



## Review of *Paraclius arcuatus* species-group (Diptera, Dolichopodidae) with description of two new species

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### Abstract

The *Paraclius arcuatus* species-group is reviewed and includes the following seven species: *P. angusticauda* Van Duzee, 1933, *P. angustipennis* Van Duzee, 1929, *P. arcuatus* (Loew, 1861), *P. brooksi* **sp. nov.**, *P. elongatus* Van Duzee, 1930, *P. pumilio* Loew, 1872, and *P. xibun* **sp. nov.** *Paraclius angustipennis*, *P. arcuatus* and *P. pumilio* are redescribed based on photographs of types and additional specimens. *Paraclius femoratus* Aldrich, 1901 is synonymized with *P. arcuatus*, **syn. nov.** and *Paraclius magnicornis* Van Duzee, 1927 is regarded as a junior synonym of *P. pumilio*, **syn. nov.** An identification key, distribution maps and high-resolution photographs of species are provided. In addition, the systematic position of *Paraclius* is discussed.

**Key words:** Dolichopodinae, long-legged flies, new species, new synonyms, Neotropical Region, Nearctic Region

### Introduction

*Paraclius* Loew, 1864 is a relatively large genus in the subfamily Dolichopodinae (Diptera, Dolichopodidae), with over 150 described species distributed in all zoogeographical regions (Yang *et al.* 2006), except the Afrotropics. Afrotropical species of both *Paraclius* and *Pelastoneurus* Loew, 1861 have been moved to different genera on the basis of not being part of the lineages represented by the generic types (Grichanov 2006), *Paraclius arcuatus* (Loew, 1861) and *Pelastoneurus vagans* Loew, 1861. In the Neotropics, there are 71 described species of *Paraclius* (Robinson 1970, 1975; Bickel & Sinclair 1997; Capellari & Amorim 2009; Brooks *et al.* 2010; Capellari 2013; Soares *et al.* 2023a, b; this work), but just two of them were ascribed to the *Paraclius arcuatus* species-group by Brooks (2005), namely *P. arcuatus* and *P. pumilio* Loew, along with one apparently undescribed species (“*Paraclius* sp. 1”). The genus itself was recovered as a polyphyletic holding taxon by Brooks (2005), and is keyed out alternatively several times in different couplets in his identification key. In a strict sense (*i.e.*, the lineage that includes *P. arcuatus*), the genus can be recognized by the following combination of characters: face of male very narrow and strongly converging below; distal section of M beyond crossvein dm-m with strong, arcuate anterior bend beyond middle; hind femur wide and flat with anterior preapical seta near apex, hypopygium with elongate anterior apicoventral epandrial seta and distinctive elongate ventral surstylus, cercus lacking basolateral tail (Brooks 2005).

To date, several species-groups of *Paraclius* can be recognized in the Neotropical Region (Brooks 2005; Soares *et al.* 2023a, b), and a decision similar to that of Grichanov (2006) may be necessary to accommodate species outside the *arcuatus* lineage, with the establishment of new genera. In this context and trying to offer the basis for

taxonomic decisions in a meaningful phylogenetic background, we here review the *Paraclius arcuatus* species-group, redescribing the two known species, describing two new ones, proposing two new synonyms and adding three previously described species to the species group. An identification key to males of all species in the group is also provided.

## Material and methods

The specimens (or photographs of them) examined in this study belong to the following institutions: American Museum of Natural History, New York, USA (AMNH); California Academy of Sciences, San Francisco, USA (CAS); Canadian National Collection of Insects, Arachnids & Nematodes, Ottawa, Canada (CNC); Instituto Nacional de Pesquisas da Amazônia, Manaus, Brazil (INPA); Museum of Comparative Zoology, Cambridge, USA (MCZ); Montana Entomology Collection, Montana State University, Bozeman, USA (MTEC).

Terminology follows mainly Cumming & Wood (2017). Specimens were identified at the generic level with the aid of the keys present in the works of Brooks (2005) and Bickel (2009). The following abbreviations and terms are used: I, II, III: pro-, meso-, metathoracic legs; MSSC: male secondary sexual character(s) (some features are considered MSSCs on the basis of comparison with other species in the genus, even when females are unknown at present);  $t_{1-5}$ : tarsomeres 1 to 5. Body length was measured from the insertion of the antenna to the tip of segment 5 in females and to the tip of segment 6 in males. Wing length was measured from the base to the apex of the wing, both given as ranges. Length of crossvein dm-m/last part of  $M_4 = CuAx$  ratio. Measurements of the leg segments are representative ratios and given according to the following formula: trochanter+femur, tibia, tarsomeres 1/2/3/4/5. The position of setae on legs is given as a fraction of the total leg segment length, starting from the base. The coloration of setae is black if not otherwise indicated.

Abdomen and terminalia were removed, treated with hot 85% lactic acid, dismembered with the aid of entomological stylets, and placed in a microvial with glycerine after examination. Wings were mounted between cover slides with Euparal and glued by one side to a small piece of cardboard. Microvials and cover slides were pinned together with their respective specimens. Label data for the primary types are cited verbatim in quotation marks (each line separated by a vertical line “|” and each label by semicolon “;”), with annotations in square brackets. External morphology photographs were taken with a Leica MC170 HD digital camera attached to a Leica M165C stereomicroscope. Genitalia photographs were taken with a Leica DFC295 digital camera attached to a Leica M205C stereomicroscope. The multiple images were stacked and combined using Leica Application Suite V4.11. The species distribution maps were created with SimpleMappr (Shorthouse 2010) using coordinates from the specimen labels and published catalogues by Robinson (1970), Pollet *et al.* (2004) and Yang *et al.* (2006).

## Taxonomic account

### *Paraclius* Loew, 1864

*Paraclius* Loew, 1864: 97. Type species: *Pelastoneurus arcuatus* Loew, 1861 (subsequent designation by Coquillett, 1910: 583).

*Leptocorypha* Aldrich, 1896: 315. Type species: *Leptocorypha pavo* Aldrich, 1896 (monotypy). Synonymized by Robinson (1970: 47).

### The *arcuatus*-group of *Paraclius*

**Diagnosis (males).** **Head.** Face gradually narrowing below (funnel-shaped), the narrowest point slightly wider than the mid ocellus (*e.g.* Figs 1D, 2C, 7E). Clypeus short, about 1/4 as long as face (*e.g.* Figs 1D, 2C, 8C, 11C). Palpus oval, short, with 1 strong apical seta, shorter than palpus (absent in *P. xibun* **sp. nov.**). Antenna dark brown to black; postpedicel suboval, subtriangular or subrectangular; arista-like stylus two-segmented, shorter than eye height, first segment usually arched, second segment long, about 2–3X longer than first segment and with dense and short microtrichia (*e.g.* Figs 1E, 2E, 8E). **Thorax.** Mesonotum with 5 pairs of strong dorsocentral setae; acrostichals

short, biseriate, ending at level of the fourth posterior dorsocentral seta (e.g. Figs 8B, 11B). **Wing.** Long and narrow; anal lobe barely developed; vein  $M_1$  strongly bowed towards  $R_{4+5}$ , weakly to strongly concave posteriorly; vein  $M_1$  ending before distal portion of wing apex; vein  $M_4$  longer than dm-m (e.g. Figs 1I, 2F, 8F). **Legs.** Legs unmodified, only ventral surface of tarsus I covered with weak whitish pile (e.g., *P. arcuatus*). Femur I with anteroventral row of short setae increasing in length at apex; femur II with anteroventral row of setae, ending in 2–3 more conspicuous setae and with 1 strong anterior preapical seta at 5/6; femur III laterally compressed, with anteroventral and dorsal rows of setae, anteroventral row increasing in length towards apex, and 1 strong anterior preapical seta at 5/6. **Abdomen.** Tergites 1–5 setose, tergite 6 either with short or long and strong lateral setae (e.g. Figs 1H, 8D, 9F, 11E) (bare in *P. arcuatus* (Fig. 2D)), segment 7 forming a long (usually as long as hypopygium) and well sclerotized peduncle; sternite 6 plate-like, weakly connected posteriorly to tergite 6 (e.g. Figs 3A, 9A, 12A). Hypopygium: Epandrium narrow, about 2.5–3X longer than high, with lateral ridge forming an acute apicoventral projection. Apicoventral epandrial lobe not developed, but recognizable by two apicoventral epandrial setae (e.g. Figs 3G, 9E, 12D); basal apicoventral epandrial seta usually longer than ventral lobe of surstylus. Ventral lobe of surstylus somewhat digitiform or L-shaped, weakly to strongly curved ventrally, with 1 stout modified apical seta (e.g. Figs 9C, 12D, 16D). Dorsal lobe of surstylus shorter than ventral lobe and weakly sclerotized, usually with strong setae at ventral and/or apical edges (e.g. Figs 3F, 9J, K, 12D). Phallus divided into two narrow and strong sclerotized arms, coated with a thin membrane, with small bumps or spinules at base of exposed part, apical part with dentiform or rounded processes (e.g. Figs 3D, 12F, 16E, 20E) (with fringe of spines in *P. angustipennis* Van Duzee (Fig. 9C, D)). Hypandrium as long as exposed part of phallus, strongly sclerotized, trough-shaped, with weak connection to epandrium basally, free laterally, apex bifurcate and weakly sclerotized (e.g. Figs 3E, 9I, 16G) (apex strongly sclerotized in *P. xibun* **sp. nov.** (Fig. 20F)), somewhat arrow-shaped, lateral margin usually with dentiform preapical processes, base of hypandrium projecting up inside epandrial capsule, cradling the phallus. Sperm pump short, well sclerotized, somewhat kidney-shaped, pipe-shaped or C-shaped, about 1/2 to 1/3 as long as ejaculatory apodeme (e.g. Figs 3D, 9C, 12E). Ejaculatory apodeme usually strongly sclerotized (weakly sclerotized in *P. brooksi* **sp. nov.** (Fig. 12E)), long and narrow, about 1/2 as long as epandrium and slightly widening apically (e.g. Figs 3D, 9C, 16E). Proctiger weakly sclerotized, dorsoventrally flattened (e.g. Figs 12E, 16E) (modified in an undivided proctiger brush in *P. arcuatus* (Fig. 3D)). Cercus short, suboval or drop-shaped, about 1/3 to 1/2 as long as epandrium, lacking basolateral tail (e.g. Figs 2D, 9G, 12B). **Females.** Similar to male in habitus and chaetotaxy, differing mainly by the face and clypeus wider (both wider than ocellar tubercle), with eyes almost parallel sided and the short postpedicel, about as long as wide (e.g. Figs 4B, C, 10B, C, 13B, C).

**Included species.** *P. arcuatus* (Loew, 1861), *P. pumilio* Loew, 1872 and the following newly ascribed species: *Paraclius angusticauda* Van Duzee, 1933, *P. angustipennis* Van Duzee, 1929, *P. brooksi* **sp. nov.**, *P. elongatus* Van Duzee, 1930, and *P. xibun* **sp. nov.**

**Remarks.** Brooks (2005) was the first to mention the *Paraclius arcuatus* species-group (*Paraclius sensu stricto*) composed of the following species: *Paraclius arcuatus*, *P. pumilio* and “*Paraclius* sp. 1”. However, after gathering information from descriptions, photos of types and identified material of nearly all New World *Paraclius* we found additional species that fit this group. The *Paraclius arcuatus* species-group is a small lineage whose monophyly is supported by the characters discussed below (see Discussion section), mainly by the male face narrowing below, clypeus short, about 1/4 as long as face, the absence of a developed apicoventral epandrial lobe, the acute apical ridge of epandrium and the trough-shaped hypandrium.

**Distribution.** The group is mostly restricted to Central and North America, with some species reaching the Caribbean Islands. The distribution range is from Northern USA to Costa Rica in Central America and the Caribbean islands of Cuba, Jamaica, Grenada, and Saint Vincent and the Grenadines, not reaching mainland South America (Figs 22, 23).

### Key to species of the *arcuatus*-group of *Paraclius* (males)

- 1 Antenna wholly dark brown to black (e.g. Figs 1E, 2E, 8E); face gradually narrowing below (funnel-shaped), narrowest point slightly wider than mid ocellus (e.g. Figs 1D, 2C, 7E); clypeus short, about 1/4 as long as face (e.g. Figs 1D, 2C, 8C, 11C); anal lobe barely developed (e.g. Figs 2F, 11F, 8F); tergite 6 either with short or long and strong lateral setae (e.g. Figs 1H, 8D, 9F, 11E); apicoventral epandrial lobe not developed (e.g. Figs 3G, 9E, 12D). . . . . *arcuatus*-group of *Paraclius* 2
- Antenna usually orangish-yellow, with only apical 1/2 to apical 1/3 of postpedicel brown to dark brown; face various, distinctly

- wider than mid ocellus at narrowest point; clypeus usually 1/2 to 1/3 as long as face; anal lobe normally developed; tergite 6 bare; apicoventral epandrial developed . . . . . other *Paraclius* groups
- 2 Postpedicel subrectangular, pointed dorsally at apex (Figs 1E, 2E, 11D); femur I wholly yellow (Figs 1A, 2A, 6A, 11A); CuAx ratio: 0.6 or greater (Figs 1I, 2F, 11F) . . . . . **3**
- Postpedicel various, not pointed dorsally at apex (Figs 8E, 15D, F, 19F); femur I mostly brown to dark brown (e.g., Figs 7A, 8A, 14A); CuAx ratio: 0.3–0.5 (e.g., Figs 7A, 8F, 15E) . . . . . **5**
- 3 Scutellum with 1 pair of short apical setae (Fig. 6C); femur II yellow with apical 1/3 to 1/2 brown to dark brown (Figs 2A, 4A, 6A); male tergite 6 bare (Fig. 2D) . . . . . *P. arcuatus* (Loew) [Widespread in Central America, Cuba and Jamaica]
- Scutellum without pair of apical short setae (Figs 1B, 11B); femur II yellow (Figs 1A, 11A); lateral margins of male tergite 6 with strong setae (Figs 1H, 11E) . . . . . **4**
- 4 Wing wholly brownish (Fig. 11F); basal apicoventral epandrial seta about 2X longer than apical seta, and both shorter than ventral lobe of surstylus (Fig. 12C, D) . . . . . *P. brooksi* **sp. nov.** [Mexico (Chiapas and Oaxaca) and Grenada]
- Wing wholly grayish (Fig. 1I); basal apicoventral epandrial seta as long as apical seta, and both longer than ventral lobe of surstylus (Fig. 1G) . . . . .
- . . . . . *P. angusticauda* Van Duzee, 1933 [Guatemala]; *P. elongatus* Van Duzee, 1930 [Saint Vincent and the Grenadines]
- 5 IIt<sub>1</sub> wholly dark brown (Figs 7A, 8A); phallus with fringe of spines at apical 1/2, not reaching the apex of phallus (Fig. 9B–D); ventral lobe of surstylus short, gently curved ventrally, about 1/3 as long as basal apicoventral epandrial seta (Fig. 9B, C, H) . . . . . *P. angustipennis* Van Duzee, 1929 [Guatemala and Mexico]
- IIt<sub>1</sub> yellow on basal 1/2 and brownish on apical 1/2 (Fig. 19A); phallus plain, lacking spines (Figs 16E, 20E); ventral lobe of surstylus long, gently to strongly curved ventrally, about 1/2 as long or slightly shorter than basal apicoventral epandrial seta (Figs 16C–E, 20D) . . . . . **6**
- 6 Tergite 6 with row of 3–4 strong lateral setae increasing in length towards posterior margin (Fig. 16I); sternite 5 U-shaped anteriorly (Fig. 16A); ventral lobe of surstylus strongly curved ventrally (Fig. 16C–E); dorsal lobe of surstylus weakly sclerotized, short, subrectangular, with 1 slender apicoventral seta, as long as dorsal lobe of surstylus, and 2 strong setae, 1 at apical margin and 1 subapical at dorsal edge (Fig. 16F) . . . . . *P. pumilio* Loew [Widespread in Mexico and USA]
- Tergite 6 with two rows of 7–8 short lateral setae (Fig. 19E); sternite 5 divided in two narrow hemitergites anteriorly (Fig. 20A); ventral lobe of surstylus gently curved ventrally (Fig. 20C, D); dorsal lobe of surstylus suboval, with dorsal row of short setae at basal 1/2, ending in 1 strong seta at middle and with 1 strong seta at apex (Fig. 20D) . . . . . *P. xibun* **sp. nov.** [Belize]

### *Paraclius angusticauda* Van Duzee

(Figs 1, 23)

*Paraclius angusticauda* Van Duzee, 1933: 23, figs 47–48. Type locality: Mocá, Guatálon, Guatemala.

**Diagnosis (males).** Postpedicel subrectangular, pointed dorsally at apex (Fig. 1E). Legs mostly yellow, except extreme base of coxa I, basal 2/3 of coxa II, basal 1/2 of coxa III, apex of dorsal surface of femur II, apical 1/4 to 1/3 of femur III, tarsi I and II from apical 1/2 of tarsomere 1, apex of tibia III and all of tarsus III brown to dark brown (Fig. 1A). Wing wholly grayish; vein M<sub>1</sub> strongly bowed towards R<sub>4+5</sub>, weakly concave posteriorly; CuAx ratio: 0.6 (Fig. 1A, I). Male tergite 6 with 3–4 strong lateral setae (Fig. 1H). Basal apicoventral epandrial seta as long as apical seta, and both longer than ventral lobe of surstylus (Fig. 1G, F). Cercus oval, brownish, yellow at base, about 1/3 as long as epandrium (Fig. 1F).

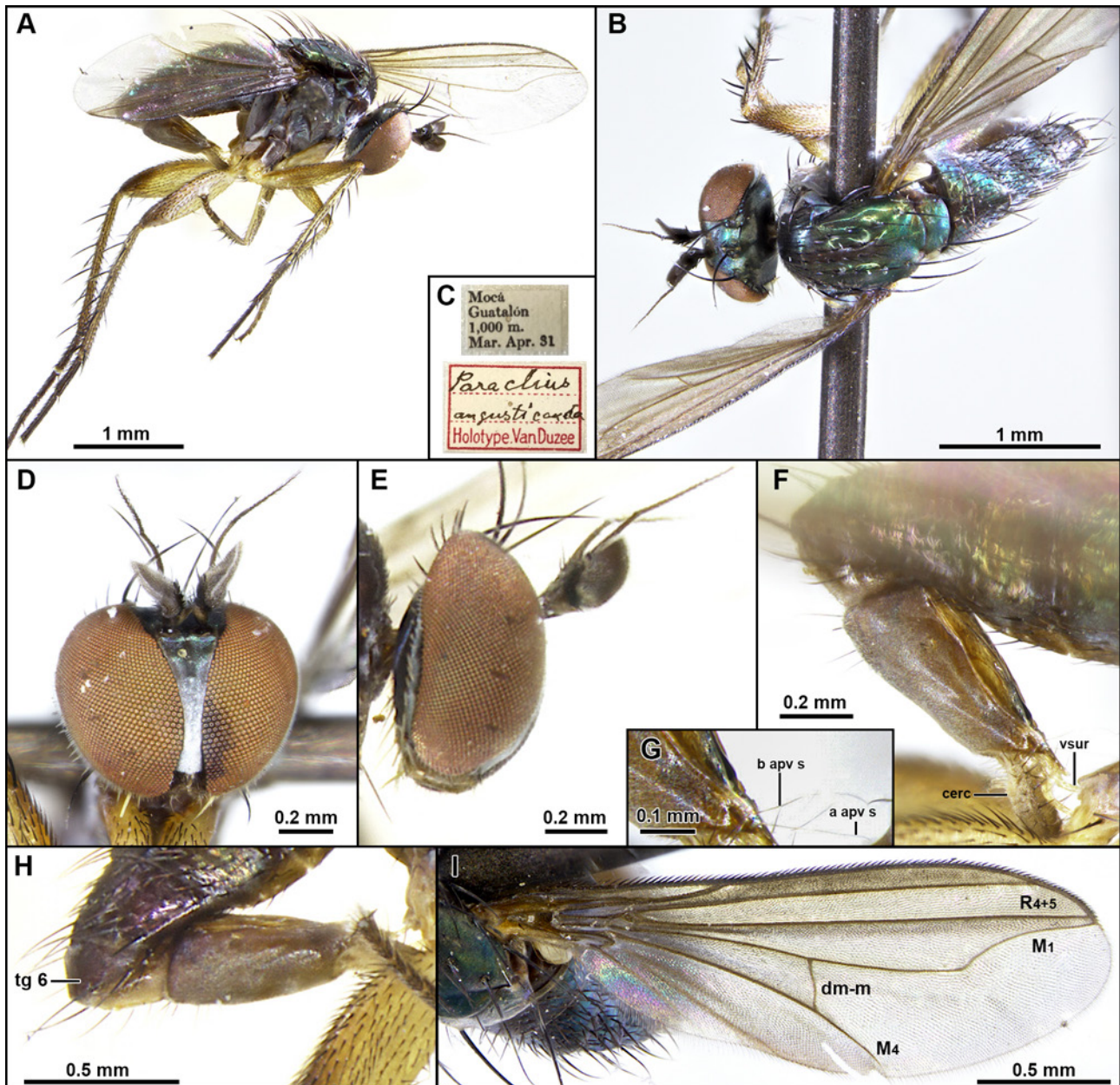
**Type material examined.** HOLOTYPE ♂ (based on photographs) (Fig. 1) labelled as: “[GUATEMALA, ca 14°27'00.3"N 91°23'48.1"W], Mocá | Guatálon | 1,000 m. | Mar. Apr. 31”; “*Paraclius* | *angusticauda* [handwritten] | Holotype Van Duzee” (AMNH). Holotype condition: good, not dissected, right IIt<sub>4,5</sub> and right IIIIt<sub>3,5</sub> broken off.

