



A new species of *Ungla* (Neuroptera: Chrysopidae) that exhibits remarkable homoplasy in male secondary sexual characters

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Abstract

A new and very unusual species of green lacewings, *Ungla pseudomeleoma* sp. nov. is described from Peru. Males of this species exhibit a remarkable example of generic-level homoplasy with *Meleoma*. Its abdominal and genitalic features are completely consistent with the genus *Ungla*. However, its external sexually dimorphic features resemble those of both *Ungla* and *Meleoma*. Females of the new species also express cranial modifications that resemble those of some female *Meleoma* species.

Key words: *Meleoma*, green lacewing, frontal horns, cranial modifications, abdominal and genital characters

Introduction

During the last five years, the number of valid described species in the chrysopid genus *Ungla* Navás, 1914, increased from nine to twenty-five (Sosa 2015, Tauber *et al.* 2017). With this new taxonomic foundation came some understanding of the variation expressed by the included species. For example, the genus was shown to comprise two distinct groups of species with separate geographic distributions and disparate ranges of morphological variation (Tauber *et al.* 2017). The southernmost group (largely from Argentina, also southern Brazil) contains seven species, all of which are relatively small in size and have similar morphology. The second (northern) group ranges from Bolivia in the south, through Peru, Ecuador, Venezuela, and Central America, to southern Mexico. This group expresses a much broader range of variation in morphology and size, and some of these species exhibit sexual dimorphism in their abdominal spiracles, wing veins, and frons.

The overall geographic range of *Ungla* falls completely within the range of *Meleoma* Fitch, 1855, another New World genus of lacewings with similar appearance (Adams 1969, Tauber 1969, Penny 2006, Raquel Gandolfo, personal communication, C. A. Tauber, personal observation). The distinction between these two genera is well documented, and specimens are distinguished primarily by features of the male abdomen and genitalia (e.g., Brooks & Barnard 1990, Penny 2002, Tauber *et al.* 2017). In addition, most species of *Meleoma* exhibit some sort of external sexual dimorphism in wing veins, stridulatory organs, or most commonly, antennal and facial modifications. However, such modifications are largely absent from *Ungla*, which has its own less conspicuous examples of sexual dimorphism that are not expressed by *Meleoma* males (Tauber *et al.* 2017). For example, males of many *Ungla* species have enlarged spiracular openings and unique structural features on the abdominal sclerites that are not known from *Meleoma*. And, males of several *Ungla* species have some enlargement and/or other small modifications of the frons.

Described here is a new species of *Ungla* that expresses a remarkable example of generic-level homoplasy with *Meleoma*. While its general features place it squarely in the genus *Ungla*, its sexually dimorphic features resemble those of both *Ungla* and *Meleoma*. Males have elaborate head and antennal modifications that rival those of the most ornate *Meleoma* males; in addition, they have spiracular enlargement that is consistent with other sexually dimorphic *Ungla* males. Females of the new species also exhibit cranial modifications similar to those of some female *Meleoma* species.

Material and methods

Measurements are from the four available specimens (two males and two females in the type series). Procedures and terminology follow those described in previous papers (e.g. Tauber *et al.* 2017). Note: the report here uses terminology for veins and cells as most recently modified by Breitzkreuz *et al.* (2017), with some exceptions and additions by Tauber (2019a, b). Divided veins are referred to with the prefixes A (anterior) and P (posterior); thus, for example, the branches of the divided Radius (R) are: (i) RA, the anterior branch, and (ii) RP, the posterior branch (formerly the Radial sector). Crossveins are depicted in lowercase with a hyphen and often begin with a number, e.g., 1c-sc is the first (basalmost) costal-subcostal crossvein. And, cells are lowercase and italicized, often with a number following, e.g., *im1* refers to the first intramedial cell. For convenience, I retained the use of the term “Banksian cell” or “b cell” to refer to the closed cells beneath RP that do not include a gradate vein, and “b’ cell” to indicate closed cells between the Pseudomedia (Psm) and the Pseudocubitus (Psc).

New species description

Ungla pseudomeleoma Tauber

Holotype. The holotype, a male, is in the Florida State Collection of Arthropods (FSCA), Gainesville, FL (Figs 1, 3, 5, 6). Its labels read: [1] “PERU: Samme, ca. / 40 km NE Trujillo / Prov. La Libertad / 7°59’S, 78°41’W / elev. ca. 1500 m. / 12–17 July 1975 / C. Porter, L. Stange”; [2] “HOLOTYPE / *Ungla pseudomeleoma* / des. C. A. Tauber 2019”. The specimen is in good condition; the right labial palpus is partially covered with a white, frothy material.

Etymology. The species name *pseudomeleoma* recognizes the elaborate *Meleoma*-like antennal and frontal modifications expressed by this species. It is a noun in apposition with the generic name.

Support for generic placement. In addition to the crucial genital characters described below, this species expresses several externally visible features that support its placement in the genus *Ungla* (c.f., Tauber *et al.* 2017). For both males and females, the wing venation—especially the insertion of the basal inner gradate on a radial vein and not on the Psm—is more typical of *Ungla* species than those in most other chrysopine genera, including *Meleoma*. In addition, males have enlarged abdominal spiracles; T9+ect is truncated so that it and the dorsal apodeme do not extend proximally below T8; T9+ect has a deep anal invagination; sternites 8 and 9 are fully fused, and S8+9 is elongate, plate-like, and terminates broadly with distal margin upturned. All of the above features characterize males of *Ungla* species. Internally, the structure and composition of the male genitalia is typical of all *Ungla* species: simple gonarcus without gonocornua, with an unarticulated frontal process on the lateral apodeme; mediuncus narrow, elongate, attached to gonarcus bridge via a flexible hinge; gonosaccus with two patches of robust setae on opposing robust plates; and the absence of a tignum, gonapsis, pseudopenis, gonocristae, and parameres. Female genital characters also are consistent with the genus *Ungla*: spermatheca round, pillbox-shaped, with tall vellum opening directly to the bursa copulatrix via a dorsal slit; spermathecal duct with two to three curves, extending posteriorly, with a distal filamentous section; subgenitale bilobed distally, with simple pocket or lobe below; and the absence of a praegenitale.

Diagnosis. Both males and females of *U. pseudomeleoma* are distinguished from other *Ungla* species by their elongate scapes with longitudinal red marks on the dorsum and by the distinctive red lines around their antennal fossae (Figs 1B, 1D, 1E, 1F, 2A, 2B, 2C). Males also are easily recognized by the unique shapes and setal patterns of the scape and basal flagellar segments (Figs 1, 3), the deeply ridged interantennal surface (Figs 1C, 1E, 1F), and the highly ornamented frons (Figs 1, 3, 5). Females of *U. pseudomeleoma* do not exhibit the extreme male modifications; however, their elongated scapes and the paired ridges between the scapes are distinctive features (Figs 2A, 2B).

Description. *Head:* Width 1.4 mm (female), 1.3–1.4 mm (male); ratio of head width : eye width, 2.4–2.6 : 1 (female), 1.8–1.9 : 1 (male). Male vertex, frons, antennal base (scape, pedicel, basal flagellar segments) with elaborate modification. Vertex with scape surrounded by large, delineated fossae, bases of scapes located close to each other, within much less than width of scape; surface of vertex between toruli, scapes longitudinally furrowed; upper surface of frons also furrowed anteriorly, bending forward, forming interantennal horn consisting of connected longitudinal ridges that merge into a medial, bifid ledge with setose lower surface. Frons invaginated below inter-

antennal horn and scapes, forming distinct, rounded, shallow cavity; lateral edges of cavity extending towards eyes; lower part of frons with two elevated, rounded ridges, each bearing pair of triangular patches of dense, elongate, dark brown setae curved upward, appearing to be a lower horn. Female face only lightly sculptured, mostly smooth, without elaborate modifications, except vertex with pair of distinct, longitudinal ridges between scapes, extending to upper part of frons.

