



## The Mesoamerican *Mesorhaga* (Diptera: Dolichopodidae), with a taxonomic conspectus of the New World fauna

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### Abstract

The Mesoamerican *Mesorhaga* Schiner are revised, illustrated and keyed, and include twelve species, ten of them newly described: *Mesorhaga lacrymans* Parent (Costa Rica and Panama), *M. cocori* n. sp., *M. hule* n. sp., *M. sarukhani* n. sp., *M. baadsvicki* n. sp., *M. villanuevi* n. sp. (all Costa Rica), *M. isthmia* n. sp. (Costa Rica, Panama, Nicaragua, El Salvador, and Mexico), *M. adunca* (Van Duzee) (Guatemala), *M. mexicana* n. sp., *M. falciunguis* n. sp., *M. minatitlan* n. sp., and *M. nayaritensis* n. sp. (all Mexico). A checklist of the New World *Mesorhaga* fauna is provided along with notes on selected species. *M. funebris* Parent from the tropical Andes is redescribed and the male postabdomen of *M. caudata* Van Duzee from Georgia, U.S.A. is illustrated.

**Key words:** Diptera, Dolichopodidae, Sciapodinae, *Mesorhaga*, Mesoamerica, Nearctic, Neotropical

### Introduction

This is the second part of a planned revision of the dolichopodid subfamily Sciapodinae in Mesoamerica (also see Bickel 2002). The genus *Mesorhaga* is nearly cosmopolitan in distribution (absent in New Zealand and Pacific islands east of New Guinea), and is defined by a number of strong synapomorphies. The genus maintains a conservative facies throughout the world, although some species groups based on derived characters can be delimited (also see Bickel 1994).

Mesoamerica is part of the Neotropical Region, and comprises Central America and southern neotropical Mexico. Since *Mesorhaga* is inadequately described and poorly known in both the Neotropical and Nearctic regions, I have produced a conspectus of all species as a combined New World fauna. This provides a comparative background for the Mesoamerican fauna, which is now the best known in the Western Hemisphere.

### Materials and Methods

Material cited in this work is housed at the following institutions: (AMNH)— American Museum of Natural History, New York; (BPBM) – Bishop Museum, Honolulu; (CAS)— California Academy of Sciences, San Francisco; (CNC)— Biosystematics Research Institute, Agriculture and Agri-Food Canada, Ottawa; (CUIC)— Cornell University, Ithaca, New York; (EMUS) — Entomological Museum, Utah State University, Logan; (INBIO) — Instituto Nacional de Biodiversidad, Santo Domingo de Heredia, Costa Rica; (INHS) – Illinois Natural History Survey, Urbana, Illinois; (INPA) — Instituto Nacional de Pesquisas da Amazônia, Manaus; (MLUH)— Martin Luther Universität, Halle an der Saale; (MCZ)— Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts; (NHMV)— Naturhistorisches Museum, Vienna;

(TMB)— Termesztudományi Múzeum, Budapest; (USNM)— National Museum of Natural History, Smithsonian Institution, Washington D.C.; (ZMHB)— Zoologisches Museum, Humboldt Universität, Berlin; (ZMUH)— Zoologisches Museum, Universität von Hamburg.

The left lateral view of the hypopygium, or male genital capsule, is illustrated for all species. In describing the hypopygium, 'dorsal' and 'ventral' refer to morphological position prior to genitalic rotation and flexion. Thus, in figures showing a lateral view of the hypopygium, the top of the page is morphologically ventral, while the bottom is dorsal. Morphological terminology follows Bickel (1994). The CuAx ratio is the length of the m-cu crossvein/ length distal section CuA. The position of features on elongate structures such as leg segments is given as a fraction of the total length, starting from the base. The relative lengths of the podomeres should be regarded as representative ratios and not measurements. The ratios for each leg are given with the following formula and punctuation: trochanter + femur; tibia; tarsomere 1/ 2/ 3/ 4/ 5. The following abbreviations and terms are used: FSSC - Female secondary sexual character(s), non-genitalic characters found only on the female body; MSSC - Male secondary sexual character(s), non-genitalic characters found only on the male body; I, II, III: pro-, meso-, metathoracic legs; C, coxa; T, tibia; F, femur; ac, acrostichal setae; ad, anterodorsal; av, anteroventral; dc, dorsocentral setae; dv, dorsoventral; pd, posterodorsal; pv, posteroventral; t, tarsus; t<sub>1-5</sub>, tarsomeres 1 to 5. On the figures, arrows are used to indicate diagnostic features.

## Taxonomy

### Genus *MESORHAGA* Schiner

**MESORHAGA** Schiner, 1868: 217. Type species: *Mesorhaga tristis* Schiner, monotypy.

**APTORTHUS** Aldrich, 1893: 48. Type species: *Aptorthus albiciliatus* Aldrich, 1893, des. Coquillett, 1910: 509.

**Diagnosis.** *Head*: vertex often deeply excavated in male, with ocellar tubercle prominent; ocellar tubercle with pair of strong diverging ocellars and 3 pairs of long diverging posterior setae; vertical seta present; male sometimes with hairs on lateral frons (MSSC); eyes well separated in both sexes; scape bare, pedicel with short dorsal and longer ventral setae; first flagellomere subrectangular; arista usually dorsal.

*Thorax*: ac varies from 3–4 pairs long setae to reduced or absent; 5 strong dc present, not sexually dimorphic.

*Legs*: males sometimes with modified podomeres; femora with only weak ventral hairs; FII and FIII without preapical setae; tibiae mostly bare, sometimes with major ad and pd setae.

*Wing*: usually hyaline or sometimes with smoky membrane; vein M<sub>2</sub> absent without fold or indication on membrane; M variable in curvature, from slightly curved to more strongly bent (see Figs. 1c, 3d); crossvein bm-cu totally absent; crossvein dm-cu straight; halter sometimes sexually dimorphic, black in males and yellow in females.

*Abdomen*: tergum 6 sometimes ventrally expanded with abundant setae; tergum 7 enclosing elongate epandrial base (e.g. Fig. 2a), with sternum 7 reduced or lost; epandrium usually elongate and cylindrical; hypopygial foramen left lateral and positioned in basal third to basal half of epandrium; phallus and hypandrium arising from base of epandrium; hypandrium tapering, narrow, and symmetrical, without left lateral arm; phallus long and narrow, and can be protruded out from the epandrium (Figs 3b, 3f); epandrial lobe usually flattened and ovate, bearing strong seta on inner margin and apically; strong epandrial seta present at base of epandrial lobe; surstylus usually with 3–4 short overlapping arms; cercus curved and tapering, usually with strong basolateral setae, and with species diagnostic shape and setae.

**Remarks.** *Mesorhaga* is an almost cosmopolitan genus that can be readily recognized by a combination of venation and male postabdominal structure. Although the unbranched and curved vein M of *Mesorhaga* has

been used as a key character for the genus, the loss of  $M_2$  (i.e., an unbranched M) has been independently derived several times within the Sciapodinae, variously as a MSSC or in both sexes. Other diagnostic features that help distinguish it from other members of the Sciapodinae include a single strong vertical seta in both sexes, hypopygial foramen positioned from basal third to basal half of epandrium, hypandrium narrow, elongate, and symmetrical, without a left lateral arm, and the cercus massive, clavate and often curved.

The habitus, venation, and derived male postabdomen make *Mesorhaga* one of the few demonstrably monophyletic genera of the subfamily Sciapodinae (for discussion of morphology, systematics and extralimital fauna, see Bickel 1994).

## Part I. Conspectus of the New World Fauna

In the New World, *Mesorhaga* includes 29 described species: 12 Mesoamerican (treated here, including 10 species newly described), 6 additional Neotropical species, and 11 Nearctic species (Pollet, et al. 2004). The life-histories of New World species are unknown, and although most of the New World species appear to have been collected in mesic forests, the genus occurs in a wide range of habitats. Many Australian species, for example, are found in semi-arid or coastal habitats, and some are even associated with crab holes (Bickel 1994).

In general, *Mesorhaga* is poorly represented in collections, often in small numbers, and most species are described from the holotype or a small type series. The large repositories I visited (USNM, AMNH, CNC, & CAS) had relatively few additional specimens of *Mesorhaga* in unsorted dolichopodid holdings, and most of these were unassociated females. Although Malaise traps occasionally take large numbers (e.g., *M. sarukhani*), this appears to be the exception rather than the rule. Possibly aspects of adult behaviour make *Mesorhaga* species less likely to be collected, either by hand or in passive traps.

### Neotropical *Mesorhaga*

I have seen undescribed species from South America in collections, again in small numbers. Possibly the genus is absent from the smaller Caribbean islands, as none were recorded from Dominica (Robinson 1975), nor have I seen the genus in collections from Hispaniola (Carnegie Museum, Pittsburgh). Naglis (2000) provided a key to Neotropical species and described two Brazilian species in detail.

Mesoamerican species are marked with an asterisk, and are treated in detail further in this paper. Acronyms of repositories housing the primary types are listed in parentheses.

\***adunca** Van Duzee 1933: 1 (*Condylostylus*) (AMNH) Guatemala.

[*albiciata* Aldrich 1893: 48 (USNM) (*Aptorthus*) U.S.A. & Puerto Rico; see below under Nearctic *Mesorhaga*].

**aurata** Naglis 2000: 252 (INPA). Brazil: Amazonas.

\***baadsvicki** Bickel n. sp. (INBIO). Costa Rica.

\***cocori** Bickel n. sp. (INBIO). Costa Rica.

\***falciunguis** Bickel n. sp. (CAS) Mexico.

**funeris** Parent 1929: 16 (MLUH, not seen). Peru; Ecuador, Venezuela. This species is redescribed and figured below, under “The *lacrymans* group.”

[*jucunda* Becker 1922: 377. Paraguay & U.S.A. See below under Nearctic *Mesorhaga*].

\***hule** Bickel n. sp. (INBIO). Costa Rica.

\***isthmia** Bickel n. sp. (USNM). El Salvador; Costa Rica, Mexico, Nicaragua, Panama.

\***lacrymans** Parent 1928: 182 (ZMUH, destroyed; neotype INBIO). Costa Rica.