**Remarks.** *Paraclius angusticauda* is remarkably similar to *P. brooksi* **sp. nov.** and *P. elongatus* by the scutellum lacking apical pair of short setae, femur I wholly yellow and male tergite 6 with strong setae. Nevertheless, it can be differentiated from *P. brooksi* **sp. nov.** by the wing wholly grayish (Fig. 1H) and basal apicoventral epandrial seta as long as apical seta, and both setae longer than ventral lobe of surstylus (Fig. 1G) (wing mostly brown (Fig. 11F), and basal apicoventral epandrial seta about 2X longer than apical seta, and both shorter than ventral lobe of surstylus (Fig. 12A, D) in *P. brooksi* **sp. nov.**). Van Duzee (1933) noted the similarity of *P. angusticauda* with *P. elongatus*, which he described a few years earlier (Van Duzee 1930), and separated the two species mainly by the color of legs and the length of IIIIt<sub>1,2</sub>, e.g.: coxa and tibia III mostly yellow and length of IIIIt<sub>1,2</sub>: 27/15 in *P. elongatus* versus coxa and tibia III mostly brownish and length of IIIIt<sub>1,2</sub>: 27/33 in *P. angusticauda*. However, Van Duzee (1933: 24) also noted that the hind tarsus could be broken in the male holotype of *P. elongatus* and the lengths of the basal tarsomeres may have been misinterpreted in his original description of that species: “It is possible that the third segment in *elongatus* was broken off, as the length of only two segments was given, but the second segment of the hind tarsi is sometimes much longer than the first in this genus, often very nearly equal, but usually the second



segment is much the longer". Examination of available photographs of the male holotype of *P. angusticauda* shows a yellow tibia III (Fig. 1A) and it's probable that *P. angusticauda* is a synonym of *P. elongatus*. However, we were unable to locate the holotype of *P. elongatus*.

**Distribution.** *Paraclius angusticauda* is recorded only from the type locality in Guatemala (Fig. 23).



**FIGURE 1.** *Paraclius angusticauda* Van Duzee, 1933, male holotype (AMNH). **A–B.** Habitus, lateral and dorsal views, respectively; **C.** Labels; **D–E.** Head, anterior and lateral views, respectively; **F–H.** Hypopygium, lateral view; **I.** Right wing. Abbreviations: a apv s = apical apicoventral epandrial seta; b apv s = basal apicoventral epandrial seta; cerc = cercus; dm-m = discal medial crossvein; M<sub>1</sub> = first branch of media; M<sub>4</sub> = fourth branch of media; R<sub>4+5</sub> = third branch of radius. Images originally lacked scale bars. Photographs by Agnieszka Pierwola, AMNH.

### *Paraclius arcuatus* (Loew)

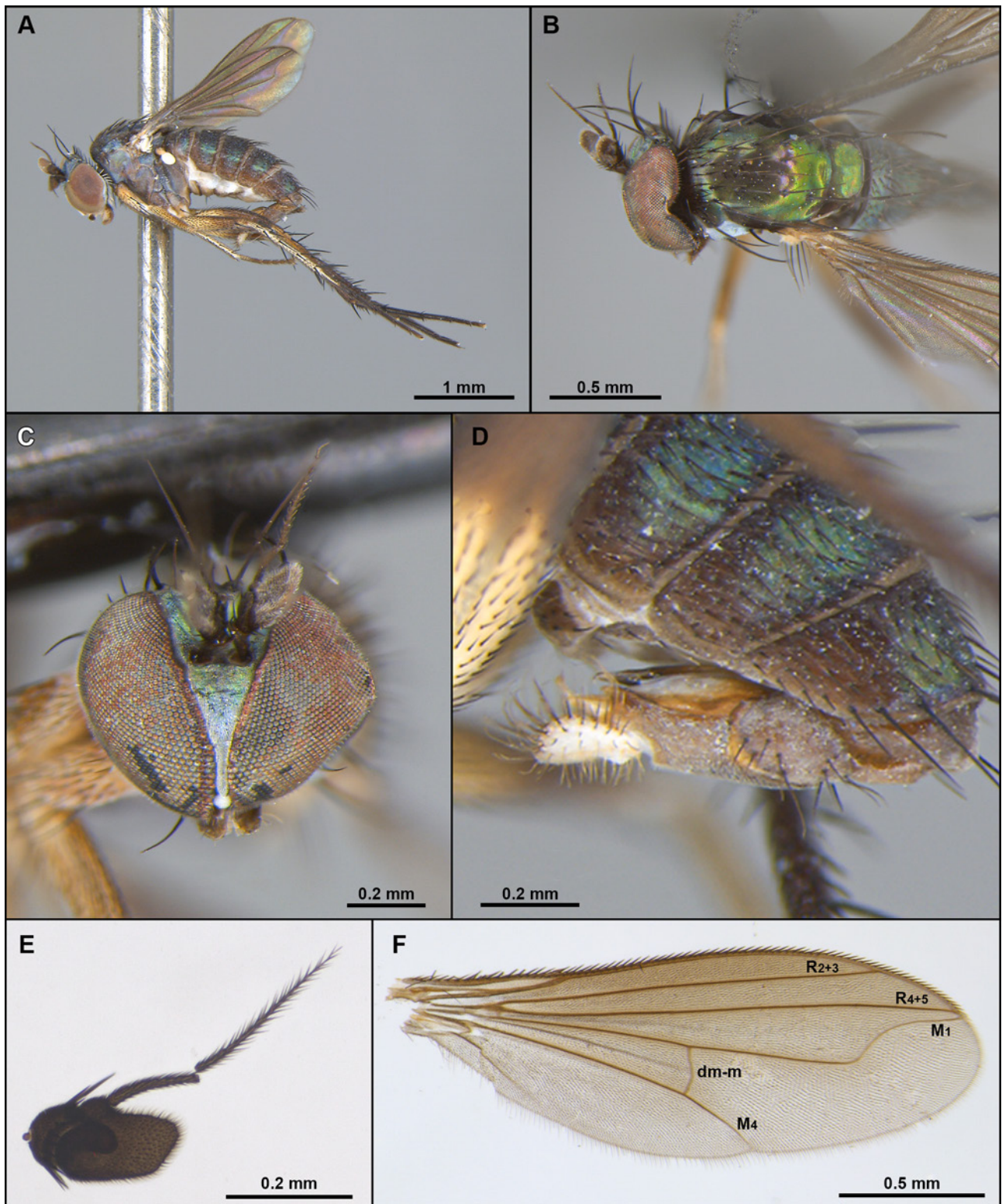
(Figs 2–6, 22)

*Pelastoneurus arcuatus* Loew, 1861: 39. Type locality: Cuba.

*Paraclius arcuatus*: Loew, 1864: 101.

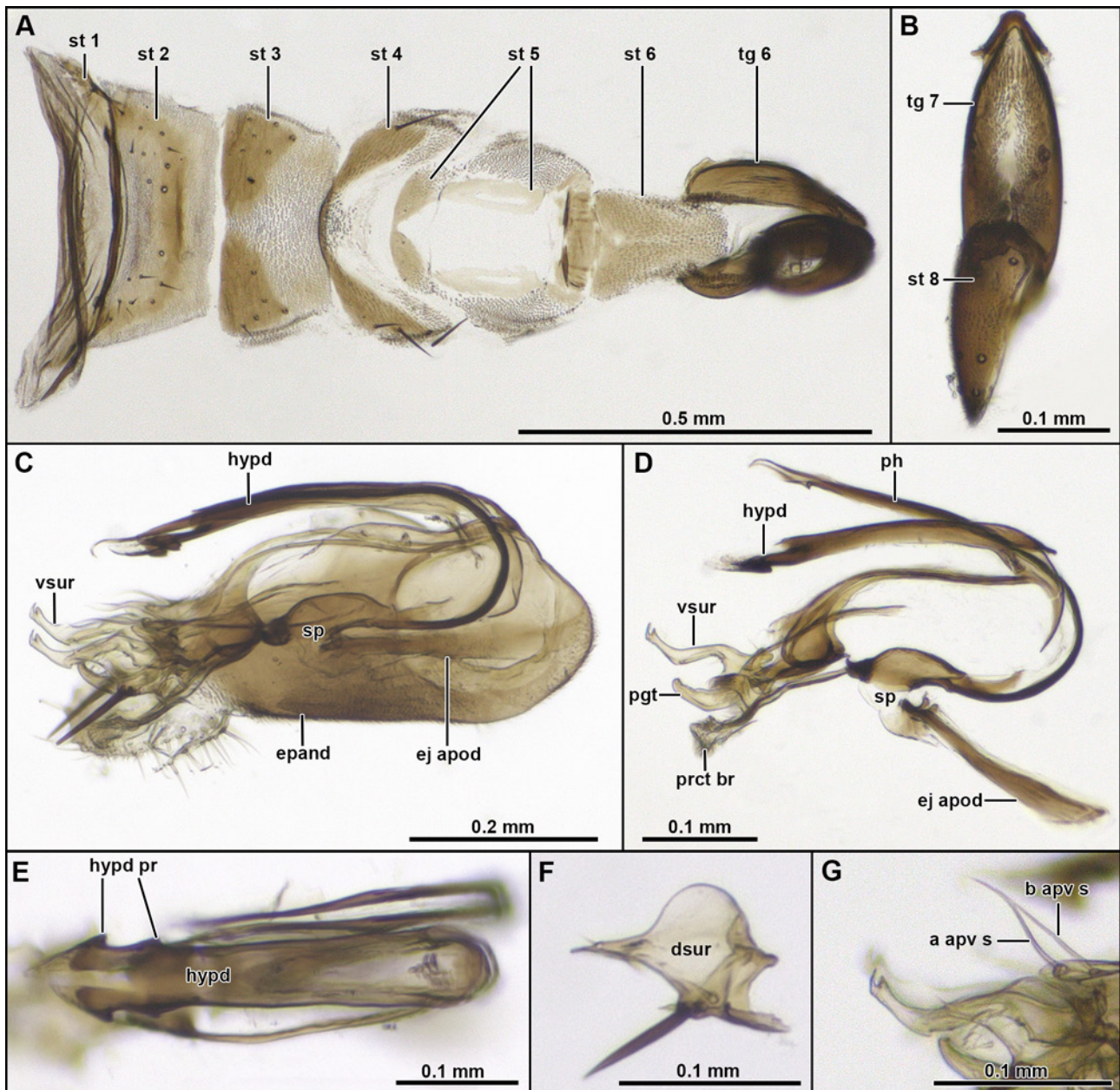
*Paraclius femoratus* Aldrich, 1901: 340 Type locality: Mexico, Veracruz, Teapa, and Frontera. **Syn. nov.**





**FIGURE 2.** *Paraclius arcuatus* (Loew, 1861), **A, D, E, F** male specimen from Honduras (CNC), **B, C** male specimen from Mexico (NMNH). **A.** Habitus, lateral view; **B.** Thorax, dorsal view; **C.** Head, anterior view; **D.** Abdomen and hypopygium, lateral view; **E.** Left antenna, inner view; **F.** Left wing. Abbreviations: dm-m = discal medial crossvein;  $M_1$  = first branch of media;  $M_4$  = fourth branch of media;  $R_{2+3}$  = second branch of radius;  $R_{4+5}$  = third branch of radius.





**FIGURE 3.** *Paraclius arcuatus* (Loew, 1861), identified male specimens from Honduras (CNC). **A.** Abdomen, ventral view; **B.** Tergite 7 and Sternite 8, dorsal view; **C.** Hypopygium, left lateral view; **D.** Internal appendages, left lateral view; **E.** Hypandrium, ventral view; **F.** Dorsal lobe of surstylus, outer view; **G.** Ventral lobe of surstylus, outer view. Abbreviations: a apv s = apical apicoventral epandrial seta; b apv s = basal apicoventral epandrial seta; dsur = dorsal lobe of surstylus; ej apod = ejaculatory apodeme; epand = epandrium; hypd = hypandrium; hypd pr = hypandrial process; pgt = postgonite; ph = phallus; prct br = proctiger brush; sp = sperm pump; st = sternite; tg = tergite; vsur = ventral lobe of surstylus.

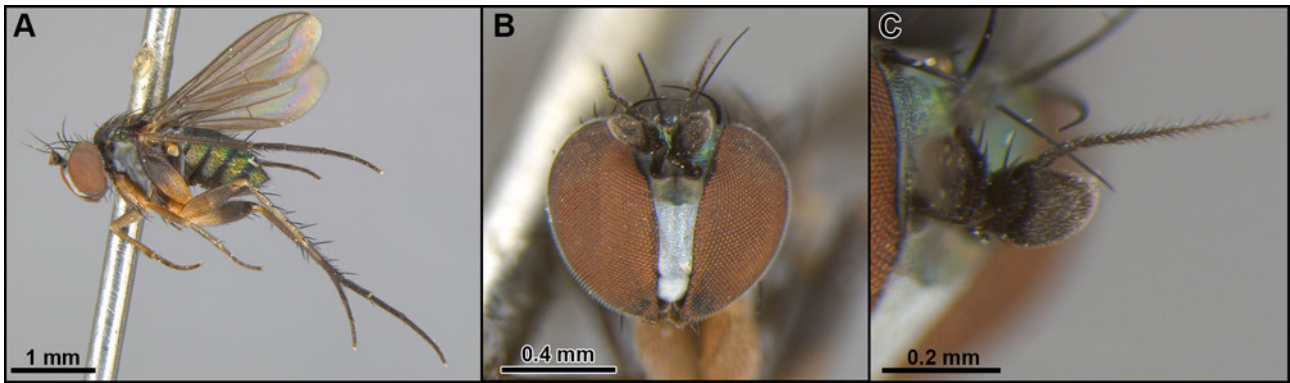
**Diagnosis (males).** Postpedicel subrectangular, pointed dorsally at apex (Fig. 2E). Scutellum with apical pair of short setae between pair of larger marginal setae (Figs 2B, 6C). Legs mostly yellow, except extreme base of coxa I, basal 2/3 of coxa II, basal 1/2 of coxa III, apical 1/3 to 1/2 of femur II, apical 1/2 of femur III, tarsi I and II from apical 1/2 of tarsomere 1, tibia III (except basal 1/4 of dorsal surface dark yellow) and all of tarsus III brown to dark brown (Figs 2A, 4A, 6A). Wing mostly brown;  $M_1$  strongly bowed towards  $R_{4+5}$ , and strongly concave posteriorly; CuAx ratio: 0.6 (Figs 2F, 4A, 5A, D). Male tergite 6 bare (Figs 2D, 3A). Basal apicoventral epandrial seta slightly longer than apical seta and ventral lobe of surstylus. Ventral lobe of surstylus long and narrow, somewhat L-shaped, gently curved ventrally at apex (Fig. 3C, D). Dorsal lobe of surstylus short and wide, with acute apical process and

with 2 strong setae at middle, 1 long at dorsal edge and 1 shorter at inner edge (Fig. 3F). Cercus somewhat drop-shaped, whitish yellow, about 1/3 as long as epandrium (Fig. 2D).

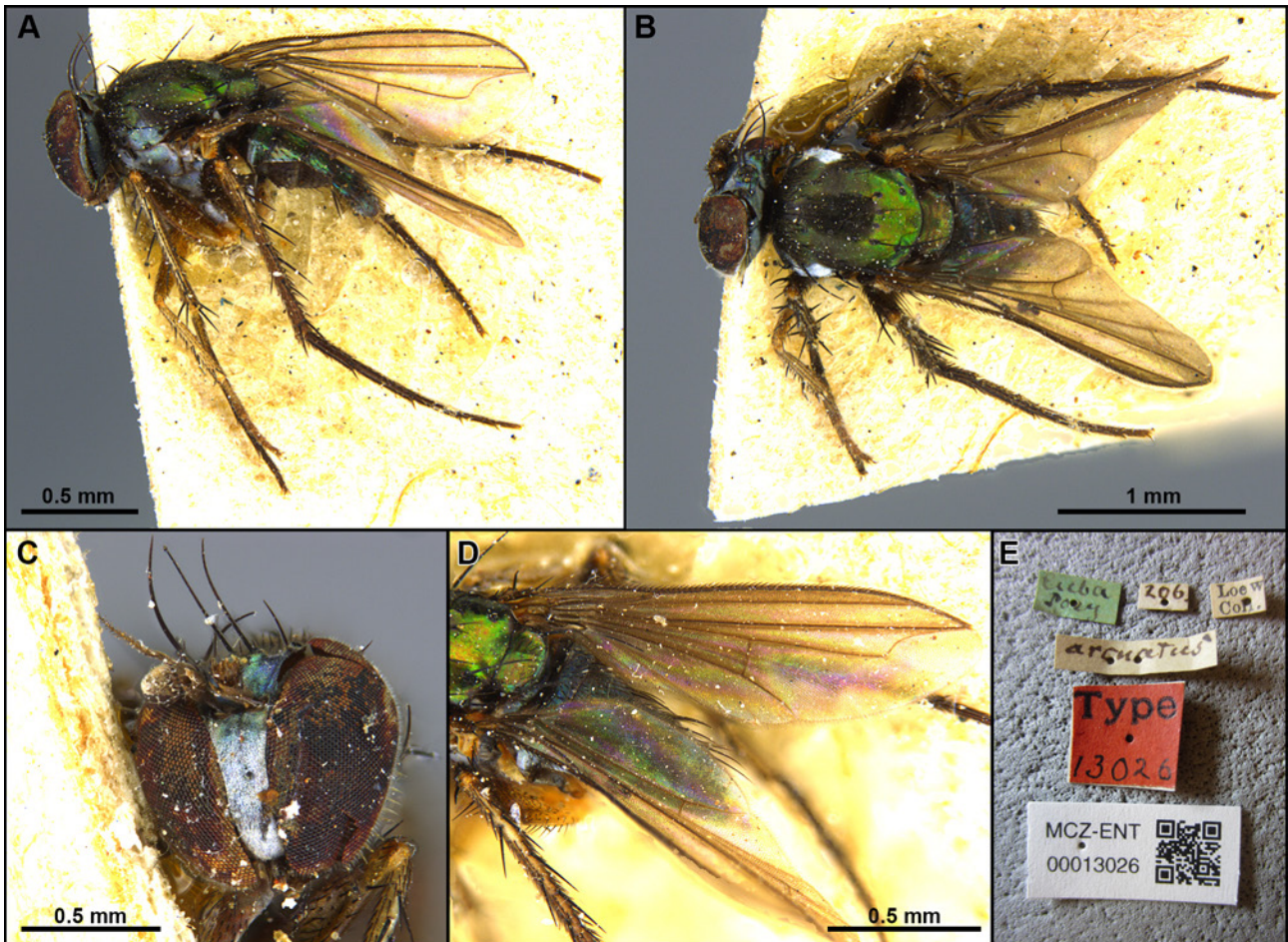
**Redescription. Male** (based on identified specimens). Body length: 2.0–2.7 mm; wing length: 1.9–2.3 mm, width: 0.6–0.7 mm (n = 12). **Head** (Fig. 2A–C). Upper-most 5–6 and the lower-most postocular setae black, remaining setae white. Frons subrectangular, 2.5X wider than high, metallic green with weak bluish-purple reflections, covered with weak yellowish gray pruinosity. Face ground color pale brown, but obscured by dense silvery pruinosity, except rectangular area below the base of antennae, which is metallic green with weak coppery reflections; face gradually narrowing below (funnel-shaped), as wide as mid ocellus at narrowest point. Clypeus rectangular, 2X higher than wide, about 1/4 as long as face, lower margin straight, ending close to lower eye margin. Palpus short, oval, and brown, covered with short black setae near apex and 1 stronger seta at apex (shorter than palpus). Proboscis brown, labellum with few slender and short pale setae; prementum with row of pale slender setae at apical edge. Postcranium dark green, covered with weak yellowish gray pruinosity, silvery and dense at region between eye margin and postocular row of setae; lower postcranium with 4 strong white setae along ventral margin and with few pale short and slender setae below the occipital foramen. Pair of divergent strong ocellar setae and pair of tiny postocellar setae; pair of strong convergent vertical setae; pair of short paraverticilar setae, slightly longer and aligned with the upper-most postocular seta. Antenna (Fig. 2E) dark brown; scape conical, dorsal surface covered with short black setae, 1 longer dorsal seta at apex, inner surface with long acute process, and ventral surface with short acute process; pedicel short, with a crown of setae and 1 longer dorsal seta at apex; postpedicel subrectangular, pointed dorsally at apex, 1.5X longer than wide, covered with dense whitish pubescence; arista-like stylus dorsal, arising at base of postpedicel, about 4/6 of eye height, two-segmented, first segment short, slightly overlapping the apex of postpedicel, covered with short pubescence, second segment long, 2X longer than first segment, covered with short microtrichia. **Thorax** (Fig. 2A, B). Mesonotum mostly metallic green, except with weak coppery acrostichal stripe extending along acrostichal setae, one dark spot above notopleuron, extending from the sutural intra-alar seta to above the base of wing, mesonotum covered with coppery pruinosity in anterior view, notopleuron covered with dense silvery pruinosity in dorsal view and a small patch of silvery pruinosity posterior to the postalar callus in posterior view. Scutellum metallic green, with weak bluish reflections. Pleura brown, covered with silvery pruinosity and weak greenish reflections mainly on the anepisternum; one short and rounded yellow spot at lower 1/2 of anepisternum, above coxa I. Metepimeron grayish brown. *Chaetotaxy*: Pronotum with row of strong and short black setae; anterior 1/6 of mesonotum covered with short black setae; acrostichals biseriate, short, increasing in length posteriorly, ending at level of the fourth posterior dorsocentral seta; 5 pairs of strong dorsocentrals increasing in length posteriorly; 1 pre-, 1 sutural and 1 postsutural intra-alars; 2 strong supra-alar setae, 1 positioned between postpronotal lobe and notopleuron and 1 near postalar callus; 1 strong, 1 short and 1 minute postpronotals; 2 strong notopleurals, 1 at middle of lower edge and 1 at posterior margin of notopleuron, slightly shorter than preceding seta; 1 strong postalar; scutellum with 1 pair of strong medial scutellar setae, 1 pair of smaller setae laterad and 1 pair of short apical setae, laterad and apical setae about 1/5 as long as medial scutellars; upper-surface of proepisternum with 2–3 short black setae immediately in front of anterior spiracle, and a few fine white setulae on upper and lower surfaces; lower surface with 1 strong black seta; metepisternum with row of fine setulae. **Wing** (Fig. 2F). Long and narrow, about 3X longer than wide, anal lobe barely developed; membrane brown to light brown. Costa ending before wing apex, at  $M_1$ ;  $R_1$  ending at basal 3/8 of wing;  $R_{2+3}$  slightly curved anteriorly towards apex;  $R_{4+5}$  nearly straight, slightly curved posteriorly at apex;  $M_1$  strongly bowed towards  $R_{4+5}$ , and strongly concave posteriorly, almost closing cell  $r_{4+5}$ ; cell  $bm+dm$  ending at 4.5/8 of wing;  $M_4$  fading apically, not reaching wing margin;  $CuA+CuP$  ending at basal 1/3 of cell  $bm+dm$ , not reaching wing margin and fading apically; length of crossvein  $dm-m$ /last part of  $M_4$  ( $CuAx$  ratio): 0.6. Lower calypter yellow with black setae; halter yellow to whitish yellow; anterior and posterior surfaces of halter knob with group of short setae; plumule yellow. **Legs** (Figs 1A, 4A, 6A). Mostly yellow, except extreme base of coxa I, basal 1/2 of anterior surface of coxa II and entire lateral surface of coxa II, basal 1/3 of lateral surface of coxa III, apical 1/2 to 1/3 of femur II and apical 1/2 of femur III, tarsi I and II from apex of tarsomere 1, and tibia and tarsus III brown to dark brown. **Leg I**. Podomere ratios: 25, 25, 8/3/3/2/3. Anterior surface of coxa I covered with short vestiture of setae (with few erect setae near base), outer edge with 2 strong setae, 1 at middle and 1 near apex, apical edge with 2 strong and 2–3 slender setae. Femur I covered with short vestiture of setae, except ventral surface mostly bare, with anteroventral row of short setae from base to apex (about 1/3 as long as width of femur at broadest point) ending in 2 preapical more conspicuous setae and 2–3 conspicuous posteroventral preapical setae. Tibia I with 1 conspicuous anterodorsal seta at 2/6, row of short setae from basal 2.5/6 to apex, 2



