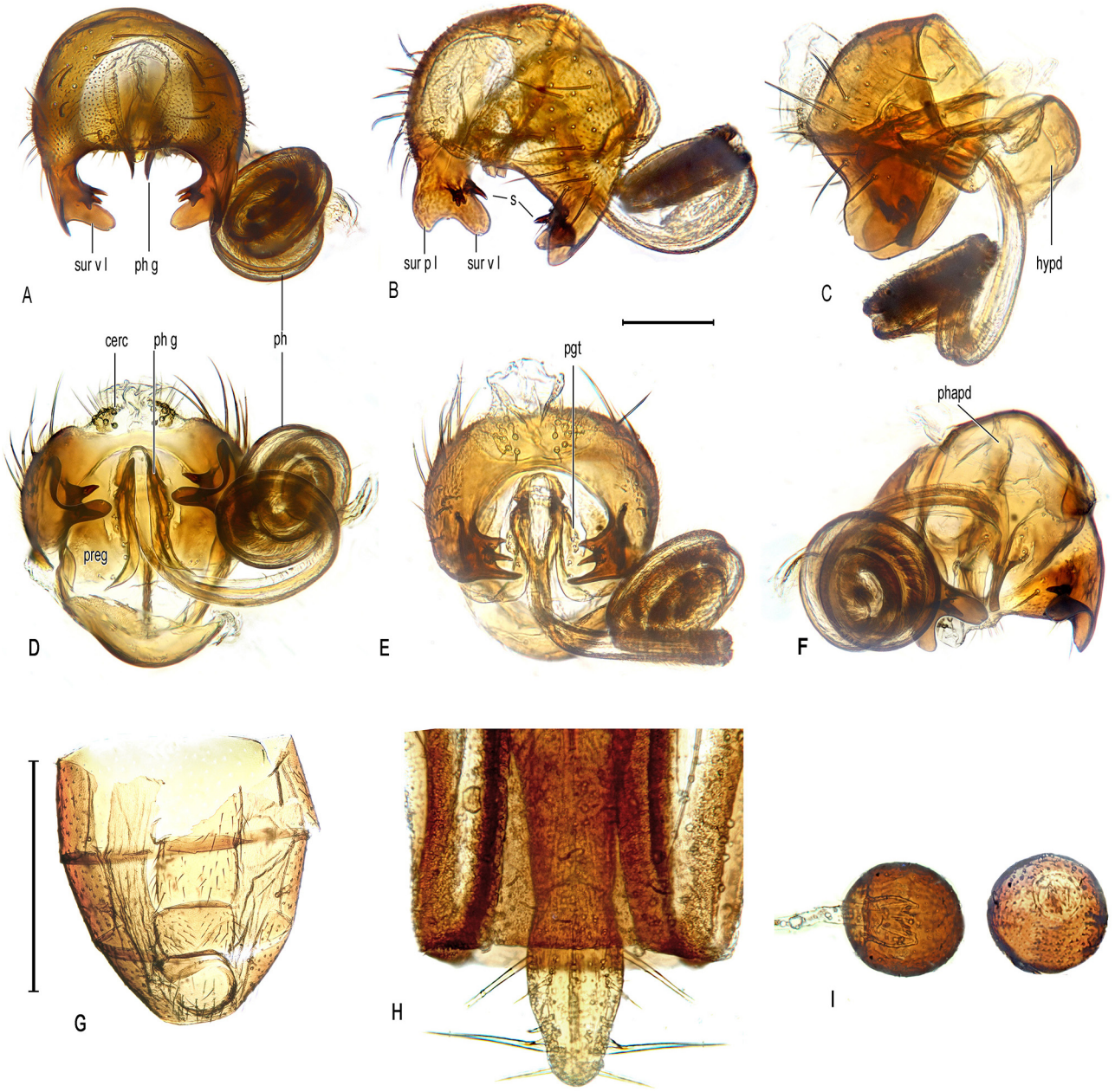

FIGURE 41. *Aspistomella steyskali* **sp. nov.**, ♂ (**A**–**G**) and ♀ (**H**, **I**) genitalia paratype (SIZK). **A**, postabdomen, posterior; **B**, same, posterolateral; **C**, same, lateral; **D**, same, ventral; **E**, same, posteroventral; **F**, same, anteroventral; **G**, preabdomen; **H**—apex of aculeus; **I**—spermathecae. Abbreviations: cerc—cerci; hypd—hypandrium; ph g—phallic guide; ph—phallus; phapd—phallapodeme; pi p—pimple-like process; p l sur—posterior lobe of surstylus. preg—pregonite; s—seta; v l sur—ventral lobe of surstylus. Scale bar **A**–**B, H, I** = 0.1 mm, **G** = 1 mm.

***Aspistomella teresensis* Araújo, V. Korneyev & Savaris, sp. nov.**
urn:lsid:zoobank.org:act:694DF8E9-372A-4A05-9CEE-9B574EBFCCA8
Figs 6 G, 42–43

Material examined. Type. Holotype ♀**: Brazil**: "ES [Espírito Santo], Brasil, IV.1969, N. Papavero col." "HOLOTYPE ♀ *Aspistomella teresensis* Araújo, V. Korneyev & Savaris" (red label) (genitalia dissected) (MZUSP).

Diagnosis. *Aspistomella teresensis* shares with *A. angustifrons*, *A. crucifera*, and *A. quinquincis a* acomparatively short headand narrow wings, wing pattern widely dark in apical half, wing venation and chaetotaxy and differs from *A. angustifrons* by the coxae, femora and tarsi yellow (in *A. angustifrons* widely black) and wing cell m_4 with hyaline area at posterior margin (in *A. angustifrons* entirely black). It differs from *A. crucifera* and *A. quinquincisa* by having cell r_1 with 1 marginal hyaline mark reaching anterior half of cell dm, instead of two incisions, as well as other characters indicated in the key. It also differs from *A. schnusei* by having a short epistome and a largely dark apical half of the wing (in *A. schnusei*, the epistome is strongly developed anteriorly and the wing is largely hyaline with narrow bands apically).

Description. Female. **Head** (Figs 42 C–F) ratio (length : height : width) = 1.19 : 1.22 : 1.71; frons, face above transverse fold, parafacial, and gena reddish to yellowish brown, epistome and occiput mostly dark brown with metallic blue tingue. Frons moderately wide (Fig. 42 F), 0.7× as long (from lunule to anterior ocellus) or 1.37× (from lunule to inner vertical seta) as wide at lunule, with subshining, black ocellar triangle and brown vertical plates; orbits, vertex, gena and occiput silver-white microtrichose; parafacial narrow, reddish-yellow, sparsely white microtrichose. Frontal plate with 5 short lateroclinate parafrontal setulae, frontal vitta sparsely whitish microtrichose, with 5 short frontal and 3 interfrontal setae (Fig. 42 F). Eye 1.15× higher than long, conspicuously incised posteroventrally. Face white microtrichose above epistome; epistome laterally brown, sparsely white microtrichose, with metallic bluish sheen. Clypeus yellow, sparsely white microtrichose, subshining. Gena brownish yellow, with long genal seta and 4additional long peristomal setae anterior of it, as long as genal seta. Occiput brownish, with cyan metallic sheen, greyish microtrichose.

Antenna yellow; scape with black setulae; pospedicel and arista missing in the holotype. Mouthparts brown to black, prementum black, sparsely microtrichose. Palp yellow, as described for *A. angustifrons*.

Thorax (Fig. 42 C) brown to black, with bluish sheen and sparse white microtrichia not hiding underlying cuticle. Mesonotal scutum 1.75× longer than wide; black setulose, with 8 rows of setulae between rows of dorsocentral setulae; acrostichal prescutellar seta present, 0.6× longer than posterior dorsocentral seta; prescutellar area with 4 setulae between posterior dorsocentral setae. Scutellum dorsally very slightly convex, entirely brown, subshining, sparsely microtrichose, devoid of setulae, with bronze sheen. Subscutellum bluish shining, sparsely microtrichose. Mediotergite bluish shining, non-microtrichose. Other setae as described for the genus. All the setae and setulae black.

Wing (Figs 6 G, 42 G) 5.9 mm (♀) long, 3.25× longer than wide; basicostal cell hyaline; costal cell straight, 5.2× longer than wide, brown in basal and apical 1/5 of length, with costa straight and forming very inconspicuous cleft before apex of vein Sc; pterostigma entirely brown, narrow triangular, 1.75× longer than wide, vein R_1 bare, ending slightly proximal to crossvein r-m level; vein R_{2+3} slightly arcuate in basal half, straight at apex. Crossvein r-m proximal to mid-length of cell dm. Cell r_{4+5} 5.8× longer than wide. Cell m_1 narrow triangular; ultimate section of M_1 3.9× longer than crossvein dm-m and 1.4× longer than penultimate section. Vein CuA Z-shaped, forming moderately short posteroapical lobe of cell cua along vein CuP, 1.14× longer than its anterior shoulder. Wing pattern with short subbasal crossband from humeral vein through cell cua into alula; wing with brown mark from apical part of costal cell to wing apex, with 1 triangular marginal hyaline mark from cell r_1 through base of cell r4+5 extending into middle of cell dm distally of crossvein r-m. One cuneiform hyaline incision from medial portion of cell m1 through cell r_{4+5} extending into cell r_{2+3}. Cell cua with longer posterior projection, at least as longer as width of cell. Cell m4 subhyaline with a hyaline ovoid portion apically crossing vein M4, reaching cell dm-m. Cell cup (anal cell sensu Kameneva & Korneyev 2010) and anal lobe half as wide as cell cua. Calypters white, with white cilia. Halter yellow.

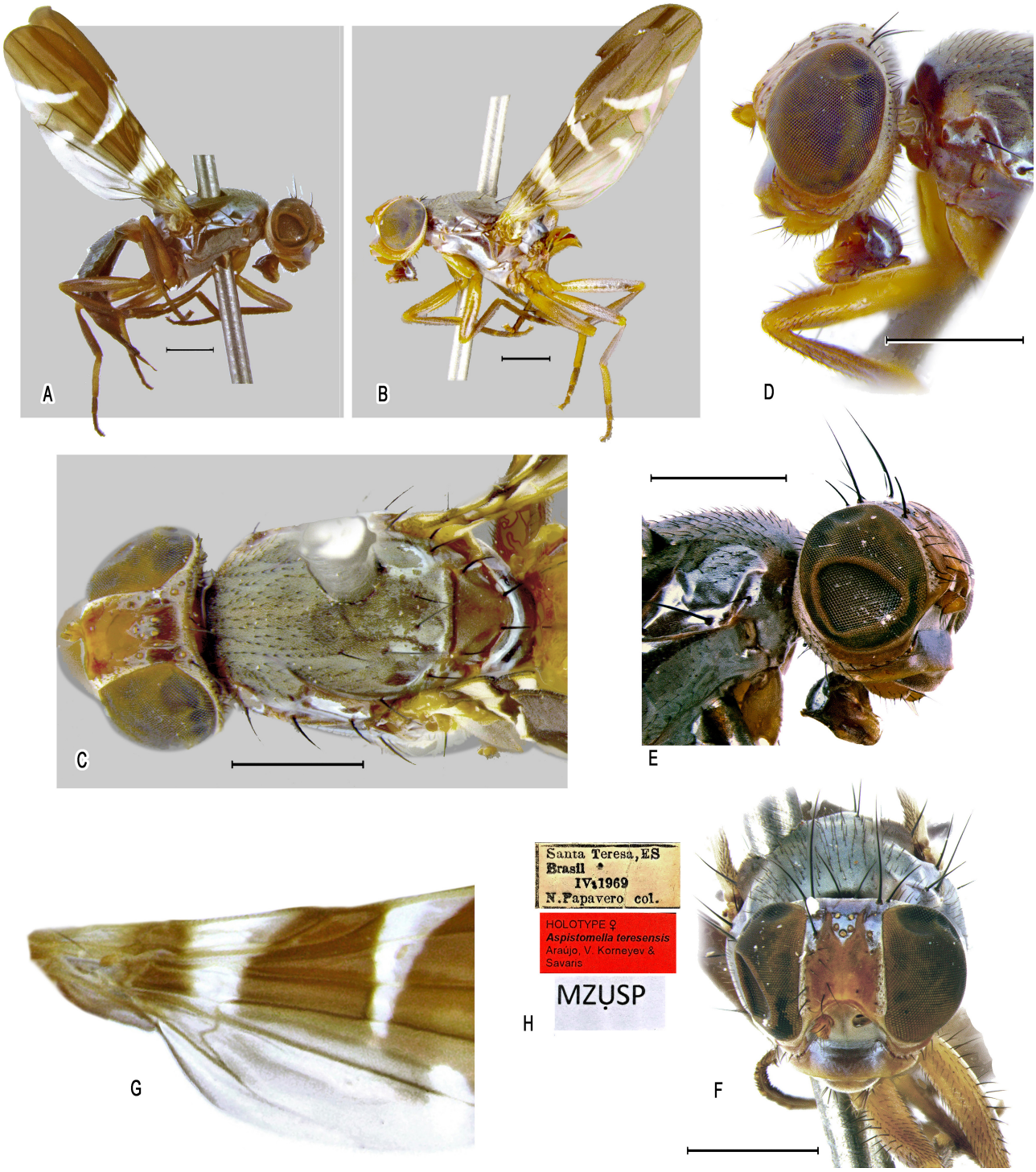

FIGURE 42. *Aspistomella teresensis* **sp. nov.**, holotype ♀ (MZUSP). **A**, habitus, right; **B**, same, left (abdomen detached); **C**, head mesonotum, dorsal; **D**, head left and fore leg; **E**, head right and anterior; **F**, same, anterior; **G**, wing, anterobasal part; **H**, labels. Scale bars: 1 mm. (All photographs by Alexandre Araújo.)

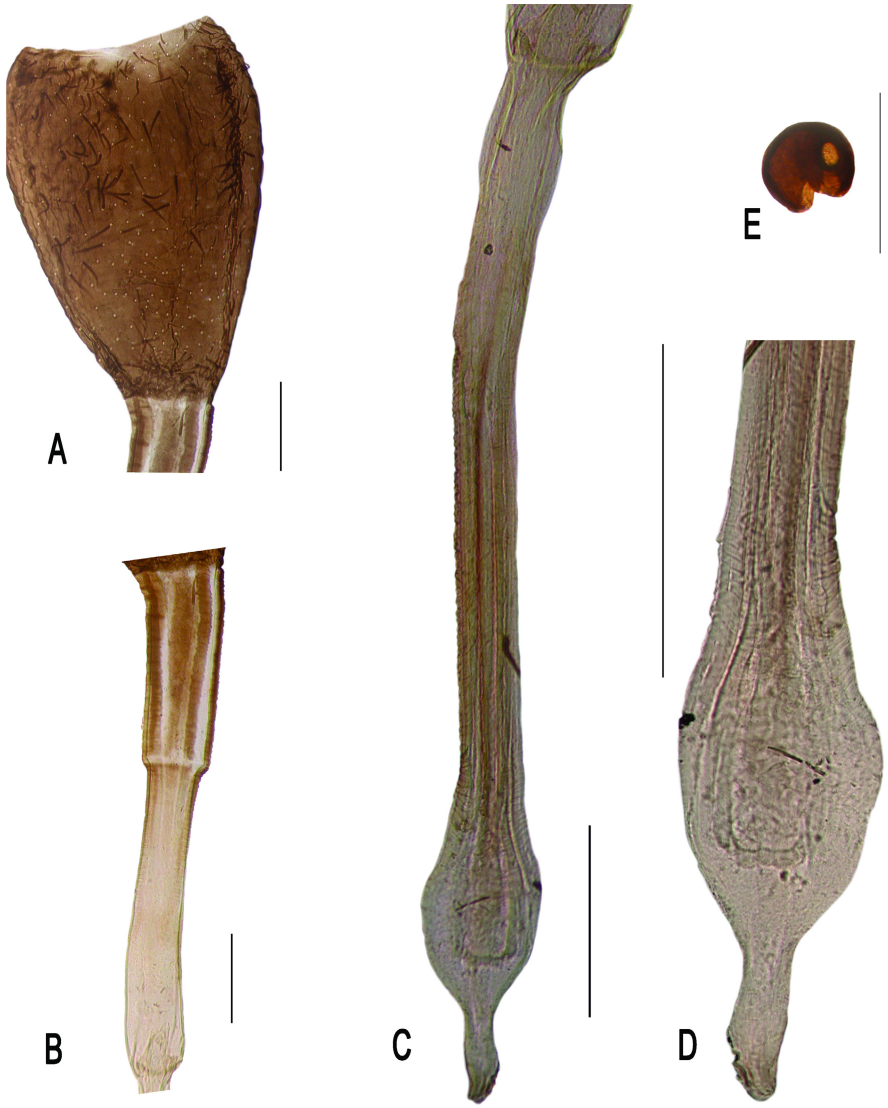

FIGURE 43. *Aspistomella teresensis* **sp. nov.**, holotype ♀ (MZUSP). **A**, oviscape; **B**, eversible membrane; **C**, aculeus; **D**, aculeus apex and cercal unit; **E**, spermatheca (one of the two). Scale bars: 0.2 mm. (All photographs by Alexandre Araújo)

Legs (Figs 42 A, B) with yellowish coxae; femora brown except apices and bases yellow; tibiae brown; tarsi brownish yellow; black setose and setulose. Fore femur uniformly setulose, with 3 longer ventral setae. Mid tibia with two strong and ventroapical seta 1.19× longer than tibia width.

Abdomen brown to black, sparse, with faint purplish or greenish metallic sheen.

Male: not known.

Female terminalia (Fig. 43). Oviscape: 0.81 mm long, narrower than abdomen, 1.43× long as wide, tapered, truncated at apex. Eversible membrane 1.11 mm long. Aculeus 0.96 mm long, 1.18× longer than oviscape, not widened basally, strongly widened in a pre-apical region, weakly sclerotised. Two subspherical spermathecae 1.1× longer than wide.

Etymology. The name of the species is an adjective that refers to the type locality (Santa Teresa, Espírito Santo, Brazil).

***Aspistomella tres* Kovac, Kameneva & V. Korneyev, sp. nov.**
urn:lsid:zoobank.org:act:75316625-D2BF-4DDE-A1EA-7440A4792038
GenBank accession number PQ331195
Figs 1 C, 5 D, 7 B, 9 B, 44–47

Material examined. Type. Holotype ♀: "**Bolivia**: Buena Vista [El Cairo] near Santa Cruz, [17.4734S, 63.6922W], on felled bamboo culm (*Guadua chacoensis*, last year), 12.i.2011, Bol 13/11 D. Kovac" (SMF). **Paratypes**: **Bolivia**: 2 ♀, Santa Cruz, near Buena Vista (El Cairo) [17.5009S, 63.7050W], on freshly felled bamboo culm (expint, *Guadua chacoensis*), 10.i.2011, Bol B4b/11; 1 ♀, idem [17.4734S, 63.6922W], on felled bamboo culm (*Guadua chacoensis*, last year), 15.i.2011, Bol B20/11; 1 ♀, idem [17.4734S, 63.6922W], on felled bamboo culm (*Guadua chacoensis*, last year), 17.i.2011, Bol B34/11; 1 ♀, idem [17.4734S, 63.6922W], on bamboo culm (*Guadua chacoensis*, last year), sheaths removed, 18.i.2011, Bol B80/11; 1♂, 2 ♀, idem [17.5009S, 63.6743W], on upright bamboo culm (*Guadua chacoensis*, last year), 29.i.2011, Bol B91/11; idem[17.5009S, 63.6743W], larva in bamboo internode (*Guadua chacoensis*, last year), emerged on 8.ii.2011, Bol B157/11, 1 ♀ (leg. D. Kovac) (dissected), idem [17.4734S, 63.6922W], larva in internode of felled bamboo (*Guadua chacoensis*, last year), emerged on 18.ii.2011, Bol Z32/3/11, 1 ♂, idem [17.4734S, 63.6922W], larva in internode of felled bamboo (*Guadua chacoensis*, last year), emerged on 25.ii.2011, Bol Z32/4/11, 1 ♂ (leg. D. Kovac) (dissected) (SMF; SIZK).

Non-type: **Bolivia**: Buena Vista (El Cairo) near Santa Cruz, [17.4734S, 63.6922W], on freshly felled bamboo culm (*Guadua chacoensis*), 9.i.2011, Bol B2b/11, 2 specimens (sex unknown, abdomens missing) (leg. D. Kovac), idem [17.4734S, 63.6922W], 28.i.2011, Bol B80/11, 1 ♀ (alcohol), idem, 28.i.2011, Bol B80/11, 1 ♀ (alcohol), idem, 29.i.2011, Bol B91/11, 1 ♀ (leg. D. Kovac) (alcohol); Bol.70.07, 30.11.2007, 5♀ (SMF; SIZK); Bol.77.07, 1.12.2007, 1♂ (alcohol) (SIZK).

Larvae. Bolivia: Buena Vista, 6.ii.2011, BolZ32/11, 5 larvae (D. Kovac leg.) (SMF).

Diagnosis. *Aspistomella tres* is similar to *A. duo*, *A. heteroptera*, *A. lobioptera*, and *A. steyskali* in having the costal vein bent anteriorly before the apex of vein Sc, the costal cell lobate, and the pterostigma very short, shorter than width of costal cell (Fig. 44 F), and differs from them by details of the wing pattern: apical quarter of cell r_{4+5} entirely dark (in *A. heteroptera*, *A. lobioptera*, *A. steyskali* crossed by hyaline incision); *Aspistomella tres* is very similar to *A. duo* in having wing apex without hyaline incisions crossing cell r_{4+5}, but differs from it by a conspicuously narrower wing and cell dm between crossveins r-m and dm-m with hyaline mark entering cell r_{4+5} anteriorly (Figs 5 C, D).

Description. Male. **Head** (Figs 44 D, E) ratio (length : height : width) = 1 : 1.4 : 1.6, frons, parafacial, and gena yellowish brown, except anterior part of frons yellow; lunule and face between antennae yellow, and occiput mostly black, at least in dorso-lateral part. Frons (Fig. 44 D) 1.2× longer than wide, with shining, partly brown or black ocellar triangle and brown vertical plates; orbits silver-white microtrichose; parafacial narrow, 0.3–0.4× broader than postpedicel, white microtrichose. Frons with 4–5 parafrontal setulae and 2–4 frontal setae at each side, frontal vitta with 1–3 interfrontal setae at each side; anteriormost setae longer than other and half as long as outer vertical seta; 1 very long orbital seta, as long as ocellar seta, 0.6–0.75× longer than inner vertical seta and 1.7× longer than outer vertical seta; postocellar seta long, 0.5× longer than inner vertical seta; outer vertical seta short, 0.4× longer than inner vertical seta and 4–5× longer than postocular setae forming one row, allied by 4–5 dorsal and 10–16 ventral occipital setae. Lunule very narrow, indistinguishable, orange. Eye 1.4–1.5× higher than long. Face above suture 0.6–0.7× higher than wide at transverse fold, yellow, densely white microtrichose; epistome (below suture) reddish brown to black, sparsely white microtrichose, with metallic greenish or golden sheen, strongly produced anteriorly and separated from upper part of face by deep suture. Clypeus brown or yellow, densely white microtrichose, matt, 0.4–0.5× higher than epistome. Gena brownish yellow, with long genal seta and 4–6 additional, much shorter, setae anterior of it, 0.3–0.4× longer than genal seta. Occiput black, except postgena brownish-yellow, with yellowish to cyan metallic sheen, moderate densely covered with greyish microtrichia partly hiding underlying cuticle; ventral part of occiput (postgena) with 3–4 setae almost as long as genal seta.

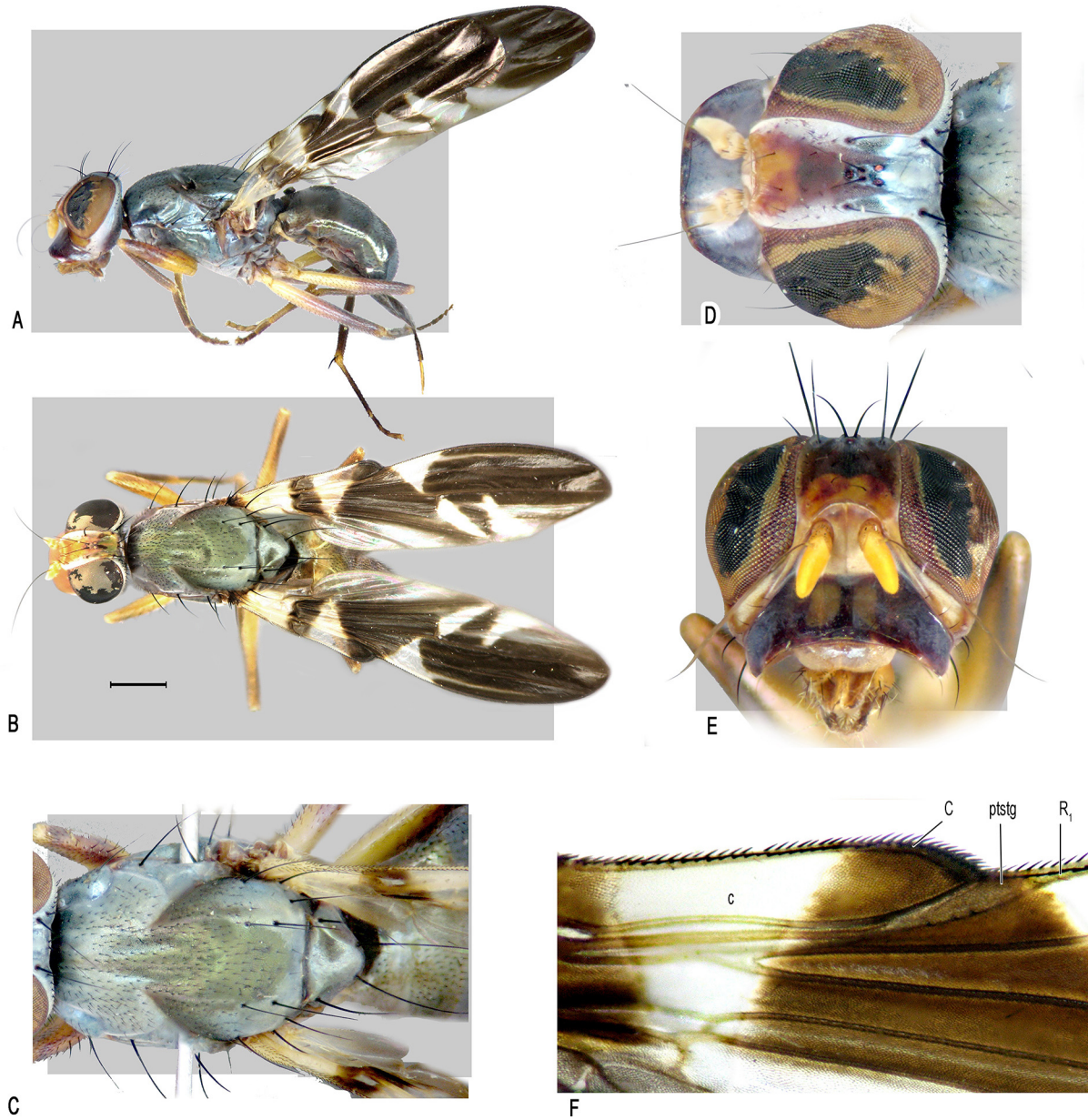

FIGURE 44. *Aspistomella tres* **sp. nov.** holotype ♀. A, habitus, left; B, same, dorsal; C, mesonotum, dorsal; D, head, dorsal; E, same, anterior; F, wing, anterobasal part. Abbreviations: c—costal cell; C—costal vein; ptstg—pterostigma; R_1—anterior branch of radius. Scale bar: 1 mm (same for A and B).