- laeta** Becker 1922: 378 (TMB, destroyed) Paraguay: Asuncion. Becker illustrated the male wing, which has a grey anteroapical cloud.
- \***mexicana** Bickel n. sp. (CAS) Mexico.
- \***minatitlan** Bickel n. sp. (CAS). Mexico.
- \***nayaritensis** Bickel n. sp. (CAS). Mexico.
- ornatipes** Van Duzee 1932b: 184. (CAS, examined) Cuba. For further discussion, see below, under the *isthmia* species group.
- saetosa** Naglis 2000: 251 (INPA). Brazil: Amazonas.
- \***sarukhani** Bickel n. sp. (INBIO). Costa Rica.
- tristis** Schiner 1868: 217 (NHMV). Colombia.
- \***villanuevi** Bickel n. sp. (INBIO) Costa Rica.

### Nearctic *Mesorhaga*

The Nearctic fauna is poorly documented and badly in need of both collection and revision. A major problem is that many Nearctic species are known only from females. The current keys (Parent 1929, Robinson 1964) are unreliable, since they are based on a mix of male and female characters (leg color, for example, can be sexually dimorphic in *Mesorhaga*).

**albiciliata** Aldrich 1893: 48 (USNM) (*Aptorthus*) U.S.A.: New Jersey, Georgia, North Carolina.. This species has also been recorded from Puerto Rico (Robinson, 1970).

**borealis** Aldrich 1893: 49 (USNM) (*Aptorthus*) U.S.A.: Minnesota. (described from female only).

**caerulea** Van Duzee 1930: 1 (AMNH, examined) U.S.A.: Connecticut. The unique holotype is a female, not a male as described by Van Duzee.

**caudata** Van Duzee 1915: 94 (CUIC, examined) U.S.A.: Georgia. The male postabdomen of this species is illustrated here (Fig. 4c, d), as a supplement to Van Duzee's original description. As noted in the original description, the cercus is curved, and yellow with long yellow setae.

**clavicauda** Van Duzee 1925a: 154 (CAS, examined) U.S.A.: Michigan, Illinois, New Jersey. I have seen additional specimens from Burlington Co., New Jersey. This species is a member of the otherwise Neotropical *isthmia* species group.

**flavipes** Van Duzee 1932a: 9 (AMNH, examined) U.S.A.: New York. Van Duzee discussed the similarity of *M. flavipes* and *M. varipes*, and I suspect they are conspecific.

**jucunda** Becker 1922: 377 (syntypes: TMB, destroyed; ZMHB, examined). Paraguay & U.S.A.. Becker provided a comprehensive description and wing illustration of *Mesorhaga jucunda* based on a male-female pair from Paraguay: Asuncion (TMB, destroyed) and a single female from Georgia, U.S.A. (ZMHB, examined). However, it is extremely doubtful that specimens from these distant localities would be conspecific, and although the description would enable recognition of new Paraguayan material (for example, the male has the last three tarsal segments of leg III widened), the species is now represented by a female syntype from the U.S.A., which I cannot identify. Therefore, without evidence to the contrary, this species should be regarded as solely Nearctic, and South American specimens close to Becker's description should be described as new.

**nigripes** Aldrich 1893: 49 (USNM) (*Aptorthus*) U.S.A.: California (described from female only). Van Duzee (1917:124) described a male of this species, based on Californian specimens.

[ornatipes Van Duzee 1932b: 184. Cuba. Robinson (1964) cites a questionable record from Georgia, USA; see above under Neotropical *Mesorhaga*].

**pallidicornis** Van Duzee 1925b: 178 (CAS, examined) U.S.A.: Ohio; Manitoba., Ontario, Midwest U.S.A, south to Texas.

*tricorniflavrai* Gunther 1982: 4 (USNM) U.S.A.: Illinois.(syn. Bickel 2002)

*Mesorhaga pallidicornis* is rather common and widespread in central North America, and has distinctive pale yellow setae on the head and thorax, coxa I and all legs yellow, and a black scape and pedicel that contrasts with a bright yellow first flagellomere. I have seen additional specimens from Indiana: New Harmony, viii.1967 (CAS); Michigan: South Haven, vi (USNM); Nebraska: Thomas Co., vii.1967 (CAS), Hooker Co., vii (USNM); Texas: Wheeler Co., vi (USNM).

**townsendii** Aldrich 1893: 50 (USNM, examined) (*Aptorthus*) U.S.A.: Arizona. (described from female only).

**varipes** Van Duzee 1917: 123 (MCZ, examined) U.S.A.: Massachusetts. (see above under *M. flavipes*).

## Part II. Mesoamerican *Mesorhaga*

The Mesoamerican *Mesorhaga* fauna is keyed below (including the single described Caribbean species, *M. ornatipes*). Distinct species groups are treated first, and the descriptions of the remaining species are treated alphabetically.

### Key to Mesoamerican and Caribbean Male *Mesorhaga*

Accurate identification of *Mesorhaga* may require clearing the hypopygium, since subtle but distinct cercal differences are often used to separate related species.

1. Wing vein M with distinct curved, almost right angle bend (Fig. 1c); wing sometimes with brown cloud in both sexes, but even then can be faint (*lacrymans* group).....2
- Wing vein M with more gentle curve (e.g. Fig. 3d); wing hyaline in both sexes ..... 5
2. Halter mostly yellow, with infuscated club; distal quarter of femora I and II and all tibiae yellow; hypopygium (Fig. 1e) (Costa Rica) .....*M. sarukhani* n. sp.
- Halter brown to black; femora dark almost entirely dark brown to black; other characters variable .....3
3. Legs entirely dark brown to black; It<sub>5</sub> (Fig. 1b) expanded and flattened, subtriangular, with long dorsal setae and expanded pulvilli (MSSC); hypopygium (Fig.1a)(Costa Rica & Panama) *M. lacrymans* Parent
- Tibiae and basitarsi I and II yellowish; It<sub>5</sub> only slightly expanded or unmodified .....4
4. Ventral postcranium with abundant black setae; lateral scutellar setae about half as long as median setae; femora with av and pv setae entirely black; TI distally and It<sub>1-2</sub> with posterior row of long setae; dm-cu crossvein distinctly longer than distal section of CuA<sub>1</sub>; distal CuA<sub>1</sub> straight; hypopygium (Fig.1d) (Costa Rica) ..... *M. cocori* n. sp.
- Ventral postcranium with abundant white setae; lateral scutellar setae about two thirds length of median setae; femora with av and pv setae, white on basal third to half, black distally; TI with pd row of brownish setae along length, with 4 -5 slightly longer black setae spaced among them; dm-cu crossvein distinctly shorter than distal section of CuA<sub>1</sub>; distal CuA<sub>1</sub> slightly curved towards wing apex; hypopygium (Fig.1g) (Costa Rica) .....*M. hule* n. sp.
5. Tarsus of leg I (Fig. 3c): It<sub>2</sub> with 6-7 black, ventral, spinelike setae, It<sub>3</sub> very short, and It<sub>4</sub> with 4 short ventral setae (MSSC); lateral frons and ocellar tubercle with supernumerary setae; lower calypter with long white setae (black in female) (*isthmia* group) ..... 6
- Tarsus of leg I ventrally bare, with It<sub>3</sub> usually longer than It<sub>4</sub>; lateral frons and ocellar tubercle with characteristic setation, lacking extra setae; lower calypter various .....7
6. Femora mostly dark brown, with metallic green reflections; IIIIt<sub>4-5</sub> flattened, ventrally pad-like; hypopygium (Fig.3a) with cercus massive and straight, distally clavate, with strong spinelike setae (Veracruz,

- Mexico to Panama) ..... *M. isthmia* n.sp.
- . Femora and tibiae mostly yellow; III<sub>t<sub>4-5</sub></sub> not flattened (Cuba).....*M. ornatipes* Van Duzee
7. Claws and/or pulvilli of tarsus I distinctly longer than those of legs II and III .....8
- . Claws and pulvilli of all tarsi short, subequal and unmodified .....9
8. Posterior claw of leg I (Fig. 2c) greatly enlarged and curved; tibia II bare of major setae; halter black; hypopygium (Fig. 2b) (southern Mexico) ..... *M. falciunguis* n. sp.
- . Both claws of leg I enlarged, and distinctly longer than those of legs II and III; tibia II with strong ad and pd setae; halter with yellow club; hypopygium (Fig. 3e) (Costa Rica) .....*M. baadsvicki* n. sp.
9. Halter yellow .....10
- . Halter brown to black .....11
10. All femora black with yellow knees; It<sub>1</sub> long, distinctly longer than It<sub>2,5</sub> combined; hypopygium (Fig. 2d): cercus with outer apical notch (Costa Rica) ..... *M. villanuevi* n. sp.
- . All femora entirely yellow; It<sub>1</sub> subequal to It<sub>2,5</sub> combined; hypopygium (Fig. 4b): cercus entire, without outer notch (southern Mexico) ..... *M. nayaritensis* n. sp.
11. Ventral postcranium with abundant white setae; wing unusually broad, almost half as wide as long; hypopygium (Fig. 3f) hypandrium with hood; cercus curved and apically clavate, with elongate subapical setae (Morelos, Mexico) .....*Mesorhaga mexicana* n. sp.
- . Ventral postcranium with abundant black setae; wing width distinctly less than half wing length ..... 12
12. Femur I brown , with long, dark brownish ventral and pv hairs along length; hypopygium (Fig. 2a): cercus curved with apical tuft of setae on subrectangular projection (Guatemala) ..... *M. adunca* (Van Duzee).
- . Femur I yellow, with only short, ventral hairs; hypopygium (Fig.4a); cercus distally expanded, with group of strong, distal setae (Veracruz, Mexico) ..... *Mesorhaga minatitlan* n. sp.

