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A New Species of *Abbrosoga* (Hemiptera: Fulgoroidea: Delphacidae), An Endemic Puerto Rican Planthopper Genus, with an Updated Checklist of the Delphacidae of Puerto Rico

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Abstract

The genus *Abbrosoga* Caldwell (Delphacidae: Delphacinae: Delphacini) was described in Caldwell & Martorell (1951) to include the single species *Abbrosoga errata* Caldwell, 1951. Here, a second species, *Abbrosoga multispinosa* **n. sp.** is described. Revised diagnostics are presented for the genus and *A. errata*, including a key to species. A compiled list of 64 delphacid species from Puerto Rico is presented, with updated nomenclature, including the new species and a new record of *Delphacodes aterrima* for Puerto Rico.

Key words: Delphacidae, Fulgoroidea, planthopper, new species, *Abbrosoga*, Puerto Rico

Introduction

The planthoppers (Hemiptera: Auchenorrhyncha: Fulgoroidea) encompass many species of economic importance, including important plant pathogen vectors (e.g., O'Brien & Wilson 1985, Wilson 2005). The Delphacidae are the second largest family of planthoppers (after Cixiidae) with more than 2,200 described species (Bartlett & Kunz 2015, Bourgoin 2018). In Puerto Rico, economic species include the plant disease vectors *Peregrinus maidis* (Ashmead) (the corn delphacid—vector of Maize mosaic rhabdovirus, MMV, e.g., Martin *et al*. 2017); *Saccharosydne saccharivora* Westwood (West Indian Canefly—vector of sugarcane yellow leaf phytoplasma, SCYLP; Arocha *et al.* 2015) and *Tagosodes orizicolus* (Muir) (the rice delphacid—vector of Rice *hoja blanca* virus RHBV, e.g., Romero *et al.* 2014). Despite their importance, the delphacid fauna of Puerto Rico remains understudied.

The insects of Puerto Rico have been subject to long-term faunistic study (e.g., Maldonado-Capriles 1996). Caldwell and Martorell (1951) reviewed the planthopper fauna of Puerto Rico (excluding Kinnaridae), presented keys to species, and provided descriptions of new species (new species attributed to the first author). Wolcott (1950) independently compiled a list of insects from Puerto Rico, including some planthopper taxa not treated by Caldwell & Martorell (1951). The Kinnaridae were treated by Ramos (1957), and additional planthopper species were reported from subsequent survey or systematic work (e.g., Kramer & Martorell 1960, Maldonado-Capriles & Navarro 1967, Segarra *et al.* 2013).

Among the delphacid species described in Caldwell & Martorell (1951), the genus *Abbrosoga* Caldwell, 1951 was established for *A. errata* Caldwell, 1951 (Delphacidae: Delphacinae: Delphacini). The genus is unusual in bearing an elongate process from the base of the aedeagus, similar to that found in many Tropidocephalini. However, *Abbrosoga* belongs in Delphacini because of the presence of teeth on the trailing margin of the metatibial spur (the 'calcar'). However, the base of the aedeagus closely approximates the anal tube so that an elongate suspensorium is not present.

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Here, the diagnostic features of *Abbrosoga* are reviewed with a second species described. Also, a key including the two species of *Abbrosoga* is provided. The new species was found among specimens collected by Dr. Alejandro Segarra while surveying planthoppers of possible economic importance in Puerto Rico. A compiled list of delphacid species from Puerto Rico, with updated nomenclature, is also provided.

Materials and methods

All available specimens of *Abbrosoga* were reviewed, including type material. Specimens were examined from the following collections.

AMNH—American Museum of Natural History, New York, NY; NCSU—North Carolina State University, Department of Entomology, Raleigh, NC; UDCC—University of Delaware, Department of Entomology, Insect Reference Collection, Newark, DE; UPRM—University of Puerto Rico, Mayagüez Campus, Insectarium Collection, Mayagüez, Puerto Rico; and USNM—Smithsonian Institution, National Museum of Natural History, 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 visualized at Discover Life (www.discoverlife.org) and 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).

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=2 males) 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. For primary types, labels were 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 rewritten 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, and specimen depository given in parentheses.

Species records for Puerto Rico were compiled from available literature plus specimen records compiled in the Tri-Trophic TCN. Early literature is summarized in the Metcalf catalog (Metcalf 1943) and citations presented in that catalog were not duplicated in Table 1. Species authors are reported in Table 1 and not repeated in the text. We do not present species synonymy lists here, as these are available in Metcalf (1943), Bartlett *et al.* (2014) and Bourgoin (2018); however, we note names as presented in Wolcott (1950) and Caldwell & Martorell (1951) to clarify updates in nomenclature.

Results

Including the new species described here, 64 species are reported from Puerto Rico (Table 1). Some literature records, including *Sogatella furcifera* and *Stobaera tricarinata*, are considered errors as noted in Table 1, and 2 species are doubtful and require verification. *Delphacodes aterrima* is reported from specimens and is a new species record for Puerto Rico. Specimen data for *Delphacodes aterrima* in Puerto Rico are available from iDigBio, and specimens are deposited in UDCC.

Taxonomy

Genus *Abbrosoga* Caldwell, 1951

Type species. *Abbrosoga errata* Caldwell, 1951

Diagnosis. Body pale with weakly patterned wings (known species with an entirely pale frons); head and thoracic carinae distinct, concolorous with body. Aedeagus bearing a ventral projection (unique among New World Delphacini); pygofer opening without ventral processes, anal tube (≈segment X) without processes.

