



The genus *Vieira* Navás (Neuroptera: Chrysopidae): a new species, a key to the species, and new geographic records

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Abstract

Vieira Navás is a small genus of Neotropical green lacewings in the tribe Belonopterygini. Here, a fifth species, *Vieira flinti* sp. nov., is described from Venezuela and Brazil. This species shares significant features with disparate members of the genus; thus the genus as a whole is now known to express a more continuous range of morphological variation than previously recognized. We present a key for identifying *Vieira* species and new geographic records for previously described species in the genus.

Key words: Chrysopinae, Belonopterygini, Neotropics, new species, *Vieira*

Introduction

Vieira Navás, 1913 (Neuroptera: Chrysopidae: Chrysopinae: Belonopterygini) is a small neotropical genus of green lacewings whose adults are characterized by dark brown or black body coloration and forewings that are marked with large brown spots or streaks. Most distinctively, the wings have a series of costal crossveins that are splayed in a fan-shape and are surrounded by brown markings. The darkness and pattern of these markings serve to make adults very inconspicuous (at least to the human eye) when they are resting on the undersides of mottled foliage in the forest (Tauber *et al.* 2006).

Initially, probably because of the markings on the stigmata of the fore and hind wings, *Vieira* was included in Leucochrysini (Navás 1913; Adams 1978; Brooks & Barnard 1990). Later, based on a series of larval and adult morphological features, Tauber (2007) transferred the genus to Belonopterygini (subfamily Chrysopinae), where it is assigned today.

Currently, four *Vieira* species are described: *Vieira iridea* (Oliver, 1793), *Vieira elegans* (Guérin Méneville, 1844), *Vieira leschenaulti* (Navás, 1913) [the type species of *Vieira*], and *Vieira brooksi* (Tauber, 2006). *V. iridea* and *V. leschenaulti* are large (forewing length: 22–32 mm) and quite different in appearance from the other two *Vieira* species. However, their descriptions are very similar to each other, and there is some question as to whether they are distinct species. The type of *V. iridea* has not been found, so it is possible that these two species indeed may be synonymous (Penny 2002; Tauber 2007); until the type is found and studied, we consider *V. iridea* to be a *Nomen Dubium*. Also, because of the large differences between these two large-bodied species and the other two, smaller-bodied *Vieira* species, we were uneasy with the current placement of all these species in the same genus.

In this paper, we describe a newly discovered and very attractive species of *Vieira* from Venezuela and northeastern Brazil. For the most part, this new species resembles *V. elegans* and *V. brooksi*, but it also shares significant features with *V. leschenaulti*. Thus, it appears that (i) the genus *Vieira* is quite diverse, (ii) its species exhibit a more continuous range of morphological variation than previously realized, and (iii) the genus itself is well characterized by distinct shared features. We provide a key and images for use in identifying *Vieira* species. We also present new records for *V. elegans* and *V. brooksi*. Previously, neither species had been recorded from Venezuela or the Brazilian state of Amazonas.

Materials and methods

To prepare specimens for study, we followed the procedures of Tauber (2007) and Sosa (2015). Images of the genitalia by Sosa were taken with a Nikon Coolpix P500 series camera coupled with a CX40 lens. These images were aligned with Adobe Photoshop software (version 11.0). Most of the images of external features by Sosa were taken with a Leica M205C stereomicroscope equipped with Leica Application Suite V4.1, allowing interactive measurements and montage. Photos (Tauber) were taken with a Q-Imaging camera fitted to an Olympus ZSX 1500 microscope; images were aligned with Helicon Focus software; and measurements were made with NIH ImageJ software (<http://rsb.info.nih.gov/ij/>). Nomenclature for adult features follows that of earlier workers (Tillyard 1916; Tjeder 1966; Adams & Penny 1985; Brooks & Barnard 1990; Tauber 2007; Tauber & Sosa 2015).

Specimens from this study are deposited in the following institutions:

CAS	California Academy of Sciences, San Francisco, CA
FSCA	Florida State Collection of Arthropods, Gainesville, FL
INPA	Instituto Nacional de Pesquisas da Amazônia, Manaus, Amazonas State, Brazil.
MIZA	Museo del Instituto de Zoología Agrícola “Dr. Francisco Fernández Yépez” Universidad Central de Venezuela, Maracay, Aragua State, Venezuela.
MJMO	Museo Entomológico “José Manuel Osorio” Universidad Centroccidental “Lisandro Avarado” Cabudare, Lara State, Venezuela.
USNM	National Museum of Natural History, Smithsonian Institution, Washington, D.C.

Vieira flinti, new species

Type material. Holotype, Male, CAS; Fig. 6. Venezuela, Yaracuy, Aroa, 1920.iii.14, J. & E. B. Williamson (deeply stained, labeled as a n. sp. by N. Penny). There are three paratypes (see below).

Etymology. The specific epithet was chosen to honor Dr. Oliver S. Flint, Curator Emeritus of Neuropteroid Orders, Entomology, Smithsonian Institution, United States National Museum of Natural History, Washington, D. C. Although a specialist on Trichoptera, Ollie is also a long-time student of the Neuroptera, the person who brought this species to our attention, and a treasured friend.

Diagnosis (Figs 1–7, 10): Externally, adults of *V. flinti* are slightly larger, but similar in gestalt to those of *V. elegans* and *V. brooksi*. Of the three species, this one appears to be the most cryptic; its largely clear wings with white veins on a relatively unreflective membrane, and diffuse patches of light brown coloration with brown venation, make the insect almost invisible against a variety of backgrounds. It differs from the other two species in that the large marks at the tips of its fore and hind wings are diffuse, and those on the hindwing do not reach the wing margin. Also, the basal forewing marks are large—surrounding several crossveins in the basal costal area, the two intramedian cells, the three median cells, the intracubital cells, and the anal veins. The basal forewing markings on the other two small species of *Vieira* are darker and less extensive.

Description. *Body* robust; dorsum largely black or dark brown, with anterior region yellowish or greenish mesally, dark brown to black laterally.

Head: Vertex green to yellowish, with light brown longitudinal streak along eyes, anterior margin of vertex; surface smooth; width 1.5–1.6 mm (including eyes); ratio head width to eye width 1.6 : 1. Distance between eyes (frontal) 0.66–0.67 mm; distance between tentorial pits 0.45–0.51 mm; length midantennae to midway between tentorial pits 0.37 mm. Antenna length 8.8–9.0 mm; proximal segments short (segments 2, 3: length 1.0–1.2 times width), with three concentric rings of setae; middle and distal segments longer (segments 7–8: length 2.2–3 times width), four concentric rings of setae. Scape slightly elongate, black marked dorsally; pedicel black throughout; flagellum dark brown to black basally, cream to yellowish distally; antennal fossae marked with black.

Frons, clypeus yellowish with conspicuous brown shaded (male) or, brown (female) markings below scapes, light brown shading on frons and clypeus (male), or with elongate brown spot mesally (female); gena with dark brown stripe from base of eye to mid-clypeal region. Labrum pale, with distal margin indented mesally, bearing numerous long, thick, golden setae. Labial palpus, maxillary palpus black, both with last segment stout, tapering apically, covered by long, golden to amber setae.

