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A New Genus and Species of Delphacidae (Hemiptera: Fulgoroidea: Delphacidae) from Costa Rica

CHARLES R. BARTLETT
Department of Entomology and Wildlife Ecology, 250 Townsend Hall, 531 S. College Ave., University of Delaware, Newark, Delaware, 19716-2160, USA. E-mail: Bartlett@udel.edu

Abstract

Melaniphax suffusculus **gen. et sp. nov.** is described from Costa Rica, representing the 57th delphacid species recorded from the country to date. The new genus is superficially similar to *Caenodelphax* Fennah in general appearance in that the body is uniformly colored with the wings infuscated. Distinctive features of the new taxon include simple, forceps-like gonostyli, a broadly compressed aedeagus with large serrate lateral flanges, and the anal tube bearing a pair of short, stout, truncate, caudally-directed processes on the ventro-caudal margin and slender, elongate processes from the antero-ventral margin.

Key words: Delphacidae, Fulgoroidea, planthopper, new species, Costa Rica

Introduction

The Delphacidae (Hemiptera: Auchenorrhyncha: Fulgoroidea) of Costa Rica were recently reviewed by Bartlett and Kunz (2015) in association with the description of a new genus and species. They provided a checklist of 55 delphacid species form Costa Rica. Subsequently, *Lamaxa occidentalus* (Muir) was reported from the country (Bartlett & Kennedy 2018), the first reported Tropidocephalini (Delphacinae).

Here, an additional delphacid taxon from Costa Rica is described representing a new genus and species. The new taxon is assigned to the subfamily Delphacinae, tribe Delphacini because the posttibial spur (calcar) bears teeth along the trailing margin, and the phallus is comprised of an entirely fused aedeagus and phallotheca, bearing an elongate suspensorium connected to the antero-ventral margin of the anal tube as is characteristic of that tribe. The new species was found among specimens associated with biodiversity surveys made in cooperation with the Instituto Nacional de Biodiversidad (INBio).

Materials and methods

All available specimens were reviewed. All specimens are from the University of Delaware, Department of Entomology, Insect Reference Collection, Newark, DE (UDCC). The primary type and a female paratype are donated to the Instituto Nacional de Biodiversidad, Santo Domingo, Heredia, Costa Rica (INBio). Exemplars are also deposited at the Smithsonian Institution, National Museum of Natural History (USNM), Washington, D.C.

Examined specimens were provided with 2D barcode labels and data captured using "Arthropod Easy Data Capture" (Schuh *et al.* 2010, Schuh 2012, Arthropod Easy Capture 2013) in the NSF sponsored "Tri-Trophic Thematic Collection Network" (Tri-Trophic TCN, http://tcn.amnh.org/). These data are available via the iDigBio (www.idigbio.org) specimen portal.

Planthopper nomenclature follows Bartlett *et al.* (2014), except forewing venation, which follows Bourgoin et al. (2015), and male terminalia follow Asche (1985) as updated by Bourgoin & Huang (1990). In the description, the term aedeagus is used as is usual in descriptive taxonomy, despite this structure actually representing the fused

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aedeagus and phallotheca. Features attributed to the genus are not repeated in the species description except for clarity.

Photographs and measurements were taken using a digital imagery system consisting of a Nikon SMZ1500 microscope, Nikon Digital Sight DS-U1 camera and NIS Elements Imaging software (version 3.0). Line art was digitally traced from photographs. All measurements are in millimeters (mm). Specimen measurements were taken for descriptive (not statistical) purposes, and are from type material (n=6) unless otherwise specified.

Abdomens were cleared (macerated) by soaking in 10% KOH solution overnight. All cleared parts were placed in microvials in glycerin and pinned beneath the specimen for permanent storage. Label data were recorded for all included specimens. The holotype label was quoted verbatim using "/" to indicate a line break and "//" to indicate a new label and with supplemental information given in brackets. For other material examined, label data were re-written to maintain consistency in pattern, beginning with the country, state or province, and more specific locality, followed by the collection date, collector, and lastly the number, sex of specimens (m=male, f=female), and specimen depository given in parentheses.

Taxonomy

Family Delphacidae Leach, 1815

Subfamily Delphacinae Leach, 1815

Tribe Delphacini Leach, 1815

Genus *Melaniphax* gen. nov.