Amended description. Elongate and slender forms. Head narrower than pronotum (Figs 1A, 3A), vertex weakly projected in front of eyes. Vertex and frons broad, fastigium rounded (Figs 1C, 3C). Medial facial carinae forking near fastigium (Figs 1B, 3B). Median carina of vertex weak. Lateral carinae of pronotum not clearly reaching posterior margin. Hind leg (Fig. 1D) with 2 lateral spines, 1 near femoral-tibial joint, 1 near midlength; tibial apex with 5 spinules, arranged 3+2. Basitarsus with 7 apical spinules, arranged 5+2, second tarsomere with row of 4 spinules. Forewing (Figs 1C, 3C) elongate, mostly clear with diffuse patterning (in distal cubital area and less often in costal region), with an elongate dark spot on commissural margin at apex of claval veins. Forewing venation (Fig. 6) with Sc and RA unbranched, RP 3 branched, M unbranched and CuA 2–3 branched. Metatibial spur foliaceous and tectiform, row of many fine, black-tipped teeth on posterior margin. Male genitalia with pygofer subquadrate in lateral view (Figs 2B, 3E), distinctly taller than wide; opening in caudal view subcircular with rounded margins (Figs 2A, 3F), lacking projections. Gonostyli (≈parameres) (Figs 4C, 5A) simple (unbranched), basal angle small; proximally diverging, apex medially converging in distal forth. Aedeagus (Figs 4B, 5B) strongly curved ventrally, subtended with slender process(es). Aedeagal base closely approximating anal tube (aedeagal base symmetrical), suspensorium O-shaped, surrounding base of aedeagus including subtending process, stem of suspensorium (between aedeagus and anal tube) short. Male anal tube unarmed.

FIGURE 1. *Abbrosoga errata* Caldwell, male holotype except D (Maricao State Forest); A. dorsal habitus, B. front, C. lateral habitus, D. hind leg and metatibial spur, ventral view, E. labels.

Remarks. Superficially, *Abbrosoga* is similar to other pale Delphacini, such as *Toya* Distant, *Metadelphax* Wagner, *Spartidelphax* Bartlett & Webb, *Syndelphax* Fennah, *Sogatella* Fennah or perhaps *Tagosodes* Asche & Wilson. The dorsum of the mesonotum bears a narrow, weak median vitta, unlike the strong vitta of *Sogatella* and *Tagosodes*. Unlike *Metadelphax*, *Toya*, *Spartidelphax* and some *Syndelphax*, the frons is entirely pale, instead of bearing dark markings near the carinae. The wings are diffusely patterned unlike macropterous *Syndelphax*. The form of the terminalia, and the aedeagus in particular, contrasts with all these genera; the aedeagus of *Abbrosoga* bears a subtending process that is not found in any of these other genera.

It is possible that *Abbrosoga* is phylogenetically most closely allied with *Phrictopyga* and *Pygospina* in that they are all pale taxa, with a weak median vitta (absent in *A. multispinosa* **n. sp.**), diffusely pale wings, and bearing (at least between *Pygospina* and *Abbrosoga*) similarities in the male genitalia (shape of pygofer, parameres and aedeagus). However, both *Pygospina* and *Phrictopyga* are slightly laterally compressed with the pygofer and anal tube bearing processes that are absent in *Abbrosoga*.

Caldwell & Martorell (1951) compared *Abbrosoga* to *Nilaparvata* Distant and *Columbisoga* Muir. *Nilaparvata* has teeth on the basitarsus of the hind legs, a synapomorphy of the genus. *Columbisoga* may have similar coloration and also has a similar structure of the aedeagus (i.e., bearing a ventral projection), but is in the Tropidocephalini, and lacks teeth on the calcar (and the distinct suspensorium found in Delphacini).

All available specimens of *A. errata* were collected at relatively high elevations, above 2000 ft (610 m) as reported by Caldwell and Martorell (1951). In contrast, specimens of *A. multispinosa* **n. sp.** were collected at low elevation (the type locality is at approximately 40 m). No plant associations are available for *Abbrosoga*. At present the genus is only known from Puerto Rico; however, we have examined a single male specimen from Costa Rica (La Selva Biological Station, UDCC) that is substantially similar to *Abbrosoga* and may be placed in the genus once more material becomes available. We have also examined a specimen from Brazil (Santa Catarina, UDCC) that has substantially similar male terminalia, but is much larger and darkly patterned and may be an allied undescribed genus.

Etymology. The etymology of "*Abbrosoga*" was not specified in Caldwell & Martorell (1951), and the underlying meaning is not obvious to us. We speculate that the name is a truncation of the Latin word "*abbreviatus*" plus the Spanish word "*soga*" (rope), meaning 'short rope' a possible reference to the suspensorium. Also, plausibly the name may be comprised of the prefix "*ab*-" (away, from) plus a truncation of "*brosis*" (Greek, food), plus "-*oga*" for euphony; or alternatively an arbitrary combination of letters. The name is treated as feminine in gender.

Key to species of *Abbrosoga* Caldwell

1 Pro- and mesothorax with narrow dorsal median vitta (Fig. 1A), scutellum pale; frons relatively narrow (Fig. 1B, frons l:w ratio >2); gonostyli distally with ventral hook in lateral view (Figs 2B, 4A); aedeagus with single ventral process (Fig. 4B), anal tube dorsocaudally without projection in lateral view (Fig. 4A). . . . . *A. errata*

1' Thorax without median vitta, scutellum dark (Fig. 3A); frons relatively wide (Fig. 3B, frons l:w ratio ~1.5); gonostyli distally truncate in lateral view (Fig. 3E); aedeagus with single ventral process and two dorsolateral processes (Fig. 5B); anal tube projected dorsocaudally in lateral view (Fig. 3E). . . . . *A. multispinosa* **n. sp.**

Abbrosoga errata Caldwell

(Figs 1, 2, 4)

Type locality. Toro Negro Mts., Puerto Rico.

Amended diagnosis. Thorax with narrow pale median vitta, scutellum pale (Fig. 1A). Forewing embrowned between apices of Sc and RA (Fig. 1C). Frons relatively narrow (frons l:w ratio ~1: 2.15–2.37). Male gonostyli distally with ventral hook in lateral view; aedeagus with single ventral process (Figs 2B, 4A), anal tube dorsocaudally without projection in lateral view.

Amended description. *Color.* General color stramineous to brownish-yellow, carinae concolorous to body; eyes dark (Figs 1A, 1C). Pro- and mesonotum with narrow pale median vitta, darker laterally; pronotum with small dark spot on either side of median carinae. Mesonotum pale medially, including scutellum, darker laterally.

Macropterous wings (Fig. 1C) clear with distal cubital area diffusely fuscous and a small spot on the commissural margin at apex of claval veins and a second on the leading margin between the apices of the Sc and RA. Hind wings hyaline.