Antenna yellow; postpedicel whitish microtrichose, 2–2.1× longer than wide, apically rounded; arista black except yellow at basal 0.2, almost bare. Mouthparts brown, prementum brown or black, subshining. Palp yellow, moderately wide, apically rounded, with 10–12 strong black setulae, of them 5–6 subapical setulae 1.5–2× longer than other setulae.

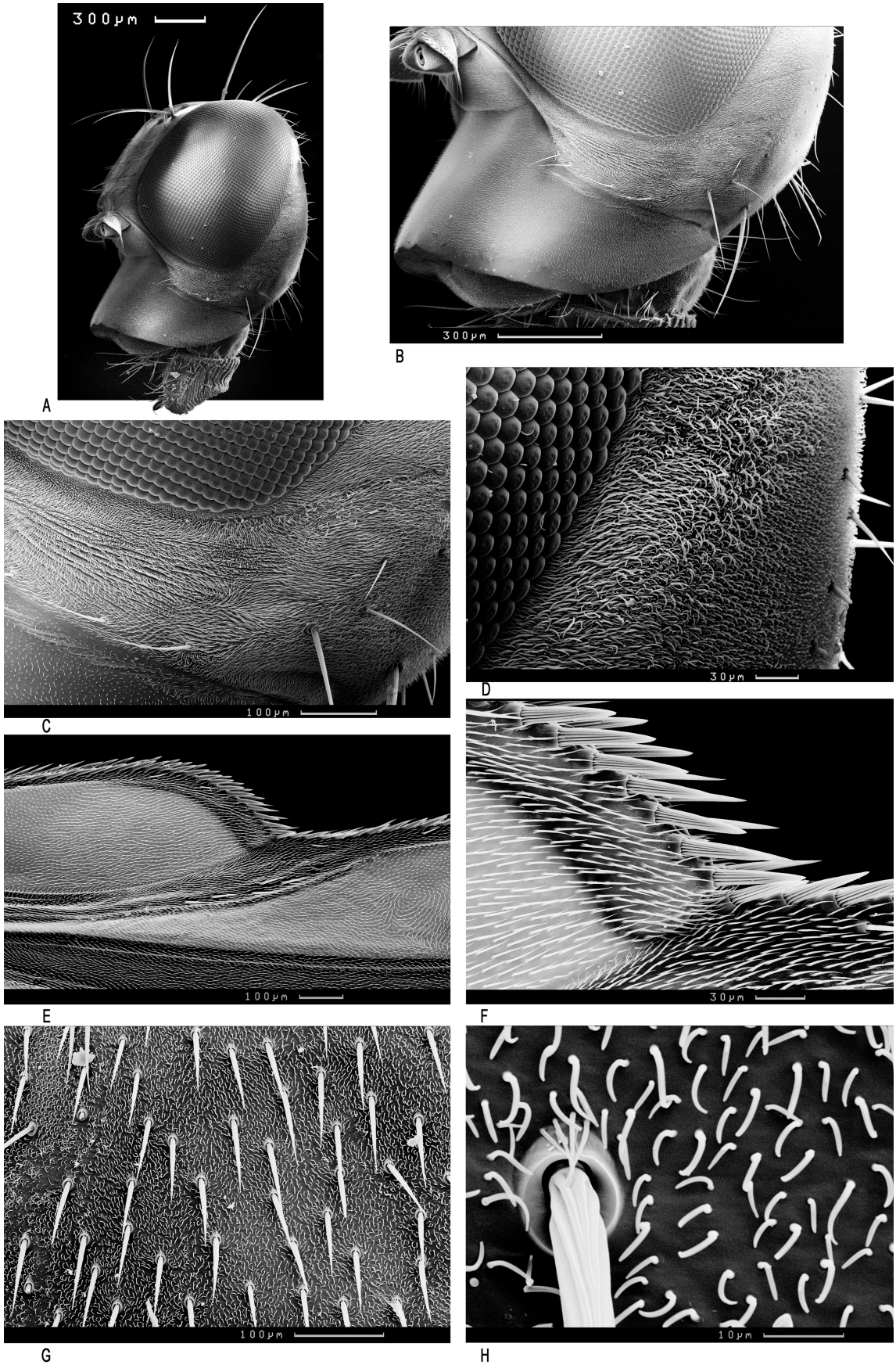

FIGURE 45. *Aspistomella tres* **sp. nov.** SEM views ♂. **A**, head, left; **B**, face and gena, anterolateral; **C**, gena: microtrichia; **D**, postgena: microtrichia; **E**, lobe of costal cell and pterostigma; **F**, microtrichia and spinulose setulae on costal vein; **G**, mesonotum, setulae and microtrichia; **H**, same, enlarged. (All photographs by Damir Kovac.)

Thorax (Figs 44 A–C) brown to black, with bluish sheen and sparse white microtrichia not hiding underlying cuticle. Mesonotal scutum 1.3× longer than wide; prescutellar area either entirely black, including postpronotal lobes and notopleuron, or widely yellowish brown with brown margins or medially black with yellowish postpronotal lobe and notopleural triangle; black setulose, with 18–20 rows of setulae between rows of dorsocentral setulae; acrostichal prescutellar setae absent in all specimens examined, at most one pair of setulae 1.5× longer than surrounding setulae present; prescutellar area medially setulose and without setulae around dorsocentral setae. Scutellum dorsally very slightly convex, orange to dark brown, sparsely microtrichose, devoid of setulae, often with conspicuous bluish or greenish sheen. Subscutellum subshining, brown to black. Mediotergite subshining black, conspicuously microtrichose. Other setae as described for the genus. All the setae and setulae black.

Wing (Figs 5 D, 44 F) 5.5–7.5 mm (♂), 5.9–7.9 mm (♀) long, 3.5–3.75× longer than wide; basicostal cell hyaline; costal cell lobate, 4–4.5× longer than wide, brown in basal and apical quarters of length, with costa conspicuously curved posteriorly and covered with slightly longer setulae before apex of vein Sc (Fig. 45 F); pterostigma entirely brown, narrow triangular, 0.3–0.4× longer than wide, vein R_1 with 4–6 setulae dorsally (Figs 44 F, 45 E, F), ending slightly distal to middle of R_{2+3} first section (between fork and crossvein dm-m) in both sexes; vein R_{2+3} faintly arcuate or almost straight, subparallel to costa to very apex. Crossvein r-m conspicuously distal to middle of cell dm in both sexes. Cell r_{4+5} 5.5–7× longer than wide, apically narrowed. Cell m_1 narrow triangular; ultimate section of M_1 4–5× longer than crossvein dm-m and 2–2.3× longer than penultimate section. Vein CuA sinuate, cell cua with very short posteroapical lobe along vein CuP. Wing pattern with short subbasal crossband from humeral vein to base of cell cua and large dark brown mark widely from apical lobe of costal cell almost to base of cell dm 3 whitish hyaline incisions (one wide triangular at anterior margin extending from cell r_1 into r_{2+3} next to crossvein r-m, and two oblique cuneiform at posterior margin, extending from cells m_1 and m_4 into cell r_{4+5} at both sides of crossvein dm-m; cell m_4, cup (anal cell sensu Kameneva & Korneyev 2010) and anal lobe grey; anal lobe as wide as cell cua. Alula 3× longer than wide, darkened in apical half. Calypters white, with white ciliae. Halter yellow with brown or black knob.

Legs (Fig. 44 A) with yellow fore coxae and all trochanters, and brown to yellow mid and hind coxae; femora yellow, in apicodorsal half mostly brown; tibiae and tarsi brown, in teneral sapecimens pale brownish yellow, black setose and setulose, without conspicuous microtrichia or metallic sheen in examined specimens. Fore femur with 2 rows of posterodorsal and posterior setae, and 1–2 preapical posteroventral setae, all slightly shorter than femur width. Mid femur anteriorly and posteriorly with short setulae, but without long erect setae; mid tibia ventrally with single spur-like seta 1.7–2× longer than tibia width.

Abdomen moderately elongate brown to entirely black, syntergite 1+2 often brownish yellow; tergites finely sparsely microtrichose, with faint cyan metallic sheen, except tergite 5 of ♂ and tergite 6 of ♀ (the latter almost entirely hidden inderneath tergite 5) brown or black without metallic sheen; setulae and setae black.

Male postabdomen (Figs 46 A–E) as described for *A. duo*, but phallus somewhat shorter, only 2.5–3× longer than epandrium height (in *A. duo*, at least 4× longer than epandrium height).

Female terminalia not dissected, aculeus not flattened, with cercal unit oval and long setulose.

Third instar larva. General structure: As in *A. duo*, body length 8.4–11.8 mm (median: 9.9 mm; n = 10), width 2.2–2.9 mm (median: 2.75 mm; n = 10).

Pseudocephalon: As in *A.duo*. Second antennal segment retracted, not visible. Structure and pattern of oral ridges as in *A. duo*, thirty central oral ridges adjacent to oral cavity, identical on both sides of the body (n = 1 larva).

Cephalopharyngeal skeleton (Fig. 7 B) as in *Aspistomella duo.* Total length about 1.3 mm (n = 2). Indentation between tips of apical tooth and ventral apodeme 0.81–0.83× as deep as wide. Hypopharyngeal sclerite 4.5–4.9× longer than high. Parastomal bars curved, 1.1–1.2× longer than hypopharyngeal sclerite.

Thoracic segments I–III: As in *A.duo*. Anterior spiracles on thoracic segment I contain 19–25 tubules per row (median = 22, n = 20 rows of tubules from 10 larvae). The number of tubules on the left or right side of the same larva differs by one to four tubules. Spatial pattern of cuticular sensilla and paired spiracular openings as in *A. duo*.

Abdominal segments I–VII. Abdominal segments I-VII bear 13 cuticular sensilla on each side of the body and a pair of rudimentary lateral spiracles (see Fig. 8 A). Ventrally, the creeping welts on abdominal segments I–VII are arranged as follows: CW1 (Fig. 47 A): three rows of long and acute spinules, first and third row continuous, middle row with about ten slightly curved short rows vertically shifted relative to each other. All bristles directed

posteriorly. CW2 (Fig. 47 B): two discontinuous or incomplete rows (b) followed by a continuous central row (c), followed by a row of large spines (row d) arranged as follows: two short horizontal central rows, each consisting of two groups of large spinules each, four to six spinules in each group, three large spinules between them, central rows laterally flanked by five inclined curved rows angled to body midline, each inclined row with anterior large spinules interconnected with a posterior group of smaller spinules; last row e with more or less continuous small spinules. All spinules directed posteriorly. CW3–CW7 (Fig. 47 C): similar to CW2, but with an additional anterior row of anteriorly oriented spinules (row a). In addition, the two central horizontal rows in row d and one adjacent inclined row on each side have a double row of large spinules (Fig. 47 C, inset). The anterior row of large spinules is anteriorly oriented and the posterior row is posteriorly oriented.

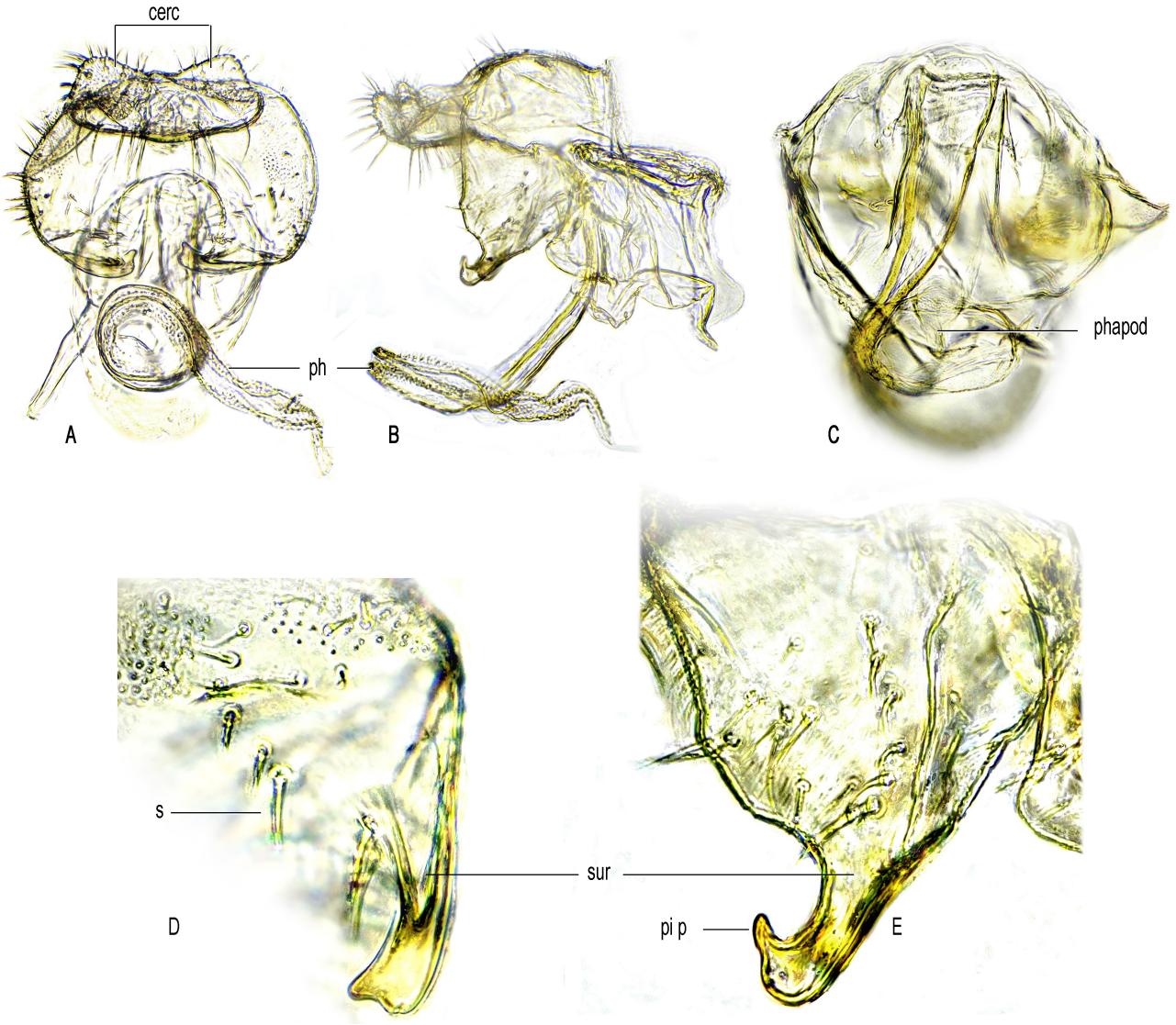

FIGURE 46. *Aspistomella tres* **sp. nov.** ♂ genitalia. **A**, postabdomen, posterior; **B**, same, lateral; **C**, hypandrium, anterior; **D**, surstylus, anteroventral; **E**, same, lateral. Abbreviations: cerc—cerci; ph—phallus; phapod—phallapodeme; pi p—pimple-like process; s—seta; sur—surstylus.

Caudal segment. The caudal segment bears 13 cuticular sensilla on each side of the body (see Fig. 8). Caudal creeping welt CW8 structured similarly to CW3–CW7, but last row arranged along the anterior margin of perianal pad with anteriorly directed bristles; large spinules less inclined, not connected to smaller spinule rows (Fig. 47 D).

Posterior spiracles (Figs 47 E, 9 B) oval-angular, length 0.5–0.72 mm (median = 0.6, n = 15), width 0.43–0.59 mm (median = 0.48, n = 15), shortest distance between spiracles 0.93–1.34 mm (n =19). Spiracular slits with 12–15 turns, shape similar as in *A. duo*, but terminal turn long, rather narrow and spiracular slits 1 and 2 symmetrical.

Apical part of yellow area not club-shaped and with sharp margins. Spiracular Hair group 1: 7–11 hair trunks, Hair group 2: 1 hair trunk, Hair group 3: 5–8 hair trunks and Hair group 4: 11–14 hair trunks (n = 4 spiracles). Anal complex as in *A. duo*.

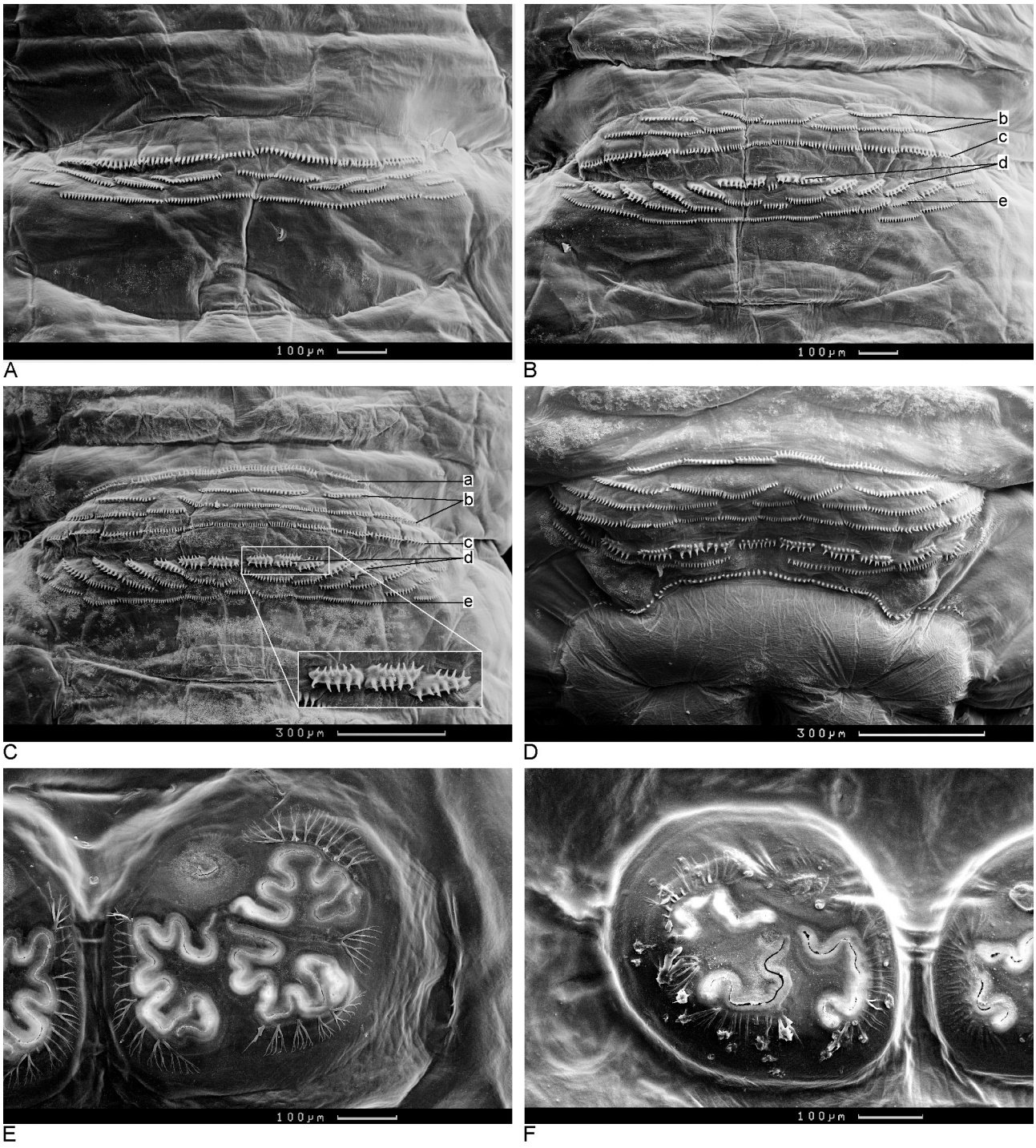

FIGURE 47. *A. tres* **sp. nov.**, SEM views of ventral abdominal creeping welts (**CW**) and anterior spiracles . (**A**-**E**) and *Aspistomella* sp., anterior spiracles (**F**). **A**, CW1 on abdominal segment I; **B**, CW2 on abdominal segment II; **C**, CW4 on abdominal segment IV, magnified area shows a double row of large spinules; **D**, CW8 on abdominal (caudal) segment VIII; **E**, right posterior spiracle of *A. tres* **sp. nov.**; **F**, left anterior spiracle of *Aspistomella* sp. Abbreviations: a-e—creeping welt rows a–e. (All photographs by Damir Kovac.)

Puparium. Length 8.4 mm; maximum width at 4th abdominal segment, 2.1 mm (n = 1).

Remarks. The three reared males are teneral and apparently faded colour in alcohol; body brown, wings almost entirely hyaline with faint traces of dark pattern as in females.

Etymology. The species name means "three" in Latin, reflecting the wing pattern, which is similar to the number "3", and is a noun in apposition.

Remarks. *Aspistomella* tres can be distinguished from *A. duo* as described under *A. duo* remarks.

Biology. Larvae inhabit water-filled bamboo internode cavities of *Guadua angustifolia*, biology as in *A. duo*.

Polyteloptera Hendel, 1909

Polyteloptera Hendel 1909b: 263.
Type species: *Polyteloptera apotropa* Hendel, 1909, by monotypy.
Polyteloptera: Hendel 1910: 11, 44, 45; Steyskal 1968: 54.22.

Diagnosis. As in most other Lipsanini, head and thorax with greenish or bluish metallic sheen, ocellar setae strong; phallus bare or covered with fine microtrichia, apically without glans; hypandrium symmetrical, with deep phallic guide, two areas of trichoid sensilla (corresponding to the pregonites and postgonites), female abdominal tergites 4–6 without anteromedial apodemes, and only two spermathecae present. Within the tribe Lipsanini, *Polyteloptera* belongs to the *Aspistomella* group of genera described above because of the combination of short parafrontal setulae, long frontal and interfrontal setae, elongated epistome and low clypeus. Species of *Polyteloptera* can be distinguished by the combination of the ultimate section of the vein M_1 being shorter than the penultimate, club-like outline of the wing and the almost claw-like pointed postpedicel.

Description

Adult. Body mostly dark brown or black, with faint cyan metallic sheen, partly hidden by sparse whitish or silvery microtrichia (Figs 48 A, B).

Head conspicuously higher than long. Frons (Fig. 48 C) as in *Aspistomella*; frontal vitta finely and sparsely microtrichose, frontal plates with short pro- or lateroclinate parafrontal setulae on each side, one row of frontal setae and usually one pair of interfrontal setae; vertex and orbits with dense white microtrichia. Vertical plates with 1 long orbital seta, and second vestigial reclinate seta anterior of it; ocellar triangle with ocelli forming elongate acute triangle and a pair of very long ocellar setae. Outer vertical setae ca. 0.3× longer than inner vertical seta. Face in dorsal portion flat, covered with white microtrichia, and with ventral portion moderately produced antero-ventrally, forming high metallic shining epistome covered with sparse, thin, erect whitish microtrichia. Parafacial brownish yellow, densely white microtrichose. Gena widened posteriorly, brownish, sparsely white microtrichose, bearing 1–2 strong genal setae and 4–6 moderately long, pro- or partly lateroclinate peristomal setulae. Occiput black or dorsomedially and lateroventrally brown to yellow, densely white microtrichose. Antenna with stipe very short, pedicel normal, with strong setulae; postpedicel twice as long as wide, dorsally concave, strongly convex ventrally, claw-like apically pointed; arista bare, somewhat thickened at base; in profile, antenna inserted below middle of eye; palp widened, ventrally setulose. Clypeus 0.3–0.4× higher than epistome, convex, densely microtrichose. Proboscis as described for *Aspistomella*.

Thorax shining black or brown, with faint cyan sheen and moderately dense, thin, semierect white microtrichia not hiding entirely shining cuticle. Postpronotal lobe with 1 seta and 7–11 setulae; proepisternum with 1 short proepiesternal seta (sometimes indistinct) and 4–7 fine subequal setulae on proepiesternal ridge. Prosternum not examined. Mesonotal scutum setulose, including prescutellar area posterior of dorsocentral setae; dorsocentral setulae forming distinct row, with 10–12 rows of setulae between them; 1 postpronotal, 2 notopleural, 1 postsutural supra-alar, 1 intra-alar and 1 postalar, 2 dorsocentral setae present; acrostichal prescutellar seta absent. Anepisternum, katepisternum, scutellum, subscutellum and mediotergite as in *Aspistomella*.