Type species. *Melaniphax suffusculus* sp. nov., by monotypy and present designation.

Diagnosis. Body dark (shades of brown), carinae concolorous to body, compact, with a slightly hunched appearance, vertex and frons in lateral view appearing smoothly rounded. Wings infused with fuscous. Calcar knife-like, with ~10 distinct teeth. Male pygofer without processes or teeth on ventral margin of opening, armature flattened, dorso-caudally projected in form of medially conjoined pair of semicircles. Gonostyli (~parameres) simple (bearing large tooth on caudal margin below midline, evident in lateral view). Aedeagus broad and short, bearing large lateral flange. Anal tube with pair of large, short and blunt caudally projected processes conspicuous on caudolateral margin and a pair of fine elongate processes originating on anterior ventral margin.

Description. Small, robust, compact; slightly hunchbacked in lateral view. Body dark, carinae concolorous. Head narrower than pronotum (Fig. 1B), vertex weakly projected in front of eyes. Vertex approximately quadrate, about equal in length and width. Inflection between vertex and frons smoothly rounded. Frons broad, sides weakly arched (Fig. 2A). Medial facial carinae forking above fastigium. Antennae relatively short, segment II somewhat longer than I. Lateral carinae of pronotum laterally arched, not reaching posterior margin. Mesonotum bearing 3 carinae, becoming obscure posteriorly, tegulae conspicuous. Hind leg (Fig. 1C) with 2 lateral spines, 1 near femoral-tibial joint, 1 near midlength; tibial apex with 5 spinules, arranged 3+2. Basitarsus with 6 apical spinules, arranged 4+2, second tarsomere with row of 4 spinules. Beak reaching (not exceeding) hind coxae.

Forewing (Figs 1A, 1B) uniformly infuscated, weakly deflexed at nodal line; venation (Fig. 3A) with Sc and RA unbranched, RP 1-2 branched (varies), M unbranched and CuA 3 branched. Metatibial spur (Fig. 1C) cultriform, bearing row of distinct black-tipped teeth on posterior margin. 2C

Male genitalia with pygofer triangular in lateral view (Fig. 2D); opening in caudal view sinuate, subcircular with keeled margins (Fig. 2C), lacking projections or teeth on ventral margin of opening. Gonostyli (≈parameres) (Figs 2C, 3D) simple (unbranched), forceps-like, basal angle small (type species bearing tooth on caudal margin just below midline). Suspensorium distinct, elongate. Aedeagus (Figs 2B, 3B, 3C) short, flattened and very stout, gonopore ventral, near apex. Male anal tube with stout, truncate caudally directed processes on laterocaudal margin and pair of fine projections from antero-ventral margin.

Remarks. Superficially, *Melaniphax* gen nov. is similar to *Caenodelphax* Fennah 1965 (*sensu* Kennedy &

Bartlett 2014). They are similar in both genera having a dark body and deeply infuscated wings, and the male terminalia are grossly similar in a structural sense but differ in numerous details. *Melaniphax* differs from *Caenodelphax* in that the former has a hump-backed appearance, with the head in lateral view having a smoothly arced profile (*Caenodelphax* has a rounded fastigium, but the face is straight in profile), median carina of frons joined above the fastigium in *Melaniphax*, below in *Caenodelphax*. *Melaniphax* has an inflection of the wings at the nodal line that *Caenodelphax* lacks. The male terminalia differ in the form of the genital diaphragm (in *Melaniphax* foliate, dorsocaudally directed, with median V-shaped concavity for reception of the aedeagus, versus in *Caenodelphax* the diaphragm medially thickened and projected caudally). The aedeagus in *Melaniphax* is strikingly stout with lateral flanges, whereas *Caenodelphax*, while somewhat flattened is more nearly tubular. Finally, *Melaniphax* has a pair of elongate processes originating on the antero-ventral part of the anal tube, lacking in *Caenodelphax*.

Melaniphax gen. nov. bears some similarities to *Akemetopon* Weglarz & Bartlett 2011 with regard to the male terminalia. Both genera have simple forceps-like parameres and similar builds to the pygofer, genital diaphragm and anal tubes, but *Akemetopon* has a ventral tooth on the opening of the pygofer and a tubular, downcurved aedeagus. The similarities may suggest a close phylogenetic relationship among these genera.