Structure. Length male 3.6–3.8 mm with wings (reported as 3.8 for male and 4.2 mm for female in Caldwell & Martorell, 1951); ~2.2 (n=1) without wings. *Head*. Head (dorsal view, including eyes) just narrower than pronotum (Fig. 1A); in lateral view, slightly projected anteriorly. Vertex with conspicuous carinae (median carina weak), length 0.30 mm, width 0.24–0.26 mm; posterior margin truncate. Frons (Fig. 1B) widest between eyes (0.26–0.27 mm), weakly narrowed dorsally (0.22 mm) and ventrally (0.18–0.20 mm), length 0.56–0.64 mm; l:w ratio 1: 2.15–2.37; median carina forking near fastigium. Clypeus 0.29–0.30 mm, with median carina. Antennal scape small, longer than wide (length 0.10–0.11 mm), pedicel nearly 3 times longer than scape (0.27–0.29 mm) bearing rows of rhinaria; flagellum long and setose. *Thorax*. Pronotum shorter than vertex (length at midline 0.18–0.19 mm); lateral carinae of pronotum diverging, not reaching posterior margin; posterior margin straight (weakly notched medially). Mesonotum at midline more than 2x length of pronotum (0.47–0.57 mm); lateral carinae weakly diverging, reaching posterior margin, median carina becoming obsolete on scutellum. Wings macropterous (Fig. 1C), exceeding abdomen (forewing 3.07–3.08 mm); forewing venation with fork of RP at approximately same level as fork of CuA (inner and outer subapical cells subequal), fusion of anal veins (i.e., Pcu and A1) much forks of RP and CuA; Sc and RA unbranched, RP 3 branched, M unbranched, CuA 2 branched. Metatibial spur large (Fig. 1D, 0.31 mm), tectiform and smooth, bearing 24–32 fine, black-tipped teeth on trailing edge. Basitarsus with 7 apical spinules, arranged 5+2, second tarsomere with row of 4 spinules. *Abdomen*. Male terminalia (Figs 2, 4). Pygofer in lateral view (Figs 2B, 4A) roughly quadrate, narrower dorsally than ventrally; anterior and caudal margin truncate, caudal margin without teeth or processes. In caudal view (Fig. 2A), pygofer opening with smoothly rounded margins; diaphragm developed but not strongly sclerotized; opening for gonostyli small, approximately oval; armature projection parallel sided, rectangular and weekly scoop-shaped. Aedeagus (Figs 2B, 4B) tubular, gradually tapering distally, curved ventrally at midlength, with an acuminate process dorsally originating just past apex of curve; gonopore appearing apical. Subtending the aedeagus is a conspicuous process, ~2/3 length of aedeagus; sinuate, widest at base narrowed to an acuminate apex. Gonostyli weakly flattened and rather parallel sided (Fig. 4C); basal angles small, diverging basally, parallel near midlength and abruptly converging near apex to broad apices, weakly convex in caudal view; in lateral view (Figs 2B, 4A) apices appearing hooked ventrally. Anal segment small, rather truncate in lateral view, processes absent, dorsocaudal angle (in lateral view) not projecting); anal column nearly as elongate as height of anal segment.

Remarks. Caldwell & Martorell (1951) remarked that all the specimens of this species were collected at above 2000' elevation. Few specimens of this species are reported and none of these with host plant associations.

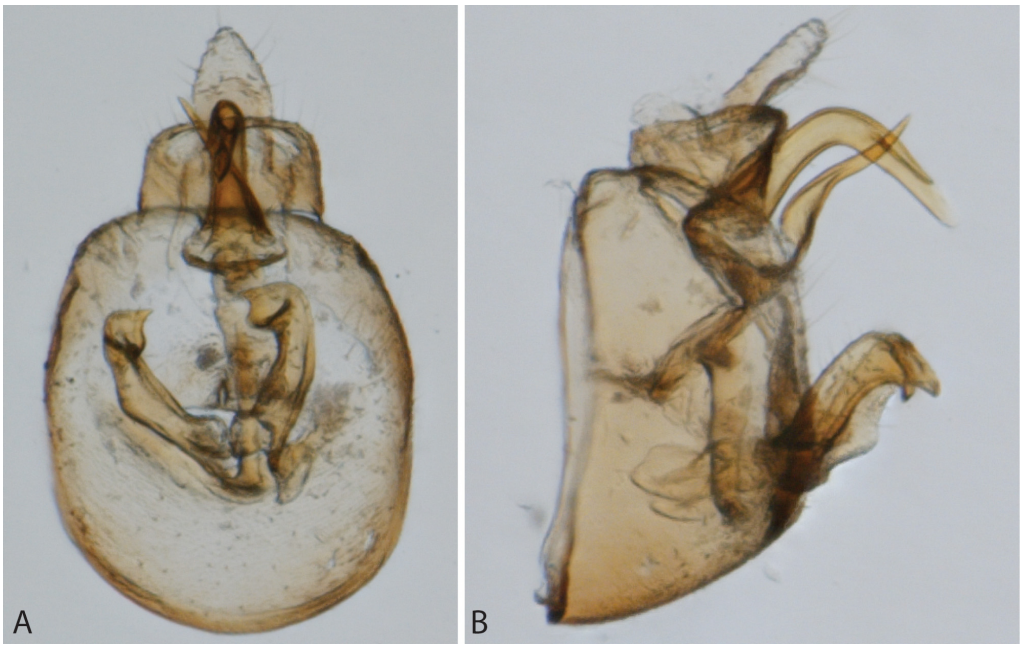

FIGURE 2. *Abbrosoga errata* Caldwell, male terminalia (Maricao State Forest), A. caudal view, B. left lateral view.

Type material examined. "Toro Negro Mts / 11-14-47 P.R. // HOLOTYPE // Abbrosoga / errata / Cald. / [barcode label UDCC_TCN 00094754]" (1 male, dissected, USNM); "Maricao / P.R. / July 27, 1914 // PARATYPE / Columbisoga / errata n.sp. / Caldwell / [barcode label] UDCC_TCN 00016869" (1 male, AMNH).

Other material examined. Puerto Rico, Jayuya, Puntita, July 1962, J. Maldonado C (1 male, dissected, USNM); HWY 120, km 14, Maricao St[ate]. For[est]., VIII-8-1999, C.W. O'Brien, P.W. Kovarik (1 male, dissected, UDCC).