short posterodorsal setae at 1.5/6 and 5/6, 2 dorsal setae at 3.5/6 (long) and 5/6 (short). Ventral surface of tarsus I from apex of  $It_1$  to  $It_5$  with weak whitish pile (MSSC). **Leg II.** Podomere ratios: 33, 33, 15/10/10/7/4. Anterior surface of coxa II covered with short vestiture of setae, and with fringe of long setae at middle, outer edge with 1 long and strong seta at middle, apical edge with 3 strong setae. Femur II covered with short vestiture of setae, with anteroventral row of setae from base to apical 5/6 (about 1/2 as long as width of femur at broadest point) ending in 1 long preapical seta, 1 short posterior preapical seta and 1 strong anterior preapical seta. Tibia II with paired antero- and posterodorsal setae at 1/6 (about half-length of second pair), 1.5/6 and 4.5/6, 1 strong anterodorsal seta at 2.5/6, 1 strong anteroventral seta at 3/6 and 1 short ventral seta at 3.5/6 and crown of strong setae at apex: 1 antero- and 1 posterodorsal, 1 dorsal, 1 antero- and 1 posteroventral. Tarsus II unmodified. **Leg III.** Podomere ratios: 34, 44, 12/17/12/8/5. Lateral surface of coxa III with 1 strong and 1 slender seta at apical half, apical edge of anterior surface with 2–3 short setae. Femur III laterally compressed, about 1.5X wider than femur II at broadest point, covered with short vestiture of setae, with dorsal row of more erect setae from base to apical 4/6 (about 1/3 as long as width of femur), with anteroventral row of setae from base to apical 4/6 (about 1/3 as long as width of femur) ending in 1 longer preapical seta, 1 short posteroventral preapical seta, and 1 strong anterodorsal preapical seta. Tibia III with paired antero- and posterodorsal setae at 0.5/6 (about half-length of second pair), 1/6, 2.5/6, 1 strong anterodorsal seta at 4/6, 1 short ventral seta at 4/6, 1 dorsal, 1 anterior and 1 ventral strong preapical setae, ventral row of sparse and erect setae from basal 2/6 to apical 4/6. Tarsus III unmodified. **Abdomen** (Figs 2A, D, 3A, B). Metallic green, tergites 1–5 covered with short vestiture of black setae and long setae at posterior margins, slightly shorter than tergites, except on tergite 5 with setae slightly longer; tergites 1–5 with weak lateral patches of silvery pruinosity and coppery and greenish reflections. Tergite 6 brown, bare, covered with silvery pruinosity in posterior view and weak greenish reflections. Tergite 7 covered with weak pruinosity and wide membranous area at middle. Sternites (Fig. 3A) brown to pale brown. Sternite 1 largely membranous, with narrow sclerotized and curved area posteriorly, slightly widening at lateral margins. Sternite 2 weakly sclerotized, with more sclerotized area at middle, somewhat C-shaped. Sternite 3 divided in two subtriangular hemitergites at anterior margin and entirely membranous at posterior margin. Sternite 4 C-shaped, curved anteriorly and very narrow at middle. Sternite 5 glasses-shaped anteriorly, divided in two 0-shaped sclerites posteriorly, with large lateral weakly sclerotized area connected with sternite 6. Sternite 6 plate-shaped, with posterior membranous region connected with tergite 6. Tergite and sternite 7 fused at apex, forming long and well sclerotized peduncle. Sternite 8 subovoid, covered with long black setae at posterior edge. **Hypopygium** (Figs 2D, 3C–G). Epandrium brown, long and narrow, about 2.5X longer than high, with acute apicoventral lateral ridge (Figs 2D, 3C). Apicoventral epandrial lobe not developed, 2 apicoventral epandrial setae present, basal seta slightly longer than apical seta and ventral lobe of surstylus (Fig. 3G), 1 short basiventral epandrial seta present. Ventral lobe of surstylus long and narrow, somewhat L-shaped, gently curved ventrally at apex, with stout modified apical seta (Fig. 3D). Dorsal lobe of surstylus short and wide, with acute apical process and with 2 strong setae at middle, 1 long seta at dorsal edge and 1 shorter seta at inner edge (Fig. 3F). Postgonite plain, short, about 1/2 as long as ventral lobe of surstylus, well sclerotized and slightly curved ventrally at apex (Fig. 3D). Undivided proctiger brush present, blunt and covered with short pubescence at apex (Fig. 3D). Hypandrium trough-shaped, with weak connection to epandrium basally, free laterally, apex bifurcate and membranous, lateral margin with 2 dentiform preapical processes, base of hypandrium projecting up inside epandrial capsule, cradling phallus (Fig. 3C–E). Phallus strongly sclerotized, divided in two narrow arms, narrowing at apex, left arm with 1 subapical short process (Fig. 3D); ejaculatory apodeme long, about 3/5 as long as epandrium, slightly widening at apex, laterally compressed and well sclerotized (Fig. 3D); sperm pump short, somewhat C-shaped, about 1/3 as long as ejaculatory apodeme (Fig. 3D). Basal sclerite of sperm pump short and narrow, somewhat C-shaped in ventral view. Cercus short, drop-shaped in dorsal view, about 1/3 as long as epandrium, whitish-yellow, outer surface covered with short setae; ventral edge with strong setae (Fig. 2D). **Female** (Figs 4–6). Body length: 2.2–3.0 mm; wing length: 2.2–2.5 mm (n = 13). Similar to male, except as noted: postpedicel suboval, as long as wide (Figs 4C, 5C); face and clypeus wide, both wider than ocellar tubercle (Figs 4B, 5C). Abdomen with 5 visible and setose segments (Figs 4A, 5A, 6A), tergites 6 and 7 with deep concavity at anterior 1/2. Sternites 6 and 7 unmodified. Tergite and sternite 8 divided medially, fused anterolaterally, forming narrow sclerite. Tergite 10 divided medially into hemitergites, each bearing 5 short spines and 1 minute lateral seta, innermost pair sometimes slightly offset, spines rounded and somewhat flattened apically.



**FIGURE 4.** *Paraclius arcuatus* (Loew, 1861), identified female specimen from Mexico (CNC). **A.** Habitus, lateral view; **B.** Head, anterior view; **C.** Left antenna, inner view.



**FIGURE 5.** *Paraclius arcuatus* (Loew, 1861), female holotype (MCZ). **A–B.** Habitus, lateral and dorsal views, respectively; **C.** Head, anterior view; **D.** Right wing; **E.** Labels. Images provided by Charles Farnum, MCZ.

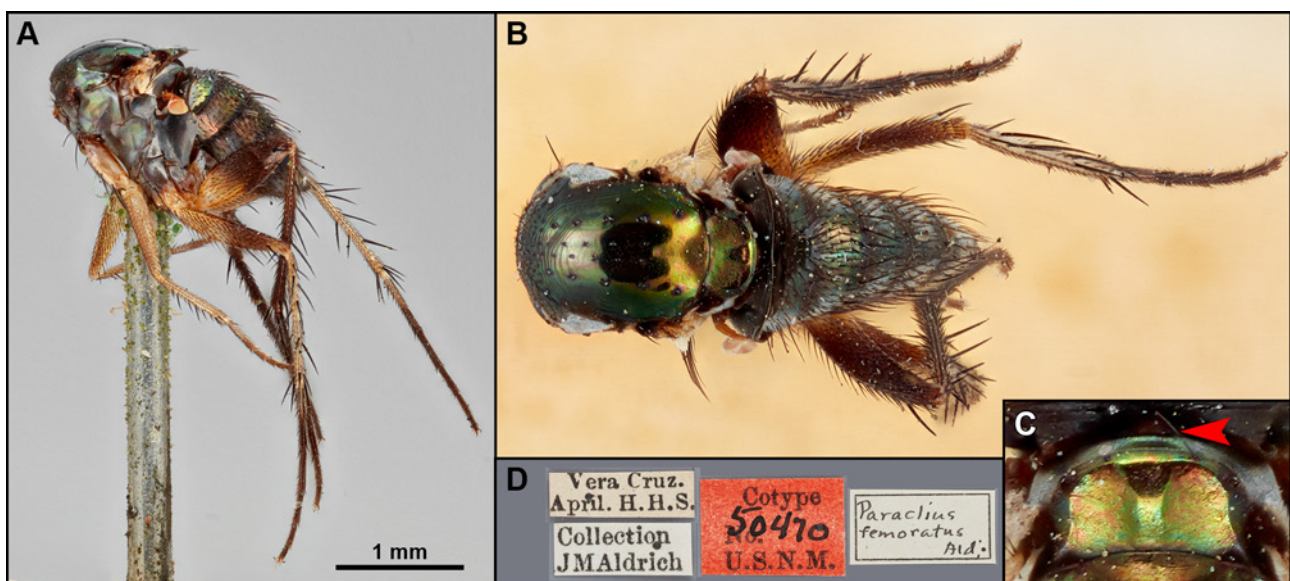
**Type material examined.** *Pelastoneurus arcuatus*: **LECTOTYPE** ♀ (based on photographs) (Fig. 5) labelled as: “Cuba [green label]”; “arcuatus”; “206”; “Loew | Coll.”; “Type | 13026” [red label]; “MCZ-ENT | 00013026” (MCZ). Lectotype condition: good, glued to a piece of paper, left postpedicel broken off, not dissected.

*Paraclius femoratus* Aldrich: **SYNTYPE** ♀ (based on photographs) (Fig. 6) labelled as: “[Mexico] Vera Cruz. | April. H.H.S.”; “Collection | JMAldrich”; “Cotype | No. 50470 | U.S.N.M.”; “*Paraclius | femoratus | Ald.*” [handwritten] (NMNH).

**Additional material examined. BELIZE:** Cayo Dist. Sibun River & Hwy [ca 17°10'36.6"N 88°36'11.3"W]



30.xi.2001, river shore, L. Masner, YPT (2 ♂, one dissected, CNC); Toledo District, Deep River at Medina Bank, N16°26.592' W88°44.704', 20.iii.2019, J.B. Runyon (1 ♀, METC); Guanacaste N.P. 11.xi.2001, roaring crk [ca 17°15'52.5"N 88°47'48.0"W], L. Masner, YPT (3 ♀, CNC); Stann Creek, 3km S Hopkins [ca 16°50'07.5"N 88°16'02.2"W], 24–25.xi.2001, mangrove, YPT, L. Masner, CNC810957 (1 ♂, CNC); BARC, nr. San Pedro, Columbia, 16°17'0"N 88°58'0"W, MT & YPT, 10–12.iii.2002, J. Skevington, CNC361120 (1 ♀, CNC). **COSTA RICA:** Prov. Guanacaste, Santa Rosa Nat'l Park, N 10°50.9' W 85°36.8' 300 m, along road near headquarters, 16.viii.2010, J.B. Runyon (1 ♀, CNC); La Caja, 8 kil. W. San Jose [ca 9°55'05.8"N 84°06'27.1"W], Costa Rica, Schmidt 1930, *Paraclius arcuatus* (Loew) det. Fred C. Harmston, Collection of Calif. Acad. of Sci. 1994, gift Fred C. Harmston, CASENT 8416961, *Paraclius arcuatus* det. S.E. Brooks, 2003 (1 ♂ dissected, CAS). **CUBA:** [Santiago de Cuba], Boniato [ca 20°05'08.8"N 75°48'13.8"W], xii.2.04 [02.xii.1904], MCVanDuzee Collection, *Paraclius femoratus* Ald., Collection of the California Academy of Sciences, San Francisco, Calif., CASENT 8416912 (1 ♂ dissected, 1 ♀, CAS); [San Jose de las Lajas] Lomas de Camoa [ca 22°57'59.5"N 82°11'00.3"W] 14.iii.1952, Dodge & Seago, *Paraclius* sp. det. Fred C. Harmston, CASENT 8416925 (1 ♂, CAS). **GUATEMALA:** Ingenio R. R. Sta. [ca 14°14'25.7"N 90°50'31.5"W], 28.iv [1926], JM Aldrich collector, *Paraclius arcuatus* Lw. (1 ♂ dissected, NMNH); Pt Barrios [ca 14°38'56.4"N 91°53'01.4"W], 03–14.iii.1905, MCVanDuzee Collection, *Paraclius femoratus* Ald. (1 ♂, CAS). **HONDURAS:** Roatán Island, West Bay, N16°17'00" W86°35'52", 23–25.xi.2012, L. Masner, YPT creek (5 ♂, one dissected, 3 ♀, CNC); La Ceiba [ca 15°45'21.0"N 86°48'13.2"W], 13.xii.1915, FJDyer Coll (2 ♀, NMNH). **JAMAICA:** [ca 18°06'10.3"N 77°16'14.9"W], JM Aldrich collection (3 ♀, all dissected, NMNH). **MEXICO:** [San Luis Potosí], El Salto [ca 22°21'45.1"N 99°15'56.7"W], 09.v.1963 (2 ♂, one dissected, 2 ♀, NMNH); Veracruz, Lake Catemaco [ca 18°25'05.5"N 95°06'37.5"W], 01.v.1969, H.J. Teskey (1 ♀, CNC); same data, except: 16.vi.1969, B.V. Peterson (5 ♀, CNC); Huichihuayán [ca 21°28'46.1"N 98°58'03.9"W], 25.viii.1988, L.J. Lipovaky (1 ♂, CNC); Chiapas, Motozintla [ca 15°21'46.0"N 92°14'43.4"W], 3000' [= 900 m], 06.vi.1969, B.V. Peterson (Mal. Tr) (1 ♀, CNC). **NICARAGUA:** Leon Zarzales [ca 12°39'44.0"N 86°26'30.5"W], 12.x.1988, J.M. Maes (1 ♂, 1 ♀, MTEC).



**FIGURE 6.** *Paraclius femoratus* Aldrich, 1901, female syntype (NMNH). **A–B.** Habitus, lateral and dorsal views, respectively. **C.** Scutellum, dorsal view (arrow pointing to the apical pair of scutellar setae); **D.** Labels. Images B and C originally lacked scale bars. Photographs by Alyssa Seemann, NMNH.

**Remarks.** *Paraclius arcuatus* is the only species in the *arcuatus*-group with 1 pair of short apical setae on scutellum, femur II brown on apical 1/3 to apical 1/2 and femur III brown on apical 1/2, male tergite 6 bare and male terminalia with an undivided proctiger brush. It is noteworthy that this is the only species in the group with plesiomorphic condition of bare tergite 6 in males (Brooks 2005, character 36), but also with longer setae arising from the posterior margin of tergite 5, which probably perform the same sensorial function of setae on tergite 6. Peter Dyte (unpublished manuscript) noted a similar situation in males of *Chrysotus* Meigen and *Diaphorus*

Meigen, with long setae on the posterior margin of tergite 6 and sternite 8 respectively. These setae might play a role in perceiving and preventing other males approaching from behind before starting courtship.

Examination of the female syntype of *P. femoratus* Aldrich (the only specimen present at NMNH) (Fig. 6) revealed that it is a synonym of *P. arcuatus*, by the typical leg color and the apical pair of scutellar setae (Fig. 6C). Aldrich stated that the female of *P. femoratus* has a narrow face, similar to male, but it is likely that the author analyzed a male with the hypopygium broken off or strongly embedded into abdomen.