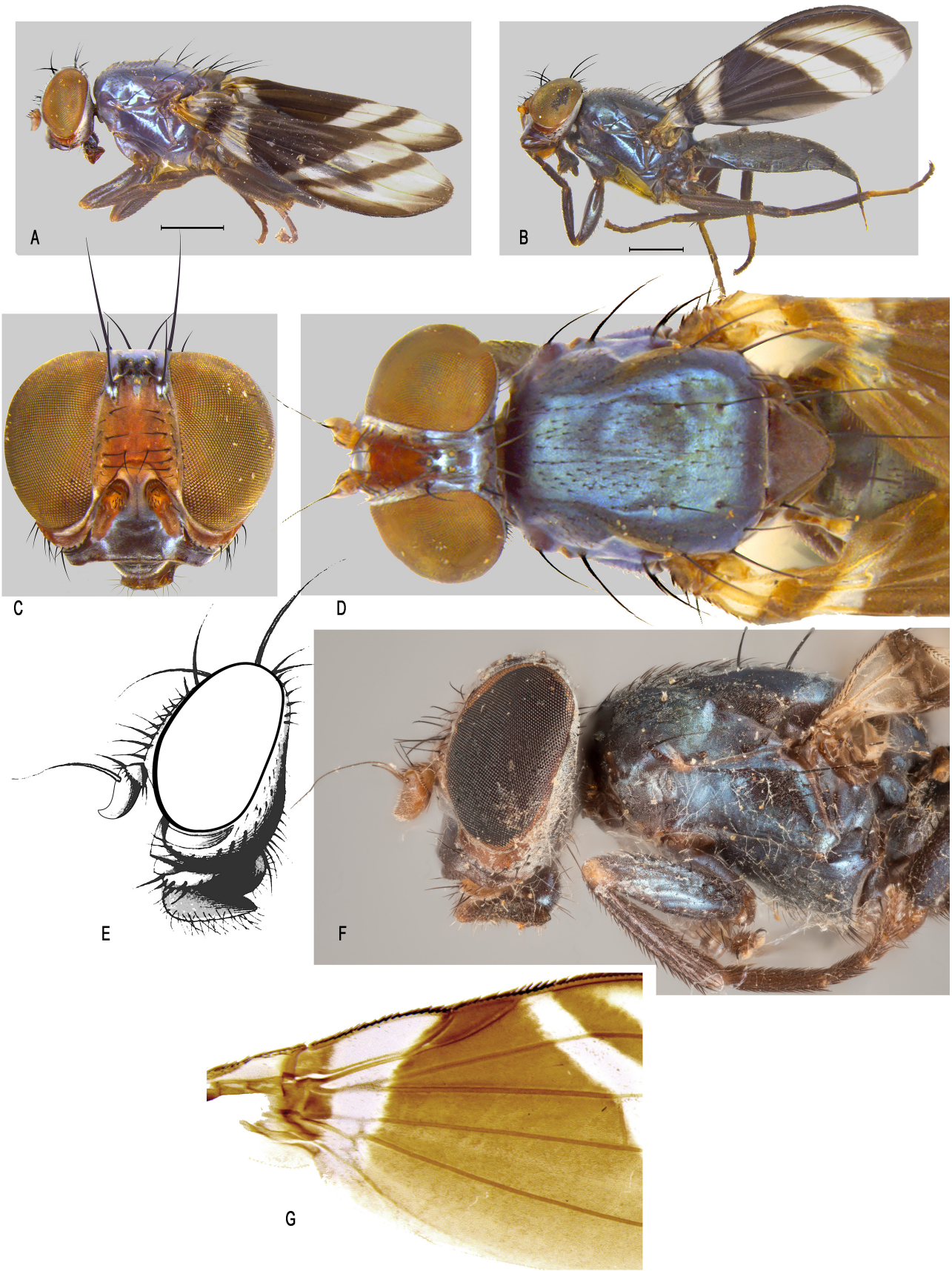

FIGURE 48. *Polyteloptera apotropa* Hendel. **A**, ♂ habitus, left; **B**, ♀, same; **C**, head, anterior; **D**, head and mesonotum, dorsal; **E**, head, left; **F**, head and mesonotum, left; **G**, wing, basal part. Scale bars: 1 mm. (**A**–**D** photographs by Marcoandre Savaris; **E**—redrawn from Hendel, 1910.)

Wing moderately wide oval, widest in apical third, narrowing towards base. Costa almost straight up to middle, then strongly curved. Vein R_1 bare, reaching costa basally from middle of wing, gradually curved towards costa. Venation as in Fig. 4 H. Cell r_{4+5} slightly widened and then tapering to tip; crossvein r-m shorter than crossvein dm-m, distal to cell dm mid; latter straight, very long and narrow. Ultimate section of vein M_1 shorter than its penultimate section and only almost twice as long as crossvein dm-m. Postero-apical lobe of cell cup conspicuous, but shorter than width of cell. Vein CuA+CuP bent away from posterior wing margin and not reaching it even as a fold. Alula at least twice as long as wide and calypters normal.

Legs. Fore femur dorsally with 2 posterodorsal rows of setae, without posteroventral setae. Mid femur anteriorly in middle part with suberect setae. Mid tibia apicoventrally with strong spur-like seta. Hind femur with usual subapical setae on dorsal surface.

Abdomen subshining brown to black, with metallic blue sheen (Fig. 48 B). Male and female abdomen with 5 visible tergites, of which tergites 3–5 subequal in length; female tergite 6 hidden underneath posterior margin of tergite 5. Sternites 3–5 unmodified, subrectangular, tergite 5 of ♂ slightly elongated.

Postabdomen: see description of the species.

Polyteloptera apotropa Hendel, 1909

Figs 4 H, 48–49

Polyteloptera apotropa Hendel 1909b: 263, 1910: 11, 44, 45; Steyskal 1968: 54.22.

Material examined. Type. Syntypes 5 ♂♀ **Brazil:** "aus Brasi1ien (S. Paulo), gesammelt von A. A. Barbiellini" (not located, possibly lost).

Non-type. Brazil: Barueri, São Paulo, 21.02.1955, 1♀ (K. Lenko) (MZUSP); idem, "3420", 18.10.1955, 1 ♂ [K. Lenko leg.] (MELQ ESALQENT001786), "3530", 26.10.1955, 1 ex. [abdomen missing], "223", 15.11.1954, 1 ex. [genitalia missing] [K. Lenko leg.]; Est. S.[ão] Paulo, S.[ão] Paulo, Cid.[ade] Jardim, 01.1945, 1♀ (Barretto) (MZUSP); São Paulo, 26.11.1971, 1♂ (V. Alin leg.) (SIZK); Minas Gerais: Cambuquira, 02.1942, 1 ex. [abdomen missing] (H. S. Lopes leg.) (MZUSP).

Diagnosis. This species can be distinguished by the combination of a dorsally incised, apically pointed claw-like postpedicel and an apically broadened wing with a short apical section of vein M_1 and a characteristic wing pattern.

Wing with four brown crossbands: narrow subbasal, extremely wide subtriangular discal, and subapical and apical crossbands separated by two oblique hyaline interspaces; the first oblique hyaline marginal interspace distal to vein R_1 crossing the wing, reaching the posterior margin at end cell m_4; the second, submarginal oblique hyaline interspace from cell r_1 to posterior margin of wing at cell m_1. The ultimate section of the vein M_1 shorter than the penultimate.

Description. Head ratio (length : height : width) = 1 : 1.43 : 1.55; frons, face above transverse fold, parafacial, and gena reddish to yellowish brown, epistome and occiput mostly dark brown with metallic blue tingue. Frons moderately narrow, 0.9–1× as long (from lunule to anterior ocellus) or 1.4× (from lunule to inner vertical seta) as width at lunule, with subshining black ocellar triangle and vertical plates; orbits, vertex, gena and occiput silver-white microtrichose; parafacial narrow, reddish-yellow, white microtrichose. Frontal plate with 6–8 short lateroclinate parafrontal setulae, frontal vitta sparsely whitish microtrichose, with 4–6 frontal and 1 (rarely 2) interfrontal setae on each side (Fig. 4C). Eye 1.5× higher than long. Face white microtrichose above epistome; epistome black to brown, sparsely white microtrichose, with metallic bluish sheen, 2.2× higher than clypeus. Clypeus black, sparsely white microtrichose, with steel blue sheen (Fig. 48 C). Gena brownish yellow, narrowly white microtrichose along orbit, with 1–2 long genal seta and 6–7 additional long peristomal setae anterior of it, slightly shorter than genal seta. Occiput brown, with slight metallic sheen, greyish microtrichose.

Antenna yellow to reddish brown, inserted below the middle of the eye; scape with black setulae; postpedicel moderately long, apically pointed and incised dorsally. Mouthparts brown to black, prementum black, sparsely microtrichose. Palp yellow to reddish brown (Figs 48 A, E, F).

Thorax brown to black, sparsely whitish microtrichose with blue sheen, more prononced on pleura; scutellum dark brown, somewhat flattened dorsally (Fig. 48 D).

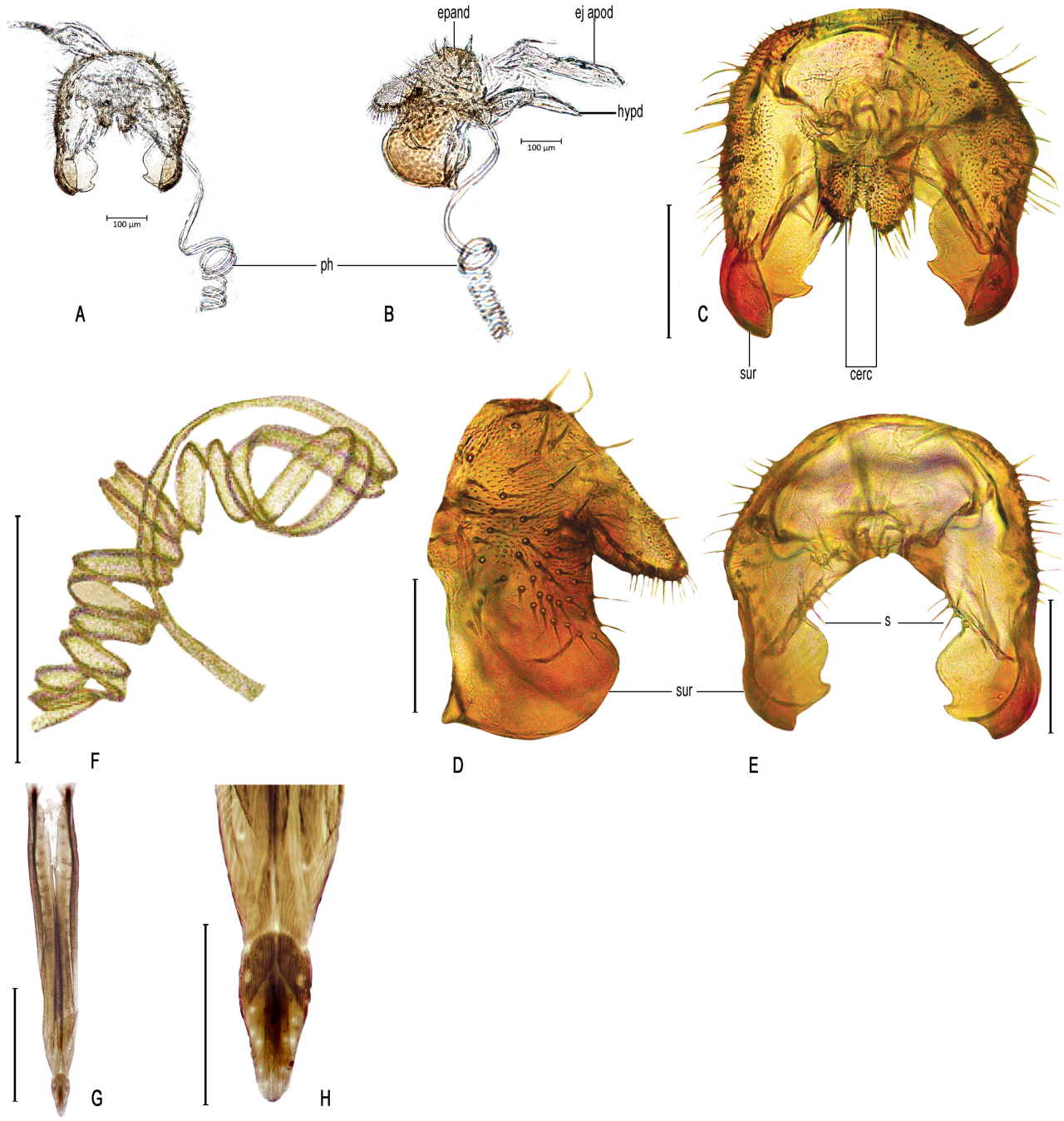

FIGURE 49. *Polyteloptera apotropa* Hendel, ♂ (**A**–**F**) and ♀ (**G**, **H**). **A**, postabdomen, posterior, left; **B**, same, left; **C**, cerci and epandrium, posterior; **D**, same, lateral; **E**, same, anterior; **F**, phallus; **G**, aculeus; **H,** cercal unit. (All photographs by Alexandre Araujo and Marcoandre Savaris.) Abbreviations: cerc—cerci; ej apod—ejaculatory apodeme; epand—epandrium; hypd—hypandrium; ph—phallus; s—seta; sur—surstylus. Scale bars: 0.2 mm.

Wing 4.0–5.2 mm long, 2.5–2.6× longer than wide, black to brown with four hyaline interspaces (Figs 4 H, 48 G). Wing base with basicostal cell hyaline, costal cell brown in basal 1/4 and apical 1/10, with costa slightly curved and forming inconspicuous cleft before apex of vein Sc; pterostigma entirely brown, narrowly triangular, 2.0–2.2× longer than wide, vein R_1 bare, ending proximally of crossvein r-m level; vein R_{2+3} slightly arcuate in basal half, almost straight at apex. Crossvein r-m distal to middle of cell dm, almost at 2/3 of its length. Cell r_{4+5} 4.1–4.2× longer than wide. Cell m_1 narrow triangular; ultimate section of M_1 1.9× longer than crossvein dm-m and 0.89× longer than penultimate section. Subbasal crossband narrow, reaching alula; discal crossband subtriangular or trapezoid,

extremely wide posteriorly, separated from subapical crossband by oblique interspace from apex of R_1 distally of r-m into apex of cell dm; subapical crossband oblique narrow, 0.5–0.8× longer than surrounding interspaces; apical crossband narrowly touching subapical crossband at costa and reaching posteriorly through the apex ov vein M_1 into the very apex of cell m_1. Alula pale grey in apical half. Calypters yellowish. Halter with yellowish knob and reddish brown stalk.

Legs (Figs 48 A, B) with brown coxae and black, bluish tinged femora; tibiae dark brown; fore tarsus blackish, mid and hind tarsi brownish yellow to reddish brown, apical segments blackish; black setose and setulose. Fore femur uniformly setulose, with 2 posterodorsal rows of setae, but no posteroventral row. Mid femur anteriorly with short suberect setulae; mid tibia ventrally with single long apicoventral seta 1.1× longer than tibia width.

Abdomen brown to black, with dull blue sheen, sparse setulose.

Male genitalia: epandrium globular, setulose; outer surstylus wide and short, mesally incised, with short and wide mesally directed ventral lobe bearing short triangular process; inner surstylus without thickened setulae or prensisetaev (Figs 49 D, E); cerci well developed, elongate, subparallel, narrowly separated (Figs 49 C, D). Phallus moderately long, bare, strongly coiled, 2–3 times as long as epandrium height (Figs 49 A, B, F).

Female terminalia (Fig. 49 G): Oviscape 0.35 mm long, narrower than abdomen, as long as wide; aculeus 0.59 mm long, 7.2× longer than wide basally, cercal unit elongate, apically narrowed but blunt (Fig. 49 H). Spermathecae not examined.

Ulivellia Speiser, 1929

Ulivellia Speiser 1929: 28.
Type species: *Ulivellia inversa* Speiser, 1929 (by original designation).
Ulivellia: Steyskal 1968: 54.22.

Diagnosis. The genus possesses all the diagnostic characters of the tribe Lipsanini and the *Amethysa* lineage: head and body with greenish or bluish metallic sheen, sparsely whitish microtrichose, ocellar setae strong; phallus bare or covered with fine microtrichia, shortened or sometimes bar-like, apically without glans; female abdominal tergites 4–6 without anteromedial apodemes, only two spermathecae present. Frons with short parafrontal setulae near orbits, and clearly differentiated from them strong frontal and interfrontal setae.

Species of *Ulivellia* are easily distinguished from most genera of the Lipsanini / *Amethysa* lineage by the presence of crossveins r-m and dm-m, which are strongly displaced basally, so that r-m is at the level of the Sc apex and dm-m is slightly distal to R_1 apex level. All known species have an elongate and narrow pterostigma and setulose vein R_1. The other lipsaniine species with the crossvein r-m at the level of the Sc apex assigned to the genera *Axiologina* Hendel, 1909 and *Euxesta* Loew, 1868 (Figs 4 I–K) have subequal, low epistome and high clypeus (Fig. 3 D).

Halter either entirely black, or with a black knob, sometimes entirely yellow.

The species of *Ulivellia* can be distinguished from the closely related and superficially similar, elongate and moderately large metallic greenish flies of the *Aspistomella* group of genera, which also often have black halteres, by the combination of the wing discal crossband uniformly narrow or not reaching posterior half of the wing (in other genera, strongly widened posteriorly) and crossvein r-m at the level of vein Sc or basal of it (in other genera, distal to the apex of the vein R_1, except in *Aspistomella garleppi*, where the crossvein r-m is proximal to the apex of the vein R_1, but still distal to the apex of vein Sc, as in Fig. 6 D, as well as surstyli bearing numerous prensisetae in the species examined (in other genera, only non-thickened or 2–3 moderately thickened setulae are present on the inner surstylus as in *Aspistomella steyskali*, which are believed to appear independently).

Description. Body mostly dark brown or black, usually with metallic sheen, often faint bluish or greenish, partly hidden by sparse whitish or silvery white microtrichia (Figs 50, 51, 53, 55, 57).

Head generally as described for *Aspistomella*. Frons smooth (Figs 50 B, 51 E, 53 D, 55 C, 57 C), with fine wrinkles, reddish or brownish yellow with black, often greenish shining vertical plates and ocellar triangle to entirely black towards vertex; frontal plates with 4–9 short parafrontal setulae and 4–10 frontal setae; frontal vitta finely and sparsely microtrichose, usually with 3–10 interfrontal setae on each side; vertex and orbits with dense, thickened, short white microtrichia. Vertical plates with 1 long and 1 vestigial reclinate orbital setae anterior of it; ocellar triangle with ocelli forming elongate acute triangle and a pair of very long ocellar setae. Face in dorsal portion flat, covered with white microtrichia (Figs 50 B, 53 D, 55 C, 57 C), and with ventral portion strongly produced antero-ventrally, forming large epistome 2–3× higher than clypeus, often metallic shining, covered with sparse, thin whitish

microtrichia. Parafacial usually brownish yellow, densely white microtrichose. Gena widened posteriorly, brownish, sparsely white microtrichose, bearing 1–2 strong genal setae and 4–6 moderately long, proclinate peristomal setulae. Occiput densely white microtrichose. Scape short, dorsally with 6–8 black marginal setulae. Pedicel with rectangular incision; one long pedicellar seta and 20–25 setulae, of them ventral longest. Postpedicel oval, 1.8–2× longer than wide, rounded at apex, densely microtrichose; arista 2-segmented (Figs 50 C, 53 C, D). Palp elongate, 4–4.5× longer than wide and almost twice as long as postpedicel, white microtrichose, with numerous ventral and ventromedial setae almost as long as palp width and 2–3 apical setae 1.5–2× longer than the rest. Clypeus at least half lower than epistome, convex, microtrichose, almost hidden in oral cavity. Proboscis with prementum and labellum moderately large, bearing long thin setulae.

Thorax mostly shining black or brown, with faint bluish, greenish or golden sheen and moderately dense, thin, semierect white microtrichia not hiding entirely shining cuticle. Postpronotal lobe with 1 seta and 5–15 setulae; proepisternum with 1 short proepiesternal seta (sometimes absent or indistinct) and 5–20 fine subequal setulae on proepiesternal ridge. Prosternum higher than wide, with distinct longitudinal suture and shallow ventral incision, sparsely microtrichose, without conspicuous setae. Mesonotum steel shining, with slight green or bluish sheen of cuticle not entirely hidden by sparse or moderately thick white microtrichia (Figs 50 E, 51 F, 53 E, 55 E, 57 E); scutum setulose, except prescutellar area posterior of dorsocentral setae; dorsocentral setulae forming clear row, with 8–18 12 poorly ordered rows of setulae between them; 1 postpronotal, 2 notopleural, 1 postsutural supra-alar, 1 intra-alar and 1 postalar, 2 dorsocentral and setae present; acrostichal seta present in *U. amnoni*, *U. laetitiae* and *U. pseudinsolita*, but absent in *U. arcuata* and *U. tenoris*. Anepisternum setulose almost entirely anterior to vertical squama, with strong seta and 5–12 shorter setae at posterior margin. Katepisternum with one, occasionally two strong posterodorsal seta. Scutellum subtriangular, slightly convex, smooth, with 2 pairs of scutellar setae, no setulae on disc and margins, sparsely microtrichose. Subscutellum matt, microtrichose. Mediotergite smooth, sparsely or densely microtrichose.

Wing from moderately elongate, 2.0–2.8× longer than wide to strongly elongate, 3.5× longer than wide (in *U. tenoris*), with dark banded wing pattern (or extensive dark pattern in males of *U. arcuata*); venation modified, with the crossvein r-m displaced basally to the level of Sc apex and dm-m closer to the level of R_1 apex than to R_{2+3} apex (Figs 4 A–G). Vein R_1 dorsally with 7–15 setulae (not known in *U. inversa*). Pterostigma longer than wide, costal vein straight before apex of subcostal vein or very slightly bent in *U. pseudinsolita*; in *U. arcuata*, costal vein conspicuously curved distally of apex of subcostal vein. Cell r_{4+5} slightly or conspicuously narrowed apically. Vein CuA Z-shaped, cell cua with moderately short posteroapical lobe along vein CuP (in *U. amnoni*, *U. laetitiae*, and *U. arcuata*) or moderately long (in *U. pseudinsolita* and *U. tenoris*). Calypters white, with white cilia. Halter creamy white (in *U. amnoni*, *U. laetitiae*, and *U. tenoris*) to brown with black or brown knob (in *U. arcuata*, *U. inversa,* and *U. pseudinsolita*).

Legs variable in coloration; coxae yellow to brown, femora usually entirely brown or black, tibiae and tarsi yellow to brown. Fore femur with 2 posterodorsal rows of setae, posteroventrally with row of 2–10 setae. Mid femur on anterior and posterior surface with row of moderately long, antero- and postero-ventrally directed setulae. Mid tibia apicoventrally with strong spur-like seta 1.5× longer than tibia width. Hind femur with 2–3 subapical setae dorsally.

Abdomen subshining brown to black, tergites and sternites with metallic green or yellow sheen, sparsely white microtrichose (Figs 50 F, 51 C, 53 B, 55 A, B, 57 F). Male and female abdomen with 5 visible tergites, of them tergites 3–5 subequal in length; female tergite 6 hidden underneath posterior margin of tergite 5. Sternites 3–5 unmodified, subrectangular, sternite 5 trapezoid (Fig. 52 A).

Male postabdomen. Sternite 8 setulose, with 2 longer setae. Cerci wide oval, moderately developed, partly fused at bases; in *U. arcuata*, flat and joined by subtriangular proctiger; in *U. laetitiae*, short oval, in *U. pseudinsolita* longer, sack-like; setulose (Figs 52 D, E; 54 A, B; 56 A–D). Epandrium ovoid, dorsally short, moderately setulose (Figs 52 C, 54 A, B, D, 56 A–D). Surstyli basally wide, in *U. laetitiae*, outer surstylus simple with narrow, elongated, mesally directed ventral lobe apically bearing dorsally directed pimple-like process, but without distinct antero-ventral and postero-ventral lobes; inner surstylus with 12–15 thickened prensisetae (Figs 54 B, D, E); in *U. arcuata*, mesally directed ventral lobe short and without pimple-like process, but with single sclerotised prensiseta at base (Figs 52 B, C); inner surstylus with row of 6–8 gradually enlarging prensisetae; in *U. pseudinsolita*, outer surstylus flattened, posteroventrally directed, apically oval with single trichoid sensillum; inner surstylus with 4 very strong claw-like mesally directed prensisetae (Figs 56 A, C). Pregonites symmetrical, with 3–5 setulae ventro-mesally,

conspicuously anterior of postgonites. Postgonites on laterobasal part of the phallic guide lobes, with 5–6 small trichoid sensilla (Figs 52 F, 54 E, 56 E). Phallus in *U. laetitiae* and *U. pseudinsolita* moderately short and narrow, about 3–4 times as long as epandrium high, almost bare, in rest coiled at right side of abdomen (Figs 56 A–D); in *U. arcuata*, phallus short and wide, bowed to the right side of abdomen, but neither coiled, nor hidden in the rest, apically with pair of denticles at both sides of gonopore (Figs 52 B–E). Ejaculatory apodeme short, bar-like, with relatively small sperm pump (Figs 52 D, 56 B).

Female terminalia: not dissected.

Preimaginal stages. **Egg** unknown.

Third instar larvae. The third instar larvae of *Ulivellia* are known from *Ulivellia arcuata* and *U. tenoris.* The morphology and the cephalopharyngeal skeleton of *Ulivellia* larvae were basically the same as in *Aspistomella* (Table 2). *Aspistomella* and *Ulivellia* could be distinguished mainly by the structure of the posterior spiracles and the locomotory creeping welts. *Aspistomella* larvae had three rows of posteriorly oriented spinules on abdominal segment I (Figs 21 A, 47 A), three rows of posteriorly oriented spinules in the anterior portion of abdominal segments II-VIII (rows b and c, Figs 21 B, 47 B) and an anterior row of anteriorly oriented spinules on segments III-VIII (row a, Figs 21 C, 47 C). In contrast, *Ulivellia* larvae have five rows of posteriorly oriented spinules on abdominal segment I (Figs 58 B, 60 A), five or more rows of posteriorly oriented spinules in the anterior part of the creeping welts of abdominal segments III-VIII (rows b and c, Figs 58 C, 60 B) and two to three anterior rows of anteriorly oriented spinules on segments II-VIII (rows a, Figs 58 D, 60 C).

The posterior spiracular slits of *U. arcuata* resembled silhouettes of kneeling and bowing humans, their spiracular slits 1 and 2 were symmetrical, and the yellow area above the spiracular slits widened towards the edge of the spiracle (Figs 9 D, 58 F). In contrast, the spiracular slits of *U. tenoris* had an additional turn in the central part, spiracular slits 1 and 2 were asymmetrical and the width of the yellow line above the spiracular slit was almost constant (Figs 9 C, 60 G); furthermore, the shape of the spiracle was more rectangular than the more oval shape of the other four species and the distance between the spiracles was comparatively large (high sd/sw index, Table 2).

Ulivellia tenoris could be distinguished from *U. arcuata* by having a double row of large spinules (rows d, Fig. 60 C), while *U. arcuata* had only one (rows d, Fig. 58 D). Furthermore, in *U. tenoris* rows b in the anterior half of the creeping welts of abdominal segments II-VIII were discontinuous, slightly curved and mesh-like (Fig. 60 C), while in *U. arcuata* they were relatively parallel to each other and continuous (Fig. 58 D). *Ulivellia arcuata* had a continuous central row c (Fig. 58 D), whereas *U. tenoris* row c had a discontinuous row c (Fig. 60 C).

Puparium (Figs 9 E, H)**.** Puparia of *Ulivellia* were similar to those of *Aspistomella*, but could be distinguished by their posterior spiracles and creeping welts, just as in larvae (*compare* spiracular slits in Figs 9 D, E). In addition, *Aspistomella* puparia were widest at abdominal segments 3–4, whereas *Ulivellia* puparia were widest at abdominal segment 7 (Figs 9 G, H). Puparia of *U. arcuata* were smaller than those of the other three species.

Habitat. The larvae of *Ulivellia arcuata* and *U. tenoris* live in the water-filled internodes of young bamboo culms of *Guadua angustifolia*. The biology of *Ulivellia* is described in the Biology section.

Remarks. In the original description, Speiser (1929) characterised *Ulivellia* as "…somewhat reminiscent of *Rivellia* [a genus of the Platystomatidae—VK] in the general appearance; however, this form belongs to the group around *Euxesta* H. Lw., including *Pareuxesta* Coquill. because the end of R_1 is setulose and the analis [vein CuA + CuP] disappears just behind the anal cell [cua].