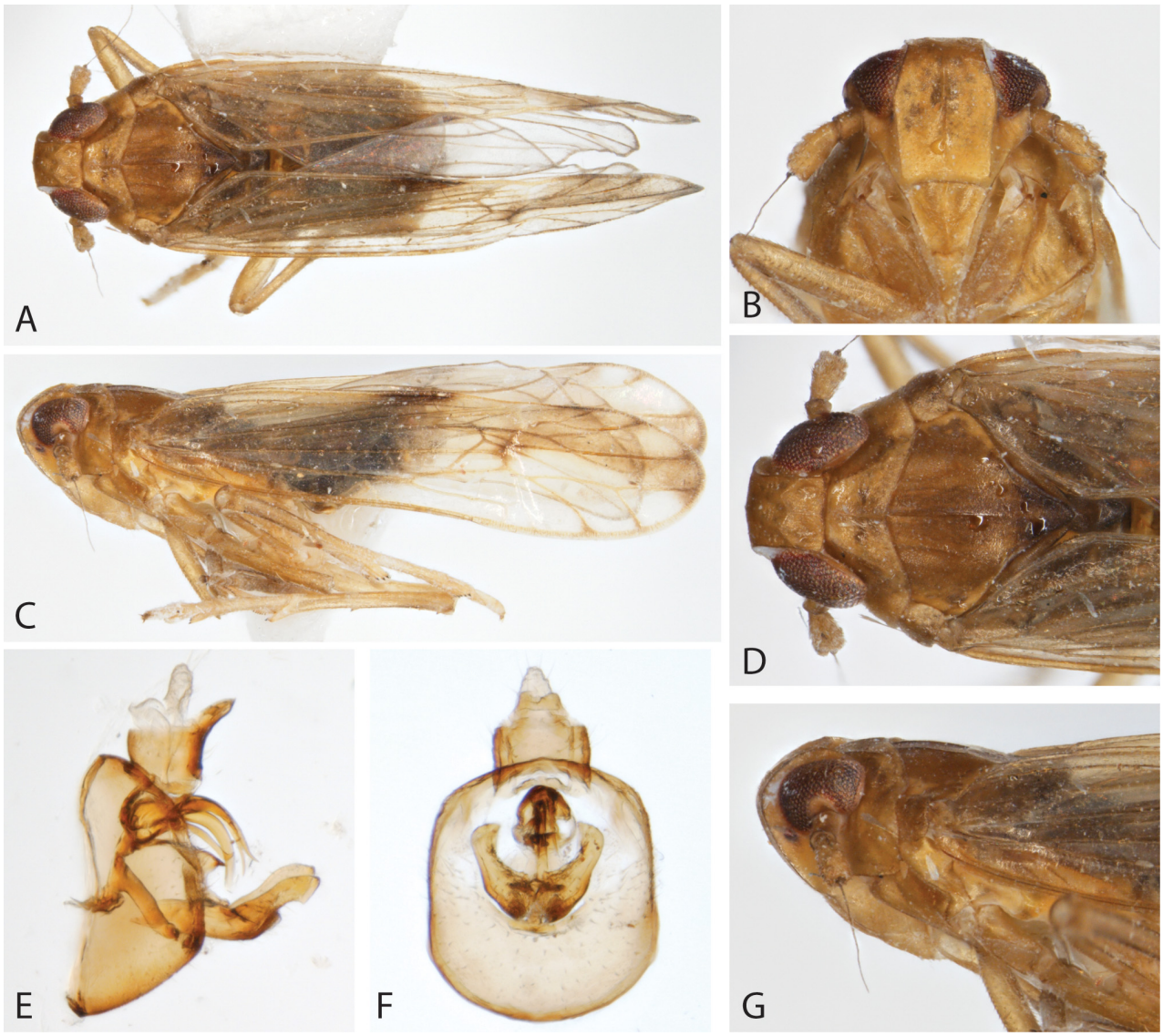

FIGURE 3. *Abbrosoga multispinosa* Otero and Bartlett, male paratype, Mayagüez, P.R. A. dorsal habitus, B. front, C. lateral habitus, D. dorsal view, head and thorax, E. male terminalia, lateral view, F. male terminalia, caudal view, G. lateral view, head and thorax.

Abbrosoga multispinosa Otero and Bartlett, n. sp.

(Figs 3, 5, 6)

Type locality. Puerto Rico, Mayagüez, 18°13. 11N, 67°08.86W.

Diagnosis. This species can be separated from *A. errata* by having its thorax without median vitta and scutellum dark (Fig. 3A). Forewing clear between apices of Sc and RA (Fig. 3C). Frons broad (Fig. 3B, frons l:w ratio ~1: 1.4–1.5). Male gonostyli distally without ventral hook in lateral view (Fig. 3E, distally acute in caudal view); aedeagus (Fig. 5B) latitudinally subdivided into 3 processes plus subtending process; anal segment with dorsocaudal projection in lateral view.