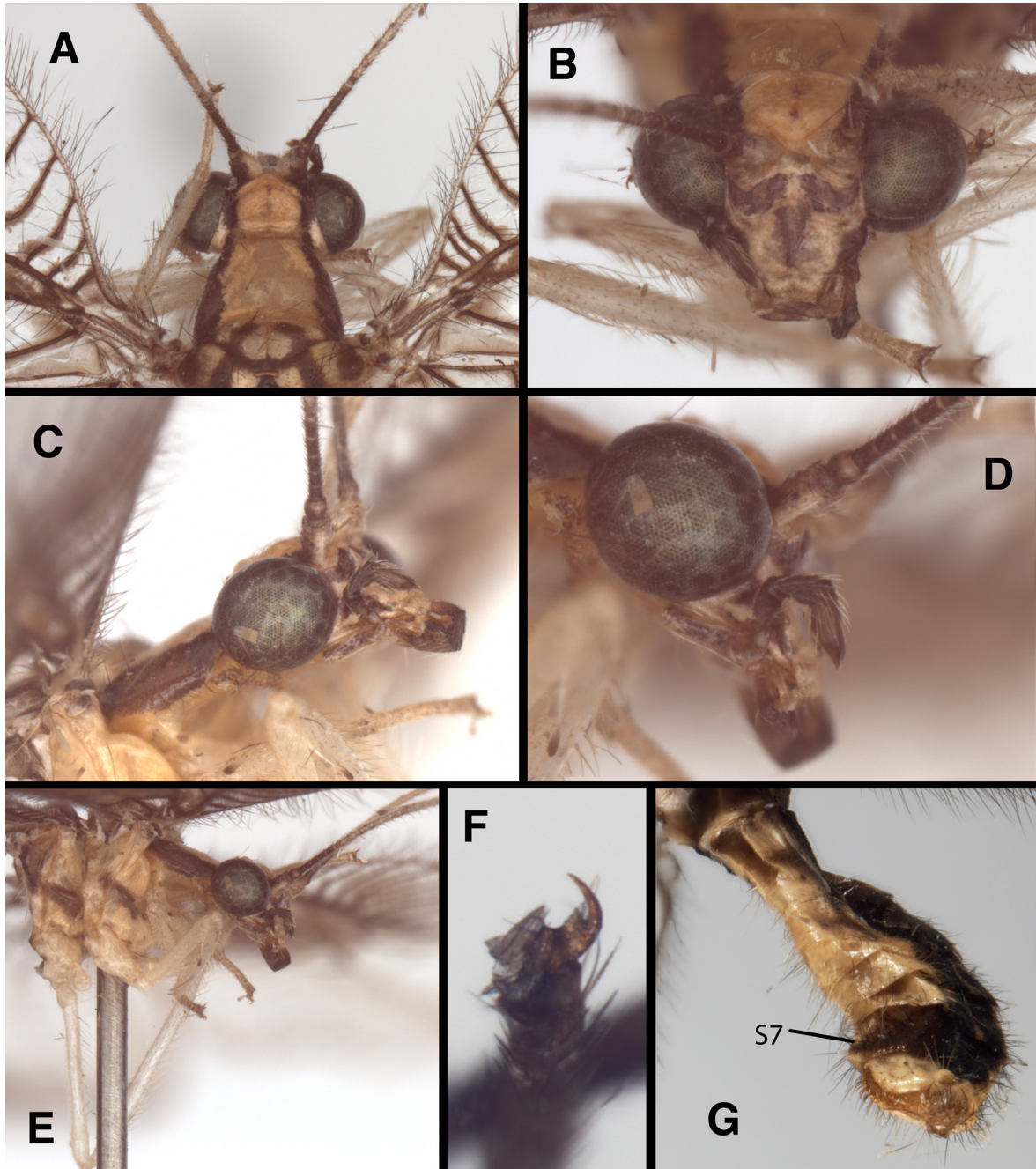


FIGURE 1. *Vieira flinti*, **sp. nov.**, Paratype (female, Brazil). External features. A. Head, prothorax (dorsal); B. Head (frontal); C. Head, prothorax (lateral); D. Head (lateral); E. Head, thorax, legs (lateral); F. Tarsal claw; G. Abdomen (ventrolateral). S7, seventh sternite.

Thorax: Prothorax wider than long (length 0.6–0.8 mm, width 1.2 mm), yellowish green mesally, with broad, brown, longitudinal bands covered with elongate, black, stout setae mesolaterally. Mesothorax broadly marked by brown spots with tufts of black setae (more dense in male than female specimens). Metathorax mostly brown, covered by long, black setae. Mesothorax, metathorax with black line across middle of pleural region. Legs cream colored, without markings, covered by numerous brown to amber setae; tarsal claws with broad, dilated base, deep narrow cleft.

Wings: Membrane transparent, not especially reflective, with light and dark brown markings and streaks, most notably at base of wings. Stigma semi-transparent, with light brown spot at each end (forewing), at basal end (hindwing).

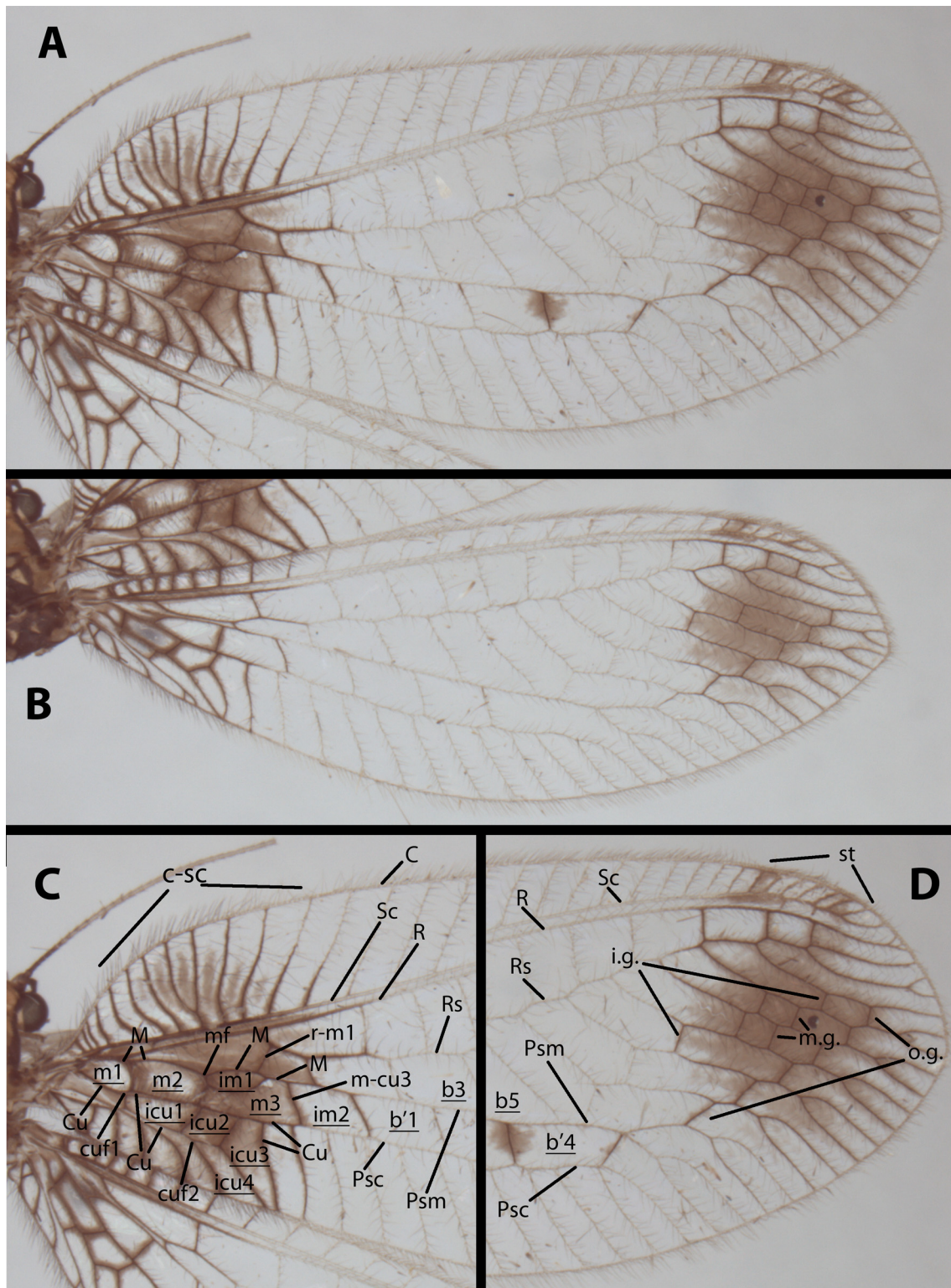


FIGURE 2. *Vieira flinti*, sp. nov., Paratype (female, Brazil). Wings. A. Forewing; B. Hindwing; C. Base of forewing, with features labeled; D. Tip of forewing, with features labeled. **Veins:** C, costa; Cu, cubitus; M, media; Psc, pseudocubitus; Psm, pseudomedia; R, radius; Rs, radial sector; Sc, subcosta. **Crossveins:** c-sc, costa-subcosta crossvein; i.g., m.g., o.g., inner, middle and outer gradate veins; m-cu3, third media-cubitus crossvein; r-m1, first radial crossvein. **Cells:** b3, b5, third and fifth upper Banksian cells; b'1, b'4, first and fourth lower Banksian cells; icu1, icu2, icu3, icu4, first to fourth intracubital cells; im1, im2, first and second intramedian cells; m1, m2, m3, first to third median cells. **Vein splits:** cuf1, cuf2, first and second furcations of cubitus; mf, first furcation of media. st, stigma.