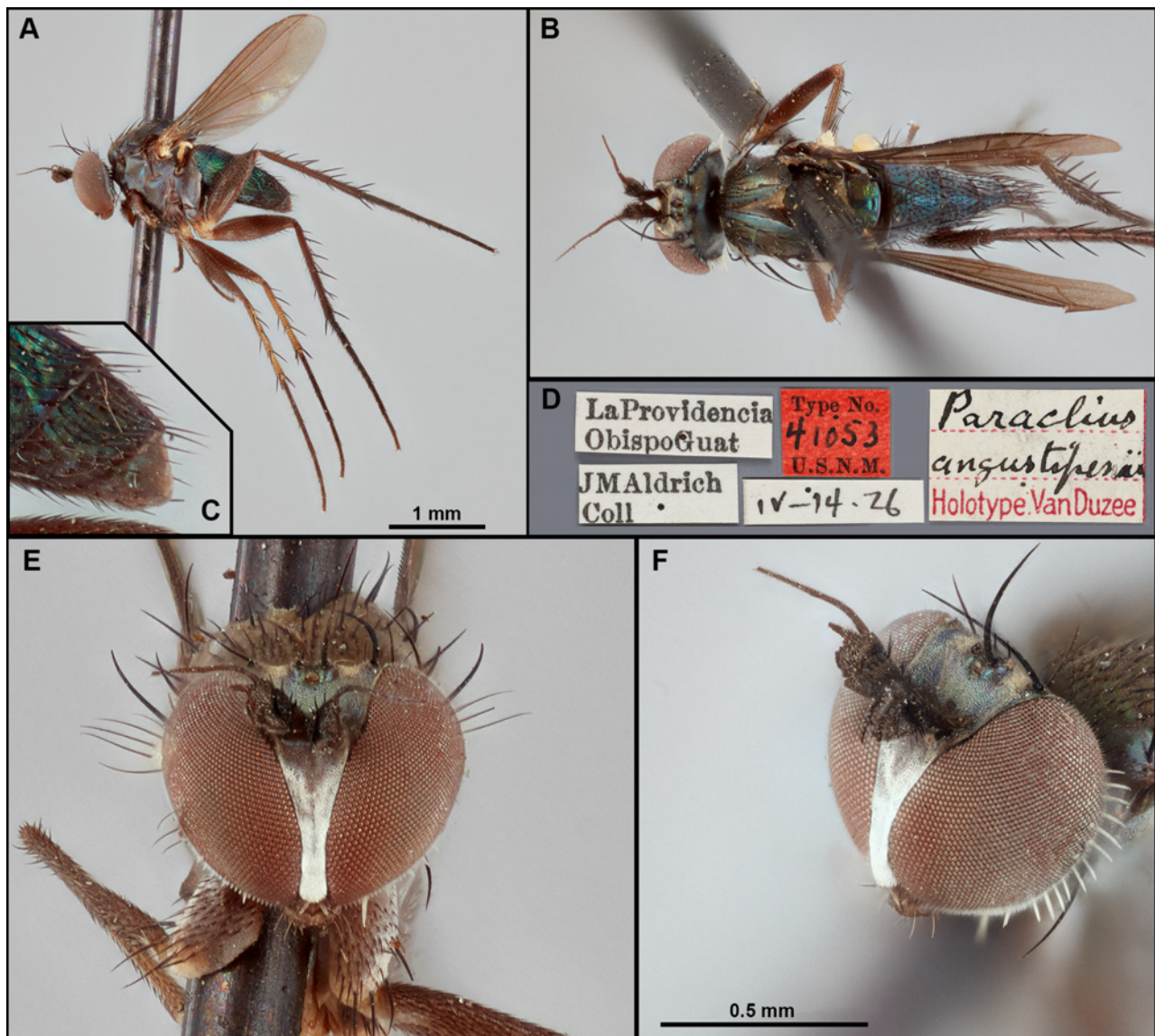
Negrobov & Maslova (2004) stated that *P. amazonae* Parent (as *P. amasonae*) is “possibly a junior synonym of *P. femoratus*”. Nevertheless, based on genitalic characters, that species is probably related to *P. flavicauda* Van Duzee and not part of the *arcuatus*-group.

**Distribution.** Cuba and newly recorded from Belize, Costa Rica, Guatemala, Honduras, Jamaica, Mexico and Nicaragua (Fig. 22).

### *Paraclius angustipennis* Van Duzee

(Figs 7–10, 23)

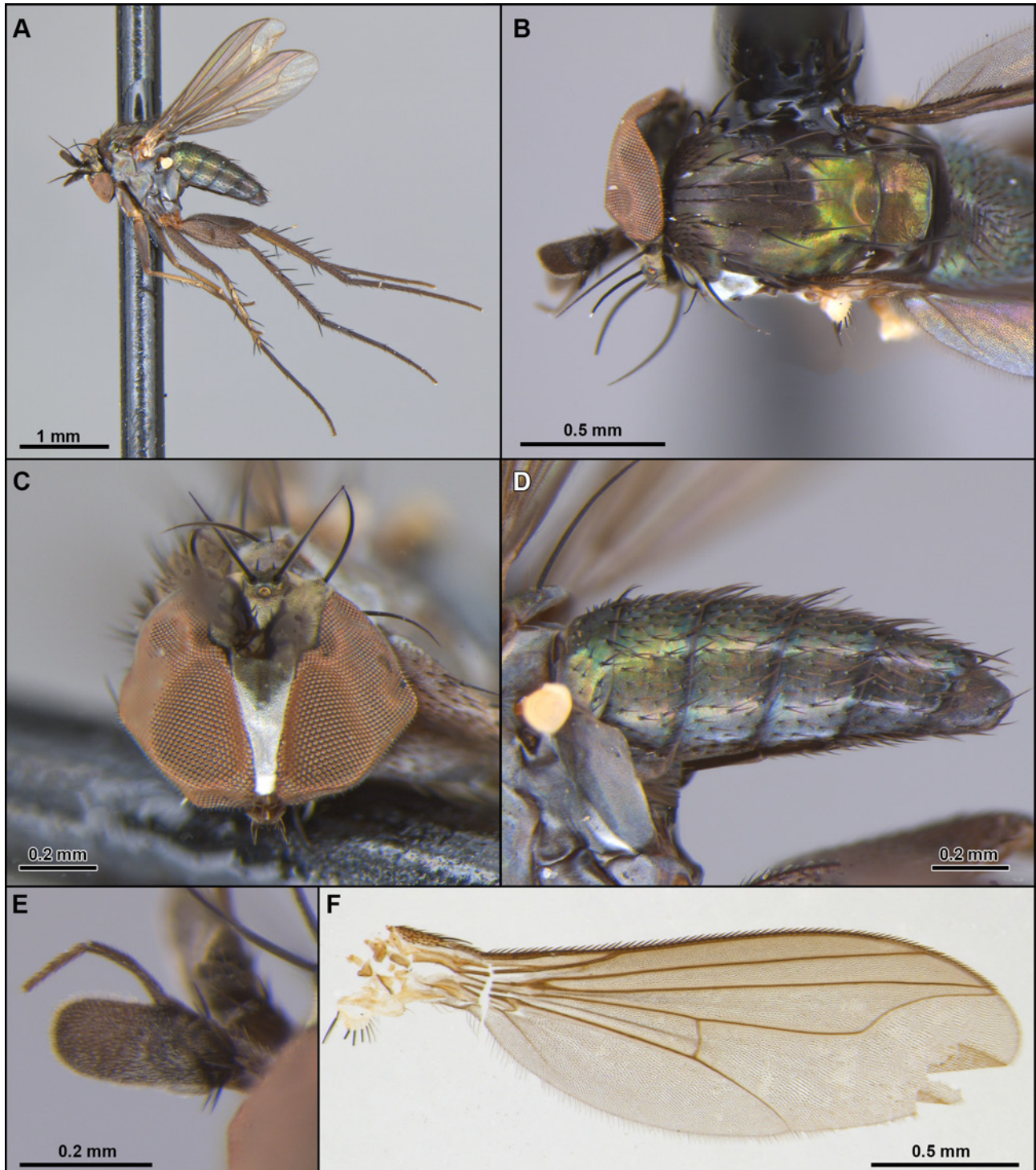
*Paraclius angustipennis* Van Duzee, 1929: 42. Type locality: La Providencia, Guatemala.



**FIGURE 7.** *Paraclius angustipennis* Van Duzee, 1929, male holotype (NMNH). **A–B.** Habitus, lateral and dorsal views, respectively; **C.** Abdominal segments 5 and 6; **D.** Labels; **E–F.** Head, anterior and anterolateral views, respectively. Images B, C, E originally lacked scale bars. Photographs by Alyssa Seemann, NMNH.



**Diagnosis (males).** Postpedicel subrectangular, with rounded apex (Fig. 8E). Anepisternum without yellow spot above coxa I (Figs 7A, 8A). Legs mostly dark brown, except apex of all coxae, trochanters, tibiae I and II, basal 1/2 of  $It_1$ , yellow (Figs 7A, 8A). Wing gently brownish;  $M_1$  strongly bowed towards  $R_{4+5}$ , weakly concave posteriorly; CuAx ratio: 0.35 (Figs 7A, 8A, F). Male tergite 6 with 4–5 strong lateral setae, 1 mostly offset seta near posterior edge (Figs 7C, 8D). Basal apicoventral epandrial seta slightly longer than apical seta, and 3X longer than ventral lobe of surstylus (Fig. 9B, E). Ventral lobe of surstylus short, somewhat digitiform, strongly curved anteriorly at base and gently curved ventrally at apex (Fig. 9B, C, H). Dorsal lobe of surstylus suboval, weakly sclerotized, narrowing and with pointed apex, with 1 strong seta at middle of dorsal edge and 1 short and slender preapical seta at ventral edge (Fig. 9J, K). Cercus short, oval, about 1/3 as long as epandrium (Fig. 9B, G).

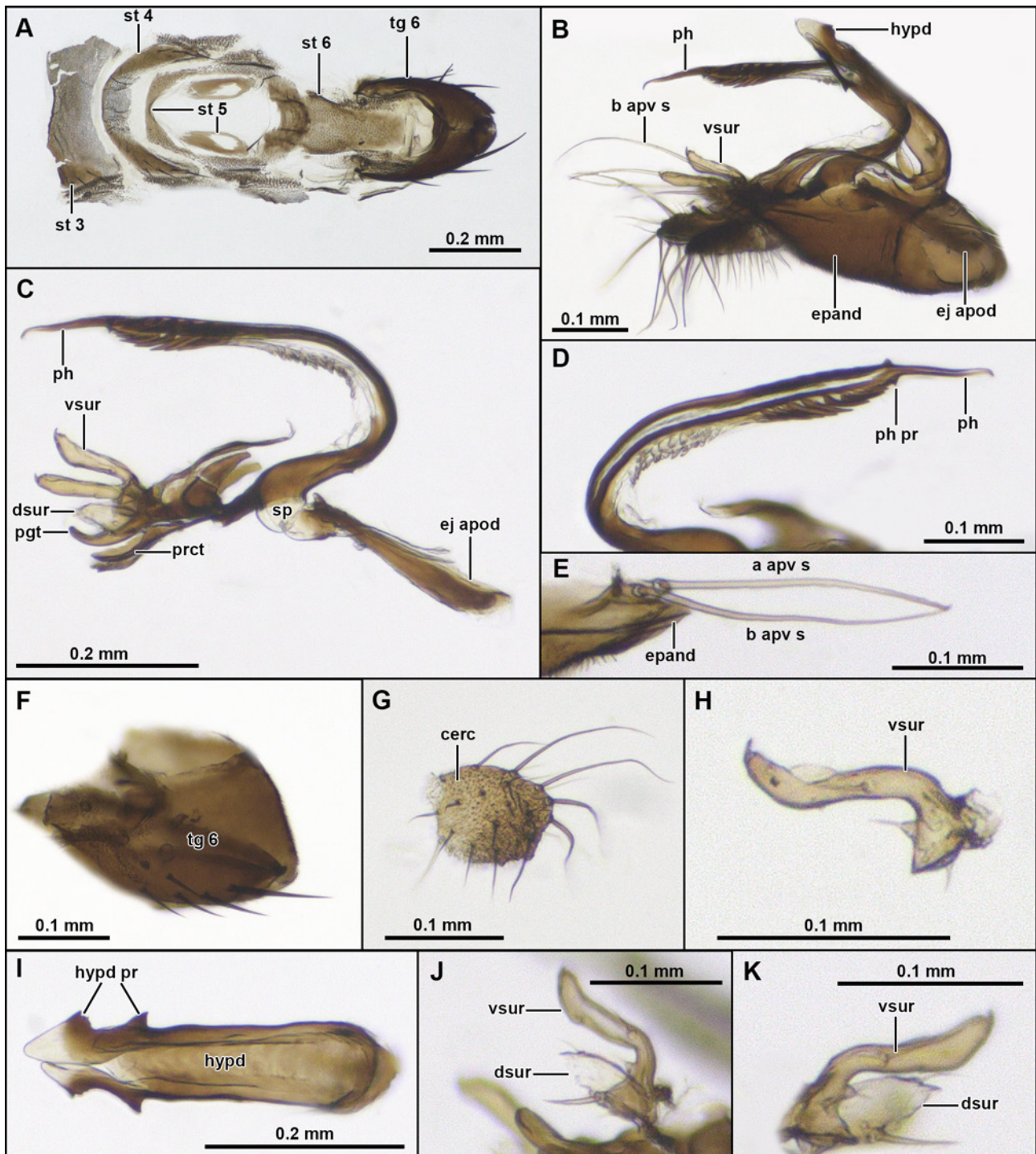


**FIGURE 8.** *Paraclius angustipennis* Van Duzee, 1929, identified male specimen from Mexico (CNC). **A.** Habitus, lateral view; **B.** Thorax, dorsal view; **C.** Head, anterior view; **D.** Abdomen, lateral view; **E.** Left antenna, outer view; **F.** Left wing.

**Redescription. Male** (based on photographs of the male holotype and identified specimens). Body length: 2.2–2.3 mm; wing length: 2.2–2.3 mm, width: 0.6 mm (n = 2). **Head** (Figs 7A, E, F, 8A, C, E). Similar to *P. arcuatus*, except as noted: upper-most 5 postocular setae black, remaining setae white. Frons metallic green, covered with dense yellowish gray pruinosity. Face homogeneously obscured by dense silvery pruinosity, face wider than mid ocellus at narrowest point. Antenna wholly dark brown; postpedicel subrectangular, 2X longer than wide, with rounded apex; arista-like stylus dorsal, arising at base of postpedicel, about 4/6 of eye height, two-segmented, first segment short, ending before apex of postpedicel, covered with short pubescence, second segment long, about 2X longer than first segment, covered with short microtrichia. **Thorax** (Figs 7A, B, 8A, B). Mesonotum with weak coppery to purple reflections. Pleura dark gray, covered with dense silvery pruinosity, with weak greenish and coppery reflections mainly on anepisternum and katepisternum. Metepimeron dark gray. *Chaetotaxy*: Scutellum with 1 pair of strong medial scutellars and 1 pair of smaller setae laterad, about 1/5 as long as medial scutellars; upper-surface of proepisternum with a few pale setulae and 2 short setae in front of anterior spiracle. **Wing** (Figs 7A, 8F). Membrane gently brownish;  $M_1$  strongly bowed towards  $R_{4+5}$  and weakly concave posteriorly; CuAx ratio: 0.35. Halter yellow. **Legs** (Figs 7A, 8A). Mostly brown to dark brown, except apex of all coxae, trochanters, tibiae I and II from basal 1/6, and basal 1/2 of  $It_1$  yellow. **Leg. I**. Podomere ratios: 25, 22, 10/3/3/2/3. Anterior surface of coxa I covered with silvery pruinosity, with short vestiture of setae; apical edge with 2–3 strong setae. Femur I with anteroventral row of short setae, ending in 3 more conspicuous preapical setae, 1 posteroventral preapical seta. Tarsus I unmodified. **Leg. II**. Podomere ratios: 30, 32, 17/10/9/6/4. Femur II with anteroventral row of short setae from base to apical 5/6 (about 1/2 as long as width of femur at broadest point), ending in 2 more conspicuous preapical setae, 1 longer posteroventral preapical seta, 1 strong anterior seta. **Leg. III**. Podomere ratios: 33, 44, 12/15/12/9/5. Lateral surface of coxa III with 1 strong and 1 slender seta on apical half, apical edge of anterior surface with 1 long seta. Femur III laterally compressed, about 1.3X wider than femur II at broadest point; with basal 4/6 of dorsal surface covered by short dense setae, ventral to anteroventral row of setae from base to apical 5/6, ending in 1 more conspicuous preapical seta, 1 strong anterodorsal seta, and 2 short posteroventral preapical setae. **Abdomen** (Figs 7A–C, 8A, D, 9A, F). Metallic green, with bluish and coppery reflections. Posterior margin of tergite 5 with long setae, but not overlapping posterior margin of tergite 6. Tergite 6 with lateral row of 4 short, strong setae and 1 upper offset seta. Tergite 7 long and glabrous, with long and narrow concavity at posterior 3/4. Sternite 5 with two 0-shaped sclerites more sclerotized posteriorly. **Hypopygium** (Fig. 9B–E, G–K). Epandrium dark brown, long and narrow, about 2.5X longer than high, with acute apicoventral lateral ridge (Fig. 9B). Basal apicoventral epandrial seta slightly longer than apical seta, and 3X longer than ventral lobe of surstylus (Fig. 9B). Ventral lobe of surstylus short, somewhat digitiform (varying from slightly wide (Fig. 9B, C) to more slender (Fig. 9H)), strongly curved anteriorly at base and gently curved ventrally at apex, with short stout modified apical seta, 1 short dorsal seta near base, inserted on short protuberance, 1 short seta at middle of outer edge (Fig. 9B, C, H, J, K). Dorsal lobe of surstylus suboval, weakly sclerotized, narrowing, with pointed apex, with 1 strong seta at middle of dorsal edge and 1 slender preapical seta at ventral edge. Postgonite plain, well sclerotized and slightly curved ventrally at apex (Fig. 9C). Proctiger plain, well sclerotized (Fig. 9C). Hypandrium wide, trough-shaped, with weak connection to epandrium basally, free laterally; apex bifurcate, membranous and asymmetrical, somewhat arrow-shaped in ventral view; lateral margin with 2 dentiform preapical process, apicalmost process bifid; base of hypandrium projecting up inside epandrial capsule, cradling phallus (Fig. 9B, I). Phallus strongly sclerotized, divided in two narrow arms, abruptly narrowing at apex; both arms with 1 subapical short process, preceded by fringe of short spines (Fig. 9B–D); ejaculatory apodeme long, about 1/2 as long as epandrium, slightly widening towards apex, laterally compressed and well sclerotized (Fig. 9B, C); sperm pump short, somewhat pipe-shaped, about 1/2 as long as ejaculatory apodeme (Fig. 9B, C). Cercus short, oval, brown, yellow at base, about 1/3 as long as epandrium; outer surface covered with short setae; ventral and apical edges with long and sparse setae (Fig. 9B, G). **Female** (Fig. 10). Body length: 2.9–3.0 mm; wing length: 2.4–2.5 mm (n = 2). Similar to male, except as noted: postpedicel short, suboval, about as long as wide (Fig. 10C); second segment of arista-like stylus 4X longer than first segment (Fig. 10C); face and clypeus wide, both wider than ocellar tubercle (Fig. 10B). Abdomen with 5 visible and setose segments (Fig. 10A). Terminalia as in *P. arcuatus*, except as noted: tergite 10 divided medially into hemitergites each bearing 4 spines and 1 minute lateral seta.

**Type material examined. HOLOTYPE** ♂ (based on photographs) (Fig. 7) labelled as: “[GUATEMALA], La Providencia [ca 14°38'43.7"N 90°26'56.6"W] | ObispoGuate”; “JM Aldrich | Coll”; “iv-14.26”; “*Paraclius* | *angustipennis* [handwritten] | Holotype Van Duzee”; “Type No. | 41053 | U.S.N.M. [red label]” (NMNH). Holotype condition: Both antennae with apex of postpedicel broken off and hypopygium missing.

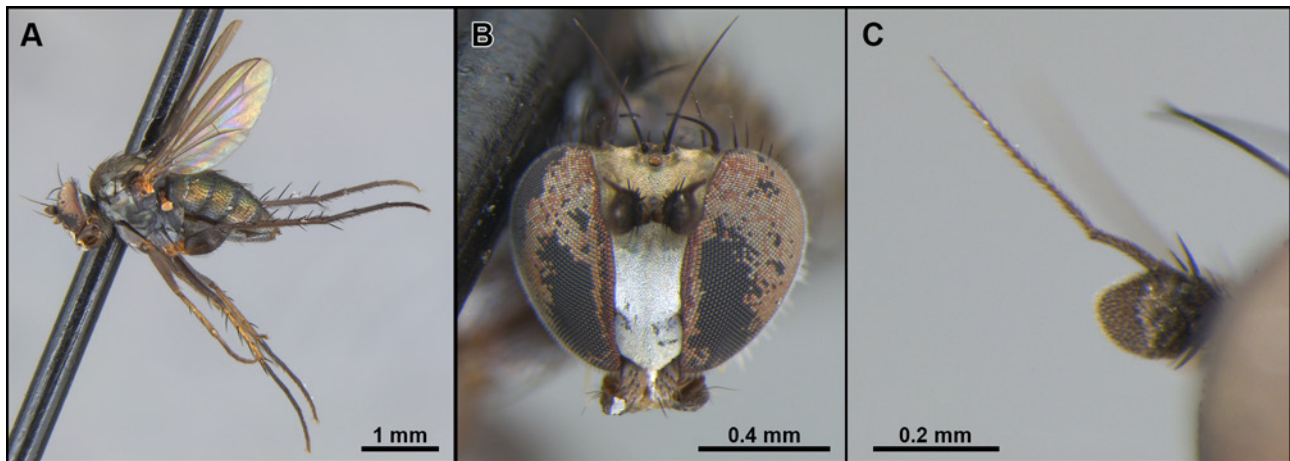




**FIGURE 9.** *Paraclius angustipennis* Van Duzee, 1929, identified male specimen from Mexico (CNC). **A.** Abdomen, ventral view; **B.** Hypopygium, left lateral view; **C.** Internal appendages, left lateral view; **D.** Apical part of phallus; **E.** Apical edge of epandrium; **F.** Tergite 6, lateral view; **G.** Right cercus, outer view; **H.** Left ventral surstylus, outer view; **I.** Hypandrium, ventral view; **J–K.** Surstyli, left and right lateral views, respectively. Abbreviations: a apv s = apical apicoventral epandrial seta; b apv s = basal apicoventral epandrial seta; cerc = cercus; dsur = dorsal lobe of surstylus; ej apod = ejaculatory apodeme; epand = epandrium; hypd = hypandrium; hypd pr = hypandrial process; pgt = postgonite; ph = phallus; ph pr = phallus process; prct = proctiger; sp = sperm pump; st = sternite; tg = tergite; vsur = ventral lobe of surstylus.