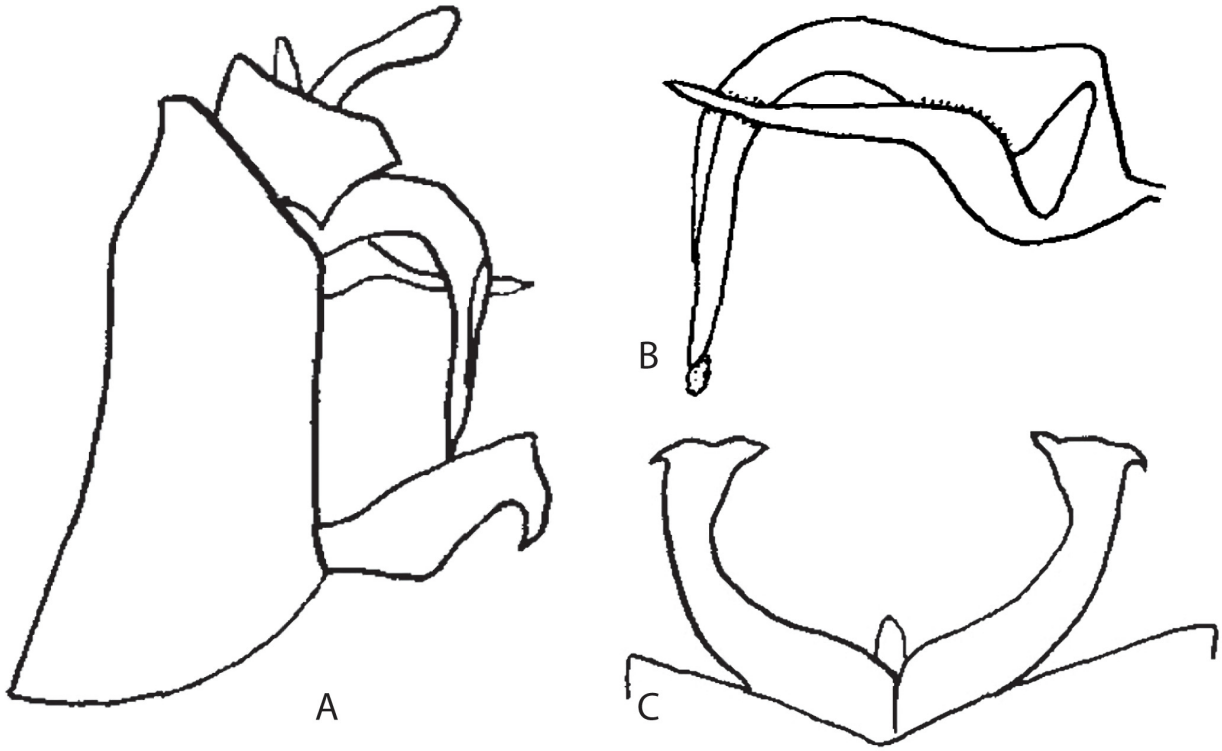

FIGURE 4. *Abbrosoga errata* Caldwell, male terminalia line art (redrawn from Caldwell and Martorell 1951), A. male terminalia, left lateral view; B. aedeagus, right lateral view; C. gonostyli, caudal view.

Description. *Color*. General color light brown (paler ventrally), eyes dark reddish (Fig. 1A). Pronotum with small dark spot on each side of median carinae, scutellum darker than scutum. Macropterous forewings (Fig. 3C) clear with cubital area distally diffusely fuscous, with an elongated spot at the apex of the clavus, hind wings clear.

Structure. Body length 3.39–3.63 mm including wings (~2.23 mm without wings). *Head.* Head (dorsal view, including eyes) narrower than pronotum (Fig. 3A), in lateral view (Fig. 3C) slightly projected anteriorly. Vertex with conspicuous carinae (median carina weak but evident), vertex subquadrate, length 0.23–0.26 mm, width 0.22–0.25 mm posterior margin truncate. Frons broad (Fig. 3B), widest near ventral margin of eyes; length 0.46 mm, width (at widest 0.31–0.32; l:w ratio 1: 1.4–1.5), narrowed both dorsally and toward frontoclypeal suture; median carina forking near fastigium. Clypeus as ¾ as long as frons, bearing median carina. Antennal scape small about as long (0.08–0.10 mm) as wide; pedicel about 2x length of scape (0.19–0.21 mm), bearing rows of rhinaria and small setae, flagellum elongate and bristle-like, about 2x length of pedicel. *Thorax*. Pronotum shorter than vertex (length at midline 0.17–0.20 mm); median carina distinct, lateral carinae diverging, nearly reaching posterior margin; posterior margin weakly concave. Mesonotum at midline about 3x length of pronotum (0.59–0.60 mm); lateral carinae slightly sinuate and weakly diverging, reaching posterior margin, median carina reaching posterior margin of scutellum. Wings macropterous, exceeding abdomen (forewing 2.67–3.01 mm); forewing venation (Fig. 6) very similar to *A. errata* except CuA 3-branched. Nodal line appearing obsolete near CuA (not reaching wing margin). Metatibial spur large (0.33–0.34 mm), tectiform and smooth, bearing 27–30 fine, black-tipped teeth on trailing edge. *Abdomen*. Male terminalia (Figs 3E, F, 5). Pygofer, in lateral view, roughly quadrate, much narrower dorsally than ventrally; anterior margin weakly concave, caudal margin weakly convex, without teeth or processes. In caudal view, pygofer opening with smoothly rounded margins; diaphragm developed, not strongly sclerotized; opening for gonostyli small, approximately oval. Diaphragm armature caudally projected with paired processes dorsally and midventral carina extending to opening at gonostyli. Aedeagus (Figs 3E, 5B), in lateral view, downcurved, with 2 elongate dorsal processes and a single elongate sinuate ventral process about 2/3 length of aedeagus; gonopore apparently at apex of aedeagus. Gonostyli, in caudal view (Figs 3F, 5A), weakly flattened, broad at base with basal angle blunt and distinct, distally rather forceps-like, converging to acute apex (in widest view), without ventral hook in lateral view. Anal tube small, rather truncate in lateral view, ventrocaudal processes

absent, dorsocaudal angle (in lateral view) elongately projected; anal column about 2/3 as elongate as height of anal tube.

Remarks. *Abbrosoga multispinosa* externally is strongly similar to *A. errata*, although it is slightly more robust, with a broader vertex and frons. We note that the scutellum is dark in *A. multispinosa* (thorax without a pale median vitta), and pale in *A. errata* (thorax bearing a narrow pale median vitta), and the forewing in *A. errata* is infuscated near between the apices of the Sc and the RA, but not in *A. multispinosa*, at least among the specimens we have examined to date. The most definitive diagnostic features is the multiple-subdivided aedeagus of *A. multispinosa* as opposed to the simple aedeagus of *A. errata.*