### The *lacrymans* group

The *lacrymans* group is characterized by:

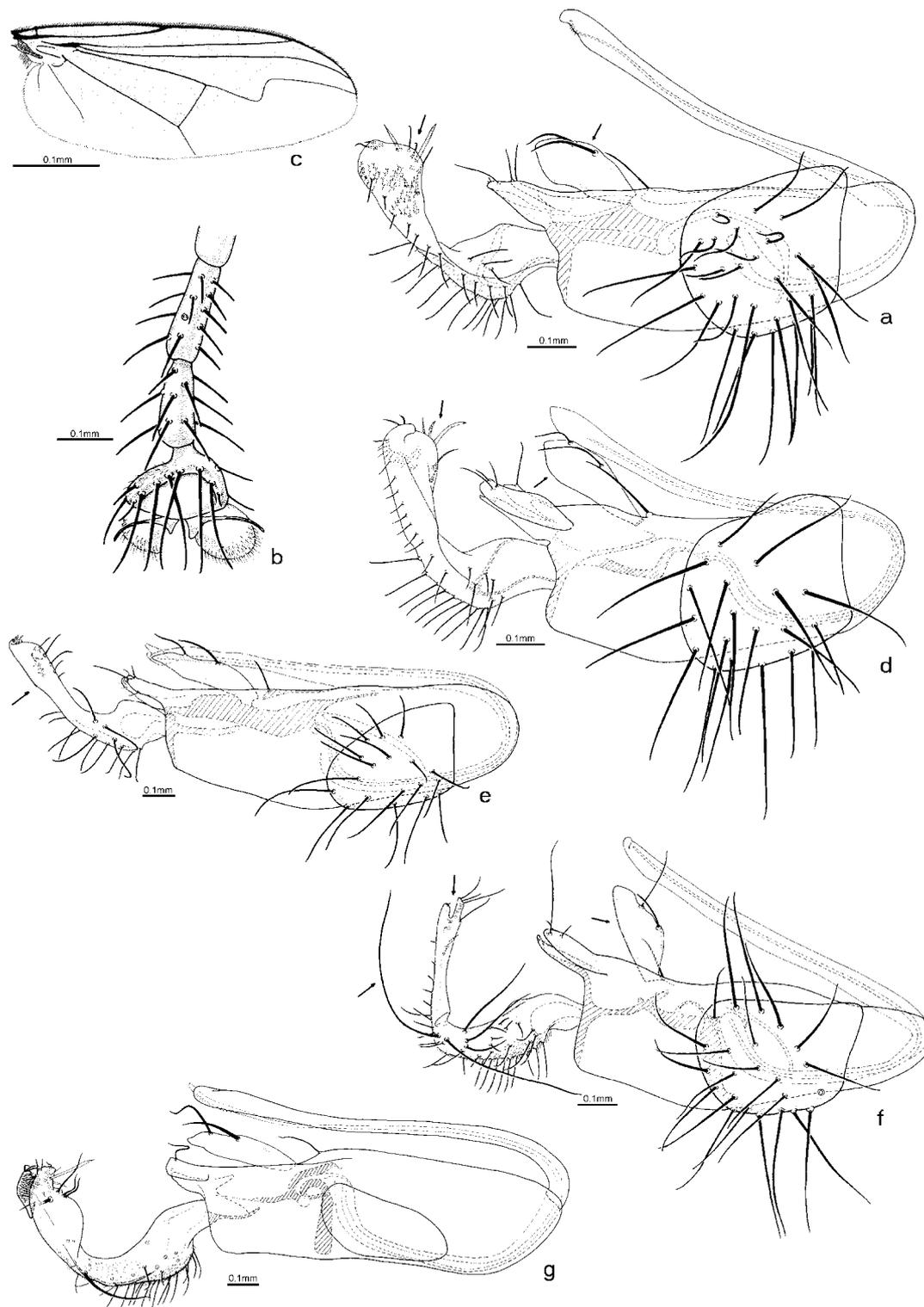
- 1 First flagellomere subrectangular with dorsal arista.
- 2 Vein M with an almost right angle bend between dm-cu crossvein and apex (Fig. 1c).
- 3 Males and females often with large area of brown infuscation on wing (Fig. 1c), although sometimes faint or appearing smoky.
- 4 Males sometimes with black halteres.

The *lacrymans* group comprises four Neotropical species occurring in forests (lowlands to elevations of 2000 m) along the Cordillera, and includes *M. lacrymans* (Costa Rica and Panama), *M. cocori* (Costa Rica), *M. hule* (Costa Rica), *M. sarukhani* (Costa Rica), and *M. funebris* (Peru, Ecuador and Venezuela). All are treated below.

### *Mesorhaga lacrymans* Parent (Figs 1a, b, c)

*Mesorhaga lacrymans* Parent 1928: 182.

**Type material.** Parent described *Mesorhaga lacrymans* based on males and females from Costa Rica: La Caja, ii–iv.1924 (ZMUH, destroyed). His description and figures allow this species to be identified with confidence. A male neotype is here designated with the label: COSTA RICA: Prov. GUANACASTE: Santa Cruz, Vista del Mar, Torre Cocosna, 972 m, 27–30 Jun 2001, Y. Cardenas, Aguamiel (INB00033144536) (INBIO).



**FIGURE 1.** *Mesorhaga lacrymans* Parent: a. hypopygium, left lateral. b. male distal tarsus I, dorsal. c. male wing, dorsal. *M. cocori* n. sp.: d. hypopygium, left lateral. *M. sarukhani* n. sp.: e. hypopygium, left lateral. *M. funebris* Parent: f. hypopygium, left lateral. *M. hule* n. sp.: g. hypopygium, left lateral.

**Additional material:** **COSTA RICA:** ALAJUELA: 3 ♂, P.N. Volcan Tenorio, Est El Pilón, 700 m, 21–27.iii.2005, Azofeifa & Luz (INBIO). GUANACASTE: ♂, Vista Miravalles, est. Cubra Muca, 1100 m, 26.vi to 6.vii.2003, Azofeifa et al. (INBIO); ♂, 3 km SE Rio Naranjo, v.1992, F. Parker (EMUS). PUNTARENAS: ♂, 6 km S. San Vito, 13–18.iii.1963 (WSU). ♂, Guanacaste: Santa Cruz, Vista del Mar, Torre Cocesna, 970 m,

18.vi.2002, Y. Cardenas; SAN JOSÉ: ♂, Escazú, C. Pico Blanco, 2000 m, 19.iv.1993, H. Vargas & M. Zumbado (INBIO); ♂ Farm La Caja, iv.1928, H. Schmidt (USNM). **PANAMA:** ♂, CHIRIQUI: 25 mi NW David, 31.iii.1960 (AMNH).

**Description. Male:** body length: 4.8–5.0 mm; wing: 4.8 x 1.7 mm.

**Head:** 5–6 strong postvertical setae present, forming cluster at end of postocular row; strong proclinate vertical present on lateral frons; vertex, frons, face, and clypeus dark metallic blue-green, with orientated silvery pruinosity; clypeus narrowed distally; palp dark brown with apical seta; proboscis brown; antenna black; arista dorsal, about as long as head height; ventral postcranium with abundant black setae.

**Thorax:** metallic green with bronze reflections; 3 pairs long ac present, with shorter paired setulae anteriorly; lateral scutellar setae almost half as long as median setae.

**Legs:** legs dark brown to black; CI and CII with black anterolateral setae; CIII with strong, black lateral seta and some shorter setae; femora with av and pv rows of black setae. I: 4.5; 4.7; 2.3/0.7/0.5/0.5/0.5; TI with irregular posterior and pd rows of black setae, longer in basal third (these long posterior and pd setae continue onto the basal tarsomeres (MSSC));  $It_{3-5}$  with long dorsal setae;  $It_5$  (Fig. 1b) expanded and flattened, subtriangular, with long dorsal setae and expanded pulvilli (MSSC.); II: 5.5; 6.2; 3.6/ 1.5/ 1.0/ 0.7/ 0.5; FII with rows of long av and pv setae; TII bare of major setae except for apicoventral seta; II: 7.0; 8.0; 2.6/2.1/1.3/0.8/0.5.

**Wing** (Fig. 1c): with dark brown cloud over basal and anterior part of the wing, extending posteriad of CuA and beyond the bend in vein M; vein M with gentle, right-angle curve at about 1/3 between dm-cu crossvein and wing apex; CuAx ratio: 1.3; lower calypter dark brown with black rim, and fan of black setae; halter stalk dark brown, club black.

**Abdomen:** tergum 1 metallic blue-green, with short, dark setae dorsally; terga 2–6 black with metallic violet reflections, with black vestiture; terga 4–5 with long black ventral setae near lateral margins; sternum 8 with long setae; hypopygium black (Fig. 1a); phallus and hypandrium elongate and narrow; long epandrial seta at base of epandrial lobe; epandrial lobe broadly ovate, with strong setae at 1/2 and 3/4; surstylus with setae as figured; cercus curved and distally expanded with some strong apical setae.

**Female:** no reliably associated specimens seen; however Parent's description notes that females have yellow tibiae and basitarsi.

**Remarks.** *Mesorhaga lacrymans* occurs in Costa Rica and Panama, at elevations from 1000 – 2000 m. This species is readily recognized by the male modified leg I tarsomere 5 and dark brown wing. According to Parent's description, females also have the dark brown wing.

### *Mesorhaga cocori* n. sp. (Fig. 1d)

**Type material.** Holotype ♂, **COSTA RICA:** LIMÓN: Sector Cocori, 30 km al Nortede Caiari, A.C. Tortuguero, 100 m, xii.1993, E. Rojas (INBIO -CR1001647246); paratype, ♀, same but 22.ix.-23.xi.1993 (INBIO)

**Additional material:** possible females: **COSTA RICA:** 2 ♀, GUANACASTE: P.N. Rincón de la Vieja, Est. Las Pallas, 800 m, 17–25.vii.1993, K. Taylor & D. Garcia; ♀, ALAJUELA: P.N. Arenal, San Carlos, Sendero Pilon, 650 m, 1–18.v.1999, Malaise trap, G. Carballo (INBIO).

**Description. Male:** body length: 5.0 mm; wing: 5.0 x 1.8 mm.

**Head:** 3 strong postvertical setae present as continuation of postocular row; strong proclinate vertical present on lateral frons; vertex, frons, face, and clypeus dark metallic blue-green, and with orientated silvery pruinosity; clypeus narrowed distally and adjacent to margins of eyes; palp dark brown with black apical seta; proboscis dark brown; antenna black; arista dorsal, about as long as head height; ventral postcranium with abundant black setae.

**Thorax:** metallic green with bronze reflections; setae black; pleura with some grey pruinosity; 3 pairs long ac present, with shorter, paired setulae anteriorly; lateral scutellar setae almost half as long as median setae.