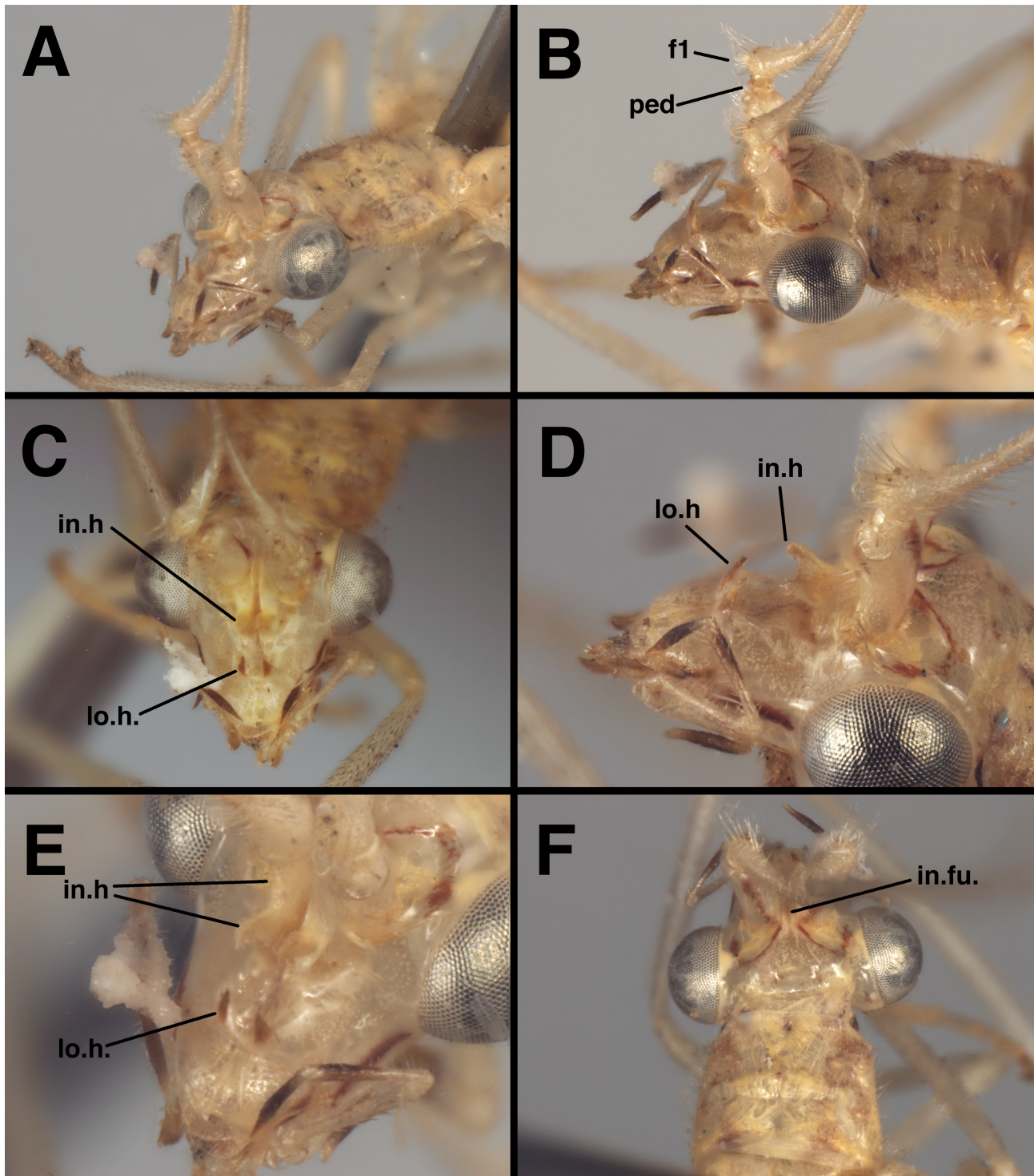


FIGURE 1. *Ungla pseudomeleoma*, **sp. nov.**, Holotype (male, Peru: La Libertad, FSCA). A. Head, prothorax (frontolateral); B. Head, prothorax (lateral); C. Head (frontal); D. Head (lateral); E. Face (frontal); F. Head, prothorax (dorsal). f1, first flagellomere; in.fu., interantennal furrow; in.h., interantennal horn; lo.h., lower horn; ped, pedicel.

Antenna: Length 12.0–12.4 mm. Scape slender, elongate (ratio of length : width, 1.7–1.8 : 1 (female), 2.3–2.5 : 1 (male)); few short setae dorsally, more numerous, long setae ventrally; sides straight (male), slightly curved later-

ally (female). Pedicel (male, female), basal flagellar segment (female) without distinct modification; basal flagellar segment (male, Fig. 8A) enlarged, bulbous, highly setose frontally, extending posteriorly from pedicel; second to fourth flagellar segments tapering, with setae of decreasing lengths.

Coloration of head: Head cream-colored (probably green in life) with dark to light red markings; vertex with pair of distinct red spots behind anterior ridge, red margin around base of torulus, dorsal fossa; female with thin red line along anterior fossa, frons with red mark along frontoclypeal margin; male without frontal or clypeal marks; gena with bright red to dark reddish black lateral stripe almost reaching eye posteriorly, extending distally to clypeal margin; clypeus with small or large black stripe laterally. Antenna with scape cream-colored, with irregular, longitudinal red stripe; pedicel, flagellum cream-colored; maxillary palpus with distal two segments dark brown, middle segment light brown, two basal segments pale, articulations pale; labial palpus with basal two segments pale, distal segment dark brown, articulation pale. Corner of cervix with small, dark brown to black mark.

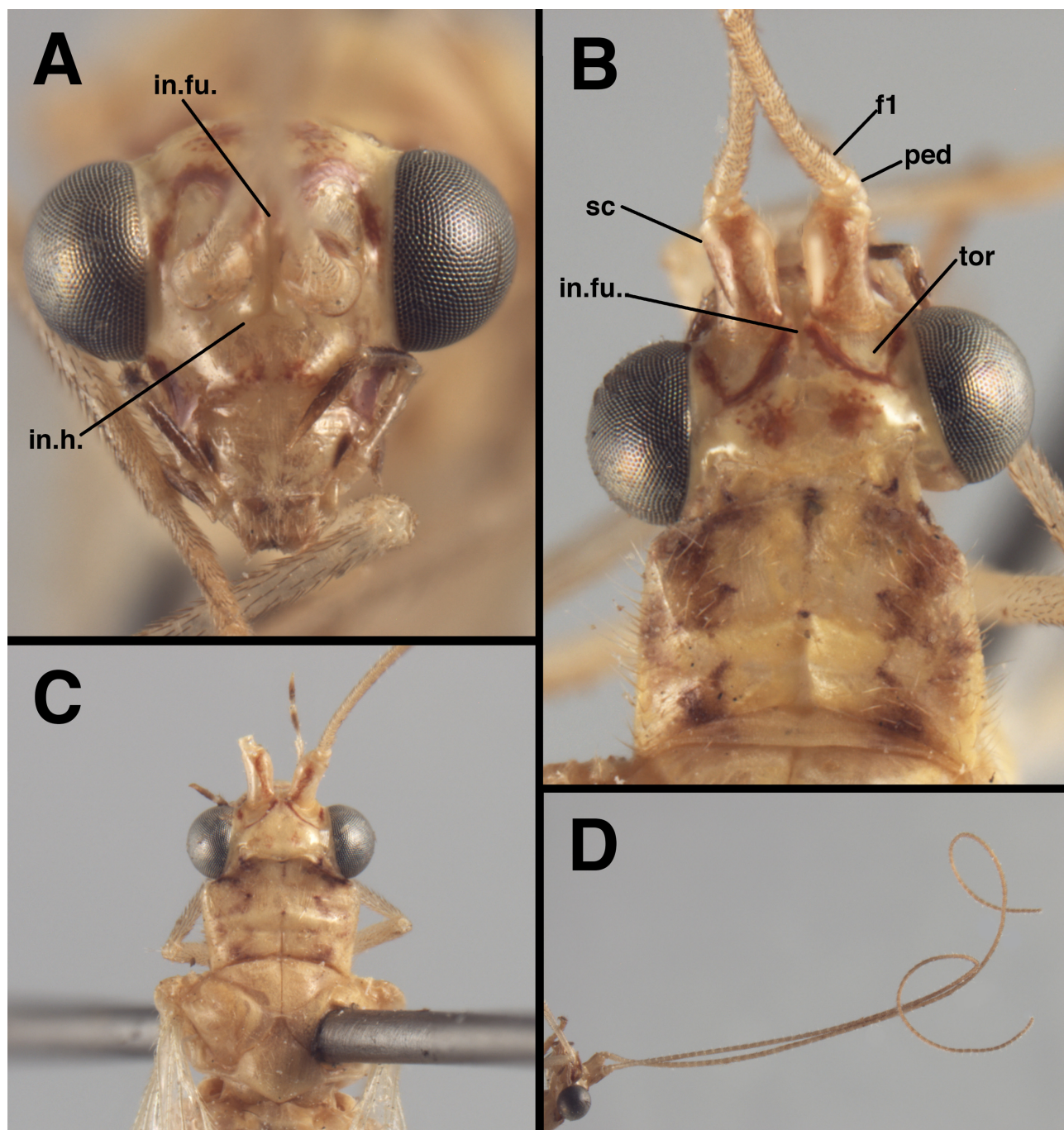


FIGURE 2. *Ungla pseudomeleoma*, **sp. nov.**, Paratypes (female, Peru: La Libertad). A. Head, frontal (FSCA); B. Head, prothorax (dorsal, FSCA); C. Head, prothorax, mesothorax (dorsal, TRC); D. Antenna (FSCA). f1, first flagellomere; in.fu., interantennal furrow; in.h., interantennal horn; ped, pedicel; sc, scape; tor, torulus..