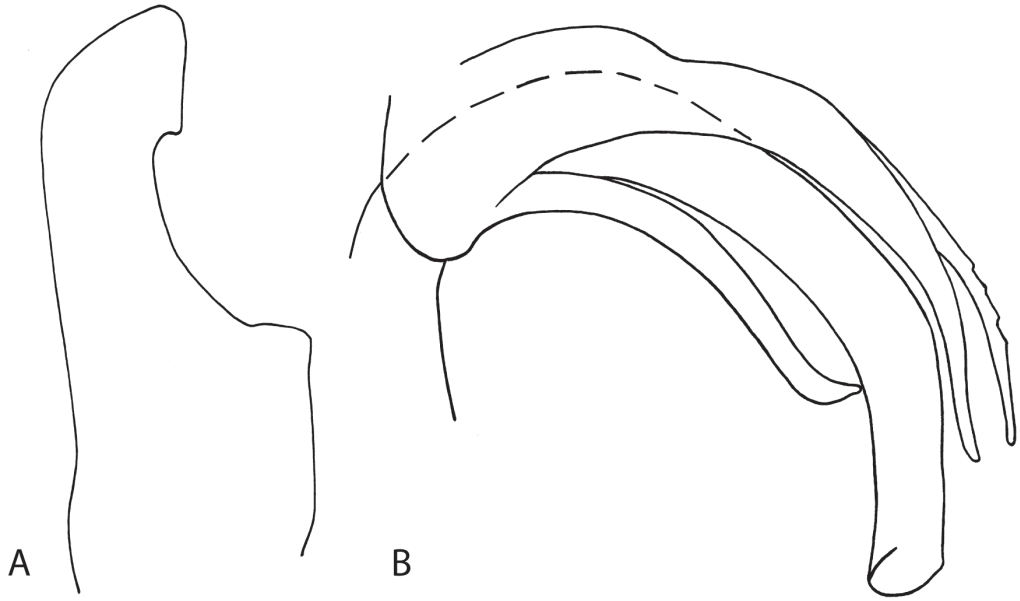

FIGURE 5. *Abbrosoga multispinosa* Otero and Bartlett, male genitalia, line art, A. left gonostylus, widest view; B. aedeagus, left lateral view (slightly rotated clockwise).

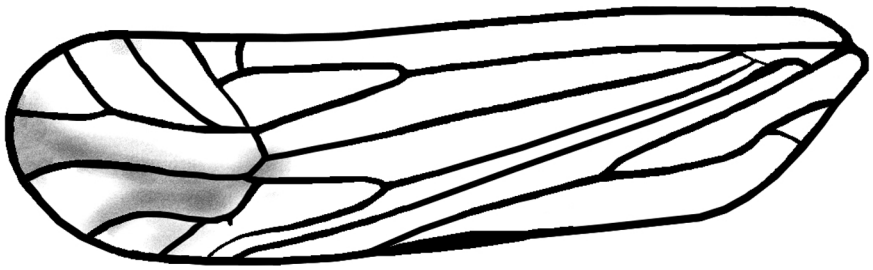

FIGURE 6. *Abbrosoga multispinosa* Otero and Bartlett, wing venation (from left wing of paratype).

Etymology. The species name is derived from the Latin word "*multus*" (much, more), truncated and joined with an *-i* to the Latin word "*spinosus*" (thorny), given a feminine termination to match *Abbrosoga*. The name is a reference to the form of the aedeagus.

Type material examined. "PUERTO RICO / Mayagüez / 18°13.11N 67°08.86W / 5-6.X.2011 / Ex: Blacklight / Coll. A. Segarra // [red paper] HOLOTYPE / Abbrosoga / multispinosa Otero & Bartlett 2018 // UDCC_TCN 00058470" (1 male, dissected, USNM). Paratype: same as holotype, except 'paratype' indicated and barcode label UDCC_TCN 00058469.

TABLE 1. Checklist of species of Delphacidae reported from Puerto Rico

	Current name	Name(s) as previously reported	References [and comments]
	Asiracinae		
1	*Copicerus irroratus* Swartz		Metcalf 1943, Wolcott 1950, Caldwell & Martorell 1951, Bartlett *et al*. 2014
2	*Pentagramma bivittata* Crawford		Caldwell & Martorell 1951, Bartlett *et al*. 2014
3	*Ugyops isolatus* Caldwell	*Ugyops isolata*	Caldwell & Martorell 1951 (Mandatory emendation ICZN 1999 article 30.1.4.3)
4	*Ugyops occidentalis* Muir		Metcalf 1943, Wolcott 1950, Caldwell & Martorell 1951
5	*Ugyops osborni* Metcalf	*Ugyops granulata* Osborn	Metcalf 1943, Wolcott 1950, Caldwell & Martorell 1951 (*U. granulata* preoccupied, replaced by *U. osborni*)
6	*Neopunana alapa* (Caldwell)	*Punana alapa*	Caldwell & Martorell 1951, Asche 1983
7	*Neopunana caribbensis* (Caldwell)	*Punana caribbensis*	Caldwell & Martorell 1951, Asche 1983
8	*Neopunana puertoricensis* (Muir)	*Punana puertoricensis*	Metcalf 1943, Wolcott 1950, Caldwell & Martorell 1951, Asche 1983
9	*Neopunana robusta* (Caldwell)	*Punana robusta*	Caldwell & Martorell 1951, Asche 1983
10	*Neopunana vulgaris* (Caldwell)	*Punana vulgaris*	Caldwell & Martorell 1951, Asche 1983
	Delphacinae: Saccharosydnini		
11	*Neomalaxa flava* Muir		Metcalf 1943, Caldwell & Martorell 1951, Fennah 1959
12	*Saccharosydne saccharivora* (Westwood)		Metcalf 1943, Wolcott 1950, Caldwell & Martorell 1951, Bartlett *et al*. 2014
	Delphacinae: Delphacini		
13	*Abbrosoga errata* Caldwell		Caldwell & Martorell 1951
14	*Abbrosoga multispinosa* **n. sp.**		
15	*Anchidelphax havanensis* (Crawford)	*Delphacodes havanensis*	Metcalf 1943, Wolcott 1950, Caldwell & Martorell 1951, Fennah 1959, 1965; Maldonado-Capriles & Navarro 1967
16	*Caenodelphax teapae* (Fowler)	*Delphacodes taepae*	Metcalf 1943, Wolcott 1950, Caldwell & Martorell 1951, Fennah 1965, Maldonado-Capriles & Navarro 1967, Kennedy & Bartlett 2014, Bartlett *et al*. 2014
17	*Chionomus havanae* (Muir & Giffard)	*Delphacodes havanae*	Caldwell & Martorell 1951, Fennah 1971, Bartlett *et al*. 2014
18	*Chionomus balboae* (Muir & Giffard)	*Delphacodes balboae*	Caldwell & Martorell 1951, Fennah 1971; Bartlett *et al*. 2014
19	*Delphacodes arcuata* Beamer	*Delphacodes albinotata* (Crawford) (nec. Muir & Giffard)	Beamer 1948, Caldwell & Martorell 1951, Bartlett *et al*. 2014 [*Delphacodes arcuata* is a replacement name]
20	*Delphacodes aterrima* Muir		Specimen record (UDCC)
21	*Delphacodes mesada* Caldwell		Caldwell & Martorell 1951
22	*Delphacodes puella* (Van Duzee)		Metcalf 1943, Wolcott 1950, Caldwell & Martorell 1951, Bartlett *et al*. 2014
23	*Delphacodes vaccina* Caldwell		Caldwell & Martorell 1951, Bartlett *et al*. 2014
24	*Euides afasciata* (Caldwell)	*Euidella afasciata*	Caldwell & Martorell 1951, Metcalf 1952, Fennah 1959