**Legs:** all coxae, trochanters, femora, and all leg III dark brown to black; tibia and basitarsi I and II yellowish; distal tarsomeres I and II dark brown; CI and CII with black anterolateral setae; CIII with strong, black lateral seta and some shorter setae; femora with av and pv rows of black setae. I: 5.0; 5.1; 2.7/ 1.0/ 0.7/ 0.6/ 0.5; TI distally with posterior rows of black setae; It<sub>1-2</sub> with posterior row of long setae (MSSC); It<sub>3-5</sub> with long dorsal setae; It<sub>5</sub> only slightly expanded and with pulvilli slightly expanded. II: 6.0; 7.0; 4.0/ 1.6/ 1.2/ 0.7/ 0.6; TII bare of major setae except for apicoventral seta. III: 7.5; 8.2; 3.3/ 2.8/ 1.5/ 0.8/ 0.5.

**Wing:** (similar to *M. lacrymans*, Fig.1c); also with dark brown clouding; vein M with gentle right-angle curve at 1/3 between dm-cu crossvein and wing apex; CuAx ratio: 1.3; lower calypter dark brown with black rim, and fan of black setae; halter stalk dark brown, club black.

**Abdomen:** tergum 1 metallic blue-green, with short, dark setae dorsally; terga 2–6 black with metallic violet reflections, with black vestiture; terga 4–5 with long black ventral setae near lateral margins; sternum 8 with long setae; hypopygium (Fig.1d) black; phallus and hypandrium elongate and narrow; epandrial lobe broadly ovate, with strong setae at 1/2 and 3/4; surstylus with setae as figured; cercus curved and only slightly expanded, with some strong apical setae.

**Female:** smaller, wing 3.5 x 1.3 mm; setae on head, antenna and thorax not as strongly developed; leg coloration similar.

**Remarks.** *Mesorhaga cocori* is known from rather low elevations in Limón province on the Caribbean coast (and possibly from females elsewhere in Costa Rica). It is close to *M. lacrymans* in genitalic structure (especially note the similarity of cerci, Figs 1a & 1d) and overall body habitus. The specific epithet *cocori* is a place name of indigenous origin and should be regarded as a noun in apposition.

### ***Mesorhaga sarukhani* Bickel (Fig. 1e)**

**Type material.** Holotype, ♂, Paratypes 28 ♂, 27 ♀, **COSTA RICA:** PUNTARENAS: Monteverde, 1500 m, 25–30.viii.1992, pan traps, D. M. Wood (Holotype, 3 ♂, 3 ♀ paratypes, INBIO; remaining material CNC).

**Additional material:** **COSTA RICA:** 3 ♂, 8 ♀, PUNTARENAS: Monteverde, 1500 m, 20–24.vi.1986, W. Hanson & G. Bohart (EMUS).

**Description. Male:** body length: 4.1–4.2 mm; wing: 4.3 x 1.6 mm.

**Head:** 6 strong postvertical setae present, 3 in line with postoculars, with 3 long setae anteriorly; strong proclinate vertical present on lateral frons; vertex, frons, face, and clypeus dark metallic blue-green, with orientated silvery pruinosity, clypeus narrowed distally; palp dark brown with strong apical seta; proboscis brown; antenna black; pedicel with long ventral seta, about half length of arista; ventral postcranium with abundant white setae.

**Thorax:** metallic green with bronze reflections; setae black; pleura with some grey pruinosity; 6–7 ac setae present, with irregular pairing, almost uniseriate; lateral scutellar setae almost two thirds as median setae.

**Legs:** all coxae, basal three-quarters of FI and FII, and all FIII dark brown; distal quarter of FI and FII, all tibiae and basitarsi I and II, yellow; distal tarsomeres I and II and all tarsus III dark brown; CI and CII with black anterolateral setae; CIII with strong, black lateral seta and some shorter setae. I: 5.0; 4.8; 2.8/ 1.2/ 0.8/ 0.7/ 0.6; FI with av and pv pale setae on basal three-quarters, distally bare; TI with short ventral near 1/2 and weak dorsal near 3/5, sometimes with weak pd seta near 1/5. II: 6.0; 6.3; 4.0/ 1.7/ 1.3/ 0.7/ 0.5; FII with rows of av and pv setae, white in basal four-fifths, black in distal fifth; TII with ad setae at 1/6, 1/2 and apically, pd setae at 1/5, 2/3, and apically, ventral setae at 1/4, 3/5, and apically. III: 6.5; 7.6; 2.6/ 2.3/ 1.2/ 0.8/ 0.6; FII with av and pv setae, white in basal three-quarters, black in distal quarter; TIII with apical ventral seta.

**Wing:** with faint brown tint; vein M with gentle, right-angle curve at 1/3 between dm-cu crossvein and wing apex; CuAx ratio: 1.2; lower calypter yellow, with black rim, and fan of black setae; halter yellow, with club infuscated.

*Abdomen*: terga metallic blue-green, with bronze reflections and matt brown areas with metallic reflections at tergal overlap between segments 2–6; tergum 1 with black marginal setae; segments 6, 7 and hypopygium dark brown; hypopygium (Fig. 1e); phallus and hypandrium elongate and narrow, with phallus extending only slightly beyond the hypandrial apex; epandrial lobe ovate, with setae at 2/5 and 3/4; surstylus with 3 arms and setae as figured; cercus only slightly curved and tapering, with some strong, dark, lateral setae basally, with longer setae on ventral surface.

**Female**: similar to male except: wing: 3.5 x 1.3; ocellar tubercle not so prominent; with only 3 strong postvertical setae in line with postocular setae; ventral seta on pedicel about one third length of arista.

**Remarks.** *Mesorhaga sarukhani* is known only from collections made around 1,500 m in forests at Monteverde, Costa Rica.

*Mesorhaga sarukhani* is named in honor of Dr. José Sarukhán, for his outstanding work as a tropical ecologist, academic administrator, promoter of conservation in Mexico, supporter of INBio's development, and participant in the creation of the National Commission for the Understanding and Use of Biodiversity in Mexico.

### *Mesorhaga hule* n. sp. (Fig. 1g)

**Type material.** Holotype ♂, paratype #m, **COSTA RICA**: ALAJUELA: R.V.S. Bosque alegre, Laguna Hulé, 700–800 m, 28.iii.2004, red de golpe, W. Porras (Holotype, INB0003926226; paratype, INB0003926297, INBIO).

**Description. Male**: body length: 4.9 mm; wing: 4.4 x 1.4 mm.

*Head*: 3 strong postvertical setae present as continuation of postocular row; strong proclinate vertical present on lateral frons; vertex, frons, face, and clypeus dark metallic blue-green, and with orientated silvery pruinosity; clypeus narrowed distally and adjacent to margins of eyes; palp dark brown with black apical seta; proboscis dark brown; antenna black; arista dorsal, about as long as head height; ventral postcranium with abundant white setae.

*Thorax*: metallic green with bronze reflections; setae black; pleura with some grey pruinosity; 3 pairs long ac present, with shorter, paired setulae anteriorly; lateral scutellar setae about three quarters as long as median setae.

*Legs*: all coxae, trochanters, most of FI and FII, and all of FIII dark brown; femoral “knees”, tibiae, and basitarsi I and II yellowish; distal tarsomeres I and II dark brown; tibia and tarsus III brown; CI and CII with black anterolateral setae; CIII with strong, black lateral seta and some shorter setae; I: 5.0; 5.3; 3.6/ 1.5/ 1.1/ 0.6/ 0.6; FI with short av and pv setae, white in basal third, black on distal two thirds; TI with pd row of longer than normal brownish setae, with 4–5 slightly longer black setae spaced among them. II: 6.0; 6.2; 3.9/ 1.6/ 1.2/ 0.4/ 0.4; FII with long av and pv setae, white in basal third, black on distal two thirds; TII with ad – pd setal pair near 1/3, ad at 3/5, pd at 1/2, and with ad, av and pv apical setae. III: 6.5; 7.5; 3.0/ 2.2/ 1.5/ 0.7/ 0.5. FIII with av and pv setae, white in basal half, black on distal half.

*Wing*: with faint smoky color; vein M with gentle right-angle bend at 2/5 between dm-cu crossvein and wing apex, and with short external stub vein at bend; distal CuA<sub>1</sub> slightly curved towards wing apex; CuAx ratio: 0.9; lower calypter dark brown with black rim, and fan of black setae; halter brownish.

*Abdomen*: terga metallic blue-green, with matt brown band near tergal overlap; vestiture black, short, dark setae dorsally, and longer laterally; sternum 8 with long black setae; hypopygium (Fig. 1g) black; phallus and hypandrium elongate and narrow, and phallus with subapical serrations; epandrial lobe broadly ovate, with strong setae at 1/2 and 3/4; cercus with strong lateral seta near bend, and apically expanded with some strong setae on inner margin.

**Female**: unknown.

**Remarks.** *Mesorhaga hule* is known from 700 – 800 m elevation in Alejuela province, Costa Rica. The wing has a faint smoky tint, and in this species can be recognized by a number of diagnostic non-gentialic characters, noted in the key. The specific epithet *hule* is from “Hulé”, a place name of indigenous origin and should be regarded as a noun in apposition.

### *Mesorhaga funebris* Parent (Fig. 1f)

*Mesorhaga funebris* Parent 1929: 16.

**Type material.** Parent described *Mesorhaga funebris* based on a male from Peru: Loreto, Iquitos (MLUH, not examined). His description and figures allow this species to be identified with confidence.

**Additional material: PERU:** 25 ♂, AVISPAS: Madre de Dios, 400 m, 10–20.ix.1962, L.Peña, (CNC). ♂, Monson Valley, Tingo Maria, Schlinger & Ross (CAS).

Possible ♀ of this species: **ECUADOR:** PINCHINCHA, Santo Domingo, Rio Palenque Stn., 240 m, 29.vii.1976 (CNC); **VENEZUELA:** T.F. AMAZONAS, Cerro de la Neblina, 140 m, 0° 50' N, 66° 10'W, 20.ii.1965 (USNM).

**Description. Male:** body length: 4.8–5.1 mm; wing: 4.2 x 1.7 mm.

**Head:** major setae black; 3 strong postvertical setae present; strong proclinate vertical present on lateral frons; vertex, frons, face, and clypeus dark metallic blue-green, with orientated silvery pruinosity; clypeus narrowed distally and adjacent to margins of eyes; palp dark brown with strong apical seta; proboscis brown; antenna black; first flagellomere rounded, subrectangular, arista dorsal, about as long as head height; ventral postcranium with abundant whitish setae.

**Thorax:** metallic green with bronze reflections; setae black; pleura with some grey pruinosity; 3 pairs long ac, with shorter paired setulae anteriorly; lateral scutellar setae almost half as long as median setae.