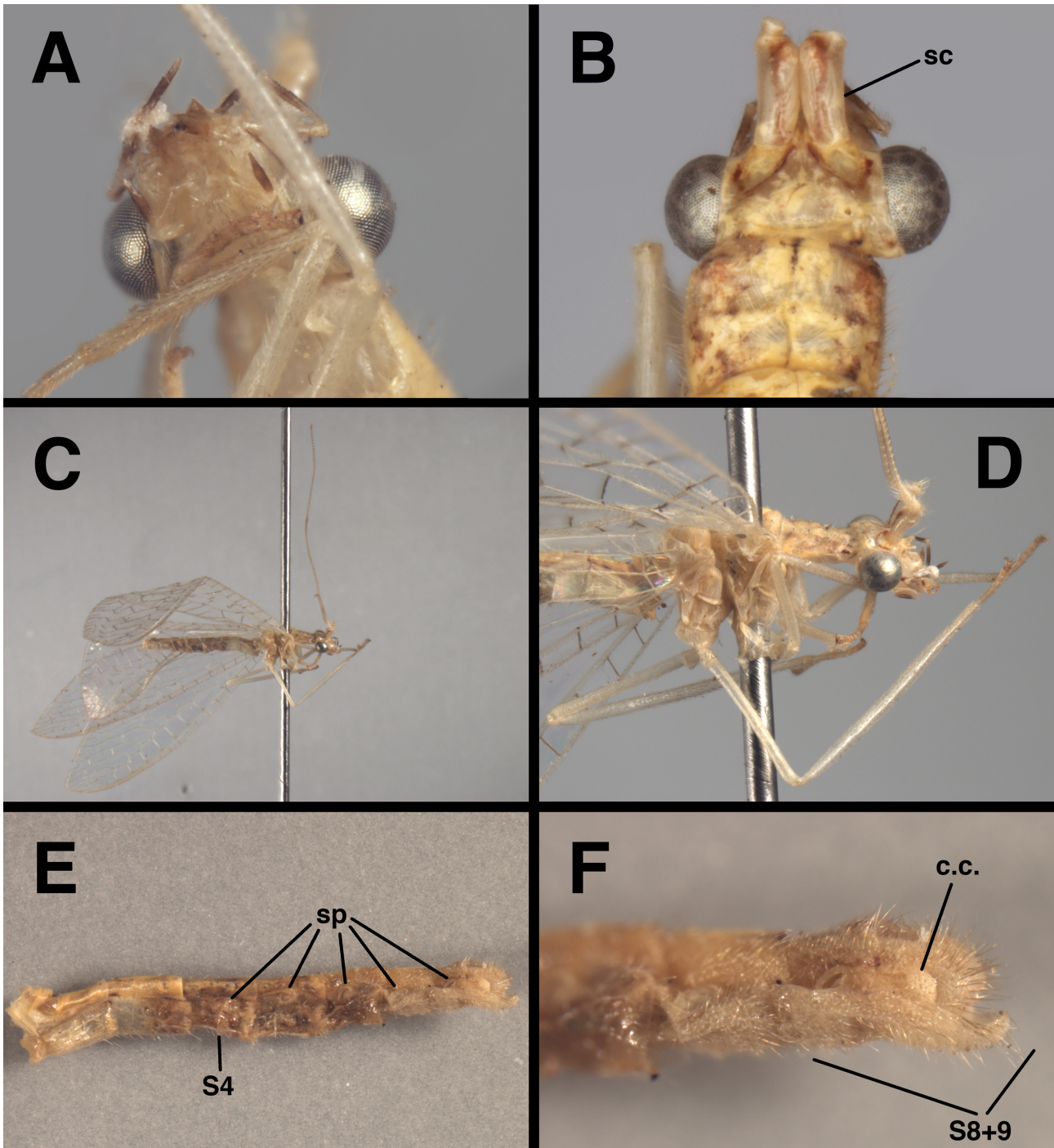


FIGURE 3. *Ungla pseudomeleoma*, **sp. nov.**, Exterior head and body (male, Peru: La Libertad). A. Holotype, head (ventral, FSCA); B. Paratype, head, prothorax (dorsal, TRC); C. Holotype, body (lateral, FSCA); D. Holotype, head and thorax (lateral, FSCA); E. Holotype, abdomen (lateral, FSCA); F. Holotype, terminus (lateral, FSCA). c.c., callus cerci; S4, fourth sternite; S8+9, fused eighth and ninth sternites, sc, scape; sp, spiracular openings.

Thorax: Prothorax length 0.6-0.8 mm, width 0.9-1.1 mm; pronotum with furrow down midline, longitudinal furrows across midsection and near posterior margin; diffused markings in irregular pattern along lateral surface, broad cream-colored band mesally; surface with numerous elongate, cream setae. Mesothorax, metathorax without distinct markings.

Wings: Forewing (Fig. 4A) slender, apex broadly subacute to rounded, membrane clear, hyaline, with light to very light suffusion of brown surrounding gradate veins; stigma very slightly opaque; longitudinal veins green, marked brown at intersections with other veins; transverse veins brown or marked brown at ends; forewing with

veins robust to slender, not crassate; RP straight; first intramedian cell ovate; basal inner gradate vein not meeting Psm; gradate veins dark brown, costal crossveins, ra-rp crossveins, intracubital crossveins brown or marked brown basally. Hindwing (Fig. 4B) narrow, apex subacute, membrane clear, hyaline, without markings; venation green, except ra-rp crossveins, intersections with RP brown at least basally. Forewing length 11.6-13.4 mm, height 3.7-4.4; ratio of length to height, 3.0-3.1: 1; height of tallest costal cell 0.8-0.9 mm (cell number 5); width of first intramedian cell 0.7-0.8 mm; 9-10 *rarp* cells (closed cells between RA and RP); third gradate cell (third cell from wing base with inner and outer gradate veins at either end) 0.8-1.3 mm long, 0.4-0.5 mm wide, ratio of length : width, 2.0-2.7 : 1; fourth gradate cell 1.0 mm long, 0.4 mm wide (ratio of length : width, 2.4 : 1); 4 b cells (closed cells beneath RP that do not include a gradate vein), 4 b' cells (closed cells between Psm and Psc); 3-4 inner gradates, 4-5 outer gradates. Hindwing length 12.2 mm, height 3.2-3.9 mm (ratio of length : height, 3.1 : 1), 9-11 *rarp* cells, 3 b cells, 4 b' cells, 2-3 inner gradates, 4-5 outer gradates.