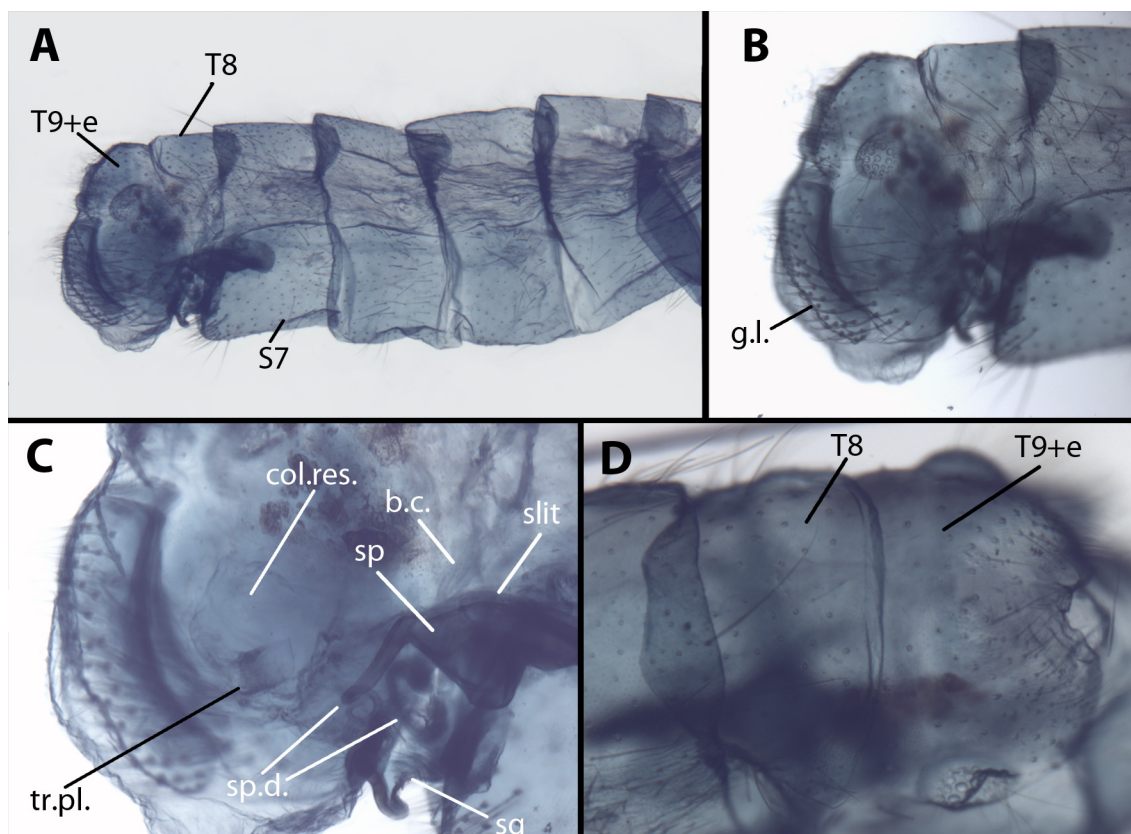


FIGURE 3. *Vieira flinti*, **sp. nov.**, Paratype (female, Brazil). Abdomen. A. Segments A4-terminus (lateral); B. Terminal segments (lateral); C. Genitalia; D. Tergite 8, tergite 9+ectoproct (dorsal). b.c. bursa copulatrix; col.res., colleterial reservoir; g.l., gonapophysis lateralis; sg, subgenitale; sp, spermatheca; sp.d., spermathecal duct; S7, seventh sternite; tr.pl., transverse plate; T8, eighth tergite; T9+e, fused ninth tergite and ectoproct.

Forewing with three prominent brown marks: first one in basal area—involving first ca. twelve costal crossveins, subcostal cell, basal part of radial sector, area around anal veins, cells b_1 , r_1 , m_2 - m_3 , im_1 , ic_1 - ic_4 ; second one at tip of wing—surrounding inner, outer gradates, apical marginal forked veins; third one smaller, surrounding penultimate crossvein between Psm and Psc. Setae enclosed within black spots long, black; other setae gold colored.

Forewing 14.6 (male) to 16.6 (female) mm long, 5.41 (male) to 6.7 (female) mm wide (at widest point); ratio of length: maximum width 2.4–2.5 : 1. Costal area broad; tallest costal cell (#9–11) 1.8–2.1 mm tall, 1.4–1.8 times width, height 0.17–0.15 times width of wing (midwing). First intramedian cell ovate, height (along median arculus) 0.2–0.5 mm, width 2.5–4.5 times height, 0.62–0.66 times width of third median cell. First radial crossvein black and distal to origin of radial sector (Rs); radial area (between radius and Rs) with single row of 11–12 closed cells; tallest cell (#6–8) 1.3–1.5 times taller than wide; two to three rows of gradate veins: three to six inner gradates in regular pattern (basal two white); inner gradate series closer to outer gradates than to Radial sector; six to seven outer gradates (all black), first five aligned in regular pattern, distal ones irregularly aligned; sometimes a third series of two gradate veins present. Height of fourth gradate cell 2.9–3.9 times width. Five b cells, four b' cells (cells beneath Psm after second intramedian cell). Four intracubital cells [two or three closed], Cu2 bifurcating so that icu_3 and icu_4 lie next to each other. Subcosta, radial sector and apical veins forked apically.

Hindwing with most basal veins surrounded by dark brown, with large brown spot distally, encompassing distal area below radial sector, distal inner, outer gradate veins, and distal gradate cells. Veins pale except near darkened areas.

Hindwing 13.5 (male) to 14.7–15.0 (female) mm long, 4.41 (male) to 4.8–5.0 (female) mm wide; 12 radial cells (counted from origin of radius, not false origin), first one black bordered; two to three series of gradates; two to five inner gradates; five to six outer gradates; ~19 costal cells before pterostigma, first eight black bordered; four large b cells (no small “t” cell); three to four b' cells beyond second intramedian cell; two intracubital cells (one closed).

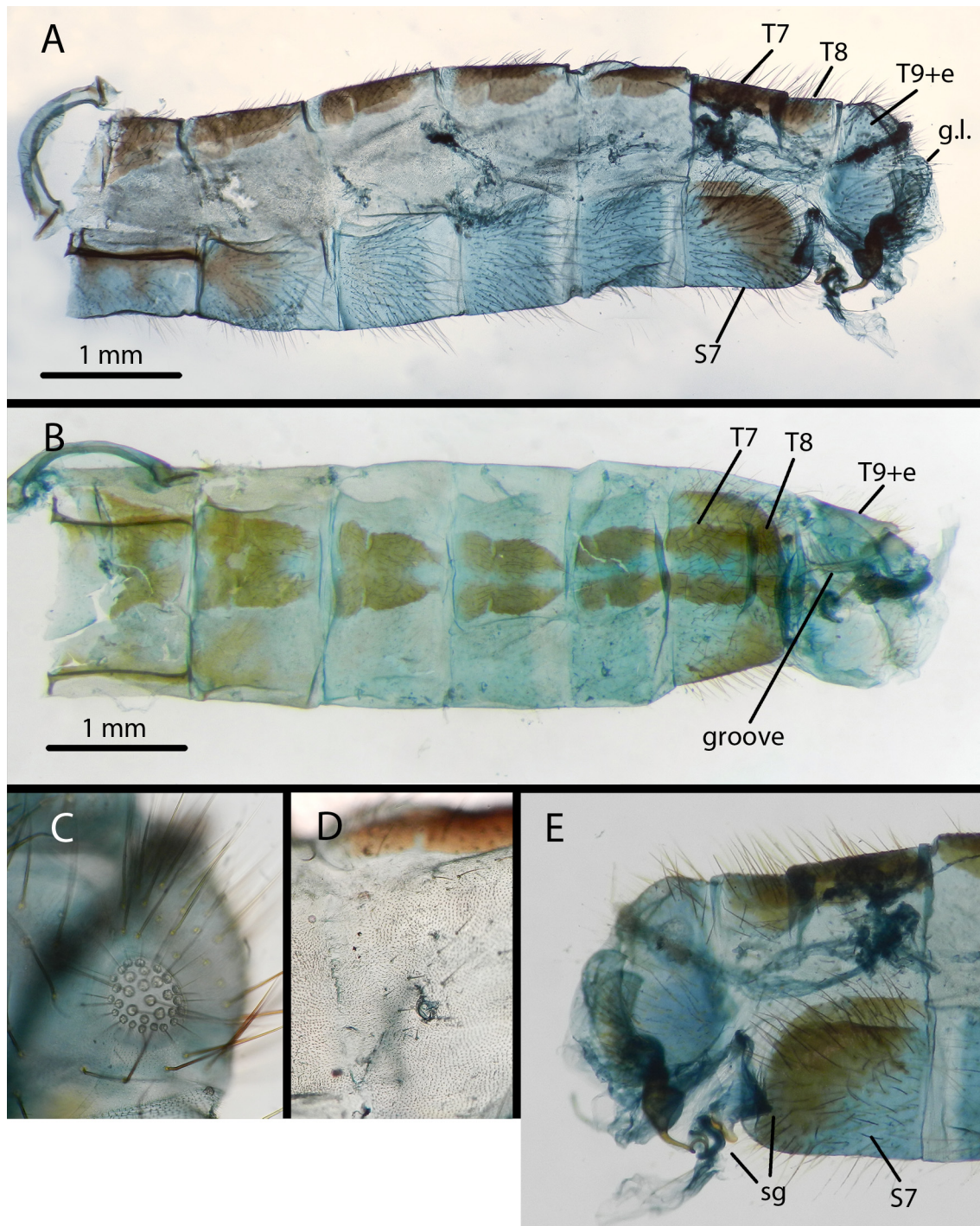


FIGURE 4. *Vieira flinti*, sp. nov., Paratype (female, Venezuela). Abdomen. A. Segments A2-terminus (lateral); B. Segments A2-terminus (dorsal); C. Callus cerci; D. Spiracle; E. Terminal segments and genitalia (extruded, lateral). g.l., gonapophysis lateralis, sg, subgenitale; S7, seventh sternite; T7, T8, seventh and eighth tergites; T9+e, fused ninth tergite and ectoproct.

Abdomen: Robust, uniformly expanded throughout. Segments of medium length and height, not particularly narrow or elongated; spiracles not especially large or small, simple, with unenlarged, bilobed atrium.

Female: Abdomen yellowish green; T1–T8 heavily marked by irregularly shaped black marks; ninth tergite, ectoproct (T9+ect) unmarked; callus cerci located dorsally on T9+ect, round, with ca. 31 trichobothria; S1, S2 with small black marks; S1–S6 densely covered with long, amber to golden setae; S7 almost entirely black, with heavy, black setae; tergites, sternites with elongate setae, slender, delicate on basal segments, becoming thicker, more robust distally; pleural regions with microtrichiae, short setae; pleuron of A6 with scattered, long, thin setae, pleuron of A7, A8 with elongate, thick, more dense setae; apical region of ectoproct with heavy, dense, up-curved

setae; left, right T9+ect fused dorsally (Brazil), separated by deep invagination (Venezuela). Gonapophyses laterales rounded ventrally, with dorsal margins angular proximally, curved distally, entirely covered with long setae, especially heavy dorsally.