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TABLE 1. (Continued)

	Current name	Name(s) as previously reported	References [and comments]
25	*Euides fasciatella* (Osborn)	*Euidella fasciatella* *Liburniella fasciatella* *Pissonotus striolus* Osborn	Metcalf 1943, 1952; Wolcott 1950, Caldwell & Martorell 1951, Kennedy *et al*. 2012, Bartlett *et al*. 2014
26	*Flavoclypeus andromedus* (Van Duzee)	*Delphacodes andromeda*	Metcalf 1943, Wolcott 1950, Kennedy & Bartlett 2014, Bartlett *et al*. 2014
27	*Flavoclypeus nigrifacies* (Muir)	*Delphacodes xerosa* Caldwell	Caldwell & Martorell 1951, Kennedy & Bartlett 2014, Bartlett *et al*. 2014
28	*Javesella pellucida* (Fabricius)	*Delphacodes pellucida*	Metcalf 1943, Wolcott 1950, Bartlett *et al*. 2014 [This record from Osborn 1935 may be in error, Caldwell & Martorell 1951 gives Osborn's record as synonym of *Delphacodes albinotata*]
29	*Kosswigianella lutulenta* (Van Duzee)	*Delphacodes lutulenta*	Metcalf 1943, Wolcott 1950, Bartlett *et al*. 2014
30	*Megamelus electrae* Muir		Caldwell & Martorell 1951, Sosa *et al*. 2007
31	*Metadelphax propinqua* (Fieber)	*Delphacodes propinqua*	Metcalf 1943, Wolcott 1950, Caldwell & Martorell 1951, Gonzon & Bartlett 2007, Bartlett *et al*. 2014
32	*Neomegamelanus elongatus* (Ball)	*Megamelanus elongates*	Metcalf 1943, Wolcott 1950
	Neomegamelanus elongatus reductus (Caldwell)	*Megamelanus elongatus reductus*	Caldwell & Martorell 1951, McDermott 1952, Bartlett *et al*. 2014
33	*Nilaparvata caldwelli* Metcalf, 1955	*Nilaparvata muiri* Caldwell 1951 (nec. China)	Caldwell & Martorell 1951, Metcalf 1955, Nast 1984, Bartlett 2007, Bartlett *et al*. 2014 [*N. caldwelli* is a replacement name for preoccupied *N. muiri*, and a senior synonym of *N. bis* Nast, see Bartlett 2007]
34	*Nilaparvata wolcotti* Muir & Giffard		Metcalf 1943, Wolcott 1950, Caldwell & Martorell 1951, Bartlett 2007, Bartlett *et al*. 2014
35	*Nilaparvata serrata* Caldwell		Caldwell & Martorell 1951, Bartlett 2007, Bartlett *et al*. 2014
36	*Nothodelphax slossonae* (Ball)	*Chloriona slossonae*	Caldwell & Martorell 1951, Wilson & Hilburn 1991, Bartlett *et al*. 2014
37	*Pareuidella magnistyla* (Crawford)	*Euidella magnistyla*	Caldwell & Martorell 1951, Kennedy *et al*. 2012, Bartlett *et al*. 2014
38	*Pareuidella weedi* (Van Duzee)	*Euidella weedi*	Caldwell & Martorell 1951, Kennedy *et al*. 2012, Bartlett *et al*. 2014
39	*Peregrinus maidis* (Ashmead)		Metcalf 1943, Wolcott 1941, 1950; Caldwell & Martorell 1951, Bartlett *et al*. 2014
40	*Phrictopyga contorta* (Muir)	*Sogata parvula* Osborn	Metcalf 1943, Wolcott 1950, Caldwell & Martorell 1951, Fennah 1959
41	*Phrictopyga occidentalis* (Muir)		Caldwell & Martorell 1951, Bartlett *et al*. 2014
42	*Pissonotus absenta* Caldwell		Caldwell & Martorell 1951 [To *incertae sedis* by Bartlett & Deitz 2000: 146, not a *Pissonotus*]
43	*Pissonotus albovenosus* (Osborn)		Metcalf 1943, Wolcott 1950, Caldwell & Martorell 1951, Bartlett & Deitz 2000, Segarra *et al*. 2013, Bartlett *et al*. 2014
44	*Pissonotus festucae* Bartlett		doubtful record from Bartlett & Deitz 2000, Bartlett *et al*. 2014
45	*Pygospina aurantii* (Crawford)	*Sogata aurantii*	Metcalf 1943, Wolcott 1950, Caldwell & Martorell 1951
46	*Pygospina reducta* Caldwell		Caldwell & Martorell 1951

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TABLE 1. (Continued)