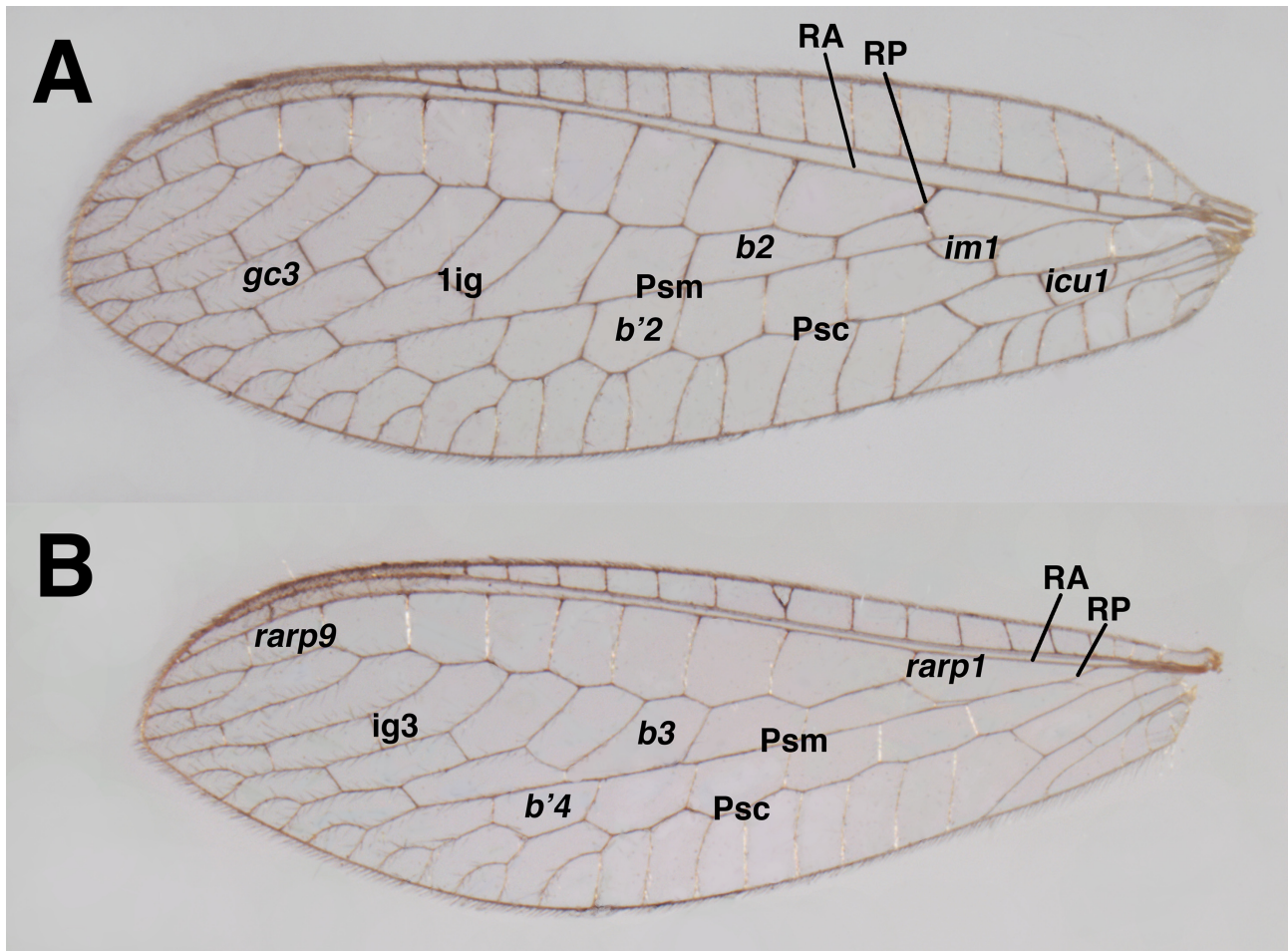


FIGURE 4. *Ungla pseudomeleoma*, **sp. nov.**, Paratype (female, Peru: La Libertad, TRC). Wings. A. Forewing B. Hindwing. *b2*, *b3*, second, third upper Banksian cells (cells below RP that do not include a gradate vein); *b'2*, *b'4*, second, fourth lower Banksian cells (cells between Psm and Psc); *gc3*, third gradate cell (cell with inner and outer gradates at the two ends); *icu1*, first intracubital cell; *1ig*, first inner gradate vein, *im1*, first intramedian cell; Psc, Pseudocubitus; Psm, Pseudomedius; *rarp1*, *rarp9*, first, ninth closed cells between RA and RP; RA, anterior branch of Radius; RP, posterior branch of Radius.

Male abdomen (Figs 5, 6): Tergites, sternites, pleural regions covered with relatively dense covering of moderately long setae; microsetae present; no microtholi. T6 (lateral view) length 0.7 mm, ~7.2x height; T7 (lateral view) length 0.6 mm, ~3.8x height; T8 (lateral view) length 0.6 mm, ~6.9x height; T9+ect (lateral view) length 0.4 mm, 1.5x height, ~0.6 length of T7; S6 (lateral view) length 0.8 mm, ~2.7x height; S7 (lateral view) length 0.7 mm, ~2.5x height. Tergites, sternites roughly rectangular, with pleural margins slightly concave. Segments A4 to A8 with large spiracles, (e.g., A7: spiracle diameter ~0.19-0.21x length of sternite). T9+ect with dorsal invagination prominent (~0.33x dorsal length of T9+ect), margins of invagination almost straight, base rounded; dorsal margin of T9+ect moderately rounded throughout, posterior margin of ectoproct convex, without knob or extension; ventral

margin straight, lightly sclerotized; callus cerci large, ovate (diameter: 0.10-0.15 mm), with discrete, well separated trichobothria.

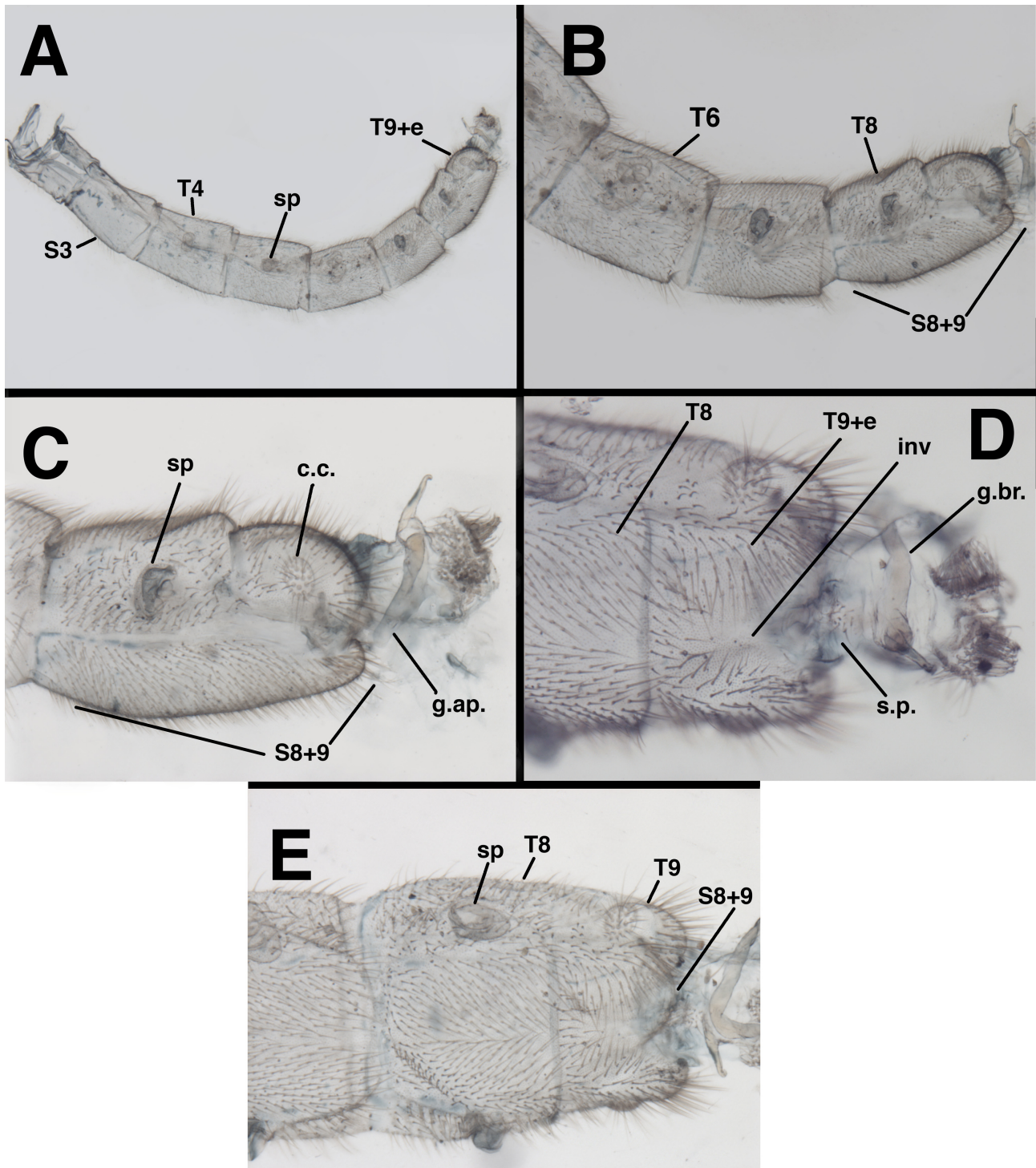


FIGURE 5. *Ungla pseudomeleoma*, **sp. nov.**, Holotype, cleared abdomen (male, Peru: La Libertad, FSCA). A. Abdomen (lateral); B. Abdominal terminus (lateral); C. Terminal abdominal segments and genitalia (lateral); D. Fused ninth tergite and ectoproct (dorsal); E. Fused eighth and ninth sternites (ventral, suture on dorsal integument between T8 and T9 visible). c.c., callus cerci; g.ap., gonarcapodeme; g.br., gonarcap bridge; inv, invaginated dorsal cleft in T9+e, above anus; S3, third sternite; S8+9, fused eighth and ninth sternites, s.p., setose subanal plate; sp, spiracular opening; T4, T6, T8, T9, fourth, sixth, eighth, ninth tergites; T9+e, fused ninth tergite and ectoproct.