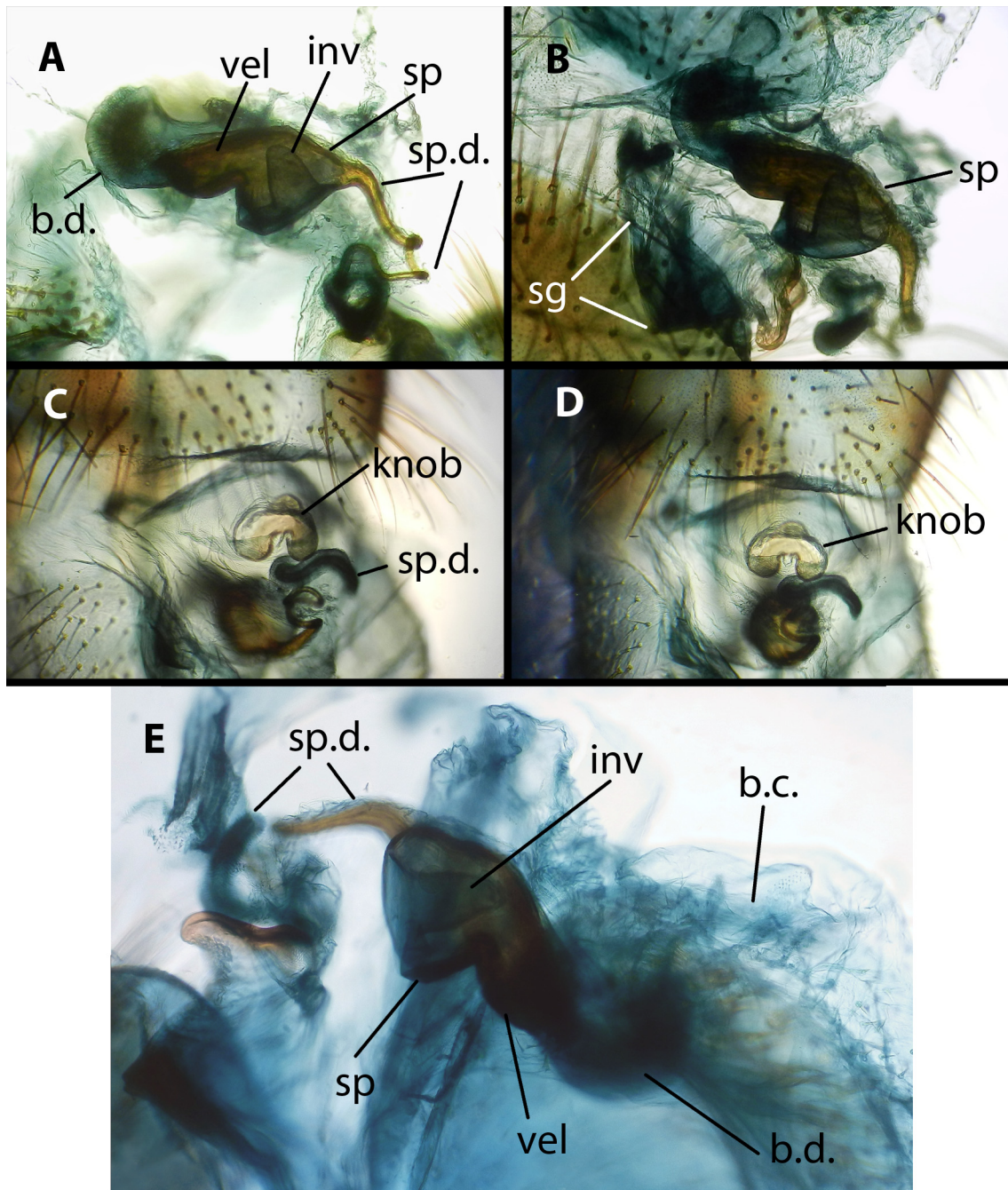


FIGURE 5. *Vieira flinti*, **sp. nov.**, Paratype (female, Venezuela). Genitalia. A, B, E. Spermathecal complex (lateral); C, D. Subgenitale, ventral. b.c., bursa copulatrix; b.d., bursal duct; inv, invagination; sp, spermatheca; sp.d., spermathecal duct; vel, velum.

Praegenitale absent. Colleterial complex with elongate, delicate gland, apparently with scattered particles; reservoir large, spherical, with colliculate, membranous surface, extending apically only into ectoproct; transverse sclerite delicate, rectangular, with slender, elongate striations. Spermathecal complex (Fig. 5) simple; spermatheca doughnut-shaped, with large, U-shaped invagination, dorsally with heavy, cylindrical, slightly bilobed velum connecting directly to bursa copulatrix via dorsal slit, velum merging distally into bursal duct, basal section of bursa copulatrix; spermathecal duct elongate (~3.0–3.5× width of spermatheca), arising from dorsal margin of spermatheca with distal one third, curvy, hair-like; bursal duct leathery basally, elongate, extending posteriorly to

bursa copulatrix; bursa copulatrix saccular, membranous; bursal glands, flat, filamentous, with rough surface, extending posteriorly from lateral margins of bursa. Subgenitale broader than long (internal, proximal section extending transversely ca. 3/4th width of segment), distal section with cordiform knob extending from thick, short, folded neck; knob with U-shaped arms, small, rounded, lower lip extending ventrally.

Male: S7 and S8 densely covered by microtrichiae and microtholi; A8 spiracle simple; T9+ect divided dorsally by groove; apical margins rounded dorsally; basal margin acute, with elongate, dorsal apodeme along dorsal margin, forked distally around callus cerci; callus cerci large, located very low on T9+ect, with ~33 trichobothria; S8+9 triangular, tapering apically; margin of apex heavily sclerotized, contiguous with ventral apodeme along dorsal margin of S8+9; apex, with dense, long setae.

Gonarcual complex robust; gonarcual bridge straight; gonarcual apodemes broad, flared distally; gonocornua strongly fused with the gonarcus, tapering, then widening, then tapering again apically to acute tip; mediuncus, with a pair of dorsal rods, pair of lateral lobes, mesal beak. Hood quadrate, heavily sclerotized, attached at base of mediuncus, extending above dorsum of mediuncus, with shallow teeth on distal margin. Hypandrium internum broad, V-shaped, with slender comes.

Material examined (in addition to holotype). BRASIL: BA [Bahia], Camacan, Res. [Reserva Particular do Patrimônio Natural] Serra Bonita, 15°23'S–39°33'W, 800m, iv.2010, 1 ♀. L. Santos col.; *Vieira* sp., Det. O. S. Flint 2013 (paratype). VENEZUELA: Aragua, El Limón, 450 m, 25.iv.1982, 1 ♀, F. Fernández Y col. (MIZA); Idem, 8.iv.1987, 1 ♂, L. J. Joly col (MJMO) (paratypes).

Variation. The most notable variation we found among the specimens is in the dorsal fusion of the left and right sides of the ninth abdominal tergite+ectoproct (T9+ect). In the females (Brazil, Venezuela) the two sides are fully and clearly fused; whereas in the Venezuelan males there is a distinct groove between the two sides.

Known geographic distribution. Venezuela (States of Aragua and Yaracuy), Brazil (Bahia State).