**Additional material examined. MEXICO:** nr jet rts 190, 200 [Mexican Federal Highways 190 and 200], Chiapas [ca 16°32'48.2"N 92°33'18.8"W], 21.v.1963 (1 ♂, dissected, CNC); nr km 220 rt 185 Oaxaca

[ca 17°04'36.1"N 96°43'27.2"W], Mex, Aug 9, 1962 [09.viii.1962]" (1 ♂, dissected INPA); Chiapas, Arriaga [16°14'33.5"N 93°54'13.1"W] 22.05.1963 (1 ♀, INPA; 1 ♀, dissected, CNC).



**FIGURE 10.** *Paraclius angustipennis* Van Duzee, 1929, identified female specimen from Mexico (CNC). **A.** Habitus, lateral view; **B.** Head, anterior view; **C.** Left antenna, outer view.

**Remarks.** *Paraclius angustipennis* possesses a densely pruinose frons and mostly brown legs, similar to *P. pumilio* and *P. xibun* **sp. nov.**, but can be differentiated from both species by the  $II_t_1$  wholly dark brown (Figs 7A, 8A, 10A), and the phallus with subapical fringe of spines (Fig. 9B, C, D) ( $II_t_1$  yellow on basal 1/2, and phallus plain, lacking subapical fringe of spines in *P. pumilio* and *P. xibun* **sp. nov.**). Van Duzee (1929: 42) described *P. angustipennis* as a female, but examination of photographs of the holotype reveals that it is a male with the hypopygium broken off.

**Distribution.** Guatemala and newly recorded from Mexico (Chiapas) (Fig. 23).

### *Paraclius brooksi* Soares, Runyon & Capellari **sp. nov.**

(Figs 11–13, 23)

**Diagnosis (males).** Postpedicel subrectangular, pointed dorsally at apex (Fig. 11D). Anepisternum with yellow spot above coxa I (Fig. 11A). Legs mostly yellow, except extreme base of coxa I, basal 2/3 of coxa II and basal 1/3 of coxa III, tarsi I and II from apex of tarsomere 1, apex of dorsal and posterior surfaces of femur III, apical 1/3 of tibia III and all of tarsus III brown (Fig. 11A). Wing brownish;  $M_1$  strongly bowed towards  $R_{4+5}$ , weakly concave posteriorly; CuAx ratio: 0.9 (Fig. 11F). Male tergite 6 with 4–5 strong lateral setae (Fig. 11E). Basal apicoventral epandrial seta about 2X longer than apical seta, and slightly shorter than ventral lobe of surstylus (Fig. 12C, D). Ventral lobe of surstylus long and narrow, somewhat L-shaped, strongly curved ventrally at apex (Fig. 12C, D). Dorsal lobe of surstylus short and wide, somewhat subrectangular, narrowing at apical 1/3, with 1 short and strong seta at middle of dorsal edge (Fig. 12D). Cercus oval, about 3X longer than wide; brownish, except base yellow; about 1/2 as long as epandrium (Figs 11E, 12B, C).

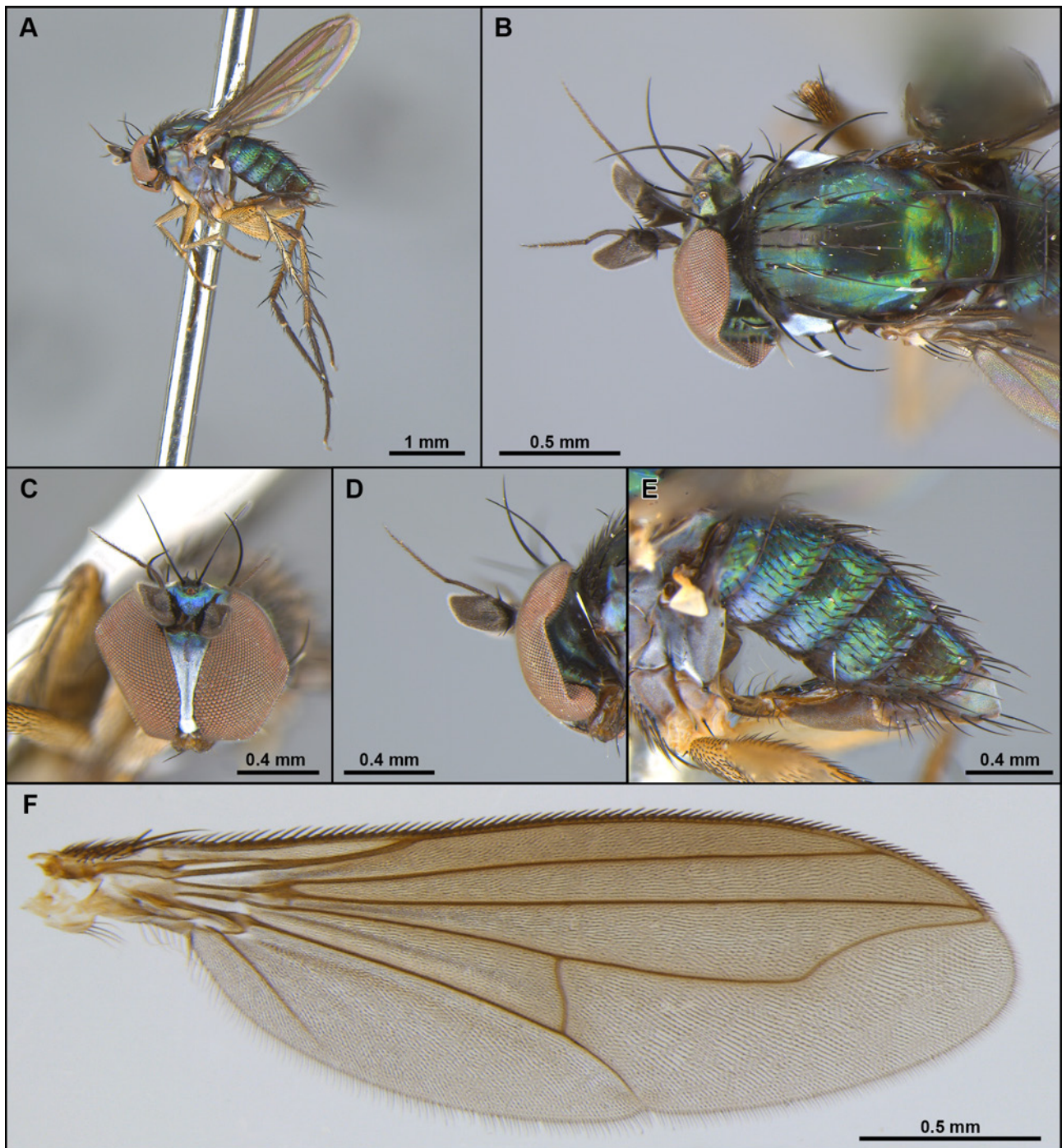
**Description. Male.** Body length: 2.8–2.9 mm; wing length: 2.6–2.8 mm, width: 0.8 mm (n = 4). **Head** (Fig. 11A–D). Similar to *P. arcuatus*, except: Upper-most 5 postocular setae black, remaining setae white. Frons subrectangular 2.3X wider than high, metallic green, with weak bluish reflections. Face ground color pale brown, but obscured by dense silvery pruinosity, except short rectangular area below base of antennae metallic green with weak bluish reflections. Face gradually narrowing below, slightly wider than mid ocellus at narrowest point. Antenna dark brown; scape conical, dorsal surface covered with short black setae, 2–3 longer setae at outer surface; postpedicel subrectangular, pointed dorsally at apex, 1.7X longer than wide; arista-like stylus dorsal, arising at base of postpedicel, length about 4/6 of eye height, two-segmented, first segment short and arched, slightly overlapping apex of postpedicel, covered by short pubescence, second segment long, about 2X longer than first segment, covered by short microtrichia. **Thorax** (Fig. 11A, B). Mesonotum mostly metallic green, with narrow acrostichal coppery stripe and weak bluish reflections. Metepimeron dark gray. *Chaetotaxy*: Scutellum with 1 pair of strong medial



scutellars and 1 pair of smaller setae laterad, about 1/6 as long as medial scutellars; upper-surface of proepisternum with sparse fine setulae and 2 more conspicuous setae in front of anterior spiracle. **Wing** (Fig. 11F). Membrane brownish;  $M_1$  strongly bowed towards  $R_{4+5}$  and weakly concave posteriorly; CuAx ratio: 0.9. **Legs** (Fig. 11A). Mostly yellow, except extreme base of coxa I, basal 2/3 of coxa II and basal 1/3 of coxa III, tarsi I and II from apex of tarsomere 1, apex of dorsal and posterior surfaces of femur III, apical 1/3 of tibia III and entirely tarsus III brown. **Leg I.** Podomere ratios: 27, 27, 11/4/3/3/3. Anterior surface of coxa I covered with silvery pruinosity on apical 1/2, apical edge with 4–5 strong black setae. Femur I with anteroventral row ending in 2–3 long preapical setae, 1 preapical and 1 apical long posteroventral setae. Ventral surface of tarsus I from apex of  $It_1$  with weak whitish pilosity (MSSC). **Leg II.** Podomere ratios: 40, 40, 20/12/10/7/5. Femur II with anteroventral row of setae from base to apical 5/6 (about 0.4X as long as width of femur at broadest point), ending in 2–3 long preapical setae, 1 posteroventral more conspicuous seta at apical 1/3, and 1 strong anterior preapical seta. **Leg III.** Podomere ratios: 42, 50, 14/20/15/10/7. Femur III laterally compressed, about 1.5X wider than femur II at broadest point. Femur III with dorsal row of more erect setae (about 1/3 as long as width of femur) from base to apical 4/6, with ventral row of short setae (about 1/4 as long as width of femur), from base to apical 5/6, ending in 3 more conspicuous preapical setae, 1 short posteroventral seta and 1 strong anterior preapical seta. **Abdomen** (Figs 11A, E, 12A, G). Metallic green, with greenish and bluish reflections. Posterior margin of tergite 5 with long setae, but not overlapping posterior margin of tergite 6. Lateral margin of tergite 6 with 4 long and strong setae, apicalmost seta longer than tergite 6. Tergite 7 covered with weak pruinosity, with narrow and deep concavity at posterior margin, reaching 2/3 of tergite. Sternite 5 U-shaped anteriorly, with two narrow 0-shaped sclerites posteriorly. Sternite 8 subovoid, setose on posterior half. **Hypopygium** (Figs 11E, 12B–F). Epanthrium long and narrow, about 2.8X longer than high, with acute apicoventral lateral ridge (Fig. 12C, D). Basal apicoventral seta about 2X longer than apical seta, slightly shorter than ventral lobe of surstylus (Fig. 12C, D). Ventral lobe of surstylus long, somewhat L-shaped, strong curved ventrally at apex, with short and stout modified apical seta (Fig. 12C, D). Dorsal lobe of surstylus short and wide, narrowing at apical 1/3, about 1/3 as long as ventral lobe of surstylus, with 1 short and strong seta at middle of dorsal edge, 1 slender seta at middle of inner surface, 1 short and slender seta at apical 1/3 of dorsal edge and 1 long and slender seta at apical 1/3 of outer edge (Fig. 12D). Postgonite well sclerotized, short and slightly curved ventrally (Fig. 12C, E). Proctiger plain, weakly sclerotized (Fig. 12E). Hypandrium trough-shaped, with weak connection to epanthrium basiventrally, free laterally, apex bifurcate, weakly sclerotized and asymmetrical, left lateral margin with 1 short dentiform preapical projection, and right lateral margin with minute dentiform projection, base of hypandrium projecting up inside epanthrial capsule, cradling phallus (Fig. 12C, E, F). Phallus entirely divided into two strongly sclerotized narrow arms, narrowing at apex, right arm with 1 thumb-shaped projection (Fig. 12E, F). Ejaculatory apodeme long and narrow, about as long as 1/2 of epanthrium, laterally compressed and weakly sclerotized (Fig. 12E). Sperm pump short and wide, somewhat C-shaped, about 1/2 as long as ejaculatory apodeme (Fig. 12E). Cercus long and oval, about 3X longer than wide, and about 1/2 as long as epanthrium, inner and outer surfaces covered by short and sparse setae, ventral edge with long setae, remarkably long on basal 1/3 (Fig. 12B). **Female** (Fig. 13). Body length: 3.2 mm; wing length: 2.6 mm ( $n = 1$ ). Similar to male, except as noted: Postpedicel short, about as long as wide, somewhat subtriangular (Fig. 13C); face and clypeus wide, both wider than ocellar tubercle (Fig. 13B). Terminalia as in *P. arcuatus*, except as noted: tergite 10 divided medially into hemitergites each bearing 4 spines and 1 minute lateral seta.

**Type material. HOLOTYPE** ♂ (Fig. 11) labelled: “Mexico, Chis. [Chiapas] 20–25 | mi. N Huixtla 3000’ [= 900 m] [ca 15°11’56.8”N 92°28’01.8”W] | 4.vi.1969 | B.V. Peterson” “HOLOTYPE | *Paraclius brooksi* | Soares, Runyon & Capellari” [red label] (CNC). Holotype condition: good, not dissected. **PARATYPES:** same data as holotype, except: 3.vi.1969 (1 ♂ with head and terminalia dissected, and left wing mounted between cover slips, NMNH); Oaxaca, above Valle Nacional [ca 17°47’34.7”N 96°15’42.7”W], 14.v.1963 (1 ♂, INPA); same data, except: 21.v.1963 (1 ♂ dissected, CNC).

**Additional material examined. GRENADA:** W. Indies 190–66, 172, Mt. Maitland [ca 12°02’50.3”N 61°42’48.9”W], (Leeward side), W.I., H. H. Smith, *Paraclius arcuatus* (Loew) det. Fred C. Harmston, Collection of the California Academy of Sciences, San Francisco, Calif., Collection of Calif. Acad. of Sci. 1994 Gift Fred C. Harmston, *Paraclius arcuatus* Lw., *Paraclius* sp. 1 (nr *arcuatus*) det. S.E. Brooks, 2004 (1 ♀, CAS). **MEXICO:** Chis. [Chiapas] 20–25, mi. N Huixtla 3000’ [= 900 meters high] [ca 15°11’56.8”N 92°28’01.8”W], 2.vi.1969, B.V. Peterson (1 ♀, CNC).



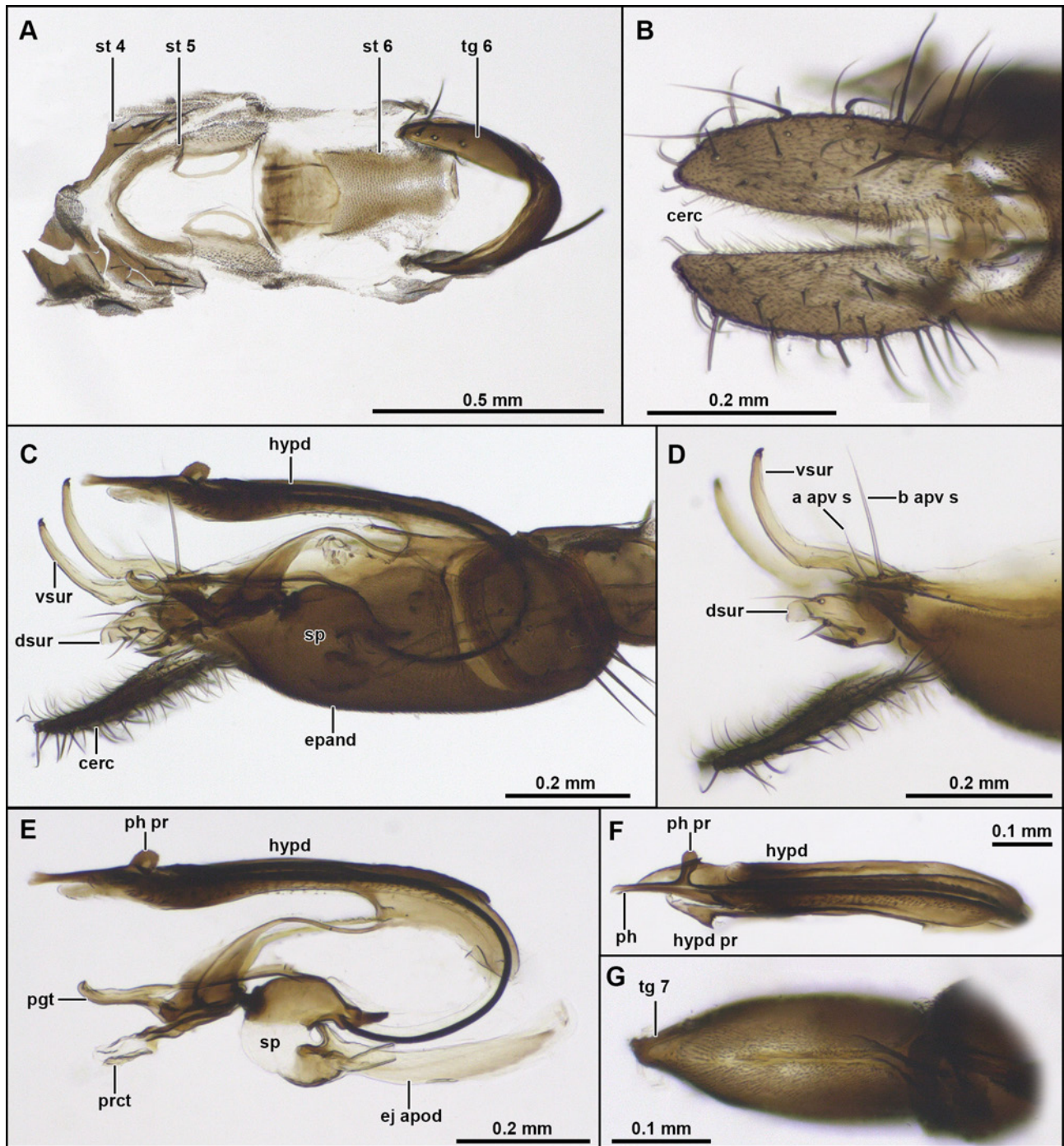
**FIGURE 11.** *Paraclius brooksi* sp. nov., A–E male holotype (CNC), F male paratype (CNC). A. Habitus, lateral view; B. Thorax, dorsal view; C–D. Head anterior and lateral views, respectively; E. Abdomen and hypopygium, lateral view; F. Left wing.

**Remarks.** *Paraclius brooksi* sp. nov. possesses mostly yellow legs and male tergite 6 with long and strong setae, similar to *P. angusticauda* and *P. elongatus*, but can be differentiated by the brownish wing (Fig. 11F) and long basal apicoventral epandrial seta which is about 2X longer than apical seta (Fig. 12D) (wing mostly grayish (Fig. 11) and basal apicoventral epandrial seta as long as apical seta in *P. angusticauda* (Fig. 1G)). *Paraclius brooksi* sp. nov. was previously mentioned by Aldrich (1902) as a “light variety” of *P. arcuatus* and by Brooks (2005) as “*Paraclius* sp. 1”.

**Etymology.** Named after Scott Brooks (CNC), who has contributed substantially to the study of Dolichopodinae

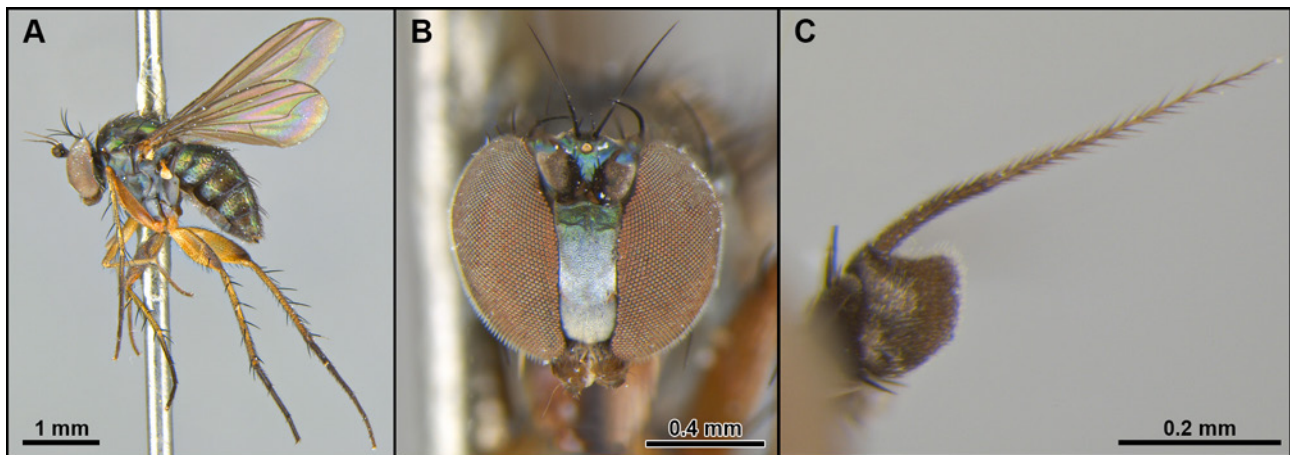


worldwide, and for his willingness to separate and prepare specimens for loan, including those used in the description of the new species.