S8+9 fused, with line of fusion not detectable; length (lateral view) 1.0 mm, ~4.8x height; dorsal margin with apodeme lightly sclerotized, mostly noticeable on basal two-thirds; dorsum tapering roughly from area below T9 to

beyond callus cerci, then forming small ledge with upturned terminus; terminus blunt (lateral view), extending very slightly beyond distal margin of T9+ect; setae dense, slender, mostly long, simple, those along distolateral margin of similar size to other setae, without flanges. Subanal plate distinct, with ~12 small setae.

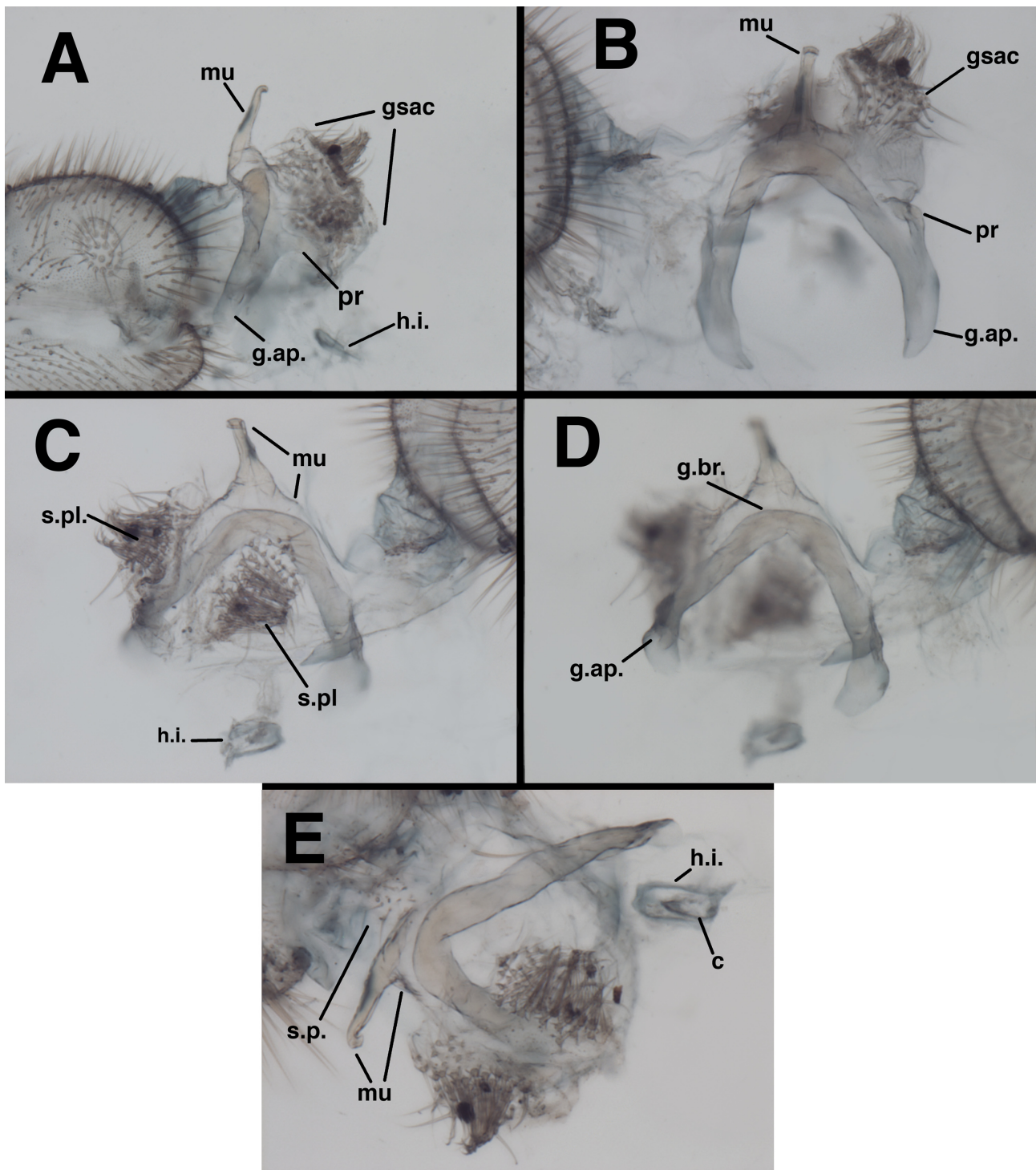


FIGURE 6. *Ungla pseudomeleoma*, **sp. nov.**, Holotype, genitalia (male, Peru: La Libertad, FSCA). A. Gonarcus complex (anterolateral); B. Gonarcus (posterodorsal); C. Gonarcus complex (frontal); D. gonarcus (caudal); E. Gonarcus complex (frontoventral). c, comes; gsac, gonosaccus; g.ap., gonarcus apodeme; g.br., gonarcus bridge; h.i., hypandrium internum; mu, median uncus; pr, unarticulated process on frontal margin of gonarcus apodeme; s.p., setose subanal plate; s.pl., paired setose plate of gonosaccus.

Gonarcus broadly arcuate, with bridge stout, rounded dorsally, acute interiorly; apodemes (arms) heavy, relatively straight, expanded distally, with lightly sclerotized unarticulated process on frontal margin extending distally

toward gonosaccus. Mediuncus with rounded base closely attached to gonarcal bridge, narrow distally, with terminus narrow, curved downward about 90° (lateral view). Gonosaccus bilobed, with lobes closely aligned, when unexpanded forming a triangular envelope around tip of mediuncus, when expanded consisting of two lobes, rounded dorsally, mesally, laterally, but flat distally; each lobe with large, dense patch of sturdy gonosetae arising from prominent setal bases facing inward when uneverted, outward when everted; gonosetae relatively long (almost as long as length of mediuncus); hypandrium internum quadrate, with dense arms, sturdy, keel-like comes.