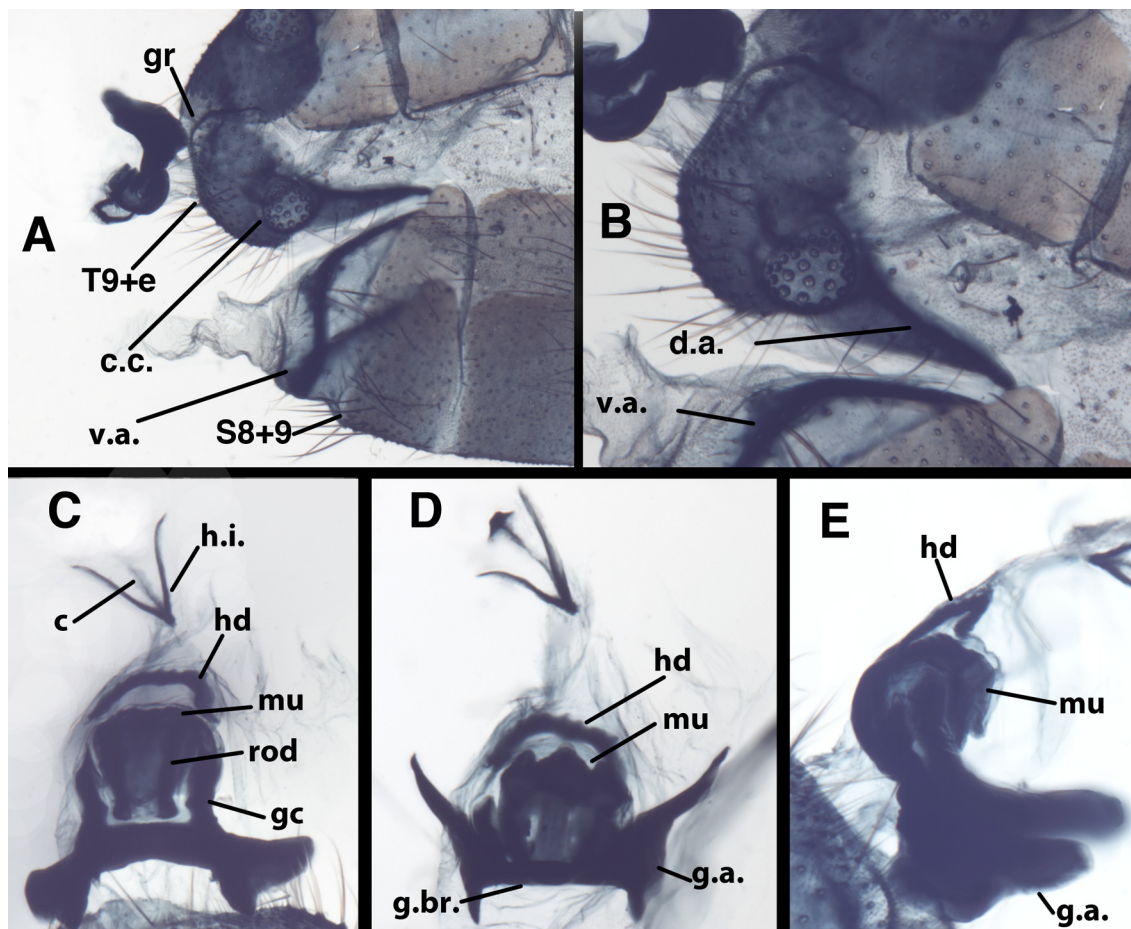


FIGURE 6. *Vieira flinti*, sp. n., Holotype (male, Venezuela). A. Terminus (lateral); B. Tergite 9 + ectoproct (lateral); C. Gonarcus (dorsal); D. Gonarcus (posterodorsal); E. Gonarcus (lateral). c, comes; c.c., callus cerci; d.a., dorsal apodeme; gc, gonocornua; g.a., gonarcual apodeme; g.br. gonarcual bridge; hd, gonarcual hood; h.i., hypandrium internum; mu, mediuncus; S8+9, fused sternites S8 + S9; T9+e, fused tergite T9 + ectoproct; v.a., ventral apodeme.

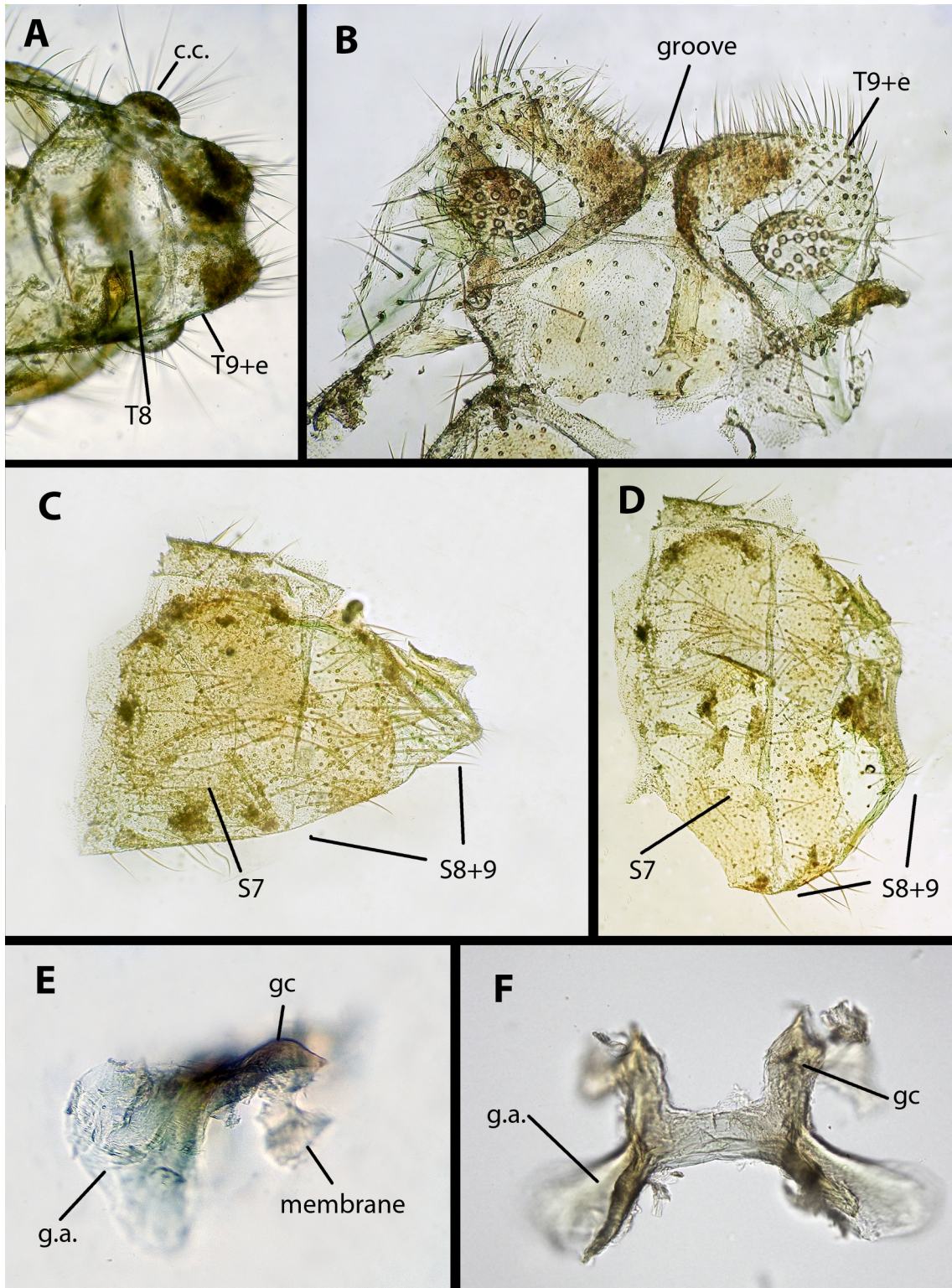


FIGURE 7. *Vieira flinti*, sp. nov., Paratype (teneral male, Venezuela). Abdomen and genitalia. A. Terminal segments (ventral); B. Terminal segments (dorsal); C. Terminal sternites (lateral); D. Terminal sternites (ventral); E. Gonarcus (lateral); F. Gonarcus (dorsal). c.c., callus cerci; gc, gonocornu; g.a., gonarcapodeme; S7, seventh sternite; S8+9, fused eighth and ninth sternites; T8, eighth tergite; T9+e, fused ninth tergite and ectoproct.

Generic characters. With the description of the new species, it is worthwhile to review the validity of the diagnostic generic features that were proposed based on previously known species (see Tauber *et al.* 2006, Tauber 2006, 2007). Below, we discuss *V. flinti* in relation to nine morphological character states that have been used to distinguish *Vieira* from other genera.

Basal radial crossvein (compare Figs 2A, 2C, 10A with Figs 8A, 9A, 11A). *Vieira elegans* originally was placed in the genus *Berchmansus* Navás because it expresses a characteristic that was considered distinctive for that genus—i.e., the basal radial crossvein leaves the Radial vein (R) before the origin of the Radial sector (Rs). Such is the condition in *V. brooksi* as well. However, in both *V. flinti* and *V. leschenaulti*, the first radial crossvein originates from the Rs after its separation from the R. Thus, it appears that this feature is not a diagnostic character for the genus.

Splayed costal crossveins on forewing (compare Figs 2A, 2C, 10A with Figs 8A, 9A, 11A). A conspicuous and defining feature of the genus is the forewing with the costal area enlarged and with a pronounced brown patch surrounding a series of splayed costal crossveins. This character state continues to hold as a diagnostic feature for *Vieira*, and it expresses some valuable variation for distinguishing among *Vieira* species. In *V. elegans* and *V. brooksi*, the enlargement of the costal area is moderate; in *V. leschenaulti* and *V. flinti* it is more abrupt basally and more pronounced across the margin of the wing. The pattern and number of splayed crossveins also varies: *V. elegans* has a small, slightly splayed patch of ~five unbranched crossveins; *V. brooksi* has a similarly small, but slightly more splayed patch of five to six crossveins, one of which is usually branched near its base; *V. flinti* has a large, well splayed patch of about ten to 13 crossveins—all unbranched in the Venezuelan specimens and with one branched crossvein (#7, #8) in the Brazilian specimen; *V. leschenaulti* has fewer (~5) splayed crossveins—all unbranched, but they are relatively widely splayed.

Bifurcation of forewing Cubital (Cu) vein (compare Figs 2A, 2C, 10A with Figs 8A, 9A, 11A). In *Vieira* there is a distal bifurcation of the forewing Cu, and among the four species the placement of the bifurcation appears to exhibit some clinal variation: In two species, *V. elegans* and *V. brooksi*, the bifurcation occurs after the Cu has left the Psc (sometimes very near the furcation of Cu from Psc); in these species both icu3 and icu4 are present and open on the exterior margin of the wing. In *V. flinti*, the bifurcation occurs at or very near the point where the Cu leaves the Psc; in this species, the icu3 is closed, and icu4 is present and open on the wing margin. In *V. leschenaulti* the bifurcation occurs still earlier—before the Cu leaves the Psc; icu3 and icu4 are both present and open, side by side on the wing margin.