	Current name	Name(s) as previously reported	References [and comments]
47	*Pygospina spinata* Caldwell		Caldwell & Martorell 1951, Bartlett *et al*. 2014
48	*Tagosodes albolineosus* (Fowler)		Wolcott 1936, 1950; Maldonado-Capriles & Navarro 1967
49	*Sogatella kolophon* (Kirkaldy)	*Sogata furcifera* (Horvath) [error]	Metcalf 1943, Wolcott 1950, Ramos 1947, Caldwell & Martorell 1951, Maldonado-Capriles & Navarro 1967 [*S. furcifera* is an identification error, *S. furcifera* not validly reported from the New World, e.g., Asche & Wilson 1990, Bartlett *et al*. 2014]
50	*Sogatella molina* (Fennah)		Bartlett *et al*. 2014
51	*Spartidelphax detectus* (Van Duzee)	*Delphacodes detecta*	Metcalf 1943, Wolcott 1950, Caldwell & Martorell 1951, Bartlett & Webb 2014, Bartlett *et al*. 2014
52	*Stobaera concinna* (Stål)	*Stobaera tricarinata* (Say) [error]	Osborn 1938, Metcalf 1943, Wolcott 1950 Caldwell & Martorell 1951, Kramer 1973, Bartlett *et al*. 2014 [records of *S. tricarinata* are probably misidentifications of *S. concinna*]
53	*Syndelphax floridae puertoricensis* (Caldwell)	*Delphacodes floridae puertoricensis*	Caldwell & Martorell 1951, Kennedy *et al*. 2012, Bartlett *et al*. 2014
54	*Syndelphax fulvidorsum* (Metcalf)	*Delphacodes fulvidorsum*	Caldwell & Martorell 1951, Kennedy *et al*. 2012, Bartlett *et al*. 2014
55	*Syndelphax humilis* (Van Duzee)	*Delphacodes humilis*	Metcalf 1943, Wolcott 1950, Caldwell & Martorell 1951, Kennedy *et al*. 2012, Bartlett *et al*. 2014
56	*Syndelphax nigripennis* (Crawford)	*Delphacodes nigripennis*	Metcalf 1943, Wolcott 1950, Kennedy *et al*. 2012, Bartlett *et al*. 2014
57	*Tagosodes albifacies* (Caldwell)	*Sogata albifacies*	Caldwell & Martorell 1951, Asche, & Wilson 1990
58	*Tagosodes approximata* (Crawford)	*Sogata approximata*	Metcalf 1943, Wolcott 1950, Caldwell & Martorell 1951, Maldonado-Capriles & Navarro 1967, Segarra *et al*. 2013, Bartlett *et al*. 2014
59	*Tagosodes cubanus* (Crawford)	*Sogata cubana*	Metcalf 1943, Caldwell & Martorell 1951, Maldonado-Capriles & Navarro 1967, Wolcott 1950, Bartlett *et al*. 2014
60	*Tagosodes orizicolus* (Muir)	*Sogata orizicola*	Kramer & Martorell 1960, Maldonado-Capriles & Navarro 1967, Bartlett *et al*. 2014
61	*Tagosodes wallacei* (Muir & Giffard)	*Sogata wallacei*	Caldwell & Martorell 1951, Bartlett *et al*. 2014
62	*Toya boxi* (Muir)		Gonzon & Bartlett 2007, Bartlett *et al*. 2014
63	*Toya nigra* (Crawford)	*Delphacodes axonopi* Fennah	Caldwell & Martorell 1951, Gonzon & Bartlett 2007, Bartlett *et al*. 2014
64	*Toya venilia* (Fennah)	*Delphacodes nigra* (*sensu* Caldwell & Martorell 1951 nec Fennah 1959)	Fennah 1959, 1965; Gonzon & Bartlett 2007

Discussion

Abbrosoga multispinosa **.** was collected from one locality in 2011 and is known from only 2 specimens. *Abbrosoga errata* is presently known from approximately 7 specimens (Caldwell & Martorell, 1951, did not provide explicit information regarding specimens examined), despite our general efforts to collect additional material. Little is known about their biology and these species may be ecologically specialized, or, passive collecting techniques are not effective. The genus is of ecological and evolutionary interest because some morphological features suggest that it may be derived basally within the Delphacini (viz. the close approximation of the base of the aedeagus to the

anal tube and the process ventrad to the aedeagus, potentially homologous to similar structures in the Tropidocephalini). Alternatively, these features may be atavistic, plesiomorphic features providing no phylogenetic evidence; or lastly, the genus may actually belong in the Tropidocephalini, despite contrary morphological evidence (e.g., teeth on the trailing margin of the metatibial spur). The last suggestion may be the least likely given that available evidence suggests monophyly of the Tropidocephalini as currently understood (Urban *et al.* 2010, Huang *et al.* 2017), although taxon sampling to test phylogenetic relationships among the Delphacini and Tropidocephalini remains decidedly unsatisfactory.

The new species of *Abbrosoga* was found during a planthopper survey conducted in Puerto Rico in 2011 for species of possible economic importance. Segarra *et al.* (2013) investigated planthoppers associated with palms, a topic of concern because of the importance of planthoppers as palm pathogen vectors (e.g., Howard & Mead 1980, Wilson 1988, Howard 1991, Howard & Wilson 2001, Gitau *et al.* 2009), where they may vector phytoplasmas, such as lethal yellowing disease (e.g., Gurr *et al.* 2016). Identification of such vectors is important both from the perspective of controlling plant diseases where they occur, and preventing further spread (e.g., Ogle & Harries 2005). Segarra *et al.* (2013) collected 1,031 planthopper specimens and recognized 30 taxa, among which 11 morphospecies (4 delphacids) were not able to be identified to species (Segarra et. al, 2013). This is interesting because, while Caldwell & Martorell (1951) provided reasonably good taxonomic tools, the results of Segarra *et al.* (2013) indicate that further surveys, investigations of ecological interactions (e.g., pathogen vector potential), systematics research, and improved taxonomic tools are required for planthoppers of Puerto Rico, and indeed more broadly for the Caribbean.

Our compiled list of delphacids from Puerto Rico (Table 1) includes 64 species reported from the island, including *A. multispinosa* **n. sp.** and a new island record for *Delphacodes aterrima* based on specimens (1 male, 3 females; collected Mayaguez, Federal Experiment Sta., 10 Oct 1975; P. Freytag) in the University of Delaware collection (UDCC). We consider the record of *Stobaera tricarinata* a misidentification of *Stobaera concinna* (the former is a temperate species, Kramer 1973), and past records of *Sogatella fucifera* are misidentifications of either *Sogatella kolophon* or *S. molina* (e.g., see Asche & Wilson 1990, Bartlett *et al.* 2014). The illustration of *Sogatella furcifera* by Caldwell & Martorell (1951, plate 19, p. 175), is certainly not that species (compare with Asche & Wilson 1990, figs 15–22). *Javesella pellucida,* originally reported by Osborn (1935) needs verification—the record appears to have been considered an error by Caldwell & Martorell (1951: 177). The species is mostly northern, but very widespread, and is doubtfully present in the fauna of Puerto Rico. *Pissonotus festucae* reported by Bartlett & Deitz (2000) is an uncertain identification based on a single specimen (in the USNM). With these caveats, this list represents the current understanding of delphacid species diversity on the island, but it is highly likely that additional species—described or otherwise—remain to be found in Puerto Rico.

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