**FIGURE 12.** *Paraclius brooksi* sp. nov., male paratype (CNC). **A.** Abdomen, ventral view; **B.** Cerci, dorsal view; **C.** Hypopygium, left lateral view; **D.** Surstyli and apical edge of epandrium; **E.** Internal appendages; **F.** Hypandrium and phallus, ventral view; **G.** Tergite 7, dorsal view. Abbreviations: a apv s = apical apicoventral epandrial seta; b apv s = basal apicoventral epandrial seta; cerc = cercus; dsur = dorsal lobe of surstylus; ej apod = ejaculatory apodeme; epand = epandrium; hypd = hypandrium; hypd pr = hypandrial process; pgt = postgonite; ph = phallus; ph pr = phallus process; prct = proctiger; sp = sperm pump; st = sternite; tg = tergite; vsur = ventral lobe of surstylus.

**Distribution.** *Paraclius brooksi* sp. nov. is known to occur in Grenada and Mexico (Chiapas and Oaxaca) (Fig. 23).



**FIGURE 13.** *Paraclius brooksi* sp. nov., identified female from Mexico (CNC). **A.** Habitus, lateral view; **B.** Head, anterior view; **C.** Right antenna, outer view.

### *Paraclius elongatus* Van Duzee

(Fig. 23)

*Paraclius elongatus* Van Duzee, 1930: 72. Type locality: Saint Vincent and the Grenadines.

**Diagnosis** (male, based on the original description). Postpedicel subrectangular, pointed dorsally at apex. Mesonotum metallic green, with bluish reflections. Legs mostly yellow, except extreme base of coxae I and III and lateral surface of coxa III brownish, femur III blackened at apex, mainly on posterior surface; tarsi I and II from apex of tarsomere I and all of tarsus III brown. Wing grayish, slightly brownish anteriorly, vein  $M_1$  strongly bowed towards  $R_{4+5}$  and strongly concave posteriorly. Hypopygium brown, cercus oval, 2X longer than wide, yellow, with dark margins.

**Remarks.** *Paraclius elongatus* is very similar and possibly conspecific with *P. angusticauda* as discussed above (see ‘Remarks’ under *P. angusticauda*). However, we were not able to examine the holotype of *P. elongatus* that was supposedly deposited in the Arthropod Museum of the University of Arkansas but could not be located.

**Distribution.** *Paraclius elongatus* is recorded only from the type locality in the Saint Vincent and the Grenadines (Fig. 23).

### *Paraclius pumilio* Loew

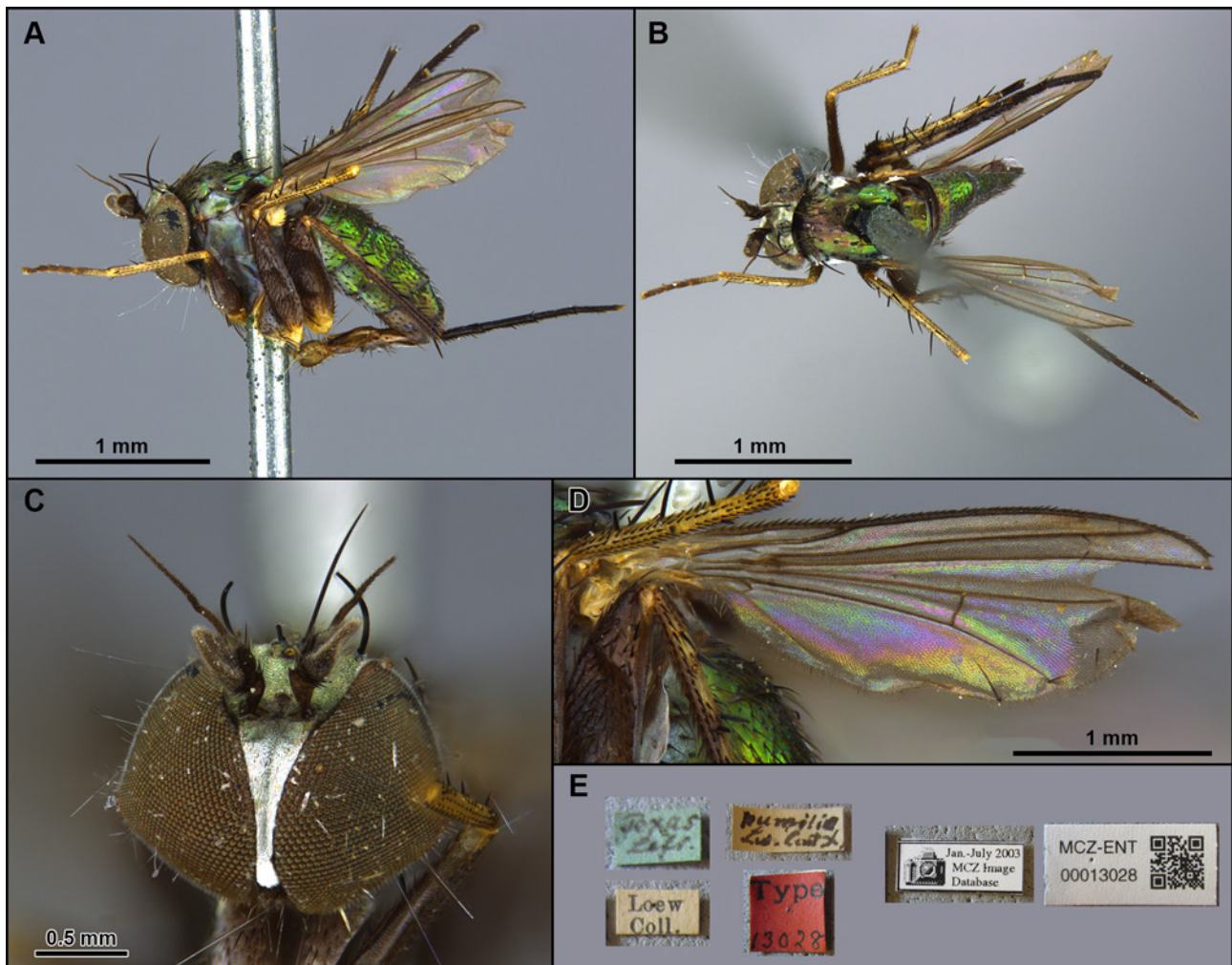
(Figs 14–18, 22)

*Paraclius pumilio* Loew, 1872: 90. Type locality: USA, Texas.

*Paraclius magnicornis* Van Duzee, 1927: 146. Type locality: USA, Idaho, Lewiston. **Syn. nov.**

**Diagnosis.** Postpedicel suboval to subtriangular, with rounded apex (Figs 14A, 15D, F). Anepisternum without yellow spot above coxa I (Figs 14A, 15A). Legs mostly dark brown, except apex of all coxae, trochanters, tibiae I and II and basal 1/4 of dorsal surface of tibia III, basal 1/2 of  $It_1$  and  $IIt_1$  yellow (Figs 14A, 15A). Wing hyaline to gently brownish anteriorly;  $M_1$  strongly bowed towards  $R_{4+5}$ , weakly concave posteriorly; CuAx ratio: 0.35 (Figs 14D, 15E, 18A). Male tergite 6 with 4 strong lateral setae (Fig. 16I). Ventral lobe of surstylus long and narrow, somewhat L-shaped, abruptly curved ventrally, almost forming a 90° angle (Fig. 16C–E). Dorsal lobe of surstylus weakly sclerotized, short, subrectangular, with 1 slender apicoventral seta, longer than dorsal lobe of surstylus, and 2 strong setae, 1 at apical margin and 1 subapical at dorsal edge (Fig. 16F). Cercus long, suboval, about 1/2 as long as epandrium (Fig. 16C, D, H).





**FIGURE 14.** *Paraclius pumilio* Loew, 1872, male syntype (MCZ). **A–B.** Habitus, lateral and dorsal views respectively; **C.** Head, anterior view; **D.** Left wing; **E.** Labels.

**Redescription. Male** (based on photographs of the male syntype and identified specimens). Body length: 2.2–2.8 mm; wing length: 1.9–2.5 mm, width: 0.6–0.9 mm (n = 20). **Head** (Figs 14A–C, 15A, B, 18B, C). Similar to *P. arcuatus*, except as noted: Upper-most 4–5 postocular setae black, remaining setae white. Frons covered with dense yellowish gray pruinosity, with weak greenish reflections. Face homogeneously obscured by dense silvery pruinosity. Postpedicel suboval or subtriangular, with rounded apex, about 1.2–1.5X longer than wide; arista-like stylus dorsal, arising near base of postpedicel, length about 4/6 of eye height; two-segmented, first segment, short, arched, ending at apex of postpedicel, covered with short pubescence; second segment long, about 3X longer than first segment, covered with short microtrichia. **Thorax** (Figs 14A, B, 15A, B). Mesonotum metallic green with weak purple and coppery reflections, postalar callus covered with silvery pruinosity. Scutellum metallic green, with lateral margins covered with silvery pruinosity. Pleura dark gray, covered with dense silvery pruinosity, with weak greenish and bluish reflection mainly on anepisternum. Metepimeron dark gray. **Chaetotaxy**: scutellum with 1 pair of strong medial scutellars and 1 pair of smaller setae laterad, about 1/5 as long as medial scutellars. **Wing** (Figs 14A, D, 15C, E, 18A). Membrane grayish; CuAx ratio: 0.35–0.40; plumule yellow to black. **Legs** (Figs 14A, 15A). Mostly dark brown, except apex of all coxae, trochanters, extreme base of all femora, apex of femur I, basal 1/2 of  $It_1$  and  $It_2$  and basal 1/3 of dorsal surface of tibia III yellow to dark yellow. **Leg I.** Podomere ratios: 24, 22, 7/3/2/2/3. Apical 1/2 of anterior surface of coxa I covered with dense silvery pruinosity, apical edge with 2–3 strong setae and 1–2 slender setae. Femur I with anteroventral row of short setae from base to apex (about 1/4 as long as width of femur) ending in 2–3 more conspicuous preapical setae, 2 posteroventral preapical short setae. Tarsus I unmodified. **Leg II.** Podomere ratios: 32, 32, 12/10/8/5/4. Femur II with row of short anteroventral

setae from base to apical 5/6 (about 1/3 as long as width of femur at broadest point), ending in 2 preapical more conspicuous setae, 1 strong anterior preapical seta, 1 posteroventral more conspicuous preapical setae. **Leg III.** Podomere ratios: 40, 50, 12/15/12/8/5. Femur III laterally compressed, about 1.5X wider than femur II at broadest point. Femur III with anterodorsal row of short setae at basal 1/2, anteroventral row of short setae from base to apical 5/6, ending in 1 longer preapical seta, 2 posteroventral preapical short setae and 1 strong anterior preapical seta. **Abdomen** (Figs 14A, 15A, 16A, B, I, 18D). Metallic green, with weak greenish and coppery reflections. Posterior margin of tergite 5 with long setae, but not overlapping posterior margin of tergite 6. Lateral margin of tergite 6 with 4 strong setae on posterior 1/2 (all shorter than tergite). Tergite 7 covered with weak pruinosity, with narrow and deep concavity at posterior margin, almost dividing tergite in two hemitergites. Sternites pale brown to brown (sternites 1–4 not examined). Sternite 5 U-shaped, as long as sternite 6 and weakly connected with tergite 6. Sternite 8 subovoid, setose on posterior 1/2. **Hypopygium** (Fig. 16C–H). Epandrium dark brown, long and narrow, about 3X longer than high, with acute apicoventral lateral ridge (Fig. 16C, D). Basal apicoventral epandrial seta slightly longer than ventral lobe of surstylus and 2X longer than apical seta (Fig. 16C, D). Ventral lobe of surstylus long and narrow, somewhat L-shaped, abruptly curved ventrally, almost forming 90° angle, with short and stout modified apical seta and 1 short dorsal seta inserted on short tubercle at base (Fig. 16C–E). Dorsal lobe of surstylus weakly sclerotized, short, subrectangular, with 1 slender apicoventral seta, as long as dorsal lobe of surstylus and 2 strong setae, 1 at apical margin and 1 subapical at dorsal edge (Fig. 16F). Postgonite plain, well sclerotized and curved ventrally at apex (Fig. 16E). Proctiger plain, weakly sclerotized and dorsoventrally flattened (Fig. 16E). Hypandrium trough-shaped, with weak connection to epandrium basally, free laterally, apex bifurcate, asymmetrical and somewhat arrow-shaped in ventral view, left lateral margin with 2 dentiform preapical processes, apicalmost process bifid, right lateral margin with 1 preapical bifid process; base of hypandrium projecting up inside epandrial capsule, cradling phallus (Fig. 16C, G). Phallus strongly sclerotized, divided in two narrow arms, narrowing at apex, both arms with 1 short subapical dentiform process (Fig. 16C, E); ejaculatory apodeme long, about 1/2 as long as epandrium, gradually widening towards apex, laterally compressed and well sclerotized (Fig. 16C, E); sperm pump short, somewhat pipe-shaped, about 1/2 as long as ejaculatory apodeme (Fig. 16C, E). Cercus long, suboval, about 1/2 as long as epandrium, whitish-yellow, outer surface covered with short setae, ventral edge with long setae (Fig. 16C, D, H). **Female** (Fig. 17). Body length: 2.9–3.3 mm; wing length: 2.5–2.8 mm (n = 12). Similar to male, except as noted: Postpedicel short, oval, about as long as wide; face and clypeus wide, both wider than ocellar tubercle. Abdomen metallic green with weak coppery reflections. Tergites 1–5 setose, with long setae at posterior margins (about 1/2 as long as tergite) and with weak lateral patches of silvery pruinosity. Terminalia as in *P. arcuatus*, including number of spines on each acanthophorite.

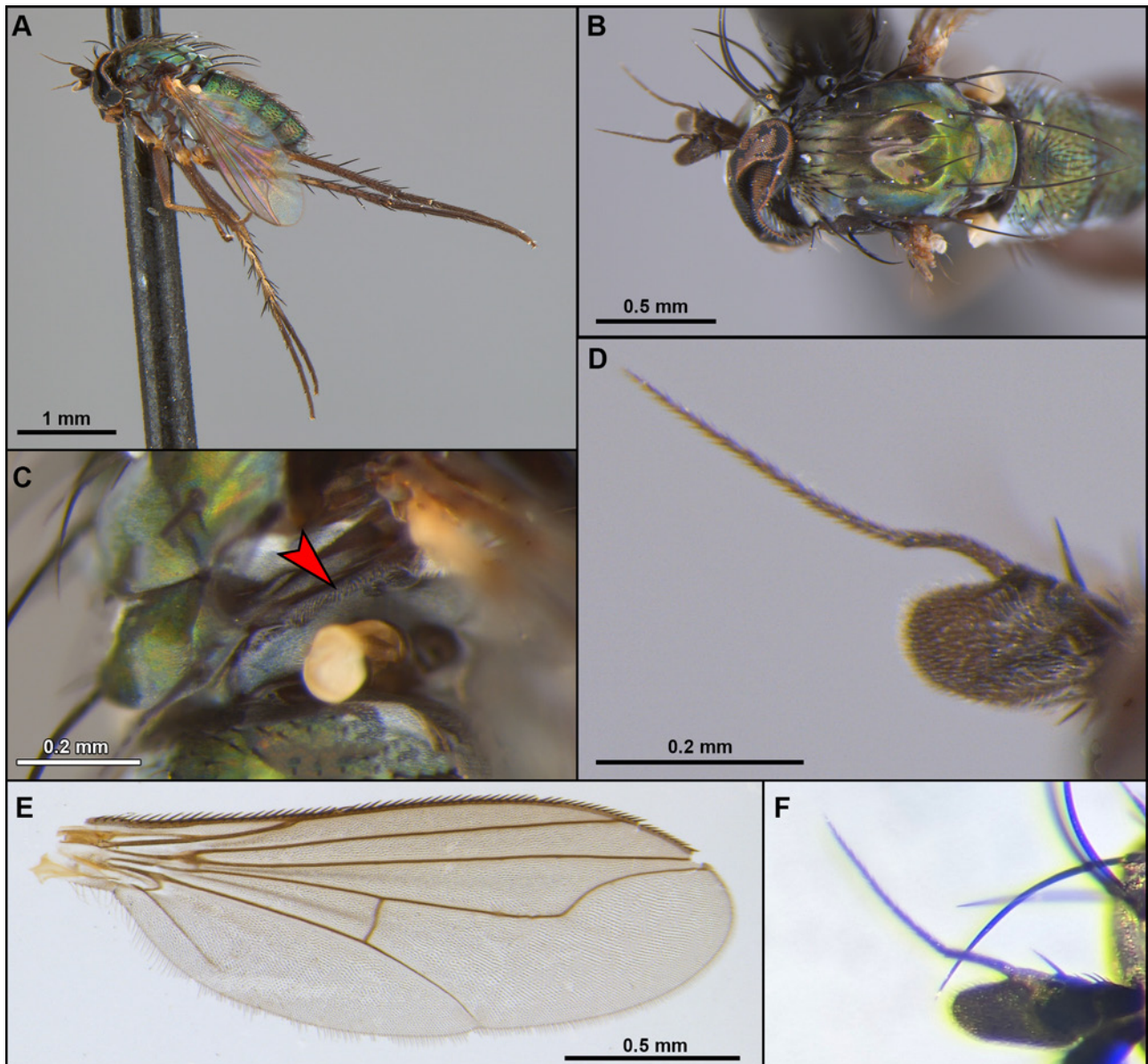
**Type material examined.** *Paraclius pumilio*: **SYNTYPE** ♂ (based on photographs) (Fig. 14) labelled as: “[USA], Texas” [handwritten]; “pumilio” [handwritten]; “Loew | Coll.” “Type | 13028”; “MCZ-ENT | 00013028” (MCZ).

*Paraclius magnicornis*: **HOLOTYPE** ♂ (based on photographs and examination of specimen) (Fig. 18) labelled as: “[USA], Lewiston [ca 46°23′24.8″N 117°00′08.8″W] | Idaho | July 20’ 25”; “Pres by | C.L Fox | Collector”; “*Paraclius | magnicornis* [handwritten] | Holotype Van Duzee”; “California Academy | of Sciences | Type No. 1881” (CAS).