Slanted distal vein of the third medial cell (m3) (compare Figs 2A, 2C, 10A with Figs 8A, 9A, 11A). In *V. leschenaulti*, the distal vein of m3 is strongly slanted distally and is followed by six closed cells beneath the Psm. In *V. flinti*, the distal vein of m3 is slanted somewhat, and in *V. brooksi* and *V. elegans* it is vertical; in all three of the above species, the m3 is followed by four closed cells beneath the Psm.

Wing markings (compare Figs 2A, 2B, 10A, 10B with Figs 8A, 8B, 9A, 9B, 11A, 11B). In all four species, the following membranous areas of the wings are characteristically and prominently marked with brown to dark brown: around the base of the fore and hind wings, around the splayed costal crossveins (forewing), around a series of basal or midbasal crossveins (hindwing); around the distal inner and/or outer gradates (fore and hind wings); around one or more Psm or Psc crossveins (fore and hind wings), around the intracubital cells (fore and hind wings). Although these areas are consistently marked in the four *Vieira* species, the size and depth of the markings vary among them. For example, the markings around the gradate veins are relatively small and more widely separated on *V. flinti*, compared with those on the other *Vieira* species.

Head and body markings (compare Figs 10C, 10D with Figs 8C, 8D, 9C, 9D, 11C, 11D). All four *Vieira* species express the following distinctive markings: elongate, longitudinal markings on sides of vertex; scapes marked with dark brown or black at least dorsally; pedicel and one or more basal flagellomeres dark; distal flagellomeres yellow.

Setation (compare Figs 1A, 10C with Figs 8C, 9C, 11C). All four *Vieira* species have patches of long, heavy, black setae on the mesothorax and metathorax. In addition, the terminal segments of the labial palpus and the terminal segments (tergites and sternites) of the abdomen have dense, relatively heavy setae. Again, *V. flinti* shares these features with its congeners, but in *V. flinti* the labial setae are golden and quite striking (Figs 1C, 1D, 10D).

Gonarcular hood. Male specimens of three *Vieira* species have been diagnosed as having a gonarcular complex bearing a “hood”-like structure either above or below the mediuncus; the structure is sclerotized and prominent in *V. elegans*, *V. brooksi* (Tauber *et al.* 2006, Tauber 2006), as well as *V. flinti* (Figs 6C, 6D, 6E); it was membranous to lightly sclerotized in the *V. leschenaulti* specimens studied to date; perhaps most were teneral (Tauber 2007). Thus, this character appears to be diagnostic of the genus.

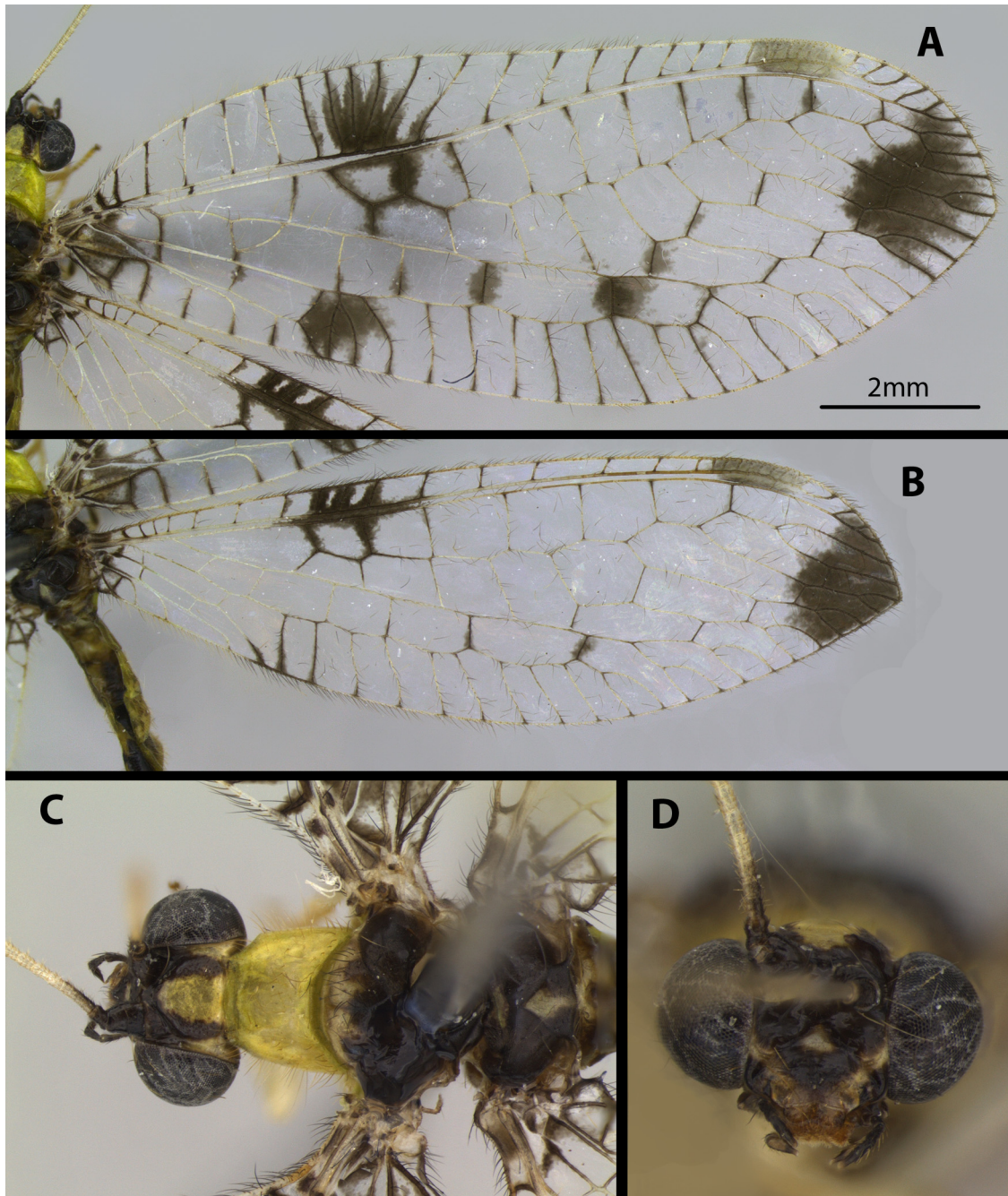


FIGURE 8. *Vieira brooksi* Tauber. (Male, Venezuela). External features. A. Forewing; B. Hindwing; C. Head, thorax (dorsal); D. Head (frontal). Scale applies to both A and B.

Spermathecal shape and size. Females of *Vieira* species were proposed to have a round spermatheca bearing an elongate, tubular, and at least somewhat bilobed velum that opens to the bursa copulatrix dorsally via an elongate dorsal slit, and also distally via the bursal duct. The spermatheca has an elongate, slender spermathecal duct (Brooks & Barnard 1990; Tauber 2007). The reproductive tract of *V. flinti* females also expresses all of these features.

From the above, it is clear that the four *Vieira* species share a number of unifying characteristics, but they also express a wide range of interspecific variation. Most notably, the four species vary markedly in body size. Indeed, the variation in many of the above features may be correlated with body size. Such a broad range of variation in size and correlated features may not be unexpected if, as is the case for all known belonopterygines, the larvae of *Vieira* species feed on ant brood and have relatively narrow ranges of acceptable prey.