[…]Due to the peculiar position of the small transverse veins, the use of Hendel's key […] of the "Genera Insectorum", one is easily misled into interpreting the form as *Axiologina* Hendel; leaving this aside, one arrives quite easily at *Pareuxesta* Coquill.—however, apart from the setae on the frontal vitta, which are much more similar to those of *Euxesta*, the vertical plates of the frons are only short, so that they hardly reach further forward than the ocellar triangle, and thus barely reach a third of the length of the frons. On the other hand, the ocelli are not arranged in an equilateral triangle, as in *Pareuxesta*, but in an acute-angled isosceles triangle. The clypeus [face—VK] is not only shallowly concave, but rather deeply depressed transversely above the centre; its upper, slightly transversely curved part has a fine median longitudinal keel, as in some *Euxesta* species; the lower part is well curved. The 3rd antennal joint [postpedicel] has a shallowly concave upper edge, otherwise the morphology of the head and its appendages, as well as that of the thorax and its bristles, does not differ from that of compared genera. The wing vein, however, has some peculiarities: The first posterior marginal cell [= cell r_{4+5}—VK] is very clearly narrowed by the convergence of the longitudinal veins. The small transverse vein [= r-m—VK] is displaced proximally (further than in *E. insolita* Hendel, but not as far as in *Axiologina*); it is slightly further than at the end of the first quarter of

the disal cell length. Due to a peculiar divergence of the cubitus [= vein M_4] towards the posterior margin, the discal cell is already widened from the first quarter of its length, so that at the the posterior transverse vein it is at least three times as wide as its base; its postero-distal corner is acute-angled. The character of the anal cell and vein has already been mentioned."

[Original description: "Im Gesamtbilde etwas an Rivellia erinnernd, gehört diese Form gewissermaßen vermittelnd in die Gruppe um Euxesta H. Lw.—Man könnte sie fast ebenso gut als etwas weitergehend seitwärts entwickelte Euxesta neben E. insolita Hendel stellen, wie man mit größerem formalen Recht sie zur Gattung Pareuxesta Coquill. rechnen könnte, weil das Ende von R_1 (Subcosta bei Hendel) dicht beborstet ist und die Analis ein Stückchen hinter der Analzelle restlos aufhört.

Hendel will ja auch schon diese Inselgattung Pareuxesta für „etwas problematisch" halten. Immerhin ist sie deutlich genug gekennzeichnet, und anderseits die jetzt neu vorliegende Form doch im Geäder einigermaßen abweichend, um nicht ohne Zwang weiterer Tatsachen alles zu vereinigen und damit tiergeographische Hinweise unnötig zu verwischen. Durch die eigenartige Stellung der kleinen Querader wird man bei Benutzung von Hendel's Tabelle in fase. 106 der „Genera Insectorum" leicht verleitet, die Form als Axiologina Hendel aufzufassen, läßt man diese Klippe beiseite, gelangt man ziemlich zwanglos auf Pareuxesta Coquill.—Abgesehen aber von der Beborstung der Stirnstrieme, die erheblich mehr derjenigen bei Euxesta entspricht, sind auch die Scheitelplatten der Stirn nur kurz entwickelt, sodaß sie kaum weiter nach vorn reichen, als das Ocellendreieck, und also kaum ein Drittel der Stirnlänge erreichen. Die Ocellen anderseits stehen nicht, wie bei Pareuxesta, in einem gleichseitigen, sondern in einem spitzwinklig gleichschenkligen Dreieck. Der Clypeus ist nicht nur seicht konkav, sondern oberhalb der Mitte ziemlich tief quer eingedrückt, sein oberer, wenig in der Quere gewölbter Teil weist, wie bei einigen Euxesta-Arten auch, einen feinen Mittellängskiel auf; der untere Teil ist gut gewölbt. Das 3. Fühlerglied weist eine seicht konkav ausgebuchtete Oberkante auf, sonst bietet die Morphologie des Kopfes und seiner Anhänge, ebenso diejenige des Thorax und seine Beborstung keine Abweichungen gegenüber den verglichenen Gattungen. Das Flügelgeäder indessen hat einige eigentümliche Züge: Die erste Hinterrandzelle ist durch Convergenz der Längsadern sehr deutlich verengt. Die kleine Querader ist (weiter als bei E. insolita Hendel, aber nicht so weit, wie bei Axiologina) wurzelwärts zurückverlagert; sie steht ein wenig weiter als am Ende des ersten Viertels der Discoidalzellenlänge. Die Discoidalzelle ist durch eine eigentümliche Schwingung des Cubitus gegen den Hinterrand zu schon von dem ersten Viertel ihrer Länge ab buchtig erweitert, sodaß die hintere Querader gut dreimal so lang ist wie ihre Basis; ihr unteres äußeres Ende ist spitzwinklig. Die Beschaffenheit der Analzelle und -ader wurde bereits erwähnt."

Ulivellia amnoni Smit sp. nov.

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Figs 4 A, 50

Material examined. Type. Holotype ♀: "**Peru**: Cuzco: Paucartambo / Puente San Pedro (50 km NW Pilcopata) / 13.1468W 71.6159S / 1600 m, 3 Sep. 1988 / leg. A. Freidberg". The holotype is in good condition and is to be deposited in the collection of TAUI.

Diagnosis. *Ulivellia amnoni* differs from all the other species of the genus by having the subbasal and discal bands in the wing connected, and therefore cell br entirely brown and crossvein dm-m bent basally in the apical fifth (Fig. 4 A).

Description. Female. **Head** (Figs 50 B, C) ratio (length : height : width) 1 : 1.36 : 1.56, mostly black, except frons, gena and parafacial brown. Frons 0.9× longer than wide (from lunule to anterior ocellus), orange brown with black ocellar triangle and vertical plates; orbits silver-white microtrichose, brown. Parafacial narrow, 0.2–0.3× broader than postpedicel, slightly white microtrichose. Frontal plates with 6–7 parafrontal setulae and 5–7 frontal setae, frontal vitta with 4–6 interfrotal setae on each side, anterior ones the longest, about 1/3 as long as ocellar seta; 2 orbital setae, posterior longer than anterior, about 0.5–0.6× longer than inner vertical seta and 3–4× longer than outer vertical seta; postocellar long, 0.5× longer than inner vertical setae; outer vertical seta short, 0.2–0.25× longer than inner vertical seta and hardly distinguishable from postocular setae forming one row allied by 8–10 dorsal and 10–15 ventral occipital setae. Lunule very narrow, indistinguishable, orange-yellow. Eye 1.5× higher than long. Face (above suture) as high as wide at transverse fold, brown, obscured ventrally, densely white microtrichose; epistome brown to black, sparsely white microtrichose, metallic shining, often with greenish or

cyan sheen, strongly produced anteriorly and separated from upper part of face by deep suture. Clypeus brown to black, sparsely white microtrichose, metallic shining, often with cyan sheen, 0.3–0.4× higher than epistome. Gena brownish yellow, with long genal seta and 3–4 peristomal setae anterior of it, 0.5–0.8× longer than genal seta. Occiput black, except postgena brown, with silver to cyan metallic sheen, moderate densely covered with white microtrichia partly hiding underlying cuticle; ventral part of occiput (postgena) with 4–5 setae almost as long as genal seta. Antenna brownish yellow; scape and pedicel with black setulae; postpedicel brown, blackish antero-dorsally, whitish microtrichose, 1.8× longer than wide, apically rounded; arista black except yellow at base, almost bare. Mouthparts black, prementum black, shining. Palp brown, yellowish apicoventrally with long black setulae, except for basal 1/4, with shorter setulae, about 0.3–0.5× longer than apical setulae.

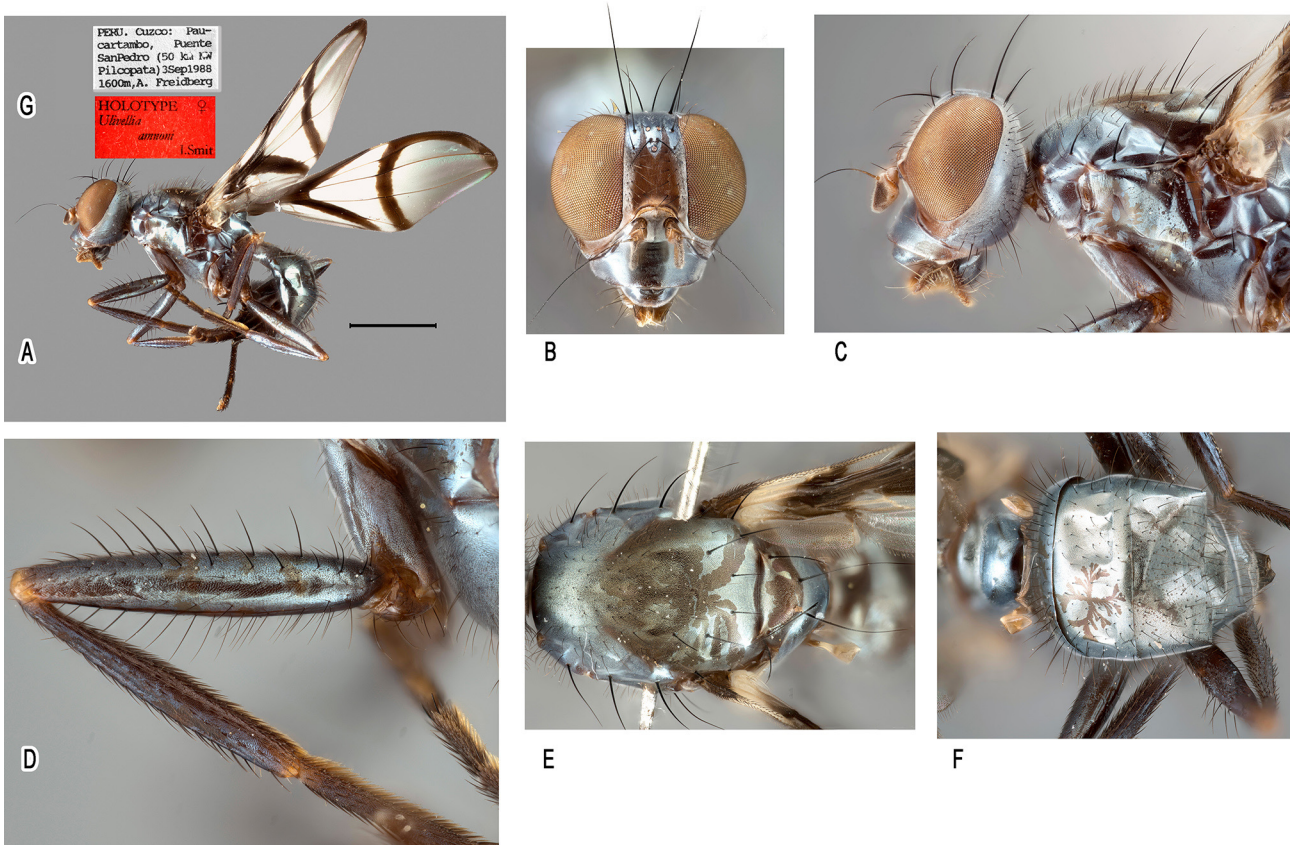

FIGURE 50. *Ulivellia amnoni* **sp. nov.** holotype ♀. **A**, habitus, left; **B**, head, anterior; **C**, head and mesonotum, lateral; **D**, fore leg; **E**, mesonotum, dorsal; **F**, abdomen, dorsal; **G**, label. Scale bar: 1 mm.

Thorax (Fig. 50 E) black, metallic shining with yellowish-green in apical half or cyan sheen and sparse yellow microtrichia not hiding underlying cuticle. Mesonotal scutum 1.46× longer than wide; presutural area with silvery cyan sheen and without inconspicuous yellowish-green vittae, postsutural area with yellowish-green sheen, black setulose, with 8–10 rows of setulae between dorsocentral setulae; 1 pair of acrostichal setae; prescutellar area devoid of setulae. Scutellum dorsally flattened, black or brownish posteriorly, finely shagreened, sparsely microtrichose, devoid of setulae. Subscutellum subshining, black with metallic silvery cyan sheen. Mediotergite shining black with metallic silvery cyan sheen, sparsely microtrichose. Anepisternum, anepimeron as well as katepisternum with only metallic silvery cyan sheen. All the setae and setulae black.

Wing (Fig. 4 A) 5.6 mm (♀) long: 2.7× longer than wide, basicostal cell hyaline; costal cell very long, 8.2× longer than wide, brown in basal fifth, with costa almost straight, forming neither lobe nor cleft; pterostigma entirely brown, narrow triangular, 8× longer than wide, vein R_1 setulose dorsally at pterostigma level, ending at level of crossvein dm-m; vein R_{2+3} at apex bent anteriorly and then subparallel to costa, turning towards it before very apex; vein R_{4+5} arcuate, first upwards from crossvein r-m and downwards distally, ending just shy of wing apex; vein M_1 curved similarly but in opposite direction, ending well beyond apex of wing; crossvein r-m at basal ¼ of cell dm; crossvein dm-m bent basally in the apical fifth. Cell r_{4+5} 5.5–6× longer than wide, broadest just beyond the middle

and apically narrowed; Cell m1 narrow triangular; ultimate section of M_1 3×. as long as crossvein dm-m and 1.5x as long as penultimate section. Vein CuA slightly convex in upper part, cell cua with short posteroapical lobe along vein CuP. Wing pattern similar to *U. inversa* and *U. laetitiae*, subbasal band broader and more or less oblique, not continued on alula, and connected with discal band therefore cell br entirely dark, discal band strongly arched, stronger than in *U. inversa* and *U. laetitiae*, broader at cell br and clearly narrowed at posterior end, preapical band slightly less arched than in U. inversa. Calypters white, with white ciliae. Halter light with light knob.

Legs (Figs 50 A, D) all entirely black bluish cyan sheen, except trochanters yellow-brown and knees narrowly brown, all sparse with microtrichia except for coxae of fore legs. Mid tibia ventrally with one spur-like seta 3× longer than tibia width.

Abdomen (Fig. 50 F) entirely black, tergites very finely shagreened and sparsely microtrichose, with metallic bluish cyan sheen, less shiny than pleura; setulae and setae black.

Male. Unknown.

Etymology. This species is named in honor of the late Dr. Amnon Freidberg, a renowned scientist with a huge knowledge on Tephritoidea, who collected the specimen. See Friedman (2019) for an account of his life and work.

***Ulivellia arcuata* Kovac & Kameneva sp. nov.**

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Figs 4 D, E, 7 C, 9 D, E, 51–52, 58.

Material examined. Type. Holotype ♂: "**Bolivia**: Santa Cruz, near Buena / Vista (near hotel Flora & Fauna) [17.5009S, 63.6743W], larva in the internode of felled bamboo (*Guadua chacoensis*, last year), emerged on 16.ii.2011, / Bol Z30/6/11 leg. D. Kovac" (SMF).

Paratypes: 2♂, **Bolivia**: Santa Cruz, near Buena Vista (near hotel Flora & Fauna) [17.5009S, 63.6743W], larva in the internode of felled bamboo (*Guadua chacoensis*, last year), emerged on 18.ii.2011, Bol Z30/7/11 (leg. D. Kovac); 2 ♂, 1♀ (1♂, 1♀ dissected), idem [17.5009S, 63.6743W], labels as in holotype, except emerged on 18.ii.2011, Bol Z31/2/11; 1♂ [17.5009S, 63.6743W], emerged on 16.ii.2011, Bol Z30/6/11; 2♀ [17.4734S, 63.6922W], emerged on 25.ii.2011, Bol Z32/4/11 (leg. D. Kovac); idem [17.4734S, 63.6922W], (El Cairo), larva in bamboo culm (*Guadua chacoensis*, last year), emerged on February 2011, Bol Z22/2/11, 1♀ (leg. D. Kovac).

Larvae. Bolivia: Buena Vista, 29.i.2011, BolZ22/11, 2 larvae (D. Kovac leg.) (SMF); idem 6.ii.2011, BolZ30/2/11, 5 larvae (D. Kovac leg.) (SMF).

Diagnosis. *Ulivellia arcuata* differs from all the other species of the genus by having wing with costal vein clearly bent at the level of pterostigma (Figs 4 D, E), as well as by the vein R_1 at pterostigma slightly dipping downwards, thickened and setulose, ending at level of crossvein dm-m; basal two-thirds of costal cell brown in both sexes; vein R_{2+3} at apex close and subparallel to costa, turning towards it before very apex, sexually dimorphic wing pattern.

Description. Male. **Head** (Figs 51 D, E) ratio (length : height : width) = 1 : 1.46 : 1.5, mostly black, except frons, gena, and parafacial brownish yellow. Frons (Fig. 51 E) 2.1× longer than wide, brownish yellow with black ocellar triangle and vertical plates; orbits silver-white microtrichose, brownish yellow; parafacial narrow, 0.2–0.3× broader than postpedicel, white microtrichose. Frontal plates with 7–8 thin proclinate parafrontal setulae and 6–8 inclinate and partly proclinate frontal setae 0.3–0.5× longer than ocellar seta, frontal vitta with 5–7 interfrontal setae at each side; 1 very long orbital seta, as long as ocellar seta and 0.8× longer than inner vertical seta and 2–3× longer than outer vertical seta; postocellar seta very long, 0.6× longer than inner vertical seta; outer vertical seta short, 0.3–0.5× longer than inner vertical seta and hardly distinguishable from postocular setae forming one row, allied by 6–7 dorsal and 10–15 ventral occipital setae. Lunule very narrow, indistinguishable, orange. Eye = 1.4× higher than long. Face (above suture) as high as wide at transverse fold, brown to brownish orange, densely white microtrichose; epistome brown to black, sparsely white microtrichose, metallic shining, often with greenish or cyan sheen, conspicuously produced anteriorly and separated from upper part of face by deep suture. Clypeus brown to black, sparsely white microtrichose, metallic shining, often with cyan sheen, 0.7–0.8× higher than epistome. Gena brownish yellow, with long genal seta and 3–4 additional setae anterior of it, 0.6–0.8× longer than genal seta. Occiput black, except postgena brownish-yellow, with yellowish to cyan metallic sheen, moderate densely covered with greyish microtrichia partly hiding underlying cuticle; ventral part of occiput (postgena) with 3–4 setae almost

as long as genal seta. Antenna brownish yellow; scape and pedicel with black setulae; postpedicel brown, often blackish antero-dorsally, whitish microtrichose, 1.7–1.9× longer than wide, apically rounded; arista black except yellow at base, almost bare. Mouthparts black, prementum black, shining. Palp yellow, brown in basal 1/6, with sparse and short black setulae, except 2–3 subapical setulae 2–3× longer than other setulae.

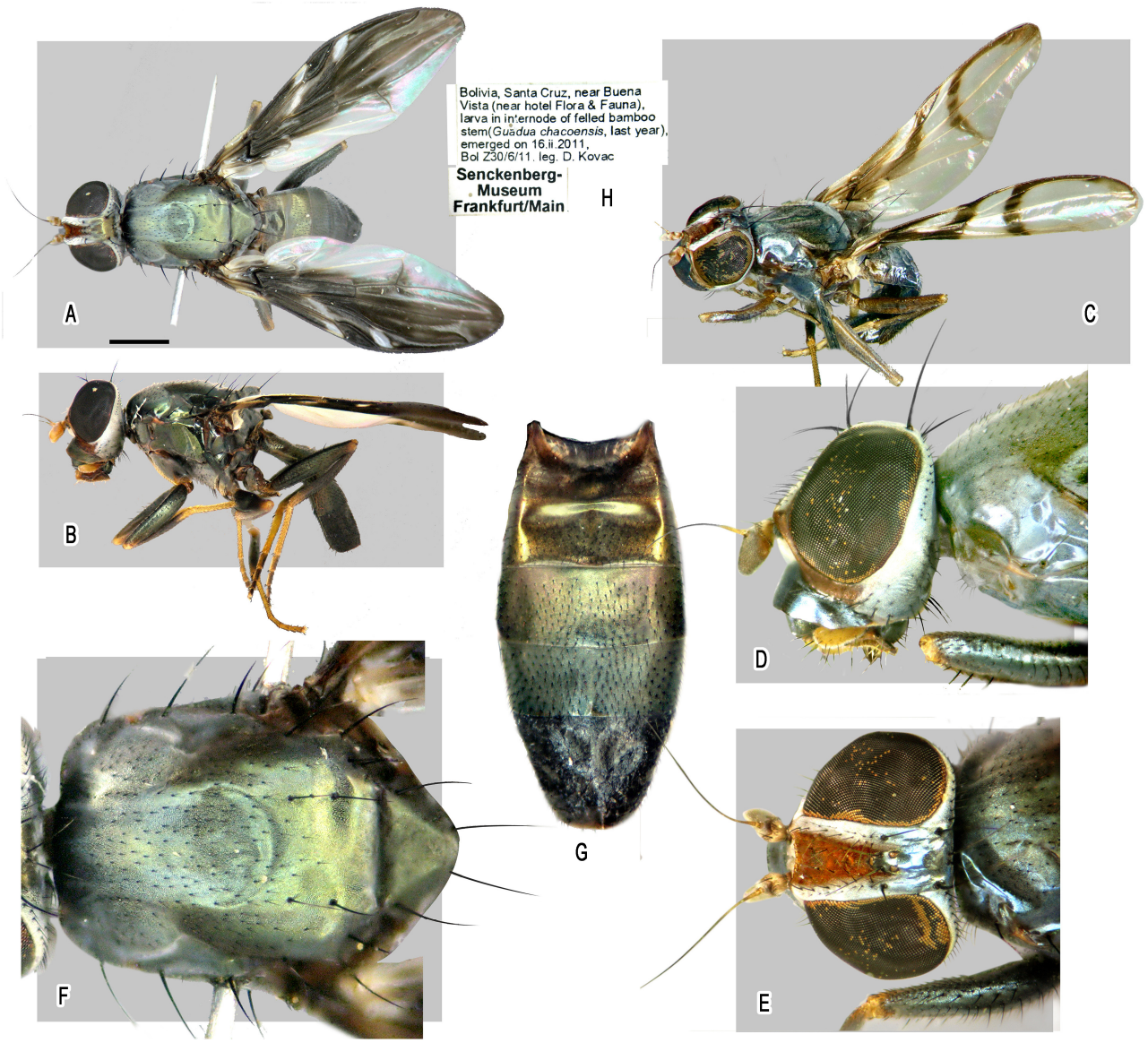

FIGURE 51. *Ulivellia arcuata* **sp. nov.** holotype ♂ (**A**–**B**, **D**–**H**) and paratype ♀ (**C**). **A**, habitus, dorsal; **B**, same, left; **C**, same, anterolateral; **D**, head left; **E**, same, dorsal; **F**, mesonotum, dorsal; **G**, abdomen; **H**, label. Scale bar: 1 mm.

Thorax (Figs 51 B, F) black, with yellowish-green sheen and sparse yellow microtrichia not hiding underlying cuticle. Mesonotal scutum 1.3× longer than wide; with 3 almost inconspicuous vittae of lightly denser microtrichia, slightly brownish laterally in postsutural area, black setulose, with 8–10 rows of setulae between dorsocentral setulae; acrostichal setae absent; prescutellar area devoid of setulae. Scutellum dorsally flattened, black or brownish posteriorly, finely shagreened, sparsely microtrichose, devoid of setulae. Subscutellum subshining, dark brown. Mediotergite shining black, sparsely microtrichose. All the setae and setulae black.

Wing (Fig. 18) 4.2–5.1 mm (♂) 3.7–4.8 mm (♀) long; 2.8–2.9× longer than wide, with costal vein clearly bent at the level of pterostigma; basicostal cell partly hyaline; costal cell very long, 9–11× longer than wide, brown in basal 0.8 of length, with costa straight and uniformly covered with short setulae; pterostigma entirely brown, rhomboid, vein R_1 setulose dorsally at pterostigma level, thickened and slightly dipping downwards at pterostigma, ending at level of crossvein dm-m in ♂ or between r-m and dm-m in♀; vein R_{2+3} at apex bent anteriorly and then

subparallel to costa, turning towards it before very apex. Crossvein r-m slightly distally (♂) or slightly proximally (♀) of middle of cell dm. Cell r_{4+5} 4.5–6× longer than wide, apically narrowed. Cell m1 narrow triangular; ultimate section of M_1 4× longer than crossvein dm-m and 3× (in ♂) or 1.9 (in ♀) as long as penultimate section. Vein CuA Z-shaped, cell cua with moderately long posteroapical lobe along vein CuP. Wing pattern with almost entirely brown cell br; sexually dimorphic, conspicuously darker in ♂, with 2 pairs of connected crossbands in ♀ (Fig. 4 E) or widely brown in anterior half in ♂ (Fig. 4 D). Calypters white, with white cilia. Halter brown with black knob.

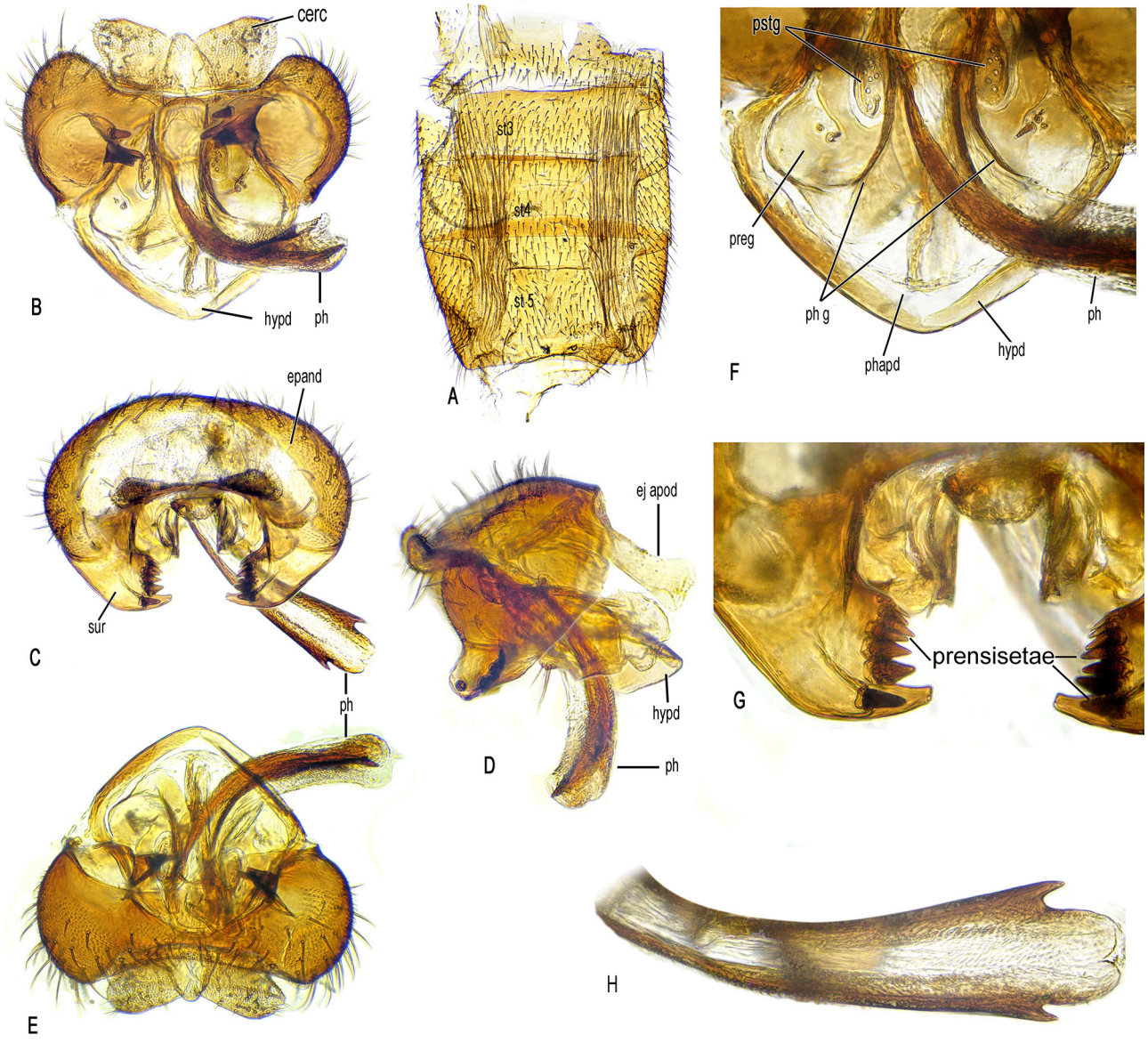

FIGURE 52. *Ulivellia arcuata* **sp. nov.** paratype ♂ (SIZK) **A**, preabdomen; **B**, postabdomen, ventral; **C**, same, posterior; **D**, same, lateral **E**, same, dorsal **F**, hypandrium, ventral; **G**, surstyli, posterior; **H**, phallus. Abbreviations: cerc—cerci; epand—epandrium; ej apod—ejaculatory apodeme; hypd—hypandrium; ph g—phallic guide; ph—phallus; phapd—phallapodeme; pstg—postgonite.