**Legs:** all coxae, basal two-thirds of FI, basal five-sixths of FII and all leg III dark brown; distal femora, tibiae, and basitarsi I and II, yellow; distal tarsomeres I and II brown; CI and CII with white anterolateral setae; CIII with strong, white, lateral seta and some shorter setae. I: 4.5; 4.7; 2.5/ 1.0/ 0.6/ 0.4/ 0.5; FI with white av and pv setae; TI bare of major setae; tarsus I unmodified. II: 5.1; 6.0; 3.9/ 1.2/ 0.8/ 0.5/ 0.4; FII with white av and pv setae basally, black in distal sixth; TII bare of major setae except for apicoventral seta. III: 6.2; 7.2; 2.8/ 2.0/ 1.2/ 0.7/ 0.5; FII with white av and pv setae basally, black in distal quarter.

**Wing:** (similar to Fig.1c); with dark brown cloud over basal and anterior part of the wing, extending posteriorly of CuA and beyond the bend in vein M; vein M with gentle, right-angle curve at 1/3 between dm-cu crossvein and wing apex; CuAx ratio: 1.2; lower calypter brown with black rim and fan of black setae; halter stalk brown, club black.

**Abdomen:** terga metallic blue-green, with matt purple bands near tergal overlap; with black vestiture; terga 4–5 with long, black ventral setae near lateral margins; sternum 8 with long setae; hypopygium (Fig.1f) black; phallus and hypandrium elongate and narrow; long epandrial seta at base of epandrial lobe; epandrial lobe ovate, with strong setae at 1/2 and 3/4; surstylus with long subapical seta; cercus bent at right angle, with some long, lateral setae near base of bend, and distal cercus parallel-sided with apical notch.

**Female:** similar to male except: wing: 2.8–3.0; ocellar tubercle not so prominent; face and clypeus wider than in male; pedicel with much shorter ventral apical seta; 1st flagellomere more rounded; ac absent or with 1–2 pairs short ac present anteriorly; abdominal tergum 1 without posterolateral row of long setae.

**Remarks.** *Mesorhaga funebris* is known from lowland elevations (less than 400 m) in Amazonian Peru, Ecuador and Venezuela.

## The *isthmia* group

The *isthmia* group is characterized by:

1. Male lateral frons and ocellar tubercle with white supernumerary setae.
2. Lower calypter with long white setae in males, black in females.
3. Cercus straight but massive, distally rounded and clavate (e.g. Fig.3a).
4. Male tarsus I sometimes modified (Fig. 3c):  $It_2$  with 6–7 black ventral spine-like setae;  $It_3$  very short, much shorter than adjacent tarsomere,  $It_4$  with 4 short ventral setae (all MSSC).
5. Male  $III_{t_{4-5}}$  sometimes flattened and ventrally pad-like.

This group comprises three species, from both the Neotropical and Nearctic regions: *Mesorhaga isthmia*, n. sp., is widespread in Central America and has all the characters listed above. *M. ornatipes* Van Duzee from Cuba has all the above characters except the male  $III_{t_{4-5}}$  is not flattened. *M. clavicauda* Van Duzee from eastern North America has all the above characters except male tarsus I is unmodified.

### *Mesorhaga isthmia* n. sp. (Figs 3a-d)

**Type material.** **El Salvador:** Holotype ♂, Sonzacate, 25.vi.1958, L.J. Bottimer (USNM). Paratypes, ♂, 2 ♀, Quezaltepeque, 500 m, 5.vii.1963, 19.vi.1963, D.Q. Cavagnaro & M. E. Irwin (CAS).

**Additional material.** ♂, **Costa Rica:** GUANACASTE, 14 km S of Cañas, 28.vii.1991, F. D. Parker (EMUS). ♂, **Mexico:** VERACRUZ: Puente Nacional, 30.ix.1975, flight trap, J.A. Chemsak (CAS). 4 ♂, 10 ♀, **Nicaragua:** Managua, km 12 Carretera Norte, 6 & 20.viii.1975, R. Mairena & M.J. Somneijer (INHS); ♂, **Panama:** Bayano, Tucumen, 19.xi.1977, M.E. Irwin (INHS).

**Description. Male:** body length: 3.8 – 4.0 mm; wing: 3.4 x 1.3 mm.

**Head:** frons, face, and clypeus dark metallic blue-green, face/ clypeus with orientated silvery pruinosity; ocellar tubercle with pair strong diverging ocellars, with 14–16 pale, white, short hairlike setae posteriad (MSSC); with 3 strong postvertical setae present, in line with postoculars; with 3 setae present on lateral slope of posterior frons (MSSC); strong proclinate vertical present on lateral frons; palp brownish with black apical seta; proboscis yellowish; antenna black; pedicel with white setae, long ventrally, shorter dorsally; first flagellomere subrectangular; arista dorsal; ventral postcranium with white setae.

**Thorax:** metallic blue-green with bronze reflections; setae black; pleura with some grey pruinosity; 6–7 irregularly paired ac; lateral scutellar setae about one-third length of medians.

**Legs:** all coxae metallic green; trochanters I and II yellow, trochanter III dark brown; basal three-quarters of FI and FII, and almost all FIII dark brown with metallic green reflections; distal quarter of FI and FII, knee of FIII, all tibiae and tarsi I and II, and basitarsis III yellow; distal tarsomeres III brown; CI and CII with white, anterolateral setae; CIII with strong, white, lateral seta and some white shorter setae. I: 4.2; 4.2; 2.5/ 1.3/ 0.4/ 0.7/ 0.5; FI with av and pv pale setae in basal three-quarters; TI bare of major setae;  $It_{2-4}$  modified (Fig. 3c):  $It_2$  with 6–7 black ventral spine-like setae;  $It_3$  very short, much shorter than adjacent tarsomere,  $It_4$  with 4 short ventral setae (MSSC). II: 5.0; 5.1; 3.0/ 1.2/ 0.8/ 0.7/ 0.4; FII with rows of white av and pv setae in basal third, av row with longer white setae to 1/2, with longest white seta at 1/2 (=almost one-third length of FII), followed distad by row of 6–8 long black setae decreasing in length from 1/2 to apex (MSSC), with only short white setae in pv row; TII with dorsal seta at 1/4. III: 5.5; 6.4; 2.4/ 2.0/ 1.2/ 0.8/ 0.5; FIII with short white av and pv setae full length; TIII without major setae;  $III_{t_{4-5}}$  flattened and ventrally pad-like (MSSC).

**Wing:** (Fig. 3d) hyaline; vein M with gentle, right-angle curve; CuAx ratio: 0.8; lower calypter yellow, with black rim and fan of long, pale yellow setae (MSSC); halter yellow.

**Abdomen:** tergum 1 covered with short pair hairs, with black marginal setae; terga 2–5 metallic blue-green, with bronze reflections and matt brown areas with metallic reflections at tergal overlap between

segments 2–6; segments 6 and 7 and hypopygium, dark brown; hypopygium (Fig.3a); base of epandrium (normally covered by sternum 8) with whitish, almost translucent cuticle, with dark rim showing track of phallus around epandrium; phallus and hypandrium elongate and narrow, phallus when fully extended arching as shown; epandrial lobe ovate, with setae at 2/5 and 3/4; surstylus with 3 short arms and setae as figured; cercus massive and straight, heavily sclerotised and distally clavate, with strong spinelike setae as figured.

**Female:** similar to male except: wing: 3.5 x 1.3; ocellar tubercle without pale hairs; 2 pairs shorter black setae posteriad; lateral frons with only vertical seta; femora with only short pale ventral setae; tarsi I and III unmodified; lower calypter with black setae.

**Remarks.** *Mesorhaga isthmia* is known mostly from lowland localities from Veracruz, Mexico, to Panama. The specific epithet is from the Greek *isthmus*, and refers to its occurrence on the narrow Mesoamerican isthmus connecting North and South America.

This species is distinctive in having obvious MSSC: white hairs on the ocellar tubercle, long white setae on the lower calypter, ventral spine-like setae on  $It_{2-4}$  (Fig. 3c), and flattened pad-like tarsomeres  $III_{4-5}$ .

### Additional Mesoamerican *Mesorhaga*

#### *Mesorhaga adunca* Van Duzee (Fig. 2a)

*Condylostylus aduncus* Van Duzee 1933: 1.

**Type material.** Van Duzee described this species as *Condylostylus aduncus*, whereas it clearly is *Mesorhaga*, a genus he would have known from his previous work. Robinson (1970) correctly referred this species to *Mesorhaga*. The male holotype (AMNH, examined) was collected in Guatemala: Guatalon, Moca, 1000 m, iii–iv.1931, J. Bequaert.

**Description. Male:** body length: 3.9 mm. wing: 3.8 x 1.6 mm.

**Head:** 3 long postvertical setae present, in line with the postoculars and curving over ocellar tubercle; strong proclinate vertical setae present on lateral frons; vertex, frons, face, and clypeus metallic green, shining, with little pruinosity; antenna black; first flagellomere rounded, subrectangular; arista dorsal, shorter than head height; ventral postcranium with abundant black setae.

**Thorax:** metallic green with bronze reflections; setae black; pleura with some grey pruinosity; 4 offset pairs long ac present; median scutellars about two-thirds length of medians.