Etymology. The "*Melaniphax*" was constructed from the Greek "*melanos*" beaning black, dark; joined with "*–phax*", a truncation of the delphacid genus name '*Delphax'*. The name is intended as masculine.

Melaniphax suffusculus sp. nov.

(Figs 1–3)

Type locality. Costa Rica, Heredia Provice nr Puerto Viejo, La Selva Biological Station.

Diagnosis. Body brown with infuscated wings, carinae concolorous with body. Head in lateral view smoothly rounded vertex + frons. Body in lateral view with hunch-backed appearance. Male terminalia without teeth or processes on the ventral margin of opening in caudal view. Gonostyli simple, forceps-like, bearing a tooth on caudal margin just below midline. Aedeagus short, compressed, very stout bearing asymmetrical lateral serrate projections. Anal tube with short, stout caudally directed projections on caudoventral margin and slender, elongate projections on anterocaudal margins.

Description. *Color.* General color brown (Figs 1A, B), carinae concolorous; genae and antennae slightly paler, pronotum (including paranota) and mesonotum dark brown, slightly paler at anterior margin of pronotum and scutellum; legs and venter paler, wings uniformly infuscate; eyes dark, ocelli with reddish cast.

Structure. Length male with wings 2.31 mm (n=3); without wings 1.3–1.4 mm (n=3); female with wings 2.4 mm (2.3–2.6 mm, n=3); without wings 1.6 mm (1.3–1.7 mm, n=3) (wings 1.96 mm (1.9–2.2 mm, n=6). Body in lateral view with slightly hunched appearance (Fig. 1A).

Head. Head (dorsal view, including eyes) distinctly narrower than pronotum (Fig. 1B); in lateral view (Fig. 1A), slightly projected, uniformly arched from posterior margin of head to frontoclypeal margin. Vertex with carinae distinct (median carina weaker), nearly square (slightly wider than long, l:w ratio 0.72: 1, length x=0.12 mm, width x=0.17 mm; posterior margin truncate. Frons (Fig. 2A) with lateral margins weakly convex, widest near lower margin of eyes (x=0.19 mm), weakly narrowed dorsally (x=0.16 mm) and ventrally (x=0.15 mm), length x=0.38 mm; l:w ratio 2.05: 1; median carina forking above fastigium. Clypeus triangular, x=0.15 mm, with median carina. Antennal scape about as long as wide (length x=0.12 mm), pedicel 1.7x longer than scape (x=0.18 mm) bearing rows of rhinaria; flagellum fine, bristlelike, longer than pedicle.

Thorax. Pronotum subequal in length to vertex (length at midline x=0.11 mm); lateral carinae diverging, not reaching posterior margin; posterior margin shallowly V-shaped. Mesonotum at midline about 4x length of pronotum (x=0.46 mm); junction of scutum and scutellum demarcated by faint inflection; lateral margins of mesonotum slightly elevated near midlength, scutellum slightly depressed. Wings macropterous (Figs 1A, B), exceeding abdomen (forewing x=1.96, 1.88–2.19 mm); forewing venation with ScP+R fork at approximately same level as fork of CuA, fusion of anal veins (i.e., Pcu and A1) much proximad of forks of RP and CuA; Sc and RA unbranched, RP 1–2 branched (varies), M unbranched, CuA 3 branched.

Metatibial spur shorter than basitarsus (Fig. 1C, 0.21 vs 0.29 mm), weakly tectiform, bearing 10–12 distinct black-tipped teeth on trailing edge.