Legs (Figs 51 B, D) with black coxae, trochanters, femora and tibiae, yellow tarsi, and usually ventrally yellowish fore coxa, fore femur, and mid knee; femora and tibiae usually with metallic greenish sheen and sparse white microtrichia, black setae and setulae. Mid femur anteriorly and posteriorly with short setulae, but without long erect setae; mid tibia ventrally with one spur-like seta 3× longer than tibia width.

Abdomen (Figs 51 G, 52 A) entirely brown or black, tergites very finely shagreened and sparsely microtrichose, with yellowish-green metallic sheen, except tergite 5 of ♂ black with blue or violet sheen; setulae and setae black.

Male postabdomen. Cerci flat and joined by subtriangular proctiger (Figs 52 B, C, E). Epandrium ovoid, dorsally short, moderately setulose (Figs 52 B–E). Surstyli basally wide, mesally directed ventral lobe short and without pimple-like process, but with single sclerotised prensiseta at base; inner surstylus with row of 6–8 gradually enlarging prensisetae (Figs 52 B–D). Pregonites symmetrical, somewhat lobate, with 2 setulae ventro-mesally, anterior of postgonites (Figs 52 B, F). Postgonites on laterobasal part of the phallic guide lobes, with 5–6 small trichoid sensilla (Figs 52 C, F). Phallus short and wide, bowed to the right side of abdomen, neither coiled, nor hidden in the rest, apically with pair of denticles at both sides of gonopore (Figs 52 B–D, H).

Female postabdomen not dissected.

Larva. **General structure**: As in *Aspistomella duo*, body length 7.1–7.7 mm (median = 6.95, n = 8), width 1.8–2.1 mm (median = 2 mm, n = 8).

Pseudocephalon. As in *A. duo*. Second antennal segment retracted, not visible. Mouthhooks tapering at apices (Fig. 7C). Twenty-nine oral ridges adjacent to oral cavity, identical on both sides of the body (n = 1).

Cephalopharyngeal skeleton (Fig. 7 C). As in *Aspistomella duo*. Total length 1.2–1.3 mm (n = 3). Indentation between tips of apical tooth and ventral apodeme 0.67–0.85× as deep as wide; one specimen with one small preapical tooth, two specimens lack preapical tooth. Hypopharyngeal sclerite 3.8–5.3× longer than high. Hypopharyngeal bridge midway along the length of the hypopharyngeal sclerite. Parastomal bars curved, 1.1–1.2x as long as hypopharyngeal sclerite.

Thoracic segments I–III. As in *A.duo*. Anterior spiracles on thoracic segment I consist of 16–19 tubules (median = 17, n = 16 tubule rows from 8 larvae). The number of tubules on the left or right side of the same larva often differs by up to three tubules. The first thoracic segment bears 14 cuticular sensilla on each side of the body, the second and third thoracic segments bear 13 cuticular sensilla, type and position of sensilla as in Fig. 8.

Abdominal segments I–VII. Abdominal segments I–VII bear 13 cuticular sensilla on each side of the body and possess a pair of rudimentary lateral spiracles (see Fig. 8). Ventrally, the creeping welts on abdominal segments I–VII are arranged as follows: CW1 (Fig. 58 B): Five relatively continuous rows of spinules, third row short, spinules in second row slightly larger, all spinules acute and directed posteriorly. CW2 (Fig. 58 C). Two relatively continuous rows with acute spinules (rows b), followed by a central continuous row with larger spinules (row c), followed by a row with large spinules (row d) consisting of five horizontal sub-rows of five to eight large spinules each, laterally flanked by five transverse rows, caudal ends of transverse portions merging into slightly curved rows of smaller acute spinules; last row continuous with small acute bristles (row e). All spinules directed posteriorly. CW3–CW7 (Fig. 58 D): similar to CW2, but two additional anterior rows (rows a), one of them with large spinules and the anterior one with small spinules, spinules in both rows directed anteriorly, other rows directed posteriorly.

Caudal segment. Caudal segment bears 13 cuticular sensilla on each body side (see Fig. 8). Caudal creeping welt CW8 similar in structure to W3–CW7, but last row arranged along the anterior margin of perianal pad with anteriorly directed spinules.

Posterior spiracles (Figs 9 D, 58 F) oval, length 0.38–0.48 mm (median = 0.4, n = 18), width 0.29–0.37 mm (median = 0.33, n = 18), shortest distance between spiracles 0.72–0.95 mm (n = 10). Spiracular slits similar to those of *U. tenoris*, but with only 5–6 smooth turns ending in a roundish hook, shape of spiracular slits resembling the silhouette of a bowing person, yellow line above spiracular slit widening from base to margin of spiracular plate, spiracular plate mostly black, central area between spiracular slits often brown. Spiracular hair group 1: 5–7 hairs, hair group: 2 1 hair, hair group 3: 4–6 hairs and hair group 4: 9–15 hairs (n = 6 spiracles). Anal complex as in *A. duo*.

Puparium (Figs 9 E, 58 G). Length 5.3 and 5.5 mm; maximum width at 7th abdominal segment, 1.6 and 1.7 mm (n = 2); pale brown, darker at both ends; strongly tapering towards anterior end, broad towards the posterior end; posterior spiracles (Fig. 9 E) and creeping welts as in third instar.

Etymology. The species name "*arcuata*" reflects an uncommom wing shape, with conspicuously bowed costal vein on its anterior margin.

Biology. Larvae inhabit water-filled bamboo internode cavities of *Guadua angustifolia*, biology as in *Aspistomella duo*.

***Ulivellia inversa* Speiser, 1929**
Fig. 4 B

Speiser 1929: 30; Steyskal 1968: 54.22.

Material examined. Type. Syntypes 2♀: **Brazil**: "Jaragua [Jaraguá] im Staate Sta. Catharina" [Santa Catarina], 12.v.1928 (leg. F. Hoffmann) (P. Speiser's private collection, Königsberg; assumed lost).

Description (after Speiser, translated). [Body length up to the beginning of the ovipositor 5 mm. Ground colour a shiny metallic, somewhat yellowish greenish blue, wings peculiarly banded.

The head has a dark brown-red velvety frontal vitta, with silver-rimmed rather broad orbits, the vertical plates and the ocellar triangle blue-green with also silvery stripes. Face next to the antennae, cheeks, the outermost sides of the clypeus including its fine margin reddish yellow, dull on the blackish antennae, the base of the 3rd joint, especially on the inside, is also reddish yellow. The palpi are blackish with a reddish-yellow tip, with black hairs or bristles below; the rather thick and clumsy proboscis is also leathery yellow. The entire back of the head is blue-green, with a slight whitish coating. Basic colour of the thorax and especially the scutellum yellowish green-blue, the bristles regular, pleurae unicoloured, barely the humeral corners slightly reddish behind. All femora reddish leathery yellow, those of the fore legs darkened metallic blue-black in the centre (front). The entire legs are also metallic blue-black in colour, and only the knee joints are a fine leathery yellow, only very finely visible on the hind legs, somewhat more pronounced on the middle legs and very distinct on the fore legs. The tarsi are all deep black. The fore legs are covered above and outside with groups of longer setae along almost the entire length, individual similarly longer setae also on the underside in front of the knee, the fore tibiae somewhat laterally flattened, which is particularly emphasised by the fine, rowed pubescence of the front and rear edges, as the lateral surfaces are quite bare; all metatarsi as long as the other tarsomeres together.—The posterior two pairs of legs without special markings. - The wings are light in colour with 4 crossbands. Their root is light-coloured, behind it there is a rather broad transverse band reaching into the anal cell, there shortened, 1½ times as long as wide, which runs from the anterior margin over the root transverse vein and the fork of the radius; it is deep black-brown. The second band is, in contrast to most related species, strongly convex towards the wing root. It begins deep black at the anterior margin, filling the space between sc and the strongly bristled r_1, both deeply blackening, its proximal border then curves slightly to the root of the discal cell, of which it leaves the inner lower corner glassy bright, in order to turn, thus now bent over towards the tip, crossing cu to the posterior margin, which it reaches opposite the centre of the beginning of the band at the anterior margin. It is on the whole just as wide as the first (half) crossband standing towards the root; its apical boundary accompanies the small transverse vein. The third crossband runs, very slightly concave towards the tip, exactly over the posterior crossvein, which it grasps in its centre. The fourth band is a lace border which joins the third band at the front edge and lines the tip as far as the media, with a faint glimmer just beyond its mouth. In the marginal cell, a narrow segment below the junction of the 8th and 4th setae remains clear. The wing veins are otherwise yellowish, but black within the band, and this colouring has r_1 and, as a finer line, r_{4+5} along their entire length. The essential information about the course of the veins has already been given in the genus description, the first posterior marginal cell is so narrowed by considerable oscillation of the media that it is not even half as wide at the wing tip as at the widest point, slightly apically from the 3rd transverse vein. Towards the tip of the small transverse vein the media is slightly curved forwards, which widens the discal cell even more here than is only due to the oscillation of the cubitus towards the posterior margin. The posterior transverse vein is slightly bent in an S-shape.—Halter with black-brown knob and lighter coloured stalk.—Abdomen unicoloured blackish greenish blue with light yellowish white stripes. Ovipositor with trapezoidal basal segment, tapering to its apex.]

"Körperlänge bis zum Anfang des Legebohrers 5 mm. Grundfarbe ein metallisch glänzendes, etwas gelbliches Grünblau, Flügel eigenartig bandiert.

Der Kopf weist eine dunkel braunrote samtene Stirnstrieme auf, mit silberbereiften ziemlich breiten Augenrändern, die Scheitelplatten und das Ocellendreieck blaugrün mit ebenfalls silbriger Bereifung. Gesicht neben den Fühlern, Wangen, die äußersten Seiten des Clypeus samt dessen feinem Rande rötlichgelb, matt. An den schwärzlichen Fühlern ist die Wurzel des 3. Gliedes, namentlich innen, ebenso rötlichgelb. Die Taster sind schwärzlich mit rötlichgelber Spitze, unten schwarz behaart oder beborstet; auch der recht dicke und plumpe Saugrüssel ledergelb. Der ganze Hinterkopf blaugrün, leicht weißlich bereift. Grundfarbe des Thorax und insbesondere des Scutellum gelblich grünblau, die Beborstung regelrecht, Pleuren einfarbig, kaum die Schulterecken hinten etwas rötlich gefärbt.

Alle Hüften rötlich ledergelb, diejenigen der Vorderbeine auf der Mitte (der Vorderseite) metallisch blauschwarz verdunkelt. Ebenso sind die ganzen Beine metallisch blauschwarz, und nur die Kniegelenke fein ledergelb und zwar an den Hinterbeinen nur ganz fein, eben sichtbar, an den mittleren etwas ausgesprochener, an den vorderen sehr deutlich. Die Tarsen sämtlich tief schwarz. Die Vorderschenkel oben und außen mit Gruppen längerer Borsten fast der ganzen Länge nach besetzt, einzelne gleichartig längere Borsten auch auf der Unterseite vor dem Knie, die Vordertibien etwas seitlich abgeflacht, was durch feine, gereihte Behaarung der Vorder- und Hinterkante noch besonders hervortritt, da die Seitenflächen ziemlich kahl sind; alle Metatarsen so lang wie die übrigen Glieder zusammen.—Die hinteren beiden Beinpaare ohne besondere Auszeichnungen.—Die Flügel (Fig. l) sind glashell mit 4 Querbinden. Ihre Wurzel ist hell, dahinter steht eine ziemlich breite, bis in die Analzelle reichende, dort abgekürzte Querbinde, die l 1/2 mal so lang wie breit ist, welche vom Vorderrande über die Wurzelquerader und die Gabelung des Radius verläuft; sie ist tief schwarzbraun. Die zweite Binde ist, abweichend gegenüber den allermeisten verwandten Arten, gegen die Flügelwurzel stark convex. Sie beginnt tiefschwarz am Vorderrande, den Raum zwischen sc und dem stark beborsteten r_1 ausfüllend, beide tief schwärzend, ihre wurzelwärtige Begrenzung geht dann leicht geschwungen zur Wurzel der Discoidalzelle, von der sie die innere untere Ecke glashell läßt, um sich, also nun spitzenwärts umgebogen, cu überschreitend zum Hinterrande zu wenden, den sie gegenüber der Mitte des Bindenbeginns am Vorderrande erreicht. Sie ist im ganzen ebenso breit wie die wurzelwärts stehende erste (Halb-) Binde; ihre spitzenwärtige Begrenzung begleitet die kleine-Querader. Die dritte Querbinde verläuft, ein ganz klein wenig spitzenwärts konkav, genau über die hintere Querader, die sie in ihre Mitte faßt. Die vierte Binde ist ein Spitzensaum, der sich am Vorderrande an die 3. Binde anschließt und die Spitze bis zur Media säumt, mit einem schwachen Schimmer noch gerade über deren Mündung hinausreichend. In der Randzelle bleibt ein schmales Segment unterhalb des Zusammenhanges der Binden 8 und 4 glashell. Die Flügeladern sind sonst gelblich, innerhalb der Binden aber schwarz und diese Färbung hat insbesondere auch ihrer ganzen Länge nach r_1 und, als feinerer Strich, r_{4+5}. Die wesentlichen Angaben über den Aderverlauf sind bereits in der Gattungskennzeichnung gemacht, die l. Hinterrandzelle ist, durch erhebliche Schwingung der Media soweit verengt, daß sie an der Flügelspitze nicht einmal halb so breit ist, wie an der breitesten Stelle, etwas spitzenwärts von der 3. Querbinde. Spitzenwärts von der kleinen Querader ist die Media etwas vorwärts geschwungen, was die Discoidalzelle hier noch etwas mehr verbreitert, als nur durch die Schwingung des Cubitus dem Hinterrande zu zustande kommt. Die hintere Querader ist leicht S-förmig gebogen.—Schwinger mit schwarzbraunem Knopf und hellerem Stiel.—Hinterleib einfarbig schwärzlich grünblau mit leichter gelblichweißer Bereifung. Legebohrer mit trapezförmigem Grundglied, spitz zulaufend."

Remarks. Despite the syntypes of this species are lost during the World War II, its description is sufficiently complete and illustrated to distinguish it from the two similar species, *U. amnoni* **sp. nov.** and *U. laetitiae* **sp. nov.** as in the key to species. It is originated from Santa Catarina, a region of Brazil, zoogeographically different from the sub-Amazonian lowland territories of Peru and Bolivia, so their differences in wing shape and pattern are believed to be taxonomically valuable to consider them distinct species rather than intraspecific morphs or subspecies.

Ulivellia laetitiae Smit sp. nov.

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Figs 2 E, F, 4 C, 53–54

Material examined. Type. Holotype ♀: "**Peru**: Madre de Dios, Rio Tambopata /Sachavacayoc lodge / 12°51'S, 69°22'W / 29 October 2008 leg. J.T. Smit" "RMNH.INS.555078 [including QR-code]", "on bamboo *Guadua weberbaueri*" (RMNH). The holotype is in good condition.

Paratypes: 1♀, **Peru**: Madre de Dios, Manu, Pantiacolla lodge, 12°39'23"S, 71°13'52"W, 350 m., on bamboo *Guadua weberbaueri*, 22 May 2008, leg. J.T. Smit, RMNH.INS.555079; 10♂, 9♀, Madre de Dios, Rio Tambopata, Sachavacayoc centre, Bridge Condonado Trail, 12°51'25.7"S, 69°22'23.1"W, 184 m., on bamboo *Guadua weberbaueri*, 5–9 June 2010, leg. J.T. Smit; 1♂, 1♀, Madre de Dios, Rio Tambopata, Sachavacayoc centre, Chacra other side of Quebrada, 12°50'59.9"S, 69°22'08.3"W, 182 m., on bamboo *Guadua weberbaueri*, 14–20 October 2010, Malaise trap, leg. J.T. Smit; 2♂, 1♀, Madre de Dios, Rio Tambopata, Sachavacayoc centre, Main Trail, 12°51'46.4''S, 69°21'46.6''W, 22 November 2010, on bamboo *Guadua weberbaueri*, leg. J.T. Smit; 2♀, Madre de Dios, Rio Tambopata, Sachavacayoc centre, old Chacra, S 12°51'15.5" W 69°21'56.6" 200 m., 20–29 November 2010, Malaise trap, leg. J.T. Smit (RMNH).

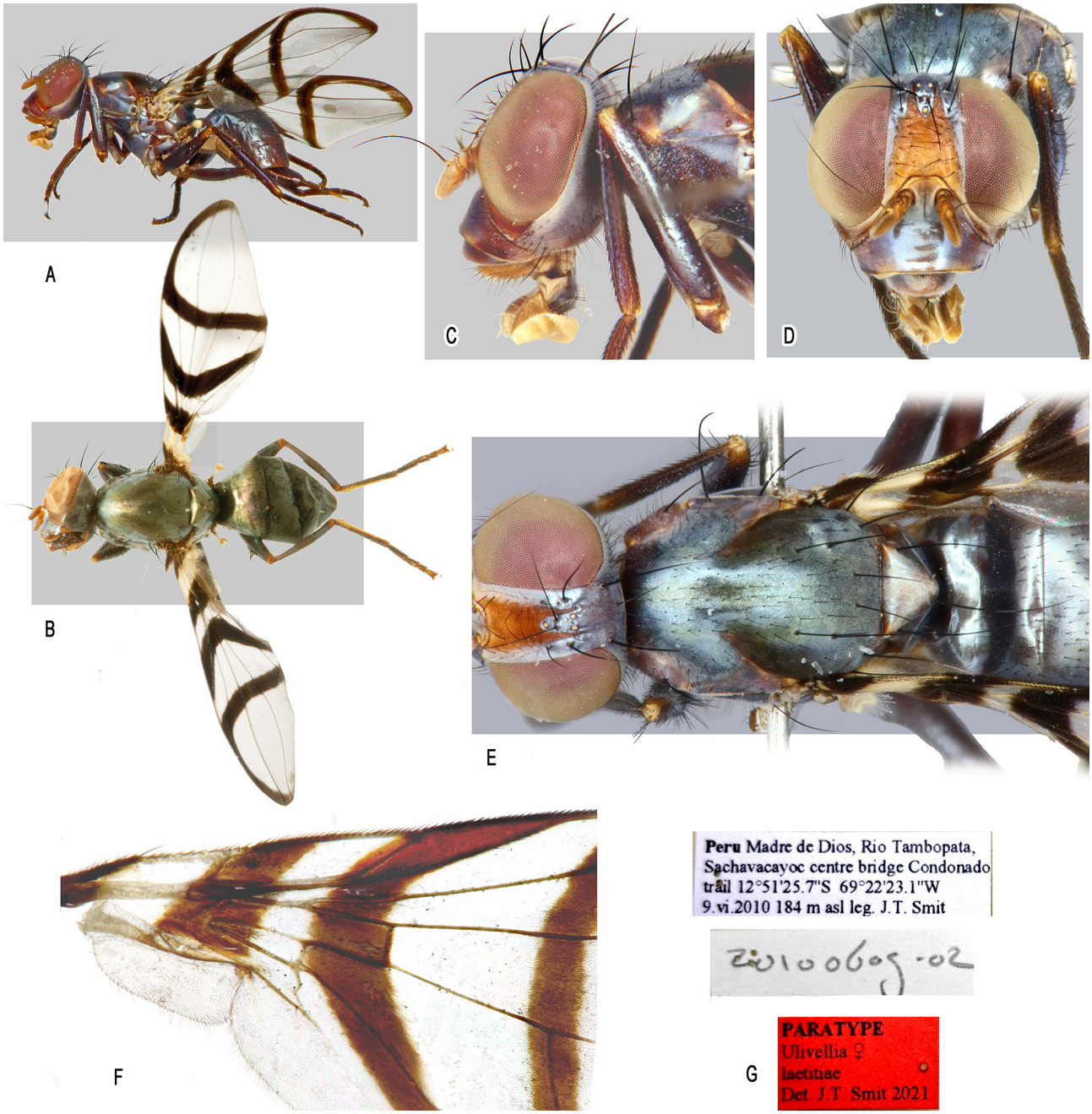

FIGURE 53. *Ulivellia laetitiae* **sp. nov.** holotype ♀ (**A**, **C**–**E**) and paratype ♂ (**B**, **F**, **G**). **A**, habitus, left; **B**, same, dorsal; **C**, head, mesonotum and fore leg, lateral; **D**, head, anterior; **E**, mesonotum, dorsal; **F**, wing, anterobasal part; **G**, labels. (**A**—photograph by John T. Smit)

Diagnosis. *Ulivellia laetitiae* differs from all the other species of the genus in that the subbasal band does not continue on the alula, the discal band is more arched than in *U. inversa* and crossvein dm-m is basally bent in the apical fourth (Figs 4 C, 53 A, B, F).

Description. Female. Head (Figs 53 E, F) ratio (length : height : width) 1 : 1.4 : 1.5, mostly black, except lower half of frons, gena and parafacial brownish brown. Frons 0.7× longer than wide (measured from ptilinale fissure to fore ocellus), orange brown with black ocellar triangle and vertical plates; orbits silver-white microtrichose, brown. Parafacial narrow, 0.2–0.3× broader than postpedicel, slightly white microtrichose. Frontal setulae relatively short, black, inclinate and partly proclinate, forming two irregular rows of 3–6 setulae on each side, all more than ⅓ and up to ½ the length of ocellar setae; 2 orbital setae, posterior longer than anterior, about 0.5–0.6× longer than inner vertical seta and 3–4× longer than outer vertical seta; postocellar 0.3× longer than inner vertical setae; outer vertical

seta short, 0.2–0.25× longer than inner vertical seta and barely distinguishable from postoculair setae forming one row allied by 9–12 dorsal and 10–15 ventral occipital setae. Lunule very narrow, indisctinct, orange-yellow. Eye 1.6× higher than long. Face (above suture) as high as wide at transverse fold, brown, obscured ventrally, densely white microtrichose; epistome brown to black, sparsely white microtrichose, metallic shiny, often with greenish or cyan shine, strongly produced anteriorly and separated from upper part of face by deep suture. Clypeus brown to black, sparsely white microtrichose, metallic shining, often with cyan sheen, 0.3–0.4× higher than epistome. Gena brownish yellow, with long genal seta and 3–4 additional setae anterior of it, 0.5–0.8× longer than genal seta. Occiput black, except postgena brown, with silvery to cyan metallic sheen, moderately densely covered with white microtrichia partly hiding underlying cuticle; ventral part of occiput (postgena) with 4–5 setae almost as long as genal seta. Antenna brownish yellow; scape and pedicel with black setulae; postpedicel brown, blackish antero-dorsally, whitish microtrichose, 1.9× longer than wide, narrowed in apical half and rounded; arista black except yellow at base, almost bare. Mouthparts black, prementum black, shiny. Palp yellowish-brown, with black setulae, ventrally and subapically with setulae 2–3 times longer.

Thorax (Fig. 53 F) black, metallically shiny with yellowish-green or cyan sheen and sparse yellow microtrichia not obscuring underlying cuticle. Mesonotal scutum 1.4× longer than wide; with 3 almost inconspicuous yellowish-green vittae in otherwise silvery cyan sheen in the presutural area, postsutural area with yellowish-green shine, black setulose, with 8–10 rows of setulae between dorsocentral setulae; 1 pair of acrostichal setae; prescutellar area without setulae. Scutellum dorsally flattened, posteriorly black or brownish, finely shagreened, sparsely microtrichose, without setulae. Subscutellum subshining, black with yellowish -green metallic sheen. Mediotergite shining black with metallic yellowish-green sheen, sparsely microtrichose. Set of setae normal for the genus. All the setae and setulae black. Anepisternum apicoventrally with yellowish-green sheen, as well as anepimeron ventrally and katepisternum nearly entirely, pleurae otherwise with metallic silvery cyan sheen.

Wing (Figs 4 C, 53 F) 5.8–6.6 mm (♂) 6.2–6.8 mm (♀) long: 2.3–2.5× longer than wide, basicostal cell hyaline; costal cell long, 4.8× longer than wide, brown in basal third, with costa almost straight, forming neither lobe nor cleft; pterostigma entirely brown, narrow triangular, 5.1× longer than wide, vein R_1 setulose dorsally at pterostigma level, ending at level of crossvein dm-m; vein R_{2+3} at apex bent anteriorly and then subparallel to costa, turning towards it before very apex; vein R_{4+5} arcuate, first upward from crossvein r-m and downward distally, terminating just shortof wing apex; vein M_{1+2} similarly curved but in opposite direction, terminating well beyond wing apex; crossvein r-m at basal ¼ of cell dm; crossvein dm-m bent basally in the apical fourth. Cell r_{4+5} 4.5–5.5× longer than wide, broadest just beyond the middle and narrowed apically; Cell m1 narrowly triangular; ultimate section of M_1 2.4×. as long as crossvein dm-m and 1.9× longer than penultimate section. Vein CuA slightly convex in upper part, cell cua with short posteroapical lobe along vein CuP. Wing pattern similar to *U. inversa* and *U. amnoni*, subbasal band broader and more or less oblique, not continued on alula, discal band strongly arched, stronger than in *U. inversa* and *U. amnoni*, broader at cell br and clearly narrowed at posterior end, preapical band slightly less arched than in *U. inversa*. Calypters white, with white ciliae. Halter creamy with yellow knob.