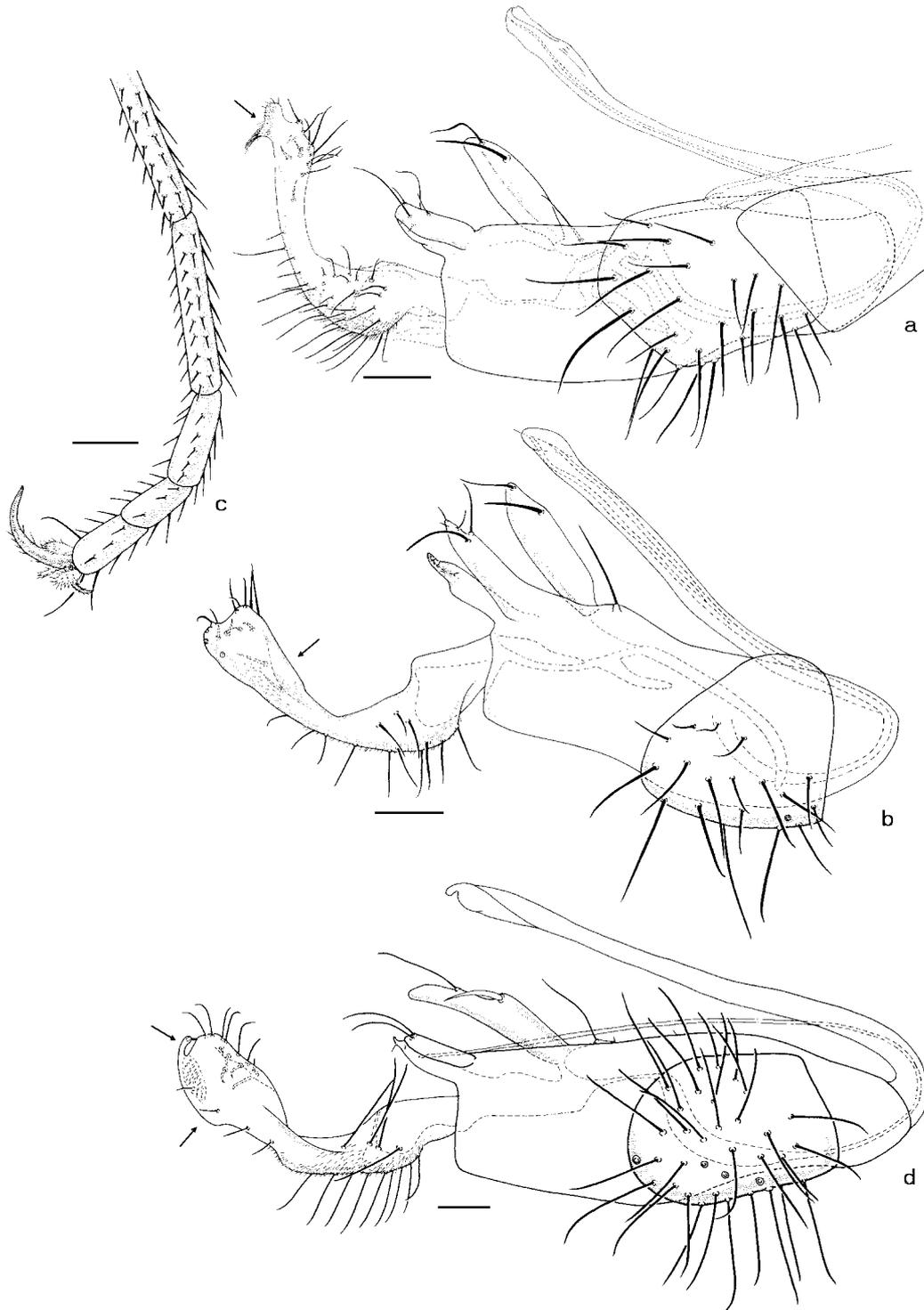
**Legs:** all coxae dark brown; coxa I with some metallic green reflections; trochanters, femora and all leg III, and tarsi I and II brown; tibiae I & II yellowish; CI and CII with black anterior hairs, CIII with black lateral seta; femora with long, dark brownish, ventral and pv hairs along length; tibiae bare of major setae. I: 4.8; 4.3; 2.7/ 1.0/ 0.7/ 0.5/ 0.4. II: 5.8; 6.4; 4.0/ 1.4/ 1.0/ 0.6/ 0.5. III: 6.3; 7.8; 3.1/ 2.1/ 1.1/ 0.7/ 0.5.

**Wing:** membrane hyaline; veins pale brown; anal angle well developed; M with almost right-angle bend halfway between dm-cu crossvein and wing apex; CuAx ratio: 0.7; lower calypter dark brown, with fan of black setae; halter dark brown.

**Abdomen:** terga metallic blue-green, covered with short, dark setae dorsally, with pale setae ventrally and on sterna; with dark, bronze-brown bands present on tergal overlap of segments 2–6; tergum 1 with posterolateral row of long, black setae; hypopygium dark brown (Fig. 2a), epandrial lobes ovate, with setae at 1/2 and apex; cercus curved, with apical tuft of setae on subrectangular projection.

**Female:** unknown.

**Remarks.** *Mesorhaga adunca* is known from the type locality at 1000 m in Guatemala. This species has relatively long legs when compared to its Mesoamerican congeners.



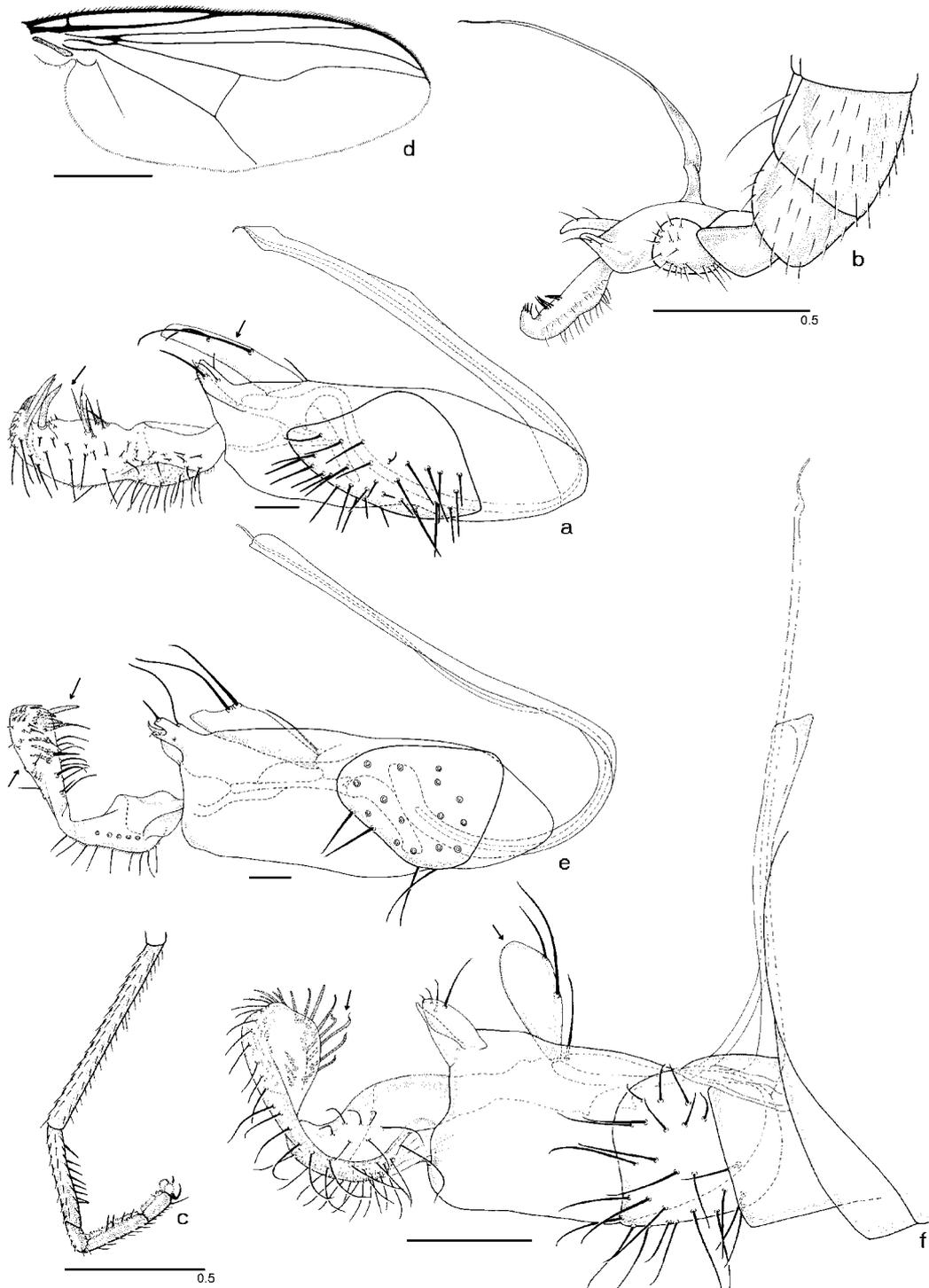
**FIGURE 2.** *Mesorhaga adunca* Van Duzee a. hypopygium, left lateral. *M. falciunguis* n. sp.: b. hypopygium, left lateral; c. male distal tarsus I, posterior. *M. villanuevi* n. sp.: d. hypopygium, left lateral.

***Mesorhaga baadsvicki* n. sp. (Fig. 3e)**

**Type material.** Holotype ♂, paratype ♂, **Costa Rica:** PUNTARENAS: Est. Quebrada, Bonita son R.B. Carara, 50 m, v.1990, R. Zuniga (Holotype, INBio 194500-469850).

**Description. Male:** body length: 3.6 mm; wing 3.3 x 1.1 mm.

*Head:* 4 strong postvertical setae present, in line with the postoculars; weak proclinate vertical present on lateral frons; vertex, frons, face, and clypeus metallic green with bronze reflections; face/ clypeus with some silvery pruinosity; palp dark, metallic green, with pale hairs and black apical seta; proboscis brown; antenna black; pedicel with long dorsal and ventral setae; 1st flagellomere elongate, subtriangular; arista dorsal; ventral postcranium with white setae.



**FIGURE 3.** *Mesorhaga isthmia* n. sp. a hypopygium, left lateral. b. male postabdomen with phallus extended, left lateral; c. male tarsus I, posterior view. d. male wing, dorsal. *M. baadsvicki* n. sp.: e. hypopygium, left lateral. *M. mexicana* n. sp.: f. hypopygium, left lateral.

*Thorax*: metallic green with bronze reflections; pleura with some grey pruinosity; 2 pairs ac near anterior part of thorax; lateral scutellar setae about half length of medians.

*Legs*: all coxae, trochanters, FI and FII almost to apices, and all leg III dark brown; femoral apices, tibiae and basitarsi I and II yellowish; distal tarsomeres I and II dark brown; CI and CII with pale anterior hairs and black anterolateral setae; CIII with black lateral seta and some shorter whitish setae; all femora with av and pv rows of white setae at least to 3/4; I: 3.7; 4.2; 2.0/ 0.7/ 0.5/ 0.4/ 0.5; It<sub>5</sub> with 2 long, strong claws, longer than on other legs (MSSC). II: 4.5; 5.2; 3.0/ 1.2/ 1.0/ 0.4/ 0.4; TII with dorsals at 1/3 and 2/3, ventrals at 2/5, 4/5, and with strong apical ad, av, and pv setae. III: 5.7; 6.4; 2.0/ 2.0/ 0.8/ 0.7/ 0.4; TIII with some slightly stronger dorsal setae, and strong apical ventral seta.