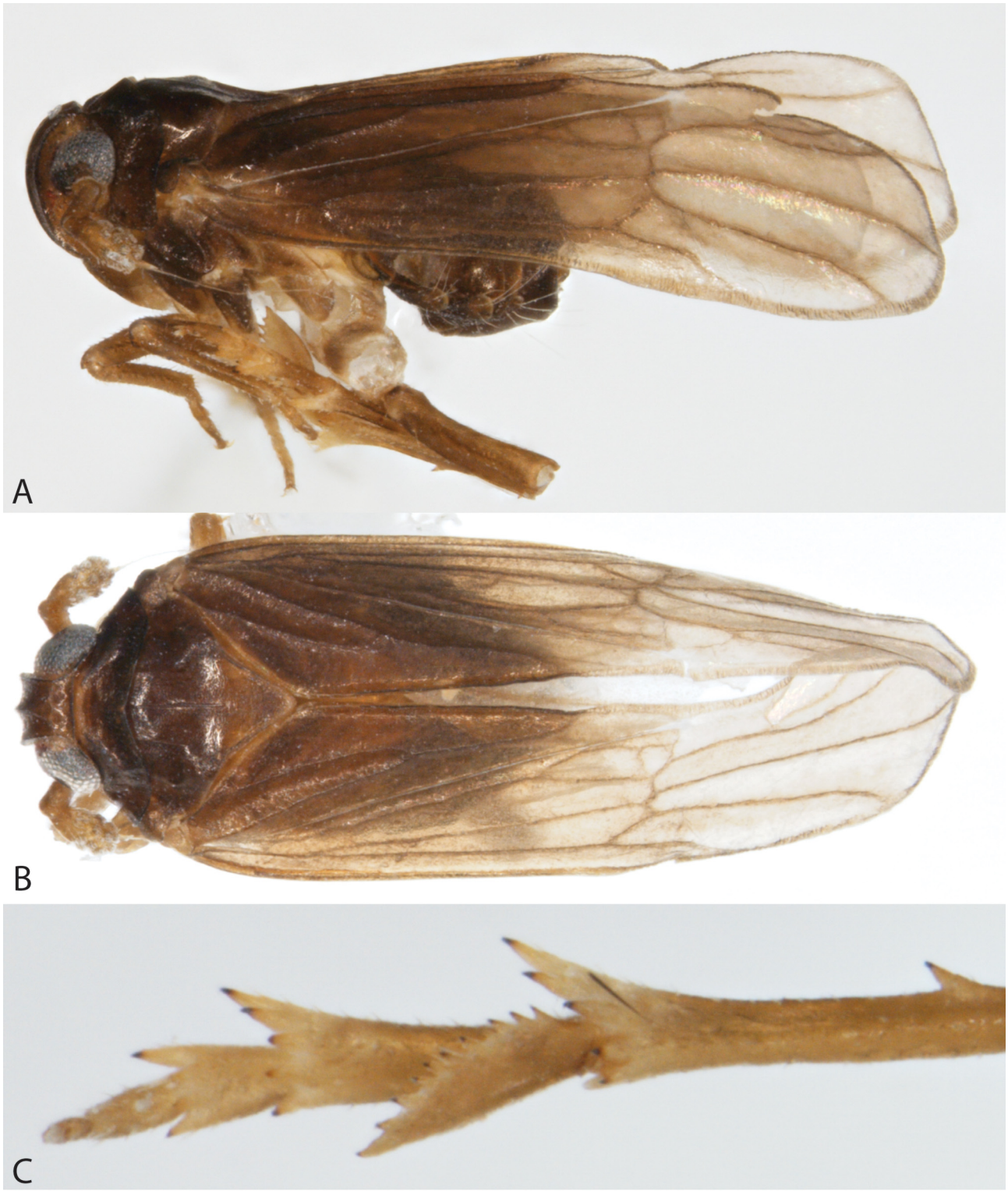

FIGURE 1. *Melaniphax suffusculus* **gen. et sp. nov.** (paratype); A. lateral habitus, B. dorsal habitus, C. Apex of hind leg, ventral view.

Male terminalia. Pygofer in lateral view (Fig. 2D) roughly triangular, narrowed both dorsally and ventrally from region near ventral margin of pygofer opening; anterior margin truncate, caudal margin without teeth or processes. In caudal view (Fig. 2C), pygofer opening with sinuate, bluntly carinate margins; diaphragm well developed; opening for gonostyli small, compressed-oval in shape with pinched lateral margins; armature projection large, dorsocaudally directed, foliate, consisting of pair of semicircles, connate medially producing median notch for aedeagus. Aedeagus peculiar (Figs 2B, 3B, 3C)—short and very broad, laterally compressed, widest before midlength (in