Legs (Figs 53 A–C) all entirely black bluish cyan sheen, femora partially with yellowish-green metallic sheen, except coxae ventrally and trochanters entirely yellow-brown and knees narrowly brown, all sparse with microtrichia except for coxae of prolegs. Mid tibia ventrally with one spur-like seta 3× longer than tibia width.

Abdomen (Figs 53 A–B) entirely black, tergites very finely shagreened and sparsely microtrichose, with metallic yellowish-green metallic sheen, less shiny than pleurae; setulae and setae black.

Male postabdomen. Sternite 8 setulose, with 2 longer setae. Cerci short oval, setulose (Figs 54 A–D). Epandrium ovoid, dorsally short, moderately setulose. Surstyli basally wide, inner surstylus with 10–11 prensisetae, outer surstylus simple with narrow, elongated, mesally directed ventral lobe apically bearing dorsally directed pimple-like process, but without distinct antero-ventral and postero-ventral lobes; inner surstylus with 12–15 thickened prensisetae (Fig. 54 D). Pregonites symmetrical, with 8–9 setulae ventro-mesally, conspicuously anterior of postgonites. Postgonites on laterobasal part of the phallic guide lobes, with 4–6 small trichoid sensilla. Phallus moderately short and narrow, about 3–4 times as long as epandrium high, almost bare, in rest coiled at right side of abdomen (Fig. 54 B). Ejaculatory apodeme short, bar-like, with relatively small sperm pump (Figs 52 D, 56 B).

Etymology. This species is named in honor of Laetitia Martina, the author's girlfriend and mother of his children. The specific epithet should be treated as a noun in the genitive case.

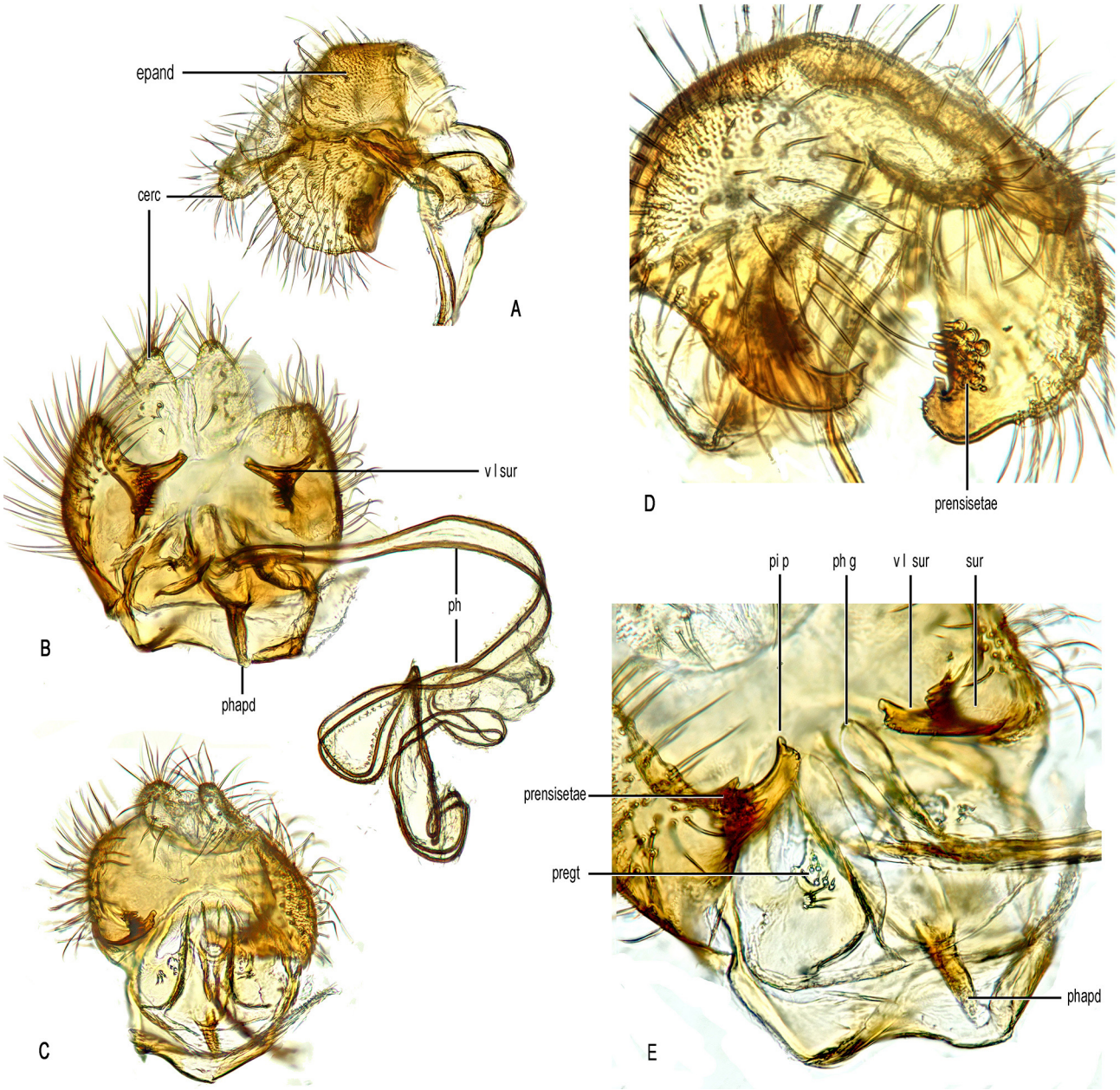

FIGURE 54. *Ulivellia laetitiae* **sp. nov.** paratype ♂ (SIZK) **A**, postabdomen, lateral; **B**, same, anteroventral; **C**, same, ventral; **D**, epandrium, with cerci and surstyli, posterolateral; **E**, surstyli and hypandrium, ventral. Abbreviations: cerc—cerci; epand—epandrium; ph g—phallic guide; ph—phallus; phapd—phallapodeme; pi p—pimple-like process; pregt—pregonite; sur—surstylus; v l sur—ventral lobe of surstylus.

Biology. All specimens were collected and many additional specimens were observed on mature stems of the bamboo *Guadua weberbaueri*, in contrast to many other species that were specifically attracted to freshly cut young shoots of the same bamboo species. This species appears to develop in the internodes of damaged mature stems of *G. weberbaueri*.

Ulivellia pseudinsolita **Kameneva & V. Korneyev sp. nov.**
urn:lsid:zoobank.org:act:F2BE9A18-8FAA-4FB2-9D3C-37489BFC0066
Figs 4 G, 55–56

Material examined. Type. Holotype ♂: **Brazil**: "Corupa [Corupá], S. Cath.[Santa Catarina] / (Hansa Humbolt) / II 1945", "A. Maler, Coll. / Frank Johnson / Donor" (abdomen dissected and attached in a plastic tube with glycerin under specimen) (AMNH).

Diagnosis. *Ulivellia pseudinsolita* differs from other species of the genus *Ulivellia* in having a wing pattern with oblique discal crossband, prescutellar acrostichal setae present, halter and legs entirely black; it most closely resembles *U. tenoris* in having wing pattern with four narrow brown crossbands, of which discal and preapical are oblique and clearly diverging posteriorly, differing from it by the wider wing and the hyaline interspace between discal and preapical crossbands narrower, colouration of legs and halters and presence / absence of acrostichal setae (see the key). Both species have a wing pattern similar to that of *Euxesta insolita* Hendel 1909 (Fig. 4 I), clearly differing by the at least partly hyaline or yellow wing base (in *E. insolita* completely black); as well as by the almost twice larger size (in *E. insolita* wing length = 3.0–3.5 mm), and the epistome / clypeus sizes.

Description. Male. Head (Figs 55 C–D) ratio (length : height : width) = 1 : 1.4 : 1.7, frons, parafacial, and gena yellowish brown, face and occiput black. Frons shiny brown, narrowed posteriorly (Fig. 55 C), 1.2× as long (from the lunule to inner vertical seta) as wide at lunule and 1.5× longer than wide at vertex or 0.85× as long (from the lunule to anterior ocellus) as wide at lunule and 1.1× longer than wide at vertex, with metallic shining, brown or black ocellar triangle and vertical plates; orbits, vertex, gena and occiput silver-white microtrichose; parafacial narrow, 0.3× broader than postpedicel, sparsely white microtrichose. Frontal plates with 6–8 proclinate parafrontal setulae and 6–7 moderately strong, frontal setae and the frontal vitta with 3 interfrontal setae on each side, anteriormost crossing, longer than other setulae and half as long as outer vertical seta; 1 very long orbital seta 1.2× longer than ocellar seta, 0.8× longer than inner vertical seta and twice as long as outer vertical seta and 1 reclinate anterior orbital seta as long as longest frontal setae; postocellar seta long, 0.7× longer than inner vertical seta; outer vertical seta short, 0.4× longer than inner vertical seta and twice as long as postocular setae forming one row, allied by 15–20 dorsal and 18–25 ventral occipital setae. Lunule indistinguishable. Eye 1.6× higher than long. Face above transverse fold 0.6× higher than wide at fold, brown, white microtrichose; epistome entirely black or dark brown, sparsely white microtrichose, with metallic cyan sheen, strongly produced anteriorly. Clypeus shiny brown, sparsely white microtrichose, 0.3× higher than epistome. Gena brownish yellow, with long genal seta and 4–5 peristomal setae anterior of it, 0.4–0.5× longer than genal seta. Occiput black, except postgena partly brown, with cyan metallic sheen, greyish microtrichose; ventral part of occiput (postgena) with 5–7 setae almost as long as genal seta.

Antenna brown; scape and pedicel with black setulae; postpedicel brown, whitish microtrichose, twice as long as wide, apically rounded; arista black to brown at base, almost bare. Mouthparts black, prementum black, with steel sheen. Palp brown, moderately wide crescent, apically rounded, with 9–12 long black setulae, of them medial setulae longer than others.

Thorax (Fig. 55 E) brown to black, with bluish sheen and sparse white microtrichia not obscuring underlying cuticle. Mesonotal scutum 1.1×as long as wide; with brown microtrichia posterolateral to transverse suture, black setulose, with 12–16 rows of setulae between rows of dorsocentral setulae; acrostichal prescutellar setae present; prescutellar area setulose behind anterior dorsocentral setae to acrostichal seta. Scutellum dorsally very slightly convex, black, almost matt, sparsely microtrichose, without setulae, laterally with bluish sheen. Subscutellum and mediotergite black, grey microtrichose. Other setae as described for the genus. All the setae and setulae black.

Wing (Figs 4 G, 55 A, B, F) 5.5 mm (♂) long, 3× longer than wide; basicostal cell hyaline or yellowish; costal cell 5× longer than wide, slightly widened apically, brown in basal half, with costa very slightly curved posteriorly, but forming neither lobe nor cleft before apex of vein Sc; pterostigma entirely brown, narrow triangular, 4.4× longer than wide, vein R_1 with 15–17 setulae dorsal to Sc apex, terminating at level of crossvein dm-m; vein R_{2+3} weakly arcuate, subparallel to costa, turning towards it before very apex. Crossvein r-m distal to center of cell dm. Cell r_{4+5} 5.8× longer than wide, widened distally of crossvein dm-m, narrowed apically. Cell m_1 narrowly triangular; the ultimate section of M_1 3.7× longer than crossvein dm-m and 2.8× longer than penultimate section, markedly deepened posteriorly at middle. Vein CuA Z-shaped, forming moderately long posteroapical lobe of cell cua along vein CuP, 1.3× longer than its anterior shoulder. Wing pattern with subbasal crossband from basal half of costal cell through cell cua into alula, wide oblique brown discal crossband from pterostigma to base of cell m_4 except its very base and apex; narrow and oblique preapical crossband from cell r_1 through crossvein dm-m merging with apical crossband in cell r_1 reaching apex of cell m_1; hyaline interspace between discal and preapical crossband 1.3–1.6 as wide as discal crossband in cell dm (Fig. 4 G, 55 A). Cell cup and anal lobe pale grey, narrower than cell cua. Alula 3× longer than wide, grey in apical 0.5–0.6. Calypters white, with white cilia. Halter dark brown to black.

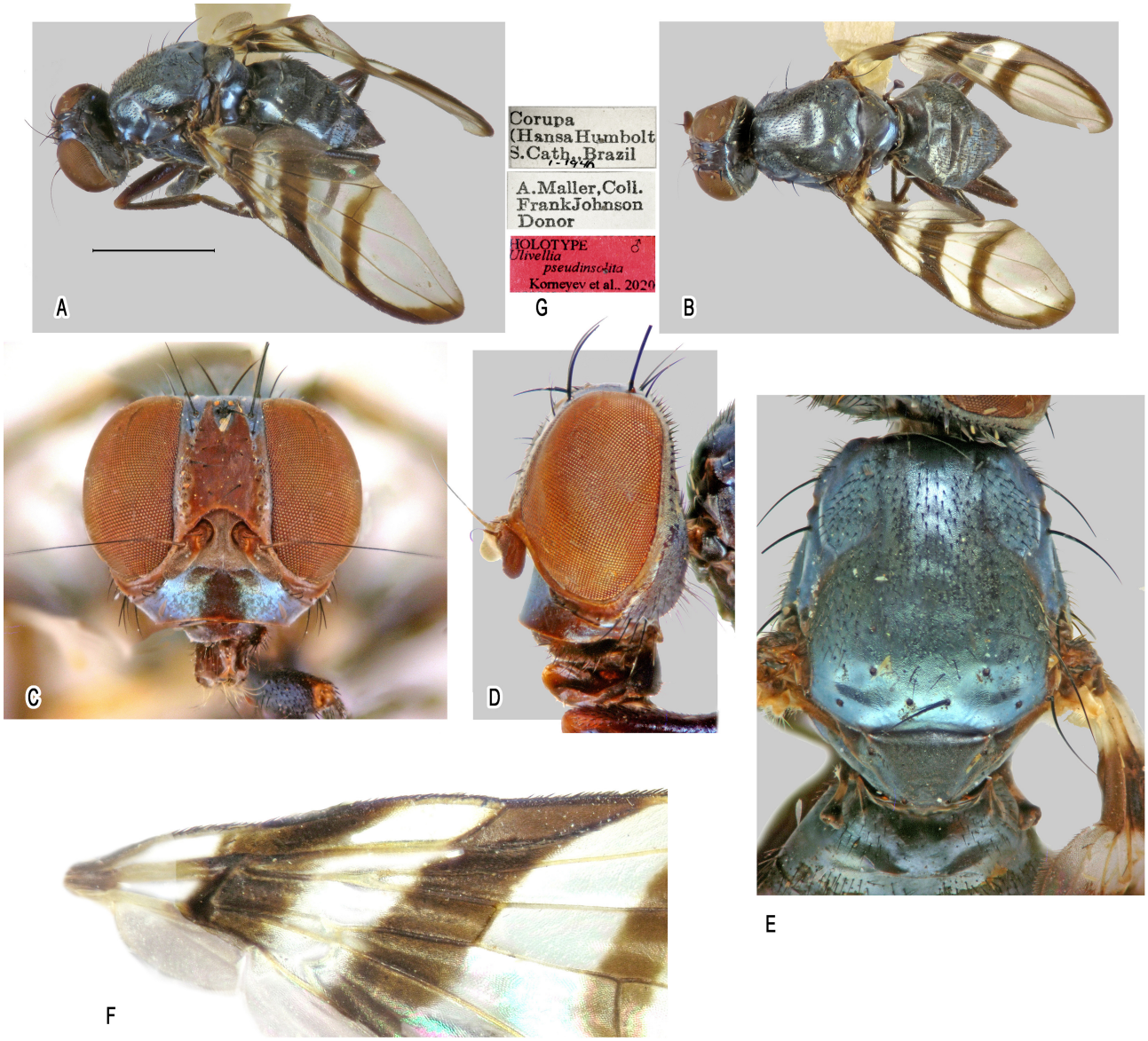

FIGURE 55. *Ulivellia pseudinsolita* **sp. nov.** holotype ♂. **A**, habitus, left and dorsal; **B**, same, dorsal; **C**, head, anterior; **D**, same, left; **E**, mesonotum, dorsal; **F**, wing, anterobasal part; **G**, labels. Scale bar 2 mm.

Legs (Fig. 55 A) with yellow or brownish yellow coxae and trochanters, femora and tibiae entirely black, except coxae and knees narrowly brown, with bluish sheen; tarsi entirely brownish yellow, black setose and setulose. Fore femur with 2 rows of posterodorsal and posterior setae slightly shorter than femur width, and 4–5 strong posteroventral setae in apical half. Mid femur anteriorly with row of short suberect setulae; mid tibia with one strong medioventral seta 2.1× longer than tibia width.

Abdomen moderately elongate (Figs 55 A, B, 56 F), black, sparsely whitish microtrichose, with cyan metallic sheen. Tergite 5 not microtrichose, somewhat shagreened, dull.

Cerci wide oval, moderately developed, partly fused at bases elongate, sack-like; setulose (Figs 56 A–D). Epandrium ovoid, dorsally short, moderately setulose; surstyli basally wide, outer surstylus flattened, posteroventrally directed, apically oval with single trichoid sensillum; inner surstylus with four very strong claw-like mesally directed prensisetae (Figs 56 A, C, D). Pregonites symmetrical, almost flat, with 5 moderately developed setulae ventromesally, conspicuously anterior to postgonites (Figs 56 C, E). Postgonites on laterobasal part of the phallic guide lobes, with 4–5 small trichoid sensilla (Figs 56 C, E). Phallus moderately short and narrow, about 2.5–3× longer than epandrium high, thin and bare (Figs 56 A–E).

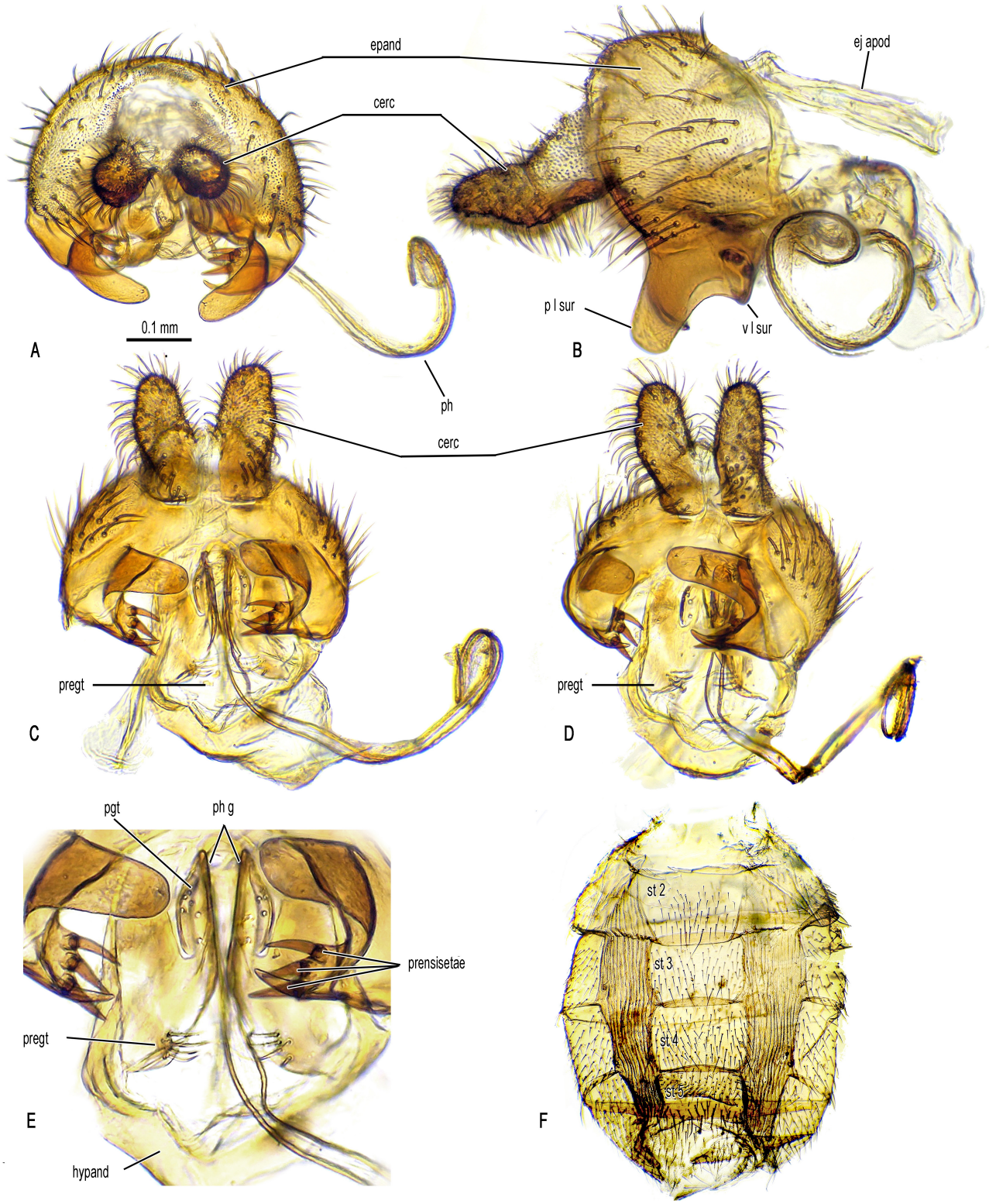

FIGURE 56. *Ulivellia pseudinsolita* **sp. nov.** holotype ♂. **A**, postabdomen, posterior; **B C**, same, ventral; **D**, same, ventrolateral; **E**, surstyli and hypandrium, ventral; **F**, preabdomen, ventral. Abbreviations: cerc—cerci; ej apod—ejaculatory apodeme; epand—epandrium; ph g—phallic guide; ph—phallus; pregt—pregonite; p l sur—posterior lobe of surstylus; v l sur—ventral lobe of surstylus; st 2— second sternite; st 3—third sternite; st 4—fourth sternite; st 5—fifth sternite.

Female unknown.

Etymology. The species name is an adjective and is composed of the Greek "pseud-" ("false") and the species name "insolita", reflecting the superficial similarity of the wing pattern to *Euxesta insolita* Hendel, 1909.

***Ulivellia tenoris* Kovac & Kameneva sp. nov.**

urn:lsid:zoobank.org:act:99D46D24-8AA7-4683-AFF4-0F7D4A2A55E0

Figs 4 F, 7 D, 8, 9 C, H, 57, 59–60.

Material examined. Type. Holotype ♀: "**Bolivia**: Santa Cruz, near Buena Vista (El Cairo) [17.4734S, 63.6922W], larva in bamboo internodium (*Guadua chacoensis*, last year), emerged on 05.ii.2011, Bol Z15/4/11, leg. D. Kovac" (SMF).

Larvae. Bolivia: Buena Vista, 6.ii.2011, BolZ32/11, 5 larvae (D. Kovac leg.) (SMF).

Diagnosis. *Ulivellia tenoris* differs from other species of the genus in the combination of non-lobed costal cell, the presence of prescutellar acrostichal setae, a completely black halter and legs; it is most similar to *U. pseudinsolita* in having a wing pattern with four narrow brown crossbands, of which the discal and preapical are oblique and clearly diverging posteriorly, and differs from it in having a narrower wing and a wider hyaline interspace between discal and preapical crossbands, in the partly yellow colouration of legs and halter, and in the absence of the acrostichal setae (see the key). Both species have the wing pattern similar to that of *Euxesta insolita*, clearly differing by the at least partly hyaline or yellow wing base (in *E. insolita* entirely black); as well as by the almost twice larger size (in *E. insolita* wing length =3.0–3.5 mm).

Description. Female. **Head** (Figs 57 C–D) ratio (length : height : width) = 1 : 1.3 : 1.7, frons, vertex, parafacial, and gena brownish yellowish brown, face and occiput mostly brown. Frons subshining yellowish-brown, narrowed posteriorly (Fig. 57 C), 1.17× as long (from the lunule to inner vertical seta) as wide at lunule and 1.4× longer than wide at vertex or 0.9 × as long (from the lunule to anterior ocellus) as wide at lunule and as long as wide at vertex; with metallic shining, brown ocellar triangle and vertical plates; orbits, vertex, gena and occiput silver-white microtrichose; parafacial narrow, 0.2× broader than postpedicel, sparsely white microtrichose. Frontal plates with 8–10 proclinate parafrontal setulae and 8–9 frontal setae, forming 1–3 irregular rows; frontal vitta with 6–7 interfrontal setae at each side, anteriormost submedial setulae crossing, longer than other setulae and half as long as outer vertical seta; 1 reclinate anterior orbital setula (as long as longest frontal setae) and 1 very long posterior orbital seta as long as ocellar seta, 0.56× longer than inner vertical seta and 1.5× longer than outer vertical seta; postocellar seta long, 0.56× longer than inner vertical seta; outer vertical seta short, 0.4× longer than inner vertical seta and twice as long as postocular setae forming one row, allied by 8–10 dorsal and 10–12 ventral occipital setae. Lunule narrow, indistinct, orange. Eye 1.5× higher than long. Face (above suture) 0.65× higher than wide at transverse fold, yellowish brown, white microtrichose; epistome dark brown, sparsely white microtrichose, with metallic cyan sheen, strongly produced anteriorly and separated from upper part of face by deep fold. Clypeus shiny brown, sparsely white microtrichose, 0.5× higher than epistome. Gena brownish yellow, with moderately long genal seta and 4–5 peristomal setae anterior of it, 0.4–0.5× longer than genal seta. Occiput brown, medially yellow, with cyan metallic sheen, greyish microtrichose; ventral part of occiput (postgena) with 8–10 setae as long as genal seta.

Antenna brownish yellow; scape and pedicel with black setulae; postpedicel brown, whitish microtrichose, twice as long as wide, apically rounded; arista brown, almost bare. Mouthparts brown, prementum dark brown, with steel sheen. Palp brown, moderately wide crescent, apically rounded, with 7–8 long black setulae, of which 3–4 apico-medial ones longer than other setulae.

Thorax (Fig. 57 E) brown to black, with greenish sheen and sparse white microtrichia not obscuring underlying cuticle. Mesonotal scutum 1.2× longer than wide; with brown microtrichia posterolateral to transverse suture, black setulose, with 10–12 rows of setulae between rows of dorsocentral setulae; acrostichal prescutellar setae absent; prescutellar area setulose to posterior dorsocentral seta. Scutellum dorsally very slightly convex, brown, subshining, sparsely microtrichose, without setulae, laterally yellow, with greenish sheen. Subscutellum and mediotergite black, grey microtrichose. Other setae as described for the genus. All the setae and setulae black.