*Wing*: with faint brown wash over wing anteriorly of vein R<sub>4+5</sub>; vein M with right-angle curve at 1/3 between dm-cu crossvein and wing apex; CuAx ratio: 0.6; lower calypter yellow, with black rim and fan of black setae; halter with brownish stalk and yellow club.

*Abdomen*: terga 1–5 metallic green with bronze reflections, covered with short dark setae dorsally; tergum 1 with posterolateral black setae; terga 7–8 black with bronze reflections; hypopygium (Fig. 3e) dark brown; phallus and hypandrium elongate and narrow; epandrial lobe subrectangular, with 2 setae on distal surface and strong seta near base; surstylus with setae as figured; cercus curved and distally clavate, with short, thorn-like setae and long, subapical setae as figured.

**Female**: unknown.

**Remarks.** *Mesorhaga baadsviki* is known only from a lowland locality in Puntarenas, Costa Rica. Males have both claws on leg I greatly enlarged.

The species is named in honor of Dr. Karl Baadsvik, for his outstanding scientific and administrative work as Director of the Norwegian Institute of Nature, his concern for biodiversity conservation, and his support in the consolidation of INBio.

### *Mesorhaga falciunguis* n. sp. (Figs 2b-c)

**Type material.** Holotype ♂, paratype ♀, **Mexico**: MORELOS: 34 miles south of Cuernavaca, 2600 ft, 4.viii.1954, J.G. Chillcott (CNC); paratypes: ♀, 12 miles east of Cuernavaca, 4400 ft, 14.viii.1954, J.G. Chillcott (CNC); 2 ♂, Cuernavaca, 12–19.vii.1961, R.R. Driesbach (CAS); ♂, ♀, 6 miles north of Cuernavaca, 8000 ft., 15.viii.1954, R.R. Driesbach (CAS); 6 ♂, 2 ♀, Cuernavaca, 1.viii.1938, L.J. Lipovsky (CAS).

**Additional material.** **Mexico**: DISTRITO FEDERAL: ♂, Mexico City, 8000 ft., 16.viii.1954, R.R. Driesbach (CAS). MORELOS: ♂, Yecapixtla, 11.vii.1970, J. & M. Sedlacek (BPBM); possible ♀, Amecameca, 8000 ft, 17.viii.1956, R.R. Driesbach (CAS).

**Description. Male**: body length: 3.8–3.9 mm; wing: 3.3 x 1.3 mm.

*Head*: 2 strong postvertical setae present in line with the postoculars; weak proclinate vertical present on lateral frons; vertex, frons, face, and clypeus metallic blue-green, with some silvery pruinosity; clypeus slightly narrowed distally; palp dark brown, with apical seta; proboscis brown; antenna black; pedicel with long ventral seta; 1st flagellomere subrectangular; arista dorsal; 1 postcranium ventrally with pale setae.

*Thorax*: metallic green with bronze reflections; pleura with some grey pruinosity; ac absent, present as single pair long setae anteriorly, or as single pair of anterior setae and 2–3 unpaired setae posteriad; lateral scutellar setae about quarter length of medians.

*Legs*: all coxae, trochanters, FI and FII almost to apices, and all leg III dark brown; femoral apices, tibiae and basitarsi I and II yellowish; distal tarsomeres I and II dark brown; CI and CII with pale anterior hairs and black anterolateral setae; CIII with black lateral seta and some shorter whitish setae; all tibiae bare of major setae, but covered with short, almost erect setae. I: 3.6; 3.4; 3.0/ 0.8/ 0.4/ 0.2/ 0.3; FI with pale ventral setae on basal three-quarters; It<sub>5</sub> with posterior claw (Fig. 2c) greatly enlarged and curved (MSSC). II: 4.6; 5.5; 3.5/

1.5/ 1.0/ 0.7/ 0.5; FII with white av and pv setae. III: 5.5; 6.5; 2.7/ 2.1/ 1.3/ 0.7/ 0.5; FIII with white av and pv setae.

**Wing:** with faint brown wash over wing anterior of vein  $R_{4+5}$ ; M with right-angle curve at 1/3 between dm-cu crossvein and wing apex; CuAx ratio: 0.8; lower calypter yellow, with black rim and fan of black setae; halter black.

**Abdomen:** terga 1–4 metallic blue-green with bronze reflections, covered with short dark setae dorsally and pale setae laterally; tergum 1 with posterolateral black setae; terga 5–6 black, with bronze reflections, expanded and rounded ventrally with abundant black setae; hypopygium (Fig. 2b) dark brown; phallus and hypandrium elongate and narrow; epandrial lobe ovate, with setae at 3/4 and apex, strong seta basally; surstylus with 2 arms and setae as figured; cercus slightly curved and tapering, apically clavate.

**Female:** similar to male except: 4 postvertical setae present; vertical seta strong; ac also with single pair of anterior setae and 4 unpaired almost uniseriate setae posteriad; femora ventrally bare; tibiae also bare of major setae and covered with short, almost erect setae; claws of leg I unmodified; halter yellow.

**Remarks.** *Mesorhaga falciunguis* occurs above 800 m in the Central Plateau of Mexico, from the Federal District to Morelos. Males have a long, sickle-shaped posterior claw on leg I (Fig 2c), hence the specific epithet from the Latin, *falci* for sickle, *unguis* for claw. Also of interest, neither sex has strong setae on the tibiae, unusual for the genus.

A badly damaged series of 3 males [Mexico: west slope of Popocatepetl, 2400–2600 m, 10.vii.1970, J. & M. Sedlacek (BPBM)] is close to *M. falciunguis*, but the male posterior claw on leg I is short. Either these specimens represent a related undescribed species, or *M. falciunguis* shows intraspecific variation in the claw length of leg I.

### ***Mesorhaga mexicana* n. sp. (Fig. 3f)**

**Type material.** Holotype ♂, **Mexico:** MORELOS, Cuernavaca, 15.viii.1954, R.R. Driesbach (CAS).

**Description. Male:** body length: 3.4 mm; wing: 3.0 x 1.4 mm.

**Head:** 2–3 strong postvertical setae present, in line with the postoculars; strong proclinate vertical present on lateral frons; vertex, frons, face, and clypeus metallic blue-green, covered with silvery pruinosity; clypeus narrowed distally and adjacent to margins of eyes; palp and proboscis brown; scape and pedicel black (first flagellomere missing); ventral postcranium with abundant white setae.

**Thorax:** metallic green with bronze reflections; setae black; pleura with some grey pruinosity; ac as 4 offset pairs of setae; lateral scutellar setae about quarter length of medians.

**Legs:** coxae, trochanters and femora, and leg III dark brown; tibiae and basitarsi I and II yellow, with their distal tarsomere brown; CI and CII with whitish anterior hairs, CIII with white lateral seta; femora with av and pv rows of white ventral setae. I: 3.6; 3.6; 2.0/ 0.7/ 0.5/ 0.3/ 0.3. II: 4.4; 4.6; 3.0/ 1.2/ 0.8/ 0.5/ 0.3. III: 5.0; 5.7; 2.2/ 1.9/ 1.0/ 0.7/ 0.5; TIII with short dorsal setae.

**Wing:** unusually broad, almost half as wide as long; M with gentle curve at 1/2 between m-cu crossvein and wing apex; CuAx ratio: 0.8; lower calypter pale yellow, with black rim and fan of black setae; halter stalk brown, club black.

**Abdomen:** metallic blue-green with bronze reflections, covered with short, dark setae dorsally and pale setae ventrally; with dark, bronze-brown bands present on tergal overlap of segments 2–6; tergum 1 with posterolateral row of long black setae; hypopygium (Fig. 3f) dark brown; hypandrium expanded apically to form hood; phallus elongate and narrow; epandrial lobe ovate, with setae at 1/2 and 3/4, with strong basal seta; surstylus rather short, with setae as figured; cercus thick basally, curved and greatly expanded apically, clavate, with groups of elongate subapical setae as figured.

**Female:** unknown.

**Remarks.** *Mesorhaga mexicana* is known only from the type locality in Morelos, Mexico. The wing on this species is wider than usual, the width being almost half the wing length, while in most *Mesorhaga* species, the wing width is about one third of the wing length.

***Mesorhaga minatitlan* n. sp.** (Fig 4a)

**Type material.** Holotype ♂, **Mexico:** VERACRUZ: Minatitlan, 26.viii–1.ix.1961, R. & K. Driesbach (CAS).

**Description. Male:** body length: 3.5 mm; wing: 3.7 x 1.3 mm.

**Head:** 2–3 strong postvertical setae present, in line with the postoculars; proclinate vertical seta on lateral frons; vertex, frons, face, and clypeus metallic blue-green, covered with silvery pruinosity; clypeus narrowed distally and adjacent to margins of eyes; palp and proboscis dark brown-yellowish; antenna black; 1<sup>st</sup> flagellomere subrectangular; arista dorsal, about as long as head height; ventral postcranium with abundant black setae.

**Thorax:** metallic green with bronze reflections; setae black; pleura with some grey pruinosity; ac present as single, irregular row of 5 setae, anteriormost paired, with single row of 3 posterior setae; lateral scutellar setae about 1/4 length of medians.

**Legs:** all coxae and trochanters brown; FI yellow, FII and FIII brown; tibiae and basal tarsomeres yellow, distal tarsomeres brown; CI and CII with black anterior hairs, CIII with black lateral seta; I: 3.6; 3.6; 1.9/ 0.8/ 0.5/ 0.4/ 0.4; It<sub>5</sub> slightly wider than t<sub>5</sub> on legs II and III. II: 4.2; 4.8; 3.0/ 1.2/ 0.8/ 0.5/ 0.4. III: 5.0; 6.0; 2.3/ 1.8/ 1.2/ 0.6/ 0.4; TIII with some short, dorsal setae.

**Wing:** hyaline; M with distinct curve at 1/2 between m-cu crossvein and wing apex; CuAx ratio: 0.9; lower calypter brown, with black rim and fan of black setae; halter black.