lateral view), tapering anteriorly to rounded apex (gonopore ventral, subapical); bearing large asymmetrical serrate flanges on left and right sides—left flange arising ventrally just past midlength, tapering distally to 4–5 strong serrations, right flange semicircular, arising diagonally bearing 7–8 serrations (becoming smaller proximally). Aedeagus tapering proximately to junction with suspensorium. Suspensorium elongate, strap-like, joined with aedeagus near base. Anal tube subquadrate in lateral view latero-caudal margins with short, strong, stout caudally directed projections (posterior margin deeply concave in dorsal view), posteriorly truncate, rugose with rounded ventral inflection; ventro-caudal margin inflected to create a rounded concavity between stout dorsal process and ventral margin; a pair of thin elongate processes arising from antero-ventral margin, projecting ventro-caudally on either side of aedeagus. Anal column short and bluntly conical, just exceeding top of anal tube.

FIGURE 2. *Melaniphax suffusculus* **gen. et sp. nov.** (paratypes); A. habitus, frontal view, B. left lateral view of aedeagus, connective and anal tube detached from pygofer, C. male terminalia, caudal view, D. male terminalia, left lateral view.

Etymology. The species name is derived from the Latin word "*suffusculus"* meaning somewhat brown or fuscous.

Remarks. The shape of the aedeagus and anal tube of this species are unusual and distinctive. Having only a single species to attribute to the genus makes it difficult to ascertain whether particular attributes should be ascribed to the genus or just to the species. In this case, I would anticipate that the very broad aedeagus bearing lateral flanges may be particular to this species, but having a broad, flattened and straight aedeagus are probably genus-level features. Similarly, the general form of the anal tube is likely a genus-level feature, but the specifics of the caudal margin and thin, elongate processes are species level considerations.

Material examined. HOLOTYPE: "COSTA RICA, Heredia / nr Puerto Viejo, La SelvaBiol. / Sta. 179ft N10 25' W84 00, /at Station 23.ii.04–23.iii.04 [sic. should read 2.iii] / CRBartlett, JCryanJUrban // HOLOTYPE / Melaniphax / suffusculus / Det: C.R. Bartlett" (INBio, male).

Paratypes: COSTA RICA: Heredia: near Puerto Viejo, La Selva Biological Station, 10.41667°N 84°W, 55 m, 23 Feb–02 Mar 2004, C.R Bartlett, J. Cryan and J. Urban (1m, 2f); 24 Feb 2004, C.R Bartlett, J. Cryan and J. Urban (3m, 1f, 1 broken); 25–26 Feb 2004, C. R. Bartlett (3m, 1f, 1 broken) (representatives donated USNM, INBio).