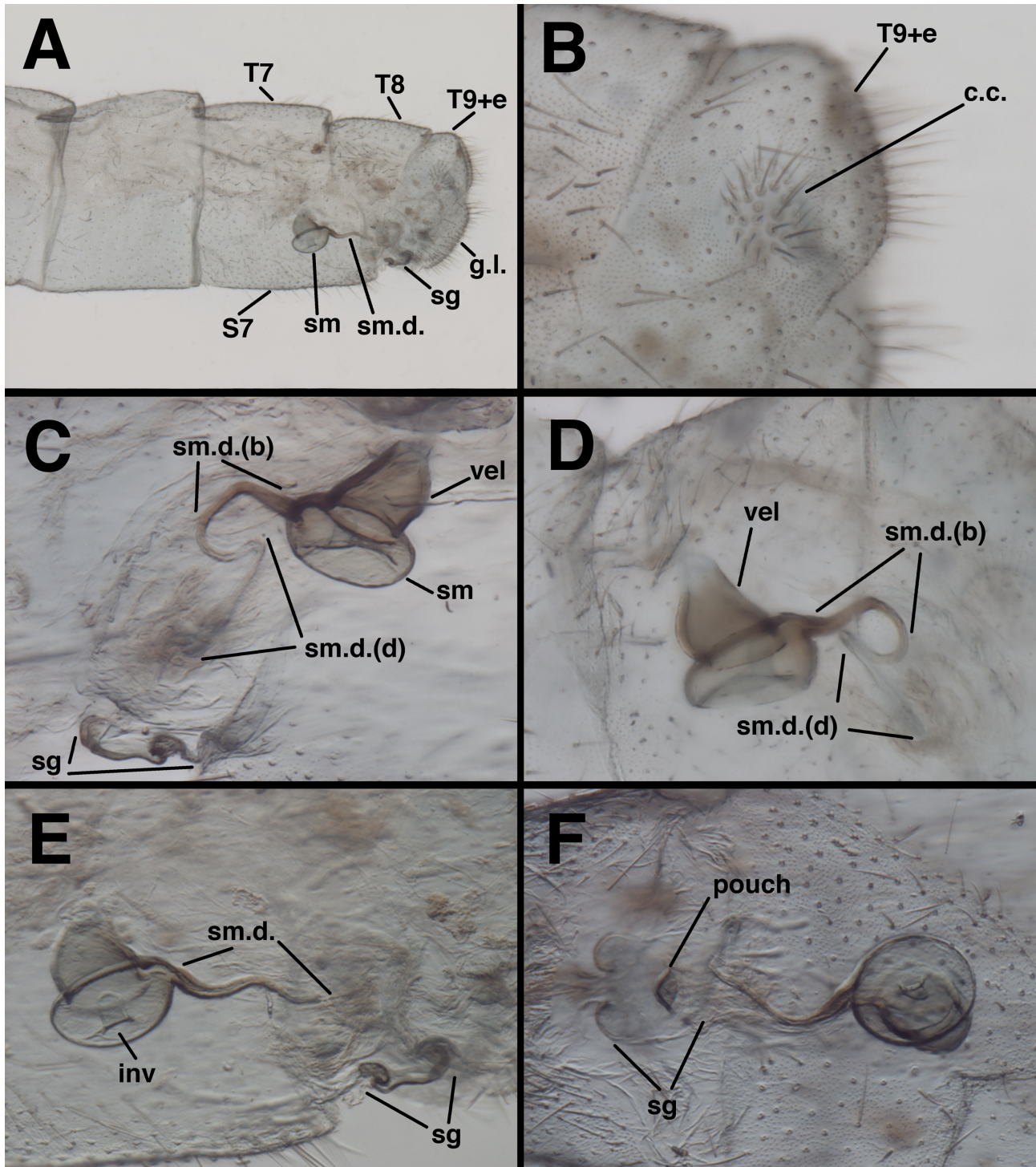


FIGURE 7. *Ungla pseudomeleoma*, **sp. nov.**, Paratype, cleared abdomen (female, Peru: La Libertad, TRC). A. Terminal segments of abdomen (lateral); B. Fused ninth tergite and ectoproct (lateral); C, D. Spermathecal complex; E, F. Spermathecal complex and subgenitale. c.c., callus cerci; g.l. gonapophysis lateralis; inv, spermathecal invagination; pouch, pouch at base of subgenitale; sg, subgenitale; sm, spermatheca; sm.d., spermathecal duct; sm.d.(b), sm.d.(d), basal, distal sections of spermathecal duct; S7, seventh sternite; T7, T8, seventh, eighth tergites; T9+e, fused ninth tergite and ectoproct; vel, spermathecal vellum.

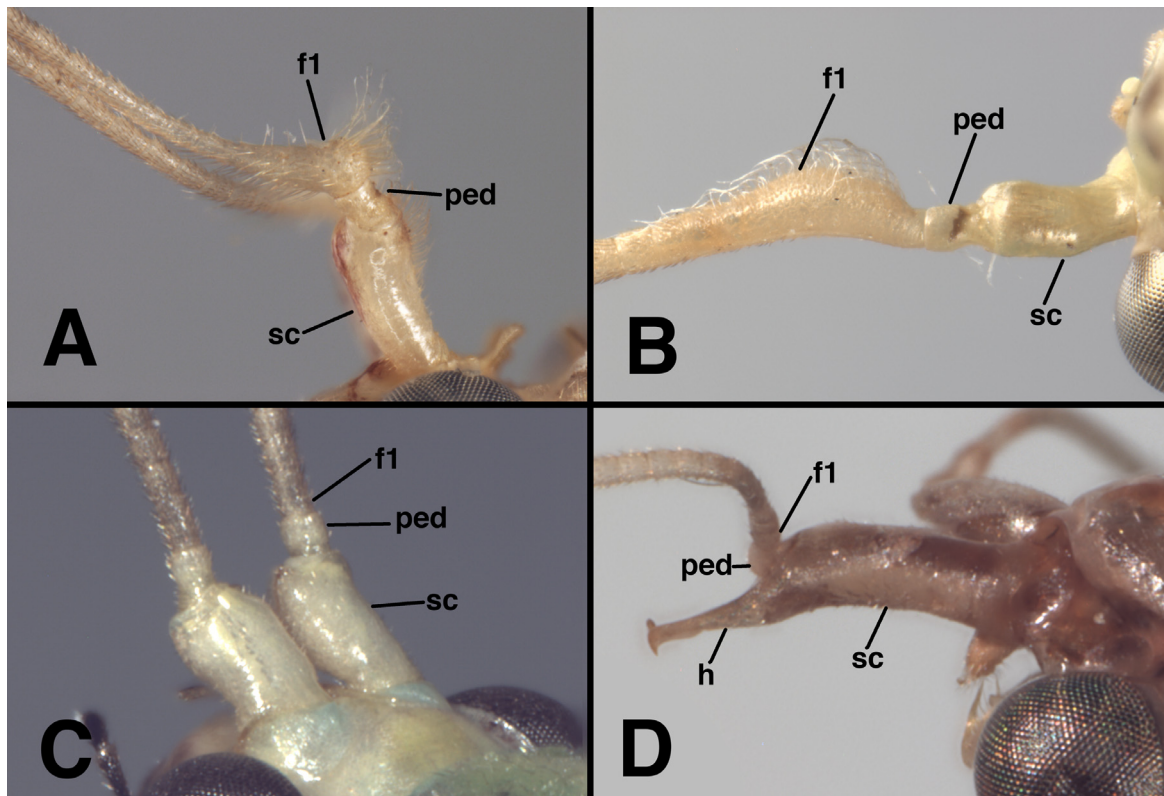


FIGURE 8. Similarity in the antennal features of *Ungla pseudomeleoma* with those of three species of *Meleoma*. A. *Ungla pseudomeleoma*, **sp. nov.**, Holotype (Peru: La Libertad, FSCA); B. *Meleoma emuncta* Fitch (USA: California, TRC); C. *Meleoma* undescribed sp. #1 (USA: Arizona, TRC); D. *Meleoma stangei* Penny (Mexico: Baja California, San Diego County Museum of Natural History). fl, first flagellomere; h, horn extending from scape; ped, pedicel; sc, scape.

Female abdomen (Fig. 7): Tergites, sternites with uniform, moderately dense setal covering, setae of moderately long length. T6 (lateral view) length 0.9 mm, ~5.9x height; T7 (lateral view) length 0.8 mm, ~7.3x height; T8 (lateral view) length 0.6 mm, ~4.5x height; T9+ect (lateral view) length 0.4 mm, 0.5x height, ~0.5x length of T7; S6 (lateral view) length 0.9 mm, ~1.6x height; S7 length 1.0 mm, ~1.8x height. Tergites, sternites roughly rectangular, with pleural margins straight. Spiracles located in center of pleural region, roughly oval externally, not enlarged.

Tergite 8 (lateral view) narrower, slightly taller than T7, with pleural region not sclerotized. Tergite 9 with ectoproct fused, extending ventrally full height of segment. Gonapophysis lateralis well sclerotized, elongate, oval (length 0.4 mm, width 0.1 mm), with relatively long, robust setae.

Bursal-spermathecal complex. Spermatheca pillbox-shaped, with vellum; vellum of approximately same height as length of base, open to bursal duct via slit on side. Spermathecal invagination truncate, extending almost full depth of spermathecal bowl. Spermathecal duct well sclerotized, wavy, with smooth surface basally, extending directly toward subgenitale, becoming straight and setose distally at base of subgenitale. Bursa copulatrix small, consisting of light membranous pouch attached to distal section of subgenitale base, with proximal section or duct extending toward spermatheca, probably with two transparent, elongate bursal glands above spermatheca and spermathecal duct.

Subgenitale. Distal section well sclerotized, with two, distinctly separated, round lobes extending from leathery, partially sclerotized, membranous base that extends internally. Lobes with rough surface.

Colleterial complex. Colleterial gland elongate, clear, with relatively broad duct extending to small, colleterial reservoir near gonapophyses laterales; reservoir clear, opening via membranous duct above round, striated transverse sclerite.

Specimens examined. Holotype (♂, FSCA) and three paratypes (all from same locality and date; 1♀, FSCA; 1♂, 1♀, Tauber Research Collection, TRC). Both of the female specimens appear slightly teneral; their structures seem softer and more membranous than those on mature specimens of other *Ungla* species.

Geographic distribution. Known only from the type locality (Peru: Department of La Libertad).