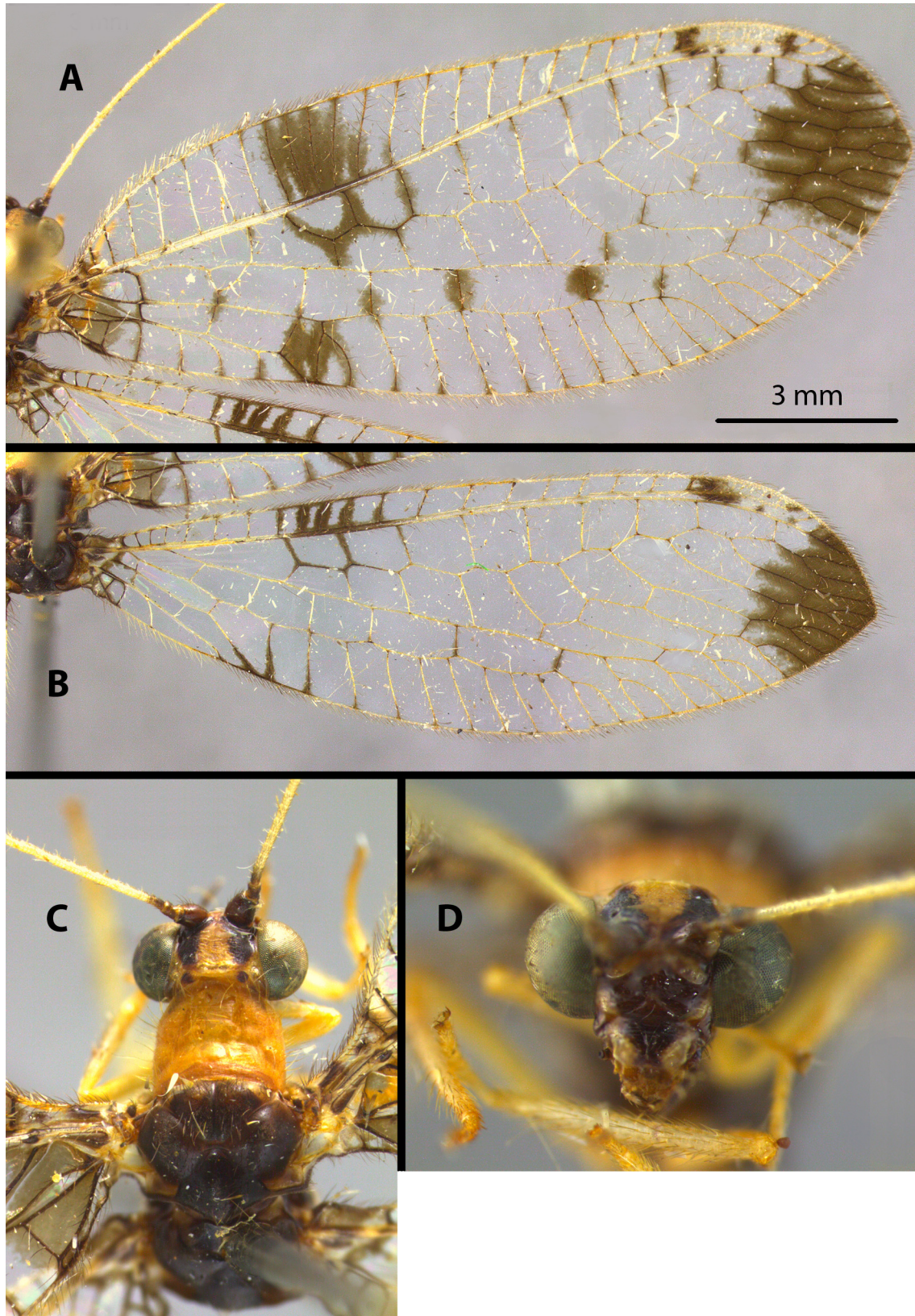


FIGURE 9. *Vieira elegans* (Guérin Méneville). (Male, Brazil). External features. A. Forewing; B. Hindwing; C. Head, thorax (dorsal); D. Head (frontal). Scale applies to both A and B.

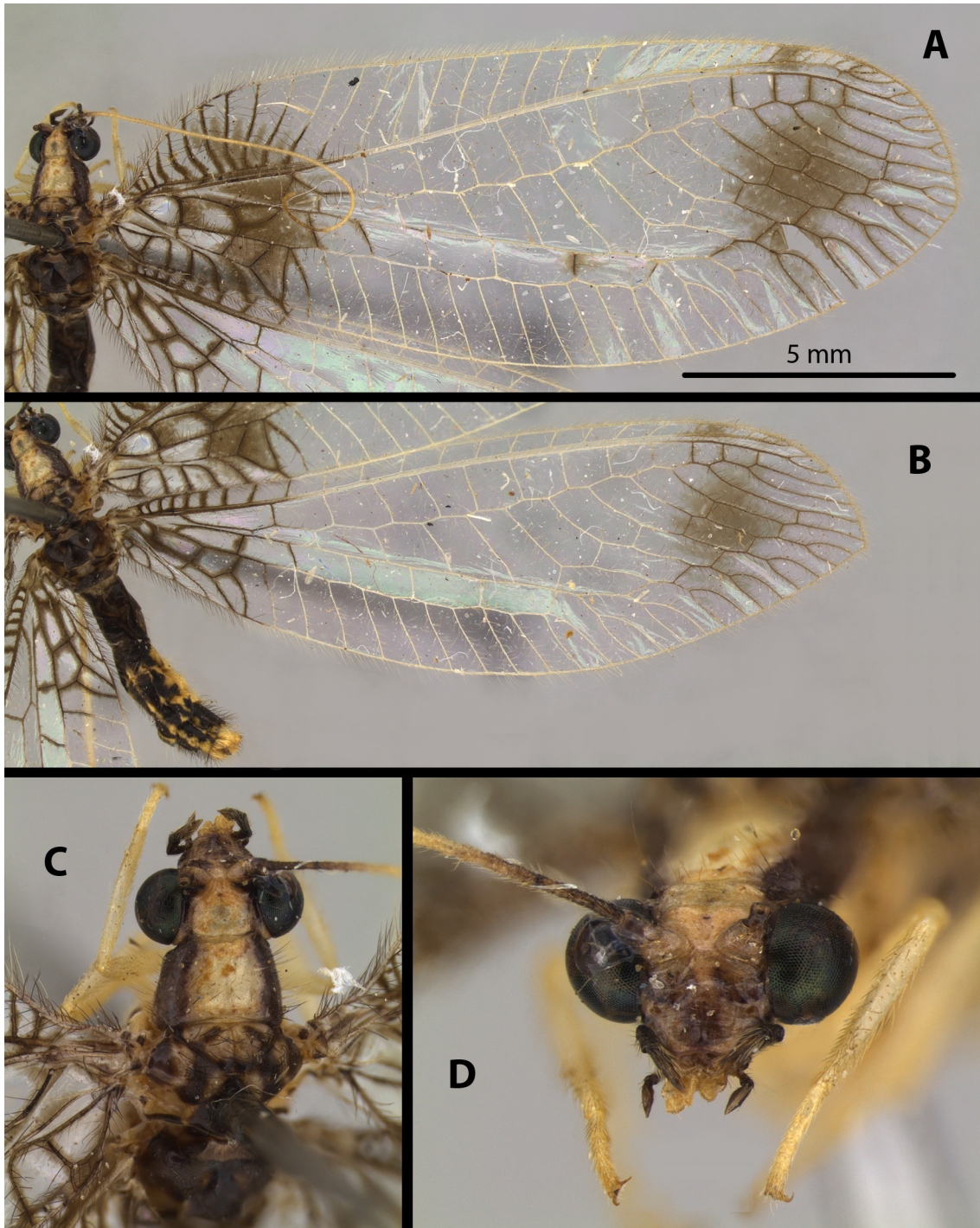


FIGURE 10. *Vieira flinti*, sp. nov. (Female, Venezuela). External features. A. Forewing; B. Hindwing; C. Head, thorax (dorsal); D. Head (frontal). Scale applies to both A and B.

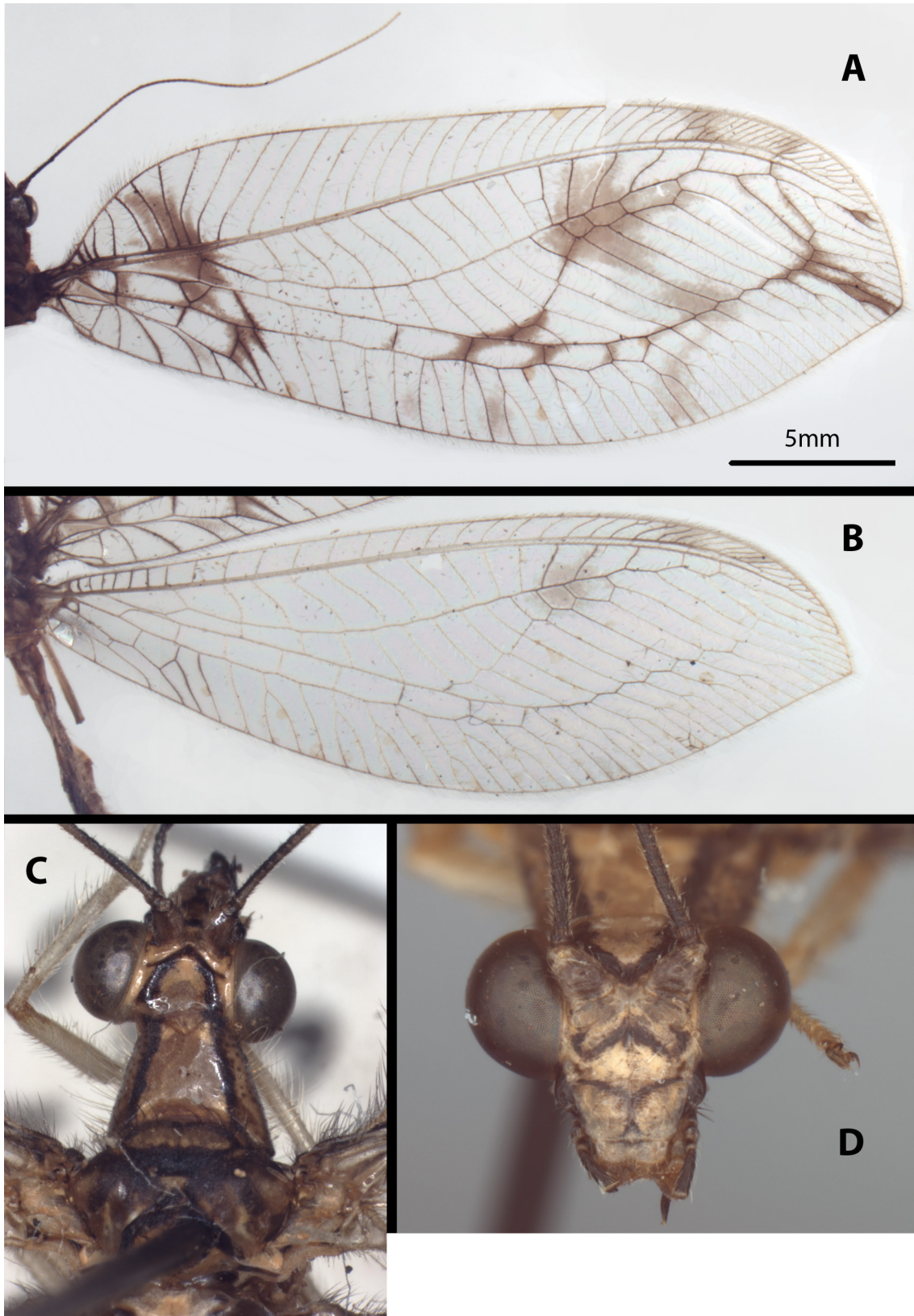


FIGURE 11. *Vieira leschenaulti* (Navás). External features. A. Forewing (female, Bolivia); B. Hindwing (female, Bolivia); C. Head, prothorax, mesothorax (female, Costa Rica; dorsal); D. Head (male, Costa Rica; frontal). Scale applies to both A and B.