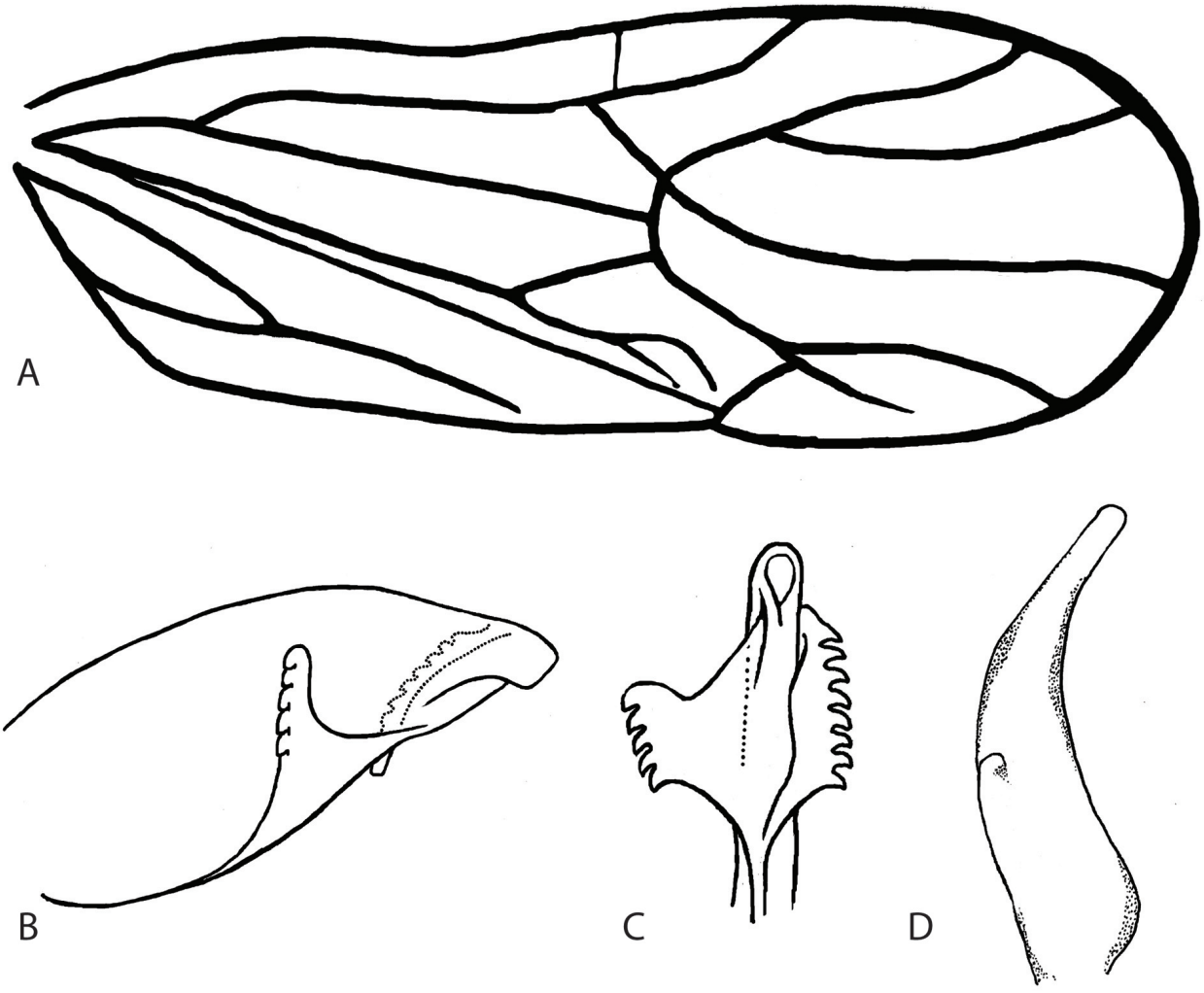

FIGURE 3. *Melaniphax suffusculus* **gen. et sp. nov.** A. wing venation, B. aedeagus, right lateral view, C. apex of aedeagus, ventral view, D. left gonostylus, widest view.

Discussion

The Delphacidae in Costa Rica are better known than those of other Mesoamerican countries. While discovery of new or unreported taxa among unprocessed specimens remains relatively easy, the approximate number of delphacid species that might be found in Costa Rica is becoming apparent. *Melaniphax suffusculus* sp. nov. represents

the 57th delphacid species reported from Costa Rica. I am aware of at least 7 delphacid taxa from Costa Rica that appear to be undescribed—3 in the Tropidocephalini, 4 Delphacini (2 *Pareuidella*, 1 *Megamelus*, 1 unplaced, some of these noted in Bartlett & Kunz 2015)—which are intended as subjects of future work. It is certain that more careful scrutiny of specimens in existing collections will yield additional taxa. Revisionary study of poorly investigated genera found in Costa Rica—e.g., *Ugyops* Guerin-Meneville, *Euides* Fieber, *Phrictopyga* Caldwell—may discover additional species, but possibly also synonymies.

INBio has DNA barcoded 285 delphacid specimens from Costa Rica, obtaining barcodes from 191 specimens representing 42 BINs (barcode index numbers, a calculated proxy for species), many of which have not been provided formal taxonomic identifications (is not clear how many of these represent new taxa as opposed to known but not identified). In a review of these BINs, it does not appear that *Melaniphax suffusculus* sp. nov. is among them.

From available collections, it would appear that the delphacid fauna of Costa Rica is near 70 species. However, additional collections, particularly if from geographically disparate regions of Costa Rica and utilizing active collecting methods (sweeping, vacuum sampling) that may yield brachypterous forms, may cause this estimate to be revised upward.

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