Discussion

Sexual dimorphism in *Ungla*

The expression of secondary sexual features in *U. pseudomeleoma* males is by far the most extreme reported for the genus *Ungla*. Males of approximately 60% of the 26 described *Ungla* species have enlarged abdominal spiracles, but only four previously described species exhibit structural modifications of the head. And, among the males of these four species the extent of the modification is very small relative to that in *U. pseudomeleoma*. For example, in the males of three species (*Ungla adamsi* Banks, *U. curimaguensis* Sosa, and *U. grandispiracula* Tauber *et al.*), the anterior region of the frons is swollen, whereas in the females of these species the frons is flat (Tauber *et al.* 2017). *Ungla adamsi* also expresses sexual dimorphism in the frontal markings. In males of this species, the frontal marking is circular, and it occurs above the swollen lower portion of the frons. In the female, the frontal marking begins on the upper part of the frons and extends laterally onto the lower and lateral parts of an unswollen frons. Finally, in *U. bolivari* (Banks) there is a small lobe on the frons of the male. No other parts of the head, including the antennae, are involved in this species' sexual dimorphism.

In comparison, the sexually dimorphic external features of *U. pseudomeleoma* not only are more elaborate than those of other *Ungla* species, but they also involve more regions of the head. That is, in addition to the ornamentation of the lower part of the male frons (which occurs in the other *Ungla* species discussed above), *U. pseudomeleoma* has extreme modifications of the antennae (scapes and basal flagellar segments), the interantennal region of the vertex (furrowed frontal horn), the upper frons (a depression), and the lower frons (swollen ridges, pair of horns apparently comprised of consolidated elongate setae).

Homoplasy with *Meleoma* Species

As shown above, *U. pseudomeleoma*'s secondary sexual characters are highly modified and very unusual for the genus *Ungla*. However, they also appear highly modified even when compared with those of *Meleoma*, a genus noted for elaborate expressions of the antennae, vertex, and frons. Indeed, *U. pseudomeleoma*'s features appear to mimic those of *Meleoma* species in many ways.

Antennal modifications. The elongation of the male *U. pseudomeleoma* scape and the enlargement and setation of its basal flagellar segments (Fig. 8A) closely resemble those of several *Meleoma* species, specifically *Meleoma emuncta* (Fitch) (Fig. 8B); for comparison with a simpler male scape in *Meleoma*, see *Meleoma* undescribed sp. #1 (Fig. 8C), and for a more complex male scape see *Meleoma stangei* Penny (Fig. 8D). Interestingly, in all the sexually dimorphic species (the *Meleoma* species, including the elaborate *M. stangei*, and also *U. pseudomeleoma*), the pedicel does not appear to be modified significantly. The elaborate features are limited to the scape and flagellum. The main antennal differences between *U. pseudomeleoma* and the majority of the horned *Meleoma* species are in the orientation and insertion of the scapes. In most *Meleoma* species the bases of the scapes are widely separated (usually by more than the width of the scape itself), and they extend outward laterally from the base. In *U. pseudomeleoma* the scapes originate close to each other, and they extend in a forward direction. However, *U. pseudomeleoma* falls within the range of variation expressed by *Meleoma*. For example, in the undescribed *Meleoma* sp #1, the interantennal horn is reduced or absent, and like those in *U. pseudomeleoma*, the scapes of males and females originate close to each other and generally extend in a forward direction (Figs 8C, 10F).

Interantennal horn (upper horn). The interantennal horn of *U. pseudomeleoma* resembles, and yet differs, from that of most species in the *M. emuncta* and *M. dolicharthra* (Navás) groups of *Meleoma* (compare Fig. 9.A1 with Figs 9B, 9C, and 9D). For example, in almost all of the horned *Meleoma* species, the base of the interantennal horn is located on the dorsal surface of the vertex between the dorsal toruli. And, in most of the horned *Meleoma* species, the dorsal interantennal region is relatively broad and smooth (Figs 9B, 9C); in others it can be furrowed, or the horn may be small (Fig. 9D). When a horn is present, the distal end usually has a deep or shallow bifurcation or other modification; often the paired tips are rounded and setose. The interantennal horn of *U. pseudomeleoma* is within the range of variation expressed by species of *Meleoma*; its horn is longitudinally furrowed from its base; the furrowing persists distally; and the tip of the horn is bifurcated and carries small setae. However, unlike in *Meleoma* species the furrowed base of the interantennal horn bends ventrally between the scapes and onto the upper surface of the frons; it then bends at a right angle to extend forward at a lower level on the frons (Fig. 9.A1-3, 10A, 10B). Also, the bifurcated arms of the horn are somewhat flattened vertically (Fig. 10B), not rounded or flattened horizontally as in most or perhaps all *Meleoma* species.

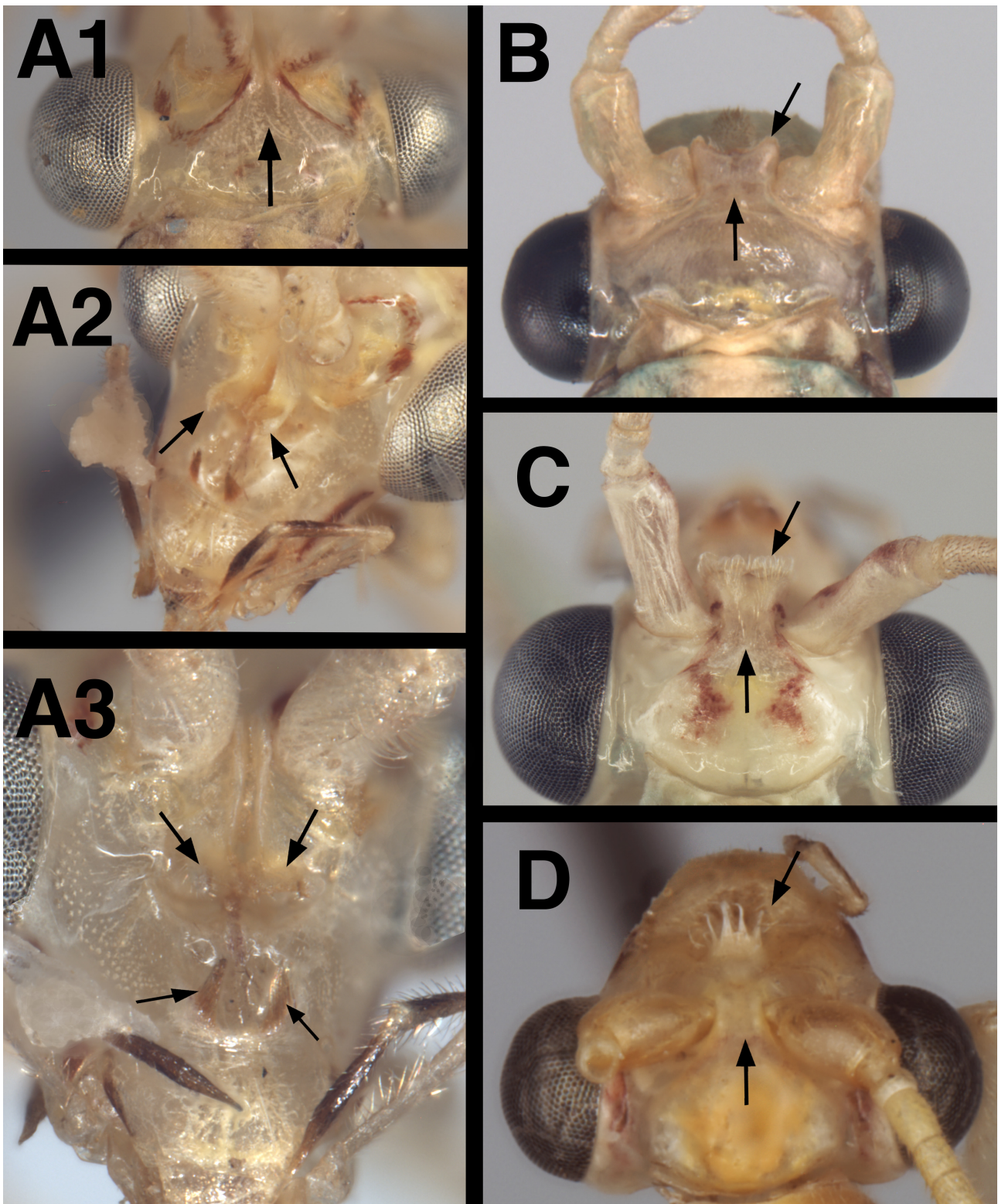


FIGURE 9. Comparison of the male cranial features of *Ungla pseudomeleoma* with those of selected *Meleoma* species, A. *Ungla pseudomeleoma*, **sp. nov.**, Holotype (Peru: La Libertad, FSCA). A1. Dorsal aspect (base) of interantennal horn (arrow indicates dorsal origin of mesal trough), A2. Frontolateral aspect of interantennal and lower horns (The arrows indicate paired distal arms of the interantennal horn; the lower horns are brown, triangular, below and anterior to the interantennal horns), A3. Frontal close-up of interantennal trough, interantennal horn, and lower horn (upper arrows indicate tips of paired interantennal horns; lower arrows indicate paired lower horns); B-D. Dorsal aspect of interantennal horn (lower arrows on each figure indicate base of the horn; upper arrows indicate tip of interantennal horn. B. *Meleoma emuncta* Fitch (USA: California, TRC); C. *Meleoma hageni* Banks (USA: Arizona, TRC); D. *Meleoma* unidentified sp. (Argentina: Jujuy, TRC).