**Additional material examined.** **MEXICO:** Oaxaca [ca 17°09′46.5″N 96°47′11.8″W], nr 660 km rt 190 [Mexican Federal Highway 190], 09.viii.1962, *Paraclius pumilio* Loew (1 ♂, dissected CNC); *idem*, nr km 220 rt 185, (1 ♀, CNC). **USA: Arizona**, Mohave Co., Burro Creek [34°33′13.8″N 113°31′25.1″W] 1900 ft, 15 mi. S Wikieup, 18.viii.1985, R. Hurley (1 ♂, MTEC). **Arkansas**, Scott Co. Bates [ca 34°54′23.6″N 94°23′16.3″W], 8.viii.1988, R. Hurley (1 ♂, MTEC). **California**, Alamo Creek, S.L. Obispo Co. [ca 35°15′39.1″N 120°42′52.2″W], 22.i.1948, W.W. Wirth, Collector, *Paraclius magnicornis* Van Duzee, Det. F.C.H. Harmston, 1948 (1 ♀, NMNH). **Colorado**, Las Animas Co. Chacuaco Creek [ca 37°30′04.8″N 103°37′43.9″W] 5500 ft 7.5 mi. E Walts Corner 11.viii.1988, R. Hurley (1 ♂, MTEC). **Illinois**, Vermillion Co., Middle Fk, Vermillion River, Potomac [ca 40°18′03.1″N 87°47′52.8″W], 17.vii.1989, R. Hurley (1 ♂, MTEC). **Indiana**, Orange Co., Patoka Lake [ca 38°25′05.0″N 86°39′40.5″W], 4 mi. S Painter Creek, 20.viii.1981, R. Hurley (1 ♂, MTEC). **Kansas**, Neosho Co., Canville Creek [ca 37°41′50.1″N 95°11′56.9″W], 2 mi. W Stark, 22.viii.1980, R. Hurley (1 ♂, MTEC). **Kentucky**, Adair Co., 1 mi. S Portland [ca 37°07′16.2″N 85°26′41.5″W], 4.ix.1976, R. Hurley (1 ♂, MTEC). **Missouri**, Caldwell Co., Little Otter Creek, 1 mi. E Hamilton [ca 39°44′40.5″N 94°00′51.3″W], 14.vii.1989, R. Hurley (1 ♂, MTEC). **Montana**, Carbon Co., Pryor Mountains, Gyp Springs, 1410 m, N45°00.36′ W108°25.80′, 4–5.vii.2018, J.B. Runyon (1 ♂, MTEC). **Oklahoma**,



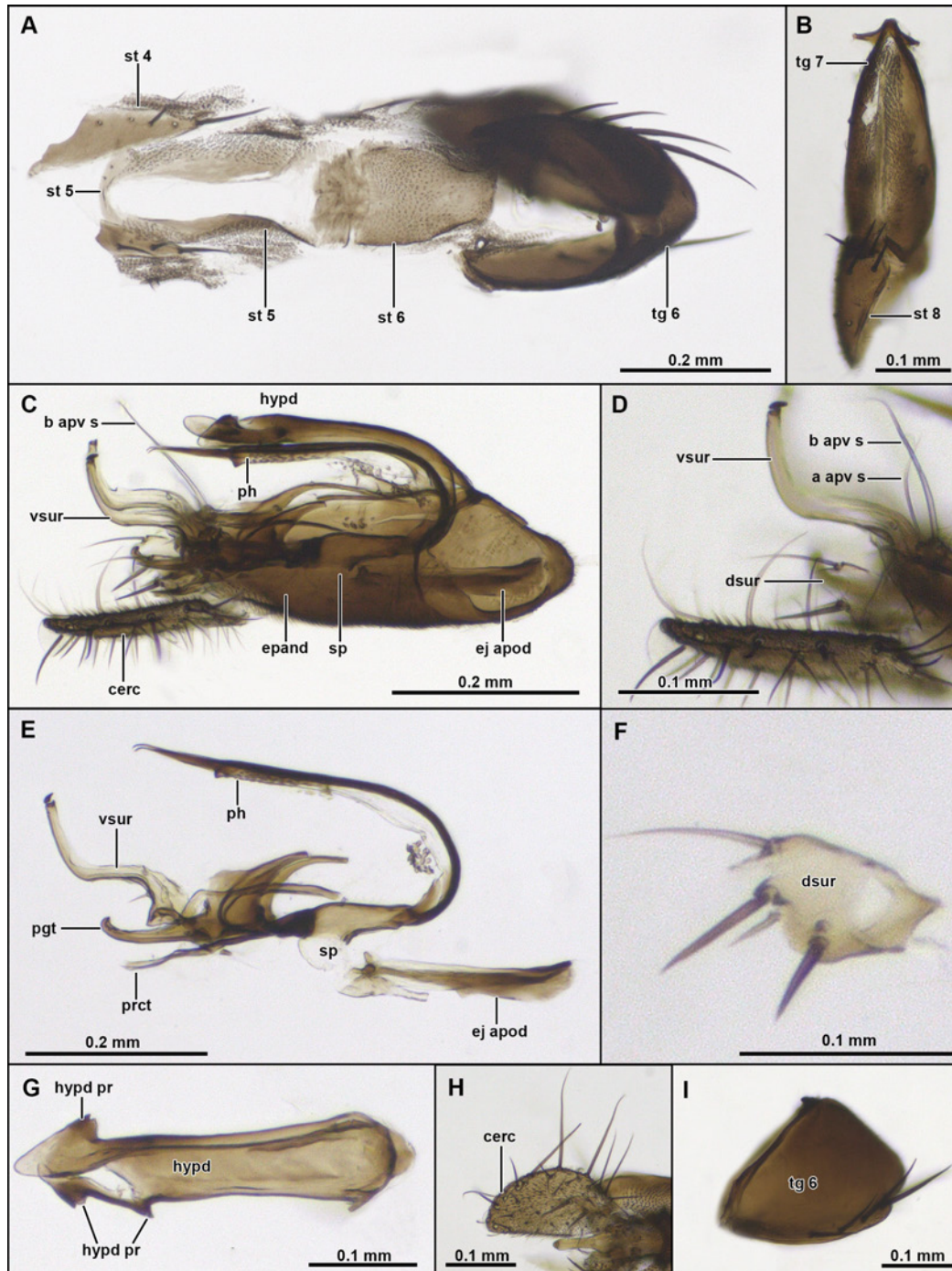
Logan Co. [ca 35°56'53.0"N 97°35'32.7"W], 3 mi. S Crescent, 5.viii.1974, R. Hurley (1 ♂, MTEC). **Pennsylvania**, Fulton Co., Little Tonoloway Creek, N39°47.936' W78°14.489', 22.vii.2007, J.B. Runyon (1 ♂, MTEC). **South Dakota**, Buffalo Co., Campbell Creek [ca 45°47'27.4"N 103°29'47.3"W], 2.5 mi., W Lees Corner, 23.vi.1987, R. Hurley (1 ♂, MTEC). **Tennessee**, Lincoln Co., Carr Creek, 4.6 mi NE Dellrose [ca 35°07'24.3"N 86°47'41.8"W], 7.viii.1992, R. Hurley (1 ♂, MTEC). **Texas**, Kerr Co., Guadalupe River, Kerrville [ca 30°03'17.0"N 99°09'58.5"W], 24.viii.1985, R. Hurley (1 ♂, MTEC); Plano [ca 33°03'04.6"N 96°40'16.0"W], July, 1907, E.S. Tucker (2 ♀, NMNH, one dissected). **Virginia**, Wise Co., Cranesnest River, 549 m, N37°02.67' W82°29.66', 18.vi.2008, J.B. Runyon (1 ♂ MTEC). **West Virginia**, Boone Co., Little Coal River, 198 m, N38°10.847' W81°50.288', 5.vi.2007, J.B. Runyon (1 ♂, MTEC);



**FIGURE 15.** *Paraclius pumilio* Loew, 1872, **A–E** identified male specimens from USA, Texas (CNC), **F** male from USA, Montana (MTEC). **A.** Habitus, lateral view; **B.** Thorax, dorsal view; **C.** Plumule, lateral view; **D.** Left antenna, outer view (male from Texas); **E.** Left wing; **F.** Right antenna, inner view. Image F originally lacked scale bar.

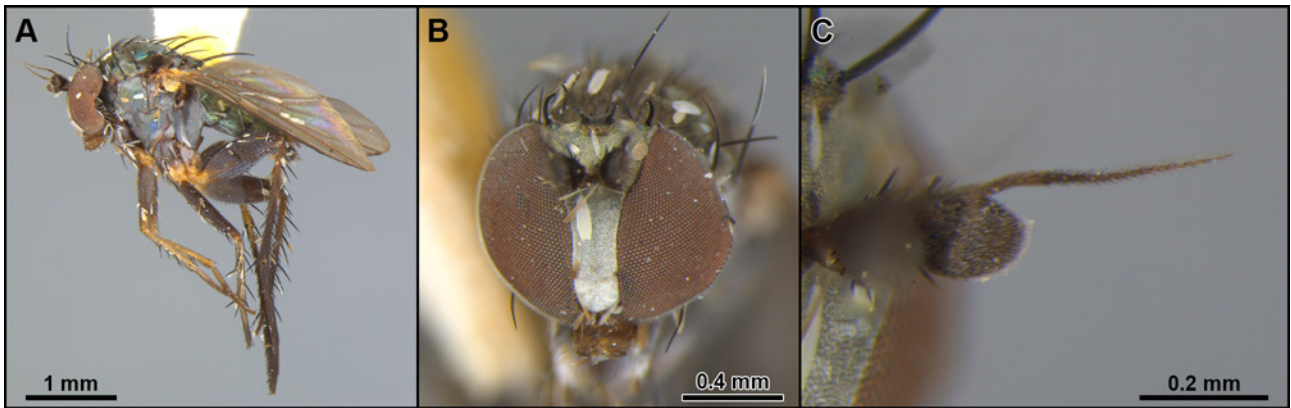
**Remarks.** *Paraclius pumilio* possesses mostly brown to dark brown legs, similar to *P. angustipennis* and *P. xibun* **sp. nov.**, but can be differentiated from *P. angustipennis* by the  $II_t_1$  yellow at basal 1/2 (Fig. 15A) and phallus plain, lacking fringe of short spines (Fig. 16E) versus  $II_t_1$  wholly brown (Figs 7A, 8A), and phallus with fringe of short spines in *P. angustipennis* (Fig. 9B–D), and from *P. xibun* **sp. nov.** by the male tergite 6 with row of 3–4 strong

lateral setae increasing in length towards posterior margin (Fig. 16I), sternite 5 U-shaped (Fig. 16A) and dorsal lobe of surstylus subrectangular, with 1 slender apicoventral seta, longer than dorsal lobe of surstylus, and 2 strong setae, 1 at apical margin and 1 subapical at dorsal edge (Fig. 16F) versus tergite 6 with two rows of 7–8 subequally long lateral setae (Fig. 19E), sternite 5 divided in two narrow hemitergites (Fig. 20A) and dorsal lobe of surstylus suboval, with dorsal row of short setae at basal 1/2, ending in 1 strong seta at middle (Fig. 20D) in *P. xibun* sp. nov.

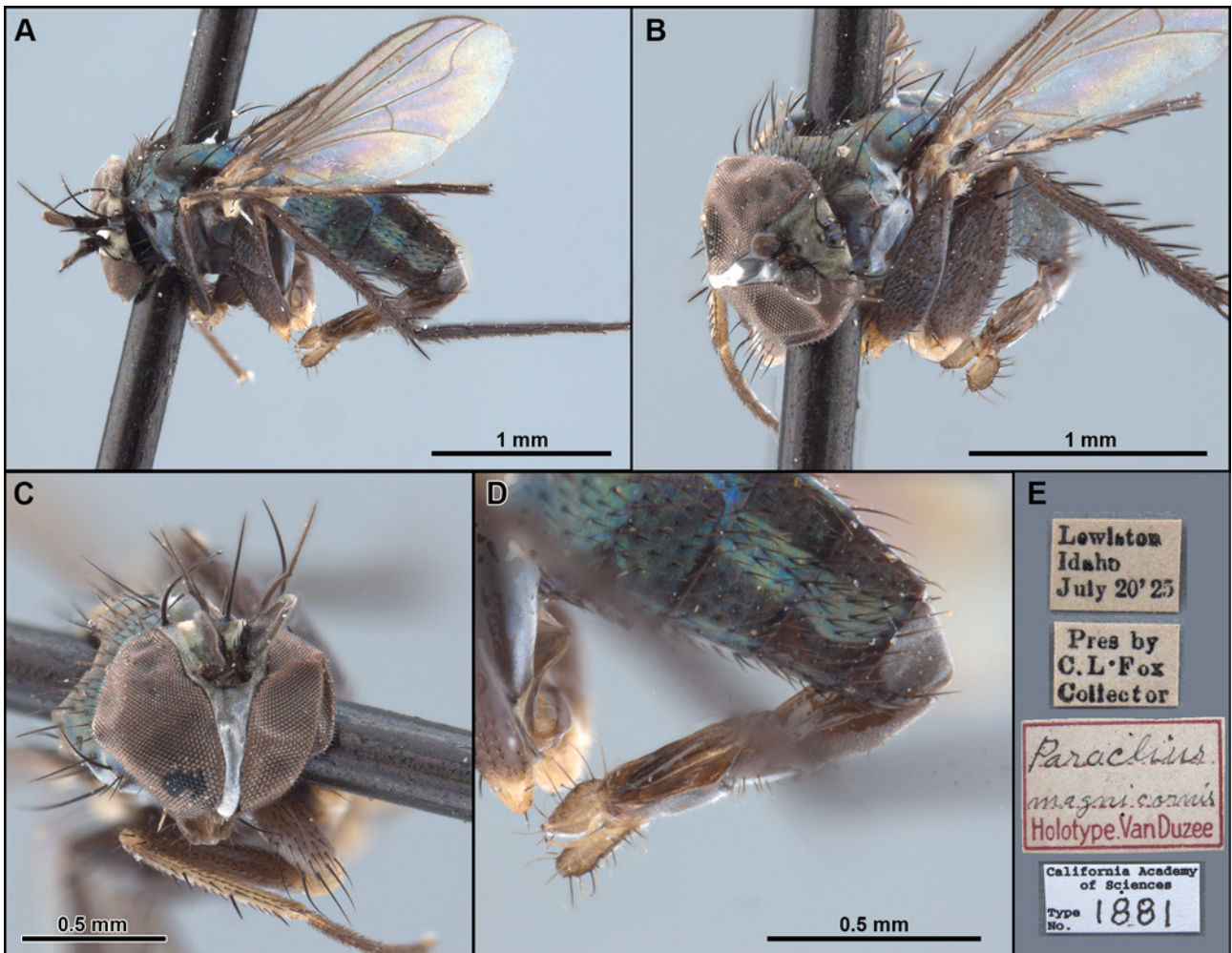


**FIGURE 16.** *Paraclius pumilio* Loew, 1872, identified male specimen from Texas (CNC). **A.** Abdomen, ventral view; **B.** Tergite 7 and sternite 8, dorsal view; **C.** Hypopygium, left lateral view; **D.** Surstyli and apical edge of epandrium, outer view; **E.** Internal appendages, left lateral view; **F.** Dorsal lobe of surstylus, outer view; **G.** Hypandrium, ventral view; **H.** Cercus, dorsal view; **I.** Tergite 6, lateral view. Abbreviations: a apv s = apical apicoventral epandrial seta; b apv s = basal apicoventral epandrial seta; cerc = cercus; dsur = dorsal lobe of surstylus; ej apod = ejaculatory apodeme; epand = epandrium; hypd = hypandrium; hypd pr = hypandrial process; pgt = postgonite; ph = phallus; prct = proctiger; sp = sperm pump; st = sternite; tg = tergite; vsur = ventral lobe of surstylus.





**FIGURE 17.** *Paraclius pumilio* Loew, 1872, identified female specimen from USA, Texas (NMNH). **A.** Habitus, lateral view; **B.** Head, anterior view; **C.** Left antenna, inner view.



**FIGURE 18.** *Paraclius magnicornis* Van Duzee, 1927, male holotype (CAS). **A.** Habitus, lateral view; **B.** Head, anterolateral view; **C.** Head, anterior view; **D.** Abdomen and hypopygium, lateral view; **E.** Labels. Photographs by Rachel Diaz-Bastin.

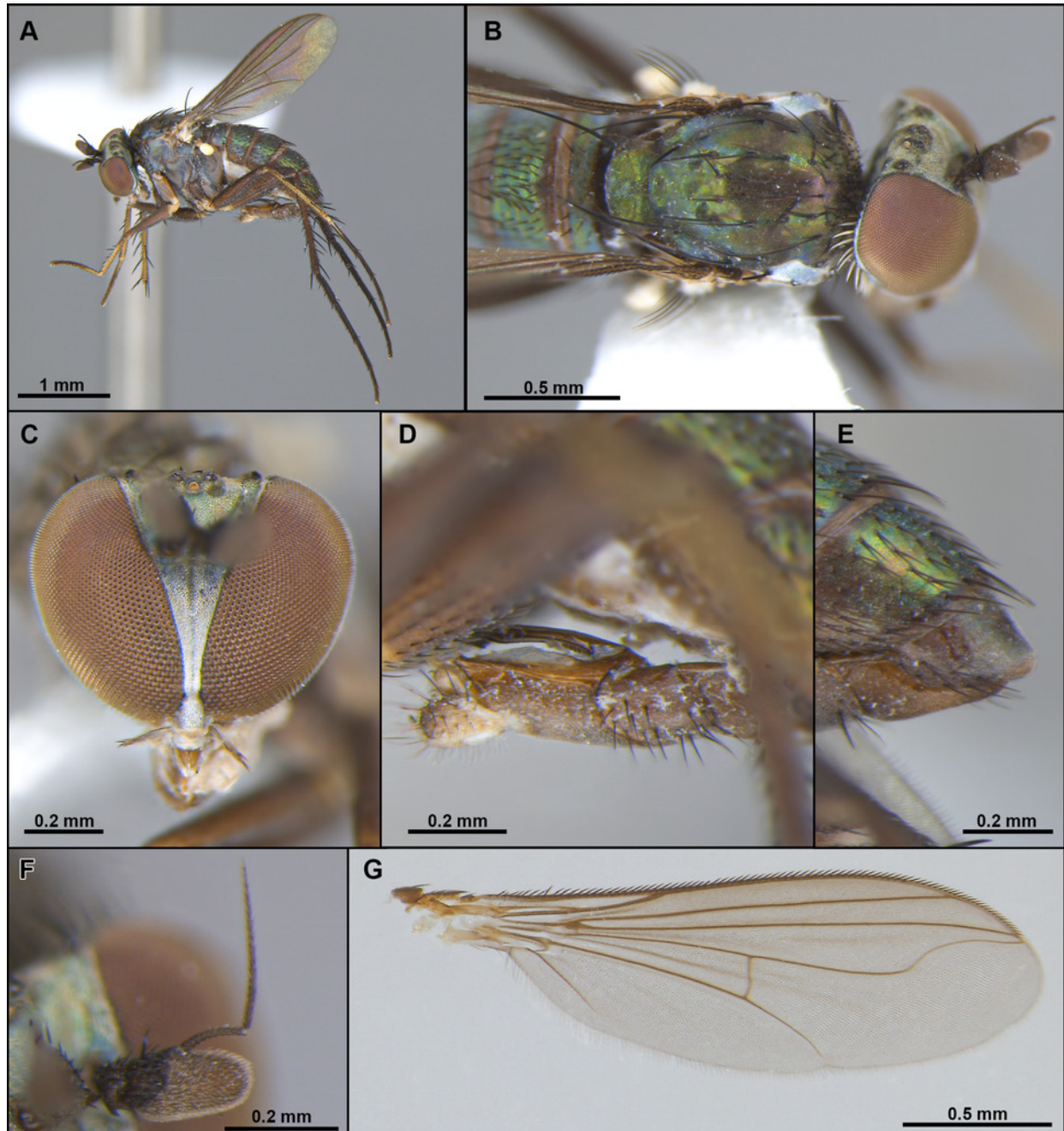
After the examination of photographs and subsequently the specimen of the male holotype of *Paraclius magnicornis* Van Duzee, 1934 housed at CAS (Fig. 18), we concluded that *P. magnicornis* is conspecific and should be synonymized under *P. pumilio*. The main difference between the two species is the shape of the postpedicel, suboval in the holotype of *P. pumilio* (Fig. 15D) and subtriangular in *P. magnicornis* (Fig. 18B). However, we have examined several specimens of *P. pumilio* with postpedicel subtriangular (Fig. 15F) and the male terminalia

matches specimens with suboval postpedicel. *Paraclius pumilio* is the most widespread species in the *arcuatus* species-group, occurring across much of the USA to southern Mexico and presents a wide morphological variation e.g.: postpedicel can be subtriangular to suboval, wing varying from hyaline to brownish and the plumule can vary from yellow to dark brown.

**Distribution.** Southern Mexico (Oaxaca) and widespread in USA (Indiana, Iowa, Maryland, Michigan, Nebraska, Tennessee, Texas and Virginia (Pollet *et al.* 2004)) and newly recorded from Arizona, Arkansas, California, Colorado, Illinois, Kansas, Kentucky, Missouri, Montana, Oklahoma, Pennsylvania, South Dakota and West Virginia (Fig. 22).

***Paraclius xibun* Soares, Capellari & Ale-Rocha sp. nov.**

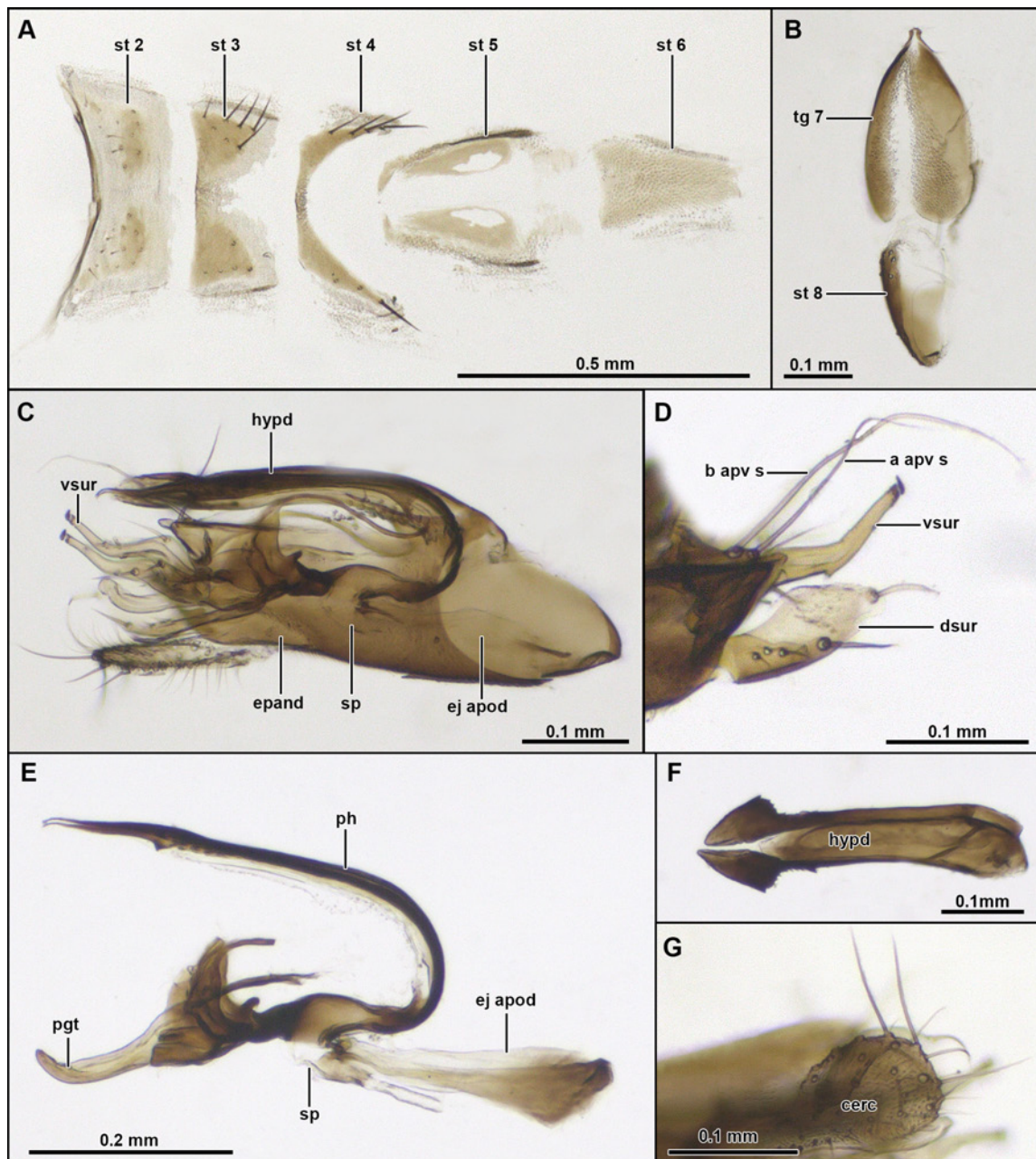
(Figs 19–21, 23)



**FIGURE 19.** *Paraclius xibun* sp. nov., A–E male holotype (CNC), F–G male paratype (CNC). A. Habitus, lateral view; B. Thorax, dorsal view; C. Head, anterior view; D. Hypopygium, lateral view; E. Male abdominal segments 5 and 6; F. Left antenna, inner view; G. Left wing.