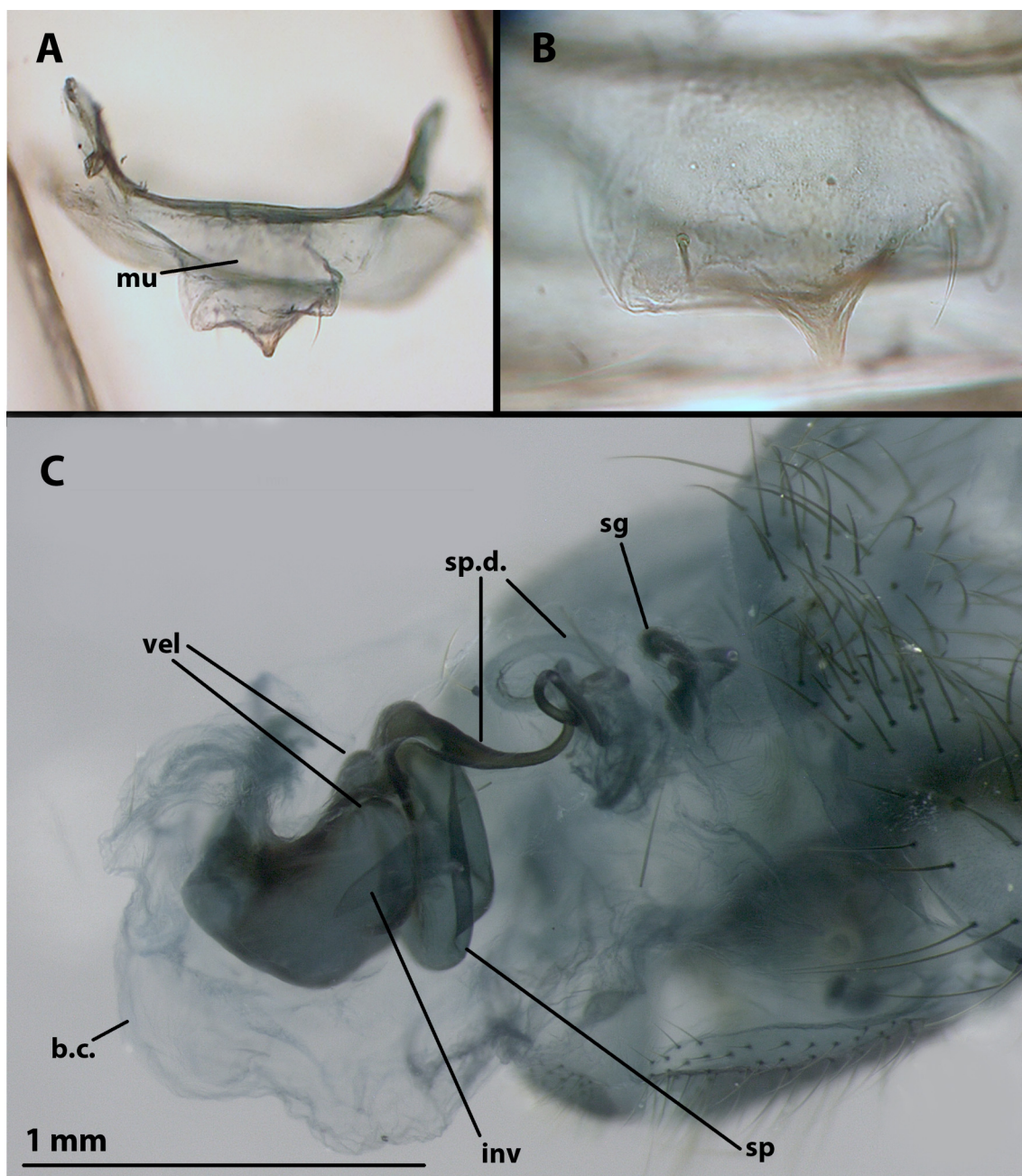


FIGURE 12. Genital features of two *Vieira* species A, B. *Vieira elegans* (Guérin Méneville), male (Venezuela). A. Gonarcus and mediuncus (frontodorsal); B. Mediuncus with pair of frontodorsal setae. C. *Vieira leschenaulti* (Navás), female (Brazil). Spermathecal complex; note bilobed velum. b.c., bursa copulatrix; inv, spermathecal invagination; mu, mediuncus; sg, subgenitale; sp, spermatheca; sp.d. spermathecal duct; vel, velum.

Key to species of *Vieira* (See Figs 8–11; wing veins are identified on Figs 2C, 2D)

1. Body large, forewing 22–32 mm long; inner series of gradate veins aligned end to end in a row extending away from the Pseudomedius and the outer gradate series and arching toward the Radial Sector (Fig. 11A) *V. leschenaulti*
- 1' Body smaller, forewing length < 17 mm; inner and outer series of gradates aligned in parallel, step-like rows 2
2. Dark markings at base of forewing large, including ~ ten basal costal crossveins, the intramedian and third median cells, and the three cubital cells; large marks at tips of fore and hind wings diffuse, not reaching wing margin (Fig. 10A) *V. flinti*
- 2' Dark marking at base of forewing small, including only the bases of the major veins (M, M1, M2, Cu, A1, A2) and a few basal crossveins (m-cu1, cu-a); large marks on tips of fore and hind wings dark, those on hindwing reaching margin of wing 3

3. Forewing relatively small (11.4–11.7 mm long); large midcostal marking including six crossveins, usually one of which is bifurcated; large mark at tip of forewing not reaching wing margin (Fig. 8A) *V. brooksi*
- 3'. Forewing relatively large (13.6–15.2 mm long); large midcostal marking including four to six crossveins, all of which are simple; large mark at tip of forewing reaching wing margin (Fig. 9A) *V. elegans*

New distribution records and notes for *Vieira* species

Vieira elegans: Male: Venezuela, Carabobo, Rio Borburata, 250 m. 17–24/VI/1971, F. Fernández Y. J. Salcedo (MIZA). NEW COUNTRY RECORD. Male: Bolivia, Santa Cruz, Buena Vista, 17°27'66"S, 63°39'62"W, 300m, 20/II/1999, (FSCA). NEW COUNTRY RECORD. Male: Brazil, Amazonas, Manaus (INPA) 24/V/1979, J. Arias, armadilha de Malaise (INPA). NEW STATE RECORD.

The above specimen from Brazil had a pair of elongate setae on the frontodorsal surface of the mediuncus; this feature was not reported for this species earlier (Fig. 12). When we reexamined male specimens from the earlier study (both from Rio de Janeiro State in Brazil), we found one seta on the mediuncus of one specimen, and none on another specimen (although there were similar setae on the membrane surrounding the mediuncus of this specimen). It appears that the occurrence of these setae may be variable in *V. elegans*, as are similar setae in *V. leschenaulti* (Brooks & Barnard 1990; Tauber 2007).

Known distribution: Bolivia, Brazil, Peru, Guyana, Trinidad, Venezuela.

Vieira brooksi: Male: Venezuela, Yaracuy, Guaquira, 10°17'N / 68°39'W. 150 m., 12/IV/2013, F. Sosa, F. Diaz, C. Martins, A. Yanez (MJMO). NEW COUNTRY RECORD. Among the splayed costal crossveins on one wing were two closely juxtaposed, but unbranched costal crossveins; in their place on the other wing was a single branched costal crossvein.

Known distribution: Panama, Bolivia, Brazil, Venezuela, possibly Costa Rica.

Vieira leschenaulti: Female: Brasil, Amazonas, Manaus—Itacoatiara Km 244, 19/I/1977, N. Penny (INPA). In addition, two female specimens from the FSCA: Costa Rica, Turrialba, CATIE, 27/VI/1984, and Brazil, Rondônia, 62 km. SW Ariquemes, nr Rancho Grande, 1-17/XI/1992, B. Dozier. A new image of the female genitalia of this species is shown in Fig. 12.

Known distribution: Costa Rica, French Guiana, Surinam, Bolivia, Brazil, Colombia, Peru.

Note: In the original description of this species, Navás (1911: 279) had two spellings for the species name. The name (“leschenaulti”) in the figure caption (Fig. 6) is misspelled; Navás undoubtedly named the species “leschenaulti” after the collector, whom he listed as “Leschenault”. The type specimen in the MNHN in Paris carries the name “leschenaulti” (Legrand *et al.* 2008: 149), and Navás used that spelling in a subsequent publication (Navás 1913: 152).

For previously reported records of *Vieira* species, see Tauber *et al.* (2006, as *Berchmansus elegans*) and Tauber (2006, 2007).

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