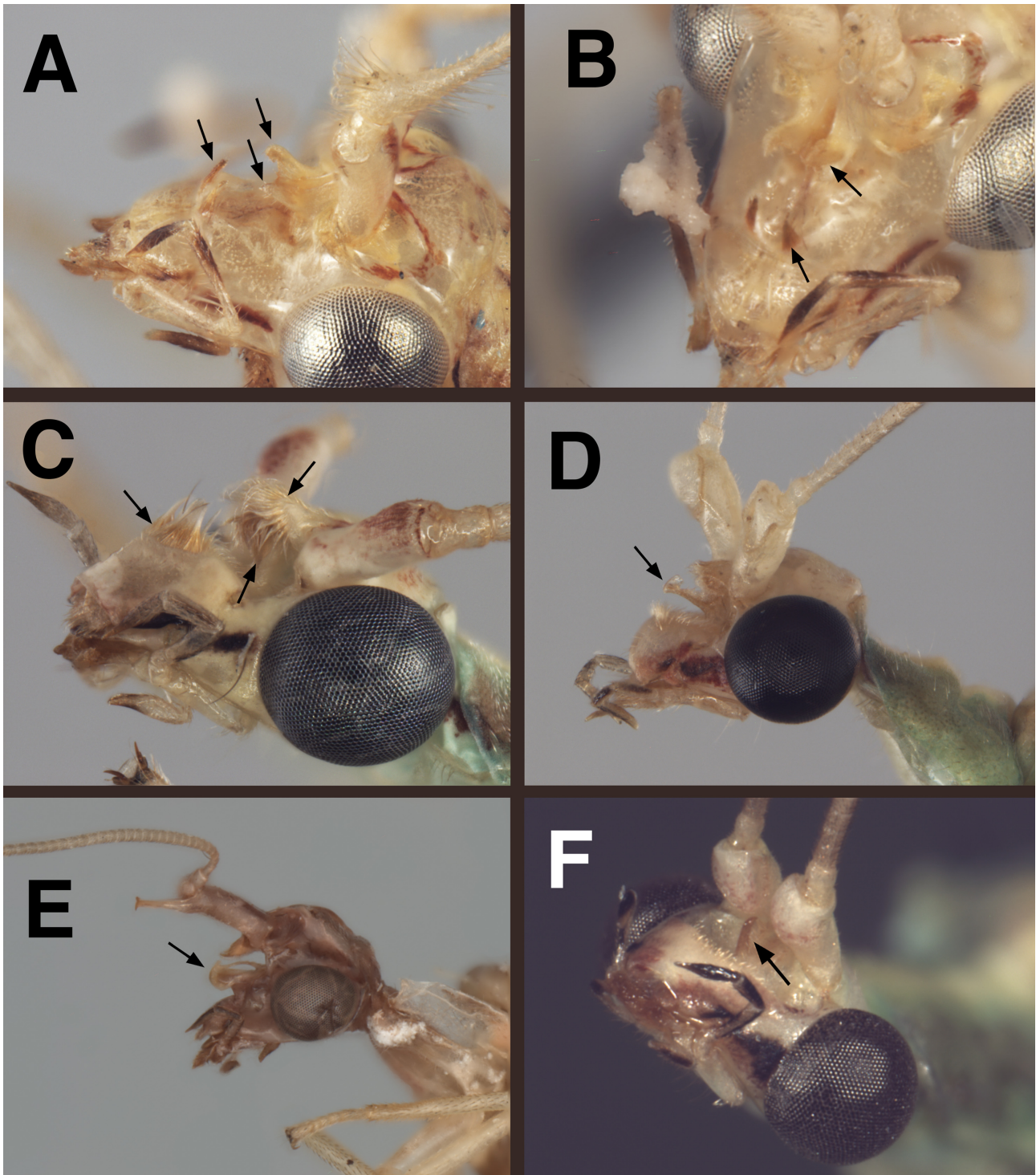


FIGURE 10. Male cranial features of *Ungla pseudomeleoma* and selected *Meleoma* species. A, B *Ungla pseudomeleoma*, **sp. nov.**, Holotype (Peru: La Libertad, FSCA). A. Lateral; B. Frontolateral (arrows in both A and B indicate paired arms of the interantennal and lower horns); C. *Meleoma hageni* Banks (USA: Arizona, TRC), lateral (downward-facing arrows indicate interantennal and lower horns, upward-facing arrow indicates horn within frontal cavity); D. *Meleoma furcata* (Banks) (USA: Arizona, TRC), lateral (arrow indicates horn within frontal cavity); E. *Meleoma stangei* Penny (Mexico: Baja California, San Diego County Museum of Natural History), lateral (arrow indicates double horn within frontal cavity); F. *Meleoma* undescribed sp. #1 (USA: Arizona, TRC), frontolateral (arrow indicates horn within frontal cavity; note absence of interantennal and lower horns).

Frontal cavity. The frontal cavity of *U. pseudomeleoma* is somewhat similar in shape to that of species in the *M. dolicarthra* species group; its lateral margins are rounded, emarginate, and fairly distinct. It is slightly shallower than the cavities of most *Meleoma* species. It is noteworthy that *U. pseudomeleoma* appears to lack a frontal horn extending from within the cavity (below the interantennal horn), as occurs in many but perhaps not all horned species of *Meleoma* (For examples, see Figs 10C–F).

In most, if not all, horned *Meleoma* species, the lower surface of the frontal cavity and/or the posterior surface of the clypeus are very setose and apparently glandular. Also, in some *Meleoma* species, e.g., *Meleoma hageni* Banks, there is a horn-like structure at the distal end of the cavity. Such is also the case with *U. pseudomeleoma*. It has a tall, narrow ridge along the distal margin of the frontal cavity, and the upper edge of the ridge bears a pair of brownish, triangular, vertically striated projections that give off a shiny metallic sheen under some lighting conditions. These structures appear to be formed by a series of rigid, closely spaced setae extending upward. Superficially, the structures in *U. pseudomeleoma* appear homologous to similar-looking ones in *M. hageni* (Fig. 10C) and *Meleoma signoretti* Fitch (Tauber 1969, Plate 5C), which also are on raised areas below the frontal cavity and are comprised of tufts of setae with a metallic sheen. However, on the *M. hageni* male, the ridge and setal tufts may be located on the upper (proximal) end of the clypeus, not on the distal end of the frons as in *U. pseudomeleoma* and *M. signoretti*. Thus, homology of these structures awaits confirmation. In all of the species mentioned above, and in at least some other *Meleoma* species, the clypeus appears to be enlarged, rigid, and shield-like. The clypeus of *U. pseudomeleoma* may have similar but less pronounced enlargement.

Function of the male head modifications. The sexually dimorphic structures of the head were shown to have roles in courtship and mating for at least two species of *Meleoma* (Toschi 1965, Tauber 1969). Specifically, during courtship the female approaches the male frontally and inserts her mouthparts into his frontal cavity. She appears to feed at the frontal region while he initiates copulation, and in *M. emuncta* it appears that the enlarged and curved male antennal structures hold the female in place while he establishes the copulatory connection. It would be very interesting to determine if the homoplasy in the sexually dimorphic head morphology seen in the horned *Meleoma* species and *U. pseudomeleoma* also includes homoplasy in behavioral function during courtship and copulation.

Acknowledgements

My sincere thanks to Lionel A. Stange for his generous help in making specimens from the Florida State Collection of Arthropods available for study, and also for pointing out the unusual *Meleoma*-like specimens. My systematic work continues to benefit from earlier support supplied by the National Science Foundation, the NRI-USDA Competitive Grants Program, the National Geographic Society, Western Regional Project W-4185, and Cornell University.

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