**Abdomen:** metallic blue-green with bronze reflections and covered with short dark setae dorsally and pale setae ventrally; dark bronze-brown bands present on tergal overlap of segments 2–6; tergum 1 with posterolateral row of long black setae (MSSC); hypopygium (Fig.4a) dark brown; phallus and hypandrium elongate and narrow; epandrial lobes ovate, with setae near apex, and strong seta near base; surstylus with 3 arms and setae as figured; cercus curved and distally expanded, with group of strong distal setae.

**Female:** unknown.

**Remarks.** *Mesorhaga minatitlan* is known only from the type locality in lowland Veracruz, Mexico. It is close to the Costa Rican *M. villanuevi* in hypopygial structure and venation.

***Mesorhaga nayaritensis* n. sp.** (Fig. 4b)

**Type material.** Holotype ♂, **Mexico:** NAYARIT, Acaponeta, 15.viii.1960, P.H. Arnaud, E.S. Ross, & D.C. Rentz (CAS).

**Description. Male:** body length: 3.6 mm; wing: 3.0 x 1.2 mm.

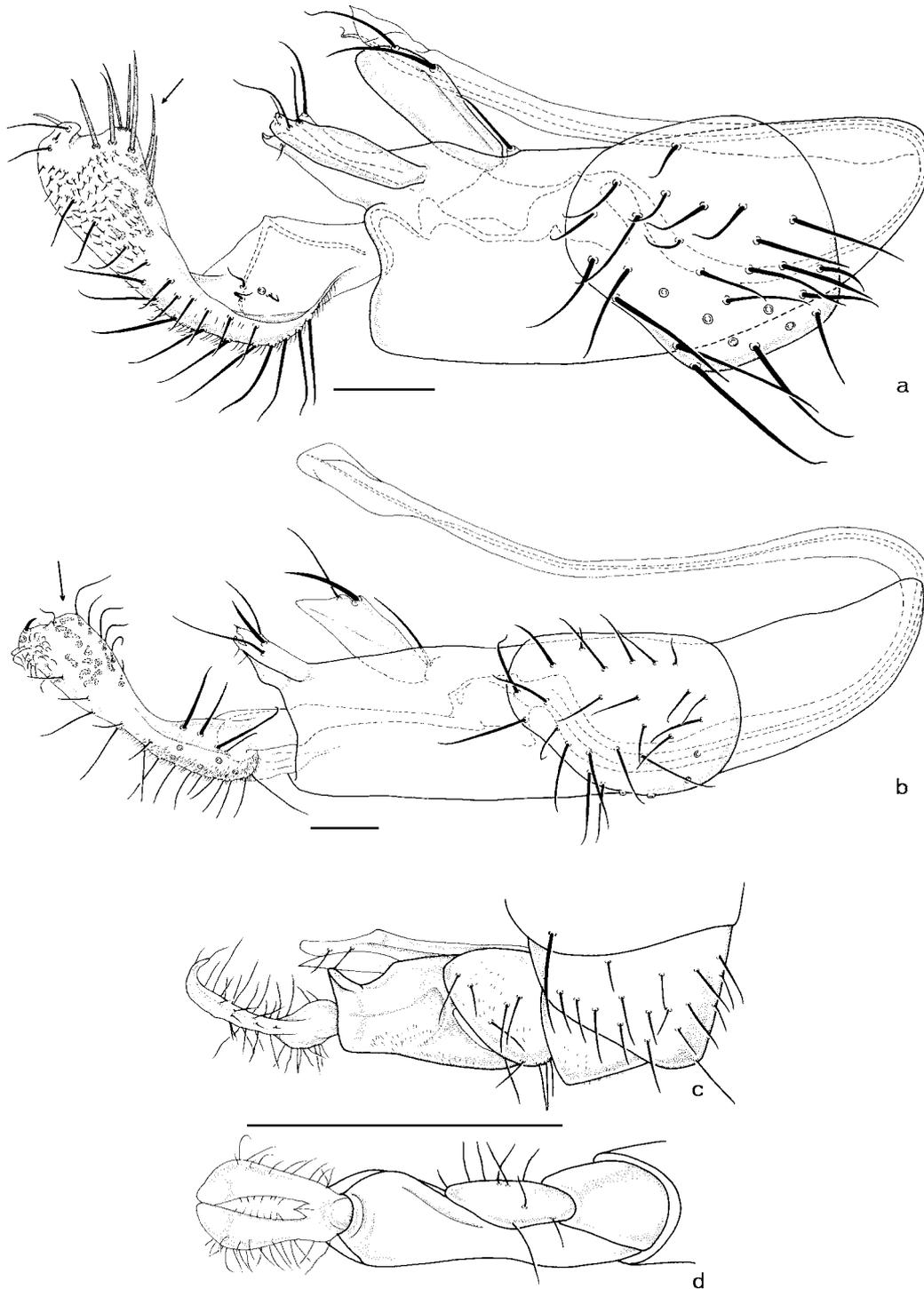
**Head:** 2–3 strong postvertical setae present, in line with postoculars; strong proclinate vertical present on lateral frons; vertex, frons, face, and clypeus metallic bronze, covered with silvery pruinosity; clypeus narrowed distally and adjacent to margins of eyes; palp brown with black seta; proboscis yellow; antenna black; 1<sup>st</sup> flagellomere subcircular with dorsoapical arista; ventral postcranium with abundant pale setae.

**Thorax:** metallic green with bronze reflections; pleura with some grey pruinosity; ac as two irregular pairs of long setae; lateral scutellar setae about one quarter length of medians.

**Legs:** all coxae brown with metallic green reflections; trochanters brown; all femora and tibiae, and basitarsi I and II yellow; distal tarsomeres I and II and all tarsus III brown; CI and CII with whitish anterior and black distolateral hairs; CIII with some whitish lateral hairs and black lateral seta; femora with pale ventral

hairs. I: 3.3; 3.2; 1.6/ 0.7/ 0.4/ 0.3/ 0.3. II: 3.8; 4.3; 2.7/ 1.0/ 0.8/ 0.6/ 0.4; TII with only short setae. III: 5.3; 5.9; 1.9/ 1.5/ 0.9/ 0.6/ 0.3; TIII with some short dorsal setae.

*Wing*: hyaline; M with gentle curve at 1/2 between m-cu crossvein and wing apex; CuAx ratio: 0.7; lower calypter pale yellow, with black rim and fan of black setae; halter yellow.



**FIGURE 4.** *Mesorhaga minatitlan* n. sp.: a. hypopygium, left lateral. *M. nayaritensis* n. sp.: b. hypopygium, left lateral. *M. caudata* Van Duzee: c. male postabdomen, left lateral; d. male postabdomen, dorsal.

*Abdomen*: metallic green with bronze reflections, covered with short dark setae dorsally and pale setae laterally; dark, bronze-brown bands on tergal overlap of segments 2–6; hypopygium (Fig. 4b) dark brown; hypandrium with apical hood slightly expanded; epantrial lobe subrectangular, with 2 setae on distal surface and strong seta near base; surstylus with setae as figured; cercus only slightly curved, distally clavate, with short medial thorn-like setae and some long subapical setae.

**Female**: unknown.

**Remarks**. *Mesorhaga nayaritensis* is known only from its lowland type locality in Nayarit, Mexico.

### *Mesorhaga villanuevi* n. sp. (Fig. 2d)

**Type material**. Holotype, ♂, **Costa Rica**: GUANACASTE, P.N. Guanacaste, Est. Pitilla, 9 km S of Santa Cecilia, 700 m, L N 330200 380200, v.1995, L.P. Rios (INBIO); paratypes, 2 ♂, same, but vi.1994 and viii.1994 (INBIO).

**Additional material**. **Costa Rica**: ♂, PUNTARENAS, P.N. Manuel Antonio, Quepos, 80 m, v.1991, R. Zuñiga, (INBIO); LIMON, ♂, Sur de Iriquois, 300 m, 23.v.1987, P. Hanson (INBIO). ALUJUELA, ♂, San Mateo, Higuito, P. Schild (USNM).

**Description**. **Male**: body length: 3.4 – 3.6 mm; wing: 3.3 x 1.3 mm.

*Head*: 2–3 strong postvertical setae present, in line with the postoculars; proclinate vertical present on lateral frons; vertex, frons, face, and clypeus metallic blue-green; palp and proboscis dark brown; antenna black; 1<sup>st</sup> flagellomere subrectangular; arista dorsal, about as long as head height; postcranium with abundant pale white setae ventrally.

*Thorax*: metallic green with bronze reflections; setae black; pleura with some grey pruinosity; ac present as irregular row of 5–7 setae; lateral scutellar setae about one quarter length of medians.

*Legs*: all coxae and trochanters black; femora black with yellow knees; tibiae and basitarsi I and II yellow; distal tarsomeres I and II and all tarsus III dark brown; CI and CII with black anterior hairs, CIII with black lateral seta; femora with long whitish ventral setae. I: 4.0; 4.0; 2.7/ 1.0/ 0.5/ 0.4/ 0.4; basitarsus I unusually long, longer than four distal tarsomeres combined. II: 4.6; 5.2; 3.3/ 1.2/ 1.0/ 0.4/ 0.4; TII with offset ad-pd setal pair at 1/5, ad at 2/3, and 2 short ventral setae. III: 5.5; 6.2; 2.5/ 2.1/ 1.5/ 0.7/ 0.6; TIII with some short dorsal setae.

*Wing*: hyaline; M with strong bend almost at 1/2 between m-cu crossvein and wing apex; CuAx ratio: 0.9; lower calypter pale yellow, with black rim and fan of black setae; halter with yellowish stalk and pale yellow club.

*Abdomen*: metallic blue-green with bronze reflections, covered with short dark setae dorsally and pale setae ventrally; dark bronze-brown bands on tergal overlap of segments 2–5; tergum 1 with posterolateral long, black setae; terga 6–8 black; hypopygium (Fig. 2d) dark brown; phallus and hypandrium elongate; epantrial lobes elongate with subapical seta, strong curved seta at midlength; surstylus with setae as figured; cercus curved and distally expanded, clavate, group of distal setae, and outer subapical notch.

**Female**: unknown.

**Remarks**. *Mesorhaga villanuevi* is known from lower elevations (coast to 700 m), on both the Pacific and Caribbean slopes of Costa Rica.

*Mesorhaga villanuevi* is named in honor of Dr. Julio Rodríguez Villanueva for his exceptional career in teaching, research, and academic administration, which has contributed remarkably to Spanish scientific progress, and for his support of INBio's mission in both Spain and Costa Rica.

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