**Diagnosis.** Postpedicel subrectangular, rounded at apex (Fig. 19F). Anepisternum without yellow spot above coxa I (Fig. 19A). Legs mostly dark brown, except apex of all coxae, all trochanters, extreme base of all femora, apex of femur I, apical 4/5 of tibiae I and II, basal 1/2 of  $It_1$  and  $It_2$ , yellow (Fig. 19A). Wing membrane grayish, gently brownish anteriorly.  $M_1$  strongly bowed towards  $R_{4+5}$ , strongly concave posteriorly. CuAx ratio: 0.5 (Fig. 19A, G). Male tergite 6 with two rows of 7–8 subequally long lateral setae (Fig. 19E). Ventral lobe of surstylus long and narrow, somewhat digitiform, gently curved ventrally, with stout modified apical seta, and with 1 short ventral and 1 short dorsal setae near base (Fig. 20C, D). Dorsal lobe of surstylus suboval, with dorsal row of short setae at basal 1/2, ending in 1 strong seta at middle and with 1 strong seta at apex (Fig. 20D). Cercus short, suboval, about 1/3 as long as epandrium, yellow, except apex brown, outer surface covered with short setae, ventral and apical edges with long setae (Fig. 20C, G).

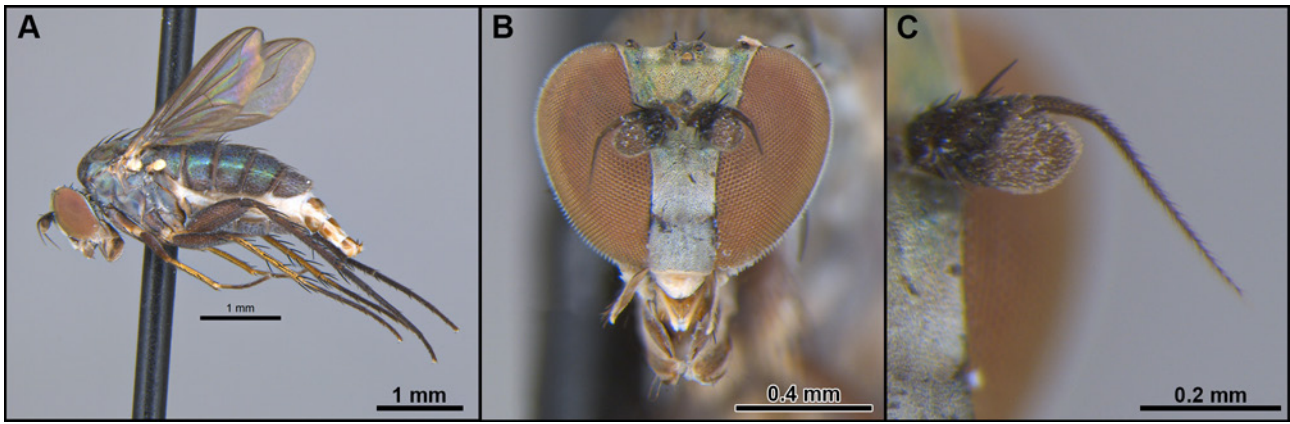


**FIGURE 20.** *Paraclius xibun* sp. nov., male paratype (CNC). **A.** Abdomen, ventral view; **B.** Tergite 7 and sternite 8, dorsal view; **C.** Hypopygium, left lateral view; **D.** Surstyli and apical edge of epandrium, outer view; **E.** Internal appendages, left lateral view; **F.** Hypandrium, ventral view; **G.** Cercus, dorsal view. Abbreviations: a apv s = apical apicoventral epandrial seta; b apv s = basal apicoventral epandrial seta; cerc = cercus; dsur = dorsal lobe of surstylus; ej apod = ejaculatory apodeme; epand = epandrium; hypd = hypandrium; pgt = postgonite; ph = phallus; sp = sperm pump; st = sternite; tg = tergite; vsur = ventral lobe of surstylus.

**Description. Male.** Body length: 2.6–3.0 mm; wing length: 2.0–2.3 mm, width: 0.7 mm (n = 7). Similar to *P. arcuatus*, except as noted: **Head** (Fig. 19A, B, F). Upper-most 4 postocular setae black, remaining setae white. Frons covered with dense yellowish gray pruinosity. Face homogeneously covered with dense silvery pruinosity, and as wide as mid ocellus at narrowest point. Palpus short, brownish, covered with a few small black setae at apex, lacking strong apical seta. Antenna dark brown; postpedicel subrectangular, rounded at apex, 1.5X longer than wide; arista-like stylus dorsal, arising at base of postpedicel, length about 3/4 of eye height, two-segmented, first segment short and arched, not overlapping apex of postpedicel, covered with short pubescence, second segment long, about 3X longer than first segment, covered with short microtrichia. **Thorax** (Fig. 19A, B). Mesonotum mostly metallic green, except for weak acrostichal coppery stripe. Scutellum metallic green. Pleura dark gray, covered with dense silvery pruinosity, with weak greenish and bluish reflections mainly on anepisternum. Metepimeron dark gray. **Chaetotaxy:** Scutellum with 1 pair of strong medial scutellars and 1 pair of smaller setae laterad, about 1/5 as long as medial scutellars; upper-surface of proepisternum with 2–3 short black setae in front of anterior spiracle. **Wing** (Fig. 19A, G). Membrane grayish, gently brownish anteriorly.  $M_1$  strongly bowed towards  $R_{4+5}$ , strongly concave posteriorly. CuAx ratio: 0.5. **Legs** (Fig. 19A). Legs mostly dark brown, except apex of all coxae, all trochanters, extreme base of all femora, apex of femur I, apical 4/5 of tibiae I and II, basal 1/2 of  $It_1$  and  $IIt_1$  yellow. **Leg I.** Podomere ratios: 26, 21, 8/3/2/2/3. Anterior surface of coxa I covered with silvery pruinosity, apical edge with 3–4 strong setae. Femur I with row of short anteroventral setae (about 1/3 as long as width of femur at broadest point) from base to apical 5/6 ending in 2–3 more conspicuous preapical setae, 2 posteroventral preapical more conspicuous setae. Tarsus I unmodified. **Leg II.** Podomere ratios: 32, 32, 15/11/9/6/4. Apical edge of coxa II with 2 strong setae. Femur II with anteroventral row of short setae (about 1/3 as long as width of femur), from base to apical 5/6, ending in 2–3 more sparse and conspicuous setae, 1 posteroventral more conspicuous preapical seta and 1 strong preapical anterior seta. **Leg III.** Podomere ratios: 35, 41, 13/16/12/8/5. Femur III laterally compressed, 1.5X wider than femur II at broadest point. Femur III with row of short setae ending in 2–3 more conspicuous setae at apical 1/3 and 1 strong anterior preapical seta. **Abdomen** (Figs 19A, E, 20A, B). Metallic green, with weak bluish reflections. Posterior margin of tergite 5 with long setae, but not overlapping posterior margin of tergite 6. Lateral margin of tergite 6 with two rows of 7–8 subequally long lateral setae. Tergite 7 with narrow and deep concavity at posterior margin, almost dividing tergite in two hemitergites. Sternite 2 almost entirely membranous, with two suboval central short hemitergites, both covered with short setae. Sternite 3 almost divided in two triangular hemitergites, with strong lateral setae. Sternite 4 somewhat U-shaped, with lateral row of strong setae. Sternite 5 divided in two long and narrow hemitergites anteriorly, with 2 suboval hemitergites at middle. Sternite 6 plate-shaped, weakly sclerotized. Sternite 8 suboval, with long setae on posterior half. **Hypopygium** (Figs 19D, 20C–G). Epandrium dark brown, long and narrow, about 3X longer than high, with acute apicoventral lateral ridge (Figs 19D, 20C). Basal apicoventral epandrial seta slightly longer than apical seta and about 2X longer than ventral lobe of surstylus (Fig. 20D). Ventral lobe of surstylus long and narrow, somewhat digitiform, gently curved ventrally, with stout modified apical seta and 1 short ventral and 1 short dorsal setae near base (Fig. 20C, D). Dorsal lobe of surstylus suboval, with dorsal row of short setae at basal 1/2, ending in 1 strong seta at middle; 1 strong seta at apex (Fig. 20D). Postgonite plain, well sclerotized and curved ventrally at apex (Fig. 20E). Proctiger plain, weakly sclerotized. Hypandrium, trough-shaped, with weak connection to epandrium basally, free laterally; apex bifurcate and strongly sclerotized, somewhat arrow-shaped in ventral view; left lateral margin with 2 dentiform preapical processes, apicalmost with serrated margin and basalmost very short, right lateral margin only with serrated process; base of hypandrium projecting up inside epandrial capsule, cradling phallus (Fig. 20C, F). Phallus strongly sclerotized, divided in two narrow arms, narrowing at apex, both arms with 1 subapical short process (Fig. 20E); ejaculatory apodeme long, about 1/2 as long as epandrium, gradually widening towards apex, laterally compressed and weakly sclerotized basally (Fig. 20E). Sperm pump short, somewhat C-shaped, about 1/3 as long as ejaculatory apodeme (Fig. 20E). Cercus short, suboval, about 1/3 as long as epandrium, yellow, except apex brown, outer surface covered with short setae, ventral and apical edges with long setae (Figs 19D, 20C, G). **Female** (Fig. 21). Body length: 2.8–3.2 mm; wing length: 2.2–2.9 mm (n = 5). Similar to male, except as noted: postpedicel suboval, as long as wide (Fig. 21C); face and clypeus wide, both wider than ocellar tubercle (Fig. 21B). Terminalia as in *P. arcuatus*, including number of spines on each acanthophorite.

**Type material. HOLOTYPE** ♂ (Fig. 19) labelled: “BELIZE: Cayo District | Sibun River & Hwy [ca 17°12'02.6"N 88°35'29.3"W] | 30.xi.2001, L. Masner | Yellow Pan Trap | river shore” (CNC). Holotype condition: good, not dissected, both antennae with second segment of arista-like stylus and right tarsus II broken off. **PARATYPES:** same data as holotype (4 ♂, one dissected, 2 ♀, INPA; 7 ♂, one dissected, 3 ♀, one dissected, CNC).

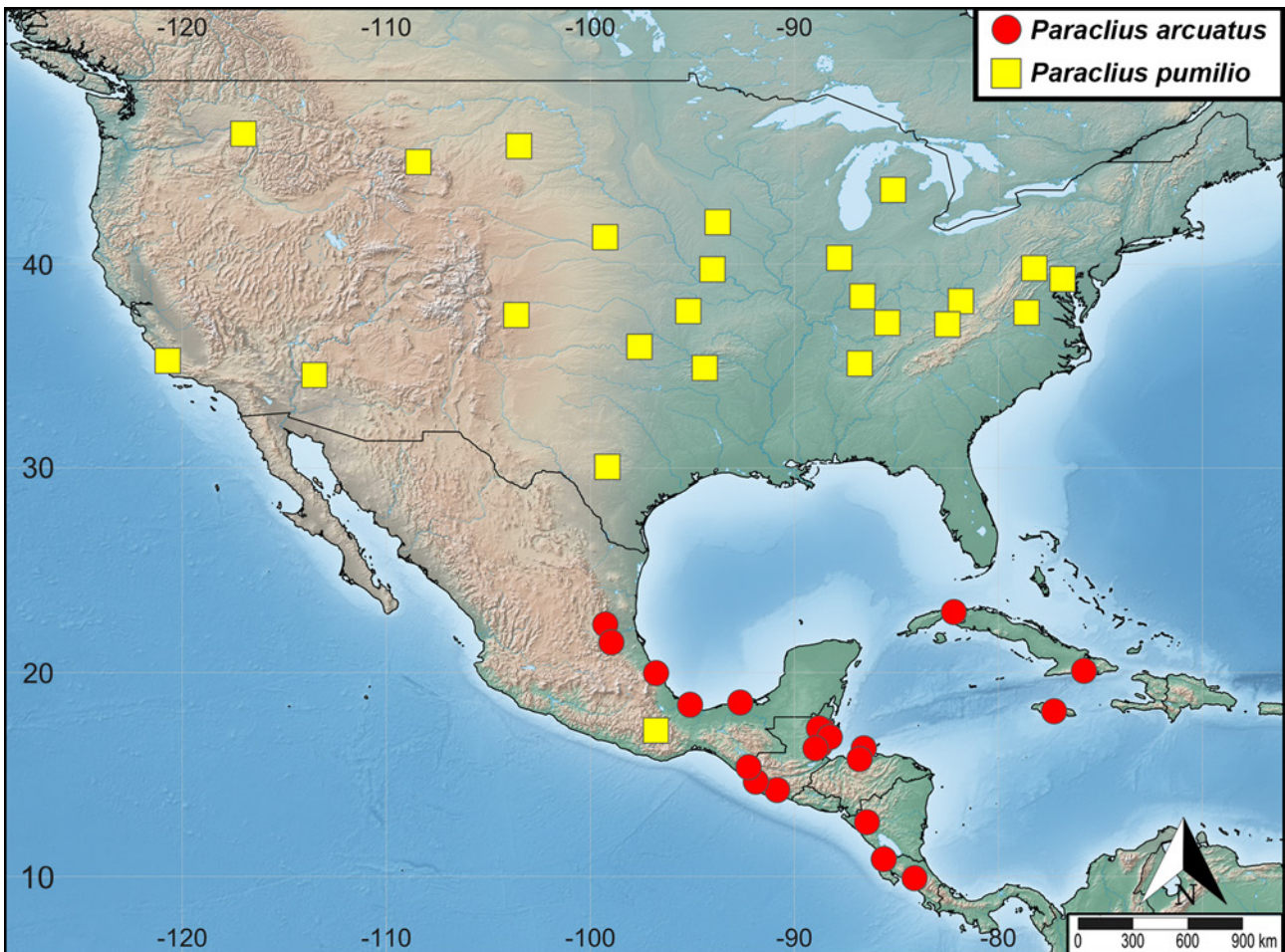




**FIGURE 21.** *Paraclius xibun* sp. nov., female paratype (CNC). **A.** Habitus, lateral view; **B.** Head, anterior view; **C.** Left antenna, inner view.

**Remarks.** *Paraclius xibun* sp. nov. is similar to *P. angustipennis* and *P. pumilio* based on the mostly brown to dark brown legs as discussed above (see Remarks under *P. angustipennis* and *P. pumilio*). It can be easily recognized by the vein  $M_1$  strongly bowed towards  $R_{4+5}$  and strongly concave posteriorly and dorsal lobe of surstylus suboval, with dorsal row of short setae at basal 1/2, ending in 1 strong seta at middle and with 1 strong seta at apex (Fig. 20D).

**Etymology.** Toponymic, referring to the Sibun River (“Xibun” in the Mayan spelling), the type-locality. Treated as a noun in apposition.



**FIGURE 22.** Known geographic distribution of *Paraclius arcuatus* (Loew, 1861) and *P. pumilio* Loew, 1872.

**Distribution.** *Paraclius xibun* sp. nov. is recorded only from the type locality in Cayo District, Belize (Fig. 23).



**FIGURE 23.** Known geographic distribution of *Paraclius angusticauda* Van Duzee, 1933, *P. angustipennis* Van Duzee, 1929, *P. brooksi* sp. nov., *P. elongatus* Van Duzee, 1930 and *P. xibun* sp. nov.

## Discussion

In addition to the characters listed by Brooks (2005) as diagnostic for *Paraclius sensu stricto* (*P. arcuatus* lineage), we include the following: male tergite 6 usually with lateral setae (absent only in *P. arcuatus*); sternite 6 plate-like, weakly connected posteriorly to tergite 6; epandrium narrow, about 2.5–3X longer than high, with lateral ridge forming an acute apicoventral projection; apicoventral epandrial lobe undeveloped, with 2 long apicoventral epandrial setae; hypandrium strongly sclerotized, trough-shaped; ventral lobe of surstylus somewhat digitiform or L-shaped, weakly to strongly curved ventrally, with 1 stout modified apical seta; ejaculatory apodeme long and narrow, about 1/2 length of epandrium; and sperm pump short, well sclerotized, somewhat kidney-shaped, pipe-shaped or C-shaped, about 1/2 to 1/3 as long as ejaculatory apodeme. All these characters indicate a cohesive morphological group and the *Paraclius arcuatus* species-group is considered here as a clade. The presence of short to long and strong setae on male tergite 6 seems a reliable apomorphy for the group, except *P. arcuatus*, since a bare male tergite 6 was considered a ground plan feature for Dolichopodinae (Brooks 2005, character 36). *Paraclius arcuatus* is of particular interest as having bare tergite 6 and a blunt and undivided proctiger brush, may indicate a sister-group relationship to the remaining species in the group, however, it shares all the other synapomorphies of the group such as the male face narrowing below (see Remarks under *Paraclius arcuatus* species-group). The pending issue of whether the species that do not belong to this lineage should be transferred to other genera is beyond the scope of this paper and to be addressed in the future.

Two additional lineages of New World *Paraclius* were recognized by Brooks (2005), the *alternans* and *ovatus* species-groups (Brooks 2005). Members of the *alternans* species-group are characterized by a greatly enlarged and somewhat spherical sperm pump and a pair of proctiger brushes (Brooks 2005). Examination of 23 species in this group allow listing the following shared features for the *alternans* species-group: male tergite 6 bare; epandrium with lateral ridge forming a rounded apicoventral projection; apicoventral epandrial lobe short, digitiform, with 2 short setae (usually as long as apicoventral epandrial lobe); ventral lobe of surstylus somewhat digitiform, with 1



short dorsal preapical dentiform process; and hypandrium tubular, cradling the phallus. *Paraclius arcuatus* has a proctiger modified into a blunt and undivided proctiger brush, different from the condition seen in the *alternans* species-group that has the proctiger divided into two narrow brushes. On the other hand, the *ovatus* species-group was primarily characterized by the possession of a ring-shaped sclerite surrounding the base of the phallus (Brooks 2005). This group is one of the most diverse New World lineages, with over 40 described and undescribed species (M. Soares, pers. obs.), and the group is likely to be split into subgroups.

Finally, the generic limits between *Paraclius* and *Cheiromyia* Dyte still must be clearly bounded, and this problem has been addressed before (Brooks 2005; Capellari & Amorim 2009; Brooks *et al.* 2010, 2018; Soares *et al.* 2023a, b). The main point is defining *Cheiromyia* based on the apomorphic male postpedicel with antler-like projections, which leaves a residue of several *Paraclius* species with unmodified postpedicel, but certainly closely related to *Cheiromyia*. This affinity is suggested by the presence of a long, tubular, and folded on itself sperm pump in *Cheiromyia* and species like *Paraclius americanus* (Schiner), *P. vulcanoae* Soares, Capellari & Ale-Rocha and *P. problematicus* (Parent) (Soares *et al.* 2023a, b). It is controversial if characters that need dissection and chemical preparation to be properly observed are desirable to diagnose a genus. If so, all those species with a modified sperm pump could be well accommodated in *Cheiromyia*. To date, no convincing synapomorphy has been found for those species of *Paraclius* alone, but even if they behave as a paraphyletic residue of *Paraclius*, this will not interfere in the recognition of the genus if it is restricted to the *arcuatus* lineage.

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