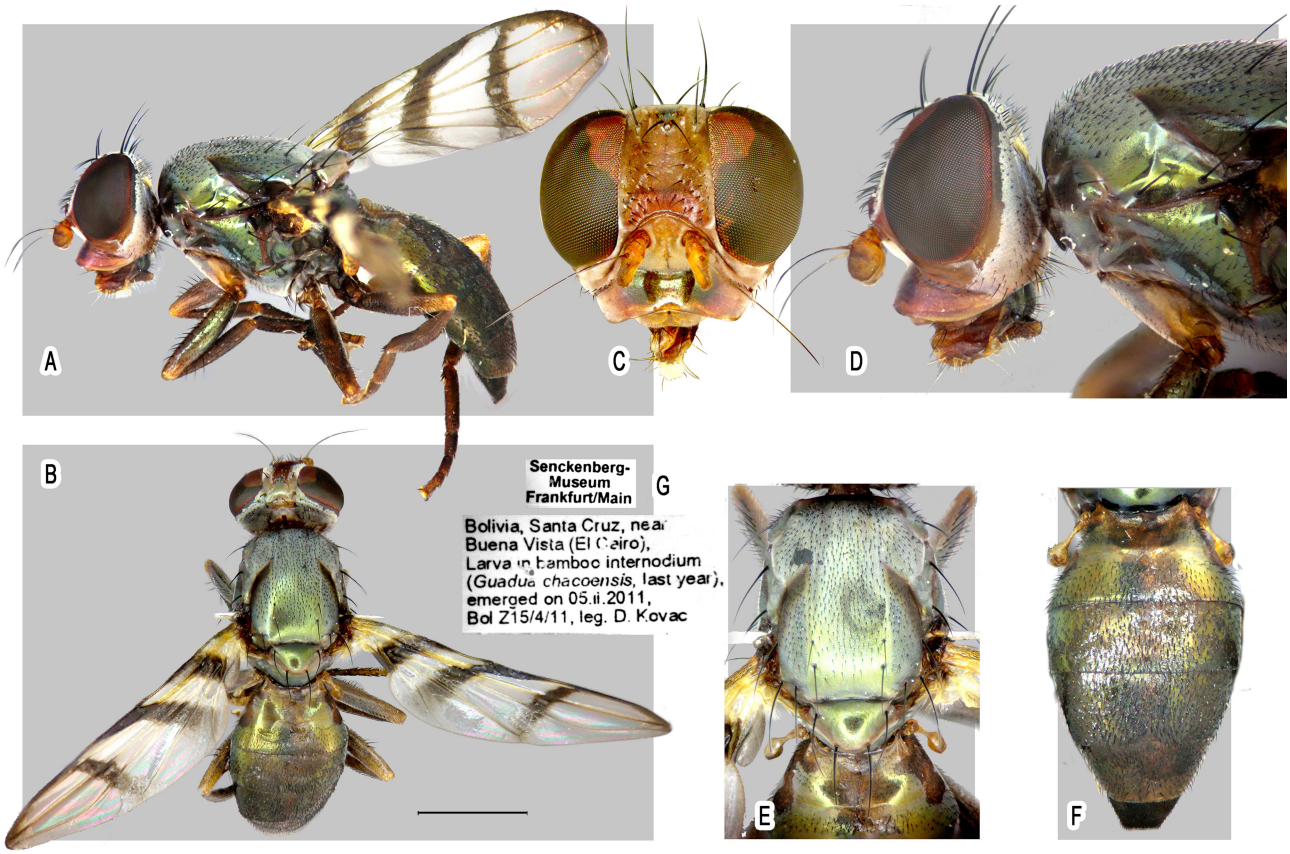

FIGURE 57. *Ulivellia tenoris* **sp. nov.** holotype ♀. **A**, habitus, left; **B**, same, dorsal; **C**, head, anterior; **D**, same, left; **E**, mesonotum, dorsal; **F**, abdomen, dorsal; **G**, labels. Scale bar 2 mm.

Wing (Fig. 4 F) 6.4 mm (♀) long, 3.2× longer than wide; basicostal cell yellowish; costal cell 7× longer than wide, brown in basal half, with costa almost straight, forming neither lobe nor cleft; pterostigma entirely brown, narrow triangular, 6× longer than wide, vein R_1 with 13–15 setulae dorsally after Sc apex, ending at level of crossvein dm-m; vein R_{2+3} weakly arcuate, subparallel to costa, turning towards it before very apex. Crossvein r-m distal to middle of cell dm. Cell r_{4+5} 7× longer than wide, widened distal to crossvein dm-m, narrowed apically. Cell m_1 narrowly triangular; the ultimate section of M_1 4.8× longer than crossvein dm-m and 1.9× longer than penultimate section, conspicuously deepening posteriorly. Vein CuA Z-shaped, forming moderately long posteroapical lobe of cell cua along vein CuP, 1.2× longer than its anterior shoulder. Wing pattern with subbasal crossband from basal half of costal cell through cell cua into alula, wide oblique brown discal crossband from pterostigma to base of cell m_4 except its very base and apex; narrow and oblique preapical crossband from cell r_1 through crossvein dm-m merging with apical crossband in cell r_1 to apex of cell m1; hyaline space between discal and preapical crossband 2.7–2.8 times as wide as discal crossband in cell dm (Fig 4 F, 57 A). Cell cup and anal lobe grey in apical half, narrower than cell cua. Alula 3× longer than wide, grey in apical 0.5–0.6. Calypters white, with white cilia. Halter brownish yellow.

Legs (Fig. 57 A) with yellow or brownish yellow coxae and trochanters, femora and tibiae entirely black, except knees narrowly brown, with bluish sheen; tarsi entirely brownish yellow, black setose and setulose. Fore femur with 2 rows of posterodorsal and posterior setae slightly shorter than femur width, and 4–5 strong posteroventral setae in apical half. Mid femur anteriorly with row of short suberect setulae; mid tibia ventrally with one subequal spur-like seta 2–2.1× longer than tibia width.

Abdomen moderately elongate (Fig. 57 F), black, sparsely whitish microtrichose, with greenish metallic sheen; syntergite 1+2 sometimes brown. Tergites 4–5 subequally long; tergite 6 of ♀ short, completely hidden beneath tergite 5.

Larva. General structure: As in *A. duo*, body length 7.6–12.7 mm (median: 9.45 mm; n = 10), width 2.5–2.9 mm (median: 2.65 mm; n = 10).

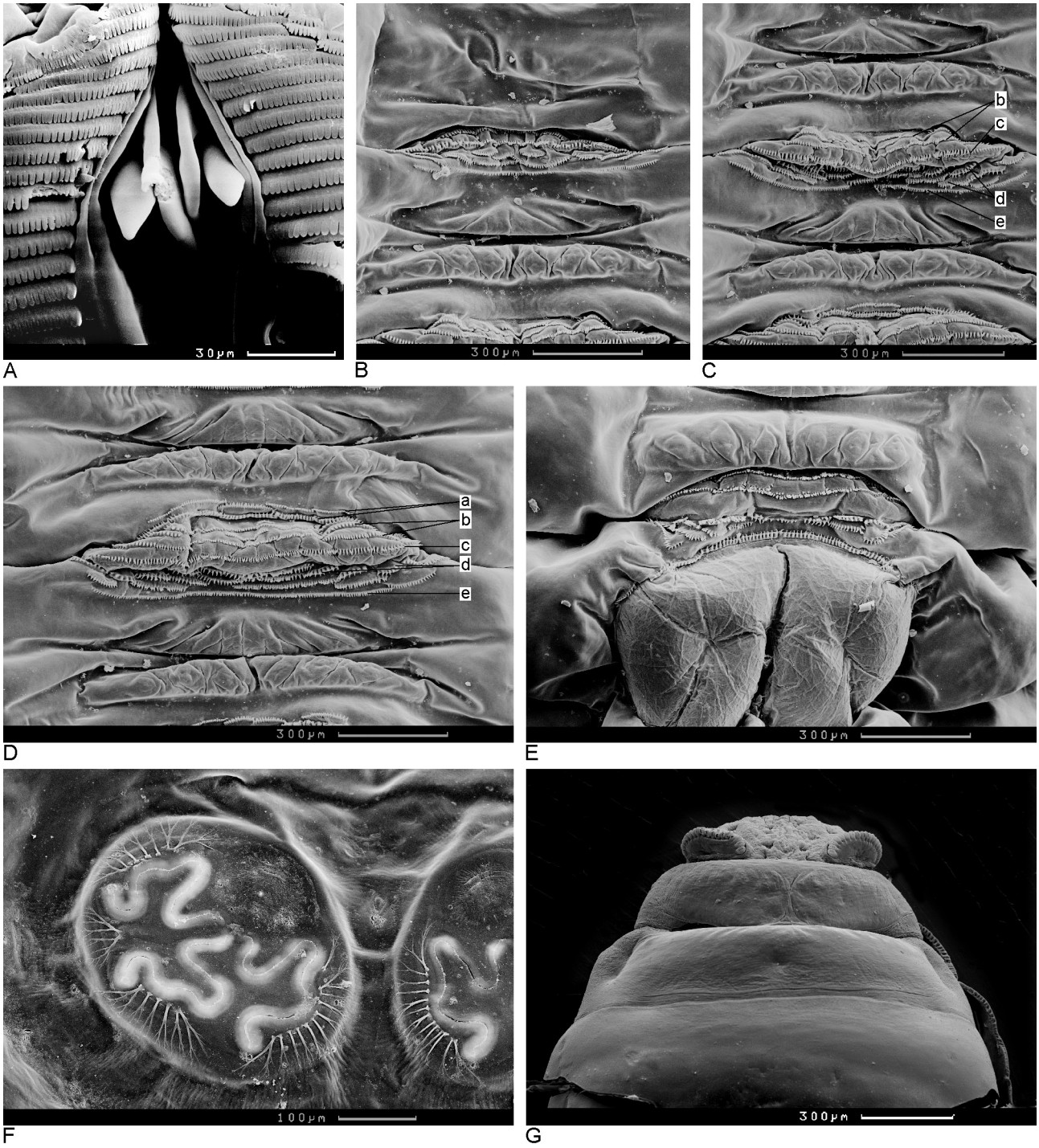

FIGURE 58. *Ulivellia arcuata* **sp. nov.**, SEM views of mouthooks and abdominal creeping welts (**CW**), posterior spiracle and puparium **A**, mouthhooks; **B**, CW1 on abdominal segment I, ventral view; **C**, CW2 on abdominal segment II, ventral view; **D**, CW4 on abdominal segment IV, ventral view; **E**, CW8 on abdominal (caudal) segment VIII, ventral view; **F**, left posterior spiracle; **G**, dorsal view of anterior portion of empty puparial integument. Abbreviations: a–e—creeping welt rows a-e. (All photographs by Damir Kovac.)

Pseudocephalon. As in *A.duo* (Figs 59 A–F). Second antennal segment retracted, not visible, 25 and 28 oral ridges adjacent to oral cavity, identical on both sides of the body (n = 2 larvae).

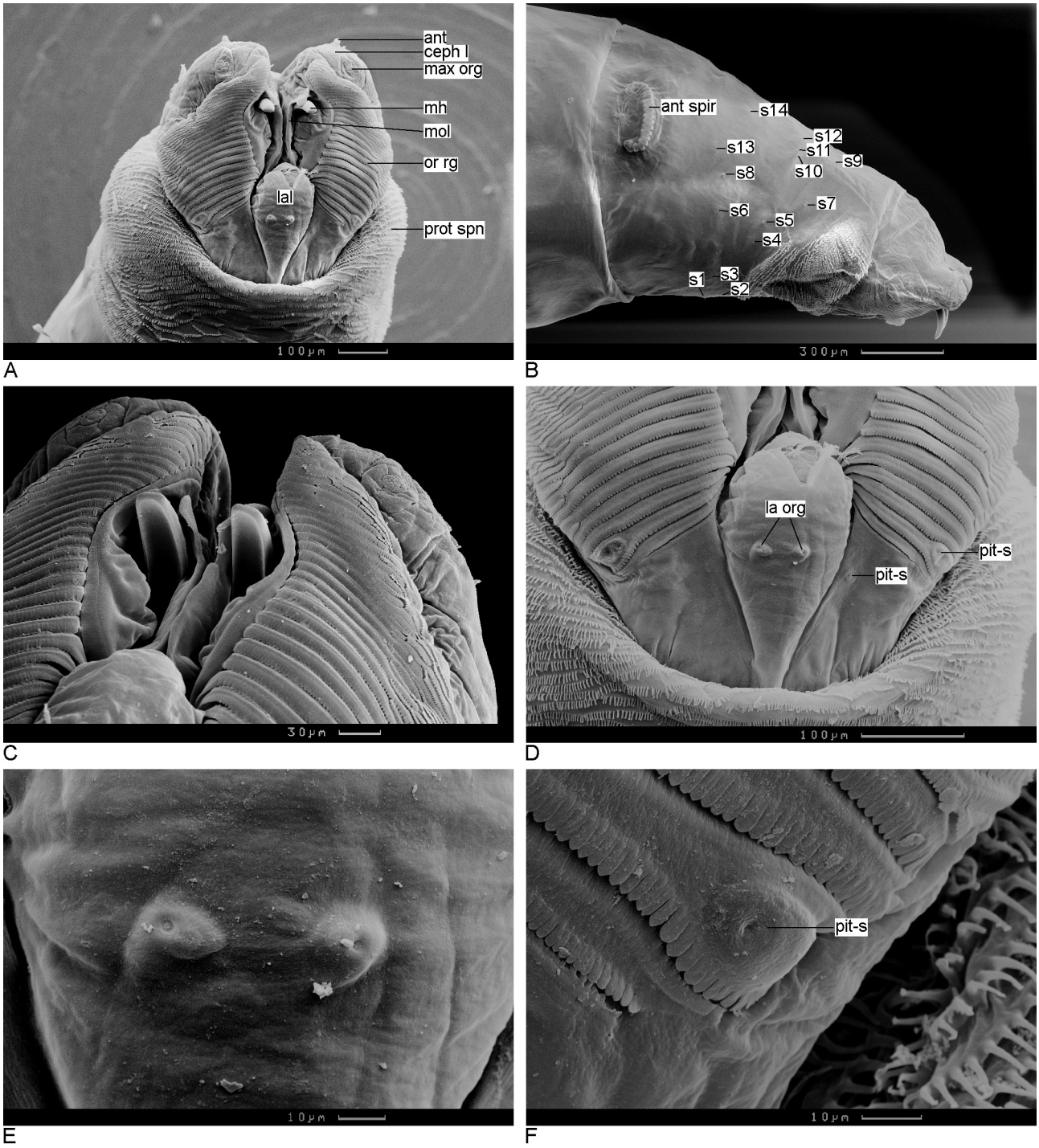

FIGURE 59. *Ulivellia tenoris* **sp. nov.**, SEM views of pseudocephalon. **A**, pseudocephalon, ventral view; **B**, thoracic segment I, lateral view; **C**, oral cavity with mouth hooks and oral ridges; **D**, labial lobe; **E**, sensory pits (labial organ) on labial lobe; **F**, pit-sensilla in left posterior corner of oral ridge area. Abbreviations: ant—antenna, ant spir—anterior spiracle, ceph l—cephalic lobe, lal—labial lobe, la org—labial organ, max org—maxillary organ, mh—mouthhook, mol—median oral lobe, or rg—oral ridges, pit-s—pit sensillum, s1–s14—cuticular sensilla s1–s14 on right side of the body, prot spn—prothoracic spinules. (All photographs by Damir Kovac.)

Cephalopharyngeal skeleton (Fig. 7 D). As in *Aspistomella duo*. Total length 1.6–1.7 mm (n = 3). Indentation between tips of apical tooth and ventral apodeme 0.59–0.68× as deep as wide; one specimen with one small, one specimen with very small, and one specimen without preapical tooth. Hypopharyngeal sclerite 3.6–5.2× longer than high. Parastomal bars curved.

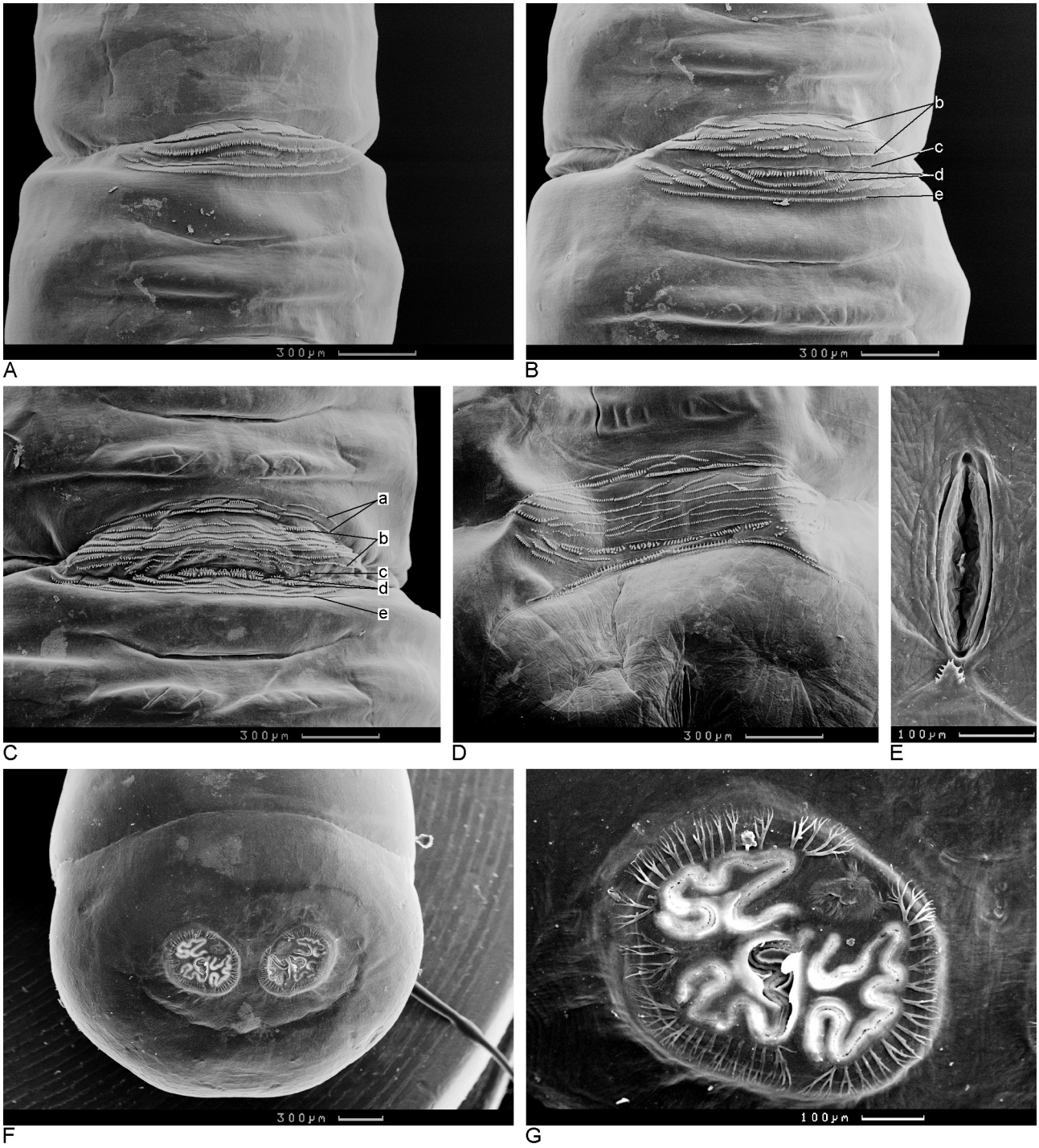

FIGURE 60. *Ulivellia tenoris* **sp. nov.**, SEM views of ventral abdominal creeping welts (**CW**) and caudal segment **A**, CW1 on abdominal segment I, ventral view; **B**, CW2 on abdominal segment II, ventral view; **C**, CW4 on abdominal segment IV, ventral view; **D**, CW8 on abdominal (caudal) segment VIII, ventral view; **E**, anal slit; **F**, posterior spiracles on caudal segment, dorsal view; **G**, left posterior spiracle. Abbreviations: a–e—creeping welt rows a–e. (All photographs by Damir Kovac.)

Thoracic segments I–III. As in *Aspistomella duo*. Anterior spiracles on thoracic segment I consist of 18–24 tubules (median = 21, n = 20 tubule rows, 10 larvae). The number of tubules on the left and right side of the same larva often differs by up to three tubules. The first thoracic segment bears 14 cuticular sensilla on each body side, the second and third thoracic segments bear 13 cuticular sensilla, type and location of sensilla are shown in Fig. 8).

Abdominal segments I–VII. Abdominal segments I–VII bear 13 cuticular sensilla on each side of the body and a pair of rudimentary lateral spiracles (Fig. 8). Ventrally, the creeping welts on abdominal segments I-VII arranged

as follows: CW1 (Fig. 60 A): Five more or less continuous rows of spinules, third row short, spinules in second row somewhat larger, all spinules acute and directed posteriorly. CW2 (Fig. 60 B): Anteriorly about 5 discontinuous rows of small spinules, row portions short and sometimes curved, forming a reticulate structure (rows b), central row discontinuous, more pronounced laterally (row c), followed by rows of large spinules (row d) arranged as follows five short horizontal central row portions containing groups of five to seven large spinules, laterally flanked by five inclined curved rows angled to the midline, more or less connected to rows of small spinules, last row continuous, consisting of small acute spinules (row e). All spinules directed posteriorly. CW3–CW7 (Fig. 60 C): similar to CW2, but two additional discontinuous rows anterior to the mesh-like structure, one of them with large and one with small spinules, all directed anteriorly (rows a); central row with groups of large spinules similar to CW2, but the five central horizontal row portions as well as 1–2 adjacent inclined row portions have a double row of spinules, the anterior ones directed anteriorly and the posterior ones directed posteriorly.

Caudal segment (Figs 60 D–G). Caudal segment bears 13 cuticular sensilla on each side of body (Figs 8 B, C). Caudal creeping welt CW8 similar in structure to CW3–CW7, but large spinules simpler, sometimes forming only one row; last row e arranged along anterior margin of perianal pad with anteriorly directed spinules (Fig. 60 D).

Posterior spiracles (Figs 9 C, 60 F, G) oval, length 0.59–0.69 mm (median = 0.6, n = 26), width 0.46–0.53 mm, (median = 0.50, n = 26), shortest distance between spiracles 0.09–0.15 mm (n = 15). There is a tendency for usually one of the two anterior spiracles to show a slight upward curvature. Spiracular slits with about 8–11 turns, central part of spiracular slits 1 and 3 rather flat with a small turn, spiracular slit 2 with large central loop, yellow meandering line of approximately constant width, central part between spiracular slits usually brownish, but in some specimens also black. Spiracular hairs Hair group 1: 13–16 hair trunks, Hair group 2: 1 hair trunk, Hair group 3: 9–10 hair trunks and Hair group 4: 14–16 hair trunks (n = 4 spiracles). Anal complex and anal slit as *in A. duo* (Figs 60 D, E).

Puparium (Fig. 9 H). Length 8.7 mm; maximum width at the 7th abdominal segment, 2.7 mm (n = 1); dark brown, anterior spiracles, posterior spiracles and creeping welts as in third instar larva.

Etymology. The species name is a Latin adjective meaning “thin” or “narrow”, referring to its wing shape.

Biology. Larvae inhabit water-filled bamboo internode cavities of *Guadua angustifolia*, biology as in *Aspistomella duo*.

Discussion

Adults

The morphology of adult ulidiids has also been poorly studied until recently. In the tribe Lipsanini, the male and female terminalia, which are of key importance for comparative morphological and phylogenetic analysis, have only been described and properly illustrated in a few species: *Acrosticta profunda* Hendel, 1909, *Euphara loculata* Hernández-Ortiz & Dzul-Cauich, 2021, *Euxesta atlantica* Ahlmark, 1995, *Euxesta pacifica* Steyskal, 1995, *Chaetopsis major* (Wulp, 1899) (Steyskal & Ahlmark 1995; Kameneva & Korneyev 2010; Hernández Ortiz & Dzul-Cauich 2021).

A recent comparative morphological analysis of the Lipsanini was carried out by the authors in parallel with this study (Kameneva & Korneyev, in press). This included a detailed study of the vestiture (microtrichia, setulae and setae) of the head, thorax, abdomen and legs, the shape of the abdominal tergites and sternites, the structure of the female ovipositor and the male postabdomen (including hypandrium, phallus, surstyli and cerci), providing numerous characters for a preliminary morphology-based phylogenetic analysis of the tribe.

The *Aspistomella* group of genera belongs to a larger generic complex, referred to here as the “*Amethysa* lineage”. Its monophyly is tentatively supported by two characters that have been neglected or overlooked in all previous studies and that were only discovered with the use of high-resolution microphotography. The frontal setulae are uniform and undifferentiated, scattered over the entire frons in all other Lipsanini, including those related to the type species of *Euxesta* and the sister group (Pterocallini) (as in Fig. 3 B). On the contrary, they are differentiated into tiny and very short parafrontal setulae along the orbits and strong setae forming a row of frontal setae (Fig. 3 A) mesal to them, and usually 1–5 pairs of interfrontal setae in all taxa assigned to the “*Amethysa* lineage”. In contrast to the Tephritidae, where the number and position of the frontal setae is constant, their number and position varied

in the "*Amethysa* lineage". Both characters do not occur elsewhere in the family Ulidiidae and are considered a synapomorphy of the taxa belonging to the "*Amethysa* lineage".

As far as is known, the species of the "*Amethysa* lineage" are associated with the stems or inflorescences of grasses: Poaceae or also some Typhaceae and Cyperaceae, whereas the other Lipsanini of known biology use decaying palms, cacti, rotting fruits and trees attacked by bark beetles and fungi, as the main substrate for larval feeding. This also outlines the "*Amethysa* lineage" as a biologically distinct and specialised part of the tribe.

Within this lineage, the *Aspistomella* group of genera is characterised by the combination of a high epistome with a low clypeus. In taxa outside the *Aspistomella* group, the epistome is always short / low and the clypeus is usually large and produced. This unique synapomorphy, together with the unmodified and non-specialised abdomen and ovipositor, clearly distinguishes it from the *Chaetopsis* group of genera, which are characterised by cylindrical abdomens with broad sternites and narrow pleura, and (in most genera except *Eumecosomyia*) a flattened, blade-like aculeus, which may be an adaptation for ovipositing directly into the leaf sheaths of grasses rather than into the holes made by caterpillars or beetles. The remaining taxa of the "*Amethysa* lineage" are diverse and do not appear to form larger monophyletic groups. In this paper, we refer to some species as "*Euxesta*" (in quotation marks), which were previously assigned to this genus, but actually belong to other genera in the "*Amethysa* lineage". Their taxonomy will be analysed elsewhere (Korneyev & Kameneva, in press).

More than half of the species described or redescribed in this paper, are known from females or damaged specimens. Only the new species described here in the genus *Ulivellia* seem to form a monophyletic clade supported by having an aberrant wing venation and the presence of thickened setulae on the mesal surface of the surstylus. Otherwise, the male genital characters are very diverse throughout the *Aspistomella* group usually showing more differences between species than similarities. We had to choose between creating new genera for groups of 1–3 species or combining them into one genus *Aspistomella*. Even the unique characters shared by the species originally described in *Aspistomella* and several new species, such as the shortened pterostigma and lobate costal cell, show a gradual, intermediate state and contradict the distribution of some genital characters. Perhaps the only reconciliation in this case was to keep the "old" genera *Polyteloptera* and *Ulivellia* in their generic status and to assign new species to *Ulivellia* and *Aspistomella* on the basis of their diagnostic characters, so that the latter genus provisionally includes the species lacking characters of the other two genera. A phylogenetic analysis based on both molecular and complete morphological data is needed for a more robust classification.

Larvae

The morphology and biology of ulidiid larvae are poorly known (overview Table 1). In the tribe Lipsanini only 12 out of 27 genera have known feeding habits. Species of *Acrosticta*, *Axiologina*, *Euacaina* and *Notogramma* developed in decaying fruit, palm tree or cactus tissue (Bohart & Gressit 1951; Steyskal 1963, 1973), *Pseudexesta prima* (Osten Sacken) in a human cadaver (Bohart & Gressit 1951), and species of the largest genus *Euxesta* (polyphyletic, according to Kameneva & Korneyev 2006 and in press) evolved in a wide range of decaying vegetation, cacti, fruit, cambium, dung, or were pests of maize (*Zea mays*) (reviewed by Ferrar 1987; Allen & Foote 1992; Goyal *et al.* 2012, 2017).

The remaining genera were mainly associated with grasses (Poaceae) or other monocots: *Chaetopsis* larvae developed in decaying monocot fruits, stems of salt marsh grasses (*Typha*, *Spartina*, *Carex*), sugar cane and maize (Allen & Foote 1992), *Eumecosomyia nubila* larvae in maize ears (Barbosa *et al.* 1986), *Zacompsia fulva* Coquillett larvae in aborted inflorescences of the vaseygrass, *Paspalum urvillei* (Genung & Weems 1974) and *Eumetopiella rufipes* (Macquart) larvae in inflorescences of barnyard-grass, *Echinochloa crusgalli* L. (Beauv.) (Valley *et al.* 1969).

Aspistomella and *Ulivellia* developed in large bamboo grasses and therefore fit well into the overall picture.

Larvae of *Aspistomella* and *Ulivellia* were secondary invaders of bamboo (Table 1). They only inhabited internodes perforated by Crambidae moth larvae and were absent from internodes with larger holes made by other animals (see "Biology" in the *Aspistomella duo* section). One explanation for this pattern could be that the internodes eaten by crambids were particularly suitable as a food source because they were less than a year old and therefore softer than older bamboos. In addition, the small entrance holes prevented access by large bamboo-inhabiting predators such as *Toxorhnychites* mosquito larvae or damselfly larvae, which DK observed in internodes with large holes, thus reducing the risk of capture.

Other Ulidiidae living in plant rot pockets belonging to *Eumecosomyia*, *Chaetopsis* and "*Euxesta*" (the latter in quotes because according to Kameneva & Korneyev (in prep.) they belong to *Amethysa*) were also known to be associated with primary invaders belonging to other insect groups. Larvae of *Eumecosomyia nubile* (Wiedemann) have been reported as scavengers in the tunnels of *Diatraea* sp. (Crambidae) in maize ears (Barbosa *et al.* 1986), *Chaetopsis* and "*Euxesta"* larvae infesting maize were known to use holes made by *Spodoptera frugiperda* (J. E. Smith) and *Helicoverpa zea* (Boddie) (both Noctuidae; see Goyal *et al.* 2012), and larvae of *Chaetopsis massyla* (Walker) were found in stems of *Carex lacustris* Willd. damaged by chloropid larvae of *Epichlorops exilis* (Coquillett) (Allen & Foote 1992). Injuries caused by primary invaders probably facilitated access to host plant tissues and their feeding activity facilitated decay, thus creating favourable conditions for saprophagous larvae. This view is supported by the fact that more *Chaetopsis massyla*, "*Euxesta" eluta* Loew and "*Euxesta*" *stigmatias* Loew flies emerged from ears pre-invaded by *S. frugiperda* than from uninvaded ears, suggesting a preference for injured ears or greater survival in ears previously infested by *S. frugiperda* (Goyal *et al.* 2012).

TABLE 1. Ulidiidae species with known larval morphology, their tribal assignments, feeding habits in the field (S = saprophagous, P = phytophagous), mode of plant attack (PI = primary invaders, SI = secondary invaders of living plants), method of study (LM = light microscopy, SEM = scanning electron microscopy) and relevant literature.

Species	Tribe	Decaying substrate	Rot pockets in living plants	Living plant tissue	Feeding habits	Mode of plant attack	Examination method	Source
Ulidiinae								
Aspistomella duo	Lipsanini		x		S	SI	LM, SEM	present study
Aspistomella tres	Lipsanini		x		S	SI	LM, SEM	present study
Aspistomella sp.	Lipsanini		x		S	SI	LM, SEM	present study
Ulivellia tenoris	Lipsanini		x		S	SI	LM, SEM	present study
Ulivellia arcuata	Lipsanini		x		S	SI	LM, SEM	present study
Chaetopsis massyla	Lipsanini		x		S	PI, SI	LM, SEM	Allen & Foote 1992; Goyal *et al.* 2011
"*Euxesta*" *eluta* *	Lipsanini		x		S	PI, SI	LM, SEM	Goyal *et al.* 2011
"*Eux.*" *stigmatias* *	Lipsanini		x		S	PI, SI	LM, SEM	Goyal *et al.* 2011
Eumetopiella rufipes	Lipsanini			x	P	PI	LM	Valley *et al.* 1969
Physiphora alceae	Ulidiini	x			S		LM	Allen & Foote 1967 (as *P. demandata*)
Seioptera vibrans	Seiopterini	x			S		LM	Allen & Foote 1967
Otitinae								
Tetanops myopaeformis	Otitini			x	P	PI	LM, SEM	Gojmerac 1956, Bjerke *et al.* 1992
Ceroxys urticae	Otitini		x		S		LM	Lobanov 1964
Tritoxa incurva	Cephaliini			x	P	PI	LM	Allen & Foote 1975
Delphinia picta	Cephaliini	x			S		LM	Allen & Foote 1967
Pseudotephritis sp.	Myennidini	x	x?		S		LM	Peterson 1960

* According to Kameneva & Korneyev (in prep.), *Euxesta eluta* and *E. stigmatias* belong to the genus *Amethysa*.

The larval morphology of only 4 species belonging to 3 out of the 27 genera of Lipsanini has been studied to date (Table 1): *Chaetopsis massyla*, "*Euxesta*" *eluta*, "*Euxesta*" *stigmatias* (Allen & Foote 1992; Goyal *et al.* 2011) and *Eumetopiella rufipes* (Valley *et al.* 1969). *Eumetopiella rufipes* was phytophagous, whereas all other larvae were saprophagous. *Chaetopsis* and "*Euxesta*" were particularly suitable for comparison with *Aspistomella* and *Ulivellia*, because they have been studied in detail by SEM (Goyal *et al.* 2011).

Important morphological characters for distinguishing the third instar larvae of *Aspistomella* and *Ulivellia* from each other were the specific shape of the spiracular slits and the fine structure of the creeping welts (see Table 2 and key to the species). There were few additional characters of limited diagnostic value to separate the species. Larvae of *U. tenoris and U. arcuata* sometimes possessed a preapical tooth, the apices of the mouthhooks of *U. arcuata* were not flattened as in *U. tenoris* or *Aspistomella* species (Fig. 58 A), and larvae of *U. arcuata* were particularly small. Other characters, such as the number of anterior tubules, oral ridges, or mouthhook dimensions, were not suitable for distinguishing all species because of their overlapping ranges.

TABLE 2. Comparison of measurements of third instar larvae of five species of *Aspistomella* and *Ulivellia* (number of specimens examined in brackets).

Larval characters	*Aspistomella duo*	*Aspistomella tres*	*Aspistomella* sp.	*Ulivellia tenoris*	*Ulivellia arcuata*
Larva					
Total length [mm]	7.5–11.2 (8) M=8.45	8.4–11.8 (10) M=9.9	9.9–10.0 (2)	7.6–12.7 (10) M=9.45	7.1–7.7 (8) M=6.95
Greatest width [mm]	1.8–2.5 (8) M=2.4	2.2–2.9 (10) M=2.75	1.9 (2)	2.5–2.9 (10) M=2–65	1.8–2.1 (8) M=2
Anterior spiracles					
Number of tubules	22–27 (19) M = 20	19–25 (20) M = 22	22–23 (2)	18–24 (20) M = 21	16–19 (16) M = 17
Pseudocephalon					
Number of oral ridges	28 (2)	30 (1)	25 (1)	25–28 (2)	29 (1)
Tip of mouth hook	blunted	blunted	blunted	blunted	tapered
Creeping welts (CW):					
Number of spinules rows in CW1 (first abdominal segment)	3(4)	3(2)	3(1)	5(3)	5(2)
Number of **a**-rows (anteriorly oriented spinules) in CW3–CW7	1 (2)	1 (2)	1 (1)	2–3 (3)	2–3 (2)
Number of **b**-rows (posteriorly oriented spinules) in CW3–CW7	2 (2)	2 (2)	2 (1)	3 (3)	5–6 (2)
Central row **c**: continuous or discontinuous	continuous	continuous	continuous	continuous	discontinuous
Large spinules in row **d** forming single or double row (CW3–CW8)	single row	double row	double row	double row	single row
Posterior spiracles					
Shape	as in Fig. 9 A	as in Fig. 9 B	as in Fig. 9 F	as in Fig. 9 C	as in Fig. 9 D

.....continued on the next page

TABLE 2. (Continued)

Larval characters	***Aspistomella duo***	***Aspistomella tres***	***Aspistomella* sp.**	***Ulivellia tenoris***	***Ulivellia arcuata***
Length [mm]	0.4–0. 5 (12) M=0.44	0.5–0.72 (15) M=0.6	0.32	0.58–0.69 (26) M=0.6	0.38–0.48 (18) M=0.4
Width [mm]	0.36–0.48 (12) M=0.42	0.43–0.59 (15) M=0.48	0.28	0.45–0.52 (26) M=0.49	0.29–0.37 (18) M=0.33
Distance between lateral edges of spiracles (= sw, Fig. 9) [mm]	0.72–1.0 (19)	0.93–1.34 (19)	0.7	1.04–1.34 (15)	0.72–0.95
Shortest distance between spiracles (= sd, Fig. 9) [mm]	0.06–0.18 (19)	0.04–0.07 (19)	0.13	0.09–0.15 (15)	0.06–0.93 (10)
Ratio sd/sw	0.07–0.15 M = 0.11	0.03–0.06 M = 0.05	0.19	0.08–0.12 M = 0.09	0.07–0.1 M = 0.08
Cephalopharyngeal skeleton					
Total length	1.6–1.7 (2)	1.3 (2)		1.6–1.7 (3)	1.2–1.3 (3)
Preapical tooth	absent (2)	absent (2)		present or absent (3)	present or absent (3)
Mouth hook (Measurements, see Fig. 10)					
Mouth hook length a	0.26–0.27 (2)	0.24–0.25 (2)		0.30–0.32 (3)	0.21–0.24 (3)
Mouth hook length b	0.09 (2)	0.08–0.10 (2)		0.10–0.11 (3)	0.05–0.06 (3)
Mouth hook length c	0.14 (2)	0.12 (2)		0.15–0.16 (3)	0.10–0.12 (3)
Mouth hook length d	0.01 (2)	0.01 (2)		0.01–0.02 (3)	0.01 (3)
Mouth hook length e	0.17–0.18 (2)	0.12–0.14 (2)		0.14–0.17 (3)	0.12–0.14 (3)
Mouth hook length f	0.10–0.11 (2)	0.10–0.11 (2)		0.09–0.10 (3)	0.08–0.10 (3)
Mouth hook length f/ mouth hook length e	0.57–0.60 (2)	0.81–0.83 (2)		0.59–0.68 (3)	0.67–0.85 (2)
Hypopharyngeal sclerite: Length/ height ratio	4.0–4.5 (2)	4.5–4.9 (2)		3.6–5.2 (3)	3.8–5.3 (3)

The most striking difference between *Aspistomella*, *Ulivellia* and other Lipsanini genera was the structure of their posterior spiracles. *Chaetopsis*, "*Euxesta*" and *Eumetopiella*, like other Ulidiidae, had oval to elongate oval spiracular slits, possessed oval to elongate-oval spiracular slits, whereas in *Aspistomella* and *Ulivellia* the spiracular slits resembled a narrow line meandering over a long distance. The posterior spiracles also differed in the number of their spiracular hairs. *Aspistomella* and *Ulivellia* had up to 16 branched spiracular hairs per group, while in *Chaetopsis* and "*Euxesta*" had up to 4 hairs per group and in *Eum. rufipes* had only one branched hair per group. In other Ulidiidae listed in Table 2, the number of spiracular slits was low (up to 6 branched hairs in *Delphinia picta* (Fabricius) according to Fig. 9 in Allen & Foote, 1967) and in third instars of the phytophagous *Tetanops myopaeformis* (Roder) spiracular hairs were often absent (Bjerke *et al.* 1992).

The structure of the anterior spiracles of Lipsanini also varied. In *Aspistomella* and *Ulivellia* there were 16–27 short tubuli per spiracle, in *Chaetopsis* and "*Euxesta"* 7–10 finger-like tubuli and in *Eumetopiella* 12–13 tubuli (Table 3). All other Ulidiidae larvae listed in Table 2 had less than 14 tubuli per anterior spiracle and in *Delphinia picta* up to 17 (Allen & Foote 1967).

Other differences between *Aspistomella*, *Ulivellia* and other Lipsanini included the structure of their perianal pads and the spatial pattern of prothoracic spinules. The perianal pads of *Chaetopsis*, "*Euxesta"* and *Eumetopiella* were oval to rhombic, relatively small, lobed and surrounded by spinules as in most other ulidiids (spinules absent in *Eumetopiella*), whereas in *Aspistomella* and *Ulivellia* they were rectangular, large, flat and only the spinules of row e in CW8 ran along the anterior margin of the perianal pad. Prothoracic spinule rows were absent dorsally in *Aspistomella* and *Ulivellia* (Fig. 20A), whereas they completely surrounded the anterior part of the prothorax in *Chaetopsis* and *Euxesta* and were absent in *Eumetopiella* (Table 3).

TABLE 3. Comparisons of morphological characters among third instar larvae of the tribe Lipsanini. CPS = cephalopharyngeal skeleton, MH = mouthhook.
***** According to Kameneva & Korneyev (in prep.), *Euxesta eluta* and *E. stigmatias* belong to the genus *Amethysa*.

Characters	***Aspistomella duo***	***A. tres***	***Ulivellia tenoris***	***U. arcuata***	***Chaetopsis massyla***	***"Euxesta" stigmatias ****	***"Eux." eluta ****	***Eumetopiella rufipes***
Oral ridges	28	30	25–28	29	19–27	30–42	31–40	"a few"
Prothoracic spinules rows	interrupted	interrupted	interrupted	interrupted	encircling	encircling	encircling	absent
Tubuli (anterior spiracles)	22–27	19–25	18–24	16–19	8–10	7–10	7–10	12–13
Anterior spiracular slits	meandering	meandering	meandering	meandering	elongate-oval	elongate-oval	elongate-oval	elongate-oval
Spiracular hairs per group	up to 11	up to 13	up to 16	up to 11	up to 4	up to 4	up to 4	1
Perianal pad	rectangular	rectangular	rectangular	rectangular	ellipsoidal	ellipsoidal	ellipsoidal	ovate
Spinules on perianal pad	lacking	lacking	lacking	lacking	present	present	present	absent
CPS length	1.6–1.7	1.3	1.6–1.7	1.2–1.3	0.88–1.09	0.73–0.99	0.75–0.97	0.92–0.11
Apical teeth of MH	long, slender	long, slender	long, slender	long, slender	intermediate	intermediate	intermediate	short, compact
MH length f/ length e	0.57–0.60	0.81–0.83	0.59–0.68	0.67–0.85	0.42	0.35	0.38	0.33
Preapical teeth of MH	absent	absent	1 present (small) or absent	1 present (small) or absent	1 (small)	absent	absent	1 (large)
Light windows on MH	present	present	present	present	present	present	present	absent
Dental sclerites	present	present	present	present	present	present	present	absent
Hypopharyngeal sclerites (length height ratio)	4.0–4.5	4.5–4.9	3.6–5.2	3.8–5.3	4.5	5.9	5.7	4.1
Ventral cibarial ridges	present	present	present	present	present	present	present	absent

Other morphological details such as the structure of the sensory organs, the shape of the oral ridges or the basic structure of creeping welts were similar among the saprophagous Lipsanini. For example, the oral ridges of *Chaetopsis* and "*Euxesta"* were composed of long central and short lateral ridges, as in *Aspistomella* and *Ulivellia*. In *Eumetopiella* and most of the other Ulidiidae listed in Table 1, short lateral ridges were not mentioned and Hennig (1939) states that larvae of *Myennis octopunctata* (Coquebert) living under tree bark have laterally unbranched oral ridges (description by Vos-de-Wilde in Hennig 1939).

Creeping welts of saprophagous Lipsanini had centrally located large spinules placed on ridges (rows d) and most rows of spinules were posteriorly oriented. Anteriorly oriented spinules occurred only in 1–2 anterior rows of abdominal segments CW3–CW8 (rows a) and in the posterior row e of CW8. The structure of the creeping welts

of *Eum. rufipes* is not known, but it may differ from that of other Lipsanini due to its phytophagous lifestyle. In the phytophagous species *Tetanops myopaeformis* the creeping welt spinules were plate-like and consisted of short groups forming a complete ring around the thoracic and abdominal segments (Bjerke *et al.* 1992).

The main difference between the cephalopharyngeal skeletons of *Aspistomella*, *Ulivellia* and other Ulidiidae was the size and shape of the mouthhooks. The cephalopharyngeal skeletons of *Aspistomella* and *Ulivellia* were larger than those of other Ulidiidae and only larvae of *D. picta* reached the lower limit of the total length of the cephalopharyngeal skeleton of *Ulivellia arcuata* (1.06–1.22 mm in *D. picta*, Allen and Foote 1967; 1.2–1.3 mm in *U. arcuata*). The apical teeth of *Aspistomella* and *Ulivellia* were long, slender and curved, whereas those of *Chaetopsis* and *Euxesta* they were short, thick and less curved. Similarly slender but less curved mouthhooks were found only in *Physiphora demandata* and *Seioptera vibrans* (Linnaeus) (Allen & Foote 1967). In *Eum. rufipes*, the apical tooth was bulky and equipped with a strong preapical tooth (Table 3).

Broad apical mandibular hooks with large preapical teeth are considered as an indicator of phytophagous larvae (see Rotheray 2019). However, mandibular hooks with large preapical teeth were also present in first instar larvae of *C. massyla* (Allen & Foote 1992). The strong dentate teeth probably allowed first instar larvae of *C. massyla* (primary invaders according to Goyal *et al.* 2012) to penetrate their host plant without external assistance and effectively fragment living plant tissue in order to expose the substrate to microbes and create a suitable feeding environment for a saprophagous larva. First instar larvae of the saprophagous *Zacompsia fulva* may also have strong apical teeth, as newly emerged larvae severed the pre-emergent seed head of *Paspalum urvillei* and fed on the decaying inflorescence (Genung & Weems 1974).

Other morphological structures indicative of different larval feeding habits were the oral and the cibarial ridges. Oral ridges are generally thought to direct food-bearing fluids into the mouth (Courtney *et al.* 2000), and cibarial ridges act as sieves, retaining particles of a few μm and larger (Dowding 1967). In the saprophagous Lipsanini oral ridges were numerous (25–30 in *Aspistomella* and *Ulivellia*, 30–40 in *Chaetopsis* and *Euxesta*) and cibarial ridges were well developed, whereas in the phytophagous *Eum. rufipes* oral ridges were reduced ("a few" according to Valley *et al.* 1969) and cibarial ridges were absent. In the phytophagous *Tetanops myopaeformis* oral ridges were also reduced (10–15 according to Bjerke *et al.* (1992): Fig. 6) and cibarial ridges were absent (also absent in *Tritoxa incurva* Loew, Allen & Foote 1975).

The cuticular sensilla of the Ulidiidae were examined for the first time in the present study (Fig. 8). They were classified as pit-, papillar-, trichoid- and trifid (= Keilin's organ) sensilla (Figs 20 E–H). The function of the cuticular sensilla of Ulidiidae is unknown, but the hair-like trichoid and trifid sensilla are probably mechanoreceptors. Papillar sensilla varied in shape and may have belonged to functionally different types of sensilla (compare s10 and s11 in Fig. 20 D). Trichoid sensilla were located ventro-laterally on first thoracic and on abdominal segments I-VIII and trifid sensilla were located ventrally on thoracic segments I–III. Papillary sensilla were particularly well represented dorsally on the caudal segment, whereas pit-sensilla were more evenly distributed and most abundant on abdominal segments I–VII (ratio of pit-sensilla vs. papillar-, trichoid- and trifid sensilla: prothorax (12/16), mesothorax and metathorax (14/12), abdominal segments (20/6) and caudal segment (8/18)).

The spatial pattern and structure of the cuticular sensilla of *Aspistomella* and *Ulivellia* were identical in all five species. There were also remarkable similarities among Tephritoidea, as can be seen when comparing *Aspistomella* and *Ulivellia* with bamboo-inhabiting Oriental Tephritidae belonging to *Acrotaeniostola*, *Acroceratitis* and other genera (Kovac *et al.* 2017; Schneider *et al.* 2018; Schneider *et al.* 2021; unpublished observations by DK). In both Ulidiidae and Tephritidae the number of cuticular sensilla was the same (prothorax: 28 sensilla, remaining segments 26 sensilla each) and the spatial pattern was identical. However, the shape of some sensilla varied. For example, trichoid-sensilla were found only in Ulidiidae, whereas in Tephritidae peg-shaped sensilla were found in the same locations.

The numbering of the cuticular sensilla distributed on the caudal segments of *Aspistomella* and *Ulivellia* (Fig. 8) corresponds to the following nomenclature used by White *et al.* (1999) for Tephritidae: sensilla No 1 (unnamed), 2 (unnamed), 3 (unnamed), 4 (v3), 5 (v2), 6 (v1), 7 (l1b), 8 (l1a); 9 (l2), 10 (l3), 11 (L), 12 (D2), and 13 (D1). Although cuticular sensilla were not suitable for separating species or genera of the Ulidiidae and Tephritidae, they could be valuable for undertaking phylogenetic studies at family and family group level.

Aspistomella and *Ulivellia* shared unique morphological characters, in particular the meandering posterior spiracular slits and the structure of the perianal pad. Long meandering spiracular slits have not been reported in other Tephritoidea and are similar to the spiracular slits of some Syrphidae, Muscidae, Calliphoridae or Tachinidae

(see Ferrar 1987, Stehr 1991). Although the shape of meandering spiracular slits may be advantageous in the aquatic environment, it is unlikely that such rare structures have evolved independently in two genera of bamboo-inhabiting larvae. Therefore, based on the structure of their spiracular slits and perianal pads, which is not found elsewhere, it is considered here to be a synapomorphy of *Aspistomella* and *Ulivellia*, which are closely related genera.

So far, *Aspistomella* and *Ulivellia* are the only Ulidiidae known to breed in bamboo. In the Oriental region, this niche is occupied by two groups of the related family Tephritidae. Representatives of the larger group belong to Dacinae (Gastrozonini) and develop in bamboo shoots, while representatives of the smaller group belong to Phytalmiinae (Acanthonevrini) and feed in bamboo shoots (*Rioxoptilona*) or in water-filled cavities of bamboo internodes (*Felderimyia*, *Ptilona*) (Dohm *et al.* 2008, 2014). Both Ulidiidae and Tephritidae inhabiting water-filled bamboo internodes share some common biological features: They depend on holes made by other insects in order to enter and exit the internode cavities, are adapted to an aquatic lifestyle, and are able to jump and pupariate in the soil.

Both Neotropical ulidiids and Oriental tephritids used holes made by Crambidae or other insects in order to overcome the thick and hard bamboo walls (overview for Tephritidae: Dohm *et al.* 2014). *Aspistomella* and *Ulivellia* probably oviposit near the freshly bored crambid holes, as their larvae were present in the internode cavities shortly after the holes were made. Two oriental tephritids, *Cyrtostola* and *Paraxarnuta*, are even able to locate large *Cyrtotrachelus* beetles (Curculionidae) as they bore their own oviposition holes in bamboo shoots. The flies wait on the beetles' backs until the holes are ready and then both the fly and the beetle lay their eggs in the same oviposition hole (Kovac & Azarae 1994).

Another peculiar behaviour observed in third instar larvae of *Aspistomella*, *Ulivellia*, *Ptilona* and *Felderimyia* was their ability to jump. Jumping is probably common in Ulidiidae and is known from *Euxesta notata* (Wiedemann), "*Euxesta*" *stigmatias*, *Notogramma cimiciforme* Loew, and *Physiphora alceae* (Preyssler) (as "*P. demandata*") (reviewed by Ferrar 1987; Seal *et al.* 1995). It probably allows the larvae to avoid predators when searching for a pupation site and also allows bamboo-inhabiting larvae to reach the ground more quickly. Larvae inhabiting bamboo internode cavities pupated in the soil, although bamboo phytotelmata are a relatively stable habitat (see Dohm *et al.* 2014). The explanation for this behavior may be that pupation in an upright, water-filled bamboo internode with smooth walls may lead to drowning in the event of strong vibrations of the culm.

Using holes of primary invaders or jumping are common behaviours in Ulidiidae and Tephritidae and not necessarily related to the bamboo habitat. On the other hand, some behavioural, physiological and morphological adaptations are probably related to their aquatic environment. Larvae of both Ulidiidae and Tephritidae deliberately crawl into the water, remain submerged for several minutes during feeding, are positively buoyant and can quickly float to the surface to obtain fresh air. When the internodes dry out, the larvae congregate at the bottom of the internode cavity (Fig. 11H) and are able to survive the draught until the next rainfall. The numerous tubuli of the anterior spiracles and the spiracular hairs of the posterior spiracles of *Aspistomella* and *Ulivellia* (see above) are probably also an adaptation to the aquatic environment. The highest number of spiracular hairs and tubuli is found in the aquatic *Aspistomella* and *Ulivellia*, while they are less numerous in *Chaetopsis* and "*Euxesta"*, which live in a wet environment, and least in *Eum. rufipes* and other phytophagous species which live in a comparatively dry environment.

The comparison of Neotropical Ulidiidae and Oriental Tephritidae living in bamboo phytotelmata shows that they have evolved similar adaptations to their aquatic environment and provides an instructive example of parallel evolution in closely related dipteran families occurring in different biogeographical regions.

Author contributions

DK and JS: field observations of biology, photography and sample collection; DK and AS: descriptions of larval morphology and biology and SEM photography; ASA, EPK, JTS, MS, SVK and VAK: descriptions of adult specimens; RS: DNA extraction and sequencing; DK, EPK and VAK: editing; VAK: preparation and mounting of most figures, species descriptions, general layout of the manuscript, supervision. All authors have contributed to the article and approved the version